

INTEGRATED PRODUCTION SERVICES
**PRODUCTION
OPTIMIZATION**



Plunger Hi-Lo Controller User's Manual

Version 4.6.0

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1 Overview of the Plunger Hi-Lo Controller

The Plunger Hi-Lo Controller is designed to automate the production cycle of an oil or gas well equipped with a plunger lift system and can be used for other well hook-ups that do not have a plunger lift system. Configuration data and well data are stored by the controller and can be reviewed through the set and read commands. The data needed most often can be read quickly using the scroll keys. The controller is normally used with a plunger detector switch. The plunger detector is used to detect when the plunger arrives at the surface and signal the controller when Sales Time (Afterflow) should start. Note, Sales Time and afterflow are used interchangeably in this manual. They both mean the time the motor valve is open after the plunger arrives. There are certain well hook-ups that do not require a plunger detector, for example, when the controller is being used as a Hi-Lo controller or an intermitter. The controller has two types of synchronization. The first type is a simple on and off mode that counts the plungers. The second type will adjust the off time to maintain a given well cycle time. The controller can be equipped with up to three transducers. They are connected to the tubing, line and casing. This allows the controller to be used in Murphy mode and has a Hi-Lo controller. The controller comes standard with a Modbus interface. This allows the entire well and configuration data to be polled by a host computer. This is useful if the controller is being used as part of an automation system.

1.1 Hi and Lo Pressure Kill

The controller has a built in Hi-Lo feature for controlling the high and low sales line pressure on the well. This is equivalent to using a stick pilot to shut in the well if the sales line pressure is out of range. The controller monitors the line pressure and goes to fall time if the pressure is too high or too low. If the high-pressure limit is set and the line pressure goes above the set limit, the controller will start the “Hi Kill timer”. This timer will wait for a given amount of time before it will activate the high pressure kill. This allows the limit to be set closer to the well operating pressure and avoids the pressure spike from packing the line when the well is first turned on from killing the well. The low kill does not have a timer associated with it. It will act immediately when the line pressure drops below the low limit. This can be used to shut the well in if the sales line breaks or starts to leak. The high kill can be disabled by entering 9999 as the limit. The low kill can be disabled by entering 0000 as the limit.

1.2 Pressure Control (Murphy Mode)

The controller has a built in function that will operate like a Murphy switch. If a transducer is connected to the tubing input of the controller, an open pressure and a close pressure can be set in the controller. The “Set 40” command is where the open pressure limit is entered and “Set 41” is where the close pressure limit is entered. To operate using this mode, the transducer is connected to the tubing on the well. A pressure is entered in “Set 40” that will guarantee the plunger will run when the tubing reaches that pressure. A pressure can also be entered in set 41 that will kill the well if the tubing should fall below it. This is useful if you know at what pressure the well will not flow against. The well off pressure has a timer associated with it, “Set 17”. Once the tubing pressure drops below the off pressure limit the timer will start. Once the timer expires the well will be shut-in. This can be used to compensate for a well that dies back before it unloads its fluid.

1.3 On and Kill switches

The controller has an “On switch” and a “Kill or Off switch” inputs. This allows connection to external devices to turn the well on and off. If the well has a tank level switch this could be connected to the kill switch. The on switch can be used with a Murphy switch.



1.4 Well Synchronization

The controller can also be used for synchronization with other wells. When “Well Sync”, see “Set 21”, is enabled the controller will keep the well cycle time constant by varying the off time. This is used when multiple wells are going into the same header system and only one well is allowed produce at a time. The well cycle is defined as the all the times that are entered with the set commands added together. If the controller does not use all of the On Time, plunger arrived before On Time expired, the time remaining must be added to the Off Time in order to keep the well cycle constant.

$$\text{WellCycle} = \text{OnTime} + \text{B OnTime} + \text{SalesTime} + \text{OffTime}$$

The shut-in time is also treated differently. It is defined in terms of WellCycles. It is done this way to prevent the well from getting out of sync. Entering a “00” in set 14 for the number of well cycles will disable the shut-in feature and the controller will go to fall time.

$$\text{Shut-InTime} = (\text{WellCycle} * \text{XX}) - (\text{OnTime} + \text{B On Time})$$

XX is the values entered in set 14. This is the number of well cycles to be shut-in.

Entering a “1” will cause the controller to stay shut-in for the rest on the WellCycle. Entering a “2” will cause the controller to stay shut-in for the rest of the current well cycle plus on more.

To use the feature, the controller must be configured for sync mode using “Set 21”. Then the “On” button pressed at the desired time for the WellCycle to start. This is important since there is no real time clock in the controller.

1.4.1 Simple Well Synchronization

The simple well sync mode works like a intermitter, but it also counts the plunger arrivals. “Set 26” will put the controller in “ON/OFF mode. The “Set 21” command is disabled for the simple sync mode. In this mode the controller will only use the On and Off Timers. You should also set the shut-in timer, B-On Timer and Plunger Fall Timer to zero. The controller will cycle on and off continuously. If it gets the plunger during the On Time it will count it.

1.5 Purge Operation

The controller can be configured to purge the fluid from the latching valve plumbing while the motor valve is closed. This is can be used during cold weather to keep the latching valve plumbing from freezing which can cause the motor valve to operate incorrectly. It can also be used to supply gas to a well head compressor. If the well head compressor is using gas from the sales line, it could stall during the plunger fall or off time when no gas is flowing. The function will allow some gas to flow while the well is shut-in. The set 22 and set 23 commands are used to configure this function. Setting them both to “00” will disable the function. If this function is configured, the valve counts will continue to increase during plunger fall of off time and the valve counts will not match the plunger arrival counts.

1.6 Battery Save Display Feature

In order to conserve the battery in the controller, the display will be powered off after two minute if there has been no keypad activity. Pressing any keypad button will reactivate the display. The controller will show the display that was active prior to turning off the display. For example if the Sales Time display was shown on the Controller Display prior to power off action, the Sales Time State would be re-displayed when any button is selected.



1.7 Plunger HiLo Operating Modes

The controller is capable of a number of types of configuration to accommodate the most challenging well hoop-up. The following list is the factory default options for the controller and will be programmed to one of them when leaving the factory. The SET 50 command, discussed later, is used to program the controller to the selected operation. In addition, the SET 51 command, also discussed later, is used to configure the controller once the mode is selected.

1.7.1 Intermittent

The controller can be used as a simple intermitter box. In intermitter mode it will operate as a simple On/Off box that will count plunger trips if a sensor is hooked up to the controller. However it will not go into a Sales (Afterflow) time.

1.7.2 Plunger

The controller can also be set up as a simple plunger box that has no auto adjustments and works on set times that are only changed by the user. It offers a Fall Time for the plunger to reach bottom. Off time which is any additional time you want the plunger to be off between cycles. On time, which is the time the motor valve will be open waiting on the plunger to arrive. Sales (Afterflow) time which is the time the motor valve will be open selling gas after the plunger arrives at surface. This option will also allow for a backup or shut in time in the event the plunger misses a predetermined amount of trips. This will allow the well to recover and then start cycling the plunger again.

1.7.3 B Valve

In this set up the controller can be programmed to offer a B valve or “tank” valve. It will operate the same as the plunger mode however after the A valve open time expires it will then go to a B valve open time in which it opens the well to the atmosphere in an attempt to surface the plunger. If the plunger arrives during the B valve open time the controller will then enter the Sales (Afterflow) cycle. This mode can be helpful in keeping a plunger running that has to be vented to the tank on occasion in order to surface.

1.7.4 Hi Lo

The controller can be used as a substitute to a stick pilot. In the HiLo mode the controller has a Hi Kill limit that will close the well until the working pressure has fallen back below the limit set. The controller will also kill the well if it falls below the Low Pressure kill limit. The controller will turn the well on and off depending on well pressure. Whereas a stick pilot has to be manually reset if the well pressure gets out of range.

1.7.5 Plunger Pressure

In the plunger pressure mode the controller will operate the same as in the regular plunger mode. However, it also has the capability to utilize a predetermined open pressure that will ensure the plunger will surface. The controller has a fall time in which the plunger is falling to bottom. It then goes into an off time. If the well on pressure has been met the controller will go straight into the on time. If the pressure has not been met it will continue to stay in the off cycle until the pressure is met or the off time expires. Once either of these conditions happens the controller goes into the on time in which it is waiting on the plunger to arrive. Once the plunger arrives it will go to the sales (afterflow) time. After the sales (afterflow) time expires the controller goes back into the fall time. If the plunger does not arrive in the on time the plunger goes into a backup or shut in cycle to help the well recover from the missed plunger trips.



1.7.6 Plunger Hi Lo

While in “Plunger Hi Lo mode”, the controller will operate the plunger just as it does in “plunger” mode. However it will also monitor the line pressure for variances. If the pressures goes above or below the determined set points, the well will go back to fall time. So if a compressor goes down and spikes the line pressure will the plunger is cycling the controller will shut the well in, allow the plunger to get back on bottom and wait on the line pressure to fall back within operating range. This mode is helpful if the system or line pressure is not constant or if other wells “head” and kill the subject well.

2 Controller Timers

The Hi-Lo Plunger Controller uses eight operating timers to control the well cycle. The timer values are established using the SET commands and can be disabled by setting them to zero.

2.1 On Time (Set 10)

The On Time is the state that opens the motor valve to produce product. The On Timer counts down from the setting in “Set 10”. If the On Time value expires, without receiving a plunger arrival the controller will go to Mandatory Shut-In (Backup) Time or B On Time bypassing the Sales Time (Afterflow). If a plunger arrival is detected during the On Time the controller will go to Sales Time (Afterflow).

2.2 B On Time (Set 11)

The B On Time opens the B motor valve to try to get the plunger to the surface. The B On Timer counts down from the setting in “Set 11”. The controller will go to B On Timer after the On Time has expired without a plunger arrival. If the B On Time value expires, without receiving a plunger arrival the controller will go to Mandatory Shut-In (Backup) Time bypassing the Sales Time (Afterflow). If a plunger arrival is detected during the B On Time the controller will go to Sales Time (Afterflow).

2.3 Off Time (Set 12)

During the Off Time the motor valves remains closed. When the controller goes to Off Time, the timer value begins to count down from the setting in Set 12. The On switch (Murphy Switch) or the well pressure on (set 40) can interrupt the off time and send the controller to On Time.

2.4 Sales Time, Afterflow (Set 13)

The Sales Time starts when the plunger arrival is detected during On Time or B On Time. Sales Time can also be referred to as the Afterflow. During the Sales Time the motor valve remains open and product is sold. The Sale Time starts with the time that was entered with Set 13. When the Sales Time timer expires, the controller will move to the Plunger Fall Time.

2.5 Mandatory Shut-In, Backup Time (Set 14)

The Mandatory Shut-In Time closes the motor valve and lets the well recover. It cannot be interrupted except by the On or Off key. The Mandatory Shut-In time is entered at the end of On Time or B On Time if no plunger arrival was detected. This time is used to allow the well to recover if the plunger did not arrive. This time needs to be long enough to get the plunger on the bottom.



2.6 Plunger Fall Time (Set 15)

The Plunger Fall Time closes both motor valves and waits for the plunger to fall to the bottom of the well. It cannot be interrupted except by the On or Off key. The Plunger Fall Time is entered at the end of Sales Time and when a high or low kill is detected. This timer is used when pressure is controlling the well. It is needed to ensure the plunger has time to get on bottom.

2.7 Hi Kill Delay Timer (Set 16)

This timer is activated when the line pressure exceeds the high-pressure limit. The timer allows the compressor time to pull the line pressure back down before the Hi Kill sends the controller to fall time. If the controller is being used as a Hi-Lo Only controller the Hi Kill delay is not used.

2.8 Lo Kill Delay Timer (Set 17)

This timer is activated when the tubing pressure falls below the well close pressure limit in “Set 41”. The timer allows the well to die back some before it unloads without shutting it in.

2.9 Battery Off Time (Not a Settable Timer)

The timer is entered when the battery voltage falls below 5.4 volts. The controller will stay in this timer until the battery is charged back to 5.8 volts. This counter will count up and not down indicating the amount of time that the controller has been in the battery off state. During this state the controller will keep both motor valves closed and not operate the pressure transducers. It does this to preserve battery power. Once the battery reaches 5.8 volts the controller will switch to plunger fall time and resume normal operations.



3 Plunger Hi-Lo Controller Display Layout

The Plunger Hi-Lo Well Controller display is laid out in four separate sections. The top left section has the current Controller State and the time remaining of that state. The top middle section displays status flags and configuration information. The top right displays the current battery voltage. The bottom left section displays four sets of travel time information and tubing & line pressure. The bottom right section displays the valve and plunger arrival counts and casing pressure.

3.1 On Time Display

You will see this display when the controller is waiting on the plunger. The A motor valve is open during this time and the B motor valve is closed.

On HH:MM:SS	ASHLOKT	X.X
T HHH:MM:SS	AV XXX P XXX	

3.2 B On Time Display

You will see this display when the controller is waiting on the plunger and the On Time has expired. The B motor valve is open during this time and the well would normally be venting to the atmosphere. The A motor valve is opened or closed depending on “Set 24”.

B On HH:MM:SS	ASHLOKT	X.X
T HHH:MM:SS	BV XXX P XXX	

3.3 Off Time Display

You will see this display after the Plunger Fall Time has expired. The motor vales will be closed. This is the normal Off Time for the well. It is used to let the well build pressure so it can run the plunger again. If there is time in the Plunger Fall Timer, it will be subtracted from the Off Time.

Off HH:MM:SS	ASHLOKT	X.X
T HHH:MM:SS	AV XXX P XXX	



3.4 Sales Time, Afterflow Display

You will see this display after the plunger has arrived. The A motor valve is open during this time and the B motor valve is closed.

Sales HH:MM:SS	ASHLOKT	X.X
T HHH:MM:SS	AV XXX P XXX	

3.5 Mandatory Shut-In Time, Backup Display

You will see this display if the plunger did not arrive during the On Time or the B On Time. Both the motor valves will be closed and pressure cannot bring the well on.

Shut HH:MM:SS	ASHLOKT	X.X
T HHH:MM:SS	AV XXX P XXX	

3.6 Plunger Fall Time Display

You will see this display if a pressure limit has been exceeded or the off (kill) switch is tripped or the well off pressure limit was reached. Both the motor valves will be closed during this time and the controller will be waiting for the plunger to get on bottom.

Fall HH:MM:SS	ASHLOKT	X.X
T HHH:MM:SS	AV XXX P XXX	

3.7 Battery Off Time Display

You will see this display if the battery voltage drops below 5.4 volts. The time will be counting up indicating how low the controller has been in this state. Once the battery voltage is above 5.7 volts the controller will go to plunger fall time. Both motor valves will be closed during this time.

Batt HH:MM:SS	ASHLOKT	X.X
T HHH:MM:SS	AV XXX P XXX	



4 Controller Status Flags

As shown in the examples above, the controller status flags are displayed in the top middle section of the display next to the battery voltage. They are only visible when their corresponding function or condition is active.

4.1 “A” A/B Mode Flag

The A/B Mode flag indicates the controller is in A/B mode. This is when the A valve will stay opened when the controller is in B On Time. This mode is to allow for certain plumbing conditions that require the A valve to be open to allow the B valve to flow. If the B valve can flow without the A valve being opened this mode should be turned off. Set 24 is used to enable and disable this mode.

4.2 “B” B Valve Pressure Limit

The “B” flag indicates that the line pressure has exceeded the pressure limit of the “B Valve vent pressure”. The controller when this flag is set will shut the A valve, open the B valve and flow the well until the B On Time expires. It then goes to Plunger Fall Time.

4.3 “H” Hi Kill Flag

The Hi Kill flag is displayed in the top right section of the display. The letter “H” indicates the line pressure has exceeded your high limit set point. See set command 34. When this occurs the controller will start the high kill delay timer. If the high condition is present when the timer expires the controller will go to Plunger Fall Time and remain there until the high condition goes away. “Set 16” is the delay timer for the Hi kill.

4.4 “L” Lo Kill Flag

The Lo Kill flag is displayed in the top right section of the display. The letter “L” indicates the line pressure has dropped below your low limit set point. See set command 35. When this occurs the controller will go to Plunger Fall Time and remain there until the high condition goes away. There is no delay time for the Lo kill, this not to be confused with the delay time used for the well-off pressure, “Set 41”.

4.5 “M” Manual Mode

This “M” on the screen indicates the controller is in manual mode. Manual mode is enabled and disabled through the set 77 command. Manual mode will stop the on and off cycles from running. The motor valve can be held open during a swabbing operation using the on key or the motor valve can be held closed using the off key overnight to allow the well to build pressure.

4.6 “N” On/Off Mode, No Sales Time

The “N” flag indicates the simple form of well synchronization is active. In this mode the controller will not go to Sales Time. All the timers except the On and Off timers should be set to zero.



4.7 “O” On Switch Flag

The On Switch flag is displayed in the top right section of the display. The letter “O” indicates the On Switch is made and the controller will go to On Time if the controller is in Off Time.

4.8 “K” Kill Switch Flag

The Kill Switch flag is displayed in the top right section of the display. The letter “K” indicates the Kill Switch is made. When this occurs the controller will go to Plunger Fall Time and remain there until the Kill Switch is reset.

4.9 “S” Well Synchronization Mode

When the controller is put in well sync mode using the “Set 21” command an “S” will be displayed in the status flag section. Well sync mode is used to keep multiple wells that are connected to a single header system in from producing at the same time.

4.10 “T” Tubing On Pressure

The Tubing On flag is displayed in the top right section of the display. The letter “T” indicates the tubing pressure has exceeded your well on limit set point. See set command 40. When this occurs the controller will open the motor valve and go to on time.

4.11 “t” Tubing Off Pressure

The Tubing Off flag is displayed in the top right section of the display. The letter “t” indicates the tubing pressure has exceeded your well off limit set point. See set command 41. When this occurs the controller will close the motor valve and go to plunger Fall Time after the delay time has expired. “Set 17” is the delay timer for the tubing off pressure.



5 Scroll Data

The Plunger Hi-Lo controller has two set of scroll keys, they are the '7' & '4' and '9' & '6'. They are used to scroll data on the display that is used often. The following sections describe the information in detail.

5.1 '7' & '4' Key Scroll Data

The '7' and '4' keys when pressed will scroll though the following data in the bottom left hand corner of the screen:

- Total Sales Time
- Long Travel Time
- Short Travel Time
- Average Travel Time
- Tubing and Line Pressure
- Line pressure with limits
- Tubing pressure with open and close settings

The '7' key will go forward through the list. If you were starting at one you would go to two. When you got to seven it would go back to one. The '4' key works in reverse, if you were starting at five you would go to four. Once you got back to one it would go to seven. The controller will stay on the number you have left it. If you stop on four, the "Average Travel Time" would stay on the display.

5.1.1 Total Sales Time

The Total Sales Time has the following format: "T HHH:MM:SS". The Total Sales Time is the time the motor valve has been open.

5.1.2 Long Travel Time

The long travel time has the following format: "LT MM:SS". The long travel time is the slowest run the plunger has made.

5.1.3 Short Travel Time

The short travel time has the following format: "ST MM:SS". The short travel time is quickest run the plunger has made.

5.1.4 Average Travel Time

The average travel time has the following format: "AT MM:SS". The average travel time is calculated using the last 25 values.

5.1.5 Tubing and Line pressure

The tubing and line pressure has the following format: "TXXXXLXXXX". The "TXXXX" represent the tubing pressure and the "LXXXX" represent the line pressure.

5.1.6 Line pressure with limits

The line pressure with limits has the following format: "LXXXX HXXXX LXXXX". The first "LXXXX" is the current line pressure. The "HXXXX" is the high pressure limit settings. The last "LXXXX" is the low limit pressure setting. This display is useful when the Hi-Lo feature of the controller is being used.



5.1.7 Tubing pressure with open and close settings

The tubing pressure with open and close settings has the following format: "TXXXX OXXXX CXXXX". The "TXXXX" is the current tubing pressure. The "OXXXX" is the tubing pressure that will open the motor valve. The "CXXXX" is the tubing pressure that will close the motor valve. This display is useful when the Murphy feature of the controller is being used. The close pressure had a delay timer associated with it. See command 17 for details.

5.2 '9' & '6' Key Scroll Data

The '9' and '6' keys when pressed will scroll through the following data in the bottom right corner of the screen:

- Total A Valve and Plunger Counts
- Total B Valve and Plunger Counts
- Casing Pressure

The '9' key will go forward through the list. If you were starting at one you would go to two. When you got to six it would go back to one. The '6' key works in reverse, if you were starting at six you would go to five. Once you got back to one it would go to six. The controller will stay on the number you have left it. If you stop on six, the "Total Valve and Plunger Counts" would stay on the display.

5.2.1 Valve and Plunger Counts

On the bottom right of the screen the "A" valve counts and plunger arrival counts are displayed. The valve counts have the following format "AV XXX P XXX". The A or B indicates which valve the counts are for, A valve or B valve. The 'V' indicates the number of valve counts with the "XXX" being the number of times the valve has been operated or cycled. The "P XXX" indicates the number of plunger arrivals detected during the A-On Time State. The maximum count for either entry that can be displayed is "999".

5.2.2 Casing Pressure

The casing pressure is displayed in the following format: CXXXX. "XXXX" is the pressure in PSI. If casing pressure is needed the controller must be equipped with a third transducer that is connected to the casing of the well. The controller does not use this in the calculation. It is for display purposes and available through the Modbus interface.



6 Keypad Operations

The Hi-Lo Controller is equipped with a 4 x 4 keypad. In an effort to keep the keypad as simple as possible it was necessary to have some keys provide more than one function. While the 'ON' and 'OFF' keys will always turn the well on and off, the 'C', 'S' and 'R' keys perform multiple functions. Also, the '7' & '4' and the '9' & '6' are used for the quick data scroll. While this may seem a little confusing at first, it does not take long to get used to.

CURRENT 7 STATUS	PRESSURE 8 STATUS	VALVE 9 COUNTS	ON
4	CURRENT 5 TIME	6	OFF
TRAVEL 1 TIME	YES 2	SETUP 3	 SET
CANCEL C CLEAR	NO 0	ENTER E EXIT	 READ

6.1 'ON' Key

This key will turn the well on and change the timer to the On Timer and open the motor valve. This is the only function this key will do and it cannot be overridden. When the controller is turned on with the "On" key, the tubing and line pressure will not be recorded in the history.

6.2 'OFF' Key

This key will turn the well off and change the timer to the plunger fall time and close the motor valve. This is the only function this key will do and it cannot be overridden.

6.3 'C' Key

The 'C' key is the clear or cancel key. It will backspace on set and read commands, clear the values in certain read commands, and cancel out of a set command once it is backspaced to the beginning. To cancel out of a command you use the 'C' key to backspace to the beginning and then press the 'C' key again to cancel out of the command. This works for both the command entry and the data entry. It is also used to clear any message the controller may display. For example, the keypad locked and unlocked messages.



6.4 'E' Key

The 'E' key is the enter key. It is used to save the data that is entered in the set commands and exit out of the set and read commands. If you do not want to save the data that is in the set command, you can use the 'C' key to backspace to the beginning and then press the 'C' key again to cancel out of the command.

6.5 'S' Key

The 'S' key is the set key. It has two functions. One to start a set command operation and the second is to scroll commands and scroll history data. If the controller is in the normal mode displaying one of the timers and the 'S' key is pressed, the controller will change the display to reads "Set". You now would enter the number for the set command you wanted to view and press the 'E' key. This would bring up that command.

The key has a secondary use is scrolling the set and read commands and the travel time history data which is the read 13 command". When you have a set or read command on the display, you can use the 'S' key to go to the next command. For example, if you are viewing the set 10 command and you press the 'S' key, the set 11 command will be displayed. When viewing the Travel Time History entries, the set key used as an upward directional key when scrolling through the history entries. (Example: If the #5 entry is shown on the display, pressing the 'S' key will move the history entries to the #4 entry.) Note on the read 13 command. When you first enter the command it will show the current travel time. If you scroll from the current travel time, entry '0', you will go to the next read command. If you want to scroll the history data you will need to hit enter again, and then scroll.

6.6 'R' Key

The 'R' key is the set key. It has two functions. One to start a read command operation and the second is to scroll commands and scroll history data. If the controller is in the normal mode displaying one of the timers and the 'R' key is pressed, the controller will change the display to reads, "Read". You now would enter the number for the read command you wanted to view and press the 'E' key. This would bring up that command.

The key has a secondary use is scrolling the set and read commands and the travel time history data which is the read 13 command". When you have a set or read command on the display, you can use the 'R' key to go to the previous command. For example, if you are viewing the set 11 command and you press the 'R' key, the set 10 command will be displayed. When viewing the Travel Time History entries, the 'R' key used as a downward directional key when scrolling through the history entries. (Example: If the #5 entry is shown on the display, pressing the 'R' key will move the history entries to the #6 entry.) Note on the read 13 command. When you first enter the command it will show the current travel time. If you scroll from the current travel time, entry '0', you will go to the next read command. If you want to scroll the history data you will need to hit enter again, and then scroll.

6.7 '0-9' Numeric Keys

These keys are used to enter numbers into the controller during a set function. As described in the section below a few have a dual use for scrolling quick data.

6.7.1 '7' & '4' and '9' & '6' Special Use Keys

The '7', '4', '9', and '6' keys serve as scrolling keys when a set or read command is not active. The '7' & '4' keys will scroll the bottom left of the display, displaying the Travel Time Information and the '9' & '6' keys will scroll the bottom right of the display, displaying the Valve and Plunger Counts. For further explanation of these special use keys refer to the sections referenced.



7 Set Command Definitions

The Set commands are used for configuring the controller. To enter a set command, first press the 'S' key, next press the first digit of the set command you want to execute. Now press the last digit of the two-digit number of the set command you want to execute. If the display reads "Set XX" with XX being your entered command, press the E key to enter the function. If you made a mistake, you can use the 'C' to backspace. If the 'C' key is pressed when only "Set" is on the screen the controller will cancel the current set operation.

Once the values are displayed for you the 'C' key will continue to be used as a backspace and cancel. As you enter numbers, the display will wrap the cursor for you. Also, the cursor will skip over the ':' in the timer set commands or any other formatting character you may see. You enter the data as if formatting characters were not there. Once you have the correct data entered, pressing the 'E' key will save it to memory and exit the set command. If you do not want to save the entered data or you were just viewing the value, the 'C' key will cancel the command without saving the data. You will have to backspace to the beginning of the line for the cancel to work.

7.1 Set 10, On Time

The SET 10 command is used to set the On Time. The display will show "On Time" on the top line of the display and the time "HH:MM:SS" on the bottom line of the display. The data is entered in hours, minutes and seconds. This is the time the controller is waiting on the plunger. To enter a time of 30 minutes, you would enter 003000, then press 'E'.

On Time
00:30:00

Above shows the "On time" set to 30 minutes

7.2 Set 11, B On Time

The SET 11 command is used to set the B On Time. The display will show "B On Time" on the top line of the display and the time "HH:MM:SS" on the bottom line of the display. The data is entered in hours, minutes and seconds. This is the time the controller is waiting on the plunger. To enter a time of one hour, you would enter 010000, then press 'E'. To disable the B On Timer, zero's should be entered in the time.

B On Time
00:30:00

Above shows the "B On time" set to 30 minutes



7.3 Set 12, Off Time

The SET 12 command is used to set the Off Time. The display shows “Off Time” on the top line of the display and the time “HH:MM:SS” on the bottom line of the display. Example: To enter a time value of 2 hours, press “020000”.

Off Time
02:00:00

Above shows the “Off time” set to 2 hour.

7.4 Set 13, Sales Time, Afterflow

The SET 13 command is used to set the Sales Time. The display shows “Sales Time” on the top line of the display and the time “HH:MM:SS” on the bottom line of the display. The data is entered in hours, minutes and seconds. The Sales Time is the time the well sells gas after the plunger arrives. To enter a time of 30 minutes, you would enter 003000, then press ‘E’.

Sales Time
00:30:00

Above shows the “Sales time” set to 30 minutes.

7.5 Set 14, Mandatory Shut-In Time, Backup

SET 14 has two different modes of operation, normal timer mode and well sync mode, see 7.5.1. In normal mode this command is used to set the Shut-In, Backup Time. The display shows “Shut-In, Backup Time” on the top line of the display and the time “HH:MM:SS” on the bottom line of the display. Example: To enter a time value of 2 hours, press “020000” then “E”.

Shut-In Backup Time
02:00:00

Above shows the “Shut-in time” set to 2 hour.



7.5.1 Set 14 Shut-In Time with Well Synchronization

In well sync mode, the SET 14 command is used to set the number of well cycles the control will be off. The display shows Shut-In, Backup Time on the top and # of well cycles on the bottom. Example: To have the well off for two cycles, press “02” then “E”.

Shut-In Backup Time
02 #WellCycles

Above shows the “Shut-In, Backup time” set to skip two well cycles.

7.6 Set 15, Plunger Fall Time

The SET 15 command is used to set the Plunger Fall Time. The display shows “Fall Time” on the top line of the display and the time “HH:MM:SS” on the bottom line of the display. Example: To enter a time value of 20 minutes and 15 seconds, press “002015”, then “E”.

Plunger Fall Time
00:20:15

Above shows the “Plunger Fall Time” set to 20 minutes 15 seconds.

7.7 Set 16, Hi Kill Delay Time

The SET 16 command is used to set the Hi Kill delay Time. The display shows “Hi Kill Delay Time” on the top line of the display and the time in seconds “XXXX” on the bottom line of the display. The time is entered in seconds. Example: To enter a time of 5 minutes, press “0300” then ‘E’.

Hi Kill Delay Time
0300

Above shows the “Hi Kill Delay Time” set to 300 seconds or 5 minutes.



7.8 Set 17, Lo Kill Delay Time

The SET 17 command is used to set the Lo Kill delay Time. The display shows “Lo Kill Delay Time” on the top line of the display and the time “XXXX” on the bottom line of the display. The time entered is in seconds. This delay is used when the tubing pressure drops below the well off pressure. The pressure must stay below the well off pressure longer than the delay time, see set command 17 for delay time. Example: To enter a time of 10 minutes, press “0600” then ‘E’.

Lo Kill Delay Time
0600

Above shows the “Lo Kill Delay Time” set to 600 seconds or 10 minutes.

7.9 Set 19, Override the Current Timer

The SET 19 command is used to override the current timer. The command is used as a diagnostic function to change the current timer if the situation warrants it. Two of the most common uses are adding a little sales time or shut-in time. The display will show “Current Timer” on the top line of the display and the time “HH:MM:SS” on the bottom line of the display. The data is entered in hours, minutes and seconds. This is the time the controller is waiting on the plunger. To enter a time of 30 minutes, you would enter 003000, then press ‘E’.

Current Timer
00:30:00

Above shows the “Current Timer” set to 30 minutes

7.10 Set 20, Clear Command

The SET 20 command is used to clear the Sales Time, travel time, valve counts, plunger counts and the travel time history. The display will show “Clear All” on the top line and a ‘0’ on the bottom line of the display. To clear the data you will have to enter a ‘1’ then press the ‘E’ key. If you do not enter a ‘1’ and press ‘E’ the data will not be cleared.

Clear All
1

Above shows the “Clear All” set to 1 to clear data.

7.11 Set 21, Well Synchronization Mode

The SET 21 command is used to put the controller in well sync mode. The display will show a “S” in the status section of the display. In this mode the controller will keep the well cycle time the same by varying the Off Time.

Well Sync ON/OFF
1 1=Yes, 0=No

Above shows the “Well Sync ON/OFF” set to 1 to enable.

7.12 Set 22, Purge Cycle Command

The SET 22 command is used to set the purge cycle time. The display will show “Purge Cycle” on the top line display and “XX” on the bottom line of the display. The “XX” represents the purge cycle in minutes. The purge command allows the motor valve to open briefly on a periodic basis during Off Time and Plunger Fall Time. This function can be used during cold weather to keep the motor valve from freezing closed due to moisture in the plumbing of the latching valve. It can also be used to supply gas to a wellhead compressor. Setting the value to 00 will disable this feature. Please note, this command will cause the plunger counts and valve counts not to match. Use set 22 and 23 together.

Purge Cycle
15

Above shows the “Purge Cycle” set to 15 minutes.

7.13 Set 23, Purge Duration Command

The SET 23 command is used to set the purge duration time. The display will show “Purge Cycle” on the top line display and “XX” on the bottom line of the display. The “XX” represents the purge cycle in seconds. Setting the value to 00 will disable this feature. Use set 22 and 23 together.

Purge Duration
10

Above shows the “Purge Duration” set to 10 seconds.

7.14 Set 24, A/B Mode

The SET 24 command is used to set the A/B Mode. The display shows “A valve on with B” on the top line of the display and the time “X” on the bottom line of the display. Example: To enable A/B mode, press “1” then ‘E’. An ‘A’ will appear on the top right of the display during normal operation.

A valve on with B
1 1=Yes,0=No

Above shows the “A valve on with B ” set to 1 to enable.

7.15 Set 25, Shut Skip

SET 25 is used to skip the mandatory shut-in time for when the plunger does not arrive. For example, if the desire is to have every third “plunger no arrival” got to shut-in time, then this command would be set to 2 like in the example below. The display shows “Shut-In , Backup Skip” on the top line of the display and the time “XX” on the bottom line of the display. Example: To enter a time value of 2, press “02” then “E”.

Shut-In,Backup Skip
02 # No Arrivals

The above example shows the “Shut-in, Backup Skip” set to skip 2 “plunger no arrivals”.

7.16 Set 26, On Off Mode

The SET 26 command is used to put the controller in on/off mode. This is the simplest of all the modes and the controller operates like a simple clock with just on and off times.

On Off Mode
1 1=Yes,0=No

Above shows the “ON/OFF mode” set to 1 to enable.

7.17 Set 30, Transducer Max Value

The SET 30 command is used to enter the Transducer Rating. This allows the controller to scale the analogs channels correctly. For a 1000 transducer 1000 is entered for a 2000 transducer 2000 is entered. The display will show “XDCR Rating” on the top line of the display and “XXXX” on the bottom line of the display. The “XXXX” represent the transducer rating in PSI. You can also use the command to scale the transducer to match a gauge on the well. If you need the controller to read a little higher you can enter 1100 for the scale instead of 1000. This will not affect the operation on the controller.

XDCR Rating
1000

Above shows the “XDCR Rating” set to 1000 PSI transducer.

7.18 Set 31, Measured 5 Volts

The SET 31 command is used to enter the actual 5-volt reading. The controller uses the 5 volts as a reference when measuring pressures and voltages. This value will normally be entered at the factory. The value should range from 0470 to 0520. If value is outside that range set to 0500. The display will show “Measured 5 Volts” on the top line and “XXXX” on the bottom line. The “XXXX” represent the voltage in the following format: XX.XX. To set it to 4.9 volts you would enter 0490. You must have a leading zero.

Measured 5 Volts
0500

Above shows the “Measured 5 Volts” set to 5 volts.

7.19 Set 32, Pressure Transducer On Time

The SET 32 command is used to enter the time the pressure transducer is on before the pressure is read. The display will show “XDCR On Time” on the top line of the display and “XXXX” on the bottom line of the display. The “XXXX” represent the 50mS steps. This allows the transducer to settle before a reading is taken. A normal value is 0003, which represent 150mS. This should not have to be changed unless a special transducer is used.

XDCR On Time
0003

Above shows the “XDCR On Time” set to 3 X 50mS or 150mS.

7.20 Set 33, Pressure Transducer Poll Rate

The SET 33 command is used to enter the poll rate of the pressure transducers. The display will show “XDCR Poll Rate” on the top line of the display and “XXXX” on the bottom line of the display. The “XXXX” represent the poll rate in seconds. A normal value of 0005 indicates the pressure transducer will be read every five seconds. Polling the transducer too often will cause the battery to drain faster. A poll rate of five is recommended for most applications.

XDCR Poll Rate
0005

Above shows the “XDCR Poll Rate” set to 5 seconds.

7.21 Set 34, Line Pressure High Pressure Limit

The SET 34 command is used to enter the high line pressure limit. The display will show “High Pres Kill Limit” on the top line of the display and “XXXX” on the bottom line of the display. The “XXXX” represent the high-pressure limit in PSI. When the line pressure exceeds the high-pressure limit, the controller will count down the high kill delay time then go to fall time. The fall time will count down to zero and if the high pressure is still present hold at zero or if the high pressure has passed it will go to Off Time. Setting the high-pressure limit to 9999 will disable it.

High Pres Kill Limit
0500

Above shows the “High Pres Kill Limit” set to 500 PSI.

7.22 Set 35, Line Pressure Low Pressure Limit

The SET 35 command is used to enter the low line pressure limit. The display will show “Low Pres Kill Limit” on the top line of the display and “XXXX” on the bottom line of the display. The “XXXX” represent the low-pressure limit in PSI. When the line pressure drops below low-pressure limit, the controller will go to fall time. The fall time will count down to zero and if the low pressure is still present hold at zero or if the low pressure has passed it will go to Off Time. Setting the low-pressure limit to 0000 will disable it.

Low Pres Kill Limit
0040

Above shows the “Low Pres Kill Limit” set to 40 PSI.

7.23 Set 36, Number of Pressure Reading to Average

SET 36 is used to set the number of pressure readings that are averaged. The smaller the number entered the more responsive and the noisier the pressure reading. The default for this is 10.

Num Readings to Ave
10

Above shows the “Num Readings to Ave” set to 10 Readings.

7.24 Set 37, Pressure Spike to override average

SET 37 is used to set the pressure increase that will override the averaging. This allows the controller to react to a large change in pressure without waiting for the average to catch up. The default is 10. This means if the pressure changes more than 10 PSI it will not average and use the new pressure as the reading.

Override Ave
10

Above shows the “Override Ave” set to 10 PSI.

7.25 Set 40, Well On Pressure

SET 40 is used to enter the pressure the well will turn on at. This is similar to using a Murphy switch. A transducer must be connected to the tubing for this to work. To enter a value of 100 psi, you would enter 0100, then press ‘E’.

Well On Pressure
0100

Above shows the “Well On Pressure” set to 100 PSI.

7.26 Set 41, Well Off Pressure

SET 41, is used to enter the pressure the well will be shut in. This can be used to keep the well from “Riding the hub” and not flowing. A transducer must be connected to the tubing for this to work. To enter a value of 40 psi, you would enter 0040, then press ‘E’.

Well Off Pressure
0100

Above shows the “Well Off Pressure” set to 100 PSI.

7.27 Set 42, B Valve vent pressure limit

SET 42, is used to enter the pressure the well will be shut in. This can be used to keep the well from “Riding the hub” and not flowing. A transducer must be connected to the tubing for this to work. To enter a value of 100 psi, you would enter 0100, then press ‘E’.

B Pres Limit
0100

Above shows the “B Pres Limit” set to 100 PSI.

7.28 Set 43, Casing On Pressure

SET 43, is used to enter the pressure the well will be turn on at and should be used with the SET 44 command. This command is used to control the well using the casing pressure. Once the casing pressure reaches the set point, the well will open the “A valve” and produce. A transducer must be connected to the casing for this function to work. To enter a value of 100 psi, you would enter 0100, then press ‘E’.

Case On Pressure
0100

Above shows the “Case On Pressure” set to 100 PSI.

7.29 Set 44, Casing Off Pressure

SET 44, is used to enter the pressure the well will shut-in at and should be used with the SET 43 command. This command is used to control the well using the casing pressure. Once the casing pressure reaches the set

point, the well will close the “A valve” and stop production . A transducer must be connected to the casing for this function to work. To enter a value of 100 psi, you would enter 0100, then press ‘E’.

Case Off Pressure
0100

Above shows the “Case Off Pressure” set to 100 PSI.

7.30 Set 50, Factory Defaults

This command is used when the controller is first assembled or a new firmware version is installed. If this command is used in the field all configuration data will be lost. The following are the different factory programming options:

- 0 Intermittent
- 1 Plunger
- 2 B Valve
- 3 HI-LO
- 4 Plngr PSI
- 5 Plngr HI-LO

Factory Default 0-5
0 Intermittent

7.31 Set 51, Setup

This command is used to configure the controller. Once the SET 50 command is used to program the controller for its intended use, the SET 51 command is used to set off the parameters needed for the program. SET 51 is equivalent to pressing the setup key on the keypad.

Setup
0 Intermittent

7.32 Set 61, Modbus Address Command

The SET 61 command is used to set the Modbus address. The display will show “Modbus Addr” on the top line display and “XXXX” on the bottom line of the display. The “XXXX” represents the Modbus address.



The Modbus address must be between 0 and 255. General 0 will not be used since it is the broadcast address and will cause the control to take action on all Modbus commands, with no response back to the master.

Modbus Addr
0001

Above shows the “Modbus Addr” set to 1.

7.33 Set 77, Manual On/Off

The SET 77 command is used to disable the timers on the controller. The display shows “Manual ON/OFF” on the top line of the display and “0” on the bottom line of the display. This is used when the well is going to be tested. Entering a ‘1’ disables the timers and the well can only be turned on and off through the buttons on the front panel. Leaving a ‘0’ will exit and do nothing. The controller will display a ‘M’ in the status flag section of the display when in manual mode.

Manual ON/OFF
1

Above shows the “Manual ON/OFF” set to 1 to enable.

7.34 Set 78, Password

The SET 78 command is used to enter a password into the controller. Passwords are in the range from 0000 to 9999, where 0000 is the disabled password value. The display shows “Password” on the top line of the display and “XXXX” on the bottom line of the display. When the controller is shipped from the factory it will have the password set to 0000. This disables the password feature. If you try to change a value and you get the message Keypad Locked. You will need to enter the password that was selected. The controller has a one-hour timeout for the password. If no keys are pressed in one hour, the controller will lock the keyboard.

Password
1234

Above shows the “Password” entered as 1234.

7.35 Set 79, New Password

The SET 79 command is used to enter a new password into the controller. The display shows “New Password” on the top line of the display and “XXXX” on the bottom line of the display. After the correct password is entered with SET 78, a new one can be entered in SET 79. The password can be any four-digit

integer. If you get a “Keypad Locked” message, you must clear it with the ‘C’ key and enter the correct password.

New Password
5678

Above shows the “New Password” set to 5678.

7.36 Set 80, Lock Keypad

The SET 80 command is used to lock the keypad on the controller. The display shows “Lock Keypad” on the top line of the display and “0” on the bottom line of the display. Entering a ‘1’ will lock the keypad when the ‘E’ key is pressed. Leaving a ‘0’ and pressing ‘E’ will exit and do nothing. There is a one-hour auto lock function. If you have a password set and a key is not pressed in an hour the keypad will lock its self.

Lock Keypad
1

Above shows the “Lock Keypad” set to 1 for locking.



8 Read Command Definitions

The Read commands are used for viewing well data. It should also be noted that some read commands have the option to clear the data that is being viewed. To enter a Read command, first press the “R” key. Next press the first digit of the read command you want to execute. Now press the last digit of the two-digit number. If the display read “Read XX” with XX being your entered command, press the E key to enter the function. If you made a mistake, you can use the “C” key to backspace. If the “C” key is pressed when only the “Read” is displayed, the controller will cancel the current read command. Pressing the “E” key will exit the read functions.

8.1 Read 10, Total Sales Time

The READ 10 command allows you to read the Total Sales Time. The display shows “Total Sales Time” on the top line of the display and the time “HHH:MM:SS” on the bottom line of the display. You can clear the Total Sales Time with the ‘C’ key without clearing any other value. The Total Sales Time is the time the motor valve has been open since the last time the Total Sales Time was cleared.

Total Sales Time
101:44:32

The above example shows the “Total Sales Time” at 101 hours, 44 minutes, and 32 seconds.

8.2 Read 11, Valve Counts

The READ 11 command allows you to read the valve counts. The display shows “Valve Counts” on the top line of the display and “A:XXXX B:XXXX” on the bottom line of the display. The “A:XXXX” represents the number of times the A motor valve has been opened. The “B:XXXX” represents the number of times the B motor valve has been opened. The valve counts can be cleared with the ‘C’.

Valve Counts
A:0233 B:0003

Above shows the “Valve Counts” A valve with 233 motor valve openings and B valve with 3 openings.

8.3 Read 12, Plunger Counts

The READ 12 command allows you to read the plunger counts. The display shows “Plunger Counts” on the top line of the display and “A:XXXX B:XXXX” on the bottom line of the display. The “A:XXXX” represents the number of times the plunger has arrived while the A valve was opened. The “B:XXXX” represents the number of times the plunger has arrived while the B valve was opened. The valve counts can be cleared with the ‘C’. Ideally, you should have the same number of plunger counts has valve counts.



Plunger Counts

A:0233 B:0003

Above shows the “Plunger Counts” A valve has 233 plunger arrivals and B valves has 3 arrivals.

8.4 Read 13, Travel Time History

The READ 13 command allows reading of the travel time history and the current travel time. The times are the current plunger travel time and the last 25 plunger travel times with the tubing and line opening pressures. The display will show “No Trv T Tube Line” on the top line and “XX MM:SS TTTT LLLL” on the bottom line. The “XX is a number from 1 to 25 the newest to the oldest. The time is displayed in the MM:SS format minutes and seconds. The “TTTT” represent the tubing pressures in PSI and “LLLL” represents the line pressure in PSI. The travel time will read “NoArv” instead of “MM:SS” if no plunger arrival detected for that cycle. If the controller was opened with the keypad, the pressure will display “Man Open” instead of “TTTT LLLL”. The ‘R’ key moves the history entries upward in numerical order and the ‘S’ key moves the history entries downward. Once you start scrolling though the histories you will have to exit using the ‘E’ key to see the current travel time again.

No Trv T Tube Line

01 11:10 0408 0078

Above shows the travel time history display. You are looking at the newest entry “No 1”. It took 11 minutes and 10 seconds for the plunger to surface and the tubing was reading 408 PSI and the line was reading 78 PSI when the motor valve was opened to surface the plunger..

8.5 Read 20, Pressure Limit Count and Delay timer

The READ 20 command allows you to read the pressure limit counts. This is the number of times the controller was shut-in by the Hi and Lo kills. The display shows “HI LO DLAY” on the top line of the display and “HHHH LLLL DDDD” on the bottom line of the display. The “HHHH” represents the number of times the high-pressure limit has shut-in the well. The “LLLL” represents the number of times the low-pressure limit has shut-in the well. The “DDDD” shows the current high-pressure kill delay timer. If there is a number counting down on the display that indicates the controller has sensed a high pressures kill situation on the well and has started the delay timer in preparation for shutting in the well. You can clear the counts with the “C” key without clearing any other value

Hi	Lo	Dlay
-----------	-----------	-------------

0123	0011	0000
-------------	-------------	-------------



Above shows the Pressure Limit and Delay Timer display. The well has been shut-in 123 times by the high-pressure kill and 11 times by the low-pressure kill. Currently, there is not a high-pressure kill delay in progress, since the "DLAY" is showing "0000".

8.6 Read 22, Current Travel Time

READ 22 allows you to read the current travel time. This time will count up while the plunger is coming. It is useful if you just arrived at a well and it is in the On Time.

Current Travel Time
00:12:06

The above example shows a travel time of 12 minutes and six seconds.

8.7 Read 23, On and Off (Kill) Switch Counts

The READ 23 command allows you to read the external switch counts. This is the number of times the external switch have cycled the controller on or off (Kill). The display shows "ON KILL" on the top line of the display and "OOOO KKKK" on the bottom line of the display. The "OOOO" represents the number of times the on switch has turn the well on. The "KKKK" represents the number of times the off (Kill) switch has shut-in the well. You can clear it with the "C" key without clearing any other value.

ON	KILL
0002	0020

Above shows the on and off switch count showing the well turn on 2 times and shut-in 20.

8.8 Read 25, Battery Voltage, High Volts, and Low Volts

The READ 25 command allows you to read the current battery voltage as well as the highest voltage it has been and the lowest voltage it has been since last cleared. The display shows "BAT HI LO" on the top line of the display and "VV.V HH.H LL.L" on the bottom line of the display. The "VV.V" is the current battery voltage. The "HH.H" is the highest voltage the battery has been charged to. The "LL.L" is the lowest voltage that the battery has been drawn down to. The highest voltage normally occurs in the late afternoon and the lowest voltage early in the morning. You can clear the high and low voltage with the "C" key without clearing any other value.

Bat	HI	LO
06.7	8.1	5.8



Above is the battery voltage display showing a current battery voltage of 6.7 volts. The highest battery voltage recorded was 8.1 volts the lowest was 5.8 volts.

8.9 Read 50, Software Version

The READ 50 command allows reading of the current software version used by the controller. The top line shows “Plunger Hi-Lo Cont.” on the top line and “Version 4.2.1” on the bottom line. If the version is different from 4.2.1 some of the function may not operate as described in the manual. Pressing the “E” key will exit this function.

Plunger Hi-Lo Cont
Version 4.6.0

The above display shows the plunger Hi-Lo controller with software version 4.6.0.



9 Plunger Hi-Lo Command Summary

9.1 Set command Summary

Set #	Commands	Entry Description
Set 10	On Timer Value	HH:MM:SS Time the A valve is on
Set 11	B On Timer Value	HH:MM:SS Time the B valve is on
Set 12	Off Timer Value	HH:MM:SS Time the valves are closed
Set 13	Sales Timer Value	HH:MM:SS Afterflow
Set 14	Shut-In	HH:MM:SS Backup Time
Set 14	Shut-In Sync Mode	XX Number of well cycles to be shut-in
Set 15	Plunger Fall Timer Value	HH:MM:SS Time for Plunger to get on Bottom
Set 16	Hi Kill Delay Timer	XXXX Delay time in seconds for the Hi Kill (LINE)
Set 19	Override Current Timer	HH:MM:SS Current Timer
Set 17	Lo Kill Delay Timer	XXXX Delay time in seconds for the Well Off Pressure (TUBING)
Set 20	Clear All	X , '1' clears, '0' does not clear
Set 21	Well Sync Mode	X , '1' enabled sync mode, '0' disables sync mode
Set 24	A/B Mode	X , '1' Sets, '0' clears, Leave A valve on during B On Time
Set 25	Shut-In Skip Arrivals	XX Number of missed trips before going to Shut-In time
Set 26	On-Off Mode	X '1' enables the On-Off Mode.
Set 30	Transducer Scale	XXXX Enter the maximum pressure rating of the transducer
Set 31	Measured 5 Volts	XXXX Enter the 5 volts from the PCB. Two decimal assumed
Set 32	XDCR On Time	XXXX Transducer on time in 50mS steps. 0003 default
Set 33	XDCR Poll Rate	XXXX The poll rate of the transducer in seconds. 0005 default
Set 34	Hi Kill Limit	XXXX The hi pressure limit (LINE)
Set 35	Lo Kill Limit	XXXX The lo pressure limit (LINE)
Set 36	Num Readings	XX Number of samples to average. Default 10
Set 37	Spike Override	XX Pressure change to override ave. Default 10
Set 40	Well On Pressure	XXXX Pressure the well will be turned on (TUBING)
Set 41	Well Off Pressure	XXXX Pressure the well will be turned off (TUBING)
Set 42	B Pressure Limit	XXXX Pressure limit to vent well (LINE)
Set 50	Factory Default	X '0-5' Set controller settings to the factory defaults
Set 51	Setup	Configures controller for the current program
Set 77	Manual On/Off	X '1' Put the well in manual On/Off Mode Timers disabled
Set 78	Password	XXXX Enter the controller password, 0000 disables password
Set 79	New Password	XXXX Enter a new password 0000 disables password
Set 80	Lock Keypad	X '1 Lock Keypad '0' do not lock keypad



9.2 Read Command Summary

Read #	Commands	Description
Read 10	Total Sales Time	HH:MM:SS Reads the Total Sales Time "E" exit "C" clears
Read 11	Valve Counts	Reads the number of valve counts "E" exit "C" clears
Read 12	Plunger Counts	Reads the number of plunger counts "E" exit "C" clears
Read 13	Tvl Time History	XX, MM:SS XXXX Read travel times and Press
Read 20	Pres Limits Count	XXXX XXXX high and low pressure counts "E" exit "C" clear
Read 22	Current Tvl Time	HH:MM:SS Reads the current travel time "E" exit
Read 23	Press Switch Count	XXXX XXXX On and Kill press switch cnts "E" exit "C" clear
Read 25	Battery Voltage	Volts XX.X, High Volts XX.X Low Volts X.X
Read 50	Software Version	Differential Controller Ver X.X.X



10 Plunger Hi-Lo Well Controller Hardware Connections

Terminal Number	Description Bottom Row
1	Solar Panel Positive connection (+), Red wire on solar panel
2	Solar Panel Negative connection (-), Black wire on solar panel
3	Battery Negative connection (-), Black wire on battery lead
4	Battery Positive connection (+), Red wire on battery lead
5	Plunger Detector Power, Normally the red wire. Not used on a two-wire detector or three-wire MSO/GO switch. DO NOT SHORT TO GROUND
6	Plunger Detector Signal (+), Normally the white or blue wire.
7	Plunger Detector ground, (-), Normally the black wire on the MSO switch.
8	On Switch (+), Normally, the XXXX wire on the Murphy switch
9	On Switch (-), Normally, the XXXX wire on the Murphy switch
10	Kill Switch (+), Normally, the XXXX wire on the Murphy switch
11	Kill Switch (-), Normally, the XXXX wire on the Murphy switch
12	Valve A Power, This is the black wire on the latching valve
13	Valve A Open, This is the green wire on the latching valve
14	Valve A Close, This is the red wire on the latching valve
15	Tubing XDCR Power, This is the red wire on the transducer
16	Tubing XDCR Signal, This is the clear or white wire on the transducer
17	Tubing XDCR Ground, This is the black wire on the transducer
18	Line XDCR Power, This is the red wire on the transducer
19	Line XDCR Signal, This is the clear or white wire on the transducer
20	Line XDCR Ground, This is the black wire on the transducer
21	RS232 Receive Data, Normally Pin 3 on a D connector
22	RS232 Ground Data, Normally Pin 7 or Pin 5 on a D connector
23	RS232 Transmit Data, Normally Pin 2 on a D connector
24	Spare
Terminal Number	Description Top Row
25	Valve B Power
26	Valve B Open
27	Valve B Close
28	Casing XDCR Power, This is the red wire on the transducer
29	Casing XDCR Signal, This is the clear or white wire on the transducer
30	Casing XDCR Ground, This is the black wire on the transducer
31	Spare



11 Plunger Hi-Lo Well Controller Specifications

Package Size

Fiberglass box - 7.6" x 7.6" x 4.55"

Package Rating

NEMA 4, 4X

Valve Control

Solenoid Pneumatic actuator

Operating Temperature

-40F to +185F, excluding the LCD.

Communications Port

RS232 9600 baud, No Parity, One stop bit, Modbus Protocol, Modbus Address 1

Battery

6V Lead Acid. 3.4 Ahr @ 20hrs (approximate 30 days w/o recharge – ideal conditions)

Valve Actuator

6 volt, 125 PSI rated all brass ¼ pipe thread connections.

Pressure Transducers

3 x 0-1000 to 0-10,000 PSI transducers. Tubing, Line, and Casing.

Solar Panel

7.5V @ 300mA

Caution: If the battery is disconnected and the solar panel exceeds 9 volts, damage to the controller can occur.

