

FilterTecTM

Operations Manual

FilterTec Applications:

Dead End Filtration* (DEF)

Filterability Studies

Filter Scale-up Studies

Filter Device Evaluation

*Also called Direct Flow Filtration (DFF)

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Rev E1, 06/05, Firmware Version 2.63 and higher

What's New?

Several things have been updated and some new features added since the last revision of this manual, and beginning with firmware version 2.61FILT:

1. **Pressure Response Improvement:** The pressure response in all modes has been dramatically improved to minimize pressure limit over-shoots. A 0-100 response factor has also been added to help fine tune this response as your flows and filter porosity needs change. We have found 100 to be the best setting, and it is the default.
2. **Temperature measurement:** The ability to monitor temperature in degrees Celsius has been added, and a standard probe to measure it in-line is available.
3. **Analog Signal Input:** The 4-20ma output of a turbidity or UV detector can be provided to the FilterTec, and it will record that value along with the other parameters of your process.

FilterTec Maintenance

A factory cleaning, testing and recalibration should be performed to your FilterTec at least once a year.

Fill Out this Form & Fax it to SciLog at FAX: 608-824-0509.

1. Scilog will send you a **loaner pump for one week** if you request it. **\$300/week**
This price includes the cost of next day shipping & insurance to send the loaner to you.
2. Use the packing material from the loaner & send your pump to:
SciLog Inc.
8845 S. Greenview Dr.
Middleton, WI, 53562
3. **SciLog will disassemble, clean and lubricate the pump head, change the seals if appropriate, test, recalibrate and generate a Performance Validation for your FilterTec.** If your pump needs a new motor or pump head, then we will contact you & get your approval before replacing them. A new motor is \$350; a new piston head is \$645; a new peristaltic Tandem head is \$235. Most of the time, cleaning and recalibration is all that is needed to insure many years of service. Price includes the cost of SciLog shipping your pump back. **\$300**
4. Once you receive your cleaned/repared FilterTec, use the packing material to repack the loaner and send it back to SciLog.
Assuming no replacement parts are required,
Total Cost, including Loaner and Shipping: \$600

Please Check all of the following that are appropriate:

Yes, I need my FilterTec cleaned and recalibrated.

Yes, I need a loaner FilterTec sent to me.

PO# _____ **or Credit Card#** _____
Credit Card Expiration Date _____

Send the Loaner and/or Repaired / Cleaned FilterTec to:

Company: _____

Address: _____

Contact: _____

Contact Phone #: _____

Contact Fax #: _____

Contact Email: _____

Call SciLog Customer Service at 800-955-1993 with any questions.

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Safety Information:

Be sure to read and observe the following requirements!

Before connecting the FilterTec to mains, make sure that the mains voltage corresponds to the voltage rating given on back panel of the pump.

Opening the FilterTec cover exposes live parts. Therefore, the cover must not be removed. If repair should be required, return the pump to the factory.

If opening of the FilterTec cover is inevitable, the pump must first be disconnected from all voltage sources.

Make sure that the mains plug has been pulled out.

Repair or adjustment of an opened FilterTec under voltage must be carried out only by a skilled person who is aware of the hazard involved.

Whenever it is likely that the protection has been impaired, the FilterTec must be made inoperative and secured against any unintended operation. The protection is likely to be impaired if, for example:

- The FilterTec shows visible damage
- The FilterTec fails to perform as intended
- After prolonged storage at temperature above 70°C
- After severe transport stresses

Before re-commissioning the FilterTec, a professional routine test according to EN 61010-1 must be performed.

Installation & Start-Up



Installation of the FilterTec must be carried out only by trained personnel in accordance with the relevant regulations and this operations manual.

Make sure that the technical specifications and input ratings of the FilterTec are observed. See “FilterTec Specifications”

The FilterTec must be connected to a properly grounded power supply receptacle.

The FilterTec location must not block access to the power disconnect point for the power supply.

The protection provided by this equipment may be impaired, if the FilterTec is used in a manner or for purposes not specified by the manufacturer, SciLog, Inc.



Start-up of the FilterTec must be carried out only by trained personnel in accordance with the relevant regulations and this operations manual.

Before first start-up, a parameter setting procedure and/or a parameter review must be performed by supervisory personnel.

User selected parameters are stored in the FilterTec memory and are battery backed for approximately one (1) year. After longer power outages these data can be lost.

Maintenance & Cleaning:



The FilterTec pump controller is maintenance free, however, for long term performance of the FilterTec, a factory cleaning, testing and recalibration is recommended at least one a year. The pump head and associated pump tubing should be flushed with distilled water for at least 5 minutes prior to pump shutdown.



To remove dust, dirt and stains, the outer surfaces of the FilterTec may be wiped using a soft, non-fluffing cloth moistened with water. If required, you may also use a mild detergent or 2-propanol.

Standards:



The FilterTec meets the following generic standards:

- Electromagnetic Emission: EN 50081-1: 1992
- Immunity to Interference: EN 50082-1: 1992

Description of this Manual:

This operations manual provides following information:

- Safety Requirements
- Product Specifications
- FilterTec Hardware, Part A
- FilterTec Software, Part B



WARNING:

Warning means that ignoring the given instructions may lead to malfunction or damage of the instrument or other equipment and to personal injury.



NOTE:

Note call you attention to important information. *Italics* are used to emphasize certain information.

Introduction:

You will find the FilterTec system easy to learn and simple to use. The state-of-the-art hardware and software design of the FilterTec allows you to automate many filtration and filter sizing processes. With proper maintenance, the FilterTec will provide many years of excellent service and performance.

Please read the following instructions carefully!

Inspections: Unpack the FilterTec and accessories carefully from the carton. Cross-check the contents against your purchase order to verify that all parts are included and undamaged.

Please do the inspection now, even if the FilterTec is not used immediately. Many carriers must receive damage claims within seven day of delivery. Please retain all packing material so unit may be shipped safely, if necessary.

SciLog Customer Service: If you need assistance, please call

1-800-955-1993 or 1-608 -824-0500

SciLog Customer Service personnel will be able to serve you more efficiently if you have the following information:

- Serial number (back panel) and model name of the equipment.
- Installation procedure you used.
- Concise list of symptoms.
- List of operating procedures and conditions you were using when problem arose.

Warranty Repair: Units covered under warranty will be repaired and returned to you at no charge. If you have any questions about applicability, please contact SciLog.

Non-warranty Repair: For out-of-warranty repair, contact the SciLog Customer Service Department. A SciLog representative will discuss service options with you and can assist in making arrangements to return the equipment, if necessary.



WARRANTY POLICY, PRODUCT RETURNS, ACCEPTABLE USE, AND OTHER RESTRICTIONS

1. WARRANTY AND RETURNS POLICY:

SCIOLOG, INC. EXPRESSLY WARRANTS THE EQUIPMENT MANUFACTURED BY IT ONLY AS SET FORTH HEREIN. SCIOLOG, INC. MAKES NO OTHER WARRANTIES, EITHER EXPRESS OR IMPLIED (INCLUDING WITHOUT LIMITATION WARRANTIES AS TO MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE). IN ADDITION, THE FOLLOWING SHALL CONSTITUTE THE SOLE AND EXCLUSIVE REMEDIES OF BUYER FOR ANY BREACH BY SCIOLOG, INC. OF ITS WARRANTY HEREUNDER.

A. PRODUCT WARRANTY – SciLog, Inc. warrants products it manufactures against defects in materials and workmanship for one (1) year from the date of shipment from SciLog, Inc. in normal use and service. If any products fail to conform to this warranty within the first ninety (90) days of the warranty period, SciLog, Inc. will, at its option, repair or replace such goods returned. If any products fail to conform to this warranty for the remainder of the warranty period, SciLog, Inc. shall furnish necessary replacement parts free of charge.

B. PARTS WARRANTY - SciLog, Inc. warrants service parts against defects in materials and workmanship for ninety (90) days from the date of shipment from SciLog, Inc. in normal use and service. If any service parts fail to conform to this warranty, SciLog, Inc. shall furnish necessary replacement parts free of charge.

C. WARRANTY LIMITATIONS - These warranties are subject to the following conditions:

1. Upon discovery of such non-conformity, SciLog, Inc. will be given prompt written notice with a detailed explanation of the alleged deficiencies.

2. The product or part must be properly installed, operated and maintained in accordance with SciLog, Inc. specifications.

3. The product or part must not be operated above rated load capacity or subject to accident, alteration, misuse, or abuse.

4. The product must not have been repaired or serviced by anyone other than SciLog, Inc. or one of its authorized dealers.

5. SciLog, Inc. shall have a reasonable time to repair or replace the effective product.

6. The buyer is responsible for shipping the product to SciLog, Inc. SciLog, Inc. is responsible for shipping the product back to the buyer.

D. RETURN POLICY - Any item may be returned within thirty (30) days from the date of shipment from SciLog, Inc. If the box is unopened (the original factory seal is intact), SciLog, Inc. will refund the full credit to the buyer. If the box is opened (the original factory seal is not intact), SciLog, Inc. will refund the full credit less a \$75 inspection fee and repair labor/parts/materials cost (if applicable) to the buyer. No returns will be accepted after thirty (30) days from the date of shipment from SciLog, Inc. The buyer is responsible for shipping the product to SciLog, Inc.

2. INTELLECTUAL PROPERTY

The sale and delivery of the SciLog, Inc.'s equipment and/or software to Buyer shall in no way transfer to Buyer any right of ownership in any patents, copyrights, trademarks, technologies, designs, specifications, drawings, or other intellectual property incorporated into the equipment and/or software.

3. DISCLAIMER OF DAMAGES

IN NO EVENT SHALL SCIOLOG, INC. BE LIABLE FOR ANY TYPE OF SPECIAL CONSEQUENTIAL, INDIRECT, INCIDENTAL OR PENAL DAMAGES, WHETHER SUCH DAMAGES ARISE OUT OF OR ARE A RESULT OF BREACH OF CONTRACT, WARRANTY, TORT (INCLUDING NEGLIGENCE), STRICT LIABILITY OR OTHERWISE. Such damages shall include but not be limited to loss of profits or revenues, loss of use of the equipment or associated equipment, cost of substitute equipment, facilities, down time costs, increased construction costs or claims of Buyer's customers or contractors for such damages. Buyer agrees that in the event of a transfer, assignment, or lease of the equipment sold hereunder Buyer shall secure for the SciLog, Inc. the protection afforded to it in this paragraph.

4. LIMITATION OF LIABILITY

The SciLog, Inc. shall not be liable for any loss, claim, expense or damage caused by, contributed to or arising out of the acts or omissions of Buyer or third parties, whether negligent or otherwise. In no event shall the SciLog, Inc.'s liability for any cause of action whatsoever exceed the cost of the item giving rise to the claim, whether based in contract, warranty, indemnity, or tort (including negligence). Any suit arising hereunder must be commenced within one (1) year from the date in which the cause of action accrues. Except as provided in Article 3, the SciLog, Inc. shall not indemnify any party.

5. NO RESPONSIBILITY FOR GRATUITOUS INFORMATION OR ASSISTANCE

If SciLog, Inc. provides Buyer with assistance or advice which concerns any parts, products, service supplied hereunder or any system or equipment in which any such part, product or service may be installed and which is not required pursuant hereto, the furnishing of such assistance or advice shall not subject SciLog, Inc. to any liability, whether based in contract warranty, tort (including negligence) or otherwise.

6. INTERNATIONAL SALES EXPORT

Buyer EXPRESSLY agrees and verifies that the purchased product(s) will not be transferred or exported to third parties or foreign nationals and that Buyer is the final end-user of the product. Export or transfer of any SciLog product without the EXPRESS written authorization of the SciLog, Inc. is strictly prohibited and may violate US trade laws and regulations, thereby subjecting the Buyer to civil and criminal liability.

7. REVISIONS TO THIS POLICY

From time to time the Company may revise the terms of this Agreement. Company will make its best efforts to inform customers of these revisions. The most current revision of these terms may be accessed over the internet by accessing the webpage located at: <http://www.scilog.com/warranty>

REGISTER YOUR PRODUCT(S) WITH SCIOLOG, INC. IMMEDIATELY AT:

<http://www.scilog.com/register>



Phone: 608-824-0500 Fax: 608-824-0509
8845 South Greenview Drive, Suite 4
Middleton, Wisconsin 53562 USA

FilterTec System Specifications:

Mechanical:

- **Dimensions:** Width: 5.75 in (14.6cm); Height: 8.5 in (212.6); Depth: 11in (27.9)
- **Weight:** 14 lbs (6.4kg)
- **Enclosure:** Aluminum / Steel; Corrosion Resistant, Recessible Handle
- **Pump Head / Motor Options:**
 1. **Tandem 1081 peristaltic pump head with 8 RPM motor**, accommodates thin-walled (0.060") pump tubing: #13, 14, 16, 25, and #17. Pump Rate Range: 0.03 to 24.3 ml/min. **Recommended for virus filtration applications.**
 2. **Tandem 1081 peristaltic pump head with 160-RPM motor**, accommodates thin-walled (0.060") pump tubing: #13, 14, 16, 25, and #17. Pump Rate Range: 0.5 to 554 ml/min. **Recommended for lab-scale DEF applications with filter area from 50 cm² to 200 cm²** e.g." Pellicon XL 50" (Millipore), "Minimate" (Pall), "LV Centramate" (Pall), "Sartocon Slice of a Slice" (Sartorius).
 3. **Tandem 1082 peristaltic pump head with 600-RPM motor**, accommodates thick-walled (0.090") pump tubing: #15, 24 and #35. Pump Rate Range: 59 to 2,258 ml/min. **Recommended for process-development DEF applications with a combined filter area of up to 0.40m²**, e.g. "Pellicon Mini" (Millipore), "Pellicon Cassette" (Millipore), "Ultrasette" (Pall), "Centramate" (Pall), Maximate" (Pall), "Sartocon Slice", "Sartocon Casstte" (Sartorius).
- **Pressure Sensors:** Accommodates up to three (3) disposable pressure sensors: P1, P2, and P3. Pressure control is achieved by modulating pump output. The user selects P1, P2 or P3 as the controlled pressure.
- **Pressure Displayed** with a resolution of 0.1 psi; choice of **bar, psi, kpa.**
- **Pressure Range:** The default pressure range of the sensors is **0-60psi**, and is calibrated at the factory. Most peristaltic pumps generate pressures up to 40 psi. If you have need for higher pressures, contact Scilog Customer Service for assistance.

Electrical:

- **Power:** 110-120 / 220-240 VAC, 60/50Hz, 75 Watts; double fused: T1AL, 250V (CE: IR35A 250VAC)
- **Operational Range:** 4 to 40° C, 100% Humidity.
- **Motor:** Choice of three (3) motors: 8, 160 and 600 RPM at 30VDC, 3.8 Amperes, Variable Pump Speed optically encoded servo-controlled motors.
- **Encoder:** 100 lines/rev. for 600-RPM motor. 120 lines per/rev. for 8 and 160-RPM motors.
- **I/O Ports:**
 1. **First serial port labeled "Balance"**, Male DB9 connector for hook-up of electronic scale.
 2. **Second Serial Port labeled "Printer"**, Female DB9; also used to interface to PC for data storage in an Excel file in your PC.
 3. **Valve V Port**, Female DB15 connector for control of a 6-way Rotary Selector Valve.
 4. **External I/O Port**, Female DB 37 connector, Can be used for Single Pressure Sensor Amplifier input, or used for remote On/Off control of FilterTec via footswitch, control of a second 6-way rotary valve (W), one analog data acquisition input, (0-5 VDC, 4-20 ma) and one TTL output. Use of Pressure Sensor Amplifier precludes access to the other contacts, use 3-Sensor Box mentioned below.
 5. **Pressure Ports:** Phone plugs for P1 = Pressure Sensor 1, P2 = Pressure Sensor 2, P3 = Pressure Sensor 3.
 6. **Temperature Port:** 2-wire watertight connector for Disposable Temperature Probe.
- **Display:** Two line LCD, 20 characters each, back-lit.
- **Data Entry:** Membrane keyboard with auditory feedback.

FilterTec Balance

- Balance with capacity of 2,000 grams x 0.01 g resolution included with FilterTec CP-8
- Balance with capacity of 8,100 grams x 0.1 g resolution included with all other FilterTec models.
- Larger balances available upon request. Contact SciLog Customer Service.

FilterTec Software

- **Main menu with five operational modes:**
- **Constant Rate Mode:** Pumps at a user defined rate, and can switch to a user defined pressure with five, user-definable alarms, in particular the **Pmaintain** Alarm that switches from Rate to Pressure control.
- **Constant Pressure Mode:** Pressure controlled flow rate is varied to maintain a user-defined pressure by modulating the Feed Rate, with five, user-definable alarms.
- **Programmable R-P Mode:** Programmable step-by-step variable Rate and Pressure control, with access to a six-way valve.
- **Setup Mode:** Selection of user preferences and interface options.
- **Manual Mode:** Manual control of motor speed and will monitor one pressure, no alarms.
- **Can change the Rate or Pressure on the fly.** This is a very useful tool in determining the optimum parameters for your process.
- **Optimizes DEF Applications:** Direct Flow Filtration.
- **Implement Filterability Studies,** in addition to Filter Size Determinations.

Documentation Software for PC

- SciDoc Excel Spreadsheet with custom macros and WinWedge interface software for data compilation. Sent to you ready to use.
- Complete process analysis with graphing of data.
- Real-time verification and documentation of process parameters.
- Includes graphs of:

Feed Rate (FF), Collection Rate (C1) and Pressure (P1) vs. Time
Collection Rate (C1) and Filtrate Quantity (Q1) vs. Time
T/W vs. Time, Vmax

Display, Printout and Excel Abbreviations:

MT = Military Time, HH:MM:SS
RT = Run Time, 00:00:00 at START
Q1 = Filtrate Quantity collected
P1 = Pressure at Sensor 1, psi, bar or kpa
P2 = Pressure at Sensor 2, psi, bar or kpa
P3 = Pressure at Sensor 3, psi, bar or kpa
AL = Alarm, e.g. AL: CV Cumulative Volume Alarm
HP=4, High Pressure Alarm is "Pmaintain"
LP=1, Low Pressure Alarm is "OFF"
Q1=3, Filtrate Weight Alarm is "PUMP STOP"

FF = Feed Rate, ml/min
CV = Cumulative Feed Volume, ml
C1 = Collection Rate, gr/min
CW = Clockwise Pump Direction
CCW =Counter Clockwise Pump Direction
ST = Pump Status, START, RUN, etc.
CV=1, Cumulative Volume Alarm is "OFF"
RT=2, Run Time Alarm is "ALERT ONLY"
LF=2, Low Flow Alarm is "ALERT ONLY"
RF = Response Factor

Part A: FilterTec Hardware

1.0 Overview:

The FilterTec is a DEF laboratory-scale filtration system that automates filterability studies and dead end filtration processes. In DEF, process solution is pumped through a filtration device, typically a 47mm diameter disk filter, having a user-selected porosity. In contrast to older, less efficient DEF procedures, SciLog's new "Pmaintain" Alarm method automates direct flow filtration (DEF) of dilute protein solutions while providing a 35% greater filtration yield.

SciLog's new "Pmaintain" Alarm method consists of the following steps: Initially, a user-defined constant pump rate fluid delivery is implemented in Constant Rate Mode until a user-defined pressure limit is reached. At this point, the fluid handling system automatically switches to a constant pressure delivery, i.e. modulating the pump output until a user-defined lower filtration flow limit is reached and the pump automatically stops.

The FilterTec system provides ease of use and operational safety: Up to six (6) user definable alarm conditions can be continuously monitored and displayed.

The user programmable alarms include:

1. **High Pressure Alarm** to monitor filter plug-up conditions, the Pmaintain Alarm is part of this Alarm menu, will change the unit from Constant Rate to Constant pressure at a user-defined value.
2. **Low Pressure Alarm** to monitor system leakage.
3. **Low Flow Alarm** to monitor filter plug-up conditions. Used along with Pmaintain in High Pressure Alarm to terminate the filtration process.
4. **Cumulative Volume Alarm** to monitor total volume based on the feed rate.
5. **Filtrate Weight Alarm** to quantitatively measure the filtrate yield.
6. **Run Time Alarm** that stops the pump action when a user defined filtration time has elapsed.

All alarms provide an auditory signal; the pump stops when user defined alarm limits are exceeded. Alternatively, any alarm can be selectively disabled. All pump filtration, as well as alarm parameters can be printed out at user defined time intervals with a SciLog serial printer. Alternatively, all of the collected data can be sent to a supervisory computer for data archiving using SciDoc or HyperTerminal.

The two-channel **TANDEM™ 1081 peristaltic pump head** can accommodate PharMed and Silicone pump tubing, **including sizes 13, 14, 16, 25, & 17**. If equipped with the **TANDEM™ 1082** model, sizes **15, 24 & 35** can be accommodated. Feed rates for all pump tube sizes are factory calibrated; however, the user can easily recalibrate any tube size with a single keystroke from the FilterTec front panel. The TANDEM™ pump head delivers flow rates ranging from 0.03 ml / min. to 2200 ml / min. for each of the two pump channels depending on motor rpm. Two TANDEM pump heads can be mounted together to provide a four-channel pumping capability, and drastic reduction in pulsation when two upper or lower channels are combined into one.

NOTE: The FilterTec usually is configured with a 160-rpm motor. However, if your flow rate needs require, the FilterTec is available with either a 600-rpm or 8-rpm motor. In Setup: Pump: Motor: Rpm, select the RPM of your installed motor. By doing so, the FilterTec will select the appropriate factory installed calibration curves and flow rates.

2.0 Front Panel: Data Entry & Display



The front panel consists of a user interface, which includes an alphanumeric display and a membrane keypad to select operational modes and alarm settings. The display is a two line, 20 characters each, liquid crystal display (LCD). The display is backlit to allow easy viewing over a wide range of lighting conditions.

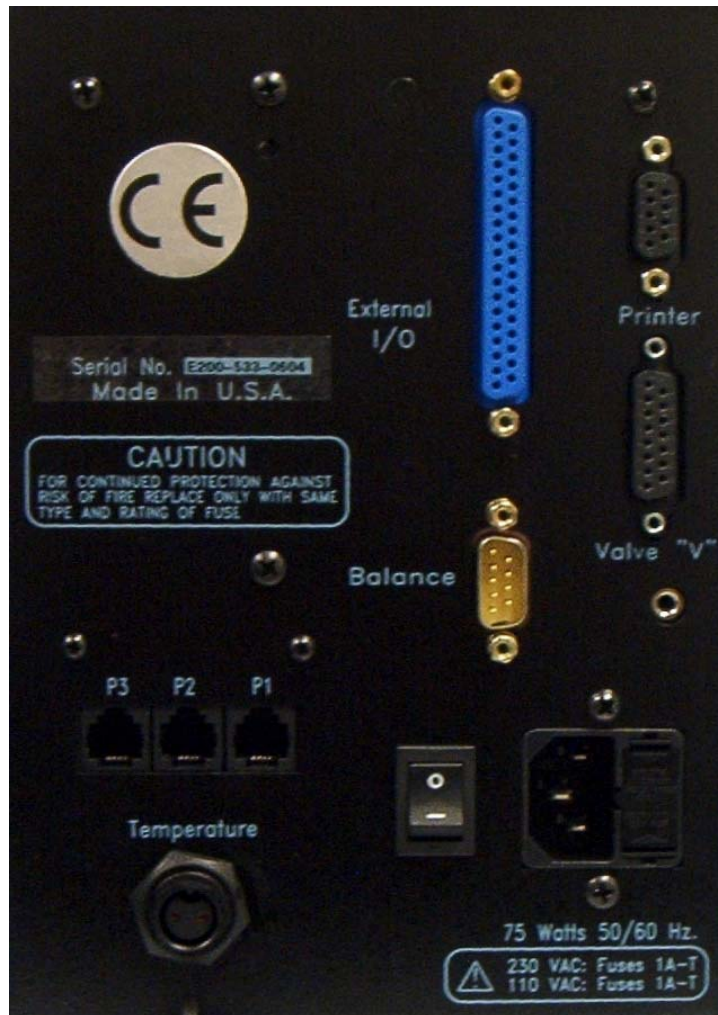
The lower line on the LCD is used to signify the function of the “soft keys” marked “A”, “B” and “C”. The “soft key” current labels are displayed in the lower line of the LCD. If you press these keys, then the function displayed above it will be performed.

The main keypad consists of eight “hard” keys whose function does not change. These keys are used for basic control and programming of the FilterTec. The basic key definitions are:

RUN	Executes the selected operational mode and starts pump. (Run Command)
STOP	Interrupts current operational mode and stops pump. (Stop Command)
RATE/PRESSURE	Sets pump RATE in ml/min, or PRESSURE in psi, depending on Mode being implemented. Allows “on the fly” changes in Constant Rate or Constant Pressure Modes. (Access to Rate, Pressure Choices in Programmable R-P Edit Mode.)
TIME	Displays motor pulses per second in Manual mode. (Access to Time statement in Programmable R-P Edit Mode.)
↔	CW or CCW pump direction.
DISPLAY/SWITCH	Changes between three operational displays in all modes. (Access to TTL 1-4 in Programmable R-P Edit Mode.)
EXIT	Exits current operational mode or menu level, stops pump.
STAR (*)	Pump rate recalibration. (Access to Valve Control in Programmable R-P Edit Mode.)

Two LED’s are also on the front panel, just to the left of the main keypad. These indicate the current pump status. A green light indicated the pump is in motion; the red light indicated that the pump has stopped.

3.0 Back Panel: Interface Options

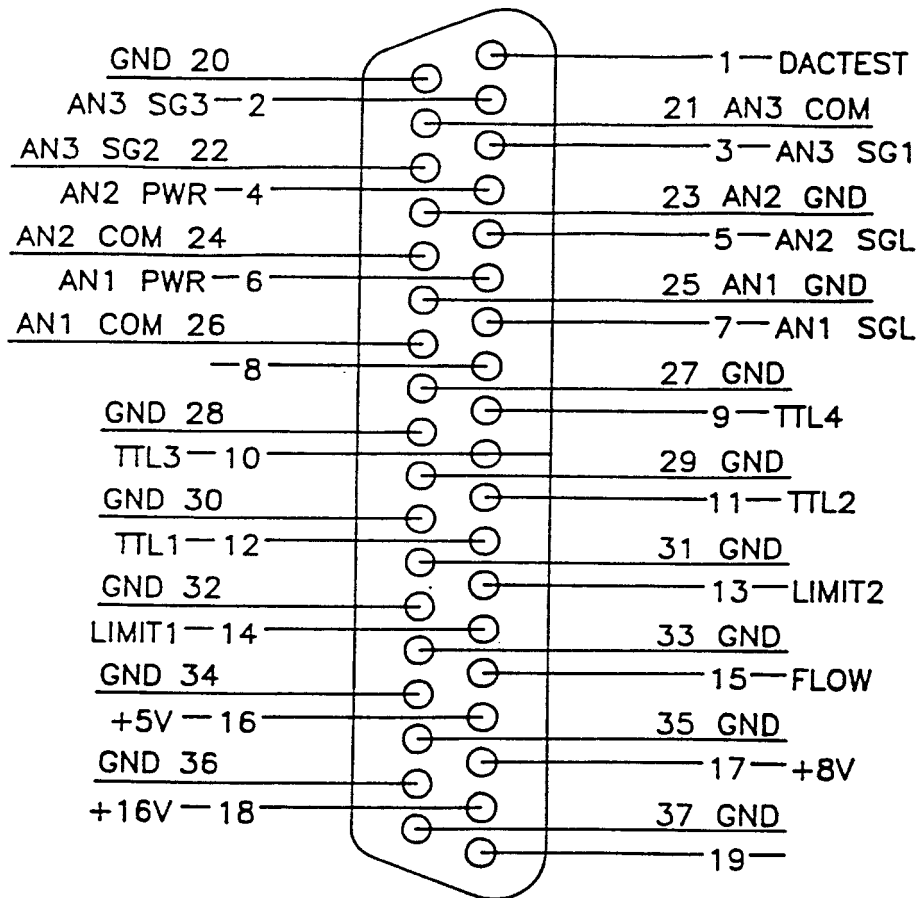


The FilterTec back panel provides interfacing ports for:

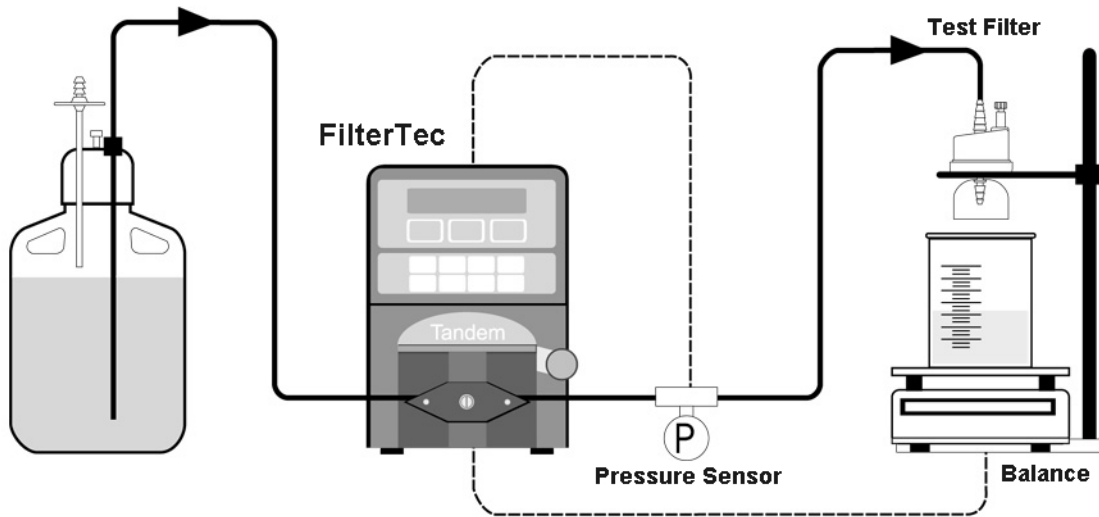
- * **SciLog Printer, (P/N: 080-095):** Female DB9, Serial Port 2, Labeled "Printer".
- * **Electronic Balance:** Male DB9, Serial port 1, Labeled "Balance".
- * **Rotary Selector Valve Kit, (P/N: 080-510):** Female DB15, Labeled "Valve V". Second Kit (Valve W) on Female DB37, Labeled "I/O".
- * **Foot Switch (P/N: 080-059):** Female DB37, Labeled "I/O".
- * **Analog Input Cable, (P/N: 080-064):** Female DB37, Labeled "I/O".
- * **Disposable Pressure Sensors, (P/N: 080-601A):** Phone jack connections for up to 3 pressure sensors.
- * **Inline Temperature Probe, (P/N: 060-090):** 2-pin watertight connector labeled "Temperature"

- 3.1 Printer Port:** The SciLog printer is connected to the FilterTec via Serial Port 2 labeled “**Printer**”. You need a printer cable (080-096) to make the connection between the printer and the FilterTec, or a SciLog RS-232 cable (P/N 080-073) to connect the FilterTec to your PC for data archival via HyperTerminal or with SciDoc Data Collection Software.
- 3.2 Balance Port:** The serial port 1 which is labeled as “Balance” allows you to interface with a number of different electronic balances: i.e. Mettler, Ohaus, and Sartorius top-loading balances. The following balance cables are required:
- * **Ohaus:** Adventurer Pro Models **P/N: 080-067PGS**
 - * **Mettler:** Series 4 Models **P/N: 080-067PGS**
- 3.3** In the FilterTec **Setup: Scale** mode, select the balance manufacturer; the FilterTec will automatically implement the correct communications parameters. The Adventurer Pro mentioned above is the preferred balance, and will ship with most systems. **Check that the proper communications parameters are also implemented in the balance you are using (see Part B, section 5.1).**
- 3.4 Pressure Sensor Connectors:** Telephone jacks for the pressure sensors, labeled “P1”, “P2”, and “P3”. Alternatively, if one sensor is all that is desired, a Pressure Sensor Amplifier can be connected to the 37 pin I/O connector on the rear of the unit. (This option is used only for upgraded UltraTecs that have not had the 3-sensor board installed.)
- 3.5 Temperature Connector:** Connects to an In-line Temperature Probe for monitoring the temperature of your fluids.
- 3.6 Valve V Connector:** Connects via cable to the Rotary Valve Selector Kit for use in PROGRAMMABLE R-P Mode to change valve position in a programmed manner. The valve has a Center Port and 6 selectable Output Ports.

3.7 I/O Connector: It is used to interface with SciLog foot switch (P/N: 080-059) and allows remote Start / Stop control of the FilterTec. Provides connection for Pressure Sensor Amplifier for those labs that only want to use one sensor. (Precludes use of other connections mentioned below.) It also has connections for a second Rotary Valve Selector Kit (Valve W) and access to TTL Switches 1-4, (Only TTL4 is available when Valve W is in use.) and Analog Input Channel 1. (Analog Channel 1 uses pins 7 and 26)



4.0 Pressure Sensor Installation:



In most applications, the disposable pressure sensors are connected to one end of a T fitting, and used in a dead-end manner.

CAUTION: Make sure you have secured all of the connecting tubing for the pressure sensors with Nylon cable ties. **At least one of the pressure sensors and tubing are located at the high-pressure side of your filtration system!**

The Pressure Sensors are labeled P1, P2, and P3 in the diagram above. If you are using a larger style filter cartridge, they plug into telephone jack connections on the rear panel. The connections are **labeled “P1”, “P2” and “P3”** for ease of use. (If your unit is configured for only one pressure sensor and equipped with a Pressure Sensor Amplifier on the I/O port on the rear of the FilterTec, then plug the sensor into its telephone jack, it is displayed as P1 on FilterTec screen and documentation software.)

The disposable pressure sensors are easy to change when the need arises, and are readily available from SciLog in packs of 10 with the proper cable attached.

5.0 TANDEM™ Dual Channel Pump Head:

The TANDEM peristaltic pump head is specifically designed for use with the FilterTec system. The SciLog TANDEM pump head will provide you with rugged reliability as long as common sense maintenance and good quality pump tubing are used. For filtration applications, you should be using either Silicone or PharMed pump tubing in the correct sizes.

The TANDEM pump head is driven by a 600 RPM, high-torque motor. The pump motor is optically encoded and servo-controlled, thus the TANDEM pump head will maintain a constant output over a wide range of filtration conditions.

However, when the pump head requires excessive torque because of pump tube failure or “freezing” of the pump head, then the FilterTec control software will recognize this condition and go into a stand-by mode, the pump motor is turned off and the following message is displayed:

<p>CHECK YOUR PUMP HEAD Press Any Key</p>

Before continuing with your pumping application, remove the defective pump head / tubing and either clean or replace with a functional pump head. This feature (PumpSense™) has been implemented by SciLog to protect your pump motor and electronics. **NOTE: There is nothing wrong with the FilterTec controller when you see this display. The problem lies with the pump head and /or pump tubing you are using.**

When you “Press Any Key” to leave the stand-by mode, you will enter the Main Menu. After you check and replaced your pump head / tubing, you may re-initialize your application.

5.1 TANDEM Pump Head Installation:

1. Identify the front and back of the TANDEM. Two 8-32 mounting cap screws, as well as the pump shaft tang extend from the back of the TANDEM pump head.
2. Facing the front of the TANDEM, open the pump head by moving the black loading lever 180° to the left. The upper and lower pump shoe will move in opposite directions, thereby exposing the inside of the upper and lower pump shoe channels.
3. With the TANDEM pump head completely opened, locate the mounting holes for the two 8-32 cap screws inside the lower pump channel.
4. On the front panel of the FilterTec, locate the mounting holes and the slotted pump head coupler.
5. Before fastening the TANDEM, align the two mounting screws and pump shaft tang of the TANDEM with the holes and slotted coupler of the FilterTec front panel mounting plate.
6. Make sure the TANDEM pump shaft tang is properly seated in the mating slot of the pump head coupler, before fastening the TANDEM to the front panel of the FilterTec.

5.2 Pump Tubing / Rate Selection:

The approximate flow rate ranges associated with various pump tube sizes and motor speeds are shown in the table below:

Tubing Size	13	14	16	25	17	18	15	24	35
Silicone Part #	400-113	400-114	400-116	400-125	400-117	400-118	400-115	400-124	400-135
PharMed Part #	400-313	400-314	400-316	400-325	400-317	400-318	400-315	400-324	400-335
Pump Rate Range*:	ml/min	ml/min	ml/min	ml/min	ml/min	ml/min	ml/min	ml/min	ml/min
CP-8 8RPM	0.03 - 0.45	0.1 - 1.6	0.4-6.4	0.9 - 12.6	1.1 - 18.3	1.7 - 24.3	0.4 - 13	0.6 - 20	0.8 - 32
CP-120 160RPM	0.5 - 10	1.7 - 35.2	6.3 - 129	12.5 - 283	18.5 - 405	24.7 - 554	9 - 260	13 - 435	16 - 650
CP-200 600RPM	2 - 34	8.6- 132	29 - 533	49 - 974	70 - 1048	103 - 1515	59-993	85-1348	111 - 2258
* Nominal Values									
Pump Head Model:	TANDEM 1081						TANDEM 1082		

For dead-end filtration applications, the selected FilterTec feed rate should not fall below the minimum feed rate for your process. First select the appropriate pump tubing size from the table above. The minimum feed rate of your process should fall into the midrange for the selected pump tube size. For example, if your Minimum Feed rate is 50 ml/min., then the appropriate pump tubing is #16 when using a 160-rpm motor. In general, avoid using pump tube sizes that force you to work at either the low or high pump rate extremes whenever possible.

The FilterTec software contains permanent, factory installed calibration tables for each of the nine (9) pump tube sizes listed above. The calibration table relates the pump motor RPM to the pump output in terms of ml / minute. However, the FilterTec can be recalibrated by utilizing the front panel star (*) key of the FilterTec.

NOTE: The FilterTec usually is configured with a 160-rpm motor, and the built-in calibration curves for that motor. If your flow rate needs require, the FilterTec is also available with either a 600-rpm or 8-rpm motor. By accessing SETUP:PUMP:Motor RPM, from the front panel, you can select the RPM of the installed motor. The FilterTec will then implement the factory installed calibration curves for that motor. This will have been done for you at the factory prior to testing and shipping.

Differences in pump tube formulation/manufacture, as well as pump tube wear over time may cause the FilterTec pump output to change slightly. Thus for very high pump rate accuracy you may want to recalibrate the FilterTec with your particular pump tubing in place. Recalibration of the FilterTec is very easy and straightforward; Please see Part B, Section 2.

5.3 Pump Tube Installation:

CAUTION: Do NOT mount or dismount the TANDEM pump head while the FilterTec is powered. Do NOT change pump tubing while the FilterTec is powered.

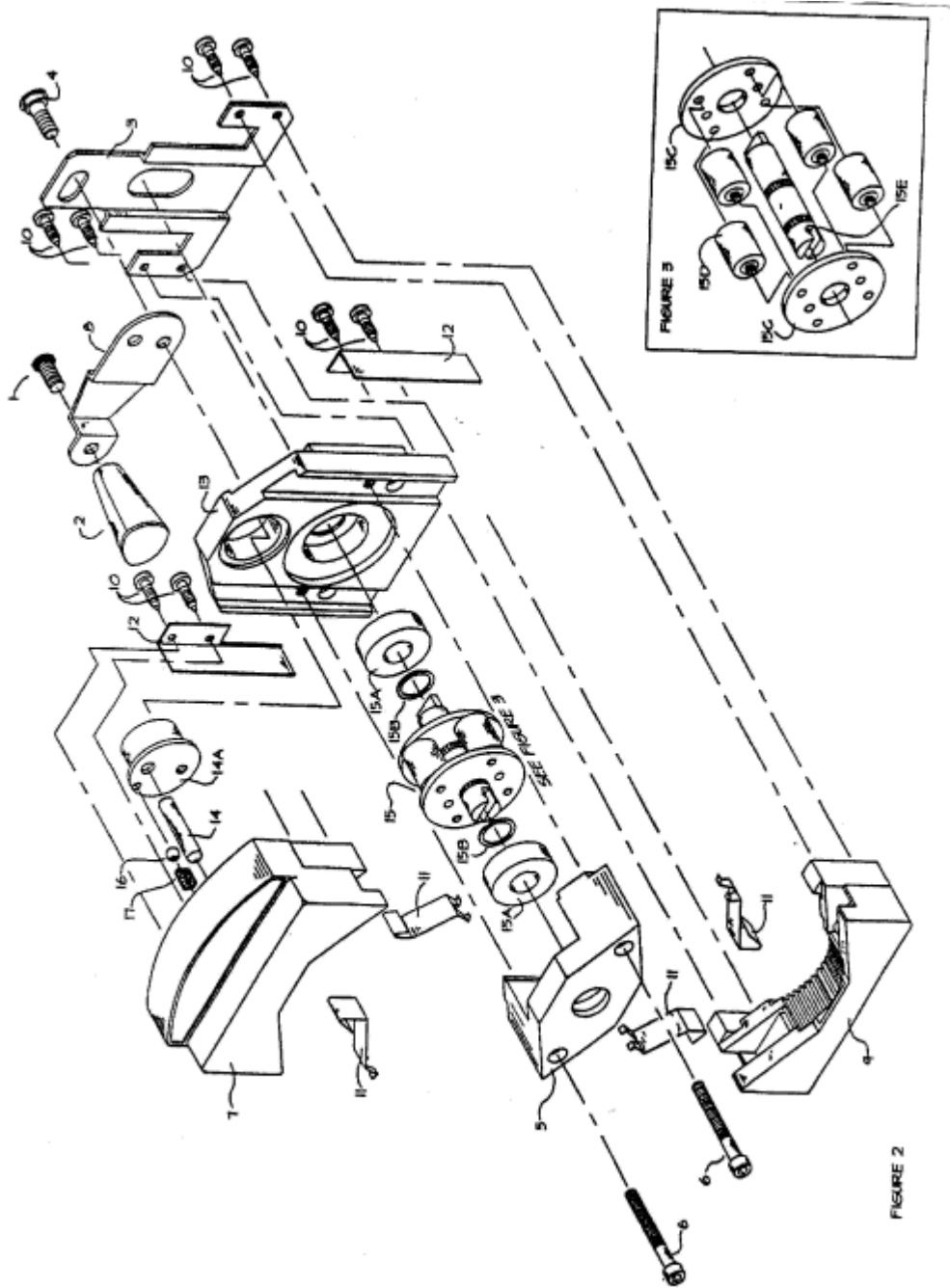
1. Open the TANDEM pump head by moving the black loading lever 180° to the left. If you are going to use the upper pump channel, feed the tubing through the upper channel; this is over the pump roller cage. If the lower pump channel is used, feed the tubing through the lower channel; this is under the pump roller cage.

WARNING: When using both upper and lower pump channels simultaneously, the same type of tubing should be used in each channel.

2. Lock the tubing in place by pushing the loading lever 180° to the right. The tube retainer spring will automatically place the correct tension on the pump tubing to prevent tube “walking”.

3. With the TANDEM pump head closed, lightly pull the two ends of the tubing in opposite directions and away from the pump head. This pulling action insures that the pump tubing is taut and within the pump channel.

5.4 TANDEM™: Parts Identification

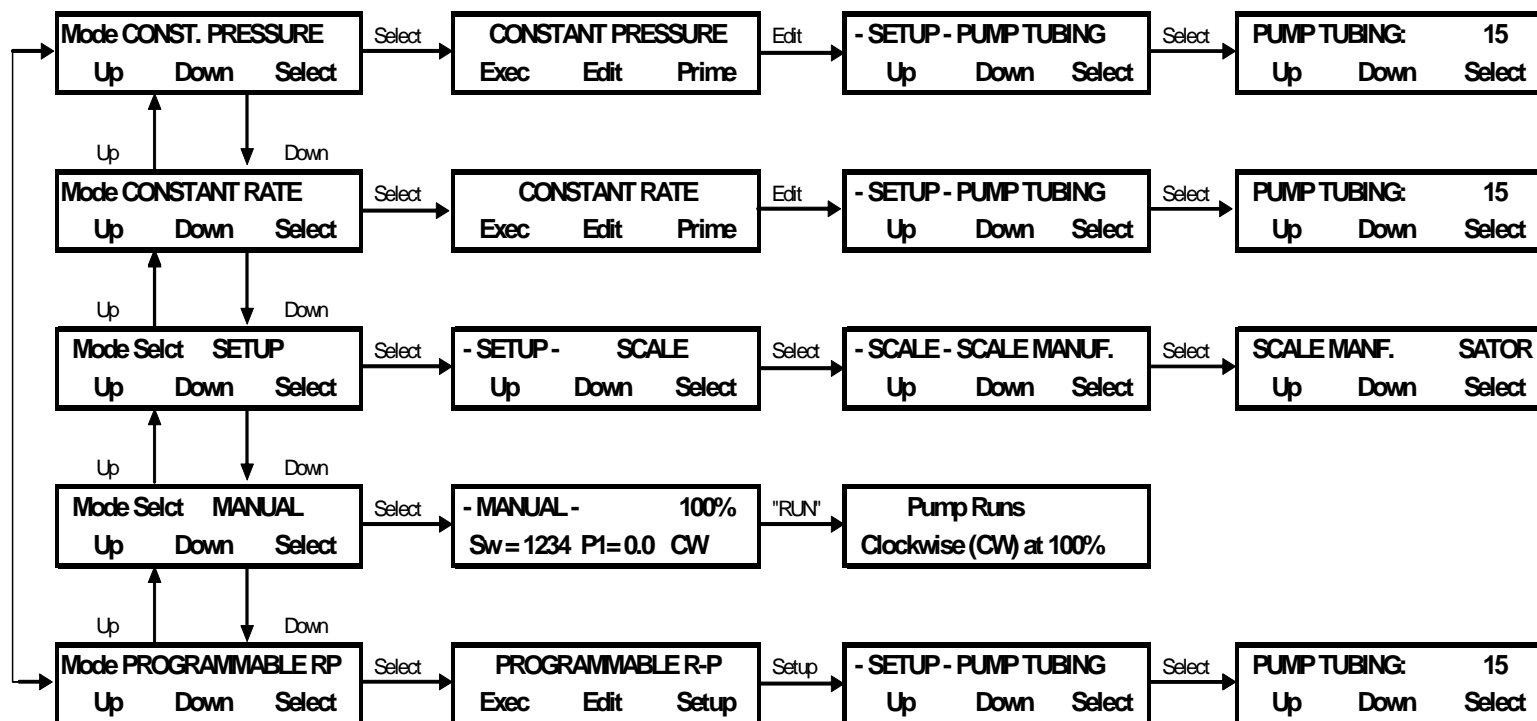


5.5 TANDEM™ Parts List:

Contact SciLog Inc (1-800- 955-1993) to order replacement parts, mention model and serial number of pump head (either TANDEM 1081 or TANDEM 1082) on which the part will be used.

Item	SciLog P/N	Description:
1	500-330	Pump Lever Stud (1)
2	500-320	Pump Lever Knob (1)
3	500-240	Plate, Lower Cam (1)
4	500-210	Cam, Lower Pump Shoe (1)
5	500-410	Bearing Block, Front (1)
6	500-411	Bearing Block Cap Screw (2)
7	500-420	Pump Shoe, Upper (1)
8	500-310	Lever, Pump (1)
9	500-430	Pump Shoe, Lower (1)
10	500-452	Pump Shoe Screw (8)
11	500-440	Tube Holding Fork (4)
12	500-451	Pump Shoe Bracket (1)
13	500-450	Pump Base (1)
14	500-220	Cam, Upper Pump Shoe (1)
14A	500-230	Cam Shaft/Cylinder (1)
15 (Fig. 3)	500-100	Assembly, Roller Housing, 1081
	500-110	Assembly, Roller Housing, 1082
16	500-250	Cam Shaft, Ball (1)
17	500-260	Cam Shaft, Spring (1)
18	500-412	Pump Body Inserts (2)

Part B: FilterTec™ Software



1.0 Software Overview: Main Menu

The FilterTec main menu consists of **five (5) operational modes** as shown on the previous page. By using “**Up**” and “**Down**” keys you can readily scroll through the main menu. You press the “**Select**” key to enter a chosen operational mode, i.e. CONSTANT RATE. By pressing the “**Select**” key you are also entering the 1st submenu level, which provides you access to the “**Exec**”, “**Edit**”, and “**Prime**” functions. In the “**Edit**” sub mode, you select the pump parameters for your filter application. In the “**Exec**” sub mode, you will be executing the parameters chosen under “**Edit**”. The “**Prime**” sub-mode runs the pump when the key is held down to ‘prime’ the system and removes the air bubbles when needed. Press the “**Exit**” key whenever you want to return to the main menu.

CONSTANT RATE Mode: This operation mode allows you to implement a **Constant Rate / Constant Pressure Filtration**, i.e. a user selected rate (filtration feed rate) is maintained during the initial phase of the filtration. If the “**Pmaintain**” alarm is enabled, the unit will change from constant rate to constant pressure control at a user defined pressure level. In the “**Edit**” sub mode you first select the pump tubing you want to use in your application. Based upon your **pump tube size selection**, the FilterTec will access factory installed calibration tables, which relate the pump output in ml/min. to pump motor speed. Please note: the pump tube calibration data can be updated by the user utilizing the star (★) key. This provides simple modification of the factory-installed data for your particular motor/pump head/tubing combination.

Five (6) user-programmable **Alarms** can be selected: **Cumulative Volume**; **Run Time**; **Lo-Pressure** (Low Filter Back Pressure); **Hi-Pressure** (High Filter Back Pressure); **Filtrate** (or Permeate) **Weight**, or **Low-Flow**. Each alarm parameter can be: 1. Off (Disabled), 2. Alarm Only (Provide auditory alarm), or 3 Stop Pump (Provide an auditory alarm and stop) when alarm limits are exceeded. The Hi-Pressure alarm has one additional option, 4. Pmaintain, which changes from rate to pressure control at a user defined limit. The FilterTec simultaneously monitors and displays up to three line pressures as provided by the 3 disposable pressure sensors. The Hi and Low Pressure alarms relate to the pressure sensor chosen as the “**Pressure Source**” as defined in the **SETUP: Pump, Press Sensor** sub mode.

At user-defined intervals, all filter/pump parameters can be printed out or send to a PC for archiving. Print parameters are set in the **SETUP: Printer**

The balance allows quantitative filtrate collection by weight, use of the Filtrate Weight alarm mentioned above, and the display and printout of the Collection Rate.

CONSTANT PRESSURE Mode: This operation mode allows you to implement **Constant Pressure Filtration**, i.e. a user selected filter backpressure is maintained by modulating the pump output. When the filtration device starts to plug up, the FilterTec will maintain the selected filter backpressure by automatically decreasing the feed rate. The FilterTec simultaneously monitors and displays up to three line pressures as provided by the 3 disposable pressure sensors. The process can be controlled by any one of the 3 line pressures as selected by the user in the **SETUP: Pump, Press Sensor** sub mode.

The filter backpressure setting, **Pump Pressure**, is selected in the “**Edit**” sub mode. This setting allows you to choose a safe backpressure that also is consistent with a desired filtrate/permeate flow rate.

NOTE: All Alarm and Print and Balance parameters are the same as discussed in CONSTANT RATE Mode, except for the replacement of the Hi-Pressure Alarm with a Low-Flow Alarm.

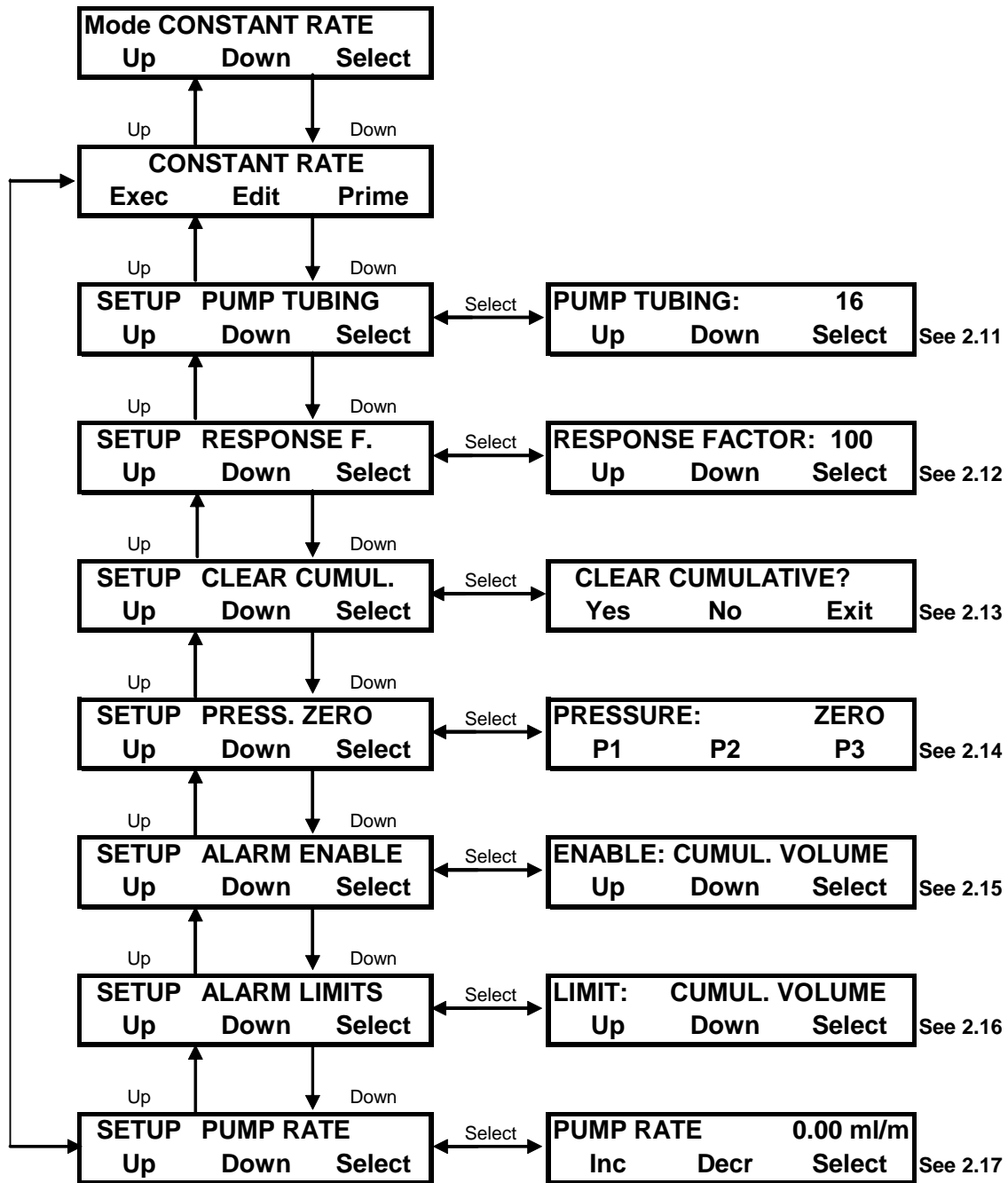
PROGRAMMABLE R-P Mode: This mode allows you to implement variable Feed Rates or Pressure Rates that change over time in a Stepped (immediate change) or Scanned (ramped) manner. This is accomplished by entering step-by-step instructions from the FilterTec front panel buttons. You can enter and control by using Run, Stop, Time, Direction, R-Step, R-Scan, P-Step,

P-Scan, V, and W commands to have the system perform changing rates and pressures, even rotary selector valve positions for switching buffers or collection vessels. A sample program is included in this manual. All alarms used in CONSTANT RATE and CONSTANT PRESSURE Modes except Run Time are available in STEP-SCAN Mode.

SETUP: This operational mode allows you to select various user preferences and interface options. The **Setup: Scale** sub-mode provides electronic balance options. Balances that can interface with the FilterTec must have bi-directional serial communication, and NOT have internal calibration or be “delta” models that change readability. Many Mettler, Ohaus, AND, and Sartorius balances can be used. The **Setup: Clock** sub mode allows you to set the time and date used in the display. The **Setup: System Test** sub mode allows checkout of FilterTec outputs and requires purchase of a special set of connectors to perform the test. **Setup: Printer** is used for setting up the printer communications parameters as well as print time interval and the print delay. **Setup: Pressure Sensor** is used to choose either a one- or three sensor interface, zero the pressure sensors, set the units (psi, bar, kpa), and choose the source for the pressure control and alarms, while **Setup: Pump** allows you to set various pump user preferences, most importantly the Motor RPM. **Setup: Analog** defines the parameters of the one analog channel used for data acquisition and reporting of 0-5vdc or 4-20 ma signals from a UV or Turbidity Detector.

MANUAL: Allows manual control of pump speed and direction, and will display the value of sensor P1. This is very useful for initial testing to determine flow rate / pressure settings. **NOTE: CONSTANT RATE, CONSTANT PRESSURE R-P STEP/SCAN, Alarm and Printer parameters are not functional in the Manual mode.**

2.0 Constant Rate Mode, Constant Rate/Constant Pressure Filtration; Edit



2.0 CONSTANT RATE Mode: Constant Rate/Constant Pressure Filtration.

SUMMARY: This FilterTec mode allows you to implement a **constant filtration rate**, i.e. a user selected pump rate (**filtration feed rate**) is maintained throughout the filtration process. The FilterTec can then switch to a user selected **constant filtration pressure**. The **Pmaintain** setting is chosen in the Alarm Enable: Hi-Pressure to cause this to occur. First select the **pump tube size** (#13, 14, 16, 25, 17, 15, 24, or 35), and then select your **pump rate** in terms of ml/min, then set the Hi-pressure Limit to your desired constant pressure. The FilterTec feed rate can be re-calibrated by the utilizing the front panel star (★) key. (If you have changed the motor sub-assembly from the factory installed one, select the correct RPM of your new motor in SETUP:PUMP:Motor RPM. The choices are 8, 160 or 600-RPM.)

NOTE: Use “Up” and “Down” keys to make a selection, then press, “Select” to implement that selection.

- 2.11 **Pump Tubing:** Select sizes #13, 14, 16, 25, 17, 15, 24, or #35, using “Up” and “Down” keys for choice of pump tubing size, then press “Select”. Based upon your **selection**, the FilterTec accesses factory installed calibration curves, which relate the pump output in ml/min. to pump motor speed.
- 2.12 **Response F:** Response Factor setting. The Pump Response Factor = 100 is the default value. Decreasing this Pump Response Factor will decrease the pumps responsiveness to pressure changes.
- 2.13 **Clear Cumul:** Resets (Clears) the following counters in the system: CV = Cumulative Volume; RT = Run Time; Q1 = Filtrate Weight.
- 2.14 **Pressure Zero:** Allows you to zero the filter backpressure reading for all 3 pressure sensors, P1, P2 and P3. The FilterTec must not be running when resetting pressure sensor output. Do not use the SPAN key unless instructed to do so by SciLog Customer Service. This is used to calibrate the pressure sensor output, and requires additional hardware. (See Mode: Setup: Pressure Sensor)
- 2.15 **Alarm Enable:** Allows you to select alarm options for six different alarm conditions. Four options are available: 1. Disable the Alarm (**Off**); 2. Enable an auditory alarm (**Alarm Only**); 3. Stop the pump and provide an auditory alarm (**Pump Stop**); or 4. (**Pmaintain**) which switches the FilterTec from Rate Control to Pressure Control at a user-defined limit and maintains that pressure by adjusting the system’s motor speed. **Pmaintain only exists as an option in the Hi-Pressure Alarm.**
- 2.16 **Alarm Limits:** Allows you to assign alarm limits for six different alarm conditions: **Cumulative Volume** in milliliters; **Run Time** in Hours: Minutes; **Lo-Pressure** (monitor system leakage) in psi; **Hi-Pressure** (filter backpressure) in psi; **Low-Flow** in ml/min; and **Filtrate (Permeate) Weight** in grams. (This alarm must be enabled in order to obtain and display the Filtrate Weight (Q1), and several values calculated from it.) **Hi and Lo-Pressure alarms are related to the Pressure Source chosen in SETUP: Press. Sensor, Source.** **Note:** Alarm condition is triggered when alarm limit is exceeded. **Alarms are not mutually exclusive.** You may select any combination of alarms.
- 2.17 **Pump Rate:** Select pump rate in terms of **ml/min**, however first select pump tube size, see 2.11. Pump Rate may be changed “on the fly” by pressing the RATE key on the front panel, making the change, and pressing ‘Select’.

Note on Re-calibration of FF (Feed Rate):

The FilterTec system contains volumetric calibration curves for various motor/head/tubing combinations that are factory installed. This value is displayed and output to SciDoc as FF. In most cases the Pump Rate (FF) is merely a starting or reference point, and the weight related data, Q1, & C1 are of greater importance. These are measured values of the Filtrate Weight Collected (Q1) and Collection Rate (C1), and are used in the Vmax data and Chart that are included in the SciDoc spreadsheet.

The Pump Rate setting in Constant Rate Mode refers to the aforementioned curves, and it can be re-calibrated to improve the accuracy of the displayed FF value.

2.18 Pump Re-calibration:

The FilterTec software contains a permanent calibration table for each of the nine (9) tubing sizes: 13, 14, 16, 25, 17, 15, 24 & 35. For a given pump tube size, the calibration table relates the pump motor RPM with the pump output in terms of ml / min. However, the user can update the FilterTec pump calibration very easily.

NOTE: The FilterTec usually is configured with a 160-rpm motor, and the built-in calibration curves for that motor. If your flow rate needs require, the FilterTec is also available with either a 600-rpm or 8-rpm motor. In order for the FilterTec to properly display the correct flow rates and cumulative volume when using these motors, access SETUP:PUMP:Motor RPM and select the appropriate RPM for the installed motor. The FilterTec will then implement the factory installed calibration curves for that particular motor. (This will have been done for you at the factory prior to testing and shipping, and should only need to be changed if you purchase and install a different motor subassembly.)

In order to use this recalibration feature, first select (in **EDIT**) the pump tube size you are using, e.g. size #17, then select the pump rate, e.g. 250ml/min. Press the **EXIT** key and then the **EXEC** key. FilterTec will now show the following display:

SET: T17 PR: 250ml/m
Press RUN when Ready

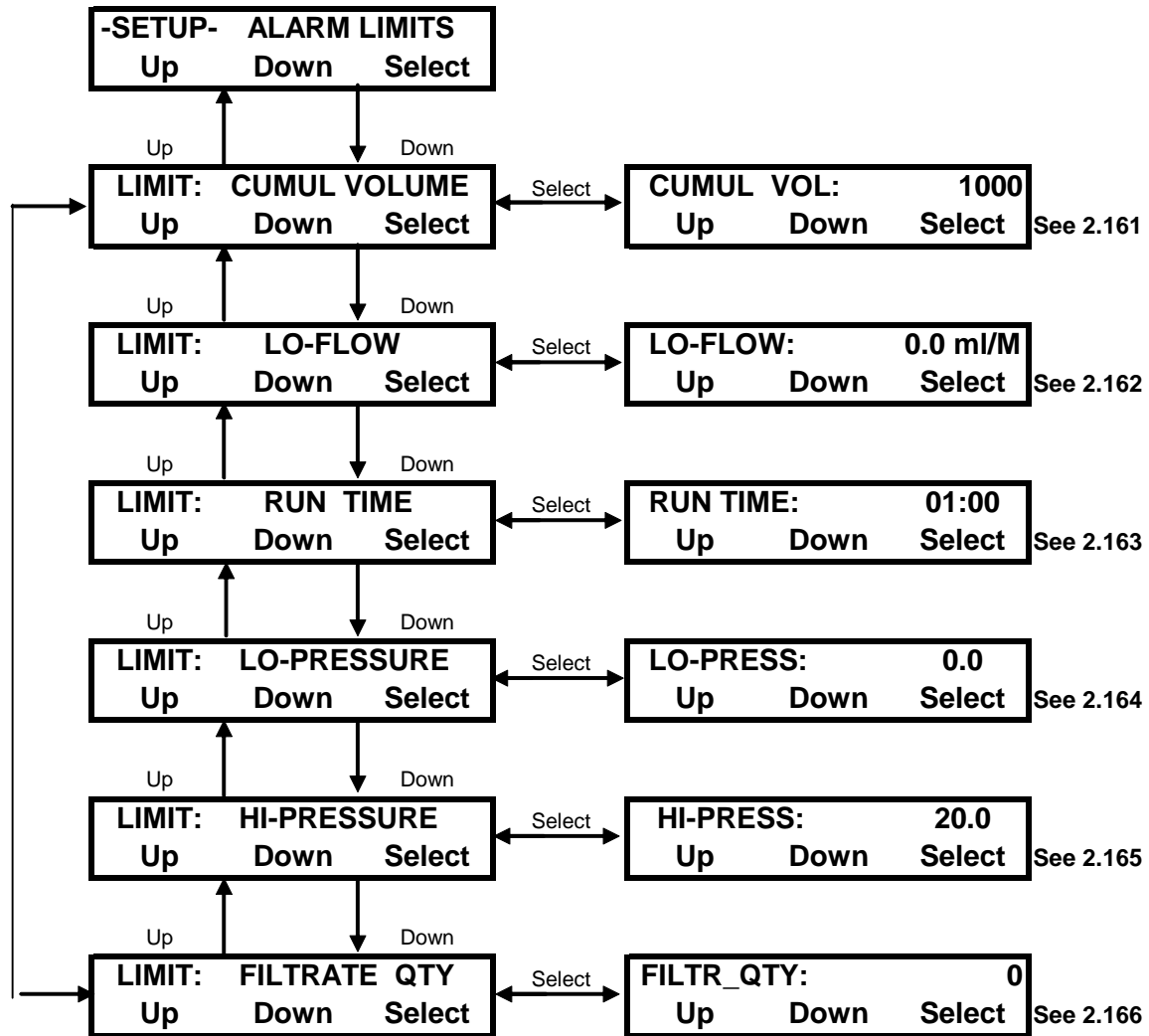
You're now ready to recalibrate your #17 pump tubing. For calibration purposes, pump water into a container, e.g. 1000grams, placed onto a top-loading balance with no filter attached. Alternatively use a 1000ml volumetric flask. Press the **RUN** key and begin dispensing. Press the **STOP** key (not **EXIT**) to stop pumping when 1000 grams have been dispensed. Press the **Star (★)** key and the following display will be shown:

DV:1000	AV:1000
Incr.	Decr. Select

Adjust (increase or decrease) the AV (Average Volume) parameter to 1000, or whatever the actual dispensed weight is, press **Select**, the calibration table for #17 pump tubing has now been updated.

NOTE: The selected calibration volume or weight should be 4+ times the selected pump rate. For example, if your selected pump rate is 250 ml/min. the minimum calibration volume / weight should be between 1000 mls or grams.

2.16 Constant Rate Mode, Alarm Limits



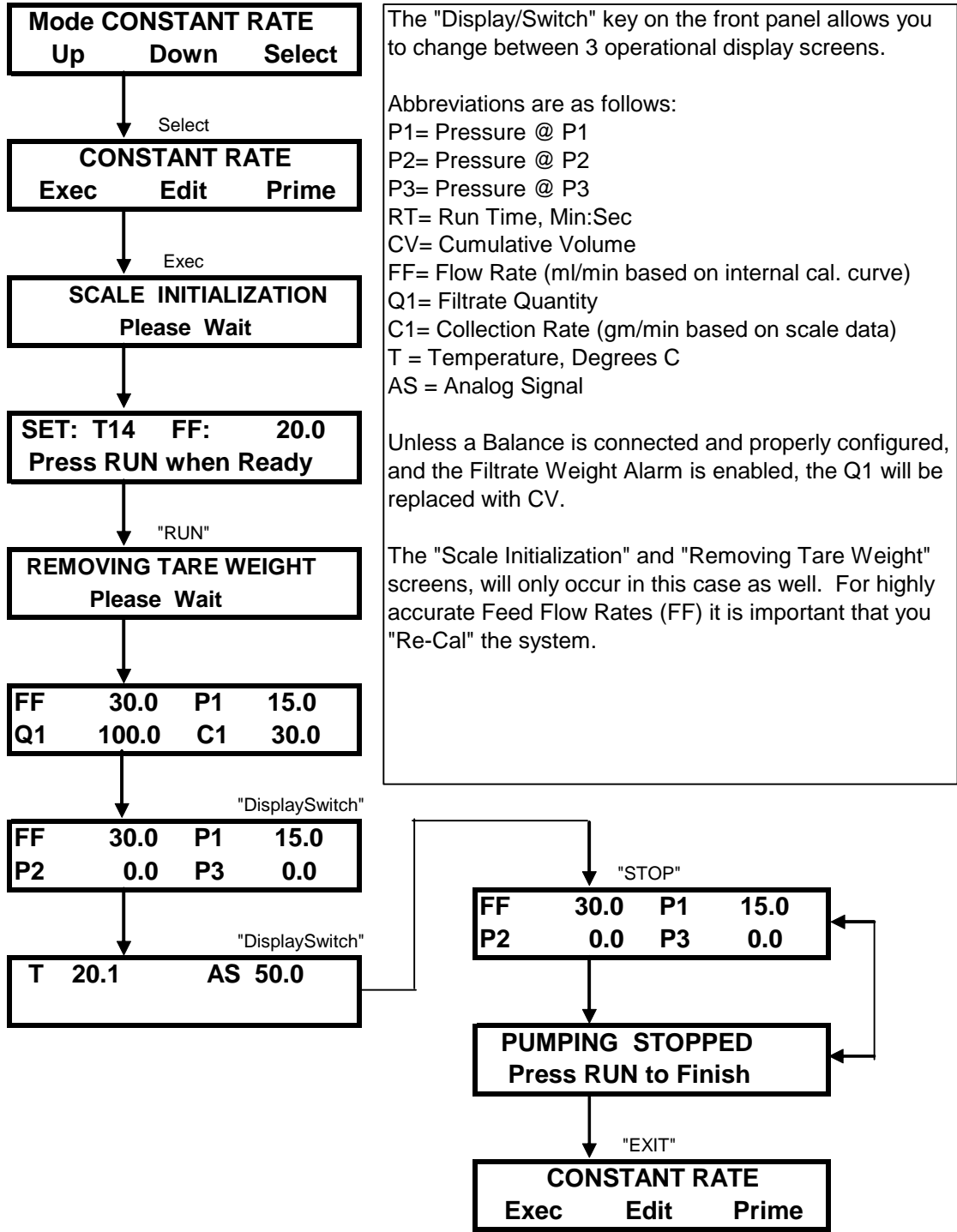
2.16 CONSTANT RATE Mode: Alarm Limits

SUMMARY: This section allows you to assign limiting values for six different alarm conditions: **Cumulative Volume (CV)** (based on feed rate) in ml; **Lo-Flow (LC)** in ml/min; **Run Time (RT)** in Hours: Minutes; **Lo-Pressure (LP)** (monitor system leakage) in psi; **Hi-Pressure (HP)** (filter back pressure) in psi; **Filtrate Weight (FQ)** in grams. **Note: The alarm condition is triggered when the alarm limit is achieved.** Alarms are not mutually exclusive. You may select any combination of alarms. See section 2.14 for the different alarm responses. For critical alarms (i.e. Lo-Flow Alarm) you want the FilterTec pump to stop (**Pump Stop**), for less critical alarm conditions you may want to choose an auditory alarm (**Alarm Only**). Each alarm may be disabled if not required. **Note: Cumulative Volume, Filtrate Weight and Run Time are cumulative alarms. If you have stopped the process and are starting over, don't forget to go back to the EDIT mode, and Clear the Cumulative values!**

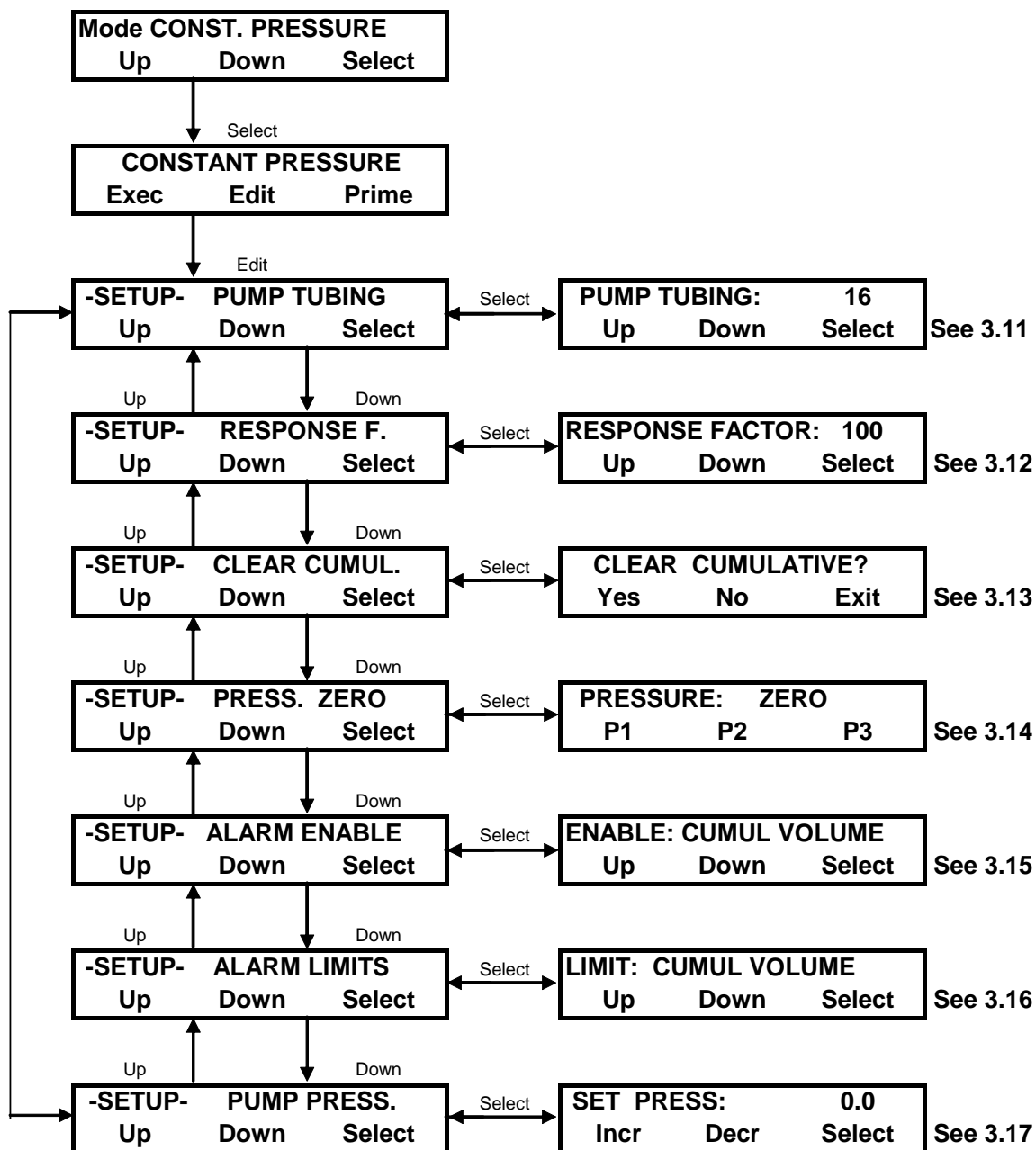
NOTE: Use “Up” and “Down” keys, then press “Select” to implement the selection.

- 2.161 **Cumulative Volume (CV):** This alarm setting represents the total volume of process solution (based on the feed rate) that is delivered through your filtration device when a balance is not in use. **Use the Filtrate Weight Alarm for this purpose if you are using a balance!** For example: if you set the **Cumulative Volume Alarm** to 10,000ml or 10 liters, the FilterTec will either alarm and/or stop the pump (see 2.15) when 10 liters of filtrate has been sent through the filtration device. This allows you to define your filtrate yield in terms of the amount of solution sent through the filtration system.
- 2.162 **Lo-Flow (LC):** At the end of the Constant Pressure portion of the process, this represents a critical alarm condition. In this operational mode, the FilterTec will detect any filter backpressure increases in the source pressure sensor (due filter plug-up) and automatically decrease the pump rate to maintain the selected **Hi-Pressure Limit** setting once the **Pmaintain** alarm has been triggered. The Lo-Flow parameter (ml/min) represents lowest pump rate before the pump shuts down, and is based on the collection rate (C1) when a balance is used and Feed Flow Rate (FF) without a balance. It should be set just below your desired minimum feed flow rate.
- 2.163 **Run Time (RT):** This alarm setting allows you to set a timer for the filtration of your process solution. For example, if you set the **Run Time Alarm** to 01:30, then the FilterTec will provide an auditory alarm and / or stop the pump after one (1) hour and thirty (30) minutes have passed. This allows you to define the processing time.
- 2.164 **Lo-Pressure (LP):** Typically set 3-5 psi units below the Hi-Pressure setting. The Lo-Pressure Alarm is triggered when a sudden filter backpressure drop occurs after rising above this setting. Such a change in the filter backpressure usually indicates a significant system leak. This is usually a critical alarm and should be set to Pump Stop.
- 2.165 **Hi-Pressure (HP):** If you have chosen the **Pmaintain** in Alarm Enable, this is the value at which the pump will change from the Constant Rate method to the Constant Pressure method. Setting the Alarm to Pump Stop creates a Constant Rate only process that will stop when the Hi-Pressure Limit is achieved.
- 2.166 **Filtrate Wgt. (FQ):** The FilterTec comes with a top-loading balance. Enter the filtrate weight (grams) that you want to collect, and the FilterTec will either alarm or stop the system when the desired weight has been collected. Set this value beyond the balance capacity if you do not wish it to trigger during normal use. (If the balance goes negative at the start of the run, the 0 gm default could trigger this alarm.) **This alarm must be enabled to at least “Alarm Only” in order for the Q1 (Filtrate Quantity) to be obtained or displayed. Default=0**

2.2 Constant Rate: Const. Rate / Const. Pressure Filtration; Execute Display



3.0 Constant Pressure: Constant Pressure Filtration; Edit



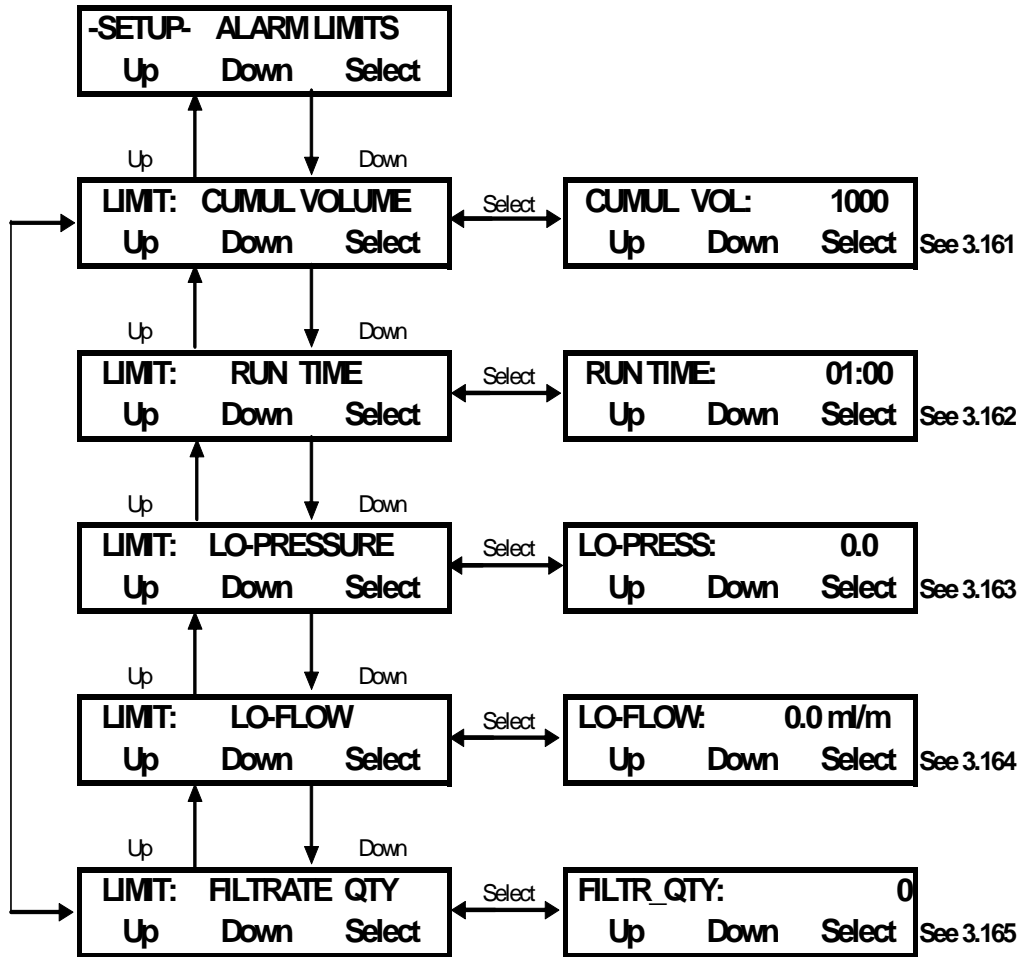
3.0 CONSTANT PRESSURE: Constant Pressure Filtration

SUMMARY: This FilterTec mode allows you to implement a **constant pressure filtration**, i.e. a user selected filter backpressure is achieved and maintained throughout the filtration process. When the filter device starts plugging up, the FilterTec detects a corresponding increase in filter backpressure. In order to maintain the selected filter backpressure setting, **the FilterTec will automatically decrease the feed rate**. Thus the constant pressure function of the FilterTec allows you to choose a safe backpressure setting that is consistent with a high filtrate flow rate.

NOTE: Use “**Up**” and “**Down**” keys, then press “**Select**” to implement that selection.

- 3.11 Pump Tubing:** Select sizes #13, 14, 16, 25, 17, 15, 24 or #35, use “**Up**” and “**Down**” keys for choice of pump tubing size, then press “**Select**”. Based upon your **selection**, the FilterTec will access factory installed calibration tables, which relate the pump output in ml/min. to motor speed. FilterTec output can also be re-calibrated by the utilizing the front panel star (★) key. (See RATE Mode)
- 3.12 Clear Cumul:** Resets (Clears) the following counters in the “Exec” front panel display: CV = Cumulative Volume; RT = Run Time; Q1 = Filtrate Weight.
- 3.13 Response F:** Response Factor setting. The Pump Response Factor = 100 is the default value. Increasing the Pump Response Factor will increase the pumps responsiveness.
- 3.14 Pressure Zero:** Allows you to zero the backpressure readings of all 3 pressure sensors. **The FilterTec must not be running when resetting pressure sensor output.**
- 3.15 Alarm Enable:** Allows you to select alarm options for five (5) different alarm conditions. There are 3 options available: 1. Disable the alarm (**Off**); 2. Enable an auditory alarm (**Alarm Only**); 3. Stop pump and provide an auditory alarm (**Pump Stop**) when user defined alarm limits are exceeded.
- 3.16 Alarm Limits:** Allows you to assign alarm limits for five (5) different alarm conditions: **Cumulative Volume** in ml; **Run Time** in Hours: Minutes; **Lo-Pressure** (monitor system leakage) in psi; **Lo-Flow** (high filter backpressure) in ml/min; **Filtrate Weight** in grams. (This alarm must be enabled in order to communicate with the balance.) The Lo-Pressure and Lo-Flow alarms are related to the pressure source chosen in **SETUP: Press. Sensor, Source.** **Note:** Alarm condition is triggered when alarm limit is exceeded. **Alarms are not mutually exclusive.** You may select any combination of alarms.
- 3.17 Pump Pressure:** Allows you to select **filter backpressure** (30psi, max. recommended) for your filtration application. The FilterTec will maintain the selected setting throughout the filtration process. Pump Pressure may be changed “on the fly” by pressing the RATE/PRESSURE key on the front panel, making the change, and pressing the ‘Select’ button. **Do not exceed the pressure rating for your filtration device;** consult the specifications provided by the filter manufacturer. Select a safe backpressure setting that also maximizes your filtrate flow rate. **NOTE:** The Source chosen in **SETUP: Press. Sensor, Source** i.e. P1, P2 or P3; or is the pressure that will be controlled by this setting.

3.16 Constant Pressure: Alarm Limits



3.16 CONSTANT PRESSURE: Alarm Limits

SUMMARY: This section allows you to assign limiting values for five (5) different alarm conditions: **Cumulative Volume (CV)** in milliliters; **Run Time (RT)** in Hours: Minutes; **Lo-Pressure (LP)** (monitor system leakage) in psi; **Lo-Flow (LC)** (pump will stop when pump feed rate falls below this limit) in ml/min.; **Filtrate Weight (FQ)** in grams. **Note: The alarm condition is triggered when the alarm limit is achieved.** Alarms are not mutually exclusive. You may select any combination of alarms. See section 3.14 for the different alarm responses. For critical alarms you may want the FilterTec pump to stop (**Pump Stop**), for less critical alarm conditions you may want to choose an auditory alarm (**Alarm Only**). **Please Note: The Lo-Pressure alarm is directly related to the Source chosen in SETUP: Press. Sensor, Source, i.e. P1, P2, etc.**

NOTE: Use “Up” and “Down” keys, then press “Select” to implement that selection.

3.161 Cumulative Volume (CV): This alarm setting represents the total volume of process solution that is delivered through your filtration device when no balance is in use. **Use the Filtrate Weight Alarm for this when a balance is in use!** For example: if you set the **Cumulative Volume Alarm** to 10,000ml or 10 liters, the FilterTec will either alarm and / or stop the pump when 10 liters of solution has been delivered through the filtration device.

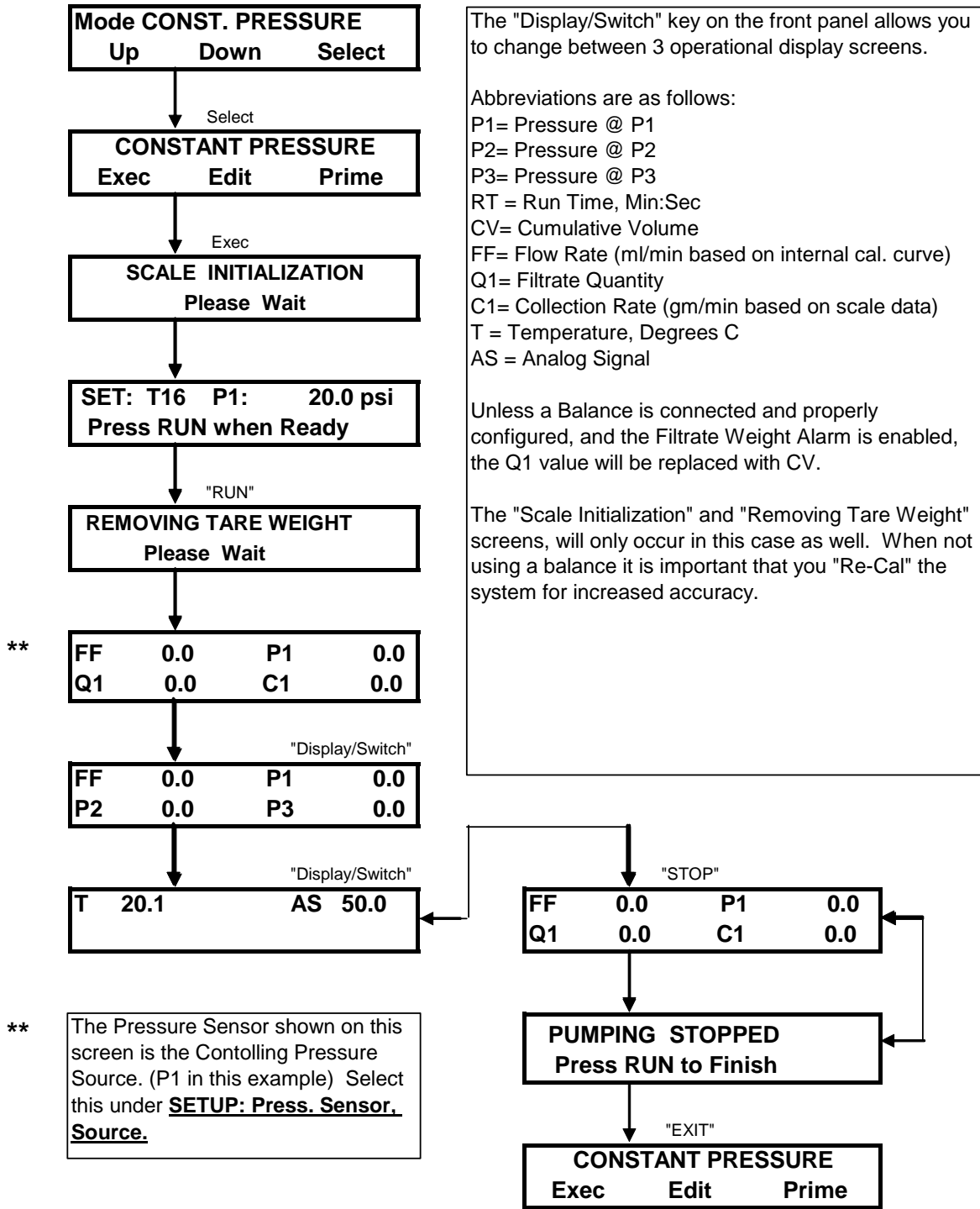
3.162 Run Time (RT): This alarm setting allows you to set a timer for the filtration of your process solution. For example, if you set the **Run Time Alarm** to 01:30, then the FilterTec will provide you with an auditory alarm and / or stop the pump after one (1) hour and thirty (30) minutes have passed. This allows you to define the processing time, i.e. the time required to obtain a desired permeate yield.

3.163 Lo-Pressure (LP): Typically set 3-5 psi units below the **Pump Pressure** setting. The Lo-Pressure Alarm is triggered when a sudden filter backpressure drop occurs after rising above this setting. Such a change in the filter backpressure usually indicates a system leak, i.e. pump tubing has slipped off the filter connection.

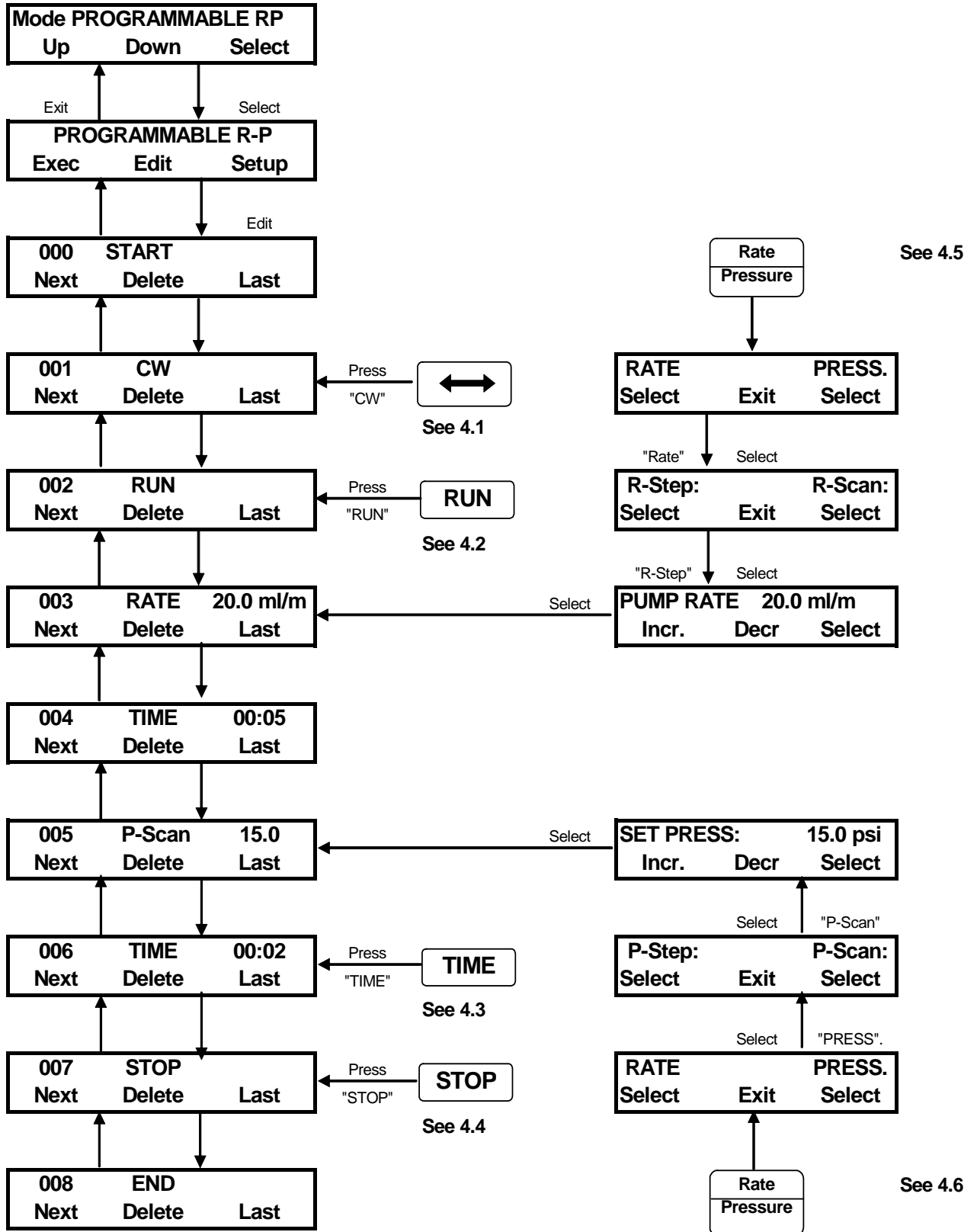
3.164 Lo-Flow (LC): For constant pressure filtration, this represents a critical alarm condition, and should be set to Pump Stop in Low-Flow Alarm Enable. In this operational mode, the FilterTec will detect any filter backpressure increases in the source pressure sensor (due to slow filter plug-up) and automatically decrease the feed rate to maintain the selected **Pump Pressure** setting (see 3.17). The Lo-Flow parameter (ml/min) represents lowest pump rate before the pump shuts down. The Lo-Flow parameter should be set just below your desired minimum feed flow rate.

3.165 Filtrate Wgt. (FQ): The FilterTec comes with a top-loading balance. Enter the filtrate weight (grams) that you want to collect, and the FilterTec will either alarm or stop the pump when the desired weight has been collected. Set this value to zero if you do not wish it to trigger during normal use. The maximum value is 99,999 gm. (100Kg). **This alarm must be enabled in at least “alarm only” mode in order for the Q1 (Filtrate Weight) to be obtained or displayed.**

Constant Pressure: Constant Pressure Filtration: Execute Display



4.0 Programmable R-P: Programmed Variable Rate/Pressure Filtration



4.0 PROGRAMMABLE R-P: How to generate a PROGRAMMABLE R-P program.

SUMMARY: In PROGRAMMABLE R-P Mode you can generate a program that changes flow rates or controlled pressure rates in a stair-stepped (STEP) or ramped (SCAN) manner over time. If you wish, you can also control a pair of rotary selector valves, or repeat the program automatically.

When generating or editing a Programmable R-P program, all program statements that you want to see implemented during a specific timing block or interval **must precede the TIME statement for that timing block**. For example, on the next page, the program statement: 001 CW, 002 RUN, and 003 RATE are all implemented at the beginning of the first timing block defined by program statement 004 TIME: 00:05 (five minutes).

4.1 CW, Pump Direction: This program statement is implemented by pressing the front panel key with the double arrows. This key functions like a toggle switch and allows you to select either CW (clockwise) or CCW (counter-clockwise) pump direction.

4.2 RUN: This statement is implemented by pressing the front panel key labeled “RUN”, it instructs the FilterTec to turn on the motor.

4.3 TIME, Timing Interval: Press TIME key, then select the desired timing interval in hours:minutes. All preceding program statements are implemented at the beginning of this TIME statement.

4.4 STOP: This statement is implemented by pressing the “STOP” key on the front panel. It instructs the FilterTec to turn off the motor.

4.5 RATE, R-Step, R-Scan: Press “RATE” key then select RATE by pressing the “A” button. Select R-Step to set a flow rate to be maintained for a given Time period. Select R-Scan to set a flow rate to be scanned (ramped) up or down to over a given Time period. Please be sure that the selected flow rate does not exceed the capacity of the installed pump head /motor combination.

4.6 PRESSURE, P-Step, P-Scan: Press “RATE” key then select PRESSURE by pressing the “C” button. Select P-Step to set a pressure to be maintained for a given Time period. Select P-Scan to set a pressure to be scanned (ramped) up or down to over a given Time period. The controlled pressure is the one specified in SETUP, PUMP, Press. Sensor, Source.

Optional Commands

Vx, Wx, Valve Position: This program statement is implemented by pressing the star (*) key followed by selecting "Rotary Valve". Six rotary valve positions for valve "V", namely, V1 thru V6, as well as, six rotary positions for a second valve "W", W1 through W6, can be selected.

COUNT: Allows you to repeat the program automatically, and not generally used. Press star (*) key, then select "SAMPL COUNT", then select "1" if you want your program to run only once, select "2" if you want to run your program twice, etc

Sample Programs:

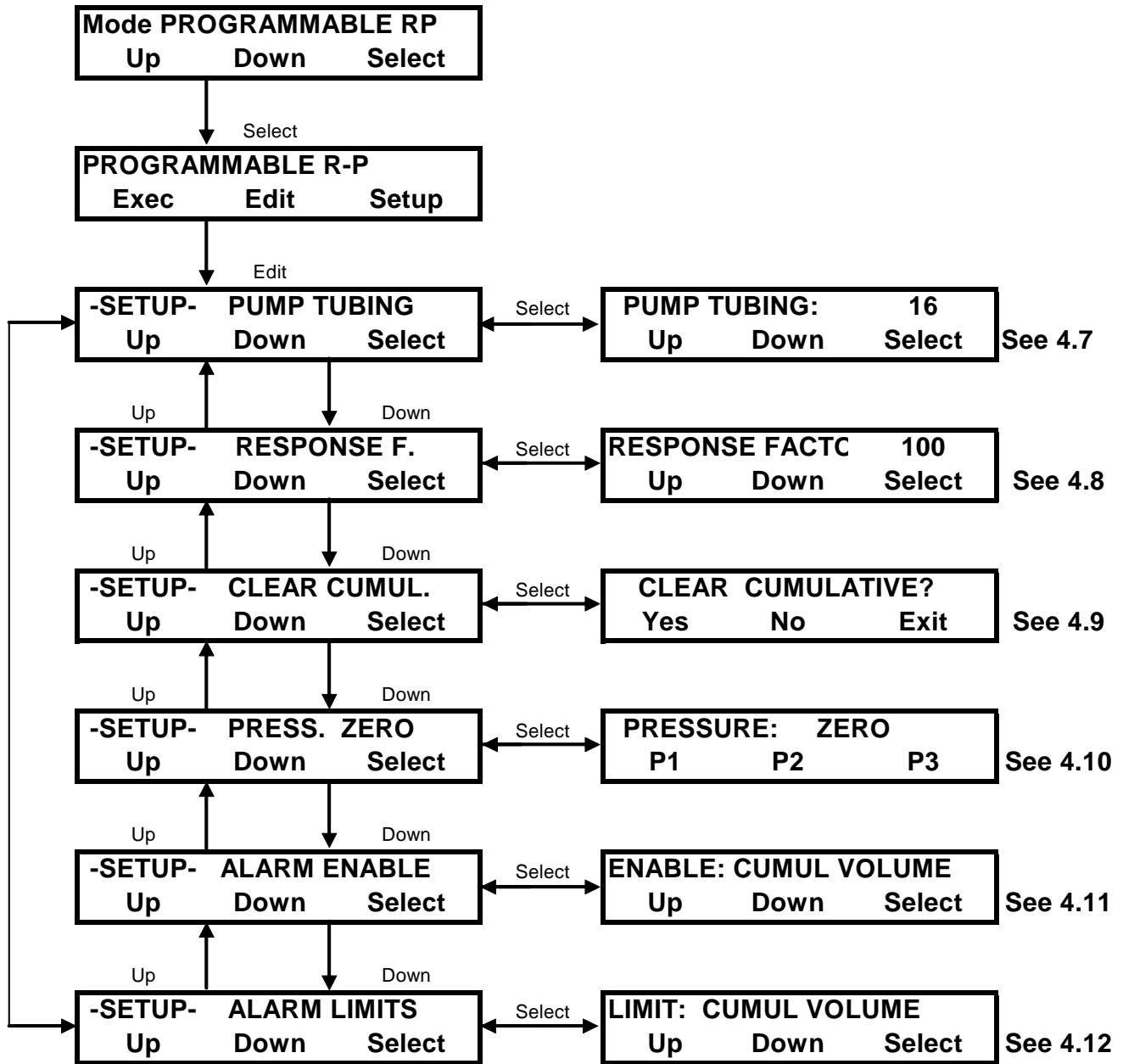
A. Program to start at 20 ml/min, and every 10 min immediately change by 10 ml/min, for a total of one hour, then stop. (R-Step).

000	START		008	TIME 00:10
001	RUN		009	RATE 50 ml/m
002	CW		010	TIME 00:10
003	RATE 20 ml/m		011	RATE 60 ml/m
004	TIME 00:10		012	TIME 00:10
005	RATE 30 ml/m		013	RATE 70 ml/m
006	TIME 00:10		014	TIME 00:10
007	RATE 40		015	STOP

B. Program to start at 20 ml/min, and every 30 min scan up 20 ml/min over a 5 min period until a final rate of 80 ml/min has been run for 30 min. (R-Step & R-Scan)

000	START		009	R-SCAN 60 ml/m
001	RUN		010	TIME 00:05
002	CW		011	RATE 60 ml/m
003	RATE 20 ml/m		012	TIME 00:30
004	TIME 00:30		013	R-SCAN 80 ml/m
005	R-SCAN 40 ml/m		014	TIME 00:05
006	TIME 00:05		015	RATE 80 ml/m
007	RATE 40		016	TIME 00:30
008	TIME 00:30		017	STOP

4.0 R-P STEP-SCAN: Setup



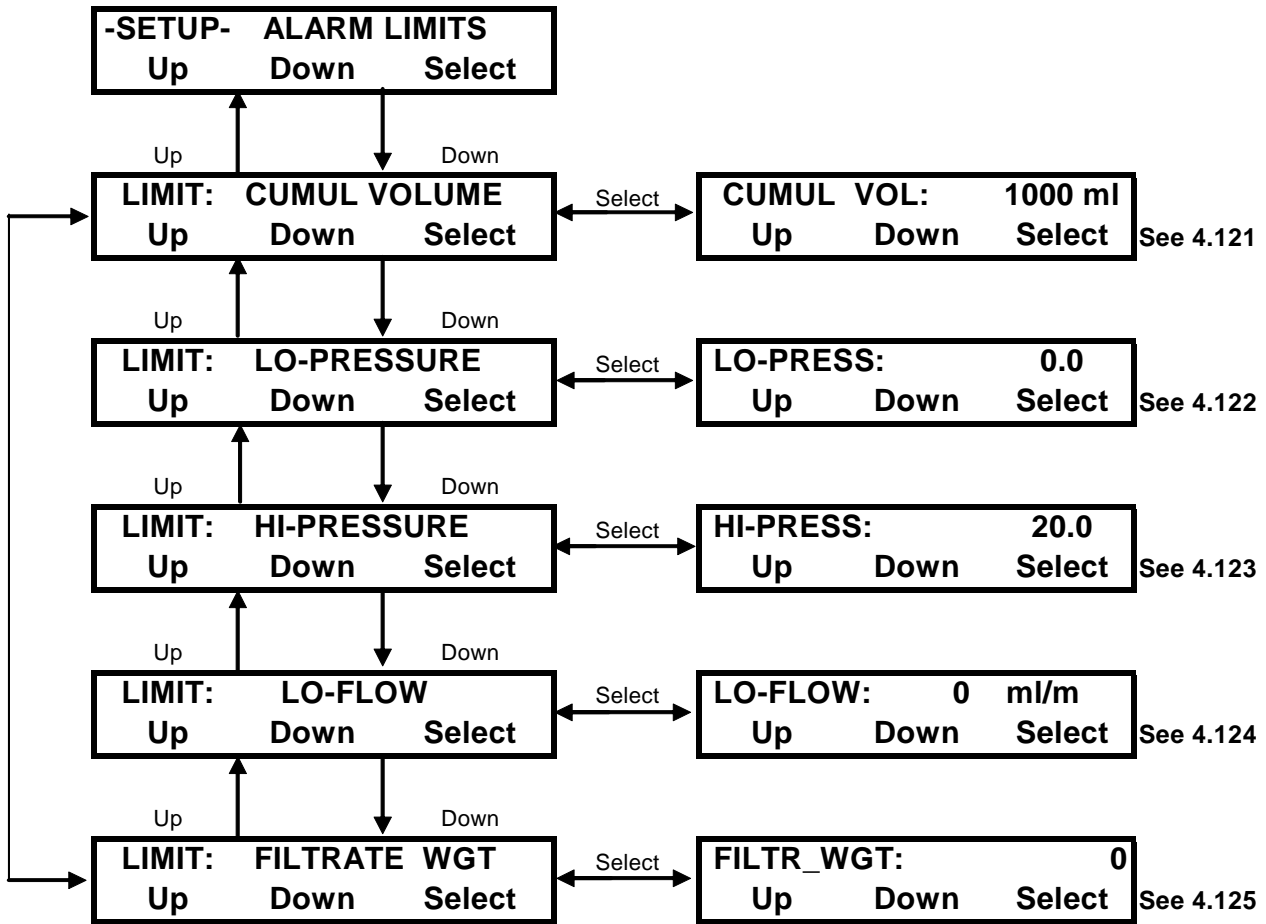
4.0 PROGRAMMABLE R-P: Setup

SUMMARY: The Setup menu is identical to the Edit menus in the other two modes except that the Pump Rate and Pump Pressure are input as part of the Step-by-Step instructions mentioned in the previous section.

NOTE: Use “Up” and “Down” keys to make a selection, then press “Select” to implement that selection.

- 4.7 Pump Tubing:** Select sizes #13, 14, 16, 25, 17, 18, 15, 24 or #35, use “Up” and “Down” keys for choice of pump tubing size, then press “Select”. Based upon your selection, the FilterTec will access factory installed calibration tables, which relate the system output in ml/min. to motor speed. The FilterTec output can also be recalibrated by the utilizing the front panel star (★) key. (See CONSTANT RATE Mode)
- 4.8 Clear Cumul:** Resets (Clears) the following counters in the “Exec” front panel display: CV = Cumulative Volume; RT = Run Time; Q1 = Filtrate Weight.
- 4.9 Response F:** Response Factor setting. The Pump Response Factor = 100 is the default value. Increasing the Pump Response Factor will increase the pumps responsiveness to pressure changes.
- 4.10 Pressure Zero:** Allows you to zero the backpressure readings of all 3 pressure sensors. **The FilterTec pump must not be running when resetting pressure sensor output.**
- 4.11 Alarm Enable:** Allows you to select alarm options for five (5) different alarm conditions. There are 3 options available: 1. Disable the alarm (**Off**); 2. Enable an auditory alarm (**Alarm Only**); 3. Stop pump and provide an auditory alarm (**Pump Stop**) when user defined alarm limits are exceeded. The Hi-Pressure Alarm has a fourth option: **Pmaintain**, which allows you to switch from the rate control method to the pressure control method when running an R-Step or R-Scan step.
- 4.12 Alarm Limits:** Allows you to assign alarm limits for five (5) different alarm conditions: **Cumulative Volume** in milliliters; **Lo-Pressure** (monitor system leakage) in psi; **Hi-Pressure** (Monitor filter plug-up); **Lo-Flow** (high filter backpressure) in ml/min; **Filtrate Weight** in grams. (This alarm must be enabled in order to obtain and display the Filtrate Weight (FQ).) The Lo-Pressure, Hi-Pressure and Lo-Flow alarms are related to the pressure source chosen in **SETUP: Press. Sensor, Source.** **Note:** Alarm condition is triggered when alarm limit is exceeded. **Alarms are not mutually exclusive. You may select any combination of alarms.**

4.12 Programmable R-P: Alarm Limits



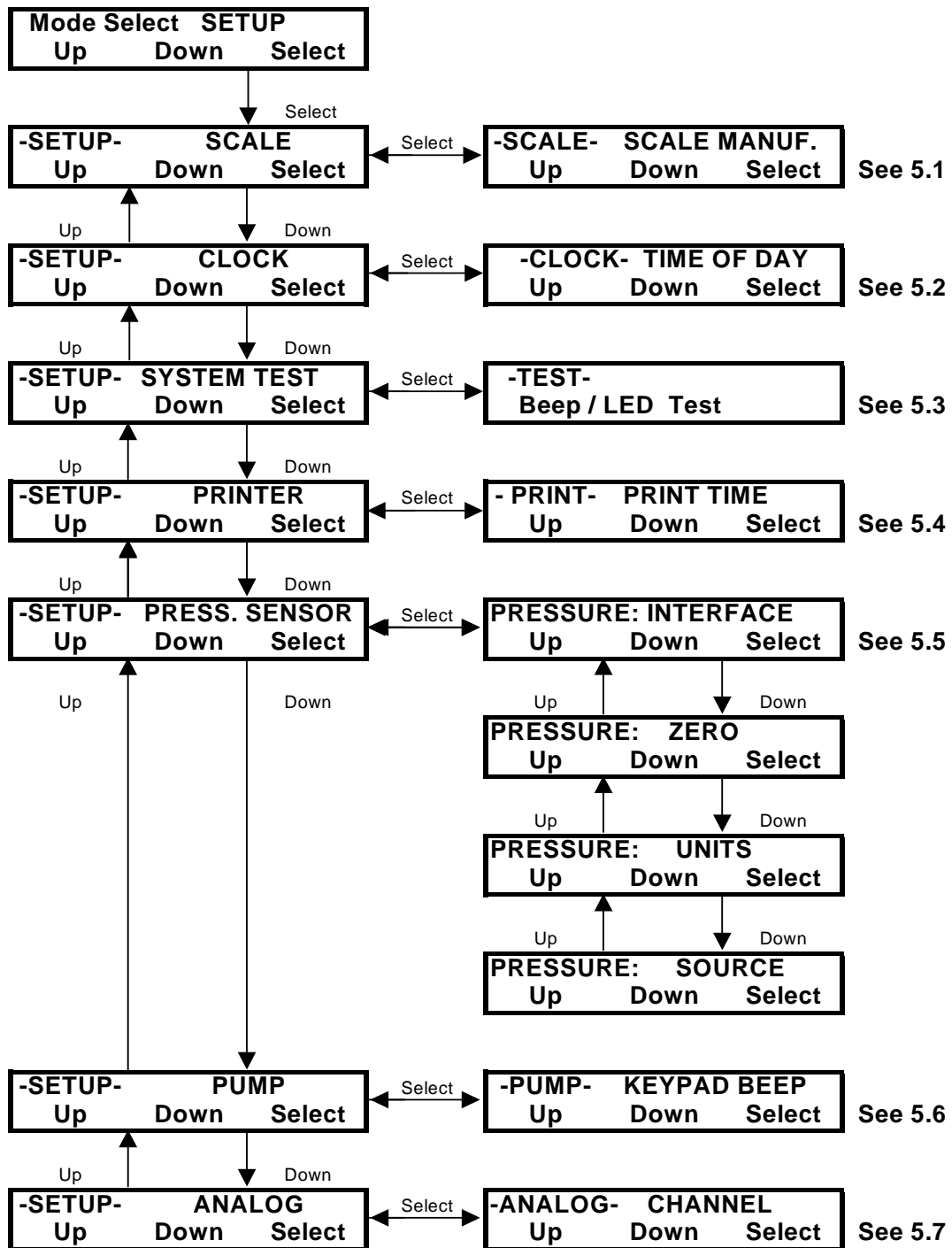
4.12 PROGRAMMABLE R-P: Alarm Limits

SUMMARY: This section describes assigning limiting values for five (5) different alarm conditions: **Cumulative Volume** in milliliters; **Lo-Pressure** (monitor system leakage) in psi; **Hi-Pressure** (Monitor filter plug-up) in psi; **Lo-Flow** (pump will stop when pump feed rate falls below this limit) in ml/min.; **Filtrate (Permeate) Weight** in grams. **Note: The alarm condition is triggered when the alarm limit is exceeded.** Alarms are not mutually exclusive. You may select any combination of alarms. See section 4.11 for the different alarm responses. For critical alarms you may want the FilterTec pump to stop (**Pump Stop**), for less critical alarm conditions you may want to choose an auditory alarm (**Alarm Only**). **Please Note: The High and Lo-Pressure alarms are directly related to the Source chosen in SETUP: Press. Sensor, Source, i.e. P1, P2, etc.**

NOTE: Use “Up” and “Down” keys to make a selection, then press “Select” to implement that selection.

- 4.121 Cumulative Volume (CV):** This alarm setting represents the total volume of process solution that is pumped through your filtration device when a balance is not in use. **When using a balance, set this limit in the Filtrate Weight Alarm!** For example: if you set the **Cumulative Volume Alarm** to 10,000ml or 10 liters, the FilterTec will either alarm and / or stop the pump when 10 liters has been pumped through the filtration device.
- 4.122 Lo-Pressure (LP):** Typically set 3-5 psi units below the desired pressure setting in the step-by-step instructions. The Lo-Pressure Alarm is triggered when a sudden filter backpressure drop occurs after rising above this setting. Such a change in the filter backpressure usually indicates a system leak.
- 4.123 Hi-Pressure (HP):** For most applications, this represents a critical alarm condition. If this is the case choose Pump Stop. Make sure you stay below the pressure limit specified by the filter manufacturer. I.e., if your filter specifies an upper pressure limit of 25 psi, you might set your **Hi-Pressure Alarm** to 20 psi. The FilterTec will alarm and stop the pump when the filter backpressure exceeds 20 psi. If you have chosen **Pmaintain**, this is the value at which the system will switch from a Rate control method to the Pressure control method and maintain that pressure.
- 4.124 Lo-Flow (LC):** For constant pressure filtration, this represents a critical alarm condition and should be set to Pump Stop in Lo-Flow Alarm Enable. In this operational mode, the FilterTec will detect any filter backpressure increases in the source pressure sensor (due to slow filter plug-up) and automatically decrease the rate to maintain the desired pressure setting in the step-by-step instructions. The Lo-Flow value (ml/min) represents lowest pump rate before the pump shuts down.
- 4.125 Filtrate Wgt. (FQ):** The FilterTec comes with a top-loading balance. Enter the filtrate / permeate weight (grams) that you want to collect, and the FilterTec will either alarm or stop the pump when the desired filtrate / permeate weight has been collected. Set this value to zero if you do not wish it to trigger during normal use. **This alarm must be enabled in at least “alarm only” mode in order for Q1 (Filtrate Quantity) to be obtained or displayed.**

5.0 SETUP



5.0 Setup

Summary: In the Setup menu consists of seven entries. In 5.1 **Setup: Scale**, you select from several different manufacturers of electronic balances: Ohaus, Mettler, and Sartorius. However, only certain models with serial communications capability can be accommodated. By choosing the scale manufacturer, the FilterTec automatically selects and implements the correct communications protocol. In 5.2 **Setup: Clock**, you can set the date and time, which is shown on the FilterTec front panel. In 5.3 **Setup: System Test** you can diagnose the electronic outputs of the FilterTec. For testing purposes you need a set of test jumpers (P/N 080-058). In 5.4 **Setup: Printer**, the communications parameters for hooking up to a SciLog printer (P/N 080-095) or a PC are selected. In 5.5 **Setup: Press. Sensor**, you chose a one- or three-sensor interface, can zero the inputs for all the sensors, select one of them as the Source, choose between psi, bar or kpa units, and set the range up to 60psi. The Source chosen is used for the Pressure Alarms in all modes, and as the control pressure in all modes. In 5.6 **Setup: Pump** certain user-preferences can be selected, in particular the Motor RPM. Finally, 5.7 **Setup: Analog** allows you to set parameters for data acquisition of a 0-5vdc or 4-20ma signal.

- 5.1 **Setup: Scale:** The following electronic scale is recommended for the FilterTec and will ship with most systems: **Ohaus Adventurer Pro** set by selecting "Ohaus3" as the manufacturer. (Default)
- 5.2 **Setup: Clock:** Set the time of day (military), **day, month, and year**. **Print Enable**, choose Time of Day, or Relative (Run) Time for the printout. Default is Time of Day.
- 5.3 **Setup: System Test:** Allows you to diagnose the outputs of the FilterTec; requires you to connect a set of test jumpers (P/N 080-058) for testing.
- 5.4 **Setup: Printer:** Select communications parameters for SciLog printer (P/N 080-095) or PC. Default settings are for communications with a printer, select **Print Time** (Default = 30 sec.), **Baud Rate** (9600), **Stop Bits** (2), **Parity** (None), **Word Length** (8), **Print Delay** = 4 sec. for printer, Print Delay = 0 sec. for PC.
- 5.5 **Setup: Press. Sensor:** You can choose between a one- or three-sensor **Interface**, and this allows you to **Zero** all 3 pressure sensors. (**Span** is used for factory calibration) Use **Source** to select the control source for pressure related alarms and control in all modes. P1, P2, P3 are available choices (Source is not an option if a one-sensor interface is chosen). **Units:** Choose from Psi (default), Bar, or Kpa units. **Range:** Default is 60, can be set as high as 100psi. If pressures higher than 60 psi are to be encountered, please consult with SciLog Customer Service for assistance.
- 5.6 **Setup: Pump:** Select the following user preferences: **Keypad Beep:** (On/Off), **Switch Configuration:** (Level / Pulse, input for Foot Switch), **Switch Polarity:** (Normal/Inverted), **TTL1:On-Off:** (Yes/No), Set Yes if controlling another pump as a slave, set NO if controlling Rotary Selector Valve "W". **Motor Start** (Hard / Soft-Ramp), **Motor RPM:** (600, 160, 8), **Power Up** (Mode/Menu/Run), **LCD Adjust** (Display Contrast Adjust), **ASCII Feedback** (On / Off, output at Serial Port 1 labeled "Balance", need RS-232 cable (P/N 080-050), **Factory Reset:** (Resets all variable parameters to their original, factory defaults).
- 5.7 **Setup: Analog:** Allows data acquisition and reporting of one 0-5vdc or 4-20ma signal from a detector. Not used for control. **Channel:** Default is 1; channels 2 and 3 are not used. **Type:** Default is 4-20ma, Choose 0-5v, 1-5v or 4-20ma.

5.1 Setup: Scale

The Ohaus Adventurer Pro Balance is the balance sent with the system when purchased. If a different balance is required, please contact SciLog for configuration info.

5.11 Ohaus Adventurer Pro Balance Parameters:

Press and hold the Menu button until MENU appears on the display. Release this button, and now use the Yes, No, and Back buttons to navigate the Sub-menus.

Please set the following Menu Items, all others are left at their factory defaults:

ReadOut

AutoZero Off

Filter Low

Print-1

Output

Whenstable Off

AutoPrint Continuous

Content

Num Only Off

Header Off

Gross Off

Net Off

Tare Off

Reference Off

Result On

GLP Off

Layout

Line Format Multi

RS232-1

Baud 600

Parity 7 No Parity

Handshake Off

In the Setup Mode, Scale Manufacturer, select "OHAUS3". By making this selection, the FilterTec will implement the correct parameters for communicating with the Adventurer Pro Series balance. You will also need SciLog P/N 080-067PGS, Balance Interface Cable. (Note: The 080-066 SciLog Ohaus Balance interface cable will not work with this balance series, and these settings will not work with any other SciLog system!)

5.5 Setup: Pressure Sensor: Span

The FilterTec has built in calibration curves for the disposable pressure sensors that are inherently very accurate for the installed default range of 0 – 60 psi, and there should be no need for you to change it. If your metrology department insists that they calibrate them periodically, the procedure for the 3-sensor interface follows. If you have a 1-sensor interface, a large gray plastic connector plugged into the 37 pin I/O port, please contact SciLog, and we will provide the procedure for calibrating that interface, as it is drastically different.

To calibrate the 3-sensor interface:

1. Obtain a NIST traceable regulated source of compressed gas (i.e. air, nitrogen).
2. Go to Mode Select: Pressure Sensor, then to Pressure: Range, and note the range specified, change if desired. (Default is 60 psi, do not reduce below 30 or increase above 100.)
3. Press Exit and scroll to Pressure: Zero.
4. Choose P1.
5. With no pressure on the sensor, press Zero (“A” button).
6. Connect regulated pressure source to P1, and increase to match range noted in step 2.
7. Press Span (“B” button).
8. Turn off pressure source, Press exit
9. Repeat steps 5 – 8, choosing P2 and then P3.
10. You have now recalibrated (spanned) all 3 sensors. It is still advisable to zero each sensor again with no pressure in the system, prior to running your tests via the Edit: Press. Sensor menu in the operating mode of choice.

6.0 Manual:

Summary: In the Manual Mode the FilterTec pump can be manually operated. The pump speed can be set by pressing the “Rate” key. The pump will also display the pressure indicated on sensor P1.

Note: The **CONSTANT RATE** and **CONSTANT PRESSURE** parameters, including the alarms, cannot be accessed in the **Manual Mode**.

When in **CONSTANT RATE** or **CONSTANT PRESSURE** operational modes, the pump speed and/or pressure can be adjusted in terms of ml/min while the pump is running. Just press the “RATE” key, make the appropriate adjustment, and press “SELECT”.

7.0 Data Acquisition:

Summary: SciLog has available a software package called SciDoc that includes data collection software and a Customized Excel spreadsheet that is automatically populated when any of the modes is executed except Manual. It also has charts that automatically are populated as the data is generated. See Section 7.1 below.

The FilterTec **serial port 2** (female DB9), is labeled “Printer”. This port is reserved for use with a SciLog serial printer or alternatively for data hook-up with a PC. When a PC is connected to the Printer Port, all data generated in RATE, PRESSURE, and STEP-SCAN modes (see 4.3, Printout format) can be sent to the PC for archiving. Please use the SciLog SciDoc Data Collection Software described in Section 7.1 below, or the connected PC must be in the “Terminal” mode (usually to be found in the “Accessory” or “HyperTerminal” program of your PC). The HyperTerminal settings are provided for you in section 7.2 entitled “PC HyperTerminal Settings.” When interfacing with a PC you will need a separate RS-232 cable (P/N: 080-073).

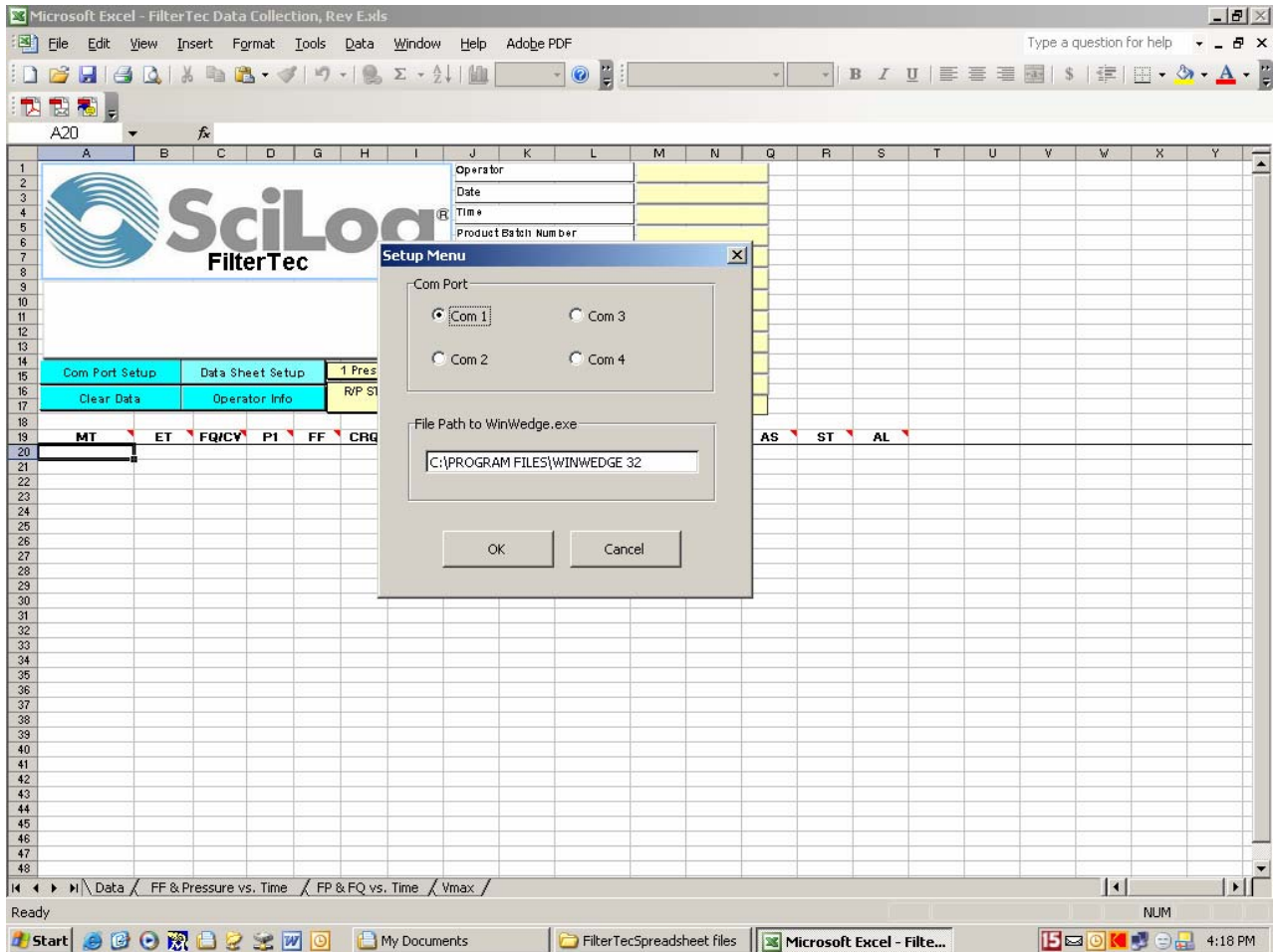
Note: For a successful hook-up with your PC via the Printer Port, the FilterTec and the PC must use the same communications protocol. Make sure that the communication parameters in Setup: Printer are the same as those listed in below.

7.1 FilterTec SciDoc Data Collection Software:

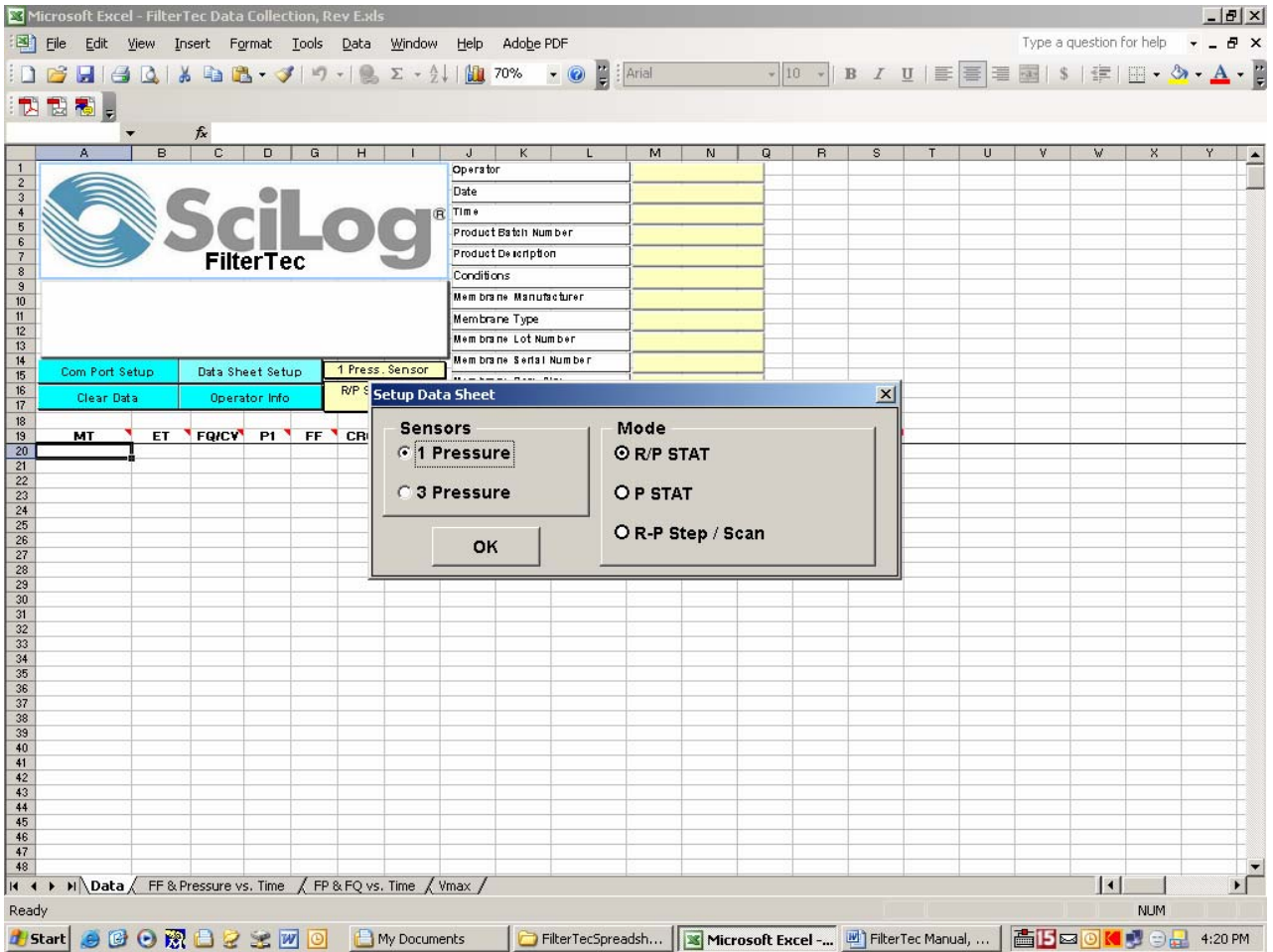
SciDoc is a software package that captures the data output of the FilterTec and places it in an Excel spreadsheet. This spreadsheet also performs some basic calculations and populates several graphs to aid you in the analysis of your process. It consists of a copy of WinWedge32 from TalTech Inc. and a custom spreadsheet with built in macros. It requires the use of a SciLog RS-232 cable, (p/n 080-073) to connect your FilterTec to an available Com Port on your PC.

Minimum system requirements for your computer are Windows 98 and Excel 2000. WinWedge32 v3.0 is included in the package.

Once installed, click on the shortcut for the spreadsheet, and you will have the following screen:

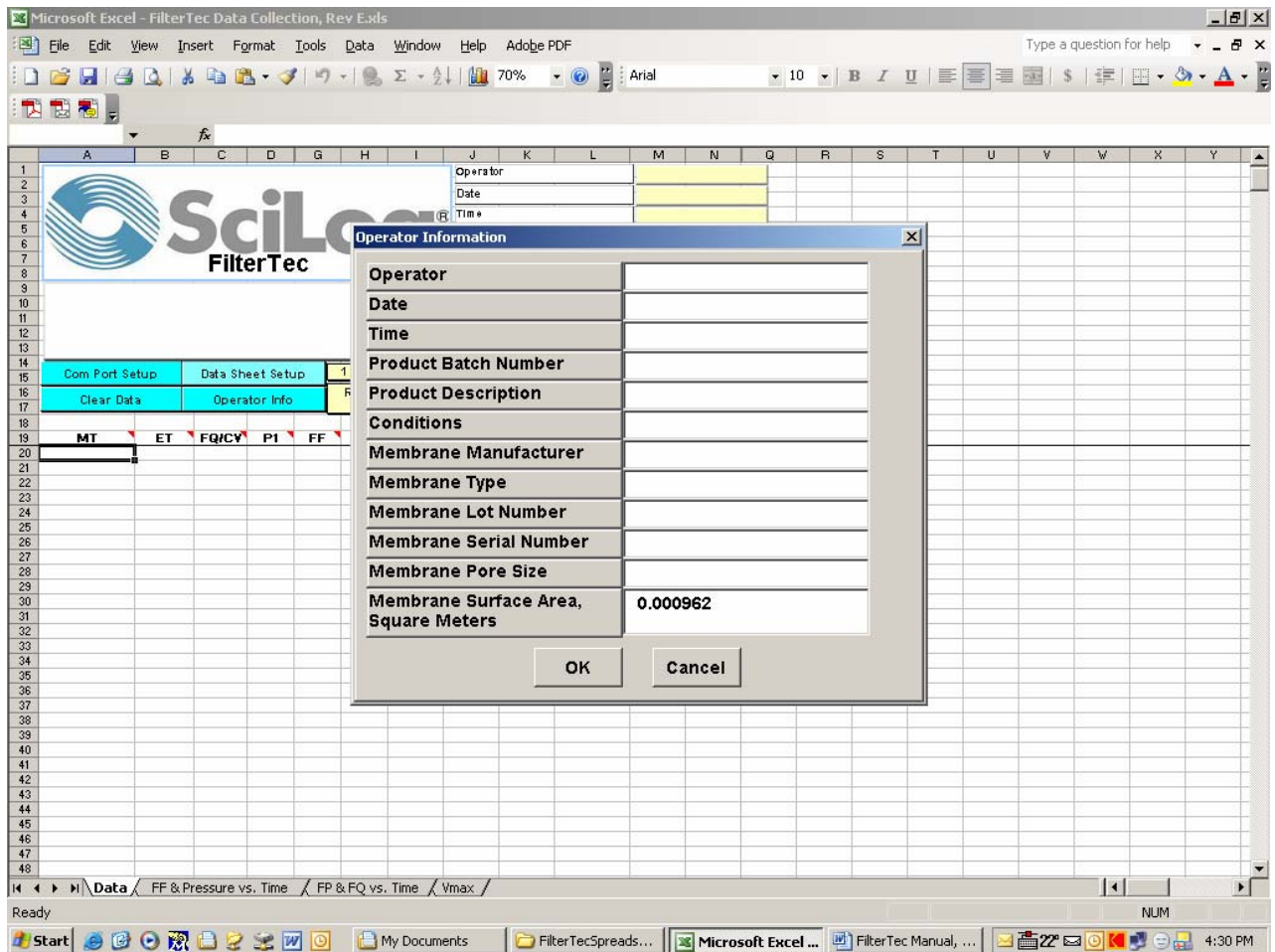


Choose the Com Port you have the FilterTec connected to, and enter the directory you installed WinWedge32 into if different than the default directory. (We highly recommend the use of the default directory!) Click on the OK button and WinWedge32 will start, showing itself as an icon in your system tray. If you chose cancel on the Setup dialog box, the “Clear Data” button will not be visible, WinWedge32 won’t be in the system tray, and you will need to click on the “Setup” button to complete these tasks in order for data collection to be possible. Once this is complete, you will have the next screen:



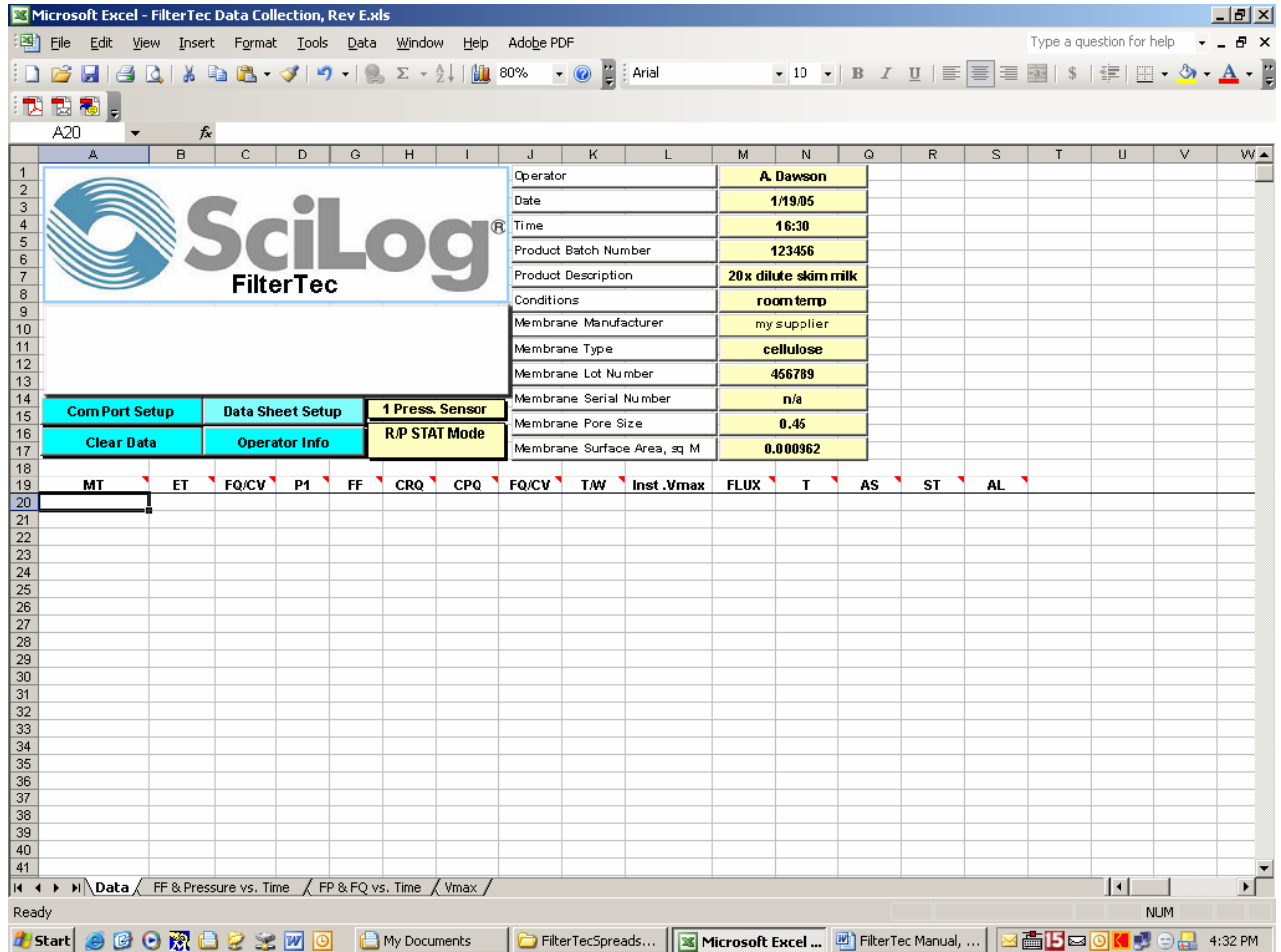
Here you will setup the data sheet for the mode you are using and the number of pressure sensors in use. Most common will be Constant Rate Mode and One Sensor. Choose the mode and either one or three sensors and click on OK. These choices may be changed between runs if the need arises by pressing the “Data Sheet Setup” button on the spreadsheet.

After pressing the ok button, the next screen appears:



Here you can enter the operator's information and that of the filter and sample you are running. **The Membrane area in square meters is a mandantory field, and must be filled in for this to function properly.** A default value of .000962 sq mtrs is entered for those using 47mm diameter filters. These fields may be updated for later runs by pressing the "Operator Info" button on the spreadsheet.

After pressing OK, the empty datasheet appears:



When ready, press Exec on the FilterTec, and then RUN after the balance has initialized. The data generated will automatically be placed in the cells of the spreadsheet, and the charts populated with the same data. The text box in the upper left of the spreadsheet contains the header information that is generated by the FilterTec. This will list the Operational Mode, the date and time, all operating parameters, alarm settings and alarm limits.

The following charts have been included for your use, and you may view them by clicking on the appropriate tab at the bottom of the worksheet:

- Filtrate Flow Rate (FF) and Pressure vs. Time
- Filtrate Flow Rate (FF) and Filter Quantity(FQ) vs. Time
- Vmax, which is T/W (seconds/gram) vs. Time (elapsed time, seconds)

You may, of course, create your own charts or modify those included by adding trendlines, changing titles, etc. While the Data worksheet cells are protected, the charts are not with this purpose in mind.

The following is an example of a completed run:

The screenshot displays a Microsoft Excel spreadsheet titled "FilterTec P Stat, 20x milk, .45 filter, balance.xls". The spreadsheet is divided into several sections:

- Header Section (Rows 1-18):** Contains a SciLog FilterTec logo and a table of parameters. The parameters include:

Operator	A. Dawson
Date	1/20/05
Time	10:00:00
Product Batch Number	123456
Product Description	20x dilute Skim Milk
Conditions	Roomtemp
Membrane Manufacturer	Cole Parmer
Membrane Type	SFCA
Membrane Lot Number	456789
Membrane Serial Number	n/a
Membrane Pore Size	0.45
Membrane Surface Area, sq M	0.000962
- Control Buttons (Rows 14-17):** A grid of buttons for "Com Port Setup", "Data Sheet Setup", "1 Press. Sensor", "Clear Data", "Operator Info", and "P STAT Mode".
- Data Table (Rows 19-41):** A table with columns: MT, ET, FQ/CV, P1, FF, T/W, Inst.Vmax, FLUX, T, AS, ST, AL. The data shows a series of time-stamped entries from 10:05:53 to 10:09:24. The status column (AL) shows "START" at the beginning and "RUN" for the rest of the entries.

A couple items of Note: The columns that are visible on the spreadsheet will change based on the mode and number of sensors chosen. Those in the screen above are for Constant Rate Mode with one sensor. Choosing three sensors will yield columns for P2, and P3. Choosing Constant Pressure Mode will hide the CRQ and CPQ columns that do not apply in that mode.

The CRQ (Constant Rate Quantity) and CPQ (Constant Pressure Quantity) columns relate to the use of the Pmaintain feature of the Hi-Pressure alarm in Constant Rate Mode. The CRQ column will populate the filtrate quantity collected under constant rate control, and when the Hi-Pressure alarm is triggered, this column stops, and the CPQ column reports the filtrate quantity collected under constant pressure control. The FQ column reports the total quantity collected.

When finished with a run, Click on File-Save as: and choose an appropriate file name based on your needs. When ready for another run, simply press the "Clear Data" button, or close and re-open the file.

Please note the following:

- * You may use the **STOP** and **RUN** keys on the FilterTec front panel to interrupt the filtration process. This will only cause minor changes in the data and charts. They show up in the data set by displaying the word PAUSE in the ST (Status) column of the Data worksheet.
- * Using the **EXIT** key however, and then pressing Exec and RUN again in the same data collection run, will replace the header information in the text box at the top of the worksheet, while continuing to add data to the bottom of the sheet. **It is recommended that you either save the data as mentioned above, or dispose of it by clicking on the “Clear Data” button prior to pressing the Exec and RUN keys again to begin a new set of data.**
- * The FilterTec allows you to change the Constant Rate or Pressure on the fly by pressing the RATE/PRESSURE key on the front panel. This is a very useful tool in determining the optimum parameters for your process. When you press this key, the FilterTec will stop sending data to the worksheet until approx 15 seconds after you have pressed the “Select” button on the front panel to finalize your choice. As your process is continuing while you do this, the data will reflect the change.

Please contact Scilog customer service at 800-955-1993 if you have any questions, comments or suggestions regarding the use of this data collection software.

7.2 PC HyperTerminal Settings:

FilterTec to PC: For PC Connections via **Serial Port 2** labeled “Printer Port” requires a SciLog RS-232 Cable (P/N: 080-073). NOTE: When you are not using the SciLog printer, the Serial Port 2 allows process data to be “dumped” into your PC for archiving. The list of settings below must match those in Setup:Printer of the FilterTec, and Print Delay should be set to “0”. For PC Connections using Serial Port 1 labeled “Balance Port” requires SciLog Serial Cable (P/N: 080-050). This connection allows Remote Control of the FilterTec using the ASCII Protocols listed in Section 6.2 that follows.

The following terminal setting procedure is intended for PCs with a **Window 95/98** software installation: Press the Window 95/98 **START** key in the lower left corner of your screen, select “**Program**” then select and open “**Accessories**”, select “**Hyper Terminal**”, double-click at the Hyper Terminal icon.

1. From the “**Connection Description**” screen, select an icon and enter a file name, i.e. FilterTec. Press “**Ok**”
2. From the “**Phone Number**” screen, select “**Direct to Com 1**” in the box labeled **Connect Using:** or select any other available Com port. Press “**Ok**”
3. From the “**Com 1 Property**” screen, select the following parameters

Bits per Second:	9600
Data Bits:	8
Parity:	None
Stop Bits:	2
Flow Control:	None

Press “**Ok**”

4. Go to “**File**” and open “**Properties**”, from the “**FilterTec Property**” screen, select the “**Setting**” screen, enter the following:

Terminal Keys:	Select
Emulation:	TTY
Backscroll Buffer:	500

While still in the “**Setting**” screen, press “**ASCII Setup**” key & select the following from the “**ASCII Setup**” screen:

Send Line Ends with Line Feed:	Select
Echo Typed Characters Locally:	Select
Line Delay	10 msec.
Character Delay:	10 msec
Append Line Feeds.....:	No Selection
Force Incoming.....:	No Selection
Wrap Lines That Exceed	Select

Press “**Ok**” at the bottom of the “FilterTec Setup” screen.

Press “**Ok**” at the bottom of the “FilterTec Property – Setting” screen

Appendix “A” Application Examples

FilterTec Software Version 2.63FILT and higher: Starting with V 2.63FILT, the pump rate algorithm was substantially improved in order to minimize pressure limit overshoots.

The FilterTec allows filter capacity determinations to be carried out by the following methods:

1. Constant Pump Rate
2. Constant Pump Rate followed by Constant Pressure
3. Constant Pressure, V_{max}
4. Programmable Step/Scan Rate/Pressure

The data obtained from these methods are used to determine optimal filtration conditions to process a given volume of solution by dead-end filtration. The desired information includes answers to the following questions:

- a. What is the optimal filter porosity?
- b. What is the required filter area?
- c. What is the required filtration time?

FilterTec Parameters: When utilizing the FilterTec for filter capacity determinations, a few, simple rules must be observed:

1. Selection of Pump Tubing: *CP120, 160 RPM Pump Motor, Tandem 1081*

The pump tube selection should be made based upon the desired / required pump output range. Do not operate the FilterTec at excessively low pump rates for any pump tubing you may have selected. For example, the Masterflex tubing size #14 has an output range from 2.0 to 35 ml/min, however, pump rates below 10 ml/min are better implemented with #13 tubing because its lower pump output capabilities and greater dynamic range. If you wish to implement a flow rate of 5.0 ml/min, #14 tubing has remaining dynamic range from 5.0 to 2.0 ml/min (stalling speed) where as #13 tubing has a remaining (ten-fold) dynamic range from 5.0 to 0.5 ml/min.

The dynamic range of the selected pump tubing is particularly important in the Constant Pressure Mode (V_{max}) as well as the Constant Rate/Pressure Mode. In both cases, the pump output decay is monitored over time. In order to record the lower end of the pump rate decay curve it is useful to utilize the widest possible dynamic range.

For Pump Rates < 10 ml/min (160 RPM Motor) use **Masterflex Tubing #13**

For Pump Rates 10 – 35 ml/min (160 RPM Motor) use **Masterflex Tubing #14**

For Pump Rates 35 - 129 ml/min (160 RPM Motor) use **Masterflex Tubing # 16**

For Pump Rates 129-283 ml/min (160 RPM Motor) use **Masterflex Tubing # 25**

2. Small Filter Area < > Low Pump Rate

Large Filter Area < > High Pump Rate

15 mm Diameter Syringe Filter:

25 mm Diameter Syringe Filter:

50 mm Diameter (Barb) Filter:

Effective
Filter Area:
(SFCA)*

1.7 cm²

2.8 cm²

20.0 cm²

Recommended
Masterflex Tubing

Sizes:

#13

#13 or #14

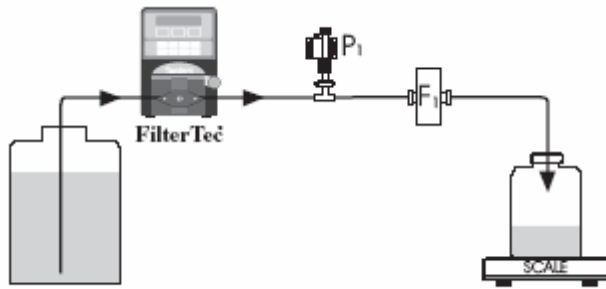
#16

NOTE: The Effective Filter Area may be different for your particular filter. Check with the manufacturer of your filter. If you use the SciDoc documentation software, enter the Effective Filter Area in the “Operator Information” box under “Membrane Surface Area, Square Meter”; e.g. 2.8 cm² is entered as 0.00028 m².

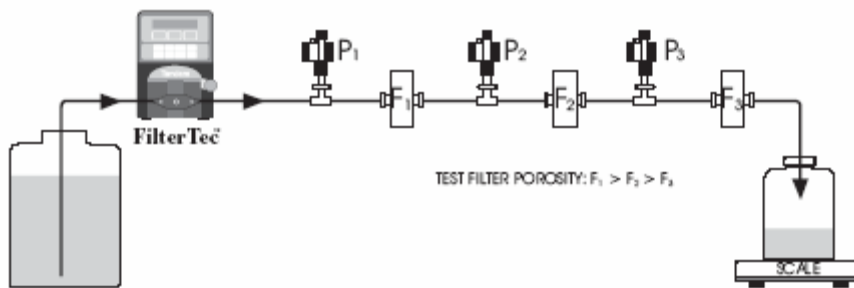
*** Depending on the filter porosity, filter material and filter housing, the Effective Filter Area may differ substantially from geometric filter surface area.**

The following diagrams show the various configurations of the FilterTec system.

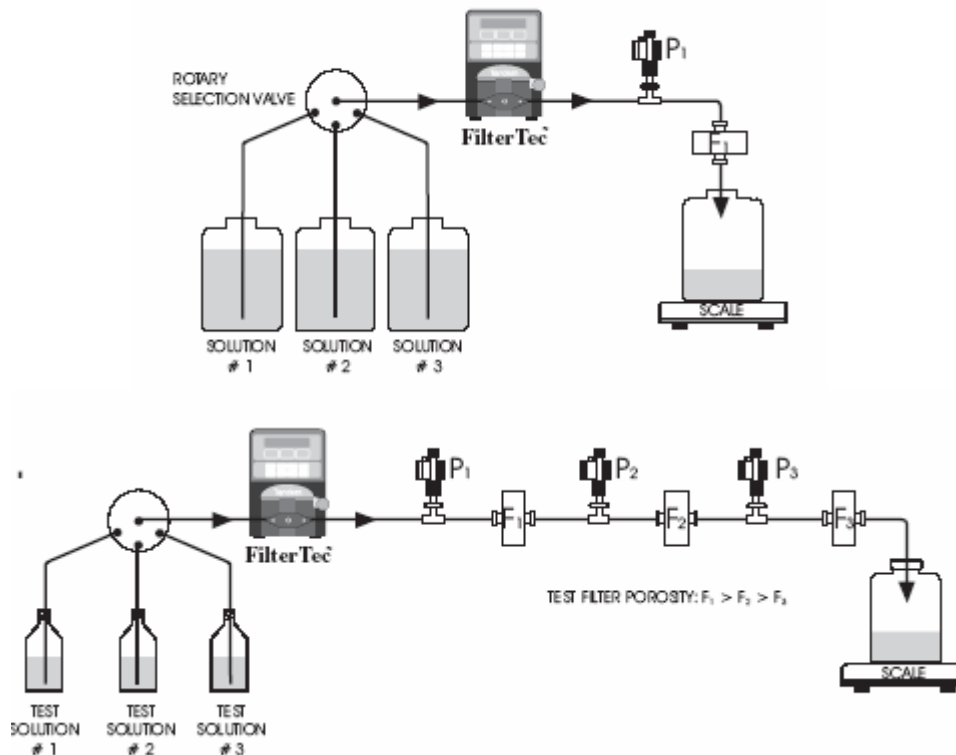
1. This is the most common setup, using a single filter and pressure sensor.



2. This is the other common setup, for testing a filter-train, using 3 filters and 3 sensors in series.



3. These may be augmented by use of a 6-way Rotary Valve to change from one solution to another in a programmed manner, using the Programmable R-P Mode.



FilterTec Settings and Parameters Worksheets

Filter

Filter Cartridge	
Filter Area, sq M	
Manufacturer	
Pore Size	
Max Psi	
Usual Operating Psi	

R-P Step Scan

Pump Tubing		
Response Factor		
Rate Scan:Initial Rate		
Rate Scan:Final Rate		
Pressure Scan: Initial psi		
Pressure Scan: Final psi		
Alarm Enable / Limits	Enable	Limit
Cumulative Volume		
Filtrate Weight		
Run Time		
Hi Pressure		
Low Pressure		
Low Flow		

R/P Stat Mode

Pump Tubing		
Pump Rate		
Response Factor		
Alarm Enable / Limits	Enable	Limit
Cumulative Volume		
Filtrate Weight		
Run Time		
Hi Pressure		
Low Pressure		
Low Flow		

P Stat Mode

Pump Tubing		
Pump Pressure		
Response Factor		
Alarm Enable / Limits	Enable	Limit
Cumulative Volume		
Filtrate Weight		
Run Time		
Hi Pressure		
Low Pressure		
Low Flow		

Filter

Filter Cartridge	
Filter Area, sq M	
Manufacturer	
Pore Size	
Max Psi	
Usual Operating Psi	

R-P Step Scan

Pump Tubing		
Response Factor		
Rate Scan:Initial Rate		
Rate Scan:Final Rate		
Pressure Scan: Initial psi		
Pressure Scan: Final psi		
Alarm Enable / Limits	Enable	Limit
Cumulative Volume		
Filtrate Weight		
Run Time		
Hi Pressure		
Low Pressure		
Low Flow		

R/P Stat Mode

Pump Tubing		
Pump Rate		
Response Factor		
Alarm Enable / Limits	Enable	Limit
Cumulative Volume		
Filtrate Weight		
Run Time		
Hi Pressure		
Low Pressure		
Low Flow		

P Stat Mode

Pump Tubing		
Pump Pressure		
Response Factor		
Alarm Enable / Limits	Enable	Limit
Cumulative Volume		
Filtrate Weight		
Run Time		
Hi Pressure		
Low Pressure		
Low Flow		

Appendix B: Troubleshooting

A. Peristaltic Pump Heads

When this occurs:	Check the following:	Possible Solution
When “Check Pump Head” error occurs with your peristaltic head.	<ol style="list-style-type: none"> 1. Does “Check Pump Head” occur with no tubing in the head? 2. Confirm the tubing sizes you are using. 	<ol style="list-style-type: none"> 1. If it occurs with no tubing in the head, call SciLog. You may need a new motor. 2. If no, make sure you are using the correct size tubing. Thick walled tubing in a thin wall pump head will cause this, and may break the head
When peristaltic pump head turns, but no fluid flows.	<ol style="list-style-type: none"> 1. Check the tubing size and pump head type, as you may be using the wrong size for that head. 2. Tubing Size is ok 	<ol style="list-style-type: none"> 1. Tandem 1081 is for thin-walled tubing, and 1082 is for thick-walled tubing. Thin-walled tubing in a thick walled head won’t produce much flow. Use the correct size tubing. 2. The pump head may be cracked from being forced closed with the tubing crosswise or the wrong size tubing. Contact Scilog for repair or replacement parts.
When the pump head turns ok with no tubing installed, won’t turn when you put tubing in, and you don’t get a “Check Pump Head” error.	The coupler is loose or broken.	Contact SciLog for tech support, or to arrange for service and an RGA#

When this occurs:	Check the following:	Possible Solution
<p>When “Scale Error” “Hit any key” shows on your screen.</p>	<ol style="list-style-type: none"> 1. Is your scale turned on, and are the cables tight? 2. Ok, the scale is on, cables are ok, and it still won't work? 3. Ok, the scale is chosen correctly, and it still doesn't work. Now what? 	<ol style="list-style-type: none"> 1. Press any key to clear the error, tighten the cables, turn on the scale, and try it again. 2. Check Section 4, Setup: Scale of this manual, then go to Setup Mode of the pump, select Scale, then Scale Mfr, and confirm the selection is correct. 3. Either refer to the same manual section mentioned above to check the scale settings, or call SciLog tech support for help correcting them.
<p>When the pump is acting weird. The aliquots are all wrong; it gets data from the balance, but slows down way to early; etc.</p>	<ol style="list-style-type: none"> 1. Has someone messed with your FilterTec? 2. Have you had electrical problems in the building lately? 	<ol style="list-style-type: none"> 1. If someone other than yourself or your supervisor has changed the settings without your knowledge, you can return them to their original settings. 2. Power spikes and brown outs can cause problems. Enter Setup; Pump, and then select Factory Reset. This step is a last resort. This will return the unit to the factory default values. You will need to return to Setup; Pump; Motor RPM, and verify its setting, as well as Setup, Pump; Pump Head to verify it as well. You will also need to re-enter your aliquots and re-calibrate them. Call SciLog tech support if needed.

B. Piston and Magnetic Gear Heads

When this occurs:	Check the following:	Possible Solution
<p>When “Check Pump Head” error occurs with your piston or magnetic gear head.</p>	<ol style="list-style-type: none"> 1. When was the last time you had the head serviced? 2. Are you pumping a gritty solution, or one that can crystallize if allowed to dry out? 	<ol style="list-style-type: none"> 1. If you believe the head is stuck due to being dried out, you can try wetting it by placing an appropriate solvent in the upper tubing overnight. 2. If it still won't turn, contact SciLog to arrange an RGA to send your pump in for service, or purchasing a service kit if you have a magnetic gear head.
<p>When your piston pump head seems to turn and the motor runs, but no fluid flows.</p>	<p>Either the piston is broken, or the coupler is loose.</p>	<p>Contact SciLog for tech support or to arrange for service for your pump and RGA#</p>
<p>When your magnetic pump head seems to turn and the motor runs, but no fluid flows.</p>	<ol style="list-style-type: none"> 1. Has the unit run dry? 2. Is it a high viscosity fluid? 	<ol style="list-style-type: none"> 1. Magnetic gear head pumps do not dry prime well after they have been broken in. You must keep the pump wet. Be sure you are using a check valve as your dispensing tip so the fluid doesn't run back into the container. 2. Magnetic gear heads do not perform well with viscous fluids, as they can de-couple. Either reduce the viscosity, provide head pressure, or choose a different style of head.

When this occurs:	Check the following:	Possible Solution
<p>When “Scale Error” “Hit any key” shows on your screen.</p>	<ol style="list-style-type: none"> 1. Is your scale turned on, and are the cables tight? 2. Ok, the scale is on, the cables are ok, and it still won't work? 3. Ok, the scale is chosen correctly, and you still get no data? 	<ol style="list-style-type: none"> 1. Press any key to clear the error, tighten the cables, turn on the scale, and try it again. 2. Check Section 4, Setup: Scale of this manual, then go to Setup Mode of the pump, select Scale, then Scale Mfr, and confirm the selection is correct. 3. Either refer to the same manual section mentioned above to check the settings on the scale itself, or call SciLog for tech support's help in correcting them.
<p>When the pump is acting weird. The aliquots are all wrong; it gets data from the balance, but slows down way to early; etc.</p>	<ol style="list-style-type: none"> 1. Has someone messed with your FilterTec? 2. Have you had electrical problems in the building lately? 	<ol style="list-style-type: none"> 1. If someone other than yourself or your supervisor has changed the settings without your knowledge, you can return them to their original settings 2. Power spikes and brown outs can cause problems. Enter Setup; Pump, and then select Factory Reset. <u>This step is a last resort.</u> This will return the unit to the factory default values. You will need to return to Setup; Pump; Motor RPM, and verify its setting, as well as Setup, Pump; Pump Head to verify it as well. You will also need to re-enter all your aliquots and re-calibrate them. Call us for tech support if needed.

C. SciDoc Documentation Software

When this occurs:	Check the following:	Possible Solution
<p>When you get a “Device Error, Com Port Not Available” error from your computer.</p>	<p>This is a computer related error, not one generated by the pump. The Com port you specified is in use or does not exist on your computer</p>	<ol style="list-style-type: none"> 1. Check Device Manager from the properties page of the My Computer Icon. Expand the + next to Ports, Com and LPT. What Com ports exist, and are they functioning properly? 2. If all in Device Mgr is fine, then some other program is using the Com Port, consult your IT or MIS dept. for assistance. You may have to specify a different Com Port for use with the SciDoc spreadsheet. 3. Known devices/programs that cause this error: <ol style="list-style-type: none"> a. Installed but not used Serial Mouse. b. RS-232 bar code reader installed on the same Com port. c. Hot Sync or Synchronize program for your PDA. d. An already open instance of SciDoc using that Com port.

When this occurs:	Check the following:	Possible Solution
You have SciDoc open, and the FilterTec running, but no data is being collected.	<p>There is no communication between the spreadsheet and the FilterTec.</p> <ol style="list-style-type: none"> 1. Check that you are using the correct cable, and that it's installed correctly. 2. WinWedge may not be running. 3. WinWedge may not be able to access the Com Port. 	<ol style="list-style-type: none"> 1. The RS-232 cable for the PC can look nearly identical to that used for the balance. They should be labeled. 2. Check the System Tray for the WinWedge Icon. If it's not there, click on the Setup Button, and indicate which port you are using. 3. You will find a button on the Taskbar indicating a "Device Error", refer to the previous troubleshooting subject for help with Com Port errors.

C. FilterTec Specific issues

When this occurs:	Check the following:	Possible Solution
You have a balance in use, but aren't getting any data from the balance.	<ol style="list-style-type: none"> 1. Is it connected and configured correctly? 2. Did you turn the Filtrate Weight Alarm off? 	<ol style="list-style-type: none"> 1. Review suggestions for the "Scale Error" problem listed above. If your not getting this error, see #2 that follows. 2. If the Filtrate Weight Alarm under Alarm Enable: Filtrate Wgt. Is set to OFF, the unit will not look for the balance, and not gather data from it. The lack of "Scale Initialization" occurring is a good clue. Set this alarm to either Beep Only, or Pump Stop. If you don't want the alarm to occur, set the Limit to either 0.0 or well beyond anything you might collect.