

# **Touchscreen Reference Manual**

**Tempress® Systems, Inc.**  
Touchscreen manual  
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## 1.Introduction

The Flat Panel Display (Touchscreen) has been designed to provide the user of the Digital Temperature Controller (DTC) and the Digital Process Controller (DPC) with improved system control and easy alteration of parameters. As well as displaying the required information, its unique “touchscreen” facility makes the input of data easier than ever before. Its compact design and physical size mean that it can be used in spaces half the size of its combined predecessors. In all, it brings total control of the furnace literally to your fingertips.

## 2. System specifications

### flexibility:

Although the touchscreen has been designed for controlling the DTC and DPC, a simple change of firmware allows it to be used for any application.

### compactness:

The controlling electronics and firmware are mounted onto the back of the display making it suitable for tight spaces.

### RS422 interface:

An RS422 current loop interface is provided, making the display suitable for connection to the DPC and the DTC.

### memory:

Programs of up to 768kB (3 x 256kB) can be written to control the display and house the menus and screens. This program is contained in the "on-board" EPROMS.

### menu driven:

The firmware provides a fully menu-driven tree-structured system with a maximum of 3 menus required reaching the desired screen.

<b>TOUCHSCREEN:</b>	Display area	: 160mm x 210mm
	Viewing angle	: > 140 Degrees.
	Input Power	: 12VDC, 2A, typical 18W
	Power consumption max.	: 24W
	Pixel pitch	: 0.381 mm
	Pixel luminance	: 125cd/m <sup>2</sup> typical
	Max. ambient Temp	: 0-40 °C

<b>Power Supply:</b>	Input Power	: 90-264VAC, max. 50W, 47-440Hz
	Output Power	: 12VDC, max. 36W
	Max. ambient Temp	: 0 – 40 °C



## 3. Installation

The touchscreen can be installed very easily. The only tool required is a Phillips screwdriver. Installation into a new furnace or to upgrade a furnace from the old display panel is very similar, but for clarity the two procedures are divided into the following two sections.

### 3.1 Installation into a new furnace

To install the touchscreen into a new furnace, ensure that the DPC is fitted.

1. Turn the tube switch off.
2. Connect the DPC and power cable to the TOUCHSCREEN (Figure 3-1).
3. Use the four screws to secure the touchscreen in its position. It is now installed and ready to be tested.

Test if the screen is operating, switch the tube power on. The Main Menu should appear on the screen. The touchscreen is now ready for use.

### 3.2 Upgrading the front panel display

The Front Panel Display is an old user interface with a keypad and a one line display. There is one Front Panel Display for each Digital Controller (DPC and DTC). The size and the shape of the new touchscreen are incompatible with the Front Panel Display and new mounting location is required.

To replace the Front Panel Display with a touchscreen, the following steps are necessary:

1. Turn the tube switch off.
2. Remove the screws that hold the DPC Front Panel Display and disconnect all the cables.
3. Remove the Front Panel Display.
4. Repeat these steps for the DTC Front Panel Display.
5. Install the new processor boards in the DPC and the DTC.

#### NOTE



Make sure that important data from the DPC and the DTC are backed up before replacing the processor boards. All data will be lost upon disconnecting the processor board.

6. Install the new touchscreen power supply.
7. Make new mounting location for the touchscreen.
8. Connect the flat cable to TOUCHSCREEN.

9. Secure the touchscreen with the screws. It is now ready for starting.
10. Turn the tube switch on. The Main Menu should appear after about 10 seconds.

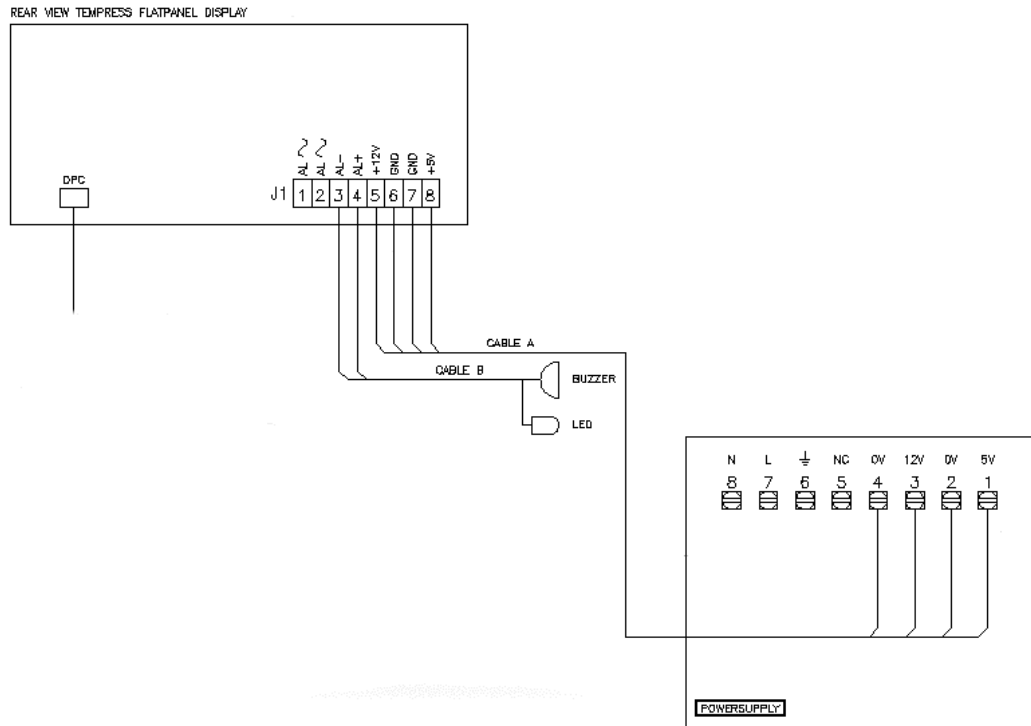


Figure 3-1 Location of Connectors

## 4. Screen Hierarchy

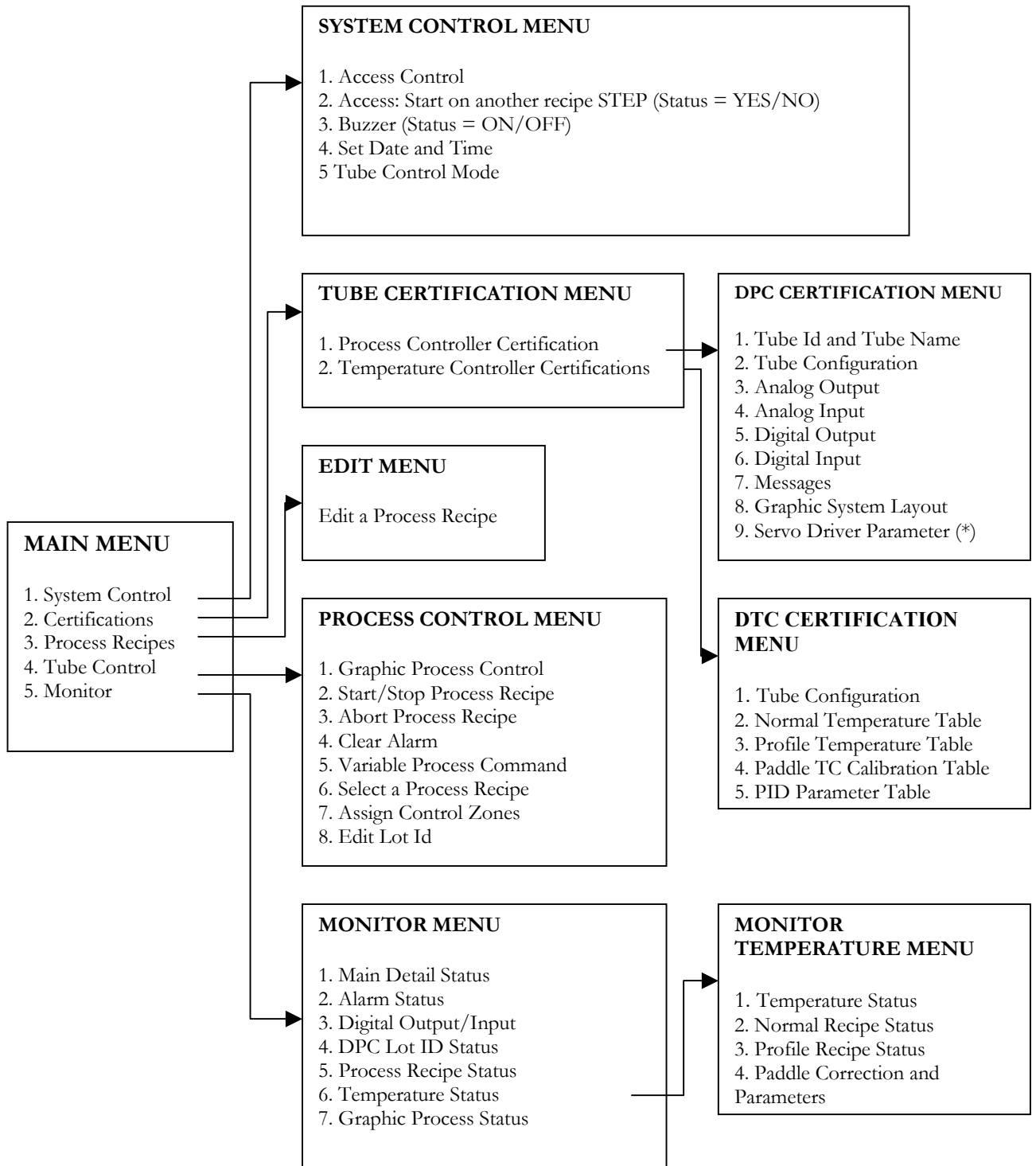


Figure 4-1 Screen Hierarchy

## 5.Data Input

Once the desired screen has been obtained, numeric or text entries can be made by the alphanumeric keys displayed at the bottom of the screen. If only numeric entries are required, one line of digits is displayed. Enter data by selecting the required sequence of digits, followed by <RETURN>.

Any mistake made before pressing <RETURN> can be corrected by using the right and left arrows to locate the cursor over the wrong digit and correct it.

### 5.1 Using the qwerty keyboard

On requiring text input, a QWERTY style keyboard is displayed in the bottom half of the screen. This allows normal alphanumeric input and also provides certain editing functions. The different keys are summarized below:

- <A-Z>, <0-9>** Used for alphanumeric input. Also provided are \* , : , . , - , / , < , > . When pressed, these keys are reproduced on the screen.
- <SPACE>** This is a space bar and produces a gap in text input.
- <RETURN>** Pressing this key will cause the input data to be stored.
- <ESCAPE>, <ESC>** Pressing this key will return the user to the Last displayed menu. If this key is pressed before the <RETURN> key, changes made since the <RETURN> key was last used will not be stored.
- <INS>** This is the insert key. This causes subsequently entered data to be stored at the position of the cursor, with any data already displayed moving one space to the right.
- <DEL>** This is the delete key. This causes the character at the position of the cursor to be deleted, with any data already displayed moving one space to the left.
  
- <↑ > <↓ >** These cursor control keys will move the cursor from field to field.
- <← > <→ >** These cursor control keys will move the cursor from section to section.
- <↑ >** Move the cursor one row up, in the same column.
- <← >** Move the cursor one column left, in the same row.
- <→ >** Move the cursor one column right, in the same row.
- <↓ >** Move the cursor one row down, in the same column.
- - > and < - -** They enable the cursor to be moved to any position in the current field, without affecting the displayed data. They will move the cursor from character to character.
- <CAP>** This is a shift-lock key and will cause all subsequent data to be input in lower case. Press a second time to revert to upper case.

## 6. Operation menu's



Figure 6-1 Main Menu

This is the first screen after power-on. The Main Menu has a title bar containing the menu name, the tube identification number and the tube name. The center of the screen contains five menus, and the bottom line gives the date and time and allows at any moment alarm messages to be displayed.

The menus are ordered in a security hierarchy, being the top menu the highest security level and the bottom menu the lowest security level.

### 1. System Control

There are five security levels to the touchscreen. The access rights can be restricted via this System Control Menu. At time of delivery the touchscreen is set unrestricted.

The access levels for the system are given below:

1. SYSTEM CONTROL	SYSTEM MASTER
2. CERTIFICATIONS	SYSTEM ENGINEER
3. PROCESS RECIPES	PROCESS ENGINEER
4. TUBE CONTROL	OPERATOR
5. MONITOR	EVERYONE

## **2. Certifications**

The Certifications Menu describes the hardware to the DPC and DTC. This menu is split up in two parts, one for the DPC and one for the DTC. It is vital that the information stored in those submenus matches the actual hardware.

## **3. Process Recipes**

Process recipes are programmed and modified in this menu. A recipe editor selection screen allows a new recipe to be made or an existing one to be modified. Two types of recipes are available: Normal and Abort. The Normal recipes are used for regular processing. The Abort recipes can be used to automatically handle possible dangerous situations.

## **4. Tube Control**

The Tube Control Menu is used to start, stop or abort a process recipe, clear possible alarms, set variable commands and assign temperature control zones. It is the most often used menu while working with a furnace.

## **5. Tube Control**

This freely accessible menu allows a quick glance on the current situation in the tube. The current status of the alarms, recipes, digital input/outputs, paddle parameters or to give a graphic display of the current system. It is not possible to make changes using this selection.

## 6.1 System controller

Entering the System Control Menu requires a username and a password.



Figure 6-2 System Control Access Screen

It is recommended to set these settings first. Once the other access rights have been changed, the System will not allow access to a second level menu without a name and password.

Once the NAME and PASSWORD are given, the following screen with the “SYSTEM CONTROL MENU” will appear:

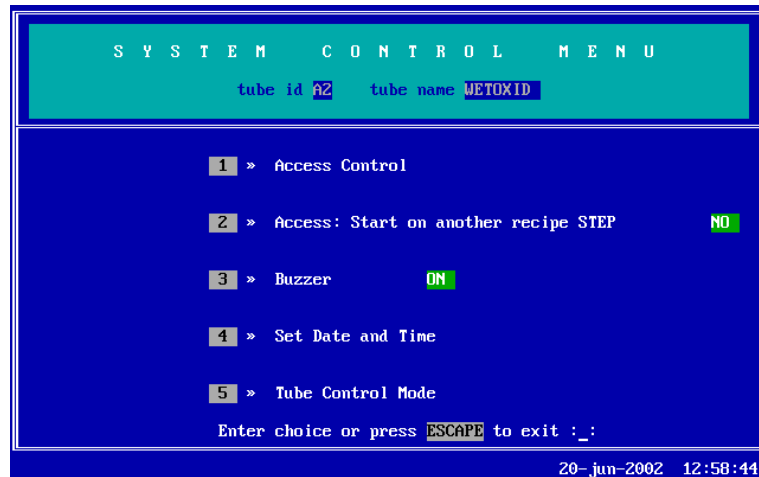


Figure 6-3 System Control Menu

### 6.1.1 Access control



Figure 6-4 Access Control

Access Control gives the opportunity to make a distinction in the user access rights. To edit a username and password, press the corresponding number (1 to 4). The username may consist of ten characters, the password only five.

Press <V> to make all the passwords visible.

1. **System Master** : To change the name of the highest level of access.
2. **System Engineer** : To change the name of the second level of access.
3. **Process Engineer** : To change the name of the third level of access.
4. **Operator** : To change the name of the fourth level of access.

To leave “Access Control” menu press <ESCAPE>.

**NOTE**



- If the Sysmaster username and password have been changed confirmation is required when exiting the Access Control Menu.
- Do not forget Sysmaster settings!!



### 6.1.2 Start on another recipe STEP (status= YES / NO)

To change access/status of 'starting on another recipe step' in YES or NO. To allow jumping to another step in a running process recipe set status to ON. Disabling this feature is done by selecting this menu item again.

**YES** To make it possible to jump to another step in the recipe.

**NO** It is not allowed to jump to another recipe step.

**CAUTION** Jumping to a wrong process step may cause serious danger.

### 6.1.3 Buzzer (status= ON / OFF)

The buzzer gives a continuous audible signal to alert users for alarms and an intermittent audible signal for operator warnings.

The buzzer can be completely switched off with this menu item. Alarms will still be visible in the bottom line of the touchscreen.

**ON** Every time an alarm appears on the TOUCHSCREEN, the buzzer will give a sound. By touching the screen the alarm will stop.

**OFF** An alarm will only appear on the TOUCHSCREEN. The buzzer will not give any sound during the whole process/recipe.

### 6.1.4 Set Date and Time

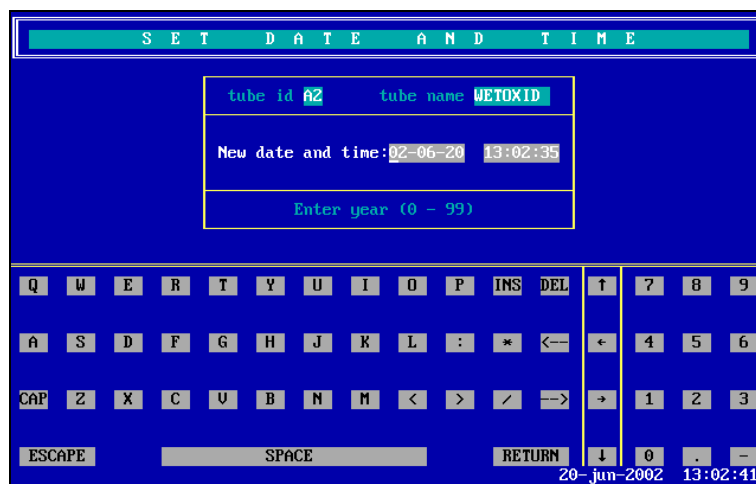


Figure 6-5 Set Date and Time

Enter the correct values; use the numeric keys on the right. Press <RETURN> to confirm or <ESCAPE> to discard the changes and return to the "System Control Menu".

Press <ESCAPE> to exit the menu until the Main Menu is displayed. Do not forget the System Master name and password, because entry to the access control menu is no longer possible without them.

### 6.1.5 Tube control mode

Tube Control takes place by Touchscreen and TSC-II. Tube Control Mode Menu allows to define which one of the user interfaces is allowed to control the tube. This is to provide unauthorized or unwanted recipe selection, or starting and stopping a recipe.

It can be important to disable one (or both) controller interface(s) to prevent any dangerous situation, like starting a recipe from TSC-II (remote control) at the same time the maintenance engineer is working on the system.

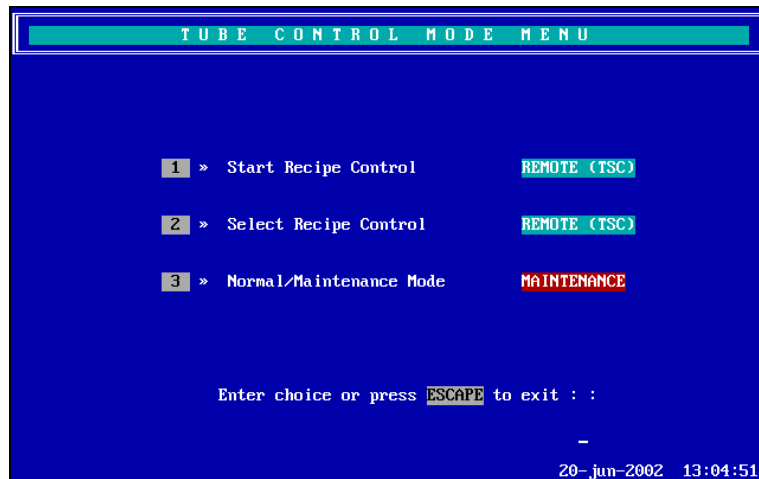


Figure 6-6 Tube Control Mode Menu

#### 6.1.5.1 Start Recipe Control

Start Recipe Control mode allows 4 levels of authority concerning the tube control by TSC-II or Touch Screen:

*REMOTE (TSC)*

Tube control is only possible by using the TSC-II server. In this configuration the Touch Screen is blocked.

*NORMAL (Local + Remote)*

Tube control is possible with the Touch Screen as well as the TSC-II server.

*DISABLED*

Tube control is not possible at all. Not by the Touch Screen and not by the TSC-II.

*LOCAL (Touch Screen)*

Tube control is only possible by using the Touch screen. In this configuration the TSC-II server is blocked.

**NOTE**



Due to safety reasons, aborting a recipe is always possible via the touch screen or the TSC2.

### **6.1.5.2 Select Recipe Control**

Select Recipe Control mode allows 4 different levels of authority concerning recipe selection:

*REMOTE (TSC)*

Recipe selection is only possible via the TSC-II.

*NORMAL (Local + Remote)*

Recipe selection is possible via the TSC-II as well as the Touch Screen.

*DISABLED*

Recipe selection via the TSC-II as well as the Touch Screen is not possible.

*LOCAL (Touch Screen)*

Recipe selection is only possible via the Touch Screen.

### **6.1.5.3 Normal / Maintenance Mode**

This mode has two options:

**NORMAL**

Tube control and recipe selection is possible according the configuration of authority of "Start and Select recipe control".

**MAINTENANCE**

Both, Touch Screen and TSC-II are blocked. Only aborting a running process recipe is possible via TSC\_II as well as touch screen.

## 6.2 Certifications



Figure 6-7 Tube Certification Menu

'Certifications' in the Main Menu gives access to the submenu 'Tube Certification Menu'. This submenu gives access to the DPC and the DTC certifications.

### 1. Process Controller Certifications

To change the certifications of the Digital Process Controller (DPC).

### 2. Temperature Controller Certifications

To change the certifications of the Digital Temperature Controller (DTC).

### 6.2.1 Process Controller Certifications



Figure 6-8 DPC Certification Menu

- |                                  |   |
|----------------------------------|---|
| <b>1. Tube Id and Tube Name:</b> | To change the Id or name of the tube.   |
| <b>2. Tube Configuration:</b>    | To change the number of process recipes, pressure control or boat parameters.                           |
| <b>3. Analog Outputs:</b>        | To change the parameters of any of the analog outputs or interlocks between analog and digital outputs. |
| <b>4. Analog Inputs:</b>         | To change the parameters of the analog inputs.  |
| <b>5. Digital Outputs:</b>       | To change the parameters of the digital outputs.  |
| <b>6. Digital Inputs:</b>        | To change the parameters of any of the digital inputs.  |
| <b>7. Messages:</b>              | To change any of the 16 available messages in the system.   |
| <b>8. Graphic System Layout:</b> | To make alterations to the graphic display.   |

### 6.2.1.1 Tube Id and Name

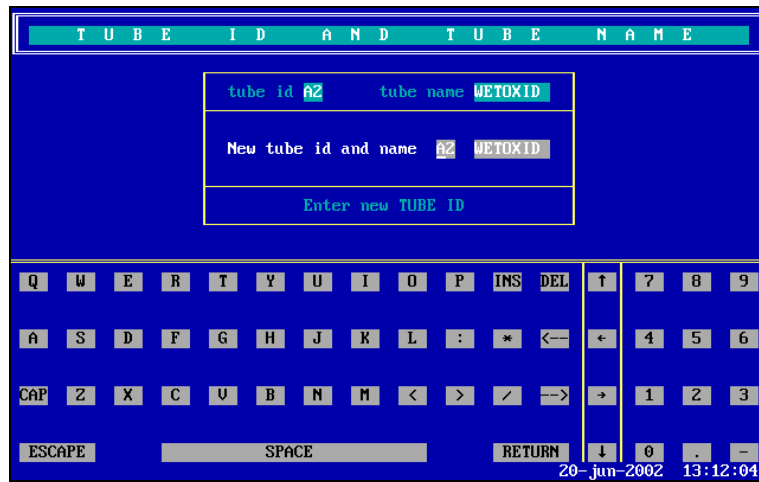


Figure 6-9 Tube Id and Tube Name

This screen enables the user to change the Id and the name of the tube.

Enter the new Id, with a maximum of two characters, followed by <RETURN>. The first character must be a letter of the alphabet in the range A to Z. The second character must be a number in the range 0 to 9.

### 6.2.1.2 Tube Configuration

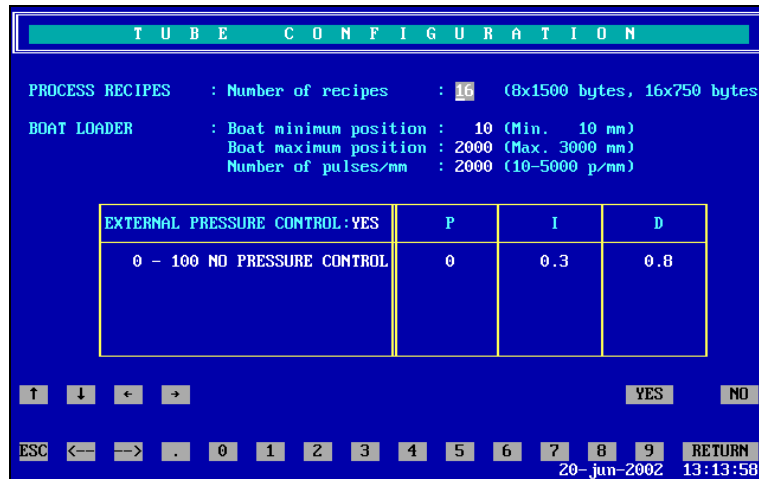


Figure 6-10 Tube Configuration DPC

This screen enables the selection of the number of recipes, boat parameters and the pressure control parameters. The new value will be stored by pressing <RETURN>. The current value can be kept by confirming with the <RETURN> key. The information in brackets show the range of the possible values for each parameter.

**Process Recipes**      The total number of process recipes can be change between 8 (8x 1500 bytes) or 16 (16x750 bytes).

**Boat Loader** When it is installed, this field shows the minimum and maximum position of the boat. (The number of pulses per mm. is only applicable to old step motors. The current servo motors do not use this parameter).

**External Pressure:** YES: Nothing can be edited. Pressure will be controlled externally.  
 NO: The range may be edited (with a maximum of five sub ranges). After editing the ranges, the PID can be entered.

To correct a mistake the cursor can be positioned over the incorrect value, using either the <RETURN> key (to move down) or the <↑> key (to move up). Enter the correct value and confirm with the <RETURN> key. To move the cursor to the right or left, without altering any digits, use <←> and <→>.

Press <ESC> to return to the DPC Certification Menu.

### 6.2.1.3 Analog Outputs

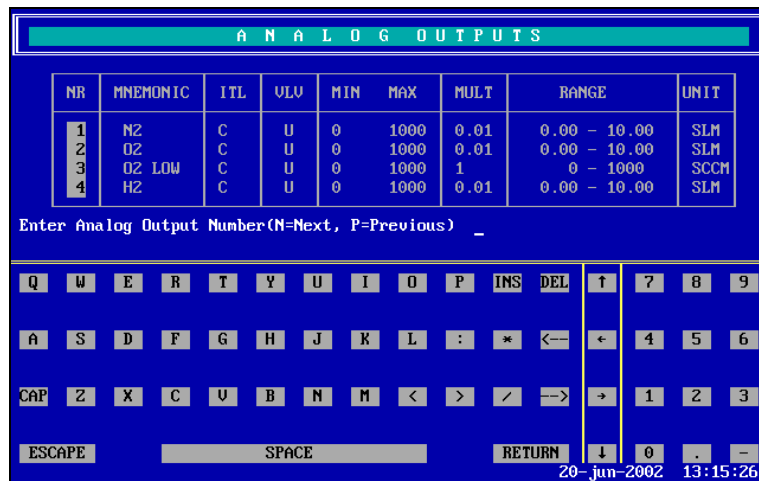


Figure 6-11 Analog Output

This screen displays the current settings of the analog outputs. To define an analog output, select the number.

Give for each output the name (mnemonics, maximum eight characters), interlock type, upstream or downstream valve, the minimum and maximum range value, the multiplication factor and its unit. Confirm input data by pressing <RETURN>.

If there are more than four analog outputs, press <N> to go to the next four combinations.

### 6.2.1.4 Analog Inputs

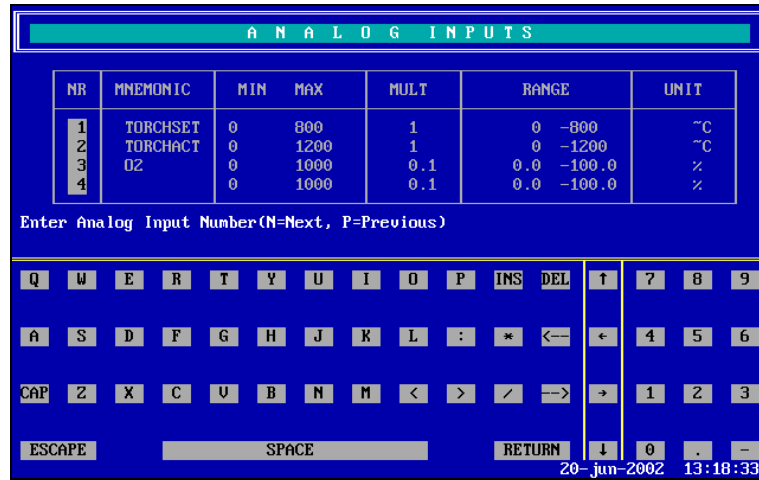


Figure 6-12 Analog Inputs

This submenu defines the settings for the analog inputs. To define an analog input first select its number.

Give for each input the name (mnemonics, maximum eight characters), the minimum and maximum range value and its unit. Confirm input by pressing <RETURN>. The possible input selection is shown on the line above the keyboard.

When all the alterations have been made, press <ESCAPE> to return to the DPC Certification Menu.

### 6.2.1.5 Digital Outputs



Figure 6-13 Digital Outputs

This submenu defines the digital outputs. The output can be edited by entering its number, followed by <RETURN>. When the name is set, confirm with the <RETURN> key. When all the changes are performed, press <ESCAPE> to return to the DPC Certification Menu.

If there are more than sixteen digital outputs, press <N> to go to the next sixteen combinations.



### 6.2.1.6 Digital Inputs



Figure 6-14 Digital Inputs

This submenu defines the Digital Inputs.

The input can be edited by entering its number, followed by <RETURN>. When the name is set, confirm with the <RETURN> key. When all the changes are performed, press <ESCAPE> to return to the DPC Certification Menu.

If there are more than sixteen digital inputs, press <N> to display the next sixteen combinations.

### 6.2.1.7 Messages



Figure 6-15 Messages

This screen displays the current messages and the message number to which they are assigned. There are initially eight of the maximum sixteen messages assigned, although any may be changed.

A mnemonic can be changed by using the cursor control keys and entering another or a new mnemonic. When all messages have been edited, press <ESCAPE> to return to the DPC Certification Menu.

Use messages as mnemonics in your recipe. During the process these messages give an idea of the progress of the process.

### 6.2.1.8 Graphic System Layout

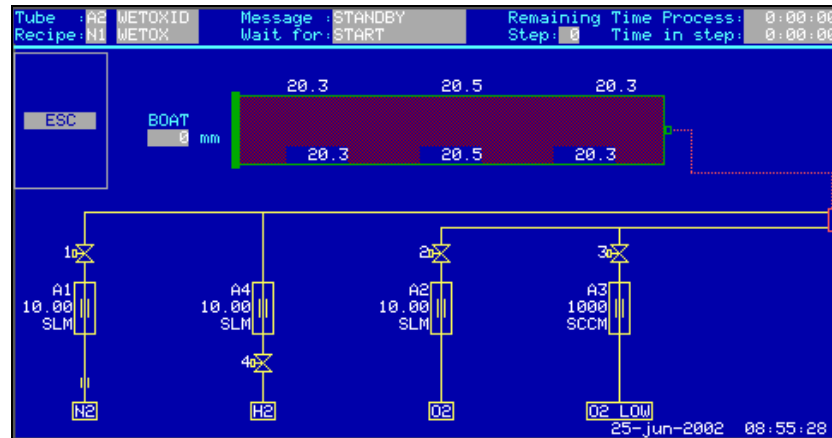


Figure 6-16 Graphic System Layout

There are two options, Graphics-1 and Graphics-2. 'Graphics-1' gives the possibility to design a graphic display. It is used to design the tube type, the pressure valves, the pump valve, the vacuum valves, the top tube-line valves and the bubbler. It is used in combination with the screen 'Graphics-2'. This one is used to draw the other valves and meters used in the system. Where 'Graphics-1' ends, 'Graphics-2' will continue.

After the screen has been activated (ON), up to four graphics can be designed and seen.

Maybe not all elements are present on your system. If this happens, unwanted elements can be omitted.

## 6.2.2 Temperature Controller Certifications



Figure 6-17 DTC Certification Menu

This menu is used to configure the DTC parameters. It is VITAL that the parameters match the actual hardware. Failure to do so leads to serious danger. It is not possible to choose another tube from this menu. The following options are available from this menu:

### 1. Tube Configuration:

The type of spike or paddle thermocouple, operating temperature range, maximum heat up rate and maximum profile deviation can be modified here.

### 2. Normal Temperature Table:

The process temperatures are predefined in the Normal Temperature Table. A maximum of sixteen individual temperature recipes are available.

### 3. Profile Temperature Table:

The profiling temperatures are predefined in the Profile Temperature Table. A maximum of sixteen individual profile temperatures are available.

### 4. Paddle TC Calibration Table:

Correction temperatures for a calibrated paddle (=profile) thermocouple can be stored in this table.

### 5. PID Parameter Table:

The proportional, integral or derivative parameters of the spike or paddle thermocouples for any of the temperature ranges can be modified in this table. USE WITH CARE!

## 6. Maximum Spike Correction Table:

The maximum spike correction table is used to prevent large overshoot in special situation.

### 6.2.2.1 Tube Configuration

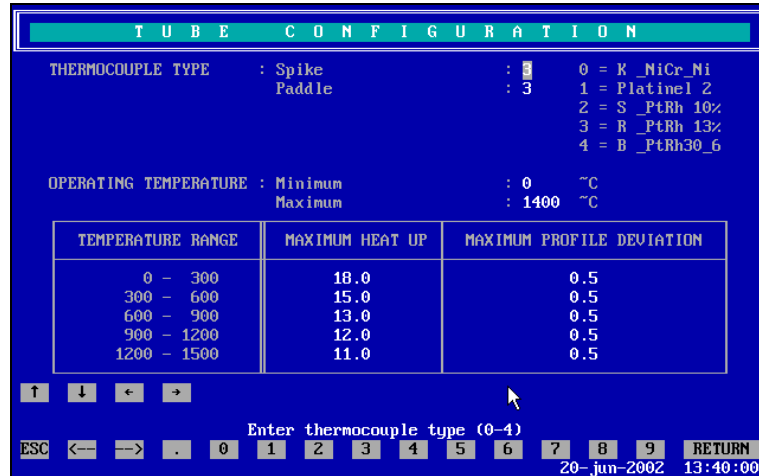


Figure 6-18 Tube Configuration

The Tube Configuration Menu is used to set the type of thermocouples on the furnace, the maximum heat up rate and the maximum profile deviation. The cursor position is highlighted and the context sensitive information is displayed on line "Enter thermocouple type (0-4)". Confirming the selection with <RETURN> will move the cursor to the next item automatically.

If an error is made the cursor can be moved back to a value using the <↑> key.

The <←> and <→> allow the cursor to be moved to the left or right within the current parameter, without altering any digit.

#### Spike Thermocouple Type:

To select the required thermocouple type, press the corresponding number (the possibilities are shown on the upper right corner of the screen), followed by <RETURN>. If no changes are required, press <RETURN> only. The cursor will automatically move to the paddle thermocouple entry, which can be changed in the same way.

#### Operating Temperature Range:

The operating temperature range can be changed next and it must match the thermocouple type. First enter the minimum temperature, followed by <RETURN>. Then enter the maximum temperature.

**Maximum Heat Up:**

The maximum heat up rate is a software limitation on the maximum ramp-up speed for each temperature range. The maximum heat up rate can be anything between 0.0 (= no limitation) and 25.5°C/min. (controlled).

**Maximum Profile Deviation:**

The maximum profile deviation is a limit used for profiling the tube. When profiling, the temperature must be at its setpoint within this limit for 15 minutes in all the zones. The temperature must remain at its setpoint within this limit to allow the profile table to be updated.

### 6.2.2.2 Normal Temperature Table

N O R M A L T E M P E R A T U R E T A B L E					
CONTROL		Spike	Independent		
RECIPE NR	TEMP SETP(°C)	SLOPE(°C/min)	HIGH/LOW LIMITS(°C)		GAIN(%)
zone 1	700.0	10.00			100
zone 2	700.0	10.00			100
zone 3	700.0	10.00			100
Enter RECIPE NUMBER to edit (0-15)					
↑ ↓ ← →		CONTROL	RC-	RC+	
ESC	←	→	.	0 1 2 3 4 5 6 7 8 9	RETURN
					20-jun-2002 13:42:07

Figure 6-19 Normal Temperature Table

The Normal Temperature Table consists of 16 positions (0-15) for process temperature recipes. These process temperature recipes can be selected based on recipe number. Every process temperature recipe contains the following parameters:

**Recipe number:**

The recipe number is the main source of recipe selection. To select a recipe, position the cursor over the recipe number and enter the number of the new recipe in the range 0 to 15 or press <RC+> or <RC-> to scroll up and down. When the desired recipe number has been selected press <RETURN> to fill in its parameters.

**Temperature Setpoint:**

Enter the Temperature Setpoint for each zone. Each entry must be in the range 0.0 (Tmin.) to 1400.0 (Tmax.) °C, as defined in the DTC configuration based on the type of thermocouple, see Figure 6-19.

**Slope:**

The slope is the temperature rise in °C/min of the Setpoint. The actual temperature will rise with equal rate after some delay. Each entry can be in the range 0,0 to 99.0 °C/min. the actual temperature rise is hardware restricted (due to power transformer limitation) and is software limited (see DTC configuration in Figure 6-18) to extent the heating element lifetime.

**High/Low limits:**

The high and low limits are used to allow some temperature deviation around the setpoint. If the actual temperature falls outside these limits a temperature alarm is generated. The limits must be in the range 0.0 to 25.5 °C where 0.0 means NO alarm limit set.

**GAIN:**

The gain is a amplification factor in the PID temperature control Loop and can be increased if a particular temperature zone does not reach its setpoint. Default setting is 100%, the range is 0% (means no power output) to 255% (maximum amplification).

**Control:**

The control section of the normal (process) temperature table defines the type of thermocouple that is used as input signal (spike or paddle) to the PID temperature control loop.

In addition, the behaviour of the different temperature control zones can be modified. Default the temperature zones are independently controlled to provide the fastest result. If so desired the center zone can be used as master and the outer zones will follow as slave when the type of control is set to master/slave.

To change the type of control on the furnace, the <CONTROL> key must be pressed, the cursor will move to the first input behind "CONTROL". This will enable the spike (press <S>) or paddle (press <P>) thermocouples to be selected for control. Selecting one of these will allow independent control (press <I>), or master/slave control (press <M>) to be selected. The control can be left unchanged by pressing <ESC> or the cursor control key down <↓>.

**6.2.2.3 Profile Temperature Table**

PF	PADDLE SETPOINT			SPIKE VALUE			OUTPUT POWER		
	zone 1	zone 2	zone 3	zone 1	zone 2	zone 3	zone 1	zone 2	zone 3
0	700.0	700.0	700.0						
1	800.0	800.0	800.0						
2	900.0	900.0	900.0						
3	990.0	990.0	990.0						
4	1000.0	1000.0	1000.0						
5	1010.0	1010.0	1010.0						
6	1100.0	1100.0	1100.0						
7									
8									
9									
10									
11									
12									
13									
14									
15									

↑ ↓ ← →    A B C D    I E

Enter paddle setpoint (0.0-1400.0 °C)    A,B,C,D=table I=insert E=erase

ESC ← → . 0 1 2 3 4 5 6 7 8 9 RETURN

20-jun-2002 13:43:41

Figure 6-20 Profile Temperature Table

The Profile temperature table is used to increase temperature accuracy for process runs.

Four profile temperature tables are available (A-D) to accommodate different process environments. Typically only one table is used, occasionally two (such as dry and wet environment in a steam oxidation capable table).

The paddle setpoint entries will be the same to all four tables and must be entered in ASCENDING order. Failure to do so will generate an error message when exiting the profile temperature table menu. A particular profile temperature table can be selected by pressing A, B, C, D. the profile temperature table exists of four columns. The first (small) column contains the profile temperature recipe number (0-15). The second column contains the paddle setpoints for each temperature zone. Zones 4 and 5 if applicable can be made visible by pressing <NEXT>.

The third and fourth columns contain the corresponding spike values and required power output to reach the paddle setpoint is column 2. These values are entered automatically when the automatic profiling procedure is performed.

- <I(nsert)> This enables a profile temperature recipe to be inserted into the table. All the other lines in the table are moved down one line.
- <E(rase)> This will delete the profile temperature recipe at the cursor position. All the other lines in the table are moved up one line.

### 6.2.2.4 Paddle TC Calibration Table

PADDLE TC CALIBRATION TABLE				
PF	CALIBRATION	CALIBRATION VALUE		
	TEMPERATURE	paddle 1	paddle 2	paddle 3
0	1500.0	1500.0	1500.0	1500.0
1	1500.0	1500.0	1500.0	1500.0
2	1500.0	1500.0	1500.0	1500.0
3	1500.0	1500.0	1500.0	1500.0
4	1500.0	1500.0	1500.0	1500.0
5	1500.0	1500.0	1500.0	1500.0

\*\* Calibration temperatures MUST be in ascending order \*\*

Enter calibration temperature (0.0-1500.0 °C)

↑ ↓ ← →
INSERT ERASE

ESC ← → . 0 1 2 3 4 5 6 7 8 9 RETURN
 20-jun-2002 13:44:43

Figure 6-21 Paddle TC Calibration Table

The paddle calibration table can be used to further improve temperature accuracy. It is only useful when a certified calibrated paddle thermocouple is available. Regular recalibration of this paddle thermocouple is required. (At least every 6 months, severe temperature cycles and/or high intensity use may require even shorter recalibration interval.)

The certified calibrated paddle thermocouple comes with a calibration table that must be entered here to allow the DTC to compensate for the calibrated paddle thermocouple properties. Up to 6 calibrated temperatures can be stored. They must be in ASCENDING order. Failure to do so will generate an error manage when exiting the paddle calibration menu.



**NOTE**



If a not calibrated paddle thermocouple is used the calibrated values of each zone must be made equal to the calibration temperature.

- <INSERT> This enables a profile temperature recipe to be inserted into the table. All the other lines in the table are moved down one line.
- <ERASE> This will delete the profile temperature recipe at the cursor position. All the other lines in the table are moved up one line.

The line above the cursor movement keys has a brief description of the possible input values, the range and its unit.

**6.2.2.5 PID Parameter Table**

P I D P A R A M E T E R T A B L E									
TEMPERATURE RANGE	SPIKE				PADDLE				
	P	I	D	GAIN	I(1)	I(2)	I(3)	D	
0 - 300	10	6.0	30	35	3.0	3.0	3.0	90	
300 - 600	8	5.0	30	45	1.5	1.5	1.5	90	
600 - 900	6	4.0	30	55	1.0	1.0	1.0	90	
900 - 1200	5	4.0	30	65	0.8	0.8	0.8	90	
1200 - 1500	5	4.0	30	80	0.5	0.5	0.5	90	

Enter proportional parameter (1-100 °C)

↑ ↓ ← →

ESC ← → . 0 1 2 3 4 5 6 7 8 9 RETURN

20-jun-2002 13:46:47

Figure 6-22 PID Parameter Table

The PID parameter table defines the proportional, integral, derivative and gain parameters for the spike TC's and the integral and derivative parameter for the paddle TC. The default values have been optimised to accommodate 98% of all hardware configurations. The values need only be modified if temperature problems such as overshoot and/or extremely long stabilization times are experienced. A particular example is the use of a heating element at temperatures well below its specified range (such as an A1 heating element operating at 425°C where a low temperature element should have been used).

### 6.2.2.6 Maximum Spike Correction Table

MAXIMUM SPIKE CORRECTION TABLE			
RANGE (°C)	Zone 1	Zone 2	Zone 3
0 - 1500	6.0	6.0	6.0
Enter temperature range (1 - 1500 °C)			

↑ ↓ ← →  
 ESC ← → . 0 1 2 3 4 5 6 7 8 9 RETURN  
 20-jun-2002 13:48:24

Figure 6-23 Maximum Spike Correction Table

The maximum spike correction table is used to prevent excess temperature overshoot in the particular situation of Paddle Control and Boat Out.

Due to cold cleanroom air entering the process tube when the boat is out the door zones measured by the paddle thermocouple will cool down. Without the maximum spike correction table filled the DTC would respond with power increase for the affected zones. When the boat is moved in the latent heat provided by this DTC action results is a large temperature overshoot and subsequent longer stabilization times. With the maximum spike correction table filled (default 6.0 °C) the DTC is allowed only the stored value (6.0 °C) temperature rise on the spike TC, thereby limiting the latent heat and reducing temperature overshoot and stabilization times upon door closure.

### 6.3 Process Recipes

EDIT A PROCESS RECIPE			
Current recipe: <b>N1</b> WETOX		Running: <b>N0</b>	
NORMAL RECIPES		ABORT RECIPES	
1 WETOX	9	1 BADABORT	
2 WETOX	10	2	
3	11	3	
4	12	4	
5	13	5	
6	14	6	
7	15	7	
8	16	8 SAFEABRT	
Enter number or 'ESCAPE' to exit (0=New rc): <b>N1</b> :			
Select type: <b>NORMAL</b>		<b>ABORT</b>	

ESCAPE ← → 0 1 2 3 4 5 6 7 8 9 RETURN  
 20-jun-2002 13:50:02

Figure 6-24 Edit A Process Recipe

The creation and/or editing of a process recipe use a specially designed editor that is fully menu-controlled. This chapter outlines the use of each mode and explains the major screens

used in editing a recipe. Appendix A gives a detailed description of all the commands that can be entered.

Selecting the menu <3> Process Recipes on the Main Menu gives the screen: Edit A Process Recipe.

The current process recipe number and name are presented at the top, including its numbering status. Two columns for normal process recipes are available on the left, giving 16 process recipe positions (with a maximum length of 750 bytes) One column on the right shows 8 positions for abort recipes. Abort recipes allow the automatic return to a safe situation if the "Abort" command is executed.

To select a recipe, select <NORMAL> or <ABORT> recipe, followed by its number. Choose "0" to enter a new recipe.

Note: The current recipe has been preselected for editing. If you want to edit the current recipe, just press <RETURN>.

To return to the Main Menu, press <ESCAPE>.

### 6.3.1 Edit a Process Recipe

```

TUBE: 32 METOXID          NORMAL RECIPE: 1 METOX          BYTES: 216
1 0 Message: STANDBY
2  Temp. Normal Recipe:0 Profile Table:A *Ramp Center zone to 700.0 °C
                               at 10.00 °C/min
3  Boat to 2000 mm at 300 mm/min (Osc. 0 mm/min)
4  Gas N2 (1) at 5.00 SLM
5  Gas O2 (2) at 0.00 SLM
6  Gas O2 LOW (3) at 0 SCCM
7  Gas H2 (4) at 0.00 SLM
8  Gas N2 TRANS (5) at 0 SCCM
9  Gas TEMP-TLC (6) at 16.0 °C
10 Dig.Outputs (1-8) XXXXX--0 ; ALL OFF
11 Dig.Outputs (9-16) -----0- ; ALL OFF
12 Alarm Limit Setting for All Analog Output channels at 0% (OFF)
13 Alarm on Dig.Inputs (1-8) 11XXX111 ; 1=PRESS N2 2=PRESSAIR 6=TEMPHOUS
                               7=TEMP SCR 8=EXCESS
14 1 Message: BOAT OUT

EDIT FUNCTIONS
Edit Modes : 1=Append 2=Change 3=Insert 4=Delete 5=Store : :
Paging     : 6=First 7=Next 8=Previous 9=Last 0=Step

ESCAPE <-- --> 0 1 2 3 4 5 6 7 8 9 RETURN
05-jul-2002 09:39:40
  
```

Figure 6-25 Recipe Editor

This is the recipe editor. The top of the screen shows the Tube Id, the Tube Name, whether it is a normal or abort recipe, its name and number of bytes.

Once a mode has been entered (Append, Change, Insert, Delete, Store), the system prompts the entry of the number corresponding to the required command. The available commands for a step are displayed at the bottom of the screen.

Exit mode without storing, by pressing <ESCAPE>, the system will prompt:

"All recipe changes will be LOST if you EXIT now". Enter 'STORE' or 'EXIT' ('ESCAPE'=continue editing)"

When an existing recipe has been changed, press <5> (Store). Press <NAME>, to change the name or <RETURN> to go on. Press <YES> to store, or <NO> to cancel the recipe.

## Editing modes

- 1=Append      The Append mode allows a new command to be added at the end of the process recipe. The editor asks: "Enter command to append (Y/N for New Process Step). Press "Y" to create a new step, or "N" to insert the step into the current one. A display of the possible commands is given, each having a corresponding number (see Appendix A). To enter a command, enter its associated number. Enter the parameters or a specific type of the command. When the instruction is completed, it will be displayed on the screen and the user is given the opportunity to leave the append mode (press <ESCAPE>).
- 2=Change      The "Change" mode allows an existing command to be modified. "Enter LINE number to change". When the desired line number has been entered, the command is displayed with all its possible parameters. Modify the desired parameter; press <RETURN> to skip the parameter. When the instruction is completed, it will be displayed on the screen. Press <ESCAPE> to leave "Change Mode" and return to the recipe or change another command.
- 3=Insert      The "Insert" mode allows a new command to be inserted above a selected line number. All lines below the specified line are moved down to accommodate the new lines. Press <3> and "Enter LINE number to insert".
- 4=Delete      The "Delete mode" allows a command line or a complete process step to be deleted. Press <4> followed by the line number, which have to be deleted. Once the line number has been entered, the line is removed from the recipe and all other lines move up one line. The step number in any branch instruction in the recipe is automatically recalculated. Enter new line number to delete its so desired or press <ESCAPE> to leave "Delete Mode".
- 5=Store      The "Store mode" allows the modified process recipe to be stored in a particular process recipe location identified by its recipe number. Selecting this option (press <5>) will invoke the recipe storing procedure. Enter the recipe number where the recipe has to be stored. The recipe name can be modified by selecting "Name" If the editor screen is exited by pressing <ESCAPE> without prior storage of the process recipe the editor will automatically give the option of storing the recipe anyway selecting "Store" to store the modified recipe or select "Exit" to leave the editor without applying changes. When the message "Process Recipe Stored" is displayed the recipe is correctly stored under the selected Id.

The same command programming is available as with "Append mode" once the new line has been selected. Press <ESCAPE> to leave "Insert" mode and return to the recipe.



**NOTE**

If a new step is inserted any branch instruction in the recipe is automatically recalculated.

**Paging modes**

The paging modes First, Next, Previous, Last and Step allow navigation through a process recipe.

- 6 FIRST Moves the cursor to the first line of the process recipe.
- 7 NEXT Scrolls one screen down.
- 8 PREVIOUS Scrolls one screen up
- 9 LAST Moves the cursor to the last line of the process recipe
- 0 STEP Allows the user to enter the step number to which the cursor needs to move to directly.

**6.4 Tube Control**



Figure 6-26 Process Control Menu

The Process Control Menu provides the main items to run a process recipe, including process recipe selection, start, stop and abort and quick modification of save (preselected) process parameters.

**1. Graphic Process Control**

The Graphic Process Control displays a graphical setup of the tube and shows the current status including temperature, pressure (if available), gasflows, boat position and process recipe name, step and remaining time.

From this screen it is possible to start stop the current process recipe, abort that recipe or return to the Process Control Menu.

## 2. Start/Stop Process Recipe

To start a new process recipe or allow a current recipe to be continued when it has been paused can be done with this instruction. These include starting from “step 0” or continue at a “Wait for Operator” command.

Optionally a direct selection of a specific process step (also known as jumping to another step) can be performed here as well.



### NOTE

Jumping to another step is only possible with a paused process recipe.

### 3. Abort Process Recipe

The abort instruction can be used to kill a running process recipe in case of emergencies. Automatic abort commands can be implemented in the process recipe to handle out of buzzer or sensor signal failure situation. A manual abort command can be issued in this menu only.

Any abort command that is executed will reset the process recipe to “step 0” unless proper abort recipes are used. See chapter Process Recipe for further details.

### 4. Clear Alarms

The clear alarm instruction will reset the current alarm list. The previous alarm list is also reset when a process recipe is started from “step 0”.

### 5. Variable process Command

The variable process command is a list of preselected process parameters that have been assigned to be variable. This list allows rapid change of setpoints without the use of the “Recipe Editor”.

### 6. Select a Process Recipe

A list of all available process recipes allows the operator to select the desired recipe.



#### NOTE

Another process recipe can only be selected if the current recipe is in “step 0”.

### 7. Assign Control Zones to Paddle Inputs

Assigning control zones to paddle inputs allows internal (paddle) thermocouple signals to be used in the DTC temperature control loop.

### 8. Edit Lot Id

A lot Id (a name) can be given here. Only its name, type, number of wafers and the slot number can be entered. A batch of wafers often comes with Lot ID. Its name and content (filler, test and/or process type) plus amount of each wafer type and its Lot number can be stored.

### 6.4.1 Graphic Process Control

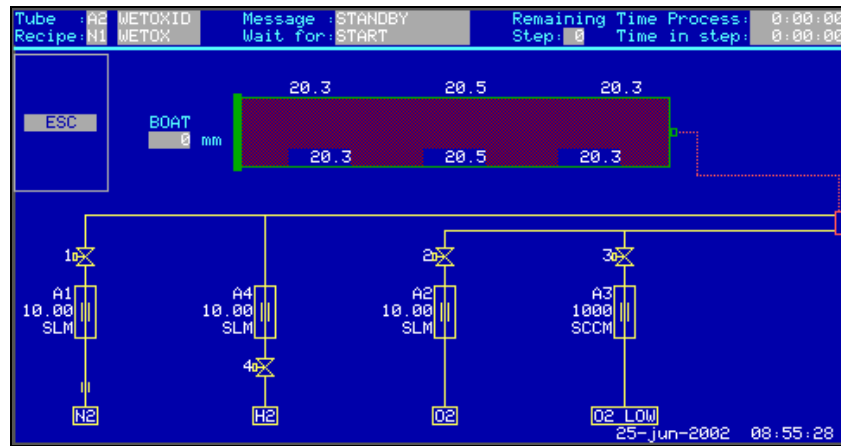


Figure 6-27 Graphic Process Control

The Graphic Process Control is a graphical interface to the tube control. The screen contains three main divisions, the process recipe status in the top field, the tube status in the large center field and the control buttons on the left.

Any alarm messages will be displayed in the bottom line


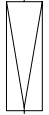



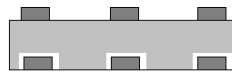



#### The process recipe field shows

- The tube Id and name
- The recipe Id and name
- The message for the current step
- The action for which the controller is waiting
- The process time
- The step number and time

The tube status field gives a graphical overview of the temperature (both spike (external) and paddle (internal) thermocouple signals), boat position, MFC and valve setting and pressure (if applicable).



The following symbols are used

	Open Valve		Flow Meter
	Closed valve		Pump
	Fine Metering Valve (FM)		Tube
	Mass Flow Controller		Orifice
	Baratron		

Up to four graphical screens can be setup to fully match the tube hardware. Each screen can be accessed by using the <NEXT> button in the bottom right corner.

### 6.4.2 Start/Stop Process Recipe

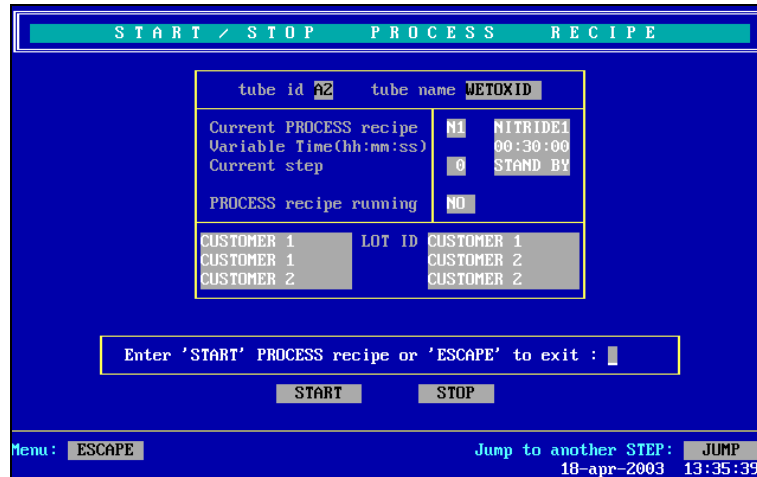


Figure 6-28 Start/Stop Process Recipe

The <Start> command is used to start a process recipe, that is to go from Step “0” to step “1”. Additionally, <Start> will be required to continue a process recipe if it has been paused by the Stop command and if the system is “Waiting for operator”.

The <Stop> command is used to stop the timer in a particular process step. The current process status is presented in the center screen. It includes process recipe id and name, optional variable time, the current process step and its running status.

An optional <Jump> command can only be issued if the process recipe is stopped. It is not possible to jump to another process step if the process recipe is still running.

**NOTE**



Jumping to another process step may cause dangerous situations. Verify the settings in the jumped to step before using this command.

### 6.4.3 Abort Process Recipe

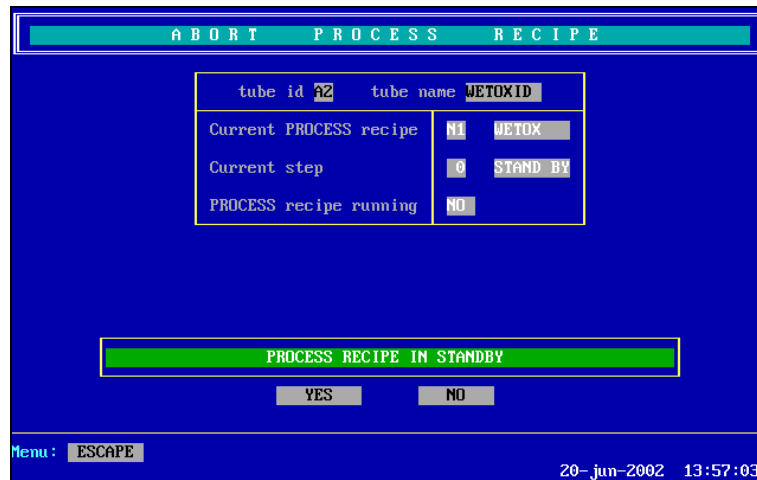


Figure 6-29 Abort Process Recipe

The abort command is a powerful instruction that will bring the tube in a safe state. Abort instruction can be implemented in the process recipe to automatically handle undesired situation such as pressure failure, gas flow problems and temperature related issued. Additionally a manual operator command can be accessed at this menu.

If a process recipe is aborted (either automatically or by operator) the process controller (DPC) will return the process recipe to step “0” immediately. Therefore it is of vital importance that step “0” has been programmed to create a safe situation.

In the event that step “0” can not be used to create safe conditions (which is common in a production environment where a minimum of operator handling is required) the use of abort recipes is obligatory.

Then, any abort command will not have the process recipe to be returned to step “0” immediately but the activated abort recipe will be performed. When the abort recipe has reached the END command only then the (aborted) process recipe will be returned to step “0”.

**NOTE**



- Operator initiated aborts may be used if an operator detects a dangerous situation in the archive that is not handled automatically. This includes the erroneous starting of the wrong process recipe.
- An abort alarm will be generated with indicated time and abort condition each time an abort command is issued.

### 6.4.4 Clear Alarms

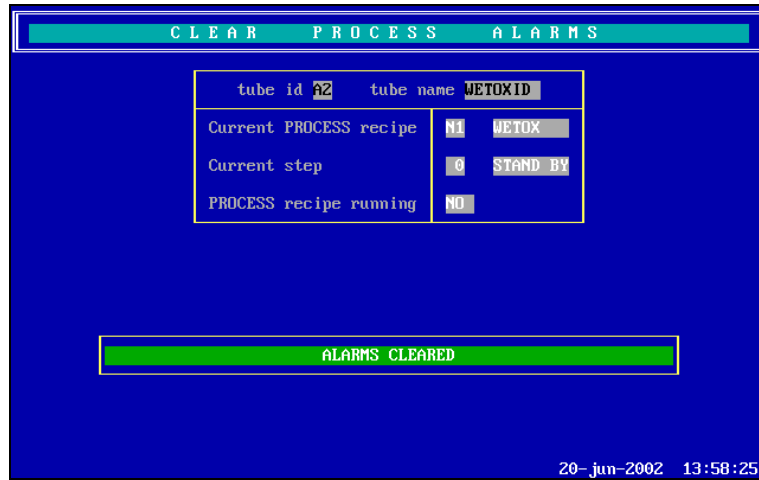


Figure 6-30 Clear Process Alarms

Alarm messages are generated automatically and indicate the type of alarm and location (for example Digital Input number 1 (N<sub>2</sub> pressure)). Solving the cause of the alarm condition automatically removes the alarm from the current alarm list (it will be steady in the process alarm list for review). This is however not valid for the Abort Alarm. The Abort Alarm can only be removed by the "Clear Alarm" command accessed in this menu.

- <YES> to clear the alarm list.
- <NO> to return to the Process Control menu.
- <ESCAPE> to go back to the Process Control Menu.

### 6.4.5 Variable Process Command

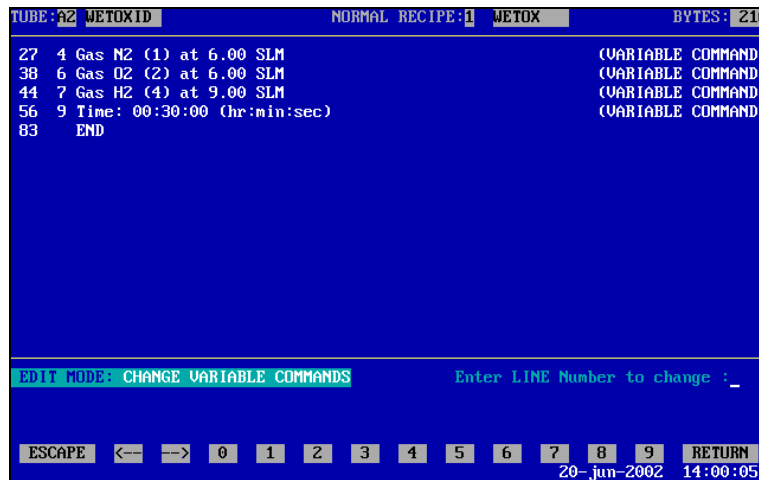


Figure 6-31 Variable Process Commands

Press <ESCAPE> to go back to the Process Control Menu. If any changes have been made, the new values will be stored and the following message will appear: "Process variable commands are stored".

The Variable Process Command is a special instruction used to quickly modify predefined commands from the process recipe, without the need to use the recipe editor. Typically, commands such as gasflow (and pressure) and process time settings are assigned to be variable. Only those assigned commands will be presented in the list of Variable Commands if that menu is selected.

Press <ESCAPE> to store the new settings and return to the "Process Control Menu". A brief 3-second message "Process variable commands are stored" will be shown to conform the new settings.

### 6.4.6 Select a Process Recipe

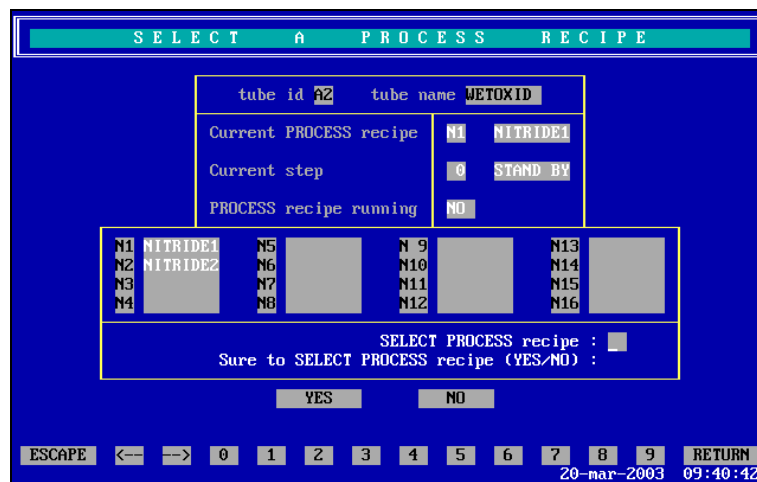


Figure 6-32 Select a Process Recipe

The selection of a new process recipe requires the current process recipe to be in step "0".

A list of all available process recipes is prevented if the current process recipe is indeed in step "0". To change the selection of the recipe, enter the recipe number followed by <RETURN>. Confirm with <YES> or press <NO> or <ESCAPE> to return to the "Process Control Menu".

### 6.4.7 Assigns Control Zones to Paddle Inputs

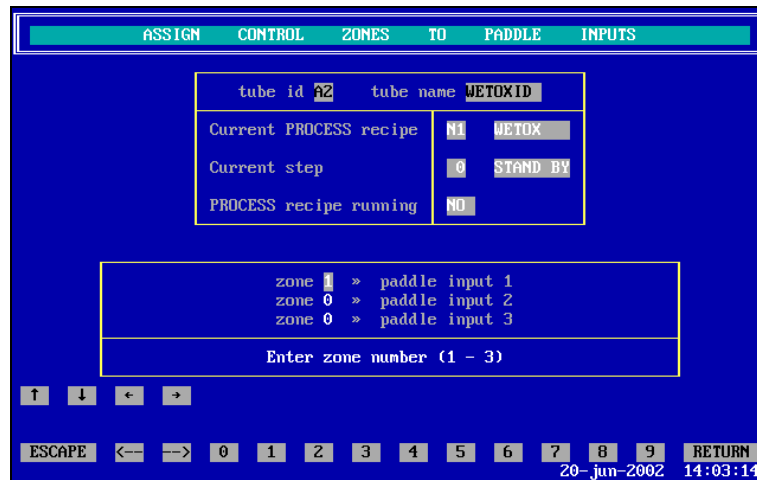


Figure 6-33 Assign Control Zones To Paddle Inputs

The Digital Temperature Controller (DTC) can use different thermocouples as input signals. Default the spike TC's are used to control the temperature as they give the fastest response and shortest recovery timer. If even more accurate temperature are required or the (automatic) profiling recipes is to be performed the paddle TC's can be assigned to be used as input signals to the DTC the "Assign Control Zones to Paddle Inputs" menu allows the temperature control zones to be connected to the paddle thermocouple.



**NOTE**

- Temperature Control Zone 1 is at the load side, zone 3 (or 5) is at the source side.
- Assign the control zones first and then connect the paddle TC wires one at a time, checking the correct thermocouple to be connected.

### 6.4.8 Edit Lot Id

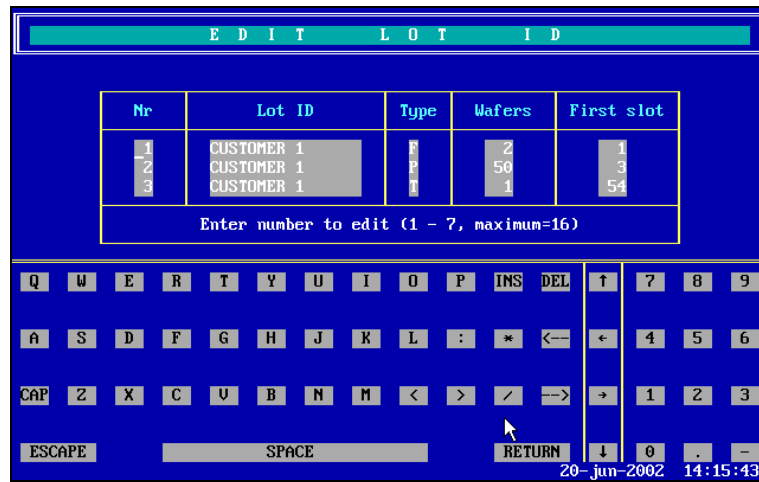


Figure 6-34 Edit Lot Id

The “Edit Lot ID” menu is used to enter a batch name. It allows tracking of process results to a particular process recipe and batch number.

A maximum of 16 Lot ID’s can be entered, including lot name, type and amount of wafers and the first slot position.

**To edit, proceed as follows:**

- Nr. First enter the number of the lot to edit, or use the cursor control.  
Press <RETURN> to proceed.
- Lot Id Enter Lot Id. Give a name with a maximum of sixteen characters.  
Press <RETURN> to proceed.
- Type Enter the wafer type, by pressing <P> (=Product), <F> (=Filler) or <T> (=Test).  
Press <RETURN> to proceed.
- Wafers Enter the number of wafers, which are being used.  
Press <RETURN> to go to the next Nr.
- First Slot Enter the slot’s number. Press <ESCAPE> when you are finished, or press <RETURN> to go to the next Nr.

At any time <ESCAPE> can be pressed to return to the “Process Control Menu”. A message “Lot ID stored” will appear to confirm any changes made.

## 6.5 Monitor

The monitor menus are used to display the current (process) status of the tube. The monitor menu does not require a username and password and can be used by anyone.

It is not possible to modify any of the parameters using this menu. The information is updated once every second.



Figure 6-35 Monitor Menu

The Monitor Menu presents an overview of the available information. The following sub menus can be selected:

**1. Main Detail Status**

This contains a summary of the main parameters including temperature, process recipe and gasflow settings.

**2. Alarm Status**

This contains the list of current alarms and the alarm that have occurred during the process.

**3. Digital Output/Input Status**

This contains the settings of all Digital Outputs and all Digital Inputs including the ON/OFF status and alarm monitoring.

**4. DPC Lot Id Status**

This contains the Lot ID used for the registration of type and number of the current wafers.

**5. Process Recipe Status**

This contains the list of all process and abort recipes stored in the DPC memory. It allows safe review of a recipe without the possibility of modifying.

**6. Temperature Status**

This contains detailed information about the temperature status, including the setpoint and the actual temperatures for the paddle and spike thermocouples, the deviation, ramp to, slope



and power parameters, the alarms, the alarm limits, the PID and gain parameters, the type of control and if automatic profiling is ready.

### 7. Normal Recipe Status

This contains the Normal (Process) Temperature Recipes, stored in the Normal Temperature Table and includes temperature setpoint, slope, limits, gain and type of control.

### 8. Profile Recipe Status

This contains the Profile Temperature Recipes stored in the Profile Temperature Table, and includes the paddle setpoint, corresponding spike value and required power output for all profile recipes.

### 9. Paddle Correction Status

This contains the (calibrated) paddle correction table, the spike and paddle PID and gain parameters and the type of thermocouple, the maximum profile deviation, and the maximum heat-up.

### 10. Graphic Process Status

This contains a graphical overview of the (Process) status.

#### 6.5.1 Main Detail Status

Tube: RZ	WETOXID	Process Time: 0:00:00	BOAT Position: 0 mm
Recipe: N1	WETOX	Step 0 Time: 0:00:00	Setpoint: 0 mm
Message: STANDBY		Wait for: START	Speed: 0 mm/min

TEMPERATURE:	PADDLE		SPIKE		Deviation	Ramp to	Slope	Power
	Setp.	Actual	Setp.	Actual				
zone 1	700.0	21.1	700.0	21.1	678.9	700.0	0.00	98
zone 2	700.0	21.4	700.0	21.4	678.6	700.0	0.00	98
zone 3	700.0	21.4	700.0	21.4	678.6	700.0	0.00	98

A-I/O	Mnemonic	Setp.	Actual	HL-LL	Unit	A-Inp	Mnemonic	Setp.	Actual	HL-LL	Unit
1	N2	0.00	10.00	1.00	SLM	1	TORCHSET	0	800	0	°C
2	O2	0.00	10.00	1.00	SLM	2	TORCHACT	0	1200	0	°C
3	O2 LOW	0	1000	100	SCCM	3	O2	0.0	100.0	0.0	%
4	H2	0.00	10.00	1.00	SLM	4					
5	N2 TRANS	0	1000	100	SCCM	5					
6	TEMP-TLC	0.0	100.0	10.0	°C	6					
7						7					
8						8					

Menu: ESCAPE	Select: BRANCH STATUS
05-jul-2002 11:08:04	

Figure 6-36 Main Detail Status

The Main Detail Status menu provides a quick summary of the current status of the tube. It includes process recipe status, temperature information and gasflow settings. Any alarms are presented at the bottom of the screen.

The top section of this screen displays the information related to:

- the Tube Id and its name;

- the Recipe Id and its name;
- the message for the current step;
- the process time;
- the step number and time;
- the action for which the controller is waiting;
- the boat position, setpoint and speed.

The temperature table shows for each zone the setpoint and actual temperature of the paddle and spike thermocouples. The deviation from the setpoint of the paddle thermocouple, find temperature with slope are presented, as well as the current power output.

Note that the Analog channels (I/O + inp.) are from 1 to 8, to look at the other channels (I/O + inp.), press <NEXT ANALOG CHANNELS>.

The actual gasflow settings and other analog input signals are presented. Analog I/O are controlled by the DPC Analog Inputs are externally controlled and only monitored. A analog I/O can be accessed by pressing <NEXT> if more than 8 analog I/O are present.

Press <ESCAPE> to go back to the Monitor Menu.

Tube: A2	WETOXID	Process Time: 0:00:00	BOAT Position: 0 mm
Recipe: N1	WETOX	Step 0 Time: 0:00:00	Setpoint: 0 mm
Message: STANDBY		Wait for: START	Speed: 0 mm/min

	PADDLE		SPIKE		Deviation	Ramp to	Slope	Power
	Setp.	Actual	Setp.	Actual				
zone 1	700.0	21.4	700.0	21.4	678.6	700.0	0.00	98
zone 2	700.0	21.5	700.0	21.5	678.5	700.0	0.00	98
zone 3	700.0	21.4	700.0	21.4	678.6	700.0	0.00	98

BRANCH SUBROUTINE					BRANCH LOOP				
RETURN :	█	█	█	█	STEP :	█	█	█	█
TO :	█	█	█	█	COUNTER :	█	█	█	█
STEP :	█	█	█	█					

Menu: ESCAPE	Select: ANALOG STATUS
	05-jul-2002 11:21:57

Figure 6-37 Branch status

Press <BRANCH STATUS>, to look at the step numbers to each subroutines return. It includes the step numbers of the loop and the number of timers each loop has to be executed.

The lower half of this screen shows the step number to which each subroutine or loop returns.

Press <ANALOG STATUS> to return to the previous screen.

Press <ESCAPE> to go back to the Main Detail Status.

### 6.5.2 Alarm Status

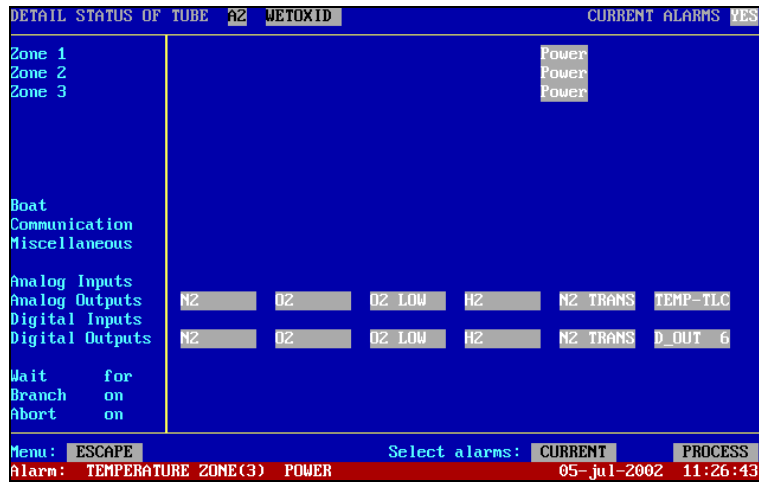


Figure 6-38 Alarm Status

The alarm status presents an overview of the alarms that (have) occurred. The alarms are grouped to allow fast fault diagnosis.

Temperature, boat, analog I/O, digital I/O and wait for and a branch alarm can be viewed.

Two screens are available, current and process alarm. The current alarm list is a real time list of all possible alarms. If an alarm condition is reset it will be removed from the current list. The process alarm list contains all the alarms that have occurred during one process run. When an alarm is reset it will still be available in this process alarm list.

The process alarm list is cleaned when the process recipe is started from step "0". The selected list is indicated in the current alarms ID

Press <ESCAPE> to go back to the "Monitor Menu".

### 6.5.3 Digital Output/Input Status

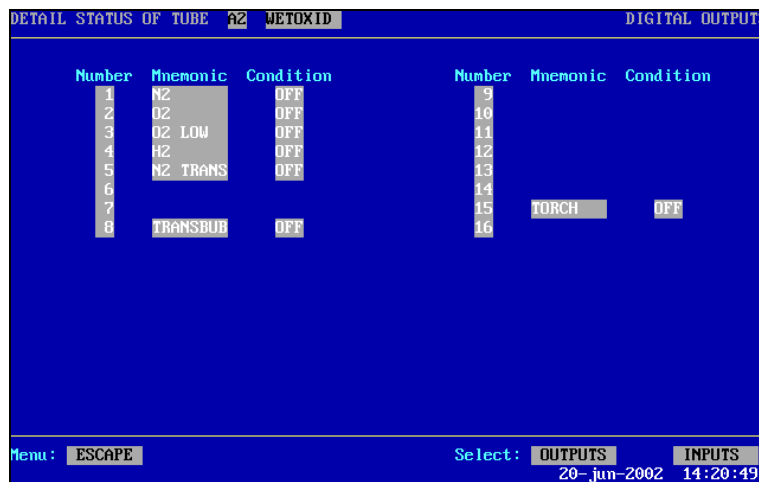


Figure 6-39 Digital Output/Input Status

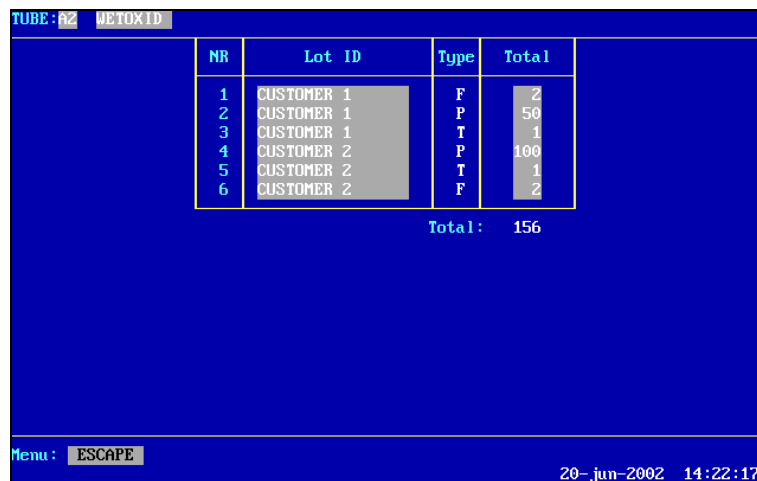
The Digital Output and Input menu gives an overview of mainly the valve settings, digital outputs (ON/OFF) and digital inputs such as pressure and door switches (ON/OFF) In addition the alarm active status is displayed. “Yes” means the digital input is monitored and a change in signal will generate an alarm. “No” means the signal is not monitored and a change of signal does not result in any alarm.

<INPUTS> Is to display the inputs.

<OUTPUTS> Is to display the outputs.

Press <ESCAPE> to go back to the Monitor Menu.

### 6.5.4 DPC Lot Id Status



NR	Lot ID	Type	Total
1	CUSTOMER 1	F	2
2	CUSTOMER 1	P	50
3	CUSTOMER 1	T	1
4	CUSTOMER 2	P	100
5	CUSTOMER 2	T	1
6	CUSTOMER 2	F	2
Total:			156

Menu: ESCAPE

20-jun-2002 14:22:17

Figure 6-40 DPC Lot Id Status

The DPC Lot ID status gives an overview of the current Lots Id.

The Lot Id, its type (P=Product, F=Filler and T =Test) and the total wafers per type and batch are displayed. A total of all wafers will be shown.

Press <ESCAPE> to go back to the Monitor Menu.

### 6.5.5 Process Recipe Status

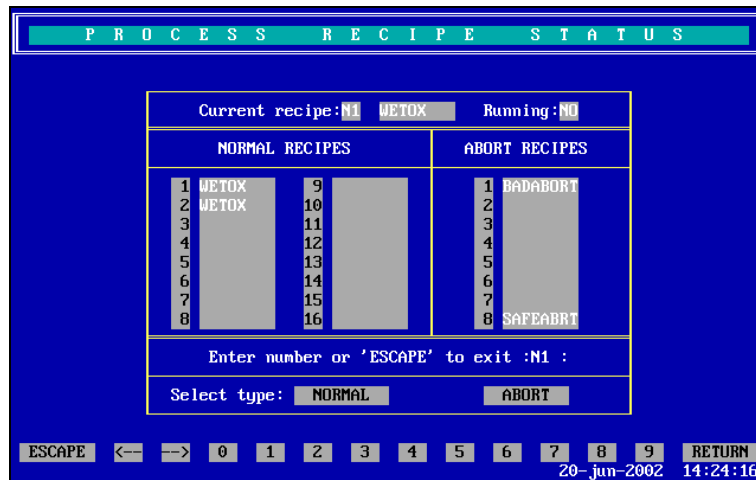


Figure 6-41 Process Recipe Status

The Process Recipe Status allows the user to monitor the contents of any process recipe present in the DPC memory *without the possibility to modify*.

Accidental alteration of the process recipe contents is not possible. Therefore this menu is the safest way to review a process recipe.

The current process recipe is preselected but any available recipe can be selected by entering its recipe number.

Press <NORMAL> to select the “normal process recipe” or <ABORT> to select the “abort recipe”. Select the appropriate number, followed by <RETURN>. The contents of the selected recipe will be presented in the following screen (contents may differ)

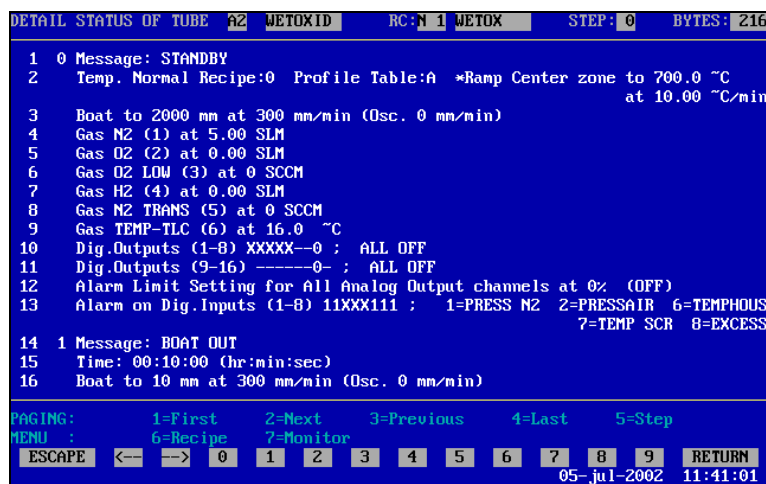


Figure 6-42 Detail Status of the Tube

The topsection of this screen displays the tube Id and name, the recipe name and number, the number of bytes the Recipe occupies in memory and, if the recipe is running, the current step number in the process (A). The next section (B) display the first page of recipe contents or, if the recipe is running, the lines starting at the contents of the current step. The

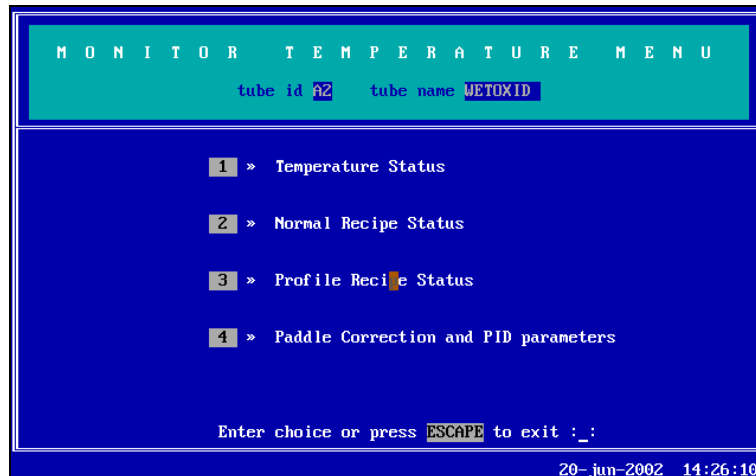
information consists of the line number, the step number and the instructions associated with that step. If a step number does not appear on a line, then that instruction is part of the last indicated step number. The bottom section (C) allows the user to navigate through the recipe or return to the menu.

**The available options are:**

- <1> Move to the first page of the recipe.
- <2> Move to the next page of the recipe.
- <3> Move to the previous page of the recipe.
- <4> Move to the last page of the recipe.
- <5> Move to a specified step of the recipe. The desired step number must be entered.
- <6> Return to the recipe menu.
- <7> Return to the monitor menu.

Press <ESCAPE> to return to the “Monitor Menu”.

**6.5.6 Temperature Status**



**Figure 6-43 Monitor Temperature Menu**

The Monitor Temperature Menu presents an overview of the available information. The following sub menus can be selected:

**1. Temperature status**

The temperature status contains very detailed information about the temperature status.

## 2. Normal Recipe Status

The normal recipe status menu presents the contents of the normal temperature table.

## 3. Profile Recipe Status

The Profile Recipe Status presents the contents of the profile temperature table.

## 4. Paddel Correction and PID parameters

The 'Paddel correction and Parameters menu' shows information about the calibrated correction values for the paddle thermocouple, the PID settings used for paddle control, the maximum achievable heat up rate and the maximum profile deviation.

### 6.5.6.1 Temperature Status

DETAIL STATUS OF TUBE 62 WETOXID											
zone	PADDLE		SPIKE		DEVIATION (°C)	RAMP TO (°C)	SLOPE (°C/min)	POWER (%)			
	Setp.	Actual	Setp.	Actual							
zone 1	700.0	1499.9	700.0	21.7	-799.9	700.0	0.00	98			
zone 2	700.0	21.6	700.0	21.6	678.4	700.0	0.00	98			
zone 3	700.0	21.6	700.0	21.6	678.4	700.0	0.00	98			
CONTROL: INDEPENDENT					NORMAL RECIPE: 0 TABLE: A						
zone	Alarm	ALARM LIMIT		PARAMETERS				PADDLE		PROFILE Ready	CONTROL P/S
		High	Low	P	I	D	Gain	I	D		
zone 1	YES	0.0	0.0	10	6.0	30	98	0.0	90	NO	SPIKE
zone 2	YES	0.0	0.0	10	6.0	30	98	0.0	0	NO	SPIKE
zone 3	YES	0.0	0.0	10	6.0	30	98	0.0	0	NO	SPIKE
Menu: ESCAPE		Select: MAXIMUM SPIKE CORRECTION TABLE								20-jun-2002 14:27:49	

Figure 6-44 Temperature Status

The temperature status contains very detailed information about the temperature status.

The first section (A) contains the tube name and number

The second section (B) contains the paddle and spike setpoint and actual value, the deviation between setpoint and paddle actual value, the final temperature destination (ramp to) to be reached with slope and the current power output. Section B is also used in the Main Detail Status as described in paragraph 6.5.1.

The third section (C) contains the type of temperature control (Independent or Master/Slave) and the manual (process) temperature recipe number (0-15) and the selected profile temperature table (A,B,C or D).

The fourth section (D) contains information about the alarm status and high and low limit settings as well as the PID control parameters. Finally, the fifth section (E) allows the user to view the contents of the maximum spike correction table or return to the monitor menu by pressing <ESCAPE>.

The maximum spike correction table is used to reduce temperature overshoot and stabilization times in the situation of paddle control and boat out combination.

The “Detail status of tube” displays the tube Id and name to which the information about temperature data for the zones of the furnace relates.

Press <ESCAPE> to go back to the Monitor Menu.

### 6.5.6.2 Normal Recipe Status

DETAIL STATUS OF TUBE <b>A2 WETOXID</b>				NORMAL TEMPERATURE TABLE		
RC	TEMPERATURE (°C)			SLOPE (°C/min)		
	zone 1	zone 2	zone 3	zone1	zone2	zone3
0	700.0	700.0	700.0	10.00	10.00	10.00
1	700.0	700.0	700.0	0.00	0.00	0.00
2	1000.0	1000.0	1000.0	10.00	10.00	10.00
3	1000.0	1000.0	1000.0	0.00	0.00	0.00
4	0.0	0.0	0.0	0.00	0.00	0.00
5	0.0	0.0	0.0	0.00	0.00	0.00
6	0.0	0.0	0.0	0.00	0.00	0.00
7	0.0	0.0	0.0	0.00	0.00	0.00
8	0.0	0.0	0.0	0.00	0.00	0.00
9	0.0	0.0	0.0	0.00	0.00	0.00
10	0.0	0.0	0.0	0.00	0.00	0.00
11	0.0	0.0	0.0	0.00	0.00	0.00
12	0.0	0.0	0.0	0.00	0.00	0.00
13	1100.0	1100.0	1100.0	10.00	10.00	10.00
14	0.0	0.0	0.0	0.00	0.00	0.00
15	50.0	50.0	50.0	0.00	0.00	0.00

Menu: **ESCAPE**      Select: **H/L LIMITS**      **CONTROL+GAIN**  
 Alarm: **TEMPERATURE ZONE(3) POWER**      20-jun-2002 14:29:37

Figure 6-45 Normal Recipe Status

The normal recipe status menu presents the contents of the normal temperature table.

The mainscreen contains for all temperature zones the spike setpoint and slope of all 16 normal (process) temperature recipes.

The bottom screen allows the selection of additional screens containing the high and low limit or the control and gain parameters of all 16 normal (process) temperature recipes.

Press <ESCAPE> to go back to the Monitor Menu.



### 6.5.6.3 Profile Recipe Status

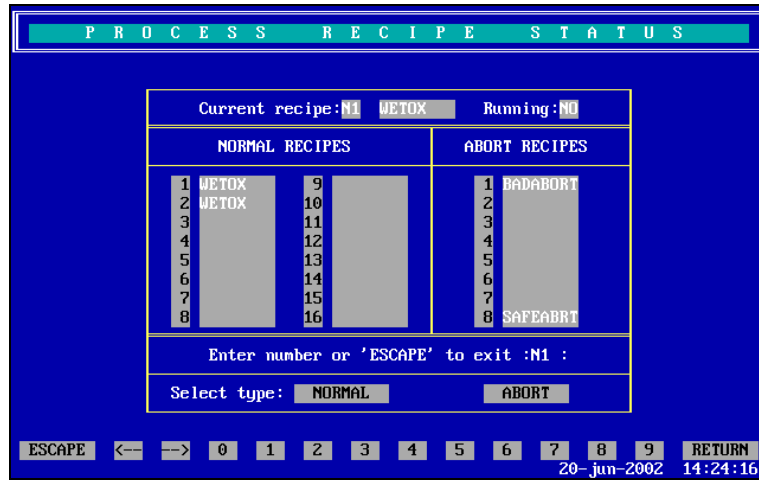


Figure 6-46 Profile Recipe Status

The Profile Recipe Status presents the contents of the profile temperature table. The paddle TC setpoint, corresponding spike TC value and the required power output are shown in the main section for all 16 profile temperature recipes.

If more than 3 zones are present the values for the remaining zones can be viewed by pressing <NEXT>, only displayed in case there are more than 3 zones. The bottom section also contains the buttons to select all other profile temperature tables (A,B,C,D).

If there are more then 3 zones press next, and the next 3 zones will appear.

Press <ESCAPE> to go back to the Monitor Menu.

### 6.5.6.4 Paddle Correction and Parameters

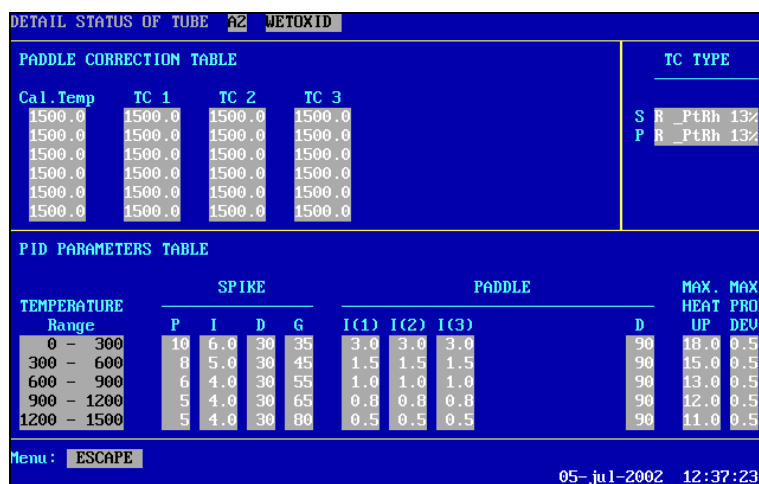


Figure 6-47 Paddle Correction and Parameters

The 'Paddle correction and Parameters menu' shows information about the calibrated correction values for the paddle thermocouple, the PID settings used for paddle control, the maximum achievable heat up rate and the maximum profile deviation.

Press <ESCAPE> to go back to the "Monitor Menu".

### 6.5.7 Graphic Process Status

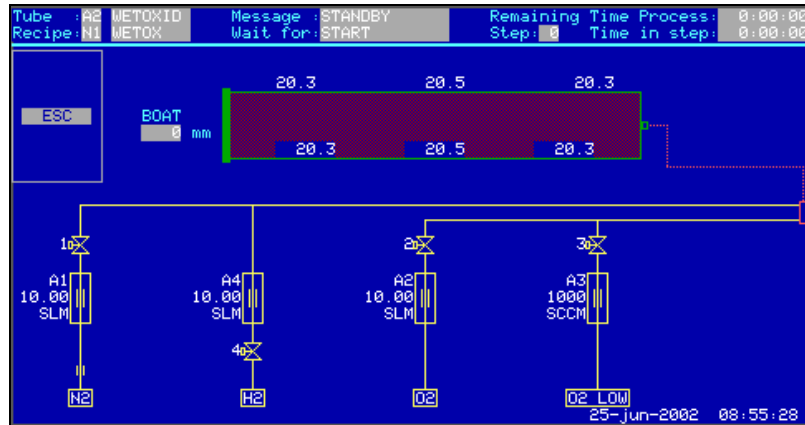


Figure 6-48 Graphic Process Status

The "Graphic Process Status" gives a graphical overview of the current tube status. The screen is equal to the graphical tube control but lacks the <START> and <ABORT> buttons. Four (4) different graphical screens can be viewed by scrolling with <NEXT>.

Press <ESC> to return to the Monitor Menu.

## Appendix A

This appendix lists the commands that can be entered into a recipe using the touchscreen recipe editor. The majority of commands require parameters to be set. These are shown in the second column.

<b>COMMAND:</b>	<b>PARAMETER:</b>
<b>1 BOAT</b>	Boat position Boat speed (5-1000mm/min) Oscillation speed (0-100 in steps of 10)(*) Variable command
<b>2 GAS + PRESSURE</b>	Gas type: 1 to 16 DEPENDING ON HARDWARE Setpoint Variable command
<b>3 ALARM</b>	1-ON Gas/Pressure 0 FOR ALL 1 to 16 DEPENDING ON HARDWARE Alarm limits (0-99%) 2-ON Digital Inputs Select inputs:   1 = 1 to 8 2 = 9 to 16 3 = 17 to 24 4 = 25 to 32  Activate each input 3- ON Analog inputs Select inputs:   0=ALL 1 to 16 DEPENDING ON HARDWARE Setpoint (certification range) Limit (0-99%)
<b>4 MESSAGE</b>	Message number (1-16) Sonalert Alarm

## 5 WAIT

- 0 - Wait for ready
  - 1 – Wait for operator
  - 2 – Wait for boat to reach setpoint
  - 3 – Wait for temperature to reach setpoint in limits
  - 4 – Wait for temperature at load zone to reach temperature
  - 5 – Wait for temperature at centre zone to reach temperature
  - 6 – Wait for temperature at rear zone to reach temperature
  - 7 – Wait for boat to reach boat position
  - 8 – Wait for Digital Inputs
- Select inputs:
- 1 = 1 to 8
  - 2 = 9 to 16
  - 3 = 17 to 24
  - 4 = 25 to 32
- Activate each input
- 9 – Wait for gas/pressure
- Select gas or pressure (1-16)
- 10 – Wait for Analog input
- Select inputs (1-16)

## 6 DIGITAL OUTPUTS

- Select outputs:
- 1 = 1 to 8
  - 2 = 9 to 16
  - 3 = 17 to 24
  - 4 = 25 to 32

Activate each output

## 7 TEMPERATURE

- 1 = Normal Recipe
- Recipe Number (0-15)
- The Setpoint and Slope parameters of the current recipe number are displayed
- Profile Table:
- 1 = Table A
  - 2 = Table B
  - 3 = Table C
  - 4 = Table D
- 2 – Profile Recipe

Recipe Number (0-15)

The Setpoint and Slope parameters of the current recipe number are displayed

Profile Table: 1 = Table A

2 = Table B

3 = Table C

4 = Table D

## 8 BRANCH

0 - Always

Step number (0-99)

Sonalert alarm

1 - On temperature alarm

Step number (0-99)

Sonalert alarm

2 - On boat alarm

Step number (0-99)

Sonalert alarm

3 - On any alarm

Step number (0-99)

Sonalert alarm

4 - On wait alarm

Step number (0-99)

Sonalert alarm

5 - Subroutine

Step number (0-99)

Sonalert alarm

6 - Return

7 - Loop

Number of times (1-99)

Step number (0-99)

Sonalert alarm

8 - On Gas/Pressure

Gas type or pressure (1-16)

Step number (0-99)

Sonalert alarm

9 – On Digital Input

Input (1-32)

Step number (0-99)

Sonalert alarm

10 – On analog input

Input (1-32)

Step number (0-99)

Sonalert alarm

## 9 ABORT

0 – Select recipe (1-8)

1 – On temperature alarm

2 – On boat alarm

3 – On any alarm

4 – On wait alarm

5 – On gas/pressure alarm

1 = 1 to 8

2 = 9 to 16

activate gas/pressure on which to abort

6 – On Digital Input alarm

Select inputs: 1 = 1 to 8

2 = 9 to 16

3 = 17 to 24

4 = 25 to 32

Activate each input

7 – Analog input

## 0 TIME

Hours, minutes, seconds (00:00:00 – 15:59:59)

Variable command

(\* ) Only used for wheelpaddles, not for non-contact cantilever systems