Instruction and Installation Manual
ANOVA-1 POC
(Firmware Version 1.1.5)
5/20/2025

Installation

Mounting-

POC can be mounted on pumpjack, on front of electrical box, or on separate pole. To get the most from your POC, we suggest you mount it in a location that will be visible from your truck so that the Status LED's can be seen.

> **WARNING- make sure wherever you mount the POC, the wires and box will not catch or be hit by pumpjack when well is in operation.**

Wiring-

Take the 6' long four-wire lead and run it into existing electrical box. Splice additional wire if required to reach your box.

Black and White wires are power wires. Attach to A/C power (85-277 volts). If your electric box has an Auto/Hand switch, we suggest you wire it into the Auto circuit to replace your existing timeclock.

Red and Green wires are control wires. They form a closed circuit when well is running, and an open circuit when well is not. In most cases, one of the control wires will connect to power and the other will connect to the motor controller/contactor. Motor current cannot run directly through the POC.

If your existing electrical box doesn't have a motor controller/contactor (i.e. you run motor current directly though knife switch or timer) H&H has low-cost solutions, reach out to us for help. The ANOVA-1 has a built-in timer, so make sure to bypass or remove any existing timer.

> **WARNING- Do not wire black and white power into greater than 277VAC, this will damage POC. If unsure, always test with multimeter.**
>
> **WARNING- Do not wire red and green control wires into greater than 2A-250VAC, this will damage POC.**

B&W POC Wires = outer timer wires

R&G POC Wires=inner timer wires
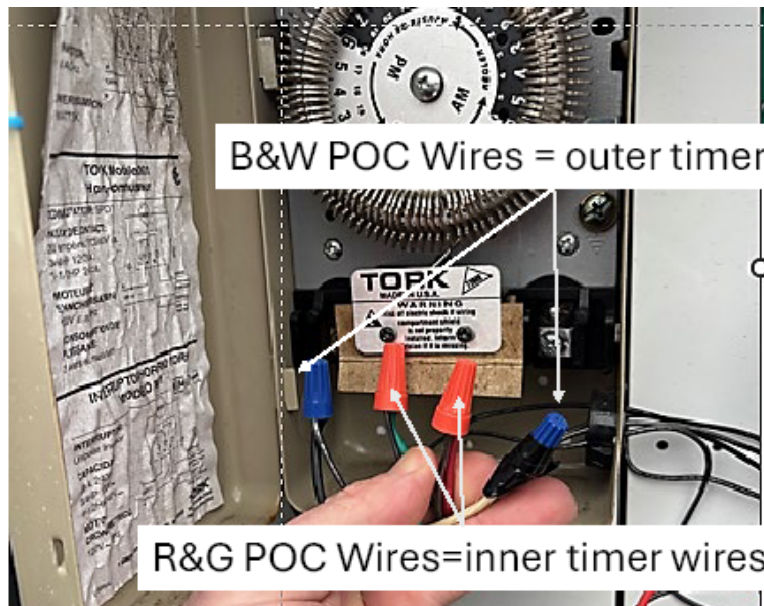
Tip: If you have an existing timer, the two outer wires going into timer are power wires, and the inner wires are control wires. Just remove wires from timer and wire into POC.

Harness Assembly-
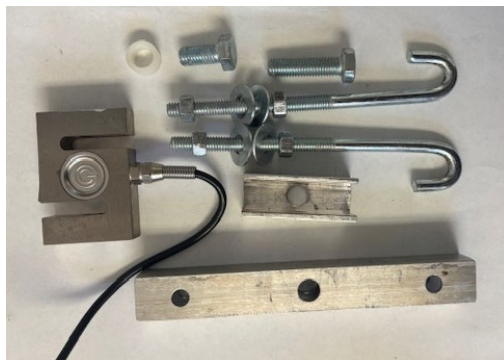
Your box includes 2 J-bolts, 4 steel washers, 4 nuts, 1-nylon spacer washer, 1- long bolt and 1-short bolt, one square tube and one c-channel.

Assemble the harness on the sensor as shown. Use long bolt on square bar side and short bolt and nylon washer on C-channel side. The C-channel does not have to be tight, twist until tight then back off so that channel is aligned with sensor as shown.

To mount harness to well, rest C-channel on top of the polish rod clamp and against polish rod. Hook J-bolts around bridle cables and tighten nuts by hand to keep in place. J-bolts can be turned inward for smaller carrier bars, or outward for larger bars.

It is preferable to mount the harness so that it is on the side closest to pump-jack, pushing the polish rod away from the jack. Always check first that you have space and that harness will not be crushed by horse head when well runs. Harness can be mounted on side away from the jack if necessary.

Set Tension and Learn Mode

Check that the Override Switch at bottom of the POC is flipped to right (AUTO). Then power up unit. You will enter MAIN MENU screen.

The ANOVA-1 uses an advanced statistical algorithm to determine pump-off. For this algorithm to work, it needs to record data while the well is known to be pumping full strokes. We call this process "Learning", and it is done by entering the LEARN MODE on your POC.

If well has enough fluid to pump for at least 5 minutes you are ready to "Learn" the well. Press C "Learn Mode" from MAIN MENU, then press A for "Learn Now" (the Learn Later option will be explained later).

You will see the message "Install Harness and Tighten J-Bolts". Tighten J-bolt nuts evenly until you hear a "beep" from the unit and screen changes to "tension correct" message. Then tighten each nut one additional full turn and set lock nuts.

Press A to start well. Once well is pumping normally, press A again to advance.

POC will progress through LEARN MODE automatically. When done, the well will shut off and return to MAIN MENU. If you think the well may have started to pump-off during the learn sequence, flip Override Switch from AUTO to Override and verify that the well is still pumping full strokes. If it is not, wait until well is ready to pump again and reenter LEARN MODE.

<u>Operation</u>

Now that you have installed and learned you well, let's look at the functions and options of the ANOVA-1 screen by screen. Most of the time, the POC will be in sleep mode with nothing on the screen. Pressing any key will wake the unit and bring you to main menu.

The '#' key is the home key and will bring you back to main menu from any sub-menu. Features and menus cannot be accessed while the well is pumping.

The POC retains all data when powered off, so it will work fine on generator powered leases.

Main Menu Screen
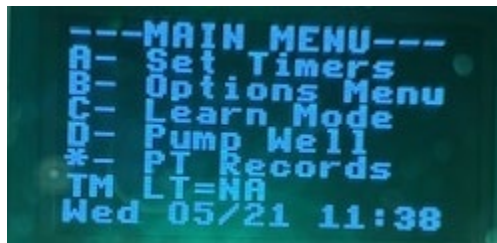
A- Set Timers

By default, the POC is in TIMER MODE. This mode turns well on at the time and day of week you choose. You can set up to 28 timers for any combination of days of the week and start times.

Follow on-screen prompts to set a timer. Set hour and minute, remembering to use 24hr time.

Next you will be promoted to enter a "Max Duration". This is the maximum number of minutes the well will be allowed to pump, even if pump-off is not detected. This acts as a fail-safe in the event the POC doesn't detect pump-off or if well makes considerably more fluid than expected. Best practice is to set this Max Duration to at least four times your expected pump time. If you set the max duration for longer than the total time between pumps (1440 minutes for once per day pumping) this function can be disabled.

Next, select days of the week to pump, then save timer by pressing * key. POC will beep to indicate that timer is set. If you want to change pump time, it is best to select your existing timer (i.e. Timer #1) and press D set. You can then overwrite the existing timer, changing only the parameters you need too.

B- Options Menu

See OPTIONS MENU section below.

C- Learn Mode

LEARN MODE is critical to the function of the POC. It is important that while "learning", the well is pumping with full strokes. It's always a good idea to "re-learn" a well by running the LEARN MODE when it is serviced, treated, the motor is changed out, or adjustments are made to pump jack.

Every time the well starts, before the POC goes into its pump-off detection mode, it enters a short ACTIVE LEARN mode. ACTIVE LEARN compares the data coming from the sensor to the statistical model created in LEARN MODE. If it detects changes in the well that are persistent and accumulating, the POC will prompt you to re-learn the well. This will be indicated by the top row of LED's showing white and the message "Learn Mode Suggested" showing on the screen when waking unit. The POC will continue to function, this is just a reminder that it would be a good idea to re-learn the POC when you are able.

When possible, always select the "Learn Now" option in LEARN MODE. This is preferable since you will be there to ensure the well is pumping normally throughout LEARN MODE. However, the "Learn Later" option can be used if a well has recently pumped off and you want it to relearn once it has filled back up and can pump. Selecting Learn Later will start enter LEARN MODE at the next timer, then go straight into a normal pump cycle. It is important that you are confident that the well will have enough fluid to pump at least 5 minutes at the next timer to use the "Learn Later" feature.

D- Pump Well

This starts well immediately. The well will pump until pump-off is detected and record a pump record.

*- Pump Records

This brings you to the PUMP RECORD screen. More on pump records in the <u>Understanding Status LED's and Pump-records</u> section.

Status Line. The line below the Pump Records Option shows information about the current settings. "TM" or "FM" indicate current mode (Timer Mode or Fillage Mode). "LT=xx" shows Low Temperature setting. If NA, then Low Temperature is disabled, otherwise the low temperature will show. Finally, if the Pump-off sensitivity has been adjusted from the default, the right side of this line will indicate this with a "sens=x". This will not show if sensitivity is set to the recommendation and default value of 3.

Time/ Date line. The bottom line on the main menu screen shows the day of week, date and current time.

Options Menu Screen
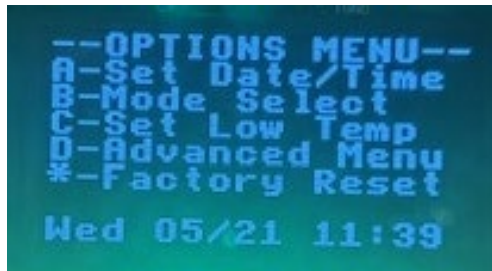
A- Set Date/Time

Follow onscreen instructions to set time and date. Remember to enter year as four digits, and to enter PM times in 24-hr format (military) time.

B- Mode Select.

Timer Mode is default. Fillage Mode will be explained later.

C- Set Low Temp

Default is disabled. You can set a temperature in Fahrenheit that will override the timer, not pump the well and return a "LT" pump record. The Low Temp feature only checks temperature when the well starts, not while pumping.
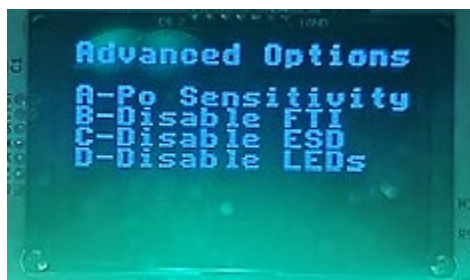
D- Advanced Menu.

See next section.

*- Factory Reset.

This will erase all well records, learn data, timer and preferences.

Advanced Options Menu

A- PO Sensitivity

This is an option to increase or decrease the sensitivity of the pump-off determining algorithm. The default value is 3 and recommended, only adjust if necessary. Lower numbers make the POC less sensitive to pump-off, so that it will tend to allow the well to keep pumping at a less than full stroke. Higher numbers make it more sensitive to pump off, so that it will tend to turn the well off sooner if the stroke is less than a full stroke.

B- Disable (Enable) FTI

FTI mode is enabled by default and recommended. FTI mode activates when well is turned on and ensures that pump jack is moving up and down as expected at the beginning of the pump cycle. This enables the POC to work when belts slip and take a few moments to get well started. If the jack doesn't start moving up and down as expected within a reasonable timeframe, FTI (Failure to Initialize) activates. The POC will shut-off well and create a FTI well record.

C- Disable (Enable) ESD

ESD mode is enabled by default and recommended. ESD will shut down well if rods begin to float while pumping. This can be caused by paraffin or high pressure at surface. It will detect paraffin when it starts to retard the movement of the rods, anywhere in the tubing.

D- Disable (Enable) LEDs

The status LED's provide an indicator of the wells pumping status, that can be viewed from a distance. See Understanding Status LED's and Pump-records section.

Pump Screen

When the POC has a command either from a timer or from the user to pump the well, it will first give a warning screen and beep for several seconds, then start the well. It will then rapidly move through FTI and ACTIVE LEARN screens. Once the PUMP SCREEN is shown, the POC is working to detect pump-off.

The PUMP SCREEN shows the last seven pump records on the left-hand side. These records are in an abbreviated form, without date or time. The newest record is at the top left of screen.

At the upper right, the current pumping time (CPT= Current Pump Time) shows in minutes.

At the lower right-hand side, the "HIT!" message will toggle on and off. This is the indicator that the traveling valve is open. If the well is pumping full strokes, this indicator, along with blue LED lights on top row of status LED's, will show just after the top of the stroke and turn off at the bottom of the stroke.

Pump-off Screen

After the well has pumped-off the pump time will show for one hour in large format.

Understanding Status LED's and Pump-records
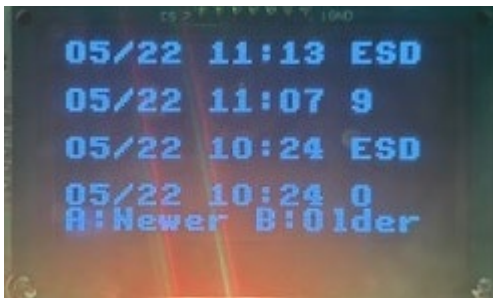
The PUMP RECORD screen can be accessed from the main menu by pressing *. You can also access this screen directly when POC is in sleep mode by pressing *, skipping the MAIN MENU screen. When in the PUMP RECORD screen, pressing A or B will scroll through the pump records. The most recent 100 pump records are retained.

Each time the well is commanded to start, either by the user or by a timer, a pump record is created. Most of the time, this pump record will consist of the date, the time the well stopped pumping and the number of minutes it pumped for. If the unit stops the well for a reason other than pump-off, a record will be made with an abbreviation indicating why the well stopped as below:
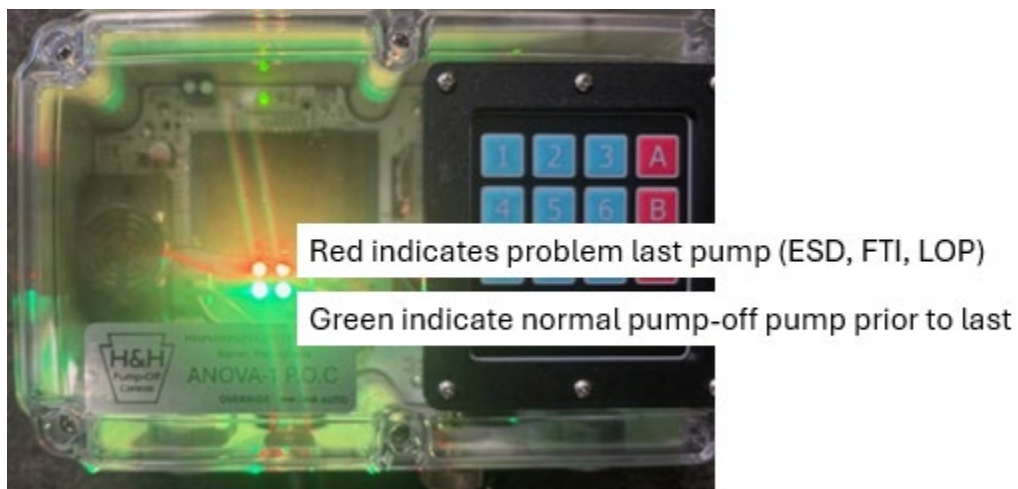
FTI- Failure to Initialize. Well didn't start up as expected. Check for belt or motor problem

LT- Low Temp. Unit didn't start because of low temperature.

ESD- Emergency Shut-Down. Unit stopped because rods started to float. Check for Paraffin, shut-valve or blockage in lead line

TO- Time Out. Max Duration was reached before pump-off was detected. This is only active when well is turned on by timer.

LOP- Lose of Power. The unit was pumping the well when power was lost. The time recorded will be the time the well started pumping.

Red indicates problem last pump (ESD, FTI, LOP)

Green indicate normal pump-off pump prior to last

The STATUS LEDs are a shortcut to see the status of a well without the need to get out of vehicle and wake up the POC. Each row of lights is treated as a single message and are always the same color. In general, the top row corresponds to the last pump, and the bottom row indicates the status of the pump prior to the last. Green lights indicate normal pump-off. TO and LT are indicated by yellow lights. FTI, ESD or LOP are indicated by red lights.

When the POC is recommending LEARN MODE, the top row will be white, and the bottom row will indicate the status of the last pump record.

While the well is pumping, the top row indicates traveling valve opening with blue lights and the bottom row indicates the last pump record status.

Fillage Mode

FILLAGE MODE works without setting any timers. Instead, when in FILLAGE MODE, the well will pump until pump-off, shut-down for a user selected "Fill Time" and then turn back on.

This will happen indefinitely. This mode is useful for new wells or reworked wells that pump a large fraction of each day.

Best practices and tips

Keep pump times greater the 5 mins, if necessary, by allowing more time between pumps.

If a well has very high fluid level, for instance after treatment or after a shut-in, it is best to relearn the well once it has been pumped-off once and is at fluid level closer to normal.

If you reach a well shortly after pump-off and want to check that it is pumped-off, use the override switch to start the well rather than pushing D on POC. If the well pumps-off in the ACTIVE LEARN sequence it will make "Learn Mode Suggested" come up faster.

Sometimes when re-learning you may get the message "Tighten J-Bolts". This is not because the nuts are getting looser, this is because the position of the horse head is different than when you installed the POC. Just tighten bolts and proceed.

If you are using the low temp feature, you may see T.O. records following a cold spell. This is normal as the well didn't pump for several days and may reach max duration before it pumps off. The well will catch up.

ESD may trigger before paraffin gets to surface. In this case, pump well on override until paraffin gets to surface, then pump paraffin into barrel.

A well record of 0 mins indicates anything less than 1 min, not that the well didn't pump at all.

The override switch completely bypasses the POC circuitry. If well is left on OVERRIDE, well records will still be made but the well will pump continuously.

If your rods float from a blockage, paraffin, or if you need to "bump" the well with a spacer tool, readjust bracket if needed and enter LEARN MODE. The slack on the bridle cables can move bracket around and/or loosen the j-bolts.

If you adjust stuffing box or greasing jack, enter LEARN MODE.

ANOVA-1 POC are built to last and repairable. If your unit fails, contact H&H about repair and warranty options.