MZ-L

user manual

revision 1.3

www.moldmasters.com

TempMaster™ series

Mold Masters®
performance delivered

AMENDMENT RECORD Mold-Masters® Users Manual

Issue	Date	Amendments	Author	Authorised
0.0B	24/04/01	First Issue	DH	SK
0.1B	11/09/01	Revised Issue	TJ	
1.0	20/09/01	Revised Issue	DT	JN
1.1	25/03/02	Revised Issue	DT	JN
1.2	01/12/02	Revised Issue	DT	JN
1.3	01/01/06	Added voltage requirement for external standby port	DT	JN

This manual is intended for use with the MZ L-Series Controller

Contents

Specification

The following are general specifications. The actual controller supplied may differ in specified options.

Supply Voltage:	380v 3 phase 50Hz with neutral, others available 220/60Hz Delta
Mains Voltage Output:	Burst fired, zero crossover and Phase Angle fired
Control Method:	Open or closed loop
Earth Leakage Measurement	Earth leakage measurement on individual cards (set at 10mA)
Overload protection:	Fast Blow Fuse
Thermocouple input:	Iron Constantan Fe/Con type 'J', Chromel/Alumel type 'K'.
Control range:	0 - 472 Centigrade (Celsius), 32 - 881 Fahrenheit
Temperature scale:	Centigrade (Celsius) or Fahrenheit
Card Diagnostics LED's	Scan, T/C Fault, load output, ground fault, and fuse fault
Printer output connector	RS-232 serial, DB9 male connector
Alarm Output	Double-pole change-over volt-free contacts, 5A max burden
T/C Tool connector	Contact H-BE24BS Male
Heater Tool connector	Contact H-BE24SS Female
Keypad	4x4 matrix, tactile switch
Display	16 x 40 characters, 128 x 240 pixels LCD, CFL Back Light
Case Details	Heavy duty metal cabinet

Safety Instructions

WARNING

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 380 volts or higher.

Safety Notices - an explanation

Within this manual, safety instructions are marked as follows:

WARNING

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.

CAUTION

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

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

How to use this manual

The purpose of this manual is to give you a complete understanding of how best to use the controller and to assist where there are problems or faults.

The first part of this manual – “Introductory Tour” contains a brief technical description of the system components and a portrayal of the Mold-Masters® operating philosophy that facilitates precision temperature control.

The following chapters then take you carefully through the stages of setting up, and running, a new control system. After considering system maintenance the final sections look at trouble shooting to assist in the unlikely occurrence of a system fault.

Installation

Where to use this equipment

WARNING

Mold-Masters® Hot Runner temperature controllers are designed for use in the plastic injection moulding industry as temperature controllers for hot runner systems as commonly used in mould tools. The controllers 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.

They 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

The various connections to the system using the cables supplied with the equipment are specified in Appendix A.

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 our Service department for advice.

Tel.: (1) 905-877-0185

(1) 800-450-2270

Fax: (1) 905-873-2818

Switching "On" and "Off"

The main Power Switch is a rotary Switch at the back of the cabinet. This Switch is sufficiently rated to disconnect the total load current during switch “On” and switch “Off”. You can use a suitably- sized padlock, or similar device, to lock the switch in the “Off” position to prevent operation during maintenance.

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 use 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 controller and keeps the switched load to a minimum to extend the life of the main Isolator.

Switching On

Provided the Start option has been set to “Stop”, then switching the main power switch to “On”, does not cause the zones to heat up.

Once the main menu is available, you can select “Run” [**3**] from the main menu to start heating the tool.

Switching Off (or Shutting Down)

We recommend that you use the controller to shut down the heating load, and only use the main isolator to switch off the whole system once it is idle.

1. Shut down the heating

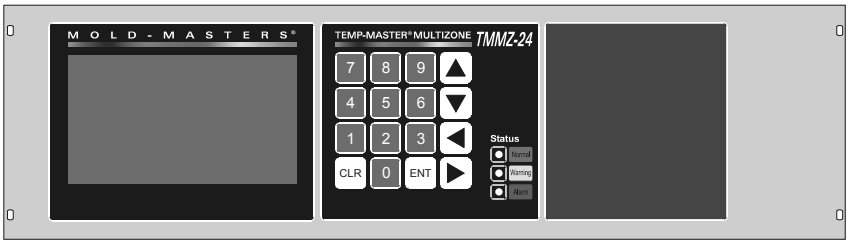
On the Main Menu select Stop [**2**] mode to reduce the heating to zero.

2. Shut down the Controller

Now use the Main Rotary Switch on the cabinet to isolate all the power from the whole system.

The LCD Console – An Introductory Tour

This part of the manual introduces you to the LCD console to show, briefly, what facilities are available and what information is available.



Navigation

The LCD Screen displays all the necessary pages and the keypad alongside provides you means of control. Most of the pages operate in the same way, for instance:

- to move between pages and for those pages where there is a choice between different functions, enter the page or selection number at the **Function** prompt and press [**ENT**]
- to leave a page and save the modifications, press [**ENT**]
- to leave a page without saving the modifications, press [**CLR**]

Status Line

At the bottom of the display is a status line, which indicates any operational mode of the controller such as 'Run', ‘Standby’ or ‘Boost’.

Password Protection

System Password is [**2**] [▲] [▲] [▼]. Certain pages, or screens, generally those which are related to configuring zones, setting limits and zone operating modes, are protected by a password. To prevent unauthorised changes, initial entry requires a system password for access.

Once the password has been supplied then all protected menus are available for the next 30 seconds. Also, this timer will reset when you enter such a screen and not restart until you leave it. This means that you can swiftly move from one protected screen to another within one session. Once you have left any protected screen, and 30 seconds have elapsed, then the protection becomes active once more.

Keypad

The standard keypad has 16 keys including 10 numeric keys (0 - 9), 4 arrow keys (up, down, left and right), an enter key (marked ENT) and a cancel or clear key (marked CLR).

Number Keys: These enter a value or menu option (always followed by the enter key).

Arrow Keys: These are used for display and tool store options. The left arrow is used to correct entry errors. It erases the last digit (up to the start of the field).

Enter Key: This key enters the command selected on the screen. E.g. to enter a value or select a menu option.

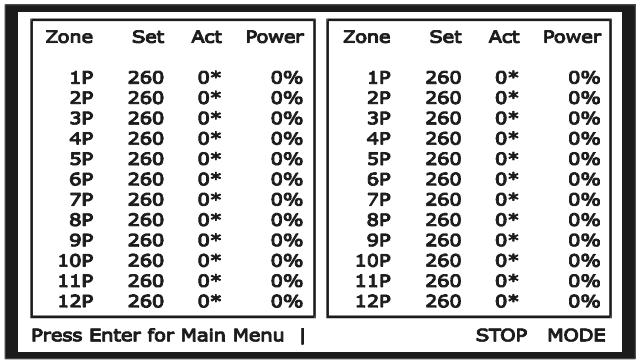
Clear Key: If an entry is started the clear key erases the whole of the entry. Pressing the clear key at the start of prompt returns the user to the previous screen.

Front Panel Status Indication

There are three LED indicators to show the status of the controller:

- **Green** Controller is operating normally.
- **Amber** One or more zones are outside of the set limits.
- **Red** A fault has been detected such as thermocouple failed or system error, and so the controller is in alarm.

The LCD Screen



The 'Home' screen for the Console is the only screen that will show two boxes of data with a total display of 24 zones.

Displayed Data

The display within each box shows:

Zone	Set	Act	Power
Zone Identifier	Shows: - Set temperature when in Auto. - Set power level when in manual, - and "S*n*" if slaved to Zone "*n*".	Shows: - actual measured temperature when in Auto, - % power in manual - and Error messages when they occur.	Shows Power level that is being supplied to maintain the current temperature. Using the arrow [🡐]/[🡒] keys toggles this display to "ground current".

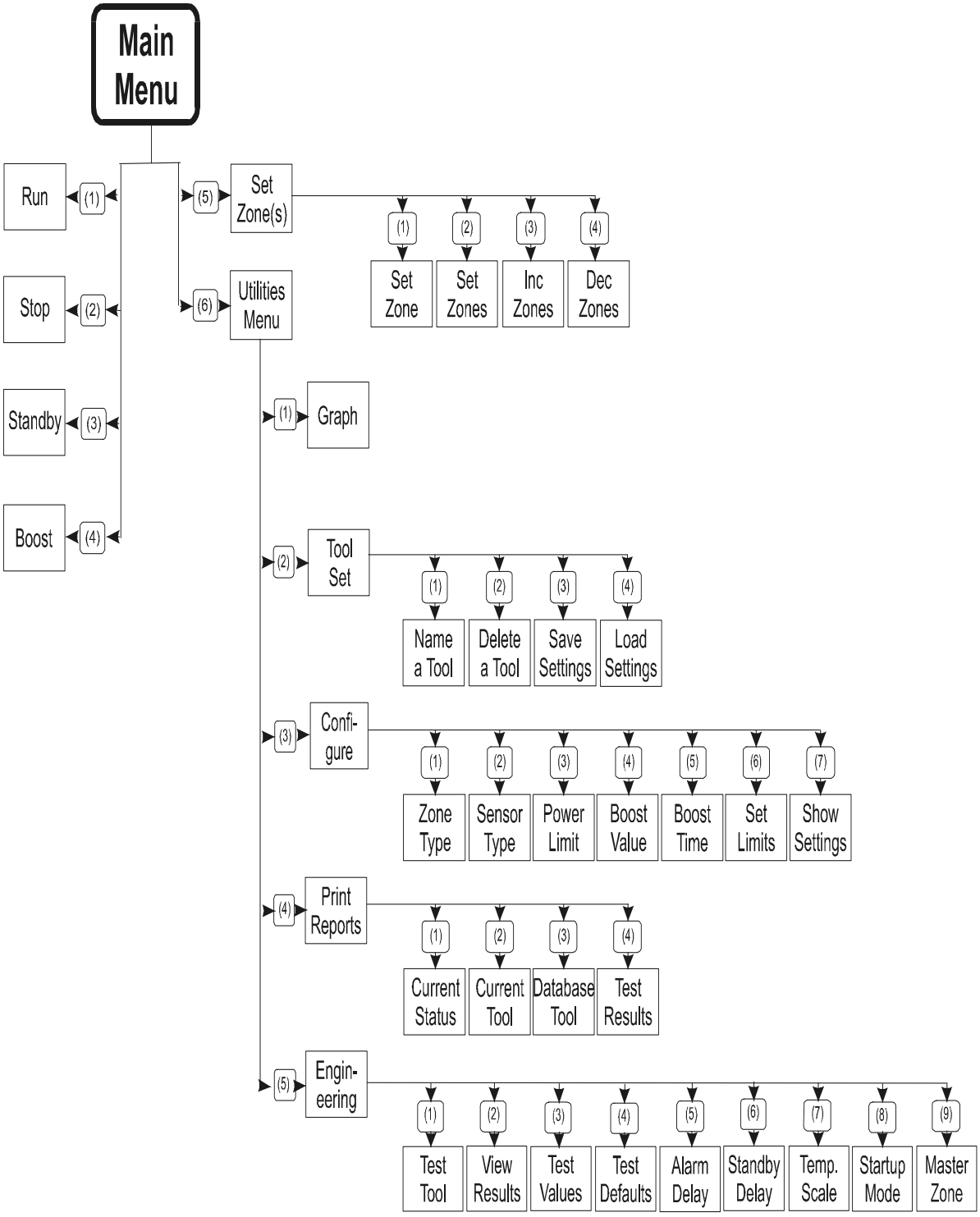
Showing further Zones

If more than twenty-four zones have been configured to the controller then you can use the [▼] and [▲] arrows on the keypad to scroll down or up to display them.

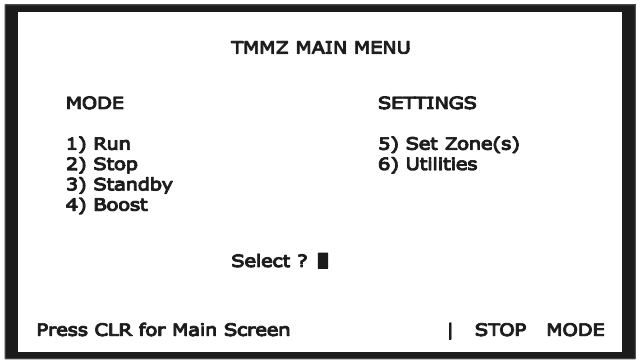
To access Main Menu

To gain control access Press [**ENT**] to reveal the Main Menu.

MZ Operation Block Diagram



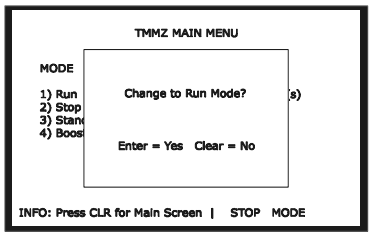
Main Menu options

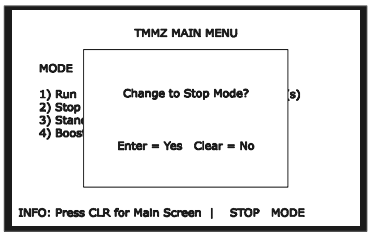


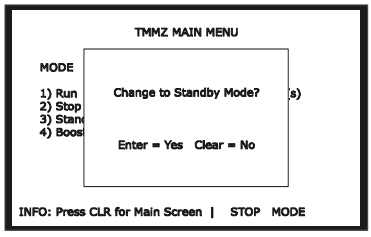
There are 6 options available on the Main Menu, which are described in the following pages.

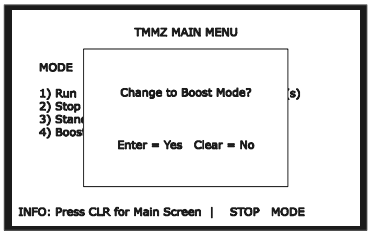
Run, Stop, Standby and Boost

Main Menu options 1-4 are immediate function options that put the controller into each particular working mode.



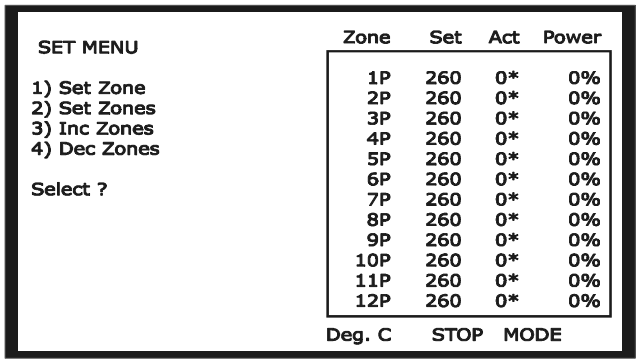






Set Zone(s) Menu

The ‘Set Zone(s)’ Menu is used to fix any one zone's temperature.



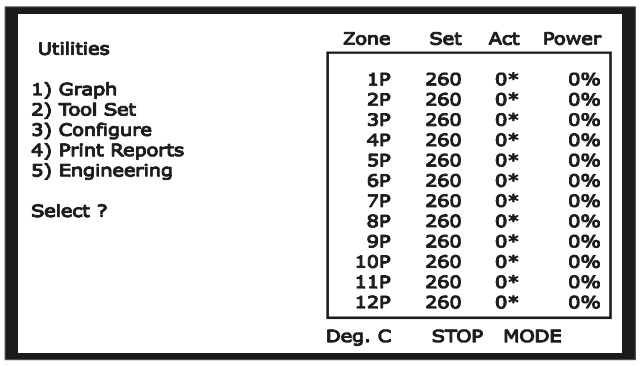
It offers the following features:

- Set Zone is used to change any of the zones individually
- Set Zones is used to set a group of zones to the same set point.
- Inc Zones is used to increase the temperature on a group of zones.
- Dec Zones is used to decrease the temperature on a group of zones.

This operation is fully described on page 25 in the "Setting Up" Chapter.

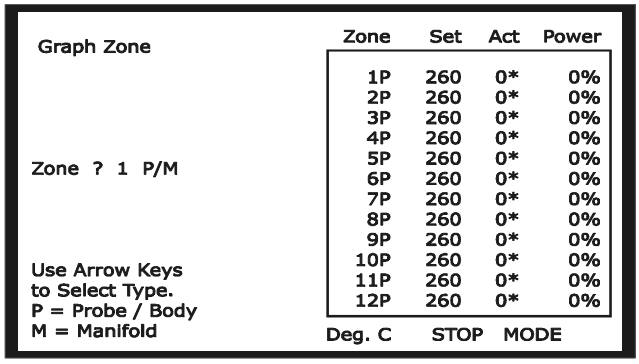
Utilities

The ‘Utilities’ option allows you to set up many of the variables in your controller according to different tool requirements.



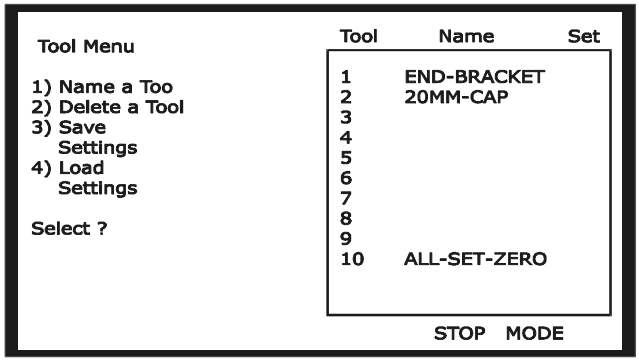
Graph

The ‘Graph’ option allows you to select any zone, in order to display its recent temperature performance over the last 5 or 30 minutes.



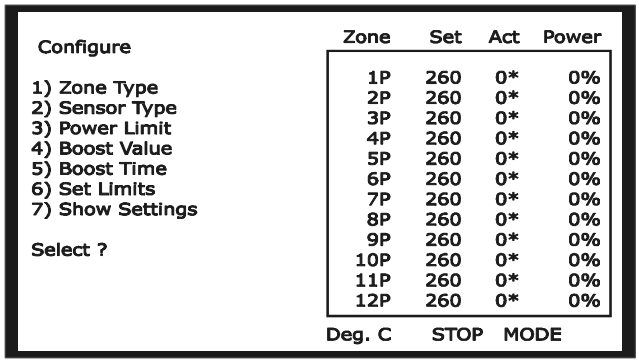
Tool Set

The ‘Tool Set’ option gives access to a store for up to 10 different tool settings which you can use at any time.



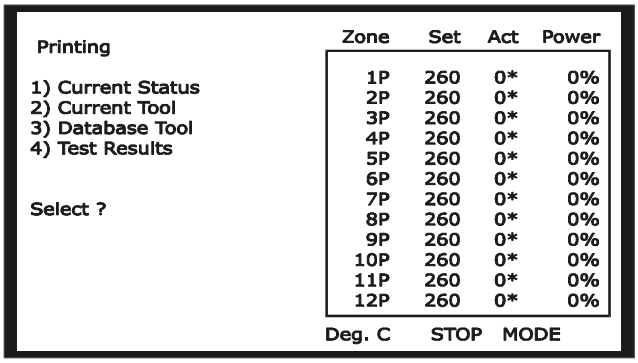
Configure

The ‘Configure’ option allows you to set up many of the variables in your controller according to different tool requirements.



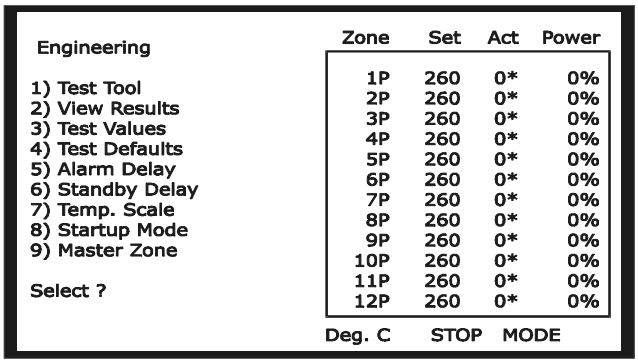
Print Reports

The ‘Print Report’ option allows you to print out both current and stored tool settings to a connected printer.



Engineering

The ‘Engineering’ section falls into two main areas as seen below:



- the first four options allow you to set up and run diagnostic health check routines on your system
- the last five options are a few extra facilities that are needed during preliminary setting up for different tools

The Controller Cabinet

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 Contact H-BE24 connectors. Wiring details are shown in Appendix A.

An alarm input and output connector is available for extending the alarm or, perhaps, inhibiting the injection process.

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

Controller Cards

The main controller cards are four-zone modular cards that provide real time temperature control.

These are all standard 6U euroboard size, with two DIN connectors, and are mounted in a single rack which may take up to a maximum of 6 cards.

Each card has three main components:

- thermocouple amplifiers,
- CPU,
- multi-voltage output triacs.

Thermocouple Amplifiers

The thermocouple amplifiers have preset responses for both J and K type thermocouples. The selection of Sensor type on the Utilities Menu sets a flag that is read by the control card; this in turn sets the differential amplifier to match the selected thermocouple type.

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 the on-board triacs using a number of self-tuning algorithms,
- controls a row of diagnostic LED's mounted on the edge of the controller cards. These LED's can be seen through the window in the faceplate of the controller.
- monitors the thermocouple every 20 milliseconds

Phase angle firing is normally used for power control. However on heavier loads such as manifolds, the control card will automatically switch over to burst-fire control once the load has warmed up.

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

Output Triacs

The controller card is fitted with four on-board triacs that are capable of controlling heating loads of up to 15 Amps peak.

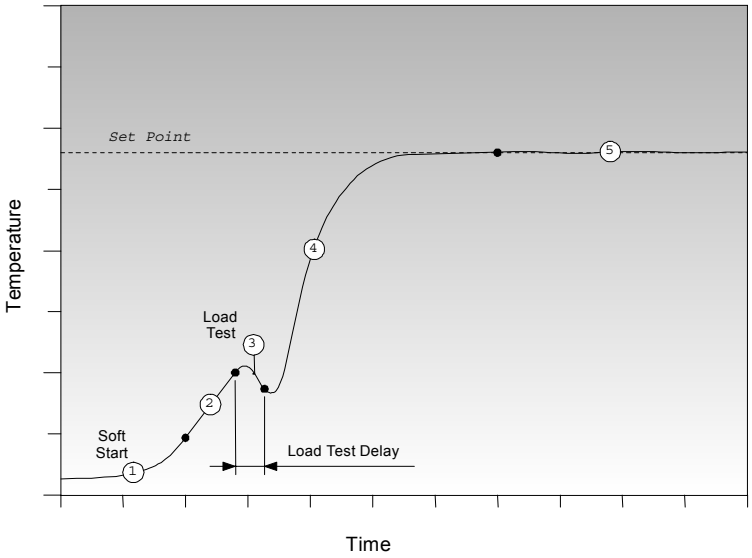
Power Supply Units (MMPSU25)

A separate power supply is provided for the cards, data communications and an alarm output relay.

How the MZ Controller Works

Mold-Masters® 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 a self-calibration routine. This is illustrated in the following diagram and explained below.



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 builds a mathematical model of the heater characteristics 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.

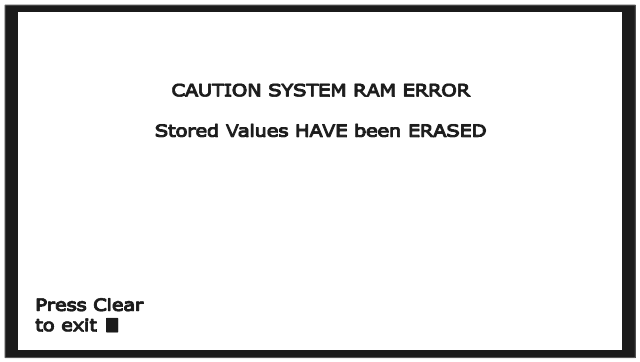
Watchdog feature

The Controller card CPU has a 'watchdog' timer that has to be reset by the system every 3 milliseconds. If for any reason the software fails to reset the timer, the program is reset to the start position, which initialises the controller and so protects the tool from over-heating. The card resumes control of the zone from the start position.

Safety Memory Check

This controller uses RAM, with a battery back up, to store all your settings such as zones, types, temperatures, limits and tool bank settings. There is an extremely low small risk that an interruption may cause any of these settings to alter and, if such an event should occur, there must be no risk to the equipment. If a zone had previously been set to, say 260 deg, should become corrupted to, perhaps 520 deg, then the controller must not attempt to establish the incorrect temperature upon the next start-up command.

To ensure this cannot happen, there is a safety memory-check facility. This checks to see that no value has been changed since the last time the controller was used. If this facility detects **any** setting is different, then it protects your system by automatically erasing **every single** stored setting within its memory. If such a rare occurrence happens to your controller you will be met by the following screen when you switch it on:



If you see this screen, you will need to go through all the various screens and input all appropriate settings. This basic task is described in the "Setting Up" section of this manual. The task is easier if you have all the correct settings written down in a safe place.

CAUTION

Mold-Masters® recommends that a hard copy of all the controller and tool settings be saved in a safe place.

Setting up your controller

New MZ series controllers are correctly configured at the factory and you should not need this section for a new system. However, if you reconfigure your controller to a new tool or environment, you may well need this chapter of the manual.

This initial set up is detailed here in easy-to-follow steps that help you to become familiar with your new equipment.

What is covered in this section

How the system automatically selects temperature range

Setting your preferred temperature display

Configuring the controller to your tool

Setting zone types

Matching sensor types

Setting the required temperatures

Selecting the Master Zone

Setting boost values

Setting alarms and limits

Checking your initial settings

Saving your initial settings

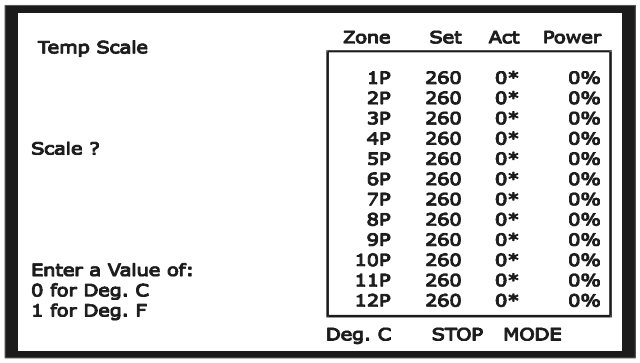
Automatic temperature-range selection

The MZ has an automatic function that establishes the temperature scales. It works by detecting the supply frequency and sets the temperature scale to centigrade on 50 Hz supplies and Fahrenheit for 60 Hz supplies

This automatic setting means that the temperature is displayed in degrees Fahrenheit in America and degrees Centigrade in most European countries. There are, however, some countries that have different parameters, for instance Brazil uses Centigrade but has 60 Hz supplies. Should this situation arise you can change the system temperature scale to a preferred range.

Setting the temperature display

Where the automatic detection shows the temperature as Centigrade rather than Fahrenheit (or vice versa) then you can easily change it.



From the main menu:

1. Select Utilities [**6**] > Engineering [**5**] > Temp Scale [**7**]
2. Enter the system Password
3. Enter a value to indicate your preferred temperature range:

   [**0**] for ‘Degrees Centigrade’

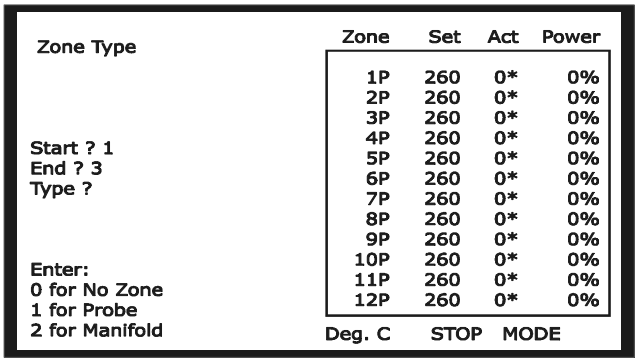
   [**1**] for ‘Degrees Fahrenheit’
4. Press [**ENT**] to confirm your choice.

Setting the Zone types

Each zone must be configured either as a probe or manifold, and set to the correct speed.

Response Speed: *Our experience at Mold-Masters® is that the majority of probes show satisfactory behaviour if you select 'Auto' for response speed. Some probes may require a faster response time and this may become apparent if the probe tends to run cooler than desired. If this happens then a 'Fast' response improves the situation. Large masses such as manifolds may require slowing down by selecting Medium or Slow.*

More recently, a new generation of probes that are even faster have made their appearance and so we have added 'Ultra' response times which are correspondingly faster in their response time. To date, very few controllers have required this ultra –fast setting... If your tool does need them, you may select settings 4 which are all faster equivalents to the normal range.

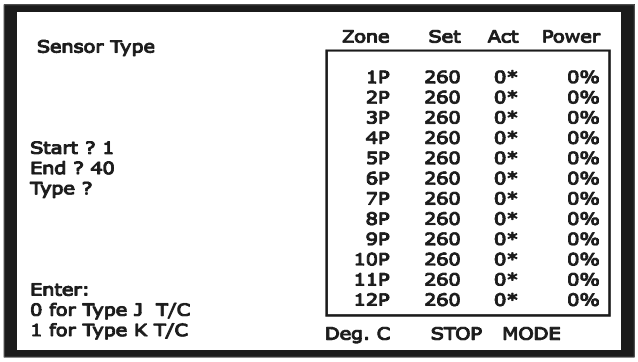


1. Select Utilities menu [**6**] > Configure [**3**] > Zone Type [**1**]
2. At the 'Password?' prompt, enter the password
3. At the 'Start?' prompt, enter the zone number for the first zone in your target group and press [**ENT**]
4. At the 'End?' prompt, enter the zone number for the last zone in your target group and press [**ENT**]
5. At the 'Type?' prompt, enter the type of zone and press [**ENT**]
6. At the 'Speed?' prompt, enter the desired response speed and press [**ENT**]
7. Repeat steps 1 to 6 for the other Zone types (manifold, and cycle synchronised)

Matching sensor types

There are two different types of probe sensors, J type and K type, with different characteristics. Control cards use differential amplifiers with dual settings in order to respond correctly to either type.

Your choice of thermocouple type at this screen sets a flag that is read by the control card. However, the sensor type is normally configured to a J-Type before leaving the factory and should only need to be altered in rare circumstances.



1. Select Utilities menu [**6**] > Configure [**3**] > Sensor Type [**2**]
2. Enter the password
3. At the ‘Start?’ prompt, enter the number of the first zone in your target group and press [**ENT**]
4. At the ‘End?’ prompt, enter the number of the last zone in your target group and press [**ENT**]
5. Enter
   [**0**] for Type J
   [**1**] for Type K
   and press [**ENT**]

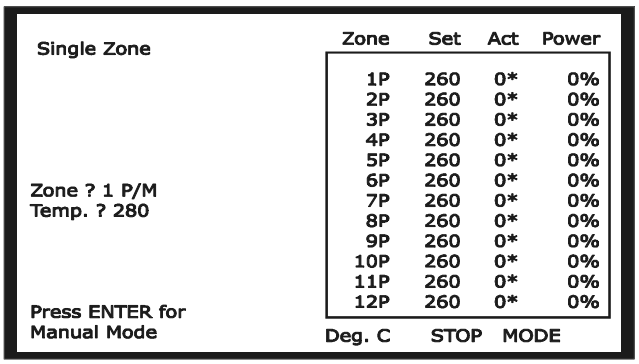
Setting the required temperatures

When you first set up your controller you must consider:

- which channels will be Probe, Manifold,
- whether they will operate in Closed Loop (Auto) Mode, Open Loop (Manual) Mode or Slaved to other channels.
- what will be your required operating temperature or power settings.

Setting one Zone at a time (Probes and Manifolds)

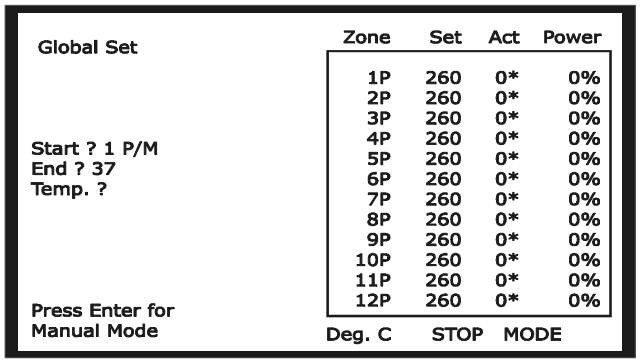
Your can set up one channel at a time by using the 'Set Zone' command from the Main Menu.



1. At the Main menu select Set Menu [**5**] > Set Zone [**1**].
2. On the 'Zone?' prompt, enter the zone number that you are configuring and press [**ENT**].
3. Use [◄], [►] to select **P** (Probe) or **M** (Manifold) and press [**ENT**].
4. Next, at the 'Temp?' prompt, the system defaults to 'Auto' mode.
5. If AUTO is not your preferred mode, then press [**ENT**] repeatedly to step though 'Manual' and 'Slave', and back to 'Auto'. As you step through these modes then you see the prompt change to 'Power?', 'Slave?' and back to 'Temp?' Once you are in your preferred Mode enter the required Temperature, Power Setting or Slave Channel as appropriate and press [**ENT**] to establish your choice.
6. Repeat Steps 1 – 5 for any other zones.

Setting several Zones together

If you have a number of channels that need common settings, such as probes, then it is easier to establish their settings as a group.

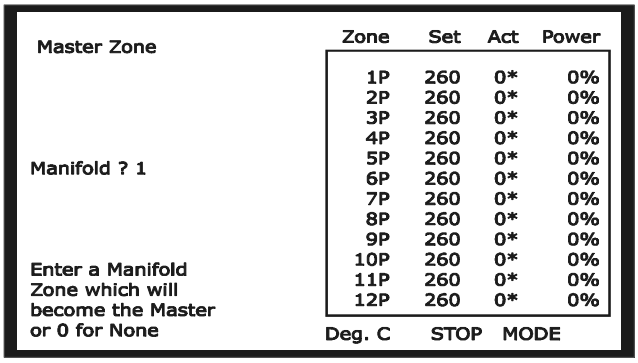


1. At the Main menu select Set Zone(s) [**5**] > Set Zones [**2**].
2. At the 'Start?' prompt enter the number of the first zone in the group and press [**ENT**].
3. Use [◄], [►] to select **P** (Probe), **M** (Manifold) and press [**ENT**].
4. At the 'End?' prompt enter the number of the last zone in the group and press [**ENT**].
5. Next, at the 'Temp?' prompt, the system defaults to 'Auto' working.
6. If this is not your preferred mode then press [**ENT**] repeatedly to step though the Modes: 'Manual', 'Slave', and back to 'Auto'. As you step through these modes then you see the prompt change to 'Power?', 'Slave?' and back to 'Temp?' Once you are in the preferred Mode, then enter your required Temperature, Power Setting or Slave Channel as appropriate and press [**ENT**] to establish your choice.

Setting the Master Zone

The "Run" command normally uses an auto-selected "Master Zone" to regulate the heating of faster Probes. During "Run", the main controller over-rides all the Probes' normal "Set" temperatures and substitutes them with the Manifold "Actual" temperature. By doing this the faster responding probes are held back to follow the slower-rising manifold temperature. The results of this programming mean that the whole tool warms up in a homogenous manner.

By selecting this "Master Zone" screen you can over-ride the controller's automatic selection of manifold zone to some other zone that you may consider more appropriate. You may also use this screen to completely de-select any Master Zone so that all the zones can warm-up in their own time without any probes being held back to follow a slower manifold. MZ uses manifold1 [1M] as the default master zone.

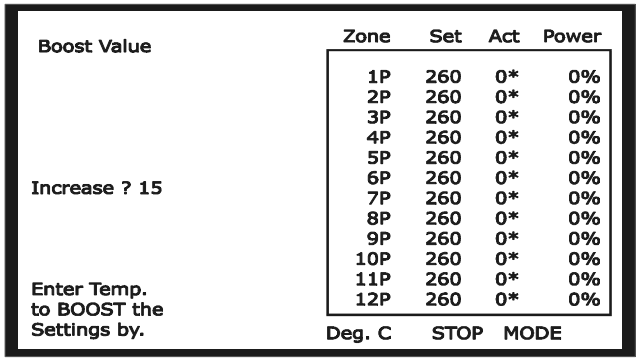


1. From the Main Menu select Utilities [**6**] > Engineering [**5**] > Master Zone [**9**].
2. Enter the System Password.
3. At the Master Zone prompt enter the zone number for your preferred manifold - or
4. Enter a 0 (zero) if you wish to de-select any master zone and enable faster probe warm-up times.
5. Press [**ENT**] to put your selection into memory and return to the Engineering Menu.

Setting Boost Values

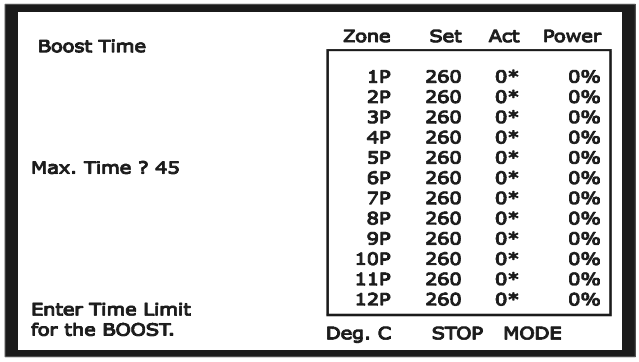
Before you can use 'Main Menu > Boost [**4**]' you must first configure the amount, and period of boost heat. These two parameters are configured separately, as described below.

Boost Temperature



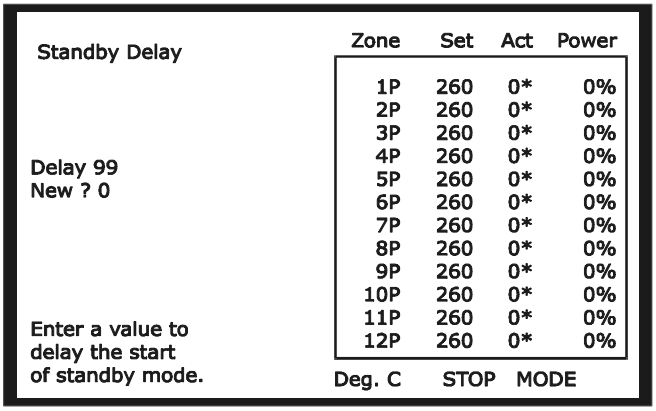
1. From the Main Menu Select Utilities [**6**] > Configure [**3**] > Boost Value [**4**].
2. Enter the System password.
3. At the 'Increase?' prompt enter the degree rise required and press [**ENT**].

Boost Time



1. From the Main Menu Select Utilities [**6**] > Configure [**3**] > Boost Time [**5**].
2. Enter the System password.
3. At the 'Max.Time?' prompt enter the Boost Time (calculated in seconds) and press [**ENT**].

Standby Delay



The time in seconds to activate the standby feature (reduce 50'C below the set temperature.)

1. From the Main Menu Select Utilities [**6**] > Engineering [**5**] > Standby Delay [**6**].
2. Enter the System password.
3. At the 'New?' prompt enter the required delay (in seconds) and press [**ENT**].

Console Alarms

Your Mold-Masters® Controller has three LEDs on the front panel to advise you about the condition of the tool and controller.

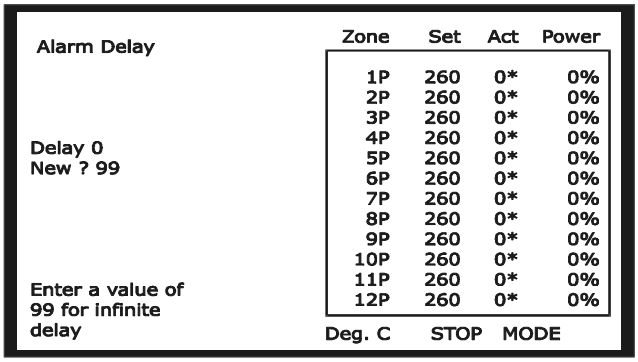
Green 'Normal'-the controller is working normally

Amber 'Warning'-One or more zones are outside their limits.

Red 'Alarm'-A fault has been detected such as thermocouple failed, System Error or Temperature out of limits failed and so the controller is in alarm.

Deferring alarms

Where a 'Temperature Limits' Alarm output option has been fitted, then you can disable it for a set period of time. This allows the tool to reach its correct operating temperatures without raising a spurious 'out of limits' alarm.



1. From the Main Menu select Utilities menu [**6**] > Engineering [**5**] > Alarm Delay [**5**].
2. Enter the password.
3. At the 'New?' prompt enter the required delay (in minutes) and press [**ENT**].

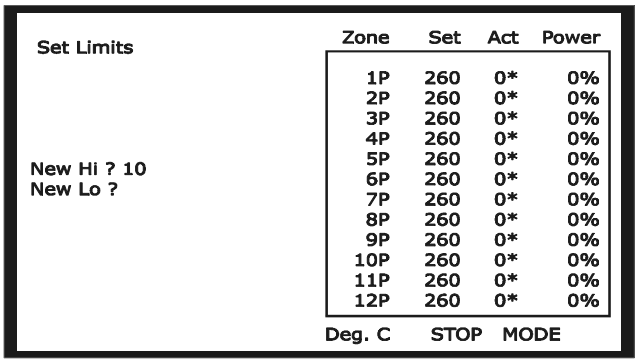
Disabling alarms

You can totally disable the Alarm Output by entering a value of '99' for the delay period.

1. From the Main Menu select Utilities menu [**6**] > Engineering [**5**] > Alarm Delay [**5**].
2. Enter the password.
3. At the 'New?' prompt enter 99 and press **[ENT].**

Monitoring temperature limits

Your controller looks at the actual temperature of all the zones and verifies that the tool is operating within specific limits. Rather than fixed points of temperature, the Hi and Lo limits are set to degrees above and below the set point. This provides an alarm window that moves with the set point.

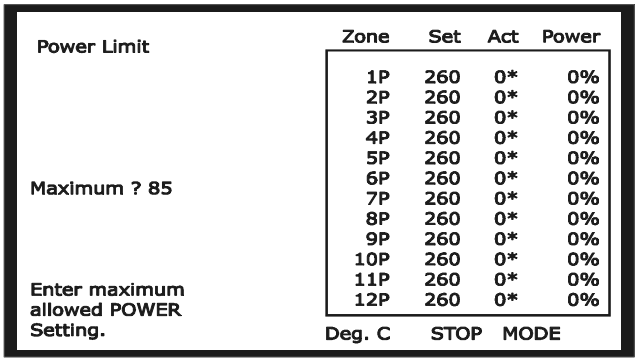


1. From the Main Menu select Utilities [**6**] > Configure [**3**] > Limits [**6**].
2. At the ‘New Hi?’ prompt enter the ‘degrees above set point’ upper limit and press [**ENT**]
3. At the ‘New Lo?’ prompt, enter the ‘degrees below set point’ lower limit and press [**ENT**]

After both have been entered the controller returns to the main display and the limits are displayed at the bottom of the screen.

Maximum power limits

If your controller is to be run in open-loop mode, then you can limit the maximum percentage power that is applied to any zone. This option prevents damage by not overheating the tool when the machine is running in open-loop mode.



1. From the Main Menu select Utilities menu [**6**] > Configure [**3**] > Power Limit [**3**].
2. At the ‘Maximum?’ prompt enter your required maximum percentage power and press [**ENT**]

StartUp Mode

This determines how your controller activates the system when the main Isolator is first switched on. There are two options available:

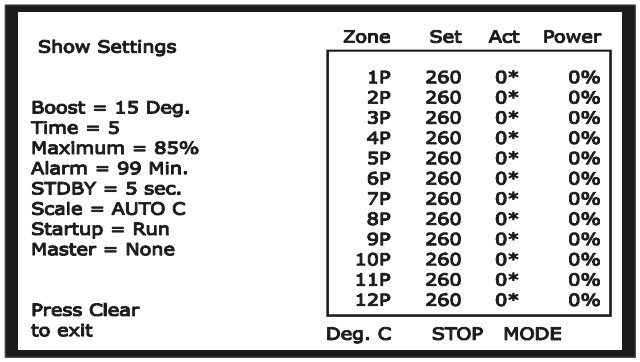
- 'Run' — the controller applies voltage to the heaters and the zones rise up to their preset operating temperature.
- 'Stop' — the controller is idle and the zones are set to Zero temperature. The operator then needs to select "Run" on the front panel to start heating the tool.

To select either of these modes:

1. From the Main Menu select Utilities [**6**] > Engineering [**5**] > StartUp Mode [**8**].
2. Enter the password.
3. At the 'Mode?' prompt enter [**0**] for 'Run' or [**1**] for 'Stop' and press [**ENT**].

How to verify your tool settings

One screen enables you to check how the controller is currently set up. The area on the left displays shared settings, such as Boost and Temp Scale. The table on the right shows individual settings — channel modes, on or off-board triac, type of sensor and power display.

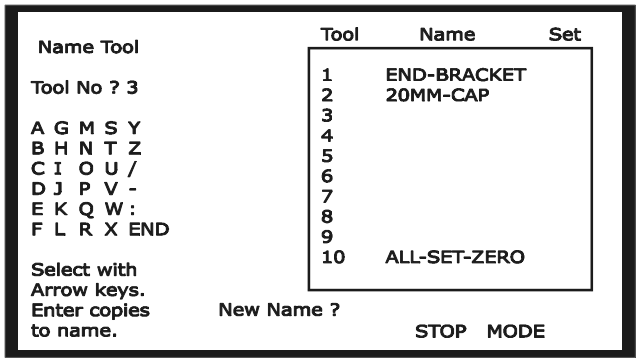


1. From the Main Menu select Utilities [**6**] > Configure [**3**] > Show Settings [**7**].

Look through the displayed current settings to see everything is set as required.

How to save your tool settings

Once you have configured the controller to operate as you require, it is good practice to save the settings to avoid having to repeat all these steps. There is a memory bank that can store, and recall, up to 10 different combinations of power, zone and alarm settings. This page only describes how to save your immediate settings, however all the tool store features are fully explained in the Customising chapter.



To Name the Tool

1. From the Main Menu select Utilities [**6**] > Tool Set menu [**2**] > Name a Tool [**1**].
2. At the 'Tool No?' prompt choose an empty row and press [**ENT**].
3. Enter a suitable and brief name for this tool setting. You can use the arrow keys to select letters, and symbols, while numbers can be entered directly from the keypad
4. Once you have completed the Tool Store name, move the flashing cursor to 'END' and press [**ENT**].
5. At the next 'Tool No?' prompt press [**ENT**] to confirm the new name.

To Save the Tool

1. From the Main Menu select Utilities [**6**] > Tool Set menu [**2**] > Save Settings [**2**].
2. Enter the tool number that corresponds to the tool that you have just named.
3. Press [**ENT**] to confirm your choice or [**CLR**] to cancel it and return to the Tool Set menu.

Running your controller

'Running your controller' is concerned with everyday use of the controller for normal production use. This is considered as selecting an appropriate run mode for the machine according to whether the tool is working or waiting. It may also be necessary to make changes to the heater temperatures and using the graphical display of recent performance, may help such decisions.

What is included in this section

Starting

Stopping

Pausing

Boost – how to apply a short increase

Raising and lowering set temperatures

Using 'Slave' Mode to compensate for a failed thermocouple

Looking at temperature history for the last 5 or 60 minutes

Starting, Stopping and Pausing

How "Run" works...

The Mold-Masters® controller is preset to self-select one of the manifold zones to be a "Master Zone". During Start-up, power is applied to all zones, but the target temperature for the faster Probes is set to follow the actual temperature of the master manifold. The manifold has a slower heat rise time than the probes and the result is a uniform temperature rise across the whole tool.

However, if a homogenous rise is not required, there is the option to de-select the Master Zone in the Engineering menu. Doing this would mean that all the zones reach their set operating temperature in their own time, in which case the Probes would be quicker to reach their normal operating temperature.

De-selecting a Master Zone controlled Start-up

1. From the Main Menu select Utilities [6] > Engineering menu [**5**] > Master Zone [**9**].
2. Enter the Password.
3. On the 'Manifold?' prompt, enter [**0**] press [**ENT**] to return to the Engineering Menu.

Run Mode

1. From the Main Menu select Run [**1**] and press [**ENT**] to confirm.

Stop Mode

1. From the Main Menu select Stop [**2**] and press [**ENT**] to confirm.

Standby Mode

This mode is available for times when the mould-tool is paused. In this condition, all the probe temperatures are reduced by 50°C. This helps to prevent degradation on certain materials. Meanwhile the manifold is maintained at its normal operating temperature to allow a fast restart.

1. From the Main Menu select Standby [**3**] and press [**ENT**] to confirm.

Boost Mode

Boost Mode provides a means of temporarily boosting the Probe, or Probe Tip, temperature. To determine how much rise and for how long it is applied, refer to the 'Setting Boost Values' on page 28.

1. From the Main Menu select Boost [**4**] and press [**ENT**] to confirm.

To Raise and Lower Operating Temperatures

If you need to increase, or decrease, the set temperature for one or more zones, then two commands, within the Set Zone(s) menu, are available for you to use.

Inc Zones

This allows you to select a group of zones and uniformly increase their set temperature by the same value.

1. From the Main Menu select Set menu [**5**] > Inc Zones [**3**].
2. At the 'Start?' prompt enter the number of the first zone in your target group and press [**ENT**]
3. Use [◄], [►] to select **P** (Probe) or **M** (Manifold) and press [**ENT**].
4. At the 'End?' prompt enter the number of the last zone in your target group and press [**ENT**].
5. At this step you have the opportunity to switch from 'Auto' to 'Manual' mode, and back, by repeatedly pressing [**ENT**]. The chosen mode is shown by the prompt that changes between 'Temp?' and 'Power?'.
6. While on your preferred mode, enter the desired temperature or power increase and press [**ENT**].
7. At this stage you can press [**ENT**] or [**CLR**] to confirm your command, and return to the Set Zone(s) menu.

Not every zone will, necessarily, be affected!

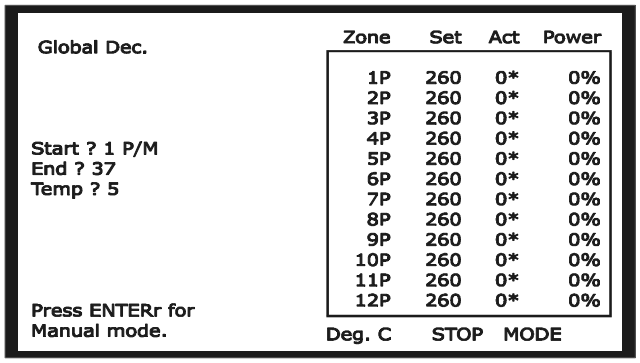
Be careful if you have your controller set up with a mixture of zones, i.e. some in Auto, some as Manual. At step 5 above, the selection of Auto or Manual constrains your selection to only those channels that are of the same configuration.
For example,

	Zones in "Auto"	**Zones in "Manual"**
Before changing	At 200° in Auto	At 50% in manual
After choosing 20° C Rise	Rises to 220° C	Stays at 50% power applied
After calling for 5% power increase	Stays at 200° C	Rises to 55% power applied

The same principal applies to both "Inc" and "Dec" commands.

Dec Zones

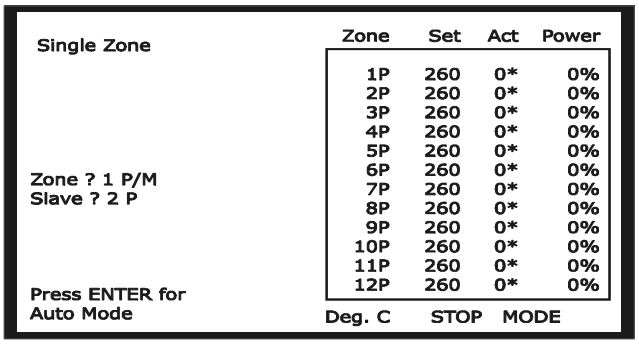
This allows you to select a group of zones and uniformly decrease their set temperature by the same value.



1. From the Main Menu select Set Zone(s) [**5**] > Dec Zones [**4**].
2. At the ‘Start?’ prompt enter the number of the first zone in your target group and press [**ENT**].
3. Use [◄], [►] to select **P** (Probe) or **M** (Manifold) and press [**ENT**].
4. At the ‘End?’ prompt enter the number of the last zone in your target group and press [**ENT**]
5. At this step you have the opportunity to switch from ‘Auto’ to ‘Manual’ mode, and back, by repeatedly pressing [**ENT**]. The chosen mode is shown by the prompt that changes between ‘Temp?’ and ‘Power?’.
6. While on your preferred mode, enter the desired temperature or power decrease and press [**ENT**].
7. At this stage you can press [**ENT**] or [**CLR**] to confirm the command, and return to the Set Zone(s) menu.

Using 'Slave' Mode to compensate for a failed thermocouple

If a thermocouple fails while the controller is working then you may see different results. A complete fail shows a 'T/C' error message against the actual zone and the actual temperature falls off to zero. Sometimes it may be intermittent in which case it may show as uncontrolled temperature deviations for the concerned zone. Your prime aim is to compensate for this condition and maintain production until the machine is free and the fault can be repaired. Slave mode allows you to disregard the particular thermocouple and slave the faulty zone to work to another zone which is healthy. This master zone then controls the temperature for the faulty slaved zone.



1. From Main Menu select Set Menu [**5**] > Set Zone [**1**]
2. At the Zone? prompt, enter the number of the zone which has the failed thermocouple.
3. Use [◄], [►] to select **P** (probe) or **M** (Manifold) and press [**ENT**].
4. Press the [**ENT**] button sufficient times until you get the Slave? Prompt.
5. Enter the number of another healthy zone that is currently working to the same set temperature as that which you require for the faulty zone and press [**ENT**].
   Note – 'Conditions for slaving zones':
   You must select a healthy zone to slave on to. For instance, if Zone 3 is already slaved to Zone 6 and you now wish to slave Zone 2, then you might not select Zone 3 as a master zone. You must choose any other healthy zone, and this includes Zone 6, which is currently selected as a master zone for Zone 3.
6. The 'Actual' column for the slaved zone now shows 'S n', where 'n' is the number of the zone that you have slaved to.

Any subsequent changes (for instance, temperature changes) that are made to the master zone, affect the slaved zone also.

Check zone performance (graph)

Your controller can record and display the temperature history for any zone over a period of time. In this model, there is the option to view a historical graph for the last 5 minutes or the last 60 minutes.

1. From the Main menu select Utilities Menu [**6**] > Graph [**1**].
2. At the 'Zone?' prompt enter which zone you want to view and press [**ENT**].
3. Use [◄], [►] to select **P** (Probe) or **M** (Manifold) and press [**ENT**].

The temperature/time graph now displays how that chosen zone has behaved over the last 5 minutes and the legend at the bottom shows further options. At this point you may:

- Press [**ENT**] to toggle the time viewed between 5 minutes and 60 minutes
- Use the [▲] and [▼] keys to toggle between X1 and X2 temperature scale
- Use the [◄] and [►] keys to move the viewed temperature window up and down the scale
- Press [**CLR**] to exit the viewed graph and return to the 'Zone?' prompt. At this stage you can select another zone to view or press [**CLR**] or [**ENT**] to return to the Main Menu.

Customising your controller

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

Our convention is that new tool settings must have a name. If you try to save a tool setting to an empty position that you have not yet named, then the machine does not accept your request. To amend this situation you must go back and name the tool position then load it with your new settings.

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

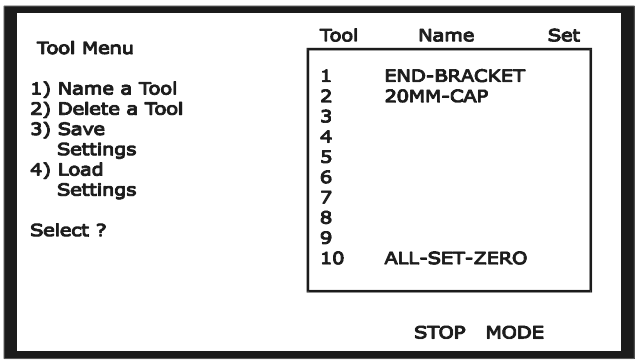
Recalling tool settings – reusing past tool settings that have been saved

Changing tool settings – altering existing tool settings

Deleting a tool – how to clear a tool position

What is in the tool store?

You can see what tools are available, and which are in use, by selecting from the Main Menu Utilities [**6**] > Tool Set [**2**]. The display then shows you:



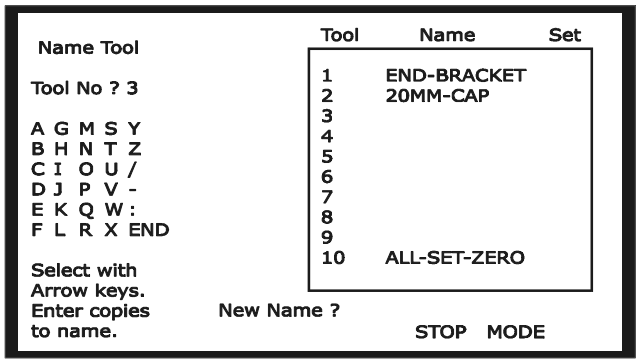
Tool: The number of the tool position. One of the positions is marked with an asterisk (*) which indicates which tool settings are currently loaded into the system.

Name: The name that you have given to each tool position.

Set: Any tool position that has settings saved in it shows a **Y** in this position. Blank positions that have been named, but contain no information, have no indication in this column.

Naming a tool

To give a name to a particular tool position:



1. From the Main Menu select Utilities [**6**] > Tool Set [**2**] > Name a Tool [**1**].
2. At the 'Tool No?' prompt enter the number of a blank tool position and press [**ENT**]
3. To create the name, use the [arrow] keys to select each letter in sequence and the [**ENT**] keys to put that letter, or symbol, into the new name. You can enter numbers directly by using the keypad. As characters are added, then the new name is displayed at the bottom of the screen.
4. When you have created an acceptable tool name, move the cursor to the 'END' and press the [**ENT**] key to put the new name into the tool position and return to the Tool Menu.

Saving tool Settings

Tool settings can be saved at any time into a named tool position.

CAUTION

If the selected tool store already holds a tool setting then the act of saving into that slot causes the old settings to be overwritten and lost. Therefore, always make sure that you select the right Tool Store for new settings.

1. From the Main Menu select Utilities [**6**] > Tool Set [**2**] > Save Settings [**3**].
2. At the 'Tool No?' prompt enter the Tool number that indicates your chosen name/position and press [**ENT**].
3. Confirm your decision by pressing [**ENT**] to confirm or [**CLR**] to exit without saving the new settings.

Recalling tool settings

Once settings have been saved to the controller then they may be instantly recalled as follows:

1. From the Main Menu select Utilities [**6**] > Tool Set [**2**] > Load Settings [**4**].
2. At the 'Tool No?' prompt enter the number of the tool that you wish to load to your controller and press [**ENT**].
3. Confirm your decision by pressing [**ENT**] to confirm or [**CLR**] to exit without loading the new settings.

NOTE: If you select a tool that has no settings in its memory then you are prompted to press [**CLR**] to exit the menu. To change to another tool that has settings, start again at step 1.

Changing tool settings

CAUTION

To permanently change a tool's settings, this procedure saves new settings to a tool position and over-writes any that are already there. Once you have done this then previous settings in the nominated position cannot be recovered.

1. Adjust the settings using appropriate menus and tools.
2. From the Main Menu select Utilities [**6**] > Tool Set [**2**] > Save Settings [**3**].
3. At the 'Tool No?' Prompt enter a number which corresponds to the tool which you want to change and press [**ENT**].
4. Confirm your decision by pressing [**ENT**] to confirm or [**CLR**] to exit without saving the new settings.

Deleting a tool

CAUTION

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. From the Main Menu select Utilities [**6**] > Tool Set menu [**2**] > Delete a Tool [**2**].
2. At the 'Tool No?' prompt enter the number of the tool that you wish to delete and press [**ENT**].
3. Confirm your decision by pressing [**ENT**] to confirm or [**CLR**] to exit without saving the new settings.

Maintaining your Controller

Maintaining your controller considers how you look after your machine. It includes electrical functional testing that may be carried out as either preventative or fault-finding maintenance. It also considers the physical aspects of maintenance and lists those routines that can extend the useable lifetime of your machine.

What is included in this section

Printing tool settings for the records

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

Viewing and printing test results – saving diagnostic test results

Servicing and repairing your controller

Printing tool settings

If you want a hard copy of any tool settings then your controller can do this for you. The print facility enables you to print the complete tool settings for any tool that may be:

- in the tool bank but not in current use
- in current use but changed
- the stored settings for the tool that you are currently using (which may be different to the actual settings if you have changed them since loading the tool).

In every case, the printout is sent directly to your connected printer. If, however, no printer is detected, then the controller reverts to normal working after approximately 10 seconds.

Current status:

This option prints out your control settings, as they are currently set.

1. From the Main Menu select Utilities [**6**] > Print Reports [**4**] > Current Status [**1**].

Current tool:

This choice prints out the settings for the tool that is currently selected. They may be different to the Current status if any settings have been modified since the tool was loaded:

1. From the Main Menu select Utilities [**6**] > Print Reports [**4**] > Current Tool [**2**].

Database Tool:

This final choice prints out the tool settings for any other tool that you have stored in your tool bank that you are not currently using.

1. From the Main Menu select Utilities [**6**] > Print Reports [**4**] > Database Tool [**3**].
2. At the ‘Tool No?’ prompt, enter the number of the tool which you want to print out and press [**ENT**].

Self Diagnostic Tests

What is tested during a self-diagnosis check?

The Mold-Masters® Controller has a diagnostic-testing tool that 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 appropriate 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 the display returns to a main screen and messages are displayed to keep you informed about progress.
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. The main screen displays a message 'COOLING STAGE', and the first zone displays 'TEST' in the 'Act' column. During the cooling, all zones are checked to see that none experience a significant temperature rise.
4. After a period of time the main screen displays a message 'POWER TEST', and the 'Set' column for the zone under test shows 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 'count' number of times, stipulated in the 'Test Defaults'.
5. Provided that the zone under test rises by an appropriate degree, 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 detects an appropriate heat rise in the zone under test then it may have detected one of two possible errors:

a) if another zone exceeds the “Max Rise”, rather than the one under test, it indicates that there is a crossover 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.)

b) if the zone under test exceeds the “Max rise”, **but** a significant heat rise is also detected in other zones, such that they exceed the “Min Rise”, then the controller displays a ‘WARN’ message. (These other zones are physically close to the zone under test, but not necessarily numerically adjacent.) 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 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 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 54 that explains their meaning and which helps to identify probable causes.

Using and Viewing current parameters

To see what current values are in the test routine:

1. From the main Menu select Utilities [**6**] > Engineering [**5**] > Test Defaults [**4**].

The screen displays:

Probe Power – how much power is applied to the probe zones.

Manifold Power – how much power is applied to the manifold zones.

Minimum Rise – this is a first stage level which only the zone under test should pass. If any other zones heat up by more than this it means that there is excessive thermal conduction from one zone to another, which may cause poor temperature control. This value may be varied to take thermal mass and probe proximity into account.

Maximum Rise – this is a second stage level which the zone under test must exceed to be considered as satisfactory. Any heat rise below this figure is counted as a 'fail'. If any other zone exceeds this setting then there must be cross wiring between heaters and thermocouples.

CAUTION

Please note that the last two default values for minimum Rise and Maximum Rise are stored as Centigrade temperatures, and displayed as numbers only. If your system is using the Fahrenheit scale, either through automatic detection of supply frequency or set as a preferred scale, you should change these two figures to obtain a correct test. Minimum Rise should be changed from 2(°C) to 4(°F) and Maximum rise changed from 6(°C) to 11(°F) respectively. These figures test correctly for a system displaying in Fahrenheit.

2. Press [**CLR**] to exit from this menu.

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.

a) 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).

b) 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 our service department for advice.

Setting your own test parameters

Before considering your own test parameters please make yourself familiar with the meaning of the values, especially Cooling and Heating Count. These values are explained in the previous section 'Viewing the current parameters'.

Test Values steps you through the six test parameters and invites you to insert your preferred option. If, at any stage, you do not enter any value before pressing [**ENT**], then the default value is accepted and used.

1. From the Main Menu select Utilities [**6**] > Engineering [**5**] > Test Values [**3**].
2. Enter the System password.
3. At the 'P–Power?' prompt enter the percentage power that you wish to apply to the probe zones and press [**ENT**].
4. At the 'M–Power?' prompt enter the percentage power that you wish to apply to the manifold zones and press [**ENT**].
5. At the 'Min–Rise?' prompt enter the number of degrees that any other zone, other than that under test, is allowed to rise before a fail is recorded. Any zones that experience a temperature rise above this minimum may have errant heater/sensor wiring. Press [**ENT**] if there is no reason to change the default.
6. At the 'Max–Rise?' prompt enter the degree rise (centigrade) that a zone is expected to reach taking the applied power into respect. Any zones that fail to reach this maximum value may

have faulty heaters or errant wiring. Press [**ENT**] if there is no reason to change the default.

7. Pressing [**ENT**] continues to step through the six settings.
8. Pressing [**CLR**] accepts the new values and returns you to the main Engineering Menu.

Resetting the Test Parameters

In order to restore the test parameters back to their original factory setting select Utilities [**6**] > Engineering [**5**] > Test Defaults [**4**]. The default test values are then automatically restored.

Performing a system diagnosis

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

1. From the Main Menu select Utilities [**6**] > Engineering [**5**] > Test Tool [**1**].

The system then runs through a comprehensive test routine, which is described earlier (See *'What is tested during a self-diagnosis check?'*).

Skipping Zones during testing

If your controller has more than a few zones and you wish just to test, say, two or three suspect zones, there is no way of configuring the self-diagnostic routine to look at specific zones and ignore the others. However the [**ENT**] and [**CLR**] buttons can be used in different ways to skip past early and late zones. Consider an example where you wish to test, say, zones 20-25 out of a total of 40 zones.

Skipping early zones with the [**ENT**] button

Run the tool test for all the zones and 'force' it to ignore the first 19 zones by pressing [**ENT**] while it is looking at each of the early 'unwanted' zones.

Skipping late zones with the [**CLR**] button

As part of the same test, monitor the test through zones 20-25 and then press the [**CLR**] button to abort the rest of the test.

What is displayed after using the [**ENT**] and [**CLR**] buttons

The final test results show messages for all the zones. It displays:

- the error message, 'user skipped test', against those zones which you forced it to bypass with the [**ENT**] button,
- test result messages for zones 20-25 ,

the message and 'user aborted test' is displayed for all the remaining zones after pressing the [**CLR**] button.

Viewing and printing test results

Viewing test results

At the end of a self-diagnosis, if the display does not automatically switch to display the results, then select Utilities [**6**] > Engineering [**5**] > View Results [**2**].

This display is a table that lists satisfactory zones and, also, any errors that are detected by the test. **Zones that perform normally display no message at all**, while those that produce a fault condition display one or more error messages.

Allowable error messages are listed in the section '*Interpreting Test Results'*

Viewing previous test results

The controller always saves the last and most recent test results. Provided you have not carried out another tool test, your last test results are still in memory to view.

1. From the Main Menu select Utilities [**6**] > Engineering [**5**] > View Results [**2**].

Printing Results

1. Ensure that you have a suitable printer connected to your controller.
2. From the Main Menu select Utilities [**6**] > Print Reports [**4**] > Test Results [**4**] and press [**ENT**].

Note: If the system does not detect a printer connection then it automatically aborts the print command after approximately 10 seconds and returns to the last menu.

Interpreting the test results

These are some of the errors that you may receive after running a system test. Each is listed along with its probable causes.

User skipped Test — You skipped the test for this zone by pressing 'ENT' while it was being tested.

User Aborted Test — You aborted out of the test by pressing 'CLR' 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 0°C, 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? — 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? — 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.

More options – 30A-Mod controller card and I/O card

30A-Mod controller card

This special controller card is able to boost the output current to 30A, ideal for high power application. Each 30A controller card contains two zones and takes up two slots in cabinet.

I/O interface card

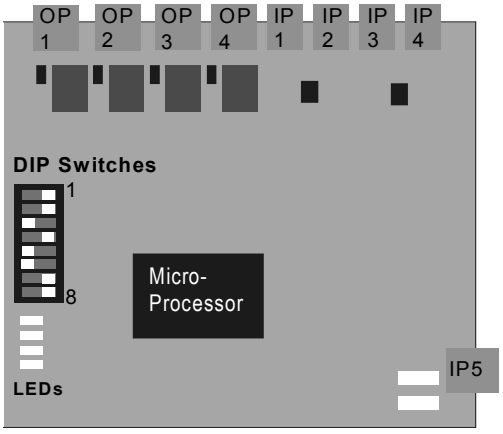
This Input/Output card offers four separate digital inputs plus one analogue input and four outputs. Its main function is to facilitate remote operation and so the 4 digital Inputs and Outputs have been nominally programmed by the manufacturer to provide the functions listed below (other functions may be available on request). The fifth T/C input, however, is user-configurable within the Easy Set-Up page, where you can set its individual Warning and Alarm levels.

Setting up I/O card address

An 8-way DIP switches on the card need to be set to the correct address for the console to read the card. This is normally the next count, or number, following the number of zones that are currently installed in the controller.

For instance:
If a MZ contains 13 of QMOD cards, the current zone count is (13x4)= 52 zones. These zones are counted starting at <u>zero</u> so the last control zone is number 51 (not 52).

Following this example, the I/O card should be counted as number "52". You must now set the DIP switches on the I/O card to its counted value for the console to see the card and read its information.



The diagram on the right shows the I/O card with the DIP switches at the left edge. Looking at the card in the same orientation, moving a switch element to the *right(R)* sets that switch to "0", while moving the switch to the *left(L)* sets the switch to "1".

In setting the switch to address "52", which in binary count is 00110100, the first switch from the bottom is number "8" and is the highest element in the binary number or most significant bit. In this example, setting the number 52 (00110100), the switches should be R R L L R L R R

I/O Connections

Description	Circuit	Nominal Function
Input 1	Input 1	Go to RUN Mode
Input 1		
Input 2	Input 2	Go to STANDBY Mode
Input 2		
Input 3	Input 3	Go to STARTUP mode
Input 3		
Input 4	Input 4	Go to STOP Mode
Input 4		
Input 5	Input 5	Thermocouple Input
Input 5		
NO Contact 1	Output 1	Injection Enable/Disable (relay closes once up to temperature)
MC Contact 1		
NC Contact 1		
NO Contact 2	Output 2	Controller Zone Alarm (relay closes when a zone has an error)
MC Contact 2		
NC Contact 2		
NO Contact 3	Output 3	Boost Mode (relay closes when the controller is put into Boost Mode)
MC Contact 3		
NC Contact 3		
NO Contact 4	Output 4	Spare
MC Contact 4		
NC Contact 4		

Servicing and repairing your controller

WARNING

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

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.

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 in the Main Screen instead of a temperature value.

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

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. Occurs only in manual mode when a current level has been pre-set.	Isolate system supply, check loom and heater wiring continuity
AUTO	The controller has detected a T/C failure and Automatically switched this zone to manual. It is using recorded settings to maintain the zone temperature.	Check from the tool back to the controller for a disconnected Thermocouple.
	(Note: this will only be seen if you have “Auto/Manual Mode Enable”)	
ERR!	No temperature rise has been detected in that zone.	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.	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.	Check your heater wiring for a low impedance path to earth.
HELP	There is a system failure	Please contact Mold-Masters®
LINE	No mains supply synchronisation pulses being received.	Check supply wiring for presence of all three phases.
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
N/Z	The controller card in this rack position is not responding.	Check card for faults.
NONE	A Zone type appears not to be selected for the card.	There is a communications problem. Try a replacement controller card.
T/C	An open circuit thermocouple has been detected.	Either slave that control zone to an adjacent zone or change to open loop control. Later, check to see whether the input fuse on the control card has ruptured or, if the fuse is good, replace the thermocouple.
REV	Thermocouple is reversed	Check the polarity of T/C.

TRC	Triac fault. This can only occur when in manual mode and closed loop, where the current is pre-set manually. If for instance, the triac output current is higher than the set point, the controller attempts to reduce output to the level required. If it fails the triac may have failed and it is flagged up as faulty.	Check the current output on the channel. If the triac has failed, return to Mold-Masters® 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 Display 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 controller card is suspected, check the LED card status lamps, what can be viewed through the LED window and the front panel of the controller.

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.

FUSE LED is lit when fuse fails.

GND LED is lit if any heater has 10mA or more leaking to chassis ground.

LOAD (1-4) LED indicates a supply to the particular zone (Note: there is One Load LED for each zone on the card).

WARNING

To remove a card from its slot, pull the black handles forward 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.

Specific Faults

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 shielded thermocouple wire or, alternatively, a faulty heater. We recommend that all earth connections be tested.
- Another cause of temperature fluctuations is by the control cards detecting varying mains supply frequency and consequently changing temperature scales. The problem can be overcome by forcing the system to a particular temperature scale in the Engineering menu.

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 menu and revise it 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.
Select Utilities [**6**] > Configure [**3**] > Show Settings [**7**] to see the current limits and revise if necessary.

Ground fault detection

The Ground fault detection detects any fault caused by earth leakage current. Earth faults can be caused if a tool has been idle for some time and damp has got into one heater. It may be possible to identify the heater and repair the faulty zone by using the adjacent heaters to heat it up and dry it out, so curing the original problem.

Fuses

There are supply fuses for four separate functions and a side panel-mounted MCB for the whole unit. In the unlikely event of a fuse failure **always** isolate the incoming main supply before opening the cabinet door or removing any panels.

WARNING

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 fuse types are listed in the attached tables.

Power Supply Units (MMPSU25)

The PSU is mounted on top of the upper chassis plate and is behind the termination rail. It is supplied by its own fuse that is located on the same termination rail.

Class	20mm Glass Fuse Antisurge
Rating	100mA

Fans

Every Cabinet has auxiliary fans to ensure adequate cooling. If any fan has stopped working then first inspect the unit to see if there are any blockages or objects fouling the impellors. Once you are certain that the fan is free to rotate then proceed to check its supply fuse which is located on the main termination rail.

Class	1 1/4 " Glass Fuse Antisurge, slow blow
Rating	2A

Controller Cards

The current "surface-mount" controller card has protection fuses for both the T/C input and for the heating load output. Older cards, which are identified by having the main CPU mounted in a socket, only have output fuses.

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.

Input Fuse Type: Surface-mount quick-blow

Code	62MAQBSM
Fuse Rating	63mA

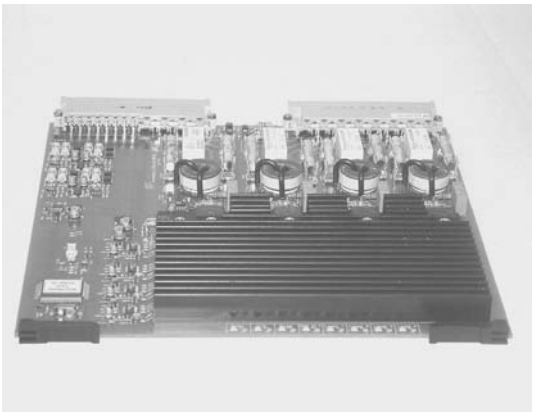
QMOD Output Fuse Type: HRC High Speed

Class	BUSS 1 ¼", Fast blow
Rating	15A or similar

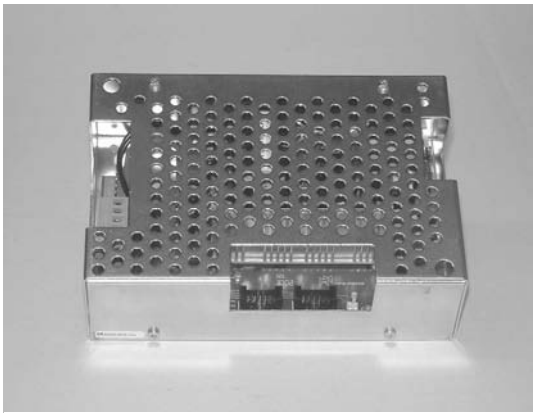
30A-MOD Output Fuse Type:

Rating	32A

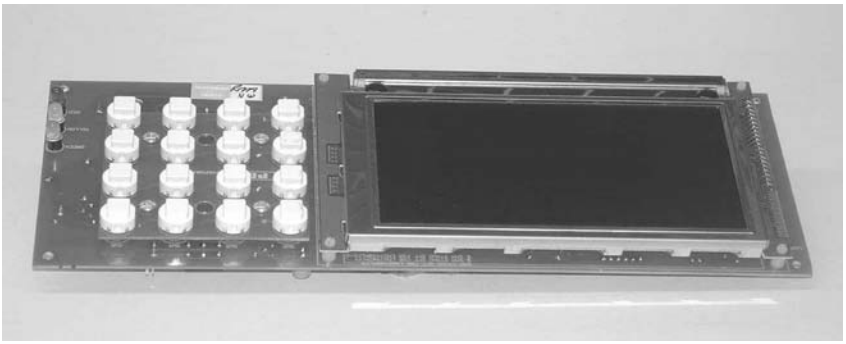
Spare Parts List



QMOD
QUAD SWITCHING CARD FOR MZ



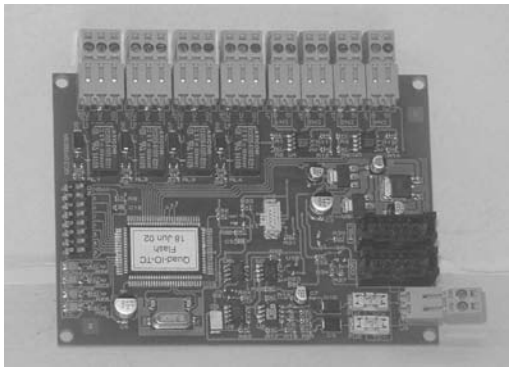
MMPSU25
25 W PSU PACK (POWER SUPPLY)



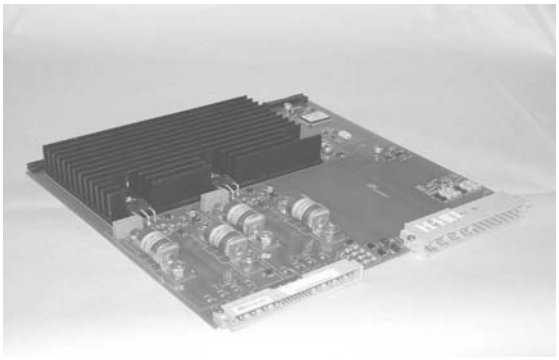
LCPUPT02
MZ MONO LCD ASSEMBLY

MCABLE.12
12 ZONE CABLE ASSEMBLY T/E-T/E

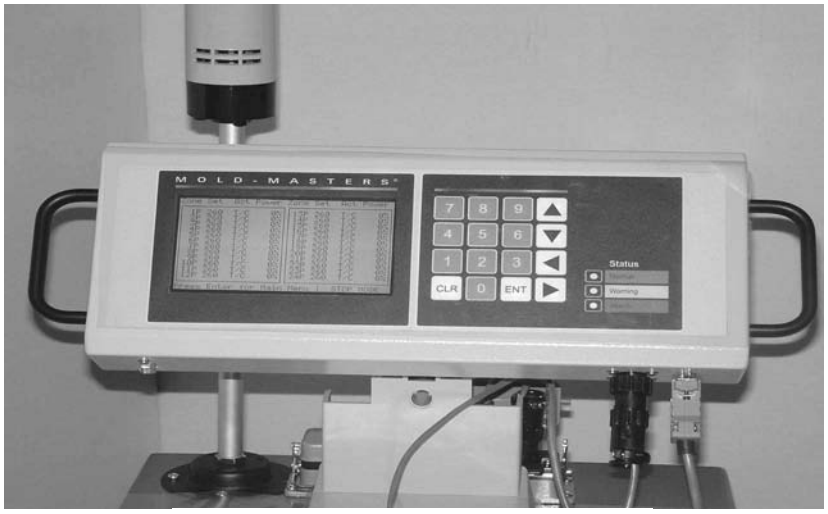
MPLUG.12
12 ZONE PLUG ASSEMBLY



MZ-IO
MZ INPUIT OUTPUT INTERFACE CARD



30A-MOD
30A TWO ZONE MODULE



MZLCD
MZ MONO LCD INTERFACE

APPENDIX A

MZ Wiring Standards

MZ WIRING STANDARDS

The following standards only apply to controllers wired to Mold-Masters® 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 supplied according to your requirements in either a star or delta supply.

Cable Marking	Supply Description
L1 (black)	Phase 1
L2 (black)	Phase 2
L3 (brown)	Phase 3
N (blue)	Neutral
Earth Symbol (green/yellow)	Earth

WARNING

N.B. The delta supply cable does not have a blue 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.

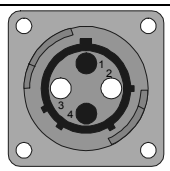
Type	Positive	Negative	Positive	Negative	Positive	Negative
J	Black	White	Red	Blue	White	Red
K	Green	White	NA	NA	Violet	Red

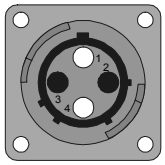
1.3 Loom Power cables

The power cables have no specific colour, except the ground wire which is green/yellow. The rest is numbered.

1.4 Alarm Output

A 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. The contacts are rated for 5A at 220V.

Pin	Connection	Input / Output	
2	Auxiliary Input signal	Standby Port: require external 12VDC	
3	Auxiliary Input Gnd		

Pin	Connection	Input / Output	
1	Alarm 220v contact 1	Alarm Port	
4	Alarm 220v contact 2		

1.5 Serial Port

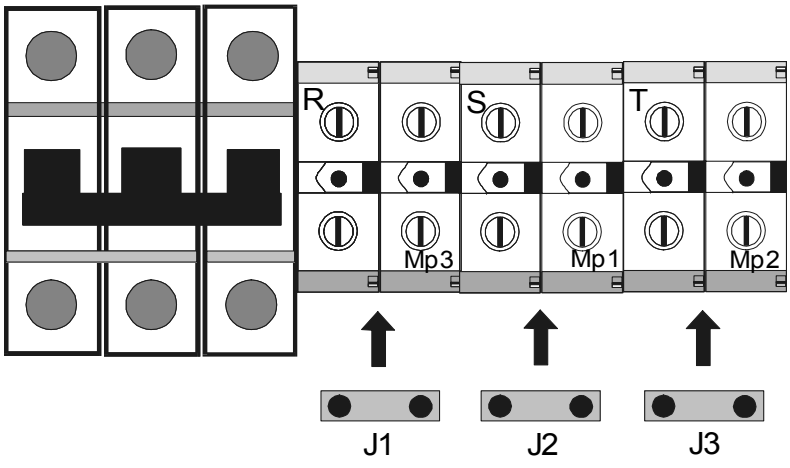
A male 9 way 'D' panel connector is provided for an RS-232 serial port. This has a dual purpose; it can output to a serial printer or communicate with a remote computer for data collection. The pin outs are as follows.

Pin	Connection
1	-
2	TXD
3	RXD
4	-
5	Gnd
6	-
7	DTR
8	-
9	-

Configuration for the serial printer:
Data length: 8 bit
Baud rate: 9,600
Parity: none
Protocol: DTR
Sig. Polarity: mark

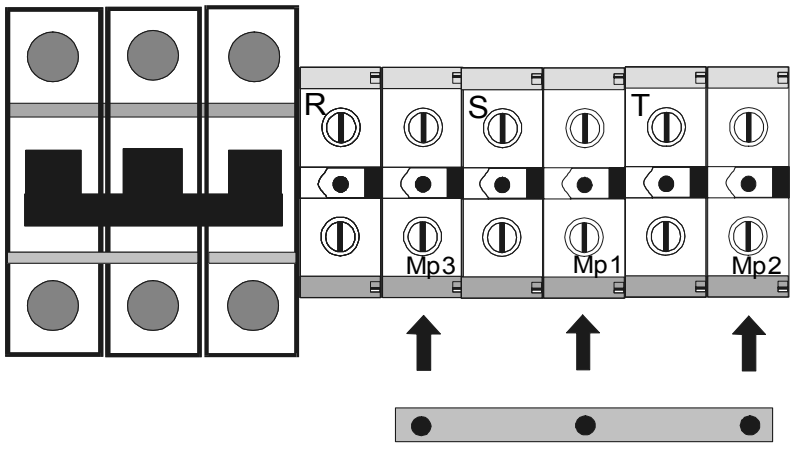
INSTRUCTION HOW TO CONVERT DELTA-WYE
FOR SINGLE BREAKER SYSTEM

AMERICAN DELTA 220V PHASE-PHASE



Install jumpers J1, J2, J3.
Do not connect Neutral (Blue) conductor.
Use black , brown, black conductor for 3 phases,
Green for GND (Delta-4 wires System)

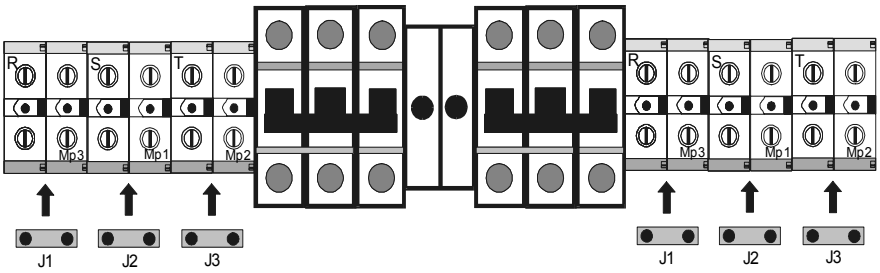
EUROPEAN/STAR 380v PHASE-PHASE ,220v PHASE-NEUTRAL



Use 3 stand offs to install Interconnected Jumper J4
Do not install J1,J2,J3
Connect Neutral (Blue conductor) to Mp2
Use black, brown,black for 3 phases and Green for
GND (WYE/STAR 5 wires Systems)

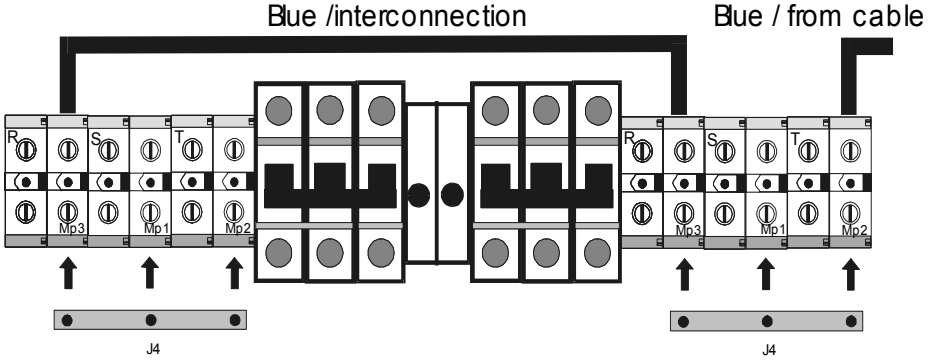
INSTRUCTION HOW TO CONVERT DELTA-WYE
FOR DOUBLE BREAKER SYSTEM

AMERICAN DELTA 220V PHASE-PHASE



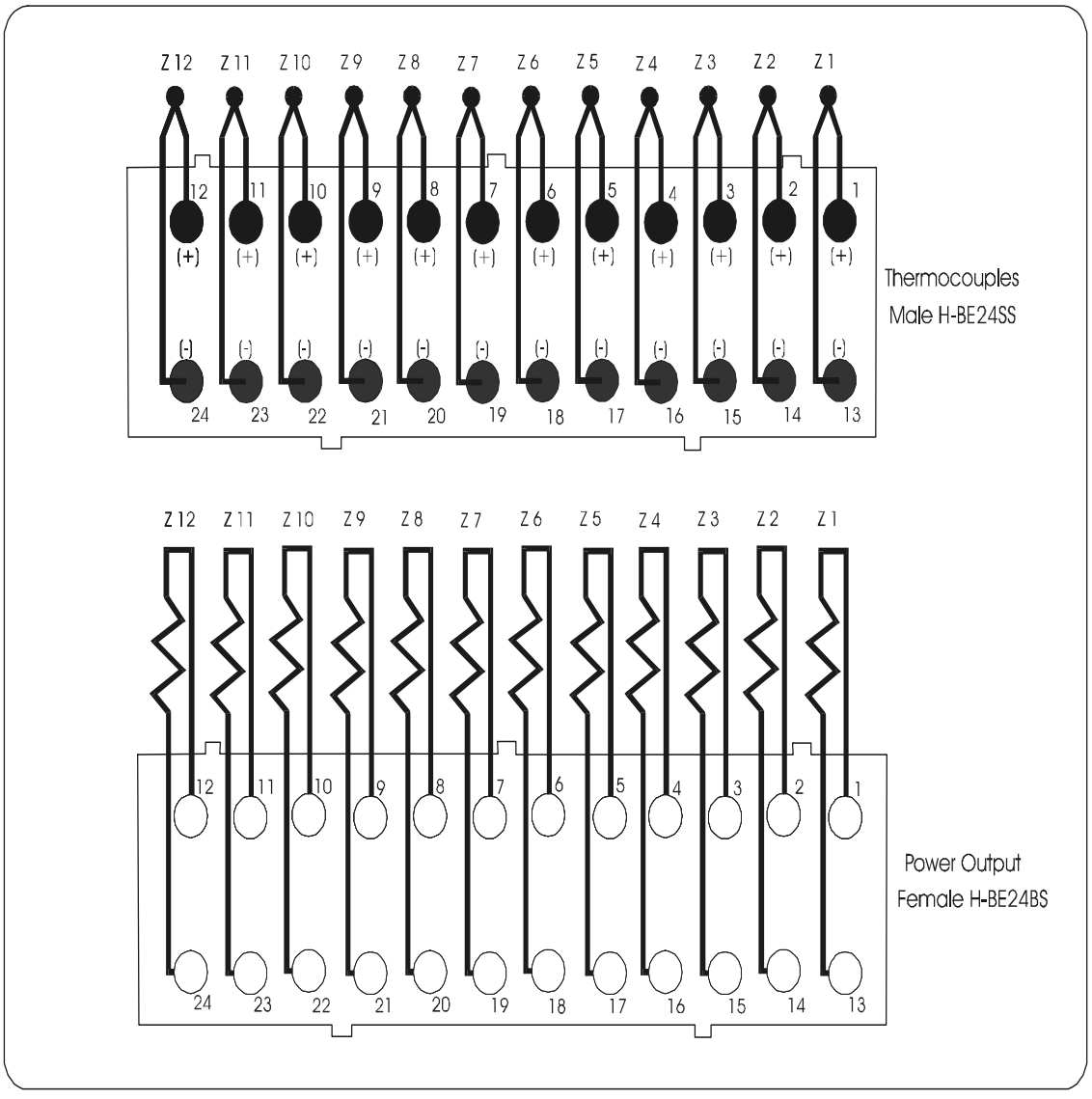
Install jumpers J1, J2, J3.
Do not connect Neutral (Blue) conductor.
Use black , brown, black conductor for 3 phases,
Green for GND (Delta-4 wires System)

EUROPEAN/STAR 380v PHASE-PHASE ,220v PHASE-NEUTRAL

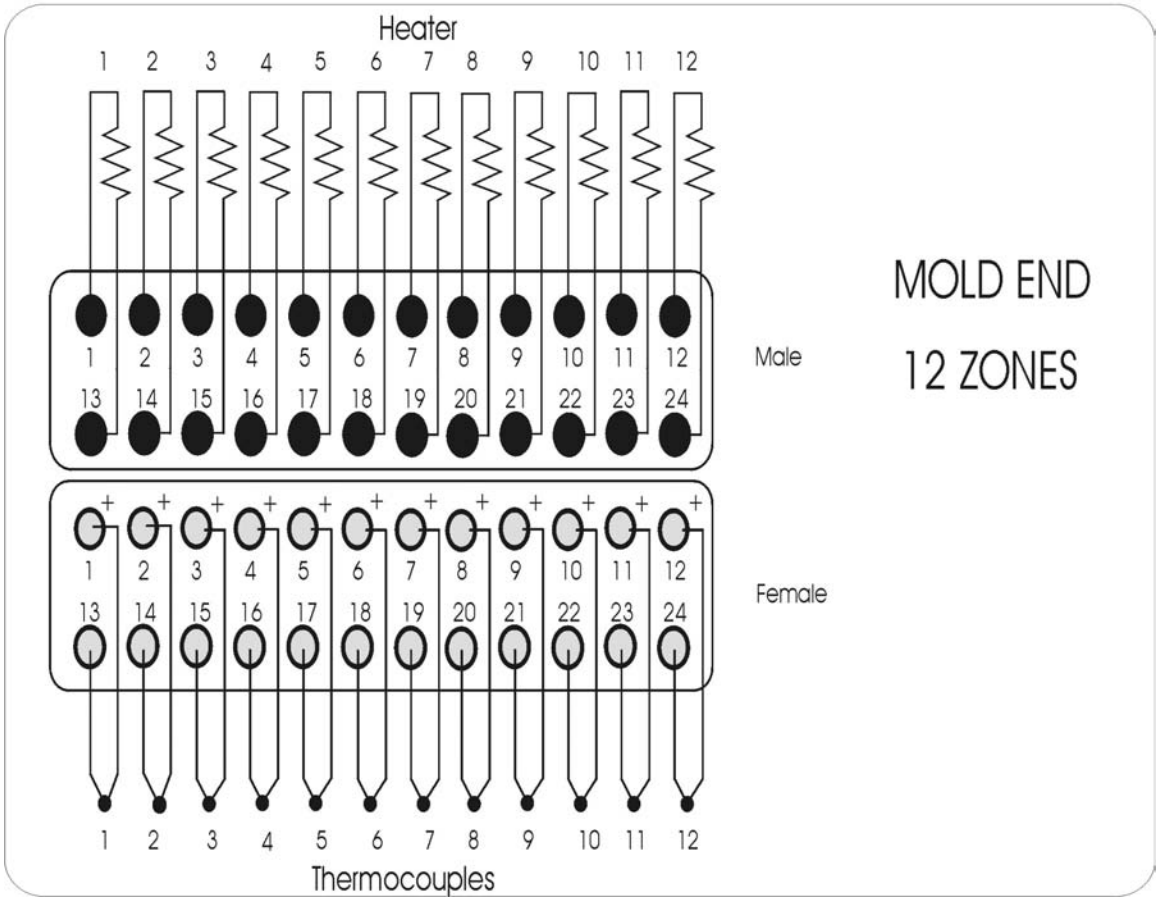


Use 3 stand offs to install Interconnected Jumper J4
Do not install J1,J2,J3
Connect Neutral (Blue conductor) to Mp2
Use black, brown,black for 3 phases and Green for
GND (WYE/STAR 5 wires Systems)
Install blue /interconnection between Mp3s

Thermocouples and Power Output Configuration



PLUGS CONFIGURATION



Glossary

Cabinet	Unit containing control electronics
Loom	Cables connecting control cabinet and tool
LCD	Liquid Crystal Display
LED	Light Emitting Diode (Warning Lights)
Manifold	Background or runner heater
Probe	Gate control heater
Prompt	Screen text asking the user for 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	An alternative 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.
Closed Loop	The normal 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.
Open Loop	An alternative method of control where power levels are set manually with no feedback of the zone temperature.
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 which 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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