

Diagnostics and Troubleshooting

For Teledyne ISCO Syringe Pumps

Syringe Pump Technical Bulletin
August 2022, TB23

Overview

This document gives information to troubleshoot basic issues that can occur on the Teledyne-ISCO Syringe Pump systems. For in-depth troubleshooting assistance please contact Teledyne-ISCO service via email at iscoservice.service@teledyne.com or via phone by dialing 1-800-775-2965.

Part Numbers

For part number information including pictures please visit Teledyne ISCO's online store at [Pump Products - Teledyne ISCO](#).

Basic Checks and Tests

For information on performing basic leak, pressure, and flow rate checks, please refer to [TB05 Field Verification Procedures](#).

Legacy Pump
Controller



Lighted display

DISP button



Current Pump
Controller

Figure 1: Identifying Legacy Controller and Current D-Series Controller

Troubleshooting Tables

The troubleshooting tables below are grouped by basic issues. Find the correct table, then start with the symptom on the left and work right towards a solution.

Table 1: Leaks

Symptom	Possible Cause	Solution	Additional Information
Leak at drip pan	Failed pump seal	Replace pump seals Inspect the cylinder and wear ring for damage replace if necessary	
Leak detected by doing a leak check listed in TB05 but no visible leak is seen	Failed pump seal	Replace pump seals Inspect the cylinder and wear ring for damage replace if necessary	
	Leak may not be visible if using a volatile solvent use water and inspect for a leak point	Find the source of the leak and see the most appropriate symptom location on this table	
	If you have verified the pump is not the issue check the upstream and downstream valves, tubing and fittings	Replace upstream and downstream devices as appropriate	
Leaking where cylinder meets cap	Loose cap	Tighten cap	
	Failed cylinder cap seal or no cap seal present	Replace cylinder cap and inspect sealing surfaces for damage and debris	
Leak at ports	Loose fittings	Gently tighten fittings	
	Damaged threads or ferrules	For 1000 and 500 ml pumps inspect threads for damage; reapply Teflon tape	
		For 100, 260, 65ml pumps inspect sealing surfaces for damage and replace ferrules	Do not apply Teflon tape to fittings using a ferrule

Table 2: Pressure

Symptom	Possible Cause	Solution	Additional Information
Pressure reading is inaccurate when compared to an external calibrated gauge	Zero pressure key pressed when pump was not open to atmosphere	Open pump to atmosphere press zero press key	
	Incorrect manual calibration	Calibrate the pressure transducer	
	Pressure transducer has drifted		
Pressure drifts out of calibration after it has been calibrated	Pressure transducer has failed	Replace the pressure transducer	
Pump does not maintain gross pressure	Poor fill	If pumping CO2 and a dip tube is not used and/or the cylinder is not chilled, reduce refill rate	
		If liquid is viscous increase tubing and valve size, reduce viscosity by heating (if deemed safe for your application)	
	Leak	See leak table	

Table 2: Pressure (Continued)

Symptom	Possible Cause	Solution	Additional Information
Pump does not maintain highly accurate pressures. Minute pressure fluctuations are seen.	Leak	See leak table	
	Temperature fluctuations	Insulate pump cylinder and tubing. Control the environment. Move the pump away from heat and cooling sources such as vents.	
	Depending on the application and the severity of the fluctuations they may be unavoidable	Please contact Teledyne-ISCO service via email at iscoservice.service@teledyne.com or via phone by dialing 1-800-775-2965 for assistance	
Will not maintain pressure above a certain pressure typically 1000PSI Or Never reaches set pressure	Broken shear key	Inspect and replace shear key if necessary	A broken shear key can catch enough to allow limited pressure to be achieved
	Not enough restriction to maintain the desired pressure	Provided you have verified the pressure is reading correctly, increase the restriction using a back pressure regulator or smaller diameter tubing	
	Poor fill	If pumping CO2 and a dip tube is not used and/or the cylinder is not chilled, reduce refill rate	
		If liquid is viscous, increase tubing and valve size, reduce viscosity by heating (if deemed safe for your application)	
	Pumping Gas	ISCO Syringe pumps are intended to pump liquids. If pumping CO2, chill the cylinder and make sure the tank has a dip tube.	
Unexpected over pressure	Software pressure limit incorrectly set	Change software pressure limit	See appropriate syringe pump manual
	Too great of a restriction for the set flowrate	Remove restriction	
		Lower flowrate	
	Pressure calibration is off	Check pressure calibration with an external gauge	

Table 3: Flow Rate

Symptom	Possible Cause	Solution	Additional Information
Measured flowrate is lower than expected Or No flow	Leak	See leak table	
	Poor fills	If pumping CO ₂ and a dip tube is not used and/or the cylinder is not chilled, reduce refill rate	
	Flow rate is set incorrectly or too low to see flow	Set appropriate flow rate	
Flowrate on screen is incorrect	If in the constant flow mode program, incorrect flow rate	Program the correct flowrate	
	If in the constant pressure mode, incorrect restriction	Increase or decrease the restriction until desired flowrate is reached	

Table 4: Error Messages

Symptom	Possible Cause	Solution	Additional Information
Failure Position A/B/C/D The pump speed (read by the motor encoder) does not correctly correspond with the amount of power required to run the motor. The letter A/B/C/D refers to the position the pump is plugged into the controller.	Controller encoder counter chip failure	Verify by connecting the pump into another open pump spot on the controller. If the error follows the pump it is a pump issue. If the error does not change to the new position the issue is in the controller or try a different controller	
	Worn motor brushes	Replace motor brushes	
	Failed motor drive board	Replace pump drive board	
	Mechanical failure hindering movement of pump	Worm gear is too tight against the brass gear. You should be able to move the large brass gear back and forth by hand approximately a 1/16 of an inch, if not loosen the mounting screws and move the worm gear forward Find the source of mechanical failure; most common are ball screw (typically a clicking noise is heard when running) thrust bearings	
Pump will not run; CYLINDER EMPTY message displayed	Pump empty; Piston at top of cylinder	Refill the pump	
Pump will not refill; CYLINDER FULL message displayed	Pump full; Piston at bottom of cylinder	Run the pump	
CYLINDER EMPTY message displayed, but piston is not at top of cylinder (cylinder not really empty) CYLINDER FULL message displayed, but piston is not at bottom of cylinder (cylinder not really full)	Universal sensor harness (limit sensor) failure	Verify operation of the limit sensors (2 total). Replace harness if either sensor fails	
VALVE ERROR	Cycle power. If the message reappears, repair or replace the valve package.	Electric Valves: Valve or valve motor failure	

Table 4: Error Messages (Continued)

Symptom	Possible Cause	Solution	Additional Information
Note: Error messages can only be removed by correcting the problem and restarting the controller. If diagnostics indicate CBA component failure (other than fuses), replace the CBA.			

Table 5: Programming and Running

Symptom	Possible Cause	Solution	Additional Information
Pump will not run	The piston is all the way at the top of the cylinder	Verify and refill the pump	
Pump will not refill	The piston is all the way at the bottom of the cylinder.	Verify and run the pump	
When running in continuous constant flow pump(s) stop in the empty position. If pumps are set in the normal pressure mode the pumps keep running at half flow rate until the pressures match	Pressure transducers on both pumps do not match each other	Check pressure calibration and calibrate or repair as necessary	Refer to Technical Bulletin TB05 Field Verification
	Not enough back pressure. 1,500 is ideal	Add back pressure using a back pressure regulator or small diameter tubing to provide backpressure	
		If adding back pressure is not an option, the pump can be set to low pressure mode and pressure matching will not occur	
	Back pressure is not stable	Leak; see leak table	
		Back pressure regulator is not stable at the flowrates of your application. Increase flowrate or change the device regulating the backpressure.	

Table 6: Electrical

Symptom	Possible Cause	Solution	Additional Information
Controller screen will not power on	Controller and/or pump power switch is not in the on position	Put the pump and controller switch in the on position	
	Controller is not connected via the A pump connector. The controller only receives power via the A pump positions	Connect the controller to the A pump position on the controller	
	Pump is not connected to power	Connect pump to power	
	Pump fuses are blown (open)	Check fuses on the back of the pump; replace if necessary	
	Exactly 5 volts is not getting to the controller. (Check 5 volts at the controller.)	Low 5 volts: adjust 5 volts at pump	Refer to syringe pump manual
		No 5 volts: check fuses on pump board replace fuses and or pump board as necessary	

Incorrect or Unstable Pressure Reading

If the pressure is out of specification, has a constant reading of 0psi, or will not stabilize, check the following points.

Incorrect or Zero Pressure

1. Ensure that fuses **F102** and **F104** are not blown.
2. Cylinder cap screwed on too tight, or not tight enough.
3. A - D Converter failure
4. Optical sensor (limit sensor) failure
5. Damaged pressure transducer
6. Shear key broken (indication of failure to automatically stop in overpressure condition). Shear key replacement procedures are available in Section 5 of the legacy manual, and Section 8 of the current manual.

Overpressure Condition

If an overpressure condition occurs, the pump will stop running. It will either stop automatically and display an error message, or the shear key will break, in which case the motors keeps running but pressure is not developed.

This can be caused by an electrical problem, such as failure of fuse **F102**, or damage to the pressure transducer.

Unstable Pressure

Densification inside the tubing associated with high viscosity applications can cause clogs. Ensure that temperature and other factors affecting viscosity are carefully maintained. For solutions, refer to [TB17 High Temperature and High Accuracy Options](#).

Fluid Leakage

Although slight leakage during normal operation is expected, leakage exceeding specifications (refer to [TB05 Field Verification Procedures](#)) may signal a problem. Areas to check are listed, in order of likelihood, along with possible causes:

Damaged seals

- Pump seals are a consumable item that becomes worn over time. Replace cylinder cap seal, piston seal, and wiper seal annually. Replace more often for applications involving heavy use or harsh/abrasive substances.
- Dirt or other solids on the seal can cause leakage. If removed and rinsed with distilled water, a seal may still be usable, but reused cap seals may leak.
- The seals are easily damaged. Use great care during handling not to leave debris or fingernail imprints on the seal's surface.
- If the cylinder cap is not screwed on tight enough, the cap seal may not be able to prevent leaks.

Fittings

- Problems with the fittings can cause leakage.
- Inspect all plugs, ferrules, and tubing connections for damaged surfaces and threads.
- Ensure that all fittings are properly tightened.

Surface finish

- Visually inspect the inside of the cylinder for scratches by shining a flashlight down inside; the surface should have a mirror finish. Some scratches or score marks may be repaired at the factory. If the marks are very deep, however, the cylinder must be replaced.
- If the surface of the piston is damaged, the piston must be replaced.
- The piston retainer can function normally as long as there are no scratches or marks on the sealing surface.

Valves

- Pumping caustic substances or fluids containing particulates can shorten the life of valve packages, usually causing leakage to occur. Options are available from Teledyne Isco for reducing or preventing damage of this nature. These options are discussed in [TB04 Pumping Salt Solutions and Brines](#).
- Leakage may be accompanied by a VALVE ERROR message. Cycle power and see if the message reappears. If it does, repair or replace the valve package.

Valves may not be closing properly. For example, if the inlet valve opens but the outlet does not fully close, a vacuum can be created.

The valve seals may become worn, or a valve may be impaired by thickening of viscous fluids. In electric valves, it is also possible for a motor to fail.

Failure of electric valves may be further indicated by leakage from the small opening in the side of the valve body (see Figure 2).

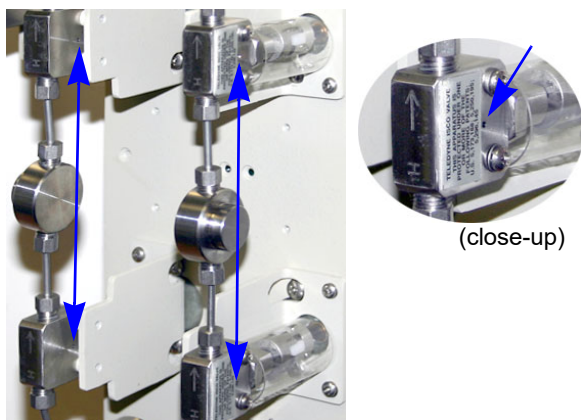


Figure 2: Weep hole on electric valves

Air valve packages can often be restored. Seal kits are available for this type of valve. Kits available:

1000D	60-5364-168
500D, 260D, 100DM/DX	60-5364-071
65D	60-5364-299

Electric valves or motors can be replaced. Replacement motors require current adjustment before operation can resume. Refer to the D-Series user manual section: *Electric Valve Motor Calibration*.

Accessing Internal Components

The following information applies across many troubleshooting areas. Refer back to this section when investigating more specific issues.

DANGER

Risk of electric shock. Disconnect the electric power before servicing. Only trained service personnel may remove the case top.

Controller Case Top Removal

Troubleshooting for a number of issues can be done on the controller main circuit board. Remove the four screws holding the case top in place (two screws on each side). Lift the cover straight up and off.



Figure 3: Controller case top screws (2 of 4 shown)

Pump Case Top Removal

Some maintenance and troubleshooting procedures require accessing the pump module interior. Remove the four screws holding the case top in place (two screws on each side). Lift the cover straight up and off.

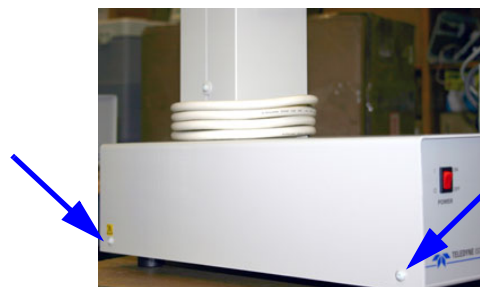


Figure 4: Pump case top screws (2 of 4 shown)

Teledyne ISCO

P.O. Box 82531, Lincoln, Nebraska, 68501 USA
Toll-free: (800) 775-2965 • Phone: (402) 464-0231 • Fax: (402) 465-3001



Teledyne ISCO is continually improving its products and reserves the right to change product specifications, replacement parts, schematics, and instructions without notice.

EAR99 Technology Subject to Restrictions Contained on the Cover Page.