

MODEL 4100-PRO

Oil/Water Emulsion Profiler

User Manual

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MODEL:	
HARDWARE NO.:	
SOFTWARE NO.:	
SERIAL NO.:	

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1.0 INSTRUMENT OVERVIEW

The Arjay Model 4100-PRO is a capacitance based monitor used for the measurement of emulsions, interfaces, and concentrations of water in oil or other mixtures in a pipe or vessel. The control panel receives input data from one or more Arjay PMC cards installed at the sensing probes and, through a site calibration, displays a graphic visual profile of the % water in oil emulsions. The probes are installed at strategic vertical and/or horizontal points in the vessel. The quantity of probes is fully optional and pre-determined for the application. Proportional analog outputs and relays are available for each probe. A Modbus communication is standard.

The unit senses the oil /water interface or emulsion concentration using an RF capacitance measurement technique for high resolution capacitance measurements. The capacitance change is proportional to the dielectric change of the fluid. The probe capacitance to % concentration is not a linear relationship over the full concentration range and accuracies are best at or near the calibration points. The controller allows for two points of calibration. A single point calibration is also available for out-of-the box use although this will not provide optimum accuracy. The % indication and corresponding outputs are ideally suited for trending and process data collection. Best sensitivity is provided in the 0-30% Water in Oil phase.

The panels receive an input from each Arjay PMC card installed in the sensing probe junction box. Through a site calibration, the unit displays the % oil emulsion. A graphics display of the vessel with user determined colour shades for % concentration is provided.

The monitoring system is comprised of one main control panel, an App board panel, the PMC cards at the probe and the sensing probes.

Optional Remote alarm panels can also be added that will display and provide audio/visual alarms.

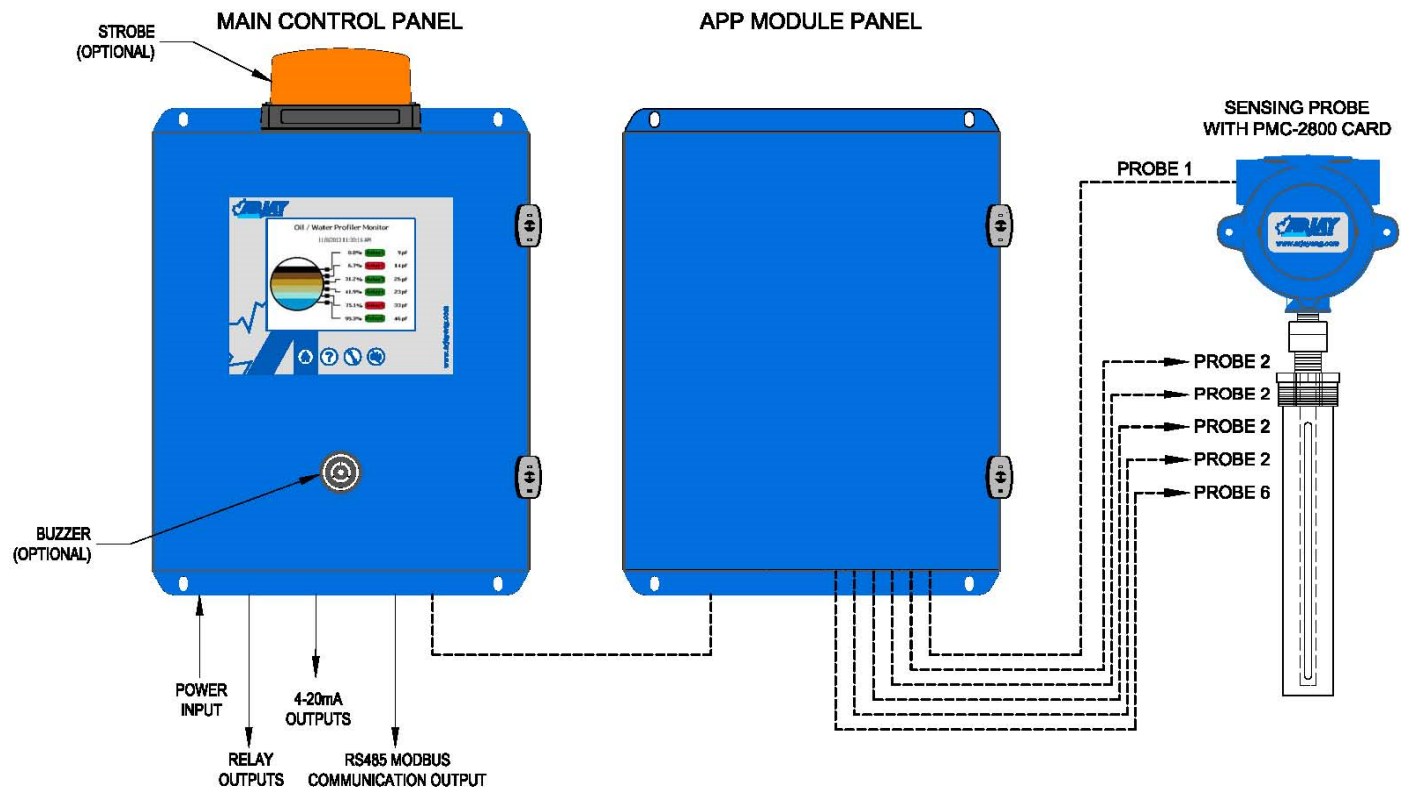


Figure 1 – Instrument System Overview

Main Panel

The main panel is a wall mounted touch screen monitor to be installed in a general purpose (non-hazardous) location that is accessible for set-up and observation of the display and alarms.

One relay is available for each probe input. See section 4.2 for instruction to change alarm setup.

A 4-20 mA non-isolated output per probe and Modbus RS-485 are provided. The power input at the main panel serves the HMI, App Board Panel, PMC and probe requirements.

An optional buzzer and strobe (beacon) are available.

The sensing probe is approved for Class 1 Group C&D hazardous locations and can also be made Intrinsically Safe for Hazardous Classified locations through the installation of an IS Barrier in the main panel.

The main panel screen provides additional user interface menus for diagnostics, analog output, calibration, set-up and general help information. Diagnostic Menus can be accessed for viewing at any time but a password entry is required to make setup changes.

Remote Panel

Remote panels are available for audio/visual alarms.

App Board Panel

The App panel houses the circuitry and processors that monitor each probe. Calibration, setup and operation functions are stored here. One App board is required per probe and provides a Modbus communication that is used by the Main Control Panel and User Interface to communicate data from the probes.

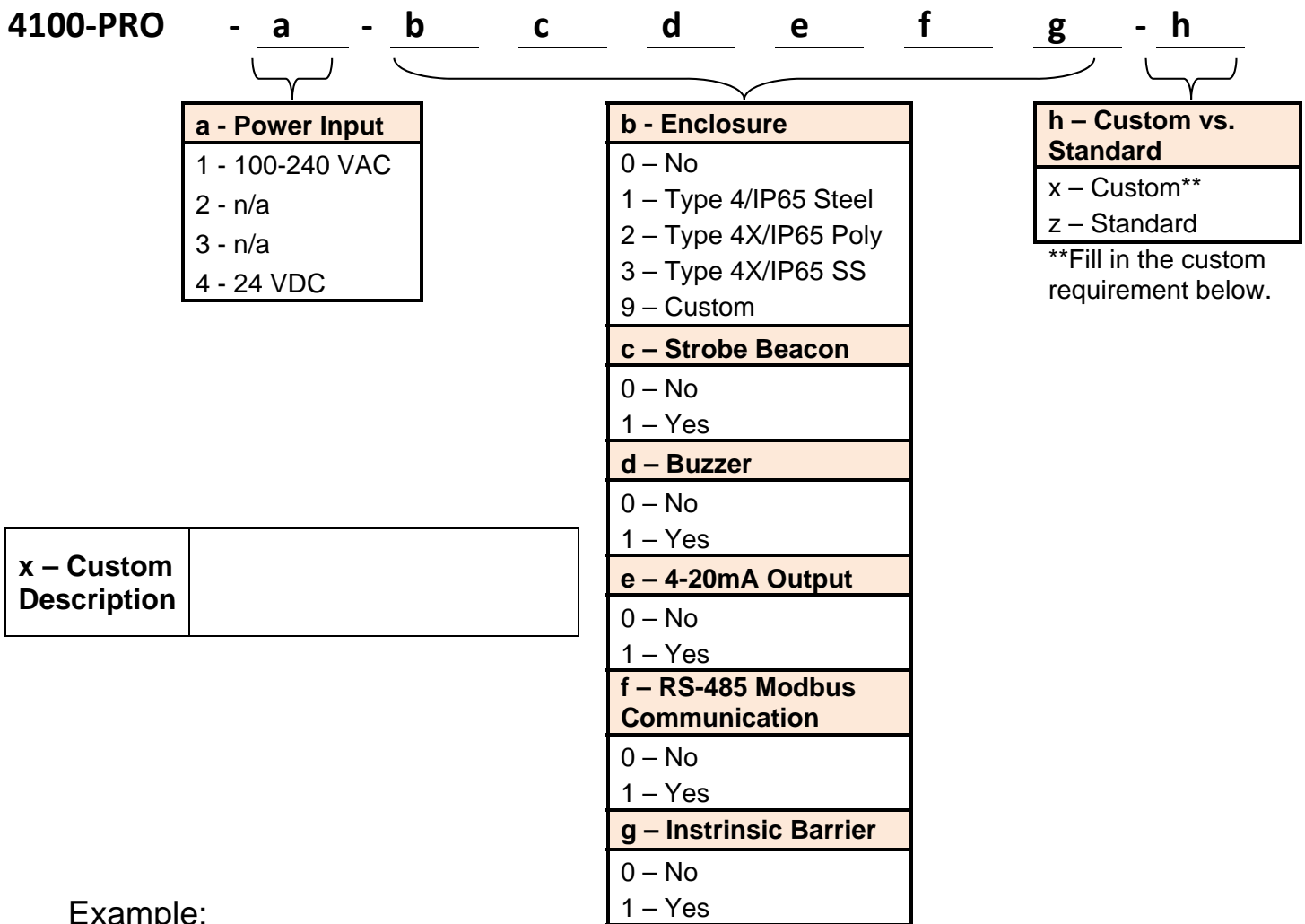
Remote PMC and Sensing Probe

An Arjay PMC card is installed in the sensing probe junction box. This converts the capacitance reading of the sensing probe into a frequency pulse for transmission to the main panel. This unique approach eliminates any operator interface requirements at the probe. All diagnostics and calibration is done at the main panel.

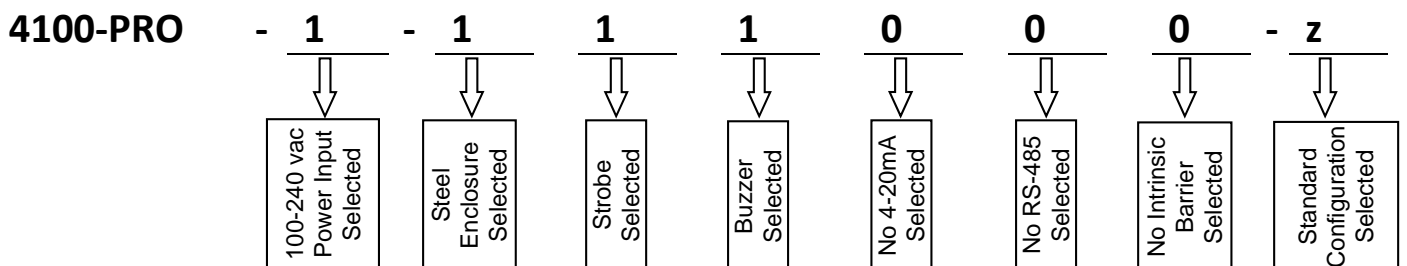
1.1 Features

- Touch Screen interface with passcode protection
- Microprocessor based Controller
- Optional Strobe / Buzzer
- Display in % oil emulsion and vessel graphics
- Diagnostic, set-up and Help menus on all screens
- one alarm relay per probe
- One common fault relay
- analog outputs and RS-485 communication
- Arjay PMC Card input per robe
- Arjay 4100-PRO module per probe

1.2 Model Numbers



Example:



1.3 Specifications

Power Input:	-100-240 VAC +/- 10%, 50/60 Hz, 1PH (1.95A → 0.97A) 2.0 fuse - 24 vdc, 4 amp MAX (Optional)
User Interface: Touch Screen	Full Colour 6 " display on Main Panel
Outputs: Alarm Relay Output	DPDT relay, 8 A @ 250 VAC dry contacts Selectable failsafe or non-failsafe Programmable time delay: 0 – 60 minutes ON and OFF One relay for each sensing probe One relay for system fault alarm
Analog (Optional)	0/4-20 mA non-isolated, 600 ohms Self powered
Communication (Optional)	RS-485 Modbus
Probe Input:	Capacitance Probe with PMC input
Accuracy:	0.04% of full scale pF
Resolution:	0.007% (0.07pF at 1000pF)
Environmental: Ambient Temperature	Controller 0 to +55 °C PMC -60°C to +55 °C Sensing Probe -60°C to +260 °C
Process Pressure	103 bar / 10342 kPA /1500 psi
Relative humidity	0 to 95% (non-condensing)
Installation Category	II
Pollution Degree	2
Mechanical Specification:	Refer to dimensional drawing

2.0 INSTALLATION

NOTE: If any damage to the instrument is found, please notify an Arjay Engineering representative as soon as possible prior to installation.

2.1 Main and Remote APP Panel Installation

Choose a mounting location in accordance with good instrument practice. Extremes of ambient temperature and vibration should be avoided (see specifications and installation drawing).

Remote APP panel can be mounted up to 1 km away from the main panel using RS485 communication cable (e.g. Belden 9841).

The PMC and sensing probe can be mounted up to 1 km away from the APP panel using 2 wire shielded cable (e.g. Belden 8760).

Important Note: The controller can be set in a Failsafe mode. This means that the relays are in an energized state during normal operation. The N.O. relay contact will be held closed and the N.C. relay contact will be held open during a normal condition. This will allow the relay to return to its non-energized (shelf) state during an alarm, fault or power failure condition.

2.2 Probe Installation

The probe length is customer specified based on the tank or pipe dimensions. Teflon coated probes with 316SS concentric shields are used. Optional materials are available.

Typical probe entry into a tank requires a 3/4" NPT opening (standard probes), 1" NPT opening (heavy duty probes), or 2"NPT (shielded probes). Flanges and concentric shields are available as options. The entrance configuration may vary depending on the application requirements. Use a wrench on only the lower half (tank side) of the probe fitting when installing or removing the probe from the tank or flange. The probe fittings are compression type with Teflon ferrules assembled by applying torque between the two fitting 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.

Pipe Mounting: The probe can be mounted parallel or at any angle into a pipe. To mount parallel, a connection point at an elbow is recommended with the probe tip at downstream direction.

To mount at 90° or other angle, consider the product viscosity and flow strain against the probe.

Tank Mounting: The probe can be mounted from any angle into the tank. If top mounted, an inactive sheath is required to blind the probe for liquid level changes and the air space. Inactive sheaths are also used when the probe mounts horizontal through a spool piece. This is to blind the probe from contaminant build-up that may occur in the spool piece.

IMPORTANT: The active probe portion (exposed white Teflon sleeve) must be submerged in liquid all the time. Exposure to air will not damage the probe, but will cause a reduced capacitance reading, resulting in a false positive oil % reading.

The following points are important when installing the probe:

1. **Reference ground:** This is important and is typically the metal walls of the tank or pipe. For non-metallic tanks, a concentrically shielded probe is required which provides its own Ground. **IMPORTANT:** For threaded entry and flange entry probes,

make sure the threads are clean to ensure a good electrical ground connection between the tank, flange and fitting.

2. **The distance between the probe and the ground reference:** This only applies to probes without concentric shields. The closer the distance to the tank or pipe wall, the greater the sensitivity of measurement; too close and bridging problems may occur.
3. **Temperature change of the material in the tank.** The amount of measurement error depends on the material. If the temperature change is excessive, temperature correction may be required.
4. **Agitators or moving objects in the tank:** Moving objects in the tank close to the probe such as agitator blades, moving baffles etc. appear as moving ground references to a capacitance probe and can cause measurement errors. In applications where these objects are present, a concentrically shielded probe should be used.

Below is an overview of the PMC (Pulse Module Circuit) installed at the probe.

1. Remove probe junction enclosure cover.
2. If PMC 2800 is not already installed, mount onto the standoffs in the base of the probe junction enclosure.
3. Remove the mating connector and wire it as shown.
4. Make sure junction box is electrical grounded.

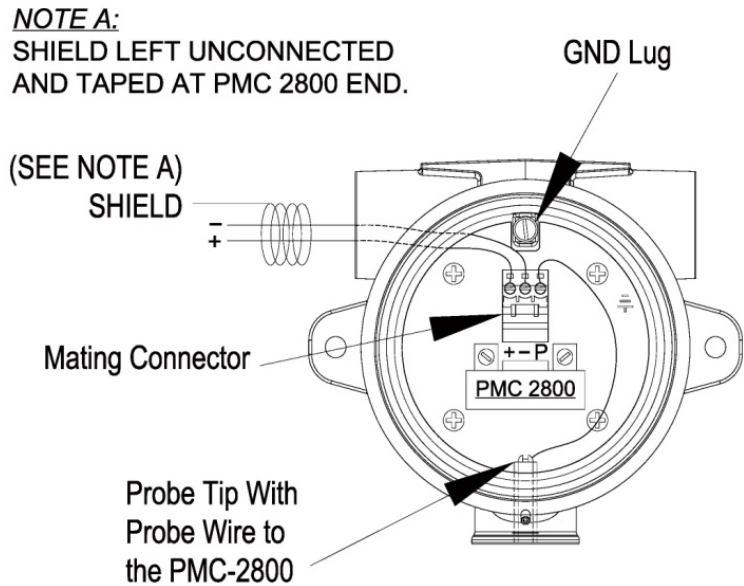


Figure 2 – PMC Installation Overview

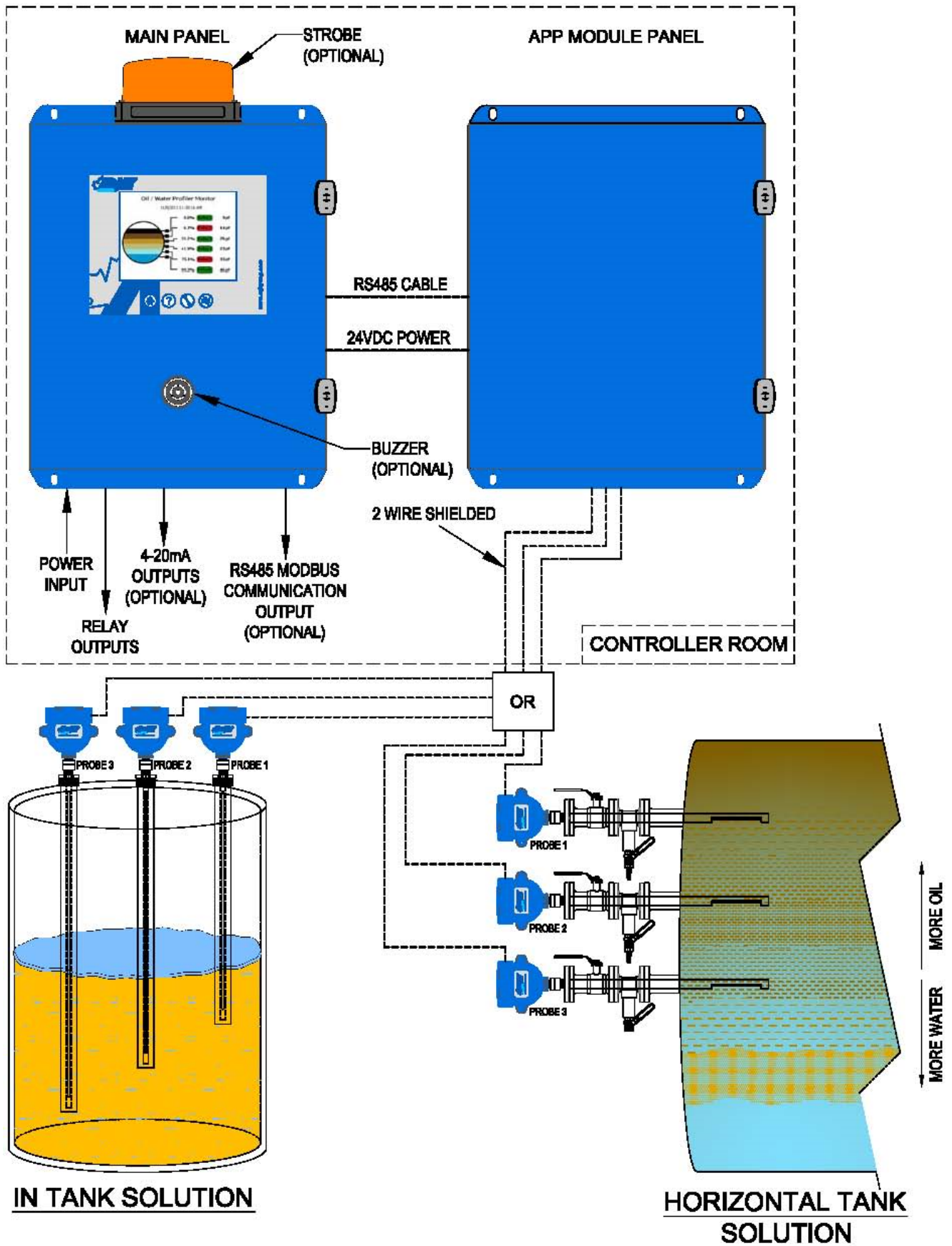


Figure 3 – Typical Water In Oil Application Overview

2.3 Electrical Installation

Refer to the drawings provided by the contractual engineer for your project and the drawings included with this manual.

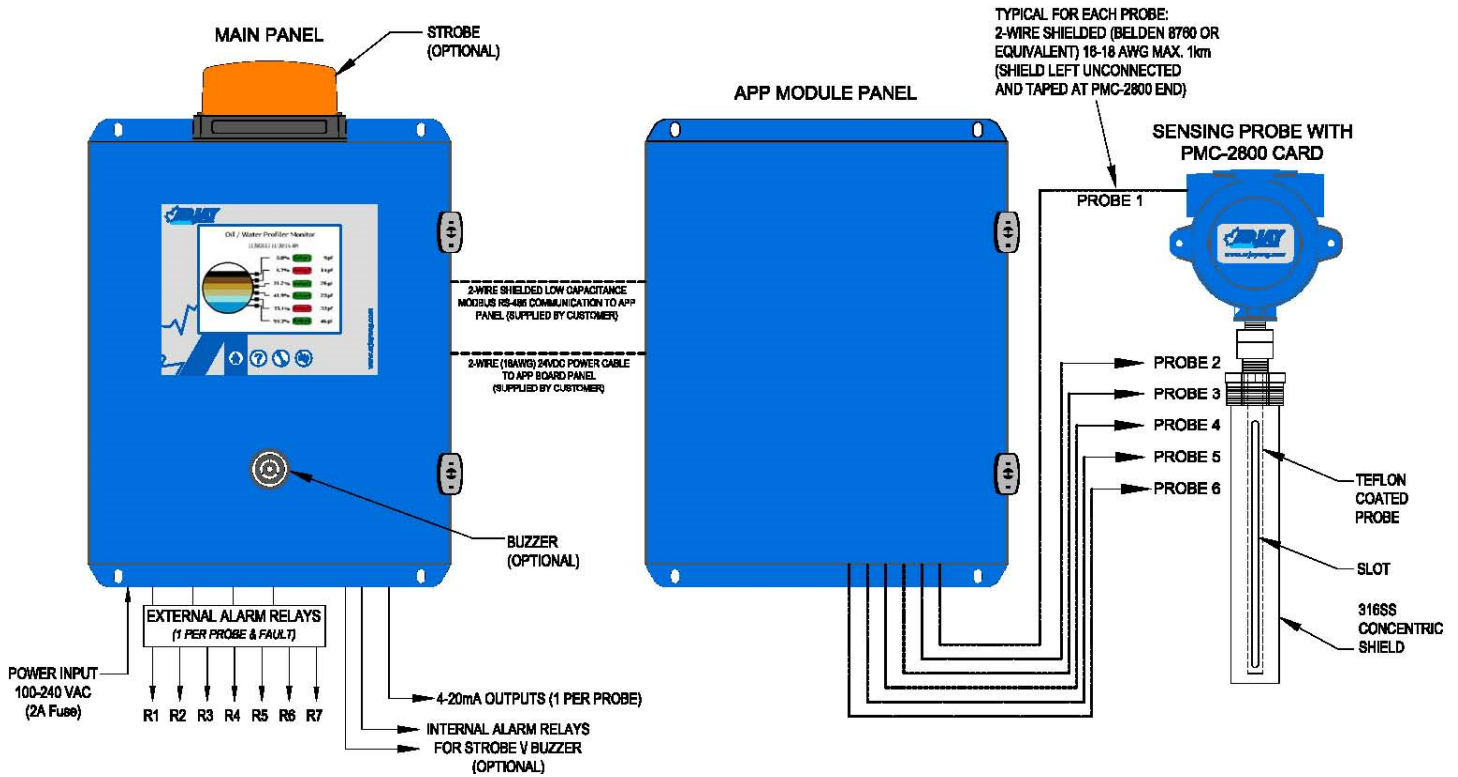


Figure 4 – Electrical Installation Overview

Wiring

The main control panel supplies a 24 VDC power to the APP panel and communicates via RS485 modbus. Each APP module communicates with the PMC2800 pulse card mounted in each individual probe via 2 wire shielded cable.

The PMC card drops a frequency pulse onto the power wiring for a return signal to each APP module. Required wiring between the PMC and the APP panel is two conductor shielded hook-up cable. When the PMC's connected, the voltage is 8-10VAC.



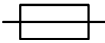
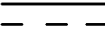




A typical wiring type is 18AWG two conductor shielded (Belden #8760 or equivalent).

*Shielded wire is required on all installations.

Maximum wire length is 1km between Main controller & APP panel and between APP panel & PMC probe junction box.

Refer to the detailed electrical drawings included at the back of this manual.

2.4 Glossary of Symbols

	Attention, consult accompanying documents Attention, veuillez consulter les documents ci-joints.		
	Protective Earth Terre de protection		Fuse Coupe-circuit; fusible
	Direct Current (DC) Courant continu		Normally open relay contacts Contacts travail
	Normally closed relay contacts Contacts Repos		Power off Arrô (mise hors tension)
	Power on Marche (mise sous tension)	L	Live Sous tension
N	Neutral Neutre	G	Ground Terre

3.0 POWER UP INTRODUCTION

3.1 Power Up

Check that the power wiring and connections to the main panel, remote APP panel, PMC card at the probe and interfaced equipment are wired in accordance with the electrical installation drawings.

Power On the unit.

The main screen will light up and run through initialization. After any power interruption, the system will run through this same 30 second initialization.

The main panel is set to factory defaults or customer specifications. **After the initial installation, the alarm and output functions must be set by the customer and a process calibration is required.** These entries are retained in the CPU memory and are not required after any further power disruption.

Confirm the screen reads similar to the following.

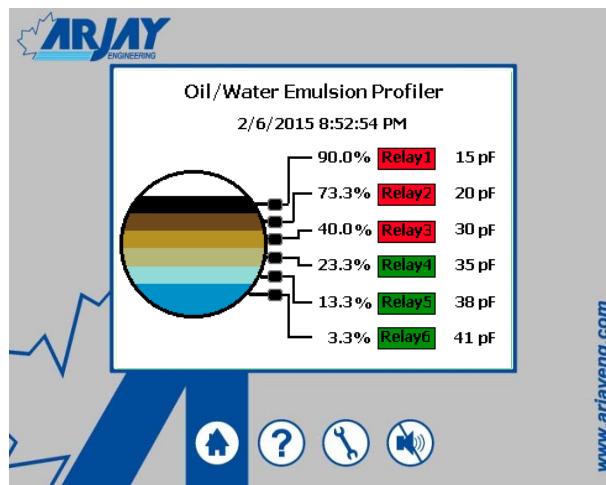


Figure 5 – Main Screen View

3.2 Screen Menu Background Information

The main screen provides a graphic display of the profile of the tank emulsions. Each colour bar represents the reading from it's corresponding probe. The % oil emulsion, raw capacitance reading (in pF) and relay status is also displayed. A flashing relay status indicates that the relay is in time delay mode.

3.2.1 Keypad Main Menu Entry

Below the touch screen are 4 touch keys.



Home

At any time, you can press the Home Key to return directly to the Home Screen



Help

This provides serial number information and an overview of the system operation and components. Contact details for technical help are included at the end of the text.



Tools

Access this section to view or configure the screen and control settings, view diagnostics and perform a calibration




Buzzer Silence

During an alarm condition the audio can be silenced (if ordered). Silencing at any panel will silence all panels. The audio alarm will automatically re-set when the alarm clears.

3.2.2 Password

This model has a touchscreen display. Tap the icon that you wish to change. A keyboard will display for your changes. Press the Return Key to complete.

Accessing any screen that allows parameters to be changed will require a password. The factory password is 2000. Touch within the Password box, a keyboard will display. After the password is entered, press the Return key  to complete. Then press OK in Logon screen. Menus can then be accessed.

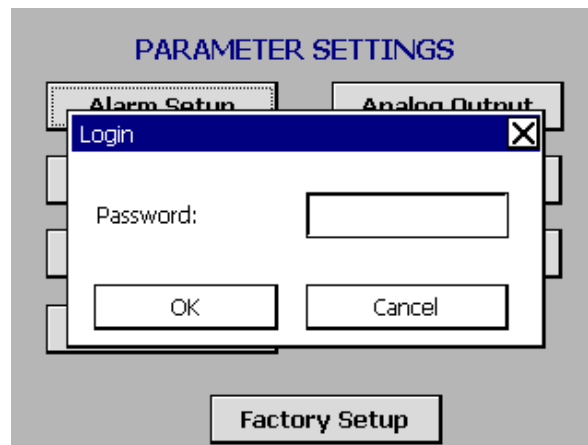


Figure 6 – Password Screen View

4.0 SETUP AND CALIBRATION (PARAMETER SETTINGS)

This section describes the screen, alarm and interface features accessed through the Main Panel. See Controller Setting Sheet (Section 6.0) in back of manual for Factory Default values.

Press “  “

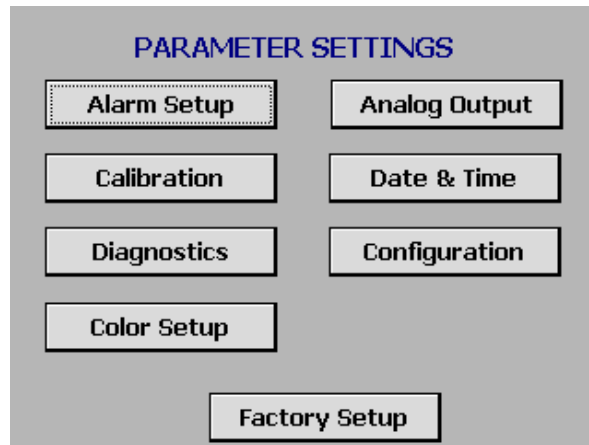


Figure 7 – Parameter Settings Screen View

Enter into the following menu items to configure your monitor.

4.1 Configuration Main Screen View

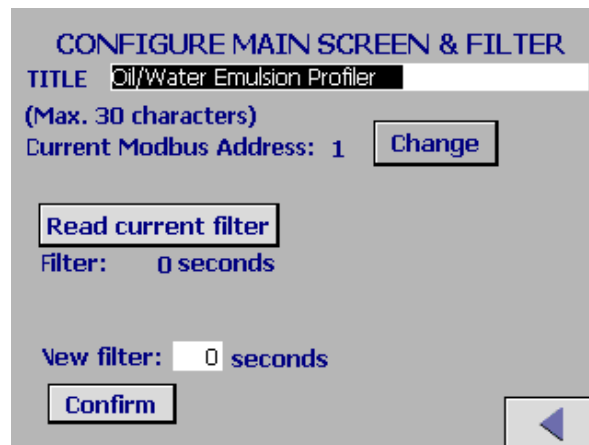


Figure 8 – Configure Main Screen View

The Password 2000 will be required to make changes in this section.

Title: You can personalize the main screen title to your application or tag # (i.e. Separator #6 - LT-4505). Touch the TITLE block and type in your description. The factory default is Oil /Water Emulsion Profiler.

Current Modbus address: See section 7.0

Data Filtering

Filtering is used to suppress rapid spikes by adding time delay to the response rate. For example, a sudden change of 40% could cause a valve to move too quickly and upset the process conditions. Adding 10 seconds of delay will dampen the display measurement and mA

output so that it approaches the 40% change over a period of 10 seconds. If the level returns to a lower point, the mA will follow the new path with the same dampening affect.

4.2 Alarm Setup

The Password 2000 will be required to make changes in this section.

There is one relay per probe input. A system Fault relay is also provided. The Failsafe action of the fault relay is selected on the Alarm Settings screen by toggling the Failsafe icon. Choose your failsafe mode for the fault relay now. Typical is to make the icon green and read Failsafe Relay.

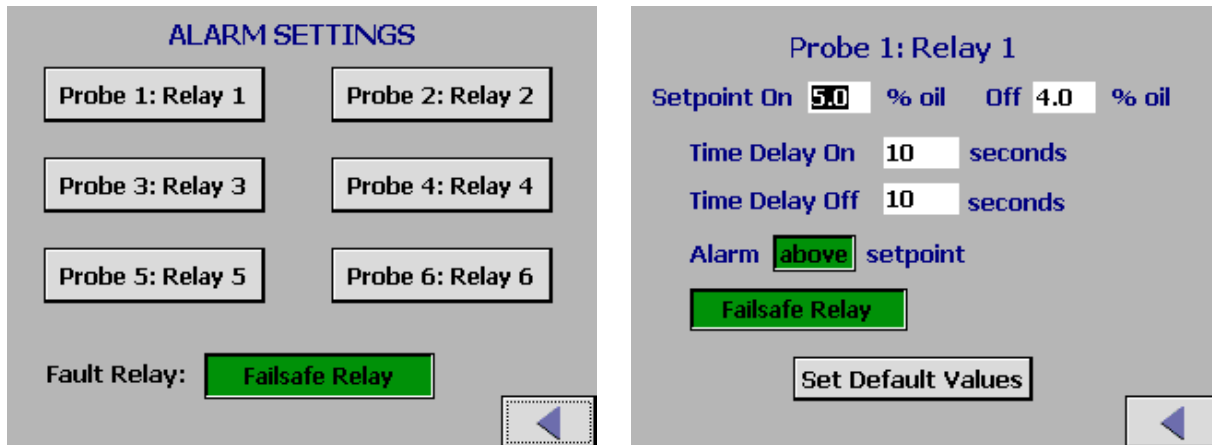


Figure 9 – Alarm Setting Screen Views

Each Relay number corresponds to probe and relay number shown on the main screen. Touch the Relay icon that you wish to set up. Enter the values for parameters described below. (See table 1 for Effect of the relay action and failsafe).

Setpoint ON

This will determine the % Oil value at which the alarm relay activates for the oil concentration.

Setpoint Off

This will determine the % value at which the alarm relay will turn off. This differential feature is used to suppress chattering of alarms if the % value is hovering at the setpoint. It can also be used to control the differential on/off of a pump or valve.

Time Delay (Maximum 3600 seconds)

Delay ON. This is the time, in seconds, that the relay will delay before activating when the alarm setpoint has been reached. Delay ON is used to suppress a nuisance alarm that may be caused by a spurious or momentary alarm condition.

Delay OFF. The time, in seconds, that the relays will stay on after the level has returned to a normal condition. Delay OFF is used to keep controls activated after the alarm has cleared to ensure a stable normal condition has been reached.

Alarm Above or Below Setpoint

This function is to guide the controller on how to control the failsafe and LED indications on the screen.

Select ABOVE if the requirement is for the relay to alarm when the % oil rises above the setpoint.

Select BELOW if the requirement is for the relay to alarm if the % oil drops below a setpoint.

The parameters are now set for relay 1. Repeat the above steps for the rest of the relays.

Failsafe

Failsafe will determine if the relays are energized or de-energized during a normal operating state (no alarm condition).

If green Failsafe Relay is selected, the relay will be energized during a normal operating condition. An alarm or power failure will de-energize the relay to the alarm state.

If in green Failsafe Relay mode, during a normal condition the N.O. contact is closed and the N.C. contact is open. WIRE ACCORDINGLY.

TABLE 1: The following table shows the effect of the Relay Action and Failsafe settings. Under normal conditions, the alarm icon on main screen would show “Green”.

Relay Action	Failsafe Setting	Effect
Above	No	<ul style="list-style-type: none"> Alarm condition when % water in oil rises above the On Setpoint for at least the alarm delay period. Alarm condition remains active until the % water in oil drops below the Off Setpoint. No action is taken when the % water in oil is between the On and Off differential Setpoint. In the alarm condition, the corresponding alarm turns Red, and the relay is energized.
Above	Yes	<ul style="list-style-type: none"> Alarm condition set and reset as above. In the alarm condition, the corresponding alarm turns Red, but the relay is de-energized.
Below	No	<ul style="list-style-type: none"> Alarm condition when % water in oil drops below the Off Setpoint for at least the alarm delay period. Alarm condition remains active until the % water in oil rises above the On Setpoint. No action is taken when the % water in oil is between the On and Off differential Setpoints. In the alarm condition, the corresponding alarm turns Red, and the relay is energized.
Below	Yes	<ul style="list-style-type: none"> Alarm condition set and reset as above. In the alarm condition, the corresponding alarm turns Red, but the relay is de-energized.

4.3 Analog Output

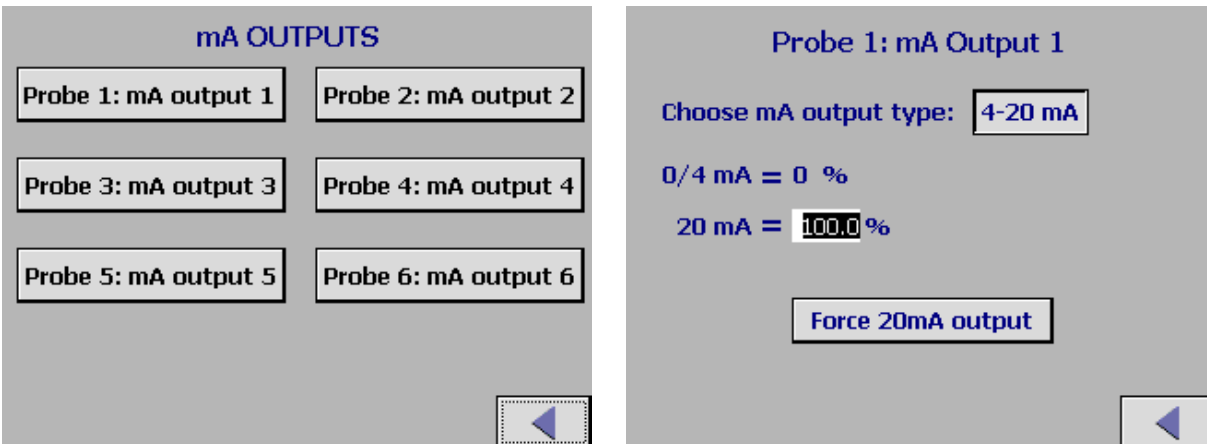


Figure 10 – Analog Output Screen View

The Passcode *2000* will be required to make changes in this section.

A mA analog output is available for each probe. Select which probe you wish to set up.

0-20mA vs 4-20mA

Select the mA output range for your application.

0/4 mA = 0 and 20 mA = xx%

The 0 or 4 mA is factory defaulted to 0 % level. The 20 mA may be offset to suit your control requirements and is entered in %. Typically 20 mA is set to the 100% oil.

Force 20mA

For maintenance purposes to check external equipment and alarms or the analog output, the mA output can be forced by pressing the “Force a 20mA output”.

4.4 Date and Time

The current date and time is displayed on the main screen. This can be changed here.

4.4.1 Color Setup

The main display has a graphic profile view of the tank and the % oil vs water emulsions. There are six colours that can be displayed to represent the different % ranges of the emulsions.

Dark blue represents the highest water concentration phase and dark brown represents the oil phase range. Enter the desired % range of each shade, starting with water. Once the first color's entered then the second color is will automatically start from the end of the last %range.

4.5 Calibration

A calibration at site is required for each probe. Enter the Calibration menu. This is passcode protected. Enter the Probe Number you are calibrating. A Pulse Card set up will be required. Confirm that the current A, K and C values shown on the screen match with the values provided on the label of the PMC card installed in junction box at the probe. If the values are different, Press the “Change” button on the screen. Enter the A, K and C values and press “Confirm”. The screen will indicate “Confirmed” and the new values will show.

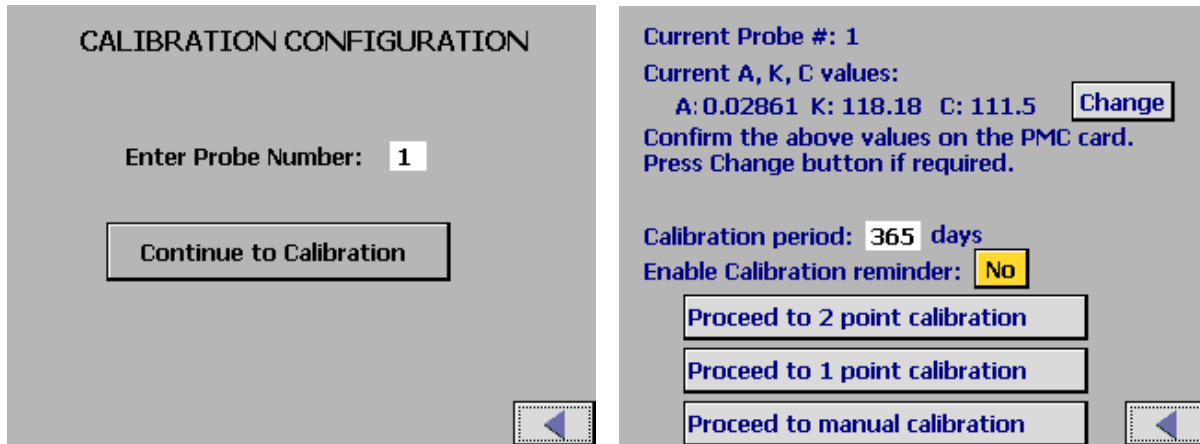


Figure 11 – Pulse Card Set-up Screen View

Calibration Reminder

The 4100-PRO has a real-time clock. After calibration, the calibration date is recorded in the diagnostics. A calibration reminder can be set for up to 999 days. This feature can be enabled by toggling Yes or No on the “ENABLE CALIBRATION REMINDER” icon. The icon “CAL REMINDER” will appear on the main screen after the preset number of days is reached. Press “CAL REMINDER” icon on main screen. If a calibration can be done when the cal reminder time is reached, Press the “Recalibration” icon.

If a calibration cannot be performed at the time of the reminder, this can be reset to a later date by entering the number of days until the next reminder is desired. Press “Enter” icon to activate the Reminder countdown.

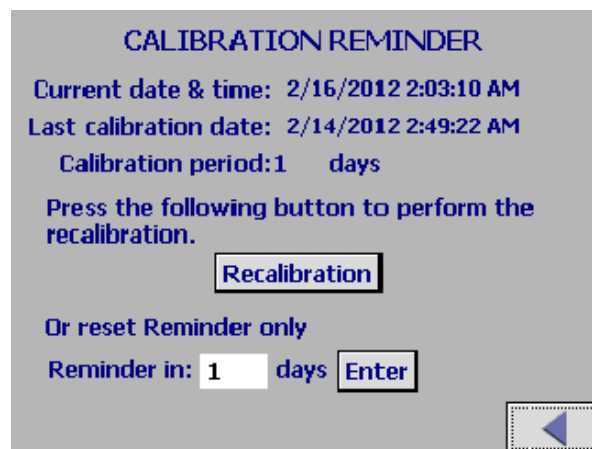


Figure 12 – Calibration Reminder Screen View

This unit allows for three types of calibration.

4.5.1 Full Calibration (2 Point) (Most Typical)

After the setup parameters have been entered for the application, a process calibration is required. The Full Calibration is most typical.

Two calibration points will need to be entered. The % oil concentration surrounding the probe will need to be changed, up or down, to cause two different calibration points. The actual % oil around the probe will need to be determined as accurately as possible.

The greater the change between the two points the better. For example, a 1% error in the entered level value for a 25% change translates to a 4% error at Full Scale.

Ideally, a 0% oil (100% water condition) and a 100% oil (0% oil) condition can be used for calibration. Until actual % concentration measurements can be made, it may be useful to calibrate all of the probes using air as 100% oil for the first point. Then fill the vessel with water and enter 0% as the second point for all the probes. As emulsions tests are done, the calibration data can be manually corrected in manual calibration to improve accuracy.

To Calibrate.

Enter 2 point Calibration to Proceed.

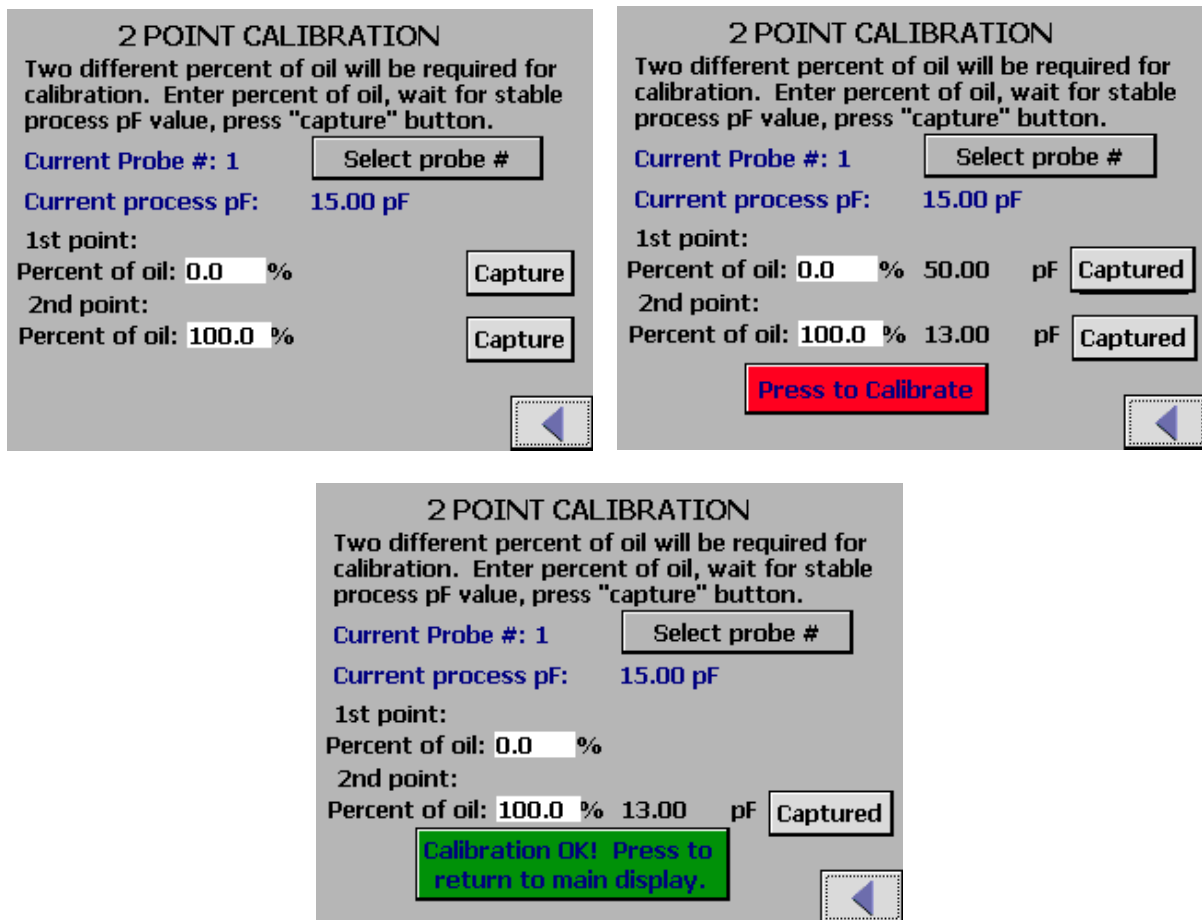


Figure 13 – 2 Point Calibration Screen View

Note that a current Probe Number and current capacitance reading in pF is displayed on the screen in blue. This is a real-time reading of the tank capacitance. If filtering has been used then the user must wait until capacitance reading has stabilized before capturing. Confirm the current probe number is correct. If not, change the probe number by pressing "Select probe#"

Enter 1st Point

Enter a value, in %, of the oil emulsion surrounding the probe being calibrated and then press "Capture" to confirm and "Captured" will display. If using air to temporarily simulate oil, enter 100%. If the first % value is known at each probe, you can select each Probe Number and enter the 1st point for all the probes before proceeding to the second point. Once the 1st point has been entered the calibration values will show up and icon will show "Captured".

Enter 2nd Point

After 1st Point is entered, the actual % oil emulsion in the vessel will need to be changed. Change the concentration up or down. The greater the change, the greater the accuracy. The current process pF reading on the screen will rise or lower accordingly to confirm that a change is being registered. Enter a value in % oil for the second point and then press Capture to confirm and "Captured" will display and a new 2nd calibration point will display.

After both calibration points have been confirmed a "Press to Calibrate" icon will appear. Press to complete calibration.

If calibration was not successful an error message will occur. Common issues are either the concentration in the vessel was not changed or the 2nd value in % was entered identical to 1st point.

If calibration is successful then icon will appear "Calibration OK!".

Press the icon to return to the main screen.

4.5.2 1 Point Calibration (Not Typical)

This calibration requires a known slope to allow for a single calibration point. This calibration is only used if prior calibration for your application has been collected. This calibration is not typical

Slope

This slope is known from a previous calibration of the oil being monitored or from a bench top test. It is shown as a negative slope.

Percent of Oil

Enter the present % of in water. If no oil is present, enter 0.0.

Current process pF

This is the current capacitance value in Pico farads (pF) of the probe selected .

To Calibrate.

Enter 1 Point to Proceed

Capture Once the above information has been entered, Press "Capture". The screen should indicate "Captured". If all values have been entered and captured then a "Press to Calibrate" icon will appear at the bottom of the screen. Press the icon. A successful calibration will show a "Calibration OK" icon.

Press the Home Key  or CALIBRATION OK icon to return to the main screen.

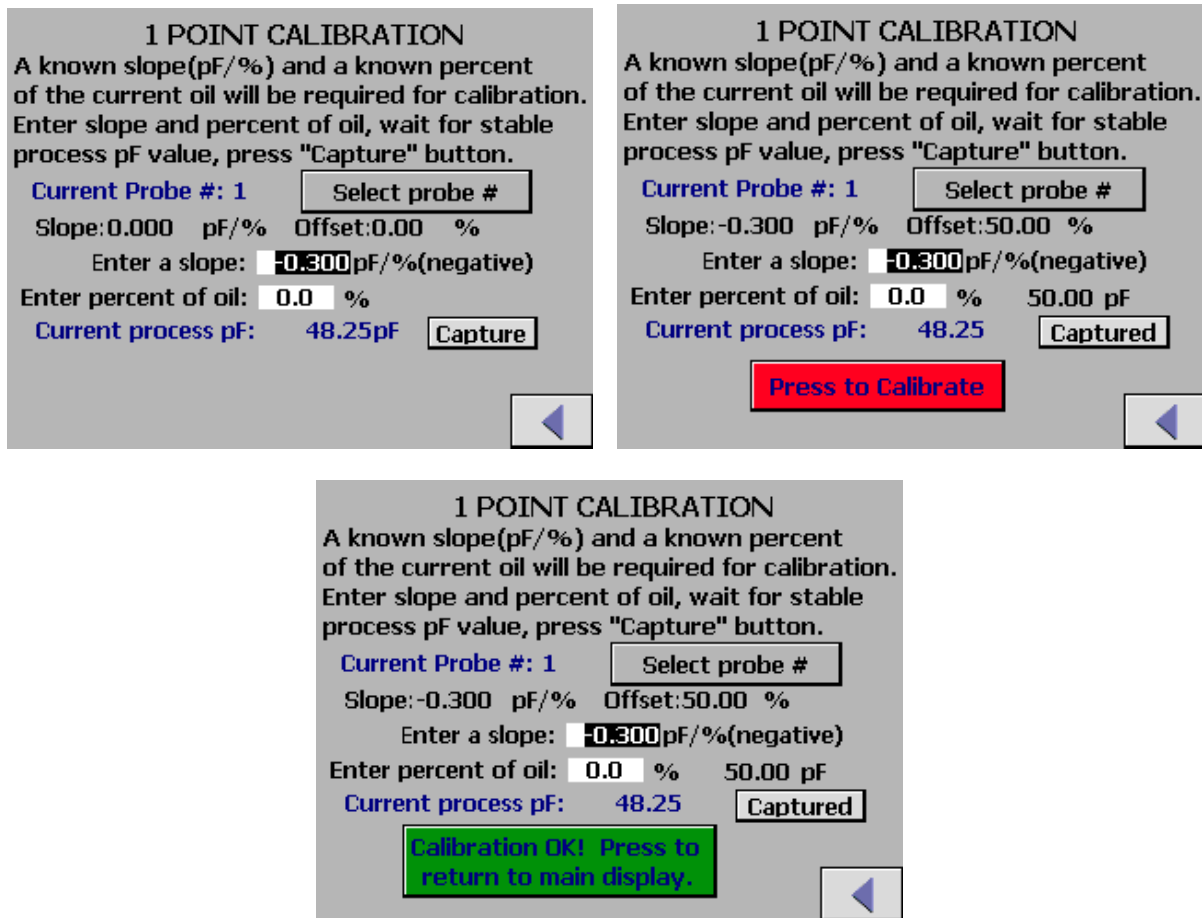


Figure 14 – 1 Point Calibration Set-up Screens View

4.5.3 Manual Calibration (Not Typical)

Manual calibration allows a user to override any of the previous calibration values and enter predetermined or observed calibration values. This feature may be used for a number of different reasons. For example.

1. One of the calibration points is desired to be re-calibrated. The user can view the pF reading of the probe in the Diagnostics menu and also record the actual % oil value at the same time. These values can then be entered in the Manual Calibration to change either Cal Point 1 or Cal Point 2.
2. If a calibration was done using 20% and 60 % as the two values (for example), but it was determined a future date that the 60% should have been entered as 70%.
3. The process concentration cannot be altered at the time of calibration so a random pF value and % value is entered as the second point to allow operations until a proper second point can be entered. See method in 1 above.

To Calibrate.

Enter Manual Calibration to Proceed

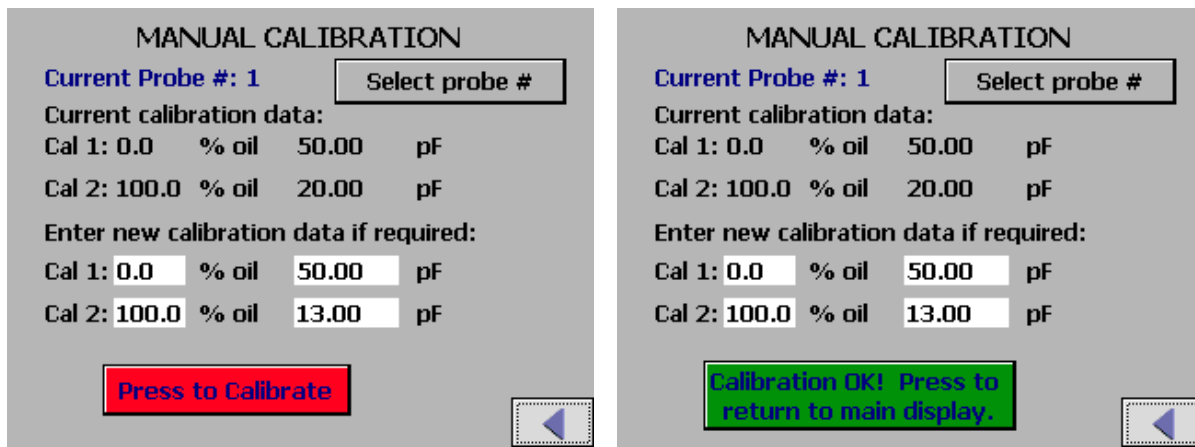


Figure 15 – Manual Calibration Set-up Screen View

When you enter the manual calibration mode, the current calibration points from the previous Calibration will be shown. Enter in new values for each calibration point then “Press to Calibrate”.

Calibration will be confirmed “Calibration OK!”.

If calibration was not successful, an error message will occur. Common problems are either level in tank was not changed or the 2nd level value in % was entered identical to 1st point.

Press the Home Key  or CALIBRATION OK to return to the main screen.

The Arjay 4100-PRO is now set up, calibrated and operating to your process conditions.

4.6 Diagnostic Information

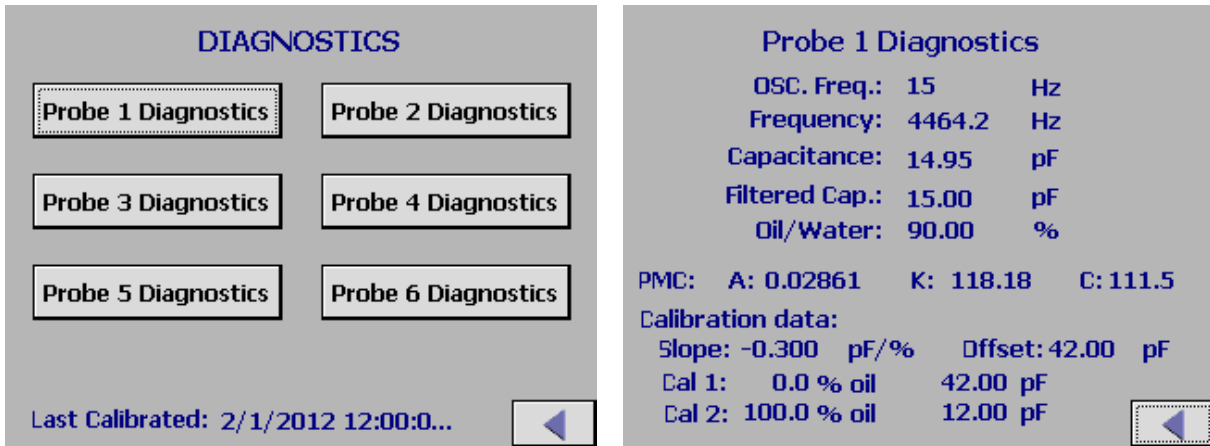


Figure 16 – Diagnostic Information Screen View

Select which probe diagnostics are desired.

These are View Only screens. They provide various diagnostic information that is communicating between the probe and the controller or has been entered during a calibration. This is a real-time display and is a valuable tool to observe process data such as product stability and change. If technical assistance is required during the setup or operation of the instrument, record or photograph these screens prior to contacting Arjay.

Oscillation Frequency: This is the frequency at which the probe is tuning itself as the product concentration changes. The frequency change is inverse to pF 0 Hz indicates there is no frequency to the pulse card and the probe may be disconnected.

Frequency: For stability and transmission to the main controller, the oscillation frequency of the probe is divided and linearized to a lower frequency in the PMC card. This response is also inverse pF.

Capacitance: This is the total probe, product and tank capacitance reading in picofarads (pF). At 0% there will be an offset capacitance due to the physical length of probe and alliance to the vessel wall. If the probe wire is not connected to the PMC card properly, this will be near or at 0.0 pF.

Filtered Capacitance: During the screen set-up, there will be an opportunity to filter the output to dampen spikes. If filtering has been entered, this reading will respond slower than the true process capacitance.


Oil / Water: If a calibration has been done, the % oil emulsion reading is available here.

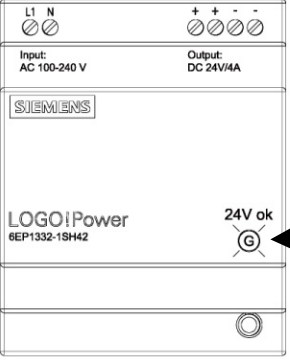
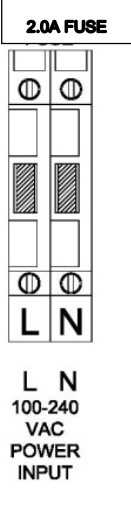
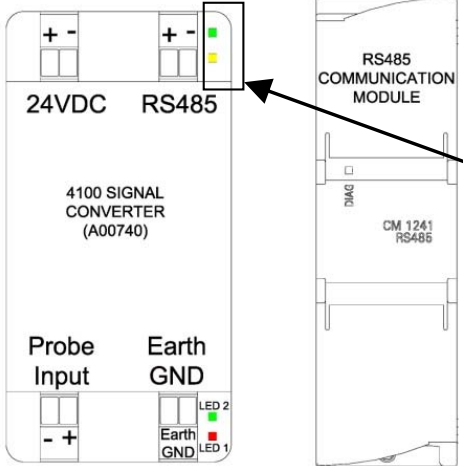
PMC: During calibration, the operator is required to enter the A,K, C values that are labeled on the PMC card as well as in the back of the manual under controller settings (Section 6.0). These 3 values are unique to each PMC card and enhance the response, accuracy and linearity of the tank capacitance for optimum performance.

Calibration data: These are the calibration values recorded after the last successful calibration.

5.0 TROUBLESHOOTING

Main Panel

Press “” for some troubleshooting tips.

	<p>Condition: Power Supply Status</p> <ul style="list-style-type: none"> • Confirm the Power Supply LED is active (Green).
	<p>Condition: Power Input Status</p> <ul style="list-style-type: none"> • Confirm the Power input is 100-240 VAC using a meter. • Confirm if input fuse has blown.
	<p>Condition: Communication Error</p> <ul style="list-style-type: none"> • Means no communication between 4100 Signal Converter (A00740) and RS485 Communication Module. • Under normal operating conditions, both LED's should be Lit and Flashing continuously. • Check wiring between 4100 Signal Converter (A00740) and RS485 Communication Module. • Confirm 24VDC power to 4100 Signal Converter (A00740).

<p>4100 SIGNAL CONVERTER (A00740)</p> <p>24VDC RS485</p> <p>Probe Input Earth GND</p> <p>LED 2 LED 1</p>	<p>Condition: No Transmitter Signal (Status LED is Red)</p> <ul style="list-style-type: none"> • Under normal operating conditions, LED 2 should be Green. If there is an error, LED 1 goes Red. • Make sure the PMC-2800 is installed. • Make sure the PMC-2800 wiring is correct and there are no breaks in the wiring. At the PMC-2800, measure across the + and - terminals with a DC meter. Make sure “Common” lead of meter is on ‘-’ terminal. It should read (+) 8 to (+)10 VDC with the PMC-2800 connected and approximately 21-24 VDC with the PMC-2800 terminal disconnected from pulse card. • The unit is not receiving a frequency signal from the remote PMC-2800 level transmitter in the probe head: Check wiring. • Disconnect probe from pulse card to ensure that probe is not pulling down the signal. pF reading should be ~ 0.0 pF with no probe hooked up. • Replace PMC-2800 if suspect water damage OR possible power outage may have damaged the pulse card. • If wiring checks out: call Arjay Technical Support.
	<p>Condition: Signal out of Range</p> <ul style="list-style-type: none"> • Check the integrity of the Teflon sheath of the probe. If this has been damaged, water could cause an electrical short circuit between the probe within the Teflon sheath and the ground reference. In this case a very high capacitance is usually registered. Check the capacitance reading in diagnostics menu. To confirm: Open the probe head and disconnect the blue wire from the probe to the PMC-2800. Using a DVM, measure the resistance between the enclosure case and the probe tip. It should read infinite resistance or OL. Make sure that fingers and hands do not touch the metal portion of the probes of the DVM since this could show a lower resistance: 1-10mohms.
<p>OIL/WATER SEPARATOR LEVEL MONITOR</p> <p>% WATER IN OIL MONITOR</p> <p>49.71 % Water</p> <p>96.34 pF</p> <p>Relay 1 On: 20.0 % Off: 15.0 %</p> <p>Relay 2 On: 40.0 % Off: 35.0 %</p> <p>Relay 3 On: 60.0 % Off: 55.0 %</p> <p>Relay 4 Fault Relay</p> <p>6/1/2012 3:16:02 PM</p> <p>No Trend</p> <p>10 days</p> <p>PLC UNIT</p>	<p>Condition: PLC Error</p> <ul style="list-style-type: none"> • If LCD display shows “##”, check the condition of Ethernet wire connected between HMI display and PLC unit for no breaks. • Make sure the Ethernet wire is not loose from PLC or HMI terminal.

	<p>Condition: Reading not Accurate</p> <ul style="list-style-type: none">• For probes without a factory supplied concentric shield, make sure the probe is parallel to its ground reference which may be the tank wall or the inside of a stilling pipe (if probe is installed in a pipe).• May require fine tuning – use manual calibration if changes are required to one of the cal points.
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6.0 CONTROLLER SETTINGS SHEET

Checked by	
Model Number	
Serial Number	
Software Rev.	

PARAMETER	DESCRIPTION	FACTORY SETTING	USER SETTING
PMC A value	PMC-2800 setup parameters		
PMC K value	PMC-2800 setup parameters		
PMC C value	PMC-2800 setup parameters		
Calibration	Cal.	% Oil Emulsion	pF Value
	1		
	2		
	3		
	4		
	5		
Zero	Zero Level value for mA output.	0.0%	
Span	Full Scale level value for mA output.	100%	
mA Range	0-20mA OR 4-20mA	4-20mA	
mA Action	<ul style="list-style-type: none"> - Direct (20mA when level at span) OR - Indirect (4mA when level at span) 	Direct	
Relay 4 (Fault)	This relay indicates Instrument Failure. It can also be selected as an Alarm Relay.	Fault	
Relay 4 Failsafe	This relay is factory default to be normally energized (no alarm) and de-energized in an alarm condition or power failure.	ON	
Relay 3 Hi Set	Alarm Relay 3 high alarm: alarm condition if level is above this value.	60%	
Relay 3 off	Alarm relay 3 differential off value	55%	
Relay 3 Failsafe	Failsafe ON sets the relay as normally energized (no alarm) and de-energized in an alarm condition.	ON	
Relay 3 Alarm Action	Alarm action above OR below alarm level	Above	
Relay 3 Alarm Delay (on)	Amount of time the level must be in an alarm condition (based on Relay 3 alarm value and Action settings) before the relay trips to the alarm condition (condition set by Relay 3 Failsafe setting).	10 sec	
Relay 3 Alarm Delay (off)	Amount of time the level must stay in an alarm condition (based on Relay 3 alarm value and Action settings) before the relay trips to the normal condition (condition set by Relay 3 Failsafe setting).	10 sec	
Relay 2 Hi Set	Alarm Relay 2 high alarm: alarm condition if level is above this value.	40%	

Relay 2 off	Alarm relay 2 differential off value	35%	
Relay 2 Failsafe	Failsafe ON sets the relay as normally energized (no alarm) and de-energized in an alarm condition.	ON	
Relay 2 Alarm Action	Alarm action above OR below alarm level	Above	
Relay 2 Alarm Delay (on & off)	Amount of time the level must be in an alarm condition (based on Relay 2 alarm value and Action settings) before the relay trips to the alarm condition (condition set by Relay 2 Failsafe setting).	10 sec	
Relay 2 Alarm Delay (off)	Amount of time the level must stay in an alarm condition (based on Relay 2 alarm value and Action settings) before the relay trips to the normal condition (condition set by Relay 2 Failsafe setting).	10 sec	
Relay 1 Hi Set	Alarm Relay 1 high alarm: alarm condition if level is above this value.	20%	
Relay 1 off	Alarm relay 1 differential off value	15%	
Relay 1 Failsafe	Failsafe ON sets the relay as normally energized (no alarm) and de-energized in an alarm condition.	ON	
Relay 1 Alarm Action	Alarm action above OR below alarm level	Above	
Relay 1 Alarm Delay (on & off)	Amount of time the level must be in an alarm condition (based on Relay 1 alarm value and Action settings) before the relay trips to the alarm condition (condition set by Relay 1 Failsafe setting).	10 sec	
Relay 1 Alarm Delay (off)	Amount of time the level must stay in an alarm condition (based on Relay 1 alarm value and Action settings) before the relay trips to the normal condition (condition set by Relay 1 Failsafe setting).	10 sec	
Filter	Digital Filter response time in seconds. Used to smooth out level fluctuations caused by splashing etc.	0 sec	
Tag Number (Optional)	For network applications only. All Arjay 4100 series controllers connected to a network must have a unique Tag Number between 1 and 100	1	

7.0 MODBUS MAP AND DETAIL

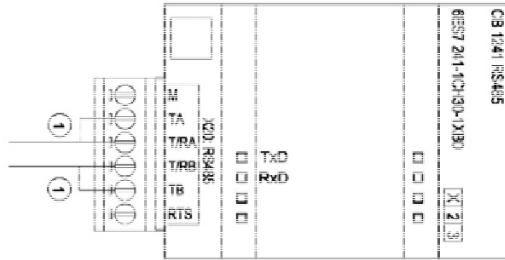
2 Wire RS-485 (1/2 Duplex)

9600 Baud, Even parity, 8 Data bits, 1 stop bit.

For connection to a PC, an RS-485 to USB converter module and modbus software (Modbus Poll, DAQfactory, etc.) be used.

The following RS-485-USB converter has been tested with the system:

Model: UT-850 (Manufacturer: Gridconnect)



① Connect “TA” and “TB” as shown below to Terminate the Network

7.1 Modbus Commands Supported

Read Coil Status Function Code: 01. Used to read relays output from PLC
 Read Holding Registers Function Code: 03. Used to read values from PLC

7.2 Register Map

Read coils status (01)

coil	DESCRIPTION	TYPE
00001	relay 1 - probe 1 alarm (Q0.0)	bit
00002	relay 2 - probe 2 alarm (Q0.1)	bit
00003	relay 3 - probe 3 alarm (Q0.2)	bit
00004	relay 4 - probe 4 alarm (Q0.3)	bit
00005	relay 5 - probe 5 alarm (Q0.4)	bit
00006	relay 6 - probe 6 alarm (Q0.5)	bit
00007	relay 7 - Common fault relay (Q0.6)	bit

Read Holding Registers (03)

REG	DESCRIPTION	TYPE	No. of Reg
40001	Probe 1 capacitance (pF)	real	2
40003	Probe 1 precent value (%)	real	2
40005	Probe 2 capacitance (pF)	real	2
40007	Probe 2 precent value (%)	real	2
40009	Probe 3 capacitance (pF)	real	2
40011	Probe 3 precent value (%)	real	2
40013	Probe 4 capacitance (pF)	real	2
40015	Probe 4 precent value (%)	real	2
40017	Probe 5 capacitance (pF)	real	2
40019	Probe 5 precent value (%)	real	2
40021	Probe 6 capacitance (pF)	real	2

8.0 DETAILED ELECTRICAL AND DIMENSIONAL DRAWINGS

Drawings are included in this section that are specific to your model ordered.

If drawings are not included here, record the serial number on the left outside wall of the main panel and contact:

ARJAY ENGINEERING TECHNICAL SUPPORT

(800) 387-9487

+1 (905) 829-2418

www.arjayeng.com