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11. SINGLE CHANNEL LIQUID EYE VERSION 2.0

11.1 DESCRIPTION

The IVEK Single Channel Liquid Eye Version 2.0, hereafter referred to as the System, consists of a Single Channel Liquid Eye Controller Module, hereafter referred to as the Controller Module, and a detector. The controller measures 166mm wide, 106mm deep, 160mm high and weighs approximately 2 pounds (4.4 kilograms). The detector measures approximately 25.4mm by 22.2mm by 12.7mm thick and attaches to the controller by a cable.

11.1.1 Controller Module Exterior Panel Figure (11.1)

The exterior panels of the Controller Module contain the Logic Interface connector, Liquid Eye Detector connector and AC power cord.

11.1.1.1 Logic Interface Connector (Item 1)

The logic interface connector is a 4-pin male circular plastic connector. It is used to monitor the fault status of the Liquid Eye Detector. The connector provides NO (normally open) and NC (normally closed) relay (dry) contacts for external interfacing. When a fault is detected, NC contacts open and NO contacts close. Refer to section 11.7 for relay contact specifications. The pin configuration is as follows;

1 = Normally Open
2 = Common
3 = Normally Closed
4 = Unused

11.1.1.2 Liquid Eye Detector Connector (Item 2)

The liquid eye detector connector is a 4-pin female circular plastic connector. The liquid eye detector cable plugs into this connector.

11.1.1.3 Power Cord (Item 3)

The power cord provides the input power to the Controller Module. Ensure the AC power cord is plugged into a properly grounded three-prong outlet capable of supplying the voltage and current specified in the Title Page section of this manual.

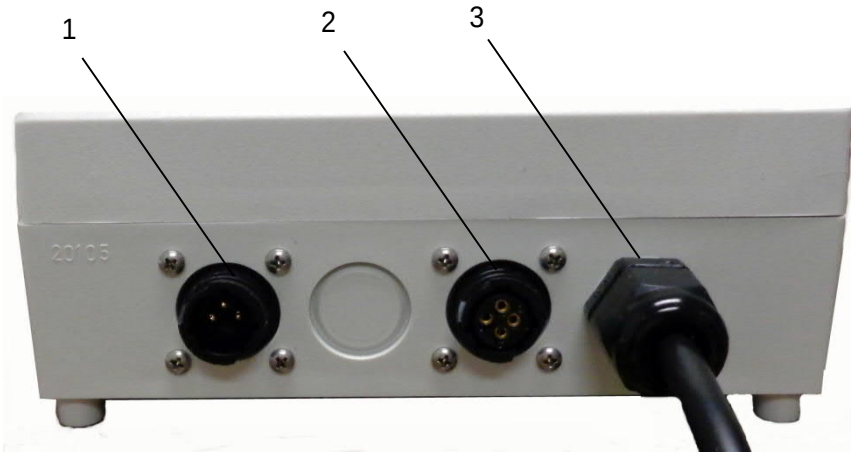


Figure 11.1 Controller Module Exterior Panel

11.1.2 Controller Module Interior Panel (Figure 11.2)

The interior panel of the Controller Module contains the operator controls and indicators for operating the System.

11.1.2.1 GAIN Adjust (Item 1)

The GAIN potentiometer adjusts the sensitivity of the Liquid Eye Detector. This is used to compensate for variations in detectors and is sometimes used to adjust for a variety of fluids and tube diameters.

11.1.2.2 INTENSITY Adjust (Item 2)

The INTENSITY potentiometer adjusts the intensity of the liquid eye detector. This allows the liquid eye detector to be used for a variety of fluids and tube diameters.

11.1.2.3 ALARM MODE CONT/LATCH Switch (Item 3)

The ALARM MODE CONT/LATCH switch selects the fault circuit operating mode. In the LATCH position, the DETECTOR indicator and audible alarm turn on when a transition from liquid to air occurs. In the CONT position, the DETECTOR indicator and audible alarm are on when air is present and off when liquid is present.

11.1.2.4 DETECTOR Indicator (yellow) (Item 4)

The DETECTOR indicator illuminates when air is present in the line. In CONT mode, this indicator is illuminated only when air is sensed. In LATCH mode, this indicator is illuminated when a transition of liquid to air is sensed and will stay illuminated until the ALARM RESET push-button is pressed.

11.1.2.5 ALARM RESET Push-button (Item 5)

The ALARM RESET push-button resets a latched alarm.

Figure 11.2 Controller Module Interior Panel

NOTE

Pressing the ALARM RESET push-button switch has no effect in Continuous mode.

11.1.2.6 AUDIBLE ALARM ON/OFF Switch (Item 6)

The AUDIBLE ALARM ON/OFF switch turns the alarm annunciator On and Off. The audible alarm sounds when the DETECTOR is illuminated if the switch is in the “ON” position.

11.1.2.7 POWER ON Indicator (green) (Item 7)

The POWER ON indicator is illuminated when the POWER ON/OFF switch is in the ON position.

11.1.2.8 POWER ON/OFF Switch (Item 8)

The POWER ON/OFF switch turns power to the Controller Module On and Off. The POWER ON Indicator will illuminate when this switch is the ON position and power is supplied to the unit.

11.1.3 Detector (Table 11.2)

The detector optically senses voids in the liquid. Detectors are available in a variety of O.D. tubing sizes as listed in Table 11.2.

11.2 OPERATION

The System optically detects air and liquids in a translucent fluid line. Typical applications include detecting either air bubbles or the absence of fluid in a liquid line. The System generates a single alarm for a single fluid line.
Some of the System features are:

- Liquid eye detector is non-intrusive to fluid line.
- Adjustment for a variety of fluids and line sizes.
- Liquid eye detector is designed to minimize the sensitivity to background light.

The System is made up of two main components; a detector and Controller Module. The detector detects air in the line and the Controller Module contains the electronics for controlling the System.

11.2.1 Detector

The detector senses the presence of air in translucent fluid tubing. One Controller Module and one detector exists for each fluid tubing location being monitored. The proper size detector must be used based on the outside diameter of the fluid tubing being monitored.

It is important to keep the detector in a stationary position once the installation procedure has been performed. Motion may cause erroneous alarm indications.

If the tubing size needs to be changed, the detector must be replaced with one of the proper size and perform the procedure in section 11.3.1 Sensitivity Adjustment.

If the liquid changes, the procedure in section 11.3.1 Sensitivity Adjustment should be repeated.

NOTE

Extreme variations in external light sources may cause detector settings to change.

11.2.2 Controller Module

The Controller Module consists of an enclosure containing the electronics for the System. The Controller Module contains circuitry to generate the alarm output, System reset signals, sensitivity adjustment and operational control for the liquid eye detector.

11.2.3 Modes of Operations

The Controller Module provides two alarm modes controlled by the ALARM MODE CONT/LATCH switch. The switch is either in the CONT (continuous) position or the LATCH position.

11.2.3.1 Continuous

In this mode, when air passes the detector a fault condition occurs, however, the fault condition only remains as long as air is detected. Once fluid passes the detector again, the fault condition no longer exists. This fault can NOT be reset by the RESET push-button.

11.2.3.2 Latch

In this mode, once a transition from liquid to air is sensed, the output is latched as a fault. Any air sensed by the detector will cause a fault condition to occur and will remain latched until 'reset' by the ALARM RESET push-button. This mode is useful when it is necessary to detect small bubbles.

11.3 INSTALLATION

The Controller Module may be mounted either horizontally or vertically. Install in a location allowing easy access to the detector connector. The dimensions for mounting the Controller Module are located on the back of the Controller Module. The following instructions describe setting up the System for use.

1. Place the System Power switch in the OFF position.
2. If monitoring the fault status is required, connect the logic interface cable to the Logic Interface connector on the Controller Module.
3. Place the detector on the tubing in the desired location. The detector can either be on the intake or discharge side of the pump depending on your specific application.
   3a. Locate the detector on the intake side if the pump connections have not been a problem. Sensing air prior to the Pump Module will prevent potential liquid problems. Letting air into the Pump Module affects dispense volume and requires priming to purge the air.
   3b. Locate the detector on the discharge side if monitoring the Pump Module connections for air leaks is important or if the connections have been a problem in the past.
4. Plug the detector connector into the connector receptacle on Controller Module.

There are several alternative positions for mounting. The following instructions describe wall mounting of the Controller Module:

1. Obtain two wall mount brackets and four screws from the Accessory kit.
2. Place the brackets in two of the four mounting positions. Secure the brackets by placing a screw in the center hole. If you are using the top two outer mounting positions, you can either place them up and down or side to side. If using the top and bottom center mounting positions, the brackets can be installed up and down on all four positions and can be installed sideways on the two outer positions.

The following instructions describe DIN Rail mounting of the Controller Module:

1. Place the Controller Module on the DIN rail and secure by pushing up the two tabs on both sides of the controller.

The following instructions describe how to lock down the cover:

1. Insert the lid screws (provided) in the recessed holes on the cover and hand tighten.

11.3.1 Sensitivity Adjustment

11.3.1.1 Standard Setup

It is recommended to make sensitivity adjustments with the System setup in the expected application. Using the pump controls, it should be possible to pass air and fluid alternately through the detector.

11.3.1.2 Optional Setup

A fluid loop can be made to perform the adjustment. Place some of the fluid from the expected application in the System tubing. There should be at least four inches of tubing completely filled with fluid and at least four inches of tubing with no fluid. Thread the tubing through the detector. Use the “joining” tubing to connect the ends of the System tubing to form a loop. The following is a list of materials required:

- Test Fluid - Sufficient amount to fill 4" of tubing.
- System Tubing -12 to 24 inches of the tubing being used in the System,
- Joining Tubing-3 to4 inches of tubing with an outside diameter slightly larger than the inside diameter of the System tubing.

11.3.1.3 Switch Settings

1. Switch the System power switch to “ON”.
2. Switch the CONT/LATCH switch to the “CONT” position.
3. Press the RESET push button to clear any faults

11.3.1.4 Adjustment

1. If using a fluid loop, rotate the loop such that air is passing in front of the detector. Otherwise, empty the fluid line at the detector.
2. Turn the GAIN potentiometer fully clockwise, then, counterclockwise twelve full turns.

NOTE

Each potentiometer is about a 25 turn potentiometer. When turning the potentiometer to either end, usually a clicking sound occurs, however, this isn’t always the case. If you do not hear a clicking sound, turn the potentiometer approximately 25 turns.

3. Turn the INTENSITY potentiometer fully clockwise, then, counterclockwise twelve full turns.
4. If using a fluid loop, rotate the loop such that air is passing in front of the detector. Otherwise, empty the fluid line at the detector. The DETECTOR indicator should be illuminated, if not, go to step 8.
5. If using a fluid loop, rotate the loop such that fluid is passing in front of the detector. Otherwise, fill the fluid line. The DETECTOR indicator should not be illuminated.
6. If the DETECTOR indicator is still illuminated, turn the INTENSITY adjustment screw counterclockwise until the DETECTOR indicator is no longer illuminated. If this fails, proceed to step 8.
7. Pass air, then fluid, alternately in front of the detector. The DETECTOR indicator should illuminate, then not illuminate respectively. If it does, the setup has been successful.
8. If steps 1 -7 fail to yield correct results; Turn the INTENSITY potentiometer clockwise to the end, then, counterclockwise twelve full turns,
9. Pass fluid in front of the detector.
10. Turn the GAIN potentiometer counterclockwise until the detector indicator is not illuminated.
11. Repeat step 7.

NOTE

If for some reason, one or more of the conditions above cannot be duplicated, see section 11.6 Problem Guide.

11.3.2 Confirm Operation

With no fluid in the line at the detector, in continuous mode, the DETECTOR indicator LED should be on. Otherwise, follow the procedure in section 11.3.1 Sensitivity Adjustment.

Start to fill the tube line with fluid. The DETECTOR indicator LED should no longer be on when the fluid, absent of bubbles, passes the detector. Otherwise, follow the procedure in section 11.3.1 Sensitivity Adjustment.

11.4 OPTIONS

There are currently no options available.

11.5 MAINTENANCE

11.5.1 Detector

Periodically, or if tubing becomes discolored, remove tubing, check for anything obstructing liquid eye detector holes, and replace tubing with new tubing.

Periodically inspect the cables and connectors for damage.

11.5.2 Controller Module

No periodic maintenance is required on the Controller Module beyond standard practices for electronic equipment.

11.5.3 Assemblv/Disassemblv

The System contains the following replaceable parts. Refer to Table 11.2 for a list of available detectors.

- Liquid Eye Detector

11.5.3.1 Liquid Eye Detector

Disassembly

1. Switch the Controller Module POWER switch “OFF”.
2. Remove the liquid eye detector cable from the Controller Module connector.
3. Slide the tubing through the liquid eye detector.

WARNING

Make sure the liquid lines are free of any hazardous liquid.

Assembly

1. Switch the Controller Module POWER switch “OFF”.
2. Slide the tubing through the liquid eye detector.
3. Connect the liquid eye detector cable to the Controller Module connector.
4. Confirm operation per section 11.3.2.

11.6 PROBLEM GUIDE

Refer to Table 11.1 for a list of possible problems and solutions.

Table 11.1 Common Operational Problems And Solutions

PROBLEM	PROBABLE CAUSE	POSSIBLESOLUTION
The POWER Indicator is not illuminated when the system power is turned “ON”	AC power may be absent or inadequate. Unit not plugged in.	Ensure AC power cord is plugged into a properly grounded outlet.
	Fuse is blown.	Contact IVEK Technical Support.
Unable to adjust detector.	The DETECTOR LED is always (or never) illuminated regardless of which material (air or fluid) is passed through the tubing (detector).	Detector is out of adjustment or the tubing is coated or dirty, replace if necessary.
	The DETECTOR LED is sometimes illuminated when fluid is passed through the tubing (detector) and/or sometimes not illuminated when air is passed through the tubing (detector).	Detector is dirty or faulty.
	When the mode is set to LATCH, the Detector Indicator remains illuminated after the Alarm Reset push button has been pressed.	Detector is out of adjustment.

11.7 SPECIFICATIONS

Input Power Requirements: 100-240V, 1A, 50/60HZ

Relay specifications: 240V AC, 3A
30V DC, 3A

11.8 MODEL NUMBER

The model number provides important information about the specifics of your Controller Module. Refer to this number when calling IVEK Technical support. The model number for your Controller Module is located in the Title Page section of this manual.

520228 - # # #

Detector Style
- **A** – Original, Through Hole Design
- **B** – New Surface Mount Design

Logic Interface, Indicator Colors
- **A** – Relay, Red Power and Red Detector LEDs (Discontinued)
- **B** – Relay, Green Power and Yellow Detector LEDs (Active)

Power Cord
- **A** – Domestic
- **B** – International

11.9 ILLUSTRATED PARTS BREAKDOWN

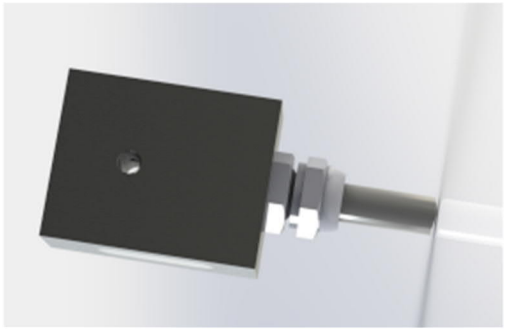
The illustrated parts breakdown (Table 11.2) contains replacement parts for the System.

	PART NUMBER	DESCRIPTION	UNITS PER ASSY
	Liquid Eye Detectors		
	152018-002	Liquid Eye Sensor Fab, Ver 2.0; 1/4” O.D. Tubing	1
	152018-003	Liquid Eye Sensor Fab, Ver 2.0; 3/8” O.D. Tubing	1
	152018-004	Liquid Eye Sensor Fab, Ver 2.0; 7/16” & 11mm O.D. Tubing	1
	152018-005	Liquid Eye Sensor Fab, Ver 2.0; 1/2” & 13mm O.D. Tubing	1
	152018-006	Liquid Eye Sensor Fab, Ver 2.0; 9/16” & 14mm O.D. Tubing	1
	152018-007	Liquid Eye Sensor Fab, Ver 2.0; 3/16” O.D. Tubing	1
	152018-008	Liquid Eye Sensor Fab, Ver 2.0; 5/16” & 8mm O.D. Tubing	1
	152018-009	Liquid Eye Sensor Fab, Ver 2.0; 5/8” & 16mm O.D. Tubing	1
	152018-010	Liquid Eye Sensor Fab, Ver 2.0; 4mm O.D. Tubing	1
	152018-011	Liquid Eye Sensor Fab, Ver 2.0; 6mm O.D. Tubing	1
	152018-012	Liquid Eye Sensor Fab, Ver 2.0; 10mm O.D. Tubing	1
	152018-013	Liquid Eye Sensor Fab, Ver 2.0; 15mm O.D. Tubing	1
	152019-001	Liquid Eye Sensor Fab, Thru Hole; 1/8” Tubing	1
	152019-002	Liquid Eye Sensor Fab, Thru Hole; 3mm Tubing	1
	152019-003	Liquid Eye Sensor Fab, Thru Hole; 1/8” Tubing, 6m Cable	1
	152031-010120	Sensor Mod, Liquid Eye w/ Retainer Cap, Sm Dia. Tub; Alum, 1/8, 2m	1
	152031-010160	Sensor Mod, Liquid Eye w/ Retainer Cap, Sm Dia. Tub; Alum, 1/8, 6m	1
	152034-101	Sensor Module, Liquid Eye, Clamp On, Style B; Alum, 3mm	1
	152034-102	Sensor Module, Liquid Eye, Clamp On, Style B; Alum, 1/8”	1
	152034-103	Sensor Module, Liquid Eye, Clamp On, Style B; Alum, 4mm	1
	152034-104	Sensor Module, Liquid Eye, Clamp On, Style B; Alum, 3/16”	1
	152034-105	Sensor Module, Liquid Eye, Clamp On, Style B; Alum, 6mm	1
	152034-106	Sensor Module, Liquid Eye, Clamp On, Style B; Alum, 1/4”	1
	152034-107	Sensor Module, Liquid Eye, Clamp On, Style B; Alum, 5/16”	1
	152034-108	Sensor Module, Liquid Eye, Clamp On, Style B; Alum, 3/8”	1
	152034-109	Sensor Module, Liquid Eye, Clamp On, Style B; Alum, 10mm	1
	152034-110	Sensor Module, Liquid Eye, Clamp On, Style B; Alum, 7/16”	1
	152034-111	Sensor Module, Liquid Eye, Clamp On, Style B; Alum, 1/2”	1
	152034-201	Sensor Module, Liquid Eye, Clamp On, Style B; Delrin, 3mm	1
	152034-202	Sensor Module, Liquid Eye, Clamp On, Style B; Delrin, 1/8”	1
	152034-203	Sensor Module, Liquid Eye, Clamp On, Style B; Delrin, 4mm	1
	152034-204	Sensor Module, Liquid Eye, Clamp On, Style B; Delrin, 3/16”	1
	152034-205	Sensor Module, Liquid Eye, Clamp On, Style B; Delrin, 6mm	1
	152034-206	Sensor Module, Liquid Eye, Clamp On, Style B; Delrin, 1/4”	1
	152034-207	Sensor Module, Liquid Eye, Clamp On, Style B; Delrin, 5/16”	1
	152034-208	Sensor Module, Liquid Eye, Clamp On, Style B; Delrin, 3/8”	1
	152034-209	Sensor Module, Liquid Eye, Clamp On, Style B; Delrin, 10mm	1
	152034-210	Sensor Module, Liquid Eye, Clamp On, Style B; Delrin, 7/16”	1
	152034-211	Sensor Module, Liquid Eye, Clamp On, Style B; Delrin, 1/2”	1

Table11.2 Liquid Eye Detectors

152018-001 shown

152019-001 shown



152034-001 shown