HG SYSTEMS

For

Compania Industrial de Tobacos Monte Paz S.A

On Behalf Of

Garbuio-Dickinson Limited

Operations Manual

For

ITM Drying Line

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REVISION HISTORY

REVISION	DATE	COMMENT
0	14/04/2008	Initial issue for review

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1 General Automatic Operating Procedure

1.1 General Assumptions

In the following sections it is assumed that:

a) Commissioning of the drying process line has been completed.
b) The burner control panel is switched-on and the emergency stop reset.
c) The main drying line PLC control panel is switched-on and the emergency stop circuit reset.
d) The HMI mounted in the main PLC control panel door is switched-on and boot-up has been completed.
e) The HMI mounted in the burner control panel door is switched-on and boot-up has been completed.
f) No process line operation is in progress on start-up.

It is also assumed that the reader has previously been trained on the operation of the PLC controlled ITM dryer and is therefore familiar with its sequence of operation.

1.2 Summary of Operations

The following is a summary of the actions which an operator should normally carry out for automatic running with product on the drying process line.

1. At the burner control panel:
   a) Select the burner fuel to use with the 'Fuel Selection' keyswitch on the panel door.
   b) If active, reset the burner lockout fault by pressing the 'Lockout Fault/Reset' pushbutton on the panel door.
   c) If active, reset any gas or oil pressure fault by pressing the 'Gas/Oil Pressure Fault/Reset' pushbutton on the panel door.
   d) On the HMI 'Control & Status Overview' screen select the burner control to 'Remote' mode.
   e) On the HMI 'Control & Status Overview' screen select the burner fuel valve to 'Remote' mode.
2. At the main control panel:
   a) On the 'Current Alarms' screen acknowledge and reset all alarms.
   b) On the HMI 'Process Setpoints' screen select a blend recipe and download the setpoints to the PLC and/or enter or edit the setpoints to the values required.
   c) On the HMI 'ITM Dryer Detail' mimic ensure that the 'Dryer Fast Sequence' control is turned-off.
   d) On the HMI 'Auto Control' screen set the 'Control Mode Selection' to Auto and then set the following controls as required:
      - Dryer Mode Selection.
      - Process Air Reverse.
      - Programmed Spray Selector.
      - Air Flow Control.
      - Water Spray Pump Control.
      - Set 'K12 Discharge Band Speed %' to the required discharge speed.
      - Turn-on 'T25 Prime Control'
      - Disable 'K11 Discharge Control'.
   e) If starting the dryer in preparation for production later, it is more energy efficient to start the dryer in preheat mode only. This starts the dryer and take-off conveyor only. To start preheat mode press the 'Dryer Preheat Control' Start button on the HMI 'Auto Control' screen. When ready for production, the 'Process Line' can be started as described next.

f) If starting the dryer in preparation for immediate production, then start the whole process line by pressing the 'Process Line Control' Start button on the HMI 'Auto Control' screen. This will start all the dryer take-off equipment, the dryer and the equipment feeding metering control tube T25.
g) Check that the dryer control sequence indicators on the 'ITM Dryer Detail Mimic' screen indicates 'Preheat' or 'Idle' only. If not, press the 'Reset to Idle' button.
h) When only the dryer 'Idle' sequence indicator is highlighted, the dryer is ready to start production and, if the Process Line has been started, the infeed conveyors K151 and K194 will start.
i) When the metering tube T25 is full, product can be released to feed the dryer by turning-off T25 Prime Control through the HMI 'Auto Control' screen.
j) Until the moisture of the product at the dryer exit falls within the limits set in the process setpoints, the product will be directed into silo K11. Once the product moisture falls between the set limits, the product will be directed to the downstream equipment.
k) Once the moisture of the product exiting the dryer falls within the set limits, the operator can discharge any off-specification product in K11 onto the product leaving the dryer. This is done by enabling 'K11 Discharge Control' and selecting the required discharge speed for K11, through the 'Auto Control' screen.
l) When all production is complete, stop the process line by pressing the 'Process Line Control' Stop button on the HMI 'Auto Control' screen. If production will be restarting within a short space of time, it may be more energy efficient to ensure 'Dryer Preheat Control' is running before stopping the process line.
m) If Preheat was started, the dryer and take-off conveyor will remain running when the process line is stopped until the 'Dryer Preheat Control' Stop button is pressed.
n) If 'Process Line Control' and 'Dryer Preheat Control' are both stopped after running, the dryer and take-off conveyor will continue to run in 'Cooldown' mode, until the dryer cylinder temperature thermostat indicates a safe temperature at which to stop the dryer cylinder.

1.3 Dryer Preheat

1.3.1 General Description

Preheat mode is used to allow the Dryer to be heated to idle temperature ready for operation without having to start the rest of the process line. It may also be selected while the process line is running in order to keep the dryer warm for the next product run which may not be ready to start immediately after the current one has finished.

Preheat Start/Stop is controlled by the operator through the 'Auto Control' display of the main panel HMI and is described in section 2.4.1.5.

1.3.2 Preheat Start-up Pre-Conditions

Before starting, the operator should check that all relevant manually controlled service supply valves are opened.

To be able to start preheat the following pre-conditions must be satisfied:

- The control mode must be selected to Auto.
- No Control Voltage alarms should be active as described in section 4.9.
- No PLC rack faults should be active as described in section 4.10.
- No System Fault alarms should be active as described in section 4.11.
- No PLC CPU cycle time overrun alarms should be active as described in section 4.12
- There must be no alarms active for the following equipment:

  07M1 – Dryer cylinder motor.
  07M2 - Dryer feed screw motor.
  07M3 - Dryer water pump motor.
  07M4 - Dryer process air fan motor.
  07M5 – Dryer process air flow damper servo motor.
  07M6 - Dryer heating air fan motor.
  07M7 - Exhaust flue fan motor.
  07M9 - Burner combustion air fan motor.
  07M10 - Burner fuel/air valve servo motor.
  07M11 - Burner fuel oil pump motor.
  07AM1 - Dryer cyclone fan motor.
  07E01 - Dryer feed hood heater sontrol.
  K153_08M1 - Take-off conveyor motor.

- The cylinder access doors must be closed and any active alarm reset.
- None of the following analogue input signal alarms should be active:

  07B01 - Dryer cylinder temperature signal.
  07B02 - Dryer cylinder temperature signal.
  07B03 - Dryer ITM mode process air temperature signal.
  07B04 - Dryer Inline mode process air temperature signal.
  07B05 - Dryer exhaust air temperature signal.
  07B06 - Dryer process air flow signal.
  - Burner fuel/air valve position feedback signal.

If the above conditions are all true then Preheat will start when the Preheat Start button is pressed on the main panel HMI 'Auto Control' screen.

1.3.3 Preheat Start-Up

On pressing the Preheat Start button on the 'Auto Control' screen of the main panel HMI, the machinery start-up klaxon will sound for 10 seconds. After this the dryer item 07 and take-off conveyor K153 will start.

The operator should view the mimic screen for the dryer as described in section 2.3.3 and press the 'Reset to Idle' button if the dryer status indicators at the bottom of the display indicate anything other than 'Preheat' or 'Idle'.

1.3.4 ITM Dryer Preheat Operation

The ITM Dryer Preheat Operation is designed to bring the dryer to idle temperature ready to start production. The following describes the dryer preheat operation when the machinery start-up klaxon stops sounding:

1. Conveyor item K153 is started and the dryer roller fans are started.

2. When conveyor K153 is confirmed running:
   - The dryer cylinder item 07M1 is started.
   - The dryer exhaust flue fan is started.

3. Once the dryer cylinder is confirmed running and the rotation sensor indicates cylinder has reached the minimum required speed:
   - The dryer feed hood electrical heater (07E01) is switched-on.
   - The cyclone fan motor 07AM01 is started.
   - The heating air fan 07M06 is started.

4. The dryer burner is started and remains running when all the following conditions shown on the 'Burner Startup Interlocks' screen (see section 3.3.2) on the burner panel HMI are met.

5. When the burner has completed its start-up sequence and has a status of 'On', the dryer cylinder temperature control loop is enabled and the temperature setpoint is set to the idle temperature. The idle temperature will be the currently set cylinder temperature setpoint minus the setpoint depression value entered during commissioning on the 'Machine Parameters' screen of the main panel HMI.

   While the dryer cylinder temperature is waiting for the Idle temperature to be reached the dryer status will be 'Preheat'.

6. Once the dryer cylinder temperature reaches the calculated idle temperature minus 1°C, the dryer status will change from 'Preheat' to 'Idle'.

1.4 Start the Process Line

It is <u>not</u> necessary to have the ITM dryer running in preheat before starting the process line, as the dryer will automatically perform a preheat if the cylinder temperature is below the idle temperature. The process line is started in automatic by pressing the 'Process Line' start button on the 'Auto Control' screen on the main panel HMI.

Before starting, the operator should check that all relevant manually controlled service supply valves are opened.

1.4.1 Process Line Start-up Pre-Conditions

The PLC control system makes the following checks before starting the process line equipment:

- The control mode must be selected to Auto.
- No Control Voltage alarms should be active as described in section 4.9.
- No PLC rack faults should be active as described in section 4.10.
- No System Fault alarms should be active as described in section 4.11.
- No PLC CPU cycle time overrun alarms should be active as described in section 4.12
- There must be no alarms active for the following equipment:

K12M1 - Silo K12 discharge band motor.
K12M2 - Silo K12 doffers motor.
K149_2M1 - Vibrating conveyor K149 motor.
K150_3M1 - Band conveyor K150 motor.
K194_4M1 - Metering band K194 motor.
K151_5M1 - Band conveyor K151 motor.
07M1 – Dryer cylinder motor.
07M2 - Dryer feed screw motor.
07M3 - Dryer water pump motor.
07M4 - Dryer process air fan motor.
07M5 – Dryer process air flow damper servo motor.
07M6 - Dryer heating air fan motor.
07M7 - Exhaust flue fan motor.
07M9 - Burner combustion air fan motor.
07M10 - Burner fuel/air valve servo motor.
07M11 - Burner fuel oil pump motor.
07AM1 - Dryer cyclone fan motor.
07E01 - Dryer feed hood heater sontrol.
K153_08M1 - Dryer take-off vibrating conveyor motor.
K154_9M1 - Band conveyor K154 motor.
K168_10M1 - Reversing band conveyor K168 motor.
K11_11M1 - Silo K11 discharge band motor.
K11_11M2 - Silo K11 doffers motor.
K155_12M1 - Band conveyor K155 motor.
K44_13M1 - Band conveyor K44 motor.
K173_14M1 - Weighing band conveyor K173 motor.

- The dryer cylinder access doors must be closed and any active alarm reset.
- Silo K12 access doors must be closed and any active alarm reset.
- Silo K11 access doors must be closed and any active alarm reset.
-
- None of the following analogue input signal alarms should be active:

07B01 - Dryer cylinder temperature signal.
07B02 - Dryer cylinder temperature signal.
07B03 - Dryer ITM mode process air temperature signal.
07B04 - Dryer Inline mode process air temperature signal.
07B05 - Dryer exhaust air temperature signal.
07B06 - Dryer process air flow signal.
- Burner fuel/air valve position feedback signal.
08B01 - Vibrating conveyor K153 temperature signal.
08B02 - Vibrating conveyor K153 moisture signal.

1.4.2 Process Line Start-Up

On pressing the Process Line start button on the 'Auto Control' screen of the main panel HMI, the machinery start-up klaxon will sound for 10 seconds. After this the following equipment will start:

- If the 'Downstream Interlock' is running the following equipment will start in sequence:
  a) Metering band K173.
  b) Reversing band K168 will start when K173 is proved running. The band direction will depend on the moisture of product leaving the dryer. If the moisture of product leaving the dryer is outside the limits set by the operator, then the band will run in reverse to fill silo K11. When the product moisture is within the limits set then the band will run forward.
  c) Band conveyor K154 will start when K168 is proved running in either direction.
  d) Vibrating conveyor K153 (if not already running because dryer preheat control has been started previously) will start when K154 is proved running.

- When conveyor K153 is confirmed running:
  e) The dryer cylinder item 07M1 is started.
  f) The dryer exhaust flue fan is started.
  g) The dryer feed screw motor 07M2 is started.

- Once the dryer cylinder is confirmed running and the rotation sensor indicates cylinder has reached the minimum required speed:
  h) The dryer feed hood electrical heater (07E01) is switched-on.
  i) The cyclone fan motor 07AM01 is started.
  j) The heating air fan 07M06 is started.

- The dryer burner is started and remains running when all the following conditions shown on the 'Burner Startup Interlocks' screen (see section 3.3.2) on the burner panel HMI are met.

- When the burner has completed its start-up sequence and has a status of 'On', the dryer cylinder temperature control loop is enabled and the temperature setpoint is set to the idle temperature. The idle temperature will be the currently set cylinder temperature setpoint minus the setpoint depression value entered during commissioning on the 'Machine Parameters' screen of the main panel HMI.

- While the dryer cylinder temperature is waiting for the Idle temperature to be reached the dryer status will be 'Preheat'.

- Once the dryer cylinder temperature reaches the calculated idle temperature minus 1°C, the dryer status will change from 'Preheat' to 'Idle'.

- Once the dryer status changes to 'Idle', the infeed conveyors are allowed to start provided all the following conditions are met and remain true:
  1. Take-off conveyor K154 is running.
  2. Take-off conveyor K153 is running.
  3. Dryer cylinder motor 07M1 is running.
  4. Dryer exhaust flue fan motor 07M7 is running.
  5. Dryer cyclone fan motor 07AM1 is running.
  6. Dryer feed screw motor 07M2 is running.
  7. The burner status is 'On'.

- Once the infeed conveyors are allowed to start, band conveyor K151 motor 5M1 is started.

- The dryer roller fans are started immediately the machinery start-up klaxon stops sounding.

- Provided metering tube 'T25 Prime Control' is not On (as described in section 2.4.1.7), when band conveyor K151 is proved running, metering band K194 motor 4M1 is started.
- Provided metering tube T25 top photocell is not covered, band conveyor K150 motor 3M1 will start and run until the photocell is covered.
- When band conveyor K150 is proved running, vibrating conveyor K149 motor 2M1 will start.
- When vibrating conveyor K149 is proved running and the 'K12 Fill Control In Auto' upstream interlock is On, silo K12 doffers motor 1M2 will start.
- When silo K12 doffers motor is proved running and vibrating conveyor K149 is proved running, silo K12 discharge band motor 1M1 will start.

The operator should view the mimic screen for the ITM Dryer as described in section 2.3.3 and press the 'Reset to Idle' button if the dryer status indicators at the top of the display indicate anything other than 'Idle'.

1.5 Metering Tube T25 Control

1.5.1 Metering Tube Prime

In order to prevent a runaway situation occurring with metering band K194 on startup, where the band runs at maximum speed because metering tube T25 is empty. A prime facility for the metering tube has been provided whereby, metering band K194 can be stopped until metering tube T25 has been filled. The details of this facility are described in section 2.4.1.7.

1.5.2 Product Feed Control

Metering tube T25 has two photocells for detecting the level of product in it. An Empty photocell and a Full photocell.

At start-up of the process line, if the metering tube is not full, the feeding conveyors are allowed to start, to fill the tube until it is full.

Once the tube has been filled, it must empty so that both the Full and Empty photocells are both uncovered before the feeding conveyors are allowed to start again.

1.5.3 Metering Tube Blocked Detection

If the metering tube top photocell is covered and the lower photocell is uncovered, it is assumed that a blockage has occurred in the tube. When this happens, an alarm is raised and the feeding conveyors are stopped until the top photocell is uncovered again and the alarm has been reset.

1.6 Process Line Stop

The Process Line is stopped by pressing the Process Line 'Stop' button on the 'Auto Control' screen of the main panel HMI. When the Process Line is commanded to stop, all the machinery will stop immediately except for certain items, which may continue to run either because the dryer Preheat Control is still running or, because the dryer cooldown thermostat indicates the cylinder temperature is too high to allow them to stop.

If Preheat Control is still running then all the equipment started under Preheat Control, as described in section 1.3.3 will remain running. Any product left in the dryer will be transported out onto conveyor K153.

If Preheat Control is not running when the Process Line is stopped then the burner is stopped immediately but, the status of the dryer cylinder cooldown thermostat will determine what happens next as follows:

- If the dryer cylinder cooldown thermostat indicates that the temperature is low enough to allow equipment to stop then, the dryer cylinder motor and exhaust flue fan motor will remain running while all other equipment stops.

- If the dryer cylinder thermostat indicates that the temperature is not low enough to allow equipment to stop then, the dryer status will change to Cooldown and all equipment except that described in section 1.8 will stop.

In order to stop the dryer cylinder and exhaust flue fan once all other equipment has stopped, the operator must change the Control Mode to Off from the main panel HMI 'Auto Control' screen.

1.7 Preheat Stop

If the dryer Preheat Control is running, while the Process Line Control is running, then stopping Preheat Control will have no effect on Process line operation.

If the Process Line is not running when Preheat Control is stopped then the burner is stopped immediately but, the status of the dryer cylinder cooldown thermostat will determine what happens next, as described in the previous section when the Process Line is stopped.

In order to stop the dryer cylinder and exhaust flue fan once all other equipment has stopped, the operator must change the Control Mode to Off from the main panel HMI 'Auto Control' screen.

1.8 Dryer Cooldown

If both the Process Line and dryer Preheat Control are both stopped by the operator, after previously having been running, then the burner is stopped immediately. However, if the dryer cylinder cooldown thermostat indicates the cylinder is still too hot to allow it to stop then, the following equipment will continue to run:

a) Vibrating conveyor K153.
b) Dryer cylinder motor 07M01.
c) Dryer cyclone fan motor 07AM02.
d) Dryer exhaust flue fan motor 07M07.
e) Dryer roller fans.

In addition some solenoids, as described below, are automatically operated to facilitate the cooling process:

a) The process air diverter is driven to the Inline position by energising 07Y10 and de-energising 07Y11
b) The feed-end air damper is opened and the delivery-end air damper is close by energising 07Y12 and de-energising 07Y13.

Once the dryer cylinder cooldown thermostat indicats the cylinder is cool enough to stop, then conveyor K153, cyclone fan motor 07AM1 and the roller fans are stopped.

In order to stop the dryer cylinder and exhaust flue fan once all other equipment has stopped, the operator must change the Control Mode to Off from the main panel HMI 'Auto Control' screen.

1.8.1 Cooldown Restart

After having shutdown all the machinery, should the dryer cylinder cooldown thermostat be re-activated then the following equipment will re-start automatically, regardless of the control mode selected:

a) Roller fans.
b) Cyclone fan.

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2 PLC Panel PC 477 HMI Operation & Displays

2.1 HMI Overview

The HMI provided in the main PLC panel is a Siemens PC477, 15-inch touch screen device. It communicates with the control PLC within the control panel over a Profibus DP communications link.

The HMI uses the Microsoft Windows XP Embedded operating system to run the application software which is Siemens WinCC Flexible 2007 RT (Run Time).

2.2 System Features

2.2.1 HMI Start-Up

On power-up of the control panel, the HMI will start automatically and run the WinCC Flexible application for this installation. Start-up is complete once the following screen appears on the HMI display:

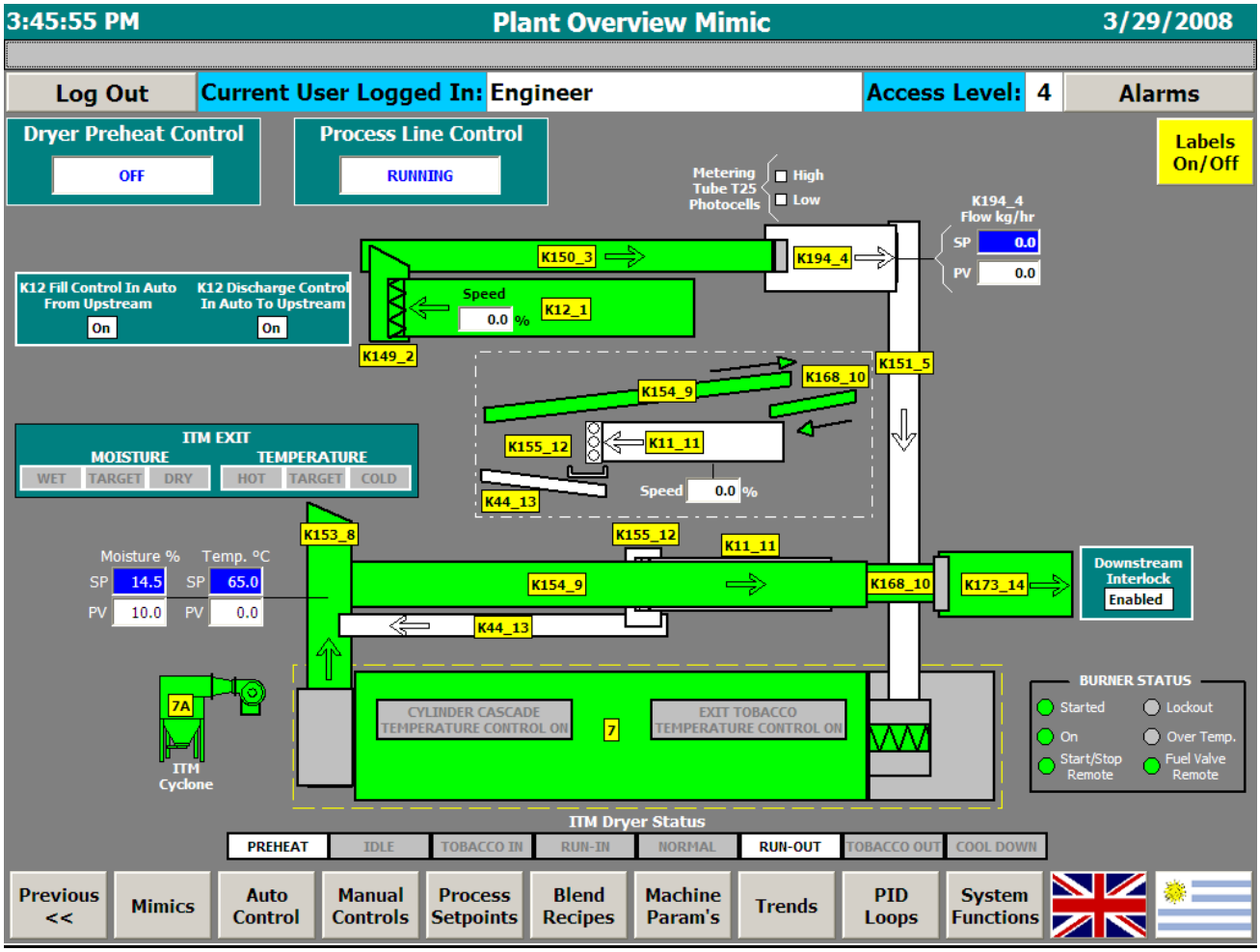


Figure 2-1 Main Panel HMI - Plant Overview Mimic – Start-up Display

This screen remains on the HMI display until another screen is requested.

2.2.2 Common Screen Features

The top of every screen always has the following features:

a) **Title:** This is the title of the currently displayed screen.

b) **Date:** This is the current date as retrieved from the HMI system clock and, is in the format MM/DD/YYYY. The current date can be adjusted using the system function 'Edit Date/Time'.

c) **Time:** This is the current time as retrieved from the HMI system clock and, is in the 12-hour format. This current time can be adjusted using the system function 'Edit Date/Time'.

d) **Alarm/System Message Banner:** A single line below the screen title displays a message for the most recent alarm to occur which is still active. The line is grey when there are no active alarms, otherwise a message is displayed on a red background for the latest unacknowledged alarm to occur. The alarm message will appear on a green background if still active but has been acknowledged by the user.

The number to the left of the message text identifies the alarm message number in the HMI discrete alarm configuration.

HMI system information messages will appear on this alarm message line. They are displayed on a white background and automatically clear from the screen after a short delay.

e) 

When pressed this will log-out any user current logged-in to the HMI.

f) **Current User Logged-In:** This is the name of the current user logged-in to the HMI. User names, passwords and assigned access groups may be edited using the system function 'Password Admin.'

g) **Access Level:** This is the current access level assigned to the currently logged-in user, and may be in the range 0 to 9. User names, passwords and assigned access levels may be edited using the system function 'Password Admin.'

h) 

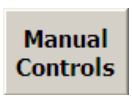
Pressing this button displays the 'Current Alarms' screen on the HMI display.

The bottom of every screen contains a common menu button bar having the following buttons:

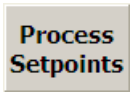
- 

Pressing this button takes the user to the previously displayed screen. By repeatedly pressing this button the user can return to any one of a number of previously displayed screens.
- 

When pressed, this button always displays the Plant Overview Mimic screen on the HMI, from which other detailed mimics can be selected for display.
- 

Pressing this button always displays the Auto Control screen on the HMI.
- 

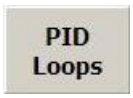
When pressed, this button always displays the first of four control screens for manual control of motors & valves.

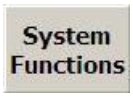
- 

When pressed, this button displays the Process Setpoints screen through which the operator can load the setpoints for a specific blend and/or, enter and adjust individual setpoints as required.
- 

Pressing this button always displays the ‘Blend Recipes’ screen. This screen allows the user to enter/edit blend recipe parameters which are groups of setpoints and data to process a particular tobacco blend through the ITM drying line.
- 

Pressing this button always displays the ‘Machine Parameters – ITM Dryer’ screen on the HMI. From this screen the ‘Machine Parameters – ITM Cooler’ screen can be displayed.
- 

Pressing this button always displays the ‘Real Time Trend Data - ITM Dryer’ screen. From this screen the user can display the historical trend data screen.
- 

When pressed, this button always displays the ‘ITM Dryer Exit Tobacco Moisture Control PID Loop’ screen on the HMI. From this screen the user can access all other PID loop screens.
- 

Pressing this button displays the System Functions menu screen on the HMI.
- 
Pressing this button changes all displayed text to the English language.
- 
Pressing this button changes all displayed text to the Uruguay Spanish language.

2.2.2.1 Touch screen Keypad & Keyboard

2.2.2.1.1 Keypad

When a numerical value is to be entered such as a setpoint, touching the value on the screen will cause the touch keypad to appear on screen as shown below:

Although it appears on the screen as it is typed, the new value is not entered until the return key on the keypad is pressed. If the 'ESC' key is pressed at any time, the data entry can be aborted and the original value is re-instated.
As the new value is entered, the minimum and maximum values that can be entered for the value appear adjacent to it on the screen.

NOTE:
Some numerical entry fields in this application require a user to be logged-on with the appropriate authorisation. If no user is logged-on or, the logged-on user does not have the appropriate authorisation, then the first time a key on the keypad is pressed the user will be required to log-on.

2.2.2.1.2 Keyboard

When any data is to be entered which could include non-numerical values such as a password, date or time, touching that data entry point on the screen will cause the touch keyboard to appear on the screen as shown below:

Although it appears on the screen as you type, new data is not entered until the return key on the keyboard is pressed. If the 'ESC' key is pressed at any time, the data entry can be aborted and the original data is re-instated,

NOTE:
Some data entry fields in this application require a user to be logged-on with the appropriate authorisation. If no user is logged-on or, the logged-on user does not have the appropriate authorisation, then the first time a key on the keypad is pressed, the user will be required to log-on.

2.2.2.2 Command Confirmation Screens

Touch screens use the screen as a command input device to start & stop equipment and processes. Typically pushbutton icons are provided on the touch screen for these types of command and, a single touch of the screen over one of these buttons is enough to trigger the command.

In order to avoid unintentional starting or stopping of equipment and processes, the majority of command buttons in this application have command confirmation screens provided, where the user must confirm the action requested by pressing a 'Confirm' button. Examples of some command confirmation screens are shown below:

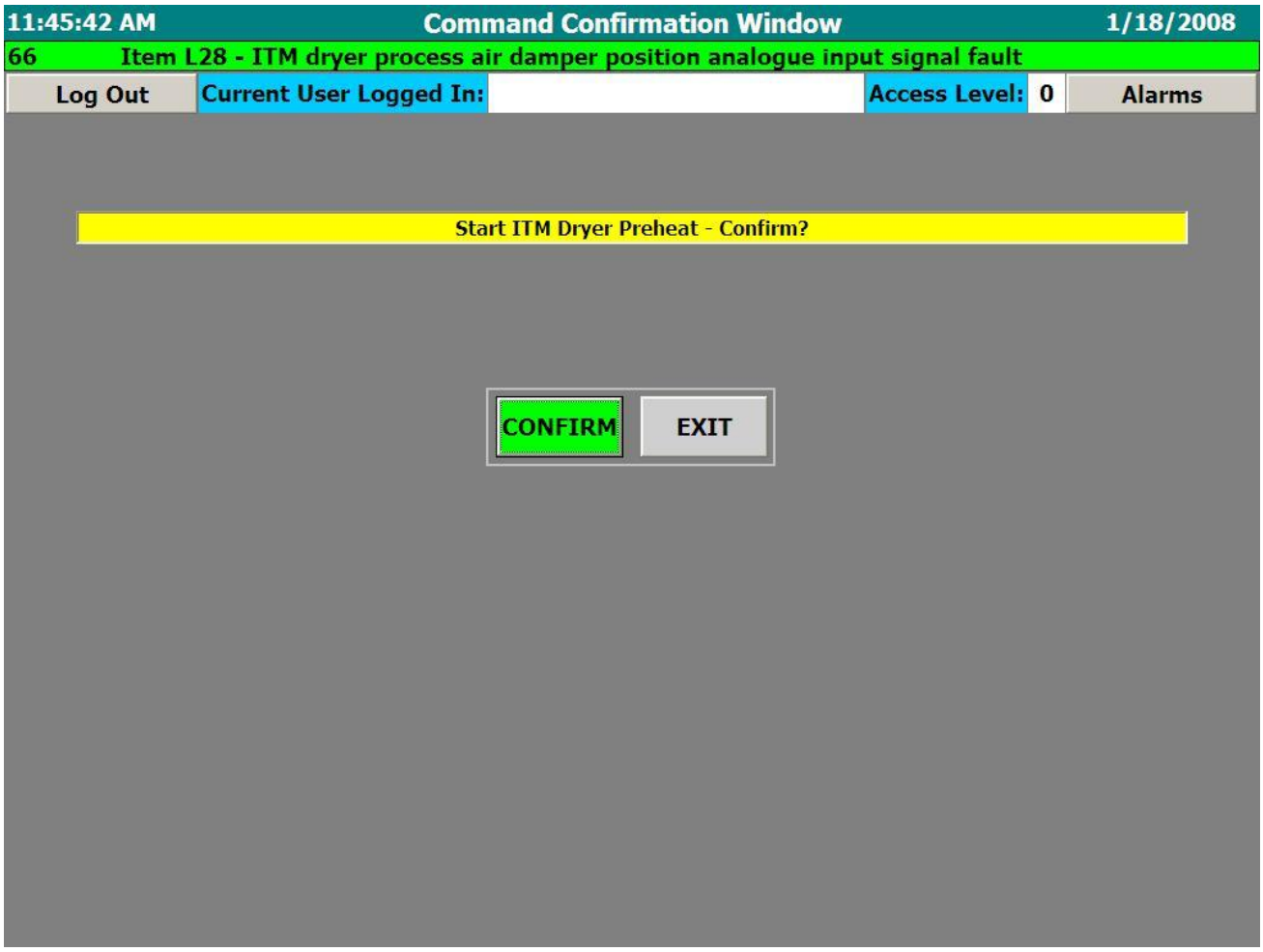


Figure 2-2 Main Panel HMI - Typical Start Command Confirmation Screen

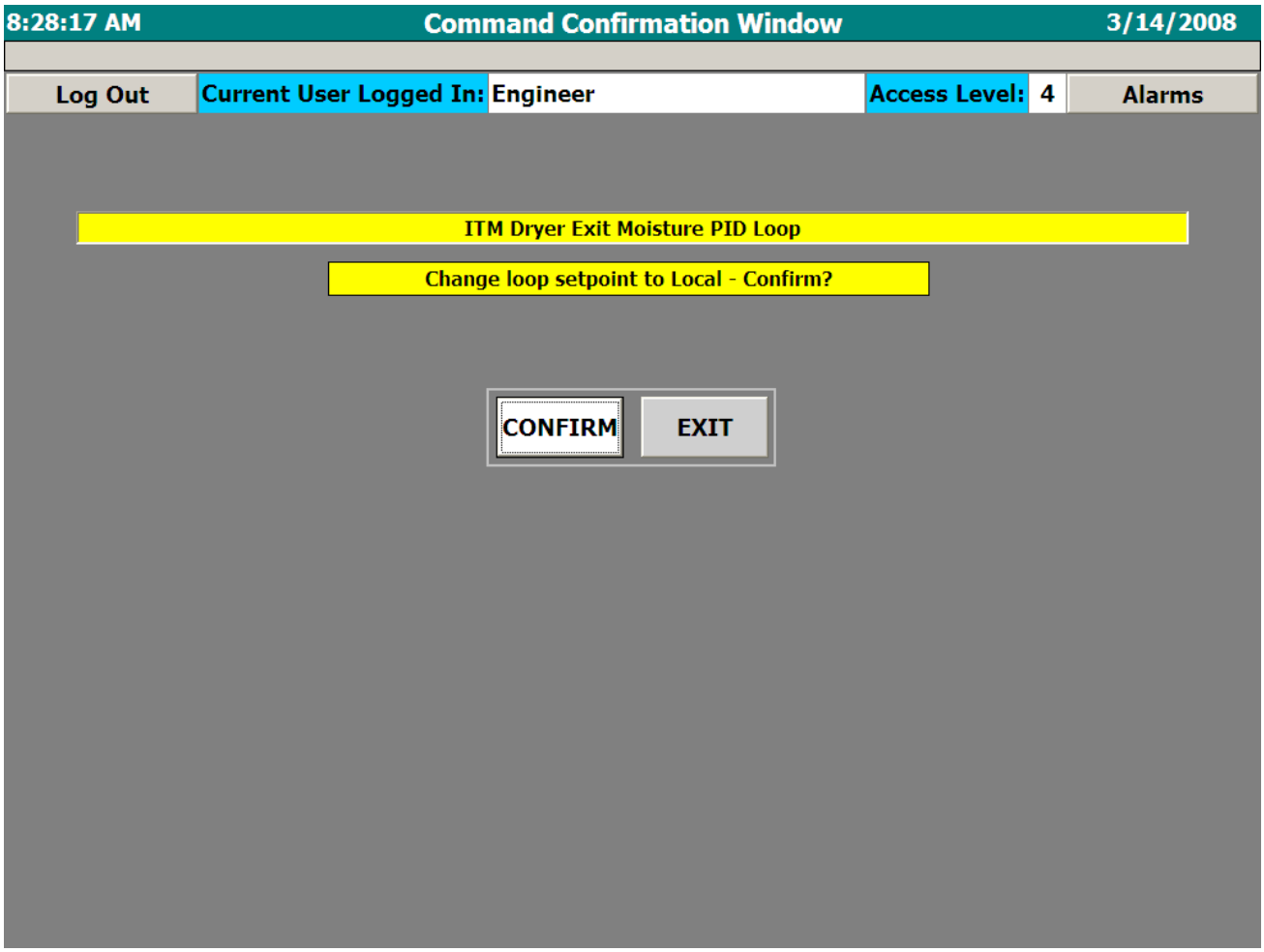


Figure 2-3 Main Panel HMI - Typical PID Loop Setpoint Selection Command Confirmation Screen

2.3 Plant Mimic Screens

Plant mimic screens are representations of the whole plant or detailed representations of a particular machine. For this application there are two mimic screens:

a) A complete drying line plant overview.
b) A detailed mimic of the ITM dryer

The features and facilities provided on these screens are described in detail in this document.

2.3.1 Commonly Used Symbol Descriptions

Plant mimic screens provide the user with pictorial status information on equipment within a section of the Lamina Process Line. There are common elements used throughout the plant mimics whose characteristics are described below:

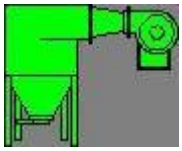
Motor symbol – Motor symbols change colour according to the status of the control switchgear and/or variable speed drive (VSD). The current motor status is indicated by changing the colour of the motor symbol as follows:

White	– Stopped & healthy.
Green	- Running with no alarms active.
Magenta	– External fault (e.g. Thermistor trip)
Magenta	– Inverter (VSD) fault
Cyan	– Stopped with isolator open.
Yellow	– Stopped with motor protection overload device tripped
Red	- Stopped with failed to start or failed to stop fault/alarm active.

A textual identification of the exact status can be identified from the maintenance control screens.

Pump Symbol – Pump symbols have the same colour changes as motor symbols.

Fan Symbol - Fan symbols have the same colour changes as motor symbols.

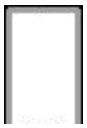


Cyclone & Fan Symbols – The cyclone vessel part of this symbol only has two colours, white for stopped and green for running based on the status of the attaches fan. The fan part of the symbol has the same colour changes as for motor symbols..

Digital Valve Symbols – Valve symbols change colour according to the status of the control outputs or, by the status of position feedback signals if they have them. The current valve status is indicated by changing the colour of the valve symbol as follows:

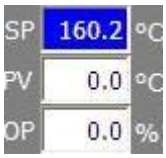
White – Closed or not energised.
Green - Open or energised.
Red - Fault or alarm active.

Motorised Valve/Damper Symbols – Motorised valves/dampers are operated by servo motors that are driven in one direction or the other by forward and reverse digital control signals. The servo motor symbol shown changes colour from white to green to indicate that one of the two control signals is energised.

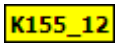


Conveyor Section – Conveyor sections are identified as rectangles generally laid out in the configuration of the plant equipment. These rectangles indicate running and stopped status only by colour change. The stopped colour is white and the running colour is green.

Photocell, Proximity & Status switches – The status of photocells, proximity switches and switch contacts are shown using rectangles that change colour according to the status of the device. Colours vary according the function of the device and are identified in the description for the relevant mimic display.



Setpoints, Process Variables & Command Variables – Setpoint (SP) values are always shown as white characters in a box with a blue background while, actual process values (PV) and command variables (OP) are always shown as white characters in a box with a black background.



Plant Item Reference – As many items as possible are identified with their plant item reference, shown in black text on a yellow background over, or adjacent to, the corresponding item. This identification is useful in cross referencing devices with electrical and mechanical drawings. These plant item references can be made to appear or disappear on the plant mimic by pressing the 'Labels On/Off' button at the top right hand of every mimic display.

2.3.2 Mimic Screen – Drying Line Overview

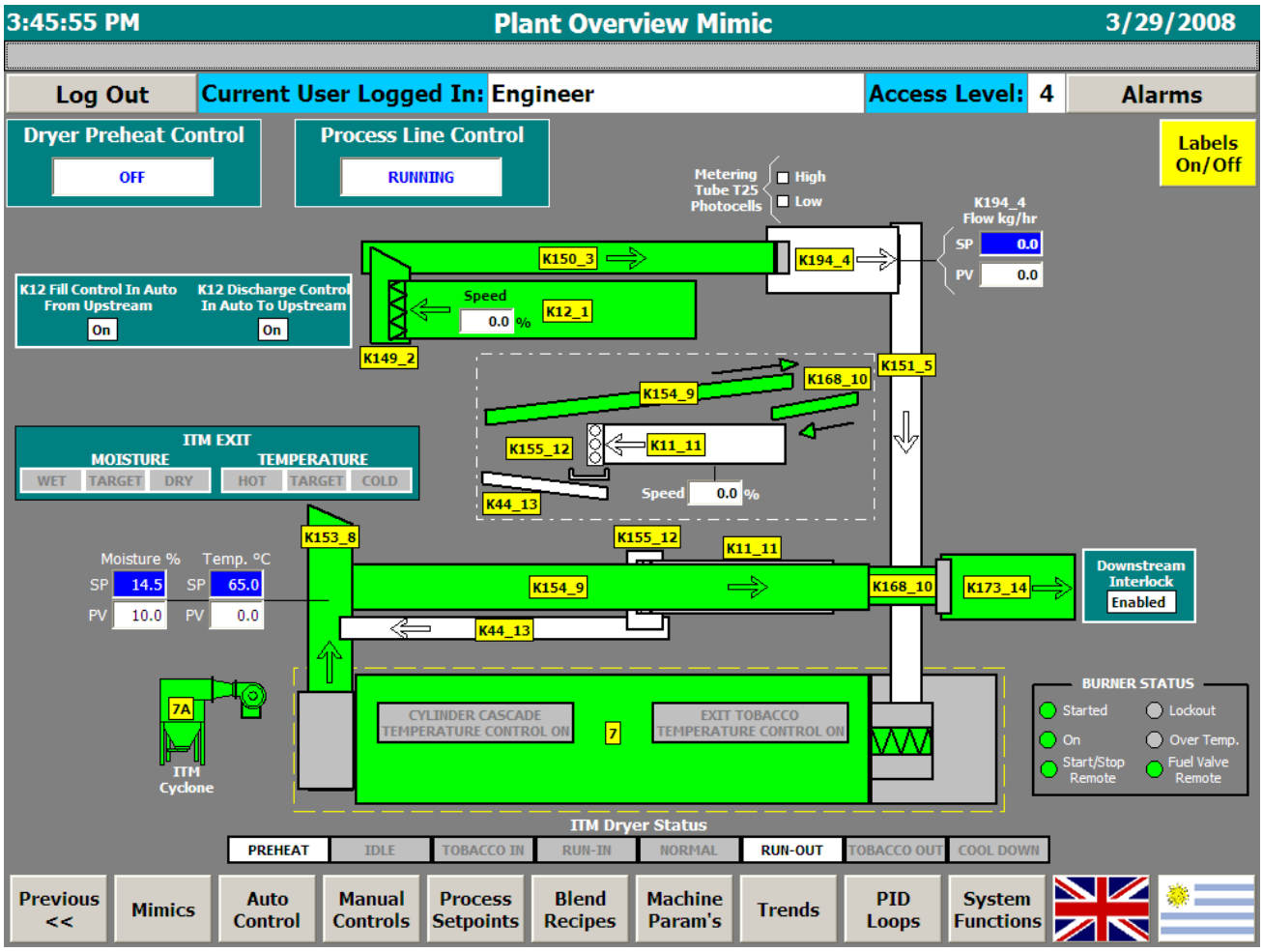


Figure 2-4 Main Panel HMI - Drying Line Overview Mimic

This mimic screen shows the complete ITM Drying Line plant under the control of the PLC. The screen can be displayed at any time by pressing the 'Mimics' button available at the bottom of every screen. The specific features of the display are described below:

2.3.2.1 Primary Auto Control Function Statuses

The primary auto control functions are Preheat, Process Line Control.

- ***Preheat*** –
  Preheats ITM dryer Item 7 automatically and includes running takeoff conveyor Item K153_8.

- ***Process Line Control*** –
  Automatically operates all machinery required to process product through the drying line from discharging of silo K12 to master weighing conveyor item K173_14.

Each of these functions may have one of the following statuses:

- ***Off –***
  Not started

- ***Starting –***
  The start-up klaxon is sounding prior to changing function status from Off to Running.

- ***Running –***
  Started equipment running or starting-up

- ***Restart –***
  A start command is required to restart equipment after failure.

- ***Restarting –***
  Start-up klaxon sounding prior to restarting failed equipment or equipment in a motor group which has returned to Auto mode.

2.3.2.2 K12 Fill & Discharge Control Mode Signal Statuses

- ***K12 Fill Control In Auto From Upstream –***
  This signal, from the control system filling silo K12, indicates to the ITM drying line control system that the filling control system is switched-on and selected to auto control mode. The status of this signal must be On in order for the ITM drying line control system to be able to discharge silo K12.

- ***K12 Discharge Control In Auto To Upstream –***
  This signal, to the control system filling silo K12, indicates that the ITM drying line control system is switched-on and that the discharge control system is selected to auto control mode. The control system filling silo K12 should not be able to fill the silo unless this signal is set On.

2.3.2.3 Downstream Interlock

This signal, from the control system controlling equipment downstream of weighing conveyor K173_14, must be set in order for weighing conveyor item K173_14 to run in automatic control.

2.3.2.4 ITM Exit – Moisture & Temperature

This refers to the product at the ITM dryer exit on conveyor K153_8. The indicators are a simple indication of whether the product leaving the ITM dryer is too wet or too dry and too hot or too cold. The Wet/Dry and Hot/Cold indicators' background colour changes from grey to orange to indicate the out of specification status. The Target indicators background colour changes from grey to green when the product is within specification.

All the indicators background colour are grey if no product is detected at the ITM dryer exit or the dryer sequence has not reached Normal operation.

2.3.2.5 Process Values

The primary process values relevant to production are shown on this screen adjacent to (or linked via black connecting lines) the equipment where measurement is effected. These values are:

- K194_4 Infeed tobacco flow rate.
- Item 7 ITM dryer tobacco exit moisture.
- Item 7 ITM dryer tobacco exit temperature.

2.3.2.6 Silo K12

- Silo K12 on the mimic shows the status of the silo discharge band and doffers.
- The speed of the discharge band is shown as the % frequency feedback from the discharge band VSD.
- The discharge band speed can be set from the Auto control screen.
- Silo K12 has an access door safety circuit which, when tripped, displays an 'Access Door Open' message inside the boundary of the silo on the mimic.

2.3.2.7 Metering Tube T25 Photocells

In automatic operation product discharge from silo K12 and the operation of the conveyors from it feeding metering tube T25 are controlled by two photocells monitoring the product in the tube.

The statuses of these two photocells are shown on the overview mimic as two small rectangles adjacent to metering band K194_4. The top photocell changes colour from white to red when covered with product while, the bottom photocell changes colour from white to green when covered with product.

From the Auto Control screen on the HMI the operator is able to stop metering band K194_4 to enable the metering tube to fill to the top photocell. By doing this, it enables metering band K194_4 to start at the proper speed to provide the required flow rate.

2.3.2.8 ITM Dryer Item 7

The ITM dryer symbol on the mimic only shows the status of the cylinder motor and feed screw motor.

There is an access door monitoring circuit associated with the ITM dryer, one which is interlocked with:

- Cylinder motor
- Feed screw motor
- Water pump
- Process air fan
- Heating air fan
- Cyclone
- Feed hood heating tapes
- Burner control

If any monitored access door associated with the ITM dryer is open a red ‘Access Open’ indicator will appear on the ITM dryer symbol over the cylinder.

The ITM dryer symbol is surrounded by a broken yellow border. This indicates that if the screen is touched within this border a detailed mimic for the ITM dryer will be displayed.

Beneath the ITM dryer cylinder are a number of status indicators indicating the current operating status of the dryer. These indicators are described in section ????.

2.3.2.9 Burner Status

A panel on the mimic to the right of the ITM dryer symbol shows the current status of the dryer burner control. The indicators in this panel operate as follows:

- ***Started –***
  Indicator changes from grey to green when start signal to burner controller in burner control panel is set on.

- ***On –***
  Indicator changes from grey to green when burner controller start-up sequence has completed, and fuel/air control valve has been released to modulation by the PLC.

- ***Start/Stop Remote –***
  Indicator changes from grey to green to indicate that remote start/stop control of the burner is selected at the burner control panel. Remote control means that burner start/stop control from the PLC in the ITM dryer panel is enabled. In local control mode the burner must be started and stopped from the burner control panel HMI.

- ***Lockout –***

Indicator changes from grey to red when the burner controller in the burner control panel has gone to lockout status.

- ***Over Temp. –***
  Indicator changes from grey to red when the dryer cylinder over-temperature thermostat indicates an over-temperature condition. When this condition is reached the burner is automatically switched-off and will not be allowed to restart until the over-temperature condition has been reset.

- ***Fuel Valve Remote –***
  Indicator changes from grey to green to indicate that remote control of the burner fuel valve is selected at the burner control panel. Remote control means that burner fuel valve position is controlled from the ITM cylinder temperature PID control loop. In local control mode the burner fuel valve position is adjusted from the burner control panel HMI.

2.3.2.10 Silo K11 & Addback Conveyors K155_12 & K44_13

Silo K11 and take-off conveyor K155_12 are hidden under band conveyor K154_9 in plan-view on the mimic. For this reason, a side elevation of this area is shown in a box with dashed line borders in the centre of the mimic. Here, the silo & conveyor arrangement can clearly be seen with the following features:

- Silo K11 on the mimic shows the status of the silo discharge band and doffers.
- The speed of the discharge band is shown as the % frequency feedback from the discharge band VSD.
- The discharge band speed can be set from the Auto Control screen.
- Silo K11 has an access door safety circuit which, when tripped, displays an ‘Access Door Open’ message, on a red background, inside the boundary of the silo on the mimic.
- When reversing band conveyor K168_10 is running, an arrow will appear below it indicating in which direction it is running. I.e. towards weighing band K173_14 or towards silo K11.
- Silo K11 and its take-off conveyors will run when the process line control status is running and the operator enables silo K11 discharge from the Auto Control mimic.

2.3.3 Mimic Screen – ITM Dryer Detail

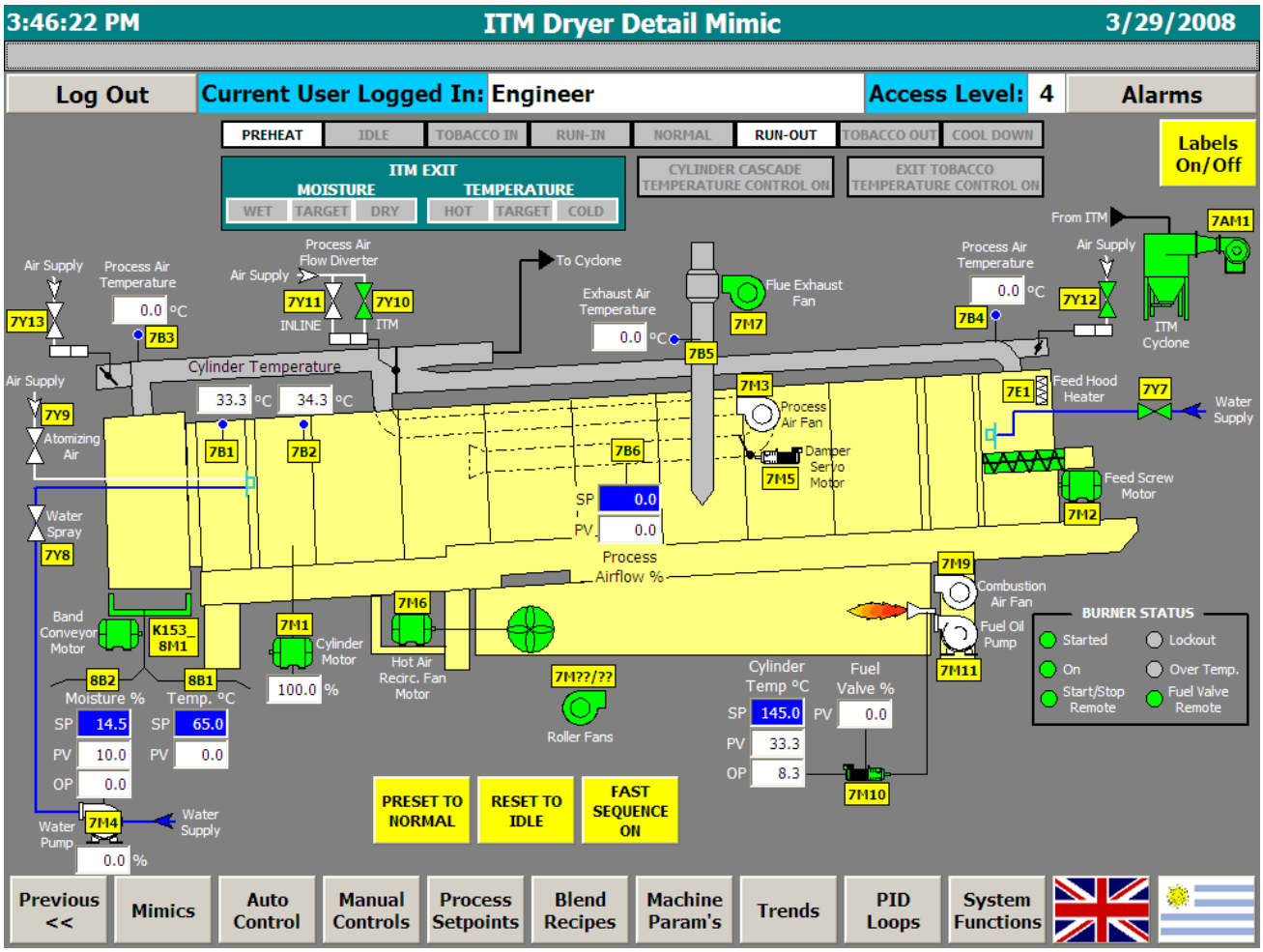


Figure 2-5 Main Panel HMI - Item 7 ITM Dryer Detail Mimic

This mimic screen shows a side elevation of the ITM dryer machine in detail, including all controlled process parameters, statuses and modes of operation. The screen is displayed by touching the ITM dryer symbol on the 'Drying Line Overview Mimic' screen.

2.3.3.1 Dryer Status Indicators

At the top of the screen are indicators for the current status of the dryer. These indicators only operate when the dryer is running in Preheat mode or the Process Line is running in automatic. Each status indicator is greyed-out when not active and changes to black text on a white background when active. A brief description of the statuses is given below:

- ***Preheat*** –
  The dryer enters this state when the Dryer Preheat Control or Process Line Control is started and the cylinder temperature is below the idle temperature. The dryer remains in this state until the actual cylinder temperature reaches or exceeds the idle temperature minus 1°C. (Idle temperature is the operator/recipe selected cylinder temperature setpoint minus the cylinder temperature setpoint depression value, as set on the machine parameters screen).

- ***Idle*** –

The dryer enters this state from:
a) Preheat when the cylinder temperature reaches or exceeds the idle temperature minus 1°C
OR
b) During Runout when the cylinder temperature setpoint ramp down is started.

- ***Tobacco In*** –
This indicator is activated when the product flow rate over metering band K194_4 is greater than 100kg/hr and remains above 50kg/hr.

- ***Run-In*** –
This indicator is active once Tobacco-In has been indicated for a preset time. The indicator remains active until tobacco is detected at the dryer exit.

- ***Normal*** –
This indicator is active once tobacco is detected at the dryer exit and the cylinder temperature ramp-up has completed. The indicator is cancelled when Run-In or Run-out statuses are active.

- ***Run-Out*** -
This indicator is active when the product flow over metering band K194_4 has been below 50kg/hr for a preset time. The indicator remains active until tobacco is no longer detected at the dryer exit or, product over metering band K194_4 rises above 100kg/hr again and the dryer returns to the Run-In state.

- ***Tobacco Out*** –
This indicator is activated during Run-In, a preset time after transport delay time (T2) has expired. The indicator is cancelled during Run-Out a preset time after transport delay time (T12) has expired. The indicator will also be activated when the product detector on K153_8 is activated.

- ***Cooldown*** –
This indicator is activated when the Process Line and Preheat operation have been stopped and the dryer cylinder cool down thermostat indicates that the cylinder temperature is still above a safe temperature at which to stop the cylinder. In this state the following equipment will continue to operate in order to cool the cylinder as quickly as possible:

  a) Cylinder motor.
  b) Process air fan.
  c) Cyclone fan.
  d) Heating air fan.
  e) Flue exhaust fan.
  f) Roller fans.
  g) Take-off conveyor.
  h) Process air flow damper is set fully open.
  i) Process air diverter set to in-line air flow.
  j) Feed-end air damper open & delivery end air damper close.

  These items will continue to run as long as the cool down thermostat indicates the cylinder temperature is too high to stop and the motor group control mode is set to auto mode.

  If Auto control mode is cancelled, the Roller fans will continue to run regardless.

2.3.3.2 ITM Exit Tobacco Status Indicators

Beneath the ITM dryer status indicators described above, is a panel with the heading 'ITM Exit', showing the status of the tobacco at the dryer exit on conveyor K153_8. These indicators are greyed-out unless tobacco is detected at the dryer exit and the cylinder temperature setpoint ramp is complete.

When enabled, the background colour of the 'Target' indicator for moisture changes to green when the moisture is within 0.3% of setpoint. If the moisture is more than 0.3% above setpoint the 'Wet' indicator background colour changes to orange. Similarly, if the moisture is more than 0.3% below setpoint the 'Dry' indicator background colour changes to orange.

When enabled, the background colour of the 'Target' indicator for temperature changes to green when the tobacco temperature is within 3°C of setpoint. If the temperature is more than 3°C above setpoint the 'Hot' indicator background colour changes to orange. Similarly, if the temperature is more than 3°C below setpoint the 'Cold' indicator background colour changes to orange.

2.3.3.3 Control Indicators

Next to the 'ITM Exit' dryer indicators at the top of the screen are two control indicators, 'Cylinder Cascade Temperature Control On' and 'Tobacco Temperature Control On'. These are described below:

- ***Cylinder Cascade Temperature Control On*** –
  This control is switched-on automatically as part of the dryer control sequence a preset time (T9) after tobacco is detected at the dryer exit. The control automatically modifies the set cylinder temperature setpoint under the following conditions:

  The moisture control water pump speed is greater than 80% and the exit moisture is still low.
  OR
  The moisture control water pump speed is less than 20% and the exit moisture is still high.

  When the control is active the indicator changes to black text on a white background.

- ***Exit Tobacco Temperature Control On*** –
  This control is switched-on automatically as part of the dryer control sequence a preset time (T10) after 'cascade Cylinder Temperature' control is switched-on. The control automatically modifies the set process air flow setpoint under the following conditions:

  a) The tobacco temperature is high and the tobacco is too wet.
  OR
  b) The tobacco temperature is low and the tobacco is too dry.

  When the control is active the indicator changes to black text on a white background.

2.3.3.4 Dryer Sequence Control Buttons

At the bottom centre of the screen are three buttons available to the operator to control the dryer sequencing, 'Reset to Idle', 'Preset to Normal' and 'Fast Sequence On'.

A user must be logged-in to the HMI with access level 1 or above in order to be able to use these buttons.

- ***Reset To Idle*** –
  This button is provided in the event that a false start of the ITM dryer sequence has been initiated by intermittent feed of product. Pressing the button will return the ITM dryer to the Idle state should it have started its Run-In sequence too early.

- ***Preset To Normal*** –
  This button is provided to switch-on the water spray pump and process air fan earlier than the normal run-in sequence.

- ***Fast Sequence On(Off)*** –
  This button is provided to enable the user to execute the dryer sequencing faster than normal.

  When 'Fast Sequence On' is pressed the faster sequencing of the ITM dryer control is active and the button background changes to white and the text changes to 'Fast Sequence Off'.

  When 'Fast Sequence Off' is pressed the faster sequencing of the ITM dryer control is cancelled and the button background changes back to yellow and the text changes back to 'Fast Sequence On'.

2.3.3.5 Process Air Flow Diverter

The process air flow diverter diverts incoming air from the process air fan either to the infeed or discharge end of the ITM dryer cylinder. At the same time the suction from the ITM dryer cyclone is diverted to the opposite end of the ITM dryer cylinder.

In operation, when the process air fan is running, the diverter is moved so that process air is diverted to the discharge end of the ITM cylinder and flows towards the infeed-end helped by the suction of the cyclone fan. Then, during run-out the diverter position is changed so that the process air is diverted towards the infeed end of the ITM cylinder and flows towards the discharge end, which helps to clear the cylinder of product.

As shown on the mimic, the diverter positioning pneumatic cylinder is fed from two two-port valves 7Y10 & 7Y11. When a solenoid is operated the diverter shown in the duct-work changes position to show the correct direction of air flow. If neither valve is operated the diverter is shown mid-way between the two positions controlled by the solenoids.

2.3.3.6 Process Air Flow Control Damper

The process air flow control damper shown at the air inlet to process air fan 7M3 is controlled by a servo motor 7M5. This damper is controlled by digital open & close control signals from the PLC. The open & close control signals pulse in normal automatic operation with 7M3 running, in order to achieve the process air flow setpoint shown adjacent to it. The process air flow setpoint shown is the sum of the desired process air flow set by the operator/recipe plus any adjustment required to achieve the desired tobacco exit temperature once Tobacco Temperature Control has been switched-on.

The process air flow damper has a deadband of +/- 2%. This means that if the actual process air flow is within 2% of the setpoint then the process air damper will stop moving.

2.3.3.7 Burner Fuel/Air Valve Control

The burner fuel/air valve is a motorised servo valve 7M10 with positional feedback controlled by digital open and close control signals from the PLC once the burner reaches the On status (while the burner is starting-up the fuel/air valve is controlled by the burner controller module in the remote brner control panel). In normal operation the fuel/air valve is pulsed open or closed until it is with 0.5% of the cylinder temperature control loop output, shown as OP adjacent to the servo motor.

The cylinder temperature setpoint shown is the sum of the desired cylinder temperature entered by the operator/recipe plus any adjustment required by the Cylinder Cascade Temperature Control when switched-on.

2.3.3.8 Combustion Air Fan 7M9 & Fuel Oil Pump 7M11

The burner combustion air fan motor 7M9 and fuel oil pump motor 7M11 are under the direct control of the burner controller module in the remote burner control panel.

The combustion air fan always starts a few seconds after the burner is started and remains running until the burner controller is shutdown and ready to restart.

The fuel oil pump only runs if fuel oil has been selected as the burner fuel before the burner is started. Once running, the fuel/oil pump will remain running until the burner controller is shutdown and ready to restart. If the fuel selection is changed to gas while the burner is running, the burner will remain running on oil until stopped. At which point the fuel oil pump will stop also.

2.3.3.9 Burner Status

A panel on the mimic to the right of the ITM dryer shows the current status of the dryer burner control. The indicators in this panel are as described in section 2.3.2.9.

2.4 Plant Control Displays

Plant control displays are those displays which give the user automatic and manual control of the plant processes and equipment. The following sections describe the facilities available to the user on the displays available.

2.4.1 Auto Control Screen

The Auto Control screen is the Drying Process Line operators main control screen for automatic operation of the process line.

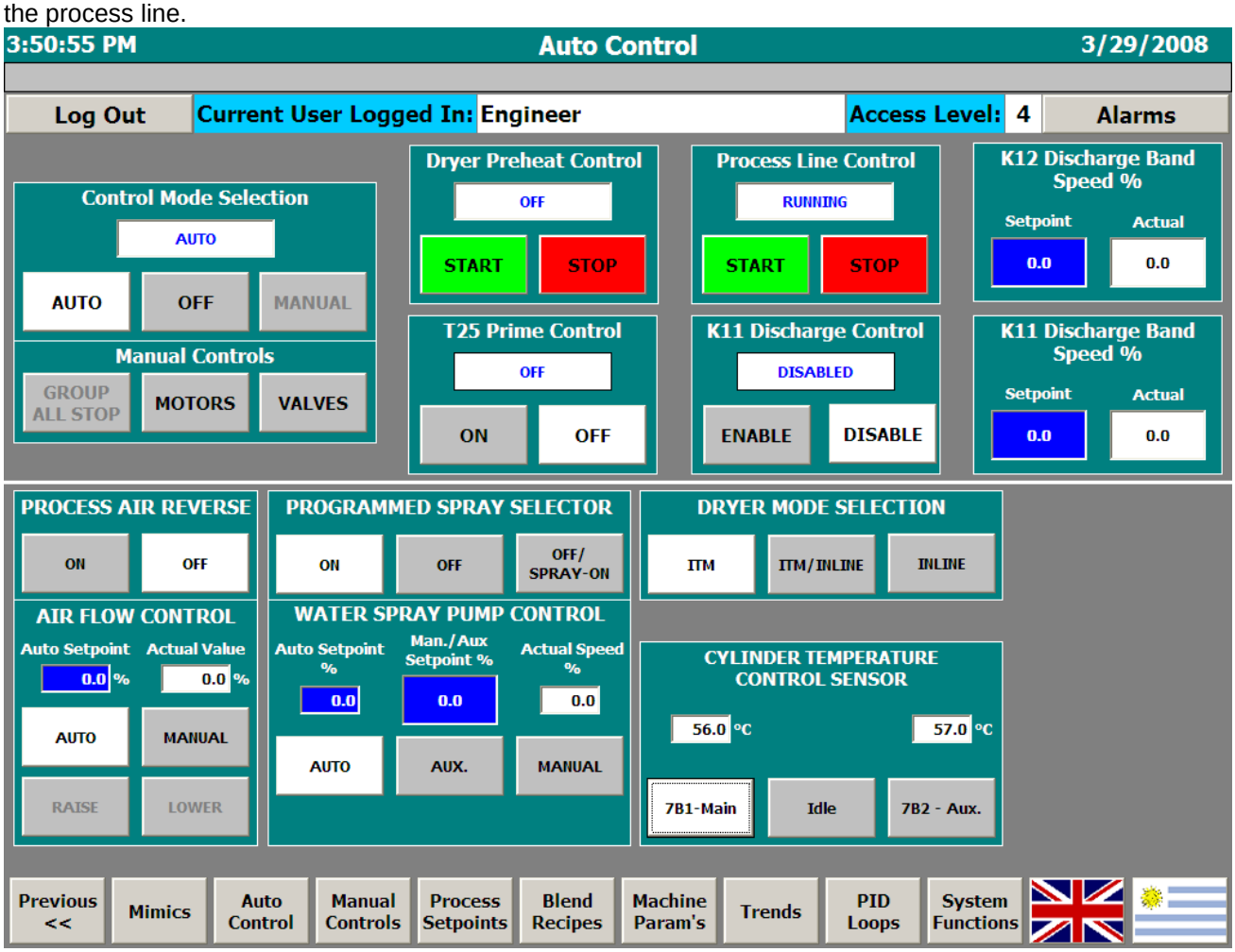


Figure 2-6 Main Panel HMI - Auto Control Display

The 'Auto Control' screen can be displayed at any time by pressing the 'Auto Control' button available at the bottom of every screen. The specific features of the display are described below:

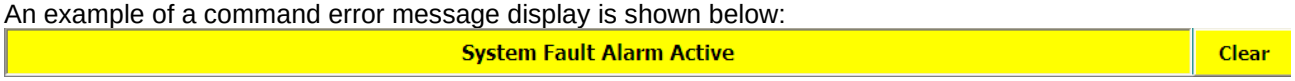
2.4.1.1 Security

As the 'Auto Control' screen is the operators main control screen for day-to-day production, no security has been put on to any of the controls. I.e. no user needs to be logged-in to the HMI in order to operate the plant in normal automatic operation.

2.4.1.2 Command Error Messages

Many of the commands on the 'Auto Control' screen have to be validated before they can be actioned. Validation is performed by the ITM PLC control system. If a command fails to validate because one or more of the conditions which are checked is found not to be true, an error message will appear at the bottom of the screen for a short period indicating the first checked condition which failed. The error message will be removed automatically after a short time or, can be removed manually by pressing the 'Clear' button that appears to the right of it.

An example of a command error message display is shown below:



2.4.1.3 Control Mode Selection

This panel at the top left of the screen contains the following:

- A window showing the current control mode selected for the process line in textual form. The control mode indicated may be AUTO, OFF or MANUAL.

- Control mode selection buttons AUTO, OFF and MANUAL.
  The user must select the OFF mode before being able to select AUTO or MANUAL mode. It is not possible to select AUTO mode when MANUAL mode is selected and it is not possible to select MANUAL mode when AUTO mode is selected.
  Whichever control mode is currently selected, the corresponding button is illuminated with a white background and should match that in the window described above.

2.4.1.4 Manual Controls

This panel, immediately below the Control Mode Selection panel, contains the following:

- Group All Stop button. A user has to be logged-on to the HMI with access level 1 or higher to use this button. When pressed, it will stop all motors and de-energise all valves that have been started/energised while the control mode selected to MANUAL.

- MOTORS button. This button has no security on it. When pressed the HMI will display the first of three manual motor control screens.

- VALVES button. This button has no security on it. When pressed the HMI will display the only manual valve control screen.

2.4.1.5 Dryer Preheat Control

This panel on the screen contains the status & start/stop buttons for ITM Dryer item 7 automatic preheat control.

In preheat operation the ITM Dryer operates independently of the rest of the drying line, and is brought to idle temperature in preparation for operation.

The possible statuses for the Preheat Control are:

- OFF - Dryer Preheat Control is switched-off
- STARTING - Dryer Preheat Control is preparing to start. The machinery start-up klaxon will be sounding.
- RUNNING - Dryer Preheat Control is running.
- RESTART - Dryer Preheat Control is running and a device involved in dryer preheat control failed. The fault has been rectified and the associated alarm reset. RESTART indicates that the user must press the Dryer Preheat START button in order to

restart the device that failed.

- RESTARTING - Dryer Preheat Control is running and is preparing to restart the device(s) which caused the RESTART status to appear.

If preheat cannot be started for any reason an error message will appear at the bottom of the screen indicating the reason why.

2.4.1.6 Process Line Control

This panel on the screen contains the status & start/stop buttons for the complete drying line automatic control. If the Preheat control is not already started then the ITM dryer will automatically start as part of the process line start-up sequence and will not allow the infeed equipment to start until it has reached idle temperature.

The possible statuses for the Process Line Control are:

- OFF - Process Line Control is switched-off
- STARTING - Process Line Control is preparing to start. The machinery start-up klaxon will be sounding.
- RUNNING - Process Line Control is running.
- RESTART - Process Line Control is running and a device on the process line has failed. The fault has been rectified and the associated alarm reset. RESTART indicates that the user must press the Process Line START button in order to restart the device that failed.
- RESTARTING - Process Line Control is running and is preparing to restart the device(s) which caused the RESTART status to appear.

If the process line cannot be started for any reason an error message will appear at the bottom of the screen indicating the reason why.

2.4.1.7 T25 Prime Control

T25 prime control is simply a means of stopping metering band K194_4 while metering tube T25 is filled. This means that metering band K194_4 will not start running at maximum speed immediately to achieve the set flow rate, as it will have a full depth carpet of product on it.

The T25 Prime Control panel on the screen contains:

- A status window. This shows in textual form the current status of the prime control which may be either ON or OFF.

- ON & OFF buttons. The button for the selected mode is illuminated with a white background.

When prime control is ON metering band K194_4 will not run in automatic control.

T25 Prime control does not automatically cancel when metering tube T25 is full.

2.4.1.8 K11 Discharge Control

Silo K11 receives off-spec product from the take-off line of the ITM dryer. Once the product leaving the dryer exit is within acceptable moisture limits, product from silo K11 can be added back on top of it at a controlled rate.

It is the operator's decisions as to when to start adding back the contents of silo K11.

The K11 Discharge Control panel on the screen contains:

- A status window. This shows in textual form the current status of K11 Discharge Control which may be either ENABLED or DISABLED.

- ENABLE & DISABLE buttons. The button for the selected mode is illuminated with a white background.

When K11 Discharge Control is ENABLED conveyors K44, K155, K11_11M1 and doffers K11_11M2 will only run of the Process Line Control status is RUNNING and band conveyor K153 is running.

2.4.1.9 K11 Discharge Band Speed

This panel on the screen provides the operator with a means to adjust the speed of silo K11 discharge band when the Process Line is running in automatic control.

The operator adjusts the setpoint by entering a value from 0 – 100% into the Setpoint box.

The Actual box displays the speed returned from the discharge band variable speed drive.

2.4.1.10 K12 Discharge Band Speed

This panel on the screen provides the operator with a means to adjust the speed of silo K12 discharge band when the Process Line is running in automatic control.

The operator adjusts the setpoint by entering a value from 0 – 100% into the Setpoint box.

The Actual box displays the speed returned from the discharge band variable speed drive.

2.4.1.11 Process Air Reverse

The Process Air Reverse panel at the centre left of the screen allows the operator to override the normal automatic process air reverse control.

Process Air Reverse is switched-on by pressing the ON button in the panel. This button has a white background when Process Air Reverse mode is switched-on and a grey background when switched-off.

Process Air Reverse is switched-off by pressing the OFF button in the panel. This button has a white background when Process Air Reverse mode is switched-off and a grey background when switched-on.

When process Air Reverse is switched-on it performs the following actions irrespective of the selected mode of operation of the dryer (see later):

a) The Process Air Fan 7M3 is switched-off.
b) The process air diverter ITM mode solenoid 7Y10 is switched-off.
c) The process air diverter Inline mode solenoid 7Y11 is switched-on.

2.4.1.12 Air Flow Control

At the bottom left-hand-side of the screen is a panel labelled ‘Air Flow Control’. This panel contains buttons to allow the operator to override the normal automatic control of the process air flow damper and manually adjust the process flow.

The Air Flow Control panel contains:

- **Auto Setpoint / Actual Value –**
  The Auto Setpoint is the current process airflow setpoint. This being the sum of the initial process air flow setpoint and the output of the tobacco temperature control PID loop (scaled +/- 25% process air flow).

The Actual Value is the currently measured process air flow value from the process air flow anemometer.

- **Auto/Manual Buttons–**
  These buttons indicate the current mode of the process air flow damper control when the background of the button is white. Pressing either button with a grey background will change the control mode to that indicated by the button text.

  Auto mode means the normal automatic control of process air flow is enabled.

  Manual mode means that the 'Raise' & 'Lower' buttons in the panel will operate the process air flow control damper.

- **Raise/Lower –**
  These buttons are greyed-out unless manual control as described above is enabled. When enabled the buttons' background colour changes to yellow. Pressing either the Raise or Lower button will then drive the damper motor 7M05 in the appropriate direction to raise or lower the actual process air flow. The damper motor will only operate as long as the Raise or Lower button remains pressed on the screen.

  The actual process air flow, set with the Raise & Lower control buttons, can be seen in the Actual Value window in the panel.

2.4.1.13 Programmed Spray Selection

The Programmed Spray Selector panel on this screen contains three buttons ON, OFF & OFF/SPRAY-ON to select the mode of operation of the dryer water sprays when the Process Line is running in automatic. The currently selected mode is indicated by the associated button having a white background.

If the Dryer Mode Selection is set to INLINE the Programmed Spray Selection will have no effect on the water sprays as they are not used in this dryer mode.

2.4.1.14 Water Spray Pump Control

The Water Spray Pump Control panel on this screen contains three buttons AUTO, AUX. & MANUAL to select the mode of operation of the dryer control spray when the Process Line is running in automatic. The currently selected mode is indicated by the associated button having a white background.

If the Dryer Mode Selection is set to INLINE the Water Spray Pump Control mode selected will have no effect on the water sprays as they are not used in this dryer mode.

- **AUTO –**
  When this mode is selected, the water control sprays are operated according to the Programmed Spray Selection mode.

- **Aux. –**
  When this mode is selected, the water control sprays are operated according to the Programmed Spray Selection mode with the following exceptions:
  a) Control spray water pump 7M4 runs at the speed set in the Man./Aux. Setpoint % window in the control panel.
  b) The ITM dryer moisture control PID loop, providing the setpoint for 7M4 is disabled.

- **MANUAL –**
  When this mode is selected the following actions occur:
  a) Control spray water pump 7M4 starts immediately and runs at the speed set in the Man./Aux. Setpoint % window in the control panel.

b) Delivery-end water spray valve 7Y8 is opened.
c) Delivery-end atomising air valve 7Y9 is opened.
d) Feed-end water spray solenoid 7Y7 is closed.
e) The ITM dryer moisture control PID loop, providing the setpoint for 7M4 is disabled.

- **Auto Setpoint % -**
  This is the speed setpoint for the control spray water pump 7M4 provided by the moisture control PID loop when it is enabled. The value may be anywhere between 0 and 100%.

- **Man./Aux. Setpoint % -**
  This setpoint is entered by the operator and provides the speed reference for the control spray water pump 7M4 when the Water Spray Pump Control mode is set to AUTO.

- **Actual Speed % -**
  This displays the actual speed of the control spray water pump 7M4 when it is running.

2.4.1.15 Dryer Mode Selection

This panel on the screen contains buttons to select the overall mode of operation of the dryer. The currently selected mode is indicated by the associated button having a white background.

ITM –
When this mode is selected, the dryer operates as a normal ITM dryer (subject to the selections made using the other controls on this screen), with process air normally flowing against the direction of product flow until the tail of the tobacco enters the dryer, in which case the process air flow is reversed.

ITM/INLINE –
When this mode is selected the dryer still operates to the normal dryer ITM mode control sequence (subject to the selections made using the other controls on this screen) with the following exceptions:

- Feed-End water solenoid 7Y7 does not operate during Run-In and Run-Out operation of the dryer.
- The process air diverter solenoid 7Y10 is always off and 7Y11 is always on so that the process air is reversed in comparison to normal ITM dryer operation.
- The feed-end air damper is always closed (except during cooldown).
- The delivery-end air damper is always open (except during cooldown).

INLINE –

2.4.1.16 Operation Complete Button

The ‘Operation Complete’ button is used by the operator to confirm that the current operation is finished after the drying line becomes empty.

The ‘Operation Complete’ button is normally greyed-out unless an operation is currently in progress and the drying line is empty, in which case the button colour is black text on a yellow background.

The button may be pressed at any time (even if greyed-out) and the control system will check that an operation is in progress and that the drying line is currently empty. If either of the two checks fails, the ‘Operation Complete’ command will not be actioned and an error message will be displayed at the bottom of the screen indicating the reason why.

If the ‘Operation Complete’ flag is successfully selected and the process line is running in automatic then, the process line will stop unless a follow-on operation has been selected and, the ‘Next Operation’ parameters are successfully validated.

2.4.2 Manual Control Screens

Manual control displays are used to test and run equipment for equipment maintenance & cleaning purposes. In addition, they also provide more detailed information about the status of individual items of equipment. The displays allow the user to start/stop motors, energise/de-energise valves and open/close trapdoors individually and out of sequence at any time. Basic personnel and machinery safety interlocks remain in operation in manual mode.

The following sections describe the manual control display features and facilities.

2.4.2.1 Manual Motor Controls Page 1

The manual control screen shown below is 1 of 3 to enable an authorised user to individually start and stop motors on the process line while Manual Control Mode is selected. This screen is dedicated to the ITM dryer infeed equipment motors plus the dryer cyclone and dryer cylinder roller fans.

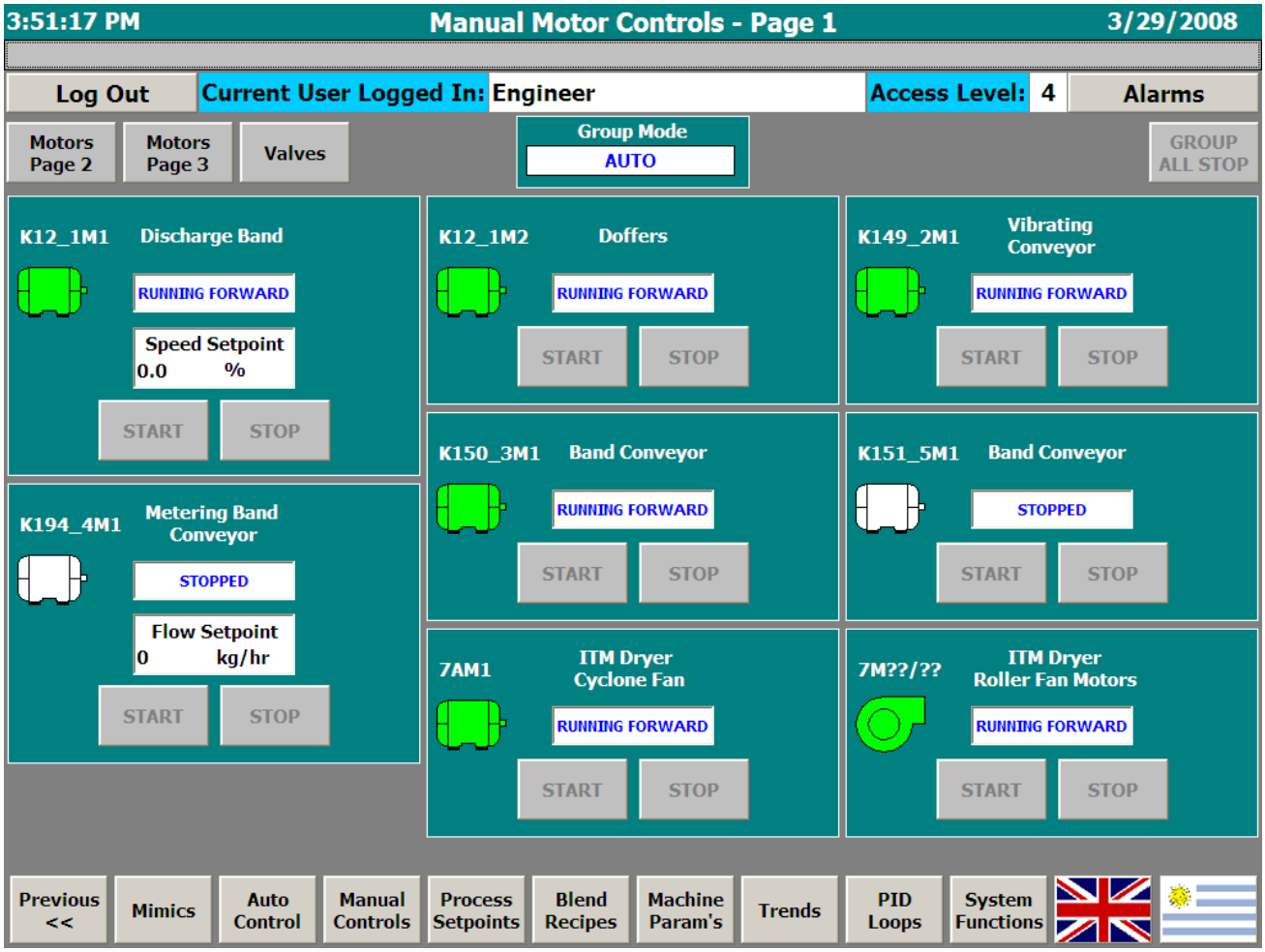


Figure 2-7 Main Panel HMI - Manual Motor Controls Screen Page 1 of 3

- Other Manual Motor Controls & Manual Valve Controls screens can be displayed by pressing the buttons at the top left of the screen.

- At the top of this screen is shown the current Motor Group Mode which may be OFF, MANUAL or AUTO.

- The individual motor Start, Stop and Group All Stop buttons are all greyed-out unless the motor group mode is selected to MANUAL mode.

- All buttons will display a command confirmation screen when pressed where, the command must be confirmed before the required action is effected.

- The motor symbols displayed in each control panel have the same colour changes according to status as described in section 2.3.1

- Motor statuses may be any one of the following:

    1. Stopped –
       Indicates the motor is healthy & not running.

    2. Running Forward –
       Indicates the motor is healthy and running in a forwards direction.

    3. Running Reverse –
       Indicates the motor is healthy and running in the reverse direction.

    4. External Fault –
       Indicates an external fault is preventing the motor from starting or caused the motor to stop. An example might be a thermistor monitoring the temperature of the motor windings.

    5. Inverter Fault –
       Indicates that there is a fault with a variable speed drive (VSD) controlling the motor.

    6. Isolated –
       Indicates the motor local isolator is not closed.

    7. Tripped –
       Indicates the overload protection device for the motor contactor or variable speed drive (VSD) has activated.

    8. Fault –
       Indicates the motor failed to run or stop within a preset time or, the motor fault alarm is active and the original cause of the fault has been rectified e.g. motor overload protection device reset. This indication may also appear for motors controlled by VSDs where the contactor supplying power to the VSD has failed to energise or de-energise when commanded.

- K12_1M1 discharge band speed can be set by touching the ‘Speed Setpoint panel and entering a value from 0 to 100%.

- Metering band K194_4M1 can be requested to run to achieve a specific flow rate by touching the ‘Flowrate Setpoint’ panel and entering a desired flow rate in kg/hr.

- Pressing the ‘Group All Stop’ button stops all motors and de-energises all valves on the process line that were running or energised in Manual control mode.

2.4.2.2 Manual Motor Controls Page 2

The manual control screen shown below is 2 of 3 to enable an authorised user to individually start and stop motors on the ITM dryer while Manual Control Mode is selected. The process air flow control damper servo motor and dryer feed hhod heater are included on this page.

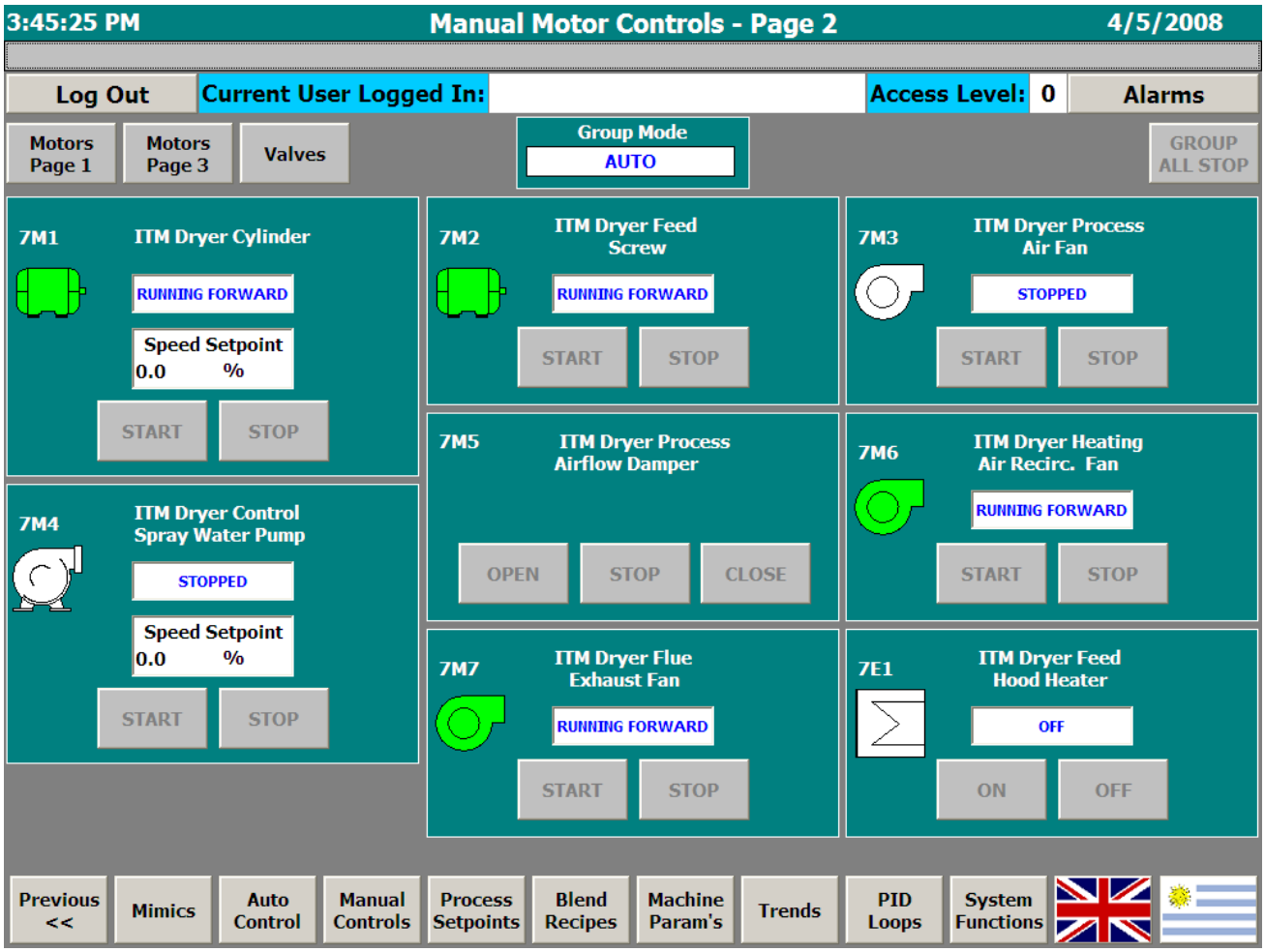


Figure 2-8 Main Panel HMI - Manual Motor Controls Screen Page 2 of 3

The screen provides the same features and facilities as those described for Manual Motor Controls screen page 1. Below are described just the differences between the screens:

- The ITM dryer Feed-Hood heater statuses may be any one of the following:

    1. Off –
       Indicates the heater is healthy & switched-off.

    2. On –
       Indicates the heater is healthy and switched-on.

    3. Tripped –
       Indicates the overload protection device for the heater contactor has activated.

    4. Fault –

Indicates the heater contactor failed to switch-on or -off within a preset time or, the heater fault alarm is active and the original cause of the fault has been rectified e.g. heater overload protection device reset.

2.4.2.3 Manual Motor Controls Page 3

The manual control screen shown below is 3 of 3 to enable an authorised user to individually start and stop motors on the process line while Manual Control Mode is selected. This screen is dedicated to the ITM dryer takeoff equipment motors.

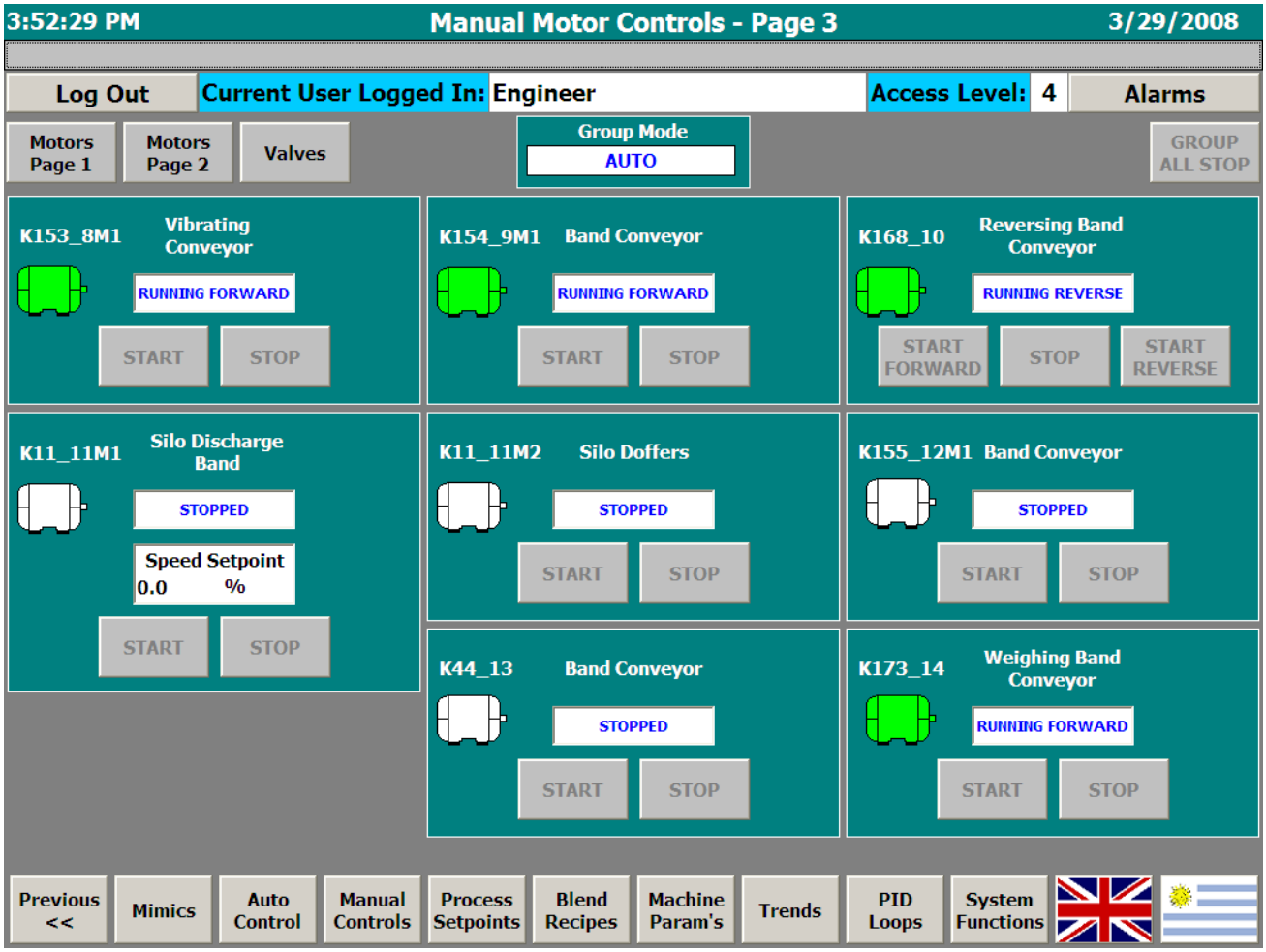


Figure 2-9 Main Panel HMI - Manual Motor Controls Screen Page 3 of 3

The screen provides the same features and facilities as those described for Manual Motor Controls screen page 1. Below are described just the differences between the screens:

2.4.2.4 Manual Valve Controls Screen

The manual control screen shown below is for manual control of all solenoid valves on the plant.

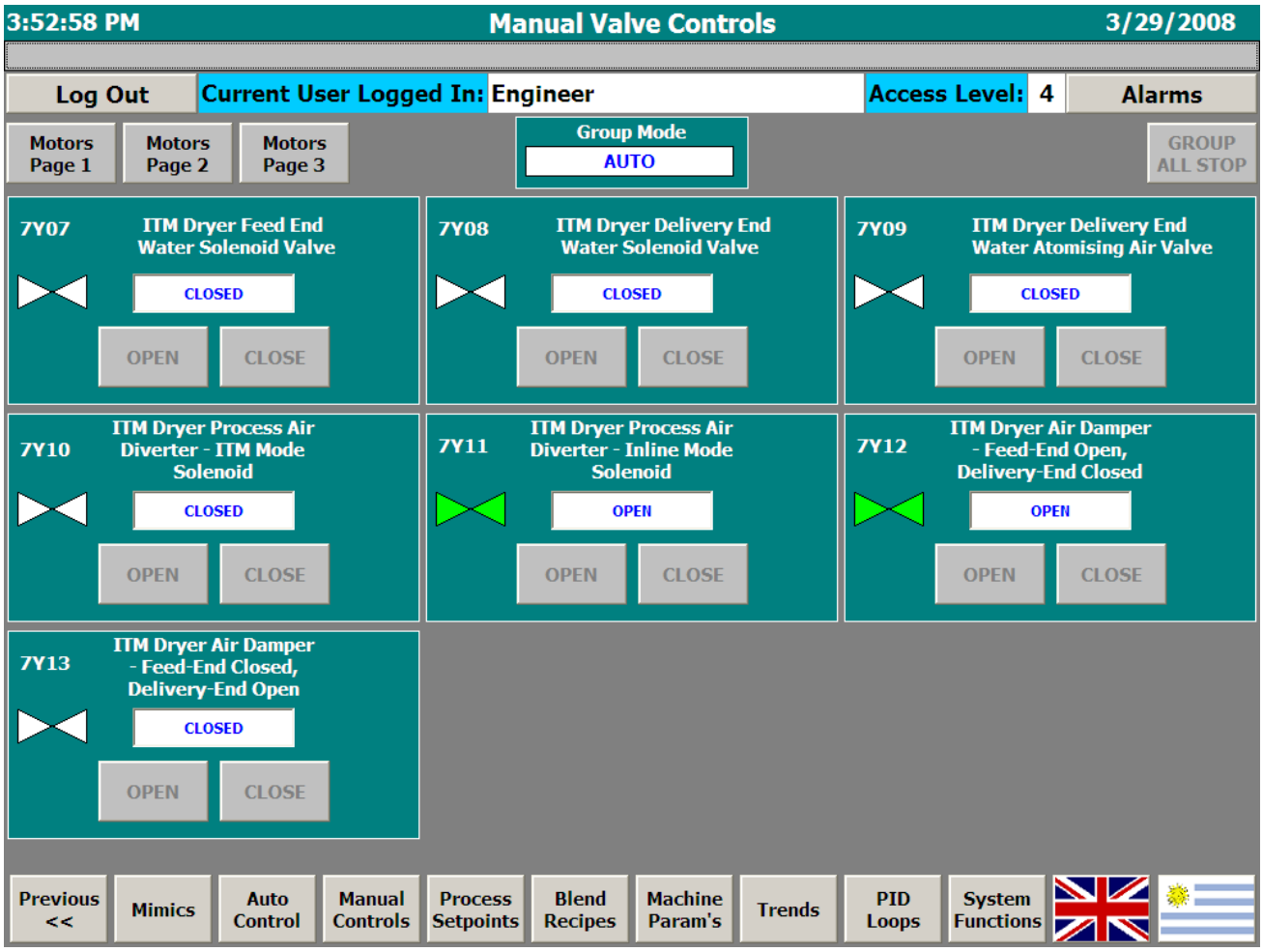


Figure 2-10 Main Panel HMI - Manual Valve Controls Screen

The following describes those features which differ from those already described for in section 2.4.2.1 for 'Manual Motor Controls Page 1' screen.

- Possible valve statuses are:
  Off – Valve not driven
  Open – Valve open or energised to open
  Closed – Valve closed or energised to close
  Fault - Valve failed to open or close

2.4.3 Data Screens

2.4.3.1 Process Setpoints Screen

The operator has the choice of selecting a pre-configured blend recipe to supply the process setpoints for the control system to use and/or to enter/edit individual parameters as necessary to meet the current ambient conditions.

The 'Process Setpoints' screen is displayed on the HMI by pressing the 'Process Setpoints' button at the bottom of any screen which shows this button. The screen appears as shown below:

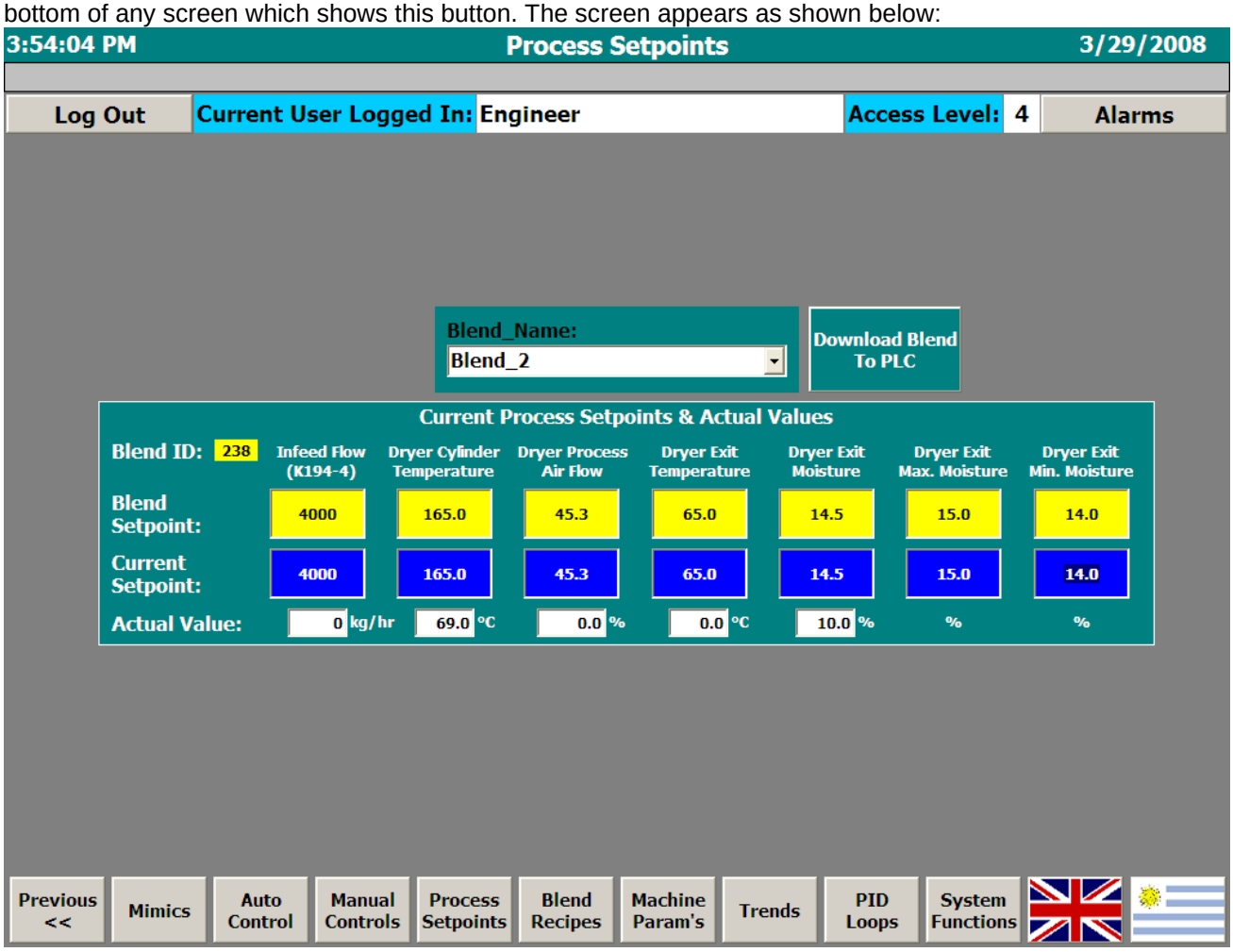


Figure 2-11 Main Panel HMI - Process Setpoints Screen

- The user is not required to log-in to the HMI in order to be able to edit the data on this screen or to download a new blend recipe of setpoints, as it will be in regular day-to-day use for normal production purposes.

- To download setpoints from a blend recipe:
  a) Touch the arrow button at the left-hand-side of the Blend_Name window.
  b) Select the blend recipe from the drop-down list window that appears, by touching its name.
  c) The drop-down list window will close and the selected blend recipe name will appear in the Blend_Name window.

d) Now touch the Download Blend To PLC button. This will cause a command confirmation window to appear showing the Blend Recipe name selected. Press the Confirm button to initiate a download of the Blend Recipe setpoints to the PLC.
e) The setpoints from the Blend Recipe will now appear in both the Blend Setpoint: and Current Setpoint: rows of data on the screen.

To enter/edit individual process setpoints, simply touch the relevant Current Setpoints: numerical value on the screen and enter the new value.

Notes:

1. The Dryer Exit Max. Moisture % must be entered between the maximum scaled range of the dryer exit moisture meter and the Dryer Exit Min. Moisture %. Similarly, the Dryer Exit Min. Moisture % must be entered between the minimum scaled range of the dryer exit moisture meter and the entered Dryer Exit Max. Moisture %.
2. The maximum value for the Process Air Flow setpoint which can be entered is the maximum value shown on the Machine Parameters screen.

The values shown in the Actual Value: row of data on the screen show the actual values of the measured process parameters. Please note that actual values of Dryer Cylinder Temperature and Dryer Process Air Flow may not meet the entered setpoints due to the action of Cascade Cylinder Temperature Control and tobacco Temperature control.

2.4.4 Blend Recipes Screen

The Blend Recipes screen is used by the production supervisor to create, edit or delete blend recipes.

A blend recipe is a group of process setpoints used in the production of a specific blend of tobacco on the drying process line.

The Blend Recipes screen is shown below:

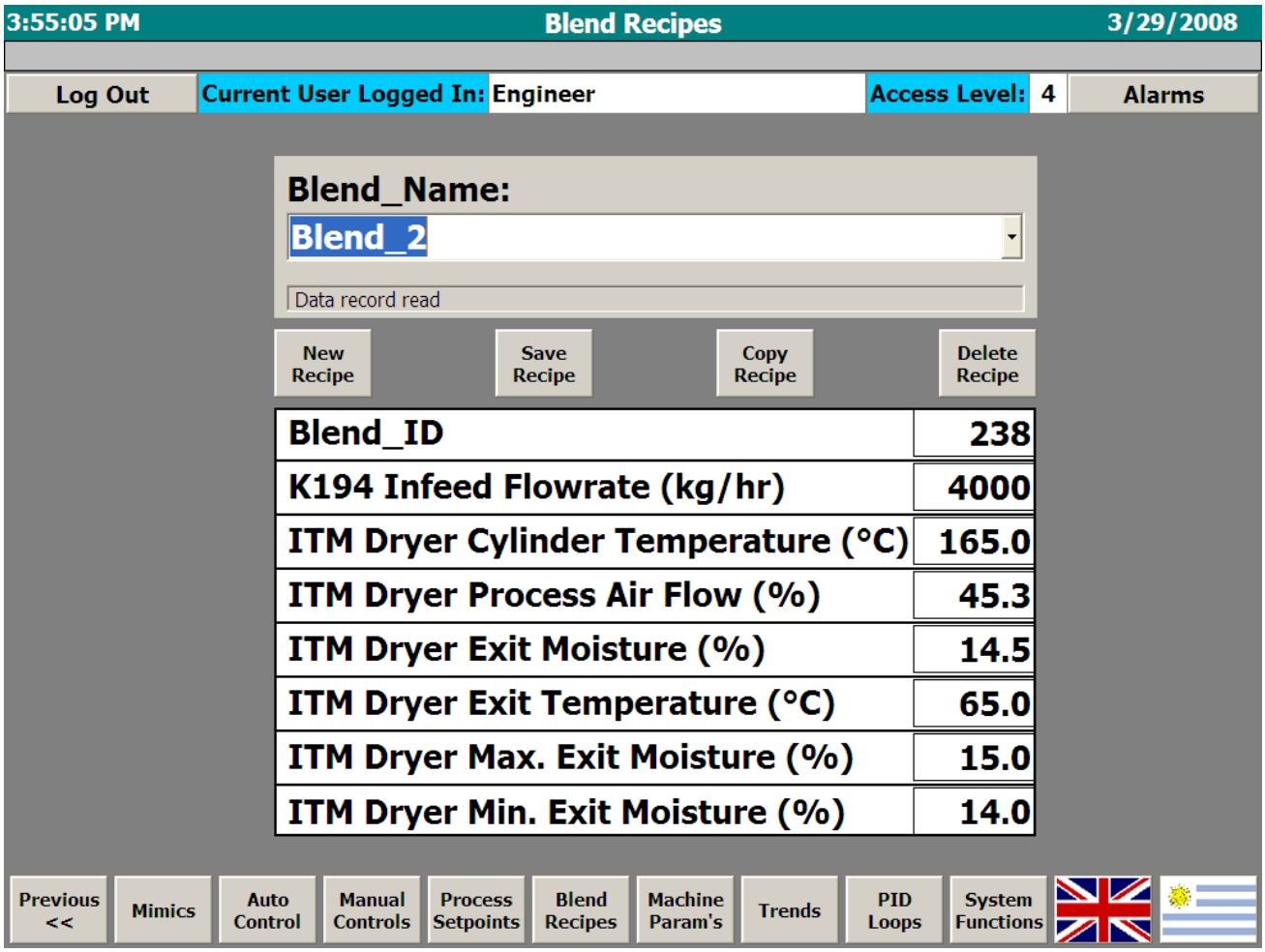


Figure 2-12 Main Panel HMI - - Blend Recipes Screen

The Blend Recipes screen is displayed by pressing the 'Blend Recipes' button at the bottom of any screen that shows it.

Only users logged-in to the HMI with access level 2 will be able to enter, edit, copy or delete blend recipes. However, a user does not have to be logged-in to the HMI in order to be able to view an existing recipe.

View a Recipe –

To view an existing recipe proceed as follows:

- Touch the down-arrow button at the right-hand-side of the Blend_Name window, and select the recipe to be viewed in the drop-down list displayed by touching it.
- Process setpoints table will then be populated with the setpoints from the selected recipe.

New Recipe Entry –

To enter a new recipe proceed as follows:

- Log-in to the HMI as a user with access level 2, 4 or 9.
- Touch the 'New Recipe' button, then touch the window beneath Blend_Name: and enter a name for the new recipe using the on-screen keyboard which is displayed.
- In the table of process setpoints, enter/edit setpoint values by touching the numerical value and entering a new value through the on-screen numerical keypad that appears.
- When all values have been entered press the 'Save Recipe' button to save the recipe on the memory card of the HMI.

Edit an Existing Recipe -

To edit an existing recipe proceed as follows:

- Touch the down-arrow button at the right-hand-side of the Blend_Name window, and select the recipe to be edited in the drop-down list displayed by touching it.
- In the table of process setpoints, enter/edit setpoint values by touching the numerical value and entering a new value through the on-screen numerical keypad that appears.
- When all values have been entered press the 'Save Recipe' button to save the modified recipe on the memory card of the HMI.

Copy an Existing Recipe -

The recipe copy function can be used to create new recipes or to overwrite existing ones. To copy a recipe proceed as follows:

- Touch the down-arrow button at the right-hand-side of the Blend_Name window, and select the recipe to be copied in the drop-down list displayed by touching it.
- Touch the 'Copy Recipe' button and use the on-screen keyboard that appears to enter a new recipe name or an existing recipe name in the 'Save As...' dialogue window that appears.

Delete a Recipe –

To delete an existing recipe proceed as follows:

- Touch the down-arrow button at the right-hand-side of the Blend_Name window, and select the recipe to be deleted in the drop-down list displayed by touching it.
- Touch the 'Delete Recipe' button and press the 'Yes' button which appears on the on-screen confirmation dialogue window.
- Once the recipe has been deleted, notice that the blend name and process setpoints table remain unchanged. To ensure that the deletion has taken place touch the down-arrow button at the right-hand-side of the Blend_Name window and the displayed blend name will disappear.

Notes:

1. The 'ITM Dryer Exit Max. Moisture %' must be entered between the maximum scaled range of the dryer exit moisture meter and the entered 'ITM Dryer Exit Min. Moisture %'. Similarly, the 'ITM Dryer Exit Min. Moisture %' must be entered between the minimum scaled range of the dryer exit moisture meter and the entered 'ITM Dryer Exit Max. Moisture %'.
2. The maximum value for the 'Process Air Flow' setpoint which can be entered is the maximum value shown on the Machine Parameters screen.
3. Some error and confirmation messages will appear briefly on the alarm line at the top of the screen when performing recipe functions. This is expected and can be useful in determining the cause of a problem.

2.4.4.1 ITM Dryer Machine Parameters Screen

The picture below shows the machine parameters screen for the ITM dryer L28.

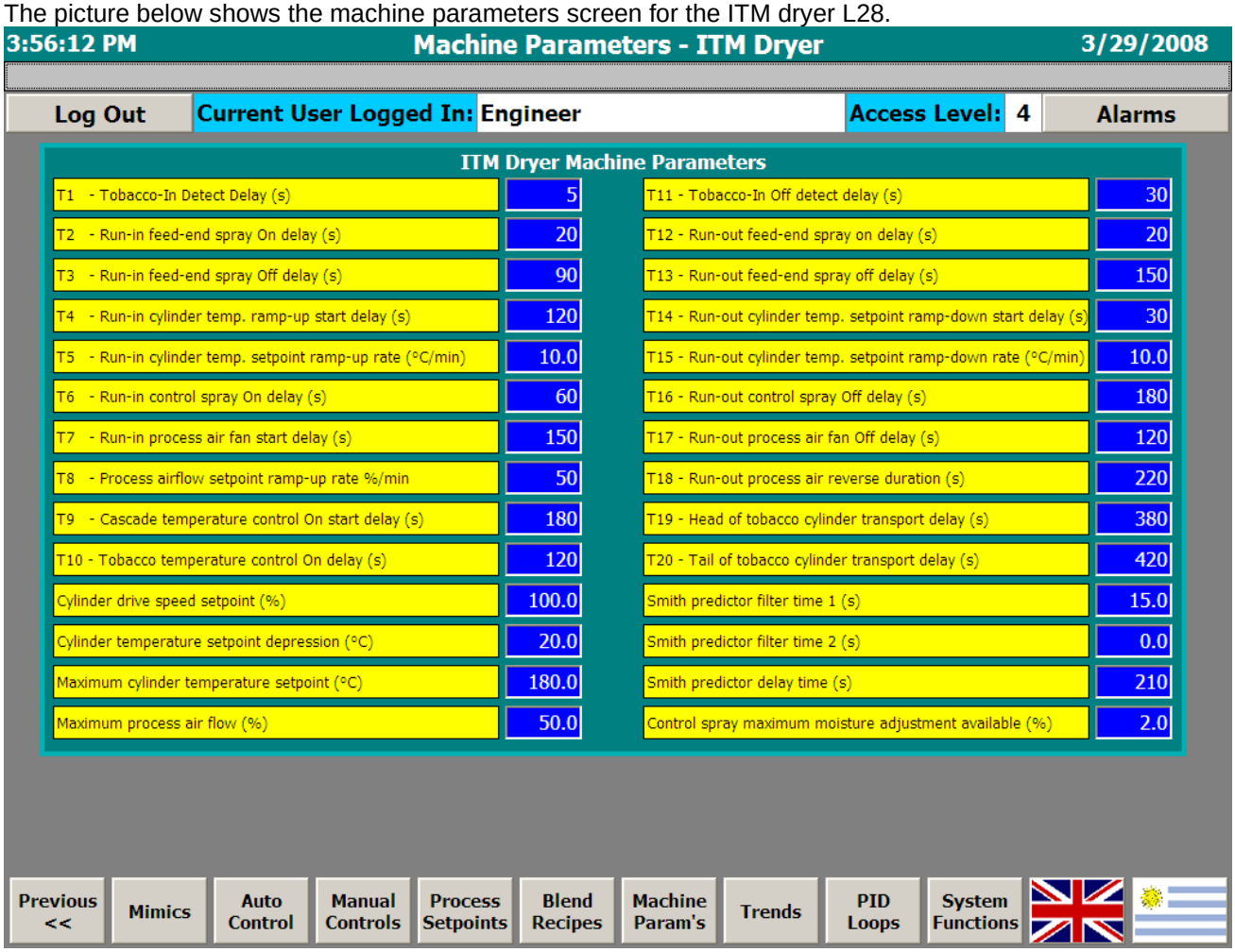


Figure 2-13 Main Panel HMI - Machine Parameters Screen

This screen is displayed on the HMI by pressing the 'Machine Param's' button at the bottom of every screen which shows it.

The following describes the specific features & facilities of the 'Machine Parameters' screen:

Security –
Only a user logged-in to the HMI with access level 4or higher (engineering access level) will be able to edit the machine parameters.

Parameters T1 – T10 –
These parameters are the values that control the run-in sequence of the ITM dryer. Not all the timers start from the same point so, the user should consult the Garbuio-Dickinson Functional Specification for the ITM dryer for guidance on setting them up.

Parameters T11 – T18 –
These parameters are the values that control the run-out sequence of the ITM dryer. Not all the timers start from the same point so, the user should consult the Garbuio-Dickinson Functional Specification for the ITM dryer for guidance on setting them up.

Parameters T19 & T20 –
These parameters effectively determine when the head and tail of the tobacco arrive at the moisture meter at the dryer exit. T19 starts after T2 completes and T20 starts after T12 completes. Modification of these time values will not only affect the dryer control but will also affect transport times to the cut stem addition point and flavouring cylinder infeed.

Note:
The Monte-Paz dryer has an external tobacco-at-dryer-exit detector which works in unison with T19 and T20 as follows:

- Tobacco is detected at the dryer exit if detected by the external tobacco-at-dryer-exit detector OR if T19 has expired.
- Tobacco detection at the dryer exit is cancelled only if the external tobacco-at-dryer-exit detector detects no tobacco AND T20 has expired.

If the user wishes to use the external tobacco-at-dryer-exit detector only, the preset value for T19 should be set as large as possible and T20 should be set to zero.

Cylinder Temperature Setpoint Depression (°C) –
This effectively determines the cylinder idle temperature. The setpoint depression is subtracted from the required cylinder temperature setpoint to get the idle temperature of the dryer. When the cylinder temperature ramp-up starts, it is the value of the setpoint depression that is actually ramped to zero to get the cylinder temperature setpoint during run-in. During run-out when the cylinder temperature ramp-down starts. It is the value of the setpoint depression that is ramped-up to the setpoint depression value set on this screen.

Maximum Cylinder Temperature Setpoint (°C) –
This value limits the maximum cylinder temperature setpoint that can be achieved by the control system in normal automatic control. It also limits the maximum cylinder temperature setpoint which can be entered by the operator.

Maximum Process Air Flow (%) –
This value limits the maximum process air flow setpoint that can be achieved by the control system in normal automatic control. It also limits the maximum process air flow setpoint which can be entered by the operator.

Smith Predictor Filter Time 1 & Filter Time 2 (s) –
The Smith Predictor is used by the moisture control PID loop to try & predict the resultant change in dryer exit moisture when the flow of the water control spray is changed. I.e. if a step change in water flow is made, ideally no further change in flow would be made until the product affected by the change in flow actually arrived at the moisture meter. The Smith Predictor uses one or two filters to match the curve of rising/falling exit moisture as the product affected by the change in water flow arrives at the moisture meter.

Using one filter, the filter time set should be the time it takes the dryer exit moisture to reach 63% of its final value, after the exit moisture begins to change as the result of a step change in water flow.

The second filter time may need to be used if the curve of rising or falling moisture, as it changes to its final value, is clearly not close to a first-order filter curve.

Smith Predictor Delay Time (s) –
This is the delay between a step change in water flow occurring and the resultant change to start happening at the dryer exit moisture meter.

Control Spray Maximum Moisture Adjustment Available (%) –
Once all other water flow adjustments have been made, this value specifies what the maximum change in dryer exit moisture is possible from 0 to 100% water flow. This value is used as part of the Smith Predictor

calculations to determine what the final expected change in dryer exit moisture might be for a change in water flow rate.

2.4.5 Trend Screens

The actual process values of analogue input signals to the PLC are logged by the HMI to provide real-time and historical trend information.

There are two trend screens in total, one real-time and one historical.

The real-time trend screen shows data from the current time back to one hour in the past, while the historical trend screen allows the user to look at data logged up to 24 hours into the past from the current time.

The main difference between real-time and historical trend screens, is that real-time trends update on screen continuously (unless stopped by the user), while historical trends are only updated by user command. In addition, if the HMI application is stopped and restarted, the last hour of real-time trend data is lost while, historical data is logged on to the memory card of the HMI and not lost.

The first trend data screen is displayed by pressing the 'Trends' button at the bottom of any screen that shows it. This will display the real-time trend screen for the ITM dryer data as shown below:

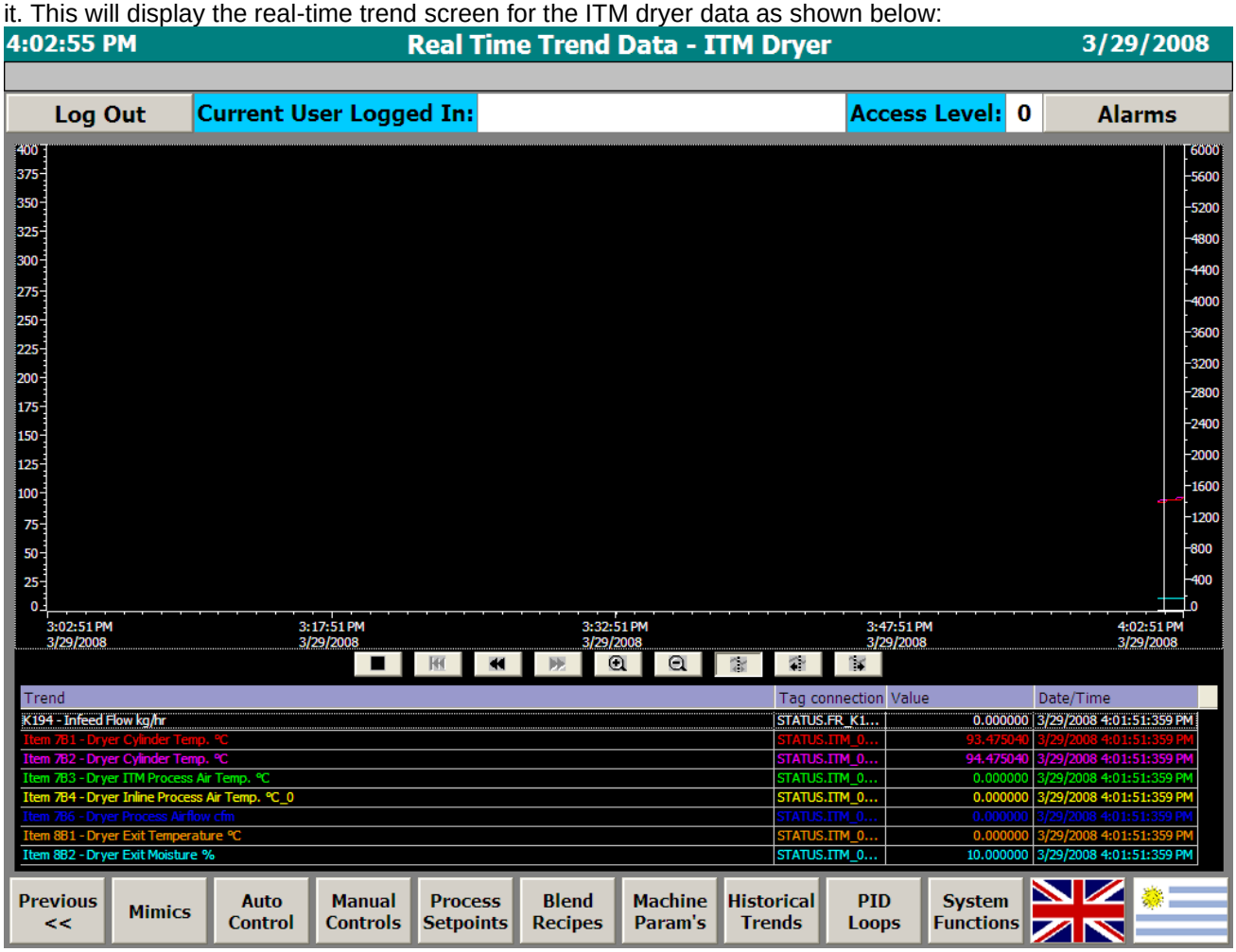


Figure 2-14 Main Panel HMI - ITM Dryer Real-Time Trend Screen

You will now note that the 'Trends' button has been replaced by a 'Historical Trends' button. When pressed, this will cause the historical trends screen to be displayed for the ITM dryer data.

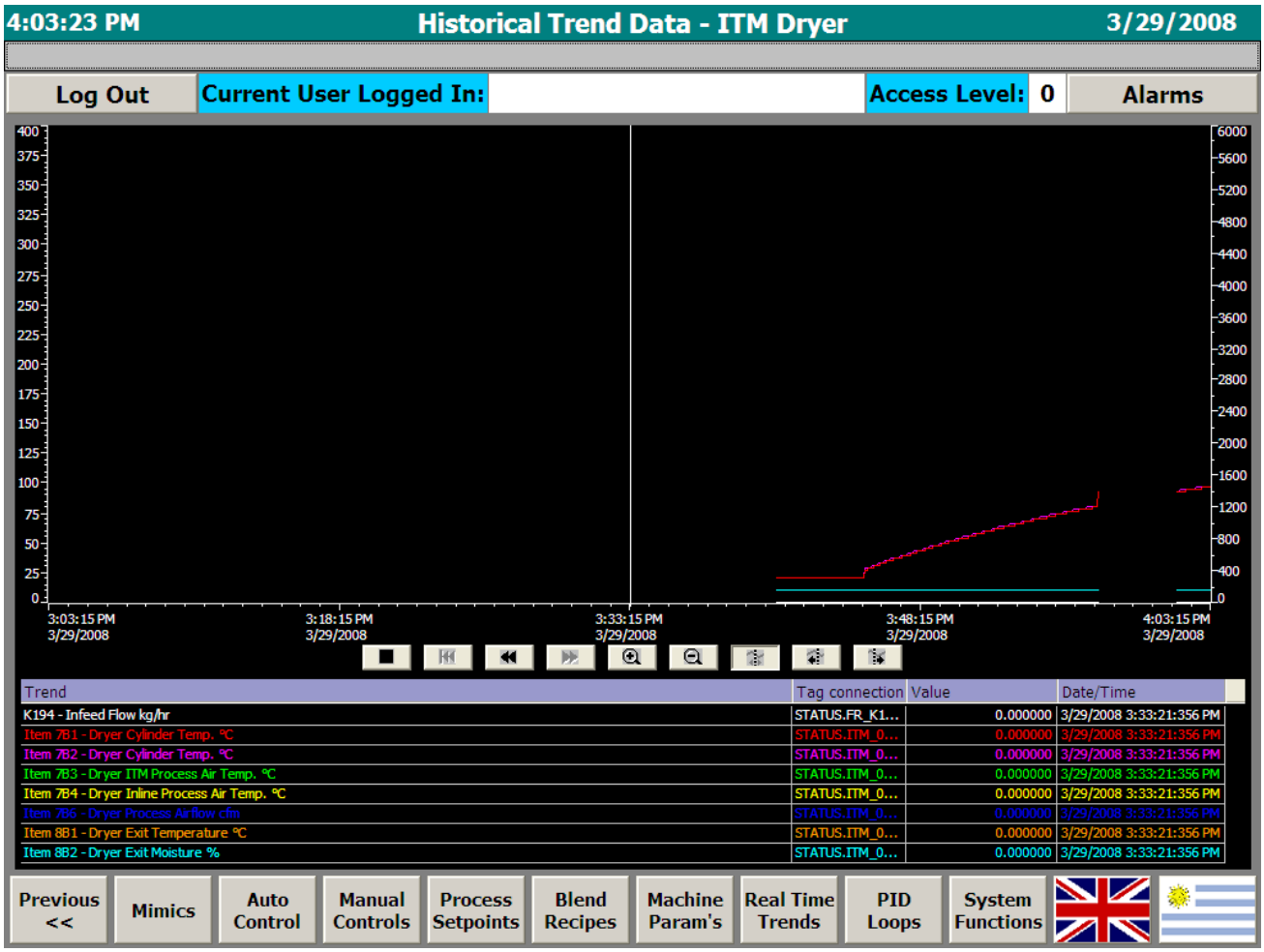


Figure 2-15 Main Panel HMI - ITM Dryer Historical Trend Screen

You will now note that the 'Historical Trends' button text has changed again to 'Real Time Trends' which, when pressed, will cause the real time trends screen to be displayed for the ITM dryer data.

The historical trends screen is identical to the real-time trends screen already shown.

The features and facilities provided by these trend screens are described below:

- **Chart area –**
  The main part of the trend screen is taken-up with the chart area bounded by two Y-axes and the X-axis.

  The X-axis represents time with the most recent time shown to the right.

  The two Y-axes have different scales because of the widely differing ranges of the process values being trended. Typically, product flow rates are trended against the right Y-axis while all others are trended against the left axis.

  The trend for a specific process value is represented by a coloured pen line which is updated from the right of the chart area and moves to the left as further samples are taken. The process values are identified in the table beneath the chart area where their descriptions are in the same colour as the pen line.

There is a single, vertical, white line shown within the chart area. This line is called a ruler and can be moved horizontally from one side of the chart to the other. Its purpose is to identify the point in time at which the individual process values are read, that appear in the table below the chart.

- **Chart Control Buttons –**
  Immediately below the X-axis of the chart area are a row of buttons for controlling and adapting the trend display.
  These buttons are described briefly below, as they appear from left to right:

  -  This button is not effective for a historical trend screen.
    It pauses update of a real-time trend screen's chart area when pressed. The button then changes to a ► symbol which, when pressed again, restarts update of the chart area. Data is not lost when the update is stopped. When the update is restarted all the data logged in the mean time will appear on the chart unless it has been stopped for more than an hour.

    Note: The chart area will only restart real-time update if the  button is not available (greyed-out). Otherwise this button must be pressed in order for real-time update to restart.

  -  This button is only available if the user has pressed the  button so that the most recent data is no-longer shown at the right hand side of the chart area. When pressed, it updates the chart with the most recent information and moves the X-axis to the left so that the current time & date are at the right hand-side of the chart. If updating has not been paused, then a real-time chart will being updating in real-time again.

  -  This button scrolls the start of the chart X-axis back in time by one half of the displayed chart width. I.e. if the current chart width is 1 hour then the start of the chart area will go back in time by 30 minutes while maintaining the current chart width.

    For a real-time trend, when this button is pressed, the chart update pauses and will only restart again if the  button is pressed or the  button is pressed (repeatedly if necessary) until the current time appears at the right hand side of the chart. Update restart will only restart provided the chart update was not pasued to begin with using the  button.

  -  This button scrolls the start of the chart X-axis forward in time by one half of the displayed chart width or, until the current time is displayed at the right hand side of the chart, whichever is the least amount of time.

  -  Each time this button is pressed the chart width is halved until the system is no longer able to halve the width. This button effectively zooms-in to decrease the width of the chart but does not zoom-in on a value range.

  -  Each time this button is pressed the chart width is doubled until the system is no longer able to double the width. This button effectively zooms-out to increase the width of the chart area but does not zoom-out from a value range.

  -  When pressed once, this button will make the vertical ruler line invisible. When pressed a second time, this button will make the ruler line visible again.

-  When pressed once, this button will move the visible ruler line one pixel to the left along the X-axis. If held down, the button will scroll the visible ruler line to the left at an increasing rate, until the left Y-axis is reached.

-  When pressed once, this button will move the visible ruler line one pixel to the right along the X-axis. If held down, the button will scroll the visible ruler line to the right at an increasing rate, until the right Y-axis is reached.

- **Trend Values Table –**
  The trend values table is shown beneath the chart area. Its purpose is:
  a) To identify the trended values by name.
  b) To identify the colour of the pens which represent the trended values.
  c) To identify the value of each process value where its trend line is intersected by the ruler line.
  d) To identify the HMI tag name from which the trend data is taken.

- **Trended data –**
  1. K194 infeed flow (kg/hr)
  2. Item 7B1 - Dryer cylinder temperature (°C)
  3. Item 7B2 - Dryer cylinder temperature (°C)
  4. Item 7B3 – Dryer ITM process air temperature (°C)
  5. Item 7B4 – Dryer Inline process air temperature (°C)
  6. Item 7B6 – Dryer process air flow (%)
  7. Item 8B1 – Dryer exit temperature (°C)
  8. Item 8B2 – Dryer exit moisture (%)

2.4.6 PID Loop Screens

PID loops are control functions to control process values to process setpoints by automatically adjusting a controlling variable. E.g. to control cylinder temperature on the ITM dryer to the final process setpoint we must adjust the position of the burner fuel/air valve.

PID loops need to be tuned to the response of the process value being controlled when the controlling variable is changed. This so that the process value reaches setpoint as quickly as the control system will allow without oscillating (i.e. oscillating about the setpoint).

PID loop screens are provided for engineers to tune the PID loops during commissioning and for technicians to use for maintenance purposes and plant response monitoring.

There are a total of four PID loop screens provided in this application as follows:

- ITM Dryer cylinder temperature control PID loop.
- ITM Dryer cylinder temperature setpoint cascade control PID loop.
- ITM Dryer exit moisture control PID loop.
- ITM Dryer exit tobacco temperature control PID loop.

The ITM Dryer Tobacco Exit Moisture Control PID Loop screen is shown below:

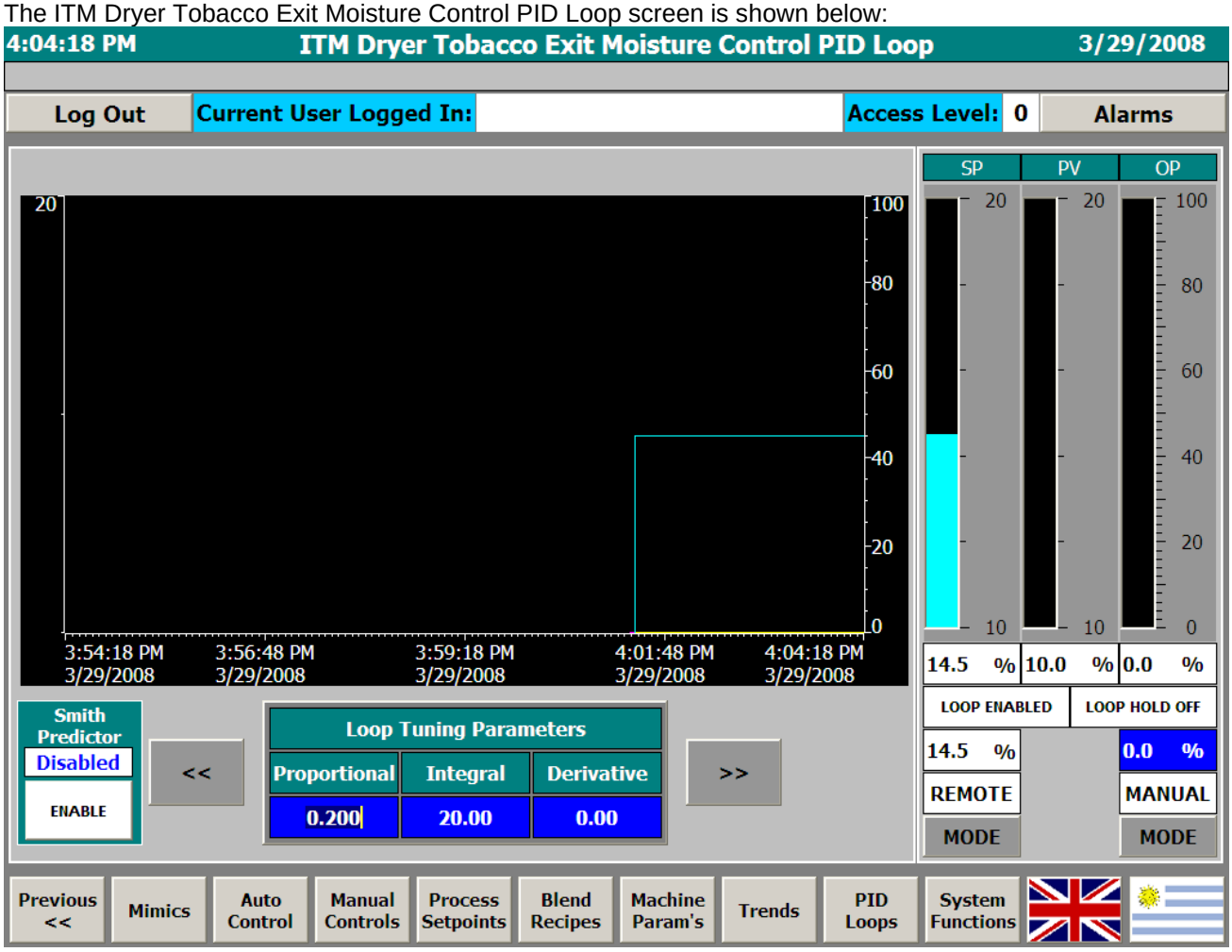


Figure 2-16 Main Panel HMI - ITM Dryer Tobacco Exit Moisture Control PID Loop Screen

2.4.6.1 General Features Applicable To All PID loop screens

- Two buttons either side of the Loop Tuning Parameters panel allow the user to scroll from one PID Loop screen to the next.
- The main chart area of the screen provides 10 minutes of real-time trend for the PID loop setpoint (SP), controlled process variable (PV) and controlling output (OP).
- To the right of the main chart area are shown the current values of SP, PV and OP in bar graph and numerical format.
- Beneath the main chart area are the loop tuning parameters of Proportional gain (P), Integral time (I) and Derivative time (D). Only a user logged in with access level 4 or higher (engineers & administrators access level) can modify these parameters.
- Beneath the bar graphs and associated numerical values are shown the loop enabled/disabled status and loop hold on/off status. The PID loop is put into these states by PLC control program to ensure proper operation of the loop at certain times.

PID loop is Enabled/Disabled –

When a PID loop is disabled, the loop output is forced to zero. Only the ITM Dryer Cylinder Temperature control makes use of this state.
When a PID loop is enabled, the loop output control is set to Auto mode and released to modulation unless, loop hold is on or the PLC has held the loop in manual mode.

PID loop Hold On/Off –
When a PID loop Hold is On, the output of the loop does not change when the mode of the loop output is Auto. This mode is typically used by the control system to hold the PID loop output at its current value because the conditions to allow modulation are not satisfied.
When a PID loop Hold is Off, the output of the loop is free to modulate as long as the loop is not disabled or the PLC has held the loop in manual mode.

- ***PID Loop Local/Remote Setpoint -***
Beneath the SP bar graph there is a 'Mode' button, above which there is a status window and above this a value.

  The status window shows the current setpoint mode selection, which may be either Local or Remote. In Local mode the background of the value above the status window will have a blue background indicating it can be changed. This is the Local setpoint value and will be the current PID loop setpoint only when Local mode is selected.

  In Remote mode the value above the status window will have a white background indicating it cannot be changed. This is the Remote setpoint value and is selected by the PLC control system and cannot be changed from the PID loop screen at all.

  A user must be logged-in to the HMI with access level 3 or above (technicians' access level) in order to be able to change the setpoint mode of the PID loop and to enter a local setpoint.

- ***PID Loop Auto/Manual Mode –***
Beneath the OP bar graph there is a 'Mode' button, above which there is a status window and above this a value.

  The status window shows the current control mode selection, which may be either Auto or Manual. In Manual mode the background of the value above the status window will have a blue background indicating it can be changed. This is the Manual output control value and will be the current PID loop output only when Manual mode is selected and the loop is not also Disabled.

  It should be noted that the PLC control system can also put the PID loop into Manual mode and set its own manual output value which cannot be changed.

  In Auto mode the value above the status window will have a white background indicating it cannot be changed. This is the Auto output value and is controlled by the PLC control system and cannot be changed from the PID loop screen at all.

  A user must be logged-in to the HMI with access level 3 or above (technicians' access level) in order to be able to change the control mode of the PID loop and to enter a manual output value.

2.4.6.2 Specific PID Loop Information

2.4.6.2.1 ITM Dryer Tobacco Exit Moisture Control PID Loop

This moisture control loop, when not released to modulation during production, is held in manual control mode by the PLC control with a fixed output of 50%.

Should the process line be stopped with the PID loop released to modulation, the PID loop Hold will be turned-on so that the loop does not continue to modulate the output.

The ITM dryer tobacco exit moisture control incorporates a Smith Predictor. The Smith Predictor tries to account for the transport delay of product from the area in the dryer where the water spray affects the product, to the exit moisture meter. The nett effect of the Smith Predictor, when enabled, is to modify the actual moisture measurement fed to the moisture control PID loop as a PV, by the expected change in moisture resulting from the change in water flow from its ideal 50% position. When working correctly, the user should see that for small deviations (<1%) of the tobacco exit moisture the output of the moisture control PID loop should change in steps.

With the Smith Predictor enabled, the user should be aware that the PV shown on the PID loop screen is not actually the tobacco exit moisture value but a value modified by the Smith Predictor.

A panel is provided on the 'ITM Dryer Tobacco Exit Moisture Control PID Loop' screen to show the status of the Smith Predictor control, i.e. whether it is enabled or disabled. A button is also provided to change the status of the Smith Predictor from Enabled to Disabled and back again. A user must be logged-in to the HMI with access level 4 or above (Engineer access level) to be able to change the Smith Predictor status.

2.4.6.2.2 ITM Dryer Cylinder Temperature Control PID Loop

The ITM dryer is fitted with two cylinder temperature probes 7B1 and 7B2. The Cylinder temperature control PID loop can use either of these signal inputs to the PLC to control cylinder temperature.

On the PID control loop screen there is an indication of which temperature probe is being used as PV for the PID control loop. There is also a button to enable the user to swap between the two cylinder temperature probes on this screen.

On the Auto Control screen there is a panel of three buttons that allow the operator to select which of the two temperature probes to use for control. The middle of these three buttons is Idle, if this is selected then the cylinder temperature control loop is disabled and the burner fuel/air valve forced to close.

2.4.6.2.3 ITM Dryer Cylinder Temperature Setpoint Cascade Control PID Loop

The function of this PID loop is to modify the cylinder temperature setpoint from its process setpoint when the following conditions are true:

a) The Tobacco Exit Moisture Control PID Loop output is > 80% and the tobacco exit moisture is still dry.
   OR
b) The Tobacco Exit Moisture Control PID Loop output is < 20% and the tobacco exit moisture is still wet.

This PID loop is held in manual mode with 50% output when the ITM dryer 'Cascade Cylinder Temperature Control' is not switched-on.

When 'Cascade Cylinder Temperature Control' is switched-on and neither of the above conditions (a or b) is true the loop Hold control is switched-on, to hold the PID loop output at its current value.

50% loop output represents 0°C adjustment to the cylinder temperature setpoint.
100% loop output represents 18 to 20°C (set on commissioning) increase in cylinder temperature setpoint.
0% loop output represents 18 to 20°C (set on commissioning) decrease in cylinder temperature setpoint.

2.4.6.2.4 ITM Dryer Tobacco Exit Temperature Control PID Loop

The function of this PID control loop is to modify the nominal process air setpoint in order to increase or decrease the dryer exit tobacco temperature. The process air flow can only be modified however if the following conditions are met:

a) The exit tobacco is hot and wet.
   OR

b) The exit tobacco is cold and dry.

This PID loop is held in manual mode with 50% output when the ITM dryer 'Tobacco Temperature Control' is not switched-on.

When 'Tobacco Temperature Control' is switched-on and neither of the above conditions (a or b) is true the loop Hold control is switched-on, to hold the PID loop output at its current value.

50% loop output represents 0% adjustment to the process air flow setpoint.
100% loop output represents 25% decrease in process air flow setpoint.
0% loop output represents 25% increase in process air flow setpoint.

2.4.7 Alarms Screens

Any fault condition detected by the PLC generates an alarm which remains active until the alarm is reset by the user through the alarm displays on the main panel HMI or the burner control panel HMI.

There is one alarms screen on the HMI from which the user can select to view a list of the currently active alarms (known as the Current Alarms screen), or a list of the last 500 alarm events (known as the Alarms History screen).

2.4.7.1 Current Alarms Screen

The 'Current Alarms' screen shows alarm messages for all currently active alarm conditions only. The screen appears on the HMI screen by pressing the 'Alarms' button at the top right hand side of every screen.

Below is a picture of the 'Current Alarms' screen:

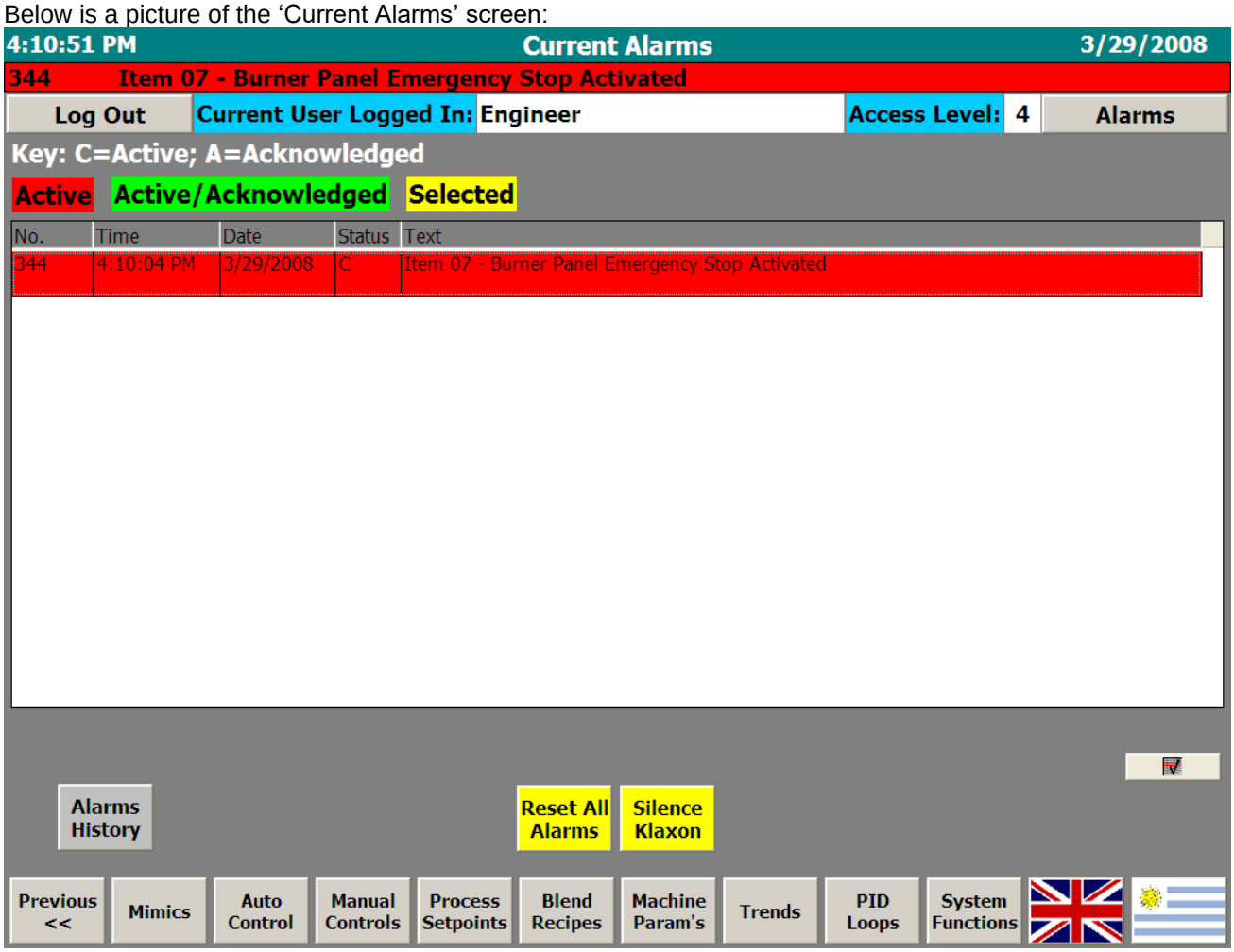


Figure 2-17 Main Panel HMI - Current Alarms Screen

2.4.7.1.1 Alarm message attributes

The main part of the display is an alarm message area with a list of alarm messages for currently active alarm conditions. Alarm messages have the following attributes:

- Alarm messages are listed in chronological order with the most recent message at the top of the list.

- All currently active alarm messages can be acknowledged by pressing the  button at the bottom right of the message area. This has no other function other than to acknowledge the alarm messages on the HMI screen, thereby changing their background colour and making it easier to determine from a distance when a new alarm has occurred.

- If the alarm messages have not been acknowledged they appear as black text on a red background.

- If the alarm messages have been acknowledged by the user on the HMI the messages will appear as black text on a green background.

- When alarms have been reset, the corresponding alarm message disappears from the 'Current Alarms' screen.

- Each alarm message has the following attributes (listed as they appear from left to right across the display):

  No. -
  This is the number of the message text within the HMI alarm message database.

  Time –
  The time that the alarm message occurred as logged by the HMI.

  Date –
  The date that the alarm message occurred as logged by the HMI.

  Status –
  C = Active & not yet acknowledged.
  CA =Active and acknowledged.

  Text –
  A message describing the alarm condition.

2.4.7.1.2 Message list navigation

- Any individual alarm message can be selected on the display simply by touching it. Selection is indicated by the alarm line changing to black text on a yellow background.
  Selecting an alarm has no purpose as there are no individual alarm functions available.

- If there are more alarms messages than will fit in the alarm message area then a vertical scroll bar will appear at the right hand side of the message area. This scroll bar operates in the same way as any normal windows scroll bar.

2.4.7.1.3 Action on new alarm generation

When a new fault condition is detected the alarm klaxon sounds and the associated alarm message appears in black text on a red background at the top of every screen on the HMI and at the top of the 'Current Alarms' screen.

Pressing the 'Silence Klaxon' button, at the bottom of the 'Current Alarms' screen, stops the alarm klaxon from sounding.

The alarm klaxon can only be silenced by pressing the 'Silence Klaxon' button on the PC477 or the burner panel HMI. In this way the user must view the alarm list when silencing the alarm klaxon.

Pressing the 'Reset All Alarms' button, resets all currently active alarms at the same time.

Note: It is not necessary to acknowledge all alarms in order to be able to reset them.

2.4.7.1.4 Alarms History Screen Selection

An 'Alarms History' button at the bottom left of the screen provides a means for the user to display the 'Alarms History' screen when pressed.

2.4.7.2 Alarms History Screen

The 'Alarms History' screen shows alarm messages for the last 500 alarm events including those currently active. The 'Alarms History' screen can only be selected from the 'Current Alarms' screen by pressing the 'Alarms History' button. The 'Alarms History' button caption then changes to 'Current Alarms' on the 'Alarms History' screen and, if pressed again will show the 'Current Alarms' screen again.

Below is a picture of the 'Alarms History' screen:

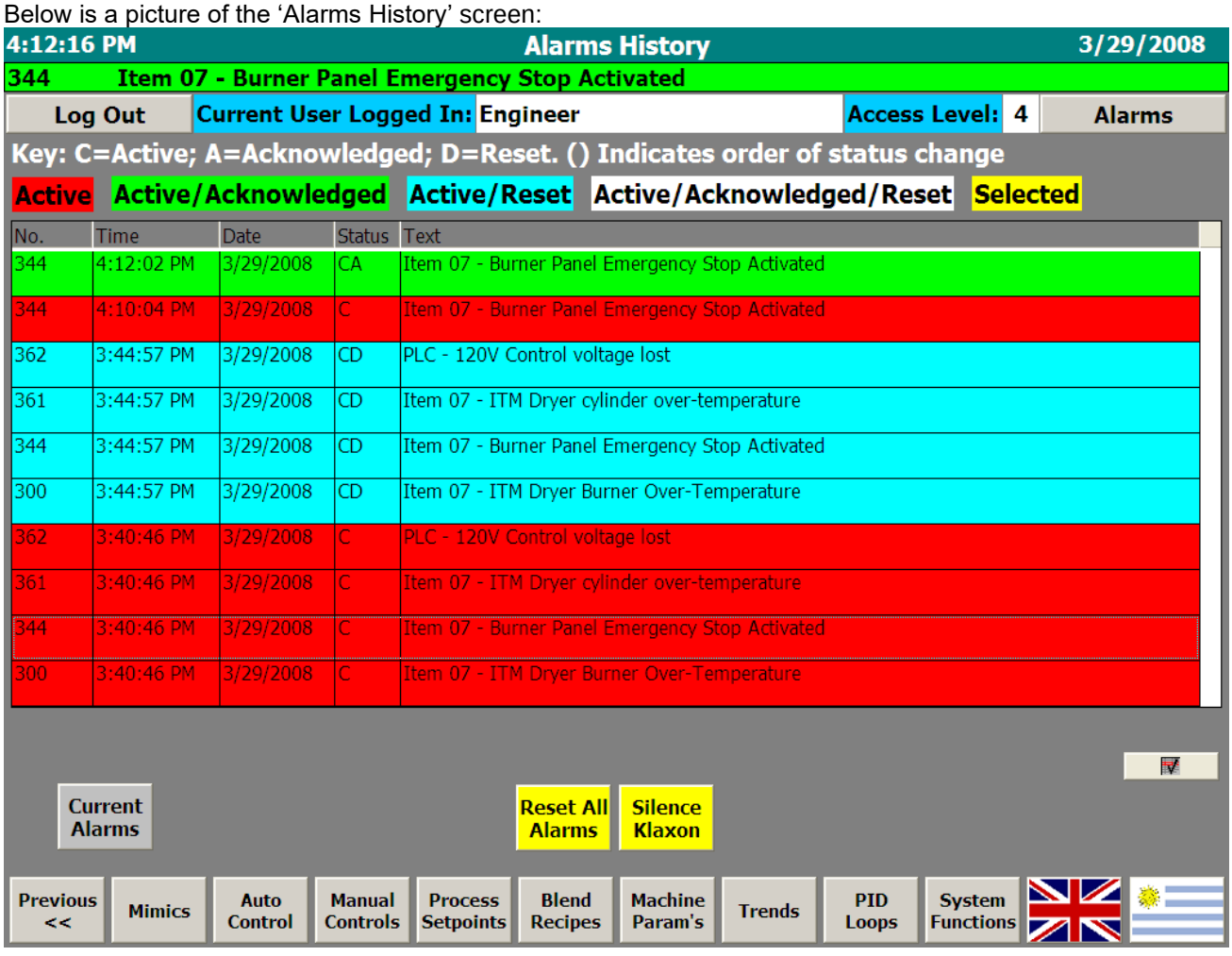


Figure 2-18 Main Panel HMI - Alarms History screen

The 'Alarms History' screen has the same attributes and functions as the 'Current Alarms' screen. The only difference being that the message area shows alarm messages for those alarms that have occurred but are no-longer active.

The message area contains one message for each change of state of a particular alarm condition. I.e. when an alarm occurs an initial entry is made in the 'Alarms History'. When the alarm is subsequently acknowledged a new entry is made with the time and date when it was acknowledged. A further entry is made

when the alarm condition is reset with the time and date when the alarm reset occurred. The foreground/background colour of each message indicates what state it is in as do the status letters as follows:

- Black text on a red background –
  This indicates the alarm condition is active and has not been acknowledged by the user on this HMI. The status of active, unacknowledged alarms is C.

- Black text on a Green background –
  This indicates that the alarm condition is active and has been acknowledged on this HMI by the user. The status of active, acknowledged alarms is CA.

- Black text on a white background –
  This indicates that the alarm condition has been acknowledged on this HMI by the user and subsequently reset. The status of active, acknowledged alarms which have subsequently been reset is CAD.

- Black text on a light blue background –
  This indicates that the alarm condition has not been acknowledged on this HMI by the user but has been reset. The status of alarms which were active and then subsequently reset without being acknowledged is CD.

2.5 System Functions

System functions for the HMI are:

- Screen Cleaning
- Editing HMI date & time
- User administration
- Shutdown of the HMI application, to access the HMI PC operating system.
- Shutdown of the HMI PC for planned maintenance.
- Preparing for transfer of a new HMI application

All these functions are accessible from the 'System Functions Menu' screen shown below:

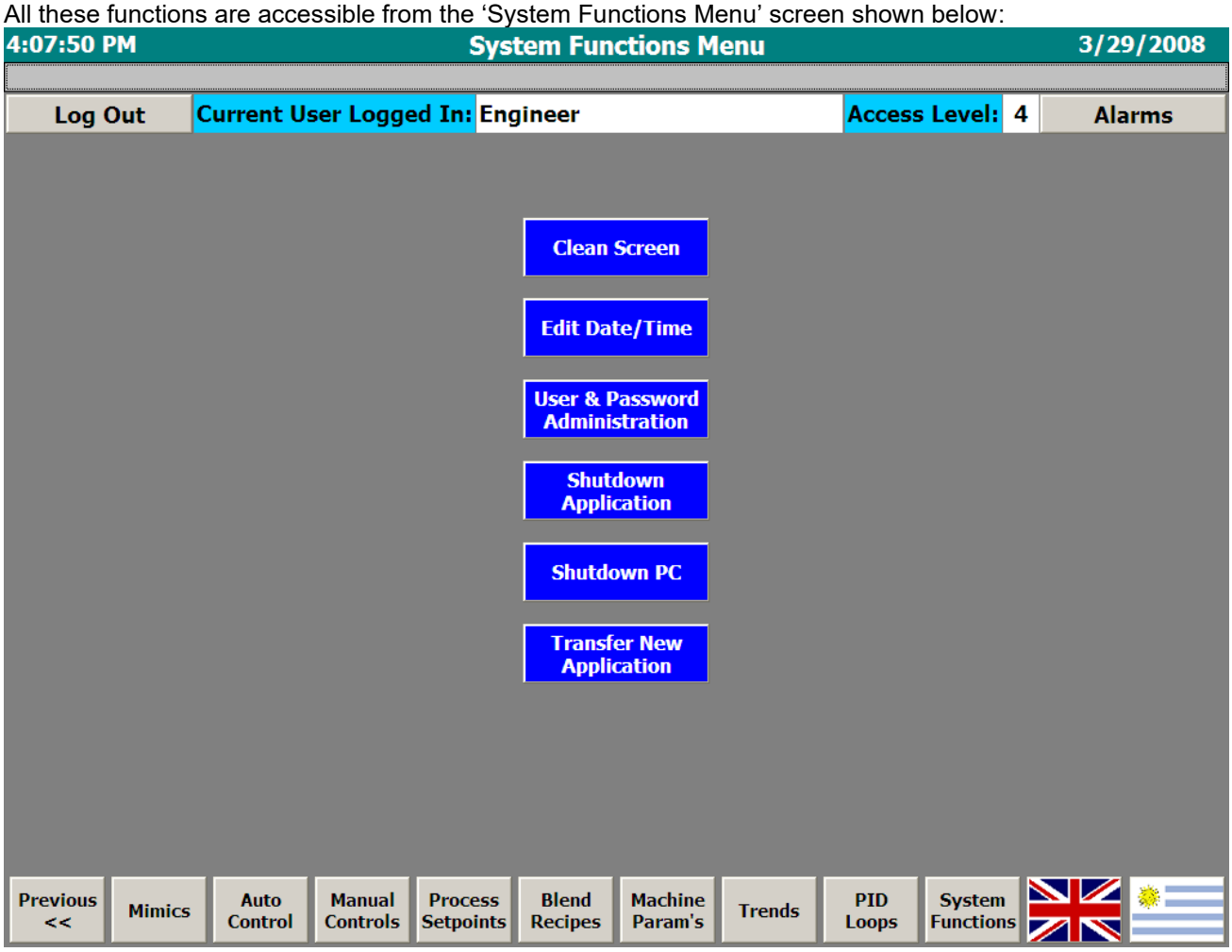


Figure 2-19 Main Panel HMI - Systems Functions Menu Screen

This screen is displayed on the HMI by pressing the 'System Functions' button at the bottom right of any screen which shows it.

The following sections describe the system functions in detail.

2.5.1 Clean Screen

This system function is available to all users from the 'System Functions Menu' screen simply by pressing the 'Clean Screen' button.

The purpose of the function is to disable the HMI touch screen so that the user can clean the screen with a damp cloth without issuing any commands to, or changing any data in, the PLC.

When pressed, the screen cleaning screen is displayed on the HMI as shown below:

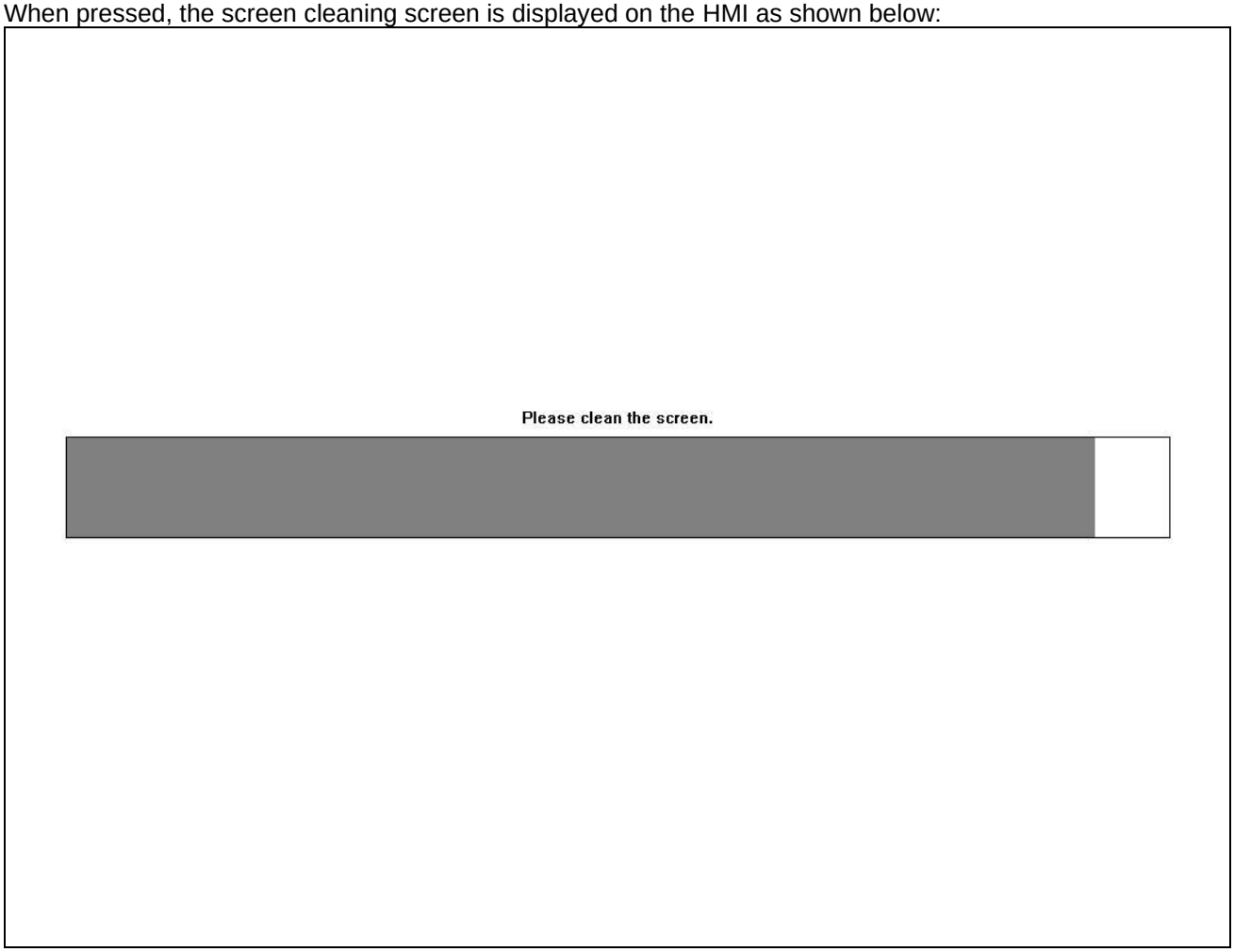


Figure 2-20 Main Panel HMI - Screen Cleaning Screen

As can be seen, the screen consists entirely of a horizontal bar graph and the instruction 'Please clean the screen'. While this screen is displayed, there are no controls or buttons available to the user. You must wait until the horizontal bar reaches the left hand side of the display before the 'System Functions Menu' is displayed again.

2.5.2 Edit Date/Time

The HMI date & time are important for logging the correct date & time that an alarm occurred and also for the historical logging of process values.

To use the 'Edit Date/Time' system function a user must be logged-in to the HMI with access level 3 or higher (technician, engineer or administrator level). Until logged-in with this access level the 'Edit Date/Time' button on the 'Systems Functions Menu' screen will be unavailable.

Once the user is logged-in with an appropriate access level pressing the 'Edit Date/Time' button on the 'Systems Functions Menu' screen will display the screen shown below:

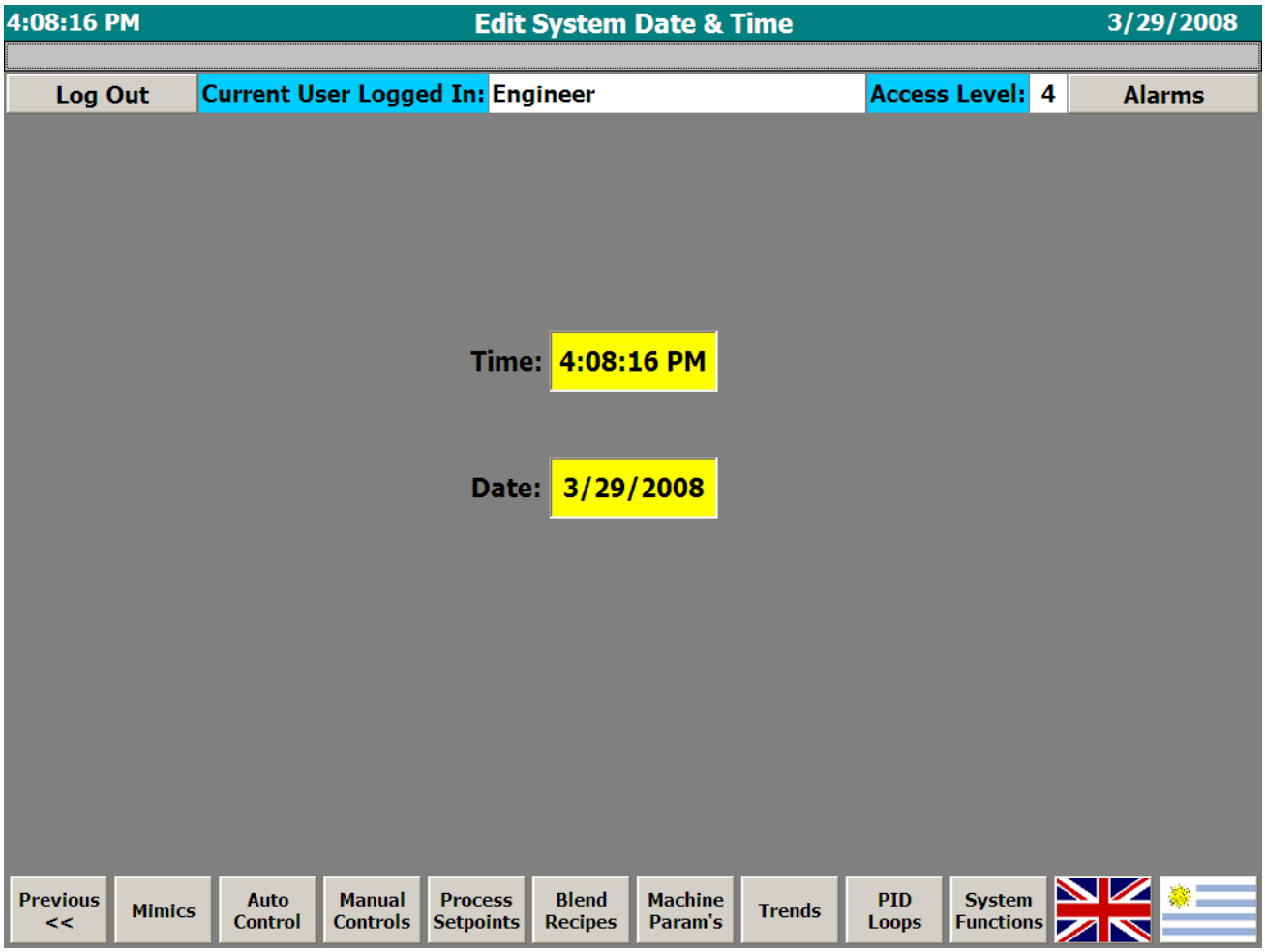


Figure 2-21 Main Panel HMI - Edit System Date & Time Screen

Touching either the date or time panel shown in the middle of the screen will cause the on-screen keyboard to be displayed.

Time may be entered in 12 or 24 hour format but the user must enter the semi-colons separating the hours, minutes & seconds. If entering the time in 12 hour format the user must enter a space after the seconds followed by AM or PM.

The date must be entered as mm/dd/yyyy including the separating slashes between day, month & year.

If the changes are accepted, the time & date shown at the top of the screen will change to that set by the user.

2.5.3 User & Password Administration

Security is used to prevent unauthorised access to commands and parameters through the HMI.

The HMI security system is setup with user groups, group authorisations and users assigned to user groups.

For this application the user groups are as follows:

- 9 - Administrators
- 4 - Engineers
- 3 - Technicians
- 2 - Supervisors
- 1 – Users

The number assigned to each user group is the ‘Access Level’ shown at the top of every HMI screen next to the user name when logged-in to the HMI.

The group authorisations created are as follows:

- Administration
- Engineer
- Technician
- Supervisor
- User

User groups are assigned one or more group authorisations as follows:

User Group	Authorisation				
	Administration	Engineer	Technician	Supervisor	User
Administrators	X	X	X	X	X
Engineers		X	X	X	X
Technicians			X		X
Supervisors				X	X
Users					X

Users are assigned to user groups and therefore inherit the authorisations of that group.

The user & password administration facilities available to the user at runtime through the ‘User Administration’ screen depend on the user group (access level) to which a user is assigned.

Any user logged-in who is not assigned to the Administrators user group can only change their own password and logoff time.

Any user logged-in who is assigned to the Administrators user group can perform the following functions:

- Add new users.
- Delete users.
- Re-assign existing users to different user groups.
- Change existing users’ passwords.
- Change existing users’ logoff times.

To display the 'User Administration' screen the 'User & Password Administration' button on the 'System Functions menu' must be pressed. This button is only available if a user has logged-in to the HMI with access level 1 or higher.

The 'User Administration' screen which appears when successfully selected is shown below:

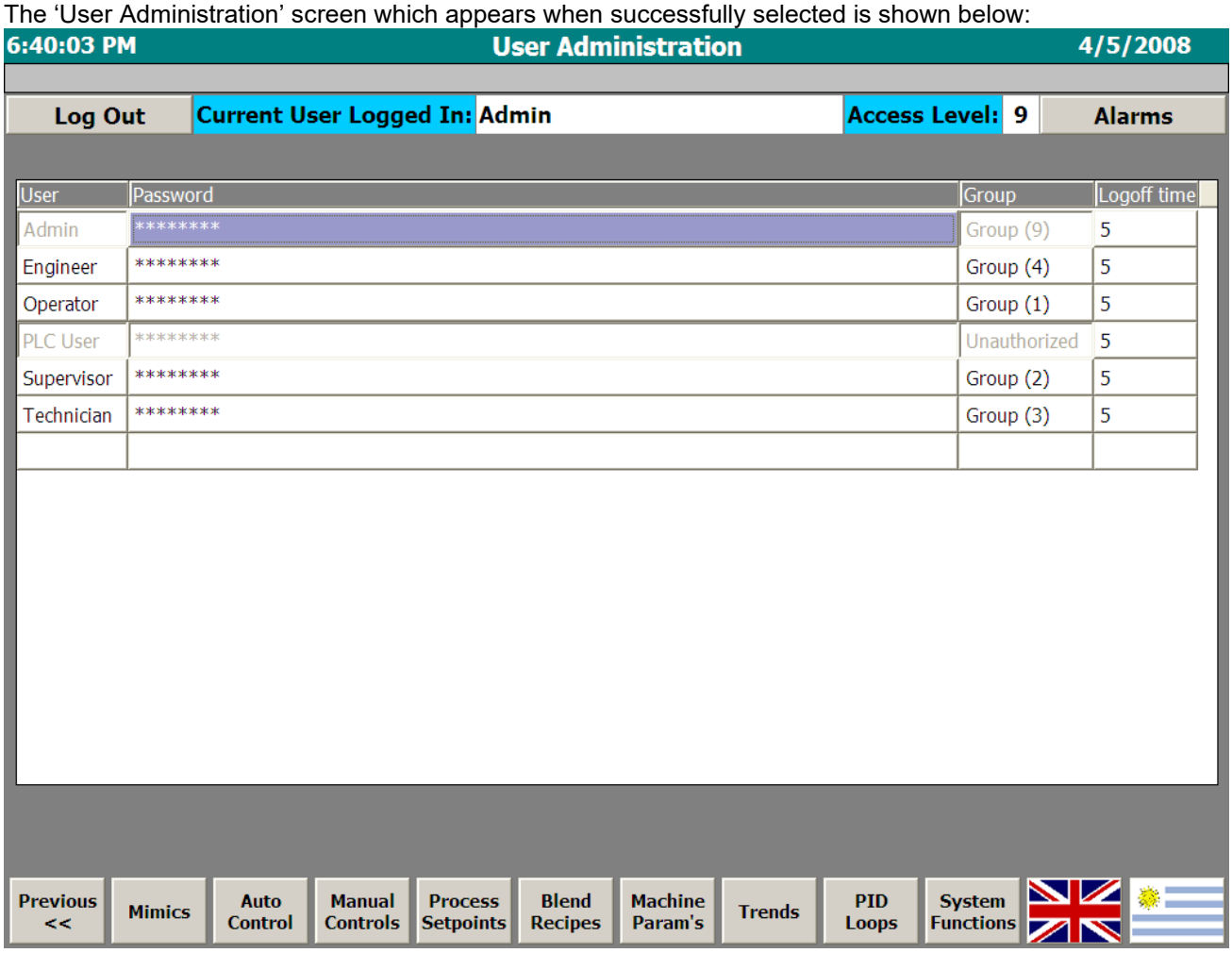


Figure 2-22 Main Panel HMI - User Administration Screen

The main section of the screen is occupied with the user administration table. In the above example, we see all the users currently configured because the user logged-in belongs to user group 9 (administrators – access level 9).

If a user belonging to a user group below 9 were logged-in to the HMI then, all that user would see in the user administration table would be their own user name, password, user group and logoff time. They would also only be able to change their password and logoff time.

You will note that the user names and user groups assigned to 'Admin' and 'PLC User' are greyed-out in the above user administration table. This means that they cannot be changed. Also, the password for the 'PLC User' is greyed-out meaning it cannot be changed either.

If the current user is logged-out while the 'User Administration' screen is displayed, the table will clear of all entries. In order to re-display entries in the table again the user should touch the screen over the table which will then cause the user log-in prompt and on-screen keyboard to appear so the user can log-in.

2.5.3.1 Add a New User

- To add a new user to the list, a user belonging to user group 9 (access level 9) must be logged-in to the HMI.

- Once logged-in double tap the empty 'User' field at the bottom of the table to display the on-screen keyboard.

- Next, double tap the empty 'User field' again so that the cursor appears in it and then type-in the new user's name followed by pressing the return key.

- Next, double tap the empty 'Password' field next to the new user name just entered. When the on-screen keyboard appears, double tap the field again so that the cursor appears in it and type the password for the new user. You will note that the password appears in the field as it is typed so that you can see any mistakes. Complete the entry by pressing the return key on the keyboard.

- You will now notice that the table will reorganise itself so that user names are in alphabetical order from top to bottom and, that the new user just entered has automatically been assigned to user group 1 (access level 1) with a 5 minute logoff time.

- If you want to change the user group to which the new user is assigned simply double tap the 'Group' field on the same row. This will highlight the group field and also display a scroll button in the field. Press the scroll button to display all possible user group numbers including UNAUTHORIZED in a list and, then touch the user group required in the list.

- To change the logoff time assigned to the new user, simply double tap the 'Logoff' field on the same row. This will display the on-screen numerical keypad. Double tap the field again so that the cursor appears, and enter the number of minutes required with no touch screen activity, after which this user should be logged-out of the HMI.

2.5.3.2 Delete an Existing User

- To delete an existing user from the list of users, a user belonging to user group 9 (access level 9) must be logged-in to the HMI.

- Once logged-in, double tap the 'User', 'Password' or 'Logoff' fields of the user to be deleted so that the on-screen keyboard or keypad appears. Do not double tap the same field again but simply press the 'Del' key on the keyboard and the user row in the table will be deleted.

- If the user deleted is also the user currently logged-in to the HMI, then the user will be logged-out and the user administration table will clear of all entries.

2.5.3.3 Re-Assign a User to a User Group

- To re-assign a user to a different user group, a user belonging to user group 9 (access level 9) must be logged-in to the HMI.

- Once logged-in, double tap the 'Group' field of the user. This will highlight the group field and also display a scroll button in the field. Press the scroll button to display all possible user group numbers including UNAUTHORIZED in a list and, then touch the user group required in the list.

Note: If the user whose user group is being re-assigned, is the user currently logged-in and, that user is currently assigned to user group 9 then, changing the user group will mean that it will not be possible to go back and assign any other user group to that user unless another user logs-in who is assigned to user group 9.

2.5.3.4 Change an Existing User's Password

- To change an existing user's password either, the user whose password is to be changed needs to be logged-in to the HMI or, a user assigned to user group 9 needs to be logged-in to the HMI.

- Once logged-in double tap the 'Password' field next to the user name. When the on-screen keyboard appears, double tap the field again so that the cursor appears in it and type the new password for the user. You will note that the password appears in the field as it is typed so that you can see any mistakes. Complete the entry by pressing the return key on the keyboard.

2.5.3.5 Change an Existing User's Logoff Time

- To change an existing user's Logoff time either, the user whose logoff time is to be changed needs to be logged-in to the HMI or, a user assigned to user group 9 needs to be logged-in to the HMI.

- Once logged-in simply double tap the 'Logoff' field in the same row as the user name. This will display the on-screen numerical keypad. Double tap the field again so that the cursor appears, and enter the number of minutes required with no touch screen activity, after which this user should be logged-out of the HMI.

2.5.4 Shutdown Application

There will be times when it is necessary for an engineer or system administrator to gain access to the desktop and operating system of the HMI. A 'Shutdown Application' button is provided on the 'System Functions Menu' to do this.

If a user is not logged-in to the HMI with access level 4 or 9 when this button is pressed then the user will be prompted to log-in with a higher access level.

Once logged-in, the HMI WinCC Flexible application will terminate when the 'Shutdown Application' button is pressed and, the Windows operating system desktop will be displayed.

2.5.5 Shutdown PC

Whenever possible it is advisable to shutdown the HMI PC in an orderly way to avoid possible data corruption of the storage card(s). A 'Shudown PC' button is provided on the 'System Functions Menu' to do this.

If a user is not logged-in to the HMI with access level 3, 4 or 9 when this button is pressed then the user will be prompted to log-in with a higher access level.

Once logged-in, the HMI WinCC Flexible application will terminate and the PC will shutdown, when the 'Shutdown PC' button is pressed.

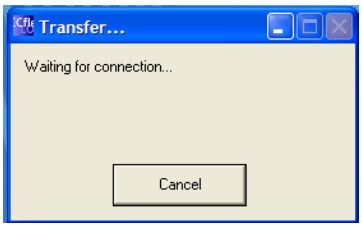
Once the PC is shutdown, it will be necessary to cycle power to it in order to restart the unit. This may be done by using the on/off switch on the back of the unit.

2.5.6 Transfer New Application

Normally, when transferring new/modified WinCC Flexible applications onto the HMI from a configuration PC it is not necessary to shutdown the existing application and deliberately select transfer mode, this usually happens as part of the transfer process. However, it has been known not to work in which case it is necessary to select transfer mode on the HMI. For this purpose a 'Transfer New Application' button is provided on the 'System Functions Menu'.

If a user is not logged-in to the HMI with access level 4 or 9 when this button is pressed then the user will be prompted to log-in with a higher access level.

Once logged-in, the HMI WinCC Flexible application will terminate and the following dialogue will appear on the HMI display.



Once the transfer operation is complete the new application will start automatically. Alternatively, if the transfer fails, the ‘Cancel’ button can be pressed to terminate the operation and restart the original application.

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3 Burner Panel TP277 HMI Operation & Displays

3.1 HMI Overview

The HMI provided in the burner control panel is a Siemens PC277, 6-inch touch screen device. It communicates with the control PLC within the main control panel over a MPI communications link.

The HMI uses the Microsoft Windows CE operating system to run the application software which is Siemens WinCC Flexible 2007 RT (Run Time).

3.2 System Features

3.2.1 HMI Start-Up

On power-up of the main control panel, the HMI will start automatically and run the WinCC Flexible application for this installation. Start-up is complete once the following screen appears on the HMI display:

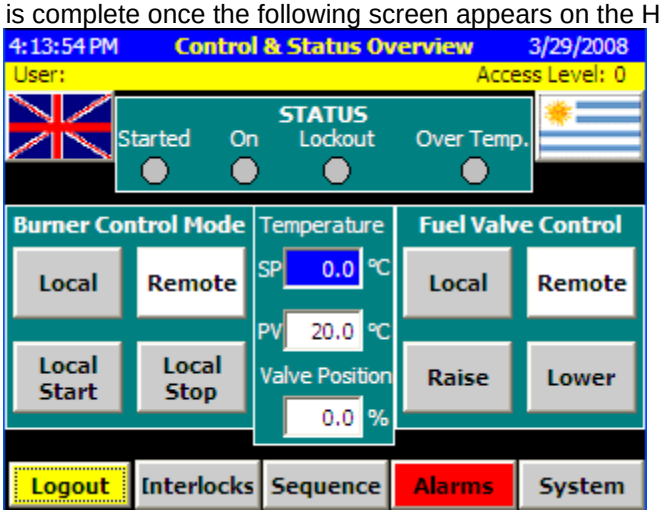


Figure 3-1 Burner Panel HMI - Control & Status – Start-up Display

This screen remains on the HMI display until another screen is requested.

3.2.2 Common Screen Features

The top of every screen always has the following features:

a) **Title:** This is the title of the currently displayed screen.

b) **Date:** This is the current date as retrieved from the HMI system clock and, is in the format MM/DD/YYYY. The current date can be adjusted using the system function 'Edit Date/Time'.

c) **Time:** This is the current time as retrieved from the HMI system clock and, is in the 12-hour format. This current time can be adjusted using the system function 'Edit Date/Time'.

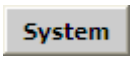
d) **User:** This is the name of the current user logged-in to the HMI. User names, passwords and assigned access groups may be edited using the system function 'Password Admin.'

e) **Access Level:** This is the current access level assigned to the currently logged-in user, and may be in the range 0 to 9. User names, passwords and assigned access levels may be edited using the system function 'Password Admin.'

f)  Pressing this button changes all displayed text to the English language.

g)  Pressing this button changes all displayed text to the Uruguay Spanish language.

The bottom of every screen contains a common menu button bar having the following buttons:

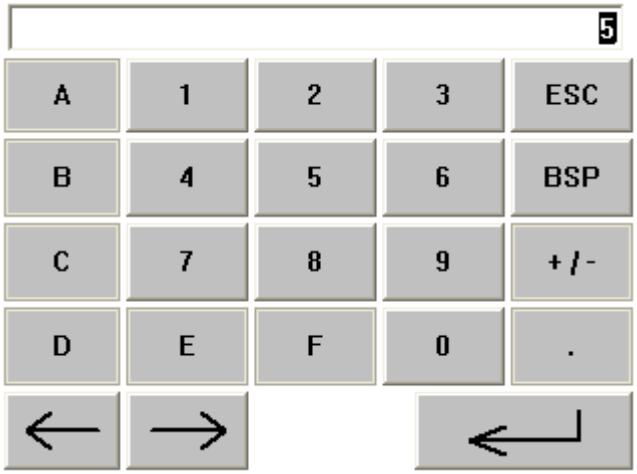
-  When pressed this button will log-out any user current logged-in to the HMI. This button is visible on all screens except command confirmation screens.
-  When pressed, this button always displays the Control & Status Overview screen on the HMI. This button is visible on all screens except command confirmation screens and the Control & Status Overview screen.
-  When pressed, this button always displays the Burner Startup Interlocks screen on the HMI. This button is visible on all screens except command confirmation screens and the Burner Startup Interlocks screen.
-  Pressing this button always displays the Burner Startup Sequence screen on the HMI. This button is visible on all screens except command confirmation screens and the Burner Startup Sequence screen.
-  Pressing this button displays the Current Alarms screen on the HMI display. When there is an active alarm, the button background is red. When there are no active alarms the button background is grey. This button is visible on all screens except command confirmation screens and the Current Alarms screen.
-  Pressing this button displays the System Functions Menu screen on the HMI. This button is visible on all screens except command confirmation screens and the System Functions Menu screen. On the Password Administration and Set Date & Time screens the button appears at the top of the screen.

Note: None of the buttons require a user to be logged-in to the HMI in order to be able to use them.

3.2.2.1 Touch screen Keypad & Keyboard

3.2.2.1.1 Keypad

When a numerical value is to be entered such as a setpoint, touching the value on the screen will cause the touch keypad to appear on screen as shown below:

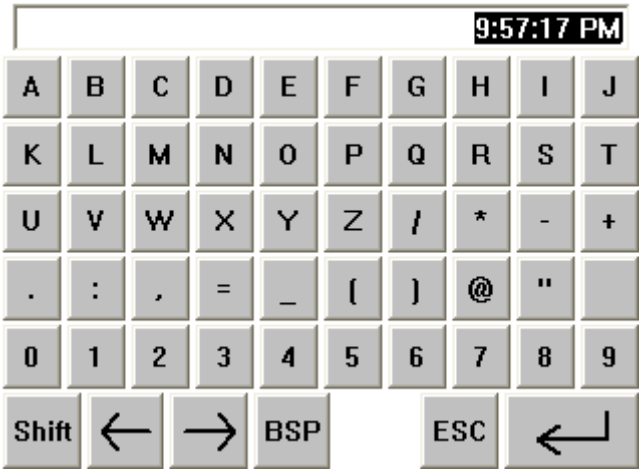


Although it appears on the screen as it is typed, the new value is not entered until the return key on the keypad is pressed. If the 'ESC' key is pressed at any time, the data entry can be aborted and the original value is re-instated.

NOTE:
Some numerical entry fields in this application require a user to be logged-on with the appropriate authorisation. If no user is logged-on or, the logged-on user does not have the appropriate authorisation, then when the numerical entry field is touched the user Log On window will appear.

3.2.2.1.2 Keyboard

When any data is to be entered which could include non-numerical values such as a password, date or time, touching that data entry point on the screen will cause the touch keyboard to appear on the screen as shown below:



Although it appears on the screen as you type, new data is not entered until the return key on the keyboard is pressed. If the 'ESC' key is pressed at any time, the data entry can be aborted and the original data is re-instated,

NOTE:

Some data entry fields in this application require a user to be logged-on with the appropriate authorisation. If no user is logged-on or, the logged-on user does not have the appropriate authorisation, then when the data entry field is touched the user Log On window will appear.

3.2.2.2 Command Confirmation Screens

Touch screens use the screen as a command input device to start & stop equipment and processes. Typically pushbutton icons are provided on the touch screen for these types of command and, a single touch of the screen over one of these buttons is enough to trigger the command.

In order to avoid unintentional starting or stopping of equipment and processes, the majority of command buttons in this application have command confirmation screens provided, where the user must confirm the action requested by pressing a 'Confirm' button. An example of a command confirmation screen is shown below:

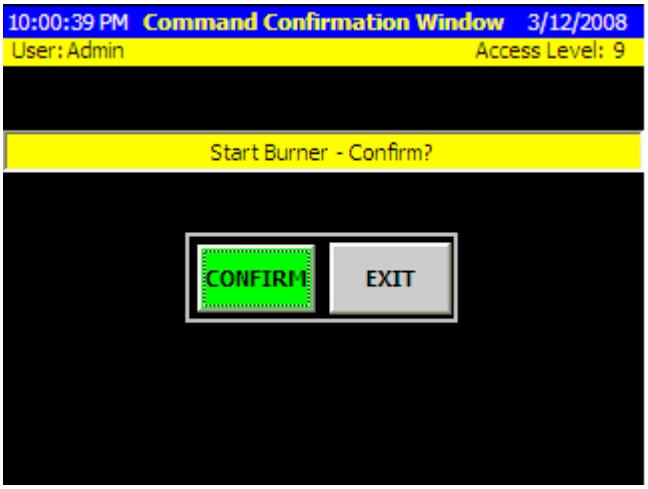


Figure 3-2 Burner Panel HMI - Typical Start Command Confirmation Screen

3.3 HMI Application Screens

3.3.1 Control & Status Overview Screen

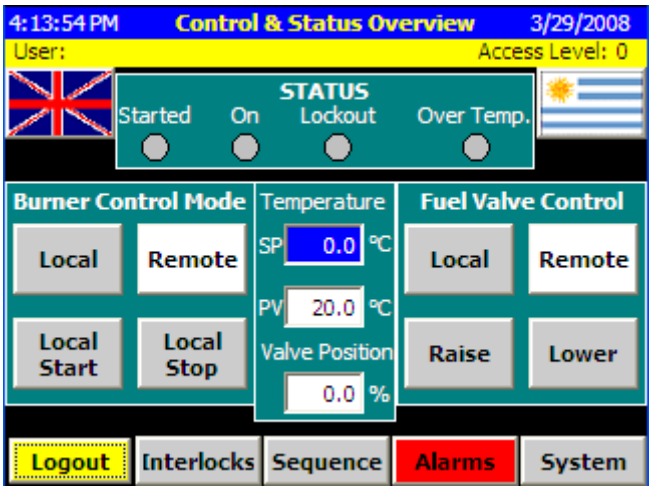


Figure 3-3 Burner Panel HMI - Control & Status Overview Screen

This screen is displayed on completion of startup of the HMI after power-up and, when the Control button is pressed on any other screen that shows it.

Security –

- All the control buttons on this screen require a user to be logged-in to the HMI with access level 2, 4 or 9 (technician, engineer or administrator).

3.3.1.1 STATUS

The STATUS panel at the top of the screen summarises the current status of the burner. The round indicators operate as follows:

- ***Started –***
  Indicator changes from grey to green when start signal to burner controller in burner control panel is set on.

- ***On –***
  Indicator changes from grey to green when burner controller start-up sequence has completed, and fuel/air control valve has been released to modulation by the PLC.

- ***Lockout –***
  Indicator changes from grey to red when the burner controller in the burner control panel has gone to lockout status.

- ***Over Temp. –***
  Indicator changes from grey to red when the dryer cylinder over-temperature thermostat indicates an over-temperature condition. When this condition is reached the burner is automatically switched-off and will not be allowed to restart until the over-temperature condition has been reset.

3.3.1.2 Burner Control Mode

The Burner Control Mode panel at the left of the screen contains buttons for selecting Local or Remote start/stop control of the burner and also Raise & Lower buttons. These buttons operate as follows:

Local –

- When pressed this button selects local start/stop control of the burner.
- If Local mode is selected, the background for this button will change from grey to white.
- If the burner has already been started before changing to local mode, the burner will continue to operate.

Remote -

- When pressed this button selects remote start/stop control of the burner.
- If Remote mode is selected, the background for this button will change from grey to white.
- If the burner has already been started before changing to remote mode, the burner will only continue to operate if the PLC control system requires it to run.

Local Start –

- This button is only available if the burner control is selected to Local control.
- The background colour of this button changes from grey to green when burner control is selected to Local.
- When pressed in Local burner control mode, this button will start the dryer burner provided all the burner startup interlocks are satisfied.

Local Stop –

- This button is only available if the burner control is selected to Local control.
- The background colour of this button changes from grey to red when burner control is selected to Local.
- When pressed in Local burner control mode, this button will stop the dryer burner if it has been started.

3.3.1.3 Fuel Valve Control

The Fuel Valve Control panel at the right of the screen contains buttons for selecting Local or Remote raise/lower control of the burner fuel valve and also Local Start & Local Stop buttons. These buttons operate as follows:

Local –

- When pressed this button selects local raise/lower control of the burner fuel valve.
- If Local mode is selected, the background for this button will change from grey to white.
- When Local mode is selected the burner fuel valve will remain in its current position until either the local Raise or local Lower buttons is pressed while the burner status is On.

Remote -

- When pressed this button selects remote raise/lower control of the burner fuel valve.
- If Remote mode is selected, the background for this button will change from grey to white.
- When Remote mode is selected the burner fuel valve will drive to the position required by the automatic control program or the burner controller.

Raise –

- This button is only available if the Fuel Valve Control is selected to Local control.
- The background colour of this button changes from grey to yellow when burner control is selected to Local.
- If pressed when available, this button will drive the burner fuel valve damper motor 7M11 so that the valve opens. The motor will only continue to operate as long as the button remains pressed.

Lower –

- This button is only available if the Fuel Valve Control is selected to Local control.

- The background colour of this button changes from grey to yellow when burner control is selected to Local.
- If pressed when available, this button will drive the burner fuel valve damper motor 7M11 so that the valve closes. The motor will only continue to operate as long as the button remains pressed.

3.3.1.4 Temperature

The Temperature panel situated in the centre of the screen displays the following information:

SP –
This is the final cylinder temperature setpoint as generated by the PLC in the main control panel.

PV –
This is the cylinder temperature control PID loop output. It shows the position of the fuel valve required by the PID loop.

Valve Position –
This is the actual position of the burner fuel valve whether it is being operated in Local or Remote Fuel Valve Control mode. In Local mode this value is useful in monitoring the operation of the valve when using the Raise & Lower buttons.

3.3.2 Burner Startup Interlocks Screen

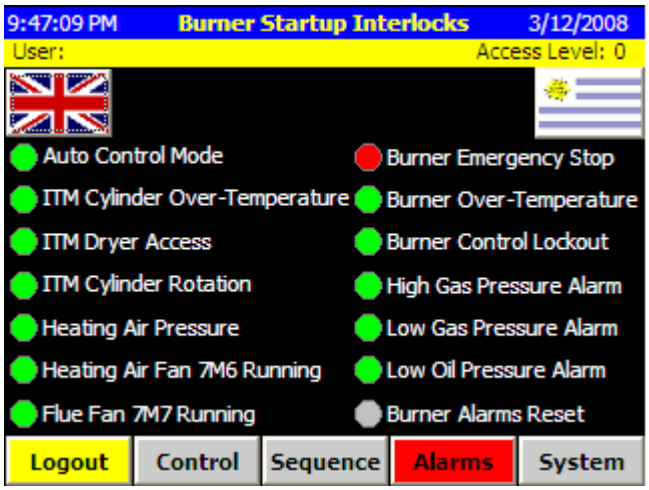


Figure 3-4 Burner Panel HMI - Burner Startup Interlocks Screen

This screen is displayed when the Interlocks button is pressed on any other screen that shows it.

The screen provides the status of all burner interlocks that are required before the dryer burner can be started. To start the burner all interlock indicators must be green. The statuses of the interlocks are irrelevant once the burner has been started or is running.

The individual interlocks are described below:

Auto Control Mode -
This indicates the process line control mode as selected through the Auto Control screen of the HMI in the main PLC control panel. Process line control must be selected to Auto control before the burner can be started.
This indicator is grey when process line Auto control mode is not selected.

ITM Cylinder Over-Temperature –
This indicates the status of the dryer cylinder over-temperature input to the PLC. This indicator is red if the dryer cylinder is over-temperature.

ITM Dryer Access –
This indicates that all PLC monitored dryer access doors are closed. If any monitored access door is open the indicator will be red.

ITM Cylinder Rotation –
This indicates that the PLC in the main panel has detected that the dryer cylinder is rotating at a minimum speed. If the dryer cylinder has not reached the required speed of rotation this indicator will be grey.

Heating Air Pressure –
This indicates the status of the dryer heating air pressure switch, which should only be made when the dryer heating air fan motor 7M6 is running and the fan is rotating at a minimum speed. The indicator is grey if there is insufficient air pressure.

Heating Air Fan 7M6 Running –

This indicates the status of the dryer heating air fan motor contactor. The indicator is grey if the contactor is not energised meaning the motor is not running.

Flue Fan 7M7 Running –
This indicates the status of the dryer flue fan motor contactor. The indicator is grey if the contactor is not energised meaning the motor is not running.

Burner Emergency Stop –
This indicates the status of the Burner panel emergency stop input signal to the main control panel PLC. If the input signal is low indicating the emergency stop button has been activated the indicator will be red otherwise, it will be green.

Burner Over-Temperature –
This indicates the status of the burner over-temperature input to the PLC. This indicator is red if the burner is over-temperature and green if not. (Note: This may in fact be the same signal as the cylinder over-temperature signal).

Burner Control Lockout –
This indicates the status of the lockout input signal to the PLC from the Burner Controller in the burner control panel. The Burner Controller goes to the Lockout state when it detects a condition which makes it unsafe to continue with burner startup or continuous operation. When the Burner Controller is in Lockout this indicator will be red otherwise, it will be green.

When the Burner Controller goes to Lockout, it must be reset by pressing the Lockout Fault/Reset button on the burner control panel door.

High Gas Pressure Alarm -
This indicates the status of the high gas pressure alarm in the burner control panel. This indicator is red if the alarm is active.

When the alarm is active it must be reset by pressing the Gas/Oil Pressure Fault/Reset button on the burner control panel door.

Low Gas Pressure Alarm -
This indicates the status of the low gas pressure alarm in the burner control panel. This indicator is red if the alarm is active.

When the alarm is active it must be reset by pressing the Gas/Oil Pressure Fault/Reset button on the burner control panel door.

Low Oil Pressure Alarm -
This indicates the status of the low oil pressure alarm in the burner control panel. This indicator is red if the alarm is active.

When the alarm is active it must be reset by pressing the Gas/Oil Pressure Fault/Reset button on the burner control panel door.

Burner Alarms Reset –
This indicates that there are no active alarms on the HMI alarms screen that will prevent the burner from being started. The indicator is grey if there are still alarms that need to be reset.
The alarms that must not be active are listed below:

- Dryer cylinder motor 7M1 alarm.
- Dryer heating air fan motor 7M6 alarm.
- Dryer flue fan motor 7M7 alarm.
- Dryer cylinder rotation alarm.

- Dryer cylinder over-temperature alarm.
- Burner controller lockout alarm.
- Dryer access door open alarm.
- Dryer combustion air pressure low alarm.
- Burner gas supply pressure high alarm.
- Burner gas supply pressure low alarm.
- Burner oil pressure low alarm.
- Burner over-temperature alarm.
- Dryer heating air pressure low alarm.
- Burner panel emergency stop alarm.

3.3.3 Burner Startup Sequence Screen

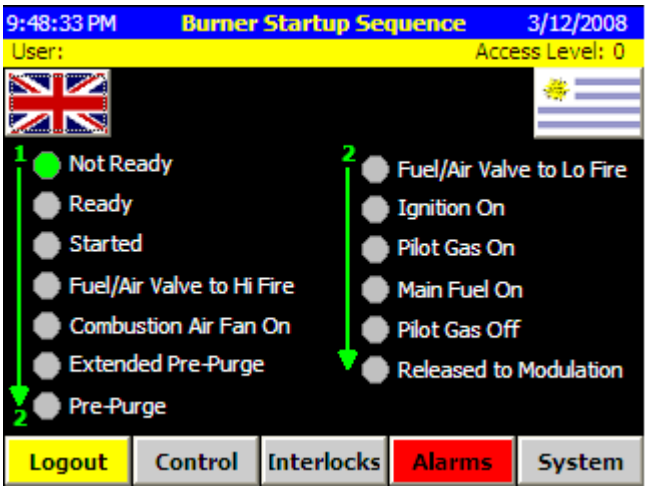


Figure 3-5 Burner Panel HMI - Burner Startup Sequence Screen

This screen is displayed when the Sequence button is pressed on any other screen that shows it.

The screen shows the progress of the burner start-up sequence from Not Ready to Released to Modulation. The currently active step of the sequence is indicated by its indicator being coloured green. When a sequence step is no longer active the indicator becomes coloured grey.

This screen is most useful when a problem occurs resulting in the burner controller going to lockout or failing to move on to the next step of the sequence. While the burner remains in lockout the step of the sequence reached will remain indicated.

The sequence step indications are described below:

Not Ready –
This step is active when the burner has not been started and any of the startup conditions shown on the Burner Startup Sequence screen are not healthy. When all the burner startup conditions have been satisfied the sequence steps-on to **Ready**.

Ready –
This step is active when the burner has not been started but all burner startup interlocks are healthy.
If the burner startup conditions become unhealthy, the sequence steps-back to **Not Ready**.
If the burner is started while on this step the sequence steps-on to **Started**.

Started –
Once active, the sequence remains on this step until the burner controller has commanded the burner fuel/air valve to go to the High Fire position. The sequence then steps-on to **Fuel/Air Valve to Hi Fire.**

Fuel/Air Valve to Hi Fire –
Once active, the sequence remains on this step until the burner fuel/air valve reaches the high fire position limit switch. The sequence then steps-on to **Combustion Air Fan On.**

Combustion Air Fan On –
Once active the sequence remains on this step until the combustion air fan motor 7M9 is running, the combustion air pressure is healthy and the fuel/air valve high fire position switch is made. The sequence then steps-on to **Extended Pre-Purge**.

Extended Pre-Purge –
Once active, the sequence remains on this step until burner extended pre-purge timer has expired. The sequence then steps-on to **Pre-Purge.**

Pre-Purge –
Once active, the sequence remains on this step until the burner controller commands the burner fuel/air valve to go to the low fire position. The sequence then steps-on to **Fuel/Air Valve to Lo Fire.**

Fuel/Air Valve to Lo Fire –
Once active, the sequence remains on this step until the fuel/air valve at low fire position switch is activated and the burner controller ignition transformer output is turned-on. The sequence then steps-on to **Ignition On**.

Ignition On –
Once active, the sequence remains on this step until the burner controller commands the pilot gas valve to open. The sequence then steps-on to **Pilot Gas On**.

Pilot Gas On –
Once active, the sequence remains on this step until the main gas valves or the oil valve are commanded to open by the burner controller. The sequence then steps-on to **Main Fuel On**.

Main Fuel On –
Once active, the sequence remains on this step until the burner controller command to open the pilot gas valve is turned-off. The sequence then steps-on to **Pilot Gas Off**.

Pilot Gas Off –
Once active, the sequence remains on this step until the burner controller turns-on the Burner Released to Modulation signal. The sequence then steps-on to **Released to Modulation**.

Released to Modulation –
Once active, the sequence remains on this step until the burner start command is turned-off.

3.3.4 System Functions Menu

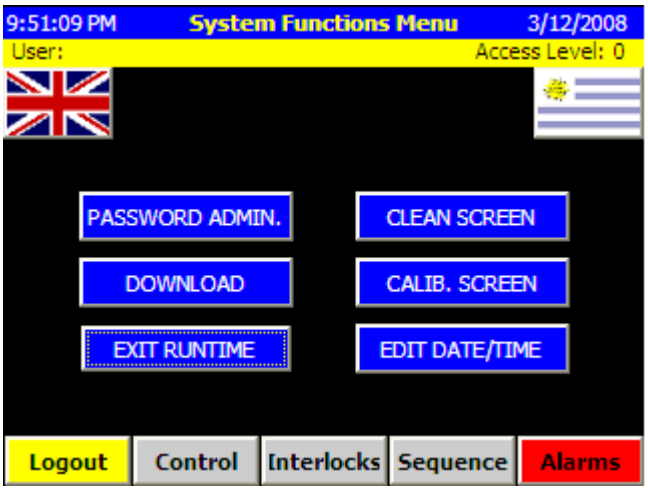


Figure 3-6 Burner Panel HMI - System Functions Menu Screen

This screen is displayed when the System button is pressed on any other screen that shows it.

This screen provides access to the following HMI system functions:

- User administration
- Preparing for transfer of a new HMI application
- Shutdown of the HMI application, to access the HMI PC operating system.
- Screen Cleaning
- Touch screen calibration.
- Editing HMI date & time

3.3.5 User & Password Administration

Security is used to prevent unauthorised access to commands and parameters through the HMI.

The HMI security system is setup with user groups, group authorisations and users assigned to user groups.

For this application the user groups are as follows:

- 9 - Administrators
- 4 - Engineers
- 3 - Technicians
- 2 - Supervisors
- 1 – Users

The number assigned to each user group is the ‘Access Level’ shown at the top of every HMI screen next to the user name when logged-in to the HMI.

The group authorisations created are as follows:

- Administration
- Engineer
- Technician
- Supervisor
- User

User groups are assigned one or more group authorisations as follows:

User Group	Authorisation				
	Administration	Engineer	Technician	Supervisor	User
Administrators	X	X	X	X	X
Engineers		X	X	X	X
Technicians			X		X
Supervisors				X	X
Users					X

Users are assigned to user groups and therefore inherit the authorisations of that group.

The user & password administration facilities available to the user at runtime through the ‘User Administration’ screen depend on the user group (access level) to which a user is assigned.

Any user logged-in who is not assigned to the Administrators user group can only change their own password and logoff time.

Any user logged-in who is assigned to the Administrators user group can perform the following functions:

- Add new users.
- Delete users.
- Re-assign existing users to different user groups.
- Change existing users’ passwords.
- Change existing users’ logoff times.

To display the ‘User Administration’ screen the ‘Password Admin.’ button on the ‘System Functions menu’ must be pressed.

The 'User Administration' screen which appears when selected is shown below:

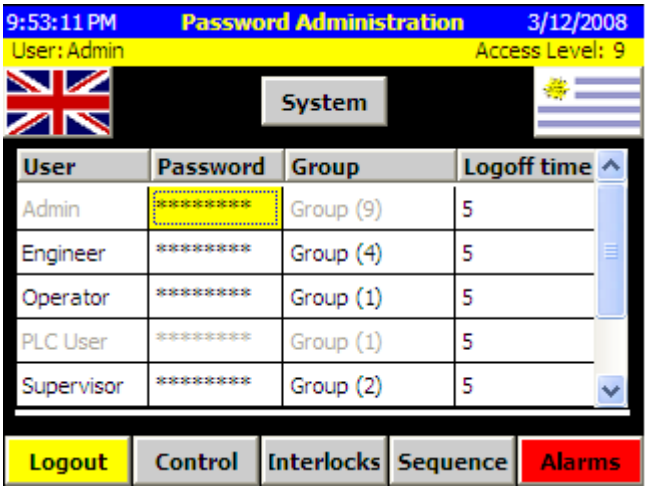


Figure 3-7 Burner Panel HMI - User & Password Administration Screen

The main section of the screen is occupied with the user administration table. To log-in, touch the administration table and enter user name & password into the Log-In dialogue that appears.

In the above example, we see all the users currently configured because the user logged-in belongs to user group 9 (administrators – access level 9).

If a user belonging to a user group below 9 were logged-in to the HMI then, all that user would see in the user administration table would be their own user name, password, user group and logoff time. They would also only be able to change their password and logoff time.

You will note that the user names and user groups assigned to 'Admin' and 'PLC User' are greyed-out in the above user administration table. This means that they cannot be changed. Also, the password for the 'PLC User' is greyed-out meaning it cannot be changed either.

If the current user is logged-out while the 'Password Administration' screen is displayed, the table will clear of all entries. In order to re-display entries in the table again the user should touch the screen over the table, which will then cause the user log-in prompt and on-screen keyboard to appear so the user can log-in.

3.3.5.1 Add a New User

- To add a new user to the list, a user belonging to user group 9 (access level 9) must be logged-in to the HMI.
- Once logged-in double tap the empty 'User' field at the bottom of the table to display the on-screen keyboard.
- Next, double tap the empty 'User field' again so that the cursor appears in it and then type-in the new user's name followed by pressing the return key.
- Next, double tap the empty 'Password' field next to the new user name just entered. When the on-screen keyboard appears, double tap the field again so that the cursor appears in it and type the password for the new user. You will note that the password appears in the field as it is typed so that you can see any mistakes. Complete the entry by pressing the return key on the keyboard.

- You will now notice that the table will reorganise itself so that user names are in alphabetical order from top to bottom and, that the new user just entered has automatically been assigned to user group 1 (access level 1) with a 5 minute logoff time.

- If you want to change the user group to which the new user is assigned simply double tap the 'Group' field on the same row. This will highlight the group field and also display a scroll button in the field. Press the scroll button to display all possible user group numbers including UNAUTHORIZED in a list and, then touch the user group required in the list.

- To change the logoff time assigned to the new user, simply double tap the 'Logoff' field on the same row. This will display the on-screen numerical keypad. Double tap the field again so that the cursor appears, and enter the number of minutes required with no touch screen activity, after which this user should be logged-out of the HMI.

3.3.5.2 Delete an Existing User

- To delete an existing user from the list of users, a user belonging to user group 9 (access level 9) must be logged-in to the HMI.

- Once logged-in, double tap the 'User', 'Password' or 'Logoff' fields of the user to be deleted so that the on-screen keyboard or keypad appears. Do not double tap the same field again but simply press the 'Del' key on the keyboard and the user row in the table will be deleted.

- If the user deleted is also the user currently logged-in to the HMI, then the user will be logged-out and the user administration table will clear of all entries.

3.3.5.3 Re-Assign a User to a User Group

- To re-assign a user to a different user group, a user belonging to user group 9 (access level 9) must be logged-in to the HMI.

- Once logged-in, double tap the 'Group' field of the user. This will highlight the group field and also display a scroll button in the field. Press the scroll button to display all possible user group numbers including UNAUTHORIZED in a list and, then touch the user group required in the list.

Note: If the user whose user group is being re-assigned, is the user currently logged-in and, that user is currently assigned to user group 9 then, changing the user group will mean that it will not be possible to go back and assign any other user group to that user unless another user logs-in who is assigned to user group 9.

3.3.5.4 Change an Existing User's Password

- To change an existing user's password either, the user whose password is to be changed needs to be logged-in to the HMI or, a user assigned to user group 9 needs to be logged-in to the HMI.

- Once logged-in double tap the 'Password' field next to the user name. When the on-screen keyboard appears, double tap the field again so that the cursor appears in it and type the new password for the user. You will note that the password appears in the field as it is typed so that you can see any mistakes. Complete the entry by pressing the return key on the keyboard.

3.3.5.5 Change an Existing User's Logoff Time

- To change an existing user's Logoff time either, the user whose logoff time is to be changed needs to be logged-in to the HMI or, a user assigned to user group 9 needs to be logged-in to the HMI.

- Once logged-in simply double tap the 'Logoff' field in the same row as the user name. This will display the on-screen numerical keypad. Double tap the field again so that the cursor appears, and enter the

number of minutes required with no touch screen activity, after which this user should be logged-out of the HMI.

3.3.6 Set Date/Time

The HMI date & time are important for logging the correct date & time that an alarm occurred.

To use the 'Edit Date/Time' system function a user must be logged-in to the HMI with access level 2, 4 or 9 (technician, engineer or administrator level). Until logged-in with this access level the 'Edit Date/Time' button on the 'Systems Functions Menu' screen will be unavailable.

Once the user is logged-in with an appropriate access level pressing the 'Edit Date/Time' button on the 'Systems Functions Menu' screen will display the screen shown below:

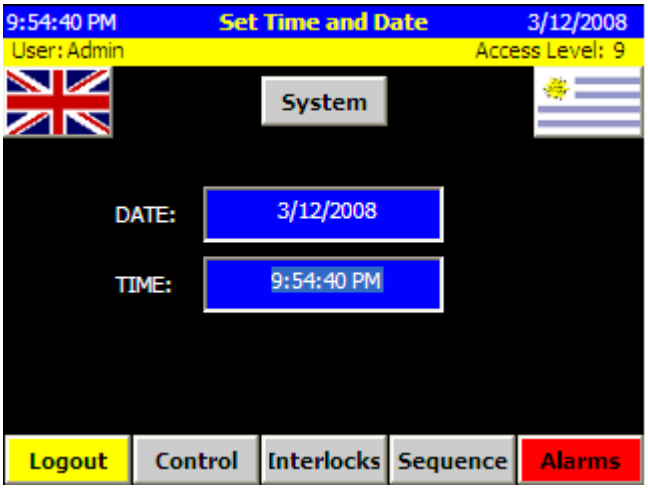


Figure 3-8 Burner Panel HMI - Set Date & Time Screen

Touching either the date or time panel shown in the middle of the screen will cause the on-screen keyboard to be displayed.

Time may be entered in 12 or 24 hour format but the user must enter the semi-colons separating the hours, minutes & seconds. If entering the time in 12 hour format the user must enter a space after the seconds followed by AM or PM.

The date must be entered as mm/dd/yyyy including the separating slashes between day, month & year.

If the changes are accepted, the time & date shown at the top of the screen will change to that set by the user.

3.3.7 Clean Screen

This system function is available to all users from the 'System Functions Menu' screen simply by pressing the 'Clean Screen' button.

The purpose of the function is to disable the HMI touch screen so that the user can clean the screen with a damp cloth without issuing any commands to, or changing any data in, the PLC.

When pressed, the screen cleaning screen is displayed on the HMI as shown below:

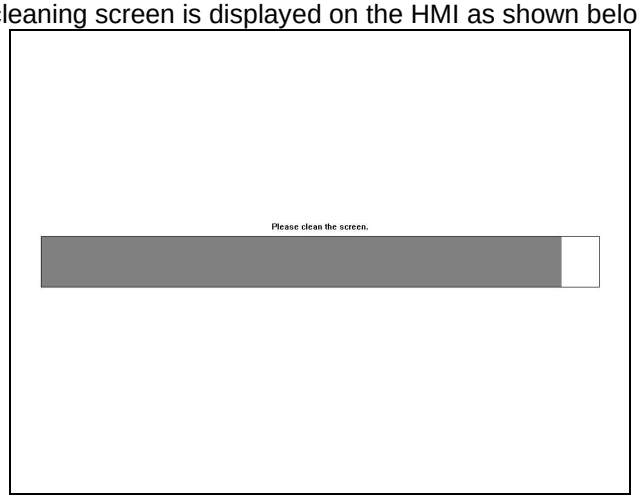


Figure 3-9 Burner Panel HMI - Screen Cleaning Screen

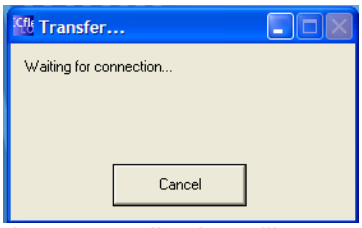
As can be seen, the screen consists entirely of a horizontal bar graph and the instruction 'Please clean the screen'. While this screen is displayed, there are no controls or buttons available to the user. You must wait until the horizontal bar reaches the left hand side of the display before the 'System Functions Menu' is displayed again.

3.3.8 Download

Normally, when transferring new/modified WinCC Flexible applications onto the HMI from a configuration PC it is not necessary to shutdown the existing application and deliberately select transfer mode, this usually happens as part of the transfer process. However, it has been known not to work in which case it is necessary to select transfer mode on the HMI. For this purpose a 'Download' button is provided on the 'System Functions Menu'.

If a user is not logged-in to the HMI with access level 4 or 9 (engineer or administrator) when this button is pressed then the user will be prompted to log-in with a higher access level.

Once logged-in, the HMI WinCC Flexible application will terminate and the following dialogue will appear on the HMI display.



Once the transfer operation is complete the new application will start automatically. Alternatively, if the transfer fails, the 'Cancel' button can be pressed to terminate the operation and restart the original application.

3.3.9 Exit Runtime

There will be times when it is necessary for an engineer or system administrator to gain access to the desktop and operating system of the HMI. A 'Exit Runtime' button is provided on the 'System Functions Menu' to do this.

If a user is not logged-in to the HMI with access level 4 or 9 (engineer or administrator) when this button is pressed then the user will be prompted to log-in with a higher access level.

Once logged-in, the HMI WinCC Flexible application will terminate when the 'Exit Runtime' button is pressed and, the Windows operating system desktop will be displayed.

3.3.10 Calibrate Touch Screen

Occassionally, it will be necessary to re-calibrate the touch screen so that when the screen is touched the correct object under the user's finger is activated. The 'Calib. Screen' button on the 'System Functions Menu' screen is provided to activate the touch screen calibration program on the HMI.

A user must be logged-in to the HMI with access level 2, 4 or 9 (technician, engineer or administrator) to enable the touch screen calibration function. If the user is not logged-in or, is logged-in without the correct access level then, when the 'Calib. Screen' button is pressed, the user will be prompted to log-in with the correct access level.

3.3.11 Current Alarms Screen

Any fault condition detected by the PLC generates an alarm which remains active until the alarm is reset by the user through the alarm displays on the main panel HMI or the burner control panel HMI.

There is one alarms screen on the burner panel HMI from which the user can select to view a list of the currently active alarms, known as the Current Alarms screen. There is no historical alarms screen on the burner panel HMI. A historical log of the last 500 alarm events is maintained by the main panel HMI and can be viewed from its own historical alarms screen.

3.3.11.1 Current Alarms Screen

The 'Current Alarms' screen shows alarm messages for all currently active alarm conditions only. The screen appears on the HMI screen by pressing the 'Alarms' button at the top right hand side of every screen.

Below is a picture of the 'Current Alarms' screen:

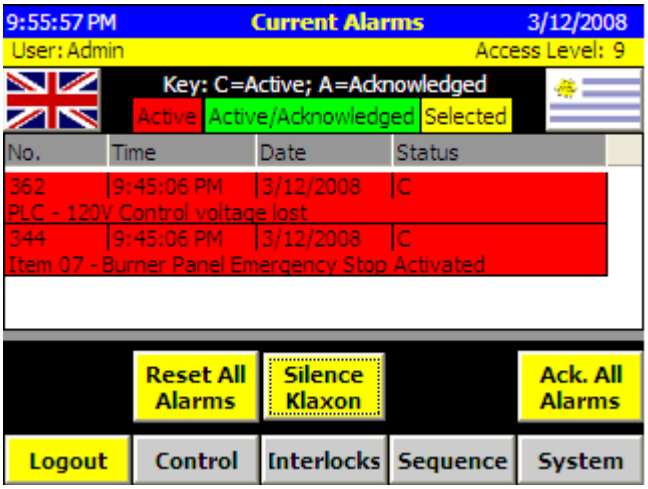


Figure 3-10 Burner Panel HMI - Current Alarms Screen

3.3.11.1.1 Alarm message attributes

The main part of the display is an alarm message area with a list of alarm messages for currently active alarm conditions. Alarm messages have the following attributes:

- Alarm messages are listed in chronological order with the most recent message at the top of the list.
- All currently active alarm messages can be acknowledged by pressing the Ack. All Alarms button at the bottom right of the message area. This has no other function other than to acknowledge the alarm messages on the HMI screen, thereby changing their background colour and making it easier to determine from a distance when a new alarm has occurred.
- If the alarm messages have not been acknowledged they appear as black text on a red background.
- If the alarm messages have been acknowledged by the user on the HMI the messages will appear as black text on a green background.
- When alarms have been reset, the corresponding alarm message disappears from the 'Current Alarms' screen.

- Each alarm message has the following attributes (listed as they appear from left to right across the display):

  No. -
  This is the number of the message text within the HMI alarm message database.

  Time –
  The time that the alarm message occurred as logged by the HMI.

  Date –
  The date that the alarm message occurred as logged by the HMI.

  Status –
  C = Active & not yet acknowledged.
  CA =Active and acknowledged.

  Text –
  A message describing the alarm condition.

3.3.11.1.2 Message list navigation

- Any individual alarm message can be selected on the display simply by touching it. Selection is indicated by the alarm line changing to black text on a yellow background.
  Selecting an alarm has no purpose as there are no individual alarm functions available.

- If there are more alarms messages than will fit in the alarm message area then a vertical scroll bar will appear at the right hand side of the message area. This scroll bar operates in the same way as any normal windows scroll bar.

3.3.11.1.3 Action on new alarm generation

When a new fault condition is detected the alarm klaxon sounds and the associated alarm message appears in black text on a red background at the top of ‘Current Alarms’ screen. In addition, the background of the ‘Alarms’ button at the bottom of every screen changes from grey to red.

Pressing the ‘Silence Klaxon’ button, at the bottom of the ‘Current Alarms’ screen, stops the alarm klaxon from sounding.

The alarm klaxon can only be silenced by pressing the ‘Silence Klaxon’ button on the main panel HMI or the burner panel HMI. In this way the user must view the alarm list when silencing the alarm klaxon.

Pressing the ‘Reset All Alarms’ button, resets all currently active alarms at the same time.

Note: It is not necessary to acknowledge all alarms in order to be able to reset them.

4 Appendix - HMI Alarm Message Descriptions

4.1 General

The following sections list of all the alarm messages programmed into both the main panel and the burner panel HMIs along with a brief description of what causes them to be triggered in the PLC.

The sections group the alarm messages by type.

4.2 Motor Alarm Messages

For every motor there are a number of possible alarm messages that may be generated which are always in the same format. This section describes each of the possible alarm messages and what may cause them.

Motor alarm messages take the general form:

'Item nnn – ttttttttttttt rrr – zzzzzzzzzzzzzzz'

Where:

nn	The plant machine item reference e.g. K155, 07, etc.
ttttttt -	A textual description of the machine e.g. vibrating conveyor, ITM dryer feed-hood heater, etc.
rrr -	Motor reference on the plant machine e.g. 07M1, 01M2 etc.
zzzzz -	Description of the specific fault e.g. 'Motor failed to start/stop', 'Motor isolator opened', etc.

Some examples of complete motor alarm messages are:

Item K194 - Metering Band Doffers Motor 04M2 - Motor isolator opened
Item 07 - ITM Dryer Cylinder Motor 07M1 - Motor inverter fault
Item K154 - Band Conveyor 09M1 - Motor failed to start/stop

4.2.1 Motor Failed To Start/Stop

This motor alarm is generated whenever the motor contactor feedback status fails to follow the commanded state within a preset time. It may also be generated if another motor fault occurs whilst the motor is running e.g. isolator open or overload protection device tripped.

Where the motor is controlled by a VSD, the motor failed to start/stop alarm may indicate one of the following:

- The contactor supplying the VSD with power has failed to energise or de-energise within a preset time as commanded.
- The VSD has failed to indicate that it is running or stopped within a preset time after being commanded by the PLC.

4.2.2 Motor Overload Tripped

This motor alarm is generated whenever the motor overload protection device for a motor is activated.

4.2.3 Motor Isolator Open

This motor alarm is generated whenever the motor local isolator is opened.

Note: There are no motor isolator inputs to the PLC so motor isolator alarms will not be generated. If a motor is isolated then a motor failed to Start/Stop alarm will be generated if an attempt is made to start the motor or it is already running.

4.2.4 Motor Inverter Fault.

This motor alarm only occurs for those motors whose speed is controlled by a VSD. When this fault occurs it means that the VSD unit is reporting a fault.

4.2.5 Motor External Fault

This motor alarm may be generated by such things as windings thermistor unit tripped etc.

Note : Electrical heaters are classed as motors in this application as they have similar switchgear to a standard DOL motor starter.

The following table lists all the motors for which alarm messages have been programmed in CP3 HMI:

List Of Motors For Which Alarm Messages Programmed into the HMIs.
K12_01M1 – Silo discharge band motor
K12_01M2 – Silo doffers motor
K149_02M1 – Vibrating conveyor motor
K150_03M1 – Band conveyor motor
K194_04M01 – Metering band motor
K194_04M02 – Metering band doffers motor
K151_05M1 – Band conveyor motor
07E1 – ITM Dryer feed hood heater
07M1 – ITM Dryer cylinder motor
07M2 – ITM Dryer Feed screw motor
07M3 – ITM Dryer Process air fan motor
07M4 - ITM Dryer Process air damper servo motor
07M5 – ITM Dryer water pump motor $
07M6 – ITM Dryer heating air fan motor
07M7 – ITM Dryer flue exhaust fan motor
07M9 – ITM Dryer burner combustion air fan motor
07M10 - ITM Dryer Process air damper servo motor $
07M11 – ITM Dryer burner oil pump motor
07MA01 – ITM Dryer cyclone fan motor
K153_08M1 – Vibrating conveyor motor
K154_09M1 – Band conveyor motor
K168_10M1 – Reversing band conveyor motor
K11_11M1 – Silo discharge band motor
K11_11M2 – Silo doffers motor
K155_12M1 – Band conveyor motor
K44_13M1 – Band conveyor motor
K173_14M1 – Weighing band conveyor motor
07 – Roller fans motor

$ = Alarms for these devices should never occur as they do not have tripped, isolated or running input signals.

4.3 Valve Alarms

This section lists alarms configured for open/close signal controlled valves. Typically, these alarms are generated when a valve has been commanded to open or close but, the sensors indicating the position of the device do not change to the required state(s) within the preset time.

Each valve has a failed to open alarm and a failed to close alarm associated with it. The table below only lists the valves for which these two alarms have been configured.

Note: Although there are alarms for all valves' positions configured in the HMI, they will not be activated unless position switches are fitted to them and the PLC program changed accordingly.

List Of Valves for which Position Alarm Messages are Programmed into the HMI.
07Y7 - ITM dryer feed-end water spray valve
07Y8 - ITM dryer delivery-end water spray valve
07Y9 - ITM dryer delivery-end water spray atomising air valve
07Y10 - ITM dryer process air diverter to ITM mode valve
07Y11 - ITM dryer process air diverter to Inline mode valve
07Y12 - ITM dryer delivery-end process air damper open valve
07Y13 - ITM dryer feed-end process air damper open valve

4.4 Access Door Alarms

Access door alarms are generic in that there is only one access door open alarm for a machine regardless of which access door is open.

Often, access can only be gained using a key exchange system, where a key is removed from the control panel to be taken to a local key box where it is used to release the mechanical access key to the machine. The act of removing the key from the control panel is what actually trips the safety circuit in this case and it is this that is reported by the alarm.

The text for these alarms is explicit as to their meaning and no further explanation is required.

List Of Access Door Alarm Messages Programmed into the HMI.
Item K12 – Silo access door open
Item K11 - Silo access door open
Item 07 - ITM dryer access door open

4.5 Rotation Fault Alarms

The ITM dryer cylinder is fitted with a rotation sensor. This sensor is merely a proximity switch picking-up the periodic passing of a metal flag attached to the cylinder. The motor driving the cylinder runs at a variable speed but must rotate at a minimum speed, so it is expected that the pulses from the rotation sensor to be at maximum regular fixed intervals. If the rotation signal input does change within these intervals we can assume that the cylinder is not rotating and if this happens while the motor indicates that it should be running then an alarm is raised.

When the alarm is triggered then, the infeed conveyors will be stopped and the ITM burner will be stopped.

List Of Rotation Faults, Alarm Messages Programmed into the HMI.
Item 07 - ITM Dryer Cylinder Rotation Fault

4.6 Metering Tube Photocell Fault Alarms.

Metering tubes are typically used to control the feed rate of product onto a metering band conveyor. The tube has three photocells which are used to crudely control the speed of a feeding conveyor. The photocells 'look' across the metering tube through clear plastic windows at different levels. If the photocells are obscured by product in the wrong order this may indicate a blockage in the tube.

The order that the photocells are obscured is monitored and, if the order is incorrect an alarm is raised.

List Of Metering Tube Photocell Faults, Alarm Messages Programmed into the HMI.
Item T25 - Metering tube blocked

Note: T25 has only two photocells so if the top photocell is covered without the bottom one being covered then the alarm will be raised.

4.7 Profibus Communications Alarms

The devices that communicate over Profibus with the PLC are Siemens Micromaster 4 variable speed drives (VSDs) and, the PLC expansion rack.

A Profibus communications alarm is raised if the device cannot be found on the Profibus network once it has been powered-up for a preset time or, is reporting a fault.

List Of Profibus Communications Alarm Messages Programmed into the HMI.
PLC - Expansion Rack 1 Profibus Communications Fault
Item K12 - Silo Discharge Band 01M1- Inverter Profibus Communications Fault
Item 07 - ITM Dryer Cylinder Motor 07M1 - Inverter Profibus Communications Fault
Item 07 - ITM Dryer Water Pump Motor 07M4 - Inverter Profibus Communications Fault
Item K11 - Silo Discharge Band 11M1 - Inverter Profibus Communications Fault

4.8 Analogue Input Signal Faults

Analogue input signals to the PLC are checked that the signals are within acceptable levels i.e. a 4-20mA signal is acceptable if it lies within 3.5 to 20.5mA outside of this range an alarm is raised.

An exception to the above is the feedback signal from the process air flow damper position signal. This feedback signal is a 2 to 10V DC signal. In this case the acceptable signal range is range 1.75 to 10.25V.

The analogue signal fault alarms configured in the HMI are listed in the table below:

List Of Process Analogue Signal Fault Alarm Messages Programmed into the HMI.
Item K194 - Metering Band Flow Rate Analogue Input Signal Fault
Item 07 - ITM Dryer Burner Fuel/Air Valve position Analogue Input Signal Fault
Item 07 - ITM Dryer Cylinder Temperature Probe 7B1 Analogue Input Signal Fault
Item 07 - ITM Dryer Cylinder Temperature Probe 7B2 Analogue Input Signal Fault
Item 07 - ITM Dryer Process Air Temperature (ITM) Probe 7B3 Analogue Input Signal Fault
Item 07 - ITM Dryer Process Air Temperature (Inline) Probe 7B4 Analogue Input Signal Fault
Item 07 - ITM Dryer Exhaust Air Temperature Probe 7B5 Analogue Input Signal Fault
Item 07 - ITM Dryer Process Air Flow Signal 7B6 Analogue Input Signal Fault
Item 08 - ITM Dryer Exit Tobacco Temperature Probe 8B1 Analogue Input Signal Fault
Item 08 - ITM Dryer Exit Tobacco Moisture Signal 8B2 Analogue Input Signal Fault

4.9 Control Voltage Alarms

Control voltages are monitored by the PLC to determine if control is available. It is expected that all control voltages will be available at all times consequently, any loss of a control voltage is alarmed immediately and the automatic processes in progress are stopped.

Loss of control voltage may be an indication that the emergency stop safety relay has tripped and has not been reset.

List Of Control Voltage Lost Alarm Messages Programmed into the HMI.
PLC - 120V Control voltage lost

4.10 PLC Rack Fault Alarms

PLC Chassis and rack fault alarms are intended to indicate that there is a fault with a module in one of the PLCs I/O racks. It will be up to a technician to diagnose the exact nature of the fault using the Step 7 programming software.

All faults are generated as the result of receiving an interrupt from the module in the appropriate slot resulting in a call to OB82 or OB85.

List Of PLC Rack Fault Alarm Messages Programmed into the HMI.
PLC - Expansion rack 1 fault
PLC - Module fault rack 0 slot 1
PLC - Module fault rack 0 slot 2
PLC - Module fault rack 0 slot 3
PLC - Module fault rack 0 slot 4
PLC - Module fault rack 0 slot 5
PLC - Module fault rack 0 slot 6
PLC - Module fault rack 0 slot 7
PLC - Module fault rack 0 slot 8
PLC - Module fault rack 0 slot 9
PLC - Module fault rack 0 slot 10
PLC - Module fault rack 0 slot 11
PLC - Module fault rack 1 slot 1
PLC - Module fault rack 1 slot 2
PLC - Module fault rack 1 slot 3
PLC - Module fault rack 1 slot 4
PLC - Module fault rack 1 slot 5
PLC - Module fault rack 1 slot 6
PLC - Module fault rack 1 slot 7
PLC - Module fault rack 1 slot 8
PLC - Module fault rack 1 slot 9
PLC - Module fault rack 1 slot 10
PLC - Module fault rack 1 slot 11

4.11 System Fault Alarms

There are a great many system faults that the PLC can generate. The most common ones such as rack/slot faults and cycle time overrun have been separated out and have specific alarm messages assigned for them. All other system faults generate interrupt calls in the program to one (or more) organisation blocks or OBs.

Alarm messages have been configured in the HMI to generate alarms when an error handling OB is called in the PLC program. These alarm messages only indicate the OB that was called. The user must then use the Siemens Step 7 programming software to go online to the PLC CPU and interrogate the diagnostic buffer to find out what the actual cause of the alarm is.

Below is a list of the alarm messages generated when an associated error handling OB is called:

List Of System Fault Alarm Messages Programmed into CP3 HMI.
PLC - System Fault - Un resolved OB80 error
PLC - System Fault - Un resolved OB81 error
PLC - System Fault - Un resolved OB82 error
PLC - System Fault - Un resolved OB83 error
PLC - System Fault - Un resolved OB84 error
PLC - System Fault - Un resolved OB85 error
PLC - System Fault - Un resolved OB86 error
PLC - System Fault - Un resolved OB87 error

4.12 Miscellaneous Alarms

Below are a list of individual alarms and associated descriptions which do not belong in any of the previous groups.

Item 07 - Burner Panel Emergency Stop Activated –
This alarm message is generated when the air supply valve L37YV1 is open and the air pressure switch does not register sufficient pressure continuously for 3 seconds.

Item 07 - ITM Dryer Burner High Gas Pressure –
The burner control panel generates a high gas pressure alarm when the burner controller is opening, or trying to open the main gas valves and the high gas pressure switch is operated. This alarm is latched and cannot be reset on the HMI until the ‘Gas/Oil Pressure Fault/Reset’ button is pressed on the burner panel door.

Item 07 - ITM Dryer Burner Low Gas Pressure –
The burner control panel generates a low gas pressure alarm when the burner controller is opening, or trying to open the main gas valves and the low gas pressure switch is operated. This alarm is latched and cannot be reset on the HMI until the ‘Gas/Oil Pressure Fault/Reset’ button is pressed on the burner panel door.

Item 07 - ITM Dryer Burner Low Oil Pressure –
The burner control panel generates a low oil pressure alarm when the burner controller is opening, or trying to open the oil valves and the low oil pressure switch is operated. This alarm is latched and cannot be reset on the HMI until the ‘Gas/Oil Pressure Fault/Reset’ button is pressed on the burner panel door.

Item 07 - ITM Dryer Burner Over-Temperature –
This alarm is generated if the over-temperature switch is activated and cannot be reset until the temperature switch is no longer activated.

Item 07 - ITM Dryer Burner Controller Lockout –
This alarm is generated from the burner controller lockout signal. The alarm cannot be reset on the HMI until the 'Lockout Fault/Reset' button on the burner panel is pressed on the burner control panel door.

Item 07 - ITM Dryer Burner Combustion Air Pressure Low –
This alarm is generated if the combustion air fan 7M9 has been running for a preset time and the combustion air pressure switch indicates insufficient air pressure.

Item 07 - ITM Dryer cylinder over-temperature –
The ITM dryer cyclone fan must be running in order to start the dryer in Preheat mode or to start the main process line. If the cyclone fan is subsequently found not to be running while Preheat or process line is running an alarm is raised. This alarm will stop the infeed equipment to the ITM dryer so that no more product can enter it.

Item 07 - ITM Dryer Heating Air Flow Pressure (7S11) Low -
When the ITM cooler flavour pump is started, a flow above the minimum flow set in the machine parameters is expected after a preset time. If the flow remains below the minimum value set then the alarm is generated

PLC - Program maximum cycle time exceeded -
If this alarm occurs it indicates that there is a programming fault with CP3 PLC program which has caused the cycle time to exceed the preset value. The PLC CPU is forced into the stopped state when this alarm is activated.