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**11. MULTIPLE CHANNEL LIQUID EYE SYSTEM**

**11.1 DESCRIPTION**

The IVEK Multiple Channel Liquid Eye System optically detects air and liquids in a translucent fluid line. The Multiple Channel Liquid Eye System electronics can either be stand alone or mounted in a cabinet with other electronics. Typical applications include detecting air bubbles or absence of fluid in a liquid line.

**11.1.1 Front Panel (Figure 11.1)**

The front panel of the Multiple Channel Liquid Eye System is largely made up of the individual front panels of the master board plug-in and the channel board plug-ins.

**11.1.1.1 Master Board Front Panel**

Functions on the master board front panel apply to all channels.

**RESET Switch (Item 1)** - This switch resets the latched fault (fast or slow) of every channel. **NOTE**

Pressing the RESET switch has no effect in Continuous mode. In Fast mode, the RESET switch will reset the latched fault only if fluid is being detected. In Slow mode, the RESET switch will reset the latched fault if either fluid or air is being detected.

**FAULT Indicator (red) (Item 2)** - When any one or more channels detect a fault condition, this LED turns on.

**AUDIBLE ALARM Switch (Item 3)** – This switch is used to turn off the audible alarm. Refer to section 11.2.7 for additional information.

**POWER Indicator (green) (Item 4)** - When +5VDC is being supplied to the board this LED turns on.

**11.1.1.2 Liquid Eye Channel Front Panel**

Functions on each channel front panel only apply to the liquid eye detector connected to that channel.

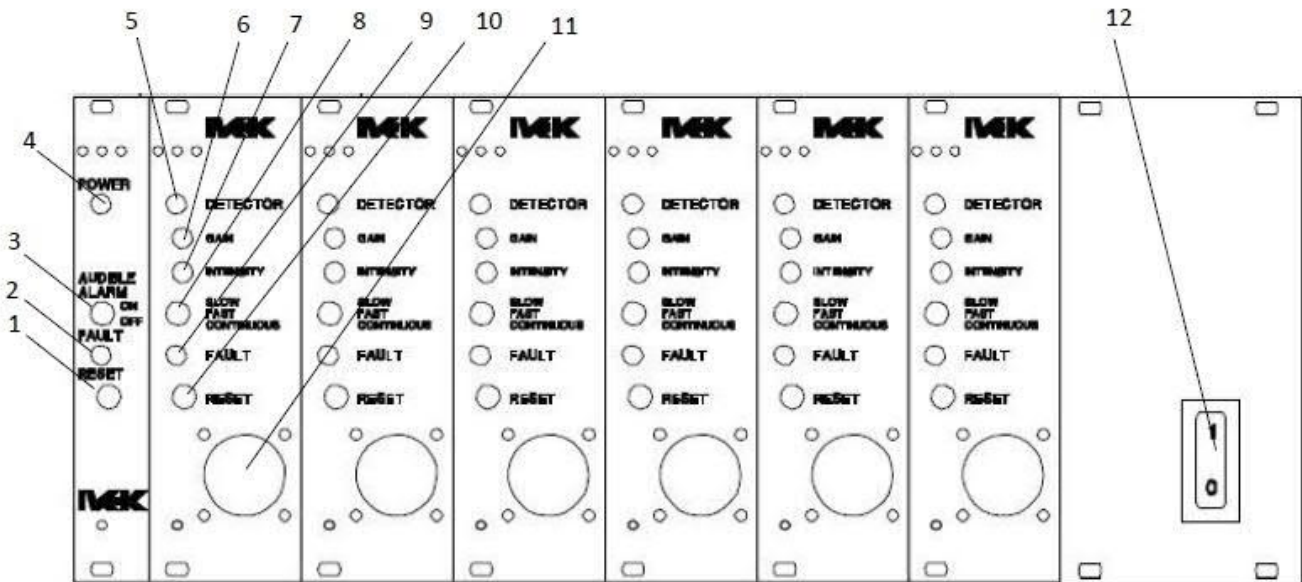


Figure 11.1 Multiple Liquid Eye Front Panel (Model # 520174-##### shown for reference)

**DETECTOR Indicator (red) (Item 5)** - When the liquid eye detector detects air, the DETECTOR LED is on. When the liquid eye detector detects liquid, the DETECTOR LED is off.

**GAIN Potentiometer (Item 6)** - The potentiometer adjusts the sensitivity of the liquid eye detector. This allows the liquid eye detector to be used for a variety of fluids and tube diameters.

**Intensity Adjustment (Item 7)** -The INTENSITY potentiometer adjusts the intensity of the liquid eye LED. This allows the liquid eye detector to be used for a variety of fluids and tube diameters.

**SLOW/FAST/CONT Switch (Item 8)** - This switch selects the fault circuit operating mode. The three switch settings are SLOW, FAST and CONT (continuous). SLOW and FAST latch the fault indicator on when air is present. CONT turns the fault indicator on when air is present and off when liquid is present. Each channel has a mode switch to allow operating channels in different modes.

**FAULT Indicator (red) (Item 9)** -When a liquid eye detector detects air this LED turns on.

**RESET Switch (Item 10)** - This switch resets a latched fault (fast or slow) for that individual channel.

**NOTE**

Pressing the RESET switch has no effect in Continuous mode. In Fast mode, the RESET switch will reset the latched fault only if fluid is being detected. In Slow mode, the RESET switch will reset the latched fault if either fluid or air is being detected.

**Liquid Eye Detector Connector (Item 11)** - A 4-pin female circular plastic connector for the liquid eye detector cable. For Model numbers 520174, 520176 and 520178 the connector is on the front panel. For part numbers 520182, 520184 and 520172 the connector is on the rear panel.

**11.1.1.3 Power Switch (Item 12)**

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.

**11.1.2 Rear Panel (Figure 11.2)**

The rear panel contains the Power Entry module, Fault Output terminal block, System Logic I/O connector and the Channel Fault Outputs connector.

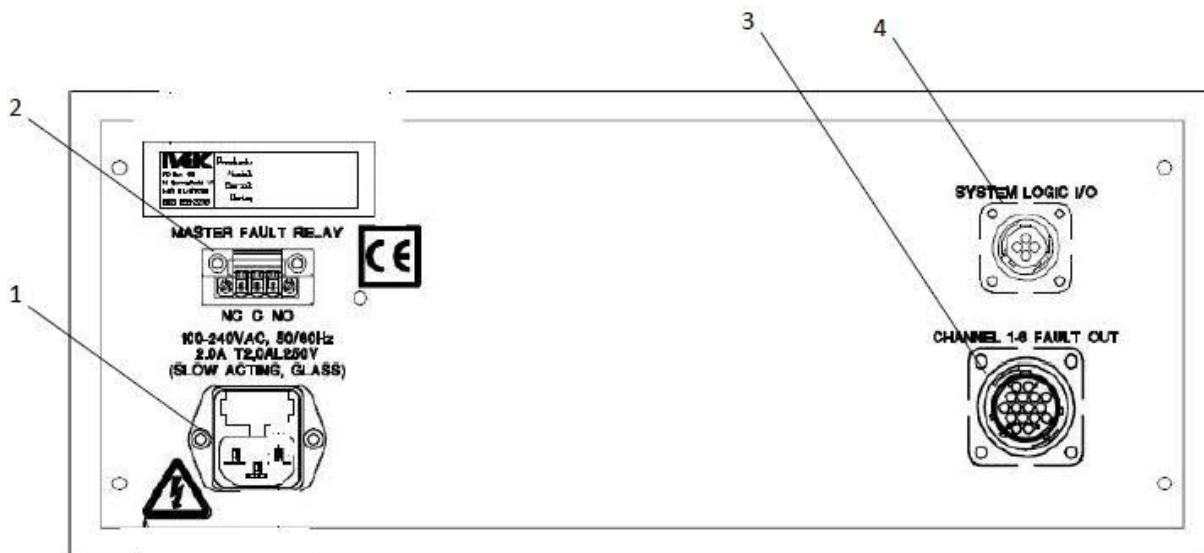


Figure 11.2 Multiple Liquid Eye Rear Panel (Model # 520174-#### shown for reference)

### 11.1.2.1 Power Entry Module (Item 1)

The power entry module contains a receptacle for a standard IEC power cord, fuse holder and fuses.

The design of the power entry module requires the line cord be disconnected before the line fuse is removed. Refer to the Title Page section for fuse information.

### 11.1.2.2 FAULT OUTPUT Terminal Block (Item 2)

This terminal strip has three screw terminals (NO, C, NC) used to monitor the fault status of the Liquid Eye Detector. The terminal block provides NO (normally open) and NC (normally closed) for external interfacing. When a fault is detected, NC contacts open and NO contacts close.

### 11.1.2.3 CHANNEL FAULT OUTPUTS Connector (Item 3)

Refer to Section 11.4.2 for a description of this option.

### 11.1.2.4 SYSTEM LOGIC I/O Connector (Item 4)

The System Logic I/O connector (Amp Series One CPC 4-pin) is used for making the electrical connection to the PLC Interface Device.

## 11.2 OPERATION

As a system, the Multiple Liquid Eye is capable of generating a single fault for multiple fluid lines. The compact modular design makes quick troubleshooting and repair possible.

Some of the Multiple Liquid Eye features are:

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

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

### 11.2.1 System Logic Interface

The System Logic interface provides connections between the Controller Module and the customer's PLC. Reset In and Fault Out signals are communicated to and from the PLC.

#### 11.2.1.1 Signal Functions

**Master Reset In** -The 'Master Reset In' signal resets the fault latches (fast or slow) of every channel. A voltage must be applied to this input to cause a reset.

**Liquid Eye Fault Out** -The 'Liquid Eye Fault Out' signal indicates that a fault has been detected in the operation of a Liquid Eye Detector. This output is complemented, i.e., the output is true when no fault exists on any channel and is false when one or more channels are faulted.

#### 11.2.1.2 Signal Levels

All signals are optically isolated. The power for all signals is provided by the customer's equipment. All inputs accept a 24 VDC signal and require 20 mA.

All outputs conduct when the signal is 'true' and do not conduct when the signal is 'false' (see FAULT OUT). Outputs can switch a signal of up to 24 VDC and 50 mA. The output consists of the emitter and collector connections to an IC opto-isolator.

**11.2.1.3 Connections**

All connections are through a 4-pin circular plastic connector, with the mating connector (630029-F04), backshell (630025-SI 1) and pins (630023-F04) supplied with the unit. Order Part number 540109 to receive all three items as a kit. Table 11.1 shows the connector pin layout.

**Table 11.1 PLC Interface**

<b>PIN</b>	<b>SIGNAL</b>
<b>1</b>	MASTER RESET IN +
<b>2</b>	MASTER RESET IN -
<b>3</b>	LIQUID EYE FAULT OUT+
<b>4</b>	LIQUID EYE FAULTOUT -

**11.2.2 Detector**

The detector, which is approximately one inch square and three eighths of an inch thick with an attached electrical cable, is used to sense the presence of air and liquid in translucent fluid tubing. One detector exists for each fluid tubing location being monitored. The proper size detector must be used for 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 fault indications.

If the tubing size needs to be changed or the liquid changes, the detector must be replaced with one of the proper size and the procedure in section 11.3.3 Sensitivity Adjustment should be repeated.

**NOTE**

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

**11.2.3 Controller**

The controller consists of an enclosure containing a card cage which holds one master plug-in and one or more channel plug-ins. The master plug-in contains circuitry to generate the system fault outputs and system reset signals. The channel plug-ins each control one liquid eye detector, provide sensitivity adjustment and operational control for that liquid eye detector.

**11.2.4 Modes of Operations**

The Multiple Liquid Eye system provides three fault modes of operation: Slow Latch, Fast Latch and Continuous.

**11.2.4.1 Slow Latch**

While in this mode, a fault condition occurs when air is sensed by the detector for 5 seconds or more. Once the fault occurs, the output is latched as a fault and will remain a fault until 'reset' by either the channel or the master. In this mode, the fault can be reset with the detector sensing either fluid or air. This mode is particularly useful when it is not necessary to detect small bubbles.

**11.2.4.2 Fast Latch**

Similar to the slow latch in that, once air is sensed, the output is latched as a fault, but in this mode any air sensed by the detector will cause a fault condition to occur and will remain a fault until 'reset' by either the channel or the master. In this mode, the fault can only be reset with the detector sensing fluid. This mode is useful when it is necessary to detect small bubbles.

**11.2.4.3 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 either the channel or master board resets.

**11.2.5 Channel Disable**

A channel enable/disable switch was not designed into this product in order to prevent accidentally disabling a monitoring system. An individual channel may be disabled in one of two ways:

1. Satisfy the detector by using a piece of tubing filled with the fluid or by doubling the detector onto the tubing of another channel being used.
2. Turn the power off. Disconnect the detector at the controller and plug a "LIQUID EYE BYPASS" in its place (available from IVEK).

**11.2.6 Individual Channel Fault**

Individual Channel Fault outputs are used to monitor the fault status of the individual Liquid Eye Detectors. The 'Channel Fault Out' signal indicates that a fault has been detected in the operation of an Liquid Eye Detector.

**11.2.6.1 Signal Levels**

All signals are optically isolated. The power for all signals is provided by the customer's equipment.

All outputs conduct when the signal is 'true' and do not conduct when the signal is 'false' (see FAULT OUT). Outputs can switch a signal of up to 24 VDC and 50 m A. The output consists of the emitter and collector connections to an IC opto-isolator.

**11.2.6.2 Connections**

All connections are through a circular plastic connector, with the mating connector, backshell, pins, and key supplied with the unit. Table 11.2 shows the connector pin layout for the standard models. Refer to Chapter 12 if your Model No. is not listed here.

**Table 11.2 Individual Channel Fault**

**Model No. 520174**

<b>PIN</b>	<b>SIGNAL</b>	<b>PIN</b>	<b>SIGNAL</b>
1	CH 1 FAULT +	9	CH 5 FAULT +
2	CH 1 FAULT -	10	CH 5 FAULT -
3	CH 2 FAULT +	11	CH 6 FAULT +
4	CH 2 FAULT -	12	CH 6 FAULT -
5	CH 3 FAULT +	13	Not Used
6	CH 3 FAULT -	14	Not Used
7	CH 4 FAULT +	15	Not Used
8	CH 4 FAULT -	16	Not Used

**Model No.'s 520176 and 520182**

<b>PIN</b>	<b>SIGNAL</b>	<b>PIN</b>	<b>SIGNAL</b>
1	CH 1 FAULT +	13	CH 7 FAULT +
2	CH 1 FAULT -	14	CH 7 FAULT -
3	CH 2 FAULT +	15	CH 8 FAULT +
4	CH 2 FAULT -	16	CH 8 FAULT -
5	CH 3 FAULT +	17	CH 9 FAULT +
6	CH 3 FAULT -	18	CH 9 FAULT -
7	CH 4 FAULT +	19	CH 10 FAULT +
8	CH 4 FAULT -	20	CH 10 FAULT -
9	CH 5 FAULT +	21	CH 11 FAULT +
10	CH 5 FAULT -	22	CH 11 FAULT -
11	CH 6 FAULT +	23	CH 12 FAULT +
12	CH 6 FAULT -	24	CH 12 FAULT -

**Model No.'s 520178 and 5820184 use 2 connectors and Module No. 520172 uses 4 connectors**

<b>PIN</b>	<b>SIGNAL</b>	<b>PIN</b>	<b>SIGNAL</b>
1	CH 1 FAULT +	13	CH 7 FAULT +
2	CH 1 FAULT -	14	CH 7 FAULT -
3	CH 2 FAULT +	15	CH 8 FAULT +
4	CH 2 FAULT -	16	CH 8 FAULT -
5	CH 3 FAULT +	17	CH 9 FAULT +
6	CH 3 FAULT -	18	CH 9 FAULT -
7	CH 4 FAULT +	19	CH 10 FAULT +
8	CH 4 FAULT -	20	CH 10 FAULT -
9	CH 5 FAULT +	21	Not Used
10	CH 5 FAULT -	22	Not Used
11	CH 6 FAULT +	23	Not Used
12	CH 6 FAULT -	24	Not Used

<b>PIN</b>	<b>SIGNAL</b>	<b>PIN</b>	<b>SIGNAL</b>
1	CH 11 FAULT +	13	CH 17 FAULT +
2	CH 11 FAULT -	14	CH 17 FAULT -
3	CH 12 FAULT +	15	CH 18 FAULT +
4	CH 12 FAULT -	16	CH 18 FAULT -
5	CH 13 FAULT +	17	CH 19 FAULT +
6	CH 13 FAULT -	18	CH 19 FAULT -
7	CH 14 FAULT +	19	CH 20 FAULT +
8	CH 14 FAULT -	20	CH 20 FAULT -
9	CH 15 FAULT +	21	Not Used
10	CH 15 FAULT -	22	Not Used
11	CH 16 FAULT +	23	Not Used
12	CH 16 FAULT -	24	Not Used

<b>PIN</b>	<b>SIGNAL</b>	<b>PIN</b>	<b>SIGNAL</b>
1	CH 21 FAULT +	13	CH 27 FAULT +
2	CH 21 FAULT -	14	CH 27 FAULT -
3	CH 22 FAULT +	15	CH 28 FAULT +
4	CH 22 FAULT -	16	CH 28 FAULT -
5	CH 23 FAULT +	17	CH 29 FAULT +
6	CH 23 FAULT -	18	CH 29 FAULT -
7	CH 24 FAULT +	19	CH 30 FAULT +
8	CH 24 FAULT -	20	CH 30 FAULT -
9	CH 25 FAULT +	21	Not Used
10	CH 25 FAULT -	22	Not Used
11	CH 26 FAULT +	23	Not Used
12	CH 26 FAULT -	24	Not Used

<b>PIN</b>	<b>SIGNAL</b>	<b>PIN</b>	<b>SIGNAL</b>
1	CH 31 FAULT +	13	CH 37 FAULT +
2	CH 31 FAULT -	14	CH 37 FAULT -
3	CH 32 FAULT +	15	CH 38 FAULT +
4	CH 32 FAULT -	16	CH 38 FAULT -
5	CH 33 FAULT +	17	CH 39 FAULT +
6	CH 33 FAULT -	18	CH 39 FAULT -
7	CH 34 FAULT +	19	CH 40 FAULT +
8	CH 34 FAULT -	20	CH 40 FAULT -
9	CH 35 FAULT +	21	Not Used
10	CH 35 FAULT -	22	Not Used
11	CH 36 FAULT +	23	Not Used
12	CH 36 FAULT -	24	Not Used

**Not all pins are used on all models. The connector is populated up to the capacity of the Controller Module which may be greater than the number of installed Channel Plug-ins.**

**11.2.7 Audible Alarm**

An audible alarm will sound any time a channel board has a fault. This is used to signal the operator there is air in a line. A DISABLE switch located on the Master Eurocard is provided to disable the audible alarm.

**11.3 INSTALLATION**

**11.3.1 Controller**

Place the system power switch in the OFF position.

Verify that all Plug-ins are pushed into the receiving back connectors and secured with the front panel screws.

Plug the connectors of each detector into the connector receptacles on the multiple liquid eye channels.

**11.3.2 Detector**

Place the detector on the tubing in the desired location. If used in conjunction with IVEK systems it should usually be on the discharge side of the pump.

**11.3.3 Sensitivity Adjustment**

**11.3.3.1 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.

**11.3.3.2 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 to 4 inches of tubing with an outside diameter slightly larger than the inside diameter of the System tubing.

**11.3.3.3 Switch Settings**

1. Switch the System power switch to "ON".
2. Switch the ALARM MODE CONT/LATCH switch to the CONT position.



### 11.3.3.4 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.

1. Turn the INTENSITY potentiometer fully clockwise, then, counterclockwise twelve full turns.
2. 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.
3. 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.
4. 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.
5. 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.
6. If steps 1 -7 fail to yield correct results; Turn the INTENSITY potentiometer clockwise to the end, then, counterclockwise twelve full turns.
7. Pass fluid in front of the detector.
8. Turn the GAIN potentiometer counterclockwise until the detector indicator is not illuminated.
9. Repeat step 7.

#### NOTE

If for some reason, one or more of the conditions above cannot be duplicated, see section 11.5 Problem Guide.

## 11.4 MAINTENANCE

### 11.4.1 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.

### 11.4.2 Assembly/Disassembly

The Multiple Liquid Eye contains the following replaceable parts:

- Master Board Plug-in
- Channel Board Plug-in
- Liquid Eye Detector
- Main Power Fuse

#### WARNING

Ensure power is off prior to replacing any parts.

### 11.4.2.1 Master Board Plug-in

Disassembly

1. Loosen two captive screws securing the master board Plug-in to the chassis.
2. Grab the handle and slide the master board straight out.

**Assembly**

1. Slide the master board Plug-in into the chassis making sure it goes into the rear connector. Secure with the two captive screws.

**11.4.2.2 Channel Board Plug-in****Disassembly**

1. Remove the liquid eye detector cable from the connector.
2. Loosen two captive screws securing the channel board plug-in to the chassis.
3. Grab the handle and slide the channel board plug-in straight out.

**Assembly**

1. Slide the channel board plug-in into the chassis making sure it goes into the rear connector. Secure with the two captive screws.
2. Connect the liquid eye detector cable to the connector.

**11.4.2.3 Liquid Eye Detector****Disassembly**

1. Remove the liquid eye detector cable from the channel board connector.
2. Slide the tubing through the liquid eye detector.

**WARNING**

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

**Assembly**

1. Slide the tubing through the liquid eye detector.
2. Connect the liquid eye detector cable to the channel board connector.

**11.4.2.4 Main Power Fuses**

The main power fuses located in the Power Entry Module on the rear panel are replaceable. The proper fuse value is described in the Title Page section of this manual.

**Disassembly**

1. Remove the power cord.
2. Using a small flat blade screwdriver, open the power entry module's cover.
3. Slide the fuse tray out and remove the fuses.

**Assembly**

1. Install the new fuses into the fuse tray and slide the tray in. The covered side on the fuse holder should be up.
2. Close the power entry module's cover.
3. Connect the power cord.

**11.5 PROBLEM GUIDE**

Refer to Table 11.3 for a list of possible problems and solutions.

Table 11.3 Common Operational Problems And Solutions

PROBLEM	PROBABLE CAUSE	POSSIBLE SOLUTION
The POWER Indicator is not illuminated when the system power is turned "ON".	AC power may be absent or inadequate. Unit not plugged in.  Fuse is blown.	Ensure AC power cord is plugged into a properly grounded outlet.  Unplug main power cord from outlet. Remove, check and replace.
Unable to adjust detector.	The DETECTOR Indicator is always (or never) illuminated regardless of which material (air or fluid) is passed through the tubing (detector).  The DETECTOR Indicator 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 out of adjustment.  Detector is dirty or faulty.
Unable to adjust detector.	When the mode is set to FAST, the Channel FAULT Indicator remains illuminated after the Channel FAULT Reset push button has been pressed.  When the mode is set to FAST and there is fluid in the tubing (detector), the Channel FAULT Indicator remains illuminated after the Channel FAULT Reset push button has been pressed.	Detector is out of adjustment.  Detector is dirty or faulty.

11.6 SPECIFICATIONS

Reset in Voltage Requirements: +24 VDC @ 20mA max  
Held active for 100msec

Input Power Requirements: 100 -240 VAC 50/60Hz

Fault Relay Output: 240 VAC, 3A, 30 VDC, 3A

**11.7 MODEL NUMBER**

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

**Front Panel Liquid Eye Connector**

1 - 6	Channel Enclosure	520174 -	#	##	#	#
7 - 10	Channel Enclosure	520176 -	#	##	#	#
11 - 20	Channel Enclosure	520178 -	#	##	#	#

**Rear Panel Liquid Eye Connector**

1 - 12	Channel Enclosure	520182 -	#	##	#	#
13 - 20	Channel Enclosure	520184 -	#	##	#	#
21 - 40	Channel Enclosure	520172 -	#	##	#	#

**Liquid Eye Sensor (Setup)**

J - All

**Number of Installed Channels**

01 - 40

**Interface**

G - Standard I/O, Source/Sink

**Line Cord & Agency Approval**

E - North American Power Cord  
 F - International Power Cord

**11.8 ILLUSTRATED PARTS BREAKDOWN**

The illustrated parts breakdown (Figure 11.3) contains replacement parts for the Multiple Channel Liquid Eye System.

INDEX NO.	PART NUMBER	DESCRIPTION	UNITS PER ASSY
		Multiple Channel Liquid Eye System	1
1*	500182-01	PCB Plug-In, Liquid Eye, Multiple, Master, 4HP, Standard	1
2	500183-02	PCB Plug-In, Liquid Eye, Multiple Chan, Conn; 8HP, Front Panel Connector	X
NS	500183-01	PCB Plug-In, Liquid Eye, Multiple Chan, Conn; 4HP, RR Connector	X
NS	152018-002	Liquid Eye Sensor Fab, Ver 2.0; 1/4" O.D. Tubing	X
NS	152018-003	Liquid Eye Sensor Fab, Ver 2.0; 3/8" O.D. Tubing	X
NS	152018-004	Liquid Eye Sensor Fab, Ver 2.0; 7/16" & 11mm O.D. Tubing	X
NS	152018-005	Liquid Eye Sensor Fab, Ver 2.0; 1/2" & 13mm O.D. Tubing	X
NS	152018-006	Liquid Eye Sensor Fab, Ver 2.0; 9/16" & 14mm O.D. Tubing	X
NS	152018-007	Liquid Eye Sensor Fab, Ver 2.0; 3/16" O.D. Tubing	X
NS	152018-008	Liquid Eye Sensor Fab, Ver 2.0; 5/16" & 8mm O.D. Tubing	X
NS	152018-009	Liquid Eye Sensor Fab, Ver 2.0; 5/8" & 16mm O.D. Tubing	X
NS	152018-010	Liquid Eye Sensor Fab, Ver 2.0; 4mm O.D. Tubing	X
NS	152018-011	Liquid Eye Sensor Fab, Ver 2.0; 6mm O.D. Tubing	X
NS	152018-012	Liquid Eye Sensor Fab, Ver 2.0; 10mm O.D. Tubing	X
NS	152018-013	Liquid Eye Sensor Fab, Ver 2.0; 15mm O.D. Tubing	X
NS	152019-001	Liquid Eye Sensor Fab, Thru Hole; 1/8" Tubing	X
NS	152019-002	Liquid Eye Sensor Fab, Thru Hole; 3mm Tubing	X
NS	152019-003	Liquid Eye Sensor Fab, Thru Hole; 1/8" Tubing, 6m Cable	X
NS	152031-010120	Sensor Mod, Liquid Eye w/ Retainer Cap, Sm Dia. Tub; Alum, 1/8, 2m	X
NS	152031-010160	Sensor Mod, Liquid Eye w/ Retainer Cap, Sm Dia. Tub; Alum, 1/8, 6m	X
NS	152034-101	Sensor Module, Liquid Eye, Clamp On, Style B; Alum, 3mm	X
NS	152034-102	Sensor Module, Liquid Eye, Clamp On, Style B; Alum, 1/8"	X
NS	152034-103	Sensor Module, Liquid Eye, Clamp On, Style B; Alum, 4mm	X
NS	152034-104	Sensor Module, Liquid Eye, Clamp On, Style B; Alum, 3/16"	X
NS	152034-105	Sensor Module, Liquid Eye, Clamp On, Style B; Alum, 6mm	X
NS	152034-106	Sensor Module, Liquid Eye, Clamp On, Style B; Alum, 1/4"	X
NS	152034-107	Sensor Module, Liquid Eye, Clamp On, Style B; Alum, 5/16"	X
NS	152034-108	Sensor Module, Liquid Eye, Clamp On, Style B; Alum, 3/8"	X
NS	152034-109	Sensor Module, Liquid Eye, Clamp On, Style B; Alum, 10mm	X
NS	152034-110	Sensor Module, Liquid Eye, Clamp On, Style B; Alum, 7/16"	X
NS	152034-111	Sensor Module, Liquid Eye, Clamp On, Style B; Alum, 1/2"	X
NS	152034-201	Sensor Module, Liquid Eye, Clamp On, Style B; Delrin, 3mm	X
NS	152034-202	Sensor Module, Liquid Eye, Clamp On, Style B; Delrin, 1/8"	X
NS	152034-203	Sensor Module, Liquid Eye, Clamp On, Style B; Delrin, 4mm	X
NS	152034-204	Sensor Module, Liquid Eye, Clamp On, Style B; Delrin, 3/16"	X
NS	152034-205	Sensor Module, Liquid Eye, Clamp On, Style B; Delrin, 6mm	X
NS	152034-206	Sensor Module, Liquid Eye, Clamp On, Style B; Delrin, 1/4"	X
NS	152034-207	Sensor Module, Liquid Eye, Clamp On, Style B; Delrin, 5/16"	X
NS	152034-208	Sensor Module, Liquid Eye, Clamp On, Style B; Delrin, 3/8"	X
NS	152034-209	Sensor Module, Liquid Eye, Clamp On, Style B; Delrin, 10mm	X

Figure 11.3 Multiple Liquid Eye (Sheet 1 of 2)

NS	152034-210	Sensor Module, Liquid Eye, Clamp On, Style B; Delrin, 7/16"	X
NS	152034-211	Sensor Module, Liquid Eye, Clamp On, Style B; Delrin, 1/2"	X

NS = Not Shown

\*Replace 500095-1 Master Card in older systems with 500182-02 for compatibility with Fault Relay output.

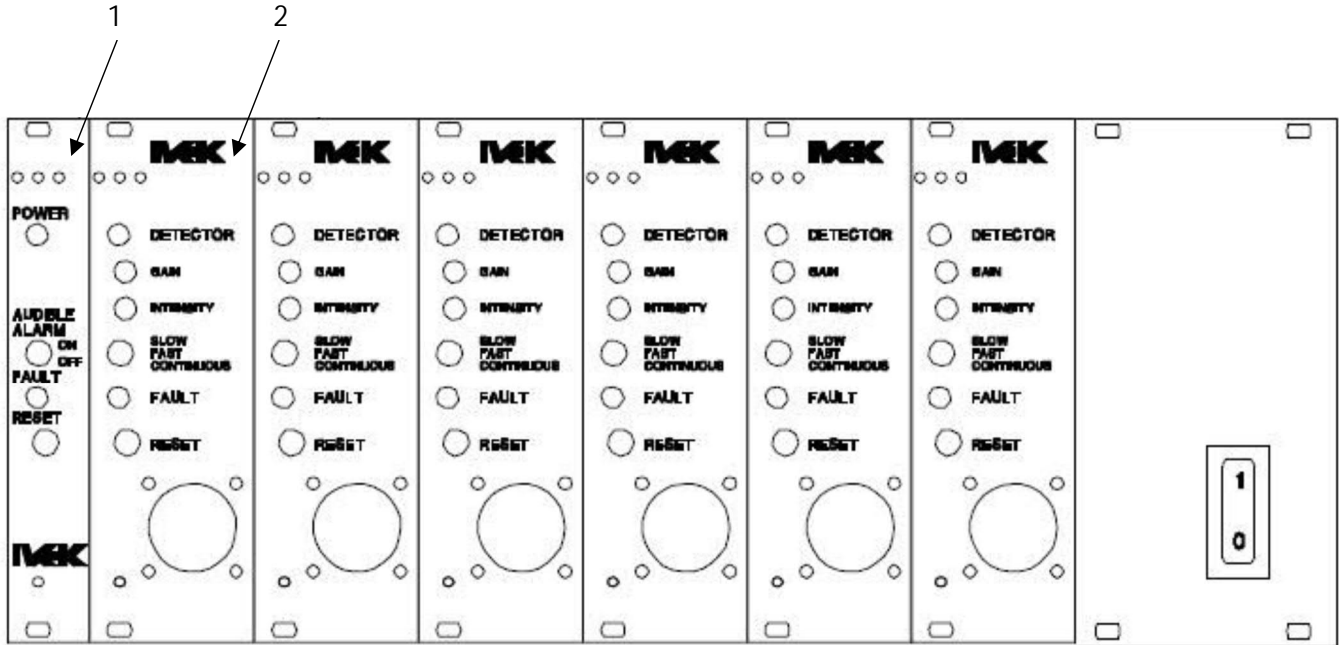


Figure 11.3 Multiple Liquid Eye (Sheet 2 of 2)