

**MODEL 9054 OIL/WATER MONITOR AND CONTROLLER
(with Pump/Valve time-out Feature) Rev.1.0**

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MODEL 9054-OWS SERIES (OIL WATER SEPARATOR PROGRAM)

A. OVERVIEW

The **ARJAY** Model 9054-OWS RF Level Control Systems are based on a micro-controller and capacitance sensor to monitor the separated oil level in a closed oil/water separation system. Control and monitoring is provided through an LCD display, 4 alarm relays, a 4-20 mA output and an RS-485 interface port. Calibration is accomplished automatically through a single data entry performed once the unit is installed into the system.

B. COMPONENT OPERATION

There are basically 3 distinct operations of the level system.

1. The Capacitance Probe inserted into the vessel provides a means to detect capacitance change through level changes. A proper ground reference is extremely important to the operation of the unit. As such, all probes are equipped with a ground shield.
2. The Pulse Card, Model PMC-9054, which is installed in the head of the probe. The circuit translates the capacitance of the probe into a frequency pulse, which can then be transmitted to the remote controller. Take care during the installation of this card to insure there are no wires shorting out the card. Again, grounding is important. Be sure both mounting screws are securely fastened.
3. The Remote Controller, Model 9054-OWS, receives the frequency pulse signal and performs the necessary operations to provide an output to its calibrated level. This level is displayed on the unit in both per cent and linear characters, as well as a horizontal bar graph for quick level reference.

C. PROBES

ARJAY'S probes are provided in a variety of styles and types for various applications involving liquids or granular materials. On an oil/water separation system using the 9054-OWS automatic calibration, the probe must be a standard duty probe with a 2" concentric shield as supplied by Arjay Engineering Ltd. A typical model number would be 1S(2")-TS-3'-CS(3'). The 9054 controller has an internal calibration based on this probe.

The probe length must extend into the separator vessel to at least the depth of maximum oil content. The probe may extend above the vessel into airspace with no adverse effects on operation.

Important note: The system operates on the principal that there is a constant fluid level surrounding the probe. Oil that enters the system displaces an equal volume of water to exit the system, thus keeping the upper 100% fluid level constant.

D. PROBE INSTALLATION

Screw the probe into the 2" NPT vessel opening (standard probes are 2", flanges or larger NPT connections are optional and may be supplied with this unit). Use wrench on **lower hex** only. Take care in installing probe. The insulation of the probe is important to the function of the instrument.

CAUTION: The probe fittings are a compression type with Teflon ferrules assembled by applying torque between the two sections. The fittings are sealed at the factory to provide a compression seal capable of withstanding high pressures. Once opened, they cannot be reassembled without new ferrules.

E. ELECTRONIC INSTALLATION

Examine the instrument for possible shipping damage.

IMPORTANT: If for any reason it is determined that parts should be returned to the factory, please notify the nearest **ARJAY** Sales Representative prior to shipping.

Choose the mounting locations in accordance with good instrument practice. Extremes of ambient temperature and vibration should be avoided. (See specifications).

1. Install the pulse card (PMC Circuit) into the probe head, making sure both legs are grounded to the junction box body. Connect the probe lead, supplied on the probe end, to the terminal marked "P".
2. Using a two wire shielded cable, connect the "-" & "+" terminals on the pulse card (located in probe head) to "XMTER" terminals marked (2) "-" & (1) "+" of TB1 in remote level monitor.
3. Use No. 16 gauge shielded wire for connections "-" and "+". The maximum length of this wire is one kilometer.
4. When using shielded wire, connect the shield to "XMTER" terminal "-" (2) (negative) at the Model 9054 controller end only.
5. Connect the capacitance probe and power per wiring drawing #92002400 included with this manual.
6. Power on the instrument.
7. The display will read "**OIL LEVEL**". The unit is now ready for calibration. If the unit display reads "**ERROR: NO XMTR SIGNAL**" check all field wiring and connections for faults.

F. MODEL 9054 FUNCTION PARAMETERS CALIBRATION

The Model 9054 is programmed to the specific pulse card used on the probe. This is to optimize the accuracy of the unit. Three numbers are required. These numbers are included on the specification sheet at the back of this manual, as well as on the side of the pulse card terminal. The numbers listed are for the pulse card shipped with the controller from the factory. Entry verification is required or re-entry if a different pulse card is used.

1. Press **FUNCTION**. The display will read "**FUNCTION**". Press **1** to configure the pulse card to the transmitter. The display will read "**CONFIGURATION**" (Press "2" for manual entry). If the "A" value is the same as the value verified on the pulse card, press **ENTER**. If the value is different than the value of the pulse card, enter the new digits (i.e., 2.500) (the * key is the decimal point). Press **ENTER**. **NOTE:** If a digit is entered wrong, press **DISPLAY** to go back one digit.

2. The display will now ask for the "K" value. If the "K" value is the same as the value verified on the pulse card, press **ENTER**. If the value is different than the value of the pulse card, enter the new digits (i.e., 2800). Press **ENTER**.
3. The display will now ask for the "C" value. If the "C" value is the same as the value verified on the pulse card, press **ENTER**. If the value is different than the value of the pulse card, enter the new digits (i.e., 50.5). Press **ENTER**. The display will read "**FUNCTION**".
4. Press "4" and select the Engineering Units.

G. PROCESS CALIBRATION

1. Press **CONTROL**. The display will read "**CONTROL SETTINGS**".
2. Press **1**. The display will read "**ALARM SETTINGS**".
3. Verify the relays are disabled by the word "**OFF**" in the lower right corner of the display. If the display reads "**ON**", press **4**. The display should now read "**OFF**". Press "**CALIB**" to now calibrate the unit.
4. Press "2" and the display will now ask for the **pf/inch of oil** (Slope). This is the automatic calibration feature and has been set at the factory for oil/water separators. Different separation applications require different "SLOPE" values. Press **ENTER** if the reading is the same as the value on the Specification Sheet in the back of this manual. If not, enter the value on the Spec Sheet. The typical slope value for oil is 4.0.
5. Press "1" for "autocal". Enter the amount of oil presently in the system in inches. If the system is calibrated at the time of the separator installation, it is likely there is 100% water and "0" oil. Enter "0" if this is the case. Press **ENTER**.
6. Press "3". The display will now ask for "**ACTIVE PROBE LENGTH**". Enter the active length of the probe in inches. The active length is the length of probe from 0% oil to 100% capacity oil. Press enter.

Note: This active length is not necessarily the full length of the probe. The probe may extend up into the manway or below the maximum oil level in the tank.

7. Press "DISPLAY". The display will now read the % level of oil in the vessel.
8. Process calibration is now complete.

H. CONTROL CALIBRATION

1. Press **CONTROL**. The display will read "**CONTROL SETTINGS**".
2. Press **1** to select alarm settings for relay activation, or press **2** to determine the zero and span values for the 4-20 mA output.

SPECIAL NOTE FOR PUMP AND VALVE APPLICATIONS

The oil/water separator operating premise is that there should always be 100% fluid in the tank (as oil enters the vessel, water is displaced at an equal volume).

The Arjay monitor senses the change from water to oil by a capacitance change around the probe and displays the amount of oil presently in the vessel. If fluid is removed from the vessel and AIR replaces this volume, the probe assumes this to be oil and will continue to read an oil condition.

Under normal site conditions, it is possible that a pump or valve will remove oil from the separator at a rate faster than the inlet can supply fresh water, thus causing air to be in the vessel where there is normally fluid. For this reason, a timed Relay sequence has been provided in the Arjay software on Relay #1. This Relay #1 will alarm at a preset oil level and start a pump or open a valve. The relay will turn off after a set time, before the oil outlet pipe can draw air.

After the relay times out, the separator can be replenished with water at a natural rate. The relay will reset itself when a 5% increase in the water level has occurred.

If the pump or valve outlet cannot remove the oil faster than oil enters the separator (such as during a spill condition), the relay will time out and the separator will continue to fill with oil until a high oil content level is reached. Relays 2, 3 or 4 can be used to set an alarm condition at any % level point along the probe.

THE FOLLOWING IS A TYPICAL SEQUENCE OF OPERATION FOR ALARM INTERCONNECTS:

(note: actual % values can be entered for your own specific application)

10% OIL LEVEL: Relay #4 contact closes. An operator is alerted by a control interconnect (i.e., an alarm light or auto-dialer) that there is an oil accumulation in the separator. Arrangements can be made for a manual pump-out operation if desired.

40% OIL LEVEL: If this condition is reached, a pump or valve is operated from Relay #1 to remove the oil. The relay times out and the separator replenishes itself with water naturally.

80% OIL LEVEL: If the pump or valve has completed its run time and oil continues to enter the separator (suggesting a spill condition), Relay #3 will activate and shut the inlet valve to the separator. The valve will remain closed and the separator will remain stagnant until an operator manually attends the site, pumps out the oil, and replenishes the system.

Relay #2 may be kept as a spare, or set up as an intermediate signal at a specified amount of oil.

ALARM SETTINGS

3. If you pressed **1**, the display will read "**ALARM SETTINGS**". To set values, press **1**.

Enter the desired per cent alarm setting for relay 1 using 5 digits (i.e., 020.0). (Note: this relay has a time out operation for pump and valve use as described above). Press **ENTER**. The display will now require a relay time-out value to be entered in seconds (0 to 9999 seconds). Determine a run time for the valve or pump that will remove the oil to a point in the separator that will not cause the pump or valve to draw air. Key in the value in seconds and press **ENTER**.

The system will guide you through relays 2, 3 and 4. These relays do not include a time sequence. Set the % level value that you desire the relay to activate. Press **ENTER** after each entry. The display will automatically return to the "**ALARM SETTINGS**" menu.

4. Press **2** to enter a time delay on the relay activation. This will suppress the relay switching until the unit has been engaged in an alarm condition for the prescribed time. Enter time in seconds from 0 to 99 (i.e., 10), press **ENTER**.
5. Press **3** to enable the relays. The display will read **ON** in the lower right corner. This activates the relay operation for use with remote alarms and devices. To disable the relays for maintenance or calibration, press **4**. Press **CONTROL**. The display will read "**CONTROL SETTINGS**".

For Failsafe selection on relays 1, 2, 3 & 4, a dipswitch is located directly on the relay board. Refer to Dwg. 92002400 for location details.

High Failsafe = NOFF

Low Failsafe = NON

ZERO AND SPAN VALUES

6. The 4-20 mA output signal may be offset from the 0-100% level operation (i.e., 4 mA = 10%, 20 mA = 90%). To set the 4-20 mA output values, press **2**. The display will read "**SET 4-20 mA OUT**". Enter the desired per cent value for the 4 mA output (zero) (i.e., 010.5). Press **ENTER**. Enter the desired per cent value for the 20 mA output (span) (i.e., 090.5). Press **ENTER**. The display will now read "**CONTROL SETTINGS**".
7. Control calibration is now complete. Press **DISPLAY**. The unit display will read "**OIL LEVEL**".

I. DIAGNOSTICS (Raw Data Readings)

The micro-controller will provide the user with raw data if required.

1. Press **FUNCTION**. The display will read "**FUNCTION**". Press **2**. The display will read "**DIAGNOSTICS**". The display will provide the user with the capacitance of the probe and the transmitter frequency that is being sent to the controller from the probe. Press **DISPLAY** to return the display to the **OIL LEVEL** format.

J. OPERATIONS TEST (To be performed on a regular schedule)

To perform an oil increase test, a probe simulation box is available (Model PMC-SIM). This hand-held box replaces the pulse card and the probe. It does not verify the operation of the installed pulse card and probe. It is used to verify the operation of the main controller unit and interconnect controls.

A complete system check may be done by lifting the probe assembly above the separator fluid into air space. The probe capacitance will decrease (simulating an increase in oil).

Probe Simulator Check

1. At the main 9054 OWS control box, disconnect the "XTMER" input wires at TB 1, terminal 1&2. These are the signal wires that come from the probe.

2. Connect the Simulator leads to terminals 1 & 2 at TB1. Be sure to connect the correct polarity.
3. Adjust the potentiometer on the Simulator to provide a reading of 0% Oil. Slowly adjust the potentiometer to show an increase of oil on the display. Verify the control operations as the oil increases.

K. COMPONENT REPLACEMENT / SPARE PARTS

Description	Order Number	Quantity installed per system
Complete Control Unit	9054-OWS-115-CN4X includes PMC card	1
Complete Probe	1S(2)-TS-'length'-CS	
Controller Parts		
Relay Board	9054-Rel	2
Micro Board	9054-Micro	1
Controller Board	9054-Lev	1
Transformer	9054-PS	1
Faceplate/keypad	9054-fcplt	1
LCD	9054-LCD	1
Probe Parts		
Concentric Shield	CS-'length'	1
Probe	1S-TS-'length'	1
Pulse Card	PMC-9054	1
Simulator	PMC-SIM	1

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