E13 Fault

(And failure of Diagnostic Pump Tube Test)

Diagnosis

Service Procedure

TS001

Revised: 08/12/22 RJC

Overview: There are eight possible reasons for an E13 Post-pump low pressure error or a Diagnostic Pump Tube Test warning or failure. The only difference between the two is that the E13 error message is generated during a run, while the other is during a Diagnostic test. The TDF instrument performs a pump tube test automatically before each run to verify tubing integrity. During this test, the tubing in the center of the instrument is pressurized to test for leaks. The instrument closes the six outlet valves, IDF(2), SDF(2), and Waste(2). The pump is then run for a brief period and pressures on each line are monitored. If a low pressure is observed the test will either fail or give a warning. For the purposes of this document, we will refer to this error simply as an E13 fault. The following is a list of possible reasons for this fault, from the most to the least likely.

1. A faulty pressure sensor
2. Worn pump tubes
3. Fluid leak in one or more of the fluid lines after the peristaltic pump up to the IDF, SDF and Waste pinch valves
4. A poor seal within one or more of the IDF, SDF or Waste pinch valves
5. An obstruction in the water line (pre-pump).
6. Poor seal within the pump
7. Open supply valve - other than water
8. A faulty water valve – restricting fluid to the pump

1. A fault pressure sensor

Using the Diagnostics screen, select “Valve Test” and open the “Waste”, “IDF Inlet” and “SDF Inlet” valves. This will relieve any pressure in the lines. Now exit the “Valve Test” screen and select “Pressures”. This will show the pressure on the six lines (as well as vacuum sensor & input pressure). The pressure readings should be reading atmospheric pressure. There may be slight variation from one sensor to the next but, if you are at sea level, they should all be reading about 14.7 psi. At higher elevations the pressures will be lower, but should all be fairly consistent. If one of the sensors is reading significantly off from the others, the sensor is bad and will need to be replaced. The faulty sensor is causing the pump tube test to fail. Part TDF19 Pressure Sensor Assembly will need to be replaced. Refer to **Service Procedure TS011** for installation instructions.

2. Worn pump tubes

The most likely cause of an E13 fault is worn pump tubes. Once the tubes have been run for some time they will wear and flatten, allowing some fluid back flow past the pump during the pump tube test. If this is significant enough the tubing will not hold pressure adequately and the test will fail or present the E13 fault. During an IDF/SDF or TDF run if the pressure is between 5.0 psi and 7.0 psi you will have the opportunity to bypass and address the problem after completing the run. If the pressure result is less than 5.0 psi, the run will be aborted. To diagnose the problem, turn the power off, access the back of the instrument and remove clear rear panel. Open the pump doors and inspect the tubing for wear and leaks. We recommend keeping a log of the number of runs a set of pump tubes has been used for to gauge when the pump tubes are near the end of their lifespan. If the pump tubes show significant wear or if leaks are observed, replace the pump tubes. There are two types of Pump Tubes. If your pump has a sticker stating “High Torque Peristaltic Pump” you need TDF99 Long Life Pump Tubes (refer to Service Procedure TS028 for installation instructions). If your pump does NOT state the “High Torque . . . “you need TDF68 Pump Tube Kit (refer to Service Procedure TS003 for installation instructions).

3. **A leak in one or more of the fluid lines (post-pump)**
   Inspect tubing in the rear of the TDF instrument in between the two light grey vertical gusset panels. Rerun the pump tube test (in Diagnostics) while observing for leaks. If any leaks are found these must be repaired before proceeding. Replace tubing (TDF77) or fittings TDF104 as needed.

4. **A poor seal within one or more of the IDF, SDF or Waste pinch valves**
   First confirm adequate air pressure to the TDF instrument. The high-pressure gauge should read 50-55 psi. If the pressure has dropped to less than 35 psi a low input pressure fault will be displayed, adjust the pressure to 50-55 PSI. Next repeat a pump tube test and observe the IDF and SDF spray nozzles for any dripping. Also watch for dripping at the ends of the waste tubes (these discharge into the drain tray). If any fluid leaks are observed the silicone tubing within the IDF, SDF, and Waste pinch valves must be replaced. Review your maintenance schedule on pinch valve tubing. Annual replacement of the pinch valve tubing is recommended. If it is needed on one valve, make the replacement on all 7 valves (Two IDF, two SDF, two Waste and one Enzyme). Use part TDF71 Pinch Valve Tubing Set. Refer to **Service Procedure TS005** for installation instructions. If after replacing the silicone tubing within the 7 pinch valves, the valve is still leaking (allowing fluid bypass), check for a leak in the yellow air lines going to six pinch valves. These valves can be actuated manually using the Diagnostics screen. Select “Valve Test” and select “IDF Inlet”, “SDF Inlet” and “Waste” to close the valves. When closed the valves are pressurized and there should be no air leaks. Also be sure they are closing and opening properly by watching the valve operate while repeatedly pressing the button on the screen. If any of the yellow air lines are cracked or leaking, these need to be replaced. Order part # 8215 and specify length needed. If problem is still not resolved, the valve may need to be replaced. Instructions on Output Pinch Valve replacement can be found at **Service Procedure TS008**. There could also be a problem with solenoid 2, 3 or 4 (Waste, IDF or SDF) within the electrical enclosure, or with the I/O circuit board. Contact ANKOM Technology at https://www.ankom.com/contact/technical-services or call 1-315-986-8090 for further assistance.

5. **An obstruction in the water supply line**
   If the connector on the end of the water tube or if the connector on the water container are not working properly they may be restricting flow of fluid to the pump. This restricted supply could cause the pump tube test to fail. Check the condition of the water connectors and make sure they engage and snap in place properly. Also, a dirty water filter could be plugged and restricting flow. Check this and clean or replace the filter if needed. Confirm the problem has been corrected by the following test. Using to the Diagnostics screen, selecting “Motor Test”. Press “Set Valves” and open the “Water supply” valve and open the “IDF Inlet” Output valve. Leave the amount (ml) set to 10.0 and leave the Motor Speed set to 240 rpm. Place small beakers under each of the IDF nozzles and press “GO” on the motor test. Confirm that approximately 10mls of water is delivered to each of the beakers. If there is limited or no flow of fluid to the beakers, or if there is difficulty with the connectors engaging properly, replace these parts. If the problem is with the water supply line, a low delivery would be seen at all six beakers. The Coupling Body with shut-off, 1/8” barb (used on the container) is part 8193; the Coupling Insert with shut-off, 1/8” barb (used on tubing end) is part 8194; and the Container Filter is part 8202. If needed, replace these parts and repeat the pump tube test.

6. **Open supply valve**
   Make sure that the supply valves have not been left open during some other aspect of service. The peristaltic pump does allow a small amount of back flow which would be exacerbated by having an open supply valve. For example, if the enzyme valve was being serviced and the pinch bar was left off, this would allow a place for the back flow to go (into the enzyme containers). Be sure all supply valves are closed and functioning properly.

7. **Poor seal within the pump**
   If there is a poor seal within the pump, a more significant back flow of fluid will be allowed during the pump tube test. During the pump tube test the pump runs for about 8 seconds and then holds pressure, measuring pressure after holding for a few seconds. During this period of holding pressure, if within the pump there is a poor seal the pump tube test will fail. When this occurs, the first thing to check is the condition of the pump tubes, but if new pump tubes have been installed and the test is still failing, check for the following. See how well the pump doors open and close. If the pump doors have become very stiff and difficult to move, corrosion has occurred on the pump door hinge shaft. This could happen because of previously ruptured pump tubes, and the pump not having been cleaned well. If the pump doors have frozen onto the hinge shaft the screws holding the hinge shaft will have either loosened or over-tightened. This will affect the gap between the pump rollers and the occlusion bed on the inside of the pump doors. If this gap is increased the tubes will not seal adequately and will allow back flow of water causing the pump tube test to fail. This will require replacing the Pump Assembly. There are two styles of pumps assemblies. If your current pump has a sticker stating “High Torque Peristaltic Pump” the replacement pump is a TDF27. If your pump does NOT say “High Torque . . .”, contact ANKOM Technology at https://www.ankom.com/contact/technical-services or call 1-315-986-8090 for further assistance. An upgrade might be necessary.

8. **A faulty water valve**
   If the water valve is not opening during the pump tube test the flow of fluid to the pump will be restricted. This restricted supply could cause the pump tube test to fail. First check to see if the water valve is getting power when it is supposed to open. Go to the Diagnostics screen and select “Valve Test”. Select “Water supply” to open the water valve. This will energize the water valve solenoid and you should be able to tell that the solenoid shaft is magnetized. If it is magnetized, then the electronics to the valve are working properly. If valve is not magnetized, contact ANKOM Technology for further assistance. Next check for mechanical function of the valve using the Diagnostics screen. Select “Motor Test” and press “Set Valves”. Open the “Water supply” valve and open the “IDF Inlet” Output valve. Leave the amount (ml) set to 10.0 and leave the Motor Speed set to 240 rpm. Place small beakers under each of the IDF nozzles and press “GO” on the motor test. Confirm that approximately 10mls of water is delivered to each of the beakers. If there is limited or no flow of fluid to the beakers (and step 5 has already been addressed) then there is a mechanical problem with the valve and the water valve will need to be replaced. Contact ANKOM Technology at https://www.ankom.com/contact/technical-services or call 1-315-986-8090 for further assistance.