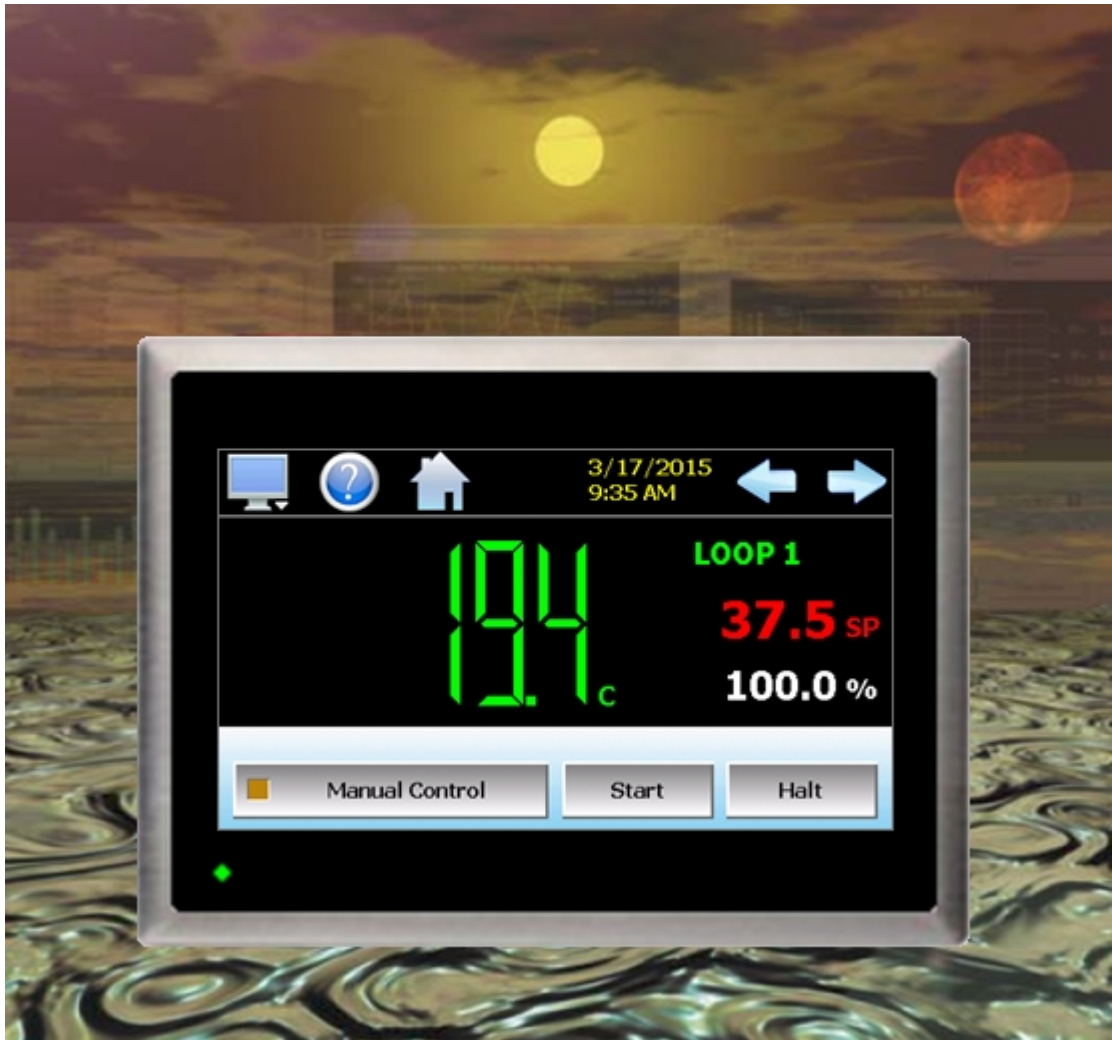# FUTUREDESIGN
CONTROLS

Orion *nCompass* MC i4.3
1 to 10 Loop Controller
Configuration Manual

Safety Information in this Manual

Notes, cautions and warnings appear throughout this book to draw your attention to important operational and safety information.

A "**NOTE**" marks a short message to alert you to an important detail.

A "**CAUTION**" safety alert appears with information that is important for protecting your equipment and performance.

A "**WARNING**" safety alert appears with information that is important for protecting you, others and equipment from damage. Pay very close attention to all warnings that apply to your application.

This symbol (an exclamation point in a triangle) precedes a general CAUTION or WARNING statement.

This symbol (a lightning bolt in a lightning bolt in a triangle) precedes an electric shock hazard CAUTION or WARNING safety statement.

Technical Assistance

If you encounter a problem with your Orion nCompass controller, review all of your configuration information to verify that your selections are consistent with your application: inputs; outputs; alarms; limits; etc. If the problem persists after checking the above, you can get technical assistance by dialing +1 (866) 342-5332 or by faxing your request to +1 (866) 332-8014, Monday thru Friday, 8:00 a.m. to 5:00 p.m. Eastern Standard Time. You can also email your request to support@futuredesigncontrols.com.

An applications engineer will discuss your application with you.

Please have the following information available:

• Complete Model #'s and/or Serial #'s for Component(s) in Question
• Complete Software Version #'s
• All Configuration Information
• All User Manuals

Warranty and return information is on the back cover of this manual.

Your Comments

Your comments or suggestions on this manual are welcome. Please send them to:
Future Design Controls, P.O. Box 1196, Bridgeview, Illinois, 60455
Telephone: +1 (888) 751-5444; fax: +1 (888) 307-8014
csr@futuredesigncontrols.com

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nCompass i4.3

Appendix
 Order Matrix
 Software License
 Software Usage Note
 Warranty
 Returns

1   What is nCompass?

The nCompass system combines all of the features of a loop controller, video/chart recorder and data logging system into a single/intuitive device. Email, SMS (text messaging), FTP (file transfer protocol for automated data backup) and remote view/control (Web server/VNC server) are standard with nCompass and can be accessed via LAN/WAN using a PC, tablet or smart phone device.

Future Designs "nCompass" provides a 4.3"color touch screen interface with standard "Smart Device" user interface features for one to ten loop OEM control applications. All loop configuration and runtime user access is configurable at the device with no PC software required. OEM's have the ability to configure runtime features (screen availability, menus, language, etc...) to easily customize the system for their requirements. These configurations can be imported/exported to any other nCompass single/dual loop device for setup (from scratch) within minutes.

Individual high performance board level PID loop control boards (one for each loop) offer up to four control outputs each, powerful profiling capabilities with up to three events and full auto tune functionality with high resolution process inputs.

1.1   Features

Each of the nCompass loop control boards provide a single digital input that can be programmed as a automatic program control input for run, hold or abort, a manual mode or failure transfer control input or a program advance to next segment control input.

Each of the loop control boards also provide up to four control outputs which can be used as PID control outputs for heat/cool, direct outputs for controlling external equipment related to the application through software switches called events, or be programmed to act as system alarm outputs.

nCompass can be operated in single set point or automatic program control mode. Program entry is made easy through the use of copy, paste and delete menu selections. Programs can be copied to the external USB memory stick and then imported to another nCompass controller which eliminates the need to enter duplicate programs into multiple systems.

Data file analysis tools make looking at historical data a simple task. Any control variable saved to the data file can be plotted on the historical data chart for any time frame within the data file's total time range.

The built in Ethernet functionality includes a 'Web Server' to provide access to all nCompass data (view only), a VNC interface for remote control and monitoring and an NTS clock, all available via a local Intranet connection (wired or wireless), or the World Wide Web using standard software like Microsoft's Internet Explorer.

nCompass provides a rich set of tools for control interaction and process monitoring. Views include single and all loop views, charts, alarm, automated program status as well as historical data, alarm log and audit trail views. The menu driven interface eliminates screen "clutter" by providing an easy to use "Smart Device" interface for interaction between the user and nCompass.

nCompass can store more than one year of data on its SD memory card. Data logging can be enabled manually or automatically during program operation. Data backup is provided with a USB memory stick for plug and play transfer of files to any PC running Microsoft Windows XP operating systems and via the FTP back-up utility.

nCompass protects system access with 4 level security (user rights based), audit trails that document all user activity and ensures data integrity by digitally signing all data files and audit trails to meet regulatory requirements.

The nCompass controller includes the following features:

- One to ten loop controller models (automatic program operation included).
- Touch screen, "Smart Device" user interface (UI).
- Video recorder mode for view only applications.
- Email, SMS, FTP, VNC and Web functionality standard.
- Remote View/Control using PC, Tablet or Smartphone.
- Detailed maintenance, alarm monitoring and alarm history.
- User configurable data logging and historical data viewer.
- 4 level security with digitally signed audit trails and data files.
- National time server connectivity with daylight savings.
- Multi-lingual user interface supports over 25 languages.
- 30,000 hour LED display

2   Configurator Overview

The nCompass configurator is a powerful tool that allows full customization of nCompass. It is a program that allows the OEM or user to set up control system options for the nCompass runtime application. The configurator program will not run at the same time as the main runtime software.

The configurator can be run when the runtime software is exited and the "Exit and run configurator on next power-up" option is selected. The next time the unit is re-powered the configurator will run.

Control functions of each loop control board can be changed while the OEM or operator is editing the configuration of nCompass through the configurator program, so any equipment being controlled by the outputs should be placed in an "off" state so that any changes will not cause an unsafe condition or damage to equipment.

NOTE: *Each time the nCompass configurator software is exited; the controller runtime software will run after the unit is re-powered.*

The nCompass configurator provides the following functionality:

- Set the number of control loops that nCompass will use (one to ten).
- Provide control loop configuration settings for input type, output function, set point range, etc.
- 'Splash Screen' name editing for custom OEM or user requirements.
- Enable/disable options for runtime menu and screen availability.
- Text editing for all system event and alarm output names.

2.1 Configurator Menu

The configurator menu is accessed by pressing the "Monitor" icon at the top left of the screen.
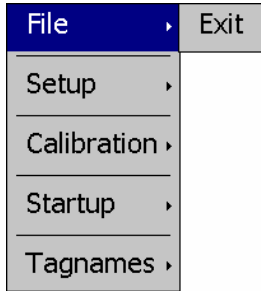
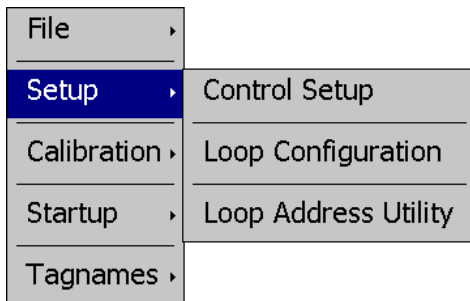The **File** menu provides the exit function for the configurator. After selecting this menu item and exiting the configurator, the controller runtime software will run after the unit is re-powered.

The **Setup** menu provides access to the primary controller setup options. These options include the controller setup (number of loops), the loop control board configuration settings and the loop address utility that can be used to automatically assign the proper communications address to an attached loop control board.
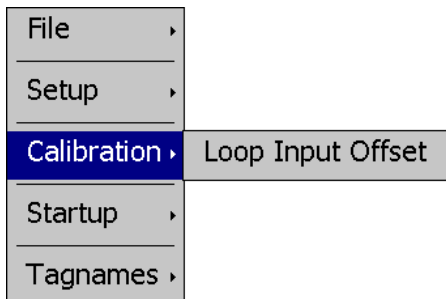
The **Calibration** menu provides access to the input offset calibration settings for the loop control boards.
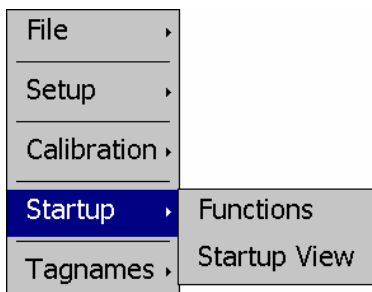
The **Startup** menu provides access to enable and disable nCompass runtime screens/menus and the desired startup view selection.
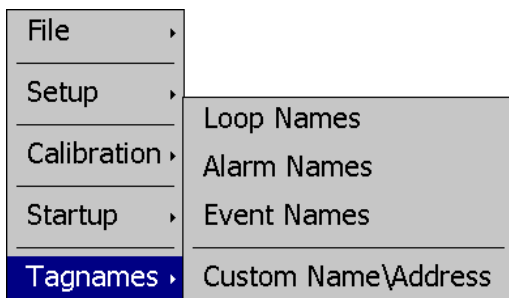
The **Tagnames** menu provides access to the text editing functions of the configurator which allow the loop, event and alarm names to be changed to match their use in the system. The menu also provides access to edit the splash screen information that is shown when the runtime application starts.

3 Configuring nCompass

IMPORTANT: *Once all configuration settings are made, you must select "Exit" from the File menu to exit the configurator prior to cycling power to nCompass. All configuration files are written upon exiting the configurator. Do not cycle power prior to exiting the configurator or settings will be lost and nCompass will not operate properly when entering the runtime application.*

3.1 Control Setup

The "Control Setup" screen is accessed from the Setup menu. It allows the user or OEM to set the number of control boards that are attached to the system. Once set, the loop configuration settings will be made available for the total number of loops entered.
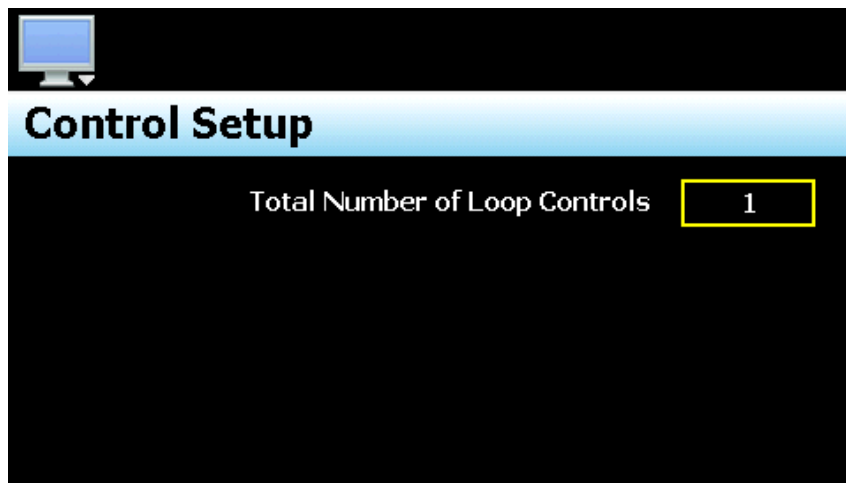
3.2   Loop Address Utility

In order for nCompass to properly communicate with each of the loop control boards, they must be configured for the proper communications address. The factory default communication settings of the loop control boards are set for a communications address of one, which correspond to the proper settings for loop 1. For a single loop nCompass control system, no further settings are required. Simply connect the communications wiring between the control board and the nCompass interface, and the system is ready to go.

For a multi loop nCompass control system, each of the control boards must be set for an address that corresponds with the loop number, i.e., 2, 3, 4…. If a display module is not available to connect to the loop control board in order to set its address, the Loop Address Utility can be used. It is accessed from the Setup menu.
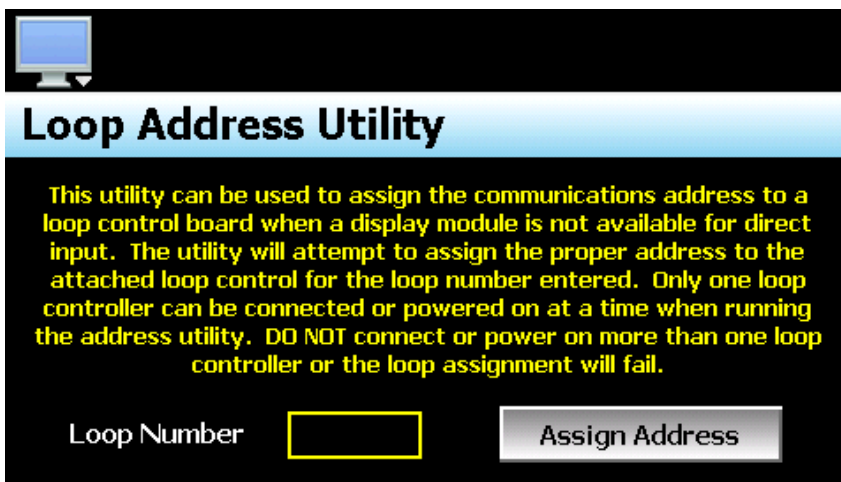

In order to use the utility, only one loop control board can be connected to nCompass at a time. Since the default address of all control boards are 1, if more than one was connected, they would all respond to the same command which would cause them all to be set to a different address. If more than one loop control board is connected, disconnect the communications wiring from the loop control board(s) that you DO NOT want to set the address on. An alternative is to remove power from the loop control board rather than disconnecting the communications wiring.
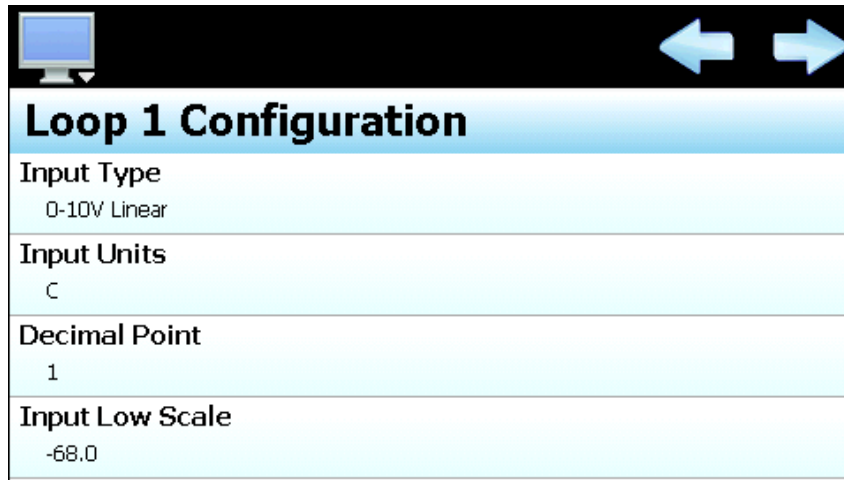
With only one loop control board powered on or connected to nCompass via the communications link, enter the loop (address) number that you want to assign to the control board and press the "Assign Address". The utility will begin scanning for the loop control board and set its address to the proper address once found. If the utility fails to set the address, check the wiring to insure it is properly connected. If the loop control board has been previously used for another application, it may be possible that the address or other communications settings have been changed, which prevent the utility from working. In this case, a display module must be connected to the loop control board to set the proper communications settings:

    Address: 1 to 10 (for loop 1 to 10)
    Baud rate: 9600
    Parity: Even

IMPORTANT: *The loop input number corresponds to the communications address that must be set in the loop control board for nCompass to access it properly. If the communications address is not set properly in the loop control, nCompass will not be able to communicate with it, or may communicate with the wrong loop control and assign the incorrect set points and control parameters to it.*

3.3   Loop Configuration

The Loop Configuration screen is accessed from the Setup menu. The screens provide all settings related to the setup of the loop control boards. The left and right arrow buttons at the top right of the screen will be shown if there is more than one loop set up for the system. This allows the user or OEM to access each loop and adjust the settings for them individually. To scan through all available settings for the loop, simply touch and hold a finger on the list and drag up or down to scroll through the list items.

To change the setting for an item, select it from the list by touching it. If the entry is a simple numeric value, the number entry pad will be shown to allow the user to enter a new value. If the item has multiple selections available, a list of individual selections for the item will be shown that the user can then select from.

IMPORTANT: *Care should be taken when configuring loop controls as automatic ramp/soak programs may be downloaded to any loop configured in the system. Each loop should be configured with the appropriate settings to insure the ramp/soak programs operate properly. Typically all loops, with the exception of communication address, are configured identically.   This especially applies to the automatic ramp/soak program global settings;*

- *Setpoint at start of automatic program (section 3.3.27)*
- *Setpoint at end of automatic program (section 3.3.28)*
- *Power Fail Recovery (section 3.3.29)*

3.3.1   Input Sensor Selection

The Input Sensor Selection is used to select the type of sensor that will be connected to the loop control board. The input type can be a temperature input (thermocouple or RTD) or a linear input type (Vdc or mA).

NOTE: *The loop control board is ordered with either a standard input for thermocouples and RTD's, a voltage input or a milliamp input. The selected input type must be set to match the type of input supplied on the loop control board or the unit will not operate correctly.*

The input type selections are mutually exclusive, i.e., selecting one input will turn all other selections off. Once the desired input type has been selected, press the "Done" button to set the input type for the loop control board and return to the main Loop Configuration screen.

3.3.2   Input Unit Selection

The Input Unit Selection is used to select the temperature units for temperature input types (thermocouple or RTD) or enter the desired engineering units for a linear input (Vdc or mA). The temperature unit selections are mutually exclusive, i.e., selecting one will turn off the other.

For linear input types, the text keypad will be shown allowing the user to enter up to 4 characters for the engineering units to display for the loop. Once the desired engineering units have been entered, press the "Done" button to set the input units for the loop control board and return to the main Loop Configuration screen.

3.3.3 Decimal Point

The decimal point entry allows the input precision to be adjusted between 0 and 1 decimal digits for temperature input types, between 0 and 2 for a 0-60mV input and from 0 to 3 for Vdc and mA input types.

IMPORTANT: *Once the loop control board has been configured with a specific decimal point, changing the decimal point will require the loop control board to be reconfigured in order to maintain previous control settings. Automatic programs, alarm set points, set point limits, input low/high scale, etc., DO NOT automatically scale. An entry of 100.0 becomes 1000 when changing the decimal point to zero (not 100), and must be re-entered to set the proper value.*

3.3.4 Input Low/High Scale

The input low and high scale values are used to set the input range for linear input types (Vdc or mA). The entries are not available for temperature input types since they utilize a fixed range based on the sensor type. The input low scale value can be set from -32768 up to the high scale value minus 50. The high scale value can be set from the low scale value plus 50 up to 32767.

NOTE: *The minimum and maximum scale values are limited by the decimal point selection. For a decimal of 0, the values are -32768 and 32767 respectively. For one decimal point, the values are -3276.8 and 3276.7. For two decimal digits, the values are -327.68 and 327.67 and for three decimal digits the values are -32.768 and 37.767.*

3.3.5 Input Filter

The Input Filter Selection is used to select the time constant to be used for filtering the process input.

The time constant selections are mutually exclusive, i.e., selecting one will turn off the others. Once the desired filter constant has been selected, press the "Done" button to set the input filter for the loop control board and return to the main Loop Configuration screen.

3.3.6 Event Input Function

The Event Input Function is used to select the desired mode of operation for the digital input of the loop control board. The event input selections are mutually exclusive, i.e., selecting one will turn off the others. Once the desired function has been selected, press the "Done" button to set the event input function for the loop control board and return to the main Loop Configuration screen.
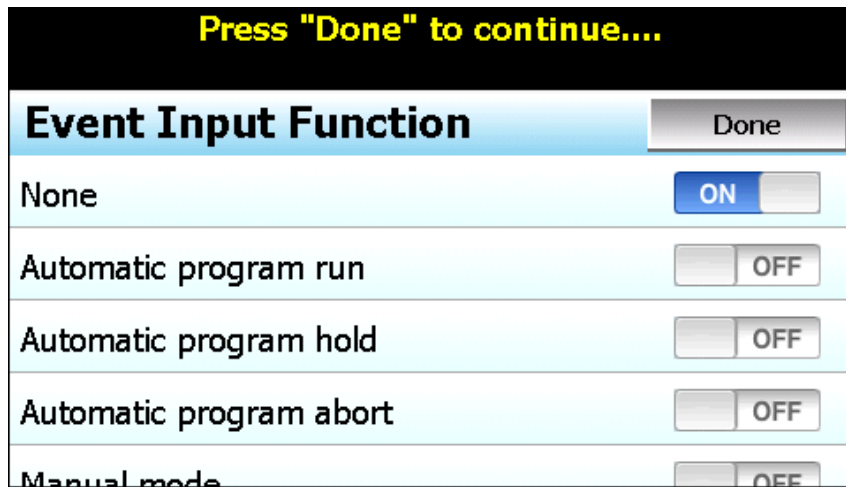
The **Automatic program run** function is a single-shot action that will start the currently loaded program when the event input is activated.

The **Automatic program hold** function will put the currently running program into hold when the event input is activated. The program will resume operation and return to the run mode when the input is deactivated.

The **Automatic program abort** function is a single-shot action that will abort the currently running program. Note that the abort function does not work if the program is in hold. The program must be running in order for the abort function to work.

The **Manual mode** function puts the loop control board into manual output mode when the input is activated. This stops all PID control action allowing the user to manually enter a fixed percentage of output. The loop control will return to normal PID control action when the input is deactivated.

The **Failure transfer** function puts the loop control outputs into failure transfer mode when the input is activated. The output will then go to the percent output value set for failure transfer. The loop control outputs will return to normal PID control when the input is deactivated.

The **Automatic program advance next segment** function is a single-shot action that will advance the currently running program by one step each time the event input is activated.

The **Automatic program run/hold** function is a combination of the automatic program run and program hold functions. Upon first activation of the input, the currently loaded program will be started if not already running. Deactivating the input will then cause the program to go into hold. The input must then be reactivated in order for the program to resume operation.

NOTE: *nCompass does not support the P41/B42 event input functions of "Off Mode" and "PID2 Select". These selections are not available through the nCompass configuration.*

3.3.7 Low/High Setpoint Limits

The low and high set point limits are used to set the OEM minimum and maximum allowed set points that can be entered for the loop control. The minimum and maximum set point range is equal to the input range for the configured input type.

NOTE: *The runtime application provides additional user low and high set point limits. These can be adjusted to further limit the allowable set point range within the band set by the OEM low and high set point limits.*

3.3.8 Output 1 Function

The Output 1 Function is used to set the mode of operation for the primary control output of the loop control board. The output can be set for heating or cooling on/off control, time proportioning or linear control. The output selections are mutually exclusive, i.e., selecting one will turn off the others. Once the desired function has been selected, press the "Done" button to set the output function for the loop control board and return to the main Loop Configuration screen.

NOTE: *The output function must be set to match the type of output ordered on the loop control board. Relay, triac and SSR output types are used for on/off and time proportioning control. The isolated Vdc and mA output types are used for linear control.*
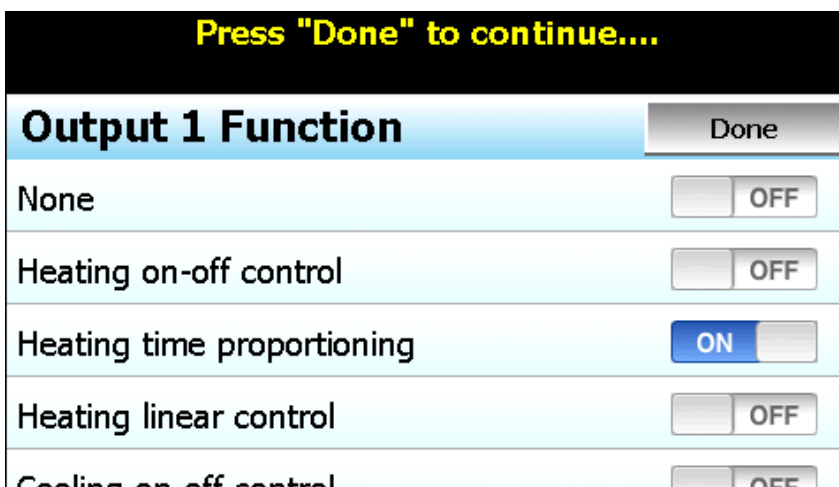
The **Heating on-off control** function will turn on the output when the process value is below set point. When the process value rises above the set point plus the on-off control hysteresis, the output will turn off.

The **Heating time proportioning** function uses the PID settings to cycle the output on and off according to the percentage of heating required using the cycle time configured for output 1. For example, if the percentage of output is 50% and the cycle time is 18 seconds, the output will repeat on/off cycles of 9 seconds each. If the output was only 25%, the output would be on for 4.5 seconds and off for 13.5 seconds of the 18 second cycle time.

The **Heating linear control** function uses the PID settings to vary the Vdc or mA output from the minimum to the maximum range of the output as a direct percentage of the heating output.

The **Cooling on-off control** function will turn on the output when the process value is above set point. When the process value falls below the set point minus the on-off control hysteresis, the output will turn off.

The **Cooling time proportioning** function uses the PID settings to cycle the output on and off according to the percentage of cooling required using the cycle time configured for output 1. For example, if the percentage of output is 50% and the cycle time is 6 seconds, the output will repeat on/off cycles of 3 seconds each. If the output was only 25%, the output would be on for 0.75 seconds and off for 5.25 seconds of the 6 second cycle time.

The **Cooling linear control** function uses the PID settings to vary the Vdc or mA output from the minimum to the maximum range of the output as a direct percentage of the cooling output.

3.3.9   Output 1 Failure Transfer

The output 1 failure transfer setting is used to set the value the output should go to if there is an input failure, i.e., sensor break. The output can be set for bumpless (-1) operation or a fixed percentage of output (from 0 to 100%) if proportioning or linear control is selected fro the output function. When failure transfer is set to bumpless, the output will remain at its previous percentage of output until the input condition is corrected. Note that this should not be used for extended periods of time as a runaway condition could occur if separate limit devices are not installed to insure safe limits of operation by turning off the system should a limit be exceeded.

If the output function is set for on-off control, the failure transfer can be set to have the output turn on (1) or turn off (0) when a sensor break occurs.

3.3.10   Output 1 ON-OFF Control Hysteresis

The output 1 on-off control hysteresis can be set when the output 1 function is set for heating or cooling on-off control. It is used to eliminate rapid cycling of the control output by applying a safe-sided dead band to the control output. When the control set point is exceeded, the output will turn on. The output will not turn off until the process rises above (for heating) or falls below (for cooling) the set point by the hysteresis value.

The hysteresis can be set from a minimum of 0.1 to a maximum of 50.0 for units of degrees Centigrade and to a maximum of 90.0 for units of degrees Fahrenheit and process units.

3.3.11   Output 1 Cycle Time

The output 1 cycle time can be set when the output 1 function is set for heating or cooling proportioning control. The cycle time can be adjusted from 0.1 to 90.0 seconds. For cycle times less than 18 seconds, it is highly recommended that the loop control board be ordered with the triac or SSR drive output for output 1 to extend the life of the control output.

3.3.12   Output 1 Low/High Limit Values
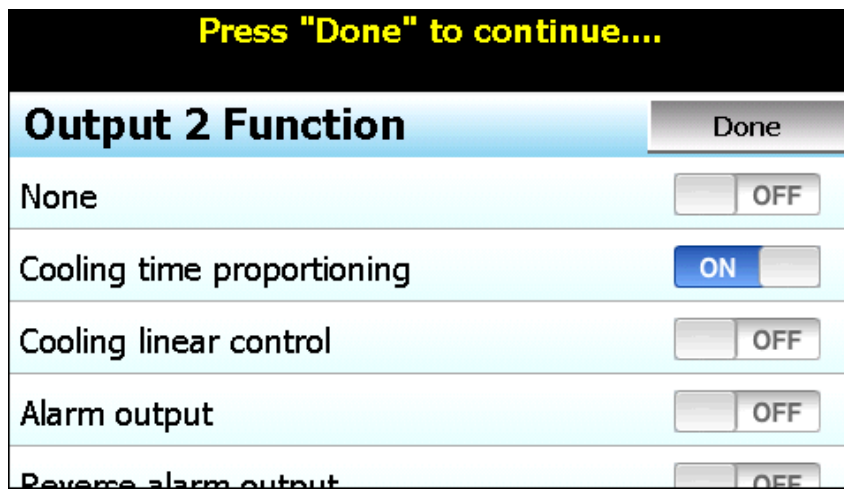
The output low and high limit values can be set when the output 1 function is set for heating or cooling time proportioning or linear control. They are used to set the minimum and maximum percentage of output that the output will control to with a default of 0% for the low and 100% for the high. By raising the low limit or reducing the high limit, the output will not exceed the output value regardless of the percent output required by the PID values.

For example, raising the low limit to 5% with the output set for heating proportioning control, even if the process value is over set point and the PID values are calling for a 0% output, the output will continue to cycle on and off at 5% heating.

3.3.13 Output 2 Function

The Output 2 Function is used to set the mode of operation for the secondary control output of the loop control board.

NOTE: *The output function must be set to match the type of output ordered on the loop control board. Relay, triac and SSR output types are used for proportioning control, alarm or event outputs. The isolated Vdc and mA output types are used for linear control.*

The output can be set for cooling time proportioning or linear control, as an alarm or an event. The output selections are mutually exclusive, i.e., selecting one will turn off the others. Once the desired function has been selected, press the "Done" button to set the output function for the loop control board and return to the main Loop Configuration screen.

The **Cooling time proportioning** function uses the PID settings to cycle the output on and off according to the percentage of cooling required using the cycle time configured for output 1. For example, if the percentage of output is 50% and the cycle time is 6 seconds, the output will repeat on/off cycles of 3 seconds each. If the output was only 25%, the output would be on for 0.75 seconds and off for 5.25 seconds of the 6 second cycle time.

The **Cooling linear control** function uses the PID settings to vary the Vdc or mA output from the minimum to the maximum range of the output as a direct percentage of the cooling output.

The **Alarm output** function activates the Alarm 1 configuration settings for assigning the type of alarm logic to apply to output 2. When the alarm condition is active, the output will turn on.

The **Reverse alarm output** function activates the Alarm 1 configuration settings for assigning the type of alarm logic to apply to output 2. The output will be normally "on" when this function is selected. When the alarm condition is active, the output will turn off.

The **Event output** function allows the output to be turned on and off via an automatic program or manually through the nCompass interface to act as a "soft" switch to turn system components on and off.

The **DC power supply output** function must be selected when the output type ordered for the loop control board output 2 is a transmitter power supply.

3.3.14   Output 2 Failure Transfer

The output 2 failure transfer setting is used to set the value the output should go to if there is an input failure, i.e., sensor break. The output can be set for bumpless (-1) operation or a fixed percentage of output (from 0 to 100%) if proportioning or linear control is selected for the output function. When failure transfer is set to bumpless, the output will remain at its previous percentage of output until the input condition is corrected. Note that this should not be used for extended periods of time as a runaway condition could occur if separate limit devices are not installed to insure safe limits of operation by turning off the system should a limit be exceeded.

If the output function is set as an alarm or event output, the failure transfer can be set to have the output turn on (1) or turn off (0) when a sensor break occurs.

3.3.15   Output 2 Low/High Limit Values

The output low and high limit values can be set when the output 2 function is set for cooling time proportioning or linear control. They are used to set the minimum and maximum percentage of output that the output will control to with a default of 0% for the low and 100% for the high. By raising the low limit or reducing the high limit, the output will not exceed the output value regardless of the percent output required by the PID values.

For example, by reducing the high limit to 80%, even if the process value is over set point and the PID values are calling for 100% cooling, the output will only produce an 80% cooling output.

3.3.16   Output 3 Function

The Output 3 Function selection allows the OEM to configure the loop control board output as an alarm or an event. The output selections are mutually exclusive, i.e., selecting one will turn off the others. Once the desired function has been selected, press the "Done" button to set the output function and return to the main Loop Configuration screen.
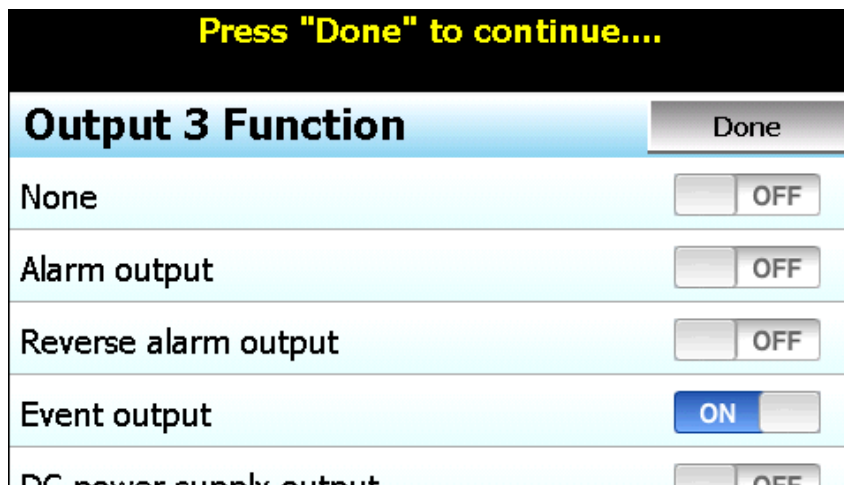
The **Alarm output** function activates the Alarm 2 configuration settings for assigning the type of alarm logic to apply to output 3. When the alarm condition is active, the output will turn on.

The **Reverse alarm output** function activates the Alarm 2 configuration settings for assigning the type of alarm logic to apply to output 3. The output will be normally "on" when this function is selected. When the alarm condition is active, the output will turn off.

The **Event output** function allows the output to be turned on and off via an automatic program or manually through the nCompass interface to act as a "soft" switch to turn system components on and off.

The **DC power supply output** function must be selected when the output type ordered for the loop control board output 3 is a transmitter power supply.
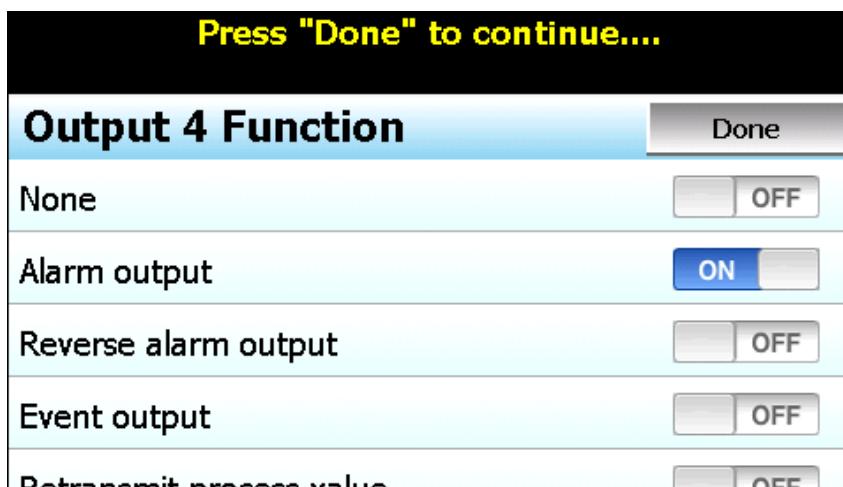
3.3.17   Output 3 Failure Transfer

The output 3 failure transfer setting is used to set whether the output should be on (1) or off (0) when there is an input failure, i.e., sensor break.

3.3.18   Output 4 Function

The Output 4 Function selection allows the OEM to configure the loop control board output as an alarm, event or retransmit output. The output selections are mutually exclusive, i.e., selecting one will turn off the others. Once the desired function has been selected, press the "Done" button to set the output function and return to the main Loop Configuration screen.

NOTE: *The output function must be set to match the type of output ordered on the loop control board. Relay, triac and SSR output types are used for alarm or event outputs. The retransmission Vdc and mA output types are used for process value or set point retransmit.*

The **Alarm output** function activates the Alarm 3 configuration settings for assigning the type of alarm logic to apply to output 4. When the alarm condition is active, the output will turn on.

The **Reverse alarm output** function activates the Alarm 3 configuration settings for assigning the type of alarm logic to apply to output 4. The output will be normally "on" when this function is selected. When the alarm condition is active, the output will turn off.

The **Event output** function allows the output to be turned on and off via an automatic program or manually through the nCompass interface to act as a "soft" switch to turn system components on and off.

The **Retransmit process value** and **Retransmit setpoint value** functions allow the loop control board output to retransmit the current input value or set point to remote devices such as a chart recorder.

The **DC power supply output** function must be selected when the output type ordered for the loop control board output 4 is a transmitter power supply.

3.3.19 Output 4 Failure Transfer

If the output function is set as an alarm or event output, the failure transfer can be set to have the output turn on (1) or turn off (0) when a sensor break occurs.

3.3.20 Output 4 Low/High Limit Values

The output low and high limit values can be set when the output 4 function is set for retransmit process or setpoint value. They are used to set the minimum and maximum percentage of the output range for the installed output type. For example, the standard range of the mA output is 0-20mA. In order to use the output as a 4-20mA output, the low limit value would need to be set to 20% (20% of 20ma = 4ma).

For the voltage output, the default range is 0-10Vdc. In order to achieve a 1-5Vdc output, the low limit would have to be set to 10% (10% of 10Vdc is 1Vdc). The high limit would then have to be set to 50% in order cut the output span in half to get a maximum output of 5Vdc.

3.3.21 Output 4 Retransmit Low/High Scale

The output retransmit low and high scale can be set when the output 4 function is set for retransmit process or setpoint value. They are used to set the retransmit range of the output. The low scale value corresponds with the output low limit value and the high scale value corresponds with the output high limit value.

3.3.22 Alarm (1-3) Function

The Alarm 1, 2 and 3 Functions are used to select the alarm type for outputs 2, 3 and 4 respectively if the output is configured as an alarm or reverse alarm. The alarm selections are mutually exclusive, i.e., selecting one will turn off the others. Once the desired alarm type has been selected, press the "Done" button to set the alarm function for the loop control board output and return to the main Loop Configuration screen.
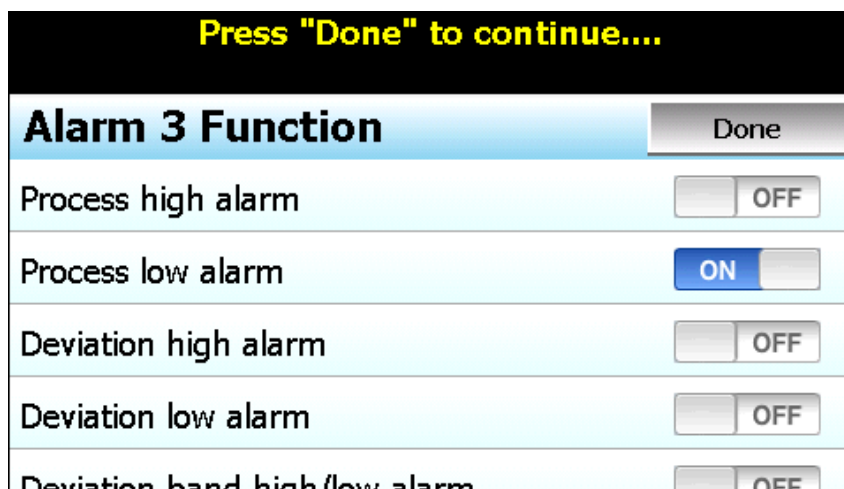
NOTE: For the following alarm descriptions, SV = the control set point value, ASP is the alarm set point and AHY is the alarm hysteresis.

A **Process high alarm** is independent of set point. When the process value is higher than the alarm set point, a process high alarm occurs. When the process value is lower than the alarm set point minus the alarm hysteresis, the alarm is off.

A **Process low alarm** is independent of set point. When the process value is lower than the alarm set point, a process low alarm occurs. When the process value is above the alarm set point plus the alarm hysteresis, the alarm is off.

A **Deviation high alarm** is dependant upon the control set point and alerts the operator when the process value deviates too high over the set point value. When the process is higher than SV+ASP (note that the alarm set point is entered as a positive value), a deviation high alarm occurs. When the process falls below SV+ASP-AHY, the alarm is off.

A **Deviation low alarm** is dependant upon the control set point and alerts the operator when the process deviates too far below the set point value. When the process is lower than SV+ASP (note that the alarm set point is entered as a negative value), a deviation low alarm occurs. When the process is higher than SV+ASP+AHY, the alarm is off.

A **Deviation band high/low alarm** sets two trigger levels relative to the control set point value. The two trigger levels are SV+ASP and SV-ASP for the high and low alarm values. When the process value is higher than SV+ASP or lower than SV-ASP, a deviation band alarm occurs. When the process value is within the trigger levels, SV+ASP-AHY and SV-ASP+AHY, the deviation band alarm is off.

An **End of automated program alarm** is not associated with the process value or set point. The alarm is turned on upon completion of an automatic ramp/soak program. The alarm will turn off when another program is started, when power is cycled to the loop control board or when the "Reset" button is pressed on the Alarm screen of the runtime application.

The **Hold mode alarm** is not associated with the process value or set point. The alarm is turned on when the running program is in hold. The alarm will turn off when the program is placed back into run or the program is stopped. Note that this "alarm" is not indicated on the nCompass interface.

The **Static mode alarm** is not associated with the process value or set point. The alarm is turned on when the loop control is in the single set point (static) mode of operation. The alarm will turn off when the loop control is running an automatic program. Note that this "alarm" is not indicated on the nCompass interface.

The **Holdback mode alarm** is not associated with the process value or set point. The alarm is turned on when the running program is in holdback. The alarm will turn off when the holdback condition has been met or the program is stopped. Note that this "alarm" is not indicated on the nCompass interface.

3.3.23 Alarm (1-3) Mode

The Alarm 1, 2 and 3 Modes are used to select the mode of operation for outputs 2, 3 and 4 respectively if the output is configured as an alarm or reverse alarm. The mode selections are mutually exclusive, i.e., selecting one will turn off the others. Once the desired alarm mode has been selected, press the "Done" button to set the alarm operation for the loop control board output and return to the main Loop Configuration screen.

Normal alarm action has the alarm output off in the non-alarm condition and on in the alarm condition. The output state is inverted for a reverse alarm output.
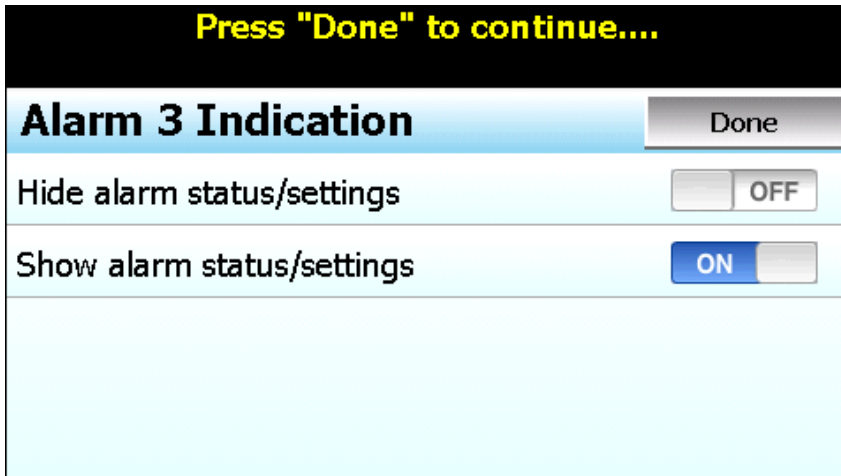
Latching alarm action will keep the alarm output on even if the alarm condition has cleared until the alarm is reset by the user. The output state is inverted for a reverse alarm output.

Hold alarm action prevents the alarm from activating on power up even when an alarm condition is present. The alarm will be blocked until the alarm condition clears. Once cleared, the alarm will then operate normally and activate when an alarm condition occurs.

The **Latching and hold alarm action** combines both the latching and hold alarm actions listed above.

3.3.24 Alarm (1-3) Indication

The Alarm 1, 2 and 3 Indication settings are used to select whether the alarm will be shown in the nCompass runtime application or be hidden from the user. This allows the OEM to configure an alarm to perform a specific control function while preventing the user from adjusting the set point or seeing the activation state of the alarm.

When the alarm indication is set for **Hide alarm status/settings**, the alarm will be removed from the nCompass runtime application. The user will not be able to edit the alarm message or adjust the alarm set point. When the alarm activates, there will be no indication or message on the alarm screen and the audible alarm will not sound. The alarm operates as a "silent" alarm with no indication to the user.

When the alarm indication is set for **Show alarm status/settings**, the user will be able to access and change the alarm set point and alarm message under the device settings. When the alarm occurs, the alarm message will be displayed on the Alarm screen and the audible alarm will sound.

The indication selections are mutually exclusive, i.e., selecting one will turn off the other. Once the desired alarm indication has been selected, press the "Done" button to set the alarm operation and return to the main Loop Configuration screen.

3.3.25 Alarm (1-3) Setpoint

The alarm set points can be set when the alarm function is set for a process or deviation type of alarm. If the alarm indication is set to "show" the alarm status and settings, the set point will also be available in the nCompass runtime under device settings for user edit. If the alarm indication is set for "hide" alarm status and settings, the alarm set point will not be available in the nCompass runtime and can only be changed via the loop settings in the Configurator.

3.3.26 Alarm (1-3) Hysteresis

The alarm hysteresis can be set when the alarm function is set for a process or deviation type of alarm. It is used to eliminate rapid on/off cycling of the alarm output by applying a safe-sided dead band to the alarm. When the alarm set point is exceeded, the alarm will activate. The alarm will not deactivate until the process rises above (for low alarm) or falls below (for high alarm) the alarm set point by the hysteresis value.

The hysteresis can be set from a minimum of 0.1 to a maximum of 50.0 for units of degrees Centigrade and to a maximum of 90.0 for units of degrees Fahrenheit and process units.

3.3.27 Setpoint at Start of Automatic Program

The Setpoint at Start of Automatic Program selection is used to select the set point that will be used by the loop control at the start of a program. The start set point selections are mutually exclusive, i.e., selecting one will turn off the others. Once the desired starting set point has been selected, press the "Done" button to return to the main Loop Configuration screen.
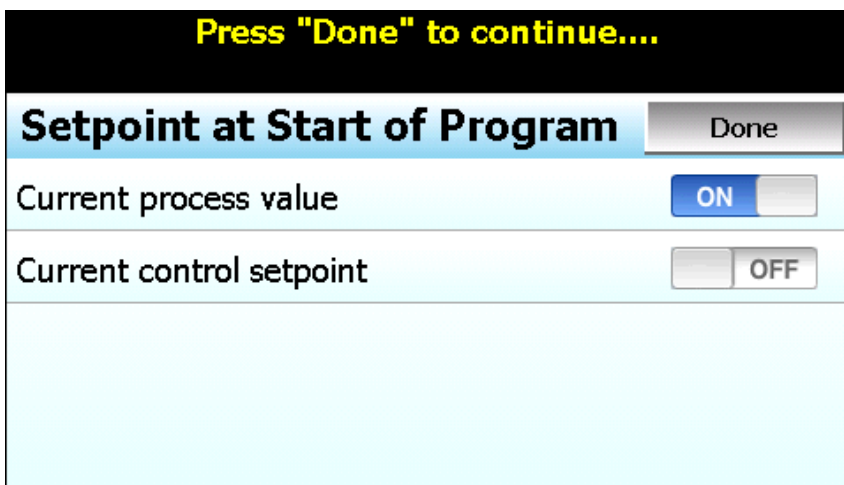
The **Current process value** selection will use the current process value as the control set point when a program is started.
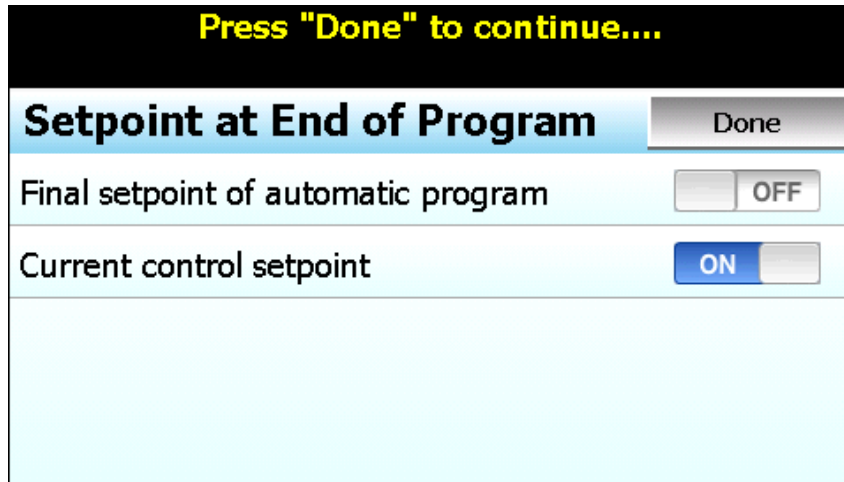
The **Current control setpoint** selection will use the current (static) set point as the control set point when the program is started.

Note that the P-Series control provides a selection for using the start set point value of a program. This selection is not supported by nCompass and can not be configured or entered for an automatic program in the nCompass runtime application. Only the current PV or control SP selections are supported.

The normal method is to start from the process value, because this will produce a smooth and bumpless start to the process. However, if the time period of the first step must be defined, using the current control set point for the starting point will insure that the first step time duration is maintained.

3.3.28 Setpoint at End of Automatic Program

The Setpoint at End of Automatic Program selection is used to select the set point that will be used by the loop control at the end of a program. The end set point selections are mutually exclusive, i.e., selecting one will turn off the others. Once the desired end set point has been selected, press the "Done" button to return to the main Loop Configuration screen.

The **Final setpoint of automatic program** selection will use the final set point value programmed on the end step of the program as the control set point when the program reaches the end step.

When this mode is selected, the program will remain active once the "End" step is reached in order to hold the loop set point at the set point entered on the end step. However, any outputs programmed as events will turn off and remain off until the user selects program "Halt" in order to turn off the program and return to static (single set point) operation. The event outputs will then be operational again. If event outputs are required to be on in order for the system to operate, the "Current control setpoint" selection should be used.
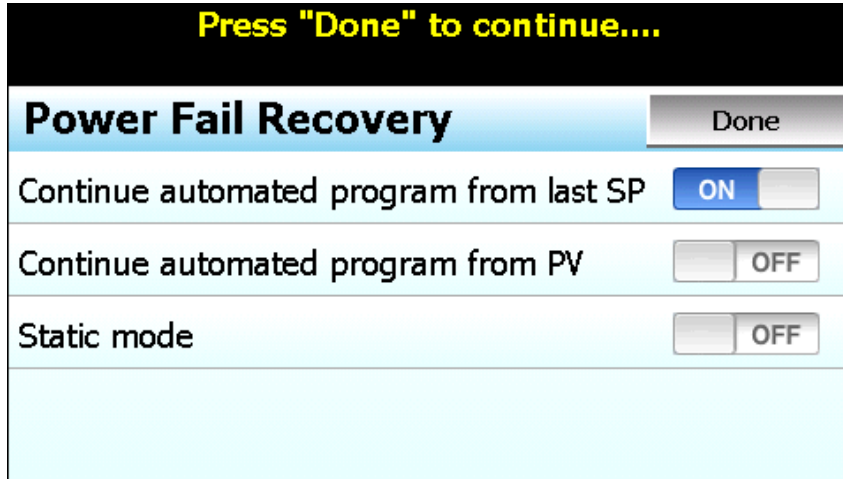
The **Current control setpoint** selection will use the current (static) set point (prior to the program being started) as the control set point when the program ends.

When this mode is selected, the set point entry for the "End" step of the program entry will be hidden as it is not used. Any outputs configured as events will then return to their static setting (on/off state prior to the program being started).

NOTE: nCompass does not support the P41/B42 "all outputs off" end of program function". This selection is not available through the nCompass configuration.

3.3.29 Power Fail Recovery

The Power Fail Recovery is used to select the desired mode of operation of the loop control board when power is restored if an automated program was running at the time power was lost. The recovery selections are mutually exclusive, i.e., selecting one will turn off the others. Once the desired recovery mode has been selected, press the "Done" button to set the power recovery mode for the loop control board and return to the main Loop Configuration screen.

The **Continue automated program from last SP** selection will resume the program from where it left off with the last set point set by the program at the time of power failure.

The **Continue automated program from PV** selection will resume the program using the current process value at the time power is restored as the set point.

The **Static mode** selection will terminate the automated program and return the loop control to the single set point mode of operation using the previous set point value prior to starting the automated program. In addition, any outputs configured as events will also be returned to their previous on/off state that they were previously set to prior to starting the program.

NOTE: *nCompass does not support the P41/B42 "Off Mode" recovery option. This selection is not available through the nCompass configuration.*

3.3.30 Loop Communication Mode

The loop Communication Mode selection is available for loop control versions V.28 and later. The loop control boards are set to the normal communication mode by default. The mode selections are mutually exclusive, i.e., selecting one will turn off the other. Once the desired communication mode has been selected, press the "Done" button to set the communication mode of operation for the loop control board and return to the main Loop Configuration screen.
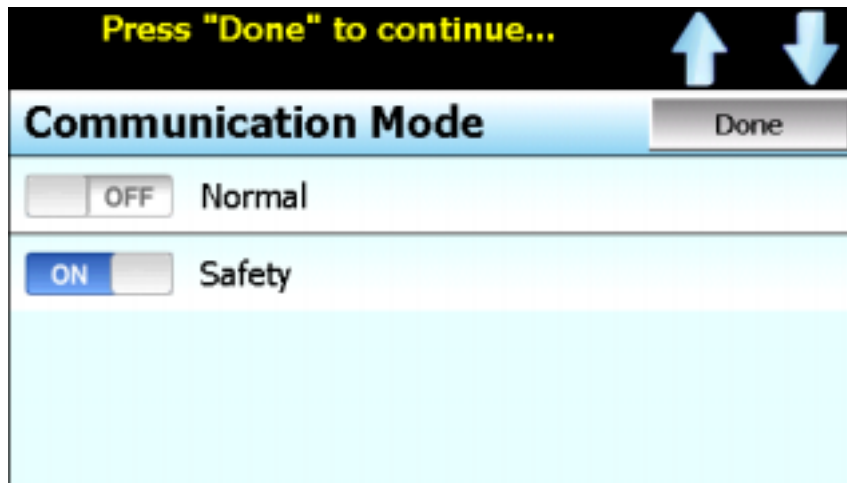
The **Normal** communication mode selection allows the control board to operate independently of the nCompass HMI. This means that if the HMI to control board communications fail (broken wire or become disconnected), the loop control board will continue to operate under its last given set point or continue running its automatic program until completion. The HMI to control board communications can then be restored without interrupting the process.

The **Safety** communication mode selection enables a watchdog in the loop control board which checks to insure that communications are active with the nCompass HMI. If communications fail (broken wire or become disconnected), the loop control board will turn off its outputs until communications are restored. This affects operation in two ways.

First, upon power up, the loop control outputs will remain off until the nCompass HMI boots up and enters the runtime application. Once the HMI begins operation and starts communicating with the loop control boards, their outputs will be enabled. This prevents the loop control boards from affecting the process until the user has the ability to enter set points, turn events on/off, etc.

Second, if a communications failure does occur, the loop control boards will turn their outputs off after a one minute delay, in affect stopping the process, until communications are restored. Since the operator has no way of turning off events or changing set points without a functioning user interface, this provides a way of automatically turning off the process.

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NOTE: *When the safety communication mode is used, all loop control board outputs are disabled when communications are missing regardless of the configured mode of operation for the output. This includes, control, alarm, event, etc.*

3.4   Calibration

Each nCompass loop control is calibrated at the factory before shipment; however, they can be recalibrated in the field with the use of proper calibration equipment. While the basic calibration of the unit is highly stable and set for life, the Loop Input offset calibration provides the means to offset the permanent factory calibration. Typically reasons for applying this offset may include the need to match a particular reference standard, to match the calibration to a particular transducer or sensor or to remove long term drift in the factory set calibration.

The input offset calibration provides a two point offset; a low point offset and a high point offset. The two point offset constructs a straight line (linear calibration) between the two points. To insure greatest accuracy, it is best to calibrate with the two points at the minimum and maximum operating ranges of the system.
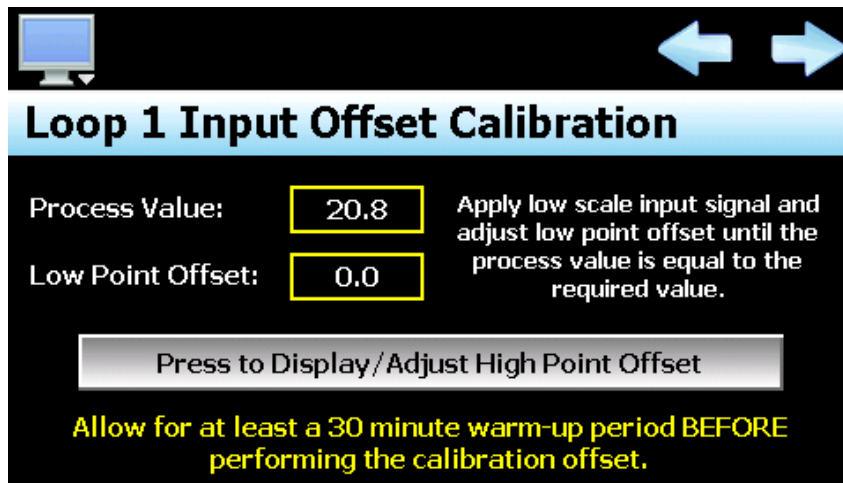
To begin calibration, send the low signal input to the loop input. If the process value does not match the reference signal, adjust the low point offset so that the process value matches the reference input signal. Press the button to switch to the high point offset and then apply the high signal input to the loop control. Adjust the high point offset if necessary in order to make the process value match the reference signal.

IMPORTANT: After a user calibration has been performed, a calibration error may occur if the input type of the loop control is later changed to a different type. Should this occur, a user calibration must be performed for the newly selected input type.

3.5 Functions

The nCompass functions are accessed from the "Startup" menu and allow the OEM to select which screens/menu items will be enabled (shown) in the nCompass runtime application. These functions can be used to customize the system to meet specific requirements.
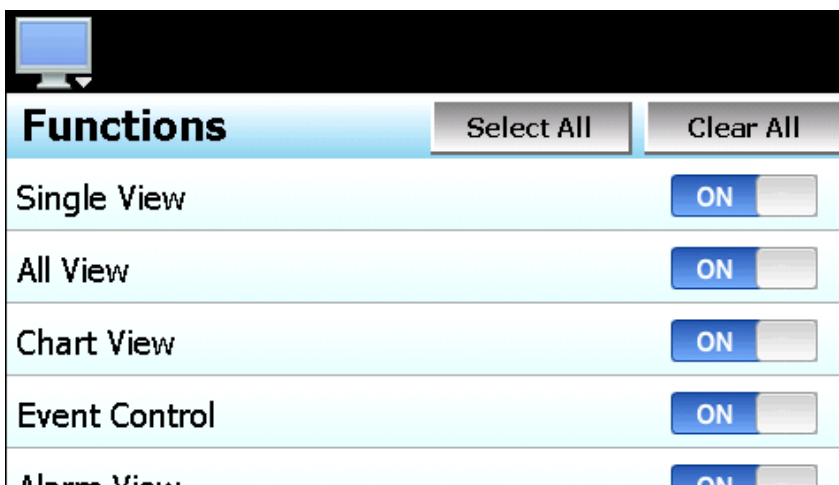
When functions are disabled at the configurator level from the **Functions** list, it will be disabled in the runtime software by removing the menu item or disabling the field so the operator can not select the function or edit any corresponding settings related to the function. The following list shows the available nCompass functions, where to find the menu item(s) applicable to the function and a description of what it applies to.

IMPORTANT: *Disabling nCompass functions that are not required for the application results in a system that is clean and easy to use for the operator; however, be careful when disabling certain items. Without access to them, there will be no way of determining if the system is operating as required.*

Orion Function	Runtime Menu Location	Description
Single View	View\Single	View loop PV, %Out, set loop auto tune, manual output mode and loop set point **NOTE:** Without access to the single loop view screen, the user will be unable to initiate auto tune or set loop in manual mode and adjust its output.
All View	View\Overall	view loop PV, %Out, set loop set point **NOTE:** Without access to at least one loop view screen, the user will be unable to manually adjust loop set points.
Chart View	View\Chart	view and set up real time trends for loops and monitors
Event Control	View\Event	view and enable or disable manual events **NOTE:** Without event screen access, user will be unable to manually turn events on/off which could prevent them from operating equipment if events are used to do so.

Orion Function	Runtime Menu Location	Description
Alarm View	View\Alarm	view and reset current alarms
	Notifications	current alarm status
		NOTE: With the function disabled, the user will only be able to access the alarm screen to reset an alarm when the alarm occurs by pressing the flashing alarm icon.
		If the alarm is latching and does not reset, the user will be unable to return to the screen to try and clear the alarm unless another alarm occurs to again display the flashing alarm icon.
Alarm Log	View\Alarm Log	view and email alarm history files
Security Settings	Security	view/set security rights, view audit trails, user log on
	Notifications	view security and audit status
		NOTE: If security is enabled, but system security is then disabled through this item, the user will be unable to log on. Default security (operator level) access will be used. This allows audit trails to be active while hiding all user security features.
		With security menu disabled, audit trail files are accessible via Log/USB File Utilities or temporarily re-enable security menu to gain access to the audit files.
Automatic Program Control/Recovery	Program	view, create, edit and run automatic ramp/soak programs
	Device\Settings\Offline\Set\Recovery	set power recovery mode
	Notifications	view program status
		NOTE: When disabled, all program items and menus will be removed from the runtime application. The user will be unable to access or start programs via the interface.
Automatic Program Holdback Entry	Program\Entry	access to enter holdback setpoint and program holdback type for a step
Automatic Program Jump Entry	Program\Entry\Step Data	access to program jump step type in an automatic program
Data Logging	Data\Data	enable/disable data logging, select points for logging, access to historical viewer, FTP and USB File utilities
	Notifications	view data log status, length and interval
		NOTE: If data logging is set to log on program operation or when nCompass starts and this menu is then disabled, data logging will be disabled. This menu item must remain visible in order for the built in data logging of nCompass to function.
		The USB File utilities will not be accessible to copy or delete data, alarm, audit or program files. Alarm, audit and data files may be transferred via FTP if unit is so configured.
Data Log Viewer	Data\Chart	access to view historical data log files
Annotations	Data\View\Annotation	access to add and view operator annotations to data files

Orion Function	Runtime Menu Location	Description
Digital Signatures	Data\View\Signature	access to view and add digital signature to data log file
File Utilities	Data\Utilities\USB	access to copy/delete alarm, audit, program and data log files **Note:** Alarm, audit and data files may be transferred via FTP if unit is so configured.
FTP/WAN Settings	Data\Utilities\FTP/WAN	access to view/configure FTP file transfer settings **NOTE:** Once the FTP is configured for Auto Backup in the runtime application, this menu item can be disabled and hidden from the operator so that OEM configuration is preserved and can not be accessed or altered. The Auto Backup to the FTP Server would occur as configured.
Loop PID Tuning	Device\Settings\View\Tuning	access loop tuning screen **NOTE:** With loop PID tuning disabled, the user will still have access to the auto tune function from the single loop view screen. Only manual tuning adjustment is disabled.
Alarm Settings	Device\Settings\Set\Alarm	access loop alarm settings **NOTE:** Alarms can be configured in the runtime and then the menu removed by disabling this function. The alarms will operate as configured in the background removing all access by the operator.
Email/SMTP Settings	Device\Settings\Email\Email	access to view/configure email settings
Communication Settings	Device\Settings\Set\Comms Notifications	access to web server, Modbus and VNC settings view web server and VNC status
Edit Event Names	Device\Settings\Set \Event	access to view/edit system event names **NOTE:** Event names can be assigned in the runtime and then this item disabled to prevent changes to event names.
Temperature Units	Device\Settings\Offline\Set\Units	access to set temperature units
Input Offset Calibration	Device\Settings\Offline\Calibrate\Offset	adjust offsets of loop control inputs
Import/Export Setup	Device\Settings\Offline\System\ Configuration	access import/export utility to back up current Orion-M configuration or restore configuration from back-up file
Setpoint Limits	Device\Settings\Set\Limits	access loop set point high low limit entry
Language	Device\Settings\Offline\Set\Language	access to set the nCompass display language selections for menus and online help

3.6 Startup View

The "Startup View" screen is accessed from the "Startup" menu and allows the OEM to define which of the main view screens the runtime application will show when it first starts and when the "Home" icon is pressed.
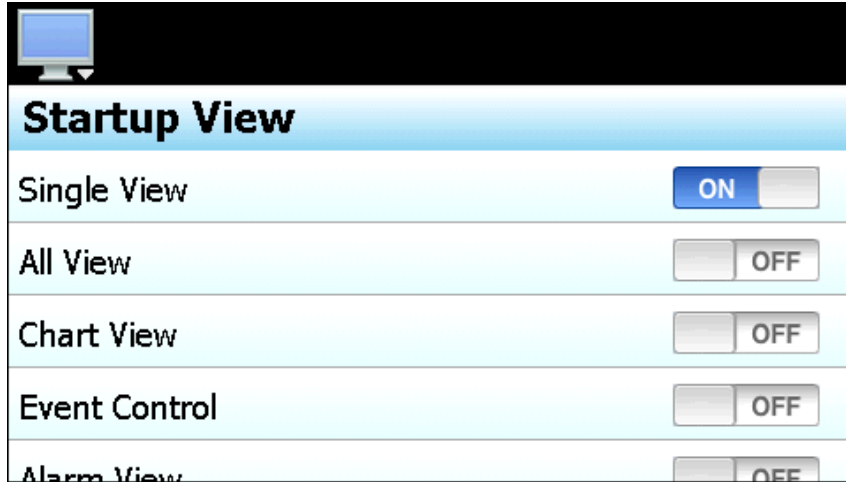
The available selections are Single loop View, All loop View, Chart View, Event Control, Alarm View and Alarm Log.

NOTE: *If the selected screen to view on startup is disabled in the nCompass functions list, the screen will only be available when the "Home" icon is pressed.*

NOTE: *The alarms are assigned in sequential order starting with the loop 1 outputs, then the loop 2 outputs, loop 3 outputs and so on. To assist in identifying each alarm during the naming process, the loop number and output associated with the alarm is displayed below the alarm name.*

3.7.3   Event Names
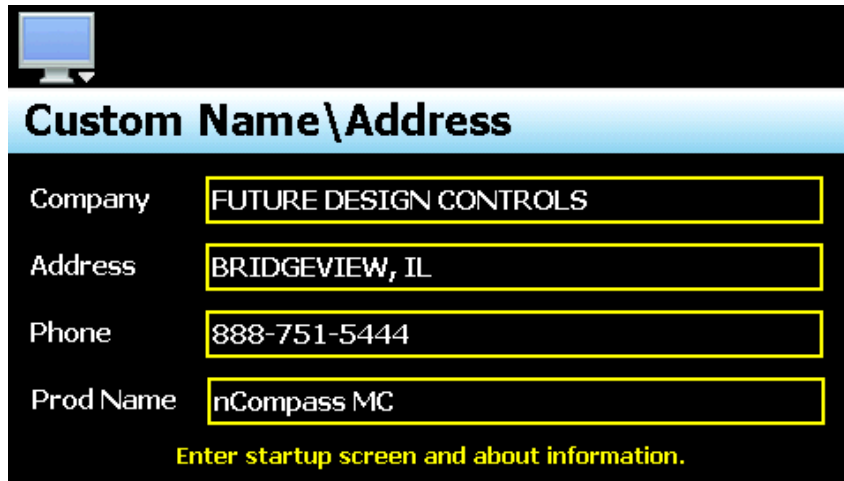
The Event Names screen accessed from the Tagnames menu and allows the OEM to edit the names of all configured event outputs. These names will be displayed in the runtime application under the Event control and program step Event screens. This allows each event to be identified by the function it performs for the end user. To change the name of an event, select the event from the list in order to show the text entry keypad. Enter the desired name for the event (up to 9 characters) and press the "Done" button when finished.

Event Names

EV 1
(Loop 1 Output 3)

EV 2
(Loop 2 Output 3)

EV 3
(Loop 3 Output 3)

EV 4
(Loop 4 Output 3)
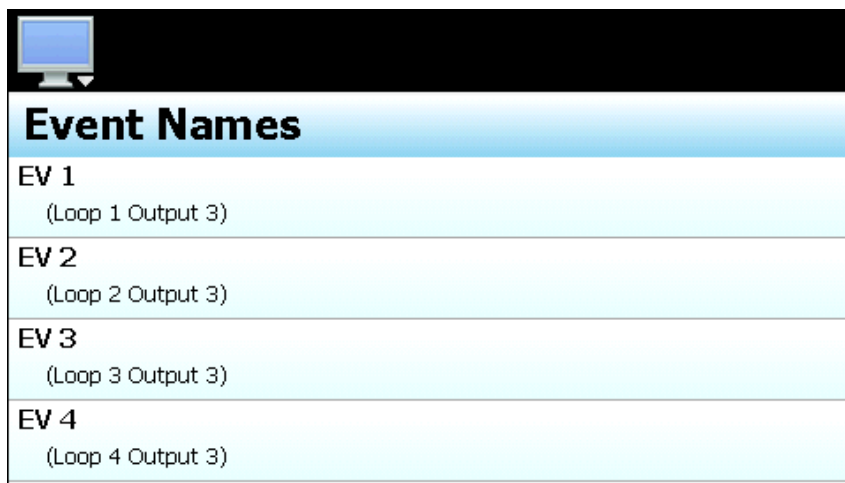
NOTE: *The events are assigned in sequential order starting with the loop 1 outputs, then the loop 2 outputs, loop 3 outputs and so on. To assist in identifying each event during the naming process, the loop number and output associated with the event is displayed below the event name.*

3.8   Custom Name\Address

The 'Custom Name\Address' screen is accessed from the 'Tagnames' menu and allows the OEM to configure the main splash screen when the nCompass runtime application starts. This is used so the OEM name and contact information is shown each time the nCompass controller is powered up. It also allows the OEM to change the name of the controller to adapt it to a specific product or market.

To edit the company, address, phone number or controller (product) name, press the field and enter the desired text. Each field can be entered with a maximum of 24 characters that will be displayed on the splash screen when nCompass starts.

Appendix

How to Order

nCompass MC is ordered as 3 to 12 components dependant upon the number of control loops, one to ten.

nCompass MC Sample Part Numbers
(minimum of 3 component part numbers is required; (1) display, (2) firmware, (3) loop #1)

Item #	Product	Sample Part Number	Description
1	Display	FDC-0450-1011-000BN	4.3" display, MC software, 11-36 VDC power input, SD slot, Ethernet, standard enclosure
2	MC Firmware	SD-MC	MC Loop Control Firmware (inserted into display SD slot)
3 · · ·	Loop #1	B42-4166-11D0	90-250VAC power input, T/C or RTD input, output #1 1A Triac, output #2 1A Triac, output #3 relay, output #4 relay, comms, no display
12	Loop #10	B42-4366-11D0	90-250VAC power input, mA input, output #1 1A Triac, output #2 1A Triac, output #3 relay, output #4 relay, comms, no display
	Options		
	Power Supply	PS5R-SD24	85-264VAC power input, Output 24VDC 15W (0.6A)
	Cable	CA2011-3D	Cable from display to B42 (DB25 connector (display), twisted pair leads (B42), shielded (10ft)

Item #1 — Model FDC - 0450 4.3" Color Touch Screen

FDC - 0450 - | 1 | 0 | 1 | 1 | 0 | 0 | 0 | B | N |

| Order Matrix # | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

(1) Power Input
  1: 11 to 36 VDC

(2) Sound Output
  0: None

(3) SD Card Slot
  1: Yes

(4) Ethernet
  1: Yes

(5) Network
  0: None

(6) Software
  0: None

(7) Enclosure
  0: Standard

(8) Overlay Color
  B: Black Overlay

(9) Special Code
  N: Neutral Overlay (no name/logo)

Item #2: Loop Control Firmware

Order Matrix # | SD | - | MC |

(Fixed characters SD-MC: SD card with MC (1 to 10 Loop Control) Display Configuration and SD plugged into display)

Control System Options *(ordered separately as appropriate)*

Cable: Display to B42 Control Board
CA2011-8D: Cable (10ft) from Display to B42 controller.

Note: Consult factory for other lengths & options

Display Power Supply (input 100-240VAC / Output 24VDC)
DIN Rail Mount: PS5R-SB24: 15W power supply (0.6A)
Open Frame: PS3X-B24AFC: 15W power supply (0.6A)

Note: Either of the above will power the FDC-0450 touch screen display

USB Memory Stick
UDF115-2GB: (2GB High Capacity USB Memory Stick (3VDC))

System Reset Timer
GE1A-C10MA110/SR2P-06: Reset Timer and socket (DIN Rail)

Note: Timer is recommended for proper system restart due to momentary power interruptions (<500ms) which can erroneous operation.

B42 Programming Display Board
B42 Display Board 300 mm cable: 3020B42-00300A-00/300
B42 Display Board 1000mm cable: 3020B42-00300A-00/1K

Printed Operators Manual
Part Number (Orion-nCompass_MC_i4.3_User_Manual.pdf)
FDC-Orion nCompass MC i4.3 User Manual

Printed Configuration Manual
Part Number (Orion-nCompass_MC_i4.3_Config_Manual.pdf)
FDC-Orion nCompass MC i4.3 Configuration Manual

Printed Communication Reference Manual
Part Number (Orion-nCompass_MC_i4.3_Comm Reference.pdf)
FDC-Orion nCompass MC i4.3 Communication Reference Manual

USB Cables & Accessories
IStick-Panel   USB Panel Mount Adapter
IStick-4X-CVR   USB Panel Mount Adapter-Nema4x

Item #3: B42 Loop Control Board - Loop 1

B42 - ☐ ☐ ☐ ☐ ☐ ☐ **D** ☐ ☐

Order Matrix #   1   2   3   4   5   6   7   8   9

(1) Power Input
- **4:** 90-250 VAC, 47-63 HZ
- **5:** 11-26 VAC or VDC *(consult factory for availability)*

(2) Signal Input (18-bit A/D)
- **1:** Standard Input
    - Thermocouple: J, K, T, E, B, R, S, N, L, C, P
    - RTD: PT100 DI, PT100 JIS
    - Voltage: 0-60mV
- **5:** 0-10V, 0-1V, 0-5V, 1-5V
- **6:** 0-20/4-20mA
- **9:** Special Order

(3) Output 1
- **0:** None
- **1:** Relay rated 2A/240VAC (SPST)
- **2:** SSR Driver 5 VDC @ 30 Ma
- **3:** 4-20mA / 0-20mA Isolated
- **4:** 1-5V / 0-5V/0 - 10V Isolated
- **6:** Triac output 1A / 240VAC,SSR
- **C:** SSR Driver 14 VDC @ 40 Ma

(4) Output 2
- **0:** None
- **1:** Relay rated 2A/240VAC (SPST)
- **2:** SSR Driver 5 VDC @ 30 Ma
- **3:** 4-20mA / 0-20mA Isolated
- **4:** 1-5V / 0-5V/0-10V Isolated
- **6:** Triac output 1A / 240VAC,SSR
- **7:** Transmitter power supply 20 VDC/25 ma Isolated
- **8:** Transmitter power supply 12 VDC/40 ma Isolated
- **A:** Transmitter power supply 5 VDC/80 ma Isolated
- **C:** SSR Driver 14 VDC @ 40 Ma

(5) Output 3
- **0:** None
- **1:** Relay rated 2A/240VAC (SPST)
- **2:** SSR Driver 5 VDC @ 30 Ma
- **6:** Triac output 1A / 240VAC,SSR
- **7:** Transmitter power supply 20 VDC/25 ma Isolated
- **8:** Transmitter power supply 12VDC/40 ma Isolated
- **A:** Transmitter power supply 5VDC/80 ma Isolated
- **C:** SSR Driver 14 VDC @ 40 Ma

(6) Output 4
- **0:** None
- **1:** Relay rated 2A/240VAC (SPST)
- **2:** SSR Driver 5 VDC @ 30 Ma
- **3.** Retransmission 4-20 / 0-20mA, isolated
- **4.** Retransmission 1-5 / 0-5 / 0-10VDC, isolated
- **6:** Triac output 1A / 240VAC,SSR
- **7:** Transmitter power supply 20 VDC/25 ma Isolated
- **8:** Transmitter power supply 12VDC/40 ma Isolated
- **A:** Transmitter power supply 5VDC/80 ma Isolated
- **C:** SSR Driver 14 VDC @ 40 Ma

(7) Output 5
- **D:** RS-485 Modbus RTU interface Isolated

(8) Display Board and cable
- **0:** None
- **3:** Display Board with 300mm connection cable
- **4:** Display Board with 1000mm connection cable

(9) Modbus Addressing: (if blank factory default is Modbus address #1)
- **CA**: Modbus Comm Address #1
- **CB**: Modbus Comm Address #2
- **CC**: Modbus Comm Address #3
- Note that field configuration of Comm address requires the optional display.

Item #4-12: B42 Loop Control Board - Loop 2-10

B42 - ☐ ☐ ☐ ☐ ☐ ☐ **D** ☐ ☐

Order Matrix #   1   2   3   4   5   6   7   8   9

(1) Power Input
- **4:** 90-250 VAC, 47-63 HZ
- **5:** 11-26 VAC or VDC *(consult factory for availability)*

(2) Signal Input (18-bit A/D)
- **1:** Standard Input
    - Thermocouple: J, K, T, E, B, R, S, N, L, C, P
    - RTD: PT100 DI, PT100 JIS
    - Voltage: 0-60mV
- **5:** 0-10V, 0-1V, 0-5V, 1-5V
- **6:** 0-20/4-20mA
- **9:** Special Order

(3) Output 1
- **0:** None
- **1:** Relay rated 2A/240VAC (SPST)
- **2:** SSR Driver 5 VDC @ 30 Ma
- **3:** 4-20mA / 0-20mA Isolated
- **4:** 1-5V / 0-5V/0 - 10V Isolated
- **6:** Triac output 1A / 240VAC,SSR
- **C:** SSR Driver 14 VDC @ 40 Ma

(4) Output 2
- **0:** None
- **1:** Relay rated 2A/240VAC (SPST)
- **2:** SSR Driver 5 VDC @ 30 Ma
- **3:** 4-20mA / 0-20mA Isolated
- **4:** 1-5V / 0-5V/0-10V Isolated
- **6:** Triac output 1A / 240VAC,SSR
- **7:** Transmitter power supply 20 VDC/25 ma Isolated
- **8:** Transmitter power supply 12 VDC/40 ma Isolated
- **A:** Transmitter power supply 5 VDC/80 ma Isolated
- **C:** SSR Driver 14 VDC @ 40 Ma

(5) Output 3
- **0:** None
- **1:** Relay rated 2A/240VAC (SPST)
- **2:** SSR Driver 5 VDC @ 30 Ma
- **6:** Triac output 1A / 240VAC,SSR
- **7:** Transmitter power supply 20 VDC/25 ma Isolated
- **8:** Transmitter power supply 12VDC/40 ma Isolated
- **A:** Transmitter power supply 5VDC/80 ma Isolated
- **C:** SSR Driver 14 VDC @ 40 Ma

(6) Output 4
- **0:** None
- **1:** Relay rated 2A/240VAC (SPST)
- **2:** SSR Driver 5 VDC @ 30 Ma
- **3.** Retransmission 4-20 / 0-20mA, isolated
- **4.** Retransmission 1-5 / 0-5 / 0-10VDC, isolated
- **6:** Triac output 1A / 240VAC,SSR
- **7:** Transmitter power supply 20 VDC/25 ma Isolated
- **8:** Transmitter power supply 12VDC/40 ma Isolated
- **A:** Transmitter power supply 5VDC/80 ma Isolated
- **C:** SSR Driver 14 VDC @ 40 Ma

(7) Output 5
- **D:** RS-485 Modbus RTU interface Isolated

(8) Display Board and cable
- **0:** None
- **3:** Display Board with 300mm connection cable
- **4:** Display Board with 1000mm connection cable

(9) Modbus Addressing: (if blank factory default is Modbus address #1)
- **CA**: Modbus Comm Address #1
- **CB**: Modbus Comm Address #2
- **CC**: Modbus Comm Address #3
- Note that field configuration of Comm address requires the optional display.

NOTES: SCADA (Supervisory Control & Data Acquisition)

FDC-nCompass Series Graphic User Interface (GUI) touch screen provides a full SCADA feature set providing ease of use with either an icon menu system with finger navigation or traditional Menu bar, data acquisition, alarm manager, operator audit trail, multi-level security with user rights, LAN connections and more.

The GUI provides ease of configuration, use & support.
- System Configuration for loop, alarm, input & outputs assignment, Help language selection and more, all without an external device or PC.
- Loop Views: view 1 to 10 controls in single or overall view as well as in a Trend format (trend up to loop controls PV, SP & Percent Out).
- Profile: Virtually unlimited number of profiles with each profile having up to 64 steps with up to 3 events.
- File Management: View, print, copy/move Profile, Alarm, Historical Data (data log files) and operator audit trial files. File transfer via LAN features or USB flash memory.
- LAN: Remote Access & touch screen operation (VNC), email/SMS on alarm, email historical, alarm & audit trail files on-demand, Web Page (view only) and FTP of alarm, audit and historical data files automatically or on-demand.

Data Acquisition:
- Data log PV, SP and PID Percent output for 1 to 10 loop controls.
- Log interval: configurable 6 seconds to 31 minutes with configurable number of days to auto start & name next file (1 to 31 days).
- File Start/Stop: Configurable; operator on-demand, on system boot, profile ramp-soak start/end or digital inputs
- File Interval: Once started a data log file is configurable to auto end and start new file with the same name as previous file with an appended time/date name. Configurable time interval is from 1 to 31 days.
- File name: Operator entered file name, batch & lot number or if running a profile, file name same as profile name. (all file names appended with date-time to file name)
- Operator Comments/Events: Unlimited operator comments/events linked to each file entered manually or via Bar Code Scanner.
- Digital Signatures: full support for user based digital signatures for each data file (data encryption).
- Historical Data File: View & print the data directly from the display (auto scale on X & Y axis with each channel selectable for right or left axis values), from a PC after data is copied/moved via LAN (FTP or email) or USB Flash Memory card provided.

NOTES: B42 Control Board (1 to 10 may be used)

B42 Loop Control: http://www.futuredesigncontrols.com/B42.HTM
- Analog Input: 200ms scan rate with 18-bit A/D resolution providing high accuracy and PID control performance
- Outputs: Maximum of 4 control or auxiliary outputs
- PID Control Outputs: up to 2 with Auto Tune capability (heat-cool) Relay, SSR driver 5V, SSR driver 14V, 1A SSR, mA* or VDC*
- Alarm or Event: up to 3 outputs (outputs #2, #3 & #4) Relay, SSR driver 5V, SSR driver 14V or 1A SSR
- Auxiliary Outputs: up to 2 outputs, one or two Transmitter power supplies and/or one Retransmission* output
  *Note: Analog mA and VDC PID and retransmit outputs are 15-bit, contributing to high performance PID control and highly accurate retransmitted PV or SP values.
- Alarm Types: Process, Deviation and Deviation Band, all High or Low
- PID Parameters: Two sets of PID values may be configured and selected by Profile Step and/or by digital event input. (see next)
- Event Inputs: Configurable for one of the following functions.
  - Profile Run (momentary)
  - Profile Hold (closed profile hold, open profile run)
  - Profile Run/Hold (closed profile run, open profile hold)
  - Profile Abort (momentary)
  - Segment Advance (momentary)
  - Manual Mode (closed manual mode, open normal control)
  - Failure Transfer: (closed failure transfer, open normal control) (transfer active %Out is a pre-configured value for each output)

NOTES: Profile Ramp / Soak Specifications

Profile Ramp/Soak:
- Profiles: Virtually an unlimited number of profiles in system memory
- Profile Type: System configurable for separate profiles per loop or common profile with slave set point operation for other loops.
- Profile Start: via touch screen or via Event input (see above).
- Profile Name: Free form 16 character (max) naming convention with auto append time/date stamp.
- Global Profile Configuration
  - Profile Time Base: Time Ramp (hh:mm or mm:ss) Ramp Rate (degrees/minute or hour)
  - Starting and Ending SP values (may be individually active or not).
  - Guaranteed Soak & Ramp (GS):
    - Range 1 to 999F (555C), configurable per step as low, high, band or inactive (disable).
- Power Fail / Recovery when Profile is active:
  - Continue from last SP value.
  - Continue from last PV value.
  - Static mode (abort profile) with last static SP entered.
- Profile Segments: (maximum of 64)
  - Jump To Segment: configurable by segment (also nested looping)
  - Events: up to 3 events* per segment.
  - Guaranteed Soak & Ramp: Configurable active or not by segment.

  * Note: The number of events available is predicated on the control board hardware, number of control boards and configuration.

- Event Input: (profile specific; refer to B42 Control Board for all options)
  - Configurable functions below (mutually exclusive to each other)
    - Profile Run (momentary)
    - Profile Hold (closed profile hold, open profile run)
    - Profile Run/Hold (closed profile run, open profile hold)
    - Step Advance (momentary)
    - Profile Abort (momentary)

Although the Event Input provides a manner to control Profile functions remotely, typically Profile actions would have the Operator using the intuitive easy to use 4.3" color touch screen (operator interface).

NOTES: Power Supply – Optional

Power Capacity Required (Watts) - A base system requires ~10 watts of 24Vdc power for the nCompass user interface. The 15W power supplies offered are sufficient to power display only.

Note: The power supply should be used to power nCompass components only and not OEM or other end user components or devices.

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