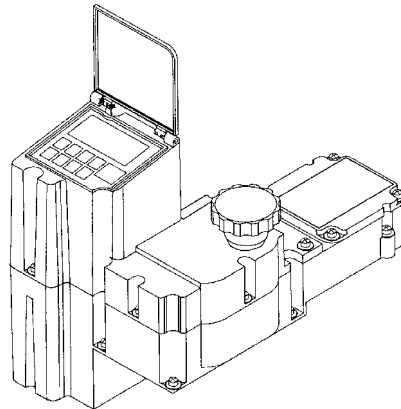


Encoder Diagnostic Procedures For Pulsafeeder ECA, DLC and DLCM controllers

Table of Contents

1	Overview	2
2	Troubleshooting.....	3
2.1	First Steps	3
2.2	Mechanical	3
2.3	Setscrew problems.....	3
2.4	Electrical.....	3
3	Pump Interface.....	4
4	Pump Stroke Length Mechanism.....	5
5	Encoder Access	6
6	Encoder Replacement.....	7



This document does not replace the complete Installation, Operation, and Maintenance manual for your controller. Consult the IOM appropriate to your controller for complete safety and operational instructions

1 Overview

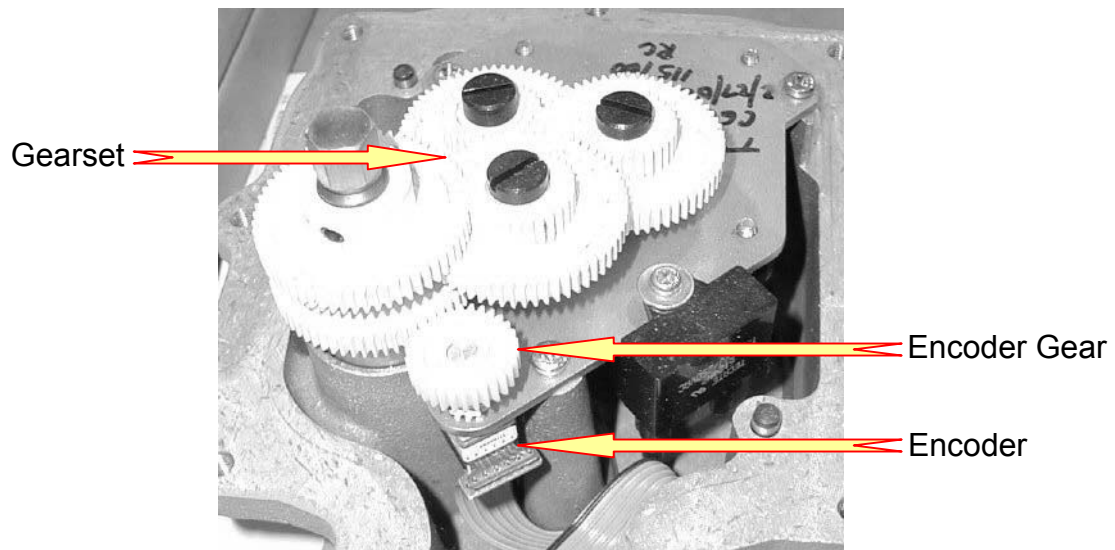


Fig. 1 - Encoder position within the enclosure

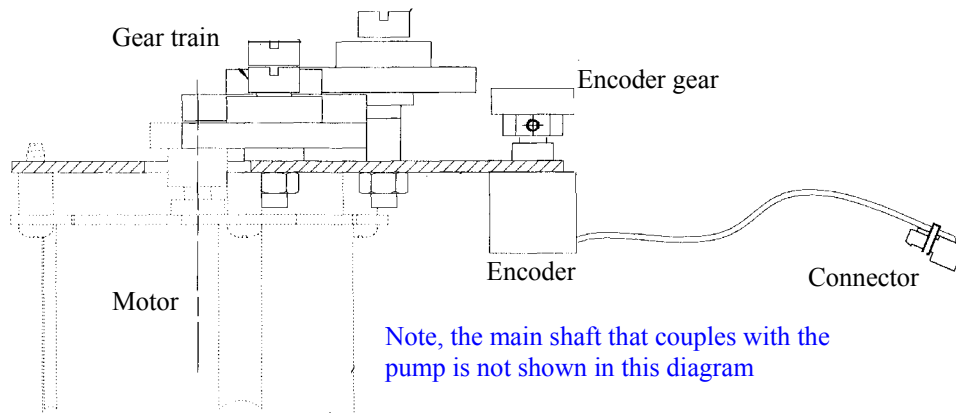


Fig. 2 - Encoder and gearset layout

Pulsafeeder supplies the DLC, DLCM, and ECA electronic controllers on the PULSAR line of metering pumps. These controllers all utilize a common drive system to actuate the stroke length mechanism within the pump. This drive system consists of a motor, gear train, and a digital encoder, which allows the controller to track the position of the stroke mechanism. The encoder produces digital pulses as the adjustment shaft rotates. By tracking these pulses, the controller can adjust the stroke position with a very high level of accuracy.

When there is a problem with the signal from the encoder, the controller will display an "ENCODER ERROR" or "POSITION ERROR" on the DLC/DLCM screen. The ECA will flash an error code on its internal LED lamps. There can be a number of reasons for this failure, this document will guide the user through several possibilities.

2 Troubleshooting

2.1 First Steps

1. Remove AC power from the controller
2. Rotate the stroke adjustment knob manually (DLC or DLCM)
Remove the top cover and rotate the stroke adjustment shaft manually (ECA)
3. Ensure that the knob rotates smoothly for several full revolutions in BOTH directions. Note that depending on pump position, the mechanism may reach either the “0 %” or the “100 %” stop point
4. Replace covers if necessary and re-apply power to the controller
5. If the cause of the error was a mechanical jam or isolated fault, the unit will recover proper operation
6. Monitor the unit as necessary for further faults

2.2 Mechanical

A primary cause of encoder errors is a mechanical problem within the pump or the controller. In these cases, it may or may not be possible to rotate the knob as described above. Suggested troubleshooting sequence:

1. Remove the controller from the pump to separate the mechanisms
2. Rotate the stroke adjustment mechanism in each section by hand to determine which parts may not be functioning correctly
3. If the trouble appears isolated to the pump, see section 4 for further information
4. If the trouble appears to be within the controller, see section 5 for access to the interior of the controller
5. Once open, examine the motor and gerset used for stroke length adjustment. Some potential problems include:
 - A. Jammed or damaged motor
 - B. Broken or fractured gears
 - C. Gears with broken or stripped teeth

2.3 Setscrew problems

A number of encoder issues have been related to the setscrew that secures the encoder gear to the encoder shaft coming loose. Carefully check this gear by hand to ensure it is securely attached to the encoder shaft. Take care to avoid applying excessive force to the encoder shaft as this can damage it.

2.4 Electrical

Electrical problems can occur which affect both the circuit boards within the controller and the encoder itself. The circuits within the controller cannot be tested without specialized fixtures and test equipment.

If no mechanical cause for an encoder error is located the next most likely cause is a malfunction of the encoder itself. Refer to section 6 for replacement instructions.

3 Pump Interface

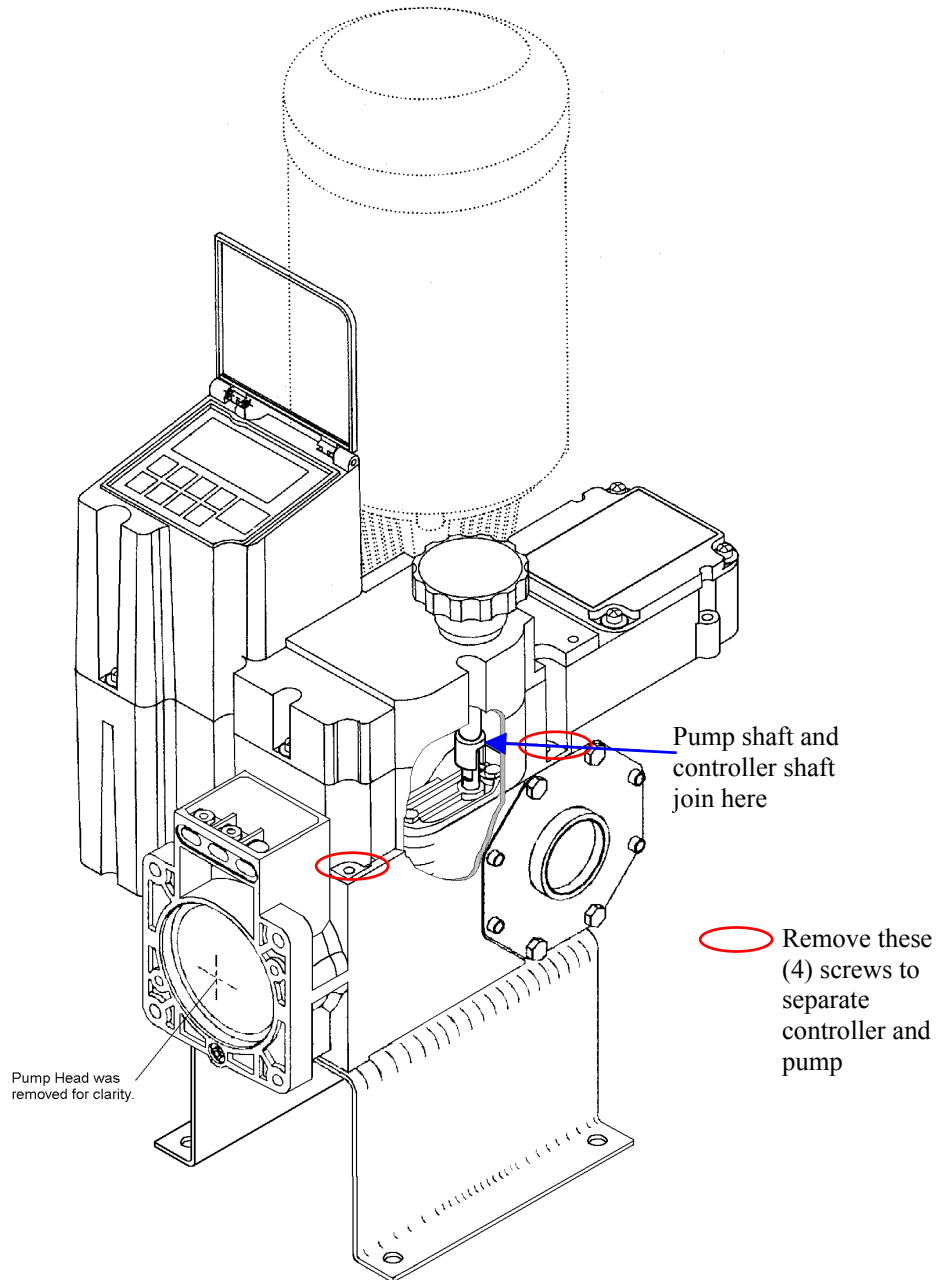


Fig. 3 – Controller/pump interface

The Pulsafeeder DLC, DLCM, and ECA controllers connect mechanically to the PULSAR pump using a two-section shaft. The lower section is mounted within the pump, and drives the stroke adjustment mechanism, regulating the stroke length and therefore the flow output of the pump. The upper section is mounted within the controller. This allows the controller to regulate the stroke length of the pump.

4 Pump Stroke Length Mechanism

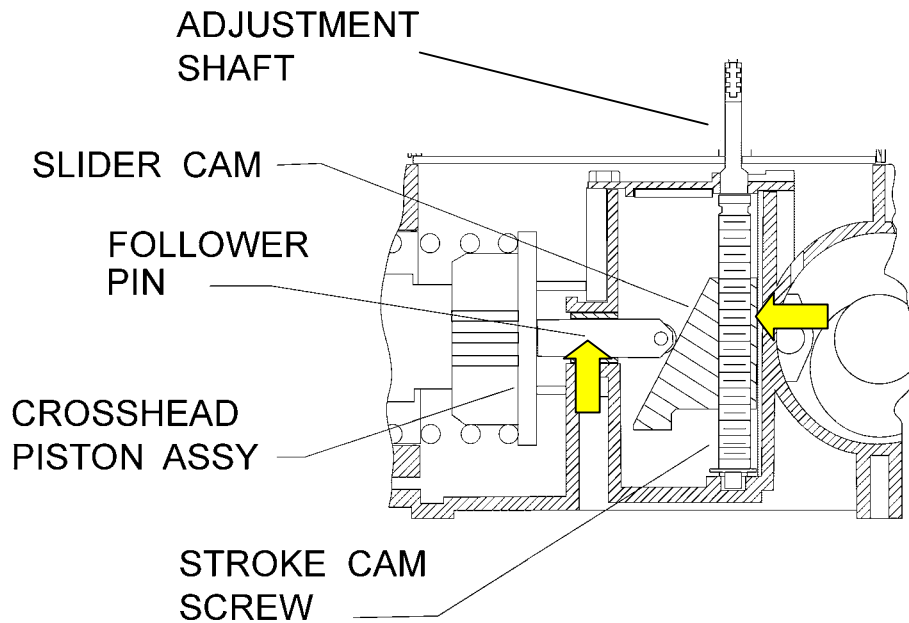


Fig. 4 – PULSAR pump stroke adjustment mechanism

The PULSAR metering pump utilizes a screw and slider cam system to regulate the stroke length of the pump. The screw shaft is rotated by the electronic controller. The rotation drives the wedge-shaped slider cam up or down on the shaft. As the cam moves up or down, it actuates a follower pin, which limits the rearward travel of the piston:

- a) Slider cam moves up, follower pin is moved forward for shorter strokes and lower flow rates
- b) Slider cam moves down, follower pin is moved back for longer strokes and higher flow rates

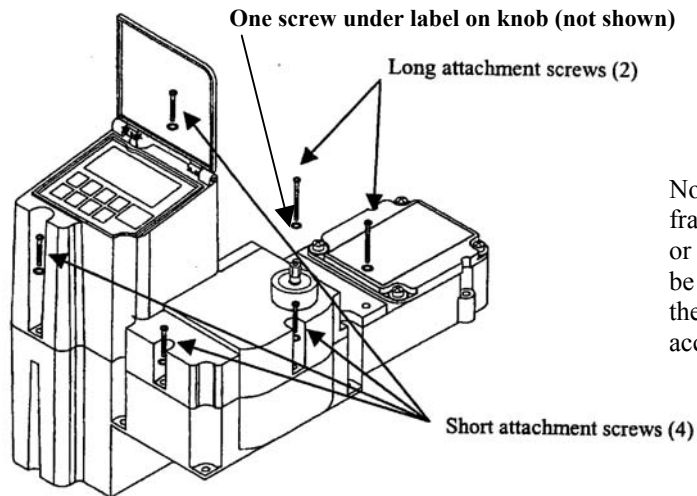
Potential causes for mechanical malfunction in the mechanism are:

- a) Damage to the threads on the screw shaft, which do not allow the cam to travel smoothly
- b) A bent or warped screw shaft
- c) Damage to the threads on the cam
- d) Damage to the face of the cam, which does not allow the follower pin to slide smoothly
- e) Damage or rotation of the follower pin, which does not allow it to extend or retract smoothly

5 Encoder Access

WARNING:

Follow all appropriate safety procedures when opening any electrical enclosure to protect personnel and processes.



Note: for certain motor frame sizes, the DLC or DLCM may have to be lifted slightly from the pump to allow access to all screws.

Fig. 5 - Upper cover assembly removal, DLC and DLCM

CAUTION: For DLC and DLCM controllers, the keypad and display module is attached to the upper cover. Use care when removing this cover, as there is a ribbon cable that connects from the internal circuit boards to the upper cover assembly. Raise the cover slowly, until this wiring can be identified and secured. The wiring may be carefully unplugged from the circuit board so that the upper cover assembly can be set aside for service.

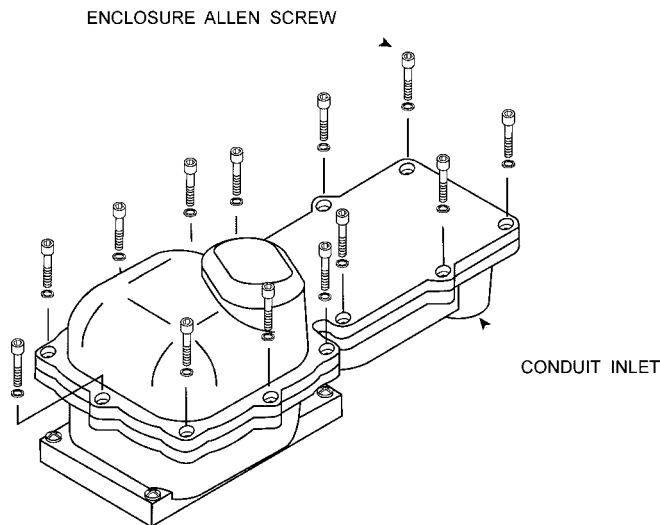


Fig. 6 - Upper cover assembly removal, ECA

6 Encoder Replacement

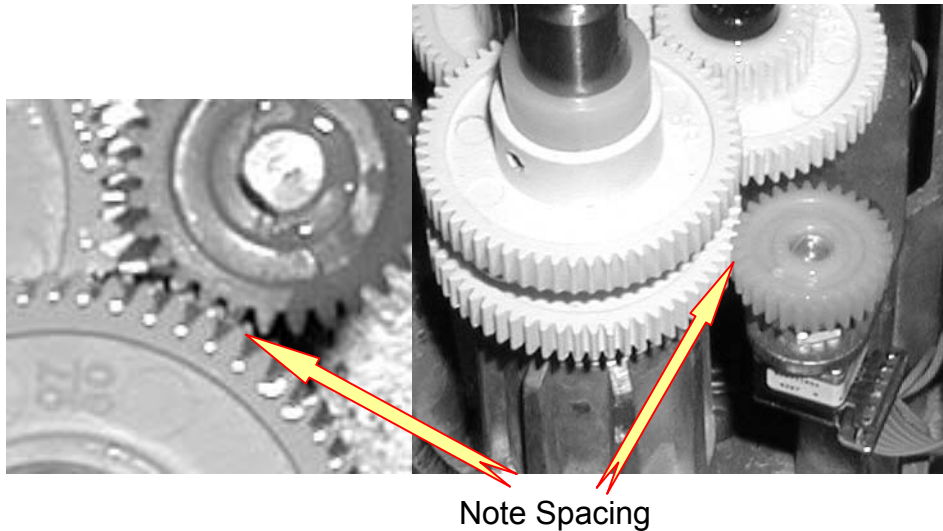


Fig. 7 - Encoder positioning for proper gear engagement

Encoders for the DLC/DLCM/ECA controllers come complete with the ribbon cable and plug attached. The current Pulsafeeder part number for this assembly is NP530100-000. Encoders are kept as a stock item at the factory.

To replace the encoder:

1. Disconnect power to the controller and follow all applicable procedures to ensure personal and process safety.
2. Remove the top cover from the controller as described previously in this document.
3. Unplug the encoder cable from the circuit board.
4. Loosen the setscrew and remove the drive gear from the encoder shaft.
5. Remove the nut and lockwasher (if present), and remove the encoder from the mounting plate.
6. **CAUTION: When handling the new encoder, do not load the shaft radially (to the side), for example when adjusting it's position or tightening the setscrew.**
7. Install the new encoder carefully, replace the lockwasher (as per the original configuration) and nut onto the shaft, but do not completely tighten them at this time.
8. Re-install the gear, aligning the height of the encoder gear to match the mating gear.
9. Apply a small drop of non-permanent locking compound to the setscrew and tighten gently, following the caution mentioned in step 6.
10. Adjust the position of the encoder as per the photographs above. Allow for a small amount of backlash between the gears. There should be no radial loading of the encoder shaft. Off axis loads on this shaft will cause premature encoder failure.
11. Once position is established, tighten the encoder mounting nut to secure it to the plate.