



**ZERO GRAVITY
FILTERS**

**SYSTEM 2000
Automatic Liquid Filtration**

Operation & Maintenance Manual



TABLE OF CONTENTS

<u>SECTION</u>	<u>PAGE #</u>	<u>TOPIC</u>
	3	Disclosure Statement
	4	Standard Warranty
Section 1	5	Installation Guide
Section 2	7	Principal Components
Section 3	10	Operation of the System 2000
Section 4	12	Control System
Section 5	18	Fault Conditions
Section 6	19	Recommended Maintenance
Section 7	21	Recommended Spare Parts
Section 8	22	Fault Diagnostics
Exhibit 1		Pressure/Flow Diagram
Exhibit 2		Wiring Diagram

Version: Gen V5.0 4 Pod
Reference: S2000 5.0
June, 2003

Disclosure Statement

Dangerous voltages are present within the filter's control panel. When working on the filter in any way, ensure that the control panel is electrically and pneumatically isolated from the supply.

The System 2000 Filter should be operated and maintained by trained personnel. It should not be used for any purpose other than for which it was designed and as specified at time of order.

Cross operates a policy of on-going product improvement. Any aspect of the product's specification may be altered without prior notice. In case of difficulty always contact the Company direct (if in the United Kingdom) or Zero Gravity Filters, Brighton, Michigan.

Standard and Limited Warranty

Seller warrants that title to goods sold hereunder is unencumbered at time of sale. All other warranties are expressly disclaimed including, but not limited to, merchantability, fitness for purpose, and all other warranties, express or implied. Seller expressly disclaims any liability for damages, actual, consequential, incidental or otherwise, for injury to property of buyer, its agent or third persons in custody of goods sold hereunder. Seller may determine to repair or replace any defects in goods of its own manufacture, which arise from defective materials or workmanship during the twelve (12) months, or (60) months on the filter elements, following the date of tender of delivery to the end purchaser if buyer gives seller timely written notice with a description of the basis for claim. Seller may refund amounts paid by buyer without other liability to buyer. The buyer acknowledges and agrees that the limitations of warranty, liability and remedy are fair and not unconscionable and the sole and exclusive remedies afforded at law with all other statutory and common law remedies being hereby waived. A claim under the warranty by the buyer for repair or replacement of goods shall be timely filed with the seller in accordance with the written procedures of the seller in effect at the time of any such claim.

SECTION 1 - INSTALLATION GUIDE

1.1 ELECTRICAL POWER SUPPLY

The control panel is to be supplied with a 110 VAC single phase supply rated at 5 Amps.

The electrical entry to the panel should be made in the bottom of the panel. Holes in the top, back, or sides of the panel are not recommended due to the possibility of water ingress.

1.2 COMPRESSED AIR SUPPLY

A compressed air supply to the panel is required and should be made in ¼" tubing to the bulkhead fitting in the base of the panel.

The supply should be between 80 to 120 psi pressure, filtered and dry at ambient temperature. Lubrication is not recommended or necessary.

1.3 PIPEWORK CONNECTIONS

The inlet and discharge headers are 6" diameter and is supplied with ANSI 150 (bolt hole) flanges. Gasket material for flanges must be selected to suit fluid conditions on site.

Flanges are stainless steel 304 grade and therefore nuts, bolts and washers should be selected accordingly. In particular, galvanised or other zinc coated fixing are not recommended.

The backwash header is 3" diameter and is supplied with ANSI 150 (bolt hole) flange. It is recommended that the backwash run have a downward grade to ensure that it is empty at the end of the backwash cycle. The backwash pipe run should be kept as short as possible and have the minimum of fittings or other potential constrictions.

The backwash run should not exceed 15 feet. If this is not possible due to site conditions, the 3" pipe diameter should be increased to 4".

1.4 VALVES

Isolating valves are strongly recommended on the inlet, discharge, and backwash headers. Butterfly shut off valves are recommended. Levers may be supplied for pipework up to and including 6". Above 6", gearboxes should be supplied.

An automatic bypass valve is recommended and the facility exists to control this valve from the control panel. This option should be specified at the time of ordering. Note the bypass valve may be electrically or pneumatically actuated but this too must be specified at the time of ordering.

1.5 FILTER SUPPORT

The filter is designed for floor or ground standing. 6" x 6" floor plates are provided with mounting holes. Please refer to your installed drawing for details.

1.6 LIFTING, WEIGHTS & DIMENSIONS

The filter may be lifted using soft straps around the top (discharge) header. Never should bare forks be used.

SECTION 2 - PRINCIPAL COMPONENTS

Mechanical Components

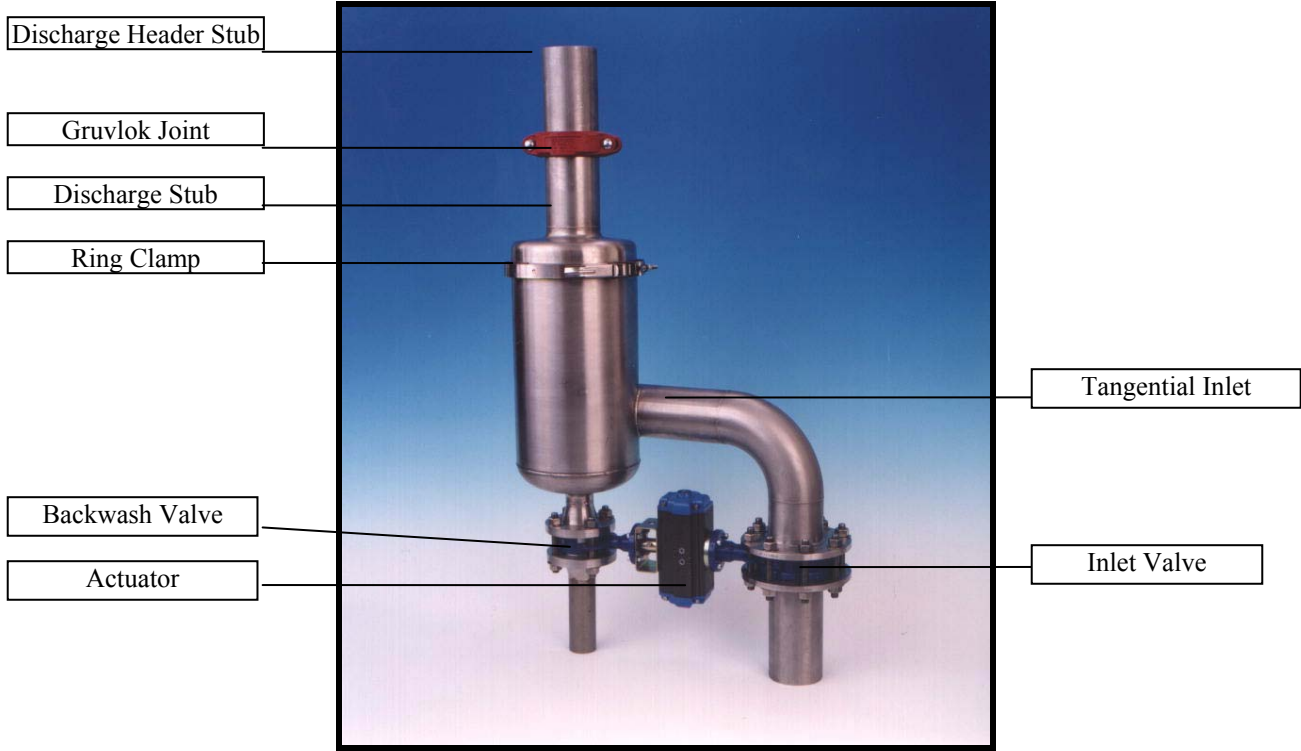
Please refer to System 2000 'Pod Parts' on the following page.

Filter Coil:	18/8 stainless steel 304 to Aerospace specification DTD 734.
Filter Cage:	30% glass filled polypropylene.
Filter Pods:	Stainless steel 304L, with 4" inlet and outlet connections, 2" backwash connection.
Frame:	3" box, stainless steel 304.
Butterfly Valves:	2" and 4" wafer style butterfly valves operated by a pneumatic actuator. Valves have cast iron nylon 11 coated bodies with Viton seats. 316 stainless steel stem and discs are provided.
Actuators:	Double acting developing 720 Lb ins at 80 psi directly mounted onto the 4" valve and using zinc plated carbon steel mounting kit on the 2" valve. Manufactured by Bray Valve and Controls, series 90, size 83.
Couplings:	
Pod lid:	Stainless steel ring clamp.
Pod Outlet:	Victaulic type, with malleable iron segments.
O-Rings:	O Rings for the pod (2 per pod) are Viton.
Controls:	
Panel:	Coated steel to NEMA 12.
PLC:	Siemens LOGO! RC (model OBA3)
Valve Manifold:	Parker series modular manifold, UL approved 24 Volt DC solenoid valves, UL approved.
Power Supply:	Siemens, UL approved.
Connections:	
Inlet and outlet:	Manifolds are 6" schedule 10, 304 stainless steel with ANSI 150 bolthole pattern, stainless steel flanges. Backwash manifold is 3" schedule 10, 304 stainless steel with ANSI 150 bolthole pattern, stainless steel flanges. Air Line: ¼" OD push in bulkhead fitting on control panel.

Electrical Supply:	110 VAC at 3 Amps Siemens 24 Volt DC transformer UL listed
Outputs:	110 VAC for remote lamp indication.
Air Supply:	80 to 120 psi Maximum.
Pressure Gauges:	2 ½" diameter stainless steel body with brass wetted parts, glycerine filled. Operating range is 0 to 100 psi.
Differential Pressure Switch:	Stainless steel body and wetted parts with Viton seals. Operating range is 3 to 47 psi. Fitted with visual setting indicators and two micro switches.
Number of Elements:	7 per pod, 28 in total.
Maximum Operating Pressure:	80 psi, 230 psi test pressure
Maximum Operating Temperature:	140° F
Filter Ratings:	75µ absolute.
Backwash Control:	Automatic: using interval timer and/or differential pressure switch, each with adjustable settings or manually using push button. Duration of backwash adjustable from 1 to 10 seconds.

Pod Parts

Pod Parts



Cage Assembly (not to scale)



SECTION 3 - OPERATION OF THE SYSTEM 2000

The two operating modes of the filter are shown on the following drawing.

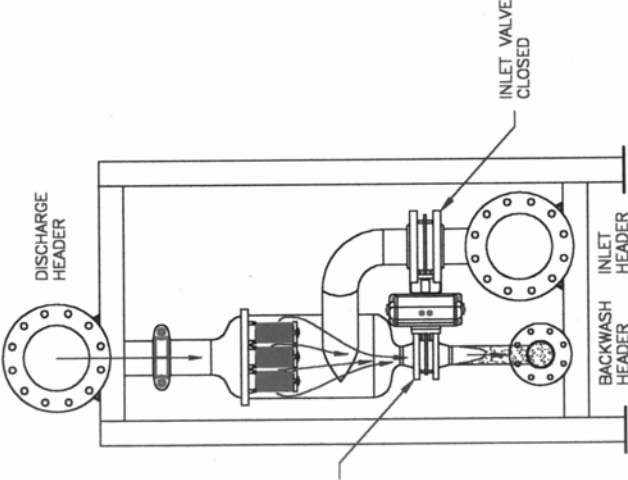
The inlet butterfly valve and the backwash valve are both connected to a common pneumatic actuator. In the filtering mode (left hand drawing) the inlet valve is open and the backwash valve is closed. Fluid enters the pod and passes upwards through the seven filter elements. Debris with a spherical diameter greater than the micron rating of the filter is trapped on the outer surface of the elements. Heavier particles are encouraged to settle at the bottom of the pod. This occurs in that the velocity of the incoming fluid is greatly reduced due to the pod's diameter being significantly larger than the 4" inlet.

When the differential pressure set point is reached, the control system operates the pneumatic actuator of the first pod and this pod is now in backwash mode (right hand drawing). A proportion of the filtered fluid now flows from the discharge header in a reverse direction through the elements and exits the pod through the backwash valve and is taken away to waste via the backwash header. This reversal of flow has the effect of opening the spiral coils of the filter elements and dislodging any trapped debris. The first pod remains in this position for the 'backwash duration' which is an adjustable set point on the PLC of the control system (see Control System). This duration can be adjusted from 1 to 10 seconds depending on site conditions. When the backwash duration of the first pod has expired, the two valves are positioned back to normal filter mode. The control system then advances and backwashes the remaining pods in sequence.

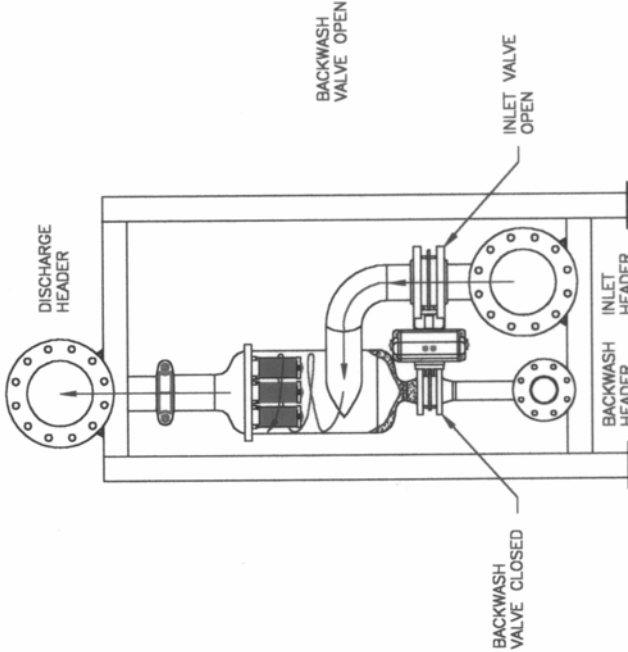
A short delay facility between pods is referred to as the 'pod interval time'. This interval is pre-set and is included to lengthen the overall time of the backwash. This can be useful on applications where the amount of fluid make up to the system is limited. The default pod interval time is 2 seconds although this can be altered by reprogramming the plc, please consult Zero Gravity Filters.

When all pods have been backwashed, the filter reverts to filtering mode.

How the System 2000 Filter Works



BACKWASHING



FILTERING

SECTION 4 - CONTROL SYSTEM

4.1 Control Panel

The filter's controls are contained in an enclosure mounted to one end of the filter's support frame. The principal components of the control system are a Siemens PLC and 24 VDC transformer, Parker air solenoid valves, terminals, Allen-Bradley lamps and buttons, and a backwash counter. Connections between the panel and filter include pneumatic air lines and a 24 VDC electrical connection for the DP switch.

Fitted to the control panel are the following:

1. The Power Lamp (green) indicates that the 24VDC supply is connected to the PLC.
2. The Backwash Lamp (yellow) indicates that a backwash cycle is in progress.
3. The Fault Lamp (red) indicates an error has occurred, see Sections 5.0 and 8.0.
4. The Backwash Button initiates a manual backwash.
5. Reset Button for reset of any fault.
6. The MCB (miniature circuit breaker) is provided to allow the power supply to the PLC to be switched off and on easily and to break at any load exceeding 2 Amps. **Ensure that power is disconnected elsewhere before working on the panel.** The MCB is located in the bottom of the control panel (refer to drawing ZG10124).

4.2 CONTROL SYSTEM

EXPLANATION OF TERMS

PLC	Programmable Logic Controller. A Siemens LOGO! 24RC is provided and is supplied from the 24VDC power supply within the panel. The power supply to the panel is an 110 VAC supply. To determine the program version that is installed on the PLC, depress the reset button three seconds and view the PLC's display.
Input	24VDC signals fed into the PLC from switches, buttons etc. The 24RC has the capacity for 12 inputs.
Output	Information in the form of 24VDC signals which can power indicator lamps, solenoid valves, counters, and factory DCS feedback (i.e. Honeywell System). The 24RC has the capacity for 8 outputs.

I/O LIST

I ₁	Not Used
I ₂	Manual Backwash Button
I ₃	Differential Pressure Switch Contacts – Backwash set point
I ₄	Backwash Interval timer. Allows the user to instigate a backwash after a preset time interval (set to 10 hours as default).
I ₅	High Differential Pressure switch contacts – High set point
I ₆	Not Used
I ₇	Not Used
I ₈	Not Used
I ₉	Not Used
I ₁₀	Not Used
I ₁₁	Not Used
I ₁₂	Reset Button
Q ₁	Pod 1 Actuator
Q ₂	Pod 2 Actuator
Q ₃	Pod 3 Actuator
Q ₄	Pod 4 Actuator
Q ₅	Pod 1 Actuator
Q ₆	Not Used
Q ₇	Backwash Counter and Backwash Lamp
Q ₈	Common Fault Lamp

4.2.1 PROGRAM ADJUSTMENTS

The LOGO! program is simply a series of control statements contained within program segments or “Boxes”. Adjustments to timers within the program are made by gaining access to the appropriate box and changing the setting.

Most variables within the program are set at start up and should not be altered without reference to Zero Gravity Filters. Certain variables are adjustable at any time by the user and are outlined below.



When the panel door is opened, the principal components can be easily recognised. In the top section is the Siemens LOGO! and power supply. In the lower section is the main MCB, power supply, terminal strips, backwash counter, and air solenoid valves which control the opening and closing of the backwash valves.

<u>Box No.</u>	<u>Customer Variable</u>	<u>Function</u>	<u>Default</u>
B03	Yes	Backwash Duration. Sets time for which backwash valve remains open for each pod (and determines the amount of fluid used during backwash).	3.0 sec
B06	Yes	DP Debounce Time. Sets time for which DP switch contacts must remain open before backwash starts.	3.0 sec
B08	Yes	Backwash Interval Time. Sets interval between backwashes.	10.00 Hr
B34	Yes	Service Interval. Sets number of backwashes after which service interval is notified.	20,000
B31	Yes	The length of time allowed for the DP Switch contacts to close before indication of an alarm condition (see Section 2.5.2).	50 sec
B46	Yes	High DP Debounce Time. Sets time for which High DP switch contacts must remain open before alarm indication.	10.0 sec

Adjustments are made by following the sequence described below:

- Step 1 Press the blue key (ESC) on the front of the LOGO! Controller.
- Step 2 Select "Parameterize" option and press OK.
- Step 3 Use the up and down keys to arrive at the required box.
- Step 4 When the desired box has been located, press OK.
- Step 5 Use the left and right arrow keys to position the cursor over the required digit, and then use the up and down keys to change the value.
- Step 6 Once the correct value can be read, press OK. The up and down keys can be used to change another box if required. Finally, press ESC twice to return to the running program.

The time/date can be altered at step 2 above by selecting "Set Clock" and following similar steps as above.

Note:

- T = actual time set
- Ta = this facility allows the actual value of any particular timer to be observed while the program is running. This feature is useful in finding the optimum value for a setting.
- Lim = the number value set
- Cnt = the actual count reached

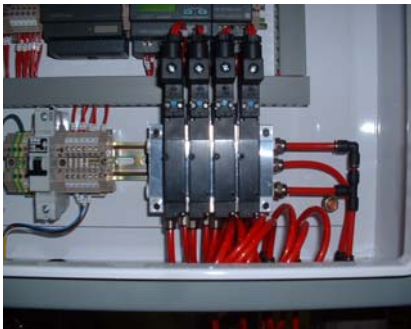
4.2.2 BACKWASH SEQUENCE

Once a backwash (self cleaning cycle) has been initiated by either the backwash button, DP switch or interval timer the following sequence takes place:

- 4 The actuator on pod 1 rotates and closes the 4" butterfly valve fitted on the inlet to pod 1 while simultaneously opening the 2" butterfly valve fitted on the backwash port.
- 5 Pod 1 is then backwashed for the length of time set on the duration timer
- 6 Once the duration time expires, the actuator rotates to open the 4" butterfly valve on the inlet port and simultaneously closing the 2" butterfly valve on the backwash port.
- 7 All the time that Pod 1 is off line, Pod's 2, 3, and 4 remain filtering.
- 8 The same procedure is then carried out for pods 2, 3, and 4 and then pod 1 again.

Note: If the backwash sequence is initiated by the DP switch, there is a three second debounce time (pause) between receiving the DP signal and starting the backwash. This debounce time eliminates unnecessary backwashes due to possible pressure surges in the system.

4.3 Air Solenoid Valves



A closer view of the solenoid valves shows the small blue manual override screws. A small screwdriver can be inserted and a 90° turn will operate the appropriate backwash valve. This is a very useful feature for testing and fault finding.

4.4 Instrument Wing

The instrument wing, mounted above the control panel, contains inlet and discharge pressure gauges (0-100 psi), and a differential pressure switch with two micro switches and visual setting indication. One micro switch is used to set the backwash setpoint and the second switch is used for indication of a high differential pressure across the filter. Please refer to Section 4.5 for information on setting the differential pressure switch.

4.5 Differential Pressure Set Points

The differential pressure switch is mounted on the instrument wing and is connected to the inlet (lower) and discharge header (upper).

The differential pressure across the filter is a measure of the amount of debris that has been trapped by the elements. The difference in pressure between the filter's inlet and discharge operates a diaphragm, which in turn will open the normally closed electrical contacts within the switch. This in turn provides a signal to the control system which then initiates a backwash.

It is imperative that the clean DP of the filter is ascertained prior to setting the backwash setpoint on the switch. To set the DP setpoint, determine the maximum acceptable DP that the filter can impose on the overall system and set the switch accordingly. The DP switch is factory set at approximately 10 psi. **Maximum setting for the DP switch is 40 psi.**

Generally, a higher set point will allow a greater amount of debris to be trapped before backwash. This will have the effect of trapping more of the smaller particles as the debris itself forms a pre-coat to the element. The disadvantage is the increased pressure drop imposed on the fluid circuit and these two aspects must be balanced on site. Too low a backwash set point will have the effect of increasing the frequency of backwash and thus the fluid loss from the circuit.

To adjust either of the set-points, remove the four screws which retain the cover of the switch and turn the appropriate adjusting nut. Clockwise rotation lowers the set point; counter-clockwise rotation raises the set point. As the nut is rotated, the setting on the visual indicator will move. The lower range of numbers is used for setting the DP at which the filter will backwash. The upper set of numbers is the setting for the high DP alarm indication.

4.6 Backwash Duration Timer

The backwash duration is the length of time that the backwash valve is open for each pod. This is how adjustments are made to achieve optimum backwash efficiency. The backwash duration can be set as low as 2 seconds without hindering backwash efficiency. The longer the duration, the longer the remaining pods are 'on-line' before they are cleaned. Therefore, at some point, a full cleaning of the filter elements will be impaired. Full element cleaning is demonstrated when the filter returns to a clean DP as evidenced by comparing the inlet and discharge gauge pressures.

The objective when setting the backwash duration is a balance between effective cleaning of the elements and fluid loss. Generally, a duration of 2 – 3 seconds will be a good compromise, although at lower pressures, say 30 psi, this may need to be increased to 5 seconds to achieve a thorough cleaning effect.

To alter the backwash duration, see Section 4.2.1.

4.7 Backwash Interval Timer

The System 2000 is recommended to be operated with the DP switch provided. This ensures that backwashing follows the contaminant load on the filter, which will often be variable. The System 2000 has an additional advanced facility which takes over from the DP switch at times of low contaminant loading. The backwash interval is the length of time (from the last complete backwash) after which the filter will carry out its own automatic backwash.

This facility is included to prevent the filter from remaining idle for extended periods of time, which may have an adverse effect on the elements. Once a backwash has taken place, initiated either by the differential pressure switch, or by pressing the manual backwash button, the interval timer is reset.

To alter the interval time, see Section 4.2.1.

4.8 Backwash Counter

A non-resettable counter located inside the control panel totals the number of backwash cycles. Note, the counter advances 1 digit after a complete backwash of all four filter pods.

SECTION 5 – FAULT CONDITIONS

DP Switch Contacts Still Open. When the backwash is initiated by the differential pressure (DP) switch, the DP switch contacts will open to start the backwash. The contacts should close upon completion of the backwash cycle to indicate that the cleaning process is complete. If this is not the case and the DP contacts remain open for 50 seconds, the fault lamp will illuminate red and output Q8 will be energized. Also an error message will be displayed on the PLC stating:

**DP switch contacts
Still open
See manual**

To reset the fault lamp once the fault has been cleared, press the reset button on the front of the control panel. If the DP switch contacts have subsequently closed, then the fault lamp will turn off. If the fault lamp remains illuminated, then check for possible faults (Section 8.0).

High DP Switch Contacts Open. A second set of contacts have been supplied to monitor the differential pressure across the filter and indicate an alarm condition if the DP exceeds the 'high' set point.

In normal operation, as the filter gets dirty the differential pressure across the filter will increase and will initiate a backwash at the user-defined set point. Upon initiation of the backwash, the differential pressure across the filter should continually decrease throughout the backwash sequence. However, if the differential pressure continues to increase, this may indicate a potential problem with the cleaning process.

The high DP set point is user-defined and if the DP across the filter reaches this set point for ten (10) consecutive seconds, then the contacts will open and the fault lamp will illuminate red (see Section 8.0). Also output Q8 will be energized and an error message will be displayed on the PLC stating:

**High DP contacts
open
See manual**

To reset the fault lamp once the fault has been cleared, press the reset button on the front of the control panel. If the DP switch contacts have subsequently closed, then the fault lamp will turn off. If the fault lamp remains illuminated, then check for possible faults (Section 8.0).

Service Required. An internal counter totals all backwashes and gives a signal once a set point is reached. This counter is factory set at 20,000 cycles or backwashes. This is a useful facility to indicate that the filter should be serviced. When this set point is reached, the fault lamp will illuminate and the PLC display will read:

Service Required

To clear this indication, press and hold the reset button for thirty seconds.

SECTION 6 - RECOMMENDED MAINTENANCE

Trained personnel at least twice per year should maintain the filter by performing the following procedures. Please refer to "Maintenance Instruction Placards" for color photographs illustrating each step. The following should be carried out.

1. Open bypass and isolate filter.
2. Switch off control panel and isolate.
3. Isolate top and bottom headers and backwash line where necessary
4. Isolate compressed air supply and vent off solenoids.
5. Drain filter using the drain valve beneath the inlet header and allowing air to enter at the top of the discharge header.
6. Remove the Gruklok clamp from pod 1 **ONLY**
7. Remove the ring clamp from pod 1
8. Remove the upper reducer and pod assembly from pod 1
9. Clean filter elements using the element cleaning instructions available from your local Representative.
10. Remove and discard all O rings from cage assembly.
11. Thoroughly clean the O ring grooves on cage assembly.
12. Fit new O rings to cage assembly (see Section 7.0 for part numbers).
13. **Visibly check that all valves are free from debris. NOTE: POWER AND AIR SUPPLY MUST REMAIN OFF THROUGH OUT THIS INSPECTION PROCEDURE UNLESS SUITABLE TRAINING IS COMPLETE.**
14. Clean all O ring mating surfaces and grease.
15. Replace cage assembly taking care that it is centrally located in the pod.
16. Clean and replace top reducer taking care that it is centrally aligned.
17. Clean, grease and replace ring clamp.
18. Clean, grease and replace Gruklok seal.
19. Clean and replace Gruklok clamp.

20. **Repeat Steps 6 – 19 for pods 2, 3, and 4.**
21. Return power and air to panel and check valve movement. Depress manual backwash button and view rotation of spacer on the 2" butterfly valve.
22. Refill and vent, open isolating valves and carry out a manual backwash using the control panel button.
23. Slowly close any bypass valve and check that it operates satisfactorily.
24. Verify illumination of green power lamp.
25. Push manual backwash button, ensure that backwash is initiated and yellow lamp illuminates.
26. Monitor differential pressure across the filter.

SECTION 7 - RECOMMENDED SPARE PARTS

System 2000 Spare Parts List

<u>Part Description</u>	<u>Part Number</u>
Filter Element (St St 316) – St St 316 Cage Assembly	660-***
Element Cage Plate, 4” pod, 4mm	8000-001
Element Cage Plate, 2” pod, 4mm	8000-002
Filter Element (St St 304) - Plastic Cage Assembly	681-***-1
Filter Element (St St 304) – St St 304 Cage Assembly	681-***-2
Element Cage Plate, 4” pod, 6mm	8000-000
Siemens LOGO PLC – 24 VDC, with Program	3001-003
EPRM with Program	3010-001
24 VDC Siemens 1.3 A Transformer	3002-001
Parker Air Solenoid Valve	3100-002
DP Switch, visual indicator, 2 micro, Brass, Nitrile	3200-003
DP Switch, visual indicator, 2 micro, ss, Viton	3200-006
Efector DP Sensor Complete	3210-001
Efector DP Sensor (High)	3211-001
Efector DP Sensor (Low)	3212-001
Patch Cord & ‘T’ Connector for DP Sensor	3213-001
Over-Center, V-band clamp	8024-000
Bray 2” Butterfly Valve – Buna Seats	8501-001
Bray 2” Butterfly Valve – EP Seats	8501-002
Bray 2” Butterfly Valve – Viton Seats	8501-003
Bray 4” Butterfly Valve – Buna Seats	8502-001
Bray 4” Butterfly Valve – EP Seats	8502-002
Bray 4” Butterfly Valve – Viton Seats	8502-003
Bray Series 90, Size 83 Actuator	8510-001
Bray Valve and Actuator Assembly – 4” x 2” Buna Seats	8500-001
Bray Valve and Actuator Assembly – 4” x 2” EP Seats	8500-002
Bray Valve and Actuator Assembly – 4” x 2” Viton Seats	8500-003
Pod O Ring – Buna (Quantity 2)	8550-001
Pod O Ring – EPDM (Quantity 2)	8550-002
Pod O Ring – Viton (Quantity 2)	8550-003
Element Seal Face O Ring – Buna (Quantity 7)	8551-001
Element Seal Face O Ring – EPDM (Quantity 7)	8551-002
Element Seal Face O Ring – Viton (Quantity 7)	8551-003

*** micron designation

SECTION 8 - FAULT FINDING

Listed below is a guide to the action required for the following faults indicated.

8.1 FAULT INDICATION

Listed below is a guide to the action required for the following faults indicated on the control panel.

INDICATION	REASON	ACTION
Fault lamp solid red and error message: DP switch contacts still open. See manual.	DP switch contacts still open after backwash.	Check operation of switch and pressure lines are clear. Check electrical connection between switch and panel. DP switch set point set to low. Check actual DP across the filter. If too high after a backwash the filter elements may need manual cleaning or backwash duration time extended (see sections 6.0 and 4.2.1)
Fault lamp solid red and error message: High DP contacts still open. See manual	High DP switch contacts still open.	Check operation of switch and pressure lines are clear. Check electrical connection between switch and panel. High DP switch set point set to low. Check air supply is on and all pneumatic lines are intact. Check if flow rate or contaminate loading on filter has increased, if so, reduce flow rate, or consider coarser elements
Fault lamp solid red and error message: Service required See manual	Service interval has been reached.	Call supplier and arrange filter service and reorder supplies, see Section 7.0 for part numbers.

8.2 FAULT FINDING

Listed below is a guide to commonly asked questions regarding filter performance.

FAULT	POSSIBLE CAUSE	REMEDY
Excessive Backwash Frequency	<p>Filter elements blocked or excessively fouled.</p> <p>DP switch set too low.</p> <p>Flow rate has increased.</p> <p>Contamination has increased.</p> <p>Backwash interval timer too low.</p>	<p>Clean and replace filter elements, see Section 6.0.</p> <p>Raise DP switch set point, see Section 4.5.</p> <p>Check and regulate.</p> <p>Check, and if possible, increase DP switch set point. If contamination load cannot be corrected, coarser elements may be required, see Section 4.5.</p> <p>Reset, see Section 4.7.</p>
Continuous Backwash	<p>See Excessive Backwash Frequency faults and remedies.</p> <p>Broken electrical connections</p> <p>DP switch has failed.</p>	<p>Check all electrical connections between switch and control panel</p> <p>Verify by removing the DP switch's electrical cover and check that contacts are being switched on rise and fall of DP. Replace switch if necessary.</p>
Upon completion of backwash, DP is higher than clean DP	<p>Filter elements blocked or excessively fouled.</p> <p>System pressure too low for effective backwash.</p> <p>Backwash duration set too low to give thorough clean.</p> <p>DP switch set point set too high causing excessive blinding of elements.</p>	<p>Clean and replace filter elements, see Section 6.0.</p> <p>Check and regulate.</p> <p>Increase backwash duration time setting, see Section 4.6.</p> <p>Check and regulate, see Section 4.5.</p>
Fluid flows from backwash line after end of backwash cycle	<p>Backwash valve is failing to close or seat properly</p>	<p>Check that the valve is being instructed to close. Look for Output Q1, Q2 or Q3 depending on which pod is leaking.</p> <p>Check air supply to actuator.</p> <p>If valve is still passing, dismantle and check for an object jamming the ball valve or damaged seats. Call supplier for service kit or replacement.</p>
Filter Leaking	<p>"O" seals failed, worn, or missing.</p>	<p>Check and replace as necessary. See Spare Parts List, Section 7, for part numbers.</p>