

APC 500

USER MANUAL



The **APC 500™** is a plunger lift controller. It is a self-contained controller that mounts locally on the wellhead. The **APC 500™** is battery powered with a solar panel backup option. Rugged construction and superior design allows the **APC 500™** to function smoothly and trouble free in harsh environments.

The **APC 500™**, **APC 1000™**, and **The Arrival Switch** are products of Mega Lift Systems. We are proud that the design and manufacture of our products are in the USA. We welcome user's suggestions and improvements. Contact us at the following address.

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1.0 INSTALLING THE APC 500™

- Find a sturdy location to mount the aluminum bracket. Controllers with the solar panel option must face due south (Northern Hemisphere installation only).
- Mount the aluminum bracket. Do not remove the controller from the bracket.
- Connect a clean, dry instrument supply gas line to the SUPPLY port. This is the supply line. It is a ¼" NPT female threaded connection. The ideal supply pressure is 30 PSIG while not exceeding 60 PSIG.
- Connect a motor valve line to the OUTPUT port. This is the output line. It is a ¼" NPT female threaded connection.
- Remove the four thumbscrews retaining the module into the controller.
- Remove the module.
- Plug external sensors, i.e., plunger arrival switch, into the External Input socket (a five-pin plug) located on the left front side of the module.
- Plug the two-pin power connector into the two-pin socket located on the back of the module (for the solar panel option this is a four-pin plug and socket). Install the module in reverse order. (See Warning Below)
- Set times – **ON**, **AF**, **OFF**, and **BU** (see 2.1).
- Clear history information (see 2.4).
- Press **OPEN** to start ON cycle. The **APC 500™** ships to you completely assembled and ready to mount.

The module is ready to program.

***** WARNING *****

Connect the battery (solar panel) to the two-pin (four-pin) socket only. Connecting the battery backwards or to other terminals will cause harm to the module and result in voiding the warranty.

2.0 PROGRAMMING THE APC 500

2.1 Definition of Time Cycles

- ON – Sales valve opens and waits for plunger to arrive at the surface. Controller recognizes the plunger arrival by the external input, AF, switching to ground, GND.
- AF – Sales valve remains open and plunger arrives at surface. External input, AF, initiates this cycle. Plunger counts are incremental and the total time stored.
- OFF – All valves closed.
- BU – All valves closed. All external switches disabled. Plunger not reaching the surface during elapsed ON time initiates this cycle (AF input not switched to ground, GND). Exit this cycle by pressing the **OPEN** key or waiting for the timer to reach zero. Entering a zero time disables BU time cycle.
- FALL (MIN OFF) – Also known as fall time and initiated by the start of the OFF cycle. The MIN OFF cycle counts down during the OFF cycle in the background. Therefore, this cycle is not visible to the user. The MIN OFF cycle disables the external ON input while it counts down.

2.2 Status Indicators

- Battery Voltage – press **LOAD** then **0**. Displays the current battery voltage. Pressing any key exits to the current time cycle display.
- Bat Lo - battery is low (see 3.0 Troubleshooting).
- OPEN – Pressing **OPEN** starts the ON cycle.
- CLOSE – Pressing **CLOSE** starts the OFF cycle.



2.3 Setting Times

- Press **LOAD**.
- Press either **ON**, **AF**, **OFF**, **FALL**, or **BU**.
- Enter time as HH:MM:SS.
- Note: Press **LOAD** to backspace. To exit, press **LOAD** while first digit flashes.

2.4 Reading Set Time

- Press **LOAD**.
- Press either **ON**, **AF**, **OFF**, **FALL**, or **BU**.
- Press **LOAD** to exit.

3.0 PROGRAMMING THE APC 500T

3.1 DESCRIPTION:

The **MEGA 500T** is a plunger lift / stop-cock controller that operates two air operated motor valves. The **MEGA 500T** has the same features as the **MEGA 500** with the addition of **HD GAS** time and the additional counters and timers for monitoring the performance of the second valve in the system.

3.2 PROGRAMMING:

To program the 2nd valve (the tank valve) to open, press **LOAD** and the **7** key. The message **A2b. no** will display. Pressing **YES** will allow the flow from the well to pass thru the **A** valve to the **B** valve. Pressing **NO** will allow flow from the well to pass thru the B valve only. Pressing **LOAD** will leave the settings unchanged. This special settings allows the installer to use the **A** valve as a check valve. The A valve reopens and the **B** valve closes upon arrival of the plunger.

The message **hd gas** will appear for two seconds. After the message disappears, enter the head gas time in hours, minutes, and seconds (HH:MM:SS). The Sales valve will remain open while the Tank valve is open. The Tank valve will close upon arrival of the plunger to the surface. At this time the **Afterflow cycle** will start, this will sale the tail gas through the Sales valve.

3.3 COUNTERS AND TOTALS:

Pressing the **Counters/Totals** key retrieves the history information about the well. The information will come in the following order:

Counters: Arrivals, No Arrivals, Total Attempts

Counter: Trips to the Tank

Total: Total Sales open time

Total: Total Closed time

Total: Total time to the Tank

3.4 DISABLING THE TANK OPTION:

Entering the time 00:00:00, disables the tank valve open. The controller will act like a normal **MEGA 500** when this option is disabled.

3.5 DISPLAY:

The middle left carat will appear when the tank is open. When the well is opened, the time in the head gas cycle is how long the tank valve will wait before opening. The tank valve will remain open the remainder of the On cycle waiting for the plunger to arrive at the surface.

4.0 READING HISTORY

4.1 Reading Counts/Totals

- Pressing **COUNTS/TOTAL** shows the number of plunger arrivals, no arrivals, and total attempted runs.

XX.XX.XX
ARRIVAL NO ARRIVAL TOTAL

- Pressing **COUNTS/TOTAL** a second time displays the total open time of the sales valve.

ON
HHHH:MM
TOTAL

- Pressing **COUNTS/TOTAL** a third time displays the total close time of the sales valve.

OFF HHHH:MM TOTAL

- Press **LOAD** at any time to exit.

4.2 Reading Travel Times

- Pressing **TRAVEL TIMES** shows newest travel time. “X” indicates the plunger run you are reading. For example, number one is the last travel time and successively higher numbers are the respective order travel time runs.

X MM:SS

- Press **TRAVEL TIMES** again to read the next to last travel time in memory. Pressing **TRAVEL TIMES** again displays the previous travel time and so on. The APC 500™ stores up to the last 25 travel times.
- Press **LOAD** to exit at any time.

4.3 Clearing History Information

- Pressing **CLEAR ALL** displays CL ALL.
- Pressing **CLEAR ALL** again erases trip counts, total times, and travel times.
- Pressing **LOAD** before pressing **CLEAR ALL** the second time exits without erasing.

5.0 TROUBLESHOOTING

5.1 No Power

- Check Batteries
 1. Are batteries adequately charged?
 2. Are batteries orientated correctly?
 3. Does the positive end of the battery point to the red wire and are batteries in proper series?
 4. Is the battery pack plug wired and plugged in correctly, i.e.; does the red wire plug into the B+ slot and the black wire into the B- slot?

5. Do the batteries have a good connection with each other and the battery pack terminals?
 6. Answer “yes” to all previous questions before moving on to the next item.
- **To check battery voltage Press LOAD then the 0 key.**
 - Unplug board from power source for a minimum of one minute. This allows the controller to properly reset. After one minute, plug the module back into the power source. After proper reset and power up, every segment on the display appears before the timer starts counting down.
 - If unit still does not power up after completely checking batteries and a proper reset, then replace the module.
 - Solar Panel Option
 1. A flashing carat in the upper left of display indicates gel cell battery is trickle charging from the solar panel. The battery is charging when the carat is not displayed. Optimal charge is 7 Volts (V). Less than 7V, charging circuit is on; greater than 7V, charging circuit is off.
 2. Is solar panel cracked? Replace solar panel.
 3. Is solar panel facing South?
 4. If battery charges during the day but runs down at night, replace battery.
 - Note: Always replace batteries immediately after Low Battery warning appears on display. New D cell batteries have a voltage of 6.5V, and must be replaced at 5.2V or lower. New gel cell batteries have a voltage of 6.3V and must be replaced at 5.9 or lower. Press **LOAD** then **0** to check battery voltage.

5.2 Latching Valve

- Latching Valve Does Not Latch
 1. Check battery voltage (see above). If battery voltage falls below 5.2V, valve will not open reliably.
 2. Is latching valve orientated correctly? “IN” facing left (input) and “CYL” facing right (output).
 3. Is valve wired to back of board correctly? Does green, red, and black wires correspond to G, R, and B?
 4. If latching valve still does not latch after steps 1, 2, and 3, replace latching valve.
 5. If latching valve replacement latching valve does not work, then replace module.
- Motor Valve Not Opening
 1. Does the latching valve “click” at opening and closing? If not, then replace latching valve.

2. Motor valve still does not open and latching valve works. Open supply line at supply port and check for PSI greater than 20 and less than 90.
 3. If pressure is not within this parameter at supply line, then adjust or replace supply gas regulator and/or drip pot.
 4. If supply gas is good, then check output line. Open controller and check for good supply gas out.
 5. If good supply and output gas when controller is open, then replace motor valve.
 6. If no supply gas out, then replace latching valve.
- Motor Valve Opens But Does Not Close
 1. Check that latching valve “clicks” on open and close.
 2. If latching valve does NOT “click”, then replace latching valve.
 3. If latching valve does “click”, open output port and check if motor valve closes.
 4. If motor valve closes, then the exhaust port on latching valve is plugged. Replace latching valve.
 - Motor Valve Opens When Closing and Closes When Opening
 1. Switch green and red wires coming off latching valve to reverse polarity (switch wires at plug, DO NOT put plug in backwards). OR
 2. Flip magnet on latching valve. If magnet cracks, you must replace magnet. OR
 3. Flip latching valve coil.
 4. Note: If controller is installed on an N O valve, only switch green and red wires to reverse polarity.

5.3 External Inputs

- With a voltmeter, check negative lead to GND and positive lead to +5, ON, AF, and OFF. With nothing else connected, voltmeter should read 5V. If not, exchange module.
- With external devices wired in and switched closed, and if voltage does not read zero, then external device is not functioning.

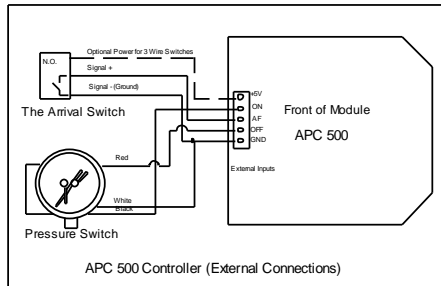
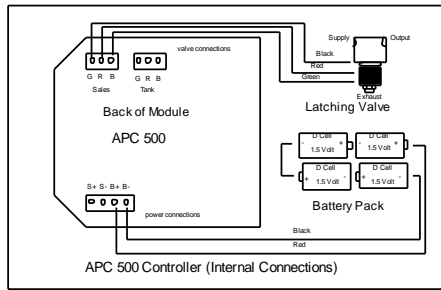
6.0 EXAMPLE INSTALLATION

6.1 Typical Time Settings for an Oil Well

- ON 00:30:00
- AF 00:00:00
- OFF 90:00:00
- BU 90:00:00
- FALL 01:30:00

6.2 Typical Wiring Diagram for an Oil Well

This can be seen on the following page. Also included is a wiring diagram for the inside of the controller as shipped new.



7.0 NEW SETTINGS

7.1 New Time Settings

- SYNC – Total cycle time, a value greater than zero enables this new function. The OFF time period is not used while this is active. The close time equals SYNC time less the travel time of the plunger and AF time. BU time can be used while in this function. BU should be set to a multiple of the SYNC time period. ie SYNC 02h:00m:00s and BU 06h:00m:00s. The external On and Off inputs should not be used while in SYNC function. The new Hi Line function does not operate while the SYNC function is active. After entering the new values push Open and Close keys to start the controller.
- Hi Line – A hold time to wait for hi line pressure to return to normal. A value greater than zero enables this new function. A setting from one to five minutes is recommended. One minute for a strong well and five minutes for a weaker well. The controller looks to the external Off input for a Murphy switchgauge closure for hi line pressure. The controller ignores the Off input while in ON and AF time periods. A switch closure causes the Hi Line time to start a full countdown of the time period. The well will not open until the line pressure is back to normal for a total of the Hi Line time period.
- Afterflow on MSO? – To access this setting press LOAD, 1. The default value on power up is 0. A value of 1 will cause the controller to record the travel time but **not** switch to the AF time. The controller will complete the ON time period before beginning the OFF time period. The enunciator on the screen will change to AF from ON upon arrival of the plunger.

7.1 New Display Options

More of the background timers can be viewed. Timers such as travel time, FALL time, SYNC time, and Hi Line time can be viewed by pressing the Clear All key and the timer's key respectively. To return to normal countdown, press Clear All and then the Load key.