

# *Nova Flow*

## *Modular Flow Computer*

### *Plug-n-Flow Architecture*

### *USER'S MANUAL*



HP-302  
June 2013

**H** **HOFFER FLOW CONTROLS, INC.**  
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## Disclaimer

Specifications are subject to change without notice.  
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# Specifications

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## General Specifications

### Environmental

Operating Temperature: -20°C to 70°C  
-40°C to 70°C, with heater option.  
(Only available with NEMA enclosure option)  
Storage Temperature: -40°C to 85°C  
Humidity: 0-95% Non-condensing

### Approvals and Regulatory Compliance

CE

Standards:

AGA 8/API 14.2  
AGA 7  
OIML Tc 8 Sc 7, R117, R118  
ISO 6551, 7637  
NIST Handbook 44, 3.37

### Enclosure

1/2 DIN panel mount, aluminum housing  
Optional Ex proof, NEMA 4X

### Power Supply

10 to 30 Volts DC, 2A max  
85-265 VAC, 50/60Hz, 400mA max

### Display

128x64 graphical display displays 4 parameters simultaneously  
Easy scroll through matrix of 48 parameters  
LED back light  
Adjustable contrast

### Keypad

3 soft keys  
14 assigned keys  
Embossed overlay  
Stainless steel membrane switches

### IR Interface (Optional)

Front panel infrared transmitter/receiver for remote operation and communication

### Diagnostics

Multiple error messages  
Failure detection for RTD and all analog inputs  
System configuration and diagnostics from a PC computer through RS-232 port

### Field Expandable Hardware and Software

Easy to add and replace modules  
Software configuration based on installed modules

## Specifications

### Alarms

Multiple visual/audio alarms  
HI/LO, HI/HI, LO/LO

### Batch Controller

Single/Dual Stage batch operations  
Count UP/DOWN  
Remote batching capability

### Energy Calculator

Cooling, Heating, Heat/Cool Auto Switch

### Flow Compensation and Calculation Methods

20-point flow linearization  
FWD/REV tables for two channels  
Mass and Volumetric calculations available for fluids and gases  
Up to 4 fluid properties tables  
Compressibility table for gases

### Security Features

Audit Trail with Time/Date/ID stamping for configuration changes

## Hardware Specification

Nova Flow construction allows full flexibility in selecting flow computer functions. The base Nova-Flow unit provides one flow meter input, and 8 digital I/O lines. Each I/O line can be configured as Input or Output. The unit has 8 expansion slots for optional I/O modules. Almost any combination of modules can be selected to meet the customer's individual needs.

### BASE UNIT

#### Flow Meter Input

Selectable: Magnetic coil, MCP coil, TTL, Open Collector, Dry Contact  
Frequency range: 0.2 to 5,000 Hz.  
Amplitude: 10mVrms to 30Vrms

#### Digital I/O

7 digital lines selectable for Input or Output  
One optically isolated Digital Output  
Software configurable function: pulse output, remote clear, batch start/stop, batch control, alarms.  
Selectable voltage level: 0-5V, 0-10V, or Open Collector rated at 30Vdc, 250mA max.

Auxiliary 24 Vdc power supply @ max 100mA



## OPTIONAL MODULES

### Dual RTD and Dual Analog Input Module

Includes two RTDs and two analog inputs  
 Compatible with 100, 1000, and 2500 Ohm RTD probes  
 Analog inputs configurable for temperature, pressure, density, specific gravity, or flow  
 Accuracy 0.025%  
 Resolution 12 bit  
 Range 4-20mA, or 1-5V  
 Over voltage and over current protected

### Analog Output Module

12 bit true D/A  
 Selectable 4-20mA, 1-5V  
 Current sourcing, or powered from external power supply

### Dual Relay Module

Includes two SPDT relays  
 Dry Contact or Solid State Relays  
 Dry Contact: Vmax 125Vac, Imax 10A / Vmax 250 V ac, Imax 5A  
 Solid State: Vmax switching 175Vdc, Imax switching 250mA, Imax carry 1.5A  
 Software configurable for flow, temperature, pressure, and density alarms (high and low)

### RS232 Port Module

Includes one RS232 serial port, screw terminal or DB9 connector  
 Printing, configuration, MODBUS interface

### RS485 Port Module

Includes one RS485 serial port, screw terminal connector  
 Printing, configuration, MODBUS interface

### Dual Pulse Out Module

Scaled pulse per unit of measure  
 Voltage level: 0-5V, 0-12V, Open Collector 30Vdc, 250mA max.

### Flow B Module (second flow input)

Magnetic coil, MCP coil, TTL/CMOS, Open Collector, Dry Contact  
 Quadrature input for magnetic coil, ISO6551 level B compliant  
 Frequency range 0.2 to 5,000 Hz  
 Amplitude 10mVrms to 30Vrms

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# Architecture

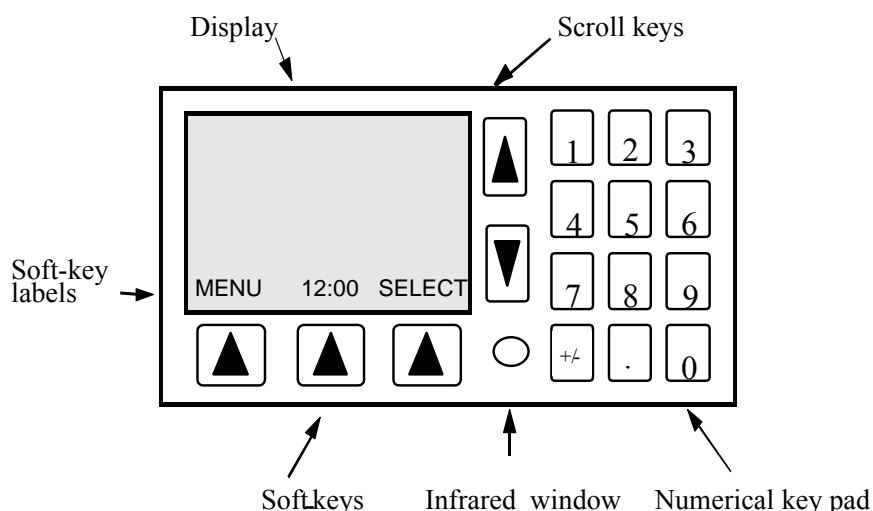
Nova-Flow architecture allows for many combinations of software and hardware options. The modular design can accommodate a variety of flow applications. The Nova-Flow chassis has 8 expansion slots accessible through the rear panel to install optional “plug-in” modules. There are several modules for various input output signals, and communication requirements. In addition there are several software options for specific applications such as batching, manifold configuration and energy calculation.

## Multiple Flow Channels

Nova-Flow can monitor up to four flow channels. The flow channels are identified with letters A, B, C, D. Channels A and B are frequency inputs and can work with a turbine meter or any other frequency producing flow meter. Channels C and D are analog inputs and can accept 4-20 mA or 1-5 volt signals. Any two of the four channels can be fully compensated for temperature and pressure with an appropriate selection of the optional modules.

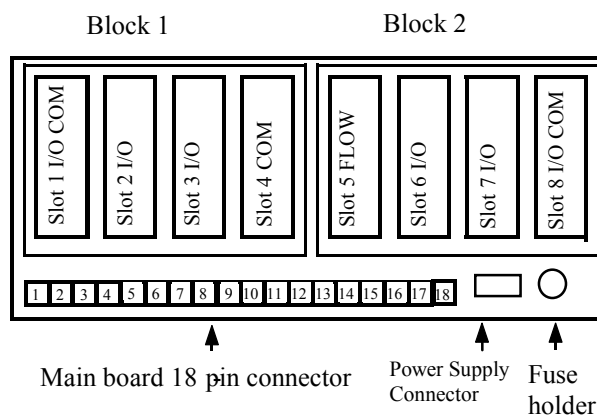
## Front Panel

Nova-Flow has a graphical display with 64x128 pixel resolution. It displays five lines of text: four lines are used for process parameters, and the fifth line at the bottom of the display is used for software-controlled key labels. There are three software-controlled keys (soft-keys) located under the display, two scroll keys on the right side of the display, and a numerical keypad. Soft-key functions vary with the operating mode of the unit. The soft-key labels are displayed above the keys and they change according to the keys function. Two scroll keys (UP and DOWN) are used to select display parameters, and to navigate in the program menu. The numerical keypad is used to enter numerical values, or to select items in the menu. Under the scroll keys there is an infrared window for communication with computers equipped with IR interface.



## Rear Panel

The main board 18 Pin connector provides connection for all standard circuits: the flow meter input, auxiliary 24 Vdc output, and 8 digital I/O lines configurable for either input or output.



There are 8 optional module slots grouped in two blocks: Block 1 and Block 2. Each block consists of four slots. Each slot has a specific functionality that has to be matched with the module type. Slot #5 is for flow meter module only, slot #4 is for communication modules only. Slots 2,3,6,7 are for input/output modules only, slots 1,8 are for use with input/output and communication modules.

|        |  |
|--------|--|
| Slot 1 | Input/output modules and Communication modules |
| Slot 2 | Input/output modules                           |
| Slot 3 | Input/output modules                           |
| Slot 4 | Communication modules                          |
| Slot 5 | Flow meter module                              |
| Slot 6 | Input/output modules                           |
| Slot 7 | Input/output modules                           |
| Slot 8 | Input/output modules and Communication modules |

Slot/Module Compatibility Table.

## Optional Modules

There are three types of optional modules: input/output (I/O), communication (COM), and flow meter modules. When installing a module, the type of module has to be matched with the type of slot in the Nova-Flow chassis.

The following modules are available:

### I/O Modules:

RTD/Analog Input  
Analog output  
Dual relay  
Pulse out

### Com Modules:

RS232  
RS485

### Flow Meter Module:

Flow B

A combination of the above modules results in over 50,000 different configurations available for Nova-Flow.

### Optional Modules

| <i>Module Name</i> | <i>Function</i>   | <i>Available slot</i> | <i>Code #</i> |
|--------------------|---|-----------------------|---------------|
| RTD/ANALOG IN      | Dual RTD 2 or 3 wire, and dual analog input 4-20mA, or 1-5V | 1, 2, 3, 6, 7, 8      | T1-T16*       |
| ANALOG OUT         | Analog output 4-20mA, or 1-5V                               | 1, 2, 3, 6, 7, 8      | A7, A8*       |
| RELAY              | Dual SPST relay   | 1, 2, 3, 6, 7, 8      | R1, R2*       |
| PULSE OUT          | Pulse output for frequency above 1Hz                        | 1, 2, 3, 6, 7, 8      | P             |
| RS232              | Serial communication, terminal block                        | 1, 4, 8               | S2            |
| RS232-DB9          | Serial communication, DB9 connector                         | 1, 4                  | S9            |
| RS485              | Serial communication, terminal block                        | 1, 4, 8               | S4            |
| FLOW B             | Flow meter input with pulse security                        | 5                     | BM, BRF       |

\*See model number designation section

### Notes!

1. When a module is installed, removed, or moved to a different slot, the software configuration has to be changed accordingly. Refer to section "Slot configuration".
2. Hoffer recommends that Slot 1 is always equipped with a serial communication module to allow configuration changes from a PC computer.

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# Model Number & Hardware Code

## Nova Flow Model Number:

**NF-A7-S2-MB-1-M-T1-1-H/L R1-P-F-BP-SP**

### Analog Outputs

(A7) 4-20mA  
(A8) 1-5Vdc

### Communication Ports

(S2) RS232/ Screw Terminal  
(S4) RS485/ Screw Terminal  
(S9) RS-232-S9

### Scaled Output Pulses

(MB) Mother board  
(P) Dual High Speed Output

### Number of Channels

(1) Single Channel  
(B) Dual Channel, Bi- directional  
(PSB) Pulse Security  
(B3) 3 Channel Unit  
(B4) 4 Channel

### Flowmeter Input

(M) Magnetic Coil  
(MC3PA) RF Coil  
(RPR) Redi-pulse RF coil  
(RPM) Redi-pulse Magnetic Coil  
(DMX) Redi-pulse I.S. Magnetic Coil  
(DRX) Redi-pulse I.S. RF Coil

### Temperature/Pressure Compensation, Analog and RTD Inputs

(T1) Two 4-20mA, two 100 ohm RTD inputs  
(T2) Two 1-5Vdc, two 100 ohm RTD inputs  
(T3) One 4-20mA, one 1-5Vdc, two 100 RTD inputs  
(T4) Two 4-20mA, two 1000 ohm RTD inputs  
(T5) Two 1-5Vdc, two 1000 ohm RTD inputs  
(T6) One 4-20mA, one 1-5Vdc, two 1000 ohm RTD inputs  
(Z) Add (Z) Compressability software after all options above for gas

### Special Features

(SP) Any special features that are not covered in the model number

### Backplane

(B) Second backplane, required if slots 6, 7, or 8 have been configured  
(BPB) Use option if (B) dual channel has been equipped in slot 5

### Accessories/Options

(F) Flowmeter mounted for (ND)  
(H) Heater for (ND) & E options only

### Enclosure Style

(P) Panel Mount  
(ND) Mounted on door with keypad accessible  
(E) Explosion Proof, Visible thru window  
(C) Portable

### Alarms

(H/L R1) ½ amp dual SPDT, high speed 200 Hz max  
(H/L R2) Dual SPDT., 10 amp relays

### Power Input

(1) 115 Vac 50/60 Hz  
(2) 220 Vac 50/60 Hz  
(\*) 10-30Vdc

## Hardware Code

In addition to the model number Nova Flow units are labeled with a hardware code to help the factory identify installed hardware options. The hardware code consists of a string of up to 8 symbols representing modules in the order they are installed in the chassis. Each symbol stands for one module. An “X” indicates there is no module installed in the corresponding slot. The first four symbols represent modules installed in the Block-1, the second four symbols represent modules installed in the Block -2. The second four symbols are deleted if there are no modules in the Block-2 slots. This also indicates that the Block-2 board is not installed.

Hardware code example:

**S2-T1-A7-S4--BM-R1-P-X**

|        |                         |                  |        |        |               |              |        |
|--------|-------------------------|------------------|--------|--------|---------------|--------------|--------|
| Slot 1 | Slot 2                  | Slot 3           | Slot 4 | Slot 5 | Slot 6        | Slot 7       | Slot 8 |
| RS232  | RTD/<br>Analog<br>Input | Analog<br>Output | RS485  | Flow B | Dual<br>Relay | Pulse<br>Out | None   |

**Module Code Table**

| <i>Module Name</i> | <i>Description</i>                                      | <i>Type</i> | <i>Code</i> | <i>Max # of Modules</i> |
|--------------------|---|-------------|-------------|-------------------------|
| Flow B             | Flow meter input with pulse security, Mag or pulse coil | Flow        | BM          | 1                       |
| Flow B             | Flow meter input with pulse security, RF coil           | Flow        | BRF         | 1                       |
| RS 232             | Serial communication, screw terminal.                   | Com         | S2          | 3                       |
| RS 232-DB9         | Serial communication, DB9 connector.                    | Com         | S9          | 2                       |
| RS 485             | Serial communication, screw terminal.                   | Com         | S4          | 3                       |
| RTD/Analog In - 1  | 2x 100Ω RTD, 2x 4-20 mA                                 | I/O         | T1          | 2*                      |
| RTD/Analog In - 2  | 2x 100Ω RTD, 2x 1-5 V                                   | I/O         | T2          | 2*                      |
| RTD/Analog In - 3  | 2x 100Ω RTD, 1-5 V, 4-20mA                              | I/O         | T3          | 2*                      |
| RTD/Analog In - 4  | 2x 1000Ω RTD, 2x 4-20 mA                                | I/O         | T4          | 2*                      |
| RTD/Analog In - 5  | 2x 1000Ω RTD, 2x 1-5 V                                  | I/O         | T5          | 2*                      |
| RTD/Analog In - 6  | 2x 1000Ω RTD, 1-5 V, 4-20mA                             | I/O         | T6          | 2*                      |
| Analog Output      | 4-20mA  | I/O         | A7          | 2*                      |
| Analog Output      | 1-5V  | I/O         | A8          | 2*                      |
| Dual Relay -1      | 2x SPST solid state                                     | I/O         | R1          | 3*                      |
| Dual Relay -2      | 2x SPST 10A, 250 VAC                                    | I/O         | R2          | 3*                      |
| Pulse out          | 2x pulse output (<200Hz)                                | I/O         | P           | 1*                      |

\*Recommended for typical applications/consult factory.

Com = communication module, I/O = input/output module, Flow = frequency input module



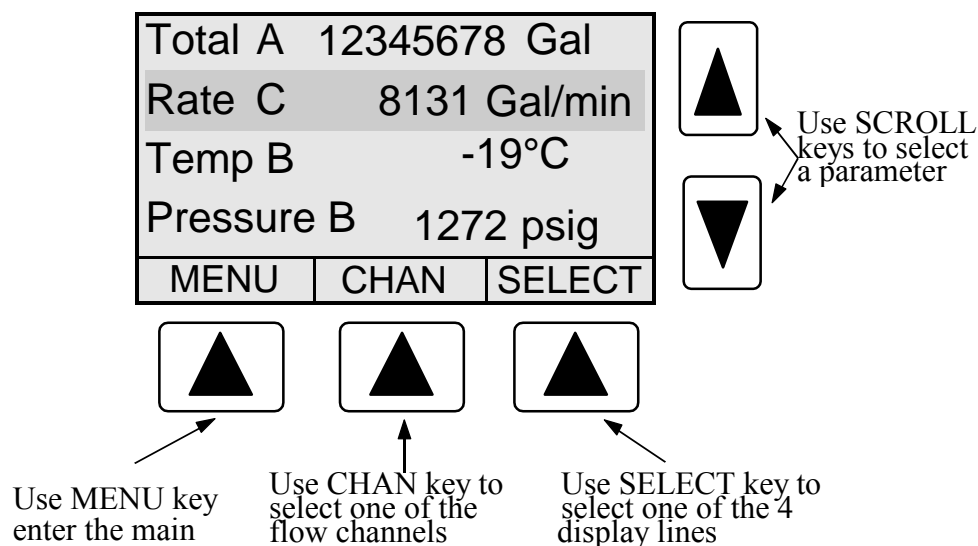
# Operation

This section applies only to units that have already been programmed. For initial programming and set up refer to the Menu Structure section.

## Displaying Process Parameters

Nova-Flow displays simultaneously four process parameters. To set a desired parameter on one of the four display lines press SELECT key until the line is highlighted, press CHAN key to choose a flow channel (on multi-channel systems), and then scroll through the parameters using SCROLL keys until the desired parameter is displayed.

When one of the lines is selected, the center soft-key label changes from DATE/TIME to CHAN on multi channel system.



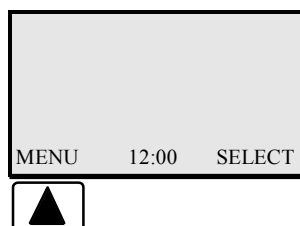
The following process parameters are utilized for the display

| <i>Parameter name</i> | <i>Displayed name</i> | <i>Description</i>  |
|-----------------------|-----------------------|---|
| Uncorrected Total     | U/Total               | Volumetric total at flowing conditions, calculated based on turbine calibration data (K-factor) stored in the Nova-Flow   |
| Total                 | Total                 | Corrected total, compensated to a selected reference conditions, expressed in units of volume or mass, depending on calculation and compensation method.  |
| Accumulated Total     | AccTot                | Accumulated corrected total   |
| Uncorrected Rate      | U/Rate                | Volumetric flow rate at flowing conditions, calculated based on turbine calibration data (K-factor) stored in the Nova-Flow   |
| Flow Rate             | Rate                  | Corrected rate, compensated to a selected reference conditions, expressed in units of volume or mass, depending on calculation and compensation method.   |
| Temperature           | Temp                  | Actual flowing temperature. A programmed default temperature is displayed whenever the default temperature is being used for calculation, or “N/A” when temperature is not selected for compensation. |
| Pressure              | Press                 | Actual flowing pressure. A programmed default pressure is displayed whenever the default pressure is being used for calculation, or “N/A” when pressure is not selected for compensation.             |
| Density               | Density               | Actual flowing density. A programmed default density is displayed whenever the default density is being used for calculation, or “N/A” when density is not selected for compensation.                 |

On multi-channel system parameters are displayed with extensions Ch A, Ch B, Ch C, or Ch D to identify the flow channel they are associated with.

## Displaying Date and Time

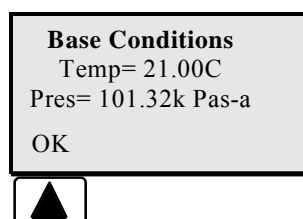
Time or date is displayed in the center soft-key field, when this field is not being used.



When time or date is displayed use the center soft-key to switch between the time and date.

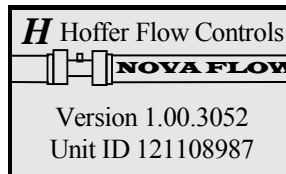
## Displaying Base Conditions

Currently configured Base Operating Conditions may be displayed by pressing the +/- key on the numerical keypad.



## Displaying Software Version and Electronic ID

The software version and unique electronic identification number may be displayed by pressing the decimal key on the numeric keypad.



## Clearing

To access the clearing menu press MENU key, and select CLEAR using ARROW keys or the numerical keypad. Select an item from the menu and press the CLEAR key. A message “Are you sure” will be displayed. Press YES key if you still want to clear a register. After pressing the YES key to confirm, information stored in the register will be lost.

Clearing is not available while flow is present. A warning message will be displayed when CLEAR key is pressed while flow is present.

## Printing

To access the printing menu press MENU key, and select PRINT using SCROLL keys or the numerical keypad. Select a desired item for printing and press PRINT key. The printing function is available while flow is present.

*Example:*

To print configuration data press MENU, select PRINT, CONFIGURATION, and press PRINT key.

## Error Messages

There are a number of warnings and error messages that guide the user if there is an operational problem or conflict in the configuration parameters. When an error occurs the center soft-key label switches to “Errors”. Press the ERRORS key to view and acknowledge errors. If there is more than one error message, press the key again until all messages are cleared. Refer to appendix D for the error messages list.

## Passwords

The Nova-Flow unit has a two level password protection: operator and supervisor. At each level there are five user ID numbers available. Any configuration parameter that may affect the flow calculation is protected with the supervisor password. The unit is shipped unprotected, with all passwords set at 0000.

## Diagnostics

To enter the diagnostic mode press MENU key, and select DIAGNOSTICS.

## Programming

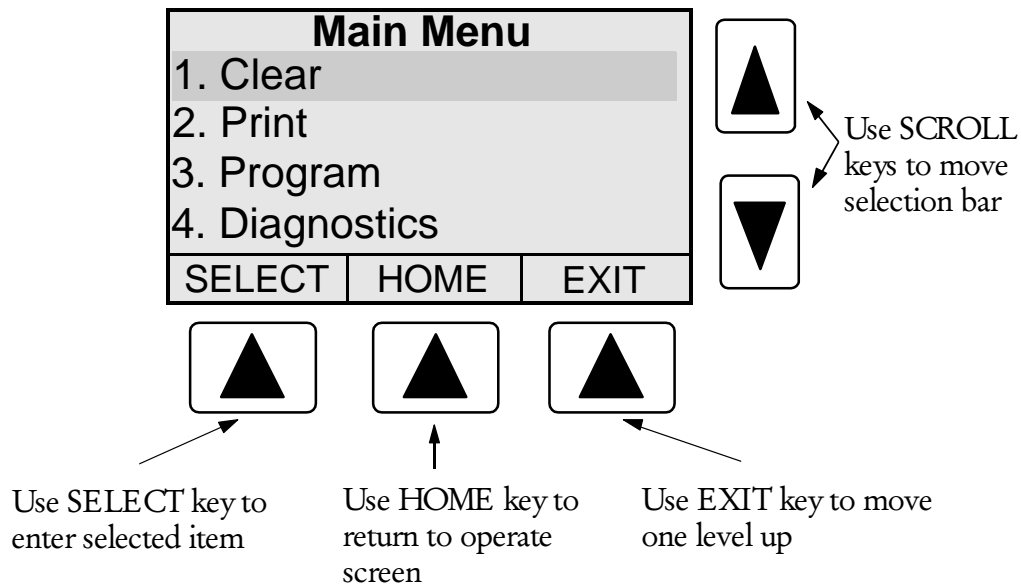
The Nova-Flow unit is shipped from the factory fully programmed per user specification. However, it is recommended to verify the program settings before the unit is installed. Programming may be performed from the Nova-Flow front panel, or from a personal computer using Hoffer configuration software. Connection to the personal computer can be established either through the RS232 cable, or the infrared interface.

The program menu may not be entered while flow is present. This prevents parameters affecting flow calculations to be changed during a process.

To enter the program mode press MENU key, and select PROGRAM.

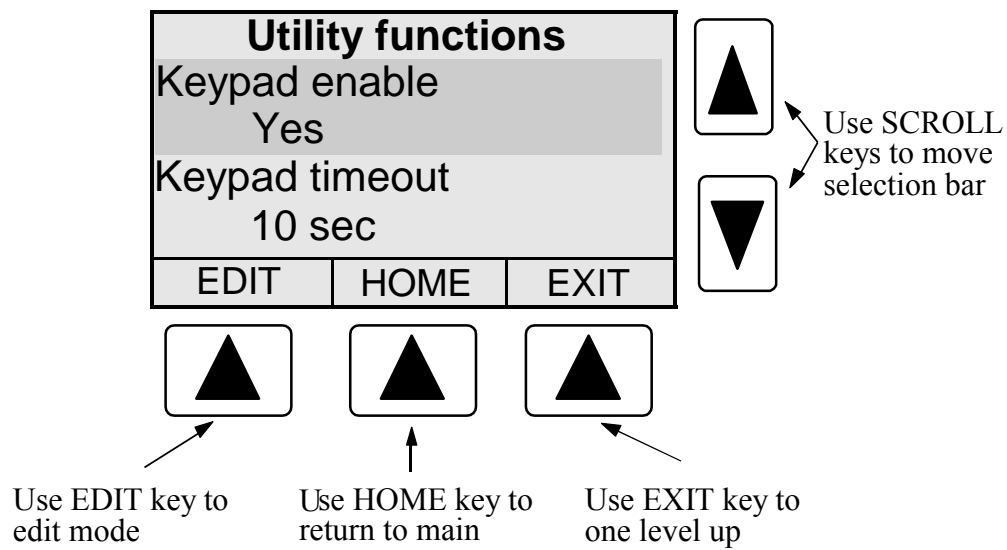
## Selecting a Menu Item

The Nova-Flow program menu is a multi-layer matrix of submenus. Refer to the menu chart in the Menu Structure section for help navigating through the menu structure and locating a desired menu item.

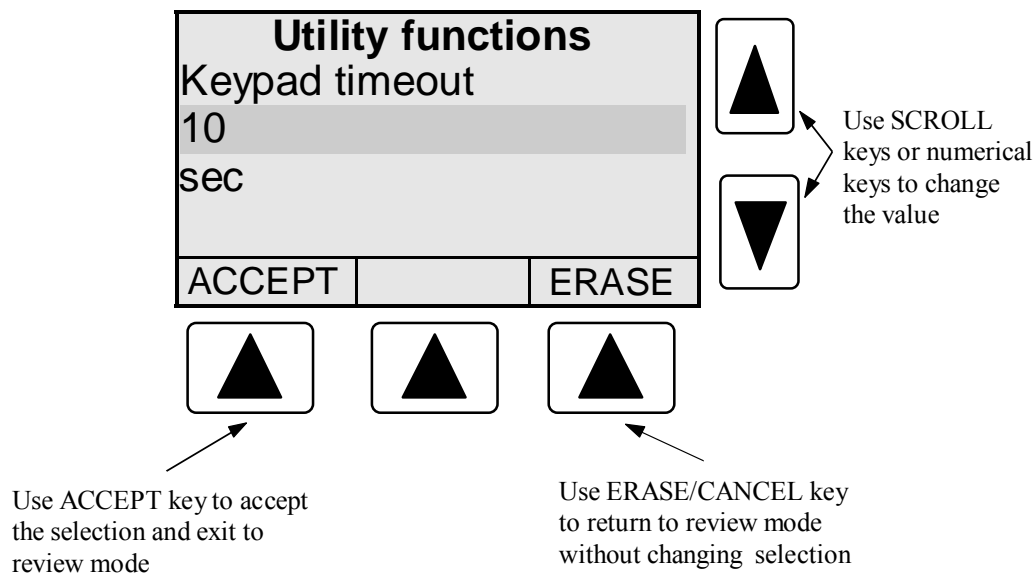


## Reviewing Settings

Program settings are displayed at the lowest level in the program menu. Once a menu item is selected, it can be changed using the EDIT key.



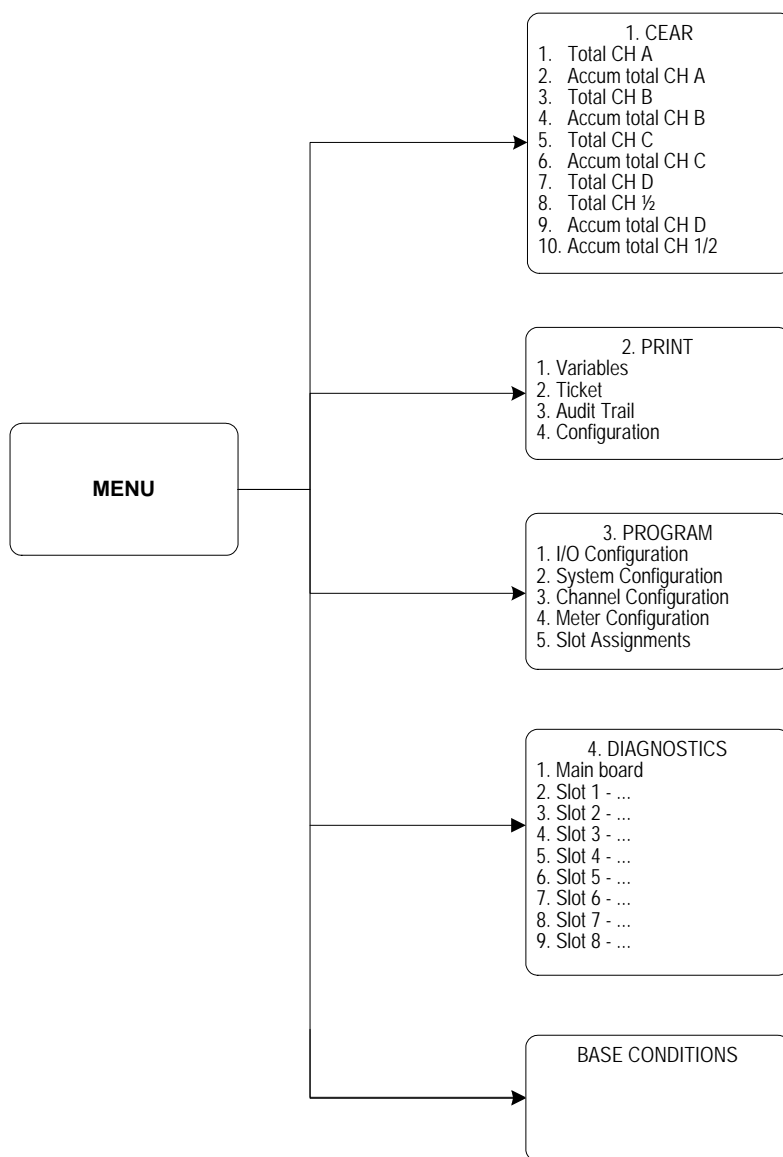
## Editing Program Settings



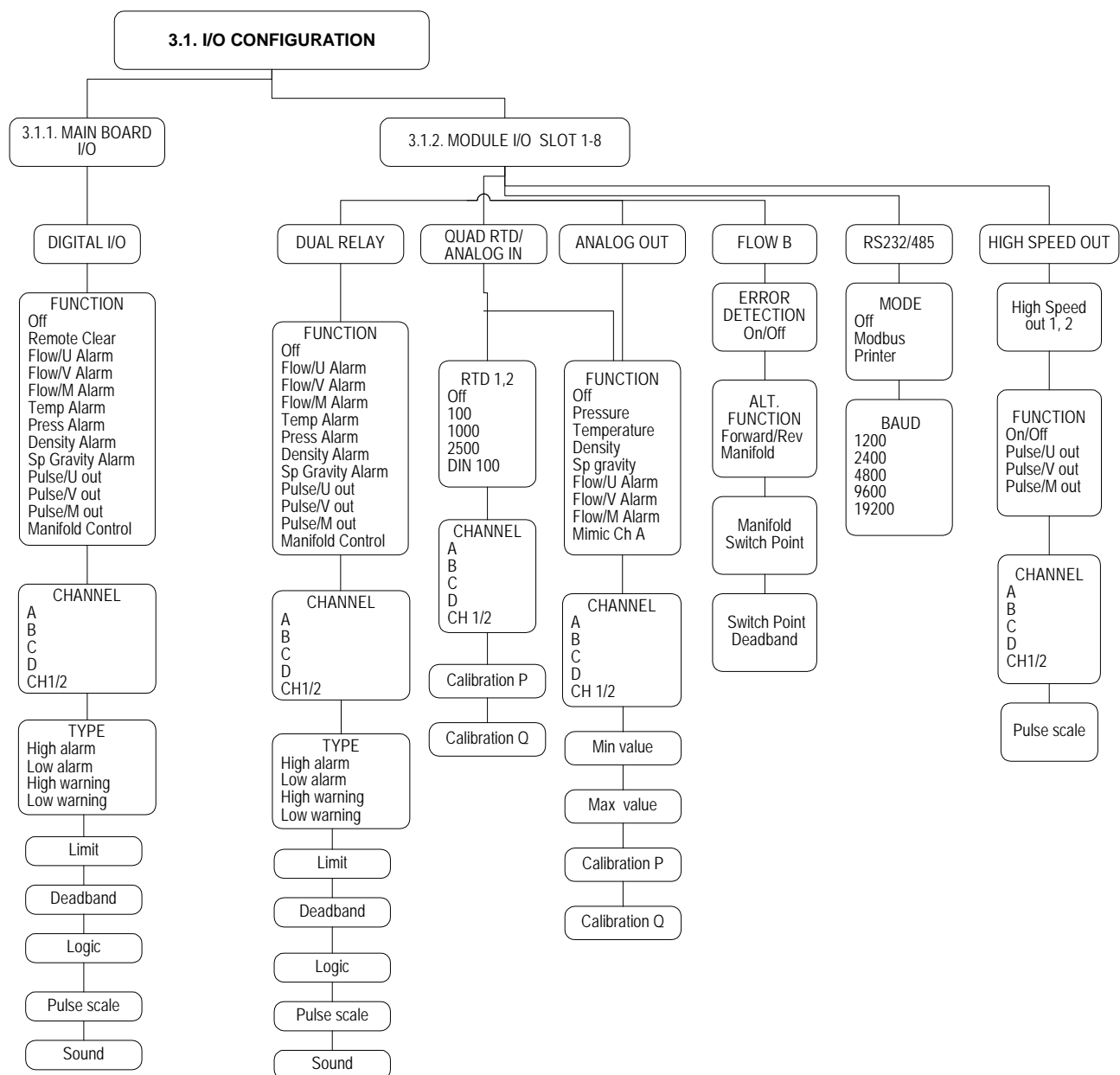
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# Menu Structure

The structure of the program menus varies depending on the type and number of optional modules installed in the Nova-Flow. Not all of the menu items described in this manual may be available on Nova Flow.

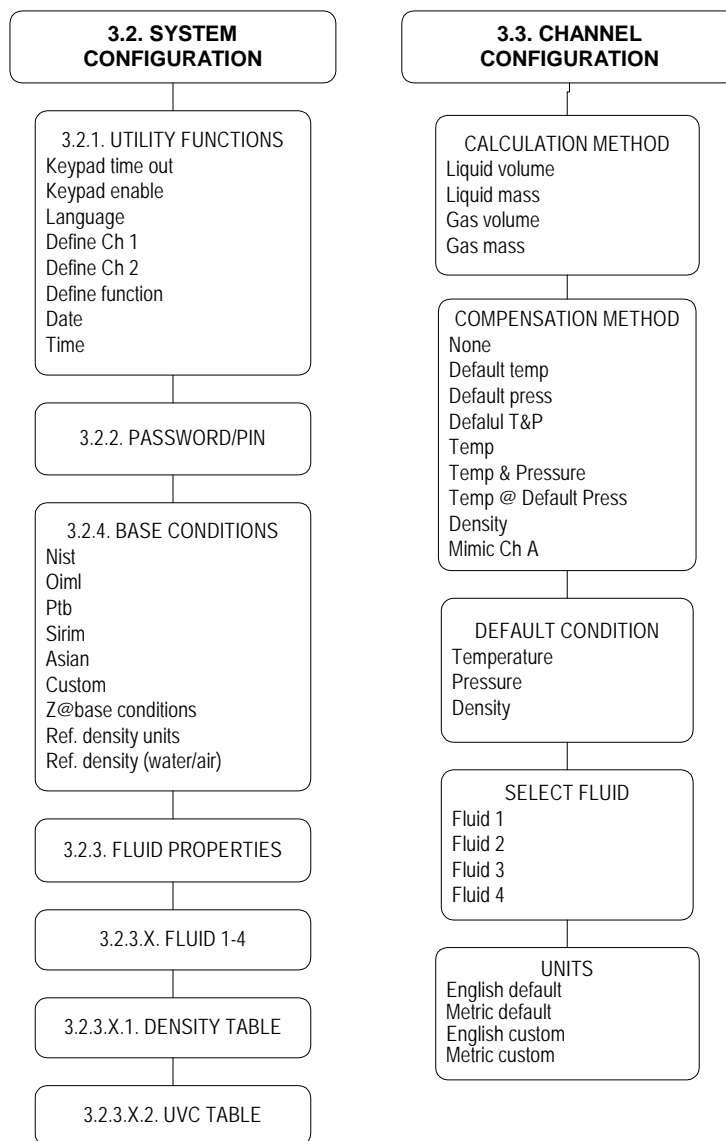


## Program Menu

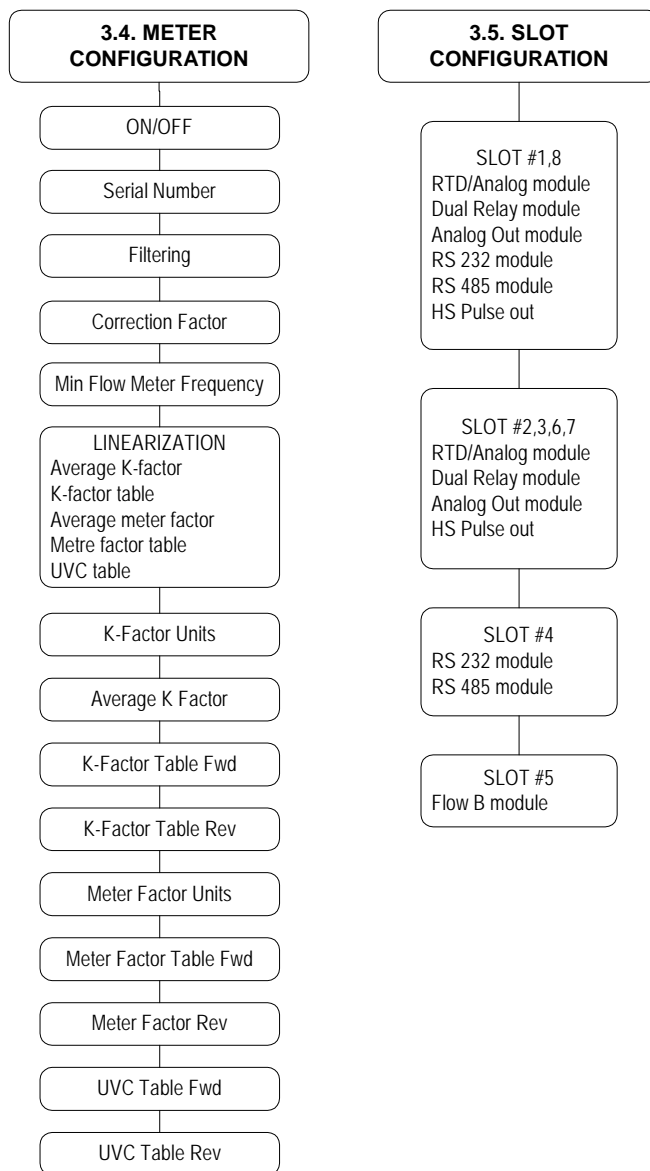




## Program Menu



## Program Menu



## 1. CLEAR Menu

1. Total CH A
2. Total CH B
3. Accum Total CH A
4. Accum Total CH B
5. Total CH C
6. Total CH D
7. Accum Total CH 1/2

Select an item from the above menu and press the CLEAR key. A message “Are you sure” will be displayed. Press YES key if you still want to clear a register. After pressing the YES key to confirm, information stored in the register will be lost.

## 2. PRINT Menu

1. Variables
2. Ticket
3. Audit Trail
4. Configuration Data

Select a desired item from the above menu and press the PRINT key.

Variables for printing may be selected from the following list located in the Windows Configuration program:

- Uncorrected Total
- Uncorrected Accumulated Total
- Total
- Accumulated Total
- Uncorrected Rate
- Rate
- Temperature
- Pressure
- Density

On multi-channel system variables are printed with extensions Ch A, Ch B, Ch C, or Ch D to identify the flow channel they are associated with.

Variables may be printed automatically at user-defined time intervals. This function is configured by entering an interval in minutes in the Print Frequency field located in the Windows Configuration Print Menu.

### NOTE

Selecting variables and setting the print time interval are available only from the Windows Configuration program.

### 3. PROGRAM Menu

#### NOTE

The Slot Assignments must be programmed before any other configuration can be performed, if the unit is being setup for the first time, or if there have been changes to the installed optional modules.

This section describes the program menu fields in detail. Whenever applicable the description is presented in the following format:

| <i>Address</i> | <i>Menu item</i> | <i>Selection</i> | <i>Comments</i> |
|----------------|------------------|------------------|-----------------|
|----------------|------------------|------------------|-----------------|

A menu item can be accessed quickly from the Nova-Flow front panel by pressing the MENU key and the address number on the numerical keypad.

An alternative method of accessing a menu item is using SCROLL and SELECT keys as described in the Operation section.

The lowest level submenu items have no numerical address assigned, and selections are made using the SCROLL keys.

*Example:*

| <i>Address</i> | <i>Menu</i> | <i>Selection</i>    | <i>Comments</i>                        |
|----------------|-------------|---------------------|--|
| 3.2.1          | Date/Time   | Enter date and time | This menu allows to set time and date. |

*To access the **Date/Time** field using numerical address:*

*press MENU key,  
press “3” key,  
press “2” key,  
press “1” key,  
scroll the selection bar down to Date/Time field.*

### 3.1. I/O Configuration

#### 3.1.1. Main Board I/O

I/O1 through I/O7 can be configured for input or output by selecting a dip switch combination on the main board. Outputs are configurable for 5V, 10Vdc, or open collector. I/O 8 is an output only and can be configured as an opto-isolated output. Refer to the Hardware configuration section for details.

| <i>Address</i> | <i>Menu item</i> | <i>Selection</i>  | <i>Comments</i>  |
|----------------|------------------|---|--|
| 3.1.1          | Function         | Remote clear<br>Flow alarm<br>Temperature alarm<br>Pressure alarm<br>Density alarm<br>Sp gravity alarm<br>Pulse out | Select a function for digital I/O line.<br>Remote clear not available for I/O8.  |
| 3.1.1          | Channel          | Channel A<br>Channel B<br>Channel C<br>Channel D<br>CH1/2   | Select applicable flow channel for digital I/O.<br>This menu applies to multi-channel systems only.<br><br>CH1/2 is defined in System Configuration (3.2.1)  |
| 3.1.1          | Type             | High alarm<br>Low alarm<br>High warning<br>Low warning  | Select a desired alarm type. This menu applies to alarm output only.<br>Warnings display message on the front panel, and sounds the buzzer if sound is selected. Alarms display message, sounds buzzer, and logs error message into the error log. |
| 3.1.1          | Limit            | Number  | Enter an alarm set point within the operating range of the parameter (Min-Max).  |
| 3.1.1          | Deadband         | Number  | Enter a value in the currently selected units alarm to avoid spurious switching around the alarm set point. Recommended value is about 1-5% of the range.  |
| 3.1.1          | Logic            | Active low<br>Active high   | For active low the output changes from high level to low level when alarm condition occurs.<br>For active high the output changes from low level to high level when alarm condition occurs.  |
| 3.1.1          | Pulse scale      | 1, 10, 100, 1000  | Select a scaling factor. This menu applies to pulse output only. "1" means one pulse is output for each unit of volume.  |
| 3.1.1          | Pulse fwd/rev    |   | Select forward or reverse flow for pulse output. This item is available on bi-directional flow system only.  |
| 3.1.1          | Sound            | On<br>Off   | Activates front panel buzzer when alarm condition occurs.  |

## 3.1.2. Module I/O Slots 1-8

| <i>Address</i> | <i>Menu item</i>    | <i>Selection</i>                        | <i>Comments</i>   |
|----------------|---------------------|---|---|
| 3.1.2.1-8.     | Slot 1-...8 module* | Varies with slots. Refer to table below | Select a slot to configure module installed in this slot. |

In the actual configuration the word “module” in the menu item is replaced with the name of the module installed in this slot, according to the Slot Assignment settings, chapter 3.5.

Example:

Slot 1- RS232  
Slot 2- RTD/Analog  
Slot 3- Relay  
Slot 4- RS232  
Slot 5- None  
Slot 6- None  
Slot 7- None  
Slot 8- None

The above examples represents a configuration consisting of four modules installed in slots 1-4. To configure a module, select a desired slot in which the module is installed, and follow the corresponding module menu.

| <i>Slot</i> | <i>Compatible modules</i>  |
|-------------|--|
| 1           | RTD/Analog Input, Analog output, Dual relay, Hi speed pulse out. RS232, RS485. |
| 2           | RTD/Analog Input, Analog output, Dual relay, Hi speed pulse out.               |
| 3           | RTD/Analog Input, Analog output, Dual relay, Hi speed pulse out.               |
| 4           | RS232, RS485.  |
| 5           | Flow B.  |
| 6           | RTD/Analog Input, Analog output, Dual relay, Hi speed pulse out.               |
| 7           | RTD/Analog Input, Analog output, Dual relay, Hi speed pulse out.               |
| 8           | RTD/Analog Input, Analog output, Dual relay, Hi speed pulse out. RS232, RS485. |

## Relay Module

| <i>Address</i> | <i>Menu item</i> | <i>Selection</i>  | <i>Comments</i>  |
|----------------|------------------|---|--|
|                | Function         | Flow alarm<br>Temperature alarm<br>Pressure alarm<br>Density alarm<br>Sp gravity alarm<br>Pulse out<br>Manifold Control | Select a function for relay output.  |
|                | Channel          | Channel A<br>Channel B<br>Channel C<br>Channel D<br>CH1/2   | Select applicable flow channel for relay output.<br>This menu applies to multi-channel systems only.   |
|                | Type             | High alarm<br>Low alarm<br>High warning<br>Low warning  | Select a desired alarm type.<br>Warnings display message on the front panel, and sounds the buzzer if sound is selected. Alarms display message, sounds buzzer, and logs error message into the error log. |
|                | Limit            | Number  | Enter an alarm set point within the operating range of the parameter (Min-Max) in the currently selected units.  |
|                | Deadband         | Number  | Enter a value in the currently selected units to avoid spurious switching around the alarm set point. Recommended value is about 1-5% of the range.  |
|                | Sound            | On<br>Off   | Activates front panel buzzer when alarm condition occurs.  |

## RTD Input

| <i>Address</i> | <i>Menu item</i> | <i>Selection</i>                                 | <i>Comments</i>  |
|----------------|------------------|--|--|
| N/A            | RTD 1, 2         | Off<br>100<br>1000<br>2500<br>DIN                | Select a type of RTD probe.<br>100, 1000, 2500 are platinum 3902 material<br>DIN is platinum 0385 material |
| N/A            | Channel          | Channel A<br>Channel B<br>Channel C<br>Channel D | Select applicable channel.   |

**Analog Input 1, 2**

| <i>Address</i> | <i>Menu item</i> | <i>Selection</i>  | <i>Comments</i>  |
|----------------|------------------|---|--|
| N/A            | Function         | Off<br>Pressure<br>Temperature<br>Density<br>Sp gravity<br>Flow<br>Mimic Ch A | Select a desired function for the analog input.<br><br>Mimic Ch A is used to copy analog input data from Ch A for the selected input function. |
| N/A            | Channel          | Channel A<br>Channel B<br>Channel C<br>Channel D                              | Select applicable channel.   |
|                | Min value        | Number  | Enter a number corresponding to the minimum value for the input range, in the units selected for the input.                                    |
|                | Max value        | Number  | Enter a number corresponding to the maximum value for the input range, in the units selected for the input..                                   |
|                | Calibration P    | Number  | See calibration procedure  |
|                | Calibration Q    | Number  | See calibration procedure  |

**Analog Output Module**

| <i>Address</i> | <i>Menu item</i> | <i>Selection</i>  | <i>Comments</i>  |
|----------------|------------------|---|--|
| N/A            | Function         | Off<br>Pressure<br>Temperature<br>Density<br>Sp gravity<br>Flow | Select a desired function for the analog output.                       |
| N/A            | Channel          | Channel A<br>Channel B<br>Channel C<br>Channel D                | Select applicable channel.   |
|                | Min value        | Number  | Enter a number corresponding to the minimum value for the input range. |
|                | Max value        | Number  | Enter a number corresponding to the maximum value for the input range. |
|                | Calibration P    |   | See calibration procedure.   |
|                | Calibration Q    |   | See calibration procedure.   |



## Split Analog Out

A split analog output is available for Forward/Reverse applications. 4 mA is maximum reverse flow, 12 mA is 0 flow, and 20 mA is maximum forward flow. The FWD/REV function in the I/O Configuration for Flow B must be enabled. When entering Min and Max parameters for the Analog Output Configuration, enter the maximum reverse flow rate in the Min field preceded with a negative sign(-). Enter the maximum forward flow rate in the Max field.

## Flow B Module

| Address | Menu item                | Selection                            | Comments  |
|---------|--------------------------|--------------------------------------|---|
| N/A     | Error Detection          | On<br>Off                            | Activates transmission error detection circuit on dual coil meter systems. The circuit detects missing pulses or pulses induced on the transmission lines.  |
|         | Alt Function             | Independent Forward/Reverse Manifold | Select Independent for independent operation of Channel A and Channel B. Select Forward/Reverse for bi-directional meters. Forward and reverse flow are being counted into registers A and B, respectively. |
|         | Manifold Switch Level    | Number                               | Enter a number corresponding to a manifold switch point in units of volumetric flow rate.   |
|         | Manifold Switch Deadband | Number                               | Enter a number corresponding to a manifold switch deadband in units of volumetric flow rates. The switch point value has to be within the overlapping range of the meters.                                  |

## Manifold Application

In manifold application Channel A is assigned to the high flow range meter and Channel B is assigned to the low flow range meter. A combined total from both meters is calculated using A+B function. The manifold relay is activated and the manifold valve is closed when Nova Flow is powered up. The relay is deactivated and the valve is opened when flow rises above the value of Manifold Switch Point + Deadband. The relay is activated and the manifold valve is closed when flow drops below the Manifold Switch Point.

## RS232 Module

| Address | Menu item | Selection                             | Comments  |
|---------|-----------|---------------------------------------|---|
| N/A     | Mode      | Off<br>Modbus<br>Printer              | Select Modbus for communication with a PC computer or Modbus master device. Select Printer for printing function. |
|         | Baud      | 1200<br>2400<br>4800<br>9600<br>19200 | Select a desired baud rate.   |

## RS485 Module

| <i>Address</i> | <i>Menu item</i> | <i>Selection</i>                      | <i>Comments</i>   |
|----------------|------------------|---------------------------------------|---|
| N/A            | Mode             | Off<br>Modbus                         | Select Modbus for communication with a PC computer or Modbus master device. |
|                | Baud             | 1200<br>2400<br>4800<br>9600<br>19200 | Select a desired baud rate.   |

## Pulse Output Module

| <i>Address</i> | <i>Menu item</i> | <i>Selection</i>  | <i>Comments</i>   |
|----------------|------------------|---|---|
| N/A            | Function         | On/Off<br>Pulse/U<br>Pulse/V<br>Pulse/M                   | Select a function for the pulse out:<br>U- uncorrected volume<br>V- corrected volume<br>M- mass |
|                | Channel          | Channel A<br>Channel B<br>Channel C<br>Channel D<br>CH1/2 | Select a flow channel   |

## 3.2. System Configuration

### 3.2.1. Utility Functions

| <i>Address</i> | <i>Menu item</i> | <i>Selection</i>                       | <i>Comments</i>  |
|----------------|------------------|--|--|
|                | Keypad enable    | Yes<br>No                              | If “No” is selected the front panel keys are disabled.<br>To enable, press any key and enter a password when prompted.                                   |
|                | Keypad time out  | Enter a number of seconds<br>Range: 0- | If the unit is left in the program mode, it will switch back to the operate mode when limit is reached.<br>Zero means the time out function is disabled. |
|                | Language         | English<br>Spanish                     | Select a desired language.   |
|                | Date/Time        | Enter date and time                    | This menu is used to set time and date.  |
|                | Define Ch1       | Ch A<br>Ch B                           | This function allows to calculate combined (+ or -) total from two flow channels. Assign channel A or B for operand Ch1 for math calculations.           |
|                | Define Ch2       | Ch B<br>Ch C<br>Ch D                   | Assign channel B, C, or D for operand Ch2 for math calculations.   |
|                | Define function  | Ch1-Ch2<br>Ch1+Ch2                     | Select addition or subtraction for calculating a net total.  |

### 3.2.2. Password/Pin

| <i>Address</i> | <i>Menu item</i>    | <i>Selection</i> | <i>Comments</i>                                 |
|----------------|---------------------|------------------|---|
|                | Supervisor pin #1-5 | Number           | Enter a 4 digit for each supervisor pin number. |
|                | Supervisor password | Number           | Enter a 4 digit for supervisor password.        |
|                | Reenter password    | Number           | Enter the supervisor password again to confirm. |
|                | Operator pin #1-5   | Number           | Enter a 4 digit for each operator pin number.   |
|                | Operator password   | Number           | Enter a 4 digit for operator password.          |
|                | Reenter password    | Number           | Enter the operator password again to confirm.   |

### 3.2.3. Fluid Properties

#### Density Table

| <i>Address</i> | <i>Menu item</i>                          | <i>Selection</i> | <i>Comments</i>  |
|----------------|---|------------------|--|
| 3.2.3          | Default conditions<br>T, P, D, Sp Gravity | Number           | Enter default temperature, pressure, density and specific gravity. Default values are used for calculation when a sensor fails, or when “default” is selected for compensation method. |

### 3.2.4. Base Conditions

| <i>Address</i> | <i>Menu item</i> | <i>Selection</i>   | <i>Comments</i>  |
|----------------|------------------|--|--|
| 3.2.3.         | Base conditions  | NIST<br>OIML<br>PTB<br>SIRIM<br>ASIAN<br>NORMAL<br>CUSTOM<br>NBP | Select a predefined set of base conditions, or select “custom” to enter user defined base conditions.<br>Base conditions are used to calculate corrected volume. |

### 3.3. Channel Configuration

| <i>Address</i> | <i>Menu item</i>    | <i>Selection</i>   | <i>Comments</i>  |
|----------------|---------------------|--|--|
| 3.3.           | Calculation method  | Liquid volume<br>Liquid mass<br>Gas volume<br>Gas mass   | Select an appropriate calculation method.<br>When “volume” is selected, mass flow rate and mass total are not available.<br>Liquids calculations are based on fluid property table programmed in the Nova Flow. Gas calculations are based on ideal gas equation and Z table programmed in the Nova Flow.  |
| 3.3.           | Compensation method | Default temperature<br>Default pressure<br>Default T&P<br>Temperature<br>T&P<br>Density<br>T,P, &D<br><br>*Mimic CHA | Select an appropriate compensation method.<br>For T, P, D compensation an associated sensor has to be connected and an analog input has to be programmed accordingly. When a sensor fails, the default value is used for calculations.<br><br>*Mimic CHA is added to the list of Compensation Methods for Channels B, C, and D. When this method is selected, compensation parameters for channel A are applied to the designated channel. |
| 3.3.           | Select fluid        | Fluid 1<br>Fluid 2<br>Fluid 3<br>Fluid 4   | Select a fluid table for the current flow channel.<br>Up to four different fluids can be programmed in the Nova Flow and switched between flow channels A, B, C, D.  |
| 3.3.           | Units               | English default<br>English custom<br>Metric default<br>Metric custom   | Select a desired set of units of measure. For a complete list of available units and conversion factors refer to appendix xx.  |

### 3. 4. Meter Configuration

| <i>Address</i> | <i>Menu item</i>        | <i>Selection</i>  | <i>Comments</i>  |
|----------------|-------------------------|---|--|
| 3.4.1.         | On/off                  | On<br>Off   | “On” has to be selected to activate the flow channel operation.  |
|                | Filtering               | Number  | This number represents the amount of smoothing applied to the input signal coming from a meter. Default value is...  |
|                | Serial number           | Number  | Enter up to a 10- digit flow meter serial number   |
|                | Correction factor       | Number  | User selected number to correct the flow rate and total. Range: 0.5-1.5. Default value is 1.   |
|                | Linearization           | Average K-factor<br>K-factor table<br>Average meter factor<br>Meter factor table<br>UVC table | Select an applicable method.<br>The menus below will be displayed only when the associated method is selected.   |
|                | Minimum meter frequency | Number  | Enter a frequency in Hz that is below an operating range of input frequency. Any signal at frequency below the min. value is considered a “noise” and it will be rejected. Default value is 0. |
|                | K-factor units          |   | Select units of measure for K-factor   |
|                | Average K-factor        | Number  | This menu is displayed when Average K-factor selected for linearization method. Enter a K-factor for the meter connected to this channel.  |
|                | K-factor table forward  |   | This menu is displayed when K-factor table fwd is selected for linearization method. For every point of the table enter frequency in Hz and K-factor value.                                    |
|                | Meter factor units      |   | Select units of measure for meter factor   |
|                | Average meter factor    | Number  | This menu is displayed when Average meter factor is selected for linearization method.   |
|                | Meter factor table      |   | This menu is displayed when Meter factor table is selected for linearization method. For every point of the table enter frequency in Hz and K-factor value.                                    |
|                | UVC table               |   | This menu is displayed when UVC table is selected for linearization method. For every point of the table enter frequency/viscosity in Hz/ctsk and K-factor value.                              |

### 3.5. Slot Configuration

For each slot (1-8) select the module type that is installed in this slot. Select NONE, if there is no module installed in the slot. Note that the list of available modules for a given slot varies from slot to slot, according to the slot/module compatibility table.

| <i>Address</i> | <i>Menu item</i> | <i>Selection</i>   | <i>Comments</i>                                 |
|----------------|------------------|--|---|
| 3.5.1.         | Slot 1           | None<br>RTD/Analog Input<br>Analog output<br>Dual relay<br>Pulse out<br>RS232<br>RS485 | Select a module that is installed in this slot. |
| 3.5.2.         | Slot 2           | None<br>RTD/Analog Input<br>Analog output<br>Dual relay<br>Pulse out                   | Select a module that is installed in this slot. |
| 3.5.3.         | Slot 3           | None<br>RTD/Analog Input<br>Analog output<br>Dual relay<br>Pulse out                   | Select a module that is installed in this slot. |
| 3.5.4.         | Slot 4           | None<br>RS232<br>RS485   | Select a module that is installed in this slot. |
| 3.5.5.         | Slot 5           | None<br>Flow B   | Select a module that is installed in this slot. |
| 3.5.6.         | Slot 6           | None<br>RTD/Analog Input<br>Analog output<br>Dual relay<br>Pulse out                   | Select a module that is installed in this slot. |
| 3.5.7.         | Slot 7           | None<br>RTD/Analog Input<br>Analog output<br>Dual relay<br>Pulse out                   | Select a module that is installed in this slot. |
| 3.5.8.         | Slot 8           | None<br>RTD/Analog Input<br>Analog output<br>Dual relay<br>Pulse out<br>RS232<br>RS485 | Select a module that is installed in this slot. |

#### 4. DIAGNOSTICS Menu

Nova-Flow provides diagnostic functions for testing Inputs and Outputs to verify hardware functionality. The Diagnostics Menu is conveniently located in the Main Menu at address 4. The table below illustrates the way in which the Diagnostics Menu is organized. This menu will change depending on how the I/O slots are assigned.

| Address | Menu Option                  |
|---------|------------------------------|
| 4.1     | Main board DigIO             |
| 4.2     | Slot1 – Assigned Module Name |
| 4.3     | Slot2 – Assigned Module Name |
| 4.4     | Slot3 – Assigned Module Name |
| 4.5     | Slot4 – Assigned Module Name |
| 4.6     | Slot5 – Assigned Module Name |
| 4.7     | Slot6 – Assigned Module Name |
| 4.8     | Slot7 – Assigned Module Name |
| 4.9     | Slot8 – Assigned Module Name |

*Organization of Diagnostics Menu*

#### Main Board Digital I/O

The Main board consists of 8 Digital I/O lines, of which I/O1-I/O7 can be configured as an input or an output and I/O8 only as an output. The figure below illustrates the layout of the Main board Digital I/O diagnostics screen. The 1s and 0s represent corresponding I/O lines, counting from left to right. For example, the first digit corresponds to I/O1, the next to I/O2, and so forth. A 1 represents a high signal level and 0 a low signal level. When a signal is applied to an input, the corresponding digit will toggle accordingly. When configured as an output, presses SELECT to highlight the appropriate I/O and use the SCROLL keys to toggle the output between high and low levels. The output may be monitored with an oscilloscope.

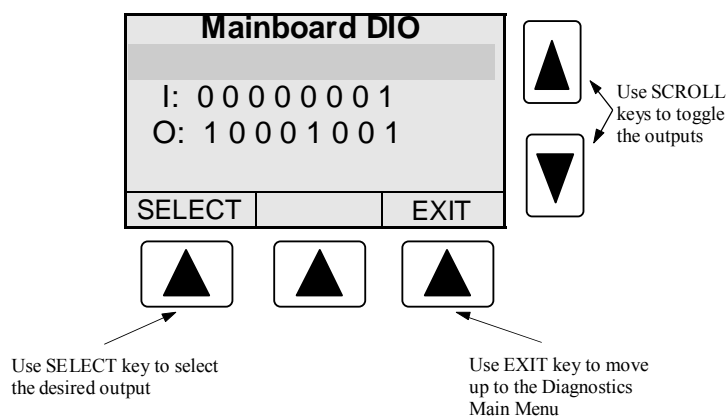


Figure 1. Main board Digital I/O Diagnostics Screen

### Dual Relay Module

The relays may be tested by connecting an Ohmmeter or a continuity tester to the corresponding output pins of the module. Pressing the SELECT key toggles between Relay1 and Relay 2. Use the SCROLL Keys to activate and deactivate the relays. A 1 activates the relay and a 0 deactivates the relay.

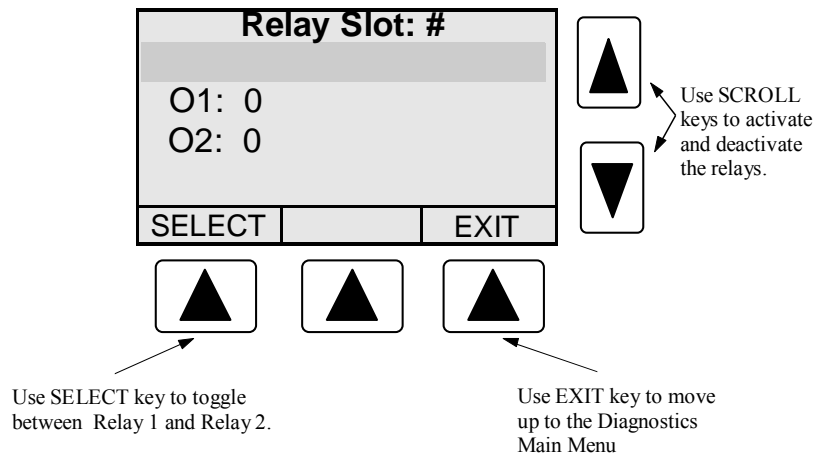


Figure 2. Dual Relay Diagnostics Screen

### Dual Pulse Output Module

The pulse outputs may be tested by connecting an Oscilloscope or a Voltmeter to the corresponding output pins of the module. Pressing the SELECT key toggles between Output1 and Output2. Use the SCROLL Keys to toggle the outputs between high and low. A 1 outputs a high signal and a 0 a low signal.

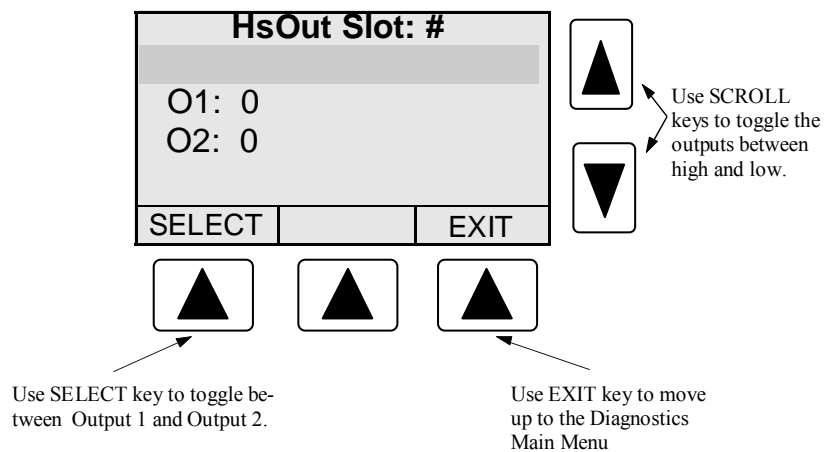


Figure 3. Pulse Output Diagnostics Screen.



## Analog Output Module

The Analog Output Module may be tested by connecting a current measuring device, such as an amp meter, to the output pins of the module. Pressing the SELECT key selects the output. Use the SCROLL keys to increase or decrease the number of D/A counts. As the number increases, the output current should increase. As the number decreases, the output current should decrease. The range of D/A counts is from 0 to 4095.

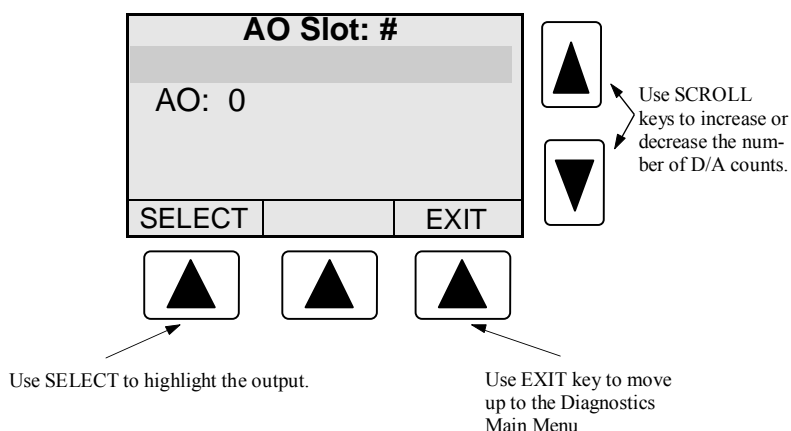


Figure 4. Analog Output Diagnostics Screen.

## RTD/ Analog Input Module

Operation of an installed RTD/Analog module may be verified using diagnostics. There are four Analog Input labels each displaying a number of A/D counts. RTD1 and RTD2 correspond to the 2 RTD inputs, while AI1 and AI2 correspond to the 2 analog inputs. A/D counts for a configured input should always be between 0 and 4095 during normal operation. As the transmitter signal increases, the number of A/D counts should increase. As the RTD temperature increases, the number of A/D counts should increase. If the counts become 0 or 4095, either the module has not been installed, configured, or calibrated, or there is an RTD or Transmitter failure.

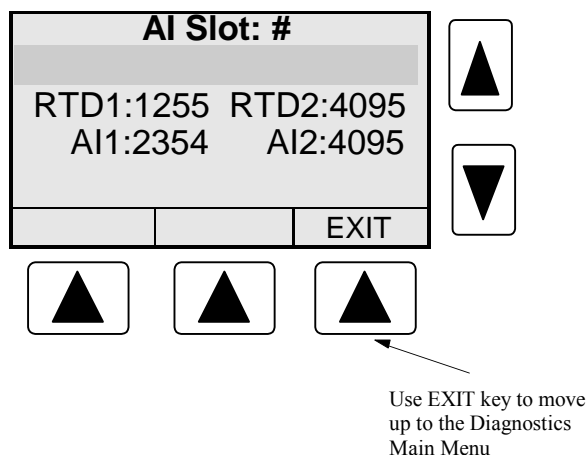


Figure 5. RTD/Analog Input Diagnostics Screen.

## **5. BASE CONDITIONS**

Base temperature and pressure selected in the program menu can viewed in this menu.

Nova Flow uses base conditions to calculate corrected total volume and corrected flow rate.

# Communications

---

Nova Flow can be equipped with up to three serial ports and the infrared port. Serial ports can be used for programming the Nova-Flow, printing, communication with a personal computer, or with a Modbus master device. When all three ports are installed and active, the priority is given to the communication port in Slot 4.

For programming Nova-Flow from a personal computer using Hoffer configuration program refer to the Windows configuration section.

For serial port wiring refer to the Installation section.

Nova-Flow supports standard MODBUS RTU (binary) encoding.

The following tables provide memory mapping for all available Modbus commands.

## Function Code 04 (Read Input Registers)

| ABSOLUTE ADDRESS | DESCRIPTION                              |
|------------------|--|
| 30001            | CHA Uncorrected Rate X 10                |
| 30002            | CHA High Word of Uncorrected Total       |
| 30003            | CHA Low Word of Uncorrected Total        |
| 30004            | CHA High Word of Uncorrected Accum Total |
| 30005            | CHA Low Word of Uncorrected Accum Total  |
| 30006            | CHA Corrected Rate X 10 (Mass or Volume) |
| 30007            | CHA High Word of Corrected Total         |
| 30008            | CHA Low Word of Corrected Total          |
| 30009            | CHA High Word of Corrected Accum Total   |
| 30010            | CHA Low Word of Corrected Accum Total    |
| 30011            | CHA Pressure                             |
| 30012            | CHA Density X 1000                       |
| 30013            | CHA Temperature (Kelvin)                 |
| 30014            | OPEN                                     |
| 30015            | OPEN                                     |
| 30016            | OPEN                                     |
| 30017            | CHB Uncorrected Rate X 10                |
| 30018            | CHB High Word of Uncorrected Total       |
| 30019            | CHB Low Word of Uncorrected Total        |
| 30020            | CHB High Word of Uncorrected Accum Total |
| 30021            | CHB Low Word of Uncorrected Accum Total  |
| 30022            | CHB Corrected Rate X 10 (Mass or Volume) |
| 30023            | CHB High Word of Corrected Total         |
| 30024            | CHB Low Word of Corrected Total          |
| 30025            | CHB High Word of Corrected Accum Total   |
| 30026            | CHB Low Word of Corrected Accum Total    |
| 30027            | CHB Pressure                             |
| 30028            | CHB Density X 1000                       |
| 30029            | CHB Temperature (Kelvin)                 |
| 30030            | OPEN                                     |
| 30031            | OPEN                                     |
| 30032            | OPEN                                     |
| 30033            | CHC Uncorrected Rate X 10                |

| <b>ABSOLUTE ADDRESS</b> | <b>DESCRIPTION</b>                       |
|-------------------------|--|
| 30034                   | CHC High Word of Uncorrected Total       |
| 30035                   | CHC Low Word of Uncorrected Total        |
| 30036                   | CHC High Word of Uncorrected Accum Total |
| 30037                   | CHC Low Word of Uncorrected Accum Total  |
| 30038                   | CHC Corrected Rate X 10 (Mass or Volume) |
| 30039                   | CHC High Word of Corrected Total         |
| 30040                   | CHC Low Word of Corrected Total          |
| 30041                   | CHC High Word of Corrected Accum Total   |
| 30042                   | CHC Low Word of Corrected Accum Total    |
| 30043                   | CHC Pressure                             |
| 30044                   | CHC Density X 1000                       |
| 30045                   | CHC Temperature (Kelvin)                 |
| 30046                   | OPEN                                     |
| 30047                   | OPEN                                     |
| 30048                   | OPEN                                     |
| 30049                   | CHD Uncorrected Rate X 10                |
| 30050                   | CHD High Word of Uncorrected Total       |
| 30051                   | CHD Low Word of Uncorrected Total        |
| 30052                   | CHD High Word of Uncorrected Accum Total |
| 30053                   | CHD Low Word of Uncorrected Accum Total  |
| 30054                   | CHD Corrected Rate X 10 (Mass or Volume) |
| 30055                   | CHD High Word of Corrected Total         |
| 30056                   | CHD Low Word of Corrected Total          |
| 30057                   | CHD High Word of Corrected Accum Total   |
| 30058                   | CHD Low Word of Corrected Accum Total    |
| 30059                   | CHD Pressure                             |
| 30060                   | CHD Density X 1000                       |
| 30061                   | CHD Temperature (Kelvin)                 |
| 30062                   | OPEN                                     |
| 30063                   | OPEN                                     |
| 30064                   | OPEN                                     |

### **Funtion Code 01 (Coil Status)**

| <b>ABSOLUTE ADDRESS</b> | <b>DESCRIPTION</b>          |
|-------------------------|-----------------------------|
| 00002-00008             | OPEN                        |
| 00009                   | Clear Totals for Ch A       |
| 00010                   | Clear Accum Totals for Ch A |
| 00011                   | Clear Totals for Ch B       |
| 00012                   | Clear Accum Totals for Ch B |
| 00013                   | Clear Totals for Ch C       |
| 00014                   | Clear Accum Totals for Ch C |
| 00015                   | Clear Totals for Ch D       |
| 00016                   | Clear Accum Totals for Ch D |

# Installation

## Notes:

1. The terminal marked with safety ground symbol must be connected to the earth ground, using a multi-stranded, braided wire.
2. To minimize susceptibility to electromagnetic noise, all sensor connections must be made using shielded twisted pair wires and shields must be connected to the designated shield or earth terminals on the Nova-Flow rear panel.
3. Signal cables must be separated from power line and relay cables to minimize possible interference problems.

## Main Connector

Figure 1 indicates the location of the Main Connector on the Nova-Flow rear panel. This 18-pin connector provides connections for a flow meter input, an AC or DC power supply input, an auxiliary 24 Vdc output, and 8 digital I/O lines. The pages that follow, illustrate typical connections made to the main connector.

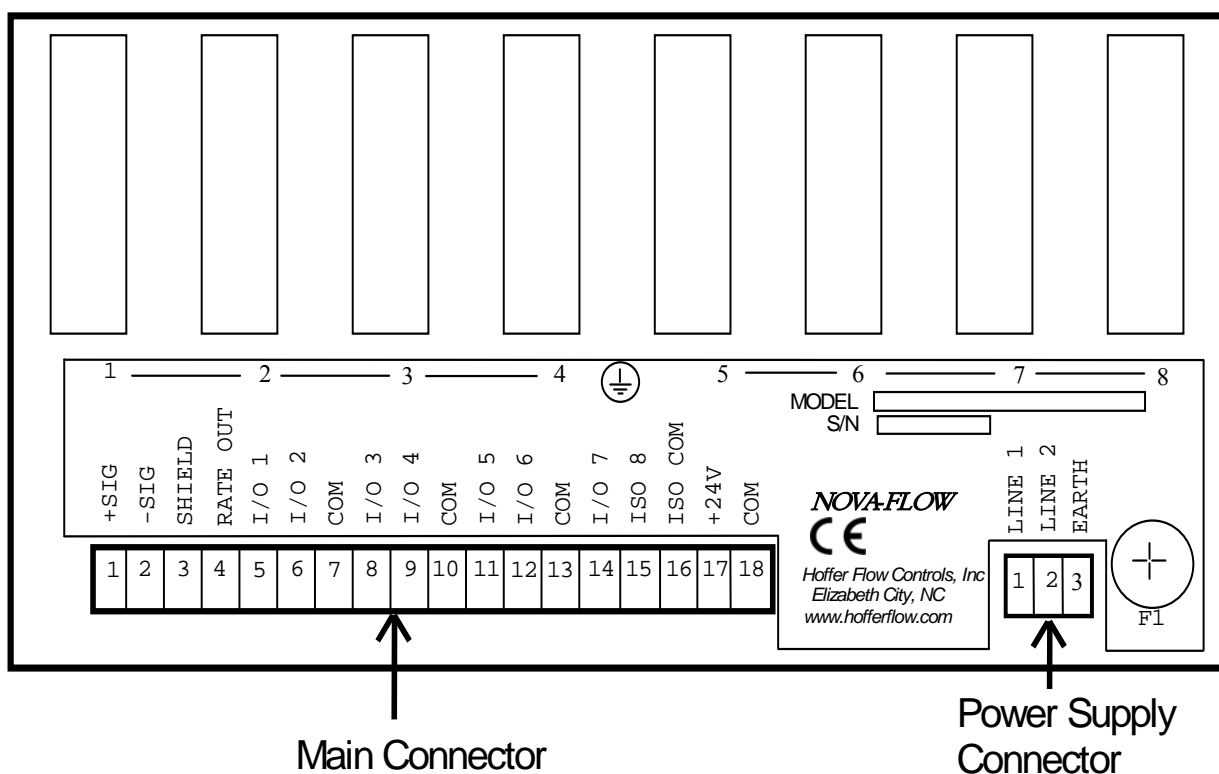


Figure 1. Main Connector on the Nova-Flow Rear Panel.

## Power Supply Connections

**Warning!** Before connecting power supply lines, verify the power supply rating indicated on the Nova-Flow unit.

Note: The power input is protected by a fuse accessible from the back panel and is designated as F1. The specified fuse rating is AGC 2 Amp/250 V.

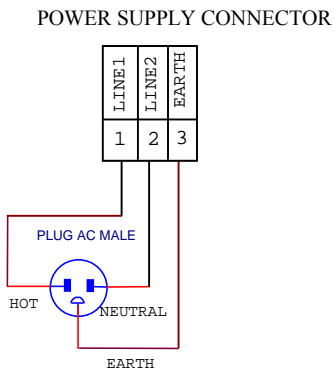


Figure 2. 120/240 VAC Power Line connection

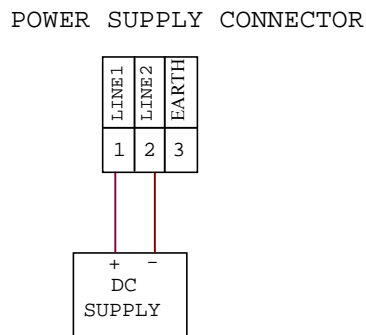


Figure 3. 10-30 VDC Power Line connection

## Pickup Coil Connections

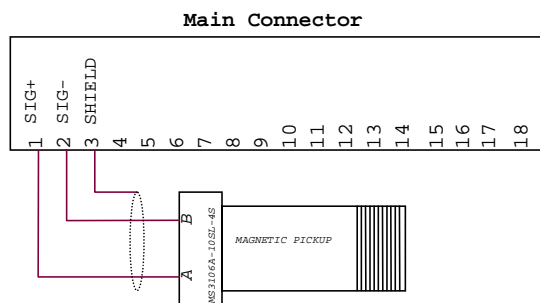


Figure 4. Magnetic Coil Connection

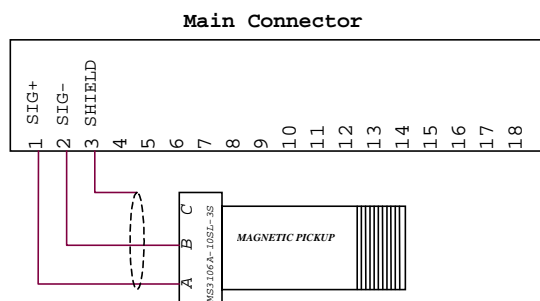


Figure 5. MCP Coil Connection

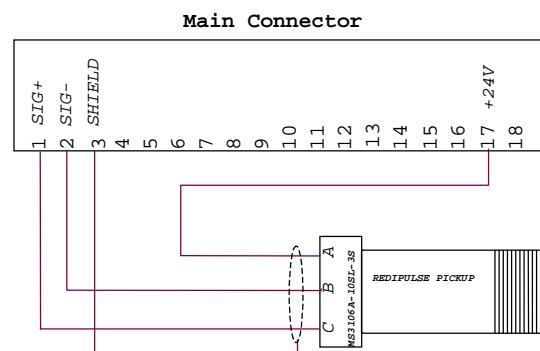


Figure 6. Redi-Pulse/Open Collector Coil Connection

## I/O1 - I/O7 Connections

The following figures illustrate example input and output connections for I/O1 – I/O7. Please refer to the Hardware Configuration section of this manual for details on the proper hardware configuration of these options.

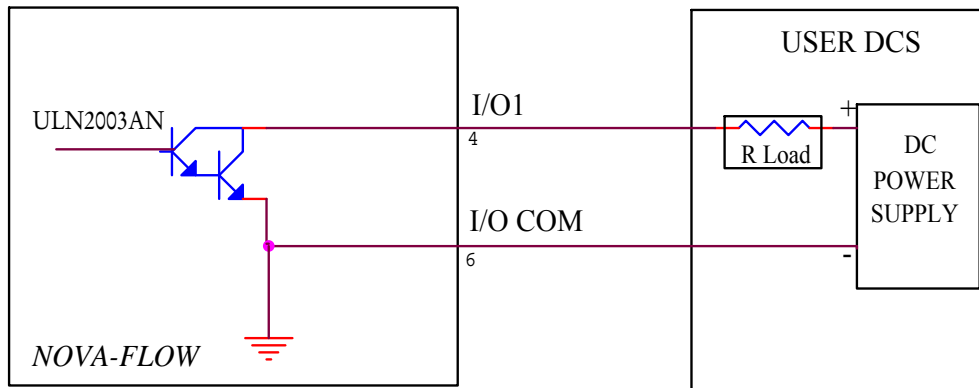


Figure 7. I/O1 Configured for Open Collector Output

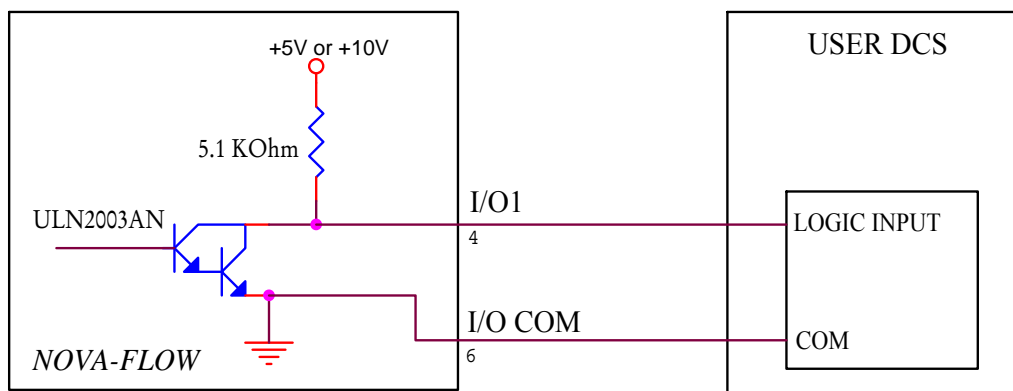


Figure 8. I/O1 Configured for 5V or 10V Output

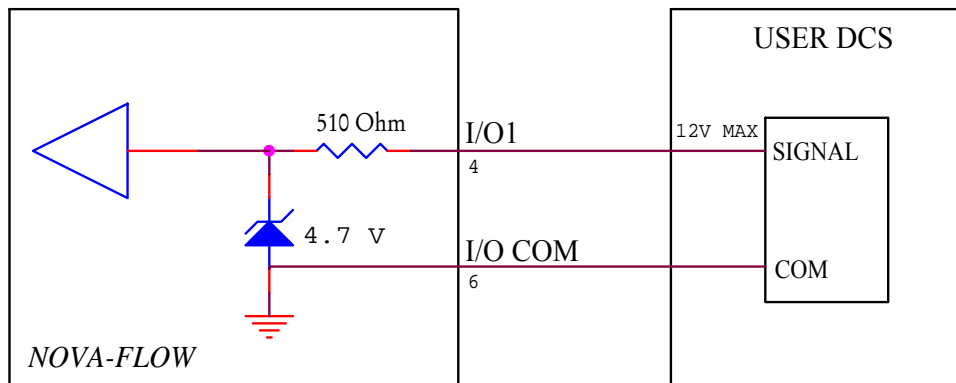


Figure 9. I/O1 Configured as an Input



## I/O8

I/O8 is an output only. It can be configured for isolated output, open collector referenced to internal ground, or digital output at 5V or 10V level referenced to internal ground. Please refer to the Hardware Configuration section of this manual for details on the proper hardware configuration of these options.

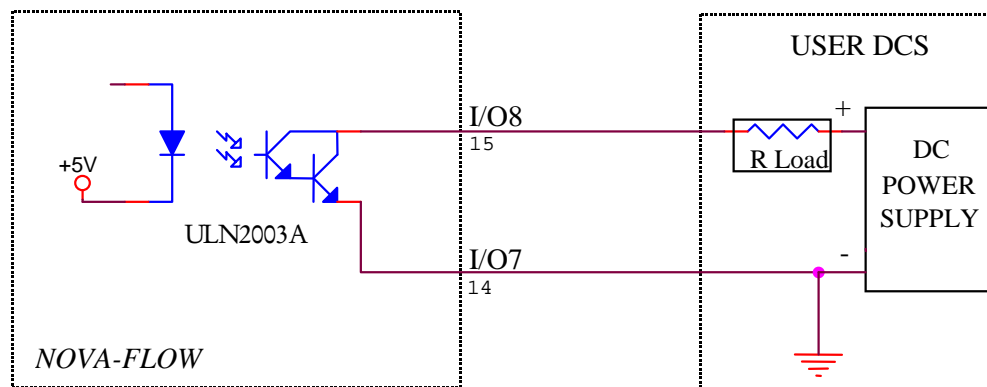


Figure 10. I/O8 Configured for Isolated Output

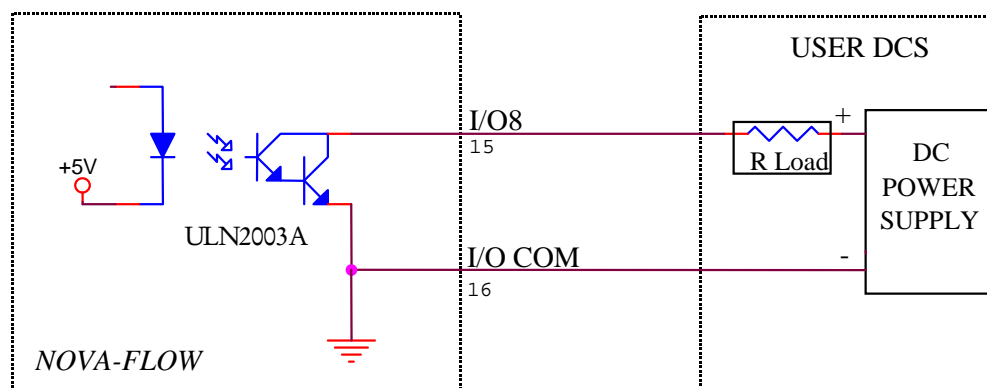


Figure 11. I/O8 Configured for Open Collector Output Referenced to Internal Ground.

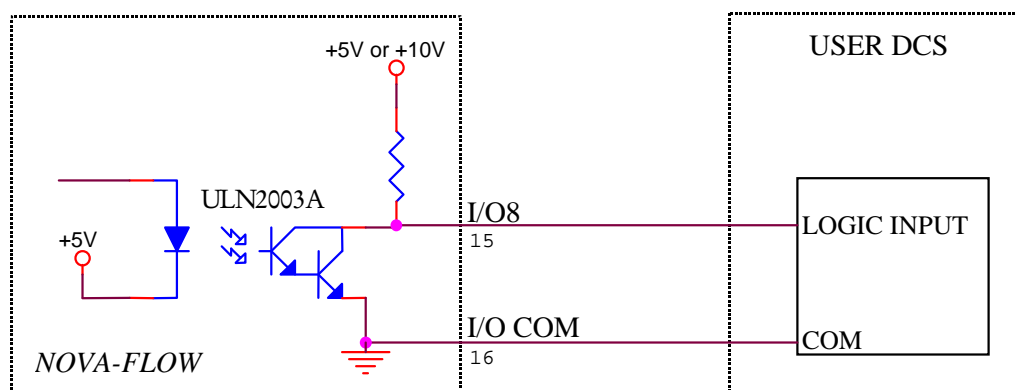


Figure 12. I/O8 Configured for 5V or 10V Outputs Internally Referenced.

## Flow B Module Connections

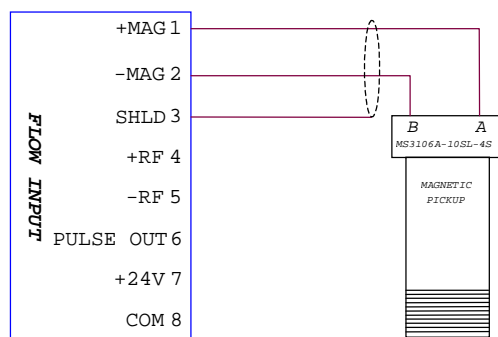


Figure 13. Magnetic Coil Connection

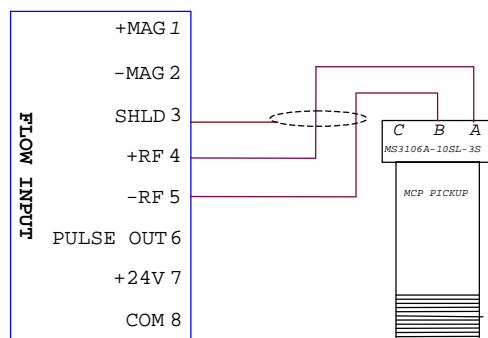


Figure 14. MCP Coil Connection

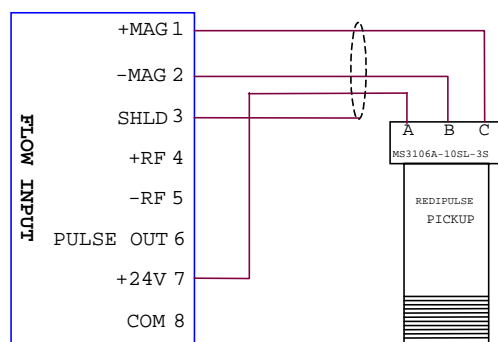


Figure 15. Redi-Pulse/Open Collector Coil Connection

## RTD/Analog Input Module

**NOTE:** Transmitters cannot be powered from pin 8 when using true four-wire RTD configuration since pin 8 will be COM instead of +24V as selected by internal jumper. Refer to the Hardware Configuration section of this manual for details.

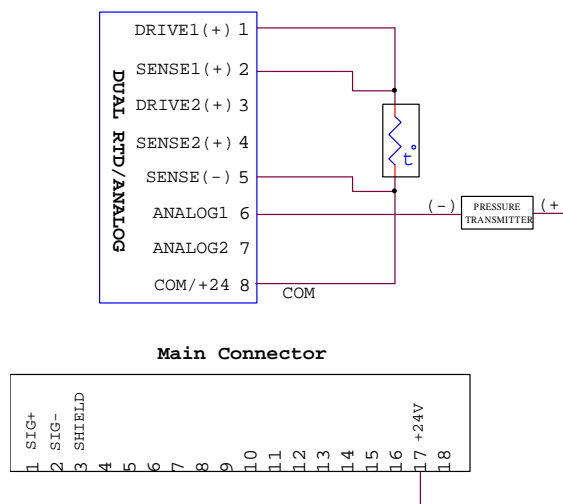


Figure 16. Four-Wire RTD and Transmitter Connection

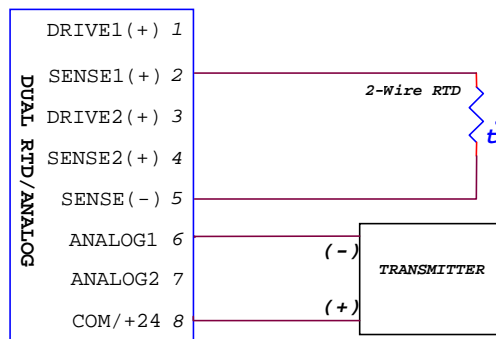


Figure 17. Two-Wire RTD and Transmitter Connection.

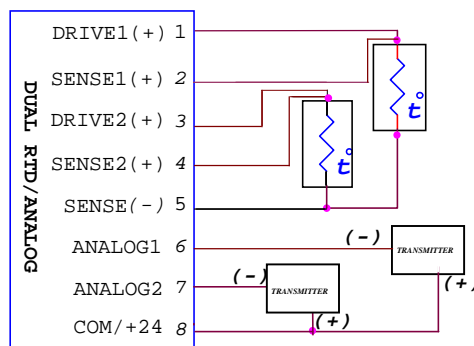


Figure 18. Three-Wire RTD and Transmitter Connection.

## Analog Output Module

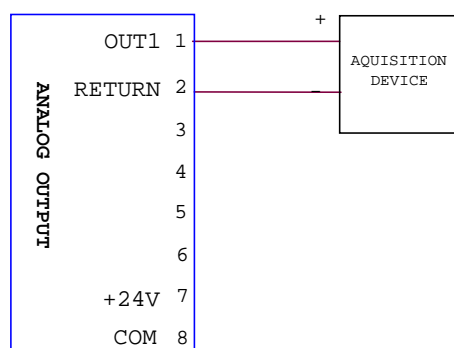


Figure 19. Analog Output Using Internal Power Supply (Sourcing).

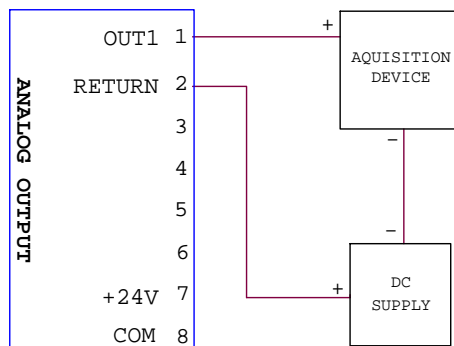


Figure 20. Analog Output Using External Power Supply (Sinking).

Dual Pulse Output Module

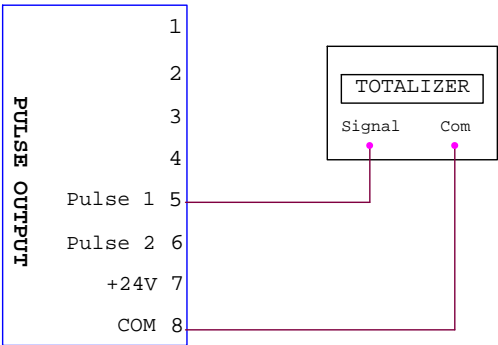


Figure 21. Pulse Output Connection.

Dual Relay Module

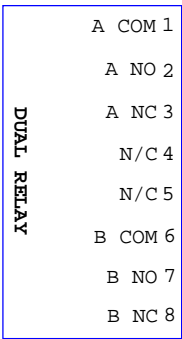


Figure 22. Dual Relay Connections.

## Communications

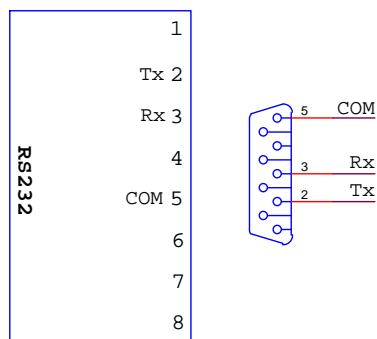


Figure 23. RS-232 Connections for Optional 8 Pin or DB-9 Connector.

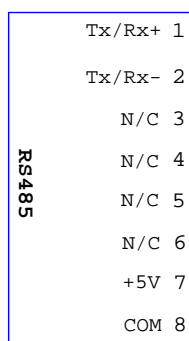


Figure 24. RS-485 Connections.

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# Hardware Configuration

## I/O Configuration

SW1, SW2, and SW3 are used for configuration of Main board I/O functions. The switches are located on the rear of the main board near the main connector.

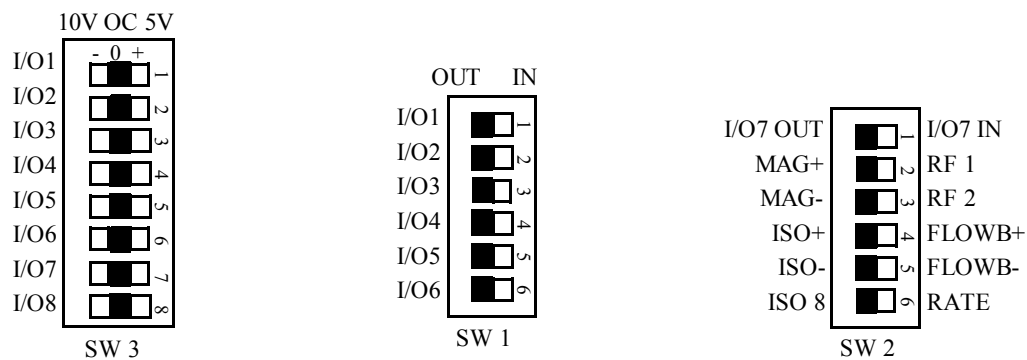


Figure 1. I/O Configuration Switches SW1, SW2, and SW 3.

## Flow Input Selection

SW3 is used for selecting the type of flow input that will be used. The following figures illustrate the proper switch settings for a variety of flow sensors.

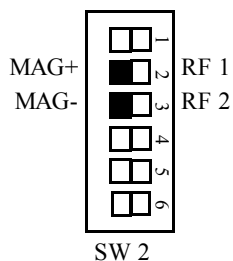


Figure 2. Magnetic Pickup Coil

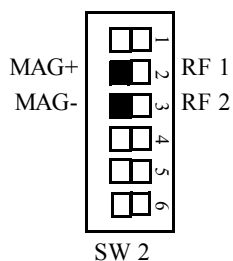


Figure 3. Redi-Pulse/Open Collector Coil Connection.

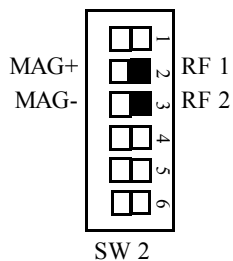


Figure 4. MCP Coil Connection

## Dual Coil Pulse Security

Flow B Module must be installed for the Pulse Security Function. Digital I/O8 is not available when Pulse Security is enabled. Figure 16 illustrates the proper switch settings to enable pulse security.

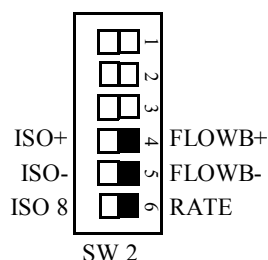


Figure 5. Switch Settings to Enable Pulse Security

## Digital I/O 1-7

I/O1 – I/O7 can be configured individually for input or output by setting SW1 and SW2-1. When configured as an output, SW1 is used to select whether the output is 5V, 10V, or Open Collector.

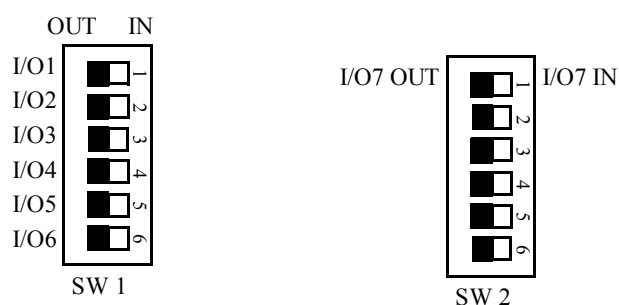


Figure 6. SW1 and SW2-1 for Selecting Digital Input or Output(Shown Configured as Output).

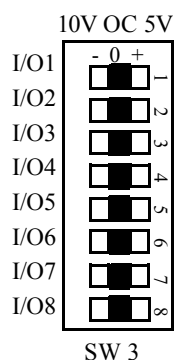


Figure 7. Selecting 5V, 10V, or Open Collector Output on SW3(Shown Configured as Open Collector).

## Digital I/O8

I/O8 is an output only. It can be configured for isolated output, open collector referenced to internal ground, or digital output at 5V or 10V level referenced to internal ground. The following figures illustrate settings for typical configurations.

**NOTE:** I/O7 is not available when I/O8 is configured as an Isolated Output.

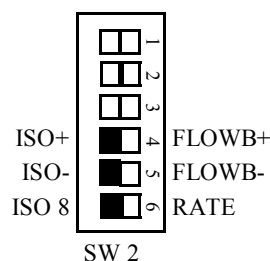


Figure 8. I/O8 Configured as an Isolated Output

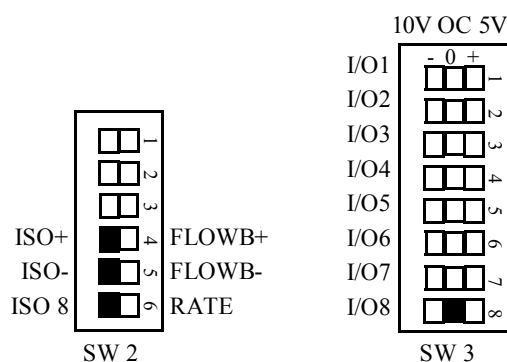


Figure 9. I/O8 Configured as an Open Collector Output Referenced to Internal Ground.

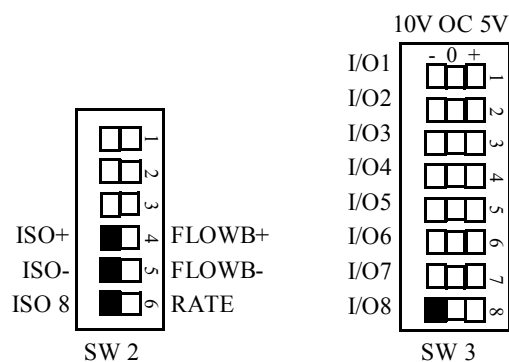


Figure 10. I/O8 Configured as a 10V Output Referenced to Internal Ground.

**RTD/Analog Input Module**

|       | <b>2 -Wire RTD</b> | <b>3-Wire RTD</b> | <b>4 -Wire RTD</b> |
|-------|--------------------|-------------------|--------------------|
| SW1-1 | ON                 | X                 | OFF                |
| SW1-2 | ON                 | OFF               | OFF                |
| SW1-3 | ON                 | OFF               | OFF                |
| SW1-4 | ON                 | ON                | OFF                |

Table 2. SW1 Settings for RTD Input.

| <b>RTD Resistance</b> | <b>R1, R2</b> | <b>R4, R5, R9, R10</b> | <b>R3, R8</b> |
|-----------------------|---------------|------------------------|---------------|
| RTD 100               | 2 k           | 1 k                    | Not installed |
| RTD 1000              | 20 k          | 1 k                    | Not installed |
| RTD 2500              | 50 k          | 1 k                    | Not installed |

Table 3. Resistor Values for Optional RTD Input Configurations.

**Note:** All resistors are factory installed. Values listed are for reference only.

| <b>Input Signal</b> | <b>Resistor A</b> | <b>Resistor B</b> | <b>Resistor C</b> |
|---------------------|-------------------|-------------------|-------------------|
| 4-20 mA             | 10                | 10                | 200               |
| 1-5 V               | 1k                | 1.5k              | 8.45k             |

Table 4. Resistor Values for Optional Analog Input Configurations.

**Note:** All resistors are factory installed. Values listed are for reference only

**Pin 8: Auxiliary 24V / COM**

There is an auxiliary 24V supply provided for loop-powered devices on pin 8. This option must be selected by equipping JP2 on the module. Pin 8 may also be used as a reference Ground for 4-wire RTD applications by equipping JP1.

**Note:** JP1 and JP2 should never be equipped simultaneously, as this will cause a power supply short.

## Analog Output Module

Analog Output may be configured for 4-20 mA or 1-5 V output, and may be powered internally or externally using removable jumpers JP1-JP4 and Pins 1 and 2 of the eight-pin connector.

|                                  | <b>JP1</b> | <b>JP2</b> | <b>JP3</b> | <b>JP4</b> | <b>Pins1&amp;2<br/>on P1<br/>connector</b> |
|----------------------------------|------------|------------|------------|------------|--|
| Externally<br>Powered<br>4-20 mA |            | Installed  |            |            |  |
| Internally<br>Powered<br>4-20 mA | Installed  |            | Installed  |            |  |
| 1-5 V                            | Installed  |            |            | Installed  | Installed                                  |

Table 5. Jumper Settings for Power and Output Options.

## Pulse Output Module

The Pulse Output signal level can be configured for open collector, 5V, or 12V using removable jumpers JP1-JP4. Do not install jumpers for open collector output.

| <b>Output level</b> | <b>Pulse 1</b> | <b>Pulse 2</b> |
|---------------------|----------------|----------------|
| 5 V Output          | JP2            | JP4            |
| 12 V Output         | JP1            | JP3            |
| Open Collector      | NONE           | NONE           |

Table 6. Jumper Settings for Optional 5V or 12V Output Level.

# Windows Configuration

The Nova-Flow WinConfig Program allows for quick, easy configuration of the Nova-Flow using a personal computer. Any programmable field available locally on the flow computer is also accessible through WinConfig. This chapter provides guidelines for basic operations available through WinConfig.

## Installation

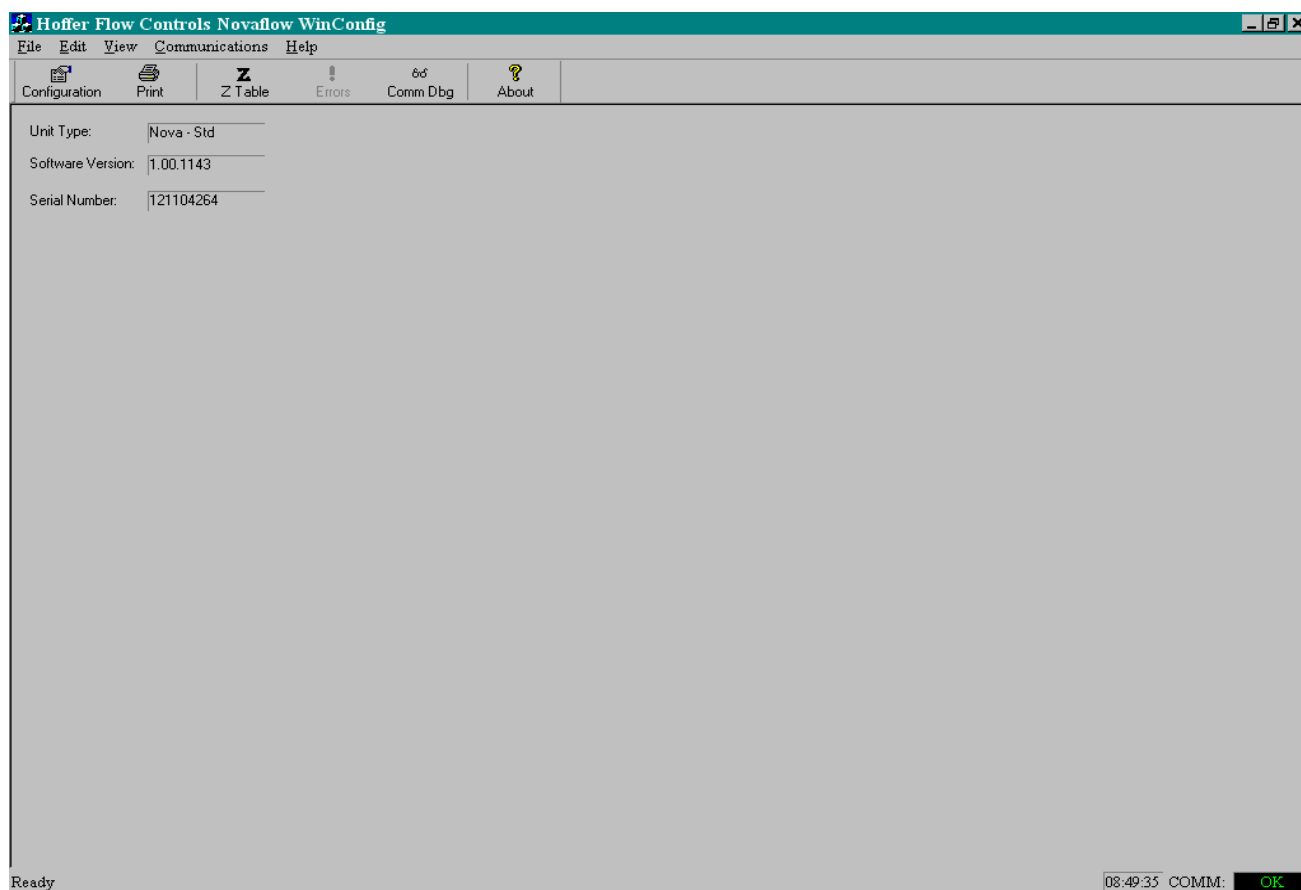
Minimum system requirements: 486 Processor running Windows 95/NT and a Communications Port.

Insert the provided disk into the computer.  
Click on the “Start” menu on the Windows desktop taskbar and select “Run”.  
Click on “Browse” and search for the drive in which the disk is located.  
Select “Setup”, and let the Setup Wizard guide the installation process.

## Startup

Below is an illustration of the “Startup” screen that will appear when the WinConfig program is invoked. Make certain that Nova-Flow is powered up before attempting to establish communications. Connection may be made to the Nova-Flow via cable or the infrared interface. Click on “Communications” then on “Initialize” and select the appropriate Com port designation and Com port type. After making the appropriate selections, click on “OK” and verify that the COMM Window in the bottom right corner of the screen displays “OK”.

After establishing Communications, the Startup screen will display the detected Unit Type, software version, and the electronic serial number assigned to the flow computer.



## Print

Clicking on “Print” in the Startup screen will print a copy of the programmed configuration parameters to a printer connected to the personal computer. A preview of the printout can be displayed by selecting “File” and then “Print Preview”.

## Z-Table

When performing gas calculations, a Z-Table may be used to determine the compressibility of the gas over operating temperature and pressure ranges. Clicking on “Z-Table” in the Startup screen will upload the current Z-Table from Nova-Flow. Data files can be opened by selecting “Load File”, selecting the proper drive and directory, and selecting the desired .DAT file. Selecting “Download” will write the Z-Table to Nova-Flow.

**Z Table**

☐ Use Default Z (1.00)

Pres (PSIA) -->      Composition: N2 0.8112 O2 0.1888

| Temp(°F) | 150     | 160     | 170     | 180     | 190     | 200     | 210     | 220     | 230     | 240     | 250     | 260     | 270     |
|----------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 32       | 0.99501 | 0.99469 | 0.99438 | 0.99407 | 0.99376 | 0.99346 | 0.99316 | 0.99286 | 0.99256 | 0.99226 | 0.99197 | 0.99168 | 0.99140 |
| 42       | 0.99575 | 0.99549 | 0.99522 | 0.99496 | 0.99470 | 0.99445 | 0.99419 | 0.99394 | 0.99369 | 0.99345 | 0.99320 | 0.99296 | 0.99272 |
| 52       | 0.99644 | 0.99622 | 0.99600 | 0.99579 | 0.99557 | 0.99536 | 0.99515 | 0.99495 | 0.99474 | 0.99454 | 0.99434 | 0.99414 | 0.99395 |
| 62       | 0.99708 | 0.99690 | 0.99673 | 0.99655 | 0.99638 | 0.99621 | 0.99604 | 0.99587 | 0.99571 | 0.99555 | 0.99539 | 0.99523 | 0.99508 |
| 72       | 0.99767 | 0.99753 | 0.99739 | 0.99726 | 0.99712 | 0.99699 | 0.99686 | 0.99673 | 0.99661 | 0.99648 | 0.99636 | 0.99624 | 0.99612 |
| 82       | 0.99822 | 0.99811 | 0.99801 | 0.99791 | 0.99781 | 0.99771 | 0.99762 | 0.99753 | 0.99744 | 0.99735 | 0.99726 | 0.99717 | 0.99709 |
| 92       | 0.99872 | 0.99865 | 0.99858 | 0.99852 | 0.99845 | 0.99838 | 0.99832 | 0.99826 | 0.99820 | 0.99815 | 0.99809 | 0.99804 | 0.99799 |
| 102      | 0.99919 | 0.99915 | 0.99911 | 0.99908 | 0.99904 | 0.99901 | 0.99897 | 0.99894 | 0.99892 | 0.99889 | 0.99886 | 0.99884 | 0.99882 |
| 112      | 0.99963 | 0.99962 | 0.99961 | 0.99960 | 0.99959 | 0.99958 | 0.99958 | 0.99958 | 0.99958 | 0.99958 | 0.99958 | 0.99958 | 0.99959 |
| 122      | 1.00004 | 1.00005 | 1.00006 | 1.00008 | 1.00010 | 1.00011 | 1.00014 | 1.00016 | 1.00018 | 1.00022 | 1.00024 | 1.00027 | 1.00030 |
| 132      | 1.00041 | 1.00045 | 1.00049 | 1.00052 | 1.00057 | 1.00062 | 1.00066 | 1.00071 | 1.00076 | 1.00081 | 1.00086 | 1.00091 | 1.00096 |
| 142      | 1.00076 | 1.00082 | 1.00089 | 1.00095 | 1.00101 | 1.00108 | 1.00115 | 1.00122 | 1.00129 | 1.00136 | 1.00143 | 1.00150 | 1.00159 |
| 152      | 1.00109 | 1.00116 | 1.00125 | 1.00133 | 1.00142 | 1.00150 | 1.00160 | 1.00169 | 1.00177 | 1.00187 | 1.00197 | 1.00206 | 1.00216 |
| 162      | 1.00139 | 1.00149 | 1.00160 | 1.00170 | 1.00181 | 1.00191 | 1.00201 | 1.00213 | 1.00224 | 1.00235 | 1.00245 | 1.00258 | 1.00269 |
| 172      | 1.00167 | 1.00179 | 1.00191 | 1.00204 | 1.00216 | 1.00228 | 1.00241 | 1.00254 | 1.00267 | 1.00279 | 1.00293 | 1.00306 | 1.00319 |

Load File...    Save File...    Download    Cancel

Figure 2. Z-Table Screen.



## Configuration

After communications have been established, clicking on “Configuration” uploads program information from Nova-Flow. Once the upload is complete, the I/O menu will be displayed. Other available menu items may be selected by clicking on the appropriate tabs at the top of the screen.

### I/O Configuration Menu

The I/O Configuration Menu is used to configure Main board I/O options as well as assigning, configuring and calibrating optional I/O modules. Diagnostic functions for specific I/O options are also available in the I/O Menu.

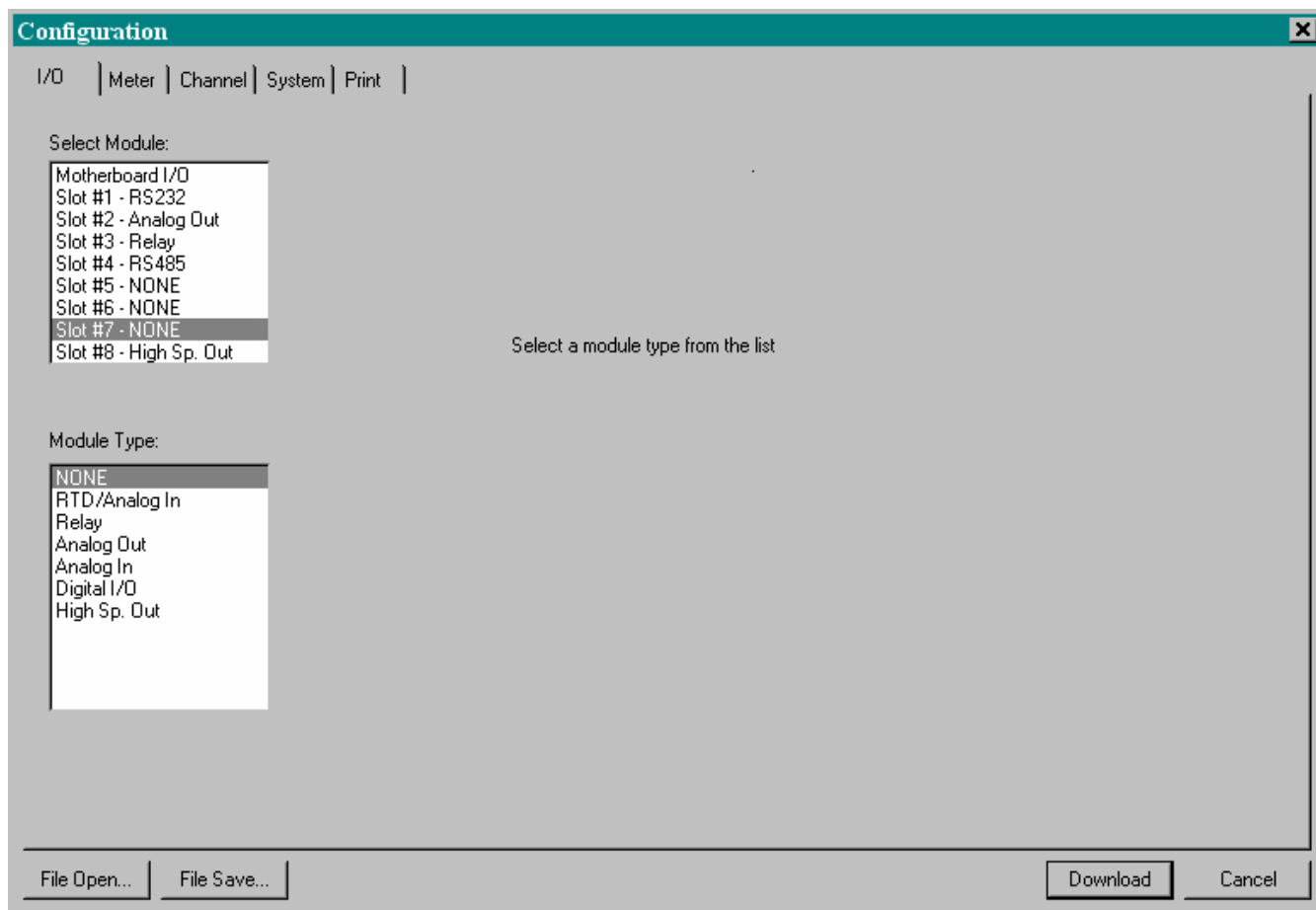


Figure 3. I/O Configuration Menu.

Meter Configuration Menu

The Meter Configuration Menu is used to configure all parameters associated with connected flow meter(s). The A, B, C, and D buttons on the left side of the screen represent the channel designations. Selecting one of these buttons will display the Meter options for the associated channel.

Configuration

I/O

Meter

Channel

System

Print

A

B

C

D

☒ Enable

Serial No:

(Alphanumeric Serial #'s cannot be edited in the instrument)

Correction Factor:

Filter:

Min. Freq:

Linearization: 

K-Factor Table

Units: 

☒ Pulses/Gallon

☐ Pulses/Liter

☐ Pulses/ACF

☐ Pulses/ACM

Forward

Num of Points:

| #  | Freq | Factor |
|----|------|--------|
| 1  |      |        |
| 2  |      |        |
| 3  |      |        |
| 4  |      |        |
| 5  |      |        |
| 6  |      |        |
| 7  |      |        |
| 8  |      |        |
| 9  |      |        |
| 10 |      |        |

Reverse

Num of Points:

| #  | Freq | Factor |
|----|------|--------|
| 1  |      |        |
| 2  |      |        |
| 3  |      |        |
| 4  |      |        |
| 5  |      |        |
| 6  |      |        |
| 7  |      |        |
| 8  |      |        |
| 9  |      |        |
| 10 |      |        |

File Open...

File Save...

Download

Cancel

Figure 4. Meter Configuration Menu.

## Channel Configuration Menu

The Channel Configuration Menu is used to configure metrological specifics such as the calculation and compensation methods, default conditions, and unit selections for each channel. The A, B, C, and D buttons on the left side of the screen represent the channel designations. Selecting one of these buttons will display the options for the associated channel.

**Configuration**

I/O | Meter | Channel | System | Print

**A**

Calculation Method: Liquid Mass

**B**

Compensation Method: Temp

**C**

Fluid: Fluid 1

**D**

Default Conditions:

Temp: 70

Press: 150

Dens: 6.575

Units

☐ English Default ☐ Metric Default

☒ English Custom ☐ Metric Custom

Total: Gallon

Rate: Gallon / Min

Temp: Fahrenheit

Pressure: Pound/sq inch absolute

Density: Pound/gallon

Mass: Pounds

File Open... File Save... Download Cancel

Figure 5. Channel Configuration Menu.

## System Configuration Menu

The System Configuration Menu provides four lower level menus as follows:

Utility Functions: Program the Menu timeout feature, Enable/Disable the keypad, Configure Math Functions.

Password/Pin: Program two levels of password protection for up to ten users.

Fluid Properties: Provides configuration parameters for up to four different fluids.

Base Conditions: Select the appropriate operating conditions.

**Configuration**

I/O | Meter | Channel | System | Print

Utility Functions

Password/Pin

Fluid Properties

Base Conditions

Select Fluid: Fluid 1 Fluid Name:

Units - Temp: F Pres: Kpas-a Dens: lb/gal

Density At Base Conditions: 1

Density Table

Num of Points: 10

| #  | Temp | PSat | DSat | PCmp | DCmp |
|----|------|------|------|------|------|
| 1  |      |      |      |      |      |
| 2  |      |      |      |      |      |
| 3  |      |      |      |      |      |
| 4  |      |      |      |      |      |
| 5  |      |      |      |      |      |
| 6  |      |      |      |      |      |
| 7  |      |      |      |      |      |
| 8  |      |      |      |      |      |
| 9  |      |      |      |      |      |
| 10 |      |      |      |      |      |

Viscosity Table

Num of Points: 0

| # | Temp | Visc |
|---|------|------|
|---|------|------|

File Open... File Save... Download Cancel

Figure 6. System Configuration Menu (Fluid Properties Shown).

## Print Menu

The Print Menu is used to select the printer that is connected to the Nova-Flow and define the associated column width. A list of variables is also provided to select specific process parameters for printing when Print Variables is selected on the Nova-Flow. The selected variables may be printed automatically at programmed intervals by entering a value corresponding to the print interval in minutes in the Print Frequency field.

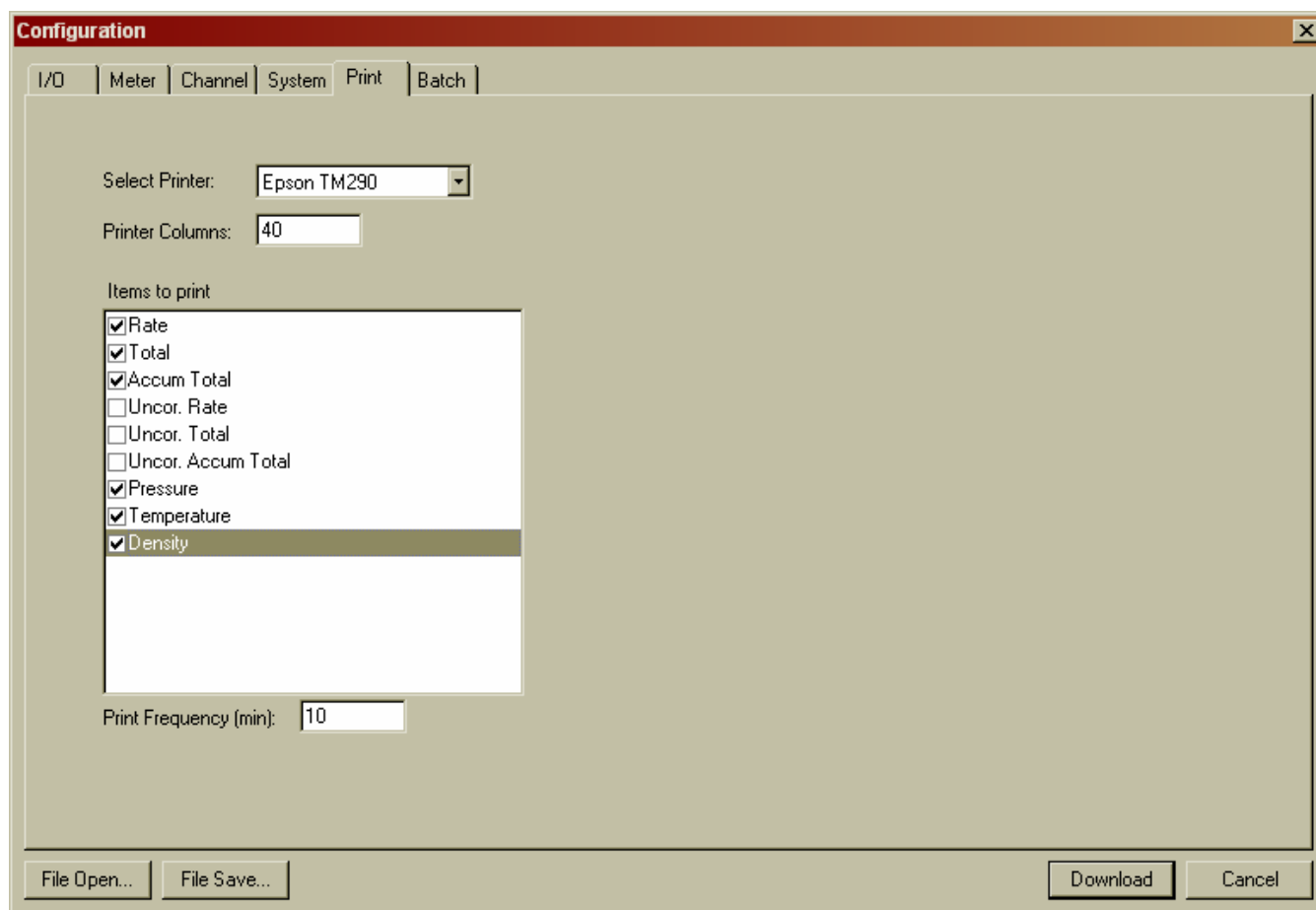


Figure 7. Print Menu.

### Downloading the Configuration

When all required parameters have been programmed, the configuration may be downloaded to the Nova-Flow by clicking on the “Download” button located in the bottom right corner of the configuration screens. After the configuration has been downloaded, a software reset is required on the Nova-Flow for the new configuration to take affect.

### Configuration Files

WinConfig allows configurations to be saved as a file for future use. The two available file functions are File Open and File Save which are described below.

### Saving Configuration Files

After all required parameters have been programmed, click on the “File Save” button located in the bottom left corner of the configuration screens. When the “Save As” window appears, select the destination drive and directory, provide a name for the file and click on “Save”. All configuration files are given an .HFC extension.

### Opening Configuration Files

To recall previous configurations, click on the “File Open” button located in the bottom left corner of the configuration screens. When the “Open” window appears, select the proper drive and directory, select the desired .HFC file, then click on “Open”.

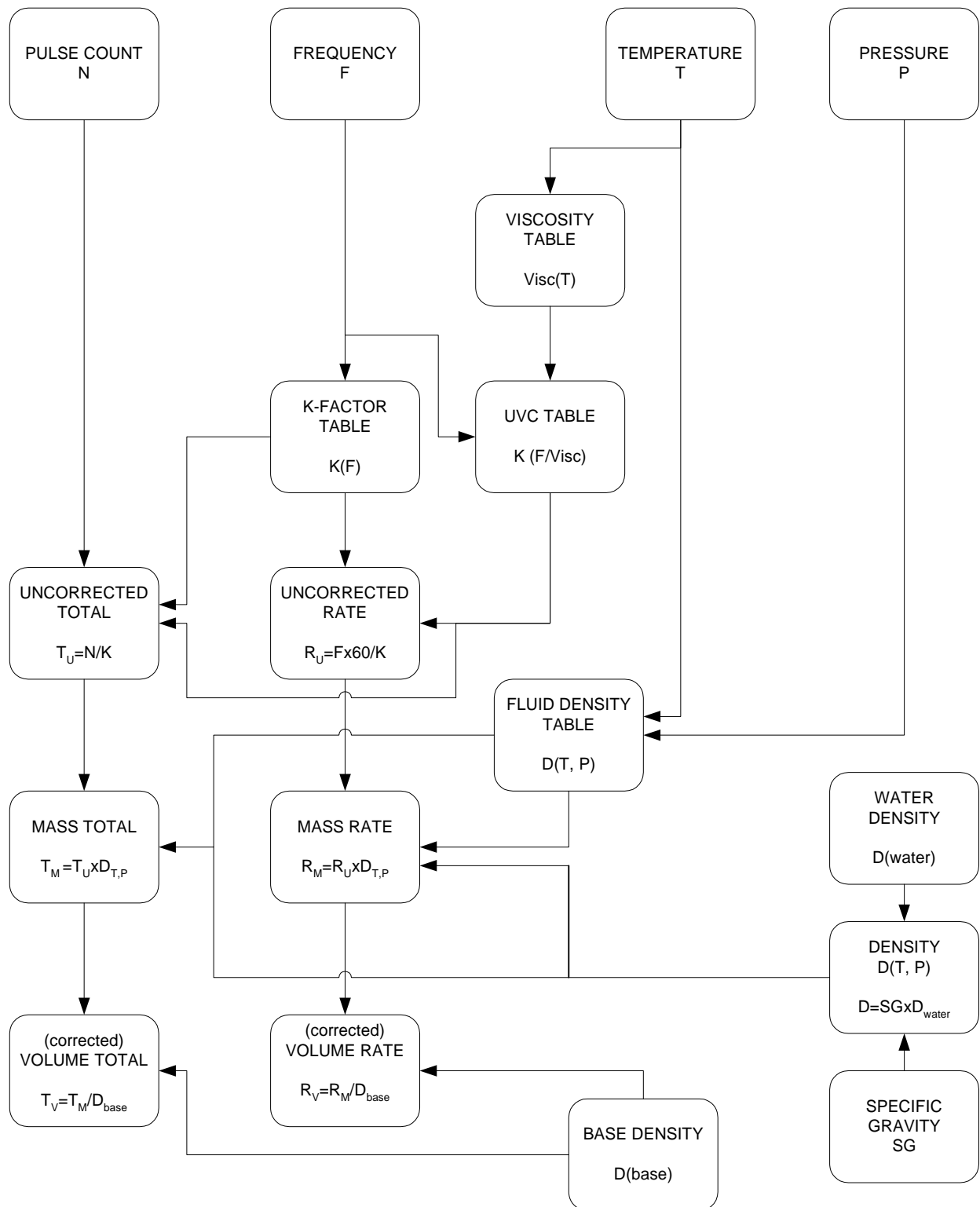
### Offline Editing

Configuration files may be created offline for future downloads. Click on “Configuration” in the Startup screen and a “Device Offline” message box will appear. Select the device type from the provided list and click on “OK”. WinConfig will then enter the configuration mode. Configure all necessary parameters and then save the configuration as a file using the previously described method.

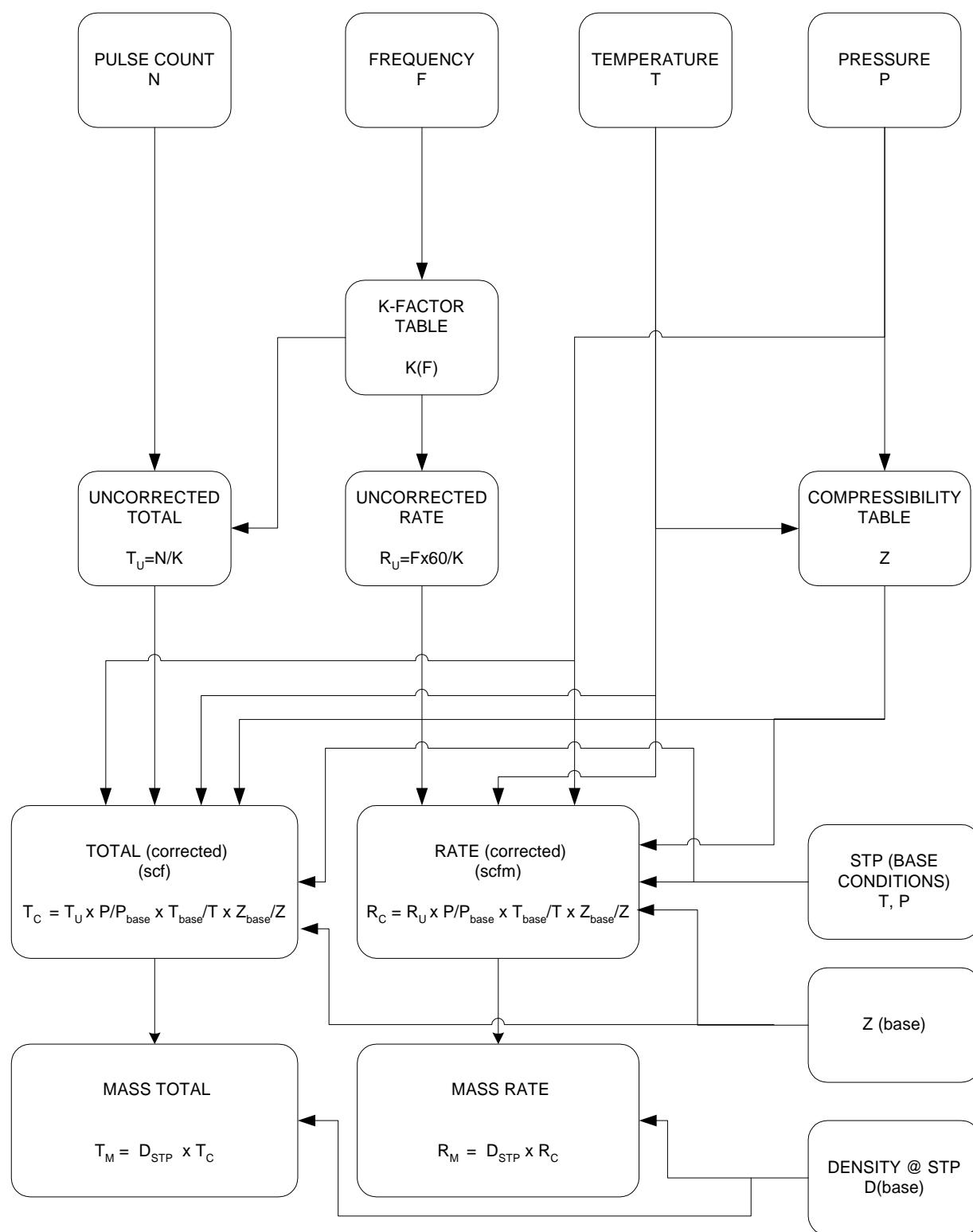
### NOTE

When editing offline, attempts to download will result in the configuration being lost. Be sure to save the configuration as a file.

## Appendix A: Liquid Calculation Flow Chart



# Appendix B: Gas Calculation Flow Chart





# Appendix C: Units of Measure

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## Liquid Volume

| Full Name        | Abbr. Name | Multiplier    |
|------------------|------------|---------------|
| Gallons          | GAL        | 1             |
| Liter            | L          | 3.785411784   |
| Milliliter       | ML         | 3785.411784   |
| Cubic feet       | FT3        | 0.133680556   |
| Pint             | PT         | 8             |
| Fluid ounce      | FLOZ       | 128           |
| Barrel (oil)     | BBL        | 0.02380952381 |
| Cubic meter      | M3         | 0.003785412   |
| Cubic centimeter | CC         | 3785.411784   |
| Quart            | QT         | 4             |
| Imperial gallon  | IGAL       | 0.832674      |

## Gas Volume

| Full Name                | Abbr. Name | Multiplier  |
|--------------------------|------------|-------------|
| Actual cubic feet        | ACF        | 0.133680556 |
| Actual liters            | AL         | 3.785411784 |
| Actual cubic centimeters | ACC        | 3785.411784 |
| Actual cubic meters      | ACM        | 0.003785412 |
| Million cubic feet       | MCF        | 133680.5556 |

## Gas Mass

| Full Name | Abbr. Name | Multiplier |
|-----------|------------|------------|
| Kilograms | KG         | 0.45359237 |
| Pounds    | LB         | 1          |
| Gram      | G          | 453.59237  |

## Liquid Mass

| Full Name  | Abbr. Name | Multiplier |
|------------|------------|------------|
| Pounds     | LB         | 1          |
| Kilograms  | KG         | 0.45359237 |
| Once       | OZ         | 16         |
| Ton        | TON        | 0.0005     |
| Metric ton | MTON       | .00045     |
| Gram       | G          | 453.59237  |

**Temperature**

| <b>Full Name</b> | <b>Abbr. Name</b> | <b>Multiplier</b> | <b>Offset</b> |
|------------------|-------------------|-------------------|---------------|
| Fahrenheit       | F                 | 1                 | 0             |
| Celsius          | C                 | 0.555555556       | -32.00        |
| Kelvin           | K                 | 0.555555556       | +459.67       |
| Rankine          | R                 | 1                 | +459.67       |

**Pressure**

| <b>Full Name</b>           | <b>Abbr. Name</b> | <b>Multiplier</b> | <b>Offset</b> |
|----------------------------|-------------------|-------------------|---------------|
| Pound/sq inch absolute     | PSIA              | 1                 | 0             |
| Atmosphere                 | ATM               | 0.068045964       | 0             |
| Pound/sq inch gauge        | PSIG              | 1                 | -14.69595     |
| Bar gauge                  | BAR-G             | 0.068947573       | -0.944302     |
| Bar absolute               | BAR-A             | 0.068947573       | 0             |
| Kilo Pascal gauge          | KPA-G             | 6.894757293       | -94.43024     |
| Kilo Pascal absolute       | KPA-A             | 6.894757293       | 0             |
| Mega Pascal gauge          | MPA-G             | 0.006894757       | -0.09443      |
| Mega Pascal absolute       | MPA-A             | 0.006894757       | 0             |
| KG/CM2-G                   | KG/CM2-G          | 0.070306958       | -0.96292      |
| KG/CM2-A                   | KG/CM2-A          | 0.070306958       | 0             |
| Millimeter of water column | MM W.C.           |                   |               |
| Inch of water column       | IN W.C.           | 27.7075924        | 0             |
| Millimeter of mercury      | MM HG             | 51.71493257       | 0             |
| Inch of mercury            | IN HG             | 2.036020967       | 0             |

**Density**

| <b>Full Name</b>     | <b>Abbr. Name</b> | <b>Multiplier</b> |
|----------------------|-------------------|-------------------|
| Pound/gallon         | LB/GAL            | 1                 |
| Kilogram/liter       | KG/L              | 0.119826427       |
| Pound/cubic feet     | LB/FT3            | 7.480519481       |
| Kilogram/cubic meter | KG/M3             | 119.8264273       |

**K-factor**

| <b>Full Name</b> | <b>Abbr. Name</b> | <b>Multiplier</b> |
|------------------|-------------------|-------------------|
| Pulse/gallon     | PULSE/GALLON      | 1                 |
| Pulse/liter      | PULSE/LITER       | 0.264172052       |
| Pulse/ft3        | PULSE/FT3         | 7.480519481       |
| Pulse/m3         | PULSE/M3          | 264.1720524       |

**Meter Factor**

| <b>Full Name</b>  | <b>Abbr. Name</b> | <b>Multiplier</b> |
|-------------------|-------------------|-------------------|
| Gallon/pulse      | GAL/PULS          | 1                 |
| Cubic meter/pulse | M3/PULS           | 0.003785412       |

**Energy**

| <b>Full Name</b>   | <b>Abbr. Name</b> | <b>Multiplier</b> |
|--------------------|-------------------|-------------------|
| Kilo BTU           | KBTU              | 1                 |
| Kilowatt-hour      | KWH               | 0.293071111       |
| Megawatt hour      | MWH               | 0.000293071       |
| Mega Joule         | MJ                | 1.055056          |
| Giga Joule         | GJ                | 0.001055056       |
| Horsepower hour US | HP US             | 0.393014834       |
| Calorie            |                   | 251995.7963       |

**Power**

| <b>Full Name</b> | <b>Abbr. Name</b> | <b>Multiplier</b> |
|------------------|-------------------|-------------------|
| Energy unit/hour | KBTU/HR           | 1                 |
|                  | KW                | 0.293071111       |

**Time**

| <b>Full Name</b> | <b>Abbr. Name</b> | <b>Multiplier</b> |
|------------------|-------------------|-------------------|
| Second           | SEC               | 1                 |
| Minute           | MIN               |                   |
| Hour             | HR                |                   |
| Day              | DAY               |                   |

**Corrected Volume (Gas and Liquid)**

| <b>Full Name</b>     | <b>Abbr. Name</b> | <b>Multiplier</b> |
|----------------------|-------------------|-------------------|
| Standard cubic feet  | SCF               | equation          |
| Normal cubic meter   | NCM               | equation          |
| Standard cubic meter | SCM               | equation          |

## Appendix D: Error Messages

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|    | <i>MESSAGE</i>           | <i>DESCRIPTION</i>  |
|----|--------------------------|---|
| 1  | CHX HIGH FLOW<br>ALARM   | Flow Rate has exceeded the limit defined for the High Flow Alarm parameter of the Digital I/O or Relay Flow Alarm output.   |
| 2  | CHX LOW FLOW<br>ALARM    | Flow Rate has fallen below the limit defined for the Low Flow Alarm parameter of the Digital I/O or Relay Flow Alarm output |
| 3  | CHX HIGH FLOW<br>WARNING | Flow Rate has exceeded the limit defined in the High Warning parameter of the Digital I/O or Relay Flow Alarm output        |
| 4  | CHX LOW FLOW<br>WARNING  | Flow Rate has fallen below the limit defined in the Low Warning parameter of the Digital I/O or Relay Flow Alarm output     |
| 5  | CHX HIGH TEMP<br>ALARM   | Temperature has exceeded the limit defined for the High Alarm parameter of the Digital I/O or Relay Temp Alarm output.      |
| 6  | CHX LOW TEMP<br>ALARM    | Temperature has fallen below the limit defined for the Low Alarm parameter of the Digital I/O or Relay Temp Alarm output.   |
| 7  | CHX HIGH TEMP<br>WARNING | Temperature has exceeded the limit defined for the High Warning parameter of the Digital I/O or Relay Temp Alarm output     |
| 8  | CHX LOW TEMP<br>WARNING  | Temperature has fallen below the limit defined for the Low Warning parameter of the Digital I/O or Relay Flow Alarm output. |
| 9  | CHX HIGH PRES<br>ALARM   | Pressure has exceeded the limit defined for the High Alarm parameter of the Digital I/O or Relay Pres Alarm output          |
| 10 | CHX LOW PRES<br>ALARM    | Pressure has fallen below the limit defined for the Low Alarm parameter of the Digital I/O or Relay Pressure Alarm output.  |

|    | <b>MESSAGE</b>                       | <b>DESCRIPTION</b>   |
|----|--------------------------------------|--|
| 11 | CHX HIGH PRES<br>WARNING             | Pressure has exceeded the limit defined for the High Warning parameter of the Digital I/O or Relay Pressure Alarm output.                  |
| 12 | CHX LOW PRES<br>WARNING              | Pressure has fallen below the limit defined for the Low Warning parameter of the Digital I/O or Relay Pressure Alarm output.               |
| 13 | CHX HIGH DENSITY<br>ALARM            | Density has exceeded the limit defined for the High Alarm parameter of the Digital I/O or Relay Density Alarm output                       |
| 14 | CHX LOW DENSITY<br>ALARM             | Density has fallen below the limit defined for the Low Alarm parameter of the Digital I/O or Relay Density Alarm output                    |
| 15 | CHX HIGH DENSITY<br>WARNING          | Density has exceeded the limit defined for the High Warning parameter of the Digital I/O or Relay Density Alarm output                     |
| 16 | CHX LOW DENSITY<br>WARNING           | Density has fallen below the limit defined for the Low Warning parameter of the Digital I/O or Relay Density Alarm output.                 |
| 17 | CHX HIGH SPECIFIC<br>GRAVITY ALARM   | Specific Gravity has exceeded the limit defined for the High Alarm parameter of the Digital I/O or Relay Sp. Gravity Alarm output.         |
| 18 | CHX LOW SPECIFIC<br>GRAVITY ALARM    | Specific Gravity has fallen below the limit defined for the Low Alarm parameter of the Digital I/O or Relay Sp. Gravity Alarm output.      |
| 19 | CHX HIGH SPECIFIC<br>GRAVITY WARNING | Specific Gravity has exceeded the limit defined for the High Warning parameter of the Digital I/O or Relay Sp. Gravity Alarm output        |
| 20 | CHX LOW SPECIFIC<br>GRAVITY WARNING  | Specific Gravity has fallen below the limit defined for the Low Warning parameter of the Digital I/O or Relay Sp. Gravity Alarm output.    |
| 21 | CHX RTD PROBE<br>SHORT               | Temperature probe resistance input is less than 5 OHMS.  |
| 22 | CHX RTD PROBE<br>OPEN                | Temperature probe resistance input is more than 15K OHMS resistance  |
| 23 | CHX PRESS FAIL                       | Pressure Analog signal input is not detected. The computed value of the analog input value of the selected channel is equal to zero volts. |

**Appendix D: Error Messages**

|    | <i>MESSAGE</i>       | <i>DESCRIPTION</i>  |
|----|----------------------|---|
| 24 | CHX TEMP FAIL        | Temperature signal analog input is not detected. The computed value of the analog input value of the selected channel is equal to zero volts. |
| 25 | CHX TEMP COMP        | Temperature of the selected channel is out of range specified for analog input  |
| 26 | CHX PRES COMP        | Pressure of the selected channel is out of range specified for analog input   |
| 27 | PULSE FAILURE        | Flow circuits detect a pulse failure in a dual coil application.  |
| 28 | TWO PHASE<br>WARNING | Pressure is between saturated pressure and 5 psia above the saturated pressure  |
| 29 | GAS INHIBIT ON       | Pressure is equal or below the saturated pressure.  |
| 30 | FLOWMETER<br>RUNNING | Displayed if the operator attempts to clear totals or make configuration changes while flow is present.                                       |