

**BROOKFIELD BELVC SOFTWARE - VERSION 4.6**

Software and Operation Manual

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# Section 1 - Software Description

The Brookfield Viscosity Controller software (BELVC) is multiple station process controller software designed specifically for Brookfield's AST-10X series process viscometers. It receives viscosity and temperature data continuously from the AST-10X viscometer. The system controls fluid viscosity to a set point in a wide variety of industrial applications such as coatings, inks, slurries and many other process fluids. The BELVC can manage up to 12 stations simultaneously. For the purpose of this manual, 12 stations are displayed on most screens.

The BELVC is installed on a computer with a Human Machine Interface (HMI) providing a graphical touch screen display to enable configuration of the process parameters as required. The software is intuitive, easy to use, and designed to function in a manner that will meet and exceed the customer requirements.

The BELVC is the software used in the following products AST-330SY (UNO), AST-350SY (DUO), & AST-420SY (MULTIPLO):



# Section 2 - Operation

The AST-335SY controller is designed to measure and control both viscosity and pH of water-based printing inks coatings. Our programming manual is arranged to show both viscosity and pH control schemes in separate sections.

## 2.1 User Interface Section Description

The main window of the application is divided into sections.

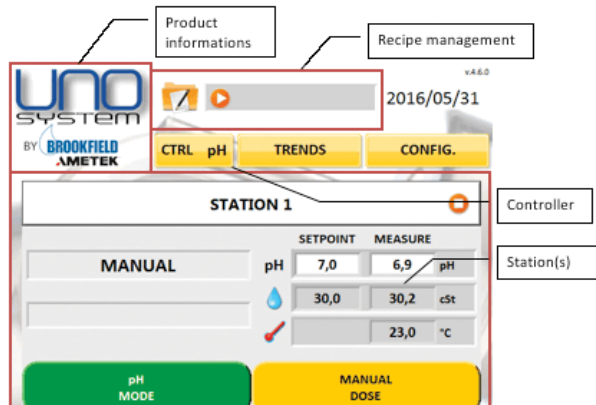


Figure 2-1

- Product Information : Logo of the product and version of the controller.
- Recipe Management : Recipe name. If touched, it opens the “Recipe Management” screen.
- CTRL : Active controller. Used for a system that has multiple controller types.
- TRENDS : Opens the “Trends” screen.
- CONFIG : Opens the “Configuration” screen.
- Station(s) : If available, displays the status and allows controller operation for each station.

## 2.2 Main Menu Functions

The following is an application example with descriptions and functionality of the buttons, graphs and display boxes located on the various screens. The lowest (Manager) security level is set.

### 2.2.1 Controller Selection

Pressing the CTRL button located on the menu bar will toggle the access to the viscosity and pH controller.



Figure 2-2: pH Controller



Figure 2-3: Viscosity Controller

### 2.2.2 Mode Button

When this button is pressed, a window opens displaying the list of all possible modes. The actual mode in operation is darkened.



**Figure 2-4**  
*General Interface*



**Figure 2-5**  
*Interface with viscosity in seconds*

Manual.....Go to Manual mode  
 Learn / Calibration.....Go to Learn or Calibration mode  
 Auto.....Go to Auto mode  
 Cancel.....Close the window

### 2.2.3 Manual Mode

When in the MANUAL Mode, the system is not controlling. Display information and graphs will be available and functions can be changed, but the system will not control until ALL ERROR alarms have been cleared and the system has been manually put back into AUTO Mode using the MODE button.



**Figure 2-6**  
*pH Controller*



**Figure 2-7**  
*Viscosity Controller*

### 2.2.3.1 Manual Dose Button

When this button is pressed, “DOSING” text is displayed in the status box. This function opens the dose valve until released, after which time the status box returns to the previous state and the valve closes.



Figure 2-8  
*pH Controller*



Figure 2-9  
*Viscosity Controller*

### 2.2.4 Learn Mode

This mode is available only when the viscosity unit is something other than “Seconds”(S). It is used to command the controller to a new set point. The controller gets a number of measures and verifies the stability of the viscosity. When the viscosity is stable, the mean measure becomes the new set point. The system goes into AUTO mode automatically. If the viscosity is unstable, the controller remains in the LEARN mode. If you press the STOP button, the operation is cancelled and you go to MANUAL mode.



Figure 2-10  
*pH Controller*



Figure 2-11  
*Viscosity Controller*

### 2.2.5 Calibration Mode (Viscosity controller only)

This mode is available only when the viscosity unit is in cup “Seconds” (S). It combines a fluid calibration, the viscosity unit, and a learn process. When you select this mode, a keypad is displayed for you to enter the actual ink measure in seconds. Then, similar to the LEARN mode, the controller obtains a number of measures and verifies the stability of the viscosity. When the viscosity is stable, the mean measure becomes the new setpoint. The system goes into AUTO

mode automatically. If the viscosity is unstable, the controller remains in the LEARN mode. If you press the STOP button, the operation is cancelled and you go to MANUAL mode.

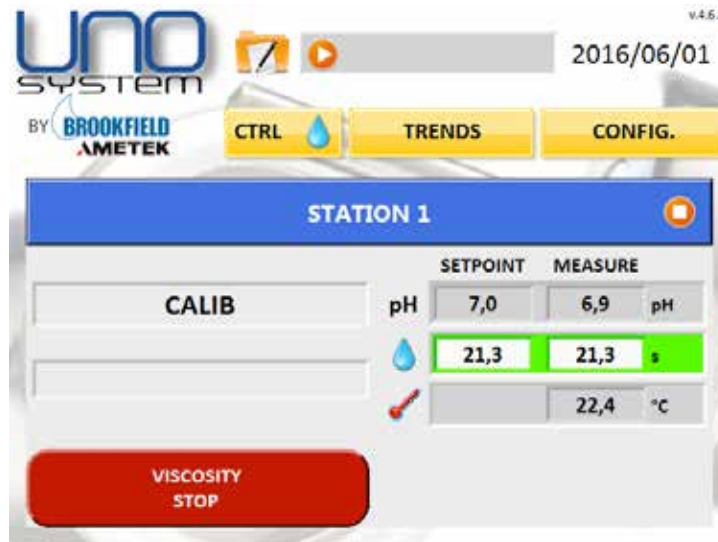


Figure 2-12

## 2.2.6 Auto Mode

The AST-10X series viscometer combined with the AST-330/350/420 controller is used to regulate the viscosity of ink or coatings in a moving process stream to ensure proper coating of the fluid onto a substrate like plastic, paper or card board.

The ink or coating is recirculated with a transfer pump in a loop from the tank to the applicator pan and back to the tank. The ink or coatings have a tendency to lose their carrier fluids (water or solvents) to the environment and the viscosity of the fluid increases. AUTO mode is designed to maintain the viscosity of the fluid to the ideal set point by adding the carrier fluid back into the process stream on an intermittent and as needed basis.

A 24VDC Feed Pump signal is needed from the Feed Pump's electrical circuit to the AST-330/350/420 indicating the circuit is energized and fluid is moving in the loop. This signal energizes the "Startup Delay" counter, which lets the fluid mix, warm and stabilize in the loop prior to making a first control measurement.

**Note:** If there is no Feed Pump signal, a PUMP STOPPED error will show on the screen and the controller will stay in MANUAL Mode until the signal is received, preventing overdosing of the carrier fluid.

The system remains in AUTO mode unless there is a system ERROR. The Operator can toggle from AUTO mode to MANUAL mode at any time to stop automatic control.

### 2.2.6.1 pH Control Process

The pH of the fluid is continuously monitored and the information is sent to the controller. The pH measured is displayed in the MEASURE box on the main screen.

The AUTO mode consists of the following cycles:


State	Description																
Startup Delay	<p>After each time the system enters into AUTO mode, the system starts counting down from the “Startup Delay” time set on the adjustable timer to zero. After expiration of the Startup Delay Timer, a repeating cycle occurs. This step occurs only when the system enters in AUTO mode.</p>  <p>The screenshot shows the UNO SYSTEM interface for Station 1. The top navigation bar includes 'CTRL pH', 'TRENDS', and 'CONFIG.' buttons. The main display area shows 'STATION 1' with a status indicator. Below this, there are two buttons: 'AUTO' and 'STARTUP'. To the right, a table displays process parameters:</p> <table border="1"> <thead> <tr> <th></th> <th>SETPOINT</th> <th>MEASURE</th> <th></th> </tr> </thead> <tbody> <tr> <td>pH</td> <td>7,0</td> <td>6,9</td> <td>pH</td> </tr> <tr> <td></td> <td>32,8</td> <td>29,8</td> <td>cSt</td> </tr> <tr> <td></td> <td></td> <td>22,8</td> <td>°C</td> </tr> </tbody> </table> <p>A red 'pH STOP' button is located at the bottom of the interface.</p>		SETPOINT	MEASURE		pH	7,0	6,9	pH		32,8	29,8	cSt			22,8	°C
	SETPOINT	MEASURE															
pH	7,0	6,9	pH														
	32,8	29,8	cSt														
		22,8	°C														

Figure 2-13




Analysis	<p>The controller compares the information and applies corrective measures if necessary. The acceptable amount of variation before an alarm is triggered is determined by the operator and is input through the Alarm Level configuration.</p>  <p>The screenshot shows the UNO SYSTEM interface for Station 1. The top navigation bar includes 'CTRL pH', 'TRENDS', and 'CONFIG.' buttons. The main display area shows 'STATION 1' with a status indicator. Below this, there are two buttons: 'AUTO' and 'STARTUP'. To the right, a table displays process parameters:</p> <table border="1"> <thead> <tr> <th></th> <th>SETPOINT</th> <th>MEASURE</th> <th></th> </tr> </thead> <tbody> <tr> <td>pH</td> <td>6,9</td> <td>6,9</td> <td>pH</td> </tr> <tr> <td></td> <td>32,8</td> <td>29,3</td> <td>cSt</td> </tr> <tr> <td></td> <td></td> <td>22,3</td> <td>°C</td> </tr> </tbody> </table> <p>A red 'pH STOP' button is located at the bottom of the interface.</p>		SETPOINT	MEASURE		pH	6,9	6,9	pH		32,8	29,3	cSt			22,3	°C
	SETPOINT	MEASURE															
pH	6,9	6,9	pH														
	32,8	29,3	cSt														
		22,3	°C														

Figure 2-14



State	Description
Control	<p>As in pH falls, due to evaporation of water or of some other adjusting fluid, the controlled injection of fluid into the ink is made to return the pH to the set point value.</p> <p>The calculation of the dosing time is defined by the following formula:</p> $(\text{SetPoint (pH)} - \text{Measure (pH)}) \times \text{Correction Factor } \left(\frac{s}{\text{pH}}\right) = \text{Injection Time(s)}$ <p>To allow a fluid injection, the injection time must be higher or equal to the “Minimum” injection time value configured. In addition, the injection time is limited to the “Maximum” injection time configured.</p>  <p style="text-align: center;"><b>Figure 2-15</b></p>
Mixing	<p>In order to ensure precise pH measurements along with stable control, the controller has built-in routines with a determined mixing time delay. These delays help eliminate wide variations in pH caused by excessive fluid injections during the control cycle.</p>  <p style="text-align: center;"><b>Figure 2-16</b></p>



**Note:** Pressing “STOP” will toggle back and forth from AUTO mode to MANUAL mode.

### 2.2.6.1 Viscosity Control Process

The viscosity of the fluid is continuously monitored and the information is sent to the controller. The viscosity measured is displayed in the MEASURE box on the main screen.

The AUTO mode consists of the following cycles:

State	Description
Startup Delay	<p>After each time the system enters into AUTO mode, the system starts counting down from the “Startup Delay” time set on the adjustable timer to zero. After expiration of the Startup Delay Timer, a repeating cycle occurs. This step occurs only when the system enters in AUTO mode.</p>  <p style="text-align: center;">Figure 2-17</p>
Analysis	<p>The controller compares the information and applies corrective measures if necessary. The acceptable amount of variation before an alarm is triggered is determined by the operator and is input through the Alarm Level configuration.</p>  <p style="text-align: center;">Figure 2-18</p>

State	Description
Control	<p>As in viscosity rises, due to evaporation of water or of some other adjusting fluid, the controlled injection of fluid into the ink is made to return the viscosity to the set point value.</p> <p>The calculation of the dosing time is defined by the following formula:</p> $(\text{Measure (u)} - \text{SetPoint (u)}) \times \text{Correction Factor (} \frac{\text{s}}{\text{u}} \text{)} = \text{Injection Time(s)}$ <p>To allow a fluid injection, the injection time must be higher or equal to the “Minimum” injection time value configured. In addition, the injection time is limited to the “Maximum” injection time configured.</p>  <p style="text-align: center;"><b>Figure 2-19</b></p>
Mixing	<p>In order to ensure precise viscosity measurements along with stable control, the controller has built-in routines with a determined mixing time delay. These delays help eliminate wide variations in viscosity caused by excessive fluid injections during the control cycle.</p>  <p style="text-align: center;"><b>Figure 2-20</b></p>

**Note:** Pressing “STOP” will toggle back and forth from AUTO mode to MANUAL mode.

### 2.2.7 Viscosity Setpoint

Pressing the SETPOINT indicator on the Main screen will open the viscosity setpoint screen, and a keypad screen will open. Enter the desired setpoint value from 0-3,300 cSt, and then press OK.

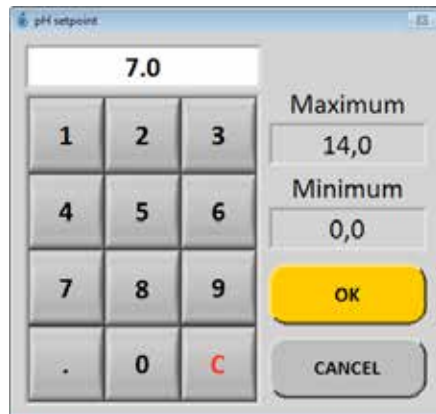


Figure 2-21  
*pH Controller*

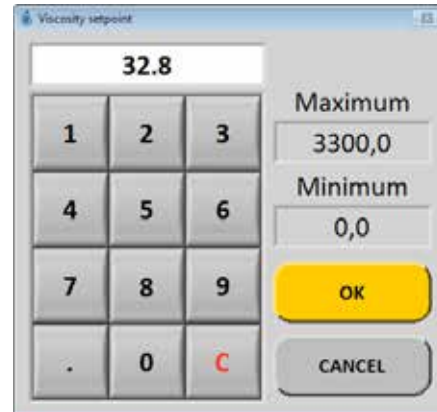


Figure 2-22  
*Viscosity Controller*

### 2.2.8 Ink Color

When on the Main screen, press the box at the top of the station's display and you will open the screen below. The background color of the box at the top of the station's display can be changed to represent the actual ink color of the print station. Choose the color spectrum in the large rectangular box. Choose the specific color in the narrow rectangle with the blue arrow.



Figure 2-23

## 2.3 Errors

Various functions and errors, such as Dosing, Feed Pump Error, Pump Stopped, Emergency Stop are also displayed in this area when activated as noted below.

### 2.3.1 Pump Stopped Error

The control system is designed to prevent control operation and displays "PUMP STOPPED" in the status box, unless a 24 VDC contact for a feed pump or other process parameter (ie: robot dipping or tank warming up) is found at the Feed Pump (see Appendix A: Instrument Wiring Diagrams).

If a Feed Pump is used, remove the jumper for the desired station at the Feed Pump Terminal Blocks and wire a 24VDC pump input to the Terminal Block.

**Note:** The viscosity system will automatically go into MANUAL Mode once this error is detected. When the PUMP STOPPED error is corrected, the system will need to be manually transferred back to AUTO Mode.



**Figure 2-24**  
*pH Controller*



**Figure 2-25**  
*Viscosity Controller*

### 2.3.2 Emergency Stop Error

The control system is designed to prevent control operation and displays “EMERGENCY STOP” in the status box unless a 24 VDC contact for an Emergency Stop Button is found. If the Emergency Stop is used, remove the jumper at the E-stop switch Terminal Blocks and wire the switch there.

**Note:** Viscosity system will automatically go into MANUAL Mode once this error is realized. Once the Emergency Stop is released, the system will need to be manually transferred back to AUTO Mode.



**Figure 2-26**  
*pH Controller*



**Figure 2-27**  
*Viscosity Controller*

### 2.3.3 PLC Communication Link Error

The HMI or user interface peripheral is linked by Ethernet to the PLC. The PLC COM ERROR

identifies that the Ethernet link between the PC and the PLC is disconnected or in a bad condition. When in this error mode, the viscosity controller stays idle and no control is available until the communication is re-established.



**Figure 2-28**  
*pH Controller*



**Figure 2-29**  
*Viscosity Controller*

To solve this error, check the status of the Ethernet link. If the error is still there, reboot the system.

### 2.3.4 MemoRail Error (*pH controller only*)

If the pH electrode or transmitter is not connected, MEMORAIL error shows on the screen and the controller will stay in its operation mode, in idle state, until the signal is received, preventing overdosing of the carrier fluid.



**Figure 2-30**

### 2.3.5 AST-100 Communication Error (*Viscosity controller only*)

The PLC is linked by RS-485 to the AST-100 viscometer transmitter. This error identifies that the RS-485 link between the PLC and the AST Transmitter is disconnected or in a bad condition.

When in this error mode, the viscosity controller stays idle and no control is available until the communication is re-established.



Figure 2-31

### 2.3.6 No Ink is Detected by the Viscometer

When the controller unit is in “Seconds” (S) and you try to calibrate the system without ink in the fluid chamber, you receive the following warning message:

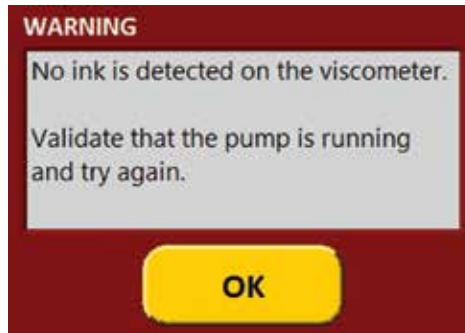


Figure 2-32

### 2.4 Trend Graphs

The trend graph presents the trends of the viscosity and the temperature. The measure is represented by a continuous line and its set point by a dotted line. The user can select the trends that he wants to see on the graph with the buttons below. The green line represents the viscosity and the red line represents the temperature.

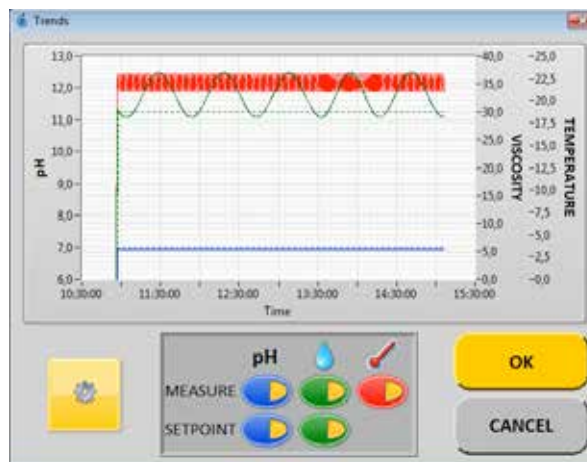


Figure 2-33

### 2.4.1 Trend Configuration

When the user presses the “Gear” button on the Trends user interface, the screen below will be displayed.



Figure 2-34

The **Acquisition Interval** determines the period of time in which the data is recorded on the buffer.

The **Historic** value specifies the window size of data displayed on the graph. This value can be set between “Acquisition Interval” value and (“Acquisition Interval” x 3000) as required. The maximum value of the historic is 24 hours.

The maximum buffer size of the graph is fixed to 3000 samples.

The relation between these two registers is defined by the following formula:



$$\frac{\text{Historic}(h) \cdot 60 \left(\frac{m}{h}\right) \cdot 60 \left(\frac{s}{m}\right)}{\text{AcquisitionInterval} \left(\frac{s}{\text{sample}}\right)} = 3000(\text{sample})$$

### 2.5 Recipes

The “Recipe” interface allows the user to save, open, and delete existing recipe parameters. The recipe menu is accessible via the following indicator on the main screen:



Figure 2-35

Each station has an icon,  or , indicating that the station is used by the recipe or not.

The recipe parameters include:

- Ink color
- pH
  - Set point
  - Alarm levels
  - Startup delay
  - Correction factor
  - Mixing time
  - Injection time minimum
  - Injection time maximum
- Viscosity
  - Set point
  - Alarm levels
  - Startup delay
  - Correction factor
  - Mixing time
  - Injection time minimum
  - Injection time maximum
  - Startup delay
- Temperature
  - Unit

### 2.5.1 Running Job (Main Screen)

The main user interface displays the running recipe with its information.

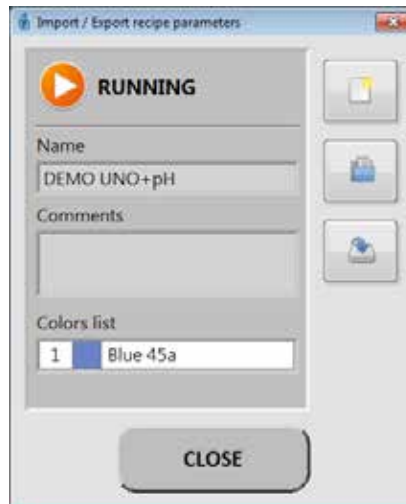


Figure 2-36

When you press:

- “Running” button goes into edit mode - see “Edit Recipe” section.
- “New” button goes to “New Recipe” procedure - see “New Recipe” section.
- “Open” button goes to “Open Recipe” procedure - see “Open Recipe” section.
- “Save” button goes to “Save Recipe” procedure - see “Save Recipe” section.

## 2.5.2 New Recipe

The **New** button allows creating a recipe.

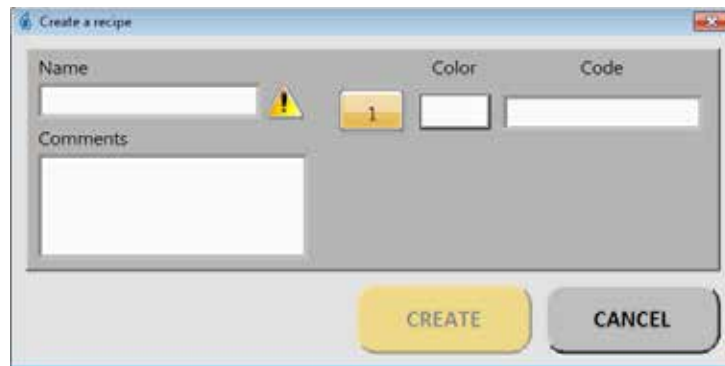


Figure 2-37

To create a recipe, fill in the following information:

### Required

- Valid **name** for the recipe. The validation status of the name is given by the icon at the right of the name field.
- At least 1 **station** enabled.

### Optional

- Recipe **comments**
- **Color** associated to the station
- **Code** associated to the station

The “CREATE” button is disabled until the recipe meets the requirements.

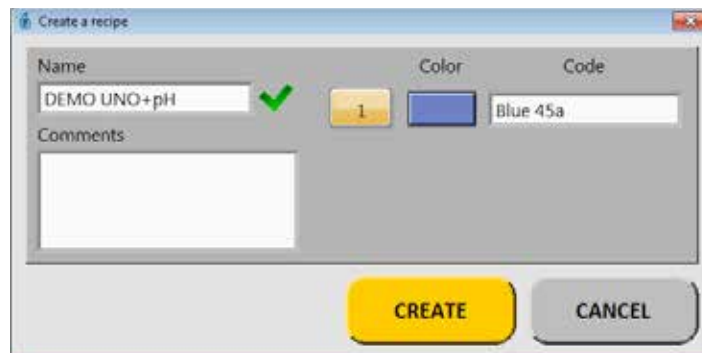


Figure 2-38

## 2.5.3 Open a Recipe

The list presents the recipes available on the hard drive. The arrow keys allow navigation in the list.

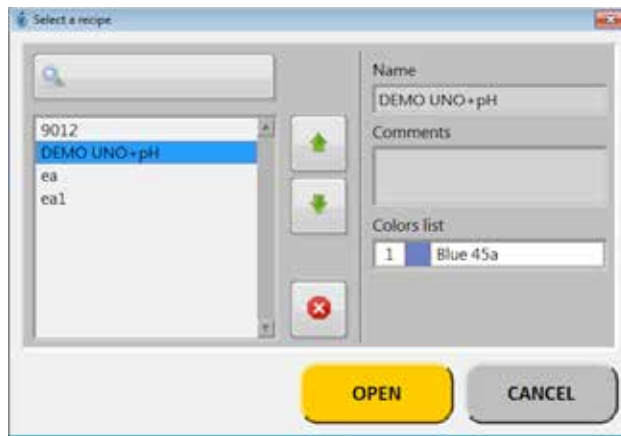


Figure 2-39


At the left, the recipes are listed according to the filter parameter (if defined).

At the right, the information for the selected recipe is displayed.

- Name
- Comments
- Station list where each entry includes:
  - Last used position
  - Color
  - Code

The Open button opens the “Edit Recipe” window. This operation configures the importation of the recipe parameters.

### 2.5.3.1 Search Recipe

The  search button allows application of a filter to the list of recipes. This filter field is not case sensitive. The result list contains recipe names where the filter is part of the file name.

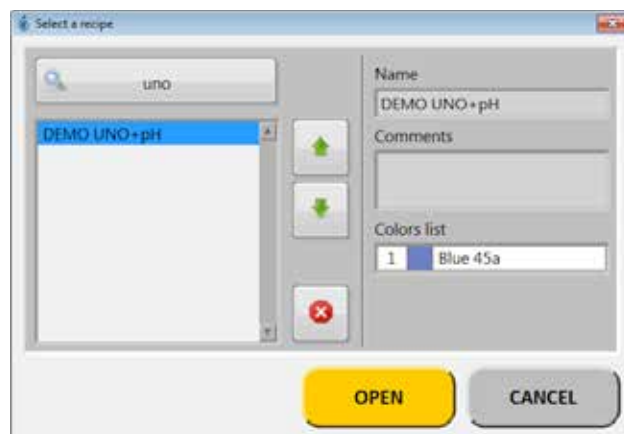



Figure 2-40

### 2.5.3.2 Delete a Recipe

The  Delete button allows for deleting of the recipe file. A dialog box will be displayed for confirmation of the action.

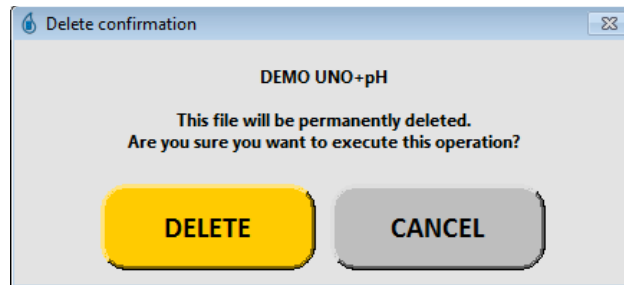


Figure 2-41

### 2.5.4 Edit a Recipe

Editing a recipe allows the following parameters to be changed.

- Recipe comments
- Station color
- Station code

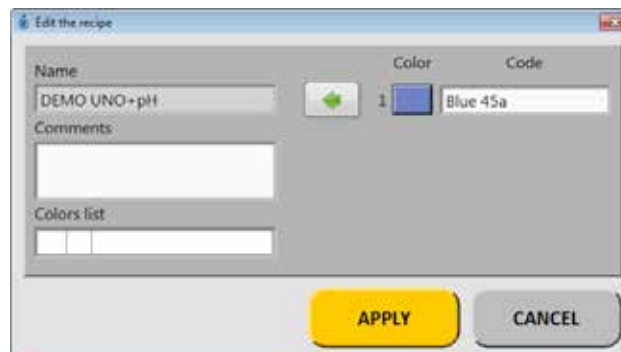


Figure 2-42

**Apply** button is available only when all colors are reassigned to a station.

#### 2.5.4.1 Move a Station

When editing a recipe, it is possible to move a station without losing parameters.

How to proceed:

1. Remove the color assigned to the station by pressing the left arrow. The color is now on the “Color list”.
2. Select the color to be assigned from the “Color list”.
3. Move the selected color to a specific station by pressing the right arrow.

### 2.5.5 Save a Recipe

The Save button allows export of recipe parameters.



Figure 2-43

### 2.5.6 Modification Detected

If the running recipe was modified since the last save and you try to import a recipe (new or existing), you will get a reminder message.

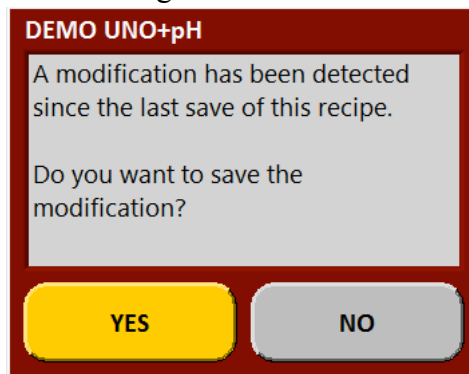


Figure 2-44

# Section 3 - Setup Menu Functions

From the main screen, when the button “CONFIG” is pressed, the Configuration menu opens. This screen allows the choice of two different types of settings - SYSTEM or STATION.



Figure 3-1

## 3.1 Login/Logout

Some specific system and station parameters have limited access. Several accounts exist, but this documentation explains two of these:

- Operator
- Manager

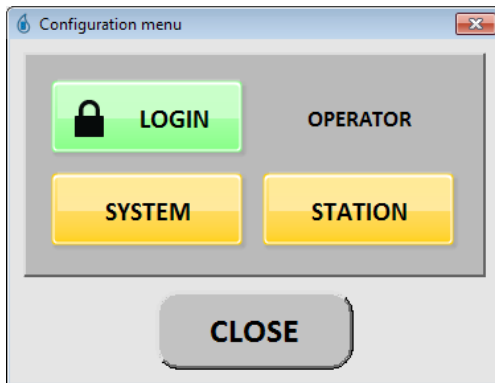


Figure 3-2

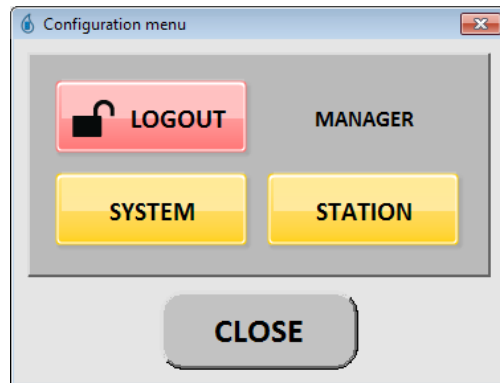


Figure 3-3

### 3.1.1 Access List

This table lists the access information for different accounts.

Legend:

- : Access granted
- : Read only

	Operator (logout)	Manager
Password	None	9985
<b>Controller</b>		
Setpoint	●	●
<b>Trends</b>		
Graphic Display	●	●
Parameters		
- Sample rate	○	●
- Historic	○	●
<b>Recipe</b>		
New	●	●
Open	●	●
Edit	●	●
Save	●	●
Delete		●
<b>System</b>		
Language	●	●
Unit		●
Date & Time		●
<b>Controller parameters</b>		
General Information	●	●
Alarm levels		
- Yellow	○	●
- Red	○	●
Auto mode		
- Startup delay	○	●
- Correction factor	○	●
- Mixing time	○	●
Injection time		
- Minimum	○	●
- Maximum	○	●

## 3.2 System Configuration

System configuration allows the system parameters to be changed.



Figure 3-4

### 3.2.1 Language Configuration

This screen allows the user to select from one of the languages available. This selection can be made at any time.



Figure 3-5

### 3.2.2 Unit

This configuration tab is divided into two sections, "Temperature" and "Viscosity".



Figure 3-6

#### 3.2.2.1 Temperature Unit

You have the choice to display the temperature in:

- Kelvin
- Celsius
- Fahrenheit

#### 3.2.2.2 Viscosity Unit

You have the choice to display the viscosity in:

- Centistokes (cSt)
- Centipoises (cPs)
- milliPascal (mPas)
- Seconds (s)

The unit of centistokes doesn't need additional configuration. This is the simplest way to control the ink viscosity.

The unit of seconds needs more configurations. You need to define:

- Ink base (select “water” or “solvent”)
- Cup used to measure the ink (select cup model from drop down menu)

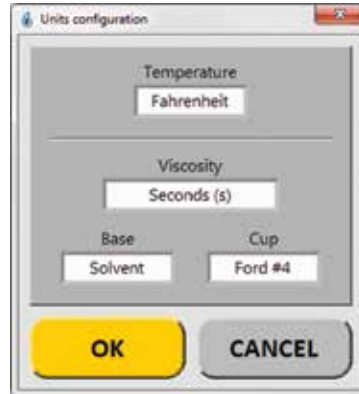


Figure 3-7

The choice of unit in seconds requires an ink calibration each time you pump a new ink on the viscometer. When you select the CALIBRATION mode, a keypad is displayed to enter the reference value of the actual ink measure in seconds. Then, similar to the LEARN mode, the controller gets a number of measures and verifies the stability of the viscosity. When the viscosity is stable, the mean measure becomes the new set point and the system goes into AUTO mode.

### 3.2.3 Date & Time

This screen allows the user to set the date and time of the system. Date and time parameters are displayed under international format.

- Date format: Year/Month/Day
- Time format: 24 hours



Figure 3-8

**Note** that changing the date & time will have an effect on the trends data. For this reason, it is recommended that the system be restarted after a modification.

### 3.3 Station Configuration

Station Configuration allows the parameters that affect the viscosity controller to be changed.

#### 3.3.1 Viscosity Alarm Level

From these screens, the user can enter a Viscosity High Alarm value and a Viscosity Low Alarm value.



**Figure 3-9**  
*pH Controller*



**Figure 3-10**  
*Viscosity Controller*

Press either the “High level” or “Low level” button to display a keypad where the desired values can be entered. Press Enter to display the new settings.

The blue buttons on the multi-colored bar can also be dragged to the desired value. These values are offsets from the Viscosity Setpoint.

For a brief explanation, consider the following:

- The setpoint is set to 21
- The low level (warning level) is at 5.0
- The high level (alarm level) is at 10.0

#### **Green level**

If the measured viscosity varies by no more than 5.0 from the setpoint, (i.e. from 16.0 to 26.0), then you have a GREEN light indicating an excellent viscosity condition.

#### **Yellow level**

If the measured viscosity varies by more than 5.0 but no more than 10.0 from the setpoint, (i.e. from 11.0 to 15.9 or 26.1 to 31.0), then you have a YELLOW light indicating an acceptable viscosity condition.

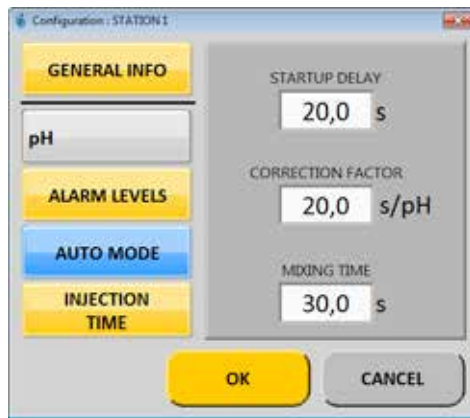
#### **Red level**

If the measured viscosity variation from the setpoint exceeds 10.0, (i.e. less than 11.0 or greater than 31.0), then you have a RED light indicating a poor viscosity condition.

**Note:** Immediate attention is required to remedy this problem.

#### 3.3.2 Auto Mode

Pressing the AUTO MODE button in the Station Configuration screen will open the Controller parameter screen. Press the desired box and a keypad will open allowing the user to set the desired timer values.



**Figure 3-11**  
*pH Controller*



**Figure 3-12**  
*Viscosity Controller*

### 3.3.2.1 Startup Delay

The Startup Delay is the amount of time that the controller will wait when it is put into AUTO Mode from the MANUAL Mode. This value can range from 10 to 60 seconds.

### 3.3.2.2 Correction Factor

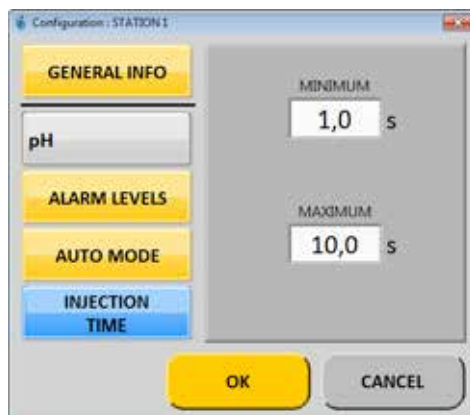
The Correction Factor is the amount of time that the system will open the injection valve based on the difference between the current viscosity measure and the set point. A correction is made only if the measure is higher than the set point. This value can be set between 0.1 and higher as required.

### 3.3.2.3 Mixing Time

The Mixing Time represents the minimum time (in seconds) between two adjustment fluid injections. This ensures that the injected fluid is well mixed with the ink, thus providing a more stable mixture.

### 3.3.3 Injection Time

Pressing the “Injection Time” button in the Station Configuration screen, will open the injection parameter screen. Press the desired box and a keypad will open allowing the user to set the desired timer values.



**Figure 3-13**  
*pH Controller*



**Figure 3-14**  
*Viscosity Controller*

### 3.3.3.1 Minimum

The Minimum value is the threshold level of time to open the correction valve. The injection command is ignored by the controller for any value below this amount of time. This value can range from 0.1 to (Maximum) seconds.

### 3.3.3.2 Maximum

The Maximum is the maximum amount of time that the valve will be opened in one correction command. This value can be set between (Minimum +2) and higher as required.

### 3.3.4 General Info

Pressing the “General Info” button, in the Station Configuration screen, will open the general information parameter screen. This allows changing of the station color and code (comments) without having to edit the recipe.



Figure 3-15

**Note** that changing this information will not update the recipe file. To save these modifications in the recipe file, see section “Save Recipe”.

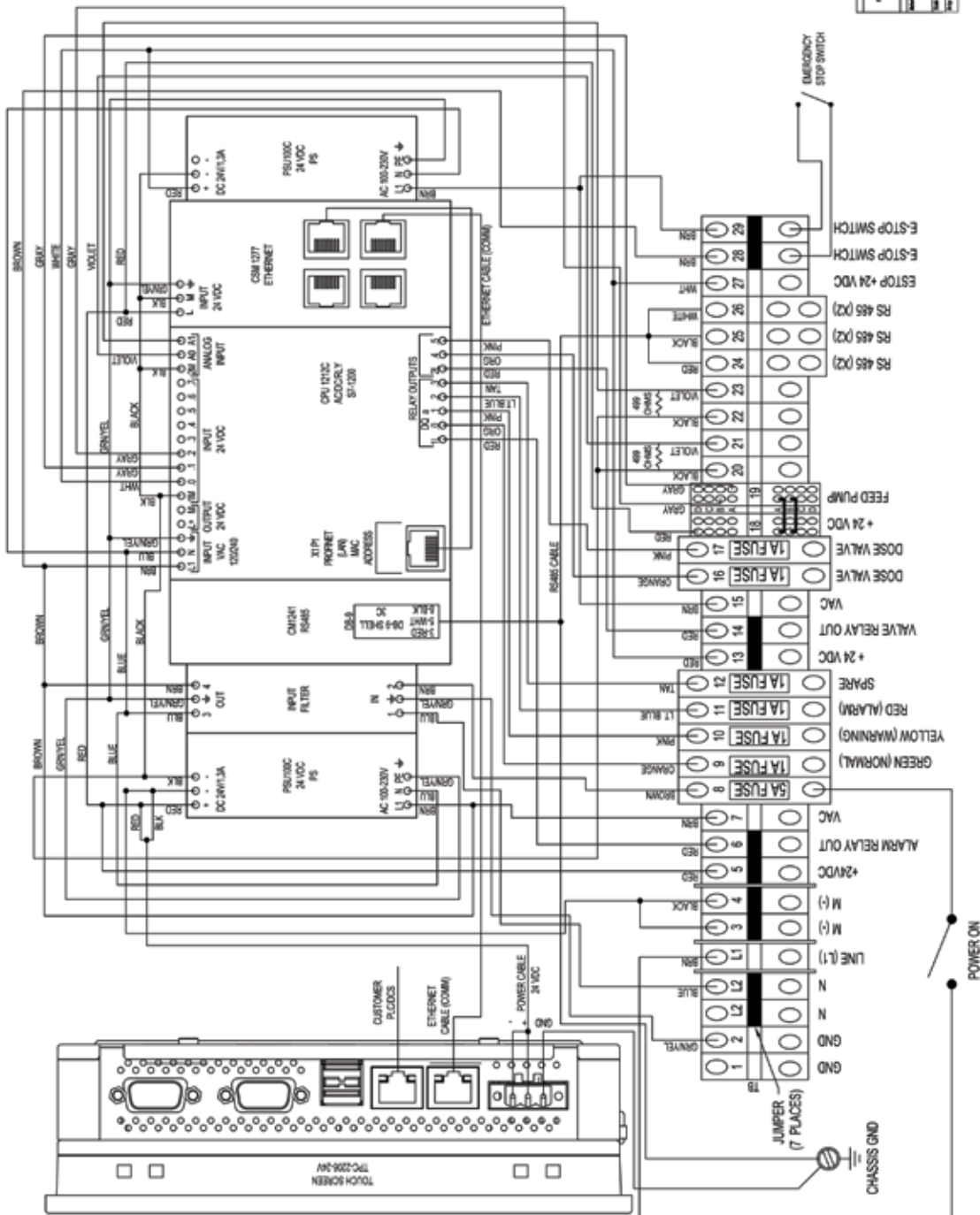
# Appendix A - Instrument Wiring Diagrams

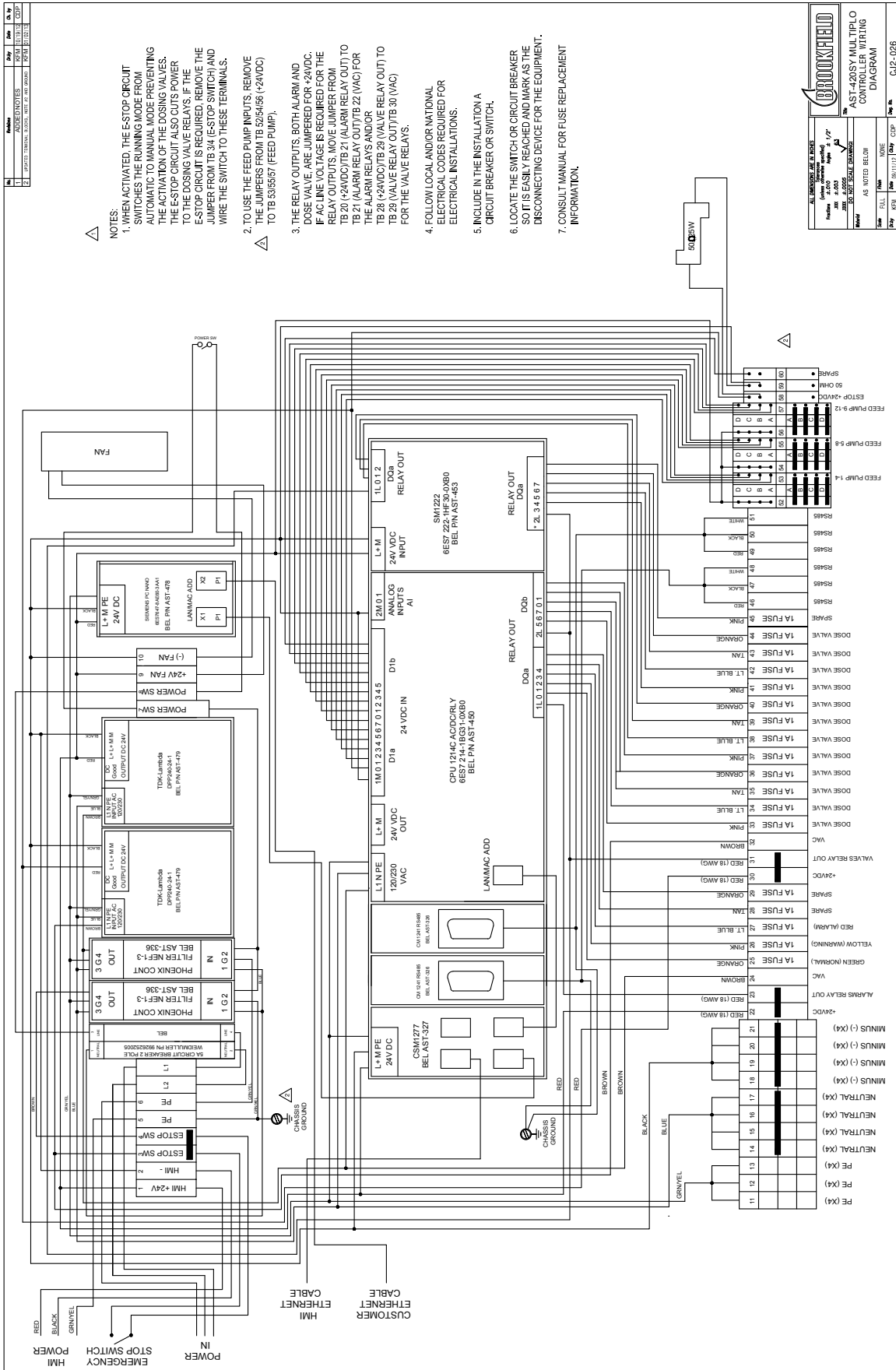
REV	DATE	BY	CHK
1	01/15/13	WJ	WJ
2	02/15/13	WJ	WJ
3	03/15/13	WJ	WJ
4	04/15/13	WJ	WJ
5	05/15/13	WJ	WJ
6	06/15/13	WJ	WJ
7	07/15/13	WJ	WJ
8	08/15/13	WJ	WJ
9	09/15/13	WJ	WJ
10	10/15/13	WJ	WJ
11	11/15/13	WJ	WJ
12	12/15/13	WJ	WJ

**NOTES:**

1. WHEN ACTIVATED, THE E-STOP CIRCUIT SWITCHES THE RUNNING MODE FROM AUTOMATIC TO STANDBY MODE PREVENTING THE ACTIVATION OF THE DOSING VALVES. THE E-STOP CIRCUIT ALSO CUTS POWER TO THE DOSING VALVE RELAYS. IF THE E-STOP CIRCUIT IS REQUIRED, REMOVE THE JUMPER FROM TB 2829 (E-STOP SWITCH) AND WIRE THE SWITCH TO THESE TERMINALS.
2. TO USE THE FEED PUMP INPUTS, REMOVE THE JUMPERS FROM TB 18A (1-2VDC) TO TB 18A (FEED PUMP) AND FROM TB 18B (1-2VDC) TO TB 18B (FEED PUMP). WIRE 24 VDC FEED PUMP SIGNAL TO STATION 1 ON TB 18A AND STATION 2 ON TB 18B.
3. THE RELAY OUTPUTS, BOTH ALARM AND DOSE VALVE, ARE JUMPED FOR +24VDC. THE VALVE RELAYS ARE JUMPED FOR THE RELAY OUTPUTS. REMOVE THE JUMPER FROM TB 13 (ALARM RELAY OUTPUT) TO TB 8 (ALARM RELAY OUTPUT) (N/C) FOR THE ALARM RELAYS AND/OR TB 13 (1-2VDC)/TB 14 (VALVE RELAY OUTPUT) TO TB 14 (VALVE RELAY OUTPUT) (N/C) FOR THE VALVE RELAYS.
4. FOLLOW LOCAL AND/OR NATIONAL ELECTRICAL CODES REQUIRED FOR ELECTRICAL INSTALLATIONS.
5. INCLUDE IN THE INSTALLATION A CIRCUIT BREAKER OR SWITCH.
6. LOCATE THE SWITCH OR CIRCUIT BREAKER SO IT IS EASILY REACHED AND MARK AS THE DISCONNECTING DEVICE FOR THE EQUIPMENT.
7. CONSULT MANUAL FOR FUSE REPLACEMENT INFORMATION.

		AST-330/3500Y CONTROLLER, AST DSD WIRING DIAGRAM	
		Part No. CLEP-037	Rev. 1.0
Date: 01/15/13	Drawn: WJ	Date: 01/15/13	Check: WJ
App: WJ	Title: WJ	Date: 01/15/13	Check: WJ





- NOTES:**
1. WHEN ACTIVATED, THE E-STOP CIRCUIT SWITCHES THE RUNNING MODE FROM AUTOMATIC TO MANUAL MODE PREVENTING THE ACTIVATION OF THE DOSING VALVES. THE E-STOP CIRCUIT ALSO CUTS POWER TO THE DOSING VALVE RELAYS. IF THE E-STOP CIRCUIT IS REQUIRED, REMOVE THE JUMPER FROM TB 34 (E-STOP SWITCH) AND WIRE THE SWITCH TO THESE TERMINALS.
  2. TO USE THE FEED PUMP INPUTS, REMOVE THE JUMPERS FROM TB 32&46&6 (±24VDC) TO TB 33&55&7 (FEED PUMP).
  3. THE RELAY OUTPUTS, BOTH ALARM AND DOSE VALVE, ARE JUMPERED FOR ±24VDC. IF AC LINE VOLTAGE IS REQUIRED FOR THE RELAY OUTPUTS, MOVE JUMPER FROM TB 20 (±24VDC/TB 21 (ALARM RELAY OUTPUT) TO TB 21 (ALARM RELAY OUTPUT/TB 22 (VAC) FOR THE ALARM RELAYS AND/OR TB 28 (±24VDC/TB 29 (VALVE RELAY OUTPUT) TO TB 29 (VALVE RELAY OUTPUT/TB 30 (VAC) FOR THE VALVE RELAYS.
  4. FOLLOW LOCAL AND/OR NATIONAL ELECTRICAL CODES REQUIRED FOR ELECTRICAL INSTALLATIONS.
  5. INCLUDE IN THE INSTALLATION A CIRCUIT BREAKER OR SWITCH.
  6. LOCATE THE SWITCH OR CIRCUIT BREAKER SO IT IS EASILY REACHED AND MARK AS THE DISCONNECTING DEVICE FOR THE EQUIPMENT.
  7. CONSULT MANUAL FOR FUSE REPLACEMENT INFORMATION.

**BROOKFIELD**  
**AST-420SY MULTIPLO CONTROLLER WIRING DIAGRAM**

Model: AST-420SY  
 Part No: M13-5905-E0317  
 Rev: 1.0  
 Date: 08/11/12

AS NOTED BELOW

Doc No: C-02-026

# Appendix B - Troubleshooting

## B.1 Viscosity Values are 0.0:

- Check Viscosity Units and ensure the units have been selected appropriately.
- Check connections of cable from RS-485 terminals in AST-100/200 transmitter (see transmitter operation manual) to RS-485 in controller enclosure.
- Make sure the power is applied to AST-100/200 Transmitter first before starting the Controller.

## B.2 Blank HMI Screen:

- Check to make sure that the power to the HMI is connected properly.

# Appendix C - Warranty Information and Guarantee

We hereby guarantee this Brookfield Viscometer to be free from defects in workmanship and materials. If found to be defective in workmanship or materials upon being returned, within one year from the date of purchase to our factory, it will be repaired or replaced at the factory without charges. Transportation charges shall be at the owner's expense.

However, if upon being so returned and after inspection, we determine that the instrument has been subjected to tampering, careless handling, improper or faulty application or installation, the above guarantee shall not be applicable and we shall have the right in any such case to make a charge to cover the cost of repairs or servicing. Brookfield assumes and shall have no liability for consequential damages resulting from the use or misuse of the instrument.

The foregoing guarantee is in lieu of all other guarantees or warranties, expressed or implied, and of all other obligations or liabilities, contractual or otherwise, either to the original purchaser of said instrument or to any other person whomsoever.

# Appendix D - Customer Support & Repair

Use the following information to contact Brookfield for technical assistance or service:

**AMETEK Brookfield**  
11 Commerce Boulevard  
Middleboro, Massachusetts 02346 U.S.A.  
TEL: 508-946-6200; 800-628-8139 (USA only)  
FAX: 508-946-6262  
EMAIL: MA-MID.sales@ametek.com

Please have the following information available when calling so that we may assist you:

- Product Part Number
- Product Serial Number
- Product Application
- Specific Problem Area
- Hours of Operation
- Equipment Type

## Instrument Repair Procedure and Guidelines

In the event that your Process Viscometer should require factory maintenance, AMETEK Brookfield has provided the following guidelines and recommendations to follow to ensure a prompt turn around time for all repaired items.

Before returning any Brookfield Process Viscometer, please contact our Process Service/Sales Department to obtain a Return Authorization Number. This will ensure that your instrument is routed to the proper Repair Department when received. Unnecessary delays may result when “unannounced” repairs arrive at our facility and have to be sorted and routed outside standard procedures. To contact the Process Service/Sales Department, please call 508-946-6200 or 800-628-8139 (USA Only); or you may prefer to email us at MA-MID.sales@ametek.com.

Please be sure to follow these guidelines when returning your instrument:

1. Make sure the Return Repair Form received from us is completely filled out with the correct information.
2. Ensure that the MSDS section of the Return Repair Form is completed and any applicable MSDS sheets are also included with your instrument to be repaired. Failure to comply with MSDS regulations may result in repair delays.
3. Including a Purchase Order with your Repair Form will allow us to complete repairs to a specified dollar amount determined by the product type, and thereby, bypassing the need to complete an “Estimate of Repair” to submit for your approval. If you wish to be informed of repair cost before proceeding, please specify on the Repair Form.
4. Out method of return shipment is via FedEx. Should you prefer a different method or wish to charge to your carrier account number, be sure to include this information.

