Table Of Contents

5. LF MULTIPLEX ACTUATOR MODULE

5.1 DESCRIPTION

The LF Multiplex Actuator Module, hereafter referred to as the Actuator Module, contains the mechanisms for controlling the rotary and linear motion of the Pump Module. The dimensions are different for each of the three configurations. Following is a chart of the dimensions for each configuration:

Size	Width	Depth	Height
8 Channel	494mm (19.4")	230mm (9.1")	410mm (16.1")
10 Channel	578mm (22.8")	230mm (9.1")	410mm (16.1")
12 Channel	662mm (26.1")	230mm (9.1")	410mm (16.1")

WARNING

Never remove or open a safety cover while the Actuator Module is running. Moving parts are located under these covers. Physical harm to individuals is possible.

5.1.1 Front (Figure 5.1)

The front of the Actuator Module contains the upper and lower guards, and piston and valve holders.

5.1.1.1 Piston Holder

The slide assembly holds the pistons in place. Access to the piston is via a slide door located on the slide assembly.

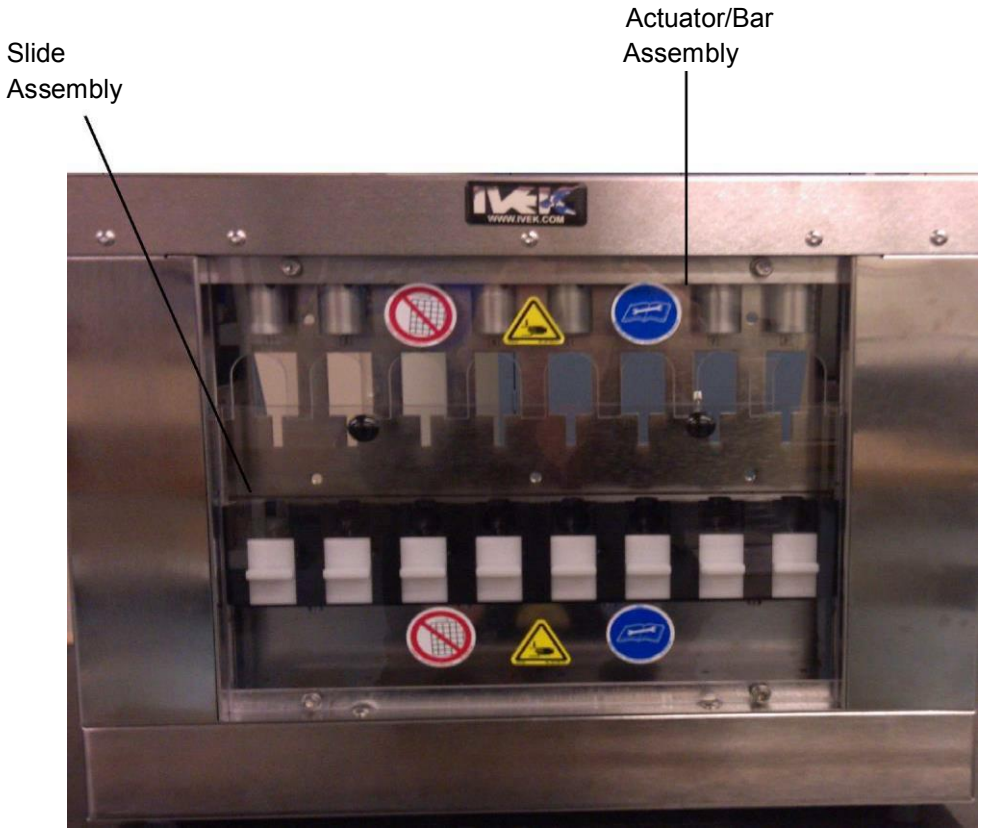


Figure 5.1 Actuator Module Front Valve Holder

The actuator/bar assembly provides the rotary motion to the valve.

5.1.1.3 Guards

The guards cover the moving parts of the Actuator Module.

WARNING

Do not remove the guards during operation of the Actuator Module.

5.1.2 Rear (Figure 5.2)

The rear of the Actuator Module contains motor, control and air connectors. Each connector must have the corrosponding cable attached to ensure proper operation of the Actuator Module.

5.1.2.1 Air Connector (Item 1)

The air connector provides a connection point from the main air line. The air input provides air to the rotary actuators. Refer to section 5.2.3 for air specification.

5.1.2.2 Motor Connector (Item 2)

This is a 16-pin connector used to connect to the Controller Module. The motor provides linear motion for the Pump Modules. This connector provides both power and feedback to and from the motor.

5.1.2.3 Control Connector (Item 3)

The Actuator Module has one or two 28-pin connectors to connect the Controller Module for controlling and sensing the movement of the piston holder. Control A connector is used for Pump Modules 1 through 8 and the linear position sensors. Control B Connector is used for the remaining Pump Modules.

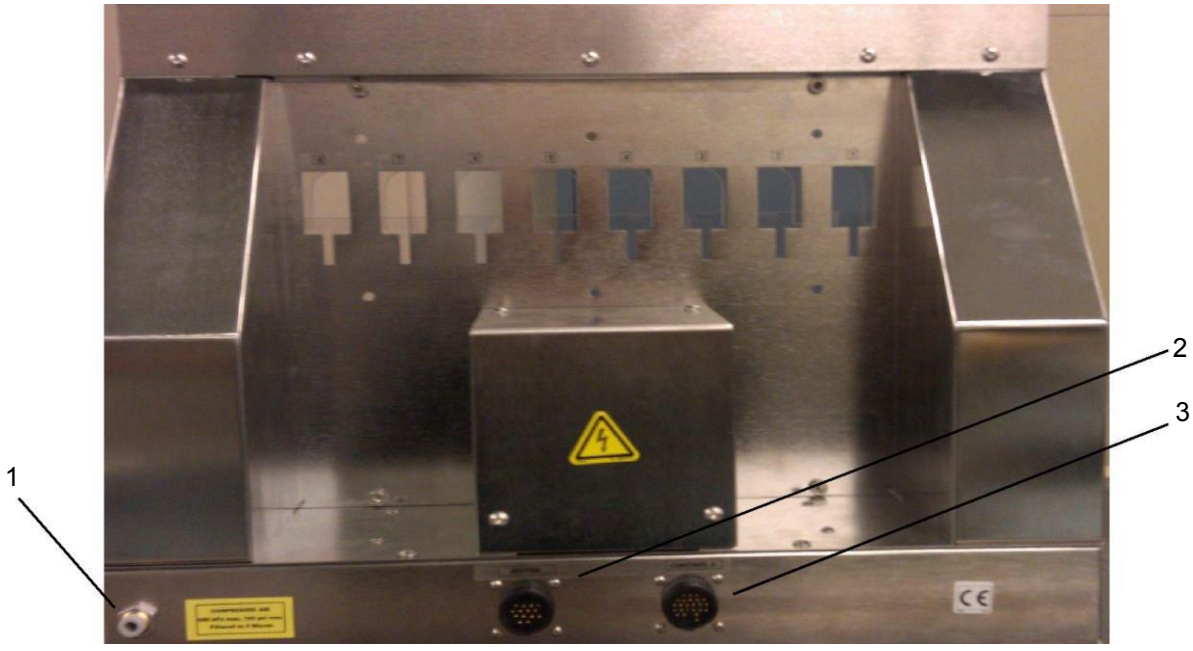


Figure 5.2 Actuator Module Rear

NOTE

Control B connector is not required for the 8 channel Actuator Module.

5.2 OPERATION

The Actuator Module utilizes a pneumatic rotary actuator and motor driven lead screw to produce a controllable linear and rotary motion. A pneumatic rotary actuator controlled by a solenoid valve creates the rotary motion of the ceramic valve. A lead screw, driven by a motor, controls the linear motion of the ceramic piston.

Electronic control over these linear and rotary functions allows a mounted Pump Module to be driven so the linear motion is used to fill or empty the Pump Module and rotary motion is used to valve to the intake and discharge ports.

5.2.1 Rotary Control

A pneumatic rotary actuator and sensor/flag control the rotary motion of the Pump Module's valve. The rotary actuator positions the valve to the intake port during the intake cycle and the discharge port during the discharge cycle. A sensor detects a flag on the rotary actuator indicating the position of the valve.

The Controller Module sends an electronic signal to a solenoid valve sending air into one of two ports on the rotary actuator. While air is entering one port, the other port is venting back through the solenoid valve to allow the rotary actuator to rotate.

The rotary sensor signals the Controller Module when the rotary actuator is in the rotary home or dispense position. The rotary sensor detects problems during rotation of the Pump Module's valve.

Rotational movement is transferred from the rotary actuator's shaft to a coupling. The Pump Module's valve is secured in the coupling. The coupling allows movement of the valve in the cylinder and provides ease of installation and removal.

When power is first applied to the Controller Module or when a fault occurs, the valve needs to be referenced to the home position prior to operation (Refer to Chapter 3).

5.2.2 Linear Control

A lead screw, slide assembly and sensor/flag control the linear motion of the Pump Module's piston. The motor drives a belt which turns a lead screw connected to a slide assembly. The connection of the lead screw to the slide assembly converts the rotary motion to linear motion. The slide assembly controls the linear motion of the Pump Module's pistons. Two sensors detect flags on the slide assembly indicating the status of the slide assembly.

The Controller Module signals the motor for controlling the linear motion of the slide assembly. This linear motion pulls liquid into the cylinder during the intake cycle and forces liquid out of the cylinder during the discharge cycle.

The linear sensors signal the Controller Module when the slide assembly is in the linear home and dispense positions. The linear home sensor detects a piston withdrawn to full chamber capacity. The dispense sensor stops the piston when the chamber has been emptied.

The Pump Module's piston is secured in the slide assembly providing uniform dispense amounts between all the enabled Pump Modules.

When power is first applied to the Controller Module or when a fault occurs, the piston needs to be referenced to the home position prior to operation (Refer to Chapter 3).

5.2.3 Pneumatic Controls

The AIR INPUT connector provides a single connection point for the air. The air feeds the rotary valves. Connect a clean, dry, oil free air line capable of supplying the air requirements described in section 5.7.

CAUTION

Do not exceed 100 PSI (6.9 Bar). Damage to the equipment may result.

5.3 INSTALLATION

General operating practices provide the best guidelines for locating the components of the system. The Actuator Module should be located for ease of use during all phases of operation and maintenance.

Some fluids may be incompatible with the electro-mechanical drive components located below the pumps in the drive area. If spills and leaks cannot be reasonably controlled IVEK recommends laying the Actuator Module on its back to reduce seepage into the drive area. Seepage is known to cause short circuits and belt degradation. IVEK offers horizontal stands for the actuators as follows;

# Channels	Stand Part Number
8	202515-08
10	202515-10
12	202515-12

5.4 OPTIONS

None.

5.5 MAINTENANCE

Periodically inspect the motor belt for wear and check belt tension. Replace the belt if necessary using the procedure described in sections 5.5.3.1.

WARNING

Disconnect the power and air sources from the Multiplex System prior to performing any assembly/disassembly procedures.

5.5.1 Belt Inspection

To inspect the motor belt (Figure 5.3):

1. Remove three cables and the air line from the rear of Actuator Module (1).
2. Remove four screws and four screws with feet securing the bottom cover to Actuator Module (1).
3. Remove three screws (2) securing belt guard (3) to Actuator Module (1).
4. Tilt belt guard (3) down to gain access to belt (7) (it should pivot toward the bottom).
5. Inspect belt (7).
6. Position belt guard (3) on Actuator Module (1) and secure with three screws (2).
7. Position bottom cover on Actuator Module (1) and secure with four screws and four screws with feet.
8. Connect the three cables and air line to the rear of Actuator Module (1).

5.5.2 Belt Tension

To check and adjust the motor belt tension (Figure 5.3):

1. Remove three cables and the air line from the rear of Actuator Module (1).

2. Remove four screws and four screws with feet securing the bottom cover to Actuator Module (1).
3. Remove three screws (2) securing belt guard (3) to Actuator Module (1).
4. Tilt belt guard (3) down to gain access to belt (7) (it should pivot toward the bottom).
5. Check belt (7) tension by moving belt (7) up and down in the area between screws (6). Belt (7) should move approximately +/- 6.4mm (1/4").

CAUTION

Do not press hard on the belt; the outside gears should not pull inward. Damage to the equipment may result.

6. Proceed to step 10 if belt (7) tension is correct.
7. Loosen two screws (6) securing belt tensioner (5) to Actuator Module (1).
8. Place your hand as shown in Figure 5.3 and move belt tensioner (5) upward until you feel tension.
9. Tighten two screw (6). Return to step 5.
10. Position belt guard (3) on Actuator Module (1) and secure with three screws (2).
11. Position bottom cover on Actuator Module (1) and secure with four screws and four screws with feet.
12. Connect the three cables and air line to the rear of Actuator Module (1).

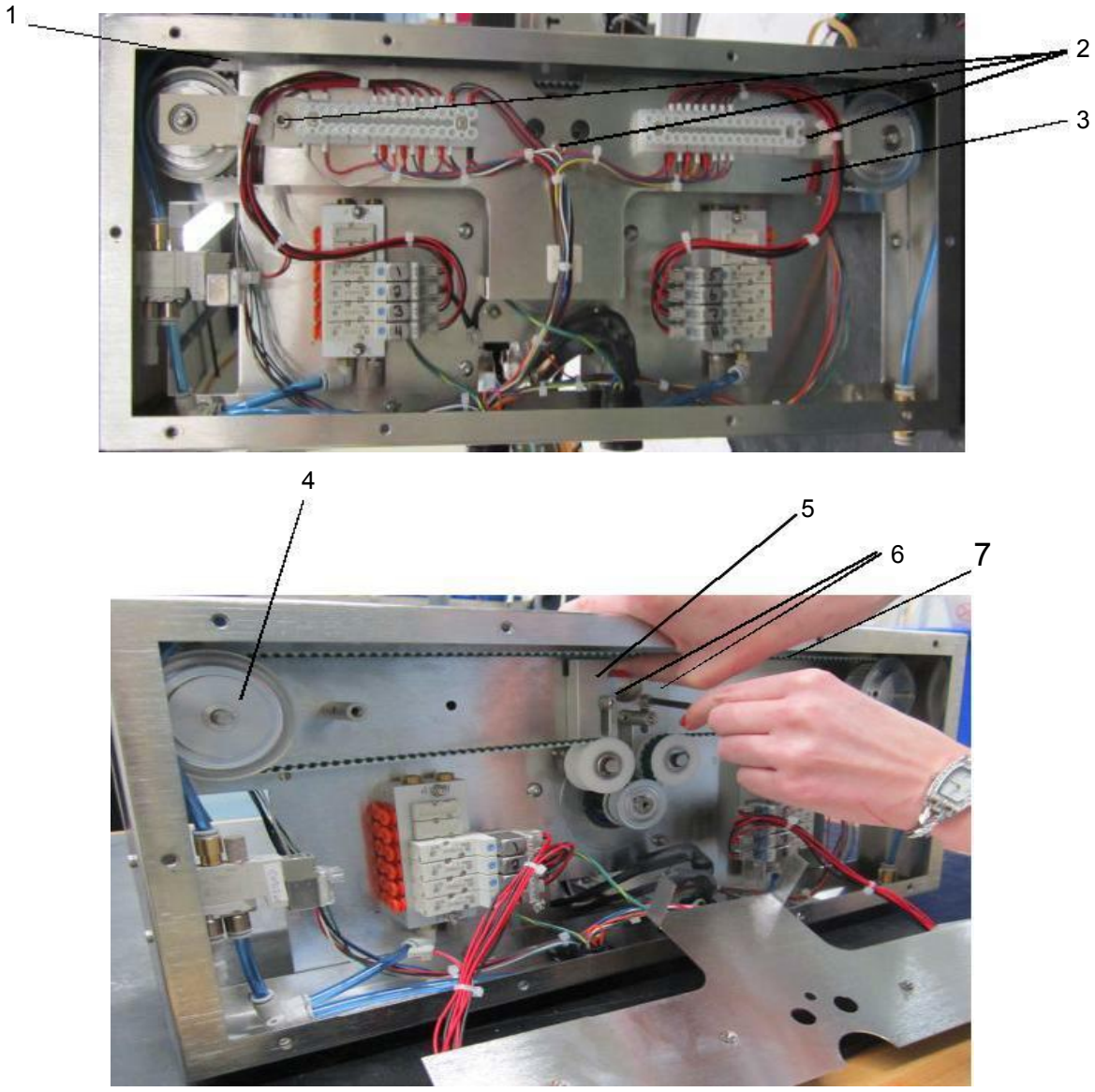


Figure 5.3 Belt Disassembly / Assembly

5.5.3 Assembly/Disassembly Procedures (Figure 5.4)

The Actuator Module contains the following replaceable parts.

- Motor Belt

5.5.3.1 Motor Belt

Disassembly:

WARNING

Disconnect the power and air sources from the Multiplex System prior to performing any assembly/disassembly procedures.

1. Remove three cables and the air line from the rear of Actuator Module (1).
2. Remove four screws and four screws with feet securing the bottom cover to Actuator Module (1).
3. Remove three screws (2) securing belt guard (3) to Actuator Module (1).
4. Tilt belt guard (3) down to gain access to belt (5) (it should pivot toward the bottom).
5. Loosen two screws (7) securing belt tensioner (6) to Actuator Module (1) and slide belt tensioner (6) down.
6. Remove belt (5). (Be very careful not to rotate any of the drive or driven pulleys.)

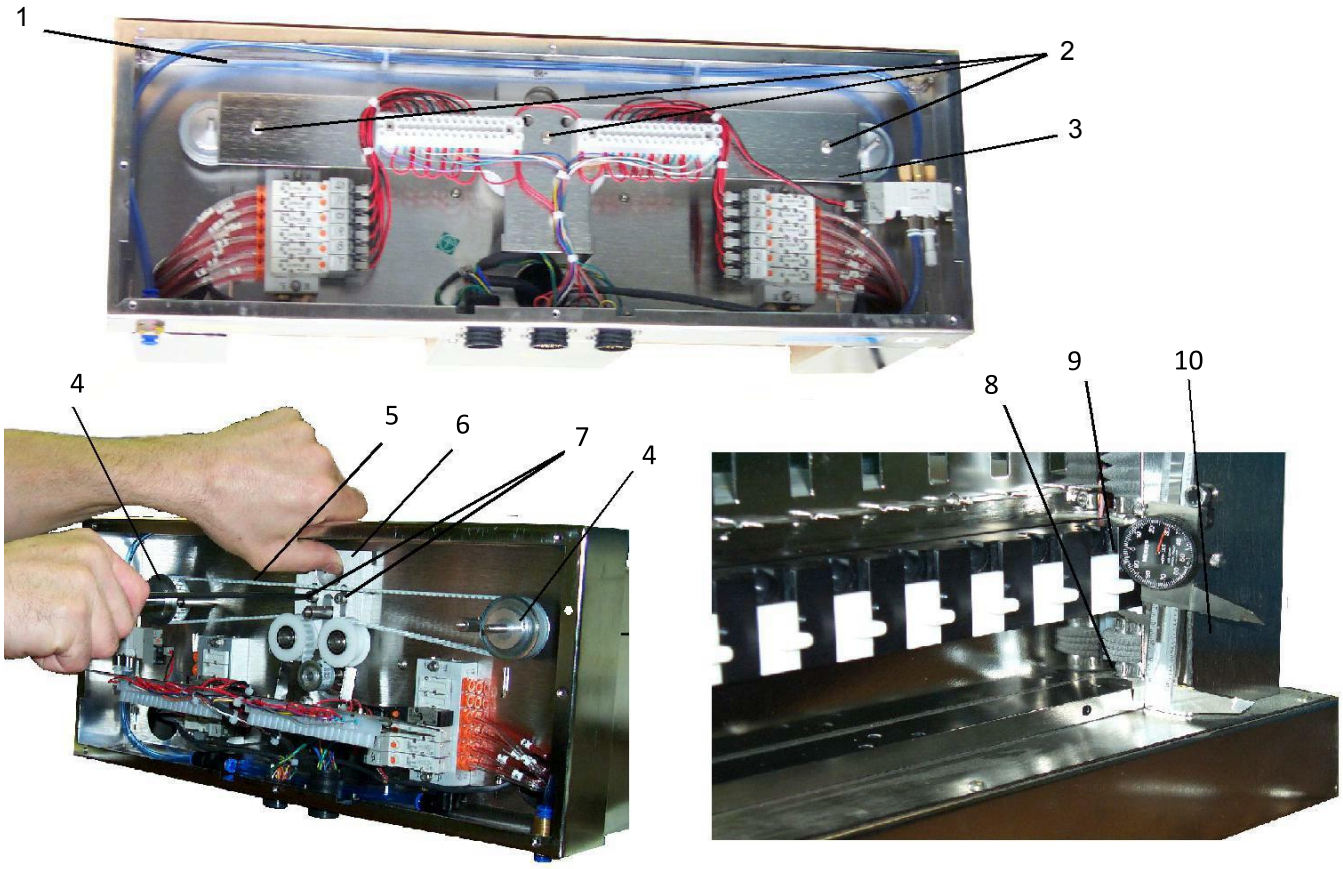


Figure 5.4 Actuator Module Assembly/Disassembly

Assembly:

1. Using calipers (10), measure the left side of Actuator Module (1) between the bottom of slide assemble (9) and plate (8). Record the measurement.
2. Turn the right side belt pulley (4), while measuring the right side of Actuator Module (1) between the bottom of slide assemble (9) and plate (8), until the measurement is the same as recorded in step 1.
3. Position belt (5) over gears (4) then remaining gears as shown in Figure 5.4 trying not to move gears (4).
4. Place your hand as shown in Figure 5.4 and move belt tensioner (6) upward until you feel tension.

5. Check belt (5) tension by moving the belt up and down in the area between screws (7). The belt should move approximately +/- 6.4mm (1/4").

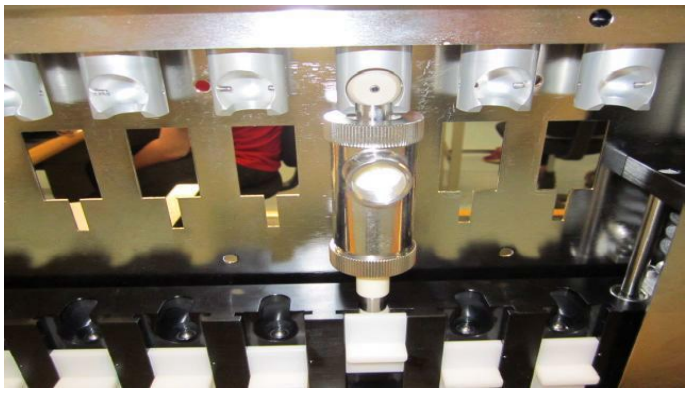
CAUTION

Do not press hard on the belt; the outside gears should not pull inward. Damage to the equipment may result.

6. Tighten two screws (7).
7. Position belt guard (3) on Actuator Module (1) and secure with three screws (2).
8. Position bottom cover on Actuator Module (1) and secure with four screws and four screws with feet.
9. Connect the two/three cables and air line to the rear of Actuator Module (1).

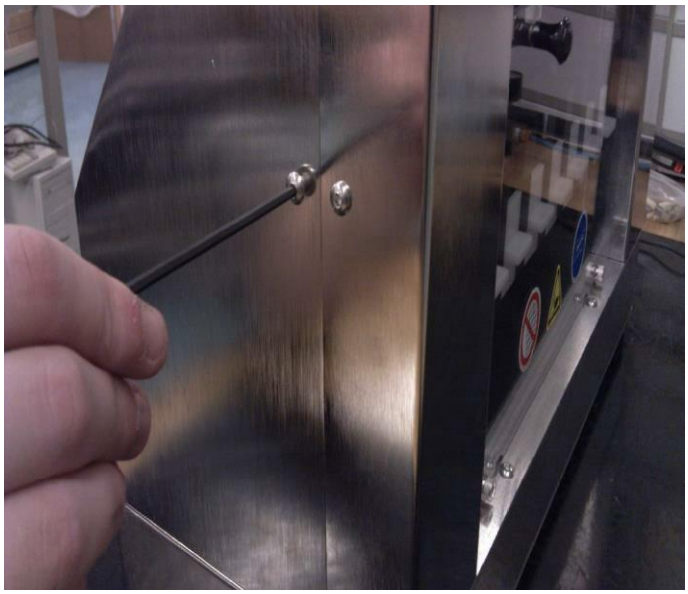
5.5.4 Grease Check Procedure

1. Remove all pump modules according to instruction 7.5.2.1 found in the maintenance section of manual chapter P07L004 (LF Multiplex Pump Module).

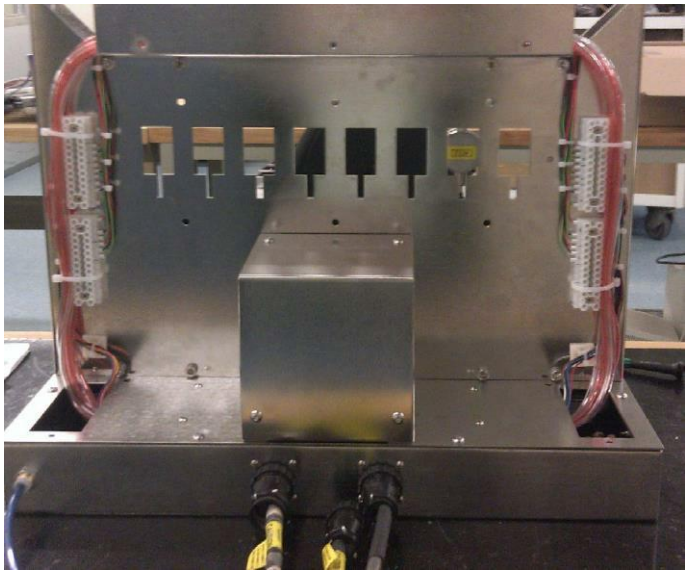


2. Remove a total of 14 screws (front and back) on the Top Cover using a 3mm HEX Wrench and remove Top Cover.

3. Remove a total of 12 screws from left and right side guards and remove guards.



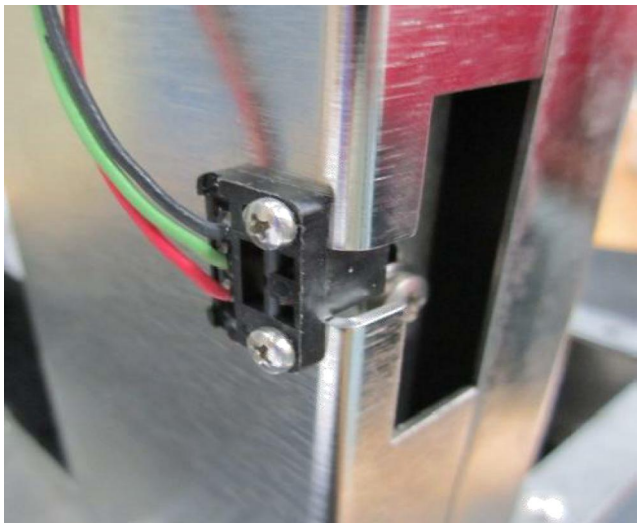
4. Inspect all wiring and tubing on the rear of the assembly to be sure there are no breaks, restrictions or wearing.



5. View each side, inspect the sensors verifying they are clean. Clean with lightly dampened IPA on a cotton swab

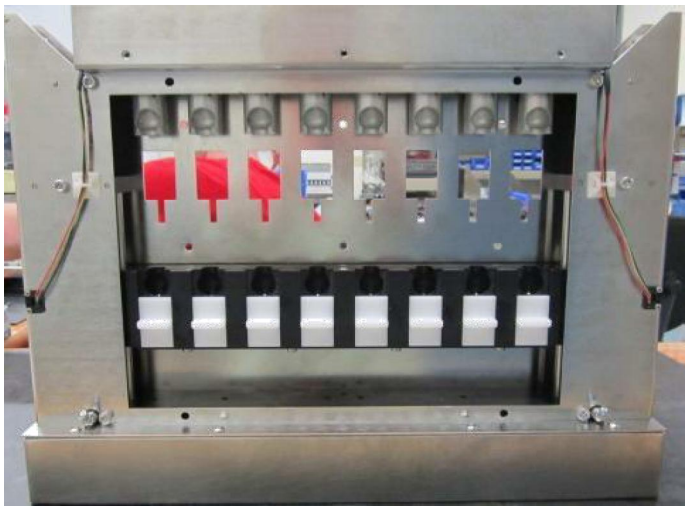
CAUTION

Wipe Carefully!! do not loosen, move or remove these sensors.

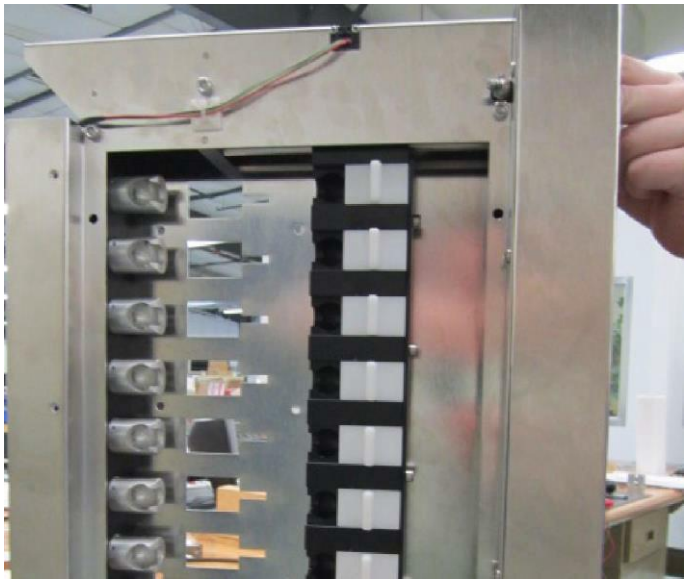


6. Carefully put Multiplex on it's side, remove the 10 screws and the bottom cover.

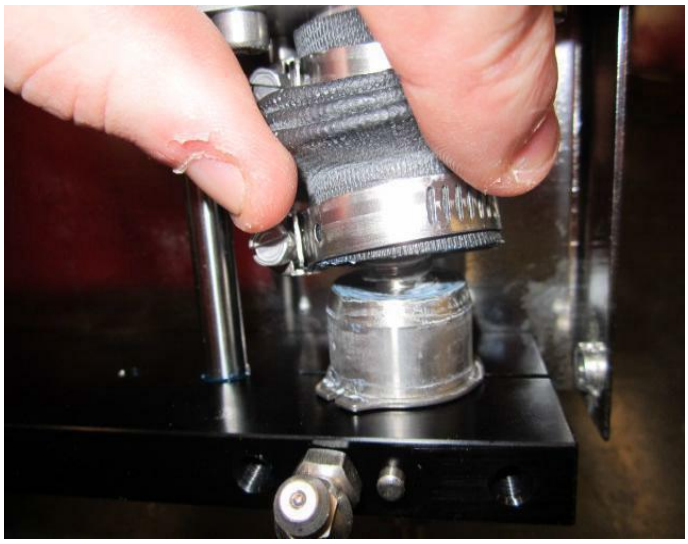
7. Put Multiplex back right side and remove 6 front guard cover screws.



8. Move the Bar to upper most position by rotating belt pulley counter clockwise.



9. Loosen LOWER clamp only on both left and right grease boots.



10. Connect grease gun containing, Mobilith XHP222 or equivalent Multipurpose Bearing Lube, to fitting. Apply slowly until grease exits top of bearing which is exposed by lifting the grease boot slightly. Wipe off excess grease with lint free cloth. Repeat on both sides. Move bar back to lowest position and then tighten grease boot clamps.

11. Replace front guard cover and secure with 6 front plate cover screws.

12. Carefully put Multiplex on its side and replace bottom cover and secure with 8 bottom cover screws.

13. Carefully put Multiplex back right side and replace left and right side guards and secure with 12 side guard screws.

14. Replace Top cover and secure with 14 top cover screws.

15. Install all pump modules according to instruction 7.5.2.1 found in the maintenance section of manual chapter P07L004.

5.6 PROBLEM GUIDE

Table 5.1 contains a list of possible problems, causes and solutions for the Actuator Module.

5.7 SPECIFICATIONS

Motor:	Brushless DC with Resolver Feedback
Max Dispense Stroke:	25.4mm (1.0")
Maximum Stroke Travel:	26mm (1.025")
Air Input (Oil Free):	5.5 Bar (80 PSI) Nominal
	3.81l/sec (8 SCFM) Nominal

CAUTION

Do not exceed 6.9 Bar (100 PSI). Damage to the equipment may result.

5.8 MODEL NUMBER

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

Actuator Module, Ver 2.0, LF 12 Multiplex	**202395**
Actuator Module, Ver 2.0, LF 10 Multiplex	**202396**
Actuator Module, Ver 2.0, LF 8 Multiplex	**202397**

5.9 ILLUSTRATED PARTS BREAKDOWN

The illustrated parts breakdown (Figures 5.5) contains replacement parts for the Multiplex Actuator Module.

Table 5.1 Common Operational Problems and Solutions

PROBLEM	PROBABLE CAUSE	POSSIBLE SOLUTION
Controller powered on but will not reference	Positive air pressure not present	Check to be sure air is present at the end of the supply line
	E-Stop not connected properly	Check to be sure the E-Stop device is working properly
	No communication between Multiplex Controller and HMI	Ensure lower case commands are being sent and a response is present after each carriage return
	Control cables A & B crossed between Controller and Actuator Modules	Ensure "A" control cable goes to "A" actuator connector and "B" control cable goes to "B" actuator ("B" is only used for 10 or 12 pumps)
System is running but not pumping fluid	Pump valve incorrectly installed in coupler	Reference the Multiplex Pump Module chapter to verify the valve is positioned correctly in the coupler
	Broken or damaged ceramic valve or piston.	Ensure the ceramic components are not damaged
	Loose fittings/damaged seals	Ensure the port seals are installed correctly and fittings are torqued according to specification.
	Restricted discharge or suction line.	Ensure there are no closed valves, plugged lines, kinks in the tubing or damaged seals
	Reservoir not vented or pressurized properly	Ensure the reservoir is either open to atmosphere or properly pressurized if the application required pressure
	Pump Module assembled incorrectly.	Reference the Multiplex Pump Module chapter to ensure the Pump Module is assembled properly
Rotary or Linear Sensor Fault	Insufficient air pressure/flow	Verify the air pressure/flow are within IVEK specs
	E-stop activated	Ensure the E-stop is not activated
	Rotary valve moving too slow for set valve timer	One or more of the rotary valves need cleaning
	Damaged control or motor cable	Check cables for possible slices or bent pins
	Broken drive belt	Reference the Multiplex Actuator Module chapter to replace the drive belt

INDEX NO.	PART NUMBER	DESCRIPTION	UNITS PER ASSY
		LF Multiplex Actuator Module	**2**
1	202397	Actuator Module, Ver 2.0, LF 8 Multiplex	1
2	212030-010	Belt, Timing, 10/T5 Pitch, (1140mm)	1
1	202396	Actuator Module, Ver 2.0, LF 10 Multiplex	1
2	212030-009	Belt, Timing, 10/T5 Pitch, (1310mm)	1
1	202395	Actuator Module, Ver 2.0, LF 12 Multiplex	1
2	212030-008	Belt, Timing, 10/T5 Pitch, (1475mm)	1

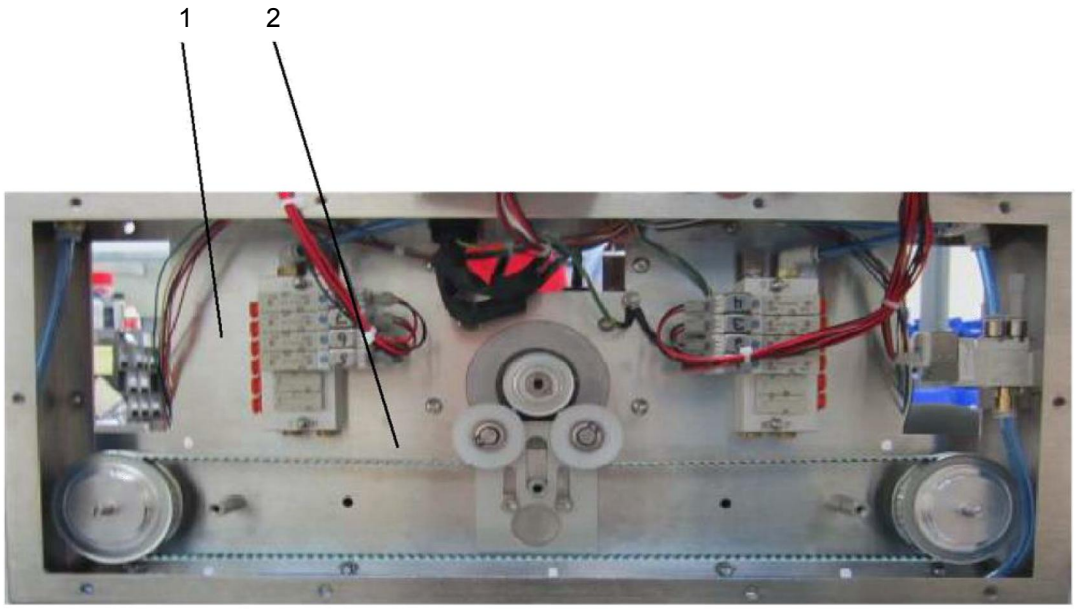


Figure 5.5 Multiplex Actuator Module (Sheet 1 of 1)