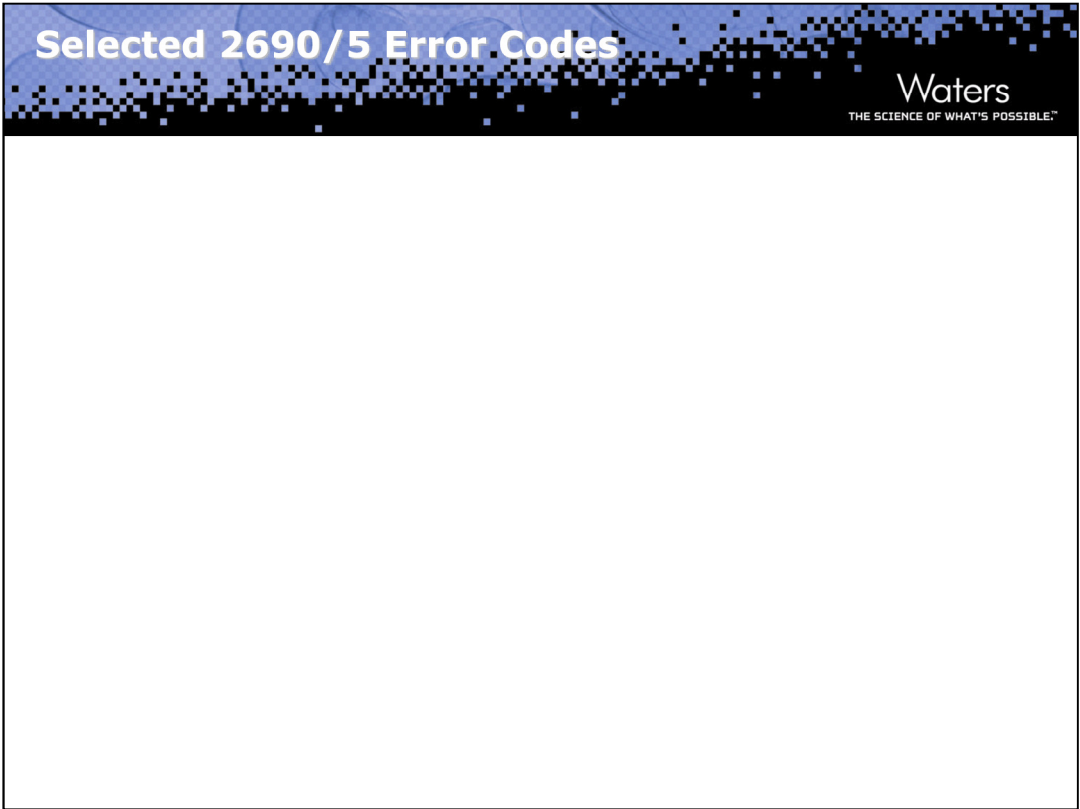




Selected Alliance Error Codes

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Waters

THE SCIENCE OF WHAT'S POSSIBLE.™

1. Bubble found on compression

The 2690/5 has a diagnostic feature to detect the presence of gas (bubbles) in the fluid stream of the Solvent Management System. This diagnostic feature can also be used to troubleshoot when a bubble detection error occurs.

Once a bubble is detected, the Solvent Management System implements a recovery sequence that increases the stroke volume while maintaining the flow rate and composition. During this process, pressure ripple as high as 40% may be observed. Although composition is maintained, the increase in stroke volume draws in larger packets of mobile phase. Therefore, shifting of retention times may be noticed due to a difference in mobile phase mixing at the time of the recovery sequence. Successful recovery results in full restoration of the programmed stroke volume and continuation of the separation. Unsuccessful recovery is dependent upon the programmed bubble detect alarm setting.

Bubble detection is based on sensing the ratio of Compression to Decompression volume, which can be viewed in Service Utilities. If the C/D ratio exceeds the threshold, a "Bubble Detection" error will occur. When this occurs, the gas-to-liquid content of the mobile phase is beyond the instrument's ability to accurately meter the solvent mixture.

Monitoring the C/D ratio will give a good indication of the gas-to-liquid content. This reference list shows the C/D ratio and expectations of conditions.

C/D Ratio	Description
1.1	Theoretically perfect <i>(physically impossible to attain perfection)</i>
1.1	Exceptionally great values
1.2 - 1.4	Normal values
1.5 - 1.7	Gas-to-liquid content increasing
1.8	Bubble Detection occurs

Definitions:

Compression - Compression value of the Primary Piston Cycle. Compression (forward movement of the plunger) of the mobile phase to bring the Primary operational pressure from 0psi to System operating pressure prior to delivery stroke.

Decompression - Decompression value of the Primary Piston Cycle. Decompression (reverse movement of the plunger) of the mobile phase to bring the Primary operational pressure from System operating pressure back to 0psi to following the delivery stroke.

C/D Ratio - The calculated ratio value of the Compression/Decompression values.

The criteria for a bubble to be detected is:



1. If the System pressure is above 650psi in the first cycle in which the C/D ratio is greater than 1.8 and the C/D ratio remains above 1.8 for the next five consecutive pump cycles (for a total of 6 cycles).

An excessive ratio value suggests that either the intake stroke has a bubble or that the mobile phase has a higher than normal gas content.

It is important to understand the amount of time it takes to fully recover from a detected bubble. There are several steps that contribute to the time it takes to complete this process. The time to clear a bubble is dependent on: (1) Programmed flow rate setting. (2) Programmed piston stroke volume. (3) Bubble detection/recovery sequence.

1. Armed - always monitoring at C/D ratio value.
2. Detected - C/D value of 1.8 or above is detected, waits then rechecks to eliminate false detection. 6 cycles
3. Recovery - steps to 135ul-stroke volume, one step up stroke sequence per cycle. 10 cycles
4. Restore - steps back to original set stroke volume, (example: from 135ul back to 25ul = 4 cycles) X # cycles
5. Waits - wait state buffer before being Armed. 6 cycles

Bubble detection is method specific. It is programmed in the Mobile Phase screen of the method. Programming of this alarm will determine if this function is active.

Alarm Response

Description

Disable - Recovery will not be performed when a bubble is detected, the error will not be logged.

Log Quietly - No audible or visual display alert, reports to error log only, bubble recovery will be automatically performed.

Alert User - Audible alert and visual display notification box will occur, reports to error log, bubble recovery will be automatically performed.

Stop Function - Current operation will be suspended following completion, audible alert and visual display notification box will occur, reports to error log, recovery sequence will not occur.

Stop Flow - Solvent delivery flow is stopped, current operation will be suspended, audible alert and visual display notification box will occur, reports to error log, recovery sequence will not occur.

Note: Bubble Detection is always active. After a bubble has been detected, the alarm setting will determine if the solvent delivery system must continue to the recovery stage. Or if this alarm is disabled, do not continue to the recovery stage. If "Log Quietly" or "Alert User" is programmed and a bubble continues to be detected, the Detection/Recovery algorithm will continue indefinitely.



The C/D Ratio can be used for troubleshooting and diagnosing symptoms that relate to a Bubble Detection error. First, you must ensure all the solvent lines have been primed in the proper fashion. For a proper comparison it is best to have all four solvent lines contain the same mobile phase. You must also ensure proper solvent conditioning has been programmed and verify that there is no related solvent conditioning errors logged. Once this criteria is met this diagnostic can now be used.

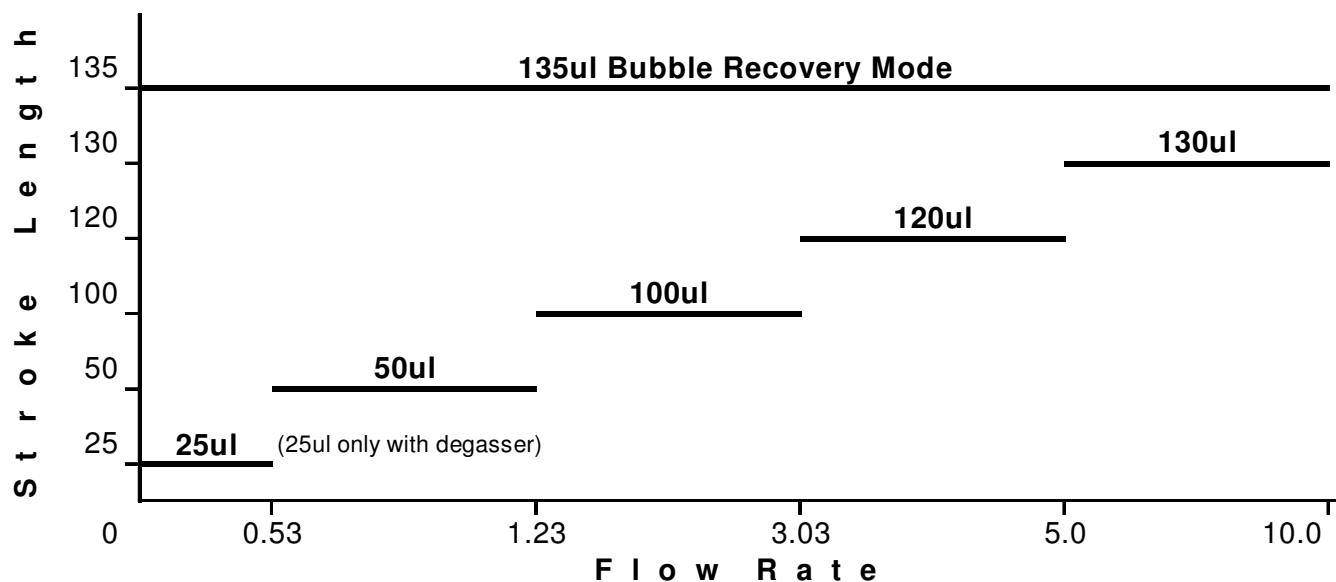
1. Program Solvent Conditioning (for example Degasser=Continuous, Spurge=100%), then let rest at 0mL for 5 minutes.
2. Set the composition to 100% Solvent Line A
3. Program a 1mL-flow rate.
4. Go to Service Utilities. Main Page-Diag-Service Util-Password=1147.
5. Monitor the C/D Ratio for 5 minutes. Record the average C/D ratio for Solvent Line A.
6. Change the composition to 100% Solvent Line B.
7. Monitor the C/D Ratio for 5 minutes. Record the average C/D ratio for Solvent Line B.
8. Change the composition to 100% Solvent Line C.
9. Monitor the C/D Ratio for 5 minutes. Record the average C/D ratio for Solvent Line C.
10. Change the composition to 100% Solvent Line D.
11. Monitor the C/D Ratio for 5 minutes. Record the average C/D ratio for Solvent Line D.

After the C/D ratios for each solvent line has been recorded, the next step is to use the C/D ratios as an indicator to help determine the cause of failure.

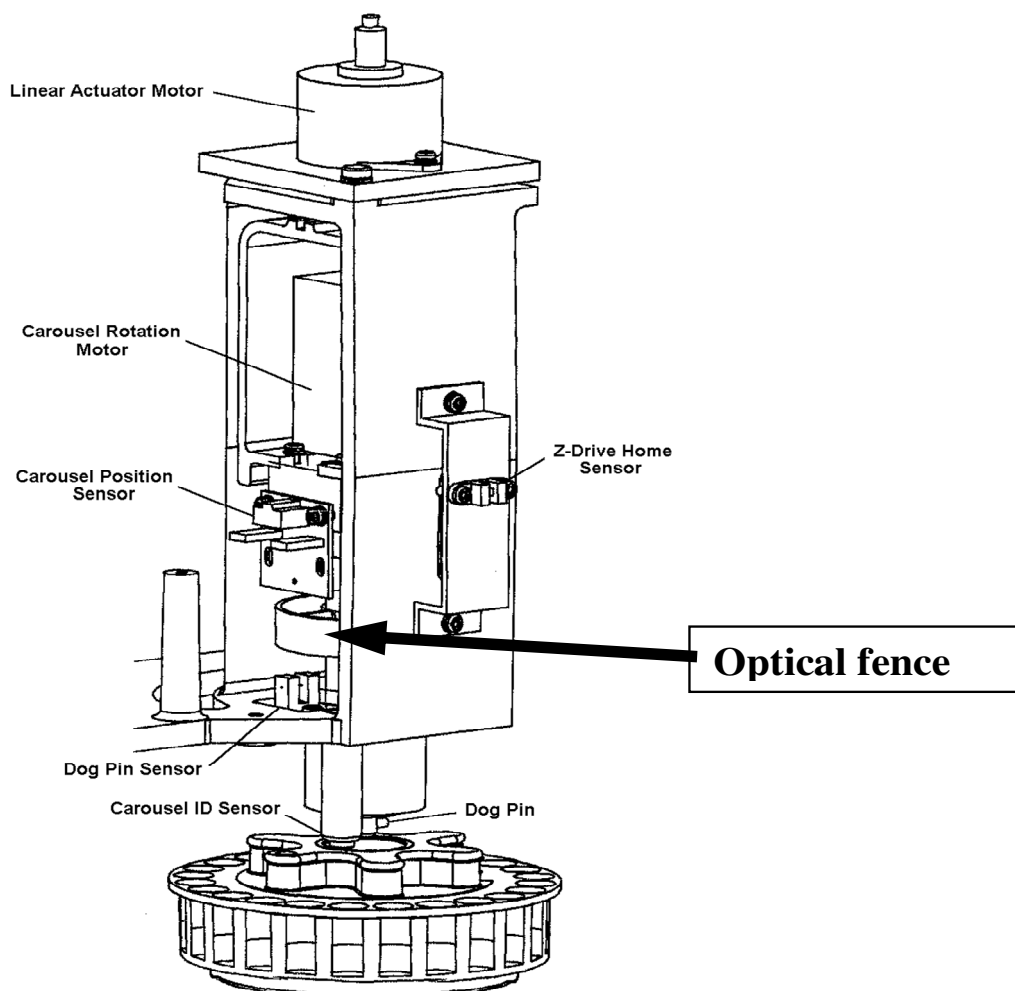
A solvent line with C/D ratios at 1.8 or above should be targeted to determine failure. It can be any fluidic path component failure for those specific solvent lines with elevated C/D ratios. Including improperly primed solvent lines, restricted solvent sink filters, solvent tube failure, loose fittings to/from degasser chambers, inefficient degasser chambers, and GPV leakage.

If all the solvent lines have elevated C/D ratios then the problem is most likely do to some component in common with all the solvent lines. Targeting the tubing connections at the output of the GPV, GPV outlet tubing connections, primary inlet check valve, check valve housing tightness, Primary Head Plunger Seal, Primary Head Face Seals, head and head nut tightness could also be suspect to cause this failure.

Rather than allowing the system to drive the plungers in the "auto" mode, bubbles may be more effectively cleared by forcing the system to operate with a stroke length of 100 μ L.



2. Carousel Z axis malfunction



Carousel Drive Operation Each time a carousel is in the LOAD position, the adjacent carousel is located under the carousel dog pin shaft assembly. Just as the carrier rotates to position and identify carousels,

The individual sample carousels must be rotated to locate specific sample vials. This is accomplished by two stepper motors within the carousel drive mechanism and is a multistep process. First, the sample carousel must be engaged by the carousel RAM shaft assembly. This is accomplished by a linear actuator motor located at the top of the carousel drive mechanism and a dog-pin shaft at the bottom of this mechanism. The linear actuator motor drives the entire carousel motor lift housing and dog pin shaft down and engages the sample carousel. The dog pin shaft is so named because of the right-angled pin at the bottom, which fits into a similarly shaped slot in the center of each sample carousel. When the dog pin engages a sample carousel, an optical fence, attached to the dog-pin shaft, drops into a sensor within the carousel drive mechanism. The corresponding DOG PIN LED - DS38 on the Fluidics Driver PCB lights.

If you get a Z axis malfunction:

1. Inspect the optical fence and insure that it is parallel to the base of the carousel drive. If the fence has gone into the sensor and wobbles so that light is detected when it shouldn't be seen you get the error.
2. The sensor may be too low.
3. The optical fence may be hitting the top of the sensor bracket.
4. Insure that the adjacent cables haven't migrated under the fence.

3. Clearing Memory

For diagnostic purposes, the 2690/5 has a set of key sequences to allow the clearing of specific data.

Upon power up the 2690/5 will perform an initialization routine. Approximately 21 seconds after power up, the instrument will give three quick audible beeps. Then, the Alliance logo appears.

Immediately after the three audible beeps are heard, press the appropriate Clear key combination sequentially. A clear message will then be displayed.

The following key sequences must be performed:

Clear 8 – Erases all methods, user and instrument configuration data, (including seal pack data). This will not clear the instrument serial number or set the seal wash pump option to be present.

Clear + Softkey1 – Zeros all lifetime data

Clear + Softkey2 – Erases error log data

Clear + Softkey3 – Erases trace log data

Clear + 0 (zero) – Clears everything, equivalent to performing all four sets of above key sequences.

Note: *Softkey1 is the leftmost softkey under the main menu, softkey2 is to the right of 1, and so forth.*

Caution: *Use these codes with caution. It is impossible to recover cleared data.*

4. Column temp h/w fault (1= communications, 2= watchdog, 3=h/w over temp, 4= internal fan, 5= not implemented, 6 thermistor)

1. Errors 1 and 2 are both communications errors. Power down and check for loose cables and connectors.
2. To correct error 3, open up the temperature window. The value may be set from 1 to 20 degrees C.
3. Error 4: The software monitors the circulating fan motor amperage. If there is a problem with the motor the amperage rises and the error is displayed and the heater is shut off.
4. Error 6, Thermistor, the RTD has failed.

5. Compression check failed

The default compression parameters are 300 psi and 20 μ l. If the system can not achieve the 300 psi using 20 μ l of volume or less this error is displayed. Things that could cause this error are:

1. Undegassed solvent
2. Leaking syringe plunger
3. Leaking V3
4. Air in the sample management system
5. A leak in the sample management system
6. Improperly adjusted seals
7. Allowable volume (5 – 30 μ L) too small

6. Compression leak test failed

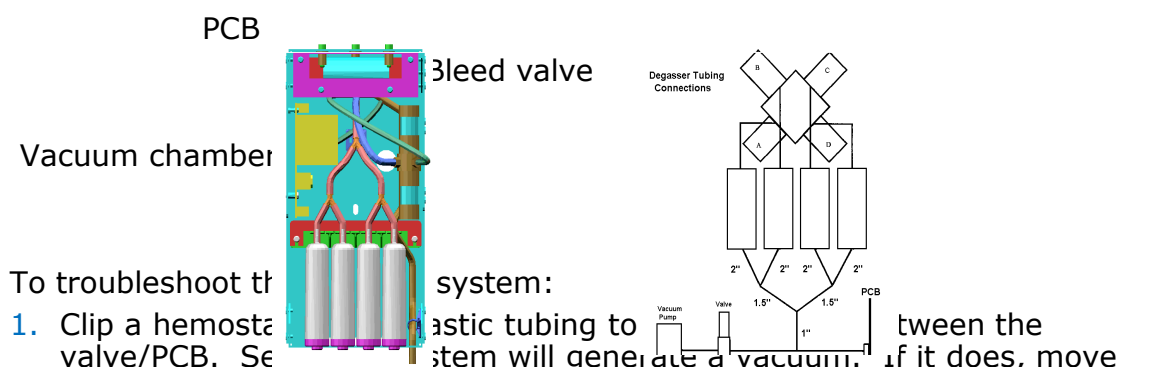
This error is displayed after the system passes the compression check. The second half of the check is monitoring the pressure decay once the system arrived at pressure. The default value is wait 1 minute and the pressure shouldn't have fallen more than 50 psi. Causes for failure:

1. Undegassed solvent

2. Leaking syringe plunger
3. Leaking V3
4. Too much time after the system reaches pressure (.1 to 5 minutes)
and/or too small a pressure decay allowed (10 to 100 psi)
5. A leak in the sample management system
6. Improperly adjusted seals
7. **Degasser pressure fault**

On the older type 2690/5's (pre 11/98) the pressure in the degassing chambers had to get below -9.8 psig and maintain an acceptable leak rate in the "normal" configuration. In the newer 2690/5's (after 3/99) the systems use absolute pressure and these systems must drop below 4 psi.

Vacuum pump

- 
- The diagram illustrates the vacuum pump system. On the left, a cross-sectional view of the vacuum chamber shows the PCB (Pressure Control Board) at the top, a bleed valve, and four degassing chambers. On the right, a schematic of the degasser tubing connections shows four vertical tubes (A, B, C, D) connected to a central manifold. The manifold has a 1" inlet from the vacuum pump and two 1.5" outlets leading to the PCB. The tubes are labeled with diameters: 2" for the main vertical tubes and 1.5" for the side connections.
- To troubleshoot the system:
1. Clip a hemostat to the plastic tubing to isolate the system between the bleed valve/PCB. See the diagram. The system will generate a vacuum. If it does, move the hemostat and isolate a pair of the chambers. If a vacuum results the problem must lie in the tubing associated with and/or the other pair of chambers.
 2. If no vacuum is detected on just the pump, valve, and PCB use a syringe to pull a vacuum on just the PCB. If there is no reaction, the PCB is bad.

3. If the PCB is OK check all of the tubing and the vacuum pump and bleed valve. One way to check this combination is to jump out the valve and simply check the pump and PCB combination.

The new chambers are effective up to 5 ml/min where the older design are effective up to 2 ml/min. When priming the degasser chambers, you should flush with a minimum of 5 volumes of solvent. The new chambers with .024 ID tubing, now have an internal volume of 10 mL's. This means that there should be a minimum of 50 mL's of solvent flushed through each channel of the degasser.

Good laboratory practice is important. If buffers are in use, always remove the buffers if the instrument is not going to be used for extended time periods. Replace the buffers with filtered water, then follow with an aqueous/organic mix.

Do not allow the degasser to operate for extended periods of time when the flow rate is at 0 ml. Organic solvents will super degas, resulting in solvent vapor condensing outside the tubular membranes.

Always "Wet Prime" after an overnight shut down or any long periods of non-use. Program a low flow rate (0.1-0.5) for 10 minutes after the Wet Prime to allow degassed solvent to flow into the system.

When connecting the threaded tubes to the chamber, do not overtighten the fitting. The fittings should be finger tight only. Be sure to use the Tefzel (purple) ferrule. This ferrule is softer and seals with less force. Less force is used to eliminate the need for overtightening and the possibility of cracked fittings or chambers.

The new style Chambers are fully backward compatible for replacement into instruments with the original style chambers. It is acceptable to have a combination of old and new style chambers in the same 2690/5 or stand alone vacuum degasser. If it becomes necessary to replace a chamber, only the failed chamber should be replaced. It is not necessary to replace all four. Customers should be informed that the flush volume is slightly higher. It would be simpler to recommend that all chambers be flushed with 50 mL's of solvent, even if there is a combination of chambers in the system.

A information sheet describing this memo in brief form and an installation guideline will be included with each spare chamber ordered. The new part number for this chamber is 700000269.

8. Fatal Error

This error is displayed when a low level operating system program on the CPU PCB has occurred. It will lock up the instrument and be display as "Fatal Error in VRTX In addition to the previous Tip & Trick Technique dated 1/16/97 consider the full list of ideas.

Use this list at your discretion, since some ideas are more severe than others.

1. Power On/Off the instrument.
2. Reseat all proms and cables on the CPU PCB.
3. Clean the battery contacts, check the voltage, and replace battery.
4. Check power supply voltages (with all options running, for max load)
5. Press the reset button on the CPU PCB.
6. Reload the software.
7. Clear RAM. (back up previous methods, they will be deleted!)
8. Replace the CPU. (back up methods previous CPU for transfer)
9. Delete some methods stored in memory to a manageable amount, only if a large amount are present. Reference to the "Release Notes, 2690/5 Version 1.00 & 1.01" discuss instrument memory capacity, it states:

Instrument Memory Capacity

The Waters 2690/5 contains sufficient nonvolatile memory capacity for storage of up to 60 methods, sample sets and sample templates. As the memory capacity is approached, the time required to create and save programs is extended from a few seconds to over 30 seconds. Saving long, complex programs can also reduce capacity. Waters recommends that no more than 30 programs be stored at any one time.

One case to date we have found an instrument with 52 saved methods showed an error, which occurred while editing a running method.

9. Lost Prime

The 2690/5 has an internal diagnostic that monitors the system transducer backpressure to protect the system from running dry. The diagnostic is totally independent of the bubble detection and clearing algorithm. This diagnostic is called the Loss Of Prime Shutdown (LOPS). If this occurs the 2690/5 will display a "Loss off of Prime" error message.

The LOPS diagnostic monitors the system backpressure of each delivery cycle. The flow delivery will automatically be given a stop flow command, and shut down if the instrument detects a low pressure limit threshold of 25 psi or below for 50 consecutive (primary/accumulator) delivery cycles.

Alarm Response

Stop Flow

Description

Solvent delivery flow is stopped
Current operation will be suspended
Audible alert and visual dialog notification box
Error will be logged

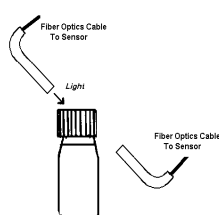
LOPS is always active through all flow rates for the normal flow mode. LOPS is not active during any priming sequence.



10. Missing Vial

With use of clear or translucent vial caps the alarm message "missing vial" may occur.

The vial detection system consists of an optical control box (located on the fluidics driver pcb) and fiber optics cables leading to/from the carousel compartment. A vial is detected when a vial cap breaks the light path. If a vial cap is not present or does not break the light path when the "Verify vial presence" is enabled (located in the config screen) a "missing vial" alarm will occur.



Vial Sensor Maintenance

Over time, the sensing ability of the device may be diminished due to accumulation of debris on the ends of the fibers or a melting of the fibers due to solvents such as Methylene Chloride and other chlorinated solvents. If vials are not being sensed, this may be the case. This can be remedied by squarely cutting off up to 1/4" at the end of the fibers and reinserting the fibers into place.

A decrease in transmitted light can also occur if the fibers are bent and/or broken. In this case the fibers must be replaced. The fibers are available as a spare part that includes a 25" length and a fiber optic cable cutter.

To replace or repair a fiber optic cable:

1. Remove the top and right side covers from the instrument. This will provide easy access to the cable at the right of the sample compartment. The cable positioned at the top of the sample compartment will require removal of the injector for easy access.
2. The fiber optic cable is secured in the sample compartment housing by a metal cable holder. While holding the cable holder firmly, loosen the epoxy around the cable and pull it out of the holder.

3. Cut 1/4" from the end of the cable using the cutter provided with the spare fiber optic cable or, if a cutter is not available, use a brand new razor blade.

Note: A clean cut is necessary for proper light transfer. The cable cutter allows you to make four cuts. Do not reuse the same position in the cable cutter.

4. Blow out the cable holder with house air to remove any dust or debris before inserting cable.
5. Bottom out new or cleanly cut fiber optic cable in the holder and secure in place with silicone.

Vial Present Sensor Adjustment

When the instrument is continually giving Missing Vial errors, the vial sensor require adjustment for greater sensitivity. This adjustment is made as follows:

1. Go to Sensor Page.
2. Observe the two LEDs on the encoder box on the Fluidics PCB.
 - a. The Green LED should be blinking continuously.
 - b. The Yellow LED should blink when it sees light and go OFF whenever the light beam is broken.
3. Remove the carousel and place your hand in the sample compartment to break the light path.
4. Increase sensor sensitivity by turning the pot slowly counter-clockwise until the Yellow LED begins to blink.

Note: *This adjustment is effective to increase sensitivity to consistently sense vials, however the opposite is not true. For example, you cannot decrease the sensitivity to fool the sensor into not sensing a vial in cases where the 2690/5 is always seeing a vial.*

11. Needle Malfunction

The injector sensor (top or bottom) did not see an appropriate change in state when expected.

Check motor function

Check sensors (flag with a business card)

The most common report is after a long period of non-use (also if a buffer has been used in the needle wash).. The dry injector seals grab the needle. Washing out the needle wash frits with clean water or repowering the system will cure the problem

12. Sample syringe over pressure

A pressure exceeding 350 psig was detected in the sample loop when V2 was open. The system has automatically stopped solvent delivery to prevent damage to the syringe. This can be caused by:

Blockage in the waste line

Bad V1, V2, or V3

Seal pack seals out of adjustment

13. Sample temp h/w fault (1=communications, 2=watchdog, 3=h/w over temp, 4=internal fan, 5=external fan, 6=thermistor high, 7=thermistor low)

- 1 and 2 are both communications errors. Power down the system and check all of the heater/chiller cables and connectors.
- 3 h/w is over temp. Try opening up the temperature range window.
- 4 Software monitors the amperage to the motors. If amperage goes high, the motor is defective and the system shuts down the device.
- 5 There are three external motors on the H/C. If amperage goes high on at least two of the motors you get the code and the system shuts down the device.
- 6 & 7 possible bad thermistor RTD probe.

14. Seal pack geometry fault (1=seal too high, 2=seal too low, 3=seal too wide, 4=seal too narrow)

Technical Discussion: This error occurs after a seal pack adjustment has been performed an result parameters fall outside of acceptable range limits.

<u>Parameter</u>	<u>Acceptable Range</u>	<u>Typical Range</u>
Top	30 – 80	40 +/- 10
Width	50 – 120	80 +/- 10
Bottom	80 – 200	Top + Width

Testing: Perform the Adjusting the seal procedure in the operator's manual. Insure that:

There is a restriction that will generate 1000 psig within 3 ml/min.

Flow should be 1 – 1.5 ml/min for best results

The system has been purged twice before you start

The methanol has been thoroughly sparged or degassed

If the error appears:

- 1. Check that the flow is between 1 and 1.5 ml/min.
- 2. Assure the Methanol is degassed
- 3. Stop the flow and check the transducer values on the display. They should be near zero and stable.
- 4. Pin plug the outlet of the system and drive the pressure up to 4500 psi for at least two minutes. This will energize the seal pack and valve seals. Re-do the seal pack adjustment.

5. Check the Sensor bracket for proper adjustment. The gap between the bottom of the top of the sensor bracket and the injector motor baseplate should be approximately 5/16 of an inch. It may be necessary to adjust the bracket UP.

To Adjust:

1. Loosen the holding screw at the base of the bracket.
2. Turn the adjusting screw on top of the bracket ¼ turn counter-clockwise.
Note: Each ¼ turn of the screw is equal to approximately 5 motor steps.
3. Re-tighten the holding screw.

15. Solvent delivery h/w fault

Failure of some component connected to the piston drive PCB.

1. Power supply 24V
2. Piston drive
3. Piston drive PCB or 7A fuse (PN WAT 290188)
4. With a H/C, 2 out of the three external fans failing or with no H/C the single external fan failing. Check the fan connections for oxidation etc.
5. Check all cable connections to the piston drive PCB.
6. Check the gray cable connection CPU to piston drive PCB.

16. Solvent delivery motor lost sync (0=Primary, 1=Accumulator)

Full list of any possible component failure.:

1. Cables, loose connections or bad cables.
2. Faulty Acc. or Prim. Transducer or Pressure not vented.
3. Piston Drive Failure, encoder, motor, or mechanical failure.
4. Piston Drive PCB, electronic component failure.
5. Power Supply, voltages may be dropping out of range.
6. CPU PCB, inability to properly translate encoding device.

Troubleshooting

DOES THE 2690/5 INITIALIZE PROPERLY?

NO,

Cables - Reseat all related cables to and from the Piston Drives, CPU PCB, Piston Drive PCB and Power Supply. Check continuity for cables end to end. Pay close attention to the "Y" power cable from the Piston Drive PCB to the Primary and Accumulator, remove the connector from the motor and remove the protective cover. Press the wires into the displacement pins to assure proper contact. Also pay attention to the large gray cable ensuring the sliding lock is connected on both ends.

Pressure on transducers - Ensure pressure is properly vented, open vent valve, re-initialize. If transducer fault occurs, swap connections on CPU to determine cause of failure due to bad transducer or CPU PCB.



Power Supply - Check voltages during initialization, if possible check with all options "ON" after initialization to ensure full power draw. Check directly on the power cable to the Piston Drive PCB, orange wire=24VDC, red wire=5VDC, black wire=common, green=ground.

Piston Drive - A mechanical tolerance may be the cause. When initializing, the plunger is gently driven to touch the head, motor steps are then counted to determine the home position and travel of the piston. A mechanical tolerance may cause the plunger to bounce back when it touches the head therefore falsely causing the motor homing to become inaccurate. To determine this theory, loosening the head nut before initialization will eliminate bounce back.

Ensure that the motor is mounted securely to the piston cylinder by checking the mounting screws for a tight fit.

YES,

DOES THE FAILURE OCCURE AT LOW FLOW RATE AND LOW PRESSURES? Follow troubleshooting ideas listed above.

YES,

DOES THE FAILURE OCCUR AT HIGH FLOW RATE AND HIGH PRESSURE, DURING WET OR DRY PRIMING, OR DURING BUBBLE DETECTION AND CLEARING?

The piston driving the plunger into the head, due to mechanical problems could cause this. Also, could be caused by torque problems with the motor or a voltage inconsistency or lack of proper voltage from the power supply, bad connections or pin contacts. Note all voltages should be checked with all options "ON" under full load.

Follow troubleshooting ideas listed above.

17. Transducer range (volts)

Are all 3 transducers the same? Yes, all the transducers are common in style. The replacement part can be ordered using WAT270966.

The most common failure will be identified upon initialization. If the software can not electronically zero the transducer an "Out of range" error will occur. When electronically zeroing there is a specified window of zeroing range, if outside the range an error will occur. This range can be viewed in the Service Utilities page, a box containing all the voltage offsets will be displayed. A perfect transducer will have a reading of 0.5V.

The range of electronic zeroing capability is 0.5V +/-0.2V (0.3V to 0.7V), if outside this range an "Out of range" error will occur. A reading of 4 volts signifies a dead transducer.

Swapping connections at the CPU board location can be used to troubleshoot and verify a specific transducer has failed. If the error follows the transducer connector that was swapped, the failed transducer, cable or connections is suspect.

If backpressure is present on the transducers this may also produce this same error. Verify all pressure has been bled from the fluid components while troubleshooting this failure.

Adjustments of fine zero for the transducers can be attempted to manually re-zero the transducer to bring it in acceptable range for the electronic zeroing. Removal of the black rubber stopper on the transducer will allow access to the adjustment potentiometer.



Selected 2690/5 Error Codes

2695 System Error Messages

MESSAGE	ACTION STEPS
Accumulator over pressure	Locate restriction... guard column / column / inline filter / blocked tubing.
Bubble found on intake approx.	Wet prime and allow system to sit at zero flow with the degasser in continuous mode for 10 min. prior to starting the run. If the flow rate is greater than 1 mL/min. install extended flow inlet tube.
Carousel malfunction	Cycle power. If message persists call Waters Service Representative.
Carousel Z axis malfunction	Cycle power. If message persists call Waters Service Representative.
Compression check failed Check for bubble and valve 3.	Solvent not degassed properly. on syringe plunger. Test seal pack Perform appropriate maintenance.
Degasser pressure fault vacuum	Replace faulty degasser chamber or pump. Call Waters Service Representative.
Lost prime	Solvent not degassed properly. Change check valves. If the flow rate is greater than 1 ml/min. install extended flow inlet tube.
Missing vial the correct vial sensor vial presence" Representative.	The missing vial should be placed in location in the tray. Disable the [Main>>Config>>Highlight] "Verify press clear. Call Waters Service
Needle malfunction wash.	Check needle wash reservoir. Prime needle Cycle power. If message persists call Waters Service Representative.
Plunger homing fault	Cycle power. Change inline filter. If message persists call Waters Service Representative.
Primary transducer range (volts) Sample	Call Waters Service Representative.

A2695 System Error Messages

MESSAGE	ACTION STEPS
Solvent delivery h/w fault	Cycle power. If message persists call Waters Service Representative.
Solvent delivery motor	Cycle power. Change inline filter. If message lost sync persists call Waters Service Representative.
Syringe Movement malfunction Representative.	Cycle power. If message persists call Waters Service Representative.
System over pressure	Locate restriction... guard column / column / inline filter / blocked tubing.
System under pressure	Connect column. Locate leak. 50 psi is needed to run the system.

Chromatographic Errors

SYMPTOMS	POSSIBLE CAUSES	CORRECTIVE ACTION
Erratic retention times	Air bubble	Wet prime the unit. Degas all solvents.
	Malfunctioning check valves	Clean/ replace check valves.
	Solvent leak	Check all fittings. Replace seals.
	Chemistry	Check mobile phase, column, Gradient Proportioning Valve.
	Clogged solvent filters	Replace filters.
	Temperature	Use column oven.
Increased retention times	Incorrect flow rate	Malfunctioning check valve. Solvent leak.
	Incorrect Mobile Phase	Change solvent.
	Column Contaminated.	Clean/replace the column.

Chromatographic Errors

SYMPTOMS	POSSIBLE CAUSES	CORRECTIVE ACTION
Reduced retention times	Incorrect flow rate	Change flow rate.
	Incorrect solvent composition	Change composition. Check gradient proportioning valve.
	High column temp.	Change column temp.
	Column contamination	Clean/ replace column.
	Solvent not degassed	Degas solvent.
Reproducibility errors	Solvent not degassed	Degas solvent.
	Air in syringe	Purge solvent management system.
	Incompatible vial septa	Switch to approved vial and septa.
	Sample management system	Contact Waters Service Representative.
Baseline drift	Column not equilibrated	Equilibrate column.
	Detector not equilibrated	Allow detector to warm up. Time will vary with wavelength and sensitivity.
	Solvent contaminated	Use fresh solvent.
	Solvent not properly degassed	Degas solvent.
	Flow/ Pressure fluctuations	Prime system. Replace check valves, pump seals.
	Temperature fluctuations	Stabilize operating environment.
	Leaking flow cell Repair leak.	
	Dirty flow cell	Clean flow cell.
Baseline noise	Flow fluctuations Malfunctioning check valve. Leaks, Seals, fittings.	
	Radio frequency noise	Eliminate interference.
	Air in detector	Purge detector.
	Solvent not degassed	Degas solvent.

Chromatographic Errors

SYMPTOMS	POSSIBLE CAUSES	CORRECTIVE ACTION
Baseline noise	Solvents contaminated	Use fresh solvents.
	Column contaminated	Clean/ replace column.
	Dirty flow cell	Clean flow cell.
	Electronic	Call Waters Service Representative.
Sensitivity loss	Solvent leak	Check all fittings
	Degraded, contaminated, or improperly prepared sample.	Use fresh sample.
	Column contaminated	Clean/ replace column.
	Loss of column efficiency	Clean/ replace column.
	Leak in flow cell	Repair leak.
	Change in mobile phase	Correct mobile phase. (i.e. pH or ionic composition)
	Contaminated solvents	Use fresh mobile phase.
	Dirty flow cell	Clean flow cell.
	Old Lamp	Replace lamp
	Needle wash solvent	Prime needle wash solvent. Solvent not appropriate for samples.
Split peaks	Column	Clean/ Replace column.