D620i

w/Operating System 2.12

USFilter

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Contents

Notes:

1. Start-Up

Thank you for purchasing our D620i controller. The D620i is full of features to enhance your control applications. At U.S. Filter Control Systems, we have more than 150 years of experience in the water and wastewater industries. We've put this experience to work for you in the D620i.

Initialization

The D620i goes through a warm initialization (reset) sequence whenever power is applied. Warm reset forces the D620i to quit the current operation and restart all software modules and control operations based on the initialization values.

Operator Interface

The Operator Interface is the means by which you interact with the D620i. Your Operator Interface consists of two parts – a two-line by sixteen-character LCD and a sixteen-key pushbutton keypad.

LCD

The LCD (Liquid-Crystal Display) allows you to easily view the various D620i display screens. The screen is a super-twist backlit LCD with approximately 0.5" tall characters.

HOME Screen

The programmer sets up the D620i's Status Displays – the most often viewed display group. The Status Display Group contains the HOME Screen where the controller's most important information is typically displayed. **The HOME Screen is the first screen to appear following initialization.** Pressing CLEAR causes the D620i to return to the HOME Screen. The HOME Screen is typically one of several Status Displays provided within the D620i controller. From the HOME Screen, simply press the DOWN or UP arrows to view other Status Displays.

Keypad

The sixteen-key keypad includes ten numerical keys, four of which also serve as navigating arrow keys (2/UP, 8/DOWN, 4/LEFT, and 6/RIGHT), and six special-purpose keys. The keys allow you to view and configure the information and settings in the D620i. The operation of each special-purpose key is described below.

CLEAR performs two functions. CLEAR backs out of several display levels and, if pressed repeatedly, returns the display to the HOME Screen. When in the program mode, (and prior to pressing ENTER), CLEAR reverts to the previous setting or adjustment.

ENTER performs two functions. ENTER confirms a selection or action. ENTER also moves from Software Module Displays to Configuration Displays (i.e., confirms the selection of the Software Module that appears in the display).

ACK acknowledges currently active alarms. Multiple alarms must be individually acknowledged.

MENU is only active while viewing Status Displays. MENU causes the D620i to reveal the Software Module Displays. Press CLEAR to move from the Software Module Displays back to the Status Displays.

FUNC has three modes of operation. When viewing the Status Displays, it reveals the Function Displays such as C800 Information (if enabled), Field Assistant, or Historian. When viewing the Alternator, the FUNC button allows you to clear fields, delete characters, or add characters in the Alternator's Order. When entering a number, FUNC negates the number (toggles +/-).

HELP provides terse help references. In future releases, context-sensitive help may be added.

Display Styles

The D620i's display screens are used to show information, current operating status, and alarms. The D620i is capable of supporting four display styles as described below.

Alarm. Operating System 2.xx supports a variety of alarm handling sequences. The Event and Group modules define the way alarms are handled.

Dynamic. Dynamic screens display system information which is continually changing (e.g., wet well level, stage operation, and pump running status).

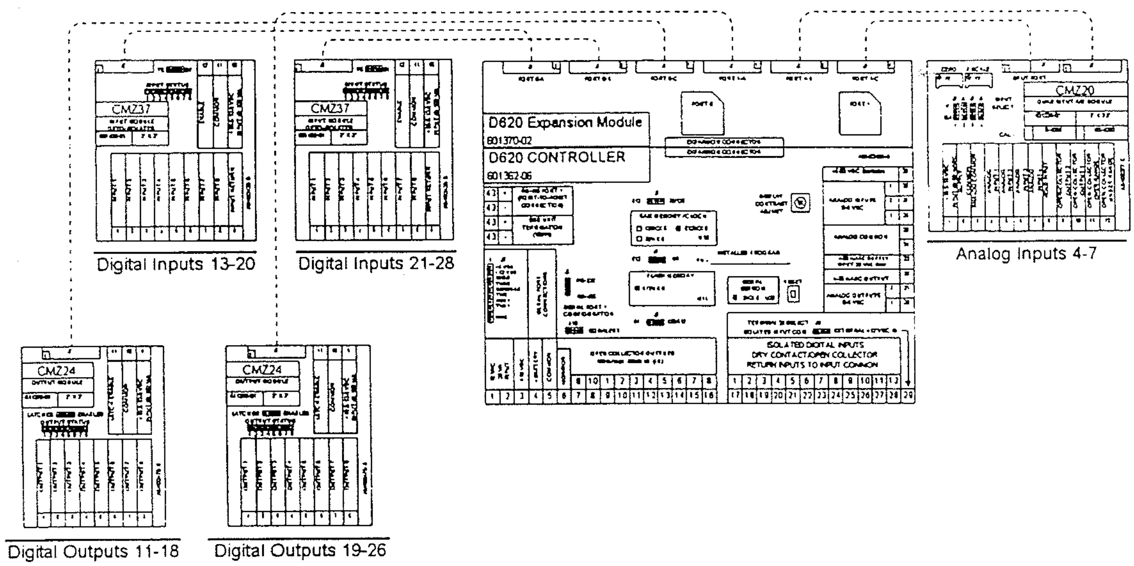
Switch. Switch screens allow you to select one of several choices which appear on the display screen. You enable a switch position by moving the cursor to the desired position and pressing ENTER. When enabled, the selected switch position is capitalized and shown in bold text.

Variable. Variable screens provide a way to show values that can be easily changed within the Status Displays. Typically, Variable displays are provided for PID setpoint adjustment. Variable displays show the current adjustment. Approximately every five seconds, the display changes and says `<ENTER> to change`. This lets you know that the setpoint (SP) can be changed by simply pressing ENTER. Once ENTER is pressed, a new screen appears showing the old (current) setpoint and providing a line for the new setpoint. If you press ENTER without entering a new setpoint, the current value is retained. Otherwise, you can enter a new value – confirmed by pressing the ENTER key. See the PID section for more details.

D620i Input/Output (I/O) Capacity

The D620i has twelve digital inputs, ten digital outputs, three analog inputs, two analog outputs, and two serial communication ports on board. Optional I/O modules and the required D62x expansion board are available. When fully configured, the D620i supports 28 digital inputs, 26 digital outputs, seven analog inputs, and two analog outputs.

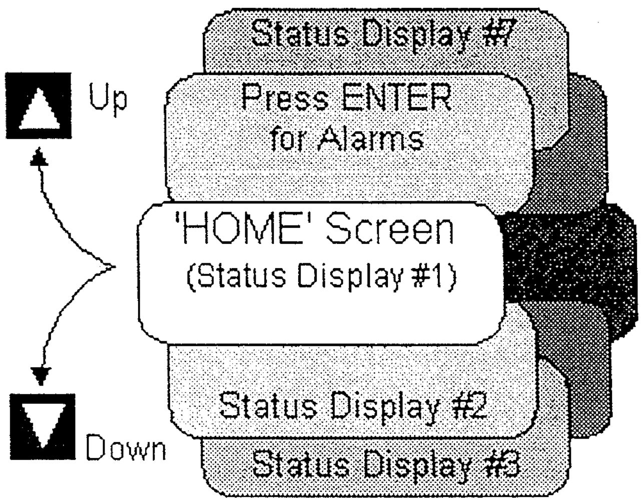
The full D620i I/O capacity is shown below. In this example the input modules are CMZ37s and the output modules are CMZ24s. Other modules are available and may be more appropriate for your particular application.



2. Display Carousels

The D620i allows you to examine and move among different screens or groups of screens. The various groups (or rings) are referred to as screen carousels. Press UP to move up and around the Status Display carousel. Press DOWN to move down and around the carousel.

A simple way to understand the carousels is to think of them like "rolling" phone directories which rotate to show multiple addresses and phone numbers. Each screen represents a card containing two lines of information. The drawing below illustrates a carousel. Moving around a carousel, and moving between different carousels, is easily done by using the UP, DOWN, and ENTER keys on the front of the controller.



Groups of Displays

The D620i contains several groups of displays. The **Status Display Group** shows status information such as tank levels, pump on/off status, and system flow rates. The **Alarm Display Group** shows the active alarms. The **Function Display Group** shows C800 Information and Field Assistant screens. The **Software Module Displays** show an alphabetized listing of the D620i's software modules. The **Configuration Displays** allow you to modify the characteristics of a selected software module. (Configuration Displays are a subset of the Software Module Displays.)

As mentioned earlier, each display group appears as a carousel. You use the ENTER, MENU, FUNC, and CLEAR pushbuttons to move between the carousels. Carousels are grouped by the type of information they provide. To make viewing easier, some carousels (typically under the FUNC button) are broken into smaller groups of screens. These groups divide the carousels into logical sets of screens and allow the various sets to be viewed as required.

Each group is discussed in detail in the following sections.

Status Displays

Status Displays provide general information about the local system process (e.g., wet well level, active control stages, pump requests, active pumps, and VFD speeds). The Status Display carousel includes an Alarm sub-group. Alarms are discussed in more detail in the following section.

The HOME Screen (mentioned earlier) is the first screen in the Status Displays carousel. It serves as the top of the controller because it shows the information viewed most frequently. **Pressing CLEAR several times will return you to the HOME Screen – from wherever you are within the D620i.** Throughout this manual, the hands-on instructions begin at the HOME Screen. Although this is not required for moving through the display structure, the HOME Screen serves as an easily accessible reference point from which to start. To move through Status Displays:

1. Start at the HOME Screen. Remember that this is done by pressing CLEAR several times.
2. Press DOWN to move to the second Status Display screen.
3. Repeat until the HOME Screen reappears.

or

1. From the HOME Screen, press UP to move to the `<ENTER> to view Active Alarms` screen.
2. Continue to press UP until the HOME Screen reappears.

You have now viewed all information available in the Status Displays.

Function Displays

Function Displays allow you to view additional standard system information. Common Function Displays are C800 Information (i.e., two-pump lift station flow calculations) and Field Assistant screens. (C800 displays are only shown when the C800 flow calculation module is enabled.) The Function Displays are accessed from the Status Display group. The following steps move you into, through, and out of the Function Displays.

1. Press CLEAR to return to the HOME Screen. (When at the HOME Screen, you are in the Status Display group.)
2. Press FUNC to view the first of possibly several Function Displays.
3. While viewing the first Function Display, press DOWN to view additional displays and eventually return to the first Function Display. (The Function Displays group, like all of the display groups, is a ring of displays. Therefore, by continually pressing DOWN, you will eventually return to the first Function Display.)
4. When you return to the first Function Display, you have viewed all of the displays in the Function Display Group. Some of these displays may have been entry screens to other display rings. Such entry screens are identified by the `<ENTER> to view` wording on the display's top line. Pressing ENTER, while viewing one of these entry screens, causes the D620i to move to a subsequent ring of displays. You can return from that ring by simply pressing CLEAR.
5. Press CLEAR to return to the Status Displays.

Now you have viewed all of the Function Displays. Their operation and meanings are detailed in following sections. For now, simply view the displays. Don't get ahead or press ENTER while in the Function Displays.

Software Module Displays

The Software Module carousel allows you to view the various software components (or modules) used to operate the D620i. The Software Module Displays are accessed from the Status Display group. The following steps move you into, through, and out of the Software Module Displays.

1. Press CLEAR to return to the HOME Screen. (When at the HOME Screen, you are in the Status Display group.)
2. Press MENU to view your Access Screen.
3. Enter your access code. If your code is 1, 2, 3, 4, press 1, 2, 3, 4, and then ENTER. (Since the Access Code Software Module allows the supervisor to use the D620i to change access codes, there is no standard code. If you do not know the code, find your supervisor or ask him/her for the appropriate code.)
4. After you press ENTER, (assuming that your access code was correct), you will see the first of several Software Module Displays. The software modules are listed in alphabetical order.
5. Press DOWN to view the other Software Modules. Typical modules include Access, Alternator, Analog, C800, C800 Linearization, Digital Inputs, Digital Outputs, Events, Groups, Logic, Math, MUX, System Clock, System Information, System Utilities, etc.
6. Continue to press DOWN until you return to the Access Module. (The Software Module Display Group, like all of the display groups, is a ring of displays. Therefore, by continually pressing DOWN, you will eventually return to the Access Modules.)
7. When you return to the Access Modules, you have viewed all of the displays in the Software Module Display Group. Press CLEAR to return to the Status Displays.

You have now viewed all of the Software Module Displays in your controller. Their operation is in following sections. For now, simply view the displays. Don't get ahead or press ENTER while in the Software Module Display Group.

Configuration Displays *(Part of the Software Module Displays)*

The Configuration Displays are a subset of the Software Module Displays. Configuration Displays show the characteristics associated with each Software Module. As mentioned above, the Software Modules are defined by a number of characteristics. The characteristics define the associated module's initial conditions (setup) and operation. Configuration Displays allow you to view and change a module's characteristics as required to match the D620i controller to the system dynamics.

Configuration Displays are accessed through the Software Module Displays. D620i controllers come pre-programmed with an assortment of modules. Characteristics of each of the modules are detailed in following sections.

3. Status Displays

As described earlier, the D620i goes through an initialization sequence when power is applied. The D620i displays the initialization screens and stops at its first display group (display carousel) – the Status Displays. Status Displays are designed to show general information about the control application.

The HOME Screen

The most important information contained within the system is displayed in the HOME Screen. We call it the HOME Screen because it is used as a reference point from which you can navigate through all of the D620i's displays. **Pressing CLEAR several times will return you to the HOME Screen, no matter where you are within the D620i.**

Alarm Displays

The Status Display carousel contains a screen which leads you to another group of displays – the Alarm Displays. To view the alarms, return to the HOME Screen and press UP. You will see:

```
<ENTER> to view
 Active Alarms
```

This is an entry point into the Alarm Display Group. You can press ENTER to move into the Alarm Display Group to view alarms. (If there are no active alarms, pressing ENTER does nothing.) When ENTER is pressed, the screen changes to read:

```
View XXX/YYY
⇑ Newest Oldest ⇓
```

This is the introductory screen in the Alarm Display carousel. You can press DOWN and review the alarms in an oldest-to-newest order or press UP to review them in a newest-to-oldest order. Pressing CLEAR (while viewing an alarm) returns you to this introductory screen. If there is only one active alarm, it is simultaneously the oldest and newest alarm. The actual alarm screens are quite similar to the one below. This screen shows the date (09-21) and the time (10:45:27 a.m.) that the event took place (e.g., Pump #1 Fail).

```
09-21 10:45:27A
Pump #1     Fail
```

Review the alarms at your convenience. When done, press CLEAR to return to the `<ENTER> to view Active Alarms` screen (Alarm Display entry point) and press CLEAR again to return to the HOME Screen.

You have now viewed the system's active alarms.

4. Function Displays

Function Displays provide supplemental information, such as C800 flow data (assuming C800 is enabled), input and output status (Field Assistant), and historical alarm information (Historian). **Pressing FUNC while in the Status Displays takes you into the Function Display carousel. You can then scroll through the Function Displays by pressing DOWN or UP.**

C800 Displays

C800 display screens are presented in a set of carousels. Press FUNC to view the C800 entry screen. You will see:

```
<ENTER> to view
C800 Information
```

Press ENTER to move from the Function Display to the C800 Information screens. (Pressing CLEAR returns you to the Status Displays.) Pressing ENTER displays the following:

Inflow Rate

```
Last Inflow Rate
     120      GPM
```

The display shows the calculated influent rate calculated over the last pump filling/pump-down/filling cycle. The C800 software monitors the pumping cycle (fill/pump down/fill) to calculate the influent flow rate during the pump operation. The influent rate display is updated after each pumping cycle.

Pressing DOWN causes the following screen to appear:

Total Station Flow

```
Total Discharge
    5120      GAL
```

The display shows the totalized (calculated) station flow (gallons) since installation or last reset. The totalizer accumulates to a maximum of 999,999,999 gallons. The C800 operating parameters can be reset to zero by entering the program mode, moving to the C800 Software Module, and authorizing a C800 reset.

Pressing DOWN reveals the following:

Individual Pump Flow Rates

```
P1 Rate:     118
P2 Rate:     121
```

The display shows the average flow rate of Pump 1 and Pump 2 (while running) over all cycles (GPM).

Pressing DOWN reveals the following display:

Accumulated Total Flow

```
P1 GAL:     2520
P2 GAL:     2600
```

The display shows the calculated total flow of Pump 1 and Pump 2 (when running) over all cycles.

Pressing DOWN reveals the following display:

Accumulated Run Time

```
P1 RTM:      2.3
P2 RTM:      2.5
```

The display shows the totalized (accumulated) running time of Pump 1 and Pump 2 in hours.

Pressing DOWN reveals the following display:

Flow Rate/Hour

```
<ENTER> to view
Inflow Rate/Hour
```

The C800 software calculates the average station inflow rate over each hour of the last five days. **A maximum of 120 screens may be embedded behind this display.** Each screen shows the average influent rate for a specific hour over the previous five days.

Upon initialization, the controller begins calculating the above data. Therefore, no historical information would exist. In such a case, there would be a single screen simply stating that the D620i is calculating the influent over the current hour and that the results are pending, as shown below.

Pressing ENTER reveals the following display:

```
Rate 04/19 08-09
Pending..
```

The display shows that the results for the current hour 8-9 a.m. (24-hour format) are currently pending (9 a.m. has not yet arrived). Therefore, these results are pending.

Pressing UP shows the previous hour (7-8 a.m.). Pressing UP again reveals the station inflow for 6-7 a.m. The process continues (up to 120 screens) until you return to the `Pending..` display for the current hour.

Pressing DOWN reveals the following screen:

Flow Rate/Day

```
<ENTER> to view
Inflow Rate/Day
```

The C800 software calculates the average station inflow rate per day over the last seven days. A maximum of seven screens may be embedded behind this display. Each screen shows the average influent rate for a specific day over the previous seven days.

Pressing ENTER reveals the following display:

```
Daily Rate 04/19
Pending..
```

The display shows that the results for the current day (4/19) are currently pending (4/20 has not yet arrived).

Pressing UP shows the average flow for the previous day (4/18). Pressing UP again reveals the station inflow for 4/17. The process continues (up to seven screens) until you return to the `Pending..` display for the current day.

Pressing DOWN reveals the following screen:

Station Flow/Day

```
<ENTER> to view
Stn Dischrg/Day
```

The C800 software calculates the average station flow (gallons) per day over the last 35 days. (Note that this is discharge flow, not influent.)

A maximum of 35 screens may be embedded behind this display. Each screen shows the calculated station discharge flow (gallons) for a specific day over the previous 35 days.

Pressing ENTER reveals the following display:

```
Dschrg on 4/19
Pending..
```

The display shows that the results for the current day (4/19) are currently pending (4/20 has not yet arrived).

Pressing UP shows the flow for the previous day (4/18). Pressing UP again reveals the calculated station flow for 4/17. The process continues (up to 35 screens) until you return to the `Pending..` display for the current day.

Pressing DOWN reveals the following screen:

C800 Pump 1 Information

```
<ENTER> to view
C800 Pump 1 Info
```

The C800 software calculates pump statistics for Pump 1 and stores the information beneath this display.

Pressing ENTER reveals the first of several screens as shown below:

```
Pump 1 Avg Flow
    118      GPM
```

The C800 software calculates the average pumping flow rate for Pump 1 over all cycles (since start-up or last C800 reset).

Pressing DOWN reveals the following screen:

```
Pump 1 Total Flow
   1250     GALS
```

The C800 software calculates the total flow for Pump 1 (gallons) over all cycles (since start-up or last C800 reset).

Pressing DOWN reveals the following screen:

```
Pump 1 Ttl Cycles
              348
```

The C800 software calculates the total number of start-stop cycles for Pump 1 (since start-up or last C800 reset).

Pressing DOWN reveals the following screen:

```
04/11      15:57
Max Starts/Hr 7
```

The C800 software counts the number of starts/hour for both pumps and captures the date and time of the most recent high count.

Here, on April 11 at 3:57 p.m. the controller counted seven starts per hour. The count is held until either a higher count is experienced or until the C800 parameters are reset.

Pressing DOWN reveals the following screen:

```
04/12      23:22
MaxCycRTM: 00.14
```

The C800 software accumulates the maximum single-cycle running time for both pumps and captures the date and time of the most recent high-run time.

Here, on April 12 at 11:22 p.m., the controller calculated a run time of 14 minutes. The count is held until either a higher count is experienced or until the C800 parameters are reset.

Pressing DOWN reveals the opening Pump 1 status information.

C800 Pump 2 Information

The information for Pump 2 is accessed and displayed in the same manner as that for Pump 1.

C800 Pump 1+2 Information

The C800 software calculates pump statistics for Pumps 1 & 2 and stores the information beneath this display:

```
<ENTER> to view
PUMP 1 + 2 Info
```

Pressing ENTER reveals the first of several screens as shown:

```
P1+2 Ttl Cycles
             45
```

The C800 software calculates the total number of start-stop cycles for Pumps 1 & 2 running together (since start-up or last C800 reset).

Pressing DOWN arrow reveals the following screen:

```
RTM for Pmps 1+2
        2.4 HRS
```

The C800 software calculates the accumulated time that both Pumps 1 & 2 ran simultaneously.

The run time is based on a run contact (typically from motor starter contacts). The count is held until either a higher count is experienced or until the C800 parameters are reset.

Pressing DOWN reveals the following screen:

```
04/12      23:22
MaxCycRTM:   5.0
```

The C800 software accumulates the maximum single-cycle running time for both pumps **operating together** and captures the date and time of the most recent high run time.

Here, on April 12 at 11:22 p.m., the controller calculated a run time of 5 minutes. The count is held until either a higher count is experienced or until the C800 parameters are reset.

Field Assistant

Field Assistant allows you to view the status of the controller's digital inputs and outputs as well as its power supply and system clock. From the Status Displays, press FUNC. Press DOWN to move to Field Assistant.

```
<ENTER> to view
Field Assistant
```

Press ENTER to move into the Field Assistant Display Group.

Viewing Digital Inputs

Pressing ENTER displays two choices for viewing (Digital Inputs, Digital Outputs). Scroll through the possibilities using UP or DOWN, stopping on the group that you wish to view. Press ENTER to move into the respective Field Assistant information carousel.

```
<ENTER> to view
Digital Inputs
```

The D620i has twelve on-board digital inputs. Optional expansion modules allow for 16 additional inputs (see the diagram on page 3). When viewing this screen, you can press ENTER and view the On and Off state of the digital inputs. Pressing DOWN reveals the first of three displays. The first display shows the on-board inputs 12-1 (reverse order). A "1" in the lower line of the display indicates that the input is active. A "0" indicates that the input is inactive. The second display shows inputs 20-13 and the third display shows inputs 28-21. Pressing CLEAR returns the display above.

Thereafter, pressing DOWN reveals the following display:

Viewing Digital Outputs

```
<ENTER> to view
Digital Outputs
```

The D620i has ten on-board digital outputs. Optional expansion modules allow for an additional 16 outputs. When viewing this screen, you can press ENTER and view the On and Off state of the digital outputs. Pressing DOWN reveals the first of three displays. The first display shows the on-board outputs 10-1. The second display shows outputs 18-11 and the third display shows outputs 26-19. Pressing CLEAR returns the display above.

Thereafter, pressing DOWN reveals the following display:

Viewing Controller Power

```
CntlPwr 13.4 VDC
Lo=13.2 Hi=14.5
```

Pressing ENTER is ineffective. Pressing DOWN reveals the following:

Viewing Date and Time

```
05:15:28 PM
07/04/95 We
```

Pressing ENTER is ineffective. Pressing DOWN reveals the Digital Input screen shown below. Pressing CLEAR reveals the `<ENTER> to view Field Assistant` – a part of the Function Displays.

Example: Move to the `<ENTER> to view Digital Inputs` display. Press ENTER. The following screen appears:

```
Dinputs 12-1
001010110011
```

This is the first of three Digital Input displays. The first two 0s at the left of the bottom line indicate that digital inputs 12 and 11 are currently Off. The 1 at the third position from the left indicates that input 10 is On.

Pressing DOWN reveals additional Digital Input displays (up to 28 total). Press CLEAR to return to the Field Assistant introductory screen (i.e., `<ENTER> to view Field Assistant`). Press CLEAR to return to the Status Displays. Press CLEAR again to return to the HOME Screen

Historian

Historian allows you to view historical alarm data, status of the controller's digital inputs and outputs, as well as its power supply, system clock, etc.

From the Status Displays, press FUNC. Press DOWN to move to Historian.

```
<ENTER> to view
   Historian
```

Pressing ENTER reveals the following display:

```
<ENTER> to view
  All Groups
```

The screen shown above is the first of five possible Historian screens. These displays show all events and alarms in historical sequence (assuming that the system has events defined and enabled). The other four displays can be reviewed by simply pressing DOWN. Move into the All Groups of displays by pressing ENTER. Pressing UP or DOWN allows you to scroll through historical event information. Pressing CLEAR returns you to the above All Groups entry screen.

If additional alarm or status groups have been defined, they appear immediately following the All Groups screen shown above. Pressing DOWN reveals the next set of information.

The first historical group shows events and alarms from **all** alarm/event groups. The second set of information is a historical listing of all events which are associated with Group #1 (refer to the Software Module section of the manual for a description of Events and Groups). The third set of information is a historical listing of all events which are associated with Group #2. This sequence follows up to and including Group #4. Examples of typical screens follow.

```
<ENTER> to view
System Alarms
```

The text shown on the bottom line of subsequent historian groups is programmed for the particular application. The wording shown above is representative only. Your system's wording may be different.

Pressing DOWN may reveal additional Historian display groupings.

```
<ENTER> to view
System Status
```

The wording shown above is representative only. Your system's wording may be different.

Pressing CLEAR several times returns the D620i's HOME Screen.

For more information on the Historian, refer to Group Modules in the Software Module section of this manual.

5. Software Modules

Software Module Displays allow you to enter the various software components (modules) used to operate the controller. The flexibility of the D620i permits virtually any number of modules to be supplied with the controller and field-tailored to your specific needs.
Recall that pressing MENU while in the Status Displays takes you into the Software Module Display carousel. Typically, the first module that you will see is the Analog Module. You can scroll through the Software Modules included in your controller by pressing DOWN or UP.

A sample Software Module Display Group is shown below.

```
<ENTER> to view
Access Module
```

Pressing MENU moved you from the Status Displays to the first of several Software Module Displays. Press CLEAR to return to the Status Displays. Press ENTER to move into and examine the characteristics of the first Access Module. Press DOWN to view the following Software Module Display.

Pressing DOWN reveals the following display:

```
<ENTER> to view
Alternators
```

The next module in an alphabetical listing is the Alternator Module. If your system utilizes an alternator, it appears immediately below the Access Module.

Additional modules appear as you continue to press DOWN. Eventually, you will review all of the Software Module menu. You will know that you have completed the review when you have scrolled through the alphabetical listing and return to the Access Module.

6. Configuration Displays

Configuration Displays allow you to change the characteristics of a given Software Module. Each Software Module contains a number of characteristics. As discussed previously, you can move from the Status Displays to the Software Module Displays by pressing MENU. Immediately after entering the Software Module Display Group, you will see a pop-screen which states that the modules are listed alphabetically.

Pressing DOWN reveals the first of several modules, the Access Module. The representative screen is shown below:

```
<ENTER> to view
Access Module
```

The Access Module is the first of several Software Modules. Each of the modules has several characteristics. Due to their versatility, some of the modules have **many** characteristics. Each characteristic performs a specific function. Each of the modules and the specific characteristics are covered in greater detail.

Some Common Characteristics

Many Software Modules have similar characteristics. Three of these are **Label**, **Forms**, and **Enable**.

Label

Labels are names assigned to a particular module. You cannot change the Label (PgmLbl) via the D620i keypad. You must use Solution Builder to change the Label.

Form

Form allows the programmer to set an operating mode or characteristic. (Not all modules have forms.) For example, the Form sets the Alternator into a standard or split mode (defined later). The Form would also set the control stage for pump-up, pump-down, or constant pressure. The D620i's Software Modules have different numbers and types of Forms.

Enable

Enable allows you to activate (enable) or deactivate (disable) a particular Software Module. When enabled, a module is allowed to function normally. When disabled, its outputs are initialized and deactivated.

Layout of Configuration Displays

Before you can adjust a module's characteristics, you should understand the layout of a typical Configuration Display. The following screen highlights the four types of information presented in a Configuration Display screen.

```
Analog 1 Label
WetWell
```

Module Type. (`Analog`) Shows the Software Module being viewed/configured. In this case, the Analog Module has been selected.

Module Identifier. (1) There can be several modules associated with each type. The identifier shows the number of the chosen module. In this case, Analog #1 has been selected.

Characteristic. (`Label`) Just as there can be several modules, there are various characteristics for each module. This field shows the characteristic chosen for viewing or configuring. In this case, the Label characteristic is being viewed.

Name/Value. (`WetWell`) Shows the assigned (or programmed) name or value that corresponds to the given module's characteristic. In this case, the Label for Analog #1 is Wet Well.

Reviewing the Configuration Displays

Start from the Status Displays. Move to the Software Module Displays. The following steps move you into and out of the first Analog Module's Configuration Displays:

1. Press CLEAR to return to the HOME Screen. (It is not necessary to go to the HOME Screen, you must simply be in the Status Displays. Going to the HOME Screen is just a quick way to get to a known location before proceeding through the Software Module Displays and into the Configuration Displays.)
2. Press MENU to move toward the Software Module Displays.
3. When prompted for the access code, enter your authorization code and press ENTER. The first Software Module Display appears.
4. Press DOWN to find the display which reads: `<ENTER> to view Analog Modules`.
5. Press ENTER. You are now looking at the first Analog Module's Programmable Label – the first of several characteristics associated with this Analog Module.
6. Press RIGHT to move the cursor under the "P" in PgmLbl (Programmable Label).
7. Press DOWN to view all of the characteristics associated with the Analog Module.
8. When you return to PgmLbl you have reviewed all of the Analog Module's characteristics.
9. Press LEFT to move the cursor under the "1".
10. Press DOWN to view additional Analog Modules. Each of the Analog Modules contain characteristics which can be configured (individually) to meet the specific needs of the application.

11. Press CLEAR to return to the `<ENTER> to view Analogs` display.
12. Press DOWN to view other Software Modules (e.g., Stages, Ramps, Alternators).
13. If you wish, press ENTER to move into any of these modules. Again, pressing RIGHT to move the cursor under the "P" in PgmLbl and pressing down to review the respective module's characteristics.

Remember, to enter a particular module, simply press ENTER when viewing the Software Module screen of your choice. Pressing ENTER displays the first Configuration Screen and allows you to view or configure the module's characteristics. Press CLEAR to move out of the Configuration Displays and return to the Software Module listing.

Moving through the Configuration Displays

```
Analog 1 PgmLbl
WetWell
```

Note the underscore cursor beneath the identifier "1" in the sample screen above. Scrolling through the various identifiers allows you to review the other Analog Modules provided within the controller. This is done by pressing DOWN or UP while the cursor is beneath the 1.

```
Analog 1 Form
Standard
```

You can view the other characteristics of a particular module. This time, instead of scrolling while the underscore is beneath the identifier "1", scroll while the cursor is beneath the first letter of the characteristic (PgmLbl). To move the underscore cursor to the right, press RIGHT. Scroll through the characteristics associated with the particular module by pressing the DOWN or UP keys.

7. Changing D620i Configuration

In the previous section, we explained how to move through the Software Modules to the Configuration Displays and how to move in and between these Configuration Displays. Now we will discuss making changes to the modules. From the Status Displays move into the Software Module Displays. Enter your access code (as directed) using the numeric keys on the keypad. When completed, press ENTER to confirm the code. You remain in the programming mode as long as there is keyboard activity (a two-minute time-out). This way, you do not have to re-enter the programming mode should additional changes be required. Once the code is entered and confirmed, the cursor becomes a flashing block cursor, indicating that the D620i is in the programming mode.

```
█ENTER> to view
Analog Modules
```

The large block cursor indicates that the D620i is in the programming mode. Exit the programming mode by pressing CLEAR to go to the HOME Screen. Then press CLEAR again and follow the instructions.

Important. The D620i's flexibility in programming is the result of very few rules or checks. You must be aware of the effects that parameter changes have on the operation of the system. The D620i does not perform any rule checking and has no specific knowledge of the application or configuration requirements. Therefore, you must understand the effect of any change before making modifications in the Configuration Displays.

Making Changes

After entering the programming mode, you can make changes to the characteristics associated with each of the modules. Changes can be done in different ways depending on the type of characteristic as follows:

- The Label characteristic cannot be changed at the D620i – Label changes require Solution Builder.
- Other characteristics are selectable in the programming mode. This means that the characteristic field is one of several selections. The characteristic is changed by 1) Moving to the characteristic, 2) Pressing ENTER to move the cursor to the bottom line, 3) Pressing UP or DOWN to review the selections, and 4) Pressing ENTER to confirm the selection.
- The Enable characteristic provides two selectable possibilities – Enabled and Disabled.
- Other characteristics allow you to change the numeric value associated with a characteristic (e.g., changing a Stage Module's On and Off setpoints or changing the Analog Module's alarm setpoints).

Changing Selectable Values

Several characteristics have selectable values. In such cases, you simply press DOWN or UP to review the selection possibilities and press ENTER to confirm your selection.

The following example screens show how Stage Module #1's Form characteristic is selected. As you enter the programming mode, the current selection is displayed. Pressing either DOWN or UP toggles the setting to other possibilities.

```
<ENTER> to view
Stages
```

After pressing ENTER, the Stage Module's PgmLbl characteristic appears:

```
Stage    1 PgmLbl
Lead Pump
```

The programmable Label cannot be changed at the D620i. Press RIGHT to move the cursor under the "P" of PgmLbl. Press DOWN to view the Form characteristic shown below.

```
  Stage 1 Form
 Active on Rise
```

The Form of the Stage Module determines its mode of operation. `Active on Rise` is used in pump-down applications. `Active on Fall` is used in elevated-tank or pump-up applications. `Pressure/Flow` is used in constant-pressure or tankless applications.

Confirming Programming Changes

Once all changes are completed, press ENTER to confirm your changes. At this point, the new information is used to control the system.

Exiting the Programming Mode

Once you have confirmed your changes, pressing CLEAR takes you out of the Configuration Display – but you remain in the programming mode. (You will still see the box cursor as a reminder.)

As mentioned earlier, D620i software revision 2.xx has been updated so that you remain in the programming mode to make all necessary changes without having to re-enter the configuration code each time. Be aware that the programming mode times out (returns to normal mode) if there is no keypad activity for two minutes. This is an easy way to exit the programming mode. Just walk away, and two minutes later the controller will go back to normal. If you want to exit the programming mode immediately, simply press CLEAR enough times to return to the HOME Screen. Pressing CLEAR while on the Home Screen activates the following:

```
 Pressing ENTER
Clears PGM mode
```

Pressing ENTER confirms the exit from the programming mode and returns you to the Home Screen.

8. Software Modules: Characteristic Descriptions

Access

The Access Module allows the supervisor (i.e., individual with the highest programming level) to set operators' viewing privileges and limit their ability to change characteristics. Viewing rights are assigned with the Access Module's view characteristic. Here, the programmer can specify an operator's (or group of operators) view level. The view level sets the maximum level of viewability. If any other module has a view level which is equal to or less than your view level, then you are able to view the module and all of the associated characteristics.

Example: The supervisor has assigned Bill Larson a view level of 2. Most of the D620i's Analog Modules all have a view level of 1. Since Bill's rights are higher than the modules', Bill is able to view most of the modules. One of the D620i's most critical Analog Modules has a view level of 3. Because Bill's view level is less than the module's, Bill will be able to see the module's label but will not be able to view any of the module's other characteristics.

Similarly, a module's programming rights are assigned with the Access Module's Prog characteristic. The programmer specifies an operator's (or group of operators) programming level. The Prog level constrains an operator's ability to adjust a module's parameters. If any other module has a Prog level which is equal to or less than your Prog level, you are able to program the module's characteristics.

Example: The supervisor has assigned Bill Larson a view level of 2 and a Prog level of 1. Most of the D620i's Analog Modules all have a view level of 1. Since Bill's viewing rights are higher than the modules', Bill is able to view most of the modules. Additionally, the supervisor has set all of the Analog Module's program rights to 2. This means that although Bill can see most of the Analog Modules and their associated characteristics, he cannot change any of the characteristics. If he attempts to change a characteristic, a pop-up screen appears and tells him that access is denied.

The supervisor is able to adjust the four access levels. Any number of individuals can be given the codes to a particular access group. A maintenance group may be given the ability to view characteristics but may not be able to change the characteristics. The electrical group may be able to view all of the characteristics and change characteristics of several modules. The supervisor is able to view all of the modules and change all of the characteristics.

Warning: For proper operation, each of the four access codes must be unique.

PgmLbl

16-character name (e.g., Bob Anderson, Road Crew, Electricians). These are set at the factory to Access Group 1, Access Group 2, Access Group 3, and Access Group 4.

Form

Not Selectable.

View

View sets Bob Anderson's access to other modules. If Bob's view level is equal to or greater than a module's view level then Bob can view the respective module.

Prog

Prog sets Bob Anderson's programming access to other modules. If Bob's Prog level is equal to or greater than a module's Prog level then Bob can program the module (i.e., change the characteristic currently appearing in the display).

LogIn

This is Bob's log-in code. Only the supervisor (person with the highest Prog level) can view and change the log-in code – 8 digits maximum. The access codes are set at the factory to 1111 (Access Group 1), 2222 (Access Group 2), 3333 (Access Group 3), etc.

Alternator

The Alternator Module is typically used to alternate the starting sequence of a group of pumps. Although it is typically applied as a pump alternator, it is not limited to simply alternating pumps. It is simply an alternator which can be used to alternate any number of things (aerators, valves, filters, etc.).

The D620i can be configured with several alternators. Each standard alternator accepts up to 16 inputs and controls 16 outputs. Optionally, each alternator can be split into two sections. With a split alternator, the Alternator Module is divided or split into two independent groups. This can be useful in applications where multiple groups of pumps are controlled and each group is a different size or capacity. In such an application, each group of pumps may require its own unique alternation sequence. Each group of the split alternator is fully configurable.

In addition, optional Failed Pump Replacement capabilities are available. The controller must be programmed to take advantage of the automatic failed replacement. Thereafter, if any of the pumps report back as not ready, the alternator automatically steps to another available pump and calls it into service. Possible alternation schemes follow.

Rotary

The alternation sequence changes when no pumps are required (i.e., when the last pump turns off, the alternator changes sequence). In a three-pump system, the initial start-up sequence is 1, 2, 3 – where Pump 1 is the first pump to be called into service. As additional pumping capacity is required, Pumps 2 and 3 come on in order. As demand falls, Pump 3 is removed. Thereafter, Pump 2 stops and Pump 1 remains in operation until it is no longer required. When Pump 1 turns off, the rotary sequence advances. Pump 2 starts the next pumping cycle.

In heavily loaded stations, the rotary sequence has a tendency to run the first pump for a prolonged period (assuming independent Off setpoints). Additionally, a rotary sequence may cause the second pump to start frequently and thus exceed its recommended maximum number of starts per hour. If your station is heavily loaded, the FOFO sequence (described below) may be a better choice for pump alternation. (The rotary alternation issues raised above are not as problematic if all of the pumps share a common Off setpoint.)

FOFO – (First On, First Off)

The alternation sequence changes when additional capacity is added or removed. When additional capacity is required, the alternator automatically enables the output which has been resting the longest. Conversely, when demand decreases and an input to the alternator is removed, the alternator automatically disables the output which has been active the longest. (The first output on is the first output off.)

Fixed Sequence

The alternation sequence is based on the field-programmed sequence. With a few presses of the D620i keypad, you can modify the pumping sequence. The D620i then automatically follows that fixed sequence.

Fixed Sequence (w/Advance)

The alternation sequence is based on the field-programmed sequence. As above, the D620i automatically follows the fixed sequence. In this case, however, the fixed sequence can be advanced, either automatically or manually, via a switch screen which appears as part of the Status Displays (if so programmed). For example:

Fixed Sequence – 4 2 3 1

The sequence will not change, even if the controller is provided with an advance input. The sequence is truly set in a 4 2 3 1 order.

Fixed w/Advance: 4 2 3 1

The sequence changes when the alternator receives an advance input. Unlike Rotary and FOFO, the sequence does not change when pumps are added or removed. Instead, it takes a direct command to advance before the alternator moves to the 2 3 1 4 sequence.

Characteristics

PgmLbl

16-character name (e.g., 4 Pump Alternator, 2 Groups, Aerator Alt, Filter Alt, etc.).

Form

Form is a selectable field. You change the Alternator's Form by moving to the Form characteristic, pressing ENTER, and then pressing DOWN to scroll through the Forms. Only two Forms are available, Standard and Split. Once set and operating correctly, the Form should not be changed.

Standard

The Standard Alternator is a single software module which can accept 16 inputs and manipulate 16 outputs as a single group. The Alternator can be split into two independent groups – thus the Split Alternator.

Split

The Split Alternator breaks the module into two distinct groups. Each group of the Split Alternator can accept any of the 16 inputs and manipulate any of the 16 outputs. The Split Alternator is typically used when the system must manipulate multiple groups of pumps. Typical examples are Old/New Pumps or Small/Large Pumps.

The Split Alternator allows you to configure two independent alternation schemes within a single module. In an Old/New Pump configuration, the first group may control the operation of the newer pumps – possibly in a FOFO sequence. The second group controls the older set of pumps – possibly in a fixed sequence where the best of the older pumps is the first pump in the fixed sequence. If your system contains two or more alternators, each of them can be split and thus provide up to four alternators.

View, Program, and Enable

View, Program, and Enable have been covered in previous sections.

1Style (Style)

1Style (Style) sets the alternation style. Selection possibilities include FOFO (First On First Off), Rotary, Fixed, and Direct. Rotary and FOFO are described above.

Fixed simply starts the pumps in the sequence specified in 1Order. Here, any input causes the first output (specified in 1Order) to activate. A second input (on any of the inputs) activates the second output as specified in 1Order.

Direct ties the inputs to the Order. If 1InSel is 1 2 3 4 5 6 and the Order is 6 3 4 1 5 2, then when input 3 is activated, output 4 is enabled. Further, when input 1 is activated, output 6 is enabled.

1InSel (InpSel)

1InSel (InpSel) allows the Alternator to accept requests on the specified inputs. The bottom line of the D620 display appears as follows:

```
1234------------
```

The D620i shows a number in the ordinal position (when the input is enabled) and shows a dash when the input is disabled. The above display indicates that the Alternator is currently configured to monitor inputs 1–4 (regardless of the number of connections made to the Alternator). When any of these inputs are active, the Alternator activates one of the available outputs. The above Input Select would be typical of a four-pump control system. The four inputs are internally tied back to four control points (typically control stages) which provide differential On/Off control.

To change the Input Select, you move to the Alternator, find InpSel, and press ENTER. The cursor is automatically positioned at the lower left corner of the display. You press UP or DOWN to toggle any of the inputs On or Off. You press RIGHT to move across the display's lower line. When the Input Select is adjusted as required, you simply press ENTER to confirm the setting.

The Alternator ignores any activity on a closed request line. The Alternator responds to requests which appear at the open input.

1Order (Order)

1Order specifies the Alternator's active outputs **and** the order in which the outputs are to be manipulated. 1Style (described above) sets the alternation style (FOFO, fixed, rotary, etc.). Order specifies the outputs which are to be manipulated.

If Style is FOFO and Order is 3 1 2 4, then the Alternator activates output 3 as the first output. Thereafter, should the Alternator receive additional requests, it responds by activating outputs 1, 2, and 4 in that order. As demand decreases, the outputs are deactivated in a 3 1 2 4 order.

Programming the Order. You change the order by moving to the Alternator, finding the Order characteristic, and pressing ENTER. The cursor then moves to the display's lower left corner. You can press the FUNC key to pop up a small editing display. This display allows you to add an element into the sequence, delete an element in the sequence, or delete all entries to the right of the cursor and continue configuration thereafter.

If the line is deleted, you then use UP or DOWN to scroll through a list of numbers which represent the Alternator's outputs (e.g., 1-16). Pressing RIGHT moves the cursor to the next element in the Order. When the Order has been programmed as desired, you simply press ENTER to confirm the program.

2Style

2Style is active only if the Alternator is split into two groups. See 1Style for programming hints.

2InSel

2InSel is active only if the Alternator is split into two groups. The second group can use any of the Alternator's inputs as the basis for alternation requests. (The inputs can be used in both the first and second groups of a Split Alternator.) For more information on 2InSel, see 1InSel.

2Order

2Order is active only if the Alternator is split into two groups. Like the first group of a Split Alternator, the second group can manipulate any of the Alternator's outputs. For more information on 2Order, see 1Order.

Ready

Ready is a read-only field. It can only be viewed at the D620i. Ready simply shows all available outputs (not failed). Should an output not appear in the Ready field, and yet be part of 1Order or 2Order, the Alternator automatically steps to the next available output and calls for additional capacity – without the need to assert additional inputs to the Alternator.

StgrOn

StgrOn (Stagger On) timing inhibits output activation until the time period has expired. When the Alternator receives an input, it delays the activation of the output until the StgrOn timing period has expired.

StgrOf

StgrOf (Stagger Off) timing inhibits output deactivation until the time period has expired. When the Alternator's input is deactivated, the Alternator delays the deactivation of its output until the StgrOf timing period has expired.

Special Note. Automatic and manual Alternator advance operates correctly when the StgrOn and StgrOf timing are set to 0. Failure to set the StgrOn and StgrOf times to zero causes the Alternator to ignore an advance command. This anomaly is present in Operating System 2.12 and prior.

MakeBr

MakeBr (Make Before Brake). This is a toggle field which allows two selections – Make Before Brake and Break Before Make. This field works with the Alternator advance inputs.

When the Alternator receives an advance input, and if MakeBr is set to Make Before Break, then the Alternator activates the next output in the sequence before deactivating an output. This ensures that pumping capacity is maintained. When MakeBr is set to Break Before Make, the Alternator removes the output before advancing the sequence and activating the next output. MakeBr is only applicable in the FOFO and Rotary Styles.

Analog

Analog Modules condition an analog input signal. The module converts the input from an electrical signal (e.g., 1-5 VDC or 4-20 mADC) to real-world engineering units.

Example: It's hard to imagine having 18.37 mADC of water in an elevated tank. An Analog Module converts the signal to 25.9 feet (over a 30.0 foot range).

Min and MaxEU are used to associate minimum and maximum input signals (e.g., 4 and 20 mADC) with real-world values (e.g., 0.0 and 30.0 feet).

Engineering units provide labels for the spanned values, giving them some meaning. Some examples of engineering units are pressure (PSI), level (feet, inches), volts (mVDC, VDC), flow (GPM), and temperature (°C, °F).

Alarm setpoints include high and low levels (pressures, flow, etc.) and signal out-of-range high and low (i.e., input signal below 0.95 VDC or above 5.05 VDC).

The Analog Module provides all of the above configuration functions.

The Analog Module provides several analog and digital outputs. The analog outputs are typically connected to control stages (i.e., differential control modules) or Analog Output Modules. Additionally, the %-Output provides a wake-up level for the D620i's software simulation module.

The digital outputs are typically connected to Event Modules which provide alarm notification upon occurrence of high, low, high-failure, or low-failure alarms.

PgmLbl

16-character name (e.g., WetWell Lvl, StnFlow, SysPressure). Analog Module #1 is set from the factory to sense the on-board DC power voltage.

Form

Two selections are possible – Standard and No Clamps. Typically, Standard is selected. No Clamps allows the analog output value to follow the line as programmed by MaxEU, MinEU, MaxRaw, and MinRaw – yet allows the engineering units output to drop below MinEU and rise above MaxEU. (In the No Clamps Form, there are No Clamps on the engineering units.)

View, Program, and Enable

View , Program, and Enable have been covered in previous sections.

Units

This is a 16-character, non-programmable field. The field simply assigns real-world units to the process variable (e.g., Ft, GPM, PSI, MSL).

MaxRaw

A D620i controller accepts analog inputs which range between 0.000 VDC and approximately 5.500 VDC. The microprocessor translates these voltages into numeric representations that range from 0 to 5500 counts (one count per millivolt). You program MaxRaw to correspond to the **maximum** incoming analog signal. This is done as follows:

1. Apply the maximum (standard) input voltage (between 0-5.5 VDC).
2. Move down to the RawVal characteristic (defined below).
3. Record the RawVal.
4. Return to the MaxRaw screen (detailed here).
5. Enter the recorded value into the MaxRaw field.

Typically the maximum input voltage is 5.00 VDC. This correlates to a MaxRaw value of 5000 counts. If the incoming signal is not a normalized 1-5 VDC or 4-20 mADC input (i.e., the input is not calibrated to produce a standard process output over its calibrated range) then MaxRaw can be changed in the field via the PC or D620i.

Example: If the maximum incoming signal is 3.85 volts, RawVal (see below) shows a raw count of approximately 3850. This value is then the maximum incoming raw value that is calculated by the D620i and based upon that maximum signal. It is programmed into MaxRaw.

MinRaw

MinRaw sets the minimum incoming raw value. In a typical process signal application (1-5 VDC), MinRaw equals 1000 counts. A D620i controller accepts analog inputs which range between 0.000 VDC and approximately 5.500 VDC. The microprocessor translates these voltages into numeric representations that range from 0 to 5500 counts (one count per millivolt). You program MinRaw to correspond to the minimum incoming analog signal. This is done as follows:

1. Apply the minimum (standard) input voltage (between 0-5.5 VDC).
2. Move down to the RawVal characteristic (defined below).
3. Record the RawVal.
4. Return to the MinRaw screen (detailed here).
5. Enter the recorded value into the MinRaw field.

Typically the minimum input voltage is 1.00 VDC. This correlates to a MinRaw value of 1000 counts. MinRaw can be changed in the field (via the PC or D620i) if the incoming signal is not a normalized 1-5 VDC or 4-20 mADC input (i.e., the input is not calibrated to produce a standard process output over its calibrated range).

Example: If the minimum incoming signal is 1.20 volts, RawVal (defined below) shows an approximate 1200 raw count. This value is then the minimum raw value and it is programmed into MinRaw.

RawVal

This is a view only field. It is used in the MaxRaw and MinRaw calibration process as detailed above. The microprocessor translates the on-board incoming analog signal into a numeric representation that ranges from 0 to 5500 counts (one count per millivolt). RawVal simply shows the current, converted value. The RawVal display is dynamic, meaning that as the incoming signal changes, RawVal automatically updates on a periodic basis.

MaxEU

MaxEU is the maximum engineering units value which is shown on the display, transmitted to a central monitoring computer, and/or used for internal calculations. For instance, in a 0.0 - 10.0 foot wet well, MaxEU is set to 10.0.

MinEU

MinEU is the minimum engineering units value which is shown on the display, and/or transmitted to a central monitoring computer. For instance, in a 0.0 - 10.0 foot wet well, MinEU is set to 0.0. Some applications require the use of Mean Sea Level (MSL). In these applications, MinEU may be 520.0 and MaxEU may be 550.0.

Example: Associating MaxRaw with MaxEU and MinRaw with MinEU.

MinRaw = 1200	MaxRaw = 3850
MinEU = 520.0 MSL	MaxEU = 550.0 MSL.

When the control senses the above minimum input signal (1.20 VDC), it converts the signal into a raw count of 1200 and applies engineering units (feet) and the proper scale (MSL ranging from 520 to 550). The controller then displays 520.0 MSL. Similarly, when the analog signal reaches 2.525 VDC, the control automatically converts this to the mid-scale value and displays 535.0 MSL.

DecPlc

DecPlc sets the decimal place used on the D620i display. (Internal D620i calculations are made using the entire value, not just the units shown on the display.) To change DecPlc, press ENTER to move the cursor to the lower line. Thereafter, press RIGHT or LEFT to move the decimal place to the desired position. An adjustment of 1234.5 indicates that the value is to be displayed in units and tenths. Similarly, 123.45 indicates units and hundredths.

HAlSp

High Alarm Setpoint. This cell programs the point at which the Analog Module activates its high alarm output. To change the High Alarm Setpoint, press ENTER. The lower line clears. (Pressing CLEAR restores the previous value.) Press in the desired High Alarm Setpoint. Press ENTER to confirm the selection.

HAlRSp

High Alarm Reset Setpoint. This cell programs the point at which the Analog Module deactivates its high alarm output. For proper operation, the High Alarm Reset Setpoint must be set **lower** than the High Alarm Setpoint (see above). The Analog Module disables the alarm output if the High Alarm Setpoint is set equal to the High Alarm Reset Setpoint.

LAlRSp

Low Alarm Reset Setpoint. This cell programs the point at which the Analog Module deactivates its low alarm output. Low Alarm Reset Setpoint must be set **higher** than the Low Alarm Setpoint (see below). The Analog Module disables the alarm output if the Low Alarm Setpoint is set equal to the Low Alarm Reset Setpoint.

LAlSp

Low Alarm Setpoint. This cell programs the point at which the Analog Module activates its low alarm output.

HFlSp

HFlSp sets the out-of-bounds setpoint. The Analog Module monitors the incoming analog signal and, should it move high and out-of-bounds, the high failure output is activated. The High Failure Setpoint is set in raw count values (i.e., 5050). For a 1-5 VDC input signal, HFlSp is typically set at 5050. Rule of thumb – set HFlSp 50 counts higher than MaxRaw.

HFIRSp

HFIRSp sets the High Fail Reset Setpoint. When the input signal returns to a standard operating range (between a normalized 1000-5000), the high failure alarm output is deactivated. The High Failure Reset Setpoint is set in raw count values (i.e., 5000). For a 1-5 VDC input signal, HFIRSp is typically set at 5000. Rule of thumb – set HFISp equal to MaxRaw.

LFIRSp

LFIRSp sets the Low Fail Reset Setpoint. When the input signal returns to a standard operating range (between a normalized 1000-5000), the low failure alarm output is deactivated. The Low Failure Reset Setpoint is set in raw count values (i.e., 1000). For a 1-5 VDC input signal, LFIRSp is typically set at 1000. Rule of thumb – Set LFIRSp equal to MinRaw.

LFISp

LFISp sets the out-of-bounds setpoint. The Analog Module monitors the incoming analog signal and, should it move low and out-of-bounds, the low failure output is activated. The Low Failure Setpoint is set in raw count values (i.e., 950). For a 1-5 VDC input signal, LFISp is typically set at 950. Rule of thumb – Set LFISp 50 counts lower than MinRaw.

Trip%

Trip% sets the percentage change tolerated before the D620i activates the Trip% output. Trip% sets a tolerance band. As long as the sensed analog signal is within the tolerance, the Analog Module's Trip% output is inactive. When the sensed analog signal goes out of the sensed band, the analog's trip output is set and the tolerance band is readjusted so that it monitors the new analog value. The analog module's trip output can be used by other modules to store an averaged value, set an alarm, etc.

Quell

Quell adjusts a signal damping factor. The D620i's response to a change in the incoming signal is constrained by the value of Quell. The greater the Quell, the smaller the response to changes in the system. The D620i uses the following equation to calculate the size of the step.

Step Size = (MaxEU - MinEU)/Quell Value

Example: MaxEU = 50.0 MinEU = 0.0 Quell = 100.0

Using the above equation, we can calculate a step size of 0.50. For instance, if the incoming process signal were to instantly change from 10.0 to 12.0, the following values would appear on the appropriate Status Display:

Initially - 10.0
After 1st second - 10.5
After 2nd second - 11.0
After 3rd second - 11.5
After 4th second - 12.0

WakeUp

WakeUp sets the value at which the D620i begins operation following power restoration. The D620i can be programmed to automatically load the WakeUp level into the Analog Module after a power outage, phase loss, or lockout/inhibit. WakeUp is typically set so that no alarms are activated and no pumps are called to operate.

ScanRt

This value sets the speed with which the Operating System processes the Analog Module. Typically this value is set at 1 second. However, 1/10th-second processing is also available for unique, tightly controlled, applications.

The D620i scans its on-board analog inputs at least once every second. The Analog Module, however, can process the signal every 1/10th second. In this way, an erratic or fluctuating signal can be smoothed.

Setting the Analog Module's ScanRt to 1/10th second does present a downside – it uses up system resources. If you attempt to enable several analog, ramp, and PID modules, and set all of them to a ScanRt of 1/10th second, you may exceed allowable processing time. The D620i responds to this over allocation of system resources by slowing down. All processes will slow down. The Operating System has an internal monitor point which can be monitored (programming required) and thereby provide an Overrun Alarm. If the Alarm Event sounds frequently, you know that the system is under performing and that you should free up some system resources by setting the analog, PID, ramp, or delay ScanRt characteristics to 1-second operation.

AOT – Analog Out

Analog Output Module allows you to adjust the module's Scan Rate. The Analog Output is typically connected to one of the D620i's internal analog signals and provides a real world output. Typical applications are an analog output for VFD control, output for chart recorders, etc.

PgmLbl

16-character name (e.g., VFD Drive Out).

Form

Not Applicable, Not Selectable.

View, Program, and Enable

View, Program, and Enable have been covered in previous sections.

ScanRt

Analog Output Scan Rate. See the Analog Module for a description of scan rate. Typically, this can simply be set to a scan rate of 1 second.

C800

The term C800 refers to a flow calculation software module developed by U.S. Filter Control Systems for use in the D620 family of controllers.

C800 technology is specifically designed to calculate station flow in a non-overloaded two-pump lift station (a majority of the stations across the USA are a two-pump configuration). The C800 software monitors sump level changes and pump starts/stops. The C800 then uses this information to calculate volume pumped versus time, and thereby generates the flow calculations. For more information on the C800 capabilities, ask for our product bulletin, *Introducing the C800 System: A Higher Degree of Flow Monitoring.*

C800 display screens are supplied as part of the D620i's Function Displays. When the C800 module is enabled, the C800 displays appear as part of the Function Display carousel. When the module is disabled, the C800 displays are automatically removed.

PgmLbl

16-character name (e.g., C800 #1).

Form

Not Applicable, Not Selectable.

View, Program, and Enable

View, Program, and Enable have been covered in previous sections.

Gal/Ft

Sets the linear gallon-per-foot ratio used to calculate the station inflow and pump rates. The wet well must be linear over the pumping range. If the wet well is non-linear, the C800 module's licensed analog input must be pre-processed by a C800 Linearization module.

P1-RTM

P1-RTM shows Pump 1's RTM (Running Time Meter). This field is programmable and can be adjusted to accommodate pre-existing mechanical RTMs.

P1Rate

P1Rate shows the calculated Pump 1 pumping rate. This is the calculated average GPM (Gallons per Minute) rate since start-up (weighted average of 10 samples). P1Rate is programmed in gallons. At the time of start-up, your programmer should preload this value with an estimate of the P1Rate. Therefore, the C800 software automatically varies the value as it monitors system activity.

P1MnRt

Pump 1 Minimum Rate. Anticipated minimum flow rate used for low flow alarm (programmed in gallons).

P1MxRt

Pump 1 Maximum Rate. Anticipated maximum flow rate used for high flow alarm (programmed in gallons).

P2-RTM

Pump 2 RTM. See P1RTM for information.

P2Rate

Pump 2 Rate. See P1Rate for information.

P2MnRt

Pump 2 Minimum Rate. See P1MnRt for information.

P2MxRt

Pump 2 Maximum Rate See P1MxRt for information.

PB-RTM

Pump 1 & 2 simultaneous RTM (Running Time Meter).

Factor

Skewing factor used when both pumps run simultaneously. If both pumps are rated at 1000 GPM when operating independently, their combined operation is less than 2000 GPM. Factor is a percentage figure (operator set) which is used by the C800 to develop an estimate of the combined operation. Factor can be programmed in the range of 0-100%.
Example: 90 represents 90% of P1Rate + P2Rate. C800 then adds P1Rate and P2Rate, multiplies by 0.9, and uses the figure as the estimated flow rate when both pumps operate.

BkFlow

Delay timer to allow for back flow (adjusted in seconds).

AbLow

Abnormal low level (set in feet and tenths). Should the wet well level fall below this setpoint, the calculated data is automatically flagged with an asterisk *, thus indicating that the calculations are based on possibly errant information. The abnormally low level should be set at the point where the wet well gallons/foot become non-linear. Adjusted in feet and hundredths.

Surchg

Surcharge (set in feet and tenths). Should the wet well level rise above this setpoint, the calculated data is automatically flagged with an asterisk *, thus indicating that the calculations are based on possibly errant information. The surcharge level is typically set at a point where the wet well begins backing up into the distribution system (surcharging the system). At that point, the wet well gallons/foot become non-linear. Adjusted in feet and hundredths.

OvFlow

Overflow (set in feet and tenths). Should the wet well level rise to a point at which the media overflows (possibly into a receiving stream), the calculated data is automatically flagged with an asterisk *, thus indicating that the calculations are based on possibly errant information. The overflow level is typically set at a point where the wet well begins flowing into the stream. At that point, the wet well gallons/foot become non-linear. Adjusted in feet and hundredths.

Reset

Allows you to reset some or all of the C800 parameters. **Use this field with caution.**

Date

The date that the C800 information (in part or whole) was reset. If the display shows `Cold` then the information is as current as the last cold start-up.

C800 Linearization

The C800 linearization module is specifically designed to allow the C800 flow characterization module to calculate flow based upon excursions of an **irregularly shaped vessel**. Multiple C800 linearization modules can be combined, if required, in order to accommodate extraordinarily complex vessels. As described above, the C800 module converts the incoming wet well level into gallons based on the C800 module's Gal/Ft characteristic. As long as the wet well has straight walls (is linear), the C800 module can be used independently of the C800 linearization module. If the wet well is irregularly shaped (has sloped sides at the bottom of the wet well or other constrictions in the vessel), the C800 module's input **must be** derived from a C800 linearization module.

The linearization module allows you to break an irregularly shaped vessel into multiple segments, assign a height of each segment and assign the gallons in each segment. If necessary, multiple C800 linearization modules can be chained in order to accommodate more complex vessels.

When using the C800 linearization, the Segment 8 Feet and Segment 8 Gallons **must be** filled in with the maximum value produced by the analog source.

PgmLbl

16-character name (e.g., C800 #1).

Form

Not Applicable, Not Selectable.

View, Program, and Enable

View, Program, and Enable have been covered in previous sections.

Sg0Ft

When a single linearization module is used, the Sg0Ft (Segment 0 Feet) setpoint is set to 0. If multiple C800 linearization modules are chained together, the Sg0Ft value simply follows from the previous module's Sg7Ft setting. (See diagram on previous page.)

Sg0Gal

When a single linearization module is used, the Sg0Gal (Segment 0 Gallons) setpoint is set to 0. If multiple C800 linearization modules are chained together, the Sg0Gal of the higher module simply follows from the previous module's Sg7Gal setting. (See diagram on previous page.)

In the above example, the Sg0Gal value in the first C800 linearization module is set to 0 gallons. The Sg0Gal of the chained (second) C800 linearization module is set to the gallons contained within the boundary defined by Sg7Ft of the first module and Sg0Ft of the second module.

Sg1Ft

The first C800 linearization module contains seven segments defined as follows:

Sg0Ft & Sg1ft - first segment
Sg1Ft & Sg2ft - second segment
Sg2Ft & Sg3ft - third segment
Sg3Ft & Sg4ft - forth segment
Sg4Ft & Sg5ft - fifth segment
Sg5Ft & Sg6ft - sixth segment
Sg6Ft & Sg7ft - seventh segment

As shown in the above example, a single C800 linearization module could not provide sufficient granularity, so a second module was chained to the first. Sg1Ft marks the top of the first segment. Sg1Gal sets the number of gallons between Sg0Ft and Sg1Ft.

Sg1Gal

Sg1Gal sets the number of gallons between Sg1Ft and Sg0Ft.

Sg2Ft (Sg3Ft, Sg4Ft,...Sg7Ft)

Sg2Ft marks the top of the second segment, Sg3Ft marks the top of the third segment, etc.

Sg2Gal (Sg3Gal, Sg4Gal,...Sg7Gal)

Sg2Gal sets the number of gallons between Sg2Ft and Sg1Ft. Sg3Gal sets the number of gallons between Sg3Ft and Sg2Ft, etc.

PrvBlk

If you are calibrating the first C800 linearization module in a series of modules, you find that PrvBlk (Previous Block) is set to 0. There are no previous C800 linearization modules to which the module is connected.

If you are calibrating higher C800 linearization modules you find that PrvBlk points to the previous C800 linearization module. If you disconnect or modify the connection, the linearization algorithm is broken.

NxtBlk

If you are calibrating the first C800 linearization module in a series of modules, you find that NxtBlk (Next Block) is set to the Next Block in the series.

If you are calibrating the highest C800 linearization module, you find that NxtBlk points to 0. There are no Next C800 linearization modules to which the module connects.

If you disconnect or modify the connection, the linearization algorithm is broken.

Delay

The D620i controller includes a set of programmable On/Off delay timers which can be assigned, as required, to meet the demand of the system. The Delay Module is simply a programmable On/Off delay - a software timer. The Delay Module provides programmable timers that delay the activation of other internal processes.

PgmLbl

16-character name (e.g., PwrFail OnDelay, Pump 1 On Dly, etc.).

Form

Not Applicable, Not Selectable.

View, Program, and Enable

View, Program, and Enable have been covered in previous sections.

OnDly

Delay Module timing ranges from 0.1 seconds to 9,999,999.9 seconds (approximately 116 days). In order to take advantage of 1/10th-second timing, the Delay Module's scan rate must be set to 1/10th second. All of the System 2.00 software modules require processing time. The 1/10th-second internal timing provided by the Delay Module may be insignificant compared to the processing time required for other modules (digital inputs and digital outputs are scanned every second). Therefore, a more realistic timing mode may be an adjustable delay, programmed in seconds with a 1-second scan rate. OnDly is a programmable delay with a timing range of 0.1 to 9,999,999.9 seconds.

OffDly

OfFDly is a programmable delay with a timing range of 0.1 to 9,999,999.9 seconds.

Method

Method is a selectable characteristic. Selection possibilities are Reset Timers and Integrating Timers. When set to Reset Timers, the Delay Module begins timing when the input is activated. If the input clears before the timer completes its timing cycle, the timer also clears (resets). When set to Integrating Timers, the Delay Module begins timing when the input is activated. As long as the input is active, the timer begins to increment an internal counter. If the input is deactivated, the timer decrements its internal timer (it does not simply clear the timer as in the Reset mode). Over the course of time, if the input is On for a greater period than it is Off, the timer eventually reaches the end of its timing cycle and the output is activated. When the control input is removed, the timer begins to decrement its internal count. If the input is Off for a greater period than it is On, the timer decrements the internal count to zero and deactivates its output.

ScanRt

ScanRt sets the speed with which the Delay Module is processed. Selection possibilities are 1/10th second or 1 second. If the programmer chooses 1/10th second, the system processes the delay more frequently. It also uses valuable system resources in the process.

DIN – Digital In

The Digital Input Module allows you to set the digital inputs' debounce time and scan rate. As standard, the D620i contains 12 digital inputs. Optional inputs can be connected via the expansion module and CMZ modules (hardware).

PgmLbl

16-character name (e.g., Dry Well Flood, VFD #1 Fault, Comminutor, HighOilLvl, etc.).

Form

Not Applicable, Not Selectable.

View, Program, and Enable

View, Program, and Enable have been covered in previous sections.

Debnce

Debounce timing. The incoming digital signal may be erratic. The debounce time allows the programmer to dampen the signal and use the dampened output. Debounce time ranges from 1 to 999 seconds.

ScanRt

ScanRt sets the speed with which the Digital Input Module is processed. Selection possibilities are 1/10th second or 1 second. If you choose 1/10th second, the system examines the digital input more frequently. In the process, it also uses valuable system resources.

DOT-Digital Out

The Digital Output Module allows you to modify the action (direction) of the digital output.

PgmLbl

16-character name (e.g., Pump 1 Reqd, Common Alarm, etc.).

Form

Not Applicable, Not Selectable.

View, Program, and Enable

View, Program, and Enable have been covered in previous sections.

Action

Selection possibilities are Direct and Inverse. When Direct is selected, the output is active when the source is active. When Inverse is selected, the digital output is active when the source is Inactive.

Event

Most often, the Event Module can be thought of as the alarm module. During the configuration process, the programmer sets up a number of system alarms such as High or Low Level, High or Low Pressure, Signal Failure, etc. The Event Module simply provides a listing of system alarms by reviewing the module's label, and allows a field operator to adjust the contact sense (i.e., you can change a NO input to a NC and vice versa). Alternately, Events can be setup to monitor system status. The programmer may use an Event to monitor the start/stop time of the pump(s).

Alarms are typically shown in the Alarm Display carousel. (This is a feature which must be programmed in the Group Module.) A Status Event is typically shown in the D620i's Historian – a feature supported under the Function Display carousel.

Events are particular occurrences which happen over the course of station operation. Events are simple On/Off, Run/Fail, High/Normal, or Low/Normal occurrences which can range from very important occurrences (e.g., pump failures) to simple reminders of station activity (e.g., Pump #1 Run).

When an Alarm Event occurs (e.g., High Wet Well Level), you may want a message to flash across the D620i's display, a strobe light to flash, and an alarm horn to sound. In order to monitor these alarm points, a single Event Module must be connected to the analog signal which corresponds to the wet well level. Conversely, when an everyday Event occurs (e.g., pump run), you may simply want to keep track of the start and stop times in the D620i's Historian.

Each Event must also be tied to a Group via the Group characteristic. The Group characteristic links the Event to the Group Module so that this, and other similar Event(s) can be treated in a similar manner. The Group Module is discussed in the following section.

PgmLbl

11-character name (e.g., WWell Level, Pressure, Flow, Pump #1, Dry Well, etc.). This label is combined with the On and Off Labels (defined below) to create the 16-character alarm message that appears on the D620i display.

Form

Not Applicable, Not Selectable.

View, Program, and Enable

View, Program, and Enable have been covered in previous sections.

OnLbl

OnLbl is a 4-character field which the D620i automatically combines with the 11-character Label (see above) to generate the complete 16-character alarm message. OnLbl indicates the On condition of the Event.

PgmLbl	*OnLbl*	*Alarm Message*	
WWell Level	High	WWell Level High	High Wet Well Level
Pressure	Low	Pressure Low	Low System Pressure
Flow	High	Flow High	High System Flow
Pump #1	Fail	Pump #1 Fail	Pump #1 Failed
Dry Well	Fld	Dry Well Fld	Dry Well Flooded

OffLbl

OffLbl is a 4-character field which the D620i automatically combines with the 11-character Label (see above) to generate the complete 16-character alarm message. OffLbl indicates the Off condition of the Event. The On and Off state of the Events can be stored in the D620i's system memory. The Event history can be viewed by moving to the Function Displays, finding Historian, and navigating to the appropriate Alarm or Status Group. (The Groups are displayed by Group name.)

PgmLbl	*OnLbl*	*Alarm Message*	
WWell Level	Nrml	WWell Level Nrml	Wet Well Level Normal
Pressure	Nrml	Pressure Nrml	System Pressure Normal
Flow	Nrml	Flow Nrml	System Flow Normal
Pump #1	Nrml	Pump #1 Nrml	Pump #1 Normal
Dry Well	Nrml	Dry Well Nrml	Dry Well Normal

Sense

Sense is a selectable characteristic. Selection possibilities are Direct and Inverse. Sense allows you to invert the sense of the input.

As programmed, the operation of the Event Module may be inverted. To change the Sense, simply move to the appropriate Event Module, press ENTER to move the cursor to the lower line, and press UP or DOWN to toggle between the selections (Direct and Inverse).

Group

Group is a selectable characteristic. Selection possibilities include one of the system's Group Modules.

Several key alarm handling sequences are missing from the Event Module. The most basic question would be, *Is this an alarm event or a status event?* For example, is the station flooded or was it that a pump just started? Other questions may be: *Should this alarm be printed? Is this an automatically or manually reset alarm? Should the D620i automatically show the alarm or should you have to navigate to the alarm group when an alarm is annunciated?*

Since many Event Modules can be handled in similar ways, we developed Groups. Each Event Module references a specific Group. If you jump ahead briefly to the Group Module description (the next module following Events), you will see that the Group Module contains a number of characteristics which specify the manner in which the alarms and events are to be handled. Rather than placing all of that information into each of the Event Modules, we simply refer to the desired group by means of this reference. When an event is activated, it automatically references the associated Group's alarm display characteristics and acts accordingly. The Group characteristic links a particular Event to a specified Group. In this way, all related Events will be treated identically by the Group Module. you can select the desired Group by moving to the Event's Group characteristic and selecting the Group from the Group listing.

Seqnce

Seqnce is a selectable characteristic. Selection possibilities are Auto Reset, Manual Reset, and Auto Acknowledge.

When Auto Reset is selected, the Event must be manually acknowledged. When the alarm condition clears, however, the Event Module automatically resets. Your acknowledgment simply silences the audible alarm. The Auto Reset means that the Event Module is automatically re-armed and prepared for subsequent alarms.

When Manual Reset is selected, the event must be manually acknowledged **and**, when the alarm condition clears, you must **manually reset** the alarm. When Manual Reset is selected and the alarm clears, the Event Module replaces the D620i's 16 character alarm message with a toggling message which states that the alarm has cleared. You reset the alarm by navigating to the D620i's Alarm Display carousel, finding the respective alarm (now showing the word `Clear` in the upper left corner), and then pressing ENTER to reset/clear the alarm message.

When Auto Acknowledge is selected, as long as the alarm condition persists, the alarm message appears. Additionally, the audible alarm sounds if the Group's Snalrt characteristic is enabled. You can press the ACK button to silence the alarm. If the alarm is sounding and alarm condition clears, the Event Module automatically acknowledges the alarm and resets its output.

Group

A Group allows a collection of Events to be treated in a single, consistent manner. Each Event Module could contain the various characteristics shown in the Group Module. More likely, however, several of the Events will be grouped together as Alarms or Status Events. In some installations, the alarms may be grouped by RTU number (e.g., all alarms from RTU1 operate as defined in Group 1).

The Group Module allows you to set up a set of operating characteristics for every Event Module which refers to that specific Group. Typical uses for Group Modules include:

- Define characteristics for all associated Pump Running Status Events.
- Define characteristics for all associated Pump Station Alarm Events.
- Define characteristics for all associated Communication Failure Events.

This treatment of Events can range from simply printing a message on a printer or chirping the D620i's sonalert to displaying an alarm message on the display screen or calling a central computer. The main characteristic of a Group is that all associated Events are treated in a consistent manner.

The Group Module works in conjunction with the Event Module to specify the manner in which the Event Module handles and manipulates alarms and status information.

PgmLbl

16-character name (e.g., Station Alarms, Station Status, etc.).

Form

Not Applicable, Not Selectable.

View and Program

View and Program are covered in previous sections.

Alarm?

Alarm is a selectable characteristic. Possibilities are Yes and No. When Yes is selected, the associated Events are grouped as Alarms (the alternate is simply a status group). When a Group is identified as an Alarm Group, each associated Event is then treated as an Alarm Event. This means that when the Event is activated, the D620i automatically flags the event as an alarm. The Operating System then examines the other alarm characteristics (below) and acts accordingly. If the Alarm? characteristic is set to No, then the Group's alarm characteristics (sonalert, horn, etc.) are ignored.

Commn?

Commn? is a selectable characteristic. Possibilities are Yes and No.

Yes – When an event occurs, the respective Event's Common output is activated. The Event Module's Common output is an Operating System resource (you cannot connect directly to the Event Module's Common output).

No – When an event occurs, the respective Event's Common output is not affected.

Snlrt?

Snlrt? (Sonalert) is a selectable characteristic. Possibilities are Yes and No.

Yes – When an event occurs, the respective Event's Sonalert output is activated.

No – When an event occurs, the respective Event's Sonalert output is not affected.

Horn?

Horn? is a selectable characteristic. Possibilities are Yes and No.

Yes – When an event occurs, the respective Event's Horn output is activated.

No – When an event occurs, the respective Event's Horn output is not affected.

Dsply?

Display? is a selectable characteristic. Possibilities are Yes and No. Display is only active if the Group's Alrm? characteristic is set to Yes (see above).

Yes – When an alarm occurs, the respective Event's Label and OnLbl appear on the D620i as an alarm. You can view the alarm by returning to the HOME Screen, pressing UP, and pressing ENTER. Thereafter, by simply scrolling through the alarm structure, you can review all alarms.

No – When an alarm occurs, the respective Event's Label and OnLbl **do not** appear on the D620i.

Print?

Print? is a selectable characteristic. Possibilities are Yes and No.

When Yes is selected, the D620i stores the respective Event in its random access memory and places a print suffix at the end of the message. The Operating System is continually scanning the storage area. The Operating System recognizes the print suffix and sets out to print the Event (using the OnCol and OnArt as defined below). After the Operating System has completed the printing process, the Operating System removes the print suffix.

When No is selected, the D620i stores the respective Event in its internal storage area. The alarm message does not have the appended print suffix. Therefore, the Operating System does not print the alarm. Print is a future capability which is not fully supported at this time.

Call?

Call? is a selectable characteristic. Possibilities are Yes and No.

When Yes is selected, the D620i stores the respective Event in its memory and places a print suffix at the end of the message. The Operating System is continually scanning the storage area. The Operating System recognizes the print suffix and sets out to print the Event (using the OnCol and OnArt as defined below). After the Operating System has completed the printing process, the Operating System removes the print suffix. Call? is a future capability which is not fully supported at this time.

Retro?

Retro? is a selectable characteristic. Possibilities are Yes and No.

When Yes is selected, the D620i stores the respective Event in its memory and places a retro suffix at the end of the message. Retro is typically used in SCADA systems. In such systems, when using a POTS (Plain Old Telephone System), the Central Terminal Unit (CTU) can call a remote and download the retro memory.

When No is selected, the D620i does not append the Retro suffix. Therefore, should the CTU call the remote unit, the Event would not be passed to the central. Retro is a future capability which is not fully supported at this time.

Hstry?

Hstry? is a selectable characteristic. Possibilities are Yes and No.

When Yes is selected, the D620i stores the respective Event in its memory and places a History suffix at the end of the message. You can view historical events (events which reference a Group in which Hstry? is enabled). The following steps allow you to view the Historian.

1. Return to the status displays.
2. Press FUNC.
3. Press DOWN.
4. Locate the display which states `<ENTER> to view Historian`.
5. Press ENTER.
6. Press DOWN to find the desired Group.
7. Press ENTER to move into the Group.
8. Press DOWN or UP to view the historical information.

When No is selected, the D620i does not append the History suffix.

Scrn?

Screen is a selectable characteristic. Possibilities are Remain at Current and Jump to Alarms. These two selections control the manner in which the D620i responds to Alarm Events.

If Remain at Current is selected and an alarm occurs, the D620i **does not** jump to the Alarm Displays. (Note: If the Snlrt? characteristic is set to Yes, the alarm generates an audible output but the screen remains at the current display.)

If Jump to Alarms is selected and an alarm occurs, the D620i automatically jumps from the current Status Display to the alarm screen. (If you are in the Function or Configuration Displays, the D620i **does not** jump to the alarm screens.)

OnClor

OnClor sets the color that the printer uses when printing the alarm message. This color is used when the alarm is activated. Possibilities include green, red, and black. Printer support is a future capability which is not available in System 2.xx.

OnAttr

OnAttr sets the characteristic that the printer uses when printing the alarm message. This color is used when the alarm is activated. Possibilities include double high, standard, narrow, and bold. Printer support is a future capability which is not available in System 2.xx.

OffClor

OffClor sets the color that the printer uses when printing the return to normal message. This color is used when the alarm is deactivated. Possibilities include green, red, and black. Printer support is a future capability which is not available in System 2.xx.

OfAttr

OffAttr sets the characteristic that the printer uses when printing the return to normal message. This color is used when the alarm is deactivated. Possibilities include double high, standard, narrow, and bold. Printer support is a future capability which is not available in System 2.xx.

Intrusion

The Intrusion Module provides a station security feature with operator log in (log-in numbers which are different than the access codes). When the Intrusion Module is enabled, and the controller is programmed with appropriate Alarm Events, a Door-Open alarm is generated when the station's door is opened. After a short, programmable time delay, the intrusion alarm is activated. You can prohibit the intrusion alarm by entering in the appropriate log-in code. Alternately, you can enter one of the four access (programming) codes. They are equally valid log-in codes.

You log in as follows:

1. Press CLEAR to return to the Status Displays.
2. Press FUNC to move to the Function Displays.
3. The log-in screen appears as the first display.
4. Use RIGHT to move the cursor to the word Login. `Login` begins to flash. Confirm the selection by pressing ENTER. The screen immediately changes to `Enter LOGIN Code`.
5. Press in the appropriate code and then press ENTER to confirm the code. If the code is correct, a pop-up screen appears briefly and identifies the log-in level (e.g., simply logged-in, Access Level 1, Access

Level 2, Access Level 3, or Access Level 4). Once logged in, you can open and close the door without concern of re-tripping the alarm.

You must log out when exiting the station. To log out, return to the Function Displays. Move the cursor to the Logout position and press ENTER. You must exit the station before the log-out time expires. The log-out time is adjustable (see below). Should you remain in the station too long, the intrusion circuitry will be enabled and the alarm will sound when you exit the station. To clear the alarm, you must return to the station, log in, and then log out.

PgmLbl

16-character field (e.g., Station Intrusion).

Form

Not Applicable, Not Selectable.

View, Program, and Enable

View, Program, and Enable have been covered in previous sections.

Delay

Delay sets the entry and exit time delay. Entry time is the time between the door opening and the generation of the intrusion alarm. Exit time is the time period between your log-out command and the rearming of the intrusion module. Delay is programmed in seconds.

Code

Code is the log-in code. This code is limited to eight digits in length. Code can only be viewed by a supervisory-level programmer (i.e., operators with the highest access level). Code can be changed in the field. Code **must be** different than any of the four access codes.

Sense

Sense is a selectable field. The two selections are Open = Alarm and Closed = Alarm. Sense allows you to change the operation of the intrusion module to accommodate either a Normally Open or Normally Closed switch.

Logic

The Logic Module accepts four discrete (On/Off) inputs and provides ten outputs. The outputs are AND, NAND, OR, NOR, EXOR, NEXOR, Q, NotQ, Any 2, and Any 3.

The Logic Module accepts four digital (On/Off) inputs and generates a number of logical (Boolean) outputs. The Logic Module is connected to provide the unique functionality often required in custom control systems. This module is provided so that you can gain an awareness of the underlying control logic. You cannot use the D620i keyboard to make changes to the control strategy.

PgmLbl

16-character field (e.g., Pump Inhibit).

Form

Not Applicable, Not Selectable.

View, Program, and Enable

View, Program, and Enable have been covered in previous sections.

Math

The Math/Weir module provides two distinctly different functions. When the modules Form is set to Math, it is programmed to perform standard math functions on analog values. When the Form is set to Weir, the module is programmed to convert an analog input into a GPM output based on one of several standard weir/flume equations.

Typical Math functions include SIN, COS, TAN, Power, Square Root, Multiply, Divide, Add, Subtract, etc. When used as a Math Module, the module accepts up to two analog inputs and provides a single analog output. You have the ability to modify one of the analog values – the Alternate B Value. The Alternate B Value should only be changed if it is a non-zero number. If the Alternate B Value is programmed as 0, the Math Module is internally referencing an internal (non-viewable) number. In such cases, changing the Alternate B Value to a non-zero value causes the Math Module to disregard the internal number and pick up the Alternate B Value.

If Alternate B is set to 0 (zero), the Math Module automatically uses the two internal (non-viewable) analog input sources and provides the appropriate output. If Alternate B is a non-zero value, the Math Module ignores the Input B Source and uses the Alternate B value. The Math Module then provides the programmed output based on the selected Form and operator. The percent characteristic provides a window of acceptability for the A=B, A>B, A<B...outputs.

When Form is set to Weir/Flume, the module is configured to calculate flow rates (GPM) for a number of standard Weirs and/or Flumes.

PgmLbl

16-character field which is viewable at the D620i display.

Form

The Math Module supports two Forms as described above. The two Forms are Math and Weir.

View, Program, and Enable

View, Program, and Enable have been covered in previous sections.

Value

If Value is set to 0 (zero), the Math Module uses its B analog input (internal) as the second variable in the equation. If Value is non-zero then the number which has been programmed into Value becomes the second element in the equation. For a better understanding of the operation of the Value characteristic, see the examples which appear at the end of the Math Module section.

The Math Module uses the second analog **only if** the Value characteristic is programmed to 0. If Value is set to any non-zero number (positive or negative) then this second analog input is ignored.

Opertr

When used as a Math Module (i.e., Form is set to Math), the following operators (comparisons and equations) are available:

Output = A + B	Output = ARC-SIN of A
Output = A - B	Output = ARC-COS of A
Output = A * B	Output = ARC-TAN of A
Output = A / B	Output = Hyperbolic SIN of A
Output = The greater of A or B	Output = Hyperbolic COS of A
Output = The lesser of A or B	Output = Hyperbolic TAN of A
Output = The absolute value of A	Output = Ln of A (Natural Log)
Output = A raised to the power B	Output = LOG of A (Base 10)
Output = Square Root of A	Output = e raised to the power of A
Output = SIN of A	Output = Hyperbolic of A
Output = COS of A	Output = A times (2 raised to B) $(A*2^{B})$
Output = TAN of A	Output = (A+B)/2

When used as a Weir/Flume Module (i.e., the Form is set to Weir/Flume), the following Weirs and Flumes are supported:

Weir/Flume Type	*Equation*
Cipoletti	$CFS=3.367*AltB*A\wedge^{3/2}$
Parshall 1 Inch	$CFS=0.338*A\wedge^{1.55}$
Parshall 2 Inch	$CFS=0.676*A\wedge^{1.55}$
Parshall 3 Inch	$CFS=0.992*A\wedge^{1.547}$
Parshall 6 Inch	$CFS=2.06*A\wedge^{1.58}$
Parshall 9 Inch	$CFS=3.07*A\wedge^{1.53}$
Parshall 12 Inch	$CFS=4.00*A\wedge^{1.522}$
Parshall 18 Inch	$CFS=6.00*A\wedge^{1.538}$
Parshall 24 Inch	$CFS=8.00*A\wedge^{1.550}$
Parshall 36 Inch	$CFS=12.xx*A\wedge^{1.566}$
Parshall 48 Inch	$CFS=16.00*A\wedge^{1.578}$
Pshall 1-8' Sp	$CFS=4*AltB*A\wedge^{(1.522*B\wedge 0.026)}$
Pshall 10-50' Sp	$CFS=3.6875*AltB*A\wedge^{1.6}$
Rectngl, Constrctd	$CFS=3.33(AltB-0.2*A)*A\wedge^{3/2}$
Rectngl, Open	$CFS=3.33*AltB*A\wedge^{3/2}$
V-Notch 22.5 deg	$CFS=0.4971*A\wedge^{5/2}$
V-Notch 30 deg	$CFS=0.665*A\wedge^{5/2}$
V-Notch 45 deg	$CFS=1.035*A\wedge^{5/2}$
V-Notch 60 deg	$CFS=1.432*A\wedge^{5/2}$
V-Notch 90 deg	$CFS=2.481*A\wedge^{5/2}$
V-Notch 120 deg	$CFS=4.329*A\wedge^{5/2}$
V-Notch Custom	$CFS=2.4818*\tan(AltB/2)*A\wedge^{5/2}$

In the above Weir/Flume equations, the Math/Weir Module's A input represents height in feet. Where appropriate, the Alternate B Value represents the Weir's width. Only the Cipoletti and Rectangular weirs require a width input. The B value can be derived from either the

Math/Weir module's Alternate B Value (i.e., set the width in feet) or from a Number Module – and thus can be adjusted on a Status Display (if programmed).

Rectngl, Constricted is a rectangular weir with end constrictions. Rectngl, Open is a rectangular weir without end constrictions.

Percnt

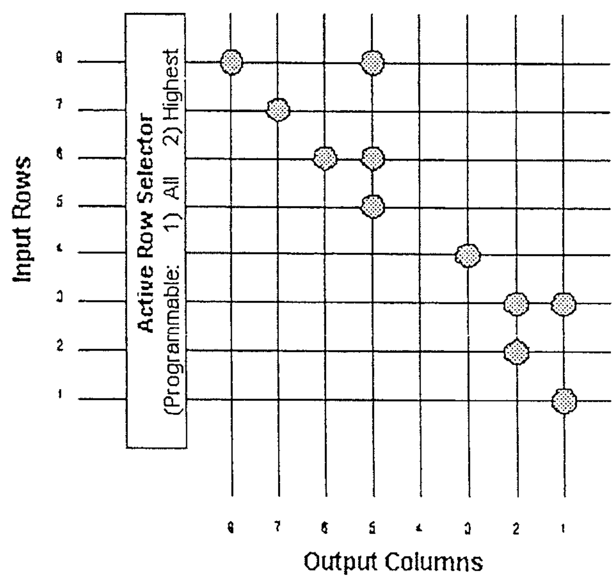
The Math Module has several comparison outputs such as A=B, A<B, A>B, etc. It is rare that A would exactly equal B. There may be, however, an allowance factor such that if A is relatively close to B, it is deemed as being equal to B.

Percnt sets an allowable gap. If Percnt = 10 (i.e., 10 percent), then when A = B +/- 10% of B, the output is active. When A is not within those bounds, the output is deactivated.

Again, Percnt specifies a percentage of B. For example, if B is a dynamic variable ranging from 1-100 and Percnt is 10, then 10% of 0 is 0 and 10% of 100 is 10. So if the module is comparing A and B and finds that A is approximately equal to B, the window of approximation grows and shrinks as B rises and falls.

Matrix

The Matrix Module provides a way to program a single-stage input to one or several outputs. Matrices are typically used in pump control (with several pumps of varying capacities) or telephone dialer applications.



Example: The columns may represent well pumps with varying outputs. The rows represent increasing levels of demand. As successive rows are activated, additional pumping capacity is called into service. Simply stated, the Matrix is a 16 x 16 pegboard and you have the ability to connect the inputs (rows) to the outputs (columns) by inserting a peg at the appropriate intersection.

PgmLbl

16-character name (e.g., Well Field #1, Alarm dialer, etc.).

View, Program, and Enable

View, Program, and Enable have been covered in previous sections.

Row 1

Connections of rows to columns are made in the programming mode. A connection is made by displaying the appropriate column number(s). If the number is shown, a connection is made between the respective row (in this case Row #1) and the column which appears in the display. If a dash is shown, the row does not connect to the column.

Example: Connecting Row 1 to Columns 1 and 2.

1. Use DOWN or UP to locate Row 1 in the list of Matrix Characteristics.
2. Move the box cursor to the first ordinal position using LEFT or RIGHT.
3. Toggle the column number 1 On and Off using DOWN or UP. (Before you move on, be sure the digit "1" is displayed.)
4. Move the cursor to the second ordinal position and again use UP and DOWN to toggle the digit "2" into the display.
5. Ensure that all other numbers (i.e., 3-16) do not appear in the display.
6. Press ENTER to confirm.

The D620i's screen appears as follows:

```
Matrix 1  Row 1
12--------------
```

In this example, Row 1 is connected to Columns 1 and 2. Therefore, when Row 1's input is activated, Columns 1 and 2 are activated.

Row 2

```
Matrix 1  Row 2
-23-------------
```

In this example, Row 2 is connected to Columns 2 and 3. Therefore, when Row 2's input is activated, Columns 2 and 3 are activated.

Row 3

```
Matrix 1  Row 3
---4------------
```

In this example, Row 3 is connected to Column 4. Therefore, when Row 3's input is activated, Column 4 is activated.

Rows 4 through 16

Refer to the above examples.

Control

Input control is a selectable characteristic. Input control allows you to either let all rows pass through the alternator or simply allow the highest row to pass.

MaxRow

MaxRow limits the number of rows displayed on the D620i display. Hiding the rows does not inhibit their operation. This field is provided so that you may hide any unused rows.

MaxCol

MaxCol limits the number of columns displayed on the D620i display. Hiding the columns does not inhibit their operation. This field is provided so that you may hide any unused columns.

MUX

The MUX (Multiplex Module) is simply a programmable switch. It is capable of switching either analog or digital signals.

PgmLbl

16-character name (e.g., Ramp MUX).

View, Program, and Enable

View, Program, and Enable have been covered in previous sections.

PrvMUX

Multiplexers can be chained. If this is the first (i.e., lowest) MUX in the series, then PrvMUX is programmed to 0. Otherwise, the value is that of the next lower MUX. This field is provided for reference only. Once programmed, this value should not be changed.

NxtMUX

As noted above, multiplexers can be chained. If this is the last (i.e., highest) MUX in the series, then NxtMUX is programmed to 0. Otherwise, the value is that of the next higher MUX. This field is provided for reference only. Once programmed, this value should not be changed.

Numbers

The Numbers Module offers a convenient location to store numbers which can be used in numeric calculations – such as PID remote setpoints. System 2.xx supports numerous Number Modules.

When a Number Module's value is shown on the D620i display, you have the ability to change the value. To change the value, move to the respective Status Display and press ENTER. The screen changes to show the current value and simultaneously shows the new value. Simply enter the new value and confirm the value by pressing ENTER. If no change is required, press CLEAR to return to the Status Display.

PgmLbl

16-character name (e.g., PID Setpoint #1).

View, Program, and Enable

View, Program, and Enable have been covered in previous sections.

Value

When initially programmed, Value holds a numeric value. The value can be changed by moving to the Number Module, finding the desired number (i.e., examine the labels to find the desired Number Module), and then changing the Value characteristic. If the Value appears as part of the Status Displays, you can change the value simply by moving to the respective Status Display, pressing ENTER, and pressing in the desired change.

PID

Important Note – Setpoint Adjustment. The local and remote setpoints are not part of the module. You will not find a characteristic for either setpoint in the following PID characteristic listing. Typically, the local setpoint is contained in a Numbers Module (previously described in this manual). The remote setpoint may come from one of several sources. Read your default sheets to determine the source for your local and remote setpoints.

PID (**P**roportional, **I**ntegral, and **D**erivative). PID refers to a control method in which the controller's output is proportional to the error (Proportional), its time history (Integral/Reset), and the rate at which the error is changing (Derivative).

A PID controller calculates the error as the difference between the current process setting and the desired value (i.e., the process setpoint). A large error indicates that the process is substantially off of the desired setpoint. Based on the programmed setpoints, the controller reacts to fluctuations in the error by increasing control output in an effort to minimize the error.

The D620i supports both analog and floating control outputs. The analog output is typically used to position proportional valves or control the speed of variable-frequency drives (VFDs). The PID module's floating control output provides open and closed contacts (i.e., outputs). These outputs are used when the controlled actuator must be pulsed or driven to a new position – as in a simple gate valve control (open-hold-close) or a furnace or oven (heat-hold).

Similar to other PID controllers, the D620i's PID module provides adjustability of the Proportional, Integral, and Derivative parameters. Additionally, U.S. Filter Control Systems provides several other parameters as detailed below.

Proportional. You use the Proportional characteristic to set a relationship which determines the controller's change in output based on a change in input. The Proportional (P) characteristic determines the controller's gain where Gain = 100%/Proportional Characteristic. Therefore, a low P value sets high gain and a very responsive, possibly hyper responsive, system. Additionally, a high P value sets a low gain and therefore more tolerant, or possibly sluggish, system. Typically, PID controllers take advantage of both the P and I functions to obtain correct, steady-state operation.

Examples of Proportional settings:

- A Proportional value of 200 sets a Gain of 100/200 or simply a gain of 1/2. Therefore, an input which is 10% greater or less than the desired setpoint causes a 5% error.
- A Proportional value of 100 sets a Gain of 100/100 or simply a gain of 1. Therefore, an input which is 10% greater or less than the desired setpoint causes a 10% error.
- A Proportional value of 50 sets a Gain of 100/50 or simply a gain of 2. Therefore, an input which is 10% greater or less than the desired setpoint causes a 20% error.

Integral. Integral is the number of resets or adjustments per minute. This is like integration, with the integral value adjusting the slope or rate of change. The controller output will change an amount determined by the proportional setting over the integration period.

Example: If the Proportional value is set at 200 and the deviation is 10%, then with an Integral value of 10, the output of the controller would change by 5% over a period of 6 seconds.

Derivative. Derivative is a value that is a factor in the calculation of the output of the controller. It uses the rate at which the process variable is approaching or departing from the setpoint value and attempts to compensate for the process response rate to minimize any overshoot when the setpoint is reached.

Label

The label is a 16-character descriptive name which defines the PID's function (e.g., Pressure Control).

Form

The Form characteristic can be viewed by operators to whom the system administrator has granted the highest security level. The PID module supports three forms:

Analog. The PID module provides an analog output which is continually updated in response to fluctuations in the process variable.

Analog w/DeadBnd. The PID module provides an analog output which is updated when the process variable exceeds an allowable dead band range (see Dead Band as defined on page 58).

Digital w/DeadBd. The PID module provides digital outputs (open and closed) which are updated when the process variable exceeds an allowable dead band range (see dead band as defined on page 58).

Example: When the PID module is used to provide an analog signal to a control element, such as a proportional valve, it may make sense to change the selection from Analog to Analog w/DeadBnd and vice versa. When the PID module controls a control element which requires a three-state floating control (i.e., open-hold-close), the only sensible option is Digital w/DeadBd. Make sure to understand your process and the PID module's function before changing the module's Form to one other than that provided by the factory.

View, Program, and Enable

View, Program, and Enable have been covered in previous sections.

OutHLm

OutHLm (Output High Limit) defines the PID module's maximum allowable high output. Since the PID generates a percentage output ranging from 0.00 to 100.00, the obvious maximum output high limit is 100.00%.

You may be controlling a process, such as a VFD (Variable Frequency Drive), where the system's maximum acceptable pressure would be exceeded if the VFD's speed was allowed to rise above 87.50%. Therefore, the PID module's OutHLm should be set to 87.50%. Thereafter, the PID module regulates the output from the maximum allowable setpoint defined here to the minimum allowable output, OuOutLLm (Output Low Limit described next).

OutLLm

OutLLm (Output Low Limit) is used to define the PID block's minimum allowable low output. Since the PID generates a percentage output ranging from 0.00 to 100.00, the obvious minimum output low limit is 0.00%.

You may be controlling a process, such as a VFD (Variable Frequency Drive application) where the VFD would not be able to support the system's minimum acceptable flow if its speed was allowed to drop below 50.80%. Therefore, the PID module's OutLLm should be set to 50.80%. Thereafter, the PID module regulates the output from the maximum allowable setpoint defined by OutHLm (described above) to the minimum allowable output, OutLLm.

SpHLm

This characteristic defines the upper limit of an allowable setpoint range (i.e., the desired maximum process variable setpoint). The PID module accepts Engineering Unit inputs ranging from 0.00 to 99,999.99 EU. Therefore, the SpHLm (Setpoint High Limit) characteristic can accept a number anywhere within that range.

SpHLm affects both the local and remote setpoints. Additionally, there is no visual indication that clamping has occurred. You must be aware of the possibility of clamping and adjust the setpoint accordingly.

You may be controlling a process which requires a nominal setpoint of 160 PSI. Additionally, the system may be damaged if the setpoint was adjusted to a level greater than 200 PSI. You set the desired process setpoint via the Numbers Module. However, this characteristic allows you to set the **maximum** allowable setpoint (SpHLm) to 200.00. Thereafter, should an external setpoint source be programmed to a setting which is higher than 200.00 PSI, the PID module automatically clamps the process setpoint to SpHLm, or in this example, 200.00.

SpLLm

This characteristic defines the lower limit of an allowable setpoint range. The PID module accepts Engineering Unit inputs ranging from 0.00 to 99,999.99 EU. Therefore, the SpLLm (Setpoint Low Limit) characteristic can accept a number anywhere within that range.

SpLLm affects both the local and remote setpoints. Additionally, there is no visual indication that clamping has occurred. You must be aware of the possibility of clamping and adjust the setpoint accordingly.

You may be controlling a process, which requires a minimum setpoint of at least 50 PSI. Additionally, the process may be disturbed if the setpoint was adjusted to a level which is less than 50 PSI. You set the desired process setpoint via the Numbers Module. However, this characteristic allows you to set the **minimum** allowable setpoint (SpLLm) to 50.00. Thereafter, should an external setpoint source be programmed to a setting which is lower than 50.00 PSI, the PID module automatically clamps the process setpoint to SpHLm, or in this example, 50.00.

HAISp

High Alarm Setpoint – set in percent and tenths (i.e., XXX.X%).

The PID's output ranges from 0.00% to 100.00%. The PID module's discrete High Alarm output is activated when the analog output exceeds the High Alarm Setpoint defined by this characteristic. The discrete High Alarm output remains active until the analog output falls below the High Alarm Reset Setpoint (HAIRSp, defined below).

In order to take advantage of the D620i's alarm annunciation capabilities, any of the module's alarm outputs must be connected to Event Modules. Once the Event Module is connected to the PID module's output (and the particular Event is configured correctly), when the alarm occurs, the D620i automatically annunciates the alarm. If the PID module's alarm output is not connected to an Event Module, an alarm is not activated when the PID's alarm output is activated.

HAIRSp

High Alarm Reset Setpoint – set in percent and tenths (i.e., XXX.X%).

The PID's output ranges from 0.00% to 100.00%. The PID module's discrete High Alarm output is deactivated when the analog output falls below the High Alarm Reset Setpoint defined by this characteristic. The discrete High Alarm output remains inactive until the analog output rises above the High Alarm Setpoint (HAISp, defined above).

In order to take advantage of the D620i's alarm annunciation capabilities, any of the module's alarm outputs must be connected to Event Modules. Once the Event Module is connected to the PID module's output (and the particular Event is configured correctly), when the alarm occurs, the D620i automatically annunciates the alarm. If the PID module's alarm output is not connected to an Event Module, an alarm is not activated when the PID's alarm output is activated.

LAIRSp

Low Alarm Reset Setpoint – set in percent and tenths(i.e., XXX.X%).

The PID's output ranges from 0.00% to 100.00%. The PID module's discrete Low Alarm output is deactivated when the analog output rises above the Low Alarm Reset Setpoint defined by this characteristic. The discrete Low Alarm output remains active until the analog output rises above the Low Alarm Reset Setpoint.

In order to take advantage of the D620i's alarm annunciation capabilities, any of the module's alarm outputs must be connected to Event Modules. Once the Event Module is connected to the PID module's output (and the particular Event is configured correctly), when the alarm occurs, the D620i automatically annunciates the alarm. If the PID module's alarm output is not connected to an Event Module, an alarm is not activated when the PID's alarm output is activated.

LAISp

Low Alarm Setpoint – set in percent and tenths (i.e., XXX.X%).

The PID's output ranges from 0.00% to 100.00% The PID module's discrete Low Alarm output is activated when the analog output falls below the Low Alarm Setpoint defined by this characteristic. The discrete Low Alarm output remains active until the analog output rises above the Low Alarm Reset Setpoint (LAIRSp, defined above).

DAISp

Deviation Alarm Setpoint – set in Engineering Units.

The Deviation Alarm is activated when the process variable exceeds the process setpoint, positively or negatively.

Example: Assume that the process setpoint is 150 PSI, the deviation alarm is 15 PSI, and the deviation alarm reset setpoint is 10 PSI. On a rising level, the deviation alarm is activated when the process variable rises above 165 PSI. The deviation alarm resets when the process variable falls below 160 PSI. Additionally, on a falling level, the deviation alarm is activated when the process variable falls below 135 PSI. The deviation alarm resets when the process variable rises above 140 PSI.

DAIRSp

Deviation Alarm Reset Setpoint – set in Engineering Units.

Refer to DAISp above for an explanation and example of the interaction of the Deviation Alarm Setpoint and Reset Setpoint.

Wakeup

Wake-up Level – set in percent and tenths (i.e., XXX.X%).

At system startup, the block will initially output this value until the true input is received and the corresponding output is calculated.

Action

Action Normal or Reverse.

This field determines the direction of the output relative to the input. Two possibilities exist – Reverse and Direct. If Reverse is chosen, the output will rise as the input falls (and vice versa). Using Direct will cause the output to rise and fall with the input.

PBand

Proportional Band (P).

The Proportional Band field is used to calculate the gain which is to be applied to the input signal. Gain is equal to 100 divided by the Proportional Band. For example, if the Proportional Band is set at 100, the gain is then equal to 1 (assuming no integral or derivative constants are being applied). In this case, if the Action field were set to Direct, a 100 mV increase in the input would result in a 100 mV increase in the error. If the Proportional Band were set to 50 in the above example, the gain would be 2 and the error would rise 2 mV for each 1 mV increase in the input.

The Proportional characteristic can range from 1 to 999,99.9. The PID's Gain = %Error/Proportional.

Intgrl

Integral (Reset).

The Integral Constant specifies how many resets per minute are to be applied to the integration. Used without the Derivative Constant, it will cause the output value to fluctuate above and below the setpoint in response to a change in input – the fluctuations gradually diminishing until equilibrium is reached. The larger the constant, the more quickly the equilibrium will be reached.

Deriv

Derivative (D).

The Derivative Constant causes the integration process to respond to error more quickly than the Integral Constant and brings the system to equilibrium more quickly.

Bias

Bias or Offset (This characteristic is for U.S. Filter Control Systems use.)

This field allows you to apply a manual (fixed) bias to the output signal instead of using a calculated integral term. Note: This menu option is available only if the Integral field (Intgrl) is set to zero. If Integral is not set to zero, this characteristic is hidden. **If and when Integral is set to zero, ensure that this characteristic is set to zero.**

PreCmp

Pre-Compensation (a.k.a. Look Ahead).

Pre-Compensation is a method used by U.S. Filter Control Systems to compensate for timing delays in a SCADA (Supervisory Control And Data Acquisition) systems. If communication delays are significant, Pre-Compensation can help anticipate changes in the input and start to correct for them. The value entered in this field is in seconds.

DeadBd

Dead Band or Hystersis – set in percent from 0.0 to 100.0.

Dead Band works in conjunction with two of the three Forms (defined on page 53). When the appropriate Form is selected, Dead Band is used to set an area of inactivity around the process setpoint. As long as the process variable is within the dead area, the PID module's output is unchanged. Should the process variable deviate outside of the dead area, the PID calculates the appropriate change and updates its output. The Dead Band percentage is based on one of the PID's non-viewable inputs called MaxAna (Maximum Analog). Typically, MaxAna points to the MaxEU (i.e., Maximum Engineering Units) of an associated Analog Module. It may, however, point to the current process variable, process setpoint, or any other analog number. Refer to the notes provided with the PID module's description to determine the origin of the DeadBd's reference value.

Example:

1. The PID module is controlling a ball valve which requires both Open and Closed inputs.
2. The PID module's Form is set to Digital w/DeadBd (Digital with Dead Band).
3. The PID module references an Analog Module for the process information.
4. The system's maximum flow rate, which is set by the Analog Module, is 5000 GPM.
5. The PID module's Dead Band is set at 10%.
6. You want to hold a flow rate of 3200 GPM. Since the PID's setpoint is held in one of the D620i's Number Modules, you must adjust the appropriate Number Module to 3200 (either directly in the Number Module or via the D620i's displays).
7. The PID module then opens the valve to the calculated position and monitors the system flow.
8. As long as the system flow remains at 3200 GPM +/- 10% (i.e., +/- 500 GPM), the PID module's output is unchanged.
9. Should the process variable fall below 2700 GPM, the PID recalculates the new output and opens the valve accordingly. Thereafter, the system flow increases and returns to approximately 3200 GPM.

CycTm

Cycle Time – set in seconds and hundredths (i.e., XXXXX.XX).

This characteristic is inactive in all Forms of the PID except Digital w/DeadBd.

The digital Form of the PID module is typically used to control a valve. The two digital outputs are activated to open and close the valve. Obviously, some care must be exercised so that the control system does not overdrive the valve's duty cycle and thereby damage the motor operator. Two factors are relevant when considering control of such a valve. They are: 1) the time the valve requires to travel from fully closed to fully open and 2) the minimum acceptable pulse. CycTm and MnCyc% allow you to configure the two characteristics.

Cycle Time specifies the time required to drive a valve, or other similar control element, from fully closed to fully open (or vice versa).

MnCyc%

Minimum Cycle Percentage ranging from 0.0 to 100.0%.

The PID module activates its two digital outputs in response to fluctuations in the sensed process variable. As stated above, the PID module, when set in the Digital w/DeadBd Form, only acts when the process variable is outside of the Dead Band. Then, the module activates the appropriate output and attempts to bring the process back to the setpoint within the allowable range specified by the Dead Band.

When the PID module activates one of its outputs (typically referred to as Open and Close), it may be necessary for the module to ensure a minimum closure time. MnCyc%, as set by this characteristic, allows you to adjust the minimum closure time. MnCyc% is adjustable in tenths, from 0.0 to 100.0%, and is based on the full excursion time as specified by CycTm (see above).

Example: A D620i controls a ball valve. In this particular case, the open-closed transit time is 120.00 seconds. Additionally, the manufacturer recommends that the valve be pulsed no more than 10 times/minute.

In this case, the maximum 10 pulses per minute would be equal to 10 open/closed steps and 10 hold times – each being 3 seconds in duration. Such a timing requirement would be accomplished by setting MnCyc% to 2.5% (i.e., 120 * 0.25 = 3). Thereafter, the PID module calculates the appropriate pulse which is required to move the valve to a new position and ensure that the pulse is at least three seconds in duration.

ScanRt

This value sets the speed with which the Operating System processes the PID module. Typically this value is set at 1 second. However, 1/10th-second processing is also available for unique, tightly controlled applications.

Setting the PID module's ScanRt to 1/10th second does present a downside – it uses up system resources. If you attempt to enable several analog, ramp, and PID modules, and set all of them to a ScanRt of 1/10th second, you may exceed allowable processing time. The D620i responds to this over allocation of system resources by slowing down. All processes will slow down. The Operating System has an internal monitor point which can be monitored (programming required) and thereby provide an Overrun Alarm. If the Alarm Event sounds frequently, you know that the system is under performing and that you should free up some system resources by setting the analog, PID, Ramp, or Delay ScanRt characteristics to 1-second operation.

PCSM-Pump Cntrl

The Pump Control Software Module (PCSM) provides pump prelube (On-Delay, Off-Delay and Failure timing). When the PCSM's input source is activated, the prelube output is immediately activated. After the On-Delay has expired, the PCSM's Call output is activated. With the activation of the Call output, the PCSM monitors the Run input. Should the pump fail to respond (i.e., fail to run), the PCSM completes its failure timing cycle and sets its failed output.

PgmLbl

16-character name (e.g., Pump 1 Control).

Form

Not Applicable, Not Selectable.

View, Program, and Enable

View, Program, and Enable have been covered in previous sections.

Units

The timing units are selectable. Possibilities are seconds, minutes, and hours.

OnTime

This is a numeric field (reference units of time above). When the PCSM receives a required input, it immediately enables the prelube output and begins the OnTime timing. When the OnTime delay has elapsed, the PCSM activates its Call output.

OffTim

This is a numeric field (reference units of time above). When the required input is removed, the PCSM starts an Off-Delay timer. When the Off-Delay timer completes its timing cycle, the Call output is deactivated.

FailTm

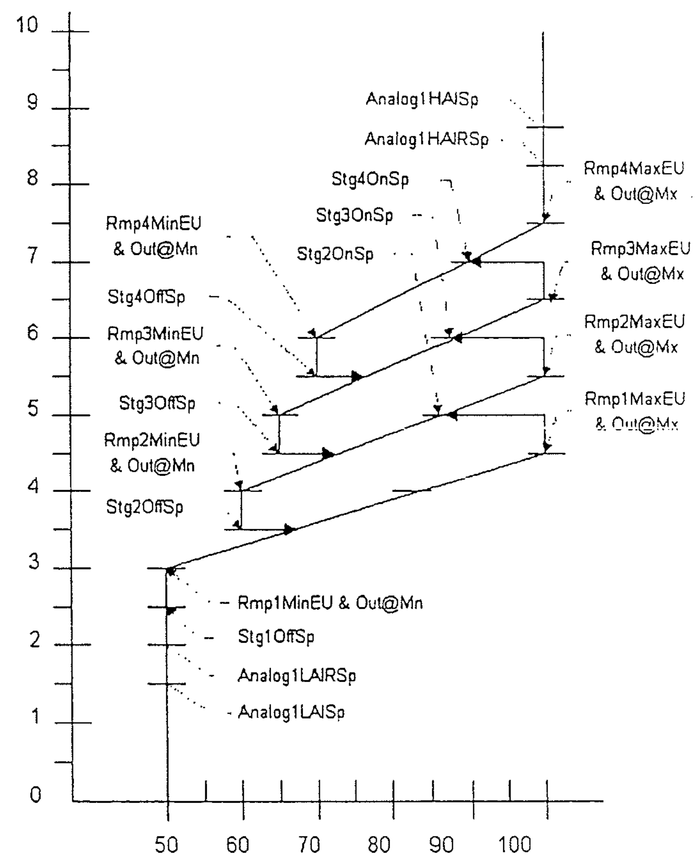
This is a numeric field (reference units of time above). When the PCSM enables its Call output, it immediately starts the failure timer. If the PCSM receives a running report-back from the Run input, it clears the failure timer. If the PCSM does not receive a running report-back, or should the running report-back signal be removed, the PCSM immediately restarts the failure timing. If the PCSM completes its failure timing cycle, it immediately generates a failure output and removes the Call output until the alarm condition has been manually reset.

RTM

This is a programmable running time meter which can be set to coincide with a mechanical meter found in the field.

Ramp

The example below shows four ramps applied in a pump-down application. The ramp modules provide setpoints for VFD speed control over the complete wet well range. A Ramp Module references the wet well level analog signal and provides a single analog output that varies over a programmed range. System 2.xx can support multiple ramp modules. The modules are used for variable speed, valve position, and chemical feed control applications



PrmLbl

16-character name (e.g., 1st VFD Ramp, 2nd VFD Ramp, 3rd VFD Ramp).

Form

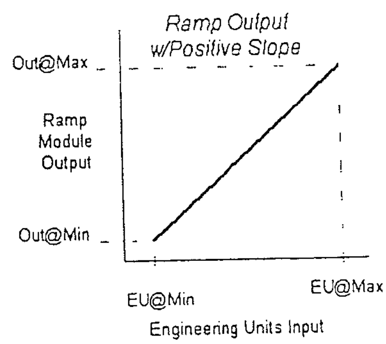
Not Applicable, Not Selectable.

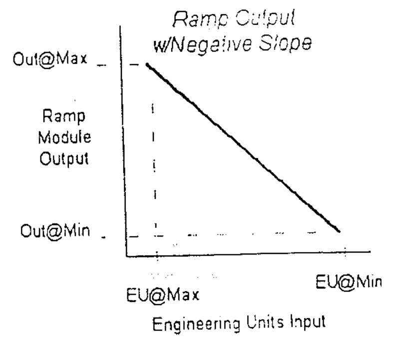
View, Program, and Enable

View, Program, and Enable have been covered in previous sections.

Out@Mx

Output at Maximum Ramp. Out@Mx is a programmable characteristic. Its programming range is between 0.0 and 100.0%. The output at maximum is the Ramp module's output when analog input reaches EU@Max.





Out@Mn

Output at Minimum Ramp. Out@Mn is a programmable characteristic. Its programming range is between 0.0 and 100.0%. The output at minimum adjusts the Ramp module's output when the incoming analog reaches the EU@Min setpoint. Refer to the above graphs.

EU@Max

Engineering Units at Maximum Output. EU@Max is a programmable value ranging between the referenced Analog Module's MinEU and MaxEU values. When the Ramp input reaches EU@Max, the Ramp generates its maximum output as defined by Out@Mx.

EU@Min

Engineering Units at Minimum Output. EU@Min is a programmable value ranging between the Analog Module's MinEU and MaxEU values. When the Ramp input reaches EU@Min, the Ramp generates its minimum output as defined by Out@Mn.

Quell

Quell is a programmable damping factor ranging from 1 to 999. A value of 1 causes the ramp to respond quickly to changes in the incoming analog signal. A nominal operating value of 5 causes the ramp to respond slowly. This means that if the input process variable were to instantly change from its minimum to maximum value, the ramp output would take five seconds to move from its minimum to maximum value.

ScanRt

This value sets the speed with which the Operating System processes the Ramp module. Typically this value is set at 1 second. However, 1/10th-second processing is also available for unique, tightly controlled, applications.

Simulation

Simulation is an option that allows you to manually vary the analog signal and, thus, allows testing of the control strategy.

Simulation is typically enabled by either an external digital input or one of the D620i's Status Displays. Refer to your order write-up to determine whether SIM has been provided and the manner in which it is enabled.

If a Status Display is used to enable SIM, you select simulation by pressing RIGHT or LEFT. This moves the cursor to the SIM (typical wording) position. You then enable simulation by pressing ENTER. If you fail to press ENTER while SIM is blinking, the D620i automatically reverts to the normal (non-simulation) mode.

Cancel simulation by returning to the Status Display screen, pressing LEFT to select the off/normal position, and then pressing ENTER to confirm the selection.

PgmLbl

16-character name (e.g., WetWell Sim, Flow Sim, Pressure Sim).

Form

Not Applicable, Not Selectable.

View, Program, and Enable

View, Program, and Enable have been covered in previous sections.

SimKey

Simulation Keys. SimKey is a selectable characteristic. Selection possibilities are 1 & 7, 5 & 0, or 3 & 9. If your system contains simulation modules, the first module typically uses the 1 and 7 keys as the increment and decrement keys. The second simulation module takes advantage of the 5 and 0 keys. The third simulation module uses the 3 and 9 keys. SimKey allows you to change the key sets.

Stage

Stage Modules provide differential (on/off) control. These modules typically receive their input from an Analog Module. The Stage Module monitors the analog input and provides an on/off control output based on specified setpoints. These activation (on) and de-activation (off) setpoints, as well as on and off time delay values, may be configured by you.

Stage Modules are typically used for controlling pumps, operating valves, or establishing alarm setpoints. Three forms are available. They are Active on Rise, Active on Fall, and Pressure/Flow.

PgmLbl

16-character name (e.g., Lead Pump, 1st Lag, 2nd Lag, ClrWellCutOut, 1st PmpReqd, 2ndPmpReqd, Valve Close).

Form

Three Forms are available. Once programmed (factory set) they should not be adjusted in the field. The three forms are:

Active On Rise. When set to Active on Rise, the Stage Module is configured to activate its output as the process input rises. In pumping applications, this would be considered the pump down setting. Since the Stage Module can be used to control any number of items (pumps, valves, alarms, etc.), the name was changed to describe the control action (activate on rise) rather than the specific nature of the control (pump down).

Active On Fall. When set to Active on Fall, the Stage Module is configured to activate its output as the process input falls. In pumping applications, this would be considered the pump up setting.

Pressure/Flow. When set to Pressure/Flow, the Stage Module is configured to activate its output as the Pressure Falls and deactivate the output as the flow decreases. This mode is typically used in a tankless, constant-pressure system.

View, Program, and Enable

View, Program, and Enable have been covered in previous sections.

On-SP

On Setpoint sets the point (e.g., level, pressure, flow, etc.) at which the stage is enabled.

Off-SP

Off Setpoint sets the point (e.g., level, pressure, flow, etc.) at which the stage is disabled.

OnTmv

On Time Value sets the on-delay time. When the On-SP is reached, the Stage Module delays for the OnTmV before activating the stage.

OffTmv

Off Time Value sets the off-delay time. When the Off-SP is reached, the stage module delays for the OffTmV before deactivating the stage.

Alert

Alert is a programmable timer with a timing range from 0 (no Alert) to 999 seconds. Alert is used to enable a series of chirps prior to activation of a stage. Alert is disabled by setting its value to 0.

Switch

The Switch Module allows the programmer to develop a number of software (a.k.a. soft) selector switches. The switches can be displayed and connected to the D620i's display screens.

PgmLbl

16-character name (e.g., Pump 1 HOA).

View, Program, and Enable

View, Program, and Enable have been covered in previous sections.

PosLbl

Position Label specifies the nameplate which is used as the basis for generating the switch positions and the text associated with the position. **This is a view-only field.**

Example: A Position Label of "hnd off auto rst" specifies a four-position Hand Off Auto Reset selector switch. The words have been shortened to fit the 16-character display constraint. The switch's Position Label uses the full 16 characters of the display.

WakeUp

WakeUp specifies the switch positions which the D620i is to activate as it returns from a power-out condition. This is a view-only field.

Wake Up appears as `--------`. If the display is a series of dashes, as shown here, then the last position (as selected by you) is to return upon power up. If a number appears in its ordinal position, then that position is to be activated as the D620i returns from power up. Examples: A WakeUp of `--3--6--` specifies that positions 3 and 6 are to be active. A WakeUp of `1---5-7-` specifies that positions 1, 5, and 7 are to be active.

System Clock

The Information Module simply lists the controller's vital statistics. Typical information includes the job's name, the order number, the programmer's initials, the date on which the operating strategy was loaded into the D620i, etc.

Label

This is a fixed 16-character label Local Time.

Time

You change the time as follows. Move to the Time characteristic and press ENTER – the cursor moves to the lower left corner of the display. Press-in the digits for the correct time (e.g., 042256 for 4 a.m. 22 minutes and 56 seconds). The cursor is then positioned over the AM/PM. Simply press UP or DOWN to toggle between AM and PM. Press ENTER to confirm the program. If you make a mistake, press ENTER to end the current entry and begin again.

Date

You change the date as follows. Move to the Date characteristic and press ENTER – the cursor moves to the lower left corner of the display. Press-in the digits for the current day (e.g., 072199 for July 21, 1999). The cursor is then positioned over the day of the week. Press UP or DOWN to roll through the days of the week. When the correct day appears, press ENTER to confirm the program. If you make a mistake, press ENTER to end the current entry and begin again.

System Information

The Information Module simply lists the controller's vital statistics. Typical information includes the job's name, the order number, the programmer's initials, the date on which the operating strategy was loaded into the D620i, etc.

The Controller Information Module allows you to view the details pertaining to the particular D620i you are viewing/configuring. Information such as the D620i's serial number, the job's shop order number, and software revision number are included. These fields are view-only and cannot be changed.

The Controller Information Module is a read-only module which provides controller-specific information. Typical screens include the serial number of the controller, the initials of the programmer, the date and time the last software revision was made, etc.

Label

System Information.

InfoA (Also:P InfoB, InfoC)

User-defined information - 16 characters in length.

InfoD (Also: InfoE, InfoF)

Reserved for factory use.

System Utilities

The Utilities Module provides a means by which the controller's operation can be cleared and restarted.

Utility 1 Label

This is a 16-character fixed field which reads "Reset Options."

Utility 1 Optn A

Four selections are available.

1. Don't Reset Now – No action is taken.
2. Reset – A warm reset is performed. If this option is selected and Utility 1 Optn B is set to Reset Confirmed! then:
   - The strategy remains intact and unchanged.
   - The operating parameters are loaded out of Flash and into RAM.
   - The controller transfers execution to RAM and begins operation.
3. Clear RAM.

4. Full Mem Clear – The controller is poised to clear the Flash. **This option should only be exercised if you have a new strategy ready for download to the flash.** If this option is selected and Utility 1 Optn B is set to Reset Confirmed! then:
   - The RAM is cleared.
   - The system strategy is cleared.
   - The default values are cleared.
   - The screen displays are cleared.
   - The D620i outputs are deactivated.
   - The system is poised for a new download.

   This is a destructive clear. Exercise with caution. Be prepared.

Utility 1 Optn B

Two selections are available – Reset Confirmed and Do Not Reset. Option A and Option B operate in unison. If you're set up for a memory clear in Option A and do not confirm it in Option B, the reset is not performed.

Utility 2 Label

Flash Write Optns. This utility gives you the ability to set when the Flash memory is to be loaded. Option A programs either an automatic or manual Flash write. If automatic is selected, the Flash is written whenever you make a change and leave program mode. If manual Flash write is selected, the Flash is written only if Option B is set to Write Flash Now!

Utility 2 Optn A

Two selections are available – Auto Flash Write and Manual Flash Write. Their operation is described above.

Utility 2 Optn B

Two selections are available – Write Flash later and Write Flash now! Their operation is described above.

Utility 3 Label

Option 3 Label is non-programmable and simply states "On DnLoad Error." This utility gives you the ability to select the D620i's operation whenever a Solution Builder download is unsuccessful. Utility 3 Option A programs either Use Flash Data or Clear Flash&Rst.

Utility 3 Optn A

Utility 3 Option A programs either Use Flash Data or Clear Flash&Rst.

Use Flash Data assumes that there is an existing control strategy which was simply in the process of being updated. If this is the case, the old strategy is started and the control continues to operate. If the system did not have an operating control strategy, the controller returns to Waiting for Download.

If Clear Flash&Rst is selected, the D620i automatically clears the Flash and resets the controller to a benign state (the control strategy is erased) whenever a Solution Builder download is unsuccessful.

Totalization

The Totalizer Module can be configured (programmed) to perform one of three totalization functions. They are flow totalization, time totalization (e.g., elapsed time meters), or pulse totalization (e.g., start counters). The programmer selects the appropriate Form.

Changes to the Form **must not** be done from the D620i's interface. Doing so may cause erroneous displays (not faulty operation).

Flow Totalization

The module can be connected to an Analog Module which tracks flow rates. The Flow Totalization Module then accumulates flow in gallons, thousands of gallons, or millions of gallons. (The multiplier is set via the Scale characteristic as described below.) The maximum flow count is a 7.1 format or 9,999,999.9 (7 digits, the decimal point, and tenths of units). The minimum flow count is 1.7 or 9.999,999,9. The 7.1 format can be used to display 9,999,999.9 million gallons (10 billion million). The 1.7 format would allow the D620i to display 9.9999999 million gallons which would be gallons to the tenth of a gallon (practically speaking, the 1/10th gallon is irrelevant).

Inherent in the Flow Totalization Module is a sub-counter (much like a trip odometer in your car). When the running actual accumulated flow reaches the "trip odometer's" setpoint, the module generates an output which can be used to pace chemicals into the process, drive an external counter, etc. The rollover is programmable.

Running Time

The module can be connected to a digital input. The module can be set up to calculate accumulated time in hours and tenths of hours. The multiplier is set via the Scale characteristic as described below. The maximum time output can be displayed in a format which ranges from 1.7 to 7.1 (i.e., 9.9999999 to 9999999.9). The number displayed is a function of the Multiplier as described below.

Pulse Count

The module can be connected to a digital input. The module can be set up to count pulse inputs. This mode is typically used to count flowmeter pulses or pump starts.

PgmLbl

16-character name (e.g., System Flow, Pump 1 RTM, Pump 2 Strt/Hr).

Form

Three Forms are selectable. They are Flow, Pulse Count, and RTM. Their operation is described above. The programmer sets the Form to conform to the given application. You **must not** use the D620i interface to change the Form.

View, Program, and Enable

View, Program, and Enable have been covered in previous sections.

Sense

Two choices (Direct and Inverse) are available. Both of these pertain to digital inputs and are, therefore, associated with the RTM and Pulse Count Forms of the Totalization Module. Direct causes the module to accumulate time or pulses when the module's input is active. Indirect programs the module to accumulate time or pulses when the module's input is inactive.

Scale

This characteristic scales the totalizer stored value.

If X1 is selected, the totalizer counts in straight units (gallons, hours, or pulses). Therefore, the number 6539.2 may represent 6539.2 gallons or hours. Since you cannot capture a 1/10th of a pulse, this number would not make sense for pulses.

If X1000 is selected, the totalizer counts in units of 1000 (1000 gallons, 1000 hours, or 1000 pulses). Therefore the number 6539.2 represents 6539.2 thousand gallons (i.e., 6.5392 million gallons), or 6,539.2 thousand hours (i.e., 6+ million hours), or 6539.2 thousand pulses (i.e., 6,593,2XX pulses).

If XMillion is selected, the totalizer counts in units of 1 Million (1M gallons, 1M hours or 1M pulses). Therefore the number 7,182.27 represents 7,182.27 million gallons (i.e., 7.18227 billion gallons), or 7,182.27 million hours (i.e., 7+ billion hours), or 7,182.27 million pulses (i.e., 7,182,27X billion pulses).

Once programmed, Scale must not be changed.

Format

Format sets the manner in which the D620i internally manipulates the number. Format is set as X,Y where X+Y<=8 and 0 < X < 7 and 0 < Y < 7. Therefore, a format of 4.1 causes the internal accumulator to count to 9999.9 and rollover. If the D620i display is set to display fewer digits, the upper characters are truncated. If the display is programmed to show more characters, the display will never fill to the space allotted. When the internal count reaches 9999.9 the accumulator automatically rolls over to 0.0.

Once programmed, Format must not be changed.

TrpCnt

View, Program, and Enable have been covered in previous sections.

MnFlow

View, Program, and Enable have been covered in previous sections.

We hope this manual was informative and helpful. If you need more help, call our help desk:

1-800-224-9474.

System 2.14 Rev A Released 3/9/98