Navigator +™ Touch Screen Programmer/Controller

Standard Features

- Touch Screen, TFT, 65,536 colors
- 640 x 480 display
- 400 MHz RISC CPU
- 32MB Intel Strata Flash, 64MB RAM
- Windows CE.NET 4.2
- RS232 (built-in) 9-pin D-SUB
- RS485/422 (built-in) 25-pin D-SUB
- Ethernet (built-in) 10/100Mbit RJ45/TP
- USB Host for keyboard, mouse, printers, etc.
- USB Device port for PC file transfer
- Internal CF memory slot for memory expansion 32 - 1024MB
- External CF data slot for data capture and extraction

Navigator +™ Touch Screen Programmer/Controller

The Envirotronics Navigator+™ Programmer/Controller is the newest instrument in the roster of touchscreen controllers from Envirotronics. Expanded communication possibilities include built-in RS232 and RS422/485 ports as well as Ethernet and both USB host and device connection ports. Remote management and “viewing” across an intranet or internet connection, the ability to add PC peripherals such as keyboard, mouse and printer, and high-speed connection for PC file transfer combine with the ease of touchscreen and intuitive command-screen design to make Navigator+™ a leap forward in programmer/controller technology.
### Specifications

**Channels:**
3 Process Variables

**Display:**
- 65,536 Colors
- TFT Display
- Backlight
- Display: 6.5” Diagonal
- Resolution: 640 x 480 Pixels

**Operating System:**
Microsoft Windows™ CE NET 4.2

**Communications:**
- Ethernet 10/100 Mbit RJ45/TP
- RS-232C 9-pin D-SUB
- RS-485/422 25-pin D-SUB
- Web server software

**Storage:**
- 1MB onboard, up to 1GB optional
- Test & data retrieval

**Processors:**
- 400 MHz RISC CPU
- 32MB Intel™ Strata Flash
- 64MB RAM

**Peripherals:**
- 1 USB Device for PC File Transfer
- 1 USB Host for Keyboard, Mouse, Printer (through PC)

**Programming:**
- Limited to onboard storage capacity

**Software Features:**
- Full PLC diagnostics
- Color graphic displays
- TCP/IP networking
- Real Time clock with battery backup

**Analog Inputs:**
- Process voltage inputs 8 standard assignable
- Expandable to 40 (optional)
- 16 bit resolution
- T/C 0.1°C or 0.1°F
- Full temperature range

**Analog Outputs:**
- Standard 0 (none)
- Up to 16 (optional)
- Outputting your choice of information

**Digital I/O:**
- Standard I/O; 0 (none)
- Up to 128 in/128 out (optional)
- Output 2A, 250 VAC
- Voltage input 24 VDC

**Data Logging:**
- 60 second intervals
- Data, setpoints, process variables, etc.

**Alarms:**
- HLS-1, HLS-2, Circulator oil, HS oil pressure, HS thermal head, HS Hi/Lo pressure, LS oil pressure, LS thermal head SW, LS Hi/Lo pressure, HS water pressure, B oiler overtemp, Temp Sentry (optional), Open sensor.
- Up to 16 alarms

**Electrical/Mechanical:**
- Panel mount
- Power requirements 24 VDC
  (obtained through PLC on board)
- Operating conditions:
  - During operation: 0° to +55°C
  - 35% to 85% RH, non-condensing
  - During storage: -20° to +70°C
- Input: 100-240 VAC 50-60Hz +10%-0%
- Dimensions:
  - in. H 6.06 x W 8.62 x D 3.94
  - mm H 154 x W 219 x D 55
- Weight: 2.5 lbs.
  - 1.1 Kg
Terms & Abbreviations

The following explains the different symbols and abbreviations used on the Navigator+™.

% Out  Percentage of output for each channel.
%  Percent as in Process variable (i.e. % relative humidity)
<  Left arrow
>  Right Arrow

Alarms

- HLS-1  High Heat Limit
- LS OPS  Low Stage Oil Pressure Switch
- LS THS  Low Stage Thermal Head Switch
- LS HLP  Low Stage Hi/Lo Pressure Switch
- HS OPS  High Stage Oil Pressure Switch
- HS THS  High Stage Thermal Head Switch
- HS HLP  High Stage Hi/Lo Pressure Switch
- HS WPS  High Stage Water Pressure Switch
- TAS-1  Steam Generator Thermostat
- CIRC O/L  Circulator Motor Overload Station 1
- TEMP SEN  Temperature Sentry
- SPARE 1 - 4  Spare Alarms - Use varies by application

Analog  Refers to type of input or output

CHx  A channel is a controlled value such as temperature, humidity, altitude, etc.
Example:  Channel 1 is Temperature Values
          Channel 2 is Humidity Values

Circs  Circulator; Refers to the air circulation motor circuit.

Comps  Compressors

Comp.  Compensated type analog input device

Comp Ch  Compared channel for Compensated input.

Config  Configuration; Refers to the settings required to accomplish the desired task.

Control Ch#  See CHx above

D %  Derivative Percent
D time  Derivative Time
Dd  Date
DEL  Delete; Removal of a step or program
Dev.  Deviation; Difference between desired and actual
Dir  Direct acting; Refers to cooling outputs
Duration  Step length
Edit  Edit; Used to make changes in a profile.

Elapsed Time  Time a profile has been running in a program step

ESC  Escape
Ev#  Event; Accompanied by a number, typically for customer use.
Evts  Events; Events are out relays that can be either manually operated or programmed into a profile.

File Save  Saves a new or edited profile

Gain  Proportional Gain % referred to as reset

GS  Guaranteed Soak Used to put a profile step’s programmed time into a hold mode. A value of “0” turns it off.
Sometimes referred to as a window or within a plus or minus value of desired temperature.

hhh  Hours; A profile steps time in hours

H Lim  High limit

High  The upper limit value.

Hold  Program is holding

Hys  Hysterisis

I Lag  I Lag; Integral delay setting in seconds.

Insert  Used in the program/edit profile screen

Loop  Brings you from the end of a current step to the beginning of a previous step, allowing the profile to cycle or nest.

Low  The lower limit value.

Log In  Security password required.

Log Out  Re-establishes security.

L Lim  Low limit
NC
Normally closed or No Connection dependant on where used.

Machine Section
Reference to the location around the compressors.

Manual
From the main screen brings you to the manual operation screen of the controller. On the manual screen it turns the chamber on to run to the assigned setpoints.

mm
Minutes A profile steps time in minutes.

mmm
Month

Next
Refers to following page.

Outputs
Are the PLC “y” relay outputs

Password
Security requirement.

P Bnd
Proportional Band; Window for control to begin adjusting its outputs to achieve the desired setpoint.

PID
Proportional, Integral, Derivative

PID Type
PWM, Analog, Open Loop, or Not used,

PID Settings
Values in controller that make the controller control.

PLC
Programmable Logic Control

Prev
Previous

Profile
A Profile is a series of steps programmed together to accomplish a test sequence.

Profile run
Brings you to the start page for timed start or instant start.

Pmp Down
Used to keep the high side of the refrigeration system run ready.

Pump down
See Pmp Down

Pump dwn sel
Valve used to accomplish Pmp Down.

PV
Process Variable This is that actual value that the system is operating at for its corresponding channel

PWM
Pulse with modulation (Cycle Time)

Ramp
Changing a “SP” value in a profile to a new value. Found in the program editor.

Resume
Restarts a program profile.

Rev
Reverse acting; Refers to heating outputs.

Run
Runs the currently loaded program.

Soak
Dwell period at a given setpoint. Sometime referred to as a soak step. Staying at one set of values for an extended period of time.

SP
Set Point; The value at which you wish to run the system for its corresponding channel

Start step
The first step you can set to start a profile. Allows to start a profile at other than its beginning.

Status
Displays the mode (Stop, Manual, Profile#)

STOP/RUN
Program run state; Also used in a program profile as an end step to shut the test off.

Stg1
Stage 1

Stp
Step; A Step is a single line of a test program.

Timed Start
Waiting to start at start time. (Program Setup)

Timed Stop
Program stopped at selected stop time. (Program Setup)

Trend
Graphical display of the current process variables.

VAL
Value

X#
PLC input value accompanied with a number.

Y#
A “Y” with a number represents an output relay from the PLC

Yy
Year
Figure 1.0 • Program Page

1.1 Current Setpoint and process values for the channels of control. The first value on the left is the “Set Point” This is the desired value that you enter manually or are running from the program you created. The next number is referred to as the “process variable” This is the actual value that is running for its corresponding channel.

1.2 Displays current step running in the selected profile. Can also be used to view another step by touching the block after the Step# and entering in another step number. When the program advances to another step it will reset to the current step running.

1.3 Type of step the current step is.

1.4 Event status for the current step

1.5 A 5 step view of the current profile in memory.

1.6 Prev – Brings you to the Trend/Setup screen.

1.7 Help – Brings you to a “Help” screen.

1.8 Run – Direct jump to the ‘Profile/Login’ screen.

1.9 Pause – Puts the current program on hold.

1.10 Resume – Resumes program in progress.

1.11 Stop – Puts the Navigator+™ controller in ‘Stop’ mode.

1.12 Next – Brings you to the Profile/Login screen (same as 1.8).

1.13 Scrollbar used to scroll up and down the profile currently in memory.

1.14 Indicator of time elapsed for the current step.

1.15 Duration control for the current step.

1.16 Displays current events that are on.

1.17 Current status of the controller (i.e. Profile, Manual, Trip, or Stop).

1.18 Current running step.

1.19 Current date and time.
1.8.1  **Start Step** - Reset all elapse timers and loop iteration counters then begins execution of the profile. Step to start execution of the profile currently in memory.

1.8.2  **Start** – Start the selected program to run.

1.8.3  **Prev** - Returns to program profile screen

1.8.4  **Pause** – Puts the current program on hold.

1.8.5  **Resume** - Resumes a previously paused profile.

1.8.6  **Stop** - Puts the Navigator+™ controller in ‘Stop’ mode.

1.8.7  **Time of day start** – Displayed in military time.

1.8.8  **Month Day Year** – Display for date of delayed start.

1.8.9  **Check mark** – Activates delay start feature if checked.

**Start, via Program**

Lets you start a selected preprogrammed profile.

See: Programming a Profile if no programs are available.

Note that you must have a program selected to run.

After selection is entered, the system will start the selected program.

There are two ways to get to the profile run screen. You can scroll to the profile screen using the (Prev/Next) buttons. Look for the login, logout, profile screen and press the “Run Profile” button Figure 5 detail (5.4). or you can go from Figure 1 detail (1.8) and press the “Run” button. (You must be logged in)

**Program Starting Step** lets you assign a starting step number, other than step 1, to start at in the program. (Figure 1.8 detail 1.8.1) After the above has been completed press the “start” button. (Figure 1.8 detail 1.8.4). The program will load and begin to run. The Status will say “Profile” (Figure 1 detail 1.14). To Stop the program press any “Stop” button that you see.

**Start Time Enabled** allows you to enter a date and time at which you would like the program to actually begin controlling, if not immediately. This option will start both the system and the program. You must press the check mark button on the Navigator+™ for the option to work correctly. (Figure 1.8). (A level 4 password is required to start a program). Start Step (1.8.1). Delayed Start enabled (1.8.8) checked. Date and time (1.8.6)
1.12.1 Alpha-numeric Keypad
2.1 Current Setpoint and process values for the channels of control. Touching on the setpoint value will allow you to enter a new value. Press the key in the lower right corner of the numberical keypad will enter value.

2.2 Prev - Brings you to the Profile/Login screen.

2.3 Manual – Starts the controller in manual mode.

2.4 Stop - Puts the Navigator+™ controller and system in ‘Stop’ mode.

2.5 Next - Brings you to the Trend/Setup screen.

2.6 Events- Touching the event buttons will turn them on/off. When the number is displayed the event is on.

2.7 Current status of the controller (i.e. Profile, Manual, Trip, or Stop).

2.8 Alarms – Direct jump to the alarm list screen.

2.9 Alarm Silence- Silences the alarm trip sonalert

2.10 Manual Mode- Displays mode of operation page name.

**MANUAL CONTROL** General information

**Starting the Navigator+™**

The Navigator+™ controller has 2 ways to start control. One method of starting control is by using manual control. The other method is by utilizing the Program Setup Mode and a program.

**Starting the System Manually**

Press the “Prev/Next” to scroll to the “Manual Run” screen. Figure (2). To enter a setpoint value, touch the corresponding button after the Ch# and below the SP Figure 2 detail (2.1). A number pad will appear. Enter the desired numerical value for the corresponding channel then hit the key in the lower right corner of the numberical pad.

Note. You may have up to 3 channels of control based on your application, enter as required for your system.

Next turn on or off the events that are desired. This is done by pressing the keys as per figure 2 detail (2.6). If a number is present the event is on.

continued…
Channel 1 S.P. sets the setpoint of channel 1.

Channel 2 S.P. sets the setpoint of channel 2. (Optional)

Channel 3 S.P. sets the setpoint of channel 3. (Optional)

**Start Manual Mode**

After the desired values have been entered press the “Manual” button at the bottom of the page. Figure 2 detail (2.3) The status area on the display will say “Manual” and the chamber will begin to operate provided all safeties are satisfied. Figure 2 detail (2.7). To Stop the manual operation press the stop key at the bottom of the page. Figure 2 detail (2.4). The status area on the display will say “Stop” and the chamber will shut off. Figure 2 detail (2.7). (Pump down will remain active if equipped).
3.1 Log On - Log On screen. There are 8 levels of Log on (Password Levels).
3.2 Profiles - Select one of the five stored programs.
3.3 Run Profile - Run Profiles brings you to the Start Time and Step of a profile. (See Fig. 1.8)
3.4 Edit Profile - Program editor for writing programs/profiles.
3.5 Log Out - Log Out
4.1 **Trend** - Direct jump to the graphic chart screen. See Fig 4.1

4.2 **All Watch** – Direct jump to the ‘All Watch’ screen. Allows user to watch the (x inputs and y outputs of the PLC as system is running). See 4.2

4.3 **Prev** - Brings you to the Program screen.

4.4 **Trend Options** - Graph Options

4.5 **Stop** – Stops System

4.6 **System** - Can view additional plc data. i.e. plc register values, memory bit status’s for high or low. See Fig 4.6

4.7 **Setup** - Direct jump to the setup ‘Setup Menu’ screen. Location of PID, Alarm configuration, analog assignments, etc. See Fig 4.7

4.8 **Alarms** - Brings you to the alarms screen. See Fig 4.8
4.1.0  Touch anywhere on screen to have taskbar appear.
4.1.1  Increments Trend back one scale at a time “Time.”
4.1.2  Exits the Trend.
4.1.3  Increments Trend back 25% of scale “Time.”
4.1.4  Touch to set Trend low scale - numeric display appears.
4.1.5  Touch to set Trend high scale - numeric display appears.
4.1.6  Reduces scale “Time.”
4.1.7  Return to current Time.
4.1.8  Increases Trend scale value “Time.”
4.1.9  Increment Trend forward 25% of scale “Time.”
4.1.10 Increments Trend forward one scale at a time “Time.”
4.1.11 Turn Trend on and off. This only lights if Trending is turned on in Trend Options.
4.2 All Watch - Direct jump to the ‘All Watch’ screen. Allows user to watch the (x inputs and y outputs of the PLC as system is running).

4.2.1 Displays current P.V. and percentage of Output

4.2.2 Displays PLC (X input) (y output) as on or off. Star is on.

4.2.3 Prev – Returns to Jump To screen.

4.2.4 Stop – Stops System
NEW

Will let you examine the contents of the PLC registers. You can choose the type of register by selecting one of the following followed by the number of the particular register you wish to view. This will create a list on the display as you select more and more registers. Touch NEW and enter the register you wish to view - such as D40

(1) M  Memory Registers
(2) T  Timer Registers
(3) C  Counter Registers
(4) D  Data Registers
(5) X  PLC Input Status
(6) Y  PLC Output Status
(7) S  PLC State Registers
4.7 Setup – Direct jump to the setup ‘Setup Menu’ screen. Location of PID, Alarm configuration, analog assignments, etc.

4.7.1 Log In - Logs you into the controller to make changes based on password level.
4.7.2 Log Out - Logs you out of control change screens. The system will automatically log you out after 30 minutes.
4.7.3 Quick Draw On/Off - Enable function if applicable
4.7.4 Analog setup - Allows for the setup values of channel inputs.
4.7.5 Alarms setup - Allows for the setup for the system alarms.
4.7.6 Calibration - Allows Calibration of the Navigator+ controller
4.7.7 Fuzzy - Fuzzy control parameters
4.7.8 Timers - Delay times for staged heat and cool
4.7.9 Passwords - Allows for changing passwords up to level 6.
4.7.10 Factory - Factory Settings
4.7.11 PLC Reset - Used to reset the PLC for changes made in setup. Resets value changes made to the PLC. This must be done any time analog or digital items are changed on the Set Up pages or during calibration.
4.7.12 ASCII Diagnostics - Communication diagnostics
4.7.13 Set Clock - Time and date entry - must be presented exactly as shown.
4.7.3.1 **Quick Draw Enable/Disable** - Turns Quick Draw On and Off.
4.7.3.2 **Cool** - Cool value. When cooling air is set below product. Used to set the difference between product Set Point value and when air temperature adjusts towards Set Point.
4.7.3.3 **Heat** - Heat value. When heating air is set above product. Used to set the difference between product Set Point value and when air temperature adjusts towards Set Point.

**Quick Draw Operation:**

Channel 1 is air temperature  
Channel 3 is product temperature

**In Manual Mode**  
Enter the value in Channel 3 for the desired product temperature. Then, within 15 seconds of entering the value in Channel 3, enter the value in Channel 1 for the maximum air temperature.

For example: if the product temperature desired is -40°C and the maximum allowed air overshoot is -65°C, you would enter -40 in Channel 3 and, within 15 seconds, enter -65 in Channel 1.

**In Program Mode**  
Enter a program as outlined in section 5.6. You will enter the maximum air temperature in Channel 1 and the desired product temperature in Channel 3. If Quick Draw is not desired in a particular step, but is enabled, you must enter the same setpoint in both Channels 1 and 3 for that step, in order to disable it.
4.7.4 Analog setup - Allows for the setup values of channel inputs.

4.7.4.1 Low; Engineering unit low setting.
4.7.4.2 High; Engineering unit high setting.
4.7.4.3 Type; Input type.
4.7.4.4 Current Analog; Current analog reading.
4.7.4.5 Current Reading; Current reading of the analog channel in the calculated engineering units.
4.7.4.6 Back Arrow; Go to the previous analog channel for setup.
4.7.4.7 Forward Arrow; Advance to the next analog channel for setup.
4.7.4.8 Comp Ch; Analog channel used in compensation calculation.
4.7.4.9 Comp; Type of compensation to execute.
4.7.4.10 Label of the current channel being setup.
4.7.5.1  Type of alarm signal (i.e. digital or analog).
4.7.5.2  Input selection for digital alarms.
4.7.5.4  Common state of digital type alarms.
4.7.5.5  Specifies if controller should halt if alarm occurs.
4.7.5.6  Return to the Set Up menu.
4.7.5.8  Stop System.
4.7.5.10 Go to the previous alarm for setup.
4.7.5.11 Advance to the next alarm for setup.
4.7.5.13 Duration of time alarm must be active before registering. True is auto / False is manual.
4.7.5.15 Alarm automatic reset.
4.7.5.16 Brings you to the alarm page.
4.7.5.17 Silences the audible alarm bell.
4.7.5.18 This is the name of the alarm.

Accessible at Password Level 4
4.7.5.16 Alarms

4.7.5.16.1  Down arrow; Scrolls page down.
4.7.5.16.2  Shows alarm information
4.7.5.16.3  Reset; Resets the alarm
4.7.5.16.4  Zoom; Enlarges view.
4.7.5.16.5  Check; Acknowledges alarm
4.7.5.16.6  Up arrow; Scrolls page up
4.7.5.16.7  ESC; Escape, returns to previous page
4.7.5.16.8  Alarm; Displays alarm history and any active alarms.

Note: When an Alarm is tripped, it must be selected, acknowledged, and then reset.
Date/Time stamp when alarms were tripped.

Press to get information indicated above

Date/Time stamp when alarms were acknowledged.

Press to get information indicated above

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>S 02/01/06</td>
<td>8:49:24</td>
<td>HLS-2</td>
</tr>
<tr>
<td>S 02/01/06</td>
<td>8:49:15</td>
<td>HLS-1</td>
</tr>
<tr>
<td>A 02/01/06</td>
<td>8:52:11</td>
<td>HLS-2</td>
</tr>
<tr>
<td>A 02/01/06</td>
<td>8:51:28</td>
<td>HLS-1</td>
</tr>
</tbody>
</table>
Date/Time stamp when alarms were reset.

Press to get information indicated above.

Blue background behind alarms show alarms reset.

Press to reset Alarms.
Use Magnifying Glass button to enlarge.
“*” Represents alarm.

“–” Represents alarm acknowledged.

Both alarms acknowledged. Each must be selected separately.

Press to acknowledge Alarm
Calibration of the Navigator+™ chamber controller requires “Setup” access to the instrument. If a “Setup” level password was not provided contact your RTP for details. Once a “Setup” level password is entered...

1. Touch “More>>” button on the “Main Screen”
2. Touch “Setup” button on the “Jump to…” screen
3. Touch “Calibration” button on the “Setup” screen
4. Touch “Next” button to advance to the channel to be calibrated. Enter a “Sample Count” of 50, return to the “Setup” menu, touch “PLC Reset”, return to channel to be calibrated.
5. Attach a calibrated NIST traceable standard to the channel being calibrated. Record “Standard” vs. “Current Reading” data. Determine if “Current Reading” values are within permissible error limits. If an unacceptable degree of error is discovered, adjust the offset to obtain acceptable results.
6. Once finished, set “Sample Count” back to “0”, go to the “Setup” screen and touch “PLC Reset”.

**Note:**

Many factors can contribute to inconsistent and/or unacceptable levels of error. Good wiring and shielding practices are required for best results. Thermocouple input channel “High” and “Low” settings have no effect, however an offset value can be entered.
4.7.7.1 - Heat Output Cycle Time (REV) - defines the maximum ON to OFF to ON time window in which heating can be called for.

4.7.7.2 - Sensitivity Value of Heat Output (REV) - determines the responsiveness the controller uses to reach a channel setpoint when heating is required. A typical setting is a value of 160 to 240.

4.7.7.3 - Sensitivity Value of Cool Output (DIR) - determines the responsiveness the controller uses to reach a channel setpoint when cooling is required. A typical setting is a value of 160 to 240.

4.7.7.4 - Cool Output Cycle Time (DIR) - defines the maximum ON to OFF to ON time window in which cooling can be called for.

NOTE:

For most processes, a fast cycle time (less than 5 seconds) will produce a better control of loads with a fast response time. A typical setting is 3 to 4 seconds.

The sensitivity setting determines how often the Navigator Plus compares the setpoint and the process variable and acts on the difference. By entering a value in either of the sensitivity settings, the Navigator+™ will compare the values and, based on the settings, will make adjustments as required. The larger the value, the more often comparisons are made for adjustments.
Reverse – Heating Delays - Heat Stage Delay is the amount of time (in seconds) the controller waits between the activation of the first stage of heaters and the second stage of heaters.

Direct – Cooling Delays - Cool Stage Delay is the amount of time (in seconds) the controller waits between the activation of the first stage of cooling and the second stage of cooling.

4.7.8.1 Stage 2 Heat – if applicable: Refer to electrical print.
4.7.8.2 Stage 3 Heat – if applicable: Refer to electrical print.
4.7.8.3 Stage 4 Heat – if applicable: Refer to electrical print.
4.7.8.4 Stage 5 Heat – if applicable: Refer to electrical print.
4.7.8.5 Stage 5 Cool – if applicable: Refer to electrical print.
4.7.8.6 Stage 4 Cool – if applicable: Refer to electrical print.
4.7.8.7 Stage 3 Cool – if applicable: Refer to electrical print.
4.7.8.8 Stage 2 Cool – if applicable: Refer to electrical print.
### 4.7.9 Passwords

- **Level 1**: Allows access for System Profile Run (Customer Use)
- **Level 2**: Allows access for Program Editing (Customer Use)
- **Level 3**: Allows access for Calibration Adjustments (Customer Use)
- **Level 7**: Allows access to Factory Settings (Factory Use Only)
5.1 **Login** - To enter your password at one of six levels.

5.2 **Profiles** – Select from one of five program profiles. (Must be logged in to password level 2 or higher)

5.3 **Prev** - Returns to the main screen.

5.4 **Run Profile** - Brings you to the run program screen. Start time, date etc.

5.5 **Next** - Forwards you to the manual screen.

5.6 **Edit Profile** - Allows for the editing of an currently loaded program profile.

5.7 **Log out** - Removes access to the everything but the stop feature and Manual mode.
5.2 Profiles – Select from one of five program profiles.

5.2.1 Profile; Program profile, check desired profile, and “Open” or “Save”
5.2.2 Prev; Previous page.
5.2.3 Open; Opens the selected file.
5.2.4 Saves; Saves an edited file.
5.2.5 File name; Profile name.
5.2.1 Profile  Program profile, check desired profile, and “Open”
Verifies your desire to open program.
5.2.1.1 Prev  Returns to previous page.
5.2.1.2 Open  Opens the desired program profile.
Figure 5.2.4 • File Save

5.2.4.1 Prev
5.2.4.2 OK to save file
5.6 Edit Profile - Allows for the editing of an existing program profile.

5.6.1 Step# Displays step being edited. Touch to change.
5.6.2 Type Displays type of step (Soak, Ramp, Loop, Stop)
5.6.3 Events When number is displayed it is “On”
5.6.4 Program display Shows a 5 step window of program
5.6.5 Prev Returns to Log In menu
5.6.6 Delete Deletes the step shown.
5.6.7 Insert Inserts a step before step shown.
5.6.8 Down arrow Walks through program
5.6.9 Up Arrow Walks through program
5.6.10 Duration Step time interval
5.6.11 GS/Loop Guaranteed soak window on loop to step number
5.6.12 CH1 Enter desired set point for current step
5.6.13 0 = Blank; 1 = GS Win; 3 = Blank; 4 = Loop to
5.6.14 0 = Stop; 1 = Soak at; 2 = Ramp to; 3 = Loop to
Editing a Program

Using the Prev/Next key scroll to the Profiles Page (Figure 5.1)

(Login to a security level of at least two (2) to edit a program.)
(Figure 5.1 Detail 5.1)

Press the Profiles button (Figure 5.1 detail 5.2) and the file screen will open. Select the file you wish to edit by touching the box in front of the desired file. (Figure 5.2 detail 5.2.1) then press open

Then press the Edit Profile button. (Figure 5.1 detail 5.6)

The edit profile screen will now be displayed. (Figure 5.6)

First is to select the step number of your program. (detail 5.6.1) Pressing the button will provide a numerical display. Enter the desired step number (if change is needed) and press the enter key.

Step Type:
Then (if required) select the type of step (detail 5.6.2), soak, ramp, loop or stop.

Programming Events
Each programming step lets you activate any or all of the up to 8 event outputs.

Event Outputs On lets you activate the event outputs 1 through 8 for this step. Enter the output numbers, in any order, of the events you wish to turn on. Any of the 8 events that were not selected will be set to OFF once you hit ENTER and selected ones set to ON.

Determine the events that may be required to perform the step function. To turning an event on touch the button and the number of the event should appear. Now select the Ch1 temperature (detail 5.6.13) by touching the button. A numerical display will appear. Type in the desired value for your applications step and press the enter key.

Guaranteed Soak
If guaranteed soak (GS) is required press the button identified as (detail 5.6.12) and enter a value via keypad. This value is the numerical amount of deviation allowed before the program can advance.

Guaranteed Soak affects the way a step behaves in terms of its time duration. If G-Soak is ON, (a value entered) the controller will wait until it achieves a process variable within the window and then will begin the countdown for that step TIME DURATION. If G-Soak is OFF, the controller will try to achieve the set point for that step within the TIME DURATION for that step, thus, the controller begins its countdown as soon as the step is begun.

Ch. 1 GS  A Value of “0” is the off function for guaranteed soak
Ch. 2 GS
Ch. 3 GS
Soak Window Adjustment
With Guaranteed Soak on, the TIME DURATION counter does not begin until you have reached your setpoint window. If your Process Variable (P.V.) has any variance outside of the window, your counter will cease until it reaches the setpoint window again.

Example: G-Soak for channel 1 is on, setpoint is at 140 degrees F, but the P.V. varies by 2 or 3 degrees off the setpoint. If the WINDOW for the channel is +/- 5, the steps counter will continue. If the P.V. varies more than 5 degrees off setpoint, the step counter will stop until it is back within the specified window.

Note: Using G-Soak in a “ramp” step will cause the controller to stop the program clock and not allow the program to progress. As a result, the program will never advance to the next step. Use G-Soak only in “soak” steps.

Step Time Duration (detail 5.6.11) tells the controller the amount of time this step is to take to achieve the given setpoint (w/ G-Soak OFF), or the amount of time that the step remains at the given setpoint (w/ G-Soak ON). It is in Hours:Minutes:Seconds. The maximum amount of time that can be entered on any one step is 99 hours 59 minutes and 59 seconds.

Selecting a Program to Run
To choose a program to run you must scroll to the profiles screen. Figure 5  Press the “Profiles” button (detail 5.2). 

Select a Program Name or Number
You are now on the File screen. Select from one of the five (5) available programs. Figure 5.2 detail 5.2. by placing a checkmark in front of the desired profile. Then press the open button. It will ask you to then acknowledge this selection. Press the open key Figure 5.2.1.1.

Now press the “run” key and follow the Start via Program steps.
Remote Command Set

Here we will show you the commands available to you via the remote COMMAND mode. This section is divided into 3 sections listed below.

Program & System Control
Manual Control
Alarm Control

In this section, the following conventions are observed:

- **monospace bold words** are sent to the controller exactly as shown
- *italicized* represent a variable value to be sent
- *channel* represents a valid channel number
- *alarm* represented by ALM and a corresponding number.

All commands are case sensitive and must be in capital letters.

System Control

These commands control the starting and stopping of the system. They correspond to the options available when the MANUAL and STOP keys on the front panel are pushed.

- **STPA** has the same effect as pressing the STOP button.
- **STRM** starts the system in manual mode.

Manual Control

- **MANWEV event_num W 0/1** sets the specified event to the specified state.
  Example: MANWEV1W 1 for “ON” and MANWEV2W 0 for “OFF”

- **000EV event_num R** returns the current state of the specified event as either 1 for “ON” or 0 for “OFF”.

- **000SP channel W value** sets the setpoint for a specified channel.
  Example: 000SP1W 235 would be 23.5.

- **000SP channel R** returns the specified channel’s setpoint.

- **PV0 channel** returns the specified channel’s P.V.
Alarm Control
These commands control and get data about the system alarms

ALM + alarm number + returns the current state of the specified alarm. Either “0” or “1” is returned. 0 shows alarm is “OFF” and 1 shows the alarm is activated.

Alarms:

Note: Some alarms listed below may not be used on your system. Verify with the electrical print for the alarms for your chamber.

ALM1 Chamber High Heat Limit alarm one (HLS-1)
ALM2 Chamber High Heat Limit alarm two (HLS-2)
ALM3 Circulator Motor Overload (C/OL)
ALM4 HS Oil Pressure Switch (HOPS)
ALM5 HS Thermal Head Switch (HTHS)
ALM6 HS Hi/Lo Pressure Switch (HHLP)
ALM7 LS Oil Pressure Switch (LOPS)
ALM8 LS Thermal Head Switch (LTHS)
ALM9 LS Hi/Lo Pressure Switch (LHLP)
ALMA HS Water Pressure Switch (WPS)
ALMB Boiler Over Temp (TAS-1)
ALMC Temp Sentry
ALMD Spare Alarm one
ALME Spare Alarm two
ALMF Spare Alarm three
ALMG Spare Alarm four

Example Commands:

000SP1W 250 This command will set the channel 1 setpoint to 25.0.
ALM1 This command will read back the alarm status of Alarm 1.
PV01 This command will read back the current temperature of channel 1.
000EV1R This command will read back the current status of Event 1. 1 signifies ON and 0 signifies OFF.
000SP1R This will read back the current setting of Setpoint 1.
STRM This command will start the controller in manual mode
STPA This command will stop the controller
MANWEV1W 1 This command will turn on Event 1.

Rules for Command Syntax

Format for Full Command:

STEP# (4 DIGITS)|COMMAND (4 DIGITS)|COMMAND VALUE (5 DIGITS MAX)

Step#: must be 4 digits long with a space. Ex: [space]001 or [space]025, etc.
Command: See following pages for command list
Remote Command Set continued...

Command Value;

IF POSITIVE: [space]VALUE.  Ex: [space]1000 or [space]555.
IF NEGATE:    NO SPACE. EX: -1000 or -555.

Example of setting step #2, Set point for channel 1 to 105:
[space]002SP1W[space]1050

Example of setting manual set point channel 1 to -55:
MANWSP1W-550

Note that all temperature settings are integers with no decimal points. For a temperature setting of 105.6 the command value would scale up by a factor of 10 for a result of 1056.

Current Port Parameters are:

9600 Baud
Odd Parity
Seven data bits
1 Stop bit

This is the ASCII Diagnostics page and can be accessed from the ‘Setup menu’.

If a correct command is sent, it will display         and the corresponding button below will light.
To clear all buttons, press “Reset All”.

If a correct command is sent, it will display and the corresponding button below will light.
## Remote Command Set continued...

**COMMANDS**

<table>
<thead>
<tr>
<th>NAME</th>
<th>ASCII</th>
<th>WRITE</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>EVENT 1</td>
<td>000EV1W</td>
<td>ON=1/OFF=0</td>
<td></td>
</tr>
<tr>
<td>EVENT 2</td>
<td>000EV2W</td>
<td>ON=1/OFF=0</td>
<td></td>
</tr>
<tr>
<td>EVENT 3</td>
<td>000EV3W</td>
<td>ON=1/OFF=0</td>
<td></td>
</tr>
<tr>
<td>EVENT 4</td>
<td>000EV4W</td>
<td>ON=1/OFF=0</td>
<td></td>
</tr>
<tr>
<td>EVENT 5</td>
<td>000EV5W</td>
<td>ON=1/OFF=0</td>
<td></td>
</tr>
<tr>
<td>EVENT 6</td>
<td>000EV6W</td>
<td>ON=1/OFF=0</td>
<td></td>
</tr>
<tr>
<td>EVENT 7</td>
<td>000EV7W</td>
<td>ON=1/OFF=0</td>
<td></td>
</tr>
<tr>
<td>EVENT 8</td>
<td>000EV8W</td>
<td>ON=1/OFF=0</td>
<td></td>
</tr>
<tr>
<td>EVENT ALL</td>
<td>000EVAR</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**MANUAL MODE**

| EVENT 1 | MANWEV1W | ON=1/OFF=0 |
| EVENT 2 | MANWEV2W | ON=1/OFF=0 |
| EVENT 3 | MANWEV3W | ON=1/OFF=0 |
| EVENT 4 | MANWEV4W | ON=1/OFF=0 |
| EVENT 5 | MANWEV5W | ON=1/OFF=0 |
| EVENT 6 | MANWEV6W | ON=1/OFF=0 |
| EVENT 7 | MANWEV7W | ON=1/OFF=0 |
| EVENT 8 | MANWEV8W | ON=1/OFF=0 |
| EVENT ALL | MANWEVAW |  |

| SETPOINT 1 | 000SP1W | SET VALUE |
| SETPOINT 2 | 000SP2W | SET VALUE |
| SETPOINT 3 | 000SP3W | SET VALUE |

| SETPOINT 1 | MANWSP1W | SET VALUE |
| SETPOINT 2 | MANWSP2W | SET VALUE |
| SETPOINT 3 | MANWSP3W | SET VALUE |

| GUARANTEE SOAK 1 | 000GS1W | SET VALUE |
| GUARANTEE SOAK 2 | 000GS2W | SET VALUE |
| GUARANTEE SOAK 3 | 000GS3W | SET VALUE |

| SECOND | 000SECW | SET VALUE |
| MINUTE | 000MINW | SET VALUE |
| HOUR | 000HRSW | SET VALUE |

| STEP TYPE | 0000STPW | SET VALUE |
| CYCLE | 0000CYCW | SET VALUE |
| GO TO | 0000GTOW | SET VALUE |
| START CONTROLLER | STRM | START CONTROL |
| STOP CONTROLLER | STPA | STOP CONTROL |
| PROGRAM START | PSTR | START PROGRAM |
| PROGRAM PAUSE | PPSE | PAUSE PROGRAM |
| PROGRAM RESUME | PRSM | RESUME PROGRAM |
| QUICK DRAW | QKDW | |

**READ**

| EVENT 1 | 000EV1R | |
| EVENT 2 | 000EV2R | |
| EVENT 3 | 000EV3R | |
| EVENT 4 | 000EV4R | |
| EVENT 5 | 000EV5R | |
| EVENT 6 | 000EV6R | |
| EVENT 7 | 000EV7R | |
| EVENT 8 | 000EV8R | |
| EVENT ALL | 000EVAR | |
### COMMANDS CONTINUED...

<table>
<thead>
<tr>
<th>NAME</th>
<th>READ</th>
</tr>
</thead>
<tbody>
<tr>
<td>EVENT 1</td>
<td>MANUREV1R</td>
</tr>
<tr>
<td>EVENT 2</td>
<td>MANUREV2R</td>
</tr>
<tr>
<td>EVENT 3</td>
<td>MANUREV3R</td>
</tr>
<tr>
<td>EVENT 4</td>
<td>MANUREV4R</td>
</tr>
<tr>
<td>EVENT 5</td>
<td>MANUREV5R</td>
</tr>
<tr>
<td>EVENT 6</td>
<td>MANUREV6R</td>
</tr>
<tr>
<td>EVENT 7</td>
<td>MANUREV7R</td>
</tr>
<tr>
<td>EVENT 8</td>
<td>MANUREV8R</td>
</tr>
<tr>
<td>EVENT ALL</td>
<td>MANREVAR</td>
</tr>
<tr>
<td>SETPOINT 1</td>
<td>000SP1R</td>
</tr>
<tr>
<td>SETPOINT 2</td>
<td>000SP2R</td>
</tr>
<tr>
<td>SETPOINT 3</td>
<td>000SP3R</td>
</tr>
<tr>
<td>GUARANTEE SOAK 1</td>
<td>000GS1R</td>
</tr>
<tr>
<td>GUARANTEE SOAK 2</td>
<td>000GS2R</td>
</tr>
<tr>
<td>GUARANTEE SOAK 3</td>
<td>000GS3R</td>
</tr>
<tr>
<td>SECOND</td>
<td>000SECR</td>
</tr>
<tr>
<td>MINUTE</td>
<td>000MINR</td>
</tr>
<tr>
<td>HOUR</td>
<td>000HRSR</td>
</tr>
<tr>
<td>STEP TYPE</td>
<td>000STPR</td>
</tr>
<tr>
<td>CYCLE</td>
<td>000CYCR</td>
</tr>
<tr>
<td>GO TO</td>
<td>000GTOR</td>
</tr>
<tr>
<td>PROCESS VARIABLE 1</td>
<td>PV01</td>
</tr>
<tr>
<td>PROCESS VARIABLE 2</td>
<td>PV02</td>
</tr>
<tr>
<td>PROCESS VARIABLE 3</td>
<td>PV03</td>
</tr>
<tr>
<td>CURRENT STEP NUMBER</td>
<td>STEP</td>
</tr>
<tr>
<td>ELAPSED TIME</td>
<td>ETIM</td>
</tr>
<tr>
<td>QUICK DRAW</td>
<td>QKDR</td>
</tr>
<tr>
<td>NAVIGATOR ID</td>
<td>ID00</td>
</tr>
</tbody>
</table>

### ALARMS

<table>
<thead>
<tr>
<th>NAME</th>
<th>READ</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALARM 1</td>
<td>ALM0</td>
</tr>
<tr>
<td>ALARM 2</td>
<td>ALM1</td>
</tr>
<tr>
<td>ALARM 3</td>
<td>ALM2</td>
</tr>
<tr>
<td>ALARM 4</td>
<td>ALM3</td>
</tr>
<tr>
<td>ALARM 5</td>
<td>ALM4</td>
</tr>
<tr>
<td>ALARM 6</td>
<td>ALM5</td>
</tr>
<tr>
<td>ALARM 7</td>
<td>ALM6</td>
</tr>
<tr>
<td>ALARM 8</td>
<td>ALM7</td>
</tr>
<tr>
<td>ALARM 9</td>
<td>ALM8</td>
</tr>
<tr>
<td>ALARM 10</td>
<td>ALM9</td>
</tr>
<tr>
<td>ALARM 11</td>
<td>ALMA</td>
</tr>
<tr>
<td>ALARM 12</td>
<td>ALMB</td>
</tr>
<tr>
<td>ALARM 13</td>
<td>ALMC</td>
</tr>
<tr>
<td>ALARM 14</td>
<td>ALMD</td>
</tr>
<tr>
<td>ALARM 15</td>
<td>ALME</td>
</tr>
<tr>
<td>ALARM 16</td>
<td>ALMF</td>
</tr>
</tbody>
</table>
To change the IP address on the Navigator+ touch screen, please follow these procedures.

1. Remove power from the touch screen.
2. Open the swing door marked CF CARD.
3. Move Dip Switch 1 to the ON position. **DO NOT MOVE ANY OTHER SWITCHES, THE PROGRAM WILL BE DELETED!**
4. Restore power to the touch screen. When the blue screen appears, touch anywhere on the screen to reach the setup menu.
5. Touch TCP/IP settings.
6. Touch each item to be changed in the window that appears. Each item touched will bring up a pop up window to allow changes.
7. When done, touch OK. This will bring you back to the main menu.
8. Remove power from the touch screen and place the Dip Switch back in the OFF position. Do not forget to close the swing door.
9. Restore power to the touch screen and the new settings will take effect.
<table>
<thead>
<tr>
<th>C</th>
<th>F</th>
<th>C</th>
<th>F</th>
<th>C</th>
<th>F</th>
<th>C</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>-80</td>
<td>-112.00</td>
<td>-35</td>
<td>-31.00</td>
<td>10</td>
<td>50.00</td>
<td>55</td>
<td>131.00</td>
</tr>
<tr>
<td>-79</td>
<td>-110.20</td>
<td>-34</td>
<td>-29.20</td>
<td>11</td>
<td>51.80</td>
<td>56</td>
<td>132.80</td>
</tr>
<tr>
<td>-78</td>
<td>-108.40</td>
<td>-33</td>
<td>-27.40</td>
<td>12</td>
<td>53.60</td>
<td>57</td>
<td>134.60</td>
</tr>
<tr>
<td>-77</td>
<td>-106.60</td>
<td>-32</td>
<td>-25.60</td>
<td>13</td>
<td>55.40</td>
<td>58</td>
<td>136.40</td>
</tr>
<tr>
<td>-76</td>
<td>-104.80</td>
<td>-31</td>
<td>-23.80</td>
<td>14</td>
<td>57.20</td>
<td>59</td>
<td>138.20</td>
</tr>
<tr>
<td>-75</td>
<td>-103.00</td>
<td>-30</td>
<td>-22.00</td>
<td>15</td>
<td>59.00</td>
<td>60</td>
<td>140.00</td>
</tr>
<tr>
<td>-74</td>
<td>-101.20</td>
<td>-29</td>
<td>-20.20</td>
<td>16</td>
<td>60.80</td>
<td>61</td>
<td>141.80</td>
</tr>
<tr>
<td>-73</td>
<td>-99.40</td>
<td>-28</td>
<td>-18.40</td>
<td>17</td>
<td>62.60</td>
<td>62</td>
<td>143.60</td>
</tr>
<tr>
<td>-72</td>
<td>-97.60</td>
<td>-27</td>
<td>-16.60</td>
<td>18</td>
<td>64.40</td>
<td>63</td>
<td>145.40</td>
</tr>
<tr>
<td>-71</td>
<td>-95.80</td>
<td>-26</td>
<td>-14.80</td>
<td>19</td>
<td>66.20</td>
<td>64</td>
<td>147.20</td>
</tr>
<tr>
<td>-70</td>
<td>-94.00</td>
<td>-25</td>
<td>-13.00</td>
<td>20</td>
<td>68.00</td>
<td>65</td>
<td>149.00</td>
</tr>
<tr>
<td>-69</td>
<td>-92.20</td>
<td>-24</td>
<td>-11.20</td>
<td>21</td>
<td>69.80</td>
<td>66</td>
<td>150.80</td>
</tr>
<tr>
<td>-68</td>
<td>-90.40</td>
<td>-23</td>
<td>-9.40</td>
<td>22</td>
<td>71.60</td>
<td>67</td>
<td>152.60</td>
</tr>
<tr>
<td>-67</td>
<td>-88.60</td>
<td>-22</td>
<td>-7.60</td>
<td>23</td>
<td>73.40</td>
<td>68</td>
<td>154.40</td>
</tr>
<tr>
<td>-66</td>
<td>-86.80</td>
<td>-21</td>
<td>-5.80</td>
<td>24</td>
<td>75.20</td>
<td>69</td>
<td>156.20</td>
</tr>
<tr>
<td>-65</td>
<td>-85.00</td>
<td>-20</td>
<td>-4.00</td>
<td>25</td>
<td>77.00</td>
<td>70</td>
<td>158.00</td>
</tr>
<tr>
<td>-64</td>
<td>-83.20</td>
<td>-19</td>
<td>-2.20</td>
<td>26</td>
<td>78.80</td>
<td>71</td>
<td>159.80</td>
</tr>
<tr>
<td>-63</td>
<td>-81.40</td>
<td>-18</td>
<td>-0.40</td>
<td>27</td>
<td>80.60</td>
<td>72</td>
<td>161.60</td>
</tr>
<tr>
<td>-62</td>
<td>-79.60</td>
<td>-17</td>
<td>1.40</td>
<td>28</td>
<td>82.40</td>
<td>73</td>
<td>163.40</td>
</tr>
<tr>
<td>-61</td>
<td>-77.80</td>
<td>-16</td>
<td>3.20</td>
<td>29</td>
<td>84.20</td>
<td>74</td>
<td>165.20</td>
</tr>
<tr>
<td>-60</td>
<td>-76.00</td>
<td>-15</td>
<td>5.00</td>
<td>30</td>
<td>86.00</td>
<td>75</td>
<td>167.00</td>
</tr>
<tr>
<td>-59</td>
<td>-74.20</td>
<td>-14</td>
<td>6.80</td>
<td>31</td>
<td>87.80</td>
<td>76</td>
<td>168.80</td>
</tr>
<tr>
<td>-58</td>
<td>-72.40</td>
<td>-13</td>
<td>8.60</td>
<td>32</td>
<td>89.60</td>
<td>77</td>
<td>170.60</td>
</tr>
<tr>
<td>-57</td>
<td>-70.60</td>
<td>-12</td>
<td>10.40</td>
<td>33</td>
<td>91.40</td>
<td>78</td>
<td>172.40</td>
</tr>
<tr>
<td>-56</td>
<td>-68.80</td>
<td>-11</td>
<td>12.20</td>
<td>34</td>
<td>93.20</td>
<td>79</td>
<td>174.20</td>
</tr>
<tr>
<td>-55</td>
<td>-67.00</td>
<td>-10</td>
<td>14.00</td>
<td>35</td>
<td>95.00</td>
<td>80</td>
<td>176.00</td>
</tr>
<tr>
<td>-54</td>
<td>-65.20</td>
<td>-9</td>
<td>15.80</td>
<td>36</td>
<td>96.80</td>
<td>81</td>
<td>177.80</td>
</tr>
<tr>
<td>-53</td>
<td>-63.40</td>
<td>-8</td>
<td>17.60</td>
<td>37</td>
<td>98.60</td>
<td>82</td>
<td>179.60</td>
</tr>
<tr>
<td>-52</td>
<td>-61.60</td>
<td>-7</td>
<td>19.40</td>
<td>38</td>
<td>100.40</td>
<td>83</td>
<td>181.40</td>
</tr>
<tr>
<td>-51</td>
<td>-59.80</td>
<td>-6</td>
<td>21.20</td>
<td>39</td>
<td>102.20</td>
<td>84</td>
<td>183.20</td>
</tr>
<tr>
<td>-50</td>
<td>-58.00</td>
<td>-5</td>
<td>23.00</td>
<td>40</td>
<td>104.00</td>
<td>85</td>
<td>185.00</td>
</tr>
<tr>
<td>-49</td>
<td>-56.20</td>
<td>-4</td>
<td>24.80</td>
<td>41</td>
<td>105.80</td>
<td>86</td>
<td>186.80</td>
</tr>
<tr>
<td>-48</td>
<td>-54.40</td>
<td>-3</td>
<td>26.60</td>
<td>42</td>
<td>107.60</td>
<td>87</td>
<td>188.60</td>
</tr>
<tr>
<td>-47</td>
<td>-52.60</td>
<td>-2</td>
<td>28.40</td>
<td>43</td>
<td>109.40</td>
<td>88</td>
<td>190.40</td>
</tr>
<tr>
<td>-46</td>
<td>-50.80</td>
<td>-1</td>
<td>30.20</td>
<td>44</td>
<td>111.20</td>
<td>89</td>
<td>192.20</td>
</tr>
<tr>
<td>-45</td>
<td>-49.00</td>
<td>0</td>
<td>32.00</td>
<td>45</td>
<td>113.00</td>
<td>90</td>
<td>194.00</td>
</tr>
<tr>
<td>-44</td>
<td>-47.20</td>
<td>1</td>
<td>33.80</td>
<td>46</td>
<td>114.80</td>
<td>91</td>
<td>195.80</td>
</tr>
<tr>
<td>-43</td>
<td>-45.40</td>
<td>2</td>
<td>35.60</td>
<td>47</td>
<td>116.60</td>
<td>92</td>
<td>197.60</td>
</tr>
<tr>
<td>-42</td>
<td>-43.60</td>
<td>3</td>
<td>37.40</td>
<td>48</td>
<td>118.40</td>
<td>93</td>
<td>199.40</td>
</tr>
<tr>
<td>-41</td>
<td>-41.80</td>
<td>4</td>
<td>39.20</td>
<td>49</td>
<td>120.20</td>
<td>94</td>
<td>201.20</td>
</tr>
<tr>
<td>-40</td>
<td>-40.00</td>
<td>5</td>
<td>41.00</td>
<td>50</td>
<td>122.00</td>
<td>95</td>
<td>203.00</td>
</tr>
<tr>
<td>-39</td>
<td>-38.20</td>
<td>6</td>
<td>42.80</td>
<td>51</td>
<td>123.80</td>
<td>96</td>
<td>204.80</td>
</tr>
<tr>
<td>-38</td>
<td>-36.40</td>
<td>7</td>
<td>44.60</td>
<td>52</td>
<td>125.60</td>
<td>97</td>
<td>206.80</td>
</tr>
<tr>
<td>-37</td>
<td>-34.60</td>
<td>8</td>
<td>46.40</td>
<td>53</td>
<td>127.40</td>
<td>98</td>
<td>208.40</td>
</tr>
<tr>
<td>-36</td>
<td>-32.80</td>
<td>9</td>
<td>48.20</td>
<td>54</td>
<td>129.20</td>
<td>99</td>
<td>210.20</td>
</tr>
<tr>
<td>C</td>
<td>F</td>
<td>C</td>
<td>F</td>
<td>C</td>
<td>F</td>
<td>C</td>
<td>F</td>
</tr>
<tr>
<td>-----</td>
<td>------</td>
<td>-----</td>
<td>------</td>
<td>-----</td>
<td>------</td>
<td>-----</td>
<td>------</td>
</tr>
<tr>
<td>100</td>
<td>212.00</td>
<td>145</td>
<td>293.00</td>
<td>190</td>
<td>374.00</td>
<td>235</td>
<td>455.00</td>
</tr>
<tr>
<td>101</td>
<td>213.80</td>
<td>146</td>
<td>294.80</td>
<td>191</td>
<td>375.80</td>
<td>236</td>
<td>456.80</td>
</tr>
<tr>
<td>102</td>
<td>215.60</td>
<td>147</td>
<td>296.60</td>
<td>192</td>
<td>377.60</td>
<td>237</td>
<td>458.60</td>
</tr>
<tr>
<td>103</td>
<td>217.40</td>
<td>148</td>
<td>298.40</td>
<td>193</td>
<td>379.40</td>
<td>238</td>
<td>460.40</td>
</tr>
<tr>
<td>104</td>
<td>219.20</td>
<td>149</td>
<td>300.20</td>
<td>194</td>
<td>381.20</td>
<td>239</td>
<td>462.20</td>
</tr>
<tr>
<td>105</td>
<td>221.00</td>
<td>150</td>
<td>302.00</td>
<td>195</td>
<td>383.00</td>
<td>240</td>
<td>464.00</td>
</tr>
<tr>
<td>106</td>
<td>222.80</td>
<td>151</td>
<td>303.80</td>
<td>196</td>
<td>384.80</td>
<td>241</td>
<td>465.80</td>
</tr>
<tr>
<td>107</td>
<td>224.60</td>
<td>152</td>
<td>305.60</td>
<td>197</td>
<td>386.60</td>
<td>242</td>
<td>467.60</td>
</tr>
<tr>
<td>108</td>
<td>226.40</td>
<td>153</td>
<td>307.40</td>
<td>198</td>
<td>388.40</td>
<td>243</td>
<td>469.40</td>
</tr>
<tr>
<td>109</td>
<td>228.20</td>
<td>154</td>
<td>309.20</td>
<td>199</td>
<td>390.20</td>
<td>244</td>
<td>471.20</td>
</tr>
<tr>
<td>110</td>
<td>230.00</td>
<td>155</td>
<td>311.00</td>
<td>200</td>
<td>392.00</td>
<td>245</td>
<td>473.00</td>
</tr>
<tr>
<td>111</td>
<td>231.80</td>
<td>156</td>
<td>312.80</td>
<td>201</td>
<td>393.80</td>
<td>246</td>
<td>474.80</td>
</tr>
<tr>
<td>112</td>
<td>233.60</td>
<td>157</td>
<td>314.60</td>
<td>202</td>
<td>395.60</td>
<td>247</td>
<td>476.60</td>
</tr>
<tr>
<td>113</td>
<td>235.40</td>
<td>158</td>
<td>316.40</td>
<td>203</td>
<td>397.40</td>
<td>248</td>
<td>478.40</td>
</tr>
<tr>
<td>114</td>
<td>237.20</td>
<td>159</td>
<td>318.20</td>
<td>204</td>
<td>399.20</td>
<td>249</td>
<td>480.20</td>
</tr>
<tr>
<td>115</td>
<td>239.00</td>
<td>160</td>
<td>320.00</td>
<td>205</td>
<td>401.00</td>
<td>250</td>
<td>482.00</td>
</tr>
<tr>
<td>116</td>
<td>240.80</td>
<td>161</td>
<td>321.80</td>
<td>206</td>
<td>402.80</td>
<td>251</td>
<td>483.80</td>
</tr>
<tr>
<td>117</td>
<td>242.60</td>
<td>162</td>
<td>323.60</td>
<td>207</td>
<td>404.60</td>
<td>252</td>
<td>485.60</td>
</tr>
<tr>
<td>118</td>
<td>244.40</td>
<td>163</td>
<td>325.40</td>
<td>208</td>
<td>406.40</td>
<td>253</td>
<td>487.40</td>
</tr>
<tr>
<td>119</td>
<td>246.20</td>
<td>164</td>
<td>327.20</td>
<td>209</td>
<td>408.20</td>
<td>254</td>
<td>489.20</td>
</tr>
<tr>
<td>120</td>
<td>248.00</td>
<td>165</td>
<td>329.00</td>
<td>210</td>
<td>410.00</td>
<td>255</td>
<td>491.00</td>
</tr>
<tr>
<td>121</td>
<td>249.80</td>
<td>166</td>
<td>330.80</td>
<td>211</td>
<td>411.80</td>
<td>256</td>
<td>492.80</td>
</tr>
<tr>
<td>122</td>
<td>251.60</td>
<td>167</td>
<td>332.60</td>
<td>212</td>
<td>413.60</td>
<td>257</td>
<td>494.60</td>
</tr>
<tr>
<td>123</td>
<td>253.40</td>
<td>168</td>
<td>334.40</td>
<td>213</td>
<td>415.40</td>
<td>258</td>
<td>496.40</td>
</tr>
<tr>
<td>124</td>
<td>255.20</td>
<td>169</td>
<td>336.20</td>
<td>214</td>
<td>417.20</td>
<td>259</td>
<td>498.20</td>
</tr>
<tr>
<td>125</td>
<td>257.00</td>
<td>170</td>
<td>338.00</td>
<td>215</td>
<td>419.00</td>
<td>260</td>
<td>500.00</td>
</tr>
<tr>
<td>126</td>
<td>258.80</td>
<td>171</td>
<td>339.80</td>
<td>216</td>
<td>420.80</td>
<td>261</td>
<td>501.80</td>
</tr>
<tr>
<td>127</td>
<td>260.60</td>
<td>172</td>
<td>341.60</td>
<td>217</td>
<td>422.60</td>
<td>262</td>
<td>503.60</td>
</tr>
<tr>
<td>128</td>
<td>262.40</td>
<td>173</td>
<td>343.40</td>
<td>218</td>
<td>424.40</td>
<td>263</td>
<td>505.40</td>
</tr>
<tr>
<td>129</td>
<td>264.20</td>
<td>174</td>
<td>345.20</td>
<td>219</td>
<td>426.20</td>
<td>264</td>
<td>507.20</td>
</tr>
<tr>
<td>130</td>
<td>266.00</td>
<td>175</td>
<td>347.00</td>
<td>220</td>
<td>428.00</td>
<td>265</td>
<td>509.00</td>
</tr>
<tr>
<td>131</td>
<td>267.80</td>
<td>176</td>
<td>348.80</td>
<td>221</td>
<td>429.80</td>
<td>266</td>
<td>510.80</td>
</tr>
<tr>
<td>132</td>
<td>269.60</td>
<td>177</td>
<td>350.60</td>
<td>222</td>
<td>431.60</td>
<td>267</td>
<td>512.60</td>
</tr>
<tr>
<td>133</td>
<td>271.40</td>
<td>178</td>
<td>352.40</td>
<td>223</td>
<td>433.40</td>
<td>268</td>
<td>514.40</td>
</tr>
<tr>
<td>134</td>
<td>273.20</td>
<td>179</td>
<td>354.20</td>
<td>224</td>
<td>435.20</td>
<td>269</td>
<td>516.20</td>
</tr>
<tr>
<td>135</td>
<td>275.00</td>
<td>180</td>
<td>356.00</td>
<td>225</td>
<td>437.00</td>
<td>270</td>
<td>518.00</td>
</tr>
<tr>
<td>136</td>
<td>276.80</td>
<td>181</td>
<td>357.80</td>
<td>226</td>
<td>438.80</td>
<td>271</td>
<td>519.80</td>
</tr>
<tr>
<td>137</td>
<td>278.60</td>
<td>182</td>
<td>359.60</td>
<td>227</td>
<td>440.60</td>
<td>272</td>
<td>521.60</td>
</tr>
<tr>
<td>138</td>
<td>280.40</td>
<td>183</td>
<td>361.40</td>
<td>228</td>
<td>442.40</td>
<td>273</td>
<td>523.40</td>
</tr>
<tr>
<td>139</td>
<td>282.20</td>
<td>184</td>
<td>363.20</td>
<td>229</td>
<td>444.20</td>
<td>274</td>
<td>525.20</td>
</tr>
<tr>
<td>140</td>
<td>284.00</td>
<td>185</td>
<td>365.00</td>
<td>230</td>
<td>446.00</td>
<td>275</td>
<td>527.00</td>
</tr>
<tr>
<td>141</td>
<td>285.80</td>
<td>186</td>
<td>366.80</td>
<td>231</td>
<td>447.80</td>
<td>276</td>
<td>528.80</td>
</tr>
<tr>
<td>142</td>
<td>287.60</td>
<td>187</td>
<td>368.60</td>
<td>232</td>
<td>449.60</td>
<td>277</td>
<td>530.60</td>
</tr>
<tr>
<td>143</td>
<td>289.40</td>
<td>188</td>
<td>370.40</td>
<td>233</td>
<td>451.40</td>
<td>278</td>
<td>532.40</td>
</tr>
<tr>
<td>144</td>
<td>291.20</td>
<td>189</td>
<td>372.20</td>
<td>234</td>
<td>453.20</td>
<td>279</td>
<td>534.20</td>
</tr>
</tbody>
</table>
Sensor Descriptions

Range Accuracy (typical @ 25°C and 5 VDC)

<table>
<thead>
<tr>
<th>Description</th>
<th>Typical Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>± 15 mV</td>
<td>± 0.03 mV</td>
</tr>
<tr>
<td>± 50 mV</td>
<td>± 0.015 mV</td>
</tr>
<tr>
<td>± 100 mV</td>
<td>± 0.0055 mV</td>
</tr>
<tr>
<td>± 500 mV</td>
<td>± 0.005 mV</td>
</tr>
<tr>
<td>± 1 V</td>
<td>± 0.005 V</td>
</tr>
<tr>
<td>± 5V</td>
<td>± 0.005 V</td>
</tr>
<tr>
<td>± 20 mA</td>
<td>± 0.008 mA</td>
</tr>
<tr>
<td>J Thermocouple 0 to 760 °C</td>
<td>± .4 °C</td>
</tr>
<tr>
<td>T Thermocouple -100 to 400°C</td>
<td>± .5 °C</td>
</tr>
</tbody>
</table>

Available Selections

- 0 - 10 VDC
- ± 10 VDC
- 4 - 20 mA
- J Thermocouple °C
- T -Thermocouple °C
- T -Thermocouple °F
Figure 4.7.5 • Alarms if used by Factory in Analog Mode

4.7.5.1 Type of alarm signal (i.e. digital or analog).
4.7.5.2 Input selection for digital alarms.
4.7.5.3 Channel selection for analog alarms.
4.7.5.4 Common state of digital type alarms.
4.7.5.5 Specifies if controller should halt if alarm occurs.
4.7.5.6 Return to the Set Up menu.
4.7.5.7 Low limit for analog type alarms.
4.7.5.8 Stop System.
4.7.5.9 High limit for analog type alarms.
4.7.5.10 Go to the previous alarm for setup.
4.7.5.11 Advance to the next alarm for setup.
4.7.5.12 Hysteresis setting for analog type alarms.
   Operating window to prevent a short cycling of the switch.
   Sometimes referred to as a make or break value. Example: Open at 10 PSI Close at 20 PSI
4.7.5.13 Duration of time alarm must be active before registering. True is auto / False is manual.
4.7.5.14 Inf secondary analog sensor is on another channel - wait until both show trip.
4.7.5.15 Alarm automatic reset.
4.7.5.16 Brings you to the alarm page.
4.7.5.17 Silences the audible alarm bell.
4.7.5.18 This is the name of the alarm.

Accessible at Password Level 4