HL2 Controller

Technical Manual

Version 1.2

Steltec Inc.

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1 Introduction

HL Series ORP/pH Control Systems feature Steltec's proprietary NTL control logic. NTL has been designed to provide precision control of water chemistry, so you use less chemical. However, the system is robust enough to handle unexpected variations in your plant's incoming flow.

About HL2

HL 2 is a dual channel ORP/pH controller suitable for monitoring and control in two separate basins or front and back side within municipal and industrial applications.

Inputs:

- 120/240 V AC
- ORP or pH sensor connected directly or through a remote pre-amp
- Sensor input is isolated
- Sensing accuracy: +/- 0.1% per year
- Range: -1000 to 1000 mV or 0.0 to 14.0 pH units
- Dual 4-20 mA analog input (used for flow readings)

Features:

- 5.7" color touch screen
- Live trending
- Auto-sensitivity tuning
- SD data logging
- Battery backup
- Start-up recall
- Alarm overrides
- NEMA 4X Enclosure

Outputs:

- Fully rangeable, Dual 4-20 mA recorder output with +/- 0.02 mA accuracy
- Used with devices up to 1000 ohms
- 6 relay outputs
- Two 4-20 mA feeder output
- Control modes per Channel: TBP / NTL / Monitor
- General alarm relay
- (2) 120/240 VAC, 5 amp relay for automatic sensor cleaning

Communications:

- Web-based enabled
- Modbus slave support

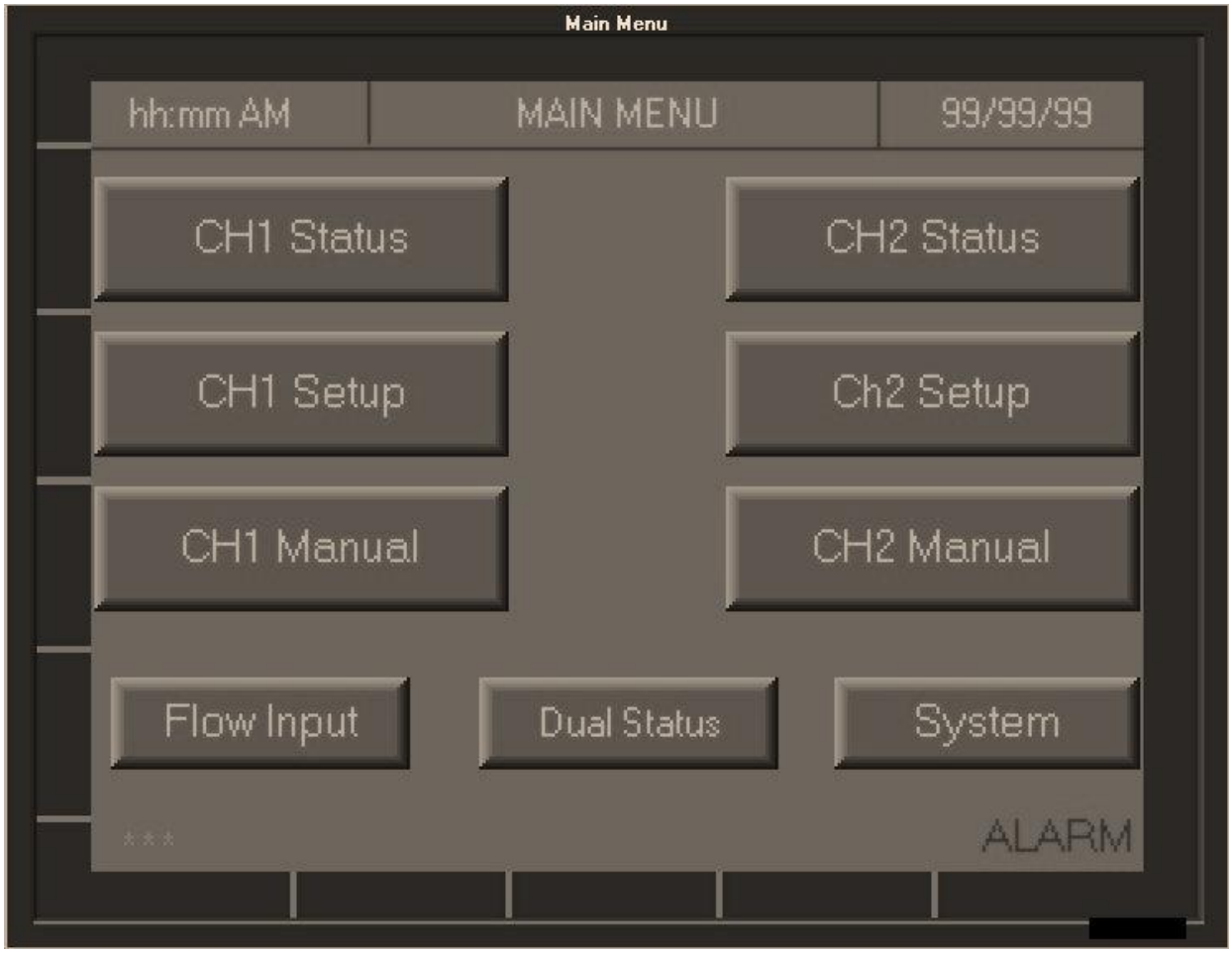
About Steltec

Founded on a combined 30+ years experience in the industry, Steltec Inc. designs and builds high quality, cutting edge water treatment controllers for municipal and industrial applications.

Steltec and its exceptional technical sales reps provide technical support for the installation, set-up and operation of their products. For assistance, please contact your sales rep or Steltec directly.

2 Main Menu

Figure 1: Main Menu Screen



CH1/CH2 Status: View the Status Screen for the current Mode

CH1/CH2 Setup: Go to the Mode selection and configuration screens

CH1/CH2 Manual: To place the controller into manual or auto

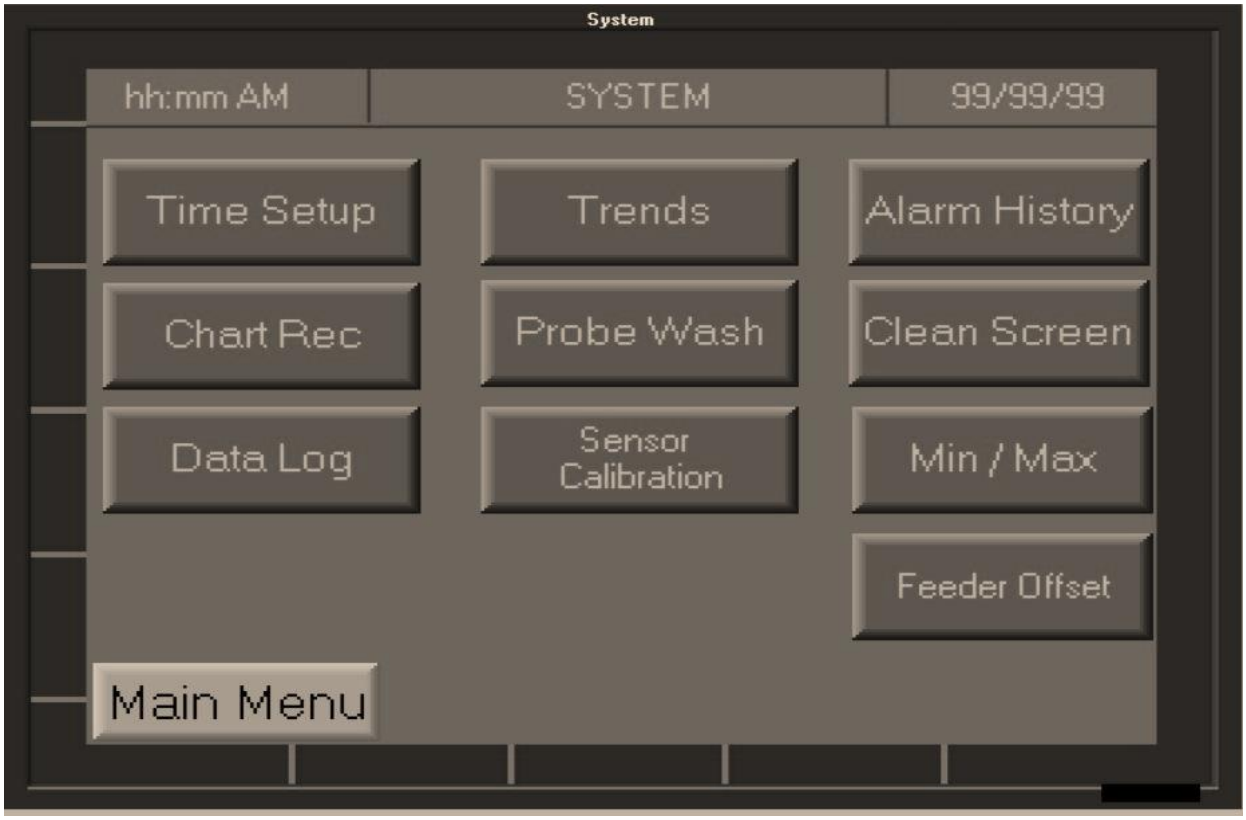
Flow Input: Go to the Flow Input setup screen

Dual Status: This button is enabled when both channels are in NTL mode

System: Go to the Systems Menu screen.

3 System

Figure 2: System Screen



Time / IP: Go to the Time and System Setup screen

Chart Rec: Go to the Chart Recorder Setup screen

Data Log: Go to the Data Log Setup and Control screen

Trends: Go to the Trends menu screen

Probe Wash: Go to the Probe Wash set-up screens

Sensor Calibration: Go to the Sensor Calibration screen

Alarm History: Show past alarms

Clean Screen: The screen will change to a blank screen with a countdown timer. Then screen can be cleaned while the timer is running. At the end of the timer the screen will revert back.

Min / Max: Will show Min and Max values of inputs

Feeder Offset: Can adjust 4-20mA output

4 Time & System Setup

This screen is used to adjust the time/date and the network settings of the system.

Figure 3: Time / System Setup Screen

Time & Date: Input the current time and date of the system in the format mm/dd/yy hh:mm:ss

IP Address: Input the IP Address for the controller

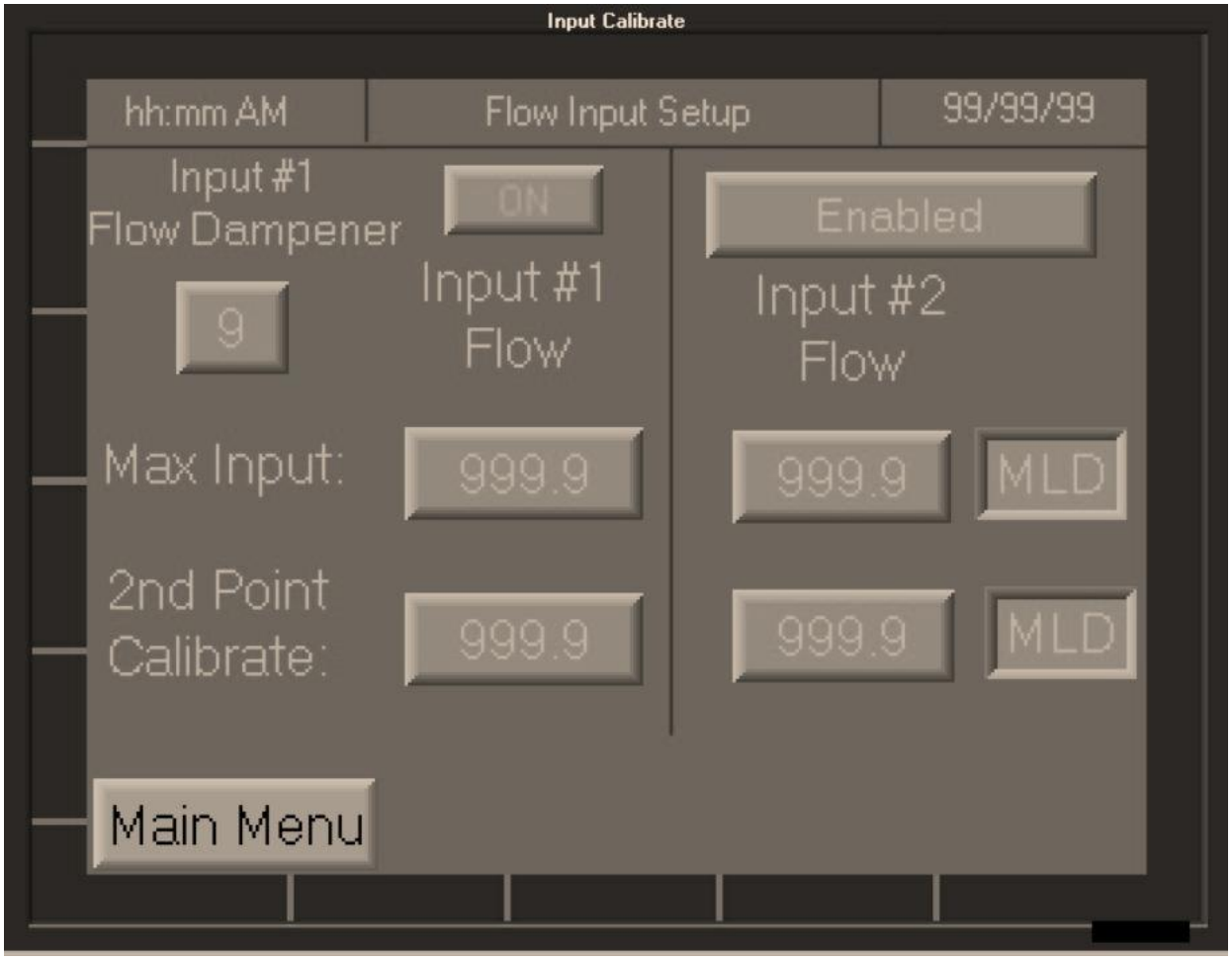
Subnet Mask: Input the Subnet Mask of the network

Gateway: Input the address of the network gateway

5 Flow Input Setup

This screen is used to calibrate how the Flow Input reading is measured.

Figure 4: Flow Input Setup Screen



Flow Dampener: If the analog signal on Input #1 is unstable, this setting will average it out over a sample range. The range can be set between 2 and 8.

The higher the range setting, the larger the dampening effect. For example, if range is set to 2, it will average the input reading out over the last 2 measurements. A range setting of 8 will use the last 8 measurements to calculate the average reading.

Max Input: Set the maximum flow that can be achieved in the application (i.e. what a 20mA reading equals.)

2nd Point Calibrate: If the flow meter reading is inaccurate, use this setting to input what current reading should be.

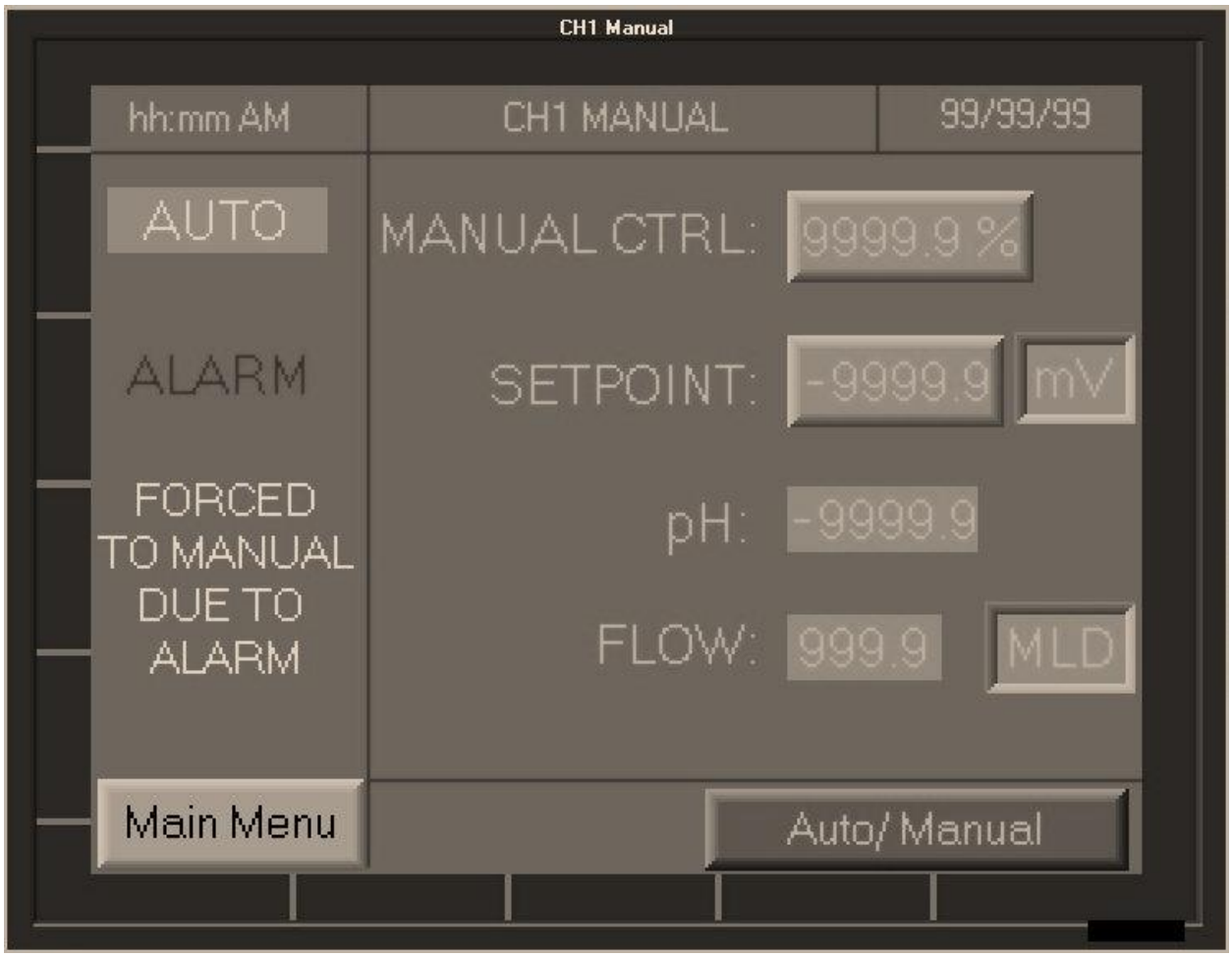
Input #2 (Enabled/Disabled): Toggles the second analog input on or off. Use Input #2 when there are two flow meters that join into one stream.

Use the "Main Menu" button to return to the Main Menu Screen.

6 Manual Control Mode CH1 / CH2

This screen controls whether the system is in Manual Mode or Auto Mode, and the control settings in each mode.

Figure 5: Manual Control Mode Screen



Auto/Manual: Toggles between Auto Mode and Manual Mode

Manual CTRL: Controls feeder speed in Manual Mode only. Enter the desired percent of feeder speed.

Set Point: Controls to the Input set point in Auto Mode only. Enter the desired Input control value.

mV/pH: Reading of current Input value.

Flow: Reading of current Flow value.

7 CH1/CH2 Setup Screens

These screens control the initial configuration of the controller. They are accessed via the “CH1 Setup” button on the Main Menu screen

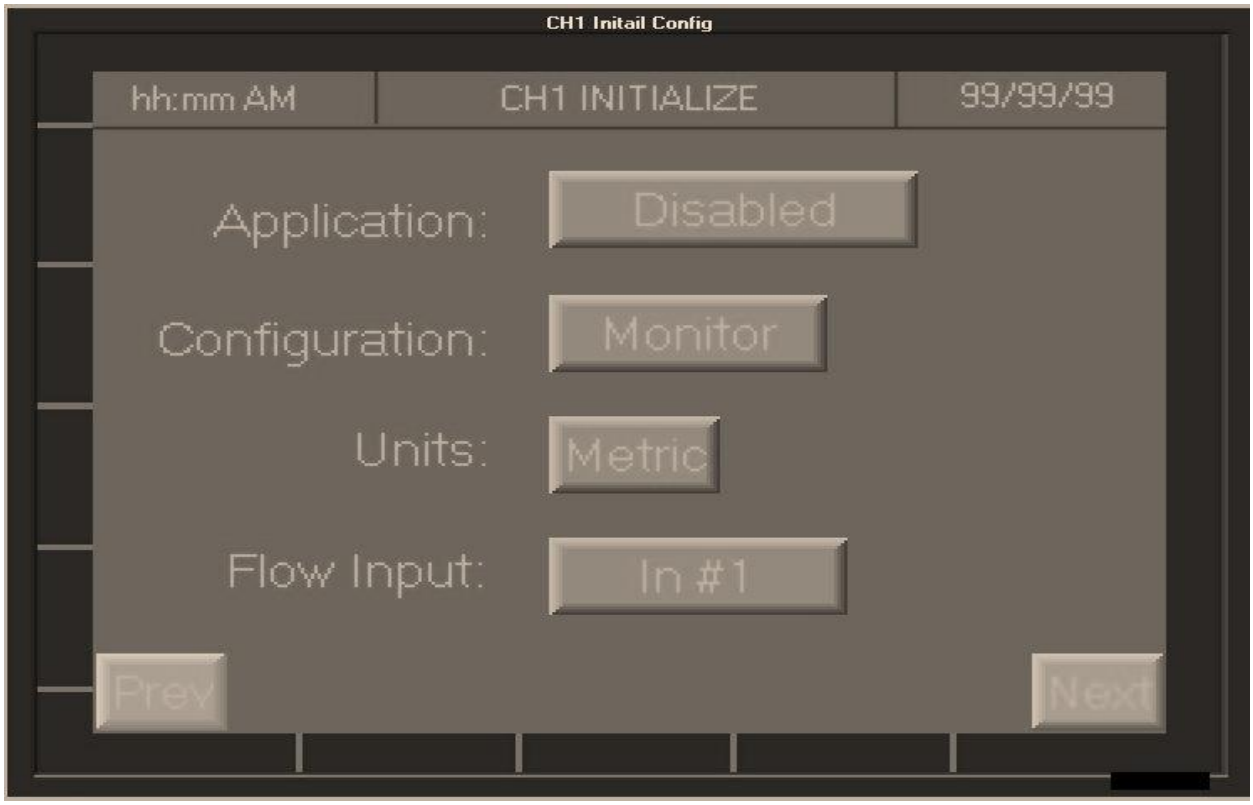
7.1 Password Screen

Users are required to input a password before accessing the Initialize Configuration screen. ***The password can be obtained from or changed by your Steltec representative.***

Figure 6: Password Screen

7.2 Initialize Configuration Screen

Figure 7: CH1 Setup/Initialize Configuration Screen



Application: Set to appropriate application.

- **Chlorination:** Also referred to as “Feed Up.” (E.g. When ORP is high, it will decrease the pump output.)
- **Dechlorination:** Also referred to as “Feed Down.” (E.g. When ORP is high, it will increase the pump output.)
- **pH:** Used for controlling pH control processes.
- **Disabled:** The controller is essentially off. All Alarms are disabled.

Configuration: Select the desired mode of control.

- **Monitor:** The controller will only display the input value (pH/ORP) and the flow.
- **Time Base:** This controller will enter Time Base Proportional (TBP) mode, an on/off type of control.
- **NTL:** This is Steltec’s proprietary control method. It uses an analog output to control the feeder, and will adjust the output as needed to keep the input value in the desired band.

Units: Sets the system of measurement to either Metric or U.S. units. CH1 sets this for both channels

- **Metric:** Select to use metric values in the setup (e.g. liters, kilograms)
- **U.S.:** Select to use the statute values or US customary units (e.g. pounds, gallons)

Flow Input: Selects the value to use for the Flow Input. CH1 sets this for both channels

- **In#1:** Uses the value from the Flow Input #1
- **In#2:** Uses the value from Flow Input #2
- **In#1+In#2:** Uses the value of both inputs added together

To continue configuration of the selected mode, press NEXT. The user will be automatically directed to the appropriate mode configuration screen (Monitor, TBP or NTL.)

8 Monitor Mode CH1 / CH2

8.1 Monitor Configuration

Monitor Configuration is a continuation of the Initialize Configuration screen when the Monitor Mode is selected. (See “Initialize Configuration” section.)

This screen is used to calibrate the controller during Monitor Mode.

Figure 8: Monitor Mode Configuration Screen

Probe Calibrate: Change the current Input reading.

Current: Current Input reading.

Press F1 to return to the Main Menu.

8.2 Monitor Status Screen

Once the Monitor mode is selected and configured via the CH1 Setup screens, the Monitor Status screen can be viewed by selecting “CH1 Status” in the Main Menu.

Figure 9: Monitor Mode Status Screen

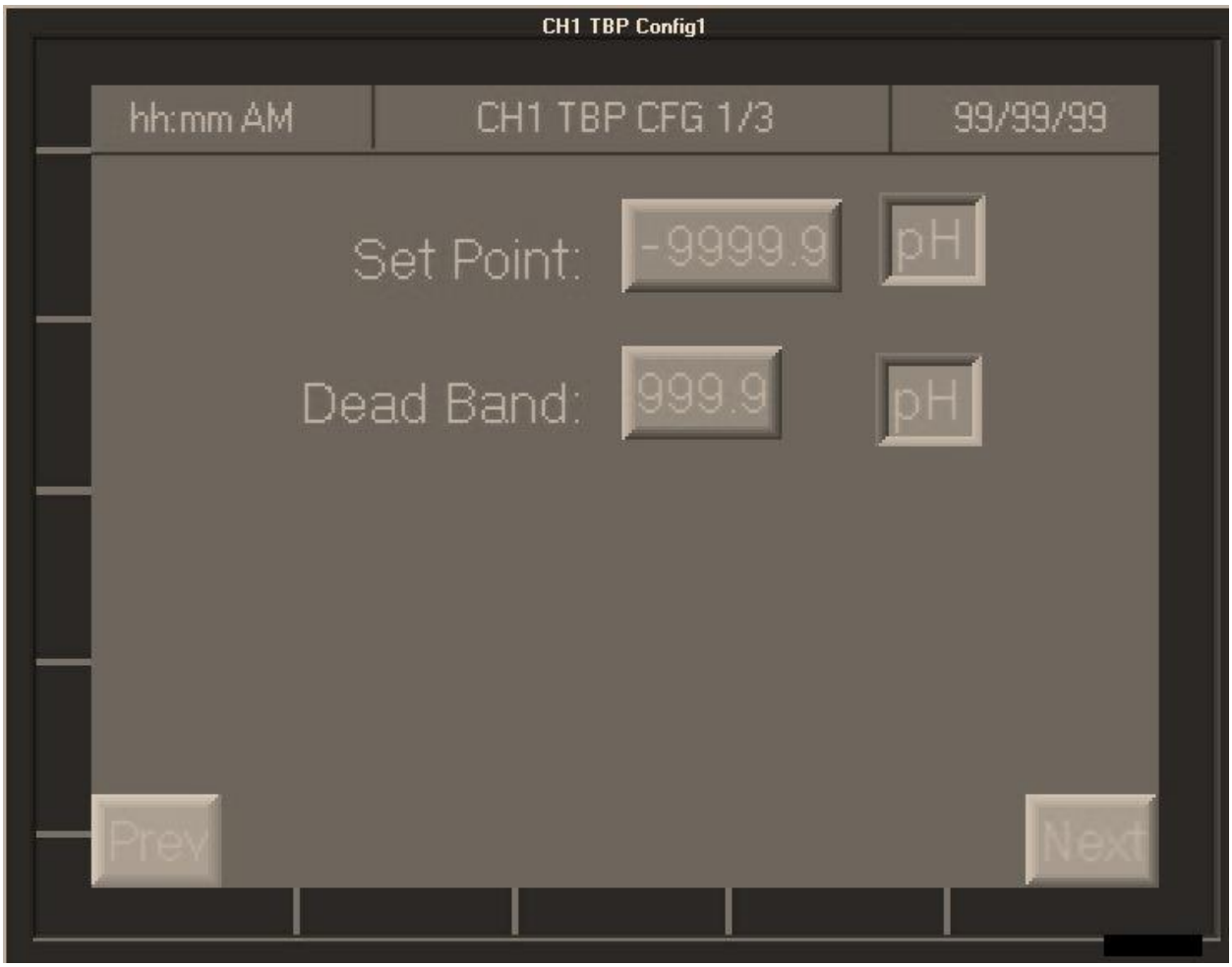
9 Time Base Proportional (TBP) Mode Ch1 / CH2

9.1 TBP Configuration

TBP Configuration is a continuation of the Initialize Configuration screen when the Time Base Mode is selected. (See “Initialize Configuration” section.)

TBP Mode is configured via a series of three configuration screens and one alarm setup screen. Use the “PREV” and “NEXT” buttons to navigate between the screens.

Figure 10: TBP Configuration Screen 1 (of 3)



Set Point: Enter the desired pH control value

Dead Band: Enter the area around the Set Point where no adjustments will be made to the output (i.e. Area = Set Point Value ± Dead Band Value)

Figure 11: TBP Configuration Screen 2 (of 3)

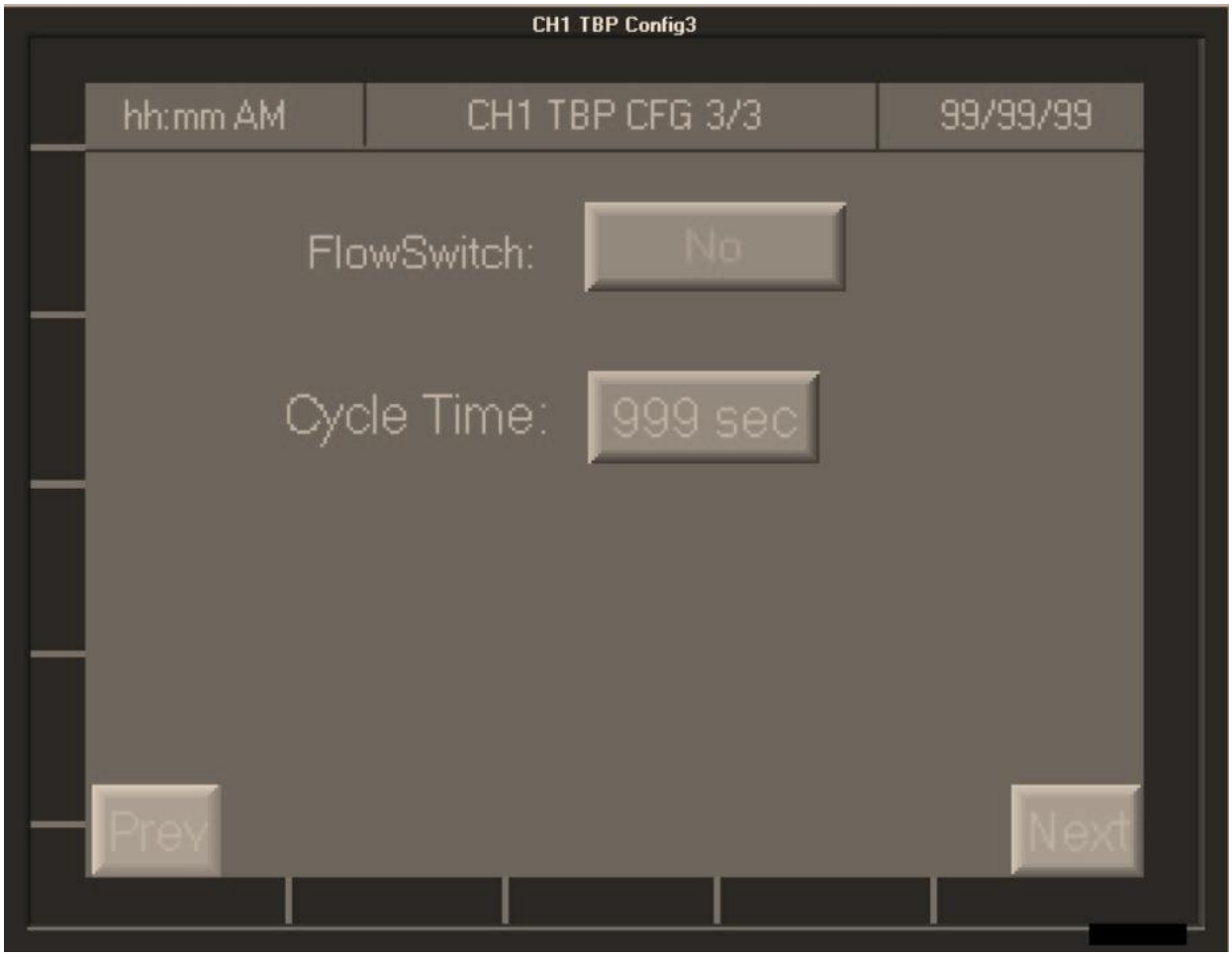
Probe Calibrate: If probe has a known value and it differs from current reading, enter the correct value here

Current: Current input reading

Feed Direction:

- **UP:** When input Value is high on time is decreased
- **DOWN:** When input value is high on time is increased

Figure 12: TBP Configuration Screen 3 (of 3)



Flow: Switch-This uses an input to Start and Stop the cycle time.

Cycle Time: Total turnover time. Only used when Flow is in Cycle mode.

Press NEXT to continue onto the TBP Alarm Setup screen.

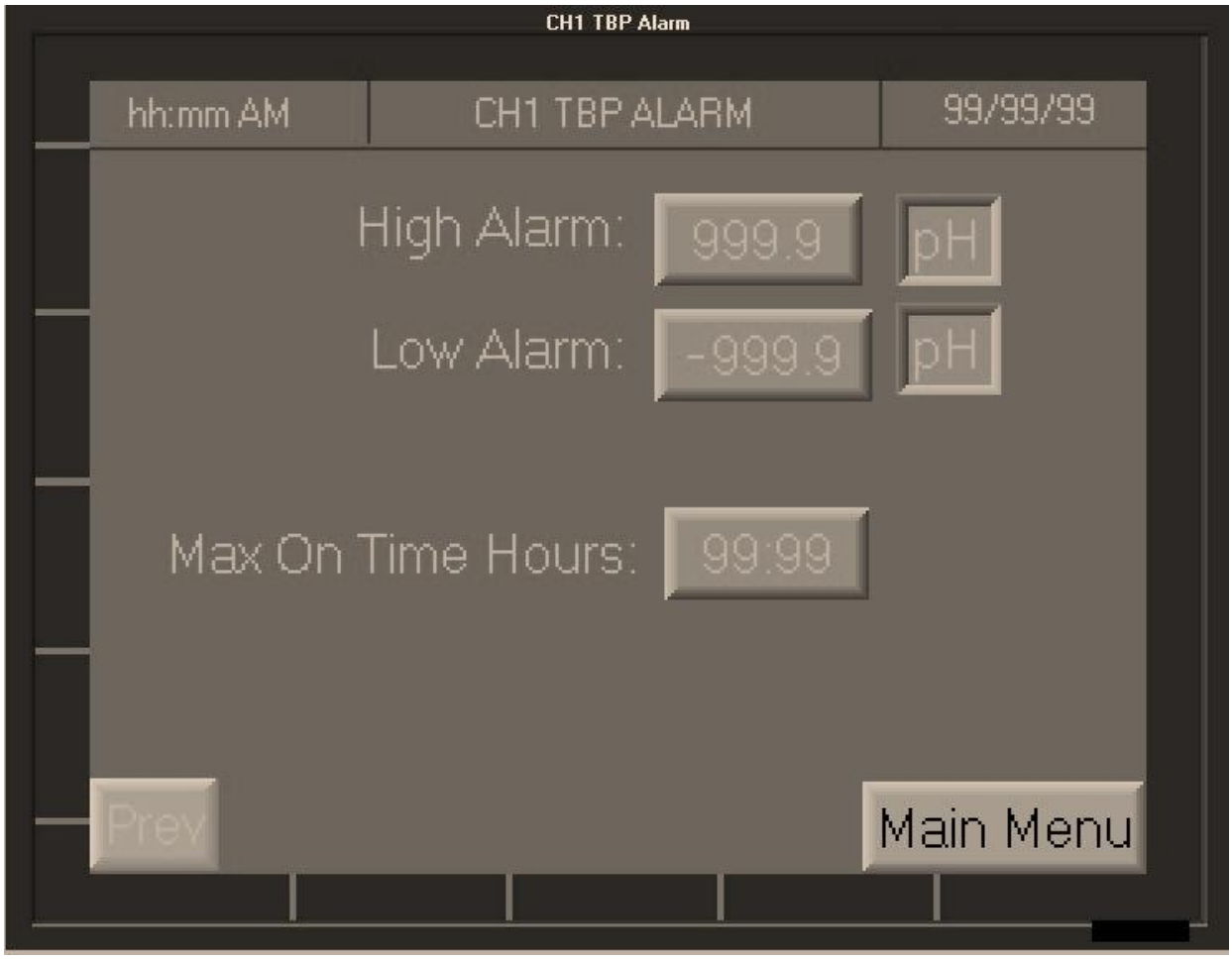
9.2 TBP Alarm Setup

TBP mode has two alarms:

- High or low pH/ORP input readings
- Exceeding the maximum feeder pump on-time

Settings for these alarms are configured on this screen. This screen is a continuation of the TBP Mode configuration screens (see previous section.)

Figure 13: TBP Alarm Setup Screen



High Alarm: Set the maximum input reading value which will trigger the high pH/ORP alarm

Low Alarm: Set the minimum input reading value which will trigger the low pH/ORP alarm

Max On Time Hours: Set the maximum number of hours that the pump can run consecutively. If this maximum time is reached, the pump will turn off and the alarm will have to be manually cleared.

9.3 TBP Status Screen

Once the TBP mode is selected and configured via the CH1 Setup screens, the TBP Status screen can be viewed by selecting “CH1 Status” in the Main Menu.

This screen will display the TBP status of the live values as well as notification of any alarms.

To jump to Alarms, press the word Alarm.

Figure 14: TBP Status Screen

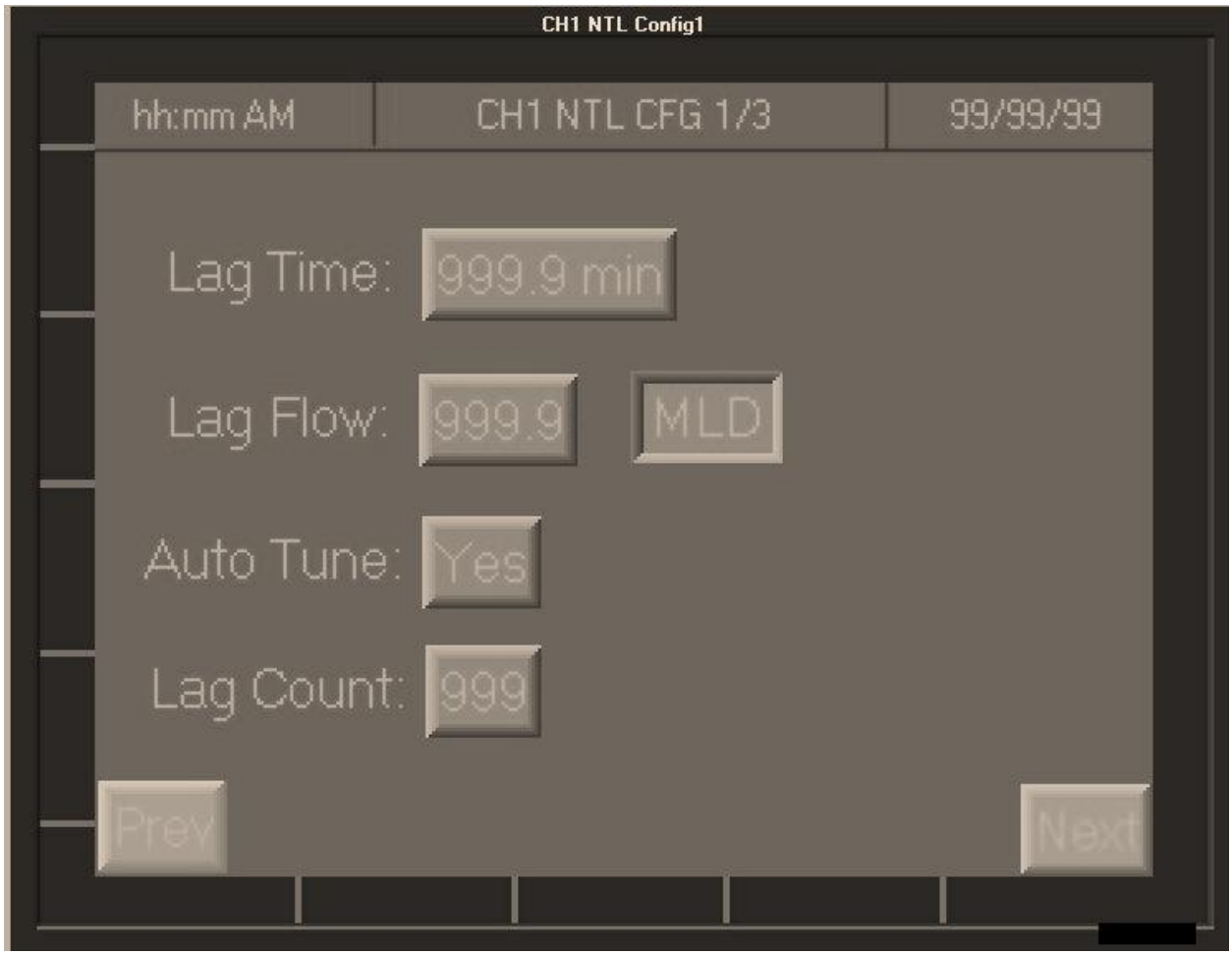
10 NTL Mode CH1 / Ch2

10.1 NTL Configuration

NTL Configuration is a continuation of the Initialize Configuration screen when the NTL Mode is selected. (See “Initialize Configuration” section.)

NTL Mode is configured via a series of 6 screens: three mode configuration screens and three alarm setup screens. Use the “PREV” and “NEXT” buttons to navigate between the screens.

Figure 15: NTL Mode Configuration Screen 1 (of 3)



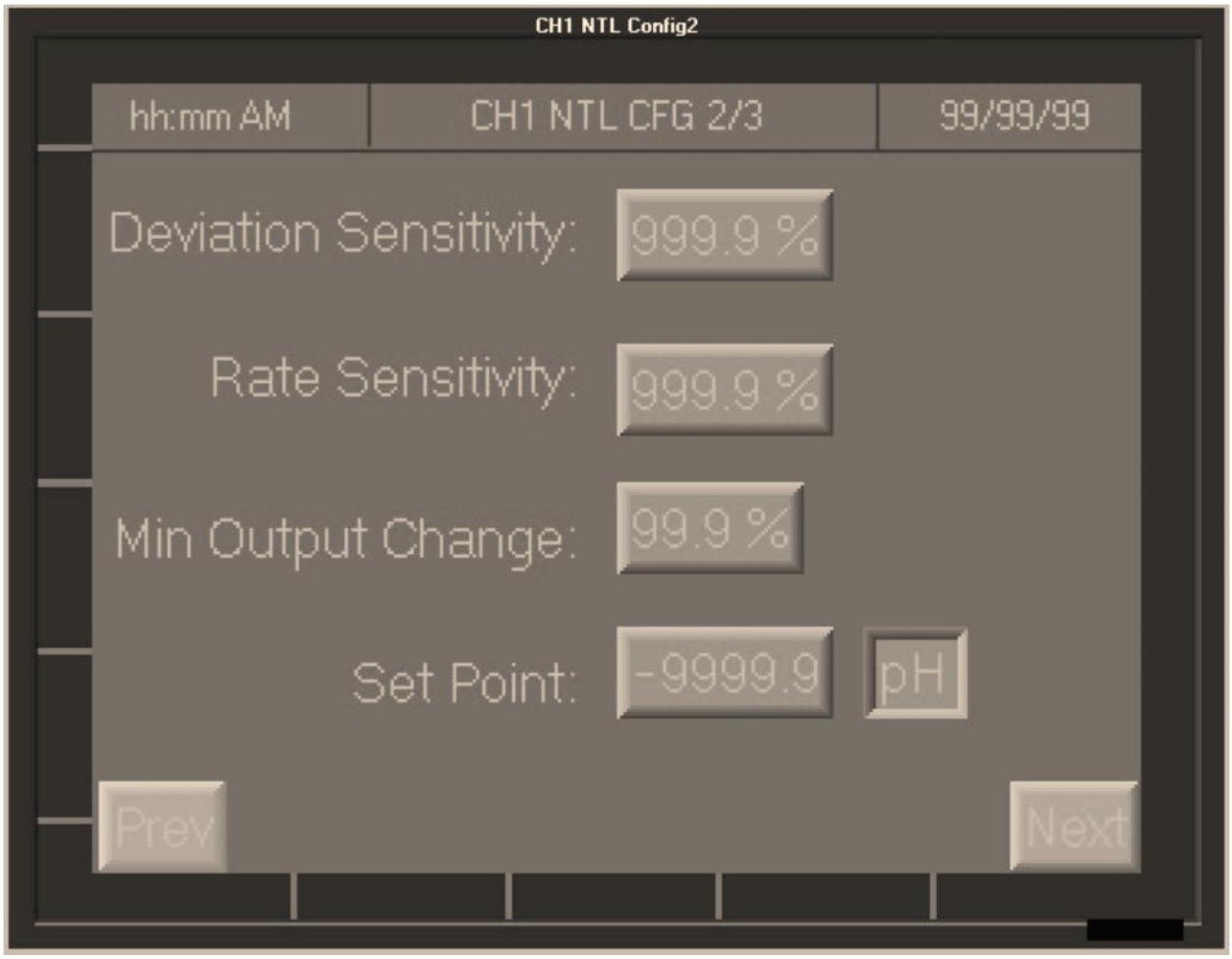
Lag Time: Input time (in minutes) from chemical injection point to input probe

Lag Flow: Flow at the time that Lag Time was measured

Auto Tune: This is a Steltec proprietary process. When turned on, this process will self-adjust the sensitivity to make larger or smaller gains depend on the how erratically the input changes.

Lag Count: Set how many Lag Time cycles need to pass before Auto Tune makes adjustments.

Figure 16: NTL Mode Configuration Screen 2 (of 3)



Deviation Sensitivity: Adjusts the sensitivity of the reaction to deviations from the set point. (Default setting is 0.1%) This value is affected by Auto Tune.

Rate Sensitivity: Reaction to Input curve (Default setting is 0.1%) This value is affected by Auto Tune.

Min Output Change: Sets how large of a deviation from set point is allowed before the controller changes the output (i.e. the "Dead Band.")

Set Point: Enter the desired Input control value.

Figure 17: NTL Mode Configuration Screen 3 (of 3)

Probe Calibrate: If the input is a known value and differs from Current, enter the Calibrate value. Always clear calibration before any recalibration procedure.

Current: Current input reading.

Feed Type (Volume/Weight): Select the appropriate feeder type

Volume: Use this for a liquid feeder.

Active: Enter the percent active chemical for feeding liquid.

Weight: Use this for a powder feeder

Max Output: Set the Maximum output from the feeder.

2nd Point Cal: Use this setting if the feeder is running at a known value to calibrate. (Feeder must be running off of the controller's analog output signal.)

Press "NEXT" to continue onto the NTL Alarm Setup screens.

10.2 NTL Alarm Setup

There are three alarms for NTL Mode:

- High or Low Feeder Output
- High or Low pH/ORP Reading
- Minimum or Maximum Dosage

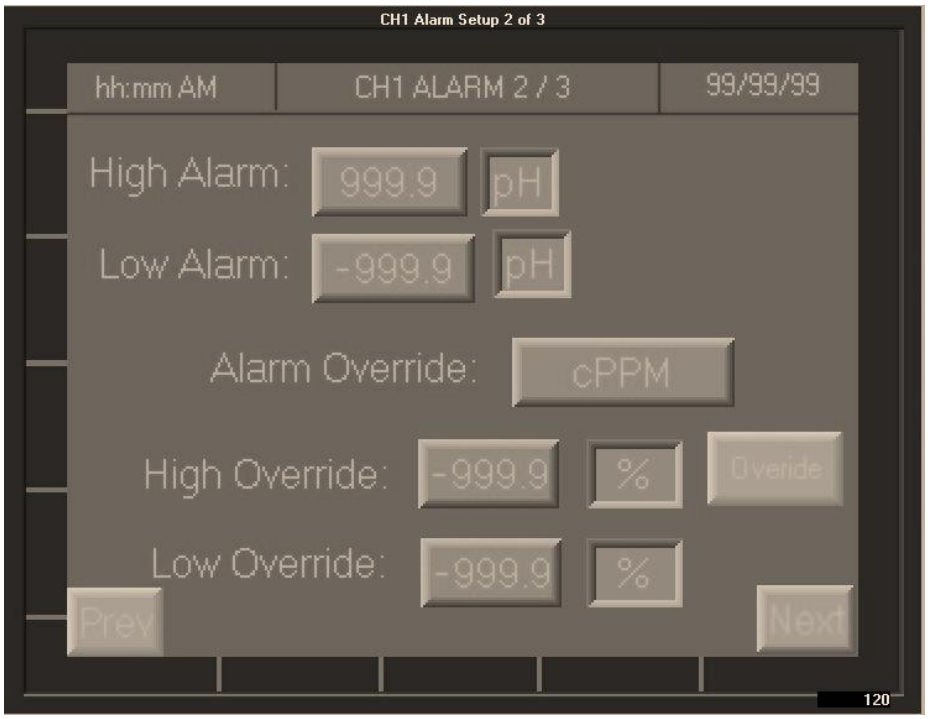
Settings for these alarms, including alarm overrides, are configured on the following three screens. These screens are a continuation of the NTL Mode configuration screens (see previous section.) Use the PREV and NEXT buttons to navigate the screens.

Figure 18: NTL Alarm Setup Screen 1 (of 3) – Feeder Output Alarm Settings

Low Output Alarm: Set the minimum feeder output percentage which will trigger the low output alarm.

High Output Alarm: Set the maximum feeder output percentage which will trigger the high output alarm.

Figure 19: NTL Alarm Setup Screen 2 (of 3) – pH/ORP Reading Alarm Settings



High Alarm: Set the maximum pH/ORP level which will trigger the high pH/ORP alarm.

Low Alarm: Set the minimum pH/ORP level which will trigger the low pH/ORP alarm.

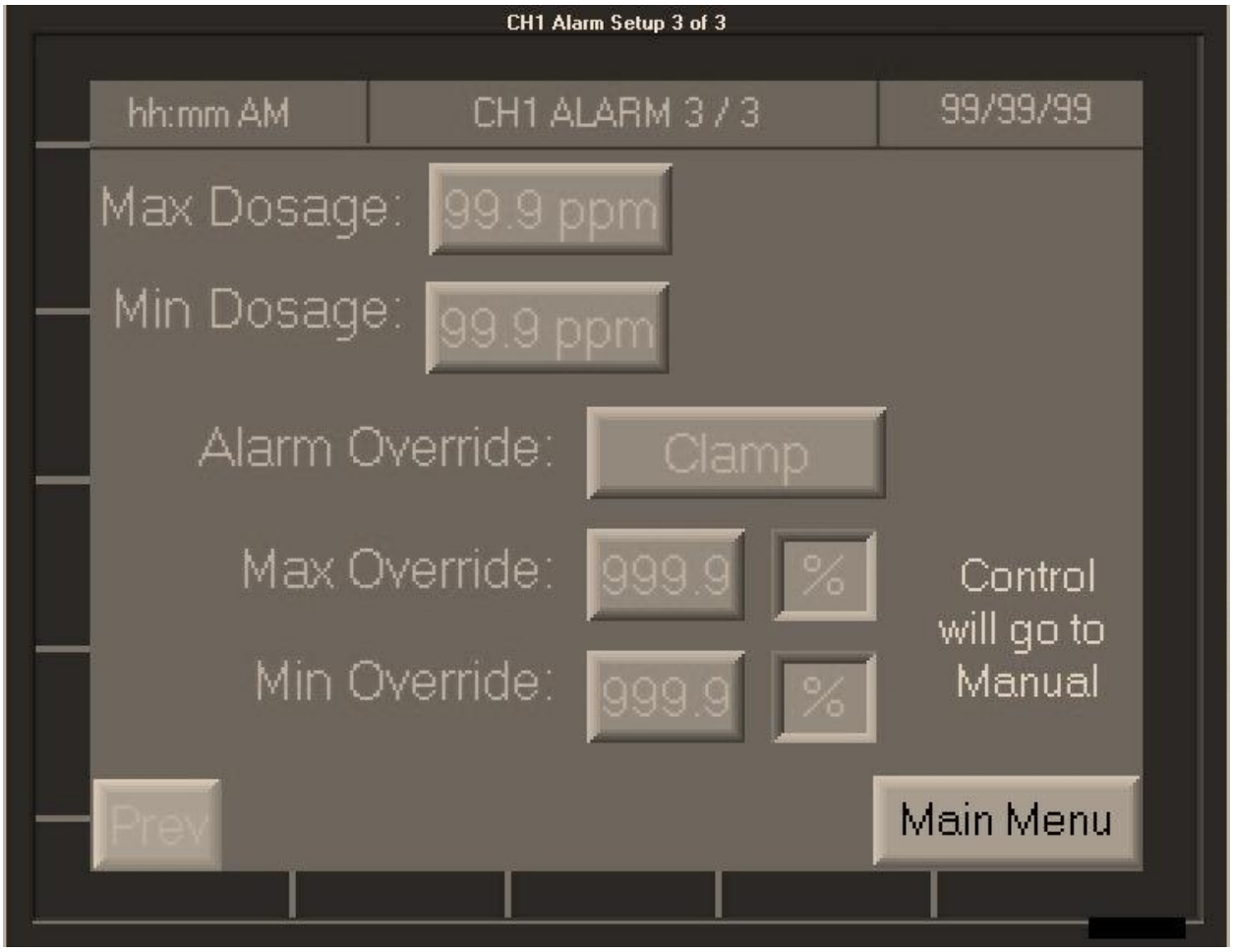
Alarm Override: Select whether the controller activates an alarm override mode when a pH/ORP alarm is triggered.

- **Fixed Out %:** When triggered, the controller will set feeder output to a fixed percentage and place controller into Manual. Enter the desired output percentages below.
- **Alt SP**: Alternate Setpoint. When triggered, the controller will control to a different value until alarm clears. Enter the desired high and low alternate setpoints below.
- **cPPM**: This will control to a cPPM . Will only control to either high alarm or low alarm. Press Overide button to chose.
- **Disabled:** Alarm will turn on but no override mode will activate.

Override Settings: These fields will change between fixed feeder output percentage (%) or alternate setpoint (pH/mV) depending on the override mode selected.

- **High Override:** Set the override for high alarm.
- **Low Override:** Set the override for low alarm.

Figure 20: NTL Alarm Setup Screen 3 (of 3) – Dosage Alarm Settings



MAX Dosage: Set the maximum level dosage the cPPM can reach before an alarm is triggered

MIN Dosage: Set the minimum level dosage the cPPM can reach before an alarm is triggered

Alarm Override:

- **Fixed Out %:** When triggered, controller will set feeder output to a fixed percentage until alarm clears. Enter the desired output percentages below.
- **Clamp:** When triggered, the controller will lock at the minimum or maximum dosage level. The system will come out of clamp once the input value has entered the dead band by the end of Lag time.
- **Disabled:** Alarm will turn on but no override will activate.

High Override: Set the fixed percentage override for high alarm.

Low Override: Set the fixed percentage override for low alarm.

10.3 NTL Status Screen

Once the NTL mode is selected and configured via the CH1 Setup screens, the NTL Status screen can be viewed by selecting “CH1 Status” in the Main Menu.

This screen will display the status of the live values as well as notification of any alarms.

To jump to Alarms, press the word ALARM.

Figure 21: NTL Status Screen

11 Alarms Status Screens

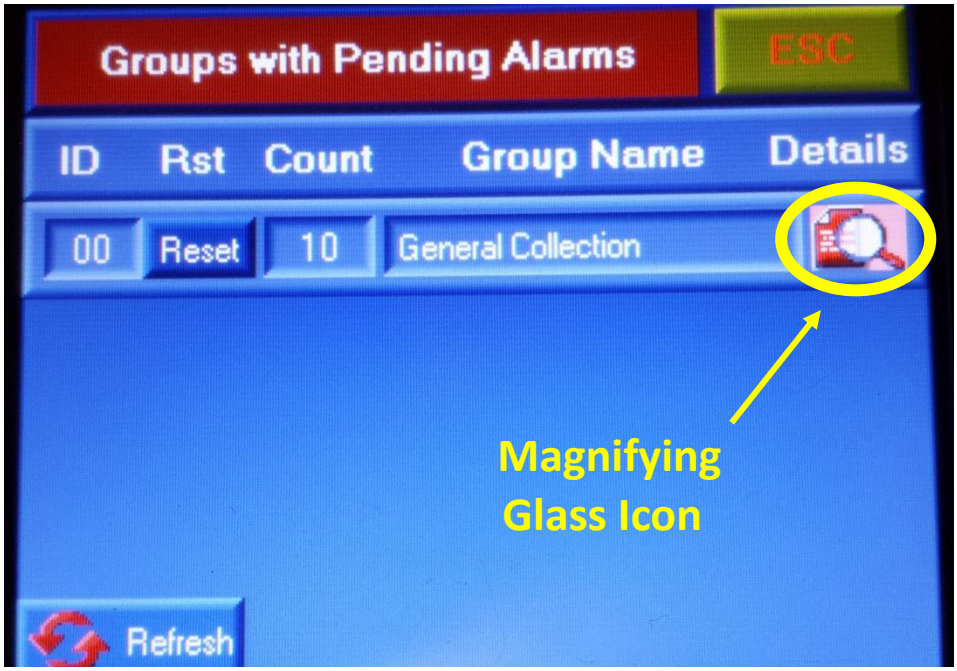
The Alarm Status screens can be accessed by pressing F4 from any screen.

11.1 Alarm Status Main Screen

Alarms are indicated by the flashing “ALARM” notice at the top of the Main Menu and Status screens. To check the source of an alarm, go to the Alarm Status Main Screen by pressing F4.

If there are no active alarms, this screen will be blank.

Figure 22: Alarm Status Main Screen



Count: Displays the number of active alarms.

Reset: Resets the count of active alarms.

Group Name: Will always display as “General Collection”

[Red magnifying glass icon]: Displays details on any active alarms – opens the Alarms in Group Status screen.

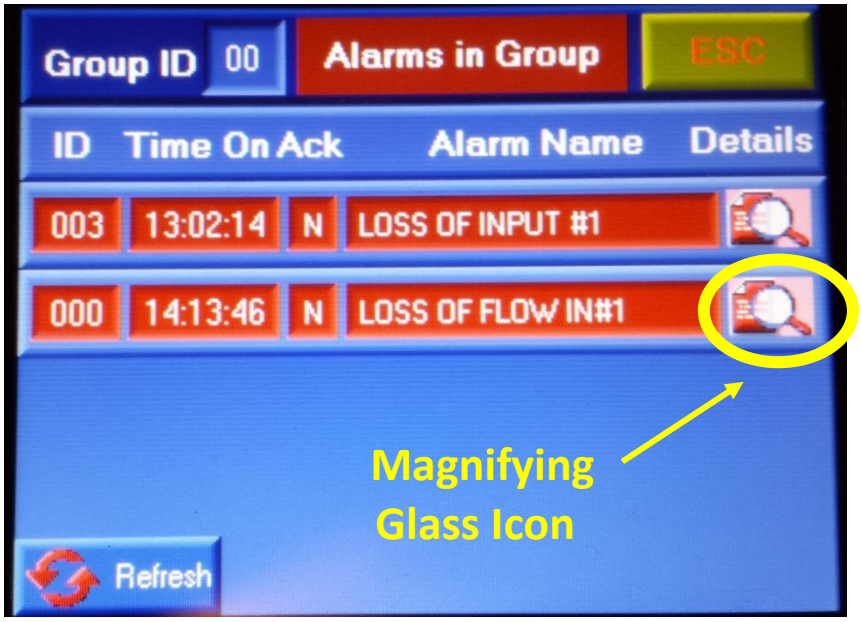
ESC: Return to Main Menu

Refresh: Refreshes the Alarm Status Main screen.

11.2 Alarms in Group Status Screen

The Alarms in Group Status screen displays any active alarms. This screen is used to view any ongoing alarm notices and access the Alarm Details screen (if an alarm needs to be acknowledged.)

Figure 23: Alarms in Group Status Screen



ID: The identification code for the alarm

Time On: Indicates the time the alarm started. Alarms are sorted from earliest to latest Time On.

Ack: Displays the acknowledgement status of the alarm. ***Alarms are acknowledged by going to the Alarm Details screen via the Magnifying glass icon.***

- **[Blank]**: Alarm does not need to be acknowledged. The alarm notice will disappear automatically once the condition has cleared.
- **N**: Alarm needs to be acknowledged, but has not been yet. The alarm notice will not disappear until acknowledged, even if the condition has cleared.
- **Y**: Alarm has been acknowledged, but is ongoing. The alarm notice will disappear once the condition clears.

Alarm Name: Displays the name of the alarm. See next section for alarm descriptions.

[Red Magnifying Glass Icon]: Press to go to the Details screen of the individual alarm to acknowledge it.

ESC: Returns to the Alarm Status Main Screen

Refresh: Manually refreshes the Alarm notices. [Note: screen will automatically refresh when an alarm condition clears.]

11.3 Alarm Details Screen

This screen shows the details of the active alarm you selected on the previous screen, and allows you to acknowledge the alarm if needed.

Figure 24: Alarm Details Screen

Ack: Will acknowledge the alarm.

Esc: To return to the Alarms in Group Status Screen.

11.4 Alarm Descriptions

The following is a list of possible alarms. Note that some alarms need to be manually acknowledged on the Alarm Details Screen before the alarm notice will clear.

Alarms requiring manual acknowledgement

- **Loss of Flow IN#1:** Indicates that the analog signal from the flow meter #1 has fallen below the 4 mA threshold. If the signal was lost abruptly, the controller will go into override mode using the last good reading.*
- **Loss of Flow IN#2:** Indicates that the analog signal from the flow meter #2 has fallen below the 4 mA threshold. If the signal was lost abruptly, the controller will use the last good reading. *
- **LOSS OF INPUT #1 / #2:** Input pH/ORP Probe signal has been lost. *
- **Data Write Fail:** Error writing to SD Card.

* *Override will hold the last value for 30 minutes then switch to Manual Mode. If the condition clears within 30 minutes, while in Override, the system will return to Auto Mode. If the*

condition clears after 30 minutes, while in Manual Mode, the operator will need to manually switch the system back to Auto Mode (see Section 6: Manual Mode).

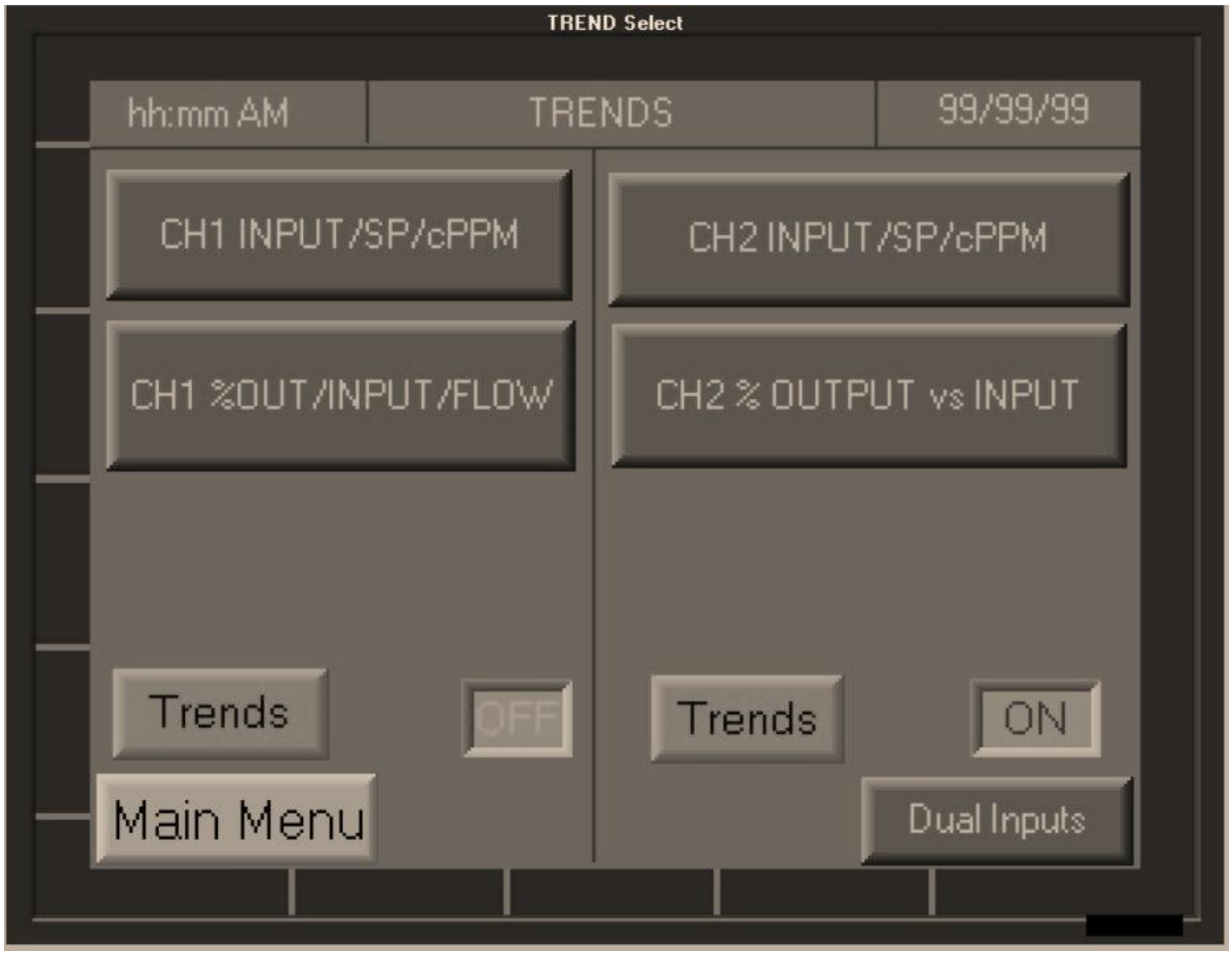
Alarms that will clear automatically (no acknowledgement needed)

- **CH1 / CH2 High pH/ORP (INPUT):** Input Value on pH/ORP is too high
- **CH1 / CH2 Low pH/ORP (INPUT)**: Input Value on pH/ORP is too low
- **CH1 / CH2 High Dosage:** Feeder output exceeded High limit
- **Ch1 / CH2 Low Dosage:** Feeder output fell below Low limit

12 Trends Function

12.1 Trends Menu Screen

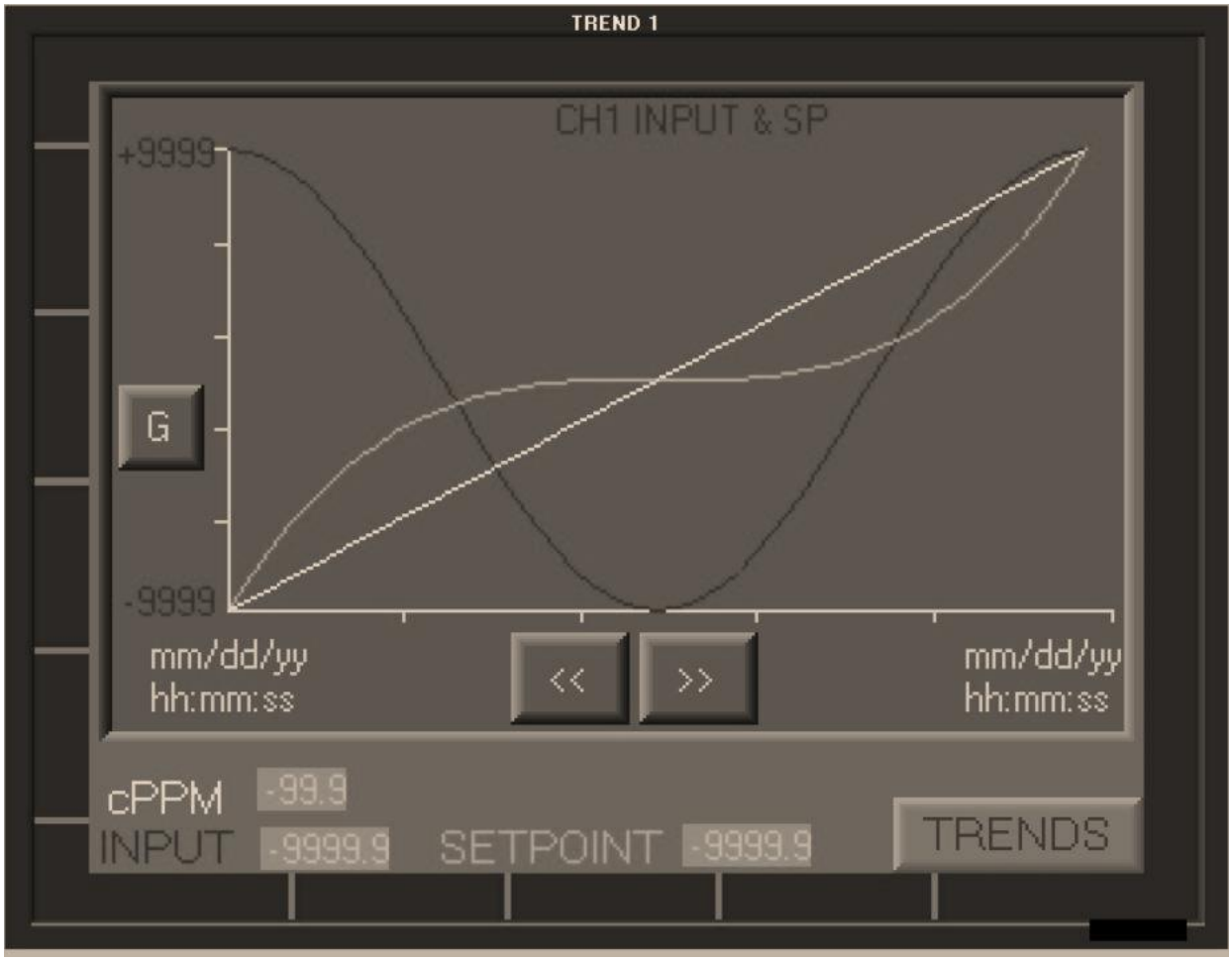
Figure 25: Trends Menu Screen



Trends: Will turn the trending features on and off. If turned, off no trending data will be stored

12.2 Trends – Input vs. Setpoint & cPPM Screen

Figure 26: Trends - Input vs. Setpoint& cPPM Screen

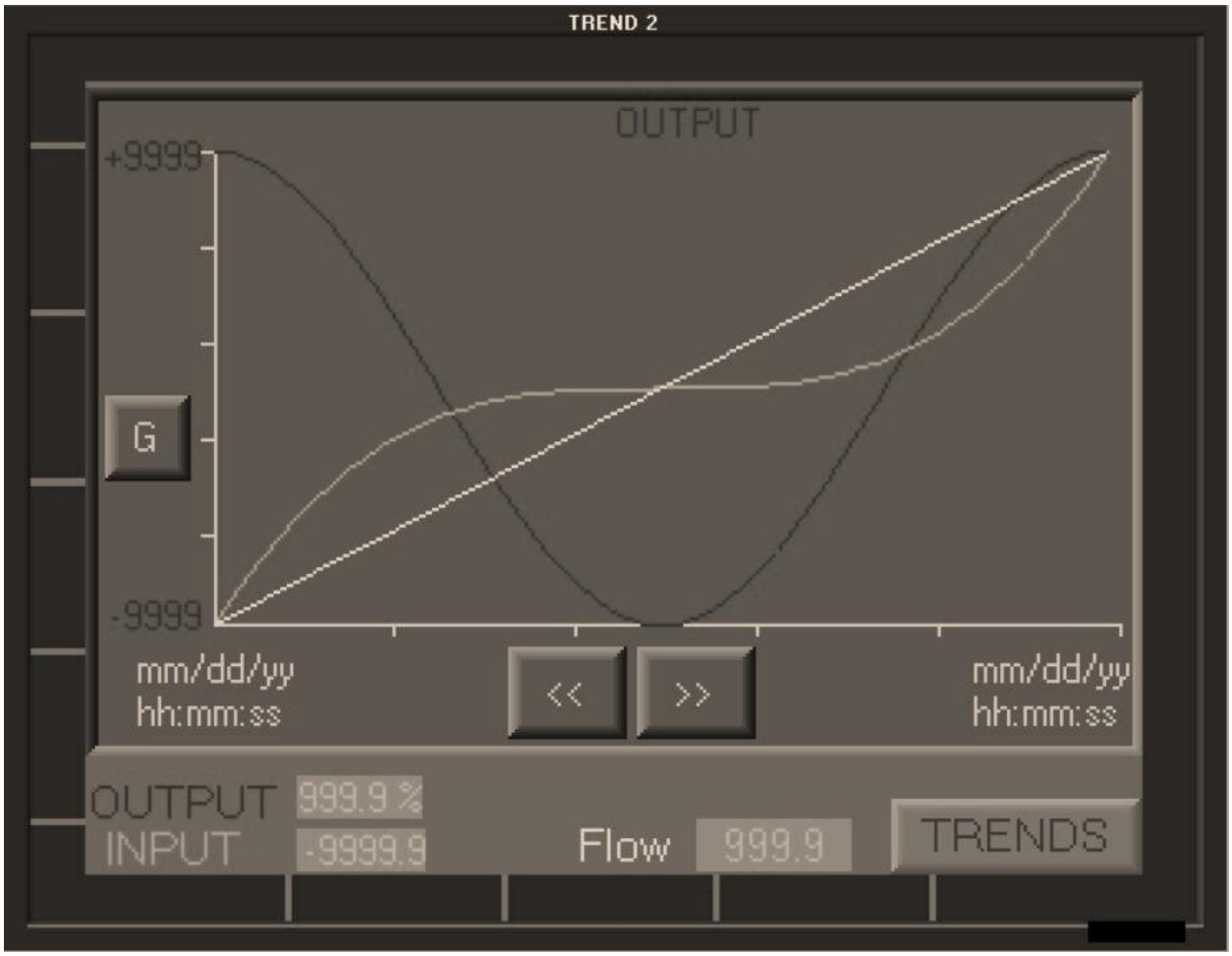


Touch the Y axis to change the scaling value.

Use arrow buttons (<< / >>) to scroll forwards and backwards.

12.3 Trends – Output vs. Input & Flow

Figure 27: Trends - Output vs. Input & Flow Screen

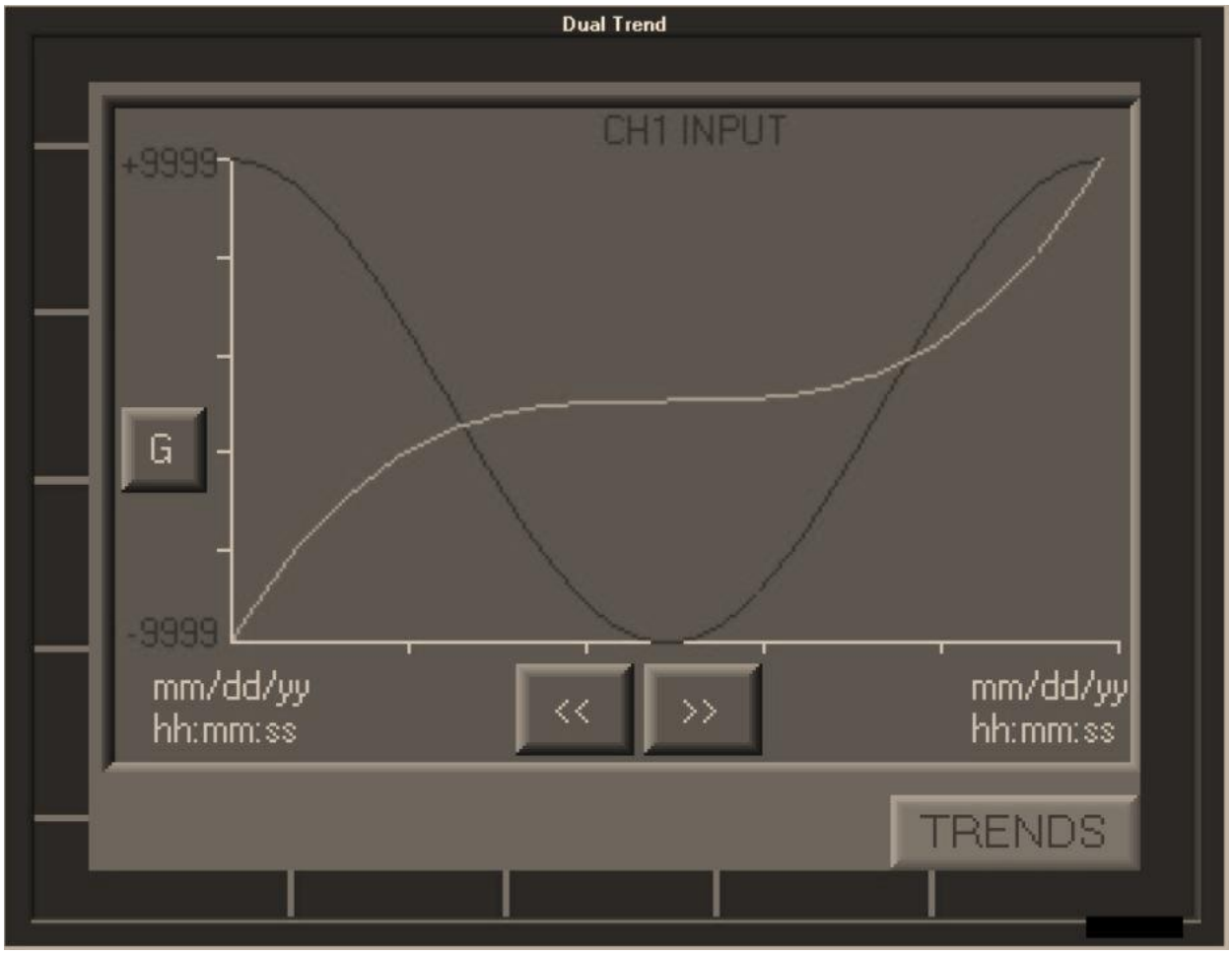


Touch the Y axis to change the scaling value.

Use arrow buttons (<< / >>) to scroll forwards and backwards.

12.4 Trends – Dual inputs

Figure 28: Trends – Both Inputs



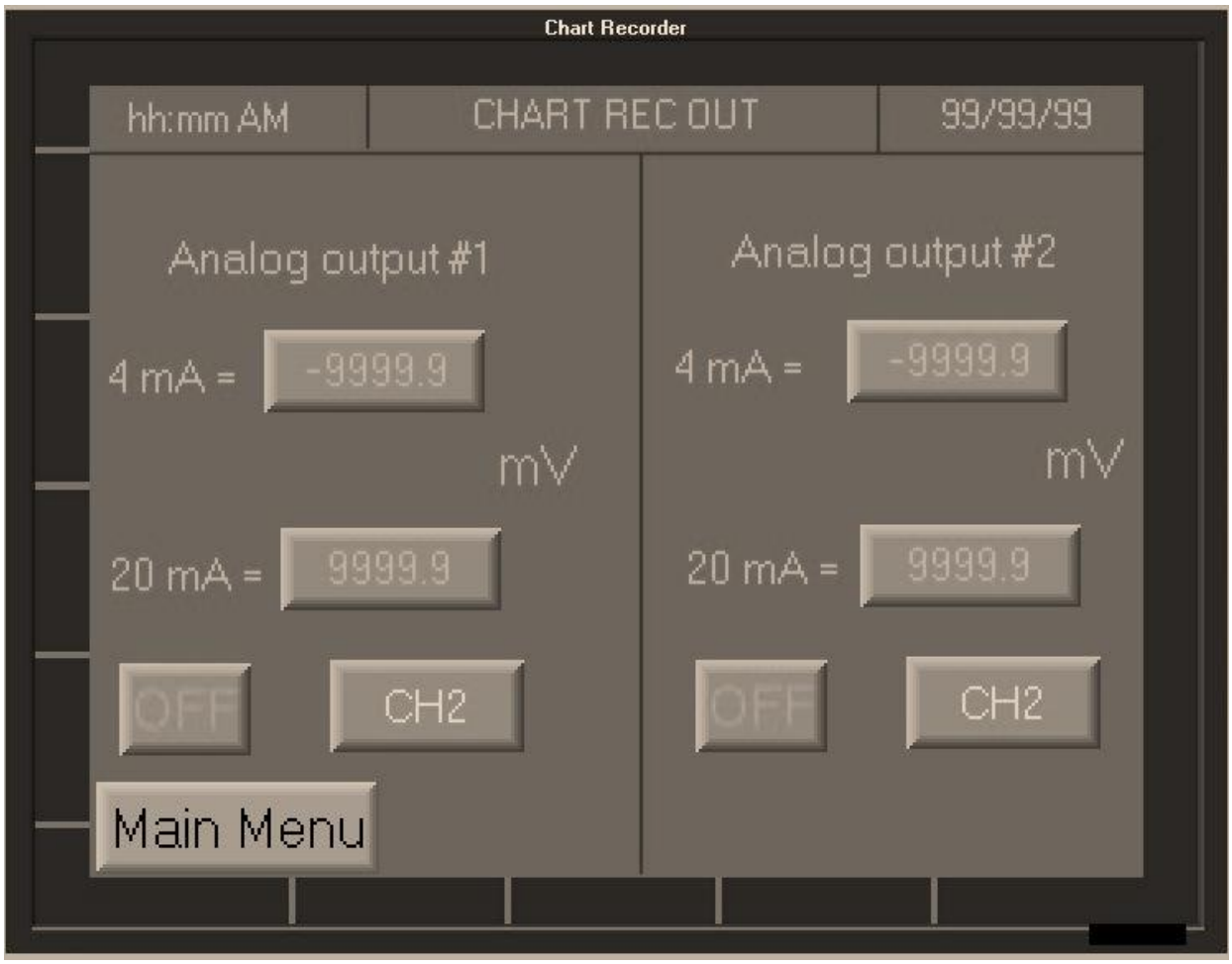
Touch the Y axis to change the scaling value.

Use arrow buttons (<< / >>) to scroll forwards and backwards.

13 Chart Recorder

The Chart Recorder feature records the sensor input values over time. Analog output #2 can be used to feed into a Chart Recorder or Remote PLC.

Figure 29: Chart Recorder Screen



ON/OFF: Turns this feature on or off

Chart Calibration: Customizes the minimum and maximum values of the Chart Recorder (4 mA and 20 mA) to the usual mV range of your application

- **4mA**: Set to the minimum value that 4mA will equal
- **20mA**: Set to the maximum value that 20mA will equal.
- **CH**: Picks which channel is outputted on that analog.

14 Data Log

The Data Log feature records a wide range of readings over time, and stores them internally. Data is then transferred to the SD card for further use. This transfer is done automatically at midnight each day, or can be done manually at any time.

Figure 30: Data Log Screen

ON/OFF: Enables or disables the data logging feature as well as SD card back up.

Data Log Rate: Set how often data will be logged in minutes. Minimum is one minute.

Data Table Level: Indicates how full the data table is. Once the data table is full, the Data Log will stop recording.

Transfer Data Now to SD: Begins a manual transfer of the data to the SD card.

Remove SD: Use this function to remove the SD Card. It will stop the Data Log from trying to write to the SD Card. **DO NOT REMOVE THE SD CARD UNTIL THE WORD "SAFE" IS DISPLAYED.** This function will reset when a formatted SD card is re-inserted.

15 Automated Probe Wash Settings

Figure 31: Probe Wash Settings Screen

ON / OFF: Turns the automated probe wash feature on or off

Rinse Time: Set how long the cleaning agent pump will run

Manual Run: Is a 20 min wash cycle

Day of the week: Select the day or days the Probe Wash will run

Start Time: Set the start time for the Probe Wash

End Time: Set the end time for the Probe Wash. Allow time for probe to re-stabilize.

When Probe wash is running the Input value will be locked at the last reading prior to the Start time.

16 Schematic

Figure 32: Control Schematic