MT Controllers come with a fixed password which is entered via the two arrow keys.

The Password is...

(up, down, up, up, down)
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Section 1 - Introduction

1.1 Intended Use

This manual is intended for use with the MT-Series Controller. Mold-Masters Hot Runner Controllers such as this MT series have been designed as a multi channel temperature controller for use in Hot Runner plastic molding equipment. They use feedback from thermocouples within the nozzles and manifolds to give precise closed-loop temperature control. Any other uses would fall outside the engineered intent of this machine which may be a safety hazard and would void any and all warranties.

This manual is designed to cover most system common configurations. If you need additional information specific to your system please contact your representative or a Mold-Masters office whose location can be found in the “Global Support” section.

1.2 Audience

This manual is written for use by skilled persons who are familiar with Hot Runner Controllers and their terminology.

1.3 Required User Skills

Operators should be familiar with plastic injection molding machines and the controls of such equipment.

Maintenance persons should have sufficient understanding of electrical safety to appreciate the dangers of 3-phase supplies. They should know how to take appropriate measures to avoid any danger from electrical supplies.

BEFORE YOU OPERATE THE CONTROLLER

We recommend that you read the manual fully before connecting up or using the controller.

1.4 Release Details

<table>
<thead>
<tr>
<th>Document Id</th>
<th>Release Date</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>M1_UM_EN_V2_2</td>
<td>November 2014</td>
<td>2</td>
</tr>
</tbody>
</table>

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Section 3 - Safety Instructions

The MT Controller is an electrical distribution and control device which is designed to be safe during normal operation.

**WARNING - HIGH VOLTAGE**

It is essential that the user DOES NOT open the cabinet without first ISOLATING the mains supplies to the equipment - there may be 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.

### 3.1 Safety Notices - an explanation

**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 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.

### 3.2 Where to use this equipment

The display console and controller cabinet together are designed for use in the plastic injection molding industry as temperature controllers for third party hot runner systems as commonly used in mold 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)
3.3 Check your 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 mold. 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 Mold-Masters Standard connections).

In such cases wiring errors have caused equipment failure. Mold-Masters (UK) Ltd. cannot be responsible for damage caused to the controller by customer wiring and/or connection errors.
Section 4 - Overview

4.1 Specification

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

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Voltage</td>
<td>95-265Vac 3 phase-to-neutral 50Hz with neutral, others available 220/60Hz Delta</td>
</tr>
<tr>
<td>Unit Overload protection</td>
<td>Miniature Circuit Breaker</td>
</tr>
<tr>
<td>Output overload protection</td>
<td>15A super-quick acting (FF) fuse on both legs</td>
</tr>
<tr>
<td>Power output</td>
<td>15A/3000W per zone</td>
</tr>
<tr>
<td>Ground Fault Detection</td>
<td>20mA per zone</td>
</tr>
<tr>
<td>Thermocouple input</td>
<td>Iron Constantan Fe/Con type ‘J’, or type ‘K’</td>
</tr>
<tr>
<td>Control Method</td>
<td>Self tuning PID</td>
</tr>
<tr>
<td>Soft-Start with Auto Tune</td>
<td>Unique low voltage method for heater safety</td>
</tr>
<tr>
<td>Temperature scale</td>
<td>Centigrade (Celsius) or Fahrenheit</td>
</tr>
<tr>
<td>Operating Range</td>
<td>0 - 472°C or 32 - 882°F</td>
</tr>
<tr>
<td>Control Accuracy</td>
<td>+/-1°C</td>
</tr>
<tr>
<td>Alarm Output</td>
<td>Closing volt-free contacts - 2A max 125Vac or 60Vdc</td>
</tr>
<tr>
<td>Interface</td>
<td>2 inches Full color LCD touch screen</td>
</tr>
<tr>
<td>Case Details</td>
<td>Heavy duty metal cabinet</td>
</tr>
</tbody>
</table>

4.2 TMXL/MT Compatibility

The MT Series Controller has been designed to give some interchangeability with its predecessor the TMXL2. It is built to the same size and fits into a similar cabinet.

However there is one major physical change which is the main zone fuses. These have been moved from under the cabinet lid on the TMXL2 to “on-the-card” for the MT.

This means that you can pull out individual cards to safely access and change any ruptured output fuse. In the TMXL2 output fuses were located under the cover which meant shutting the system down to gain safe access to replace a ruptured fuse.

DO NOT put TMXL cards into an MT case. Although cards appear interchangeable, putting a TMXL card into an MT case would render the output circuit unprotected since there would be no output fuse.

Conversely it is safe to put an MT Cards into a TMXL case since this would overprotect by having series output fuses on the card and under the case lid.
4.3 Controller — Tool Connections

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

4.4 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.: (44) 1432-265768
Fax: (44) 1432-263782

4.4.1 Filter Option

In countries where noise across power lines is a concern, Mold-Masters recommends that you fit the model 63AYC10B in-line filter which is supplied by TC Connectivity.
4.5 Switching “On” and “Off”

The main power switch is a rotary switch found at the front of the Controller. It is sufficiently rated to disconnect the total load current during switch On and switch Off.

4.5.1 Switching On

When the controller is switched on, all zones go into “Run” mode automatically to start heating the tool.

<table>
<thead>
<tr>
<th>Switching off individual modules</th>
<th>Switching off the whole controller</th>
</tr>
</thead>
<tbody>
<tr>
<td>Each module has its own power switch. Use the button below the screen to turn the module off and on.</td>
<td>When you switch the power off all zone settings are memorised. If you have set different zones to slightly different temperatures in order to get optimum performance then those settings are held and will be the same when you next switch on.</td>
</tr>
</tbody>
</table>
4.5.2 Switching off individual zones

1. To switch off any single zone choose that zone to show the initial menu.

2. Choose [×] to switch off that zone.

3. See that zone now displays “OFF”.
   (Repeat the same steps to switch back on again)
4.6 The Controller Cabinet
The power supply to the control cabinet is via a strain-relief mounted
cable gland plug wired in star or delta configuration. (Please check
your specifications for details of which configuration has been
configured.) Connections to the tool are by looms terminating type
Contact 24-pole connectors with 48-pole housing or their equivalents.
There are normally two types of cables supplied; a thermocouple
connection, and a power connection, both using type H-BE24BS as a
preferred connector.

Typical wiring details are shown in Appendix A.
An alarm output option is available for extending the alarm, or,
perhaps, inhibiting the injection process.

4.6.1 Controller Modules
The controller is dual-zone modular unit that provides real time
temperature control.
Each card has three main components:
• thermocouple input circuits,
• CPU,
• multi-voltage output triacs.

Thermocouple Inputs
The thermocouple inputs have preset responses for both J and K-
type thermocouples. The selection of sensor type can be done in
Program Menu; this in turn sets the CPU linearization to match the
selected thermocouple type.

Central Processor Unit (CPU)
The CPU provides the following facilities:
• closed and open loop control of the zones.
• processes thermocouple and current readings to show on display.
• checks for alarm conditions, including excess current, incorrect
thermocouple wiring, zone over temperature condition, low imped-
ance between heater and ground, and generates alarm informa-
tion for the display screen and alarm relay.
• controls the output power to the on-board triac using a number of
self-tuning algorithms.
The card requires no analogue calibration and is ready for use once
set up from the display console.

Output Triacs
The controller card has a pair of on-board triacs that are capable of
controlling heating loads of up to 16 Amps peak.
4.7 How the MT 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. This is illustrated in the following diagram and explained below.

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 in program parameter r1. Power is slowly increased until the correct rate of rise is achieved.

At ramp temperature rE, the dwell time rt is activated (2 minutes), this permits any residual moisture in the heating elements to be eliminated. After all zones reached to ramp temperature, they will start heating up together again.

The controller continues to ramp up the temperature to the set point with the speed set in program parameter r2, which should be achieved with minimum over-shoot.

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.

4.7.1 Setting the Ramp feature (On/Off)

Normally the controller starts to heat a zone and then it pauses at around 120° C for 2 minutes in order to dry out any damp that may be present (see page 5-8 for full description).

If you prefer not to wait for this dwell period then you can use the “Ramp” feature to skip the delay period and attain molding temperature quicker.
4.8 Navigation

This part of the manual introduces you to the controller card to show what facilities are available and what information is available.

4.8.1 Main Display Screen

Once the controller card is turned on, it always shows temperature display for the two zones along with set Temperature, current applied power and percentage power with those various elements shown here.

Within this manual all screen images will show “Zone 1” and “Zone 2”. However on actual controllers all the modules are usually set to read successive zones ie Zone 1, Zone 2, Zone 3, Zone 4 etc.

4.8.2 Initial Menu

Press anywhere in Zone 1 area or Zone 2 area to get an initial menu for either zone – note that the initial menu will always appear at the bottom half of the screen.

In this menu, the buttons are as follows:

- Set the (auto) temperature or (manual) power level up or down by using the [▲] and [▼] buttons.
- Turn the zone on or off by using the [●] button.
- Select more functions by choosing the [□] button
- Escape from Manual back into the default Auto mode by choosing the [●] button.
- Leave this menu and return to two zone display by choosing the [●] button.
Function Menu

Pressing [عال] on the initial menu brings you to the Function menu which has three function options and a further “Program” menu.

[Manual] puts the selected zone into manual operation.

Returning to Auto is achieved by choosing [∀] in the previous options.

[Standby] decreases that zone temperature by a pre-set amount.

Returning to Auto is achieved by choosing [∀] in the previous options.

[Boost] raises that zone temperature by a pre-set amount. The temperature remain at this raised level for two minutes then returns to Normal level.

Program Menus

Select [Program] from the function menu to reveal further set-up options. After you enter the program menu then [ٍ] and [ٍ] buttons cycle you through the various options seen in the above diagram.

A more complete description of these various parameters is explained further on in the Setting-up and Operation sections of this User-Manual.
Section 5 - SetUp

New MT series controllers leave the factory with their default settings which are as shown in this table.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Default Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zone Temperature</td>
<td>260°C or 500°F</td>
</tr>
<tr>
<td>Standby level</td>
<td>100°C or 180°F</td>
</tr>
<tr>
<td>Boost level</td>
<td>75°C or 135°F</td>
</tr>
<tr>
<td>Over temperature range</td>
<td>10°C or 18°F</td>
</tr>
<tr>
<td>Under temperature range</td>
<td></td>
</tr>
<tr>
<td>Ramp</td>
<td>On</td>
</tr>
<tr>
<td>Auto-Man</td>
<td>On</td>
</tr>
<tr>
<td>Extended Alarms for Manual, Standby and Boost</td>
<td>Off</td>
</tr>
</tbody>
</table>

If you are reconfiguring your controller to a new tool or environment then this section of the manual shows how to alter those default settings to your preferred values and afterwards to save them.

Should anything seem wrong with your new settings then it is possible to restore the default settings at any time. This is described in “Restoring factory settings and recalibration” on page 7-2.

What is covered in this section

Setting your preferred Temperature Scale
Matching Sensor Types (J or K)
Changing zone PID Characteristics
Setting the Ramp Feature
Setting Boost Level
Setting Standby Level
Monitoring Temperature Limits
Setting response to Thermocouple failure
Inhibiting users from switching to Manual, Standby or Boost
Extending Alarms for Manual, Standby or Boost operation
Language
Setting the Required Temperatures
5.1 Set Zone Numbering

For MT Controllers that have two or more modules there is an option that allows you to number the higher zones in a logical sequence. The result for an MT-06-06 for example would appear as seen here.

1. To set this numbering style proceed as follows
   From the Temperature Display Screen, choose either zone to obtain the initial menu.

2. Choose [ ] to obtain the Function Menu.

3. Choose [Program] to obtain the Program Menu.
4. Choose [▲] or [▼] to find the page containing a Zone# option.

5. Choose [Zone#] to open the zone numbering option.

6. Use [▲] and/or [▼] to set the desired zone number.

7. Choose [✓] twice to return to the main display.
5.2 Setting the Temperature Scale

The MT Controller can show temperature in Fahrenheit or Centigrade. Changes in this parameter apply to both zones of the controller card.

1. From the Temperature Display Screen, choose either zone to obtain the initial menu.

2. Choose [_manage] to obtain the Function Menu.

3. Choose [Program] to obtain the Program Menu.

4. Choose [page_up] or [page_down] to find the page containing a C/F option.
5. Choose [C/F] to open the Temperature Scale option.

6. Select either [C] or [F] to suit the local operating preference.

7. Choose [*] twice to return to the main display. The Main Display is now in Centigrade.
5.3 Changing zone PID Characteristics

On initial start-up, each module CPU reads the zone heater characteristic and determines an appropriate PID curve for that zone. Occasionally the zone may not pick an optimum setting or even if correct you may wish to override that setting and change the zone response time.

In this situation you may select and alter the PID setting for any zone. Generally speaking a small nozzle works best on a “Fast” setting while a larger manifold uses “Med(ium)” and a really large heating platen may require “Slow”. If you are having problems matching a zone then consult your local dealer for service advice.

Also note that once the controller has run and the PID curve has been selected, then the screen will show which speed was automatically selected by making that ring blue.

1. From the Temperature Display Screen, choose either zone to obtain the initial menu.

2. Choose [ ] to obtain the Function Menu.

3. Choose [Program] to obtain the Program Menu.
4. Choose [▲] or [▼] to find the page containing the PID option.

5. Choose [PID] and select an alternative timing.

6. Choose [✔] twice to return to the main display. The system is now set to running at an appropriate speed.
5.4 Setting the Ramp feature

Normally the controller starts to heat a zone and then it pauses at around 120°C for 2 minutes in order to dry out any damp that may be present (see page 4-6 for full description). If you prefer not to wait for this dwell period then you can use the “Ramp” feature to skip the delay period and attain molding temperature quicker.

The default setting is normally Ramp On which follows the normal delay period.

1. From the Temperature Display Screen, choose either zone to obtain the initial menu.

2. Choose [] to obtain the Function Menu.

3. Choose [Program] to obtain the Program Menu.

4. Choose [] or [] to find the page containing the Ramp option.
5. Choose [Ramp] and set it to Off.

6. Choose [ ] twice to return to the main display.
5.5 Setting Boost Value

Before you can use the Boost function, you must first configure the Boost value. The Boost settings made here are only for Boost Temperature and are individually set for each zone.

The Boost period is set at 2 minutes and is not configurable.

When boost is activated, the controller will raise the zone temperature. Please note that, on a slow responding manifold, if you set a high boost temperature, the zone may not reach the set boost temperature before the boost time limit expires.

The default or factory Boost setting is 75°C or 135°F. If your controller is set in Centigrade at 200°C, temperature will raise to 275°C. If your controller is set in Fahrenheit at 400°F; temperature will boost up to 535°F.

1. From the Temperature Display Screen, choose either zone to obtain the initial menu.

2. Choose [Ex] to obtain the Function Menu.

3. Choose [Program] to obtain the Program Menu.
4. Choose [▲] or [▼] to find the page containing a Boost option. Choose [Boost] to open the value setting option.

5. Use [▲] and/or [▼] to set the desired boost Temperature.

6. Choose [x] twice to return to the main display.
5.6 Setting Standby Value

Before you activate Standby function, you must first configure the amount. The Standby settings made here are only for Standby Temperature and are individually set for each zone. When standby is activated, those zones with any standby value configured will reduce their temperature.

The default or factory Standby setting is 100°C or 180°F. If your controller is set in Centigrade at 300°C, temperature will lower to 200°C. If your controller is set in Fahrenheit at 580°F; temperature will lower to 400°F.

1. From the Temperature Display Screen, choose either zone to obtain the initial menu.

2. Choose [ ] to obtain the Function Menu.

3. Choose [Program] to obtain the Program Menu.
4. Choose [↑] or [↓] to find the page containing a Standby option. Choose the [Standby] button to open the value setting option.

5. Use [↑] and/or [↓] to set the desired Standby Temperature. Note: Hold your finger on [↑] or [↓] to raise or lower value by large amounts.

6. Choose [●] twice to return to the main display.
5.7 Monitoring Temperature Limits

Your controller card monitors the actual temperature of each zone and verifies that the zone is operating within specific limits. Rather than fixed points of temperature, the Over-temperature (Ot) and Under-temperature (Ut) Limits are set as deviation above or below the set point. If these temperatures are exceeded, the alarm relay on the MT card changes state to raise a disable injection interlock or alarm.

Warn and Alarm limits

Although there is only one upper and one lower Alarm setting, each gives a visual warning at half way point. If an upper alarm is set to 10 degrees then a Warning will show at 5 degrees. The same holds true for the under temp alarm level.

1. From the Temperature Display Screen, choose either zone to obtain the initial menu.

2. Choose [ ] to obtain the Function Menu.

3. Choose [Program] to obtain the Program Menu.
4. Choose [Ot] to open the value setting option.

5. Use [] and/or [] to set the desired Over Temperature Limit. Note: Hold your finger on [] or [] to raise or lower value by large amounts.

6. Choose [] to return then [Ut] to open the Under Temperature Limit. Use [] and/or [] to set the desired Temperature Limit.

7. Choose [] twice to return to the main display.
5.8 Setting Ground Fault Detection

The default setting is “On” where the card will start to decrease power if it detects more than 20 mA leakage current. If it detects an earth leakage of 40 mA or more then it reduces output to zero.

If the option is set to “Off” then the zone will continue to deliver normal power.

1. From the Temperature Display Screen, choose either zone to obtain the initial menu.

2. Choose [ ] to obtain the Function Menu.

3. Choose [Program] to obtain the Program Menu.
4. Choose [▲] or [▼] to find the page containing a Ground selection.

5. Choose [Gnd] to open the page and set it to On or Off as required.

6. Choose [❑] twice to return to the main display.
5.9 Setting Mold Leak Detection

By monitoring average power it may be deduced that any zone that starts to require a higher power level to maintain some temperature may have a fault condition. The most common fault to exhibit this behavior is that of plastic melt leaking away from the nozzle. This in turn requires more power to heat the extra plastic which is possibly leaking somewhere into the mold or runner system.

Leak Detection in the MT is means of setting a known power level above which the unit triggers an output alarm and gives visual signal if extra power is measured. In this case the alarm is the common outgoing alarm condition and the visual signal is seen when the power level in the zone window displays red rather than normal yellow (as seen alongside).

1. From the Temperature Display Screen, choose either zone to obtain the initial menu.

2. Choose [ ] to obtain the Function Menu.

3. Choose [Program] to obtain the Program Menu.
4. Choose [▲] or [▼] to find the page containing a Leak option.

5. Choose [Leak] to open the page then choose [▲] and [▼] to set the Leak Detection power level.

6. Choose [Exit] twice to return to the main display.
5.10 Setting response to Thermocouple failure

Choose a response for any zone that detects a failed thermocouple.

Normal (Auto-Man OFF) – No action corrective taken- the zone power sets down to 0% and it shows a T/C fatal alarm.

Auto Manual (Auto-Man ON)- The zone has sufficient data, after 10 minutes steady running, to switch to Manual mode at a power level that should hold the previous temperature.

1. From the Temperature Display Screen, choose either zone to obtain the initial menu.

2. Choose [ ] to obtain the Function Menu.

3. Choose [Program] to obtain the Program Menu.
4. Choose [↑] or [↓] to find the page containing an Auto-Man option.

5. Choose [Auto-man] to open the page and set it to On.

6. Choose [×] twice to return to the main display.
5.11 Inhibiting users from switching to Manual, Standby or Boost

It is possible to stop a user from selecting Manual Control, or Standby or Boost function. To do this open the Factory setting page and tick the M.Dis (Manual Disabled) box as shown below.

1. From the Temperature Display Screen, choose either zone to obtain the initial menu.

2. Choose \[\uparrow\] to obtain the Function Menu.

3. Choose \[Program\] to obtain the Program Menu.

4. Choose \[\uparrow\] or \[\downarrow\] to find the page containing a \[Factory\] option.
5. Enter the password and then choose [✓] to access the next screen.

6. Check the M.Dis box.

7. Choose [✗] to return to the main display.

8. To check this setting choose [✗] and [Program] to see these User function buttons greyed out and no longer function. To reset return to the Factory box and uncheck M.Dis.

Note: Selecting this option will inhibit the front panel rocker switch so that Standby or Boost selection there will also be ineffective.
5.12 Extending Alarms for Manual, Standby or Boost operation

There are a currently three conditions which may be selected to generate external alarm conditions. These options are available to give an outgoing (closing) signal if the controller is set to Manual (Alm-Man), Standby (Alm-tdn) or Boost (Alm-tup).

Their default condition is “Off” but any, or all, may be changed to “On” in which case activating Manual, Standby or Boost may generate an alarm output.

1. From the Temperature Display Screen, choose either zone to obtain the initial menu.

2. Choose [ ] to obtain the Function Menu.

3. Choose [Program] to obtain the Program Menu.
4. Choose [▲] or [▼] to find the page containing an Alarm option.

5. Choose any of the three options ([Alm –tdn] shown here) to open the page and set it to On.

6. Choose [×] once to return to the Alarm Selection in order to select more Alarm options.

7. Choose [×] a second time to return to the main display.
5.13 Language
There are four language options available for the MT controller and selection is done as follows.

1. From the Temperature Display Screen, choose either zone to obtain the initial menu.

2. Choose [loys] to obtain the Function Menu.

3. Choose [Program] to obtain the Program Menu.
4. Choose [▲] or [▼] to find the page containing a Language option.

5. Choose [Language] to open the page and set it to the required language.

6. Choose [x] twice to return to the main display.
5.14 Setting the Required Zone Temperatures

Once all the user options have been set then you should set the normal operating temperatures.

1. From the main display choose whichever zone whose temperature you wish to set.

2. Use [▲] and/or [▼] to adjust the set temperature.
   Note: you do not need to choose just once for each degree change - keeping your finger or stylus on the button will allow the temperature to run up or down until it reaches the desired set point.

3. Choose [●] to return to the main display.
   Repeat for other zones.
Section 6 - Operation

‘Operation’ 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 to use the graphical display of recent performance, which may help such decisions.

What is included in this section

- Run Mode
- Off Mode
- Manual Mode (open loop control)
- Slave Mode
- Standby Mode
- Boost Mode - how to apply a short increase
- Changing Set Temperature
6.1 Run Mode

1. Controller here shows one zone turned Off.

![Image of controller showing one zone turned Off.]

2. Choose that zone, and then choose [●] to Start.

![Image of controller showing start button.]

3. Choose [●] to return to main screen and see Zone 1 now in Auto-Run mode.
   Repeat these steps for the other zone if needed.

![Image of controller showing Zone 1 in Auto-Run mode.]

6.2 Off Mode (Single Zone)

1. Each card controls two zones at a time, which can be turned off individually.

2. Choose either zone and then choose [○] to Stop.

3. Choose [×] to return to main screen and see Zone 1 now in Off mode. Repeat these steps for the other zone if needed.

6.3 Off Mode (Single Module)

1. Turn the module off by choosing the [○] button on the front of the individual card.
6.4 Manual Mode

Manual mode (open loop working) can be simply selected as an alternative to running in Auto (closed loop).

If the screen at step three shows the Manual, Standby and Boost buttons greyed out then this function has been inhibited (see page 5-22).

1. From the Temperature Display Screen, choose either zone to obtain the initial menu.

2. Choose [ ] to obtain the Function Menu.


4. Choose [ ] to return to main display and see that Zone 1 is now running in Manual Mode.
6.5 Manual Mode - Power Level

1. Choose the Manual zone to obtain the initial menu.

2. Choose [↑] to raise, or [↓] to lower, the power setting (and hence the temperature).
6.6 Slave Mode

Slave mode is an alternative to Manual and can be selected if one zone has a faulty thermocouple. The Slaved zone then mimics the same power output as the healthy zone and, provided that they had been running at a similar power level previously, then the slaved zone will hold a similar temperature.

1. From the Temperature Display Screen, choose either zone to obtain the initial menu.

2. Choose [谲] to obtain the Function Menu.

3. Choose [Program] and use up/down keys to find Slave.

4. Choose [Slave].
5. Choose Slave [On].

6. Choose [x] twice to return to main display, and see that Zone 1 displays “S2” to indicate it is slaved to Zone 2.

7. To restore to Auto repeat the first five above steps and select Slave [Off].
6.7 Standby and Boost Mode
There are two options for switching to standby or boost mode.

1. You can set each zone individually by using the module touch screens.

2. Alternatively you can switch all zones together by using the cabinet Boost/Normal/Standby selector shown below.

6.7.1 Standby – whole cabinet
Switch the Boost/Normal/Standby selector towards the right and select Standby. All zones are set down by the standby amount and remain at that lower temperature until the switch is restored to the centre off position.

6.7.2 Boost – whole cabinet
Switch the Boost/Normal/Standby selector towards the left and select Boost. All zones are raised by the boost amount for a set period of two minutes even though the switch may be left in Boost position.

6.7.3 No Standby or Boost option
Note that if the Factory setting has been set to Manual Disable then the Standby/Boost rocker switch will have no effect on controller temperature. If you suspect it may have been set then choose any zone and then choose \([\text{X}]\) to obtain the Function Menu. If the three buttons have been greyed out, as in this view, then Standby and Boost are not available.

6.7.4 Standby/Boost individual zones
These are described on the following pages.
6.8 Standby mode – Individual zones

This mode is available for times when the mold-tool is paused. In this condition, all the zone temperatures can be reduced by the predetermined amount, which helps to prevent degradation on certain materials. To set the reduction, refer to “Setting Standby Level” on page 5-12. Once the standby mode is activated, both zones would be reduced to standby temperature.

If the screen at step three shows the Manual, Standby and Boost buttons greyed out then this function has been inhibited (see page 5-22).

1. From the Temperature Display Screen, choose either zone to obtain the initial menu.

2. Choose [ ] to obtain the Function Menu.

3. Choose [Program] to obtain the Program Menu. Choose [Standby] to enter Standby mode and reduce zone temperatures.

4. The screen reverts to main display but you can see the standby temperature and confirmation message “tdn” flash alternately in the Actual Temperature window.
6.9 To come out of standby

1. Choose the Standby Zone to obtain the initial menu.

2. Choose [φ] to come out of Standby and revert to Auto.

3. Choose [●] to return to main display.
6.10 Boost Mode – Individual zones

This mode provides a means of temporarily boosting the zone temperature for a non user-configurable period of 2 minutes.

If the screen at step three shows the Manual, Standby and Boost buttons greyed out then this function has been inhibited (see page 5-22).

1. From the Temperature Display Screen, select either zone to choose the initial menu.

2. Choose [ ] to obtain the Function Menu.

3. Choose [Program] to obtain the Program Menu. Choose [Boost] to enter boost mode for the fixed 2 minute period.

4. The screen reverts to main display but you can see the boosted temperature and confirmation message “tup” flash alternately in the Actual Temperature window.
6.11 Changing Set Temperature (Auto or Manual)

Using the up and down buttons changes temperature setting for both Auto and Manual zones

1. Increase Setting:
   Touch on the zone to display the initial menu and choose [] to raise the temperature.
   Chose [ ] to revert to main Display.

2. Decrease Setting:
   Touch on the zone to display the initial menu and choose [] to lower the temperature.
   Choose [ ] to revert to main Display.
Section 7 - Maintainance

7.1 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.

7.1.1 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.

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

External cables should be checked to see that there has 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.
7.2 Restoring factory settings and recalibration

There are two main functions which are available for restoration and recalibration. These are available via the Factory option which is password protected.

1. From the Temperature Display Screen, select either zone to obtain the initial menu.

2. Choose [ ] to obtain the Function Menu.

3. Choose [Program] to obtain the Program Menu. Choose [↑] or [↓] to find the page containing a [Factory] option.

4. Enter the password and then choose [✔] to access the next screen.

5. The Factory screen gives the following options:
   - Defaults – restore the unit to default settings
   - CAL – enter a calibration check routine
   - M.Dis – enable or disable user options
   These are described on the next page.
7.2.1 Default settings

These are the settings which would have been applicable when the unit left the factory and was first received. They are:

<table>
<thead>
<tr>
<th>Setting</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zone Temperature</td>
<td>260ºC or 500ºF</td>
</tr>
<tr>
<td>Standby level</td>
<td>100ºC or 180ºF</td>
</tr>
<tr>
<td>Boost level</td>
<td>75ºC or 135ºF</td>
</tr>
<tr>
<td>Over temperature range</td>
<td>10ºC or 18ºF</td>
</tr>
<tr>
<td>Under temperature range</td>
<td></td>
</tr>
<tr>
<td>Ramp</td>
<td>On</td>
</tr>
<tr>
<td>Auto-Man</td>
<td>On</td>
</tr>
<tr>
<td>Extended Alarms for Manual,</td>
<td>Off</td>
</tr>
<tr>
<td>Standby and Boost</td>
<td></td>
</tr>
</tbody>
</table>

7.2.2 Calibration Routine

Before starting Temperature calibration you need

a. a Thermocouple simulator capable of providing accurate set points of 20ºC and 400ºC.

b. a suitable connector plug so that you can connect your simulator to the appropriate zones without any heater zones being connected. If in doubt consult the loom wiring diagram to check for heater and T/C pin connections.

7.2.3 Calibration sequence

1. Connect the simulator to the normal T/C inputs for both zones on the module being calibrated.

2. Choose [Cal] and [✓] to start the calibration routine.

3. The screen asks for a 20ºC source – set your T/C simulator to 20ºC.

4. The screen timer counts down as it sets the low range setting.

5. The screen asks for 400ºC source – set your T/C simulator to 400ºC.

6. The screen timer counts down as it sets the high range setting.

7. The screen informs you that the calibration has completed.

8. Remove the T/C Simulator and temporary connector.

7.2.4 M.Dis Option

It is possible to stop a user from selecting Manual Control, or Standby or Boost function. To do so, check the M.Dis (Manual Disabled) box on this screen.
Section 8 - Troubleshooting

Individual Card Diagnostics

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

If a zone temperature is seen to deviate from the actual setting beyond the alarm limits then the display will change to White text in Red box and generate a remote alarm.

The following is a list of alarm conditions that may be detected and which will also activate the output contacts.

<table>
<thead>
<tr>
<th>Error Message</th>
<th>Cause</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERR!</td>
<td>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.</td>
<td>Check thermocouple wiring, it may be reversed. Heater wiring may be faulty or element may be open circuit.</td>
</tr>
<tr>
<td>FUSE</td>
<td>The output 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.</td>
<td>Replace the fuse with one of the same rating and type, i.e. High Rupture Current load fuse. The fuse is located on the control card.</td>
</tr>
<tr>
<td>GND</td>
<td>The system has detected an earth fault.</td>
<td>Check your heater wiring for a low impedance path to earth.</td>
</tr>
<tr>
<td>Error Message</td>
<td>Cause</td>
<td>Action</td>
</tr>
<tr>
<td>---------------</td>
<td>-------</td>
<td>--------</td>
</tr>
<tr>
<td>LINE</td>
<td>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.</td>
<td>There is a phase detection within the controller. Although a fault within the circuit 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.</td>
</tr>
<tr>
<td>REV</td>
<td>The card has detected an abnormal input at the T/C termination that indicates a shorted or Reversed thermocouple.</td>
<td>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.</td>
</tr>
<tr>
<td>T/C</td>
<td>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.</td>
<td>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.</td>
</tr>
</tbody>
</table>
8.1 Other possible fault Conditions

8.1.1 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.

8.1.2 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.

8.2 Module Removal
To remove a control module from its slot, unscrew four corner screws first. 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.
8.3 Overload protection

The modular circuit Breaker (MCB) offers general over-current protection and there are fuses for various sub-circuits. Of the two rear panel-mounted fuses, one protects the cooling fans and the second protects the internal back-plane distribution which feeds the individual cards.

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.

8.3.1 Fans

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 the panel-mounted fuse at the rear of the unit.

<table>
<thead>
<tr>
<th>Fuse</th>
<th>32mm Anti-surge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rating</td>
<td>2A</td>
</tr>
</tbody>
</table>

8.3.2 Controller Cards

Each module card has separate protection fuses for its on-board power supply, the T/C input and for the heating load output.

On-board Power supply

The module power supply has a mains-voltage glass fuse located alongside the power supply circuit.

<table>
<thead>
<tr>
<th>Fuse</th>
<th>20mm Anti-surge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rating</td>
<td>1.6 A</td>
</tr>
</tbody>
</table>

Output Fuse Type: HRC High Speed

If the module shows a “FUSE” alarm then the card may be easily removed and the fuse changed. Only use Ceramic Body Fuses on Control Cards, NEVER use glass bodied fuses.

<table>
<thead>
<tr>
<th>Fuse</th>
<th>32mm Ceramic FF Ultra Fast</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rating</td>
<td>15A</td>
</tr>
</tbody>
</table>

Input Fuse Type: Surface-mount quick-blow

If the module shows a “T/C” alarm then this may indicate that the input fuse has ruptured. The card may be easily removed and the fuse changed.

<table>
<thead>
<tr>
<th>Part Code</th>
<th>Nano Ceramic Very fast</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rating</td>
<td>62mA</td>
</tr>
</tbody>
</table>
Appendix A

MT 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.

Filter Option

In countries where noise across power lines is a concern, Mold-Masters recommends that you fit the model 63AYC10B in-line filter which is supplied by TC Connectivity.

CONNECTION INFORMATION

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.

For European Star 380V:

For 2 / 4 zones controller cabinet: Use 4 conductors

<table>
<thead>
<tr>
<th>Cable Marking</th>
<th>Supply Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1</td>
<td>Phase 1 black</td>
</tr>
<tr>
<td>L2</td>
<td>Phase 2 gray</td>
</tr>
<tr>
<td>L3</td>
<td>Phase 3 brown</td>
</tr>
<tr>
<td>N</td>
<td>Neutral blue</td>
</tr>
<tr>
<td>Earth Symbol</td>
<td>Earth green/yellow</td>
</tr>
</tbody>
</table>

For 5 zones or higher controller cabinet: Use 5 conductors

Change jumper settings (use one 3-way jumper strip)

Join MP1, MP2, and MP3 to the blue (N) conductor at the terminal blocks.

<table>
<thead>
<tr>
<th>Cable Marking</th>
<th>Supply Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
<td>Phase 1 black</td>
</tr>
<tr>
<td>S</td>
<td>Phase 2 brown</td>
</tr>
<tr>
<td>T</td>
<td>Phase 3 black</td>
</tr>
<tr>
<td>N (Mp1, Mp2, Mp3)</td>
<td>Neutral blue</td>
</tr>
<tr>
<td>Earth Symbol</td>
<td>Earth green/yellow</td>
</tr>
</tbody>
</table>
For American Delta 240V:
For 2 / 4 zones controller cabinet: Bring the 4 conductors into the cabinet

<table>
<thead>
<tr>
<th>Cable Marking</th>
<th>Supply Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1</td>
<td>Phase 1 black</td>
</tr>
<tr>
<td>L2</td>
<td>Phase 2 gray</td>
</tr>
<tr>
<td>L3</td>
<td>Phase 3 blue</td>
</tr>
<tr>
<td>Earth Symbol</td>
<td>Earth green/yellow</td>
</tr>
</tbody>
</table>

For 5 zones or higher controller cabinet: Use 4 conductors
N.B. The delta supply cable does not have a neutral wire.
Cable colours may vary therefore wire up according to the Cable Markings.

Change jumper settings (use three 2-way jumper strips)
Join R-MP3, S-MP1, and T-MP2 at the terminal blocks.
Do not link all MP1, MP2, and MP3 together.

<table>
<thead>
<tr>
<th>Cable Marking</th>
<th>Supply Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-MP3</td>
<td>Phase 1 black</td>
</tr>
<tr>
<td>S-MP1</td>
<td>Phase 2 brown</td>
</tr>
<tr>
<td>T-MP2</td>
<td>Phase 3 black</td>
</tr>
<tr>
<td>Earth Symbol</td>
<td>Earth green/yellow</td>
</tr>
</tbody>
</table>

Alarm Output
A HAN4A 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 molding machine. The contacts are rated for 0.5A at 220V.
An input can be accepted through the same connector. It may be used for Remote Standby Mode. For exact details, consult the specification for the particular model.

<table>
<thead>
<tr>
<th>Pin</th>
<th>Connection</th>
<th>Input / output</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Auxiliary Input signal</td>
<td>Standby Port</td>
</tr>
<tr>
<td>2</td>
<td>Auxiliary Input Ground</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Alarm 240v contact 1</td>
<td>Normally Open Alarm Contacts</td>
</tr>
<tr>
<td>4</td>
<td>Alarm 240v contact 2</td>
<td></td>
</tr>
</tbody>
</table>

HAN4A Connector
Voltage Selection - Star or Delta

**Star Supply Option**

- three-way strap installed to tie three lines to neutral
- two-way straps not required

**Delta Supply Option**

- two-way straps installed to tie three lines to phases
- three-way strap not required
Normal Tool Connector MT – 2 / 2 - 0*

Power - TC - Connection
ZONE    PINS
R 1     3 / 8
R 2     4 / 9
TC 1    1(+) / 6(-)
TC 2    2(+) / 7(-)

Maximum:
230Vac - 16A
Connector:
WZ - 10 - 1RX

Dimensions:
- 93 mm
- ca. 70 mm
- 83 mm
- 32 mm
- 35 mm
- 43 mm
Normal Tool connector MT-x/4-0*

Power - TC - Connection

<table>
<thead>
<tr>
<th>ZONE</th>
<th>PINS</th>
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</thead>
<tbody>
<tr>
<td>R 1</td>
<td>9 / 10</td>
</tr>
<tr>
<td>R 2</td>
<td>11 / 12</td>
</tr>
<tr>
<td>R 3</td>
<td>13 / 14</td>
</tr>
<tr>
<td>R 4</td>
<td>15 / 16</td>
</tr>
<tr>
<td>TC 1</td>
<td>1(+) / 2(-)</td>
</tr>
<tr>
<td>TC 2</td>
<td>3(+) / 4(-)</td>
</tr>
<tr>
<td>TC 3</td>
<td>5(+) / 6(-)</td>
</tr>
<tr>
<td>TC 4</td>
<td>7(+) / 8(-)</td>
</tr>
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</table>

Maximum:
230Vac - 16A
Normal Tool connector for MT-6-xx*

Power - TC - Connection

<table>
<thead>
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<th>ZONE</th>
<th>PINS</th>
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<tbody>
<tr>
<td>R 1</td>
<td>1 / 2</td>
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<tr>
<td>R 2</td>
<td>3 / 4</td>
</tr>
<tr>
<td>R 3</td>
<td>5 / 6</td>
</tr>
<tr>
<td>R 4</td>
<td>7 / 8</td>
</tr>
<tr>
<td>R 5</td>
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<tr>
<td>TC 1</td>
<td>13(+) / 14(-)</td>
</tr>
<tr>
<td>TC 2</td>
<td>15(+) / 16(-)</td>
</tr>
<tr>
<td>TC 3</td>
<td>17(+) / 18(-)</td>
</tr>
<tr>
<td>TC 4</td>
<td>19(+) / 20(-)</td>
</tr>
<tr>
<td>TC 5</td>
<td>21(+) / 22(-)</td>
</tr>
<tr>
<td>TC 6</td>
<td>23(+) / 23(-)</td>
</tr>
</tbody>
</table>

Maximum:

230Vac - 16A

Connector:

WZ - 24 - 2RX

Dimensions:

- 140 mm
- 170 mm
- 56 mm
- 32 mm
- 35 mm

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Revised November 2014
Normal Tool connector for MT-12-xx & MT-18-xx (Europe)

### Normal Tool connector for MT-12-xx & MT-18-xx (Europe)

**Zone** | **Pin**
--- | ---
R1 | 1(+), 13(-)
R2 | 2(+), 14(-)
R3 | 3(+), 15(-)
R4 | 4(+), 16(-)
R5 | 5(+), 17(-)
R6 | 6(+), 18(-)
R7 | 7(+), 19(-)
R8 | 8(+), 20(-)
R9 | 9(+), 21(-)
R10 | 10(+), 22(-)
R11 | 11(+), 23(-)
R12 | 12(+), 24(-)

Max: 230VAC / 16A

Type: WZ-24-1RX

### Normal Tool connector for MT-12-xx & MT-18-xx (Europe)

**Zone** | **Pin**
--- | ---
T/C1 | 1(+), 13(-)
T/C 2 | 2(+), 14(-)
T/C 3 | 3(+), 15(-)
T/C 4 | 4(+), 16(-)
T/C 5 | 5(+), 17(-)
T/C 6 | 6(+), 18(-)
T/C 7 | 7(+), 19(-)
T/C 8 | 8(+), 20(-)
T/C 9 | 9(+), 21(-)
T/C 10 | 10(+), 22(-)
T/C 11 | 11(+), 23(-)
T/C 12 | 12(+), 24(-)

Type: WZ-24-1RX

Revised November 2014
Normal Tool connector for MT-12-xx & MT-18-xx (North America Standard)
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