



WellPro™ Controller

Installation and Operations Manual

In order to consistently bring you the highest quality, full featured products, we reserve the right to change our specifications and designs at any time. The latest version of this manual can be found at www.fwmurphy.com.

Warranty - A limited warranty on materials and workmanship for two years is given with this FW Murphy product. A copy of the warranty may be viewed or printed by going to www.fwmurphy.com/support/warranty.htm



Murphy has made efforts to ensure the reliability of the WellPro controller and to recommend safe usage practices in system applications. Please note that in any application, operation and controller failures can occur. These failures may result in full control outputs or other outputs which may cause damage to or unsafe conditions in the equipment or process connected to the WellPro controller. Good engineering practices, electrical codes, and insurance regulations require that you use independent external protective devices to prevent potentially dangerous or unsafe conditions. Assume that the WellPro controller can fail with outputs full on, outputs full off, or that other unexpected conditions can occur.

BEFORE BEGINNING INSTALLATION OF THIS MURPHY PRODUCT:

- Please read the following information before installing the WellPro controller. This installation information is intended for WellPro controller only. Before installing, visually inspect the product for any damage during shipping.
- Disconnect all power and be sure machine is inoperative before beginning installation.
- Installation is to be done only by qualified technician.
- Observe all Warnings and Cautions at each section in these instructions.
- Device shall be wired in accordance with Class I, Division 2 wiring methods.
- This equipment is suitable for use in Class I, Division 2, Groups B, C, and D hazardous Areas.
- **WARNING**–Explosion Hazard–Substitution of components may impair suitability for Class I, Division 2.
- Please contact Murphy immediately if you have any questions.

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1 Overview

The WellPro controller is a display and controller combination that delivers the basics – autostart, speed control and all of the necessary inputs/outputs in one complete package.

The heart of the system is the main input/output (I/O) module, or controller which can be mounted using four screws to fasten the housing to a flat sub panel surface. It is designed to work with any Modbus (Master) compliant Human Machine Interface (HMI).

The controller is designed to monitor, control, protect, and optimize small to medium sized gas operated compressors and pumps in the field. Proper operation is maintained by monitoring set points and digital, analog, and thermocouple input points and providing the logic to take corrective and/or proactive steps.

The controller also allows for controlled shut down and no-flow monitoring as well as auto start up and engine control capabilities.

The controller provides real-time data via communications ports to a connected display and/or supervisory system. This advanced system offers multiple options for remote communications and operation. The industry standard Modbus RTU protocol means greater support for a wide variety of equipment including radio and satellite communications systems.

1.1 Basic Components and Key Features of the WellPro

The WellPro system consists of a display module and controller module. No special cables are required.

- **Display module (WPC3-3):** 128 x 64 LCD graphic display; (-40 to 85) °C
 - Power
 - 10 - 32 VDC: 1W typical, 6W (max)
 - Storage power able to withstand 12V crank

NOTE: Maximum power ratings based on display heater operating at maximum with 10V supply. Heater is only operational below -10C.
Typical based on 24V supply.
 - Package and design
 - Same 5" x 5" design as annunciators with NEMA4 compliant faceplate
 - 11 key keypad
 - Communications
 - LED active indication for each port
 - RS485 (Modbus RTU Master)
 - RS485/USB 1.1 compliant port (Modbus RTU master/firmware upgrade)
 - Approvals
 - CSA, CLASS 1, DIVISION 2, Groups B, C and D certifications are pending.
- **Controller module (WPC3-1):**
 - 8 digital inputs (DI)
 - 6 digital outputs (DO)
 - Direct input for analog and thermocouple inputs
 - 6 analog inputs (AI)
 - 2 thermocouples (TC)
 - 1 magnetic pickup (MPU)
 - 2 analog output (AO).

2 Power and Input/Output Types

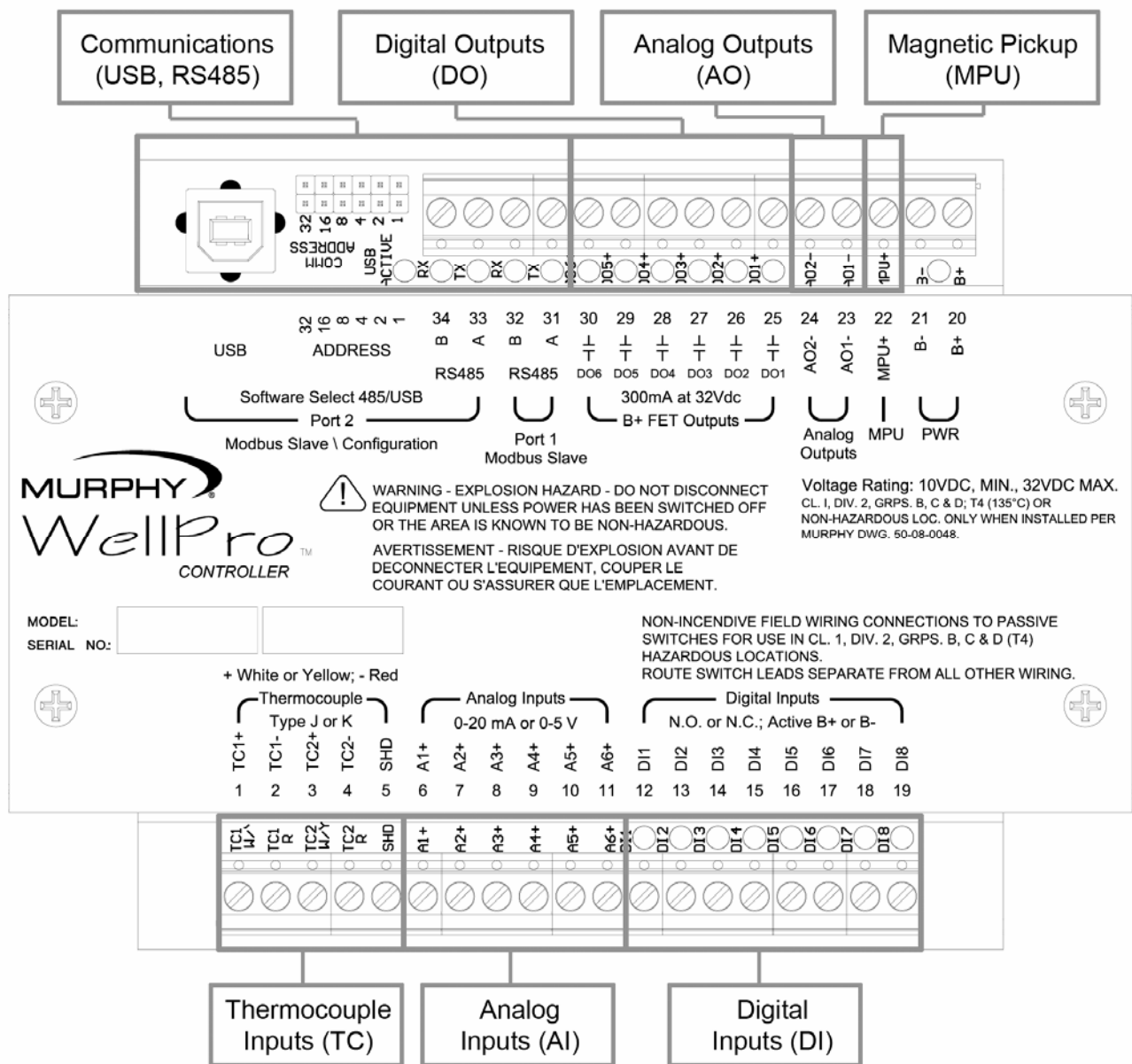
2.1 Power Supply Wiring

Requirements: 10 to 32 VDC: 24W (max) (LED active indication)

There are two screw terminal connectors for power hookup at terminals 20 and 21 labeled B+ and B- respectively.

NOTE: Run power directly from battery posts to controller power terminals when battery is the power supply.

2.2 Input/Output Types and Specifications for the WellPro Controller



2.2.1 Digital Inputs (DI)

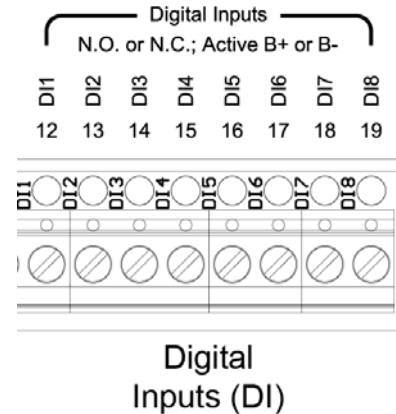
Number of devices: 8

Device types: discrete input, normally open (N/O) or normally closed (N/C), active high/active low, non-incendive.

There is one screw terminal connector for each digital input.

Terminals 12 to 19 are DI terminals.

Green LEDs give visual indication of active input signal.



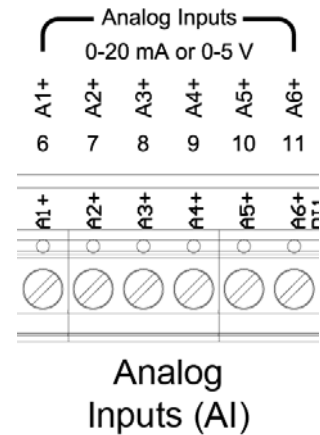
2.2.2 Analog Inputs (AI)

Number of devices: 6

Device types: analog input, (4 to 20) mA or (0 to 5) V, 10 bit hardware.

There is one screw terminal connector for each analog input.

Terminals 6 to 11 are AI terminals.



2.2.3 Thermocouple Inputs (TC)

Number of devices: 2

Device types: thermocouple input, type J or K, 12 bit hardware.

Grounded and ungrounded thermocouples are supported. However, ungrounded thermocouples are recommended. Errors in readings with grounded thermocouples can be the result of differences in grounding between devices.

Open thermocouple detection: drives terminal reading high (max of scale).

Automatic cold junction compensation is built-in.

There are two screw terminal connectors for each thermocouple.

Terminals 1 to 4 are TC terminals where white or yellow indicate positive inputs and red indicates negative inputs.



NOTE: An additional terminal connector is provided, identified as SHD, which isolates thermocouple shields. Thermocouple SHD terminal 5 is intended to be wired to an isolated bus bar for thermocouple shield wires. If grounded thermocouples are used, the shield terminal should not be connected. If shields are grounded, do connect shields to SHD terminal. Connect all shields to SHD or to ground but never both.

2.2.4 Magnetic Pickup (MPU)

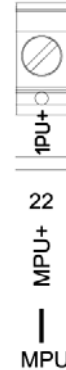
Number of devices: 1

Device types: magnetic pickup (MPU), (5 to 120) Vrms, (30 to 10k) Hz.

There is one screw terminal connector for the magnetic pickup positive input. The negative side of the MPU can be connected to B- (terminal 21).

MPU Input terminal: 22

Magnetic Pickup (MPU)



2.2.5 Digital Outputs (DO)

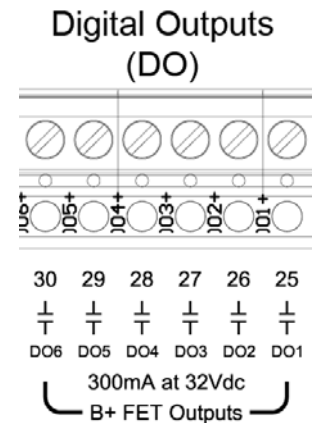
Number of devices: 6

Device types: B+ sourcing FET (high speed) discrete output, normally open (N/O) or normally closed (N/C)

There is one screw terminal connector for each FET output.

Terminals 25 to 30 are for the six FET terminals.

Green LEDs give a visual indication of active output signal.



Analog Outputs (AO)

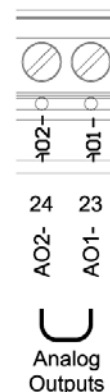
Number of devices: 2

Device types: analog output, (4 to 20) mA or (0-20)mA, 16 bit hardware

There is one screw terminal connector for each analog output.

Internal B+ is provided to the analog output circuit.

Analog Outputs (AO)



3 Hazardous Area Operation

The WellPro certifications for CSA, CLASS 1, DIVISION 2, Groups B, C and D are pending.

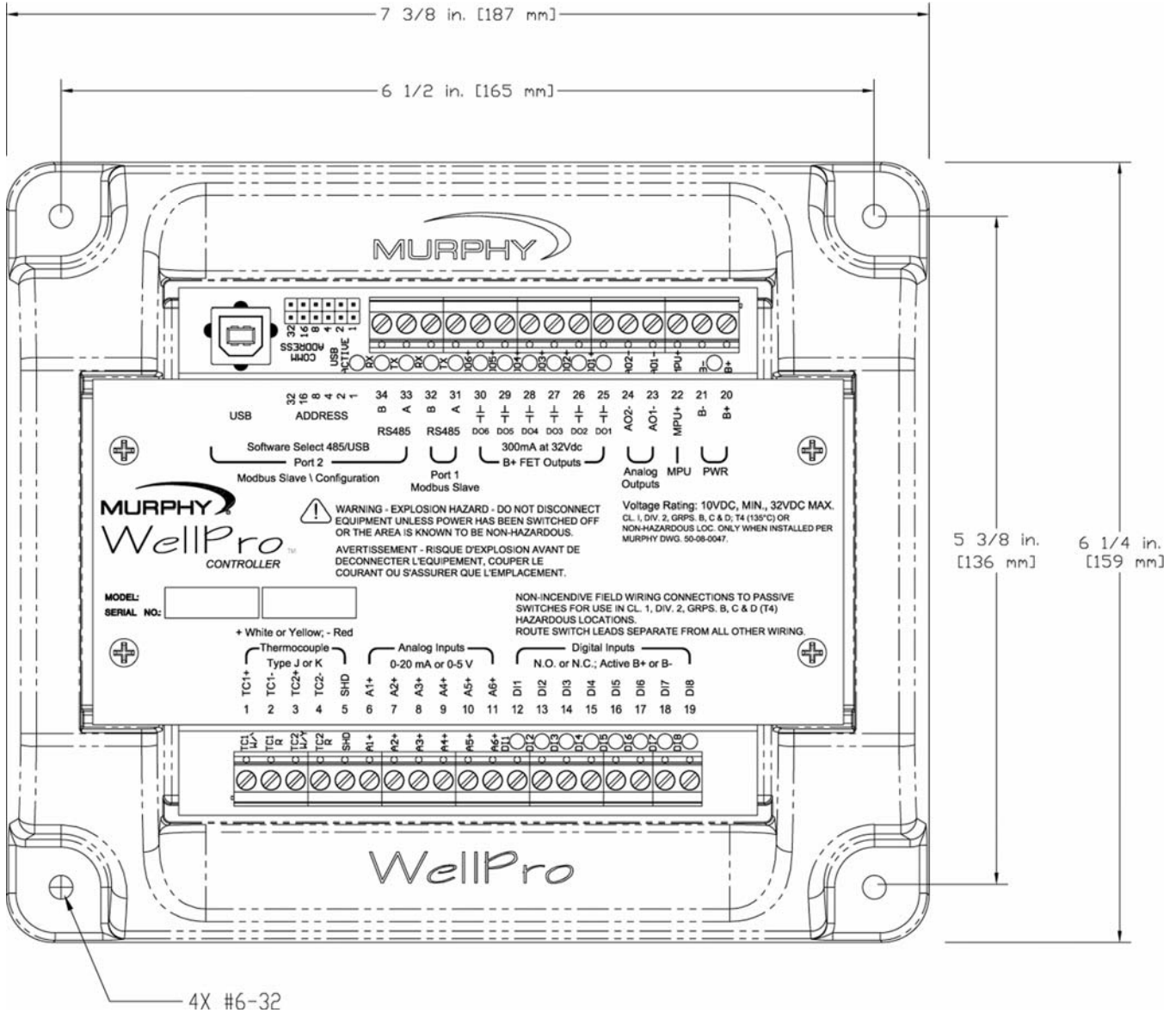


Warning: Explosion hazard – Do not disconnect the equipment unless the power has been switched off, or the area is known to be non-hazardous.

4 Hardware Installation and Wiring

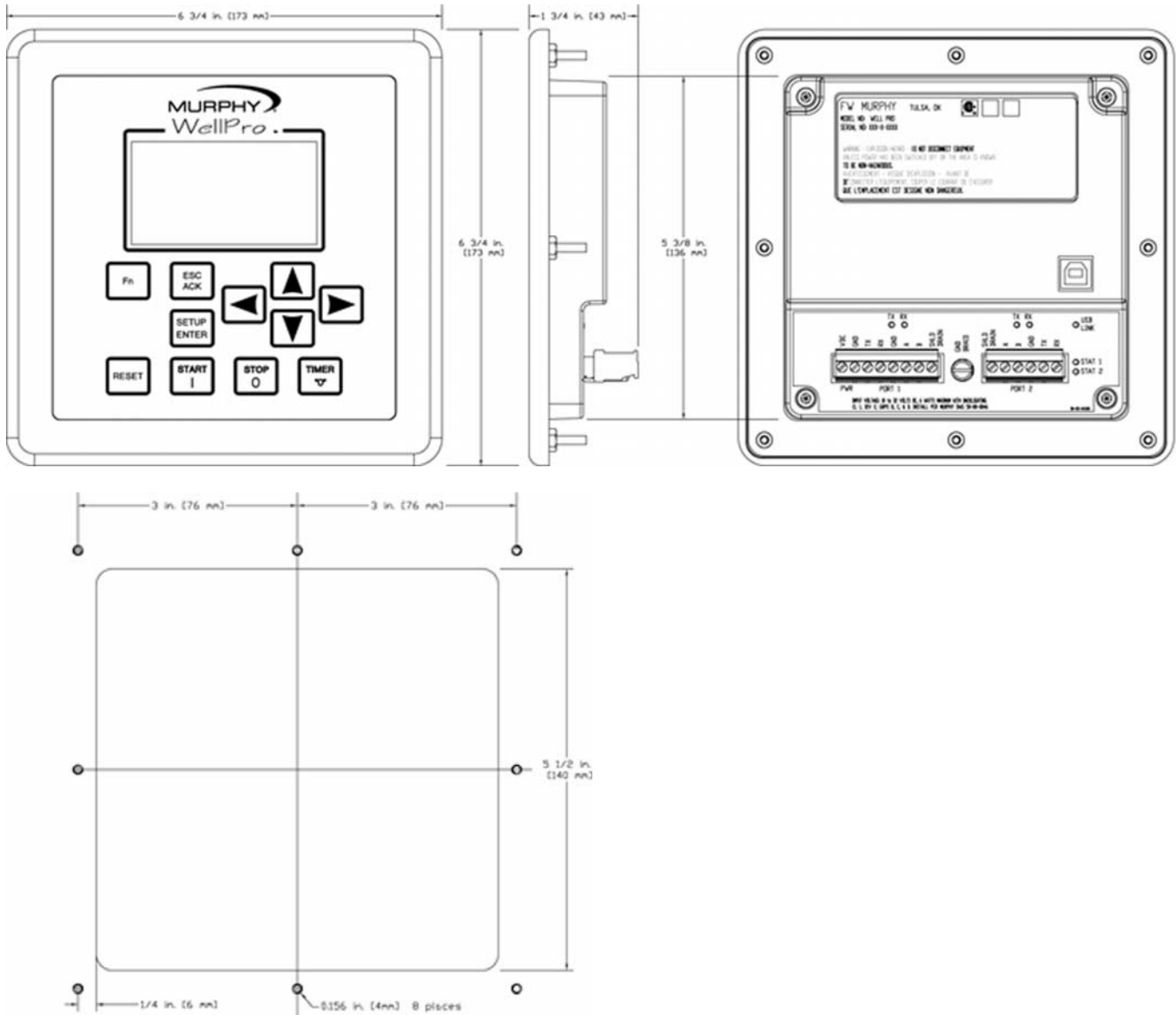
4.1 Mounting the WellPro I/O Module

The controller can be mounted using four screws to fasten the housing to a flat sub panel surface.

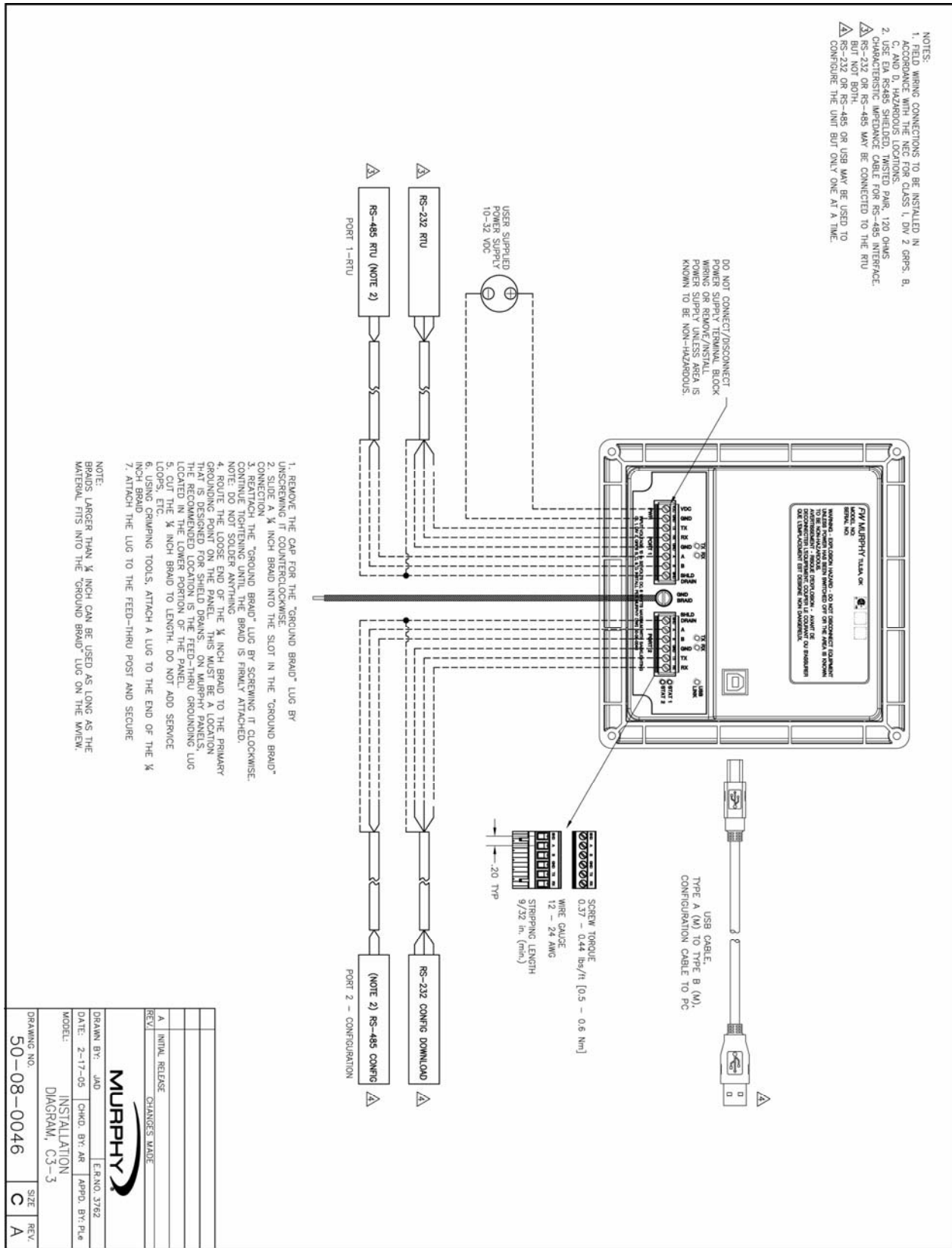


4.2 Mounting the WellPro Display

The WellPro display can be mounted in the same hole cutout of other Murphy display modules. However, eight screws instead of four screws attach the display to the mounting surface. This is necessary to achieve a NEMA4 seal.



4.3 Wiring the WellPro Display



4.4 Wiring the WellPro Controller

NOTES:

- FIELD WIRING CONNECTIONS TO BE INSTALLED IN ACCORDANCE WITH THE NEC FOR CLASS 1, DIV 2 GRPS. B, C, AND D. (MAXIMUM AMBIENT TEMPERATURE 85 °C) HAZARDOUS LOCATIONS.
- INSTALL A 1A, 600V PIV DIODE IN PARALLEL WITH FET AND IGBT OUTPUTS (TM4005 - FWM P/N 96-16-1002).
- USE TWO CONDUCTOR CABLE WITH FOIL SHIELD AND DRAIN WIRE FOR MPFU INPUT.
- USE EIA RS485 SHIELDED, TWISTED PAIR, 120 OHMS CHARACTERISTIC IMPEDANCE. INSTALL 120 OHMS TERMINATING RESISTOR ON FIRST AND LAST NODE ON RS-485 NETWORK. ALL RS-485 DEVICES MUST SHARE DC COMMON GROUND. TO MAKE NETWORK RUGGED, A PULL-UP/PULL-DOWN MAY BE HELPFUL. (FWM P/N 10-00-7607).
- TO GROUND IGNITION USE PILOT RELAY WITH 100 OHM, 2W SERIES RESISTOR TO GROUND.
- RELAYS MUST BE HERMETICALLY SEALED RELAYS, CSA OR UL APPROVED FOR USE IN CL. 1, DIV. 2, GRPS. B, C, & D HAZARDOUS LOCATIONS.
- NON-INCENDIVE FIELD WIRING CHARACTERISTICS:
 VOC = 16 VDC
 ISC = 10.8 uA
 Cmax = 0.2 uF
 Lmax = 100 mH

WARNING - EXPLOSION HAZARD - DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS. AVERTISSEMENT - RISQUE D'EXPLOSION - AVANT DE DECONNECTER L'EQUIPEMENT, COUPER LE COURANT OU S'ASSURER QUE L'EMPLACEMENT EST DESIGNÉ NON DANGEREUX.

NON-INCENDIVE FIELD WIRING CONNECTIONS TO GENERAL PURPOSE ENCLOSURE PASSIVE MECHANICAL SWITCHES OR MURPHY SOLID STATE SWITCH DEVICES APPROVED FOR USE IN CL. 1, DIV. 2 GRP. B, C, AND D HAZARDOUS LOCATIONS.

ROUTE SWITCH LEADS SEPARATE FROM ALL OTHER WIRING.

SCREW TORQUE
0.37 - 0.44 lbf/ft (0.5 - 0.6 Nm)

WIRE GAUGE
12 - 24 AWG

STRIPPING LENGTH
9/32 in. (mm)

REV	INITIAL	RELEASE	CHANGE'S VALUE
A			

DRAWN BY: JAD	CHKD. BY: AR	ERAND: JAKA
DATE: 3-12-05	APPR. BY: PLG	
INSTALLATION DIAGRAM, WELLPRO		
DRAWING NO: 50-08-0048	SHEET 1 OF 2	SIZE: C
		REV: A

Wiring the WellPro Controller – (continued)

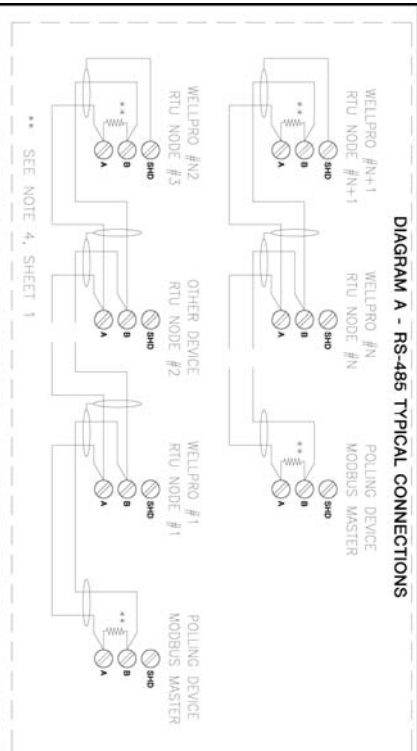


DIAGRAM B - TYPICAL VOLTAGE INPUT WIRING

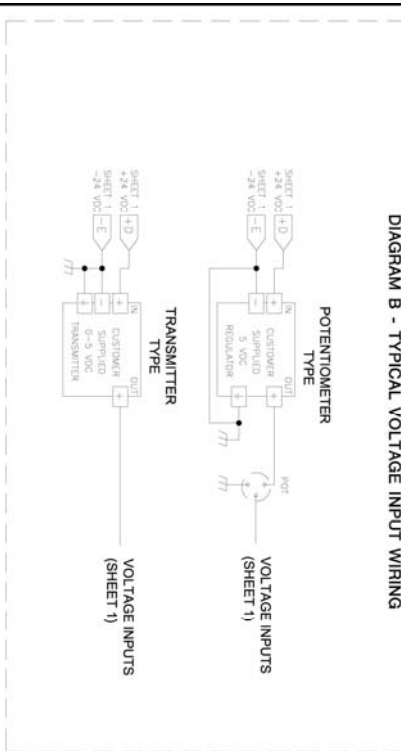
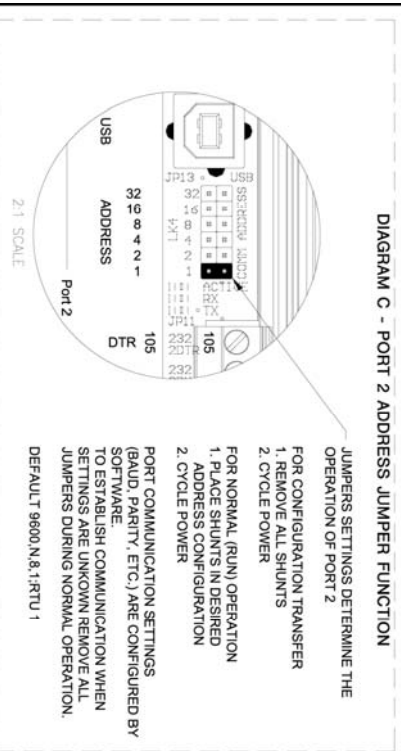


DIAGRAM C - PORT 2 ADDRESS JUMPER FUNCTION



WARNING - EXPLOSION HAZARD - DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS.
 AVERTISSEMENT - RISQUE D'EXPLOSION - AVANT DE DECONNECTER L'EQUIPEMENT, COUPER LE COURANT OU S'ASSURER QUE L'EMPLACEMENT EST DESIGNÉ NON DANGEREUX.

DRAWING NO. 50-08-0048 SHEET 2 OF 2
 SIZE C REV A

5 Using the Display

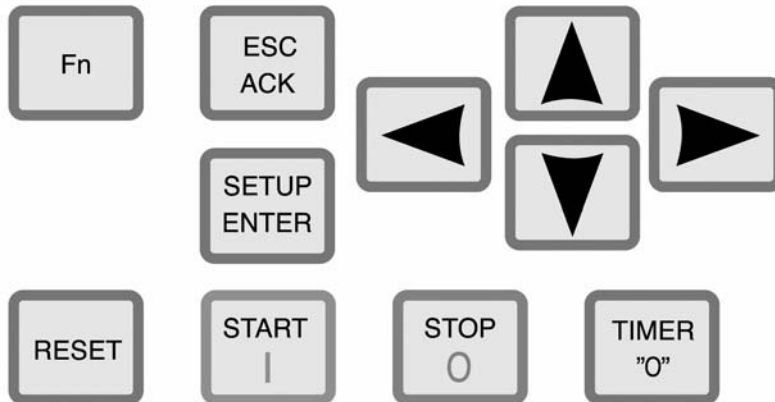


The display module is a highly integrated operator interface specially programmed to complement and support the controller. The primary purpose of the display is to:

- view controller operational information
- view/edit controller operational parameters
- send commands to controller, such as stop, edit, and reset

5.1 Features






5.1.1 Keypad Description and Navigation









The keypad for the display has 11 keys. The following table describes the keys and their function for each of the three screen types:

- Operating status screens
- Setup screens (password required)
- Edit screens (password required)

Many of the keys have a modified action relative to the current location of the cursor and the current page being displayed.

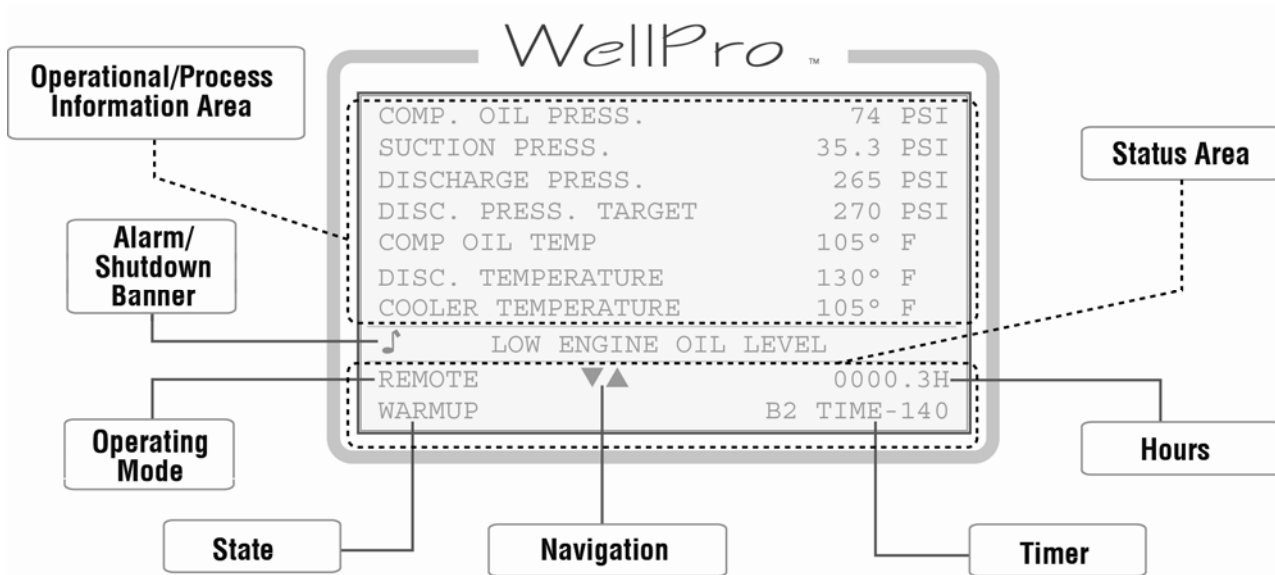
Key	ID	Description
	ESC/ACK	<p>Operating Status Screen Acknowledge the active message/alarm that is currently displayed in the alarm banner. Acknowledges all active messages and alarms displayed in the active alarm screen.</p> <p>Set Up Screen Exit Setup mode.</p> <p>Edit Screen Exit without saving changes to the current configuration.</p>
	Fn (Function Key)	<p>Operating Status Screen Enter "Function mode" and display a dialog box with additional available functions. Automatically cancels upon moving to the next mode, or if no subsequent function is chosen within five seconds.</p> <p>Set Up Screen No associated action.</p> <p>Edit Screen No associated action.</p>
	SETUP/ENTER	<p>Operating Status Screen Enter Setup Mode.</p> <p>Set Up Screen Enter Edit mode or Sub-menu.</p> <p>Edit Screen Accept and save changes made to a current parameter before exiting edit mode.</p>
	RESET	<p>Operating Status Screen Reset any active timers and alarms/faults.</p> <p>Set Up Screen No associated action.</p> <p>Edit Screen No associated action.</p>
	START	<p>Operating Status Screen Initiates start sequence only when held for two seconds to avoid accidental start.</p> <p>Set Up Screen No associated action in either shutdown mode, or remote mode on standby.</p> <p>Edit Screen No associated action.</p>

Key	ID	Description
	STOP	<p>Operating Status Screen Initiates stop sequence only when held for two seconds to avoid accidental stop.</p> <p>Set Up Screen Initiates stop sequence only when held for two seconds to avoid accidental stop.</p> <p>Edit Screen No associated action.</p>
	ARROW UP	<p>Operating Status Screen Scroll up one line. Automatically repeats if held down continuously until reaching the first line. For history screens, scrolls up one history (for example: shutdown or event).</p> <p>Set Up Screen Scroll up one line. Automatically repeats if held down continuously until reaching the first line.</p> <p>Edit Screen Increase the digit selected by the cursor (from 0 to 9). The user will not be allowed to increase the selected digit if it would result in exceeding range limits.</p>
	ARROW DOWN	<p>Operating Status Screen Scroll down one line. Automatically repeats if held down continuously until reaching the final line. For history screens, scrolls down one history (i.e. shutdown or event).</p> <p>Set Up Screen Scroll down one line. Automatically repeats if held down continuously until reaching the final line.</p> <p>Edit Screen Decrease the digit selected by the cursor (from 0 to 9). The user will not be allowed to decrease the selected digit if it would result in exceeding range limits.</p>
	ARROW LEFT	<p>Operating Status Screen Display previous screen. Automatically repeats if held down continuously until reaching the first screen.</p> <p>Set Up Screen Display previous screen. This key has no action when in a sub-menu.</p> <p>Edit Screen Move the cursor left one position when a numeric value is displayed.</p>

Key	ID	Description
	ARROW RIGHT	<p>Operating Status Screen Display next screen. Automatically repeats if held down continuously until reaching the final screen.</p> <p>Set Up Screen Display next screen. This key has no action when in a sub-menu.</p> <p>Edit Screen Move the cursor right one position when a numeric value is displayed.</p>
	TIMER "0"	<p>Operating Status Screen Zero displayed timer (global timers, state timers, etc.)</p> <p>Set Up Screen No associated action.</p> <p>Edit Screen No associated action.</p>

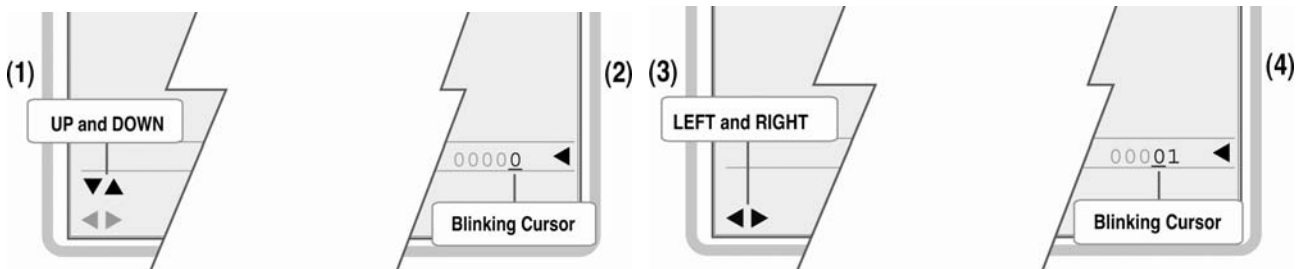
5.1.2 Display Context

The graphic LCD displays are organized around operating status screens and setup screens. The actual number of status screens will be related to the total number of end devices configured for the controller. In either screen set, up to ten (10) lines are visible at a time; with up and down arrow characters indicating more lines are available on the page. Also, for both screen sets, navigation between screens is accomplished by pressing the left or right arrow keys.



5.1.3 Numeric Entry

The WellPro display allows individual editing of each position of the desired number. This is accomplished by entering the edit mode and using the UP/DOWN arrow keys (1) to adjust the number above the blinking cursor (2) between 0 and 9. To edit another position, simply use the LEFT/RIGHT (3) arrow keys to move the cursor to that position (4) and repeat the edit process until the desired number is displayed.



In this way, values are “built” rather than “scrolled” through. Some digits may not be allowed to increase if it would result in exceeding range limits. Values which can be positive or negative will have a sign (±) to the left of the number. To change the sign value simply move the cursor to the sign using the LEFT arrow key and “toggle” between + and – using the UP and DOWN arrow keys. If the range of the value will exceed range limits the sign may not be allowed to

change. In this case, try reducing the number by decreasing the left most digit by one or more and attempt to change the sign again.

In some instances, a word rather than a value is represented in the Edit Mode. This works like the sign value as an ON/OFF or YES/NO prompt where the value is “toggled” between choices using the UP/DOWN arrow keys. The value is not active in the controller until the ENTER key has been pressed to send the value to the controller. Pressing the ESC key will discard any changes and keep the original value prior to entering the Edit Mode.

5.2 Operational Screens

In addition to the set up screens reviewed in the “Setup Screens and Menus” section, the display offers a number of operational displays. On the Operating Status screens, the two bottom lines display the state, hours, mode and active timer status. This information is key to understanding the “status” of the controller.

Mode refers to the Operating Mode of the controller and can be LOCAL or REMOTE. Depending on the configuration active in the controller, the operation may differ depending on what Mode the controller is currently displaying.

NOTE: The Mode can be changed by pressing certain keys, if the configuration allows for REMOTE mode.

Pressing RESET or START or STOP is a Local function and will change the Mode to Local if it is in REMOTE.

Pressing Fn before pressing RESET or START or STOP is a REMOTE function and will change the Mode to REMOTE if it is in LOCAL.

5.2.1 Default Operating Screen

After turning on the power, the user will view the Murphy logo screen for three seconds before the next screen displays, which is a software-configured default operating screen. Possible screen types that may have been configured as a default operating screen, or which may be also displayed, include:

- a) “Line by Line” allows process data to be displayed in a list format with description and value.
- b) “Gage” allows user to display four (4) most important pieces of data on a 2 x 2 table in larger font.
- c) “PID” up to 4 PID screens.

5.2.2 Murphy Logo Screen



Logo Screen

The Murphy logo is the first screen in the sequence of display screens and can be viewed by holding down the left arrow until scrolling left ceases.

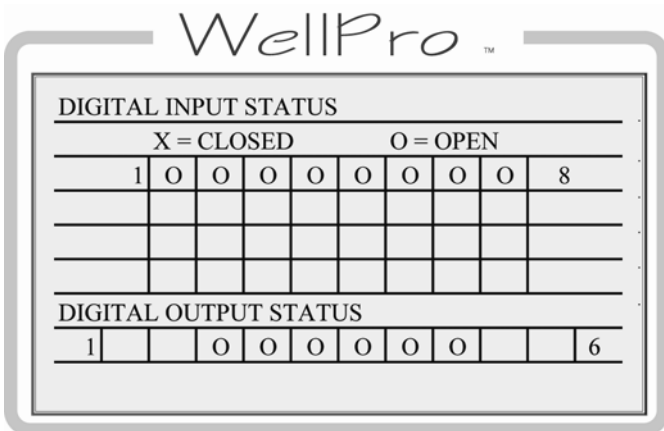
5.2.3 Corporate and Version Information Screen



Info Screen

Following the Murphy Logo screen is the Murphy corporate contact information which also lists firmware version information for the display and the controller.

5.2.4 Digital Status



The image shows a screen titled "WellPro" with a "DIGITAL INPUT STATUS" table. The table has 10 columns and 4 rows. The first row contains the numbers 1, 0, 0, 0, 0, 0, 0, 0, 0, 8. Below this is a "DIGITAL OUTPUT STATUS" table with 10 columns and 1 row. The first column contains the number 1, and the last column contains the number 6. The legend indicates X = CLOSED and O = OPEN.

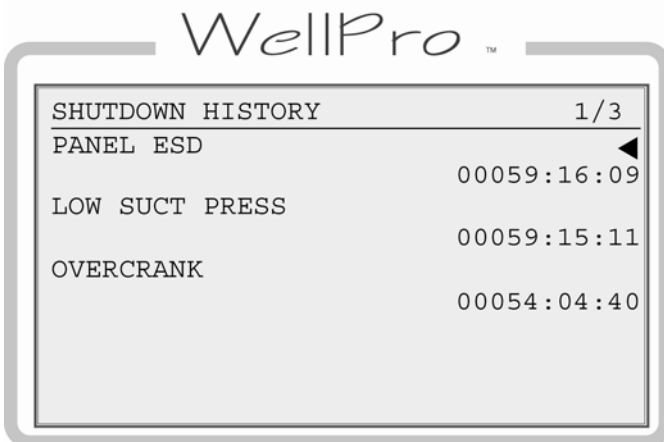
DIGITAL INPUT STATUS									
X = CLOSED					O = OPEN				
1	0	0	0	0	0	0	0	0	8

DIGITAL OUTPUT STATUS									
1			0	0	0	0	0	0	6

Diagnostic-Digital Inputs Screen

The user can see the state of each digital input and output in a table—whether it is open or closed.

5.2.5 Shutdown History Screen



The image shows a screen titled "WellPro" with a "SHUTDOWN HISTORY" list. The list has three entries: "PANEL ESD" with a time of "00059:16:09", "LOW SUCT PRESS" with a time of "00059:15:11", and "OVERCRANK" with a time of "00054:04:40". The top right corner shows "1/3".

SHUTDOWN HISTORY		1/3
PANEL ESD	00059:16:09	
LOW SUCT PRESS	00059:15:11	
OVERCRANK	00054:04:40	

Shutdown History Screen

The history of the last 20 shutdowns is displayed on this screen, with the most recent at the top of the list and the oldest at the bottom.

Each event is displayed with the shutdown label on one line and the hour meter reading on the following line. Pressing the up/down arrows will scroll up/down one shutdown at a time rather than one line at a time.

The "1/3" at the right end of the top line means the user is viewing shutdown one of a total of three stored. The newest shutdown will always be number one and it will push the older shutdowns further down the list.

5.2.6 Shutdown Snapshot

SHUTDOWN SNAPSHOT	
ENGINE SPEED	500 RPM
SUCTION PRESS.	35.3 PSI
DISCHARGE PRESS.	265 PSI
COMP. OIL PRESS.	74 PSI
ENG. OIL TEMP.	125 F
COMP. OIL TEMP	105 F
DISC. TEMPERATURE	35.3 F
COOLER TEMPERATURE	35.3 F
AMBIENT TEMPERATURE	35.3 F

Shutdown Snapshot Screen

The shutdown snapshot screen is a capture of the values displayed on the Line-by-Line custom screen at the time of a Fault SD or ESD event. These values will be retained and display on the shutdown snapshot screen until the next Fault SD or ESD event occurs. An asterisk displayed instead of a value indicates the shutdown snapshot has not captured any data or is not functioning.

NOTE: Only the first Line-by-Line screen configured will be captured. If no Line-by-Line custom screen is configured, the shutdown snapshot will not function.

5.2.7 Event History Screen

EVENT HISTORY		1/3
PANEL ESD	00059:16:09	◀
PANEL RESET	00059:15:58	
LOW SUCT PRESS	00059:15:11	

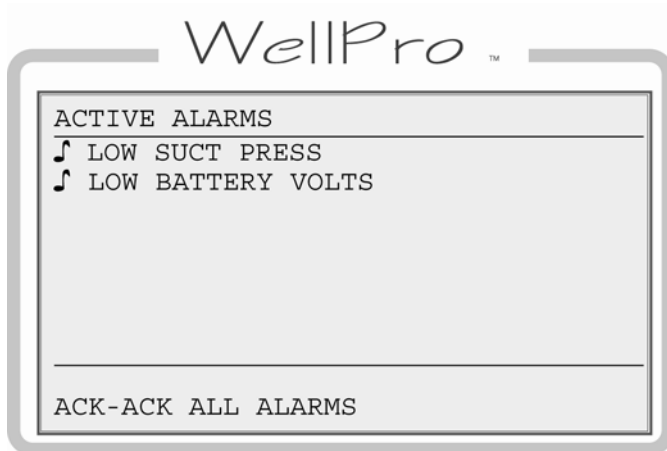
Event History Screen

The history of the last 32 events is displayed on this screen, with the most recent at the top of the list and the oldest at the bottom.

Events include shutdowns, starts, stops, resets, etc.

The user can easily view the events (alarms, etc.) logged before and after a shutdown.

5.2.8 Active Alarms Screen



Alarms Screen

All active alarms and warnings will be displayed on this screen.

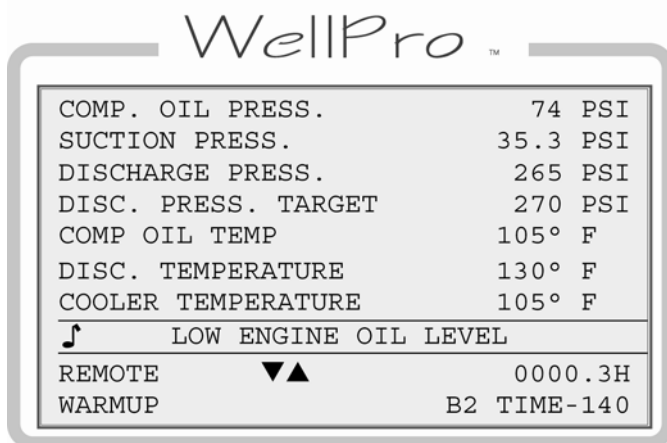
If there are more than six active alarms, there will be up/down arrow icons at the bottom of the screen and the user can press the up/down arrow keys to scroll up or down.

Unacknowledged alarms will be preceded by a musical note character and acknowledged alarms will have a bar through the staff of the note.

Pressing ACK on this screen will acknowledge all active alarms.

A maximum of twenty (20) active alarm will be displayed.

NOTE: Alarms are warnings based on setpoints and/or digital inputs which are separate from shutdowns.



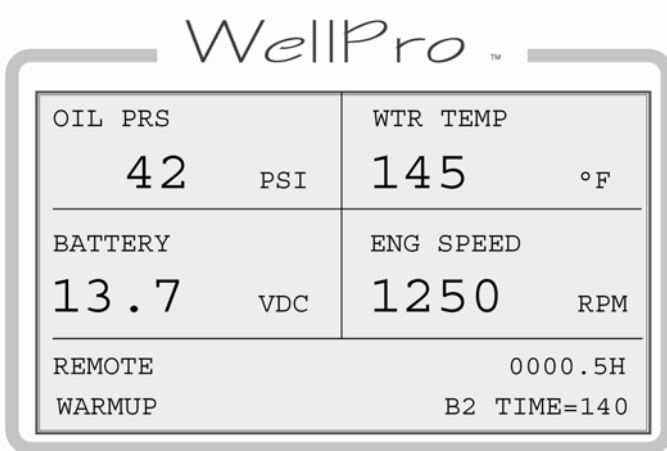
Operating Status Screen 3

This screen shows the alarm annunciation as it will appear on a status screen.

The alarm message(s) will overwrite the bottom line of the active screen area. It will blink on for a second and then blink off for about a second. This will continue until the user presses the ACK key or the event clears on its own.

If there is more than one unacknowledged alarm active, each alarm will be displayed for one second until acknowledged. The ACK key will acknowledge the alarm currently displayed. Pressing the Fn key followed by the ACK key will switch to the active alarms screen.

5.2.9 Gage Display



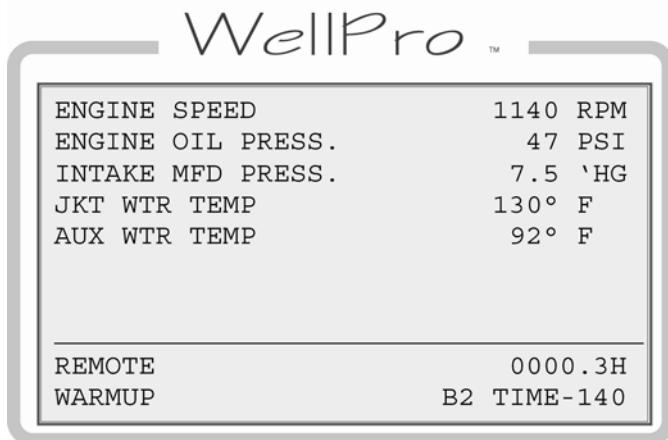
Custom Gage Screen

This is an example of a gage display.

This display provides larger characters for easier viewing as well as a means to prominently display items of interest. Unacknowledged alarms will overwrite the bottom half of the lower two gage boxes.

The two bottom lines are used to display the mode, hours, state and active timer status.

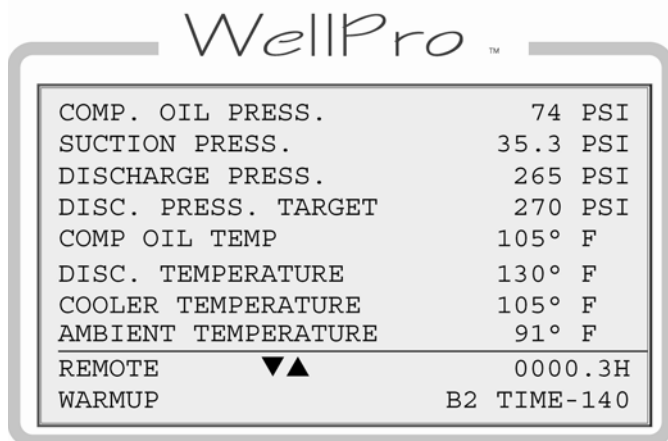
5.2.10 Line-By-Line



Operating Status Screen 1

This is an example of a line-by-line status screen.

Notice that there are no up/down arrows at the bottom of the screen because there are no additional lines to be displayed on this screen.



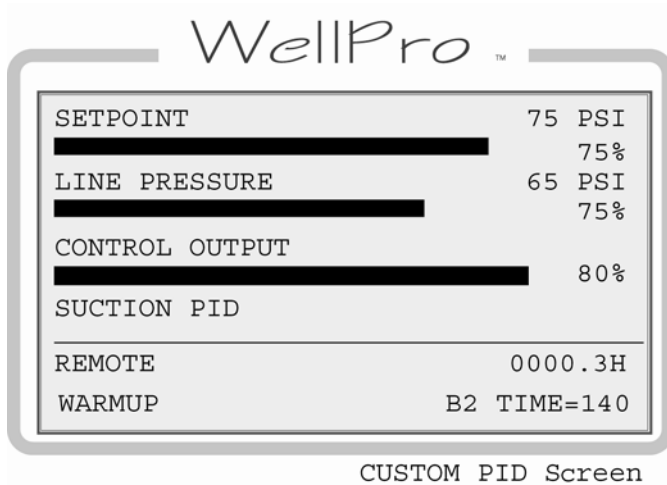
Operating Status Screen 2

This is an example of a custom line-by-line status screen with more parameters.

If the parameters do not fit in the viewable area of the screen, up/down arrow icons at the bottom of the screen can be used to scroll up or down.

The two bottom lines are used to display the mode, hours, state and active timer status.

5.2.11 PID Screen

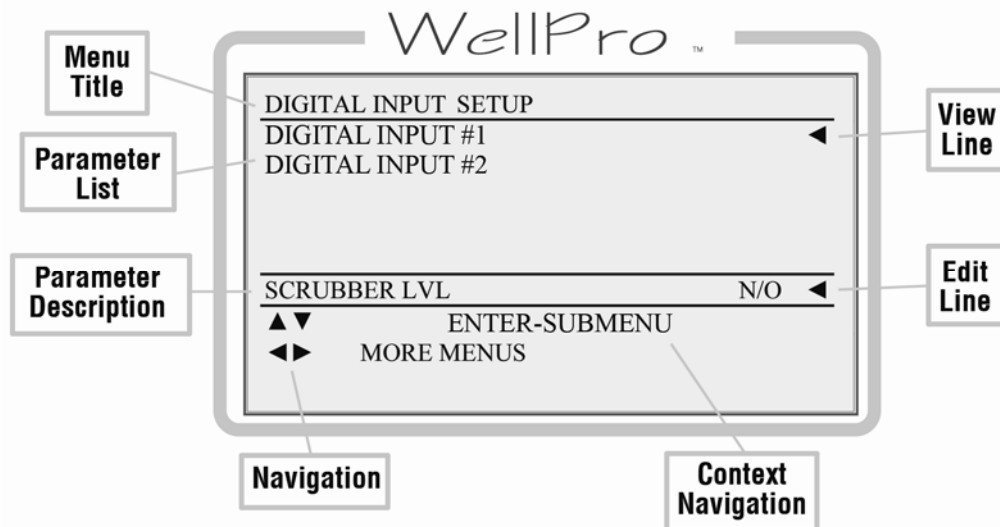


Display any configured PID functions in this convenient format. The control output will be displayed as a percentage of the range.

The bottom two lines are used to display the mode, hours, state and active timer status.

5.3 Setup Screens and Menus

The setup screens provide access to system parameters. These settings can be modified with appropriate password access. The two bottom lines in the setup screens display navigation and command options available such as EDIT, ACCEPT, CANCEL and MORE MENUS.



5.3.1 Password Screen

Some settings are password protected, including the setup screens.

This is the first screen displayed when the SETUP/ENTER key is pressed.

The password need only be entered once during any editing session. The password will reset when the editing session is exited, or is timed-out due to keypad inactivity.

The cursor begins at the last digit on the right. The user can adjust the value of each digit with the up/down arrows while the left/right arrows are used to select the digit to edit.

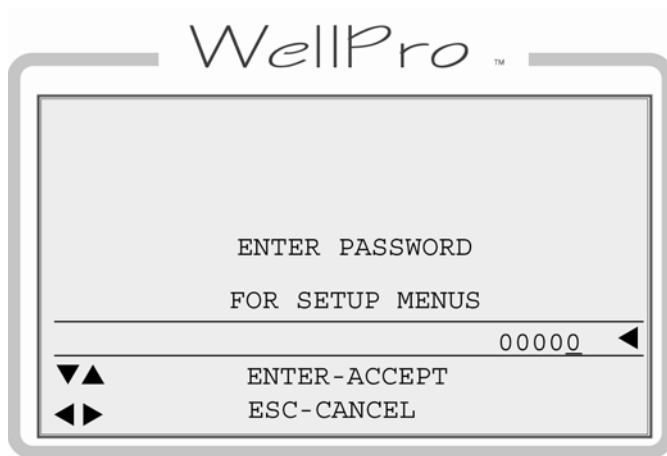
Passwords are assigned by Murphy and each digit can range from zero to nine (except the first digit on the left) for a total range of 00000 to 65535 for the complete password.

The user will not be allowed to increase the selected digit if it would result in exceeding range limits.

NOTE: If the Standard password is not zero and a password of all zeroes is entered, the user will have “view only” access.

Inactivity Timeout: Setup procedures must be started and completed in a timely manner.

NOTE: After three minutes without activity, the keypad returns the default operational screen and a password must be re-entered to return to the setup and edit menus.



Password Screen

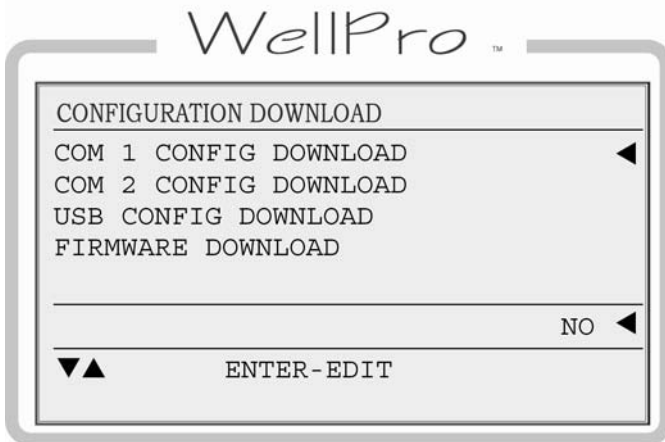
There are three separate levels of passwords to accommodate several security needs:

“Standard” password – Allows access to every feature except the super user menu. Valid standard passwords can be zero or any number between 100 and 65535. If the standard password is set to zero, the result is that anyone can have read/write access to setup menus.



Super User Menu Screen

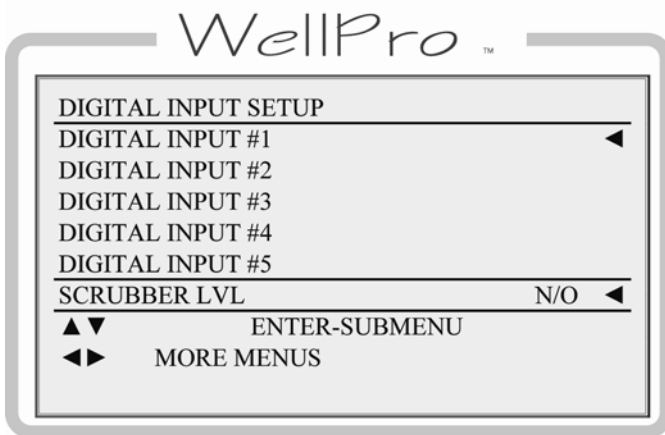
“Super User” password – Adds the super user menu to the standard menus. Valid super user passwords can be in the range of 100 to 65535. The super user password can not be the same as the standard password and cannot be set to zero.



Download Only Screen

“**Download Only**” password – This special 35 jump code allows access to a download menu and is set to a fixed value of 35. This allows a configuration to be downloaded in the event that the current passwords are lost or no initial configuration has been downloaded.

5.3.2 Digital Input



Digital Inputs Setup Screen 1

For up to eight configured digital input devices, the user may edit:

- a) **Signal Type** - Select normally open (N/O) or normally closed (N/C).
- b) **Signal Filter** - Select None to disable filter function for the digital input. This will not disable the digital input for normal operation.

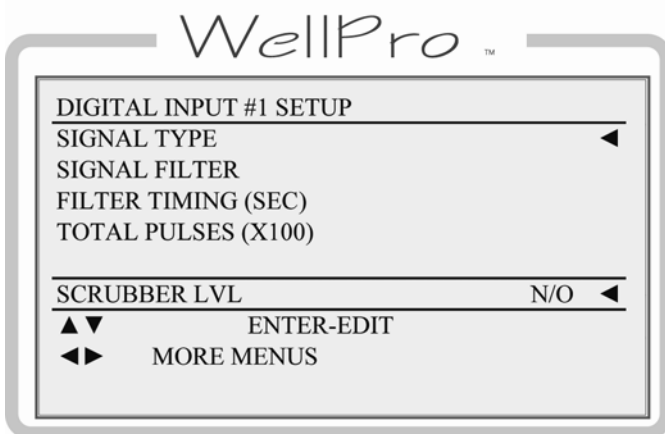
Select Pulse for lubricator divider blocks with a proximity switch output. Select DB to debounce or delay input detection for unstable inputs such as surge tank level.

- c) **Filter Timing** - Delay time in seconds for the selected filter type.

For Pulse, this delay is the transition time for the lubricator divider block to cycle.

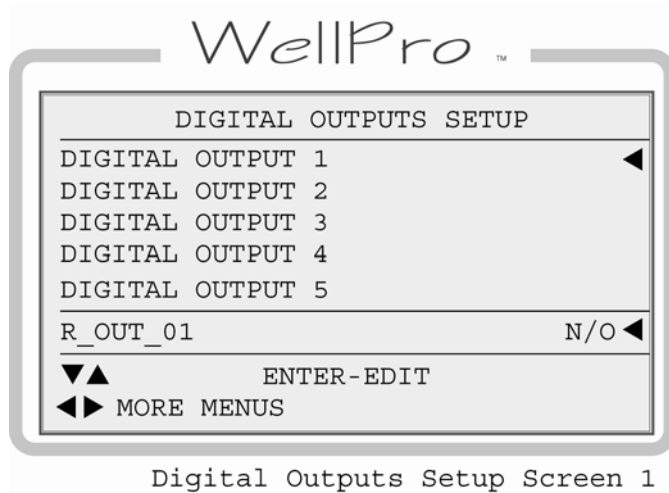
For DB, this is the duration the digital input must remain either ON or OFF before the input will be recognized and accepted as ON or OFF by the sequence. If the input does not remain ON or OFF for the duration of the delay, the timer will reset.

- d) **Total Pulses** - Total number of pulses counted when the filter type is set to Pulse. The value is expressed in hundreds of pulses; a displayed reading of 1 is equal to 100 pulses.



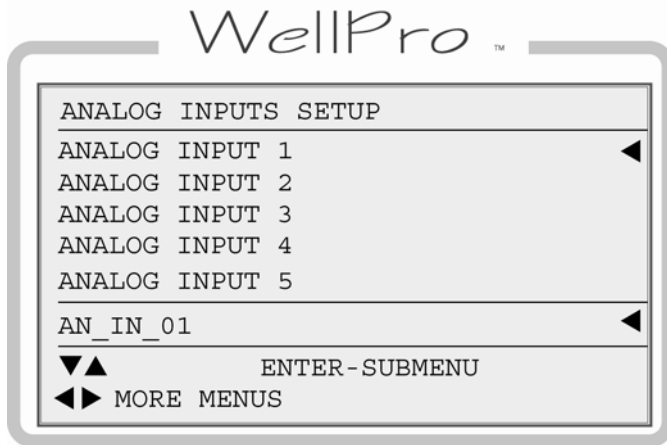
Digital Inputs Setup Screen 2

5.3.3 Digital Output

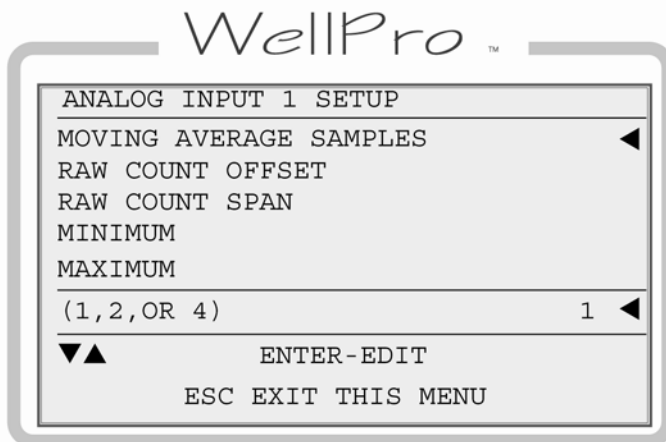


For up to 6 configured digital output devices, the user may select whether an output is normally open (N/O), or normally closed (N/C).

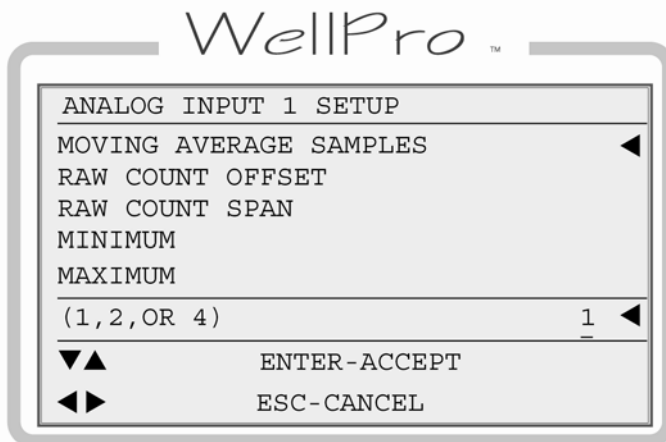
5.3.4 Analog Input



Analog Inputs Setup Screen 1



Analog Input 1 Setup Screen



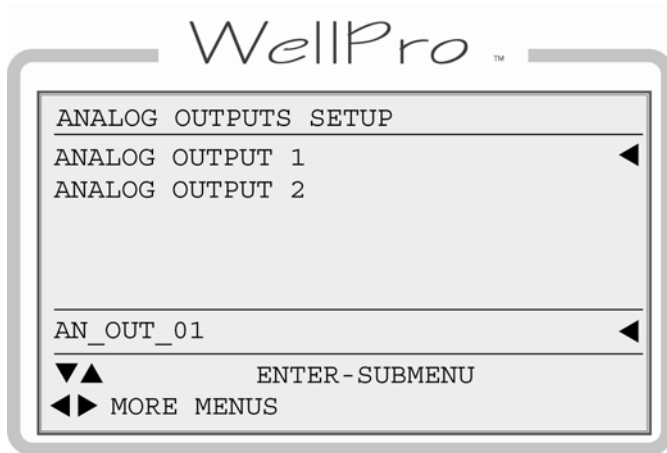
Analog Input 1 Setup Screen

For up to 6 configured analog input devices, the user may edit:

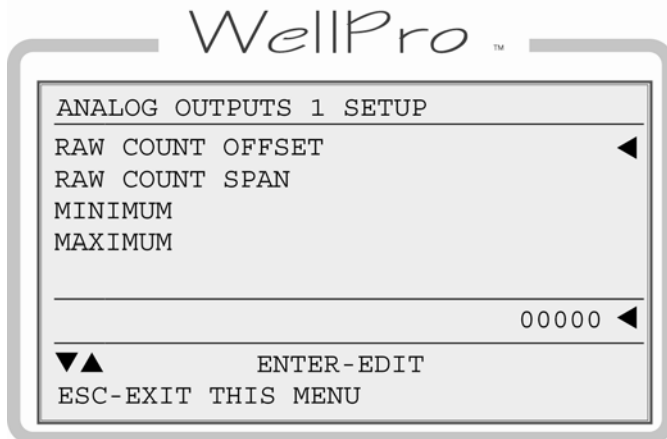
- a) **Moving Average Samples.** (1, 2, 4).
- b) **Raw Count Offset** to determine the lowest reading expected from the device. Typically 147 for 4-20mA or 0 for 0-5VDC
- c) **Raw Count Span** to determine the span from the lowest to highest reading expected from the device. Typically 586 for 4-20mA or 1023 for 0-5VDC
- d) **Minimum** to apply the appropriate minimum engineering scale. Example: 0 PSI for a 0-100 PSI PXT.
- e) **Maximum** to apply the appropriate maximum engineering scale. Example: 100 PSI for a 0-100 PSI PXT.

NOTE: Minimum and Maximum are used to define the input scaled in engineering units. Dual scales are not supported.

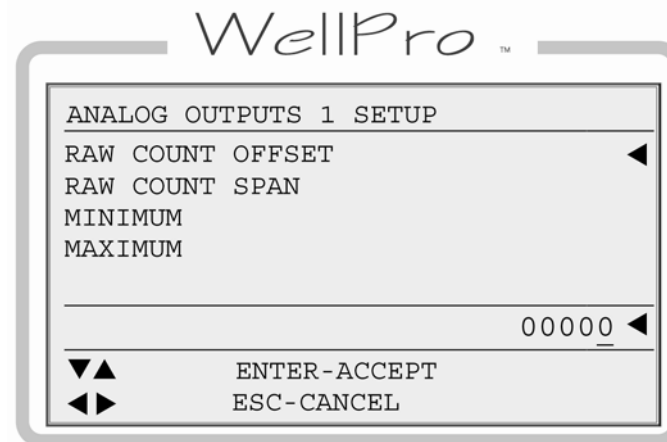
5.3.5 Analog Output



Analog Output Setup Screen



Analog Output 1 Setup Screen

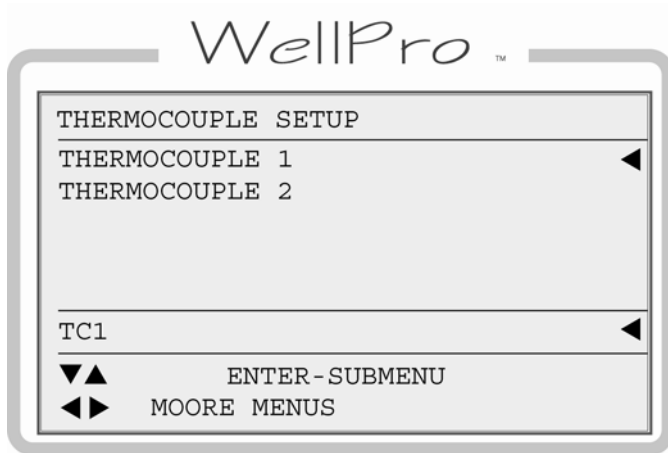


Analog Output 1 Setup Screen 1

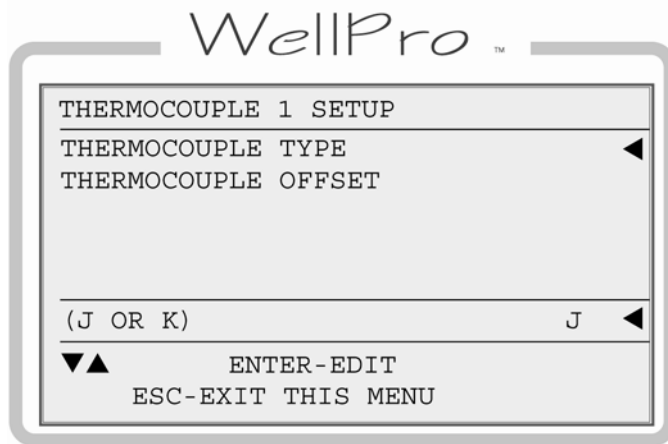
For up to 2 Analog Output devices, the user may edit:

- a) **Raw Count Offset**, the lowest reading expected from the device. Typically set to 0.
- b) **Raw Count Span** to determine the span from the lowest to highest reading expected from the device. Typically set to 10000.
- c) **Minimum** to apply the appropriate engineering scale. In most cases, 0% addresses a typical application and it is the WellPro's default value.
- d) **Maximum** to apply the appropriate engineering scale. In most cases, 100% (10000) addresses a typical application and it is the WellPro's default value.

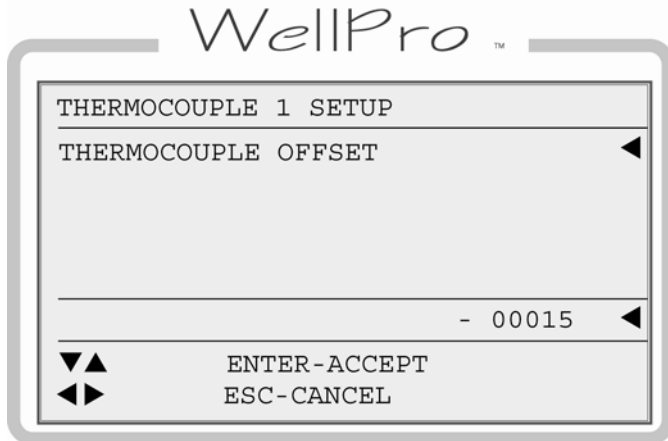
5.3.6 Thermocouple Input



Thermocouple Setup Screen



Thermocouple 1 Setup Screen

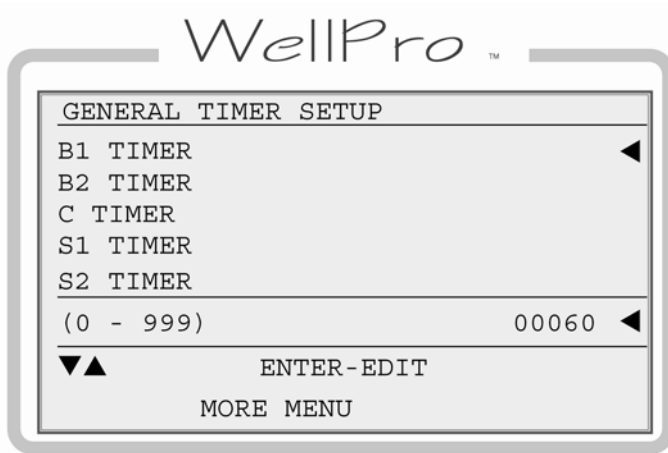


Thermocouple 1 Setup Screen 1

For up to 2 thermocouple input devices the user may edit:

- a) **Thermocouple Type.** Identify whether the calibration type should be set to J or K.
- b) **Thermocouple Offset.** Assign the thermocouple offset value.

5.3.7 General Timer Setup



General Timer Setup Screen

User may edit all general purpose timers. Generally, global timers affect engine operation. They also help define an event.

B1: All event types can be associated with, and locked out by, a Bx timer. B1 is the first global timer used for delaying an event condition detection. The timer starts in a running State (10 – 13) depending on which timers have been marked “In Use”. B1 is also known as the “Lockout Timer”, start bypass or start/run timer.

B2: The second global timer used for delaying event condition detection. B2 is also known as a secondary “Lockout Timer.”

NOTE: The Bx timers start after the Start key has been pressed and the controller has reached a "Running" state. States 10-13 are the "Running" states.

C: The delay allowing a clear reading before beginning testing for the arming of Class C events. The default and typical time for most applications is 2 seconds.

S: Users have up to five (5) options to assign additional special global timers to signals. The Sx timers begin concurrently with the Bx timers.

No-Flow: The global delay used for delaying the triggering of a no flow event. This global no-flow timer is enabled after B1 expires, and begins timing after any of the pulse transition times configured in the digital input dialog expires.

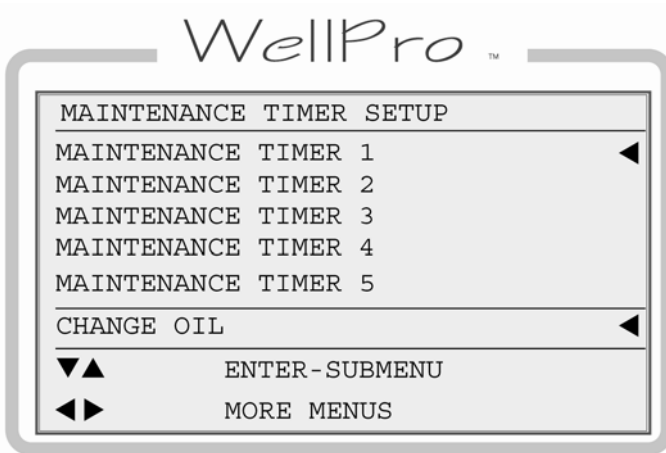
Test: Time given to allow for maintenance testing of end devices without triggering a fault or shutdown condition. The timer initiates when switched to test mode.

Ignition Off Delay: Time delay before the assigned ignition output turns off. This is typically used to burn remaining fuel vapors after the fuel valve is turned off.

Ignition On Delay: Time delay before the assigned ignition output turns on. This is typically used to delay ignition until engine has started cranking (also known as a purge delay).

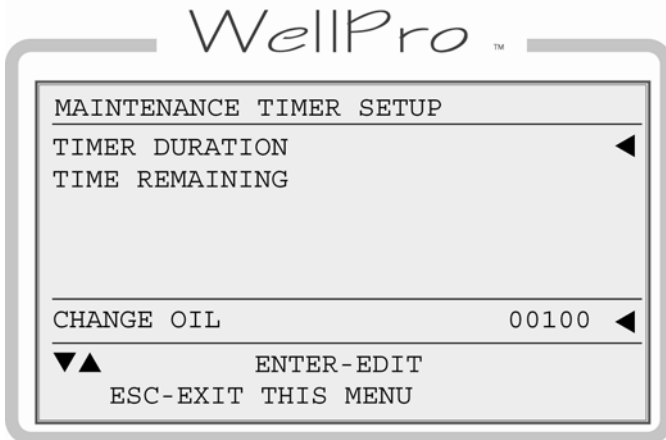
Fuel On Delay: Time delay before the assigned fuel valve output is turned on. This is typically used to delay fuel until ignition has been turned on.

5.3.8 Maintenance Timer Setup



Maintenance Timer Setup Screen

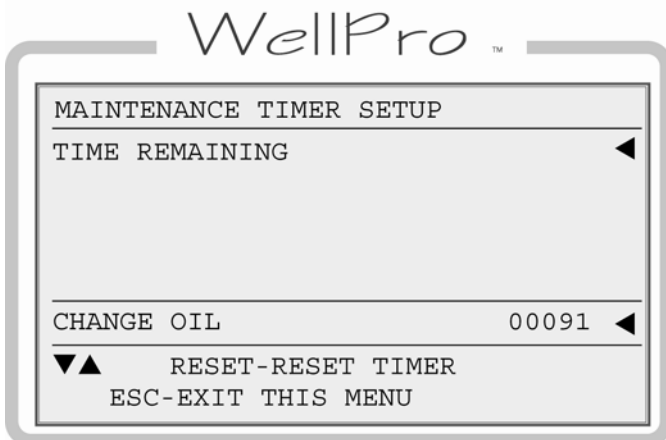
The user may access and edit the ten (10) maintenance settings for timer duration.



Maint_1 Setup Screen

The user may also access and reset all timer duration and time remaining settings. All maintenance timer units are in hours.

NOTE: Timers must be manually initiated, or restarted, in WellPro display.



Maint_1 Setup Screen 1

To initiate or reset timers, position cursor on TIME REMAINING and press the reset key.

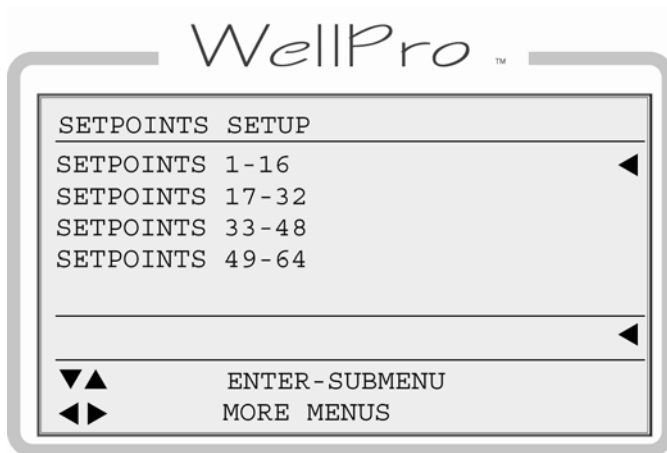
5.3.9 Setpoints Setup

User can edit any of the 64 setpoints that are configured.

Setpoints further configure variable input types such as MPU, analog, or thermocouples by defining a threshold, exception, or any other out-of-limit event that may require action. Multiple setpoints are often applied to a process and they may be configured as often as needed to meet changing conditions.

Common alarm and shutdown setpoints a user might have configured include:

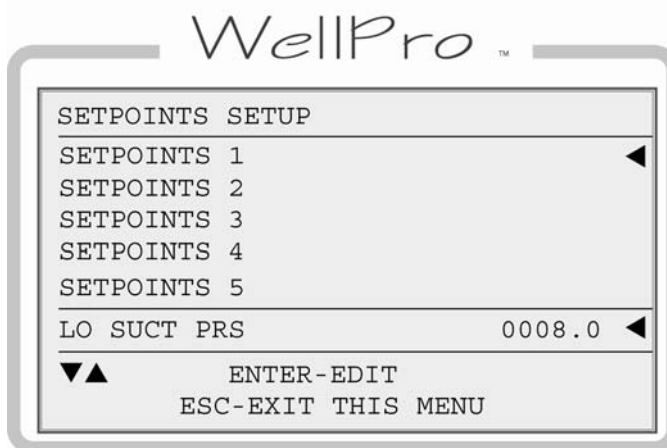
- High shutdown (High-High)
- High warning (High)
- Open warning (Open or Fail)
- Low warning (Low)
- Low shutdown (Low-Low)



Setpoints Setup Screen

To edit a configured setpoint:

a) Assign numeric threshold that if crossed, triggers the setpoint.



Setpoint Setup Screen 1

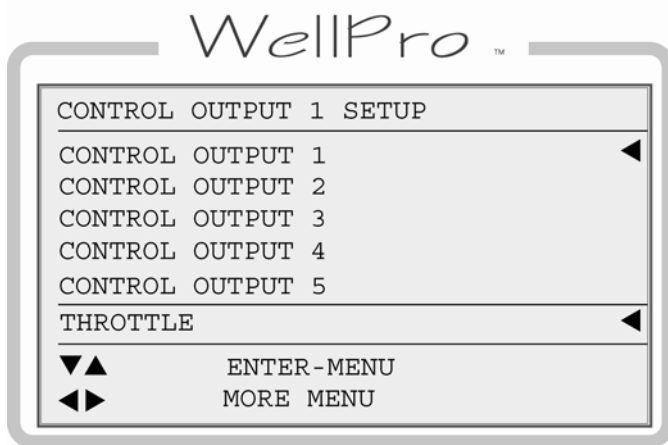
b) Adjust the sign of the threshold value as plus (+) or minus (-) by moving the cursor to the sign symbol position and use the up and down keys to toggle the sign.

5.3.10 Control Output Setup

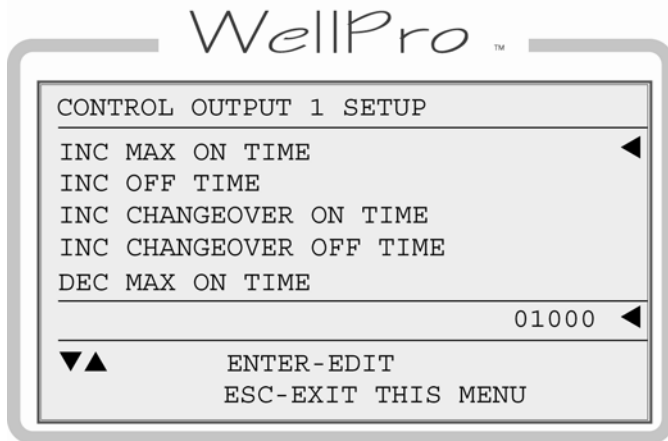
The controller allows users to define up to eight (8) outputs to augment control not otherwise defined by digital output assignments.

The controller can be configured to define an analog output, a digital output, a single pulsed digital output, or two pulsed digital outputs.

NOTE: Control outputs 1 through 4, are directly related to PID calculation loops and are further defined in the PID dialog screens described in the PID Setup section. For example, PID 1 assumes control of control output 1, PID 2 assumes control of output 2, and so on.



Control Output Setup Screen



Control Output 1 Setup Screen

If the configured output is a pulsed cycle, the user may edit those behaviors by assigning values to the following:

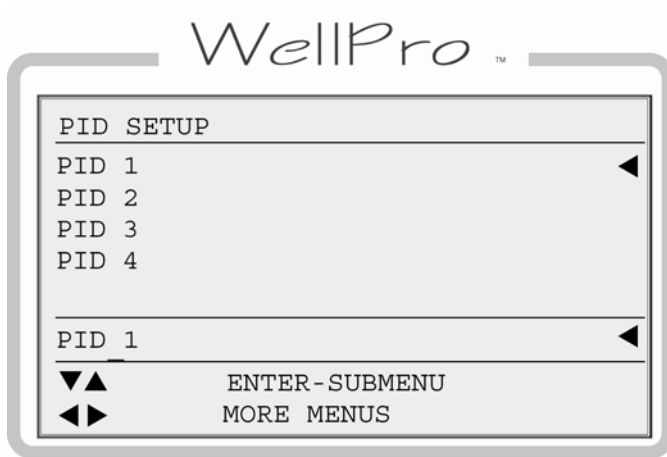
- a) **Increase Max On Time.** Set limit of maximum on-time for Increase pulses.
- b) **Increase Off Time.** Set fixed off-time for Increase pulses.
- c) **Increase Changeover On Time.** Set fixed on-time for single pulse on direction change for Increase.
- d) **Increase Changeover Off Time.** Set fixed off-time for single pulse on direction change for increase.
- e) **Decrease Max On Time.** Set limit of maximum on-time for decrease pulses.
- f) **Decrease Off Time.** Set fixed off-time for decrease pulses.
- g) **Decrease Changeover On Time.** Set fixed on-time for single pulse on direction change for decrease.
- h) **Decrease Changeover Off Time.** Set fixed off-time for single pulse on direction change for decrease.

5.3.11 Proportional Integral Derivative (PID) Setup

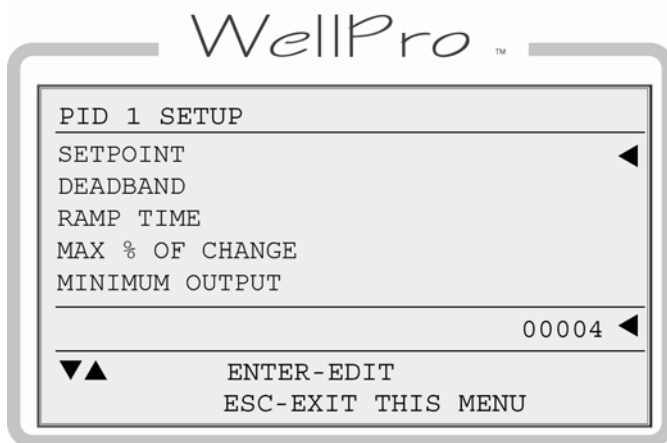
Users may view and edit up to four (4) configured PID control loops. A PID loop provides a constant feedback control loop, in which the PID can correct for a measured process variable against a desired setpoint, output the corrective action to the process and wait for and recalculate the next measurement.

The ultimate goal of the PID is to reduce the error to zero while maintaining the control setpoint (e.g. speed, load, pressure).

NOTE: During the time a PID is enabled, the PID always overrides control output settings found in the states configuration. PID 1 assumes control of control output 1, PID 2 assumes control of control output 2, and so on.



PID Setup Screen



PID 1 Setup Screen

To view and edit PID settings:

- a) **Setpoint:** Assign the desired goal—the target feedback base value.
- b) **DeadBand:** Assign a value around the setpoint during which the PID will not calculate error or take action.
- c) **Ramp Time:** Assign a time interval for the PID to calculate error.
- d) **Max % of Change:** Assign a percentage rate of change of the output, greater than which may cause harm to the system.
- e) **Minimum Output:** Assign a percentage as minimum output. Typically 0 (zero).
- f) **Maximum Output:** Assign a percentage as maximum output. Typically 10000 (100.00%)
- g) **Proportional:** Assign a constant value for the proportional coefficient of the PID loop calculation that causes a portion of the output to be a fixed amount proportional to the size of the error.

h) **Integral:** Assign a value for the integral coefficient of the PID loop calculation that causes a portion of the calculated output to change with accumulated error over time.

i) **Derivative:** Assign a constant value for the derivative coefficient of the PID loop calculation that causes a portion of the calculated output to change with the change in the size of error versus time.

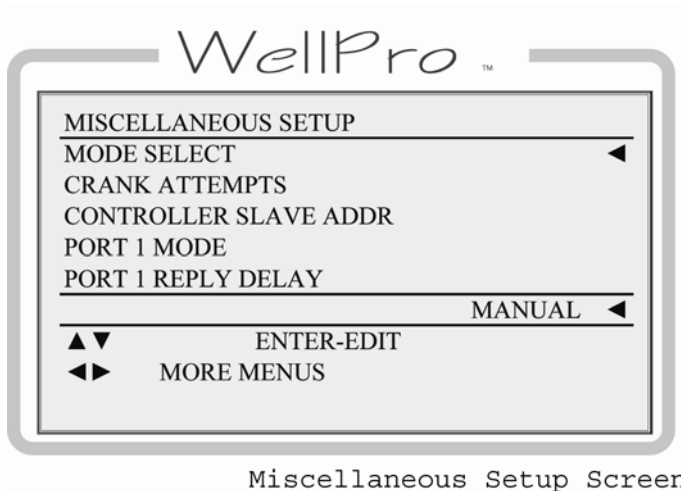
j) **OverRide Ramp Time:** Assign a time interval value to wait before making the next override adjustment.

NOTE: Override settings are only used when there is a configuration for overriding the primary PID control loop with another process variable.

k) **OverRide Ramp Amount:** Determine the increments in a given direction (positive or negative) that the primary setpoint should be altered to regain balanced processes. In the example of the discharge and suction pressure application, this value would indicate how much the PID should resist its goal in reaching the setpoint.

l) **OverRide Max Change:** Assign a maximum allowed change. This represents the total amount of change allowed into or out of the ramp amount from the setpoint. The maximum change value should be large enough to effect change.

5.3.12 Miscellaneous Setup



User can access and edit the miscellaneous settings.

a) **Mode Select:** Select operation mode (manual, auto, and timed).

b) **Crank Attempts (1-99):** Define a value for number of crank attempts after which an over-crank sequence will be triggered in the event logic.

c) **Port 1 Slave Address (1-255):** Provide the value for the Modbus address for port 1. The factory default is 1.

d) **Port 1 Mode:** Select communication port 1 as RS232, or RS485.

NOTE: The WellPro controller can only communicate using RS485.

e) **Port 1 Reply Delay (0-32767):** To ensure sufficient time for the Modbus reply, assign appropriate time value for delay Modbus reply port 1. Typically set to 18. This setting only applies to Port Mode RS485.

f) **Port 1 Baud Rate:** Select appropriate transmission baud rate (9600; 19200; 38400; 57600; 115200)

g) **Port 2 Mode:** Select communication port 2 as RS232, or RS485.

h) **Port 2 Reply Delay (0-32767):** To ensure sufficient time for the Modbus reply, assign appropriate time value for delay Modbus reply port 2. Typically set to 18. This setting only applies to Port Mode RS485.

i) **Port 2 Baud Rate:** Select appropriate transmission baud rate (9600; 19200; 38400; 57600; 115200)

NOTE: All ports use:

-Parity: NONE

-Data Bits: 8

-Stop Bits: 1

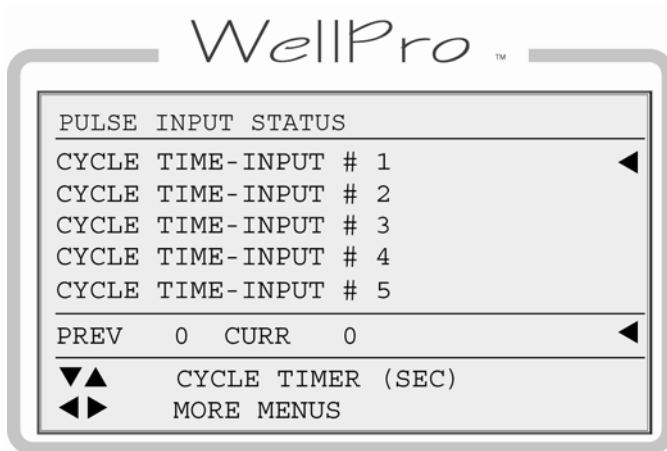
j) **Flywheel Teeth:** Define a value for flywheel teeth (Pulses Per Revolution) used to calculate RPM.

WARNING: The following cold junction temperature offset value should only be adjusted by personnel with a full working knowledge of the WellPro controller in conjunction with calibrated reference equipment.

j) **Core Cold Temp Offset:** Enter a non-zero value for core temperature adjustment (in tenths) to adjust the temperature readings for all thermocouple inputs on the WellPro controller. Entering a non-zero value will adjust the cold junction compensation reading used to calculate temperature.

l) **Hour Meter:** The user may make hour meter adjustments. The range is 0 – 65535 hours.

5.3.13 Pulse Input Status



Pulse Input Status Screen

Pulsed inputs are designed to accept a cycling digital output from a lubricator divider block; typically from a general purpose proximity switch.

The user may view information about the pulsed inputs. If a digital input is designated for use as a pulsed input, it will display how much time elapsed before the last transition, and how much time has elapsed since that transition. If the input is not designated as a pulsed input, there will be zeros displayed. Both have a maximum value of 999.

5.3.14 Super User Menu

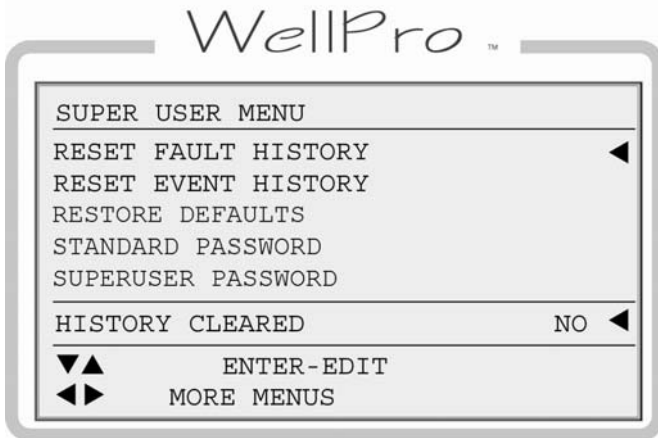


Super User Menu Screen

The super user menu will only be visible if the super user password has been entered.

- a) **Com Fail Disable:** Set to Yes to prevent the Com Fail message from appearing when communication is lost or cannot be established.
- b) **Setup T/O Disable:** Set to Yes to prevent automatic logout from the Setup menus when no keys are pressed for the timeout period.
- c) **Config Fail Disable:** Set to Yes to prevent the Invalid Configuration screen from appearing when the display and controller configurations do not match.

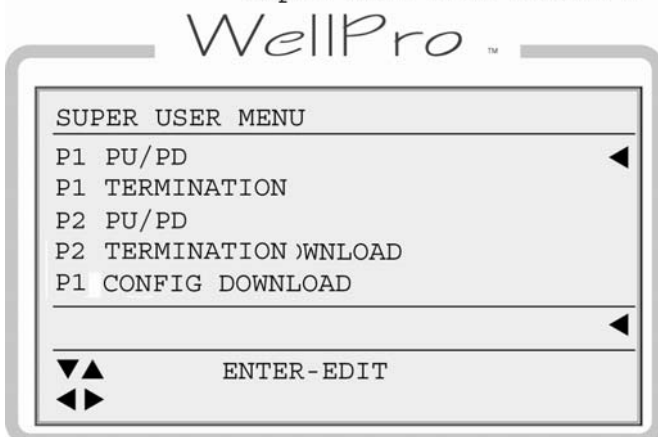
NOTE: Settings a thru c are for troubleshooting purposes and are not retained on power cycle.
- d) **Reset Fault History:** Set to Yes to clear the Shutdown History screen.
- e) **Reset Event History:** Set to Yes to clear the Event History screen.



Super User Menu Screen 2

NOTE: The **Reset History** commands do not permanently switch to Yes when entered, but instead toggle back to No after sending the command to the controller.

Also, the message “HISTORY CLEARED” will be displayed until another key is pressed.



Super User Menu Screen 3

f) **Restore Defaults:** Set to Yes to overwrite all settings changed through the display to the original configuration settings from the last download.

NOTE: The Restore Defaults command does not permanently switch to Yes when entered, but instead toggles back to No after sending the command to the controller.

Also, the message “DEFAULTS RESTORED” will be displayed until another key is pressed.



Super User Menu Screen 4

g) **Standard Password:** Set to Yes to enter the Standard User Password edit screen. The current password is displayed and can be changed.

h) **Superuser Password:** Set to Yes to enter the Superuser Password edit screen. The current password is displayed and can be changed.

NOTE: The Password commands do not permanently switch to Yes when entered, but instead toggle back to No after returning from the Password view/edit menu.

The **P1** and **P2** signify communication port 1 and communication port 2 and are for setting up the RS485 interfaces on the display's serial ports.

i) & k) **PU/PD** designates internal pull-up and pull-down resistors. These can be connected or disconnected by these settings.

j) & l) **TERMINATION** designates internal terminating resistors. These can be connected or disconnected by these settings.

NOTE: By default, both PU/PD and TERMINATION settings are set to YES for both Port 1 and Port 2 to enable these features for RS485.

m) **P1 Config Download**

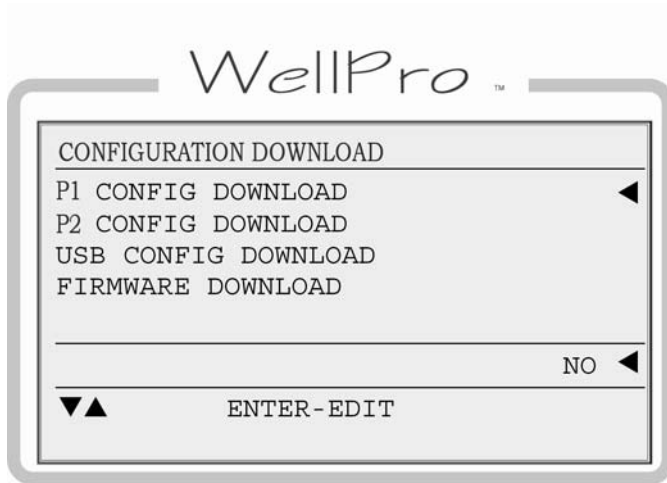
n) **P2 Config Download**

o) **USB Config Download**

p) **Firmware Download**

NOTE: Items m thru p communication port functions are also available for the configuration download menu. Refer to the section "Downloading Configurations to the Display" for details on download functions.

5.3.15 Configuration Download



Download Only Screen

This menu allows for download only and can be accessed through the special jump code 35.

It is the only screen available by entering the password 35.

New configurations can be downloaded to the display by selecting the desired connection.

(P1 Config Download, P2 Config Download, and USB Config Download)

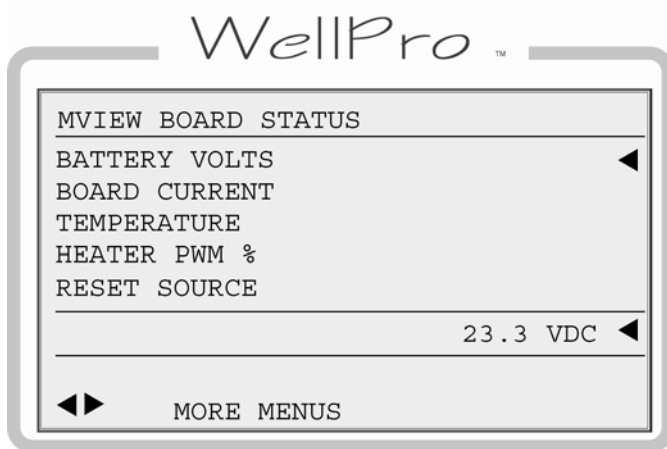
After enabling the download, download progress is indicated on the left side of the edit box as a percentage complete. After selecting Yes for download, and until No is selected after download is complete, only the enter key will be active.

See the “Operational Screens” section for further details about downloading configurations.

- a) **P1 Config Download:** Selecting Yes initiates configuration download through communication port 1.
- b) **P2 Config Download:** Selecting Yes initiates configuration download through communication port 2.
- c) **USB Config Download:** Selecting Yes initiates configuration download through USB port.
- d) **Firmware Download:** Selecting Yes initiates firmware download. This feature only supports USB download. The USB cable must be plugged into the USB port and connected to a pc before activating this selection. A firmware update mode screen will remain until the unit has been reset by remote command or a power cycle.

See section “Downloading Firmware Updates to the display” for downloading new firmware.

5.3.16 Display Board Status



MView Board Status Screen

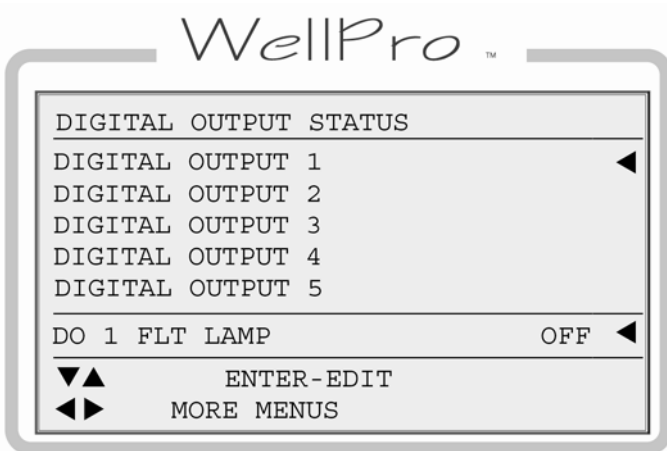
The user may view diagnostic information that reflects the operating conditions of the display only.

- a) **Battery Volts** - Indicates internal voltage measurement of display VDC input.
- b) **Board Current** - Indicates internal power measurement of display. Typical current measured at 24VDC is .04A or 40 milliamperes.

NOTE: This value is higher when ambient temperature is below -10F. During this time the LCD heater will be active and consuming more power.

- c) **Temperature** - Indicates internal temperature measurement of display. This is used primarily to monitor ambient temperature to operate LCD heater.
- d) **Heater PWM %** - Refers to the LCD heater which only operates in cold temperature conditions.
- e) **Reset Source** - Indicates the cause of the last reset. Possible causes include external reset, power-up, brown-out and watch dog.

5.3.17 Digital Output Status

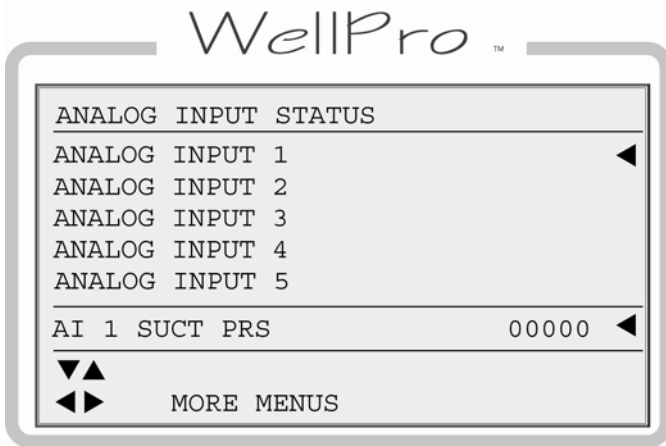


Diagnostic-Digital Outputs State Screen

For each of the devices configured, the user can see the state of each output and has the ability to force an output for the purpose of testing. A force is associated with a timeout so that it will be automatically cancelled when returning to normal operation. Each force operation resets the timeout to 5 minutes. The force timer expires after 5 minutes if no other forces are activated or when the user navigates away from the digital output status screen.

The Force timer is shown in the bottom right corner of the digital output status screen when forces have been activated.

5.3.18 Analog Input Status



Diagnostic-Analog Inputs Screen

The user can view the raw counts of the analog inputs for troubleshooting.

NOTE: These values are used to establish the offset and span settings.

Typical approximate raw readings for 4-20mA input:

4mA = 147

20mA = 733

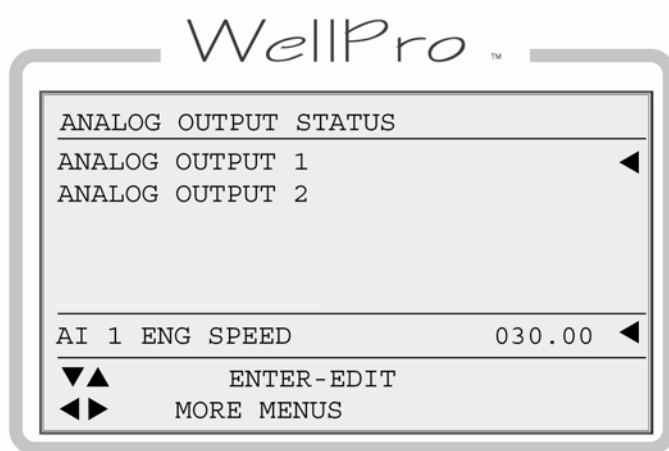
The Span (16mA) is 586, therefore:

8mA = 293

12mA = 439

16mA = 585

5.3.19 Analog Output Status



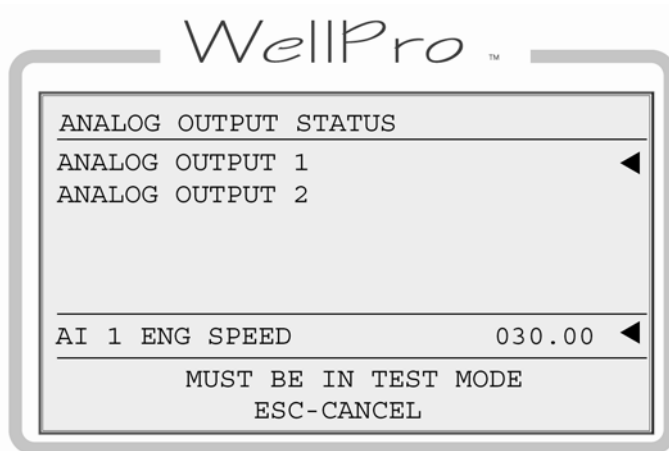
Diagnostic Analog-Outputs Status Screen

The user can see the state of each output, and if in test mode, has the ability to force an output for the purpose of testing.

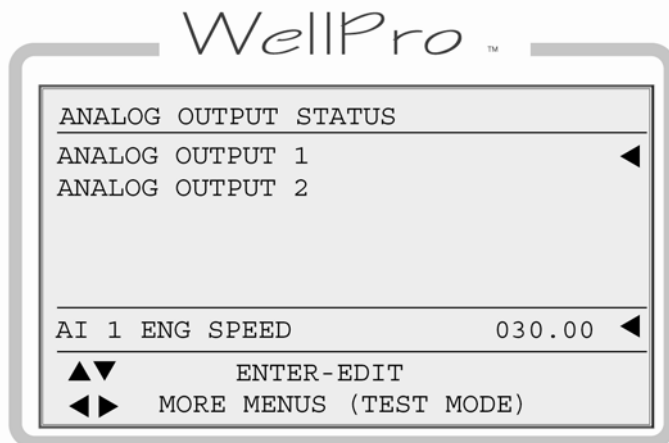
To force the output, enter a value from 0.00% = 4mA to 100.00%. = 20mA

Any value in between will output a portion of the 16mA span proportional to the percent value.

Analog outputs under the control of PID or other control output settings cannot be forced. To force a PID controlled output, place the PID in manual mode and operate the manual output value.

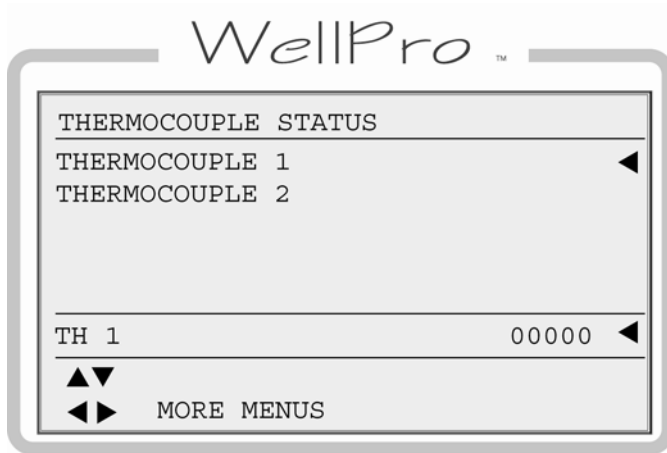


Diagnostic Analog-Outputs Status Screen 2



Diagnostic Analog-Outputs Status Screen 3

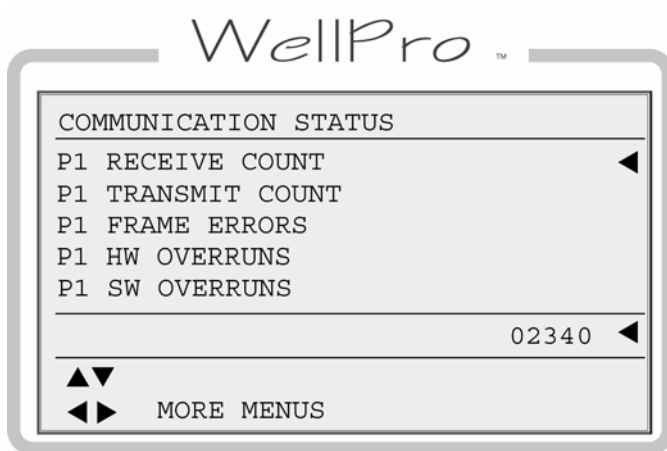
5.3.20 Thermocouple Status



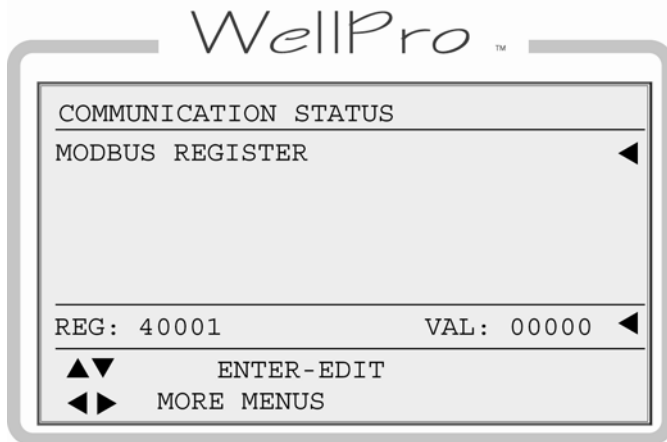
Diagnostic Thermocouples Screen

The user may view the raw counts of the thermocouple inputs for troubleshooting.

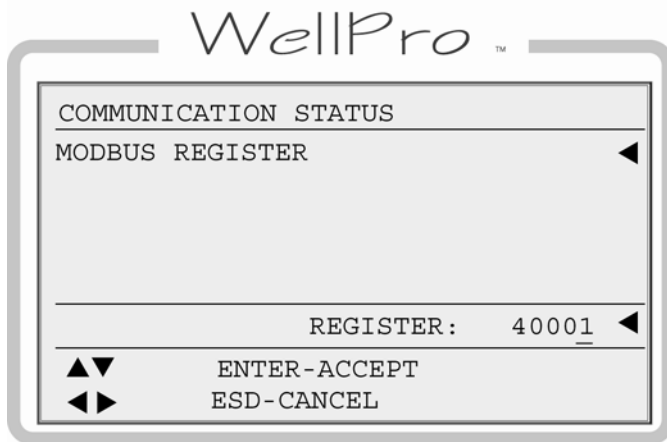
5.3.21 Communication Status



Communication Status Screen 1



Communication Status Screen 2

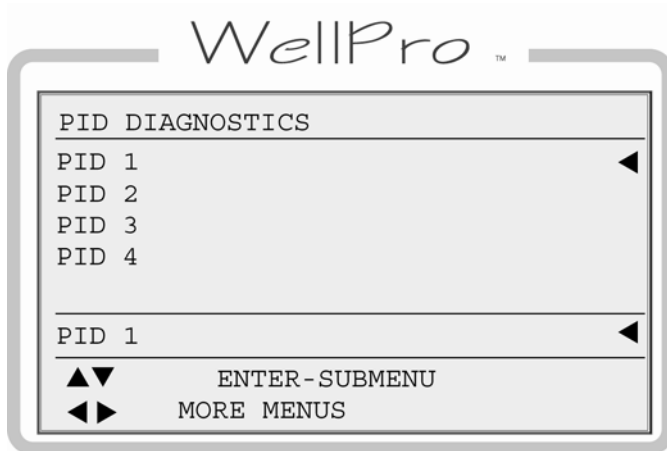


Communication Status Screen 3

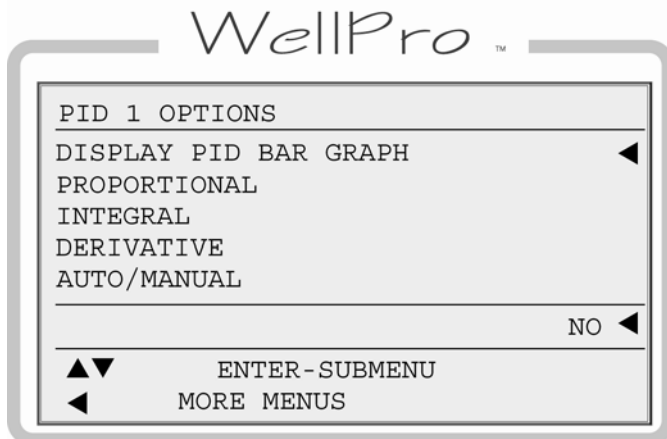
Users may view the statistics for both of the display unit serial ports, including Modbus RTU requests and responses.

- a) **P1 Receive Count**
- b) **P1 Transmit Count**
- c) **P1 Frame Errors**
- d) **P1 HW Overruns**
- e) **P2 SW Overruns**
- f) **P2 Receive Count**
- g) **P2 Transmit Count**
- h) **P2 Frame Errors**
- i) **P2 HW Overruns**
- j) **P2 SW Overruns**
- k) **Modbus Requests**
- l) **Modbus Responses**
- m) **Modbus Exceptions**
- n) **Modbus Invalid Response**
- o) **Modbus No Response**
- p) **Clear Statistics**
- q) **Modbus Register**

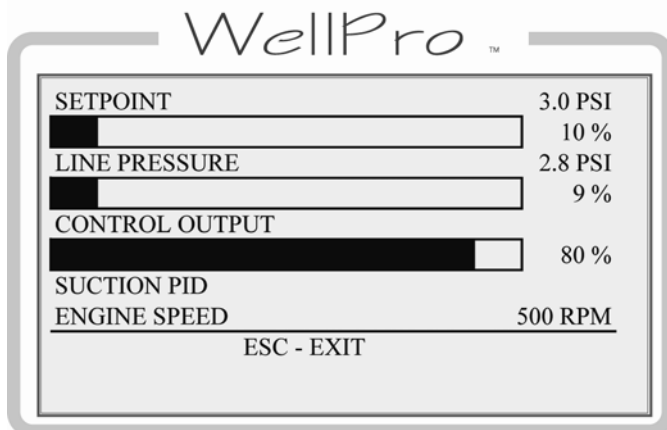
5.3.22 PID Diagnostics



Diagnostic PIDs Screen



Diagnostic PIDs Screen 2



Diagnostic PIDs Screen 3

For each of four (4) possible configured PIDs, user may edit:

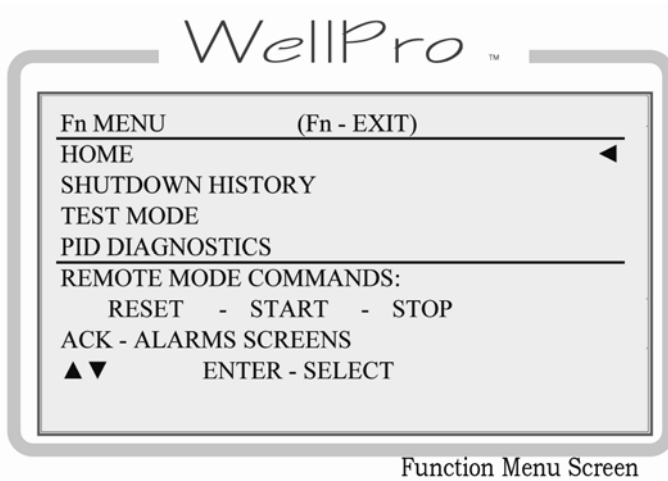
- a) **Display PID Bar Graph:** Monitors the results of modifying the PID components.
- b) **Proportional:** Edit the proportional coefficient value.
- c) **Integral:** Edit the integral coefficient value.
- d) **Derivative:** Edit the derivative coefficient value.
- e) **Auto/Manual:** Setting to manual mode allows the corresponding Set Output value to be adjusted.
- f) **Set Output (Manual):** In manual mode allows adjustment from 000.00 to 100.00. The output will correspond to the control output associated with the PID.
- g) **Reference Line Select:** Setting to select the display value that will appear on the line above the separator line and below the PID name.

This setting is useful for showing the process value of a different analog, thermocouple, or speed input that may be effected by changes to the PID output.

Select from available analog, thermocouple, or speed inputs or None to disable the Reference Line Select feature.

5.4 Additional Navigational Aids

5.4.1 Function Key



Pressing the function (Fn) key from any screen will display a new screen. All available function key commands will be displayed there.

In this case, the user can select from a help screen, the alarms screen or issue a remote mode command. If the Fn key is not followed by another key press in five seconds, function mode will time out and the dialog box is replaced with the previous screen.

NOTE: In all cases the Fn key options will be context sensitive. Some options will only be available from certain screens or under certain conditions.

6 Communications

6.1 Controller Communication Ports

6.1.1 Port 1 (SERIAL)

Port 1 is intended as the primary port for the local device, the WellPro display, and should be utilized for the display in order for the boot loader mode to properly execute in pass-through mode.

Interface: Refer to the sequence of operations to determine how the communication port has been configured.

Protocol: Modbus RTU (slave)

Connection: There are three (3) screw terminal connectors for RS485. These are identified as A, B, and SHD.

6.1.2 Port 2 (SERIAL)

Interface: Refer to the sequence of operations to determine how the communication port has been configured.

Protocol: Modbus RTU (slave), Proprietary (binary)

Connection: There are three (3) screw terminal connectors for RS485. These are identified as A, B, and SHD.

Modbus RTU Slave Address Configuration: The operator may assign a unique Modbus RTU address to each controller (slave) unit that may be in the system. This allows the master controller to differentiate between the modules. For example, to name the controller address 21, place the shunts on LK1, LK4, and LK16 ($1 + 4 + 16 = 21$). Typically, this configuration is set to (1) by the factory.

6.1.3 Port 2 (USB)

Interface: USB 1.1 compliant port capable of emulating RS232 communications via royalty-free pc driver.

Protocol/Services: Modbus RTU (slave), Proprietary (binary)

Connection: There is a USB type B connector.

Automatic selection of USB is provided when a signal is detected on the USB type B connector. Connection for RS485 will not be enabled on port 2 when USB is connected.

6.2 Downloading Configurations and Firmware Updates

The controller and display are configured and upgradeable through software transfers using a PC or laptop computer.

Configurations provide the necessary instructions to the controller and display and install default parameters that can be adjusted through the display or Modbus RTU.

Firmware defines the available features that can be configured in the controller and display.

Since no chips are used to change the behavior of the equipment, Murphy can provide future enhancements and support changes to process requirement for customers using a simple email.

6.2.1 Boot Loader

It is necessary for the controller to enter boot loader mode in order to receive downloads for a firmware update, and configurations from MTransfer. During boot loader mode the WellPro is able to receive configuration updates from the MTransfer software and transmit configuration updates to the display through pass-through.

Communications will operate according to default state parameters for configuration transfers. During boot loader mode, the transfer rate is 9600, N, 8, 1 and assumes a serial communication port setting of RS485 or a USB connection.

The controller recognizes whether the incoming data is for a configuration, or firmware update.

In order for the controller to enter boot loader mode, the address jumpers are removed during power up (power cycled). The WellPro display and third party HMI devices will not receive a response to polls on port 1 while the boot loader is active.

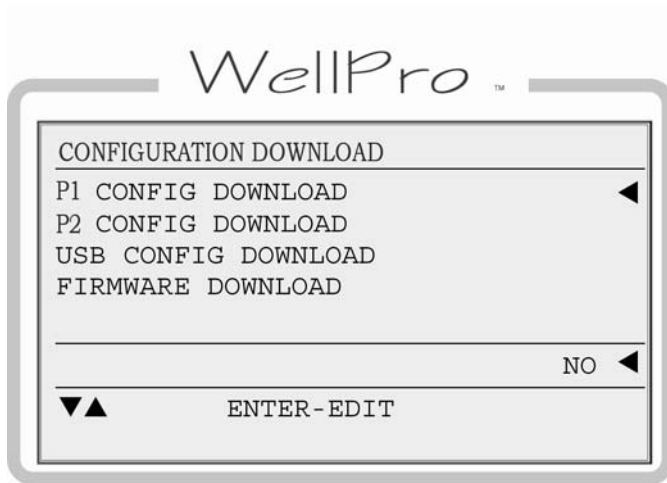
Power on the WellPro controller must be cycled with the jumper installed to resume normal operation, or run mode. See section "Port 2 (Serial)" in the Controller Communication Ports chapter for more details on address jumpers.

6.2.2 Pass-through

During boot loader, the controller allows users to remain connected to both the PC and the display and update the two devices with a single connection.

The WellPro controller accepts the message through one port (port 2) and passes it through another port (port 1) directly to the display, as if the pc and display were directly connected.

6.2.3 Downloading Configurations to the Display



Download Only Screen

All configuration downloads will use a baud rate of 9600. The port 1 selection will use the hardware setup of the current configuration. The port 2 selection is a fixed hardware setup for RS485. Selecting USB for configuration download connects the USB adapter to port 2 internally.

All normal communication with the controller is stopped while in download mode.

The display will indicate the transfer is complete by displaying 100%.

Special 35 Jump Code

In the case that no configuration has been downloaded, or a password has been lost, the display allows a "Download Only" password that will allow access to the download menu.

The password is set to a fixed value of 35.

6.2.4 Downloading Configurations via MTransfer Software

The controller allows the user to easily download a configuration through the MTransfer software.

1. Connect your PC to the controller using either the RS485 or USB connection on Port 2. For USB, a PC device driver must be installed. Upon initial connection to the WellPro, a new Com Port will be activated on the PC device manager. Take note of the new Com Port assignment to be used for all future communications with the WellPro.
2. Remove address jumpers from the controller located near the USB connector and cycle power to the controller. Take note of the original location of the jumpers to re-install them correctly after download.
3. Click on the Transfer menu, and then choose Configurations.
4. Select the configuration file supplied by FWMurphy from dialog and click Open. You may need to change the selection for Files of Type to find the file type you wish to download. In most cases, this will be *.MCP, however, other file types are available for specific configuration types.

5. After selecting the configuration file, the next dialog will provide a choice for the target device and PC Com Port to transfer the data. Choose the appropriate Com Port and controller as the target device and click next.
6. Click Begin Transfer from the dialog box that appears and the transfer will begin. When the Status message displays Transmitting 148 lines, the connection has been established and should be providing a progress bar.
7. While the transfer is in progress, the display can be setup to accept the new configuration.
8. From the display keypad, press SETUP and enter password 00035 and press ENTER..
9. The display will show the CONFIGURATION DOWNLOAD screen. Make sure the cursor is positioned on the line COM 1 CONFIG DOWNLOAD and press ENTER.
10. Change the NO to YES in the edit line at the bottom of the screen using the UP ARROW key and press ENTER. The display is now ready to accept a download..
11. At this step, wait for the controller download to complete and click close on the MTransfer dialog.
12. Repeat steps 3 - 6 choosing the display as the target device in Step 5.
13. Click Begin Transfer from the dialog box that appears and the transfer will begin. When the Status message displays Transmitting 655 lines, the connection has been established and should be providing a progress bar.
14. Once the transfer is complete click Close on the dialog and replace the address jumpers on the controller.
15. Cycle power on the controller and display and the new configuration will be loaded and running.

6.2.5 Downloading Firmware Updates to the Display



Firmware updates for the WellPro display require a USB connection. While boot loader mode for the display is not required for configuration downloads, it is required for firmware updates.

The boot loader can be entered by menu selection if the USB cable is currently connected, otherwise the display will reset and restart the current application firmware. Optionally, the boot loader can be entered by connecting the USB cable and cycling power. (This method will leave the display blank while in the boot loader.)

Upon entry to the boot loader, all communication from the display to the controller will stop. There is a red status LED below the USB connector that will blink three times and then remain on while the boot loader is active.

While a file is being transferred, the com 2 transmit LED will be lit continuously. A successful download should complete in approximately five minutes.

Special 35 Jump Code

The display allows a “Download Only” password that will allow access to the download menu. The password is set to a fixed value of 35. Once at the “Download Only” screen on the display, the user will select to download a firmware update.

Super User Menu

The super user menu is used to download firmware updates. All normal communication with the controller is stopped while in download mode. The display will indicate the transfer is complete by displaying 100%.

6.2.6 Error Messages

On occasion an invalid configuration error might display because the configuration between the WellPro controller and its devices are out of synch -- the checksums do not match. The invalid configuration screen will appear briefly after downloading configurations until comparisons are made.

The user may direct the error message to be ignored through a setting at the super user menu. At "CONFIG FAIL DISABLE", the user would select Yes to ignore the data mismatch.

This setting is temporary. Once power is cycled-on, the error message will continue until comparisons between the devices yield no configuration mismatch.

Two options are available for synchronizing data when fine-tuning changes are made in the field. They are:

- A super user could choose to also download the configuration from the super user menu on the display.
- A user without access to the super user menu could activate the download through the special jump code 35.



Comm Fail Screen

This screen indicates that the controller is not responding to poll requests. There are only two ways to exit this screen, either by normal responses resuming or if the SETUP/ENTER key is pressed.



This screen will be displayed when a configuration fault is detected.

Possible sources of the fault include a corrupt or missing configuration in the display, a corrupt or missing configuration in the controller or a mismatch of configurations in the display and controller.

This screen will appear briefly after configuration downloads and may appear briefly after initial communication is established until comparisons are complete.

The fault can be resolved by downloading the proper configuration to one or both devices

NOTE: This error message does not always indicate a problem, but may only signify that initial comparisons between devices do not match.

6.3 Modbus RTU Protocol

The WellPro controller was programmed with the Modbus RTU protocol which is a system based on a “master” and “slave” relationship. With Modbus RTU protocol, the master and slave are able to continue to communicate with each other through defined messages over a variety of network types. The master initiates the queries or commands, and the slave responds to the query with a message or takes action based on the query.

In this case, the master is either Modbus client software, or the WellPro display, but never both simultaneously as there can only ever be a single Modbus master.

The WellPro system communicates through Modbus using remote terminal unit (RTU) transmission mode to maximize data processing.

As with all numeric data defined within Modbus, the programming is limited to accepting integers (whole numbers only, no decimals). This is important whenever a decimal point is defined for analog inputs.

For example, for the controller to properly read “100.0” with an implied decimal point of 1, the user would need to enter “1000” and 1000 would be stored in the appropriate Modbus register. From the display, the value will be represented with a decimal in the fixed position.

6.4 Transferring Data in Modbus

Note that text visible on the display is not stored in the controller. Except for the version description in the version and security dialog for each configuration file, descriptions assigned in the configuration are not stored in the controller. Descriptions for various I/O and processes are downloaded to the display and reside as a configuration in that device only. Configurations of the display are one way only.

Parameter changes made in the display are actually communicated to the WellPro controller where the logic resides. No changes made through the display affect the display configuration. The display merely reads from, and writes to the controller. As such, the display can write numeric parameters to the controller.

6.5 Modbus Register Address Listings

For a complete Modbus address map, please refer to the WellPro Modbus reference document.

7 Replacement Parts and Assemblies

Choke (50000774) Ignition noise (choke) filter

8 Glossary

Analog Input	Terminals 6 to 11 are analog inputs on the WellPro controller. Accepts voltage signals within the range of (0 to 5) VDC or (4 to 20) mA and are compared to controller set points and/or displayed.
Boot Loader	Means by which the WellPro controller communicates with the display and MTransfer to receive and transfer new or updated configurations and firmware; and ensure data and configuration synchronization.
Controller Setpoints	User defines normal operating range for the controller to optimize the equipment. Setpoints can also define some other threshold, exception or event that may require action. Multiple setpoints are often applied to a process and they may be manipulated as needed to meet changing conditions.
DeadBand	The user set range at which input may fluctuate without the controller taking any action. The range may be fixed or variable.
Digital Input	Terminals 12 to 19 are the digital input channels. User selects whether digital input is normally open (N/O), or normally closed (N/C). Users may also associate these inputs with transition times for indicating no-flow conditions on divider blocks.
Event	Defines the action required by the controller in response to any number of parameters. Event actions range from simple alarm message to emergency shutdown (ESD).
No-flow Input (pulsed input)	Designed to protect against compressor or engine failures, the controller monitors the cycle time of lubrication system cycles and if that cycle time falls under a user assigned value, the controller will activate a defined associated action such as an alarm or shutdown.
Offset	User defined value to correct for known variance in the raw data.
Panel Ready	In states, the first logical step in start up.
Permissive	A process condition, (digital input or analog setpoint), that must be met in order for the sequence to proceed to the next state.
Signal	An electrical quantity of voltage or current that is used to represent or signify some other physical quantity such as the state of a switch (ON/OFF) or the status of a device (SHUTDOWN/OK).
Span	The difference between the full scale output and the offset as raw data.
Start Delay	A time delay function to prevent premature start up.

State	Predefined step of multiple logical steps (or states) needed to successfully start and operate a compressor.
Thermocouple	<p>A device for measuring temperature consisting of two dissimilar metals of high purity for an accurate temperature/voltage relationship. User defines whether the calibration is J or K. Terminals 1 to 5 are for thermocouple inputs.</p> <p>Type J uses Red (-) and White (+) insulation. Type K uses Red (-) and Yellow (+) insulation.</p>

9 Appendices

9.1 Back Panel LED Description

There are a total of seven (7) LED indicators on the back panel, labeled as follows:

9.1.1 (Port 1)

TX – Turned on while port 1 is transmitting data.

RX – Turned on while port 1 is receiving data.

9.1.2 (Port 2)

TX – Turned on while port 2 is transmitting data.

RX – Turned on while port 2 is receiving data.

9.1.3 USB LINK

The LED turns on while there is a USB connection to a computer.

9.1.4 STAT 1

Turns on for one half second and then turns off for one half second, repeating as long as there is a valid configuration running.

NOTE: This indicator is not active while the boot loader is running.

9.1.5 STAT 2

This LED is only active while the boot loader is running. It flashes briefly three times when the boot loader starts up and then stays on until leaving the boot loader.

9.2 Restrictions on Numeric Values in Gage and PID Monitor Screens

Due to a combination of the limited space and the spirit of the design objectives, there are certain restrictions imposed upon the formatted size of numbers in the display screens.

- Positive numbers with no decimals can be displayed with up to four digits.
- Negative numbers are limited to three digits.
- Numbers of either sign with a decimal place are limited to three digits.
- Numbers with more than two decimal places will not be displayed at all, but will be replaced with dashes.

If a number with decimals is larger than the imposed limits, the display algorithm will attempt to adjust the precision so as to display as many of the most significant digits as possible.

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