Soap Stick Launcher
Controller Manual, Series 09
for
Gas Well Deliquification
Version 13.2

Introduction

Automatic Soap Stick Launchers are used for unloading liquid from gas wells and to optimize each well's individual production. This method offers a greater R.O.I. versus other artificial lift techniques for de-watering gas wells.

The Launcher is available in 9 or 18 stick capacities with pressure ratings of 1500 and 3000 PSI. It is offered in well bore thread sizes of 2" NPT, 2-3/8-8 rnd and 2-7/8-8 rnd. The Launcher Controller is menu driven and can be programmed to introduce one or more soap sticks into the well bore based on a timed schedule of the operator's choosing. See Section 9, *Best Practices*. The Soap Launcher is also capable of operating flow control valves in the Sales Line as well as Casing Sales or a Tank Valve. Alternately, the Launcher can also accept a variable launch schedule derived from a SCADA input signal.

The Launcher is a self-contained unit that does not require the well to be shut-in for re-loading. Typically, the Launcher utilizes as little as 35 PSI of supply gas from the tubing to operate. If that is not available, alternatives exist (see Section 10.2).

A Soap Launcher can be expected to give years of service delivering solid surfactant sticks into the well bore of producing gas wells. Due to its compact construction, the Model 9 can be relocated to another well and does not require a crane or a crew and can be accomplished by a single person. Low profile crossovers are available if transferability between well bore thread sizes is desired.

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SECTION 1: Quick Overview

1.1 Door Instructions

Reprinted (see box) is a copy of the Loading and Programming Instructions as posted on each unit.

Current Status First line on the display shows the flowing or shut-in status of the well and the time remaining.

Launch a Stick button (manual launching)
Press the Launch-a-Stick button at any time.
This will also re-start the Cycle Time at this point.

Re-load Instructions Close the master or swab valve. Press the **Reload** button to begin the reload sequence. Follow the screen prompts. Enter the number of sticks loaded if less than full.

Change Settings? Screen → Yes → Enter
The full Menu List is 19 lines long.
Use the arrow keys to scroll up and down.

Cycle Time = Time period between each stick drop cycle
(8 hours = 3 cycles a day).
Shut-in Time = Duration of SalesLine shut-in time.
Enter zero for maximum flow time.
LaunchDelay = Time period from sales valve closure to the drop of a soapstick. (A Shut-in Time period is required to enable the delayed launch process.)
Low Temp = Will disable the Launcher when temp falls below the desired set point.
Model Type = Enter M9, M10, M18D or M-E
(D = double sticks) (E = electric)
#Of Sticks = Launcher will drop more than one stick at a time.
One is the preference for vertical completions.
No Launch = Low supply gas PSI will disable the Launcher to prevent water damage to the regulator, soap sticks and the control system.
History List = List of stick drops, reloads, Error Messages and PSI readings.
BackInService = Exits the Menu Screen and returns to Current Status.
Default Setting = Resets to the factory Menu settings and Model 9
The operator should confirm the correct model.
Error Messages= Diagnostic prompts identify equipment and operator error plus maintenance reminders.

1.2 Key Pad Button Description

The ***Launch-a-Stick*** button is used to initiate a stick drop and advance to the beginning of the next cycle time (see *Cycle Time* in Section 3.2). If the operator has programmed the Controller to employ a delayed launch *(Launch Delay)*, the operator will be given an on-screen option to push the *Launch-a-Stick* button a second time (see *Launch Delay*, Section 3.5).

The ***Hold/Re-Load*** button is used to initiate the re-loading process. It may also be used to disable the Launcher for a fixed or infinite time period. See Section 1.3; *Re-Loading Procedure* and Section 4; *Deactivation*

The ***Arrow keys*** are used to navigate through the Settings Menu while programming.

The ***Yes/No*** button is used by the operator to answer the questions posed by the Controller.

The ***Enter*** button is used to confirm operator data entry.

1.3 Re-Loading Procedure

To initiate the re-loading process, close the crown or master valve and press the ***Hold/Re-Load*** button at the bottom of the key pad. This will cause the Controller to close the Sales Line valve if a sales valve is present in the line. The Controller will prompt the operator to '*close the green equalizing valve and"* to bleed down the Canister by *"**opening the red needle valve***." The green needle valve isolates the Launcher from tubing pressure and the red needle valve is used to release pressure from the Launcher. The Launcher can be re-loaded once the Lid is removed. Note: The Canister lid cannot be easily opened until all of the internal pressure is exhausted. This is a built-in safety feature. The Controller will prompt the operator for confirmation of the re-loading process and remind the operator to "***close the red blow-down valve and re-open the green equalizing valve.****"* The Controller will assume that 9 (or 18) soapsticks were placed in the Canister. If the Canister has less than a full charge of sticks installed, the operator can enter the correct count at this time on the screen. **Note:** Even though the Launcher may be empty, it will continue to actuate including the actuation of the flow control valve(s). To deactivate the Launcher see Section 4, *Deactivation*.

SECTION 2: Current Status Screen

The ***Current Status*** screen displays the active timer function as it counts down to the next function. The Controller also displays the *number of sticks remaining* in the canister plus the option to change the factory settings (*Change Settings? YES / NO*). There are seven functions (listed below) that might be displayed. Not shown on the *Current Status* screen is the *Cycle Time* which is the sum of the Shut-in and Flow times (see also Section 3.2; *Cycle Time*).

2.1 Flow Time

This display denotes the remaining time that the well will flow prior to the next stick drop. The *end* of the current Flow Time period marks the beginning of the next cycle.

2.2 Shut-in Time

This display shows the countdown prior to the re-opening of the sales valve. The operator is also given the option to re-open the sales valve early.
Note: Flow control is not possible without the correct solenoid (SL32) installed in the Controller and a flow control valve in the sales line.
See Section 10.3, *The Flow Control Valve Explained.*

2.3 Launch Delay Time

This display window down-counts time until a stick is launched. When a value is entered into the Launch Delay setting, the Launcher will delay the launch sequence. See Section 3.5 for a description of this important feature.

2.4 Casing Delay Time

This display denotes the time remaining until the Casing Sales Valve is opened. The Controller will display a Casing Delay countdown only if a value exists in the Settings Menu screen. See Section 3.6 for a description of this function.

2.5 Close Casing Valve (Yes/No - Enter)

The Casing Open time remaining is not displayed in the Current Status window. Instead the Current Status window offers the operator a chance to *close* the casing valve. Otherwise, the casing valve will remain open until its allotted time runs out.

2.6 Tank Delay Time

This display denotes the time remaining until the Tank valve is opened. The Controller will display a *Tank Delay* countdown only if a value exists in the Settings Menu screen. See Section 3.15 for a complete description of this feature.

2.7 Tank Flow (Open) Time

When this time-clock is counting down in the Current Status window, the tank valve is open and will remain open until its allotted time runs out.
See Section 3.15

SECTION 3: Change Settings Menu

After the proper installation and calibration of the Soap Launcher (see Section 5, *Calibration*), the Controller is pre-set with a default *Cycle Time* of 8:00 hours and will *not* utilize any special features of the Controller. The operator will need to access the *Change Settings Menu* to set the preferred timing and usage features in accordance with the needs of the well. To access the Settings Menu, enter *Yes* at the ***Change Settings?*** option in the main menu. This will display the Change Settings Menu. The settings menu has 19 lines of discrete settings and each setting is described below. The arrow keys are used to scroll through this menu. To exit the Settings Menu, scroll up or down to ***Back-in-Service*** and answer *Yes, then Enter.*

3.1 Back in Service? (Yes / No)

This selection will return to the Current Status screen if *Yes* is selected or jump to the Deactivation Menu if *No* is selected. Placing the controller Back in Service will confirm and save all recent changes.

3.2 Cycle Time

In the Change Settings menu, Cycle Time is entered in as follows:
Hours: Minutes: Seconds

The Cycle Time setting indicates how often the operator would like to drop a soap stick. If the operator would like to drop a single soap stick 3 times a day, the Cycle Time would be set at 8 hours (8:00:00). See Section 3.12 to drop more than 1 soap stick at a time. Also see Section 9, *Best Practices*. Cycle Time is the sum of the Shut-in Time (if any) plus the Flow Time period.

3.3 Shut-In Time

In the Change Settings menu, Shut-In Time is entered as follows:
Hours: Minutes: Seconds

A shut-in occurs when the flow-control valve in the flow (sales) line is commanded to close by the Launcher Controller. Shut-in Time is the total shut in period during a given Cycle period. A Shut-in period is optional. If it is used at all, it occurs at the *beginning* of each Cycle period. After the shut-in period ends, the Sales Valve (flow control) re-opens and the Flow Time begins. For the Launcher to utilize this function, it must be equipped with a #SL32 solenoid. If the Launcher is not equipped with a #SL32 solenoid, then the value entered in the Shut-in column will be ignored and the Flow Time will match the Cycle Time. If the Launcher *is* equipped with an SL32 solenoid and a Sales Line valve, the Cycle Time will remain the same and the operator's input value will be entered into the Shut-in Time. Flow time is altered automatically to:

Cycle Time minus **Shut-in Time** equals **Flow Time**

There are three occasions or reasons to shut-in a well while using a soap stick launcher. For optimum production, see Section 9.4, *Best Practices* to choose *or* avoid a shut-in period.

3.4 Flow Time

FlowTime is the total open flow period during a given Cycle period. FlowTime will match CycleTime unless the operator wishes to "Shut In" (stop cock) the well (see Section 3.3). FlowTime cannot be changed *directly* by the operator. The Processor will perform the arithmetic. FlowTime is a function of the CycleTime minus the Shut-in Time. See Section 3.3, *Shut-in Time*.

3.5 Launch Delay

Launch Delay is located in the Change Settings menu and is entered as follows:
Hours: Minutes: Seconds

Launch Delay is the amount of time *after the well is shut-in* that the Soap Launcher '*delays*' before dropping a stick. The Launch Delay period begins

concurrently with Shut-in Time at the beginning of a Cycle period. Shut-in and Launch Delay are only possible when the Soap Launcher is equipped with a (part) #SL32 solenoid and a flow control valve (sales valve) in the flow line. The Launch Delay function is utilized when the operator wants to shut-in the gas well and give the well time to build up to the minimum required pressure for correct operation. Unlike the Launcher itself, a motor valve in the Sales Line does not require a supply gas pressure as high as 30 PSI to activate. Once the Sales Valve is closed, the well begins to build pressure in excess of the 30-35 PSI required by the Launcher. Launch Delay feature is also used when a high flow or extremely wet well needs to settle down before launching a soap stick. See Sections 3.11, 3.13, 7.3 and Section 9.12, *Best Practices*, *Launch Delay.*

3.6 Casing Delay and Casing Flow

Casing Flow and Casing Delay are entered as: *Hours: Minutes: Seconds*
When the inflow from the formation permits, the operator will choose to flow from the Casing as well as the Tubing during a given Cycle period. These two functions control sales from the casing the way the Shut-in Time and Flow Time control sales from the tubing. The Soap Launcher can accommodate this flow but requires a third Solenoid (part #SL32). In use, the casing sales valve is *closed* during the Casing Delay period. The casing sales valve is *open* during the Casing Flow period. The total Casing Delay (closed) time and Casing Flow time together equal the Cycle Time. See Sections 2.4, 2.5 and 9.9, *Best Practices.*

Ex.1 Casing Delay time (6 hrs) plus Casing Flow time (3 hrs) equals Cycle Time (9 hrs)
In example 1, the Cycle time is set at 9 hours and the Casing Flow time occurs in the last third of the Cycle Time period.

Ex.2 Casing Delay (3hr) and Casing Flow (2hr) plus remainder of Casing Delay (3hr) equal Cycle Time (8hr)
In example 2, the Casing Flow period of 2 hours occurs near the middle of the 8 hour Cycle Time.

Ex.3 Casing Delay (0hr) and Casing Flow (3hr) plus remainder of Casing Delay (5hr) equal Cycle Time (8hr)
In example 3, the Casing Flow time of 3 hours occurs at the beginning of the Cycle Time which was set at 8 hrs.

3.7 Low Temperature Set Point

Some operators prefer to not drop a stick during freezing conditions. This setting is the operator's choice for the lowest temperature at which the Launcher will function to drop sticks. The operator may raise or lower this *minimum temperature setting*. Caution: raising this set point too high will disable the Launcher even under normal operating conditions. To enter negative numbers, use the Yes/No button.

See also Sections 3.8, 3.9, 3.10 & 7.2 and also Sections 8.3.4 & 8.6

3.8 Re-Start Temperature Set Point

After the Launcher has been disabled by a temperature drop, it will not re-start the launching process until a higher temperature has been reached. The operator may choose the re-start temperature. The re-start temperature must be at least two degrees higher than the low temperature set point. To convert to a negative number, toggle the Yes/No button.

3.9 Temperature Delay Setting

Temperature Delay time is entered as follows: *Hours: Minutes: Seconds*

The Temperature Delay setting is related to the Low Temp and Re-Start Set Point. Temperature Delay is a deactivation period that begins *after* the ambient temperature has risen above the re-start set point. The operator may increase or decrease this delay period. This delay period can be used to allow sufficient time for frozen flow lines to thaw even if the ambient temperature increase is not very high. The default setting is zero minutes of temperature delay.

3.10 Degrees F or C ?

The operator is given the option to display temperature in either degrees Celsius or Fahrenheit. To change this setting, press the *Yes*/N*o* button to select the desired display.

3.11 Model Type ?

In this setting, the operator must identify the type of Launcher installed. The correct model identification enables the Controller to maintain a soap stick inventory on the Status Screen and to activate the lower chamber of the Model 10. The pressure rating of the Launcher is not required for the Controller algorithm.

The Models are as follows:

M-9 Model 9 Soap Launcher

The Model 9 Launcher holds 9 sticks in a circle and drops 1, 2, 3 or 4 at a time. It is the most commonly used Launcher. It can be equipped with extra solenoids to control sales and casing valves.

M-10 Model 10 Soap Launcher

The Model 10 Launcher holds 9 or 10 sticks and is used for extremely wet wells to isolate the soapsticks. In operation, a stick drops from the main canister into a lower chamber and from the lower chamber into the well bore. The Model 10 will not control a casing or tank valve, only the sales valve. The Model 10 can be used to isolate the soapsticks from extreme pressure, also. The M10 is taller than the standard M9 Launcher.

M-18D Model 18 Soap Launcher

The Model 18 Launcher holds 18 sticks and drops 2, 4, 6 or 8 sticks in each cycle. The M18 can be handy for de-watering horizontal completions. See Section 9.11, *Horizontal vs. Vertical Well Completion*

M-E Model E Soap Launcher

The Model E Launcher is a battery operated version of the Soap Stick Launcher. The Model E is powered by a 12 volt battery driving a linear actuator which opens and closes the 2" ball that releases the soap stick into the well bore. The Model E is the preferred choice when the flowing tubing pressure is insufficient to power the standard gas operated Models.

M-H Model H Soap Launcher

The Model H is a heavy walled container (9 or 18 sticks) that is rated to 3000 psi. See Section 8.2.1

Combinations

Example: A Model 18DEH would contain 18 sticks in a high pressure container utilizing electric actuation.

3.12 # of Sticks to Drop

This setting gives the operator the option of dropping more than one stick per Launch Cycle. The maximum number of sticks dropped per cycle for the M9 and M10 Launcher is four. The maximum number of sticks dropped by the Model 18D Launcher per cycle is 8. The Model 18 drops sticks in multiples of two. See Section 9, *Best Practices* for suggestions on when to avoid dropping multiple sticks vs. when multiple sticks are preferred.

3.13 No Launch Below Minimum PSI

This setting indicates the minimum supply gas pressure with which the Launcher will operate. While the default factory setting is 30 PSI, the operator may choose to increase or decrease this setting. The Manufacturer requires a minimum 35 PSI of supply gas to maintain the product warranty. Should the supply gas Regulator fail to deliver sufficient pressure to the Launcher, the Launcher will not activate and an error message will be displayed on the screen. This is a warning for the operator to rectify the supply gas problem. Some wells flow with less than 35 PSI on the sales line. In that case, supply gas may be piped from the casing to the external input port on the Launcher nearest the

Regulator. Alternately, the well may be shut-in and allowed to pressure-build prior to the launch sequence (see Section 3.5, *Launch Delay*).

3.14 How Many Skips?

This setting pertains strictly to Soap Launchers that are slaves to a telemetry system. Generally, if a signal from a S.C.A.D.A. system is received, the Soap Launcher will begin a drop cycle as programmed. The Skip Setting allows the Soap Launcher the option of ignoring these input signals a set number of times (skips). A setting of zero will initiate a drop cycle every time a signal is received from the SCADA (see Section 6, *SCADA Systems*). Any Sales Valves under the control of the Launcher Controller will continue to operate as programmed.

3.15 Tank Option?

Tank Option is a *Yes* or *No* choice in the Settings Menu screen. Choosing *Yes* will substitute Tank Delay/Tank Open instead of Casing Delay/Casing Flow. Tank and Casing options CANNOT be used at the same time.

Tank Delay and Tank Open are each entered as follows:

Hours: Minutes: Seconds

Tank Open diverts flow from the tubing to the tank temporarily. This is done to remove backpressure from against the tubing and promote liquid unloading from the tubing of weaker wells. During the Tank Delay period that occurs before Tank Open, the well flows to the separator per normal conditions. Tank Delay is typically ten minutes long (5 minute minimum) and begins concurrently with the start of the tubing Flow Time. Tank Open is the duration of time spent venting to the tank. The Tank Open time is typically less than fifteen minutes. The Soap Launcher can accommodate such a function but requires a Solenoid #SL32 (see Sections 9.5, 9.10 and 10.3). The default minimum Tank Delay time is 5 minutes which allows for the sale of head gas into the sales line prior to the Tank Open time period. Some operators will choose delete the Tank Delay period. They want to vent to the tank immediately, believing that the extra flow velocity will insure de-liquification of the well. The Settings Menu will accommodate that option with on-screen prompts.

3.16 Back in Service?

This selection will return to the Current Status screen if *YES* is selected or jump to the Deactivation Menu if *NO* is selected. See Section 4 for an explanation of the Deactivation options.

3.17 Load Default?

Entering *Yes* will reload the factory default settings. The pressure and position calibrations are not affected by a return to the default settings. The Model 9 is the default model choice. The operator must re-enter the correct model # after re-loading the default settings. See Section 3.11 & Section 5.4

3.18 History Screen

The History Screen is a rolling record of Soap Launcher activity. The most recent activity is listed first and the oldest activity is removed from the bottom of the list. The list is 50 lines long. This record includes successful and unsuccessful stick drops, error message reports and reloading, all with an hour-only time stamp. The most recent stick drop or other event is listed on the History Screen as event #1. The second most recent stick drop or event on the History Screen is listed as #2, etc. A short sample of the History screen is re-created below:

History Screen
#1 Au Launch 35T0024
#2 Au Launch 35T0020
#3 Low Temp 35T016
#4 Reloaded 35T0008
#5 Mn Launch 35T0001

The format for an event is as follows: **## (Message Space) PPTTTT**
In this format, the ## is the event number, the central wording is a description, the PP represents supply gas pressure during the event and the TTTT is the elapsed time (in hours only) since the first event. In the example above, an automatic launch (Au Launch) occurred during event #1 and #2, the supply gas pressure was 35 PSI and the last launch (most recent) occurred at hour 24 and counting. During event #3, a failure occurred and an Error Message was posted, (see Section 7, *Error Codes*). Line #4 records that a *reloading* took place 16 hours ago (24 minus 8 = 16). Event #5 (Mn Launch) was a manual launch about 24 hours ago. The History Screen can record the last 50 launches or other events that occurred during the last 9999 hours. The recording of time is rounded to the nearest hour.

3.19 Solar Air Compressor Time Settings

When the flowing tubing pressure at the wellhead is insufficient to power the gas operated ball valve on the Launcher (35 psi minimum), a Solar Air Compressor may be employed. The Solar Air Compressor does not maintain a constant air supply but instead is energized only after commanded by the Launcher Processor. This methodology extends the lifetime of the battery and the air pump. Usually, the Compressor is maintained in the 'on' position for about 30 seconds or until the soap stick(s) is launched. Thereafter, the Compressor will be energized every 10 minutes or so to insure that the Motor Valve(s) maintains its correct position. The 'compressor-on' and 'compressor-off' setting can be modified up to a maximum on-time of 99 seconds and a maximum off-time of 99 minutes. If the Launcher is not controlling any motorvalves, the 10 minute default setting can be extended to the 99 minute maximum to increase battery life. These settings can be found at the bottom of the Change Settings Menu. Contact your distributor or Pro-Seal Lift Inc. for

more details on the use of the Solar Powered Air Compressor. See Section 10.2.3 *Low Supply Gas and Tubing Pressure Solutions,* and Sections 8.3.6 and 8.4.2

SECTION 4: Deactivation Menu

Occasionally, the operator will want to pause the soap stick launching operation for some reason such as when the field must be shut-in or when the compressor is down. The Launcher may be deactivated for a known period of time or it may be deactivated *indefinitely*. The Deactivation Menu may be accessed by answering *No* to the *Back in Service*? question. Follow the screen prompts. The operator has a choice between a timed deactivation (definite) or an *indefinite* deactivation. Using the *Indefinitely* setting means that the operator *must* return to the Launcher to physically re-activate the launching routine; whereas, the *Deactivate* option means that the Launcher will re-start itself after the (operator's chosen) time period has expired. To define the temporary deactivation time period, enter that amount of time onto the Deactivation line. All previous settings are retained during the deactivation period, but the Launcher will perform no action until the deactivation time runs out or the operator returns. Below is a description of the options in this Menu.

- *Deactivate?* - Selecting *Yes* will prompt the operator for the time duration.

- *How Long?* - This is entered as follows- *Hours: Minutes: Seconds*. This timer allows the operator the option of shutting down the Launcher for a finite period of time. When the timer expires, the Launcher will resume normal function using the settings previously entered by the operator.

- *Indefinitely?* - Selecting *Yes* will put the Soap Launcher in sleep mode. All settings will be saved in this mode, but the Launcher will perform no action until the operator returns the Soap Launcher back into service. The question marks (??**:**??**:**??) indicate an infinite time duration.

SECTION 5: Diagnostic and Calibration Screen

5.1 Diagnostic Screen Access

From the *Current Status* screen, press 1 to access the Diagnostic Screen.
Press Enter to escape the Diagnostic Screen.

5.2 Definitions of Abbreviations

BAT = battery voltage
SLR = solar panel voltage
TMP = ambient temperature (see Section 3.7)
PSI = supply gas pressure at the Controller (see Section 5.5)
SV = sales valve solenoid confirmation
(This solenoid, SL32, is an optional item used to control a motorvalve)
POT= position sensor confirmation, Yes/No
(This sensor is not present on retrofit installations)
VAL= micro-voltage output of the position sensor, used to calibrate the sensor
VP = ball valve position (Open, Closed or Stuck)

5.3 Quick-Time Test Routine

During factory inspection, a specific test time is loaded into the Controller to test the Launcher and its components. The operator should never need to employ this Quick-Time program. The Quick-Time program cannot be modified successfully in the field either. Service technicians access the Quick-Time program by pressing 1, then 19 and holding the *9* for several seconds. The screen will flash briefly that the '*timers are loading'* from the memory. To escape the Quick-Time program, press 1 to access the diagnostic screen, then press 1 and the *Reload* button in succession. See Section 5.4, *Reload Defaults*. The Reload button must be held for several seconds until the *default setting* timers are loaded from the memory. At that point, the operator should enter his preferred settings for the Cycle Time and Shut-in Time (if any).

5.4 Reload Defaults

The factory default settings are chosen as the most common settings for operating the Soap Stick Launcher. Any time the operator is uncertain about changes to the controller program, the operator may revert to the factory default settings. The default settings are found at the bottom of the Change Settings menu. Returning to the default settings does not affect the calibration of the sensors. However, the operator must enter the correct model # to match the Launcher itself. See Section 3.11, *Model Types* & Section 3.17, *Re-Load Defaults.*

5.5 Pressure Sensor Calibration (Series 09, serial #2675 and later)
Press 1, 1, 8 (hold the *8* for several seconds) and follow the screen prompts that will pop up. A supply gas pressure sensor is installed as part of the Series 09 Controller to monitor the availability of the supply gas. Loss of supply gas is a common problem and the sensor prevents the Launcher from attempting a launch that will not succeed. This sensor is calibrated at the factory and should not need re-calibration unless it is for a retrofit installation. To calibrate the pressure sensor (of Version 11 and later), the operator must first set the pressure regulator to 20 PSI. It is important to have a reasonably accurate pressure gauge reading for this calibration. If the pressure gauge is questionable, the technician should install a second gauge for accuracy. After the regulator is correctly set to 20 PSI, press 1 to enter the Diagnostic Screen. Then press 18 and hold the *8* for several seconds until the screen asks for a confirmation from the operator. Press *Enter* to confirm that the pressure is 20 PSI. The Controller will record this pressure and then ask the operator to reset the pressure regulator to 40 PSI. This higher pressure is also recorded by the processor and is used to determine the minimum supply gas pressure prior to each subsequent launch. Unplugging the battery will not affect this calibration. See Section 5.7, *Version Number,* Section 7.6 *Regulator Failure* and Sections 8.3.3 and 8.3.5 in *TroubleShooting.*

5.6 Position Sensor Calibration (Series 09, serial #2675 and later)
The position sensor that monitors the position of the 2" ball valve is set at the factory and should never have to be re-calibrated. The calibration procedure for a new panel or a new sensor is as follows; Press 1 to enter the Diagnostic Screen. Press 10 and hold the zero (0) for several seconds until the screen informs that the ball valve is opening. (*Caution*: This calibration routine will cause the ball valve to open.) Follow the screen prompts thereafter. The procedure opens and closes the 2" ball valve and asks the operator to visually confirm the process. Thereafter, the Controller monitors the valve position for any errors in the function of the Launcher (see Section 7, *Error Codes*). Unplugging the battery will not affect this calibration.

5.7 Program Version Number
To view the Version number of the Controller, press 1 to enter the Diagnostic Screen, then press and hold 2 to view the version screen. The screen displays the solenoids that are installed in the Controller also. Release the 2 and the display reverts to the Diagnostic Screen. Press Enter to escape the Diagnostic Screen. See Section 11.2, *Version Update Record*

SECTION 6: SCADA System Utilization

6.1 SCADA input signal

The Launcher and Controller (and motorvalves) can be manipulated by a SCADA signal. Wiring from a (neutral voltage) contact closure on the SCADA controller between two terminal points (16 and 23) on the Launcher panel will initiate a soapstick launch routine. This soapstick launching routine can also include the Launch Delay feature and the flow-control valve operations. Additionally, the operator may program the Launcher Controller to ignore certain signals received from the SCADA device (see Section 3.14). This is done to diminish the number of sticks dropped. In operation, the Launcher is programmed by the operator to drop a stick at (the maximum) 99 hour intervals. During that period, the SCADA will command the launching sequence based on flow rate measurements or other factors. The SCADA will no doubt drop a stick more frequently than every 99 hours. Meanwhile, the Launcher Controller maintains launch records, maintenance reports and an inventory of the soap sticks in the Canister. The Launcher Controller is also RS232 capable.

6.2 Wiring Description

The connection between the SCADA controller and the Launcher Controller can be accomplished with 2 wires. A common ground wire from the SCADA ground source is connected to terminal #23 (ground) thus establishing a voltage floor. A momentary switch-able ground signal from the SCADA is used to pulse terminal #16. This action will cause a stick to drop. The technician can demonstrate this technique with a momentary jumper between #16 and #23. A limited schematic is pasted on the Processor itself. The Launcher does not (should not) receive a positive voltage from the SCADA source.

SECTION 7: List of Error Codes

7.1 EM 01 Supply Gas Pressure Too Low

The standard pneumatic Launcher functions by the action of supply gas pressure acting on an air cylinder. The Controller monitors the supply gas pressure to insure a minimum PSI of 30. If the pressure is too low, the Controller will not attempt the launch of a soap stick. Should the pressure fall below the minimum set-point just prior to the launch routine, the Launcher will display an Error Message (EM01) on the screen and will not launch a stick until the correct PSI is achieved. Later, if the pressure climbs back above the minimum set-point, the Launcher will proceed with the launch of the soap stick. Nonetheless, the EM 01 will remain on the screen until the operator removes the message. This feature gives the operator a chance to review and remedy the fault. Without this low pressure failsafe feature, the 2" ball valve would probably try to open then become stuck in a half open position. The operator may raise or lower this minimum pressure requirement in the Change Settings menu (see Section 3.13). However, the operator is cautioned *against* lowering the minimum supply gas

setting without cause. See Section 10.2 for solutions to chronic low supply gas pressure problems.

7.2 EM02 Temperature Too Low

Some operators do not wish to drop soap sticks in transitional freezing weather. The Controller monitors the ambient temperature and will disable the Launcher during the periods of cold weather that fall below the temperature set-point. Should this happen, the Controller will display an Error Message on the screen. If the temperature climbs above the *re-start set point* (see Section 3.8), the Launcher will resume operating. Even so, the EM02 will remain on the screen until the operator removes it. This feature makes the operator aware of any potential problems. The *re-start temperature set-point* should be set a few degrees above the *disable* set-point. This spread is used to confirm that warmer conditions are approaching. Additionally, the operator has the option of specifying the length of time that a warmer temperature must exist prior to the resumption of the launching routine (see Section 3.9). Cold climate operators will choose to adjust the temperature lockout set point to a realistic setting. See Section 8.6 *Cold Climate Operation*

7.3 EM 04 Shut-in Time Must be 1 Minute Longer than Launch Delay

This Error Message will occur while in the Change Settings menu only. Because a Launch Delay takes place during the Shut-in time, a Launch Delay is not possible without a Shut-in period. The Controller will automatically add-in a Shut-in time that is 1 minute longer than the Launch Delay period but the operator may choose to increase the duration. See Section 3.5 and 9.12, *Launch Delay.*

7.4 EM 06 Ball Valve did not Close, Chop Stick?

The Controller monitors the position of the 2" ball valve. If it fails to close correctly, an Error Message will be displayed on the screen. The Launcher will try again, periodically, to close the ball valve. Even if the valve is eventually closed, the EM 06 will remain on the screen until the operator reviews and removes it. See Section 8, *Troubleshooting*, to review the possible causes of a failure to close.

7.5 EM 07 Ball Valve did not Open

The Controller monitors the position of the 2" ball valve. If it fails to open fully, the Launcher will wait 10 seconds and try again to open the ball valve. If it fails to open correctly, an Error Message will be displayed on the screen. The EM 07 will remain on the screen until the operator reviews and removes it. See Section 8, *Troubleshooting*, to review the possible causes of a failure to open.

7.6 EM 10 Regulator Failure Prediction

All versions of the Launcher processor monitor for sufficient supply gas pressure just prior to a launch sequence. If the available supply gas pressure falls below a set minimum, the Launcher will not initiate a launch sequence. Version

12.7 (and later) of the Launcher Processor maintains a more comprehensive monitoring routine of the supply gas pressure. Consequently, the Processor is able to predict clogged conditions at the filter of the Regulator. The Processor will *alert* the operator (on screen) as much as two weeks in advance of component non-functionality. The operator can then schedule replacement of the Regulator. See Section 8.2.3 and Section 8.3.5

7.7 PM Periodic Maintenance Reminder

While not an actual error message, the screen will periodically display, for the operator, a reminder to perform routine maintenance. This task includes a cleaning of the canister interior, a shot of grease for the ball valve and white grease for the threads and the O-Ring inside the Lid. Note: anti-seize is not recommended for the Lid threads. See Section 8.1, 8.5 & 10.4

SECTION 8: Trouble Shooting

8.1 The Lid

8.1.1 Problem: The Lid is becoming harder to install/remove

Comment: The Lid requires periodic greasing to ensure proper function.

Solution: Grease the Lid and O-Ring with white lithium grease once a month.

NOTE: Do not use anti-seize on the Lid threads because its viscosity aggravates the problem. Do not use WD-40 which is a solvent and will deteriorate the O-Ring seal in due course.

8.2 The Canister and 2" Ball Valve

8.2.1 Problem: The soap sticks were disintegrated when the Launcher was re-opened

Comment: Soap sticks are not affected by high pressure but they do absorb gas while under pressure and then crumble when rapidly depressurized.

Solution 1: De-pressurize the Launcher more slowly if it contains soap sticks at 300 PSI or higher.

Solution 2: The operator should launch the few soap sticks that remain in the Launcher prior to re-loading if the pressure in the Launcher is greater than 300 PSI.

Comment: Having an excessively high pressure build during the shut-in period can also destroy soap sticks when the Sales Valve is re-opened (de-pressurization). For example, if the flow line pressure is 600 PSI and the shut-in pressure builds to 1000 PSI prior to flow resumption, the rapid pressure drop from 1000 to 600 PSI is enough to disintegrate a soap stick. The solution here is to schedule the re-opening at a lower pressure, say 900 PSI. Some soap stick brands can withstand a 400 PSI pressure drop. Other popular brands will disintegrate if the pressure drop exceeds 100 PSI. See Section 9.7, *Shut-In Duration*

8.2.2 Problem: A soap stick has sheared in half in the ball valve

Comment: Crooked or soft, sticky soap sticks will hang up in or on the turret magazine. There are several possible causes listed in the preferred order.

Solution 1: Remove the turret and clean with a rag and rubbing alcohol. Coat the I.D. of the Canister and the magazine with light oil (not WD-40). Some operators use *PAM* or similar vegetable-based cooking oil in a spray can.

Solution 2: Close the master valve and sales line valve. Open the 2" ball valve at the bottom of Launcher and inspect for clogging due to chopped sticks; remove as necessary. When replacing the turret, make sure that it is seated around the bottom pawl shaft. Inspect the Turret (magazine) for a bent vane or a broken weld.

Solution 3: Remove the Turret and inspect the spring located between the two pawls located at the bottom of the Canister. If it is broken, order a replacement.

Solution 4: Re-timing the Turret - Inspect the position of the Turret vane over the outlet at the bottom of the canister. The V shape of the vanes must be centered over the 2" opening. If it is not, proceed with a review of the timing process: a] extend the air cylinder by opening the ball valve full open. Step back from the Launcher and confirm that the polish rod of the air cylinder is absolutely vertical. If not, tighten or loosen the Canister body with respect to the 2" ball valve. b] Re-inspect the vane to determine if it is directly over the 2" opening. If not, continue with the timing procedure by making an adjustment to the threaded linkage (orange colored). Shortening the Linkage will advance the Turret. See Section 8.2.7 also.

8.2.3 Problem: The ball valve opens partially or not at all

Comment 1: Insufficient supply gas to (or from) the regulator. See Section 7.6 *Regulator Filter Failure*

Solution: Check to make sure the filter inside the regulator is not plugged and that the gauge shows the required minimum 35 PSI of pressure. Push ***launch a stick*** and watch the regulator; if the needle dips by 10 PSI during the launch sequence, the regulator filter is becoming plugged and the Regulator should be replaced (part #700325-27). Version 12.7 of the program is able to predict when the filter within the Regulator is becoming plugged and the Controller display will alert the operator of the need to replace the Regulator before failure occurs. See Section 5.7 *Version Number*

Comment 2: The ball valve has become too stiff to operate due to trash or sand in the seals.

Solution: Check to make sure the ball valve operates easily. Remove the orange Actuator (crescent shaped) from the ball valve. Using a small wrench, check for ease of motion. If it is difficult to move by hand, new seals will be required. Order a seal kit with or without a replacement ball. Contact your distributor or call 936-291-9114. See Section 8.2.5

8.2.4 Problem: The Soap Launcher will not blow down completely

Comment: The red relief valve and green bypass valve (¼" needle valves) can become clogged over time and not let gas pass through freely. This problem is aggravated by the 2" ball valve if it leaks excessively.

Solution: Replace the needle valves as necessary. See Section 8.2.5

8.2.5 Problem: The 2" Ball Valve sounds as if it is leaking when the Lid is removed

Comment: Once the Lid is replaced and the Canister is equalized via the green needle valve, the leaking will stop. It stops when the pressure above the ball valve equals the pressure below the ball valve.

Solution: A small leak can be ignored. If the leak is excessive, split the ball valve at the seam; replace the seals and perhaps the ball. Replacing the seals and/or ball is an easier operation than replacing the entire ball valve. Part #700971-24, replacement seals; Part #700998-24, replacement ball.

8.2.6 Problem: Wet soapsticks in the Canister

Comment 1: Some high liquids formations slug water into the Canister during the brief moment that the Ball Valve is open.

Solution 1: The Model 10 Launcher has a double chamber arrangement that will prevent water slugs from entering the main Canister. Therefore, the soapsticks remain dry. See Section 3.11, and Section 9.6

Comment 2: The purpose of the self-dumping Drip-Pot is to remove produce water before it enters the Canister. Some gas streams are so misty wet that the Drip-Pot is overwhelmed.

Solution 2: The Drip-Pot can be replaced with a Pressure Balance Modulator that will feed dry casing gas into the Canister insuring dry supply gas and a dry environment for the soapsticks. Contact your distributor.

8.2.7 Well Head Tree Issues

Comments: Occasionally, Launchers are installed above other 2" NPT peripheral hardware such as a heavy walled tee or nipple. A soapstick will not consistently pass through heavy wall nipples, resulting in chopped sticks.

Solution: If high pressure integrity is mandatory, then these heavy-wall nipples must be tapered at the upper end to guide the passage of the soap stick.

8.3 The Controller

8.3.1 Problem: Controller doesn't react to the new time setting entry

Comment: New data will take effect *after* the current cycle time is completed, normally.

Solution: If waiting is not acceptable, push ***Launch a Stick*** and the new cycle time will take effect now. This feature can be used proactively to push the Cycle start time to a specific time of day (see Section 10.1, *Advanced Features*).

8.3.2 Problem: I never see the full Cycle Time that I entered

Comment: The Current Status Screen displays different times depending on which options and times are chosen.

Solution: To view the Cycle Time, enter the Change Settings menu and scroll down to review the Cycle Time entry. See Section 2, *Current Status Screen* and Section 3.2, *Cycle Time*.

8.3.3 Problem: Pushing ***Launch a Stick*** does not work

Comment: While this inactivity may be attributed to low supply gas, there are internal controller parts that may also be a problem. Possibly the ball valve is stuck or too stiff to open. Has the keypad itself gotten wet?

Solution 1: Push the other keys to confirm that all other keys will function. When the keypad is damaged, usually more than one key will fail.

Solution 2: The exhaust ports on the bottom of the Controller are sometimes plugged by small dirt-dauber wasp. Insert a paper clip into each of the 2 small holes at the bottom (outside) of the Controller to free any trash that has accumulated in these ports. **NOTE:** Running the paper clip or other probe t*oo far* into these ports will not harm the Controller.

Solution 3: The spool of the solenoid in the Controller might be corroded and no longer working. To conduct a manual test of the solenoid, remove the four screws holding the Controller panel in place. The solenoid is located at the bottom center of the Controller. It is labeled part #SL34. Note: the SL34 is written upside down. Push each of the light blue buttons on the solenoid to override the electrical signal. The right-handed (B) button opens the ball valve; the left-handed blue button (A) should close the ball valve. To visually check for corrosion, remove the two small screws holding the solenoid in place and look inside the back of the solenoid. Corrosion will appear white and flaky; if this is seen, the solenoid should be replaced. **NOTES:** 1) The solenoid cannot be cleaned and re-used successfully. 2) use care when re-aligning the gasket.

Solution 4: Remove the orange actuator from the ball valve and operate the ball valve with a small wrench. If the ball valve does not move freely, it should be rebuilt by replacing the seals and ball. This is easier than replacing the entire valve which would require a timing procedure. See Section 5.6, *Position Sensor Calibration;* Section 8.2.2, *Solution 4* and Section 8.2.5, *Ball Valve Leaks.*

8.3.4 Problem: Display is hard to see in daylight or cold weather

Comment: The display grows darker in cool conditions and fades in the heat.

Solution: Adjust the grayscale at the back of the panel. Reduce the back light level to extend battery life.

8.3.5 Regulator Failure Prediction

Problem: Display calls for the replacement of the Regulator (version 12.7)

Comment: The Launcher Processor monitors the pressure of the supply gas available to operate the Launcher before and after the launch sequence. Whenever this available pressure is deemed to be compromised, the Controller will display a warning notice. There are two causes of insufficient pressure; insufficient pressure from the well head or a clogged filter at the regulator.

Solution: Re-order a replacement Regulator, part #700325-27.

See Section 3.13, Section 7.1, and Section 7.6 *Regulator Filter Failure* and Section 10.2 *Low Supply Gas Solutions.*

8.3.6 Display Screen Issues

Problem: The Display shows two black bars across the Screen

Comment: These dark bars will occur when 12v power is being back-fed to the Controller from the 12v supply located in the Solar Compressor enclosure.

Solution: Turn off the power switch in the Solar Compressor enclosure, then turn off the black slide switch located in the Controller enclosure. This switch is hidden to the left of the keypad panel and can be reached with a pencil point or other small probe. Re-power the Controller first, then the Solar Compressor.

See Sections 3.19, *Solar Air Compressor* and Section 8.4.2, *Peripherals.*

8.4 Peripherals

8.4.1 Problem: Motor Valve function does not work; Sales valve will not open/close

Comments: Control of a sales and/or casing valve is an optional accessory. For the Controller to operate a motor valve in the sales line, the proper solenoid must be installed. See Section 10.3

Solution: Confirm that a SL32 solenoid is installed in the Controller enclosure by pressing 1, then 2 and read the on-screen confirmation. Press Enter to escape. Alternately, remove the panel and make a visual inspection for one or two SL32's. The SL34 controls the launch sequence only.

8.4.2 Problem: The (optional) Solar Air Compressor does not turn on when it is time to launch a stick or open the sales valve.

Comment: Two light gage wires connect the Launcher Processor (version 12.7 or later) to the Solar Air Pump. This allows the Compressor to run only when the Launcher requires an air supply.

Solution: a] double check the integrity of the wiring; b] double check the battery voltage; c] while in the Current Status screen, press 1 which will energize the relay at the Compressor and should cause it to pressurize; d] request a wiring diagram from your distributor or Pro-Seal Lift, Inc; e] confirm that the Processor activity LED #2 is lit during the launch sequence; f] replace the Relay in the compressor housing; g] prove that the circuit breaker will pass heavy amperage, not just a continuity test; h] direct wire the pump to test the maximum pressure output (at least 90 psi). See Section 3.19 and Section 10.2.3

8.5 Storage

Problem: Launcher not in use. What is the proper long-term storage procedure?

Comment: If the Launcher is not needed for a period of time, it is best to leave it on the well until it can be relocated to another wellhead. Laid down in a warehouse, the Launcher will begin oxidizing within a few weeks. After 30 days, the ball valve will become too stiff to operate easily. The Launcher will not adsorb oxygen from the atmosphere if it is left pressurized on the wellhead.

Plus, if the Launcher remains outside, the solar panel will maintain a charge on the battery.
Solution: If the operator is unable to leave the Launcher on a well, empty the Soap Launcher of all sticks and wipe down the turret with a rag and alcohol based cleaner, then coat all exposed metal surfaces with a rust inhibiting oil (not WD-40), including the inside of the ball valve. Store the Launcher in a clean, dry environment. (WD-40 is a solvent that will attack the O-Rings and other elastomeric components.)

8.6 Cold Climate Operation

Comments: While the Soap Launcher can effectively operate in cold temperature, the lower limit of its operation is dependent upon the salt content of the unloading liquid. The higher the chloride content, the lower the operating temperature will be without the need to insulate. See Section 3.7-10 and Section 7.2
Solution 1: Launchers shipped to cold climates are equipped with an extra ¼" NPTF port opposite the 1/8" bypass port on the lower sub, below the 2" FP ball valve. This extra port is used to inject a portion of the methanol drip into the area just below the 2" ball valve. This limited amount of methanol prevents the ball valve from freezing. The bulk of the methanol should be injected into the sales line beyond the wing block via a 'tee' in the methanol supply line.
Solution 2: In an extreme cold temperature environment, a 'dog house' may be required.

8.7 Troubleshooting the Model E linear actuator Launcher

Comments: The Model E is not subject to regulator failure, insufficient supply gas or corroded solenoids. It is susceptible to seal stiffness from sand or other causes. Because of increased electrical consumption, it does require a larger solar panel and battery capacity.
Solution: Press 1 to view the battery and solar panel voltages. Any time an Error Message 06 or 07 appear, check the valve for excess stiffness, confirm that the correct Model type is listed in the Change Settings Menu then replace the 12v Relay (part #4000765-26). See Section 3.11, *Model Types.*

SECTION 9: Best Practices Recommendations

9.1 Return on Investment

There are 5 or 6 methods used to de-water gas wells. The use of surfactants in the form of soap sticks offers the greatest return on investment because they are a very effective method at the absolute least cost for de-watering. Nonetheless, soap sticks must be deployed correctly, i.e. at the correct time and in the correct amount. An automatic Launcher is not always required to deliver soap sticks routinely but it helps by insuring the delivery schedule. Depending on the market value of gas produced, a Launcher becomes an affordable purchase when the increase realized is in excess of 25 to 50 MCFD. The stiffest competition

faced by the automatic Launcher is a 'two-valve' launcher and a dedicated operator. The capital cost of the automated Launcher must be balanced against the operating cost of personnel and vehicle time.

9.2 How Many Soapsticks per Barrel of Water?

One soap stick is sufficient to treat one barrel of water to the proper dilution rate. But in reality, one soap stick can *move* from 3 to 5 barrels of liquid. This phenomenon has an explanation. When operated correctly, a soap stick falls into the ***top*** of the water column that is located in the tubing at whatever depth it may reside. Hot or cold, the top portion of the water column is a low-density, bubbling cauldron of bursting gas bubbles and stirring water. As the soap stick falls through this column, it loses speed and begins dissolving from water contact and elevated temperature. The limited amount of water treated by surfactant will break into small *mist-like* particles as a result of this chemical treatment plus the mechanical action of the popping bubbles. Smaller water particles such as this mist are more easily carried to the surface by the up-flowing gas stream. The removal of the *weight* of this (~ one barrel of) water reduces the back pressure against the formation. At this point, the formation pressure is comparatively greater than the remaining weight of the liquids in the tubing. With that, the bottom-hole pressure (and volume) will push another few barrels of liquid to the surface, even though this additional liquid will not have been thoroughly treated by any surfactant. This represents an additional savings in chemical costs.

9.3 How Many Soapsticks per Launch Cycle?

From the above paragraph (9.2), we see that one soapstick will remove a fair amount of water. The best use of soapsticks would be to launch another (single) soapstick just after the flow increase from the previous stick begins fading. If a well makes very little water but also suffers from low bottom-hole pressure, then the operator has the option of dropping only ½ stick per cycle. Even so, that well could require multiple doses a day, ½ stick each (see Section 9.8). Alternately, the Model 18 Launcher drops 2 soapsticks at a time. This M-18 Launcher is used on those wells that require a volume of surfactant to match high volumes of water, typically in the larger tubing sizes. Another exception to the single soapstick rule of thumb is the horizontal well (see Section 9.11, *Horizontal Well Bore*).

9.4 Should the Well be Shut-in to Drop a Soapstick?

The well does *not* have to be shut-in to drop a soapstick into the well bore. It is better that the well be active when the soapstick encounters the water column. It is not beneficial to locate the surfactant at the bottom of the tubing or in the rat-hole unless the water column is of limited height. The exceptions to this *no shut-in* rule are detailed in Sections 9.5 and 9.11

9.5 Weaker Wells

Soapsticks are used to reduce the critical velocity required to lift water from the well bore. If the sustainable flow rate from the well is still less than that required to produce the well, even with surfactants, the operator must increase the instantaneous flow rate somehow. One of the first choices is to lower the back pressure by installing compression or flowing to the tank, (Section 3.15). Like surfactants, this technique will prove effective to a point. After that point, the operator should shut-in the well long enough to build up reserve energy for removing the accumulated liquids from the tubing. In this process, the well should be shut-in for a limited duration, empirically determined, and the soapstick should be dropped not more that 10 minutes prior to the re-opening of the well. A 3 to 5 minute fall is adequate. This '*drop and re-open timing technique'* will place the soapstick in the *top* of the water column, not down around the perfs or in the rat hole.

9.6 How Many BWPD per Day Can be Moved by Soapsticks?

Some formations produce 100 barrels (and more) of water a day. It would not be preferred to shut-in such a well long enough to allow a plunger to fall. However, dropping a soapstick into the well bore will modify the chemistry of the near-surface water. Though this water is plentiful, it is severely gas-cut and the soapstick will fall into and through it. In so doing, the production from the well will continue and perhaps increase. The limiting factor for using a Soapstick Launcher in this situation is the ability to launch a stick without allowing water to enter the Canister. Should that be the problem, the solution is for the Launcher Controller to close the flow-control valve in the sales line prior to the stick launch. This closure will reduce the likelihood of produced water entering the Launcher and contaminating the remaining stick inventory. Unlike plunger lift, the closure period need only be about 2 minutes long prior to the launching of the stick. After launching, the well may be re-opened within 1 minute. Because of the compressive nature of the fluids in the top of the tubing column, this momentary closure will not be detrimental to the overall flow rate. A 3/8" make-up gas feed around the sales line motor valve will keep the compressor running during the temporary shut-in. See Section 8.2.6

9.7 How Long Should the Well Be Shut-in?

It is preferred that vertical completions are not shut-in at all. The exceptions are: a) high flow rate wells and b) low flow rate wells.
See Section 8.2.1 *TroubleShooting*

9.7.1 High Flow Rate A flow rate above 250 MCF in 2-3/8" tubing can retard the fall of the soapstick across (past) the wing block passageway (350 MCF for 2-7/8" tubing). In that case, a shut-in prior to launch might be necessary. Any shut-in period should be limited, though. The Launcher should be programmed to close the well for one or two minutes before beginning the launch sequence. After one or two minutes of fall time, the flow control valve may be reopened. If

the well is an active water-maker, these time periods may be doubled to keep carry-over water out of the Canister.

9.7.2 Low Flow Rate A weaker well can be shut-in to build a little extra volume for extra lifting velocity when the well is reopened. The length of the shut-in is a function of the inflow rate, the tubing diameter and the volume of the annulus, if any. Choose a longer period at first, and then reduce the shut-in time period over the following weeks to establish the minimum shut-in requirement. The automatic Launcher makes this procedure much easier to perform.

9.8 Producing from Low Bottom Hole Pressure Wells

A low bottom hole pressure well should not be shut-in as a rule. The purpose of a shut-in is to build pressure which increases the volume of gas in the tubing and annulus. However, a low pressure well will not build pressure above the limits of the formation. Therefore, a shut-in will not achieve the desired results. The better solution is to employ compression plus surfactants to produce from a low pressure formation. Surfactants can be introduced in smaller quantities more frequently so that the floating mist column is not too heavy against the formation all at once. See Section 3.15 and Section 9.3

9.9 When Should the Casing Sales Option Be Utilized?

Production from the casing is reserved for larger flow rates and for the back pressure reduction that it affords medium flow rates. Nonetheless, bottom hole liquids are more easily removed via the tubing because of the higher velocity achieved from tubing flow. The Cycle Time duration is a function of the need to introduce more surfactant into the well bore (tubing). As excess liquid accumulates in the well bore, a soapstick is dropped into the tubing just prior to the opening of the tubing to flow. The flow from the casing is terminated to encourage velocity flow up the tubing. It is velocity in conjunction with the surfactant that will carry liquids to the surface. The Soap Launcher can be programmed to control these valves. See Section 3.6; 8.4.1 and 10.3

9.10 Using the Tank Open Option

The Tank Open technique is common in a plunger lift installation. It is used to remove any back-pressure from the tubing so that the well can unload liquids from the tubing. A tank valve (motor valve) must be installed from the flow line to divert flow directly into the tank. The purpose of the Tank Delay period is to sell high pressure head gas into the sales line immediately after the sales valve is opened. After the tubing pressure reaches parity with the sales line pressure, the tank valve can be opened for a few minutes to reduce back pressure from the tubing and allow the well to unload. The Tank Open time duration is determined empirically by the operator. See Section 3.15

9.11 Horizontal vs Vertical Well Completion

Horizontal completions can be successfully de-watered with soap sticks but the preferred technique for utilizing soap sticks in a horizontal is almost totally opposite that of a vertical completion.

9.11.1 A vertically completed well should receive one soapstick at a time and it should not be shut-in, generally. If ever the vertical well is shut-in, it should be shut-in for the least amount of time and the stick drop should take place a minute or two before the well is reopened. The frequency of surfactant launching is determined by a moderate decrease in the flow rate. It is time to drop another stick when the flow rate diminishes. The average vertical well receives 1 soapstick every 8 hours though generalizations are difficult to give. The operator is advised to drop more sticks than thought necessary. After a few days or a week, the number of sticks dropped per day may be reduced. The operator can monitor the flow rate to maximize production by maintaining the optimum surfactant infusion.

9.11.2 A horizontally completed well should be treated with 3 or 4 soapsticks *at a time* and the well should be *routinely* shut-in for an *excessive* length of time. The length of the flow time for a horizontal well is determined by the decrease in the flow rate also, but the flow rate should be allowed to decrease precipitously before the well is shut-in. The launch of multiple soapsticks should occur at the beginning of the shut-in period, unlike a vertical completion. A best starting point for soaping a generally 'L' shaped horizontal would be 3 or 4 sticks dropped at the beginning of an 8 hour shut-in period followed by a 20 hour flow period. Again, generalizations are risky to make.

(see *COMPARATIVE SOAPING TECHNIQUES, HORIZONTAL vs. VERTICAL COMPLETIONS,* published by the Southwestern Petroleum Short Course, April, 2008.)

9.12 Launch Delay

Launch Delay is the amount of time *after the well is shut-in* that the Soap Launcher '*delays*' in dropping a stick. The Launch Delay period begins concurrently with the Shut-in Time at the beginning of a Cycle period. No matter how long the Launch Delay period, the Shut-in period will be at least 1 minute longer. There are several reasons to choose the Launch Delay feature:

9.12.1 High Gas Rate If the well flows at a rate above 250 MCFD in 2-3/8" tubing, the Launch Delay feature will allow the flow to abate just prior to the stick drop. The remaining Shut-in Time after the stick drop should be between from 2 to 5 minutes. A longer Shut-in is not preferred for this type of well.

9.12.2 High Water Flow Rate The well that makes a lot of water is similar to the high gas rate well. The purpose of the Shut-in is to let the well calm down prior to dropping the soap stick. This keeps the soap stick from being drawn against the wing block. The Shut-in period should be minimized if possible. The Cycle Time determines the number of sticks dropped per day (see Section 3.2). The Shut-in

period (Section 3.3) does not need to be longer than 4 or 5 minutes unless there are contra-indications. A Launch Delay period (Section 3.5) of about 2 minutes will cause the stick to fall at the 2 minute point in the 5 minute Shut-in period. This timing will prevent water splash from entering the Launcher Canister when the soapstick exits the Launcher. (also see Section 3.11 *Model 10 Launcher*)

9.12.3 Pressure Build Period Some wells that are on compression have flow from the tubing at pressures less than 35 PSI. The pneumatic Launcher requires 35 PSI to insure proper function. If the available pressure from the tubing is not high enough, the Controller can be programmed to close the sale line valve (Section 3.3) thus causing a pressure build in the tubing for the benefit of the Launcher. Once the soapstick is dropped, the sales line valve will be re-opened by the Controller. The Cycle Time is determined by the number of soapsticks to be dropped each day. The Shut-in Time is determined by the length of time required for the well to pressure-build to, say 45 PSI, probably 30 minutes. The launch of the soapstick should occur near the end of the Shut-in period when the pressure is above 35 PSI. Therefore, the Launch Delay period should be set at about 27 or 28 minutes, a few minutes short of the Shut-in time period. See Section 10.2 for other options.

9.12.4 Volume Build Period The requirement to build volume is *different* from the requirement to build pressure. A low pressure well can flow at a high rate. Whereas a high gauge pressure at the tubing does not, of itself, indicate a high flow rate. It is a high flow rate that is required to move liquid from the tubing to the surface. The well that does not have sufficient average volume (flow rate) can generate instantaneous flow rate by storing volume in the tubing and annulus in the form of pressurized gas. The Launcher Controller can accommodate this need by commanding closure of the sales valve, which will cause the pressure build. The duration of the volume-build shut-in must be determined empirically by the operator. When this Shut-in period is almost over, a soapstick should be launched into the tubing. Therefore, the Launch Delay setting should be about 3 minutes less than the Shut-in Time setting.

SECTION 10: Advanced Features, Tips and Tricks

10.1 Launching at a Specific Hour of the Day

In this example, the operator is at the well at 8 AM. The operator wants to drop one soapstick into the well everyday at 12 noon and another at 12 midnight. To achieve this goal, first set the Cycle Time to 4 hours (04:00:00) and press the Launch-a-Stick button on the Controller. This will cause the Launcher to activate and launch a stick right away (8AM). The next stick will drop at 12 noon but also every 4 hours thereafter. Instead of allowing that drop frequency to happen, reset the Cycle Time to 12 hours (12:00:00). When the 12 noon soapstick is dropped into the tubing, the Controller will update to the new Cycle Time (12:00:00) that was entered just after 8AM. Every drop thereafter will be in increments of 12 hours. Note: If the Launch-a-Stick button is pressed at any

time thereafter, the stick-drop time will shift to 12 hours from that moment on. Also, see Section 8.3.1

10.2 Low Supply Gas and Tubing Pressure Solutions

For simplicity and convenience, the pneumatic Launcher receives its supply gas from the pressure in the tubing.

Question: Tubing pressure is routinely less than 35 PSI. Can the Launcher operate with less than 35 PSI?

Answer: No, but there are solutions to this problem.

10.2.1 Tubing Shut-in The simplest solution is to have the Launcher Processor shut-in the tubing automatically until the pressure in the tubing exceeds 40 PSI. See Sections 3.5, 3.13, 5.5, 7.1, and Sec. 9.12.3 *Pressure Build.*

10.2.2 Casing Gas as Supply Another option is to pipe casing gas to the Launcher Regulator. The Launcher is equipped with an alternate supply gas port (1/4" SS tubing) for bringing supply gas from the casing to the Launcher. The Launcher Regulator is then used to reduce the casing pressure to 35 PSI. See Section 7.1 and Section 8.4.2

10.2.3 Solar Air Compressor A third option is to employ a low volume Solar Powered Air Compressor. The Launcher Processor will control the timing of the air compressor to minimize pump run time, preserving battery and pump life. See Section 3.19 *Solar Compressor Time Settings*

10.2.4 Model E Launcher The Model E Soap Stick Launcher linear auctuator is powered by a 12 volt battery and solar panel. Consequently, it does not require high tubing pressure or volume to operate. See Section 3.11

10.3 Flow Control Valve and the SL-32 Solenoid Function

Most Launcher installations do not employ a flow control valve (motor valve) in the sales line. However, a sales line valve can be very helpful in maximizing liquid removal and production from certain gas wells. To operate the closure of the sales line valve, the Launcher Controller must have a SL32 solenoid installed internally. The SL32 is an optional accessory and must be ordered with the Launcher to be included at the time of installation. However, the SL32 solenoid is easily installed as an add-on item should the operator require it at a later date. Another (second) SL32 solenoid is used to open and close the casing valve. This is the same solenoid used for controlling flow from the tank valve. See Sections 3.3, *Shut-in Time*; Section 3.5, *Launch Delay* and Section 9.9

10.4 Maintenance Tips

The inside diameter of the Launcher will remain cleaner longer if the soapstick magazine is periodically sprayed with a light oil or light grease spray. Aerosol oil sprays for lubrication can be difficult to locate and purchase. An alternative oil spray that works well in the Launcher is a food-grade spray such as *PAM* or

other brands of aerosol food oils. Liberally coat the magazine, the Lid and the I.D. of the Launcher about once a month. See Sections 7.7, 8.1 and 8.5

SECTION 11: Program Version Update Record

11.1 Locating the Version Number

The operator can determine the Version number in Screen 1. From the Current Status page, press 1 to bring up Screen 1. Then press and hold the #2 button to view the version page. See Section 5.7

11.2 Version Feature or Modification

Version 11.0
Modifies pressure sensor calibration algorithm from 50 psi to 20 then 40 psi.
Version 12.2
Reduces minimum Tank Delay to zero seconds option. See Section 3.15
Version 12.7
Added the regulator failure prediction algorithm.
Version 13.0
Added the Solar Air Compressor control algorithm to the Processor.
Version 13.2
Limits minimum Cycle Time to 20 seconds.

distributed by
Pro-Seal Lift Systems, Inc.
Huntsville, Texas

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