
# SciLog® PureTec® System

Installation, Operating & Maintenance Instructions

Parker

ENGINEERING YOUR SUCCESS.

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# Precautions

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|---|
| **READ this manual BEFORE operating or servicing this equipment.** |
| **FOLLOW these instructions carefully.** |
| **SAVE this manual for future reference.** |
| **DO NOT allow untrained personnel to operate, clean, inspect, service or tamper with this equipment.** |
| **ALWAYS DISCONNECT this equipment from the power source before cleaning or performing maintenance.** |
| **CALL Parker Customer Service for parts, information and service.** |

| | |
|---|---|
|  | **WARNING** |
| | DISCONNECT ALL POWER TO THIS UNIT BEFORE INSTALLING, SERVICING, CLEANING OR REMOVING THE FUSE. FAILURE TO DO SO COULD RESULT IN BODILY HARM AND/OR PROPERTY DAMAGE. |
|  | **CAUTION** |
| | OBSERVE PRECAUTIONS FOR HANDLING ELECTROSTATIC SENSITIVE DEVICES. |
|  | **WARNING** |
| | ONLY PERMIT QUALIFIED PERSONNEL TO SERVICE THIS EQUIPMENT. EXERCISE CARE WHEN MAKING CHECKS, TEST AND ADJUSTMENTS THAT MUST BE MADE WITH POWER ON. FAILING TO OBSERVE THESE PRECAUTIONS CAN RESULT IN BODILY HARM. |
|  | **WARNING** |
| | FOR CONTINUED PROTECTION AGAINST SHOCK HAZARD, CONNECT TO PROPERLY GROUNDED OUTLET ONLY. DO NOT REMOVE THE GROUND PRONG. |

**IF the power cord is lost or damaged, contact Customer Service to obtain a new one. Do not replace it on your own.**

# Précautions

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| **LISEZ ce manual AVANT de faire fonctionner ou d’entretenir cet équipment.** |
| **SUIVEZ attentivement ces instructions.** |
| **CONSERVEZ ce manuel pour future référence.** |
| **NE LAISSEZ PAS du personnel non qualifié utiliser, nettoyer, inspecter, entretenir, réparer ou manipuler cet équipement.** |
| **DÉBRANCHEZ TOUJOURS cet équipement de la source de courant avant de nettoyer ou d’exécuter l’entretien.** |
| **APPELEZ PARKER pour pièces détachées, renseignements et entretien.** |

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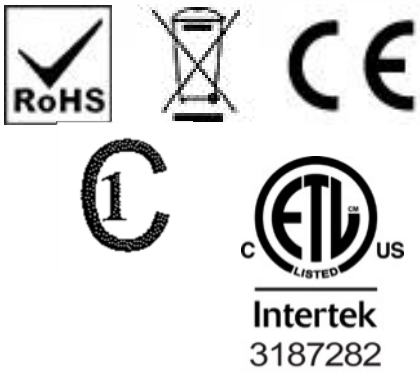
|---|---|
|  | **⚠ ATTENTION** |
| | DÉBRANCHEZ TOUT COURANT DE CETTE UNITÉ AVANT DE FAIRE L’INSTALLATION, D’EFFECTUER L’ENTRETIEN, LE NETTOYAGE OU AVANT DE RETIRER LE FUSIBLE. NE PAS OBSERVER CES PRÉCAUTIONS RISQUERAIT DE CAUSER DES BLESSURES CORPORELLES OU/ET D’ENDOMMAGER L’ÉQUIPEMENT. |
|  | **⚠ PRUDENCE** |
| | SOYEZ PRUDENT LORSQUE VOUS MANIPULEZ DES APPAREILS SENSIBLES À L’ÉLECTROSTATIQUE. |
|  | **⚠ ATTENTION** |
| | AUTORISEZ SEULEMENT LE PERSONNEL QUALIFIÉ À ENTRETENIR CET ÉQUIPEMENT. SOYEZ PRUDENT LROSQUE DES VÉRIFICATIONS, TESTS ET AJUSTEMENTS DOIVENT ÊTRE EFFECTUÉS SOUS TENSIONS. NE PAS OBSERVER CES PRÉCAUTIONS RISQUERAIT DE CAUSER DES BLESSURES CORPORELLES. |
|  | **⚠ ATTENTION** |
| | POUR ASSURER UNE PROTECTION CONTINUE CONTRE UNE DÉCHARGE ÉLECTRIQUE, BRANCHEZ UNIQUEMENT SUR UNE PRISE CORRECTEMENT RELIÉE Á LA TERRE. NE RETIREZ PAS LA FICHE DE TERRE. |

**SI le cordon d'alimentation est perdu ou endommagé, contactez le service clientèle pour en obtenir un nouveau. Ne le remplacez pas par vous-même.**

# Table of Contents:

# Standards:




EN 61326-1:2006, Class B

EN 6100-3-2:2006

EN 6100-3-3:1995 +A1:2001 +A2:2006

EN 61010-1 Issued: 2001/03/01

Conforms to UL STD 61010-1:2012 Ed.3+R:29Apr2016

Certified to: CAN/CSA-C22.2 No 61010-1-12:2012 Ed.3+U1:U2

# Installation & Start-Up:

Installation of the PureTec™ System 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 PureTec™ are observed. See “PureTec™ Specifications”.

The protection provided by this equipment may be impaired if the PureTec™ is used in a manner inconsistent with this manual or for purposes not specified by the manufacturer.

# Maintenance & Cleaning:

The PureTec™ is practically maintenance free. The SciPres™ disposable sensors used with the system come pre-calibrated from the factory and require no maintenance. The Tandem™ peristaltic pump head should periodically have tubing debris cleaned from it, but requires no lubrication.

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

The SciPres™ disposable sensors may be sanitized with 0.1 Molar NaOH, or 2-propanol. They may be autoclaved up to twice, and newer units with the grey rings around the cable connector may be gamma irradiated.

# Introduction:

You will find the PureTec™ System easy to use. The state-of-the-art hardware and software design of the PureTec™ allows you to control measure and document your Tangential Flow Filtration / separation processes. With proper maintenance, the PureTec™ Auto Purification System will provide many years of excellent service and performance.

# Please read the following instructions carefully!

**Inspections:** Remove the products carefully from the shipping container. Check the contents against the purchase order to verify that all parts are included and undamaged.

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

**Customer Service:** Parker customer service: If assistance is required, please contact us at: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DH3 2SF, England
phone +44 (0)191 4105121
fax +44 (0)191 4105312
email: bioscience.emea@parker.com
www.parker.com/bioprocessing

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2340 Eastman Avenue
Oxnard, California, USA 93030
toll free: 877 784 2234
phone: +1 805 604 3400
fax: +1 805 604 3401
email: bioscience.na@parker.com
www.parker.com/bioprocessing


Parker customer service personnel will be able to serve you more efficiently if you have the following information:

- Serial number and model name of the equipment
- Installation procedure being used
- Concise list of symptoms
- List of operating procedures and conditions in use when problem arose

# Warranty

Country specific information can be found at: www.parker.com/termsandconditions

# PureTec Maintenance

Factory based preventative maintenance is recommended on an annual basis.

Contact your Territory Manager or Parker Technical support to obtain a TSP Number and pricing on this procedure.

# PureTec 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, Recessed Handle.
- **Pump Head / Motor Options:**
  1. **Tandem 1081 peristaltic pump head with 8-RPM motor,** thin-walled (0.060") pump tubing: #13, 14, 16, 25, 17, and #18. Flow Range: 0.03 to 24.3 ml/min. **Recommended for virus filtration applications.**
  2. **Tandem 1081 peristaltic pump head with 160-RPM motor,** thin-walled (0.060") pump tubing: #13, 14, 16, 25, 17, and #18. Flow Range: 0.5 to 554 ml/min. **Recommended for lab-scale TFF applications with filter area from 50 $cm^2$ to 200 $cm^2$,** 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,** thick-walled (0.090") pump tubing: #15, 24 and #35. Flow Range: 59 to 2,258 ml/min. **Recommended for process-development TFF applications with a combined filter area of up to 0.40$m^2$**, e.g. "Pellicon Mini" (Millipore), "Pellicon Cassette" (Millipore), "Ultrasette" (Pall), "Centramate" (Pall), Maximate" (Pall), "Sartocon Slice", "Sartocon Casstte" (Sartorius).
  4. **High Pressure / High Performance peristaltic pump head with 8 RPM motor,** accommodates high pressure tubing 16HP (max. 6.4 ml/min) and 15HP (max.13 ml/min), capable of generating working pressure up to 60 psi. **Recommended for high-pressure virus filtration; requires pressure-compatible filtration device.**
- **Pressure Sensors:** Accommodates up to three (3) SciPres™ disposable sensors: P1 = Feed Line Pressure. P2 = Retentate Line Pressure, P3 = Permeate Line Pressure. PureTec calculates and displays Trans-membrane Pressure (TM), **TM = (P1 + P2) / 2 - P3**.

In the Constant Pressure Mode, pressure control is achieved by modulating pump output. The user selects P1, P2, P3 or TM as the controlled pressure.

- **Pressure Displayed** with a resolution of 0.1 psi; choice of **bar, psi, kpa**.
- **Pressure Range: 0-60psi**. This can be re-calibrated using an external pressure reference source.

**Electrical:**

- **Power:** 90 - 264 V~, 47-63 Hz, 150 VA, listed Class 2 switching power supply. Double fused: 1A-T, 250V (CE: IR35A 250V~).
- **Battery:** CR1220, used to support the internal clock only, not user serviceable.
- **Motor:** Choice of three (3) motors: 8, 160 and 600 RPM at 24V ⎓, 3.8 Amperes, Variable Pump Speed optically encoded servo-controlled motors.
- **Encoder:** 100 lines per / rev. for 600-RPM motor. 120 lines per / rev. for 8 and 160 RPM motors.

- I/O Ports:
  - **“Printer”**, Female DB9 connector for data collection with Printer or PC.
  - **“S1”**, Male DB9 connector for RS-232 connection to an electronic scale.
  - **“S2”**, Male DB9 connector, Not utilized on PureTec. Do not remove the cover.
  - **“S3”**, Male DB9 connector, Not utilized on PureTec. Do not remove the cover.
  - **“External I/O”**, Female DB37 connector used for remote On/Off control of PureTec via footswitch, or for Analog interface with SciCon or other 4-20 ma source, A1, A2, A3.
  - **“V”**, Female DB15 connector, Not utilized on PureTec.
  - “**Temperature**”, 2 pin Conxall connector for SciTemp™ disposable Temperature Sensor.
  - **“P1, P2, P3”**, RJ11 connectors used for SciPres disposable Pressure Sensors.
  - **“USB”**, USB-A connector, used for RS-232 data collection with a PC.
  - “**Ethernet**”, RJ-45 connector, used for Modbus TCP/IP connection with system. (when available)
- **Display:** Two line LCD, 20 characters each, back-lit.
- **Data Entry**: Membrane keyboard with auditory feedback.

## Environmental:

- Temperature range: 4 to 40° C.
- Altitude: up to 2000 Meters
- Indoor, dry environments only, clean-up is wipe down only.(IP 20)
- Relative humidity: 0-95%
- Voltage fluctuations +/- 10%
- Pollution degree: 2

### PureTec Stirrer

- **Compact magnetic stirrer, small yet powerful**. Stainless steel housing. Smooth continuous speed adjustment.
- **Stirrer Speed Range**: 0 to 900 RPM; LED light, on/off switch.
- **Maximum Stirring Volume**: about 500 ml
- **Overall Dimensions of Stirrer**: 3.4 in Wide x 3.4 in Deep x 2 in High
- **Dimensions of Stirrer with Vessel**: 3.4 in Wide x 3.4 in Deep x 9 in High
- **Mono-Mold Stir bar** with spinning ring: 5/8” long; Teflon (PTFE) coated.

### PureTec Vessel

- **Vessel:** Clear medical grade polysulfone with graduations every 25 ml, with polysulfone cap & base. **No threaded parts**. O-rings on outside of vessel and cap. Cap can be sealed. Can be sanitized with isopropyl alcohol, dilute bleach or dilute sodium hydroxide.
- **316 stainless steel channels and Luer adaptors in cap and base.** All wetted parts made of FDA approved materials. **No threaded parts**.
- **Three ports in cap:** air vent, exchange bugger, alternate retentate return.
- **Two ports in base:** retentate return and feed outlet.
- **Vessel Volume:** 500 ml volume, using a dedicated inlet port, additional process solution can be siphoned into PureTec vessel. 50 ml and 1000 ml versions are available.

### PureTec Balance

- Balance with capacity of 8100 grams x 0.1 g resolution included with all PureTec models.

# PureTec Software

**Main menu with four operational modes:**

- **Constant Rate Mode**: Constant Rate Filtration with eleven user-definable alarms.
- **Constant Pressure Mode**: Constant Pressure Filtration with eleven user-definable alarms.
- **Setup Mode**: Selection of user preferences and interface options.
- **Manual Mode**: Manual control, no alarms.

**Analog Interface**: SciCon for Conductivity & Temperature or other device with 4-20ma output can be directly connected for monitoring and 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 TFF Applications**: Concentration, Diafiltration, Ultrafiltration

# Documentation Software for PC

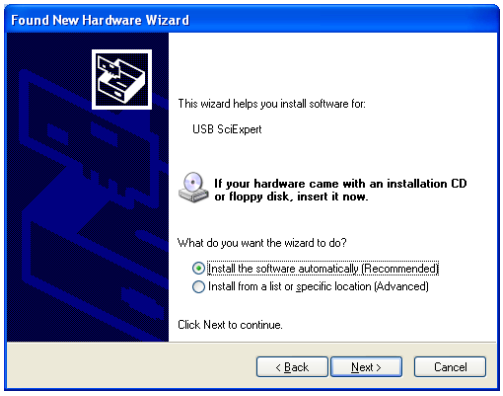
- Win Wedge PC interface software with custom macros for Excel for data compilation. Sent to you ready to use.
- Complete process analysis with graphing of data
- Real-time verification and documentation of process parameters
- Includes graphs of:
  Permeate Flow Rate (FP) vs. Trans-Membrane Pressure (TMP)
  Permeate Flow Rate (FP) vs. Time
  Permeate Flow Rate (FP) vs. Ln {Retentate Flow Rate (FR)}
  Permeate Flow Rate (FP) vs. Ln {Concentration Factor (CF)}
  Permeate Flux (LMH) vs. Trans-Membrane Pressure (TMP)

# Display, Print out and Excel Abbreviations:

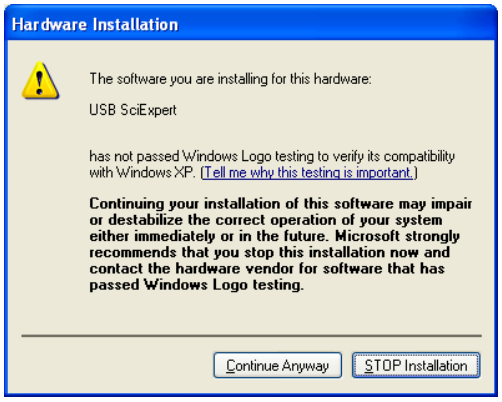
**MT** = Military Time, HH:MM:SS
**RT** = Run Time, 00:00:00 at START
**FQ** = Filtrate Weight collected
**P1** = Feed Line Pressure, psi, bar or kpa
**P2** = Retentate Line Pressure, psi, bar or kpa
**P3** = Permeate Line Pressure, psi, bar or kpa
**TM** = Calculated Trans-Membrane Pressure
**AL** = Alarm, e.g. AL: CV Cumulative Volume Alarm
**HP** = 3, High Pressure Alarm is “PUMP STOP”
**LP** = 1, Low Pressure Alarm is “OFF”
**FQ** = 3, Filtrate Weight Alarm is “PUMP STOP”
**CF** = Concentration Factor, if concentrating a solution, be sure to enter the Initial Process Volume where indicated.
**NWP** = Normalized Water Permeability @ 20 degrees C
**A1** = Analog 1 Value
**A3** = Analog 3 Value
**FF** = Flow Rate, Feed, ml/min
**CV** = Cumulative Feed Volume, ml
**FP** = Flow Rate, Permeate (“Flux”), gr/min
**FR** = Re-circulation Rate; FR = FF - FP
**CW** = Clockwise Pump Direction
**CCW** = Counter Clockwise Pump Direction
**ST** = Pump Status, START, RUN, PAUSE, EXIT
**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
**T** = Temperature, degrees C
**Flux** = Liters per square Meter per Hour (LMH)
**A2** = Analog 2 Value

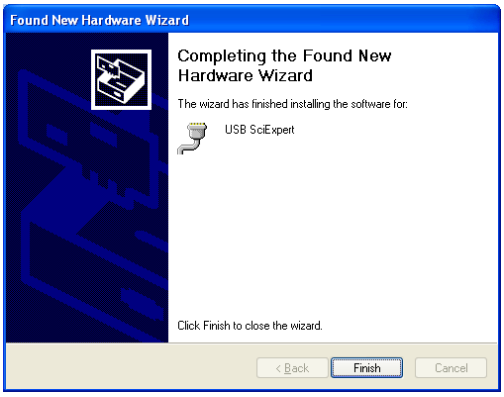
# Installation of the USB Driver:

Upon connecting the PureTec to the PC via a USB cable, the following “New Hardware Wizard” window appears. Select ‘No, not at this time” and click “Next”.  The second screen appears:


Insert the CD containing the PureTec Operating Manual into the PC, choose “Install the software automatically” and click “Next”.  The following screen appears:



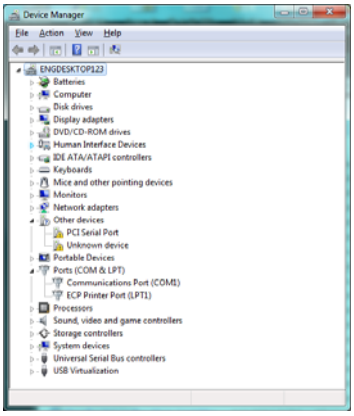



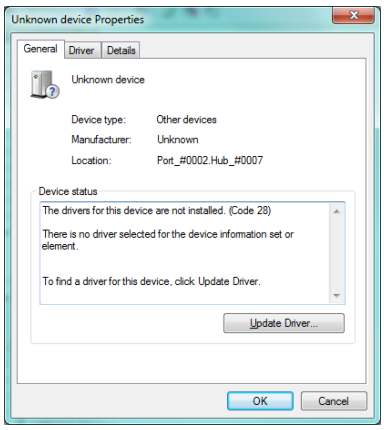

Choose “Continue Anyway”, and the driver will finish loading, allowing you to communicate to the FilterTec Plus via the assigned Com Port.


By opening Windows Device Manager and clicking on the + for Ports, you can determine the

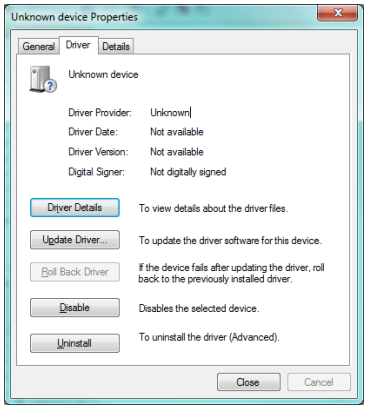
Com Port assigned to the PureTec. It will be listed as “USB SciExpert”. (COM8 as shown)Windows 7 users will often not have the “New Hardware Wizard” run properly, and the driver will not be installed. When this occurs:

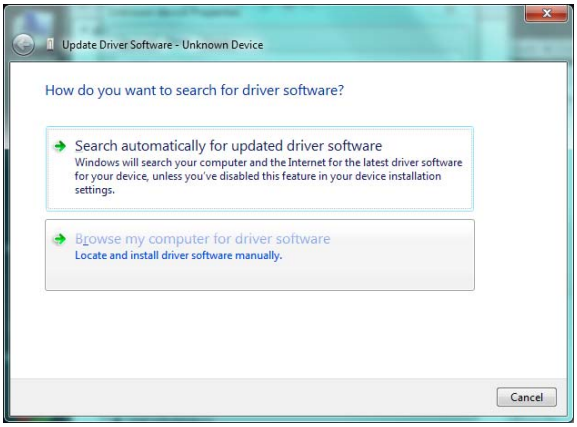
1. Open Device Manager and look under Other Devices for “Unknown Device” or similar and double-click on that device.



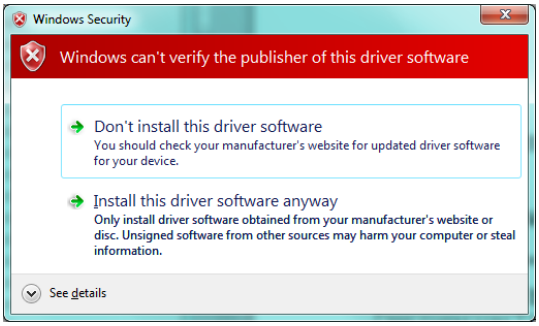



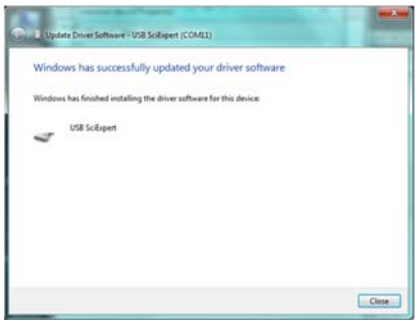

2. Click on “Update Driver” on that screen or on the Driver Tab. Click on “Browse my computer” on the next screen and browse to the CD drive that contains the ChemTec Manual and click on OK.




3. As mentioned earlier you will get a security warning about windows verification for the driver. Click on Install anyway and the installation will finish properly.



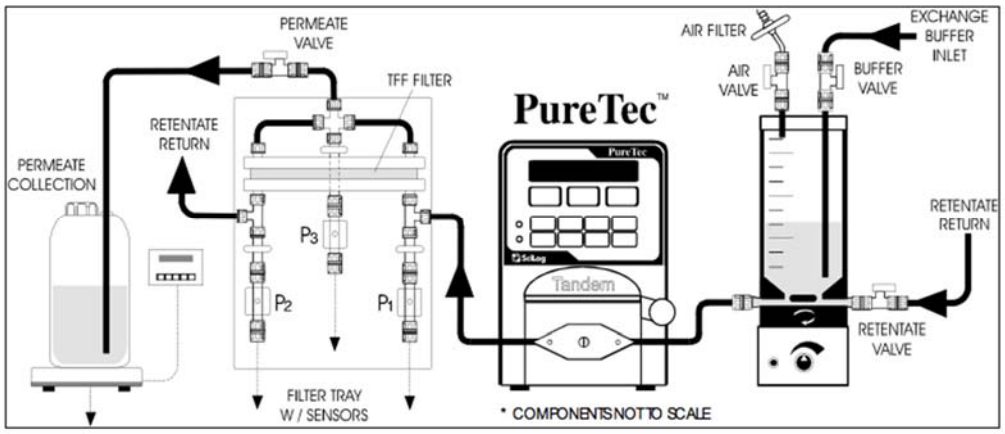

4. Please review Device Manager at completion of this process to confirm the COM port assigned to the ChemTec, now listed under Ports as “USB SciExpert”.

# Quick Start: “Diafiltration at a Constant Flow Rate with Pressure Monitoring and Control”

**Equipment:** You will need the following items to get started:

| SciLog P/N | Description | Quantity |
|---|---|---|
| 200-718PURE | PureTec CP-120 w/1081 Peristaltic Head, 160 rpm motor, 500 ml Diafiltration Vessel w/ Stirrer, Balance, Tubing and Connector Kit. (Includes #16 Pharmed tubing, #16 Tygon tubing, Luer fittings, etc.) SciDoc Data Collection Software. Both Balance and RS232 Cables. Filter Manifold / Organizer. 3 SciPres Disposable Pressure Sensors. | 1 pc |
| | Appropriate TFF Cartridge (Pellicon XL, Minmate, etc) | 1 pc |
| | Appropriate Exchange Buffer, Permeate Reservoirs | 1 ea |
| | Filter Manifold/Organizer (Optional) | 1 pc |

**Figure 1**




The following chart shows tubing dimensions and the available flow rates based on tubing size, and motor speed:

| 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 | 8 RPM | 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 | 160 RPM | 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 | 600 RPM | 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** | | |

## Hardware Setup:

1. Unpack all the components, visually identify and inspect for damage. Refer to Figure 1 above for assembly steps listed below. The drawing is not to scale, and may seem reversed.
2. Place the Diafiltration Vessel on the Stirrer, rotating it until it is seated firmly. Remove the small Luer caps from the SS ports. Do not attempt to remove the SS ports, or to

separate the vessel tube from its base. They are sealed with epoxy for your benefit.
Plug the Stirrer in using the provided power supply.

3. At the Diafiltration bench, place the Exchange Buffer reservoir to the far left. Then, moving to the right, place the Diafiltration Vessel and PureTec, then the Filter Manifold with the TFF cartridge, and finally the Filtrate reservoir on top of the Balance. Leave some space between these items so you can hook up cables and tubing. The Filter Manifold may be placed on top of the PureTec if bench space is at a premium, and to minimize hold-up volume.
4. Connect the interface cable between the PureTec and the balance paying close attention to the labels on the cable and those on the rear of the PureTec. The “Pump” end of the cable is connected to the “S1” connector on the rear panel of the PureTec. The “Balance” end of the cable plugs into the output connector on the rear of the balance.
5. Connect the RS232 Cable (P/N 080-073) to the “Printer” connector on the rear panel of the PureTec. Plug the other end of the cable into Com1 or any other available Com port on the rear of your PC. Alternatively, a USB cable may be used, the driver for which is included on the CD with this manual.
6. Plug in and power-up all the equipment.
7. Using the parts from the Fittings Kit, connect one of the Valves (P/N 060-005) to each of the lower (Feed and Retentate Return) ports of the Diafiltration Vessel. Connect valves to 2 or 3 of the ports on the top of the vessel. One of these will be an Air Vent, another the Exchange Buffer port and the third can be used as an alternate Retentate Return port. If not used, cap this third port with one of the caps removed from the vessel earlier. Install one of the included PTFE Syringe Filters (P/N 060-007) into the Air Vent Valve. **Close all valves at this time!**
8. Place the filter cartridge into the Filter Manifold along with three of the SciPres Disposable Pressure Sensors. Using the appropriate barbed fittings from the Fittings Kit, connect the Feed port of the cartridge to the SciPres Sensor near the end of the Manifold. This will be P1. Connect a Retentate port to the SciPres on the left of the Manifold (P2) and the Permeate port to the Sensor on the right side of the Manifold (P3). Cap the remaining port. The included #16 Tygon tubing may be used for these connections.
9. Cut four pieces of the Pharmed tubing to complete the plumbing with the PureTec. It is strongly recommended to secure the barbed connectors used with all tubing with Nylon Cable Ties (P/N 010-002) included in the Fittings Kit. Keep the tubing that is part of the recirculation loop as short as possible to minimize hold-up volume. The first two pieces will need male Luer connectors on both ends. One piece connects to the Diafiltration Vessel using the port nearest the pump head. Open the pump head by rotating the lever 180 degrees counter clockwise, and route the tubing over the upper set of rollers. Confirm that the tubing is under the centering springs and close the head by rotating the lever back to its original position. Connect the other end of this tubing to P1 on the inlet port of the filter cartridge. The other piece of tubing with Luer fittings on both ends will connect between P2 on the Retentate port of filter cartridge and the remaining port on the bottom of the Diafiltration Vessel. (Alternatively, this could be connected to one of the ports on the cover of the Vessel.) The remaining pieces of tubing needed to complete the plumbing need a male Luer fitting on only one end of the tubing. (These connections may be made with the included Food Grade Tygon tubing included in the kit if desired.) One piece is connected to the Exchange Buffer Valve on the cover of the Diafiltration Vessel and routed to its reservoir. The final piece connects to P3 on the Permeate port of the filter cartridge and routed to the Permeate collection reservoir on the Balance.

**NOTE:** There are several valves involved in this process. Their position and status is critical to the proper implementation of the system.

## Program Editing and Execution:

First consider the parameters of the Diafiltration process to be implemented, and the programming of PureTec and its alarms. Before programming the system, know the maximum pressure rating of the filter cartridge; the flow rate or pressure level and source that it is desired to maintain or monitor, and the amount of filtrate to collect if using the Filtrate Weight Alarm as the end point control. The PureTec operates under two modes, either Rate mode, where it pumps at a constant user-defined flow rate, and monitors the pressures, or Pressure mode, where the flow rate is varied to maintain a constant user-defined pressure. (It should be noted that the Source chosen in **SETUP: Press. Sensor** is used for the Pressure Alarms in both modes as well as the controlled Pump Pressure in Pressure Mode.)

The PureTec displays and documents the Filtrate Weight (FQ), the Cumulative Volume (CV) of media re-circulated thru the pump, the Filtrate Collection Rate (FP), and inputs from all three SciPres pressure sensors, as well as the calculated Trans-Membrane pressure (TM) in the system. Five different alarms can be activated, Filtrate Weight, Run Time, Hi-Pressure (or Low-Flow), Low-Pressure and Cumulative Volume. All the alarms may be set to "**Off**" (disabled), "**Alarm Only**" (an audible alarm), and "**Pump Stop**" (stops the pump and sounds the audible alarm).

## RATE Mode, Constant Rate Filtration: Edit/Alarm:

Press the "**EXIT**" button several times to reach the top of the menu. This display is seen:

| **Mode Select** | | **RATE** |
|---|---|---|
| **Up** | **Down** | **Select** |
| **A** | **B** | **C** |

Press "**C**" to Select. This screen now appears:

| **- Const. RATE MODE -** | | |
|---|---|---|
| **Exec** | **Edit** | **Prime** |
| A | B | C |

Pressing "**B**" for Edit gives you access to the following parameters:

**PUMP TUBING:** Use the "**A**" and "**B**" keys to scroll through the size choices of #13,14,16, 25, 17, 18, 15, 24 or 35 tubing, and press "**C**" to Select. Size #16 is the Default. (Note, #15, 24 and 35 tubing are thick-walled and require the Tandem 1082 head.) The PureTec will access factory installed calibration curves, which relate pump speed to output in ml/min. This calibration may be updated by using the Re-Cal feature, accessed via the star (✶) key on the front panel. Refer to the Re-Cal section of this Manual for instructions in its use.

**CLEAR CUMULATIVE:** Resets (clears) the counters for Cumulative Volume (CV), Filtrate Weight (FQ), and Run Time (RT). Press "C" to select, then the "**A**" button to indicate "**Yes**" to the question: "**Clear Totals**?"

**PRESSURE ZERO:** Allows you to Zero all three SciPres Disposable Pressure sensors, P1, P2 and P3. Release all pressure in the system, press "C" to select, then choose the appropriate sensor, and press "Zero" and then "Exit". Exit takes you up two levels in this menu. (Span is used for Factory Calibration only.)

**ALARM ENABLE:** Allows you to select the alarm options for several different alarms as listed below. The options are "**Off**" (disabled), "**Alarm Only**" (an audible alarm), and "**Pump Stop**" (stops the pump and sounds the audible alarm).

**ALARM LIMITS:** Allows you to set the limits for the following alarms:

- **CUMULATIVE VOLUME:** Total amount of solution that has been pumped through the filtration device in milliliters. This allows you to define your yield in terms of the amount circulated through the system.
- **FILTRATE WEIGHT:** Enter the amount of filtrate to collect in grams. The PureTec will stop or alarm when the desired weight has been collected. You need an electronic top-loading balance connected to the PureTec in order to implement this alarm. Set to 0.0 or beyond the capacity of the scale to keep it from alarming. MUST be set to Alarm Only or Pump Stop to communicate with the scale.
- **HI-PRESSURE:** For most applications, this represents a critical alarm, and under ALARM: ENABLE should be set to "PUMP STOP". This value is usually set 5-7 Psi below the pressure limit specified by the filter manufacturer.
- **LOW-PRESSURE:** This is typically set 3-5 Psi below the Hi-Pressure setting. This alarm is triggered when a sudden drop in backpressure occurs, i.e. when a leak in the system has occurred.
- **RUN TIME:** Allows you to set a timer for the process. The alarm will trigger when the entered total time is achieved.
- **HI and LO ANALOG 1, 2 or 3:** The PureTec has the ability to interface with up to three 4-20 mA analog inputs. The upper/lower range and upper/lower limits can be set to alarm based upon these inputs.

**PUMP RATE:** Select a pump rate in terms of ml/min. However, be sure to choose the correct pump tube size first. Try to choose a tubing size that places the pump rate in the middle of the flow rate range for the motor/tubing combination. Please refer to the chart at the beginning of this document, or the one on the side of the PureTec for more information.

### Priming the system:

a. The first step in the Diafiltration process is to Prime the system and check for leaks. Fill the Vessel with Exchange Buffer. Note: It is important that the inlet tubing be submerged at all times if using the alternate Retentate Return on the top of the vessel.
b. Fill the Buffer Reservoir with fluid and connect the Buffer feed line to the Buffer Valve if not already connected. Close the Buffer and Air Vent Valves.
c. Place the Filtrate line in the Filtrate Reservoir and put it on the balance if you are using one. Close the Filtrate Valve. Open both the Feed and Retentate Return valves at this time.
d. Select RATE Mode in the PureTec and set the appropriate parameters and alarms as mentioned above.
e. Pressing the "**EXIT**" on the PureTec will return to the Constant Rate Mode screen shown below:

| **- Const. RATE MODE -** | | |
|---|---|---|
| **Exec** | **Edit** | **Prime** |
| **A** | **B** | **C** |

f. Press "**A**" to Execute, and the following screens will be displayed:

| |
|---|
| **-SCALE INITIALIZATION-** |
| **Please Wait** |

| |
|---|
| **SET: T15 FF: 100** |
| **Press Run when Ready** |

g. Press "RUN" on the front panel of the PureTec allowing the Exchange Buffer to be recirculated through the system removing any air bubbles. The balance will tare, and the

following screen will be displayed: (NOTE: P1 in this example has been chosen as the Pressure Source, under **SETUP: Press Sensor, Source**). Check for leaks in the system, and note the volume of solution in the Diafiltration Vessel. The following screen is displayed:

| | | |
|---|---|---|
| **09:27:03 P1 10.0 RUN** | | |
| **CV 265.5 FF 100.0** | | |
| **A** | **B** | **C** |

Pressing the “SWITCH” key on the front panel will allow you to change to the following two additional screens:

| | | |
|---|---|---|
| **P1 10.0 P2 10.0** | | |
| **P2 10.0 TM 10.0** | | |
| **A** | **B** | **C** |

| | | |
|---|---|---|
| **T 24.3 FP 20.0** | | |
| **FQ 100.0 FR 80.0** | | |
| **A** | **B** | **C** |

CV=Cumulative Volume (ml), 09:27:03=Military Time (hh:mm:ss), FF=Feed (Pump) Flow Rate, RUN=Pump Status, P1=Inlet Pressure (Psi), P2=Retentate Pressure (Psi), P3=Filtrate Pressure (Psi), TM=Trans-Membrane pressure (Psi), T=Temperature (degrees Celsius), FQ=Filtrate Weight (grams), FP=Permeate Flow Rate, FR=Recirculation (Retentate) Flow Rate.

h. Open the Filtrate and Buffer Valves, be certain that the Air Vent valve is closed. The level in the Diafiltration vessel will drop slightly as a vacuum is created, and then remain constant as more buffer is added.

i. Adjust the flow rate as necessary by using the “RATE” key on the front panel of the PureTec.

## Processing Product:

a. **NOTE:** always close the Buffer and Filtrate valve before starting or stopping the PureTec. Fill the Diafiltration Vessel with the solution to be processed and close the container.

b. If needed, refill the Exchange Buffer Reservoir and empty the Filtrate Reservoir. Place the tubing back in both containers.

c. If required, edit the Pump Rate and other parameters entered during the priming process. Press “Execute” and then “RUN” from the front panel to start the pump. If the system was not previously primed, a decrease in volume in the Vessel will be observed. This volume will be recovered at the end of the process.

d. **To concentrate the product**, keep the Buffer Valve closed and open the Filtrate Valve and Air Vent Valve. This will reduce the volume in the Diafiltration Vessel as the Filtrate is removed, thus concentrating the solution. When the desired concentration volume has been achieved, close the Filtrate and Air Vent Valves.

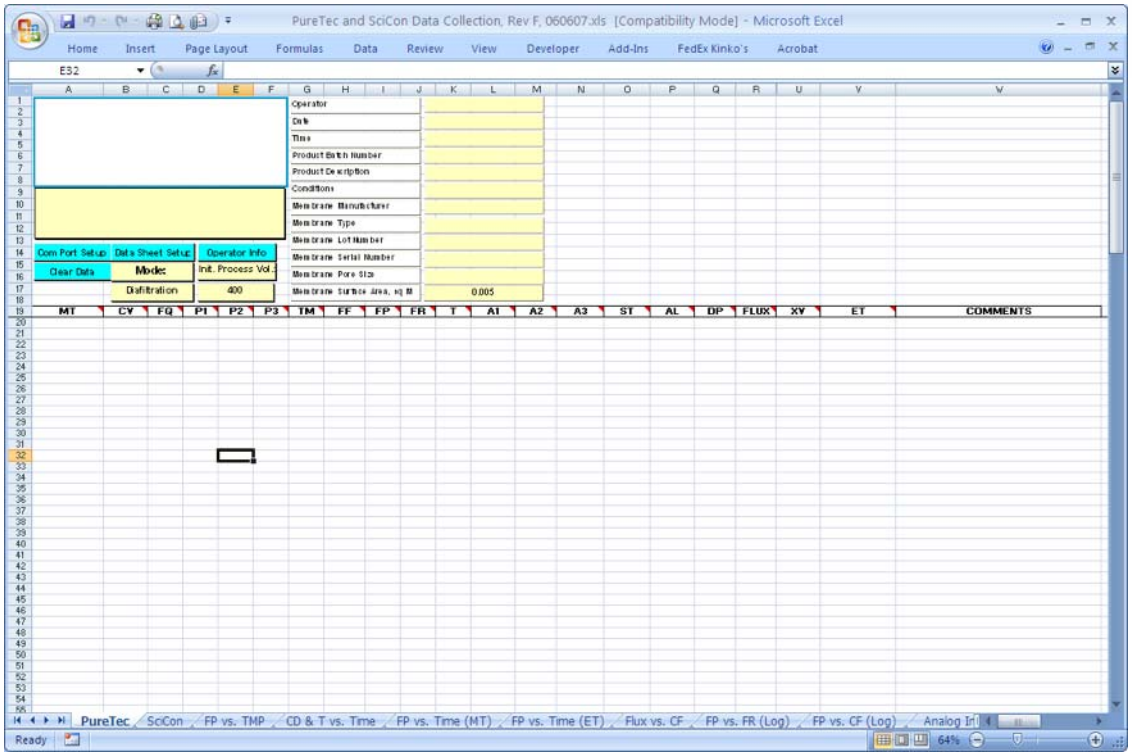
e. **To wash the concentrated solution,** open only the Filtrate and Buffer Valves. Once the solution is concentrated, the PureTec could be stopped, the Cumulative Counters cleared, and the Filtrate Weight alarm set to stop the pump when the desired amount of Exchange Buffer has been collected in the Filtrate Reservoir. The balance also allows you to monitor the Permeate Flow Rate (FP), which can be optimized by altering the pump rate on the fly from the front panel. Press the “RATE” key, increase or decrease the rate as needed, and press “C” to select it. The Exchange Buffer will be added at the same rate the Filtrate is removed by the vacuum created in the Diafiltration Vessel.

   If there is more solution to process than the Vessel would originally hold, more can be added by connecting the Exchange Buffer tubing to a container with additional process solution. When this container is empty, the pump could be stopped, the tubing reconnected to the Exchange Buffer, and the solution either concentrated further or washed.

f. **To empty the Diafiltration Vessel at the end of the run,** close the Buffer and Filtrate valves, and Stop the pump. Close the Valve on the Retentate return line at the bottom of the Vessel. Have a container ready for the transfer. Disconnect the return line at the valve, and carefully place it in the container. Open the Air Vent valve, and press RUN on the pump, this will pump the contents of the Diafiltration Vessel out through the pump and filter cartridge and into the transfer container. Re-connect the tubing, open the Retentate valve again, and your system is ready for cleaning.

### Documentation:

The PureTec displays and prints out several filtration-related parameters. The user can scroll though three display options providing an instantaneous overview of the filtration progress and status. All information is printed out in an “Excel-friendly” format. Alternatively, our SciDoc Software, which uses WinWedge software in conjunction with a customized Excel spreadsheet, can be used to summarize the filtration data and create graphical representations of the data on your PC as shown below:




**Abbreviations:**

MT = Military Time, HH:MM:SS
RT = Run Time, 00:00:00 at START
FQ = Collected Filtrate /Permeate Weight
P1 = Feed Line Pressure, psi
P2 = Retentate Line Pressure, psi
P3 = Permeate Line Pressure, psi
TM = Calculated Trans-Membrane Pressure
AL = Alarm, e.g. AL: CV Cumul. Volume Alarm
HP = 3, High Pressure Alarm is “PUMP STOP”
LP = 1, Low Pressure Alarm is “OFF”
T = Temperature, degrees C.
FLUX = Liters/square Meter/Hour (LMH)
A1 = Analog Signal 1
A3 = Analog Signal 3

FF = Feed (Pump) Rate
CV = Cumulative Feed Volume, ml
FP = Permeate Flow Rate (“Flux”), gr/min
FR = Re-circulation Rate; FR = FF - FP
CW = Clockwise Pump Direction
CCW =Counter Clockwise Pump Direction
ST = Pump Status, START, RUN, PAUSE, EXIT
CV = 1, Cumulative Volume Alarm is “OFF”
RT = 2, Run Time Alarm is “ALERT ONLY”
LF = 2, Low Flow Alarm is “ALERT ONLY”
NWP = Normalized Water Permeability @ 20 C
CF = Concentration Factor, FQ/Initial Volume
A2 = Analog Signal 2
DP = Differential Pressure, P1-P2

**NOTE:** Three alarm levels are defined and displayed in the program header of the printout as follows: **1=Off** (Deactivated); **2=Alert** (Metering continues, auditory beep/5V output to remote alarm occurs); **3=Stop pump** (Stops the pump, auditory beep/5V output to remote alarm occurs). Immediate data printout occurs when **RUN, STOP** or **EXIT** keys are pressed, and when an alarm occurs. All other printouts occur at a user definable frequency in hours:minutes. (Mode:Setup, Printer, Time)

# Part A: PureTec™ Hardware:

## 1.0 Overview:

**The PureTec is a TFF laboratory-scale ultra filtration system** that enables you to purify and desalt protein solutions, concentrate antibodies, enzymes, lymphokines and other protein solutions, as well as, cell harvesting or cell removal, the washing of cells and viruses, and the depyrogenation of small molecule solutions. In a typical concentration application the PureTec automates and optimizes TFF to separate filtrate and concentrate retentate. This optimization makes the TFF application more efficient and increases product yield.

The PureTec is designed to process minimal volumes of material and includes a **500 ml Retentate reservoir incorporating a magnetic stirrer** to ensure product mixing during concentration or diafiltration. Up to four pressures can be monitored with **SciPres™ disposable Pressure Sensors**. 3 pressures are measured: feed/inlet line, retentate and permeate/filtrate. The PureTec calculates and displays the trans-membrane pressure (TMP). Any one of the pressures can be chosen for Alarm and/or Control. In addition, a **SciTemp™ disposable Temperature Sensor** can monitor the product temperature, allowing for easy calculation of the **Normalized Water Permeability (NWP)** values. Finally, an electronic balance is connected to the PureTec for monitoring the quantitative collection of filtrate and its collection rate.

**The PureTec can be connected directly to the SciCon Conductivity Monitor to monitor and alarm based on Conductivity or Temperature.**

**The PureTec system provides ease of use and operational safety:** Several user definable alarm conditions can be continuously monitored and displayed.

The user programmable alarms include:

- **High Pressure (Low Flow) Alarm** to monitor filter plug-up conditions,
- **Low Pressure Alarm** to monitor system leakage,
- **Cumulative Volume Alarm** to monitor total circulated volume based on the feed rate.
- **Filtrate Weight Alarm** to quantitatively measure the filtrate / permeate yield,
- **Run Time Alarm** that stops the pump action when a user defined filtration time has elapsed.
- **High Temperature** to monitor the temperature of your process.
- **Hi and Low Analog Alarms** for all three Analog signals to monitor the inputs from external devices: pH, Conductivity, Turbidity detectors.

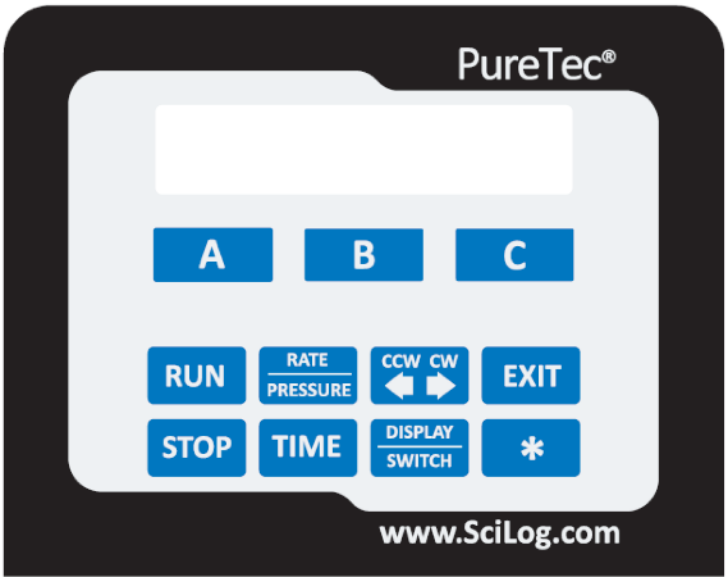
All alarms provide an auditory signal; the pump stops when user defined alarm limits are exceeded. Alternatively, any alarm can be selectively disabled. All pump filtration, as well as alarm parameters can be printed out at user defined time intervals with a SciLog serial printer. Alternatively, all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

The two-channel **TANDEM™ 1081 peristaltic pump head** can accommodate PharMed and Platinum-cured Silicone pump tubing, sizes **13, 14, 16, 25, 17 & 18**. If equipped with the **TANDEM™ 1082** model, sizes **15, 24 & 35** can be accommodated. All pump tube sizes are factory calibrated, however, the user can easily recalibrate any tube size with a single keystroke from the PureTec front panel in Constant Rate mode.

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 with appropriate Y-type connectors.

**NOTE:** The PureTec usually is configured with a 160-rpm motor. However, if your flow rate needs require, the PureTec 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 PureTec will select the appropriate factory installed calibration curves and flow rates for the selected tubing size.

# 2.0 Front Panel: Data Entry & Display:



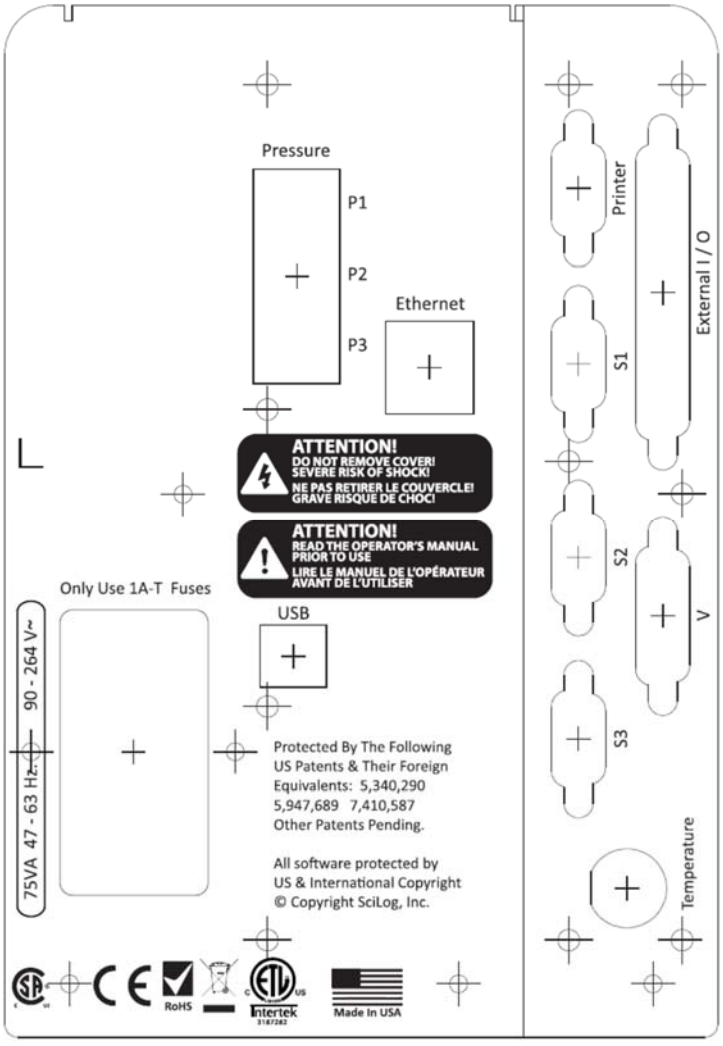

The front panel consists of a user interface, which includes an alphanumeric display and a membrane keypad to select operational modes and alarm settings. The display is a two line, 20 character each, liquid crystal display (LCD). The display is backlit to allow easy viewing over a wide range of lighting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

| | |
|---|---|
| RUN | Executes the selected operational mode and starts pump. |
| STOP | Interrupts current operational mode and stops pump. |
| RATE PRESSURE | Sets pump RATE in ml/min, or PRESSURE in psi, depending on Mode being implemented. Allows “on the fly” changes in Rate or Pressure Modes. |
| TIME | Not used in the PureTec. |
| CCW CW | Sets motor direction, counter clockwise or clockwise. |
| DISPLAY SWITCH | Changes between alternate displays in all modes. |
| EXIT | Exits current operational mode or menu level, stops pump. |
| * | Used for flow rate re-calibration. |

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 PureTec back panel provides interfacing ports for:**

- SciLog Printer (P/N: 080-095) or PC RS-232 connection: Female DB9, labeled “Printer”.
- (S2 and S3 are not utilized in the PureTec.)
- Foot Switch (P/N: 080-059) or SciCon Monitor: Male DB37, Labeled “External I/O”.
- SciPres Disposable Pressure Sensors: 3 RJ11 telephone jacks, one for each pressure sensor. Labeled “P1, P2, P3”.
- SciTemp Disposable Temperature Sensor: Conxall 2 pin connector. Labeled “Temperature”.

**3.1** **PRINTER PORT:** The PureTec can be connected to a PC for data collection or to a SciLog Printer via the female DB9 RS-232 port labeled “Printer”**.** You need a SciLog RS-232 cable (P/N 080-073) to connect to a PC for data archival. Alternatively, a USB cable (090-158) may be used. A printer cable (080-096) is required to make the connection between the SciLog serial printer and the PureTec. As both are available, one may gather data in both methods simultaneously.

**3.2** **SCALE PORTS:** The male DB9 ports labeled “S1”, “S2” and “S3” are RS-232 ports for electronic scales. For the PureTec, only S1 is used. (Please do not remove the covers on the unused ports.) This port allows you to interface with a number of different electronic scales: i.e. Mettler, Ohaus, and Sartorius top-loading scales. The following scale cables are required:

- **Mettler:** PGS, PM, Viper Models: P/N: 080-067PGS
- **Ohaus:** GT, “Precision Advanced” & “Explorer” & “Voyager” Models: P/N: 080-066
- **Ohaus:** IP Series High Capacity: P/N: 080-067
- **Ohaus:** Adventurer Pro Series: P/N: 080-067PGS
- **Sartorius:** Most Series Balances : P/N: 080-068

In the PureTec **Setup: Scale** mode, select the scale manufacturer; the PureTec will automatically implement the correct communications parameters. **Check that the proper communications parameters are also implemented in the scale being used.**

**3.3** **PRESSURE SENSOR PORTS:** RJ11 Telephone jacks for the SciPres disposable Pressure Sensors, labeled “P1”, “P2”, and “P3”. The disposable pressure sensors plug into these jacks using the included cables.

**3.4** **TEMPERATURE PROBE PORT:** The SciTemp disposable Temperature Senor connects to this port with a twist-lock connector cable. Temperature is measured in degrees Celsius.

**3.5** **VALVE V PORT:** Not used in conjunction with the PureTec.

**3.6** **USB PORT:** Used for connection to a PC, providing a Com Port. Can be used for data collection as an alternative to the Printer port. The driver is included on the CD that contains this manual.

**3.7** **ETHERNET PORT:** Used for connection to the PureTec via a LAN. IP Address, Subnet Mask, and Gateway are configured in the Setup menu. The communication protocol is Modbus TCP/IP, and a list of registers is in the appendix of this manual. (When available.)

**3.8** **External I/O Connector:** DB37 connector used to interface with various devices, allowing up to three 4-20 ma Analog inputs (A1, A2 & A3) for recording data or alarming based upon that data. It also allows an interface with SciLog foot switch (P/N: 080-059) and allows remote Start / Stop control of the PureTec**.**

For pin configuration, consult the drawing on this page. The DB37 port at the back panel provides three analog input channels:

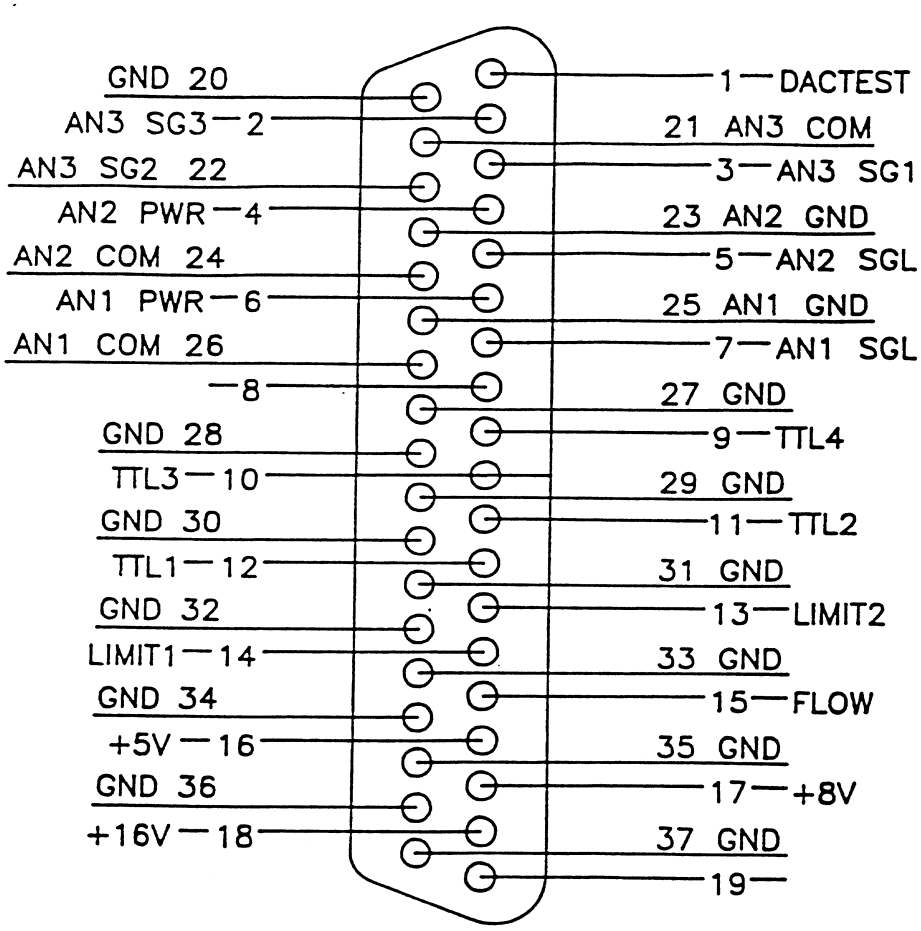
**Analog channel 1** (pin 7 signal, pin 25 ground**)**

**Analog channel 2** (pin 5 signal, pin 23 ground)

**Analog channel 3** (pin 2 signal SG3, pin 21 common)

When a Footswitch or External Run / Stop Cable is desired, Pins 19 and 37 are used.

**Pin out of DB37 External I/O Connector on Rear Panel:**



# 4.0 500 ml Diafiltration Sample Reservoir / Mixer.


This graduated reservoir resides on a magnetic stirrer with its own power supply and a magnetic stir bar is included. It is constructed of FDA approved polysulfone and can be easily sanitized using alcohol, bleach or dilute sodium hydroxide. It has 5 female Luer ports, all of which may be used with 2-way valves.

On the lid is the Air Vent with its valve and filter, the Exchange Buffer Inlet port with a valve, as well as an alternate Retentate Return port. This lid is sealed to the reservoir with a pair of o-rings, and easily lifted off the top for filling and cleaning.

**NOTE: SEAL QUALITY IS IMPROVED BY WETTING THE O-RINGS WITH DISTILLED WATER IMMEDIATELY BEFORE USE**.

The alternate Retentate Return port is used in high-flow (>500 ml/min.) diafiltration applications to ensure complete mixing of the retentate.

The bottom of the reservoir also has 2 ports. The Outlet port, nearest the pump head, is where the tubing that passes through the pump head to the inlet of the filter is attached. The Return port has a valve used when emptying the system, and is where the Retentate Return line from the filter cartridge is usually attached.

The position of the valves and the proper plumbing of the system are critical to its proper use.

**The vessel is also available in a 50 ml size, and a larger 1000 ml size that is twice the height of the standard one.**

## 5.0 Pressure Sensor Installation:

The SciPres disposable pressure sensors are connected in-line with the tubing and used in a flow through manner.  The SciPres sensors have polysulfone and silicone wetted surfaces that meet all USP Class VI requirements.

The SciPres Disposable pressure sensors are easy to change when the need arises, and are readily available from SciLog in packs of 5. They may be sanitized using several methods, CIP with NaOH or alcohol, autoclaved up to twice, or gamma irradiated. (Only those with grey rings around the connector are gamma stable.)

**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!**

# 6.0 TANDEM™ Dual Channel Pump Head:

The TANDEM peristaltic pump head is specifically designed for use with the PureTec 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 Platinum-Cured Silicone or PharMed pump tubing in the correct sizes.

The TANDEM pump head is driven by an 8, 160, or 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 PureTec 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:

**CHECK PUMP HEAD**
**Press Any Key**

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 PureTec 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.

## 6.1 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 tangential flow filter applications, the selected PureTec pump rate should not fall below the minimum feed rate for your system. First select the appropriate pump tubing size from the table above. The minimum feed rate of your system should fall into the midrange for the selected pump tube size. For example, if your Minimum Recirculation Flow rate is 60 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.

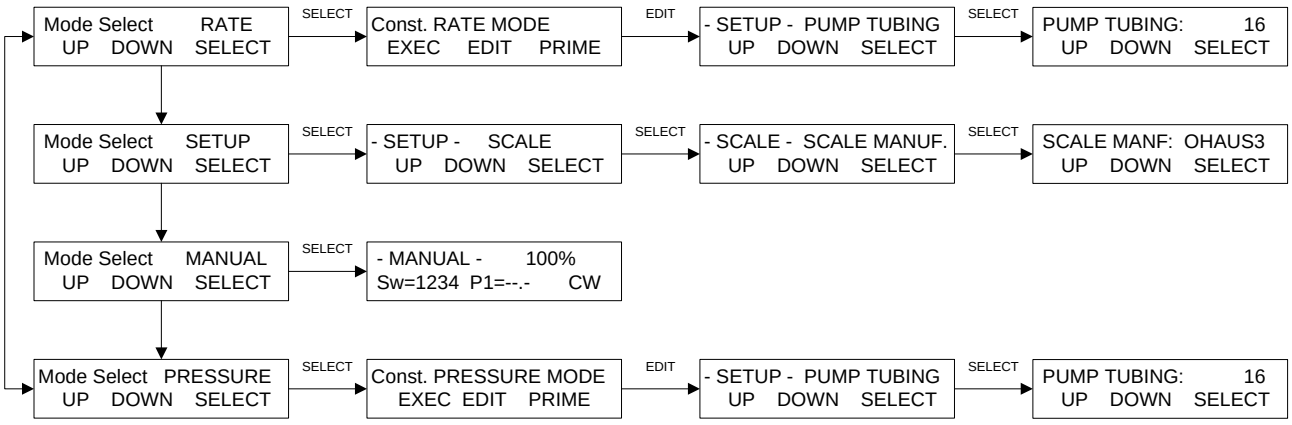
The PureTec software contains permanent, factory installed calibration tables for each of the nine (9) pump tube sizes listed above. The calibration table relates the pump motor RPM to the pump output in terms of ml / minute. However, the PureTec can be recalibrated by utilizing the front panel star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

**NOTE:** The PureTec usually is configured with a 160-rpm motor, and the built-in calibration curves for that motor. If your flow rate needs require, the PureTec 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 PureTec 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 PureTec pump output to change slightly. Thus for very high pump rate accuracy you may want to recalibrate the PureTec with your particular pump tubing in place. Recalibration of the PureTec is very easy and straightforward; please refer to the page on Re-calibration.

# Part B: PureTec™ Software

**1.0 MAIN MENU**



# 1.0 Software Overview:  Main Menu

The PureTec main menu consists of **four operational modes** as shown on the previous page. By using **"Up"** and **"Down"** keys one can readily scroll through the main menu. Press the **"Select"** key to enter a chosen operational mode, i.e. RATE. By pressing the "Select" key one also enters the 1st submenu level, which provides access to the **"Exec"**, **"Edit"**, and **"Prime"** functions. In the "Edit" sub mode, select the pump parameters for the process. In the "Exec" sub mode, the parameters chosen under "Edit" are executed.  The "Prime" sub mode runs the pump when the key is held down to 'prime' the system and remove the air bubbles when needed. Press the **"Exit"** key to stop the system and return to the main menu.

**RATE MODE:** This operation mode allows implementation of **Constant Pump Rate Filtration,** i.e. a user selected pump rate (filtration feed rate) is maintained during filtration. In the "Edit" sub mode first select the pump tubing to use. Based upon this **tube size selection,** the PureTec 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.

Several user-programmable **alarm parameters** can be selected: **Cumulative Volume** (Retentate)**; Run Time; Lo-Pressure** (Low Filter Back Pressure); **Hi-Pressure** (High Filter Back Pressure); **Filtrate** (or Permeate) **Weight,** and **High / Low Analog 1-3.**  Each alarm parameter can be: 1. Turned off, 2. Provide auditory alarm only, or 3. Stop the pump and provide an auditory alarm when alarm limits are exceeded. The PureTec simultaneously monitors and displays the inlet, retentate, and filtrate line pressures, as well as the calculated trans-membrane pressure, as provided by the three SciPres 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 sent to a PC for archiving. Print parameters are set in the **SETUP: Printer**

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

**PRESSURE MODE:** This operation mode allows implementation of **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 PureTec will maintain the selected filter backpressure by automatically decreasing the pump rate. The PureTec simultaneously monitors and displays the inlet, retentate, permeate line pressures, and the calculated trans-membrane pressure as provided by the three SciPres disposable pressure sensors. The process can be controlled by any one of the three line pressures or the trans-membrane pressure (TM) as selected by the user in the **SETUP: Pump, Press Sensor** sub mode.  (P1 and TMP are most useful)

The filter backpressure setting, **Pump Pressure**, is selected in the "Edit" sub mode. This setting allows choice of a safe backpressure that also is consistent with a desired filtrate/permeate flow rate.

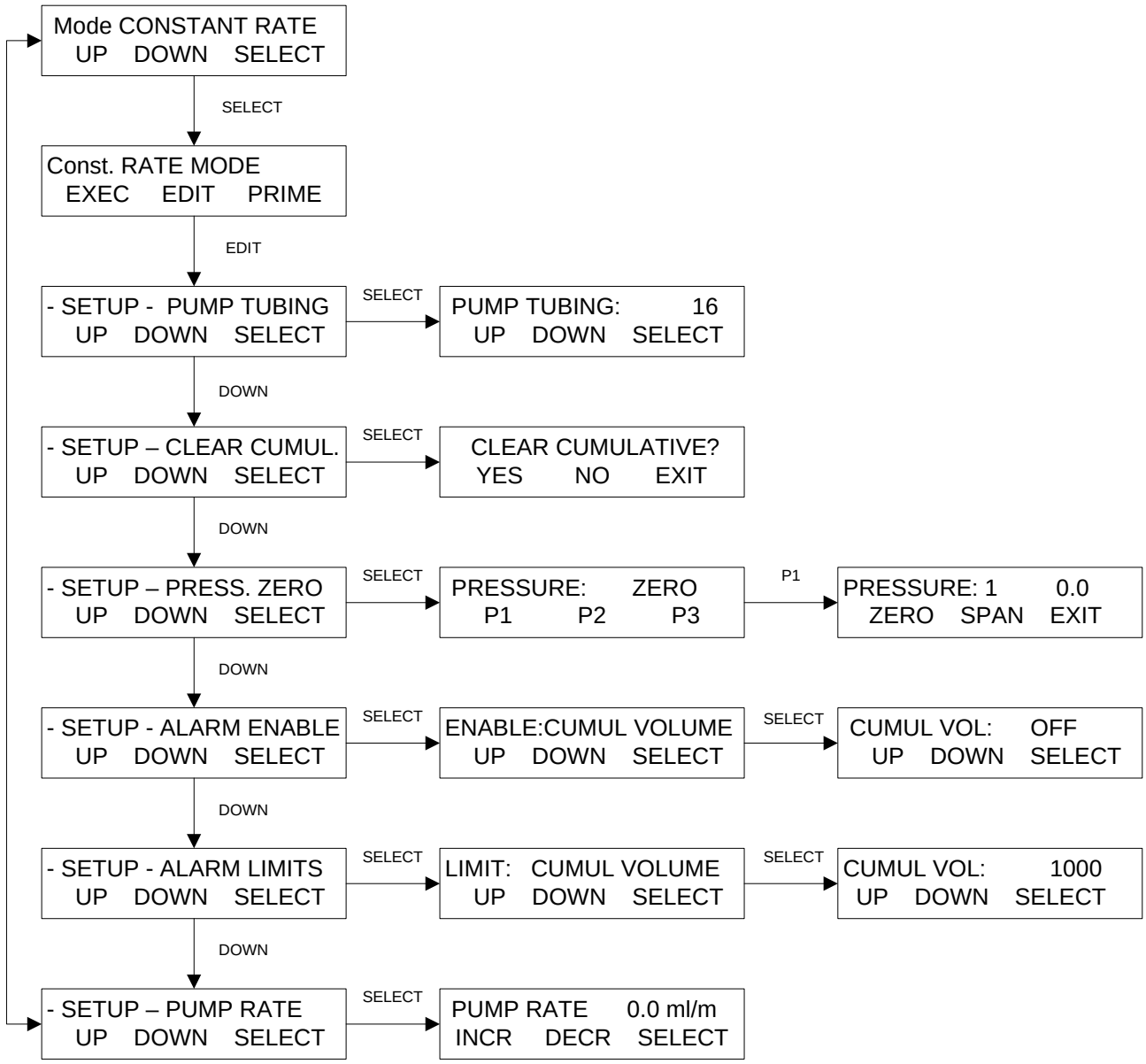
**NOTE: All Alarm and Print and Balance parameters are the same as discussed in RATE Mode, except that Hi-Pressure is replaced by Lo-Flow.**

**SETUP:** This operational mode allows selection of various user preferences and interface options. The **Setup: Scale** sub mode provides electronic balance options. Balances that can interface with the PureTec must have bi-directional serial communication, and NOT have internal calibration or be “delta-range” models that change readability on the fly. Many Mettler, Ohaus, AND, and Sartorius balances can be used. The **Setup: Clock** sub mode allows setting of the time and date used in the display. It also allows a choice between Relative Time and Time of Day for the PureTec printout. The **Setup: System Test** sub mode allows checkout of PureTec outputs and inputs and requires purchase of a special test fixture. **Setup: Test Mode** allows testing of these same inputs and outputs independently. **Setup: Printer** is used for setting up the printer communications parameters as well as print time interval and the print delay. **Setup: Analog** is used to set the upper and lower ranges for the analog inputs. These settings relate directly to their related alarms. **Setup: Temperature Offset** is used to offset the temperature measured by the available in-line probe. **Setup: Pressure Sensor** is used to zero the three pressure sensors, set the units (psi, bar, kpa), and choose the source for control and the main display, while **Setup: Pump** allows you to set various pump user preferences, most importantly the Motor RPM.

**MANUAL:** Allows manual control of pump speed and direction. RATE and PRESSURE Mode Alarms and printer parameters are not functional in the Manual mode.

## 2.0 CONSTANT RATE MODE

Constant Rate Filtration: Edit Menu



# 2.0 RATE Mode: Constant Rate Filtration

**SUMMARY:** This PureTec mode allows implementation of **constant rate filtration**, i.e. a user selected pump rate (**filtration feed rate**) is maintained throughout the filtration process. First select the **pump tube size** (#13, 14, 16, 25, 17, 18, 15, 24, or 35), and then select the **pump rate** in terms of ml/min. The optically encoded, servo controlled pump motor is capable of maintaining the selected pump rate over a wide range of filtration conditions. The PureTec flow rate can also be re-calibrated by the utilizing the front panel star (✶) key. (If the motor sub-assembly has been changed from the factory installed one, select the correct RPM of the 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.

**PUMP TUBING:** Select sizes #13, 14, 16, 25, 17, 18, 15, 24, or #35, using **"Up"** and **"Down"** keys for choice of pump tubing size, then press **"Select".** Based upon the **size selection,** the PureTec will access factory installed calibration tables, which relate the pump output in ml/min. to pump motor speed. PureTec pump output can also be re-calibrated by the utilizing the front panel star (✶) key.

**CLEAR CUMUL:** Resets (Clears) the following counters in the "Exec" front panel display: CV = Cumulative (Retentate) Volume; RT = Run Time; FQ = Filtrate Weight.

**PRESSURE ZERO:** Used to zero the filter backpressure reading for all 3 SciPres pressure sensors, P1, P2 and P3. The PureTec pump must not be running when zeroing the SciPres sensor.

**ALARM ENABLE:** Allows selection of alarm options for several different alarm conditions. Three options are available: 1. Disable the Alarm **(Off);** 2.Enable an auditory alarm **(Alarm Only);** or 3. Stop the pump and provide an auditory alarm **(Pump Stop).** The alarms are triggered when user defined alarm limits are exceeded.

**ALARM LIMITS:** Allows assignment of alarm limits for several different alarm conditions:

- **Cumulative Volume** (Retentate) in milliliters;
- **Hi Temp** in degrees C;
- **Hi / Lo Analog 1-3** for alarms based upon external 4-20 mA analog inputs;
- **Run Time** in Hours: Minutes;
- **Lo-Pressure** (monitor system leakage) in psi;
- **Hi-Pressure** (filter backpressure) in psi;
- **Filtrate Weight** (Permeate) in grams; (This alarm must be enabled in order to obtain and display the Filtrate Weight (FQ) and Permeate Flow Rate (FP) values.)

**Hi and Lo-Pressure alarms are related to the Pressure Source chosen in SETUP: Press. Sensor, Source.** The alarm condition is triggered when alarm limit is exceeded. Alarms are not mutually exclusive. You may select any combination of alarms.

**PUMP RATE:** Select pump rate in terms of **ml/min,** however first select pump tube size. Pump Rate may be changed "on the fly" by pressing the Rate / Pressure key on the front panel, making the change, and pressing 'Select".

## 2.1 Pump Re-calibration:

The PureTec software contains a permanent calibration table for each of the nine (9) tubing sizes: 13, 14, 16, 25, 17, 18, 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 / minute. However, the user can update the PureTec pump calibration very easily.

**NOTE:** The PureTec usually is configured with a 160-rpm motor, and the built-in calibration curves for that motor. If your flow rate needs require, the PureTec is also available with either a 600-rpm or 8-rpm motor. In order for the PureTec 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 PureTec will then implement the factory installed calibration curves for that particular motor. (This will have been done at the factory prior to testing and shipping, and should only need to be changed if a different motor subassembly is purchased and installed by the end user.)

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. 500ml/min. Press the **EXIT** key and then the **EXEC** key. PureTec will now show the following display:

| |
|---|
| **SET: T17 PR: 500ml/m** |
| **Press RUN when Ready** |

The system is now ready to recalibrate the #17 tubing. For calibration purposes, pump water into a container, e.g. 1000grams, placed onto a top-loading balance. 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:

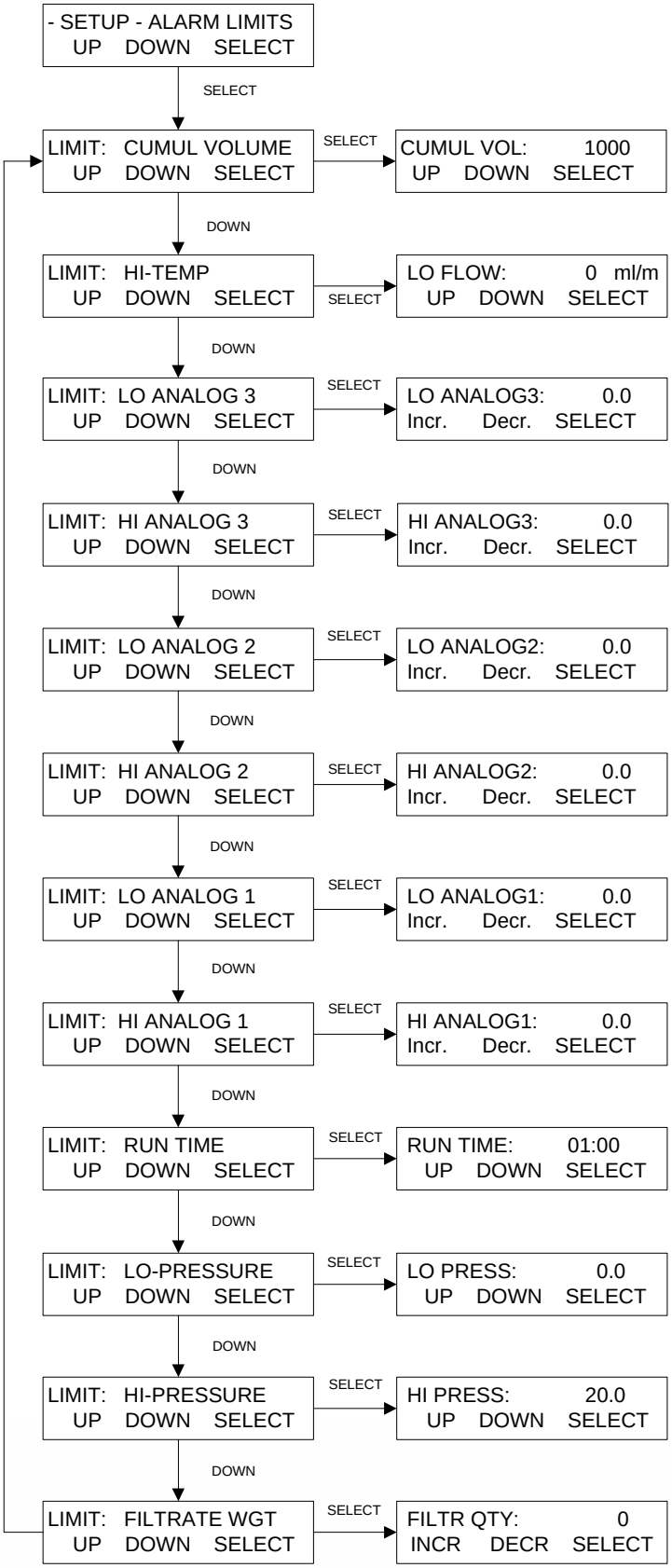
| | | |
|---|---|---|
| **DV:1000** | | **AV:1000** |
| **Incr.** | **Decr.** | **Select** |

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

**Important:** The selected calibration volume or weight should be 2-4 times the selected pump rate. For example, if your selected pump rate is 500 ml/min. the minimum calibration volume / weight should be between 1000 - 2000 mls or grams.

## 2.2 CONSTANT RATE MODE

Constant Rate Filtration: Alarm Limits Menu



# 2.2 RATE Mode:  Alarm Limits

**SUMMARY:** This section allows the assignment of limiting values for several alarm conditions: **Cumulative Volume (**based on feed rate) in milliliters; Hi-Temp (HT) in ºC; **Hi and Low Analog 1-3** for external 4-20 mA analog inputs; **Run Time** in Hours: Minutes; **Lo-Pressure** (monitor system leakage) in psi; **Hi-Pressure** (filter back pressure) in psi.; **Filtrate  Weight** (Permeate) in grams; **Note: The alarm condition is triggered when the alarm limit is exceeded.** Alarms are not mutually exclusive. Any combination of alarms may be selected. For critical alarms (i.e. Hi-Pressure Alarm) the PureTec should stop (**Pump Stop**), for less critical alarm conditions choose an auditory alarm (**Alarm Only**).  Each alarm may be disabled if not required.

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

**CUMULATIVE VOLUME** (CV):  This alarm setting represents the total volume of process solution (based on the feed rate) that is pumped through your filtration device. For example: if the **Cumulative Volume Alarm** is set to 10,000ml or 10 liters, the PureTec will either alarm and/or stop the pump when 10 liters of retentate has been pumped through the filtration device. This allows control of permeate yield in terms of the amount of retentate recirculated through the filtration system.

**HI AND LO ANALOG 1-3** (HA/LA): Hi and Lo limits for the three Analog Inputs can be configured within the ranges established in Setup: Analog.  Lo limits only trigger after first being exceeded.  This allows control of the process from an external detector.

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

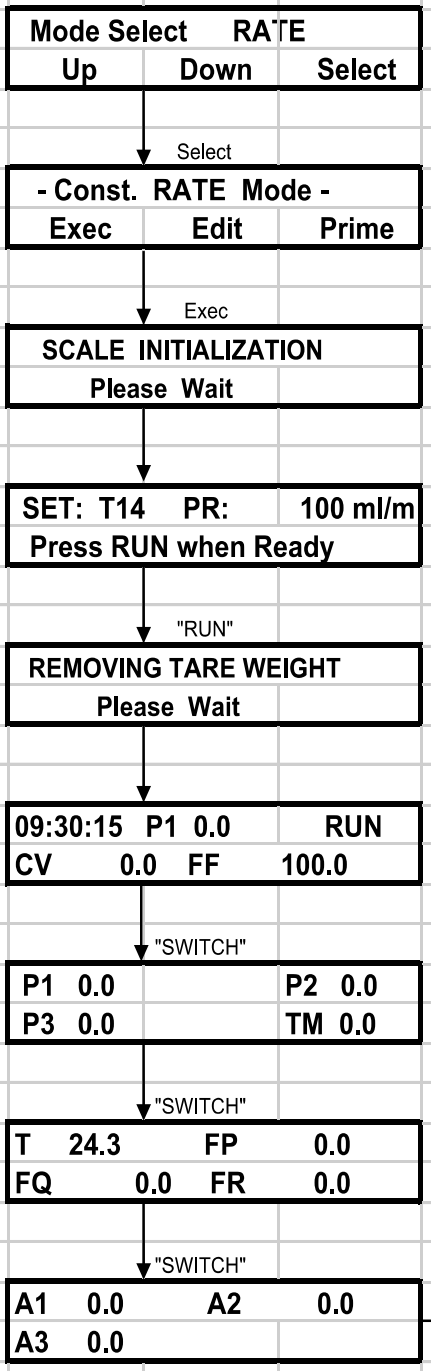
**LO-PRESSURE** (LP): Typically set 3-5 psi units below the Hi-Pressure setting. The Lo-Pressure Alarm is triggered when a sudden filter backpressure drop occurs after rising above this setting. Such a change in the filter backpressure usually indicates a system leak, i.e. pump tubing has slipped off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

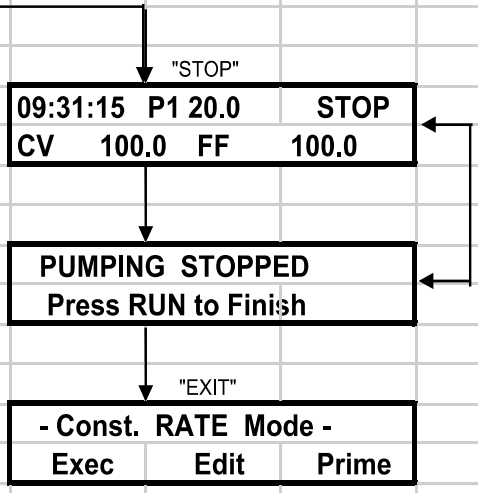
**HI-PRESSURE** (HP):  For most applications, this represents a critical alarm condition. If this is the case choose **Pump Stop**. Make sure to stay below the pressure limit specified by the filter manufacturer. For example, if the filtration device specifies an upper pressure limit of 25 psi, set the **Hi-Pressure Alarm** to 20 psi. The PureTec will alarm and stop the pump when the filter backpressure exceeds 20 psi.

**FILTRATE WGT** (FQ): The PureTec comes with a top-loading balance.  Enter the filtrate / permeate weight (grams) to collect, and the PureTec will either alarm or stop the pump when the desired filtrate / permeate weight has been collected.  Set this value to 0.0 or beyond the capacity of the scale to keep it from triggering during normal use.

**NOTE:** This alarm must be enabled in at least "alarm only" mode in order for the FQ (Filtrate Weight) and FP (Flow Rate, Permeate) to be obtained or displayed.

## 2.3 RATE Constant Rate Filtration; Execute Display



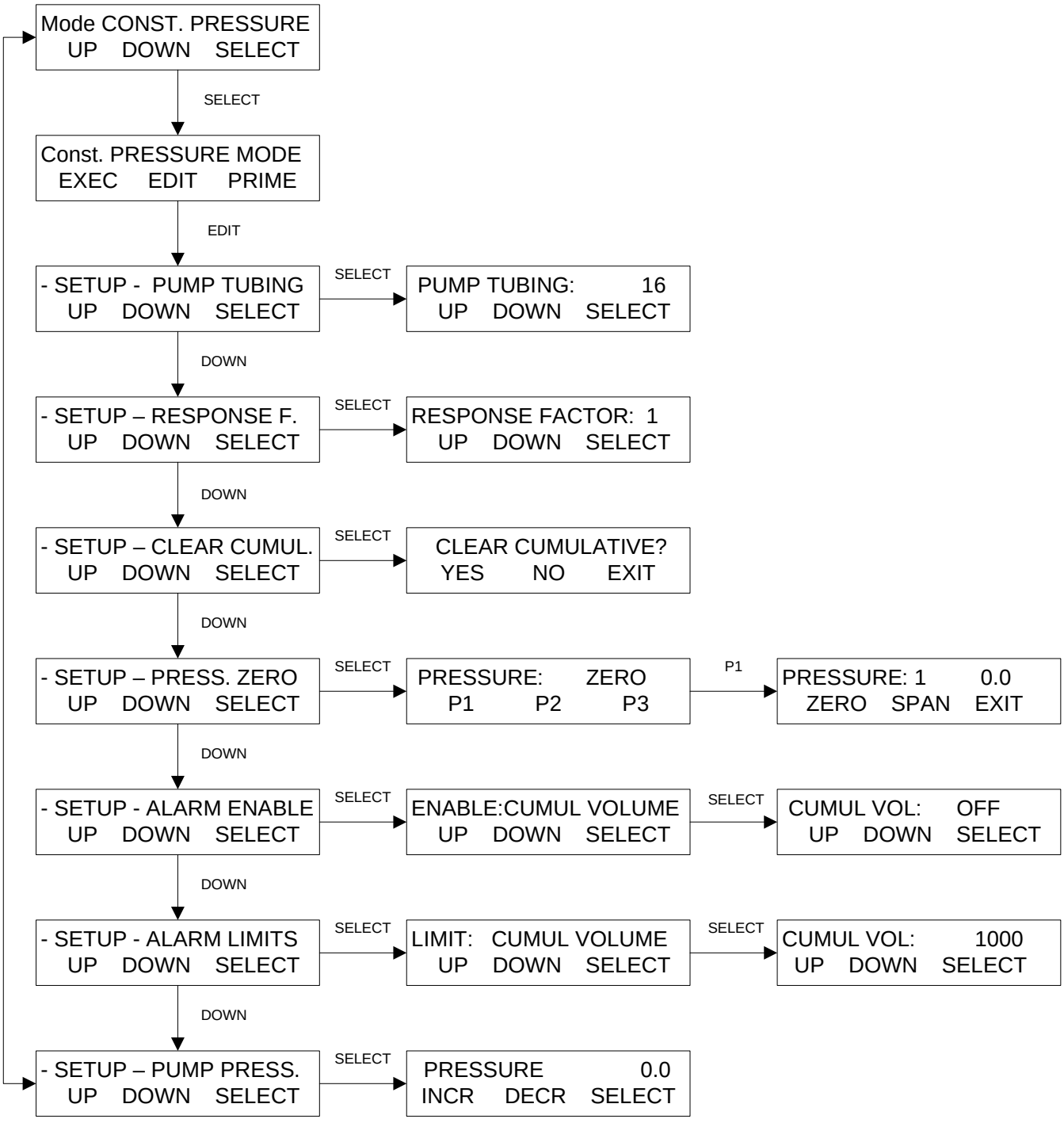

The "Display/Switch" key on the front panel allows you to change between 3 operational display screens.

Abbreviations are as follows:
P1= Inlet Line Pressure
P2= Retentate Line Pressure
P3= Filtrate Line Pressure
TM= Trans-Membrane Pressure
CV= Cumulative Volume
FF= Flow Rate, Feed
FQ= Filtrate Quantity
FP= Flow Rate, Permeate (Collection Rate)
FR= Flow Rate, Recirculation
T = Temperature (By in-line probe)
A1 = Conductivity from SciCon
A2 or A3 = Temperature from SciCon
RUN= Pump Status

Unless a Balance is connected and properly configured, and the Filtrate Weight Alarm is enabled, the Filtrate Quantity and Flow Rate, Permeate displays will be zero. The "Scale Initialization" and "Removing Tare Weight" screens, will only occur in this case as well.

## 3.0 CONSTANT PRESSURE MODE

Constant Pressure Filtration: Edit Menu



# 3.0 PRESSURE: Constant Pressure Filtration

**SUMMARY:** This PureTec mode allows implementation of **constant pressure filtration**, i.e. a user selected filter backpressure (30 psi. max.) is maintained throughout the filtration process. When the filter device starts plugging up, the PureTec detects a corresponding increase in filter backpressure. In order to maintain the selected filter backpressure setting, **the PureTec will automatically decrease the flow (feed) rate**. Thus the constant pressure function of the PureTec allows the choice of a safe backpressure setting that is consistent with a high filtrate/permeate flow rate.

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

**PUMP TUBING:** Select sizes #13, 14, 16, 25, 17, 18, 15, 24 or #35 using “Up” and “Down” keys for choice of tubing size, then press “Select”. Based upon the size selection, the PureTec will access factory installed calibration tables, which relate the pump output in ml/min. to pump motor speed. PureTec pump output can also be re-calibrated by the utilizing the front panel star () key. (See RATE Mode for Re-cal instructions.)

**CLEAR CUMUL:** Resets (Clears) the following counters in the “Exec” front panel display: CV = Cumulative Volume; RT = Run Time; FQ = Filtrate Weight.

**RESPONSE F:** Response Factor setting. The Pump Response Factor = 1 is the default value. Increasing the Pump Response Factor will increase the pumps responsiveness.

**PRESSURE ZERO:** Used to zero and span the backpressure readings of all 3 SciPres pressure sensors. Span is done only when using a known pressure source that matches the Range set in SETUP, PUMP, PRESS. SENSOR, Range. (Default = 60) Do not run the PureTec while resetting the pressure sensors.

Do not exceed the maximum pressure of 60 psi for the SciPres sensors or damage to the sensor may occur.

**ALARM ENABLE:** Used to select alarm options for several 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.

**ALARM LIMITS:** Used to assign alarm limits for several different alarm conditions:

- Cumulative Volume in milliliters;
- Hi / Lo Analog 1-3 based on range set in Setup: Analog;
- Hi-Temp in ºC;
- Run Time in Hours: Minutes;
- Lo-Pressure (monitor system leakage) in psi;
- Lo-Flow (high filter backpressure) in ml/min;
- Filtrate Weight (Permeate) in grams (This alarm must be enabled in order to obtain and display the Filtrate Weight (FQ) and Permeate Flow Rate (FP) values.

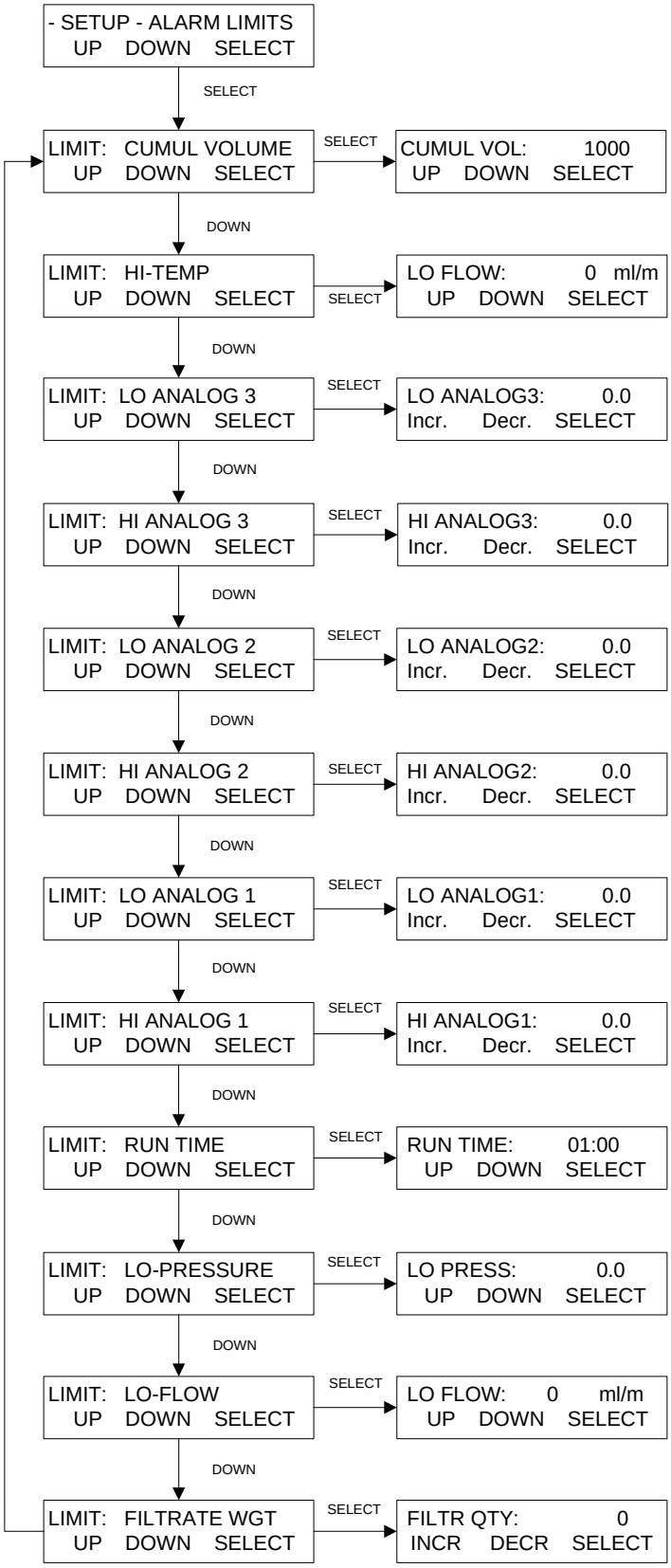
The Lo-Pressure and Lo-Flow alarms are related to the chosen pressure source.

**Pump Pressure:** Allows selection of the **filter backpressure** for the process. The PureTec will maintain the selected setting throughout the run. Pump Pressure may be changed “on the fly” by pressing the Rate/Pressure key, making the change, and pressing the ‘Select’ button. **Do not exceed the pressure rating for your filtration device.**

NOTE: The Source chosen in SETUP: Press. Sensor, Source, i.e. P1 or TM (Trans-membrane Pressure) is the pressure that will be controlled by this setting.

## 3.1 CONSTANT PRESSURE MODE

Constant Pressure Filtration: Alarm Limits Menu



# 3.1 PRESSURE: Alarm Limits

**SUMMARY:** This section allows assignment of limiting values for several different alarm conditions: **Cumulative** (Retentate) **Volume** in milliliters; Hi Temp in ºC; **Run Time** in Hours: Minutes; **Lo-Pressure** (monitor system leakage) in psi; **Lo-Flow** (triggered when 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. Any combination of alarms may be selected. For critical alarms set the pump to stop (**Pump Stop**), for less critical alarm conditions an auditory alarm (**Alarm Only**) can be chosen.

**NOTE**: The Lo-Pressure alarm is directly related to the Source chosen in SETUP: Press. Sensor, Source, i.e. P1, TM, etc.

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

**CUMULATIVE VOLUME** (CV): This alarm setting represents the total volume of process solution pumped through the filtration device. For example: if the **Cumulative Volume Alarm** is set to 10,000ml or 10 liters, the PureTec will either alarm and/or stop the pump when 10 liters of retentate has been pumped through the filtration device. This allows control of yield in terms of the amount of retentate recirculated through the system.

**HI AND LO ANALOG 1-3** (HA/LA): Hi and Lo limits for the three Analog Inputs can be configured within the ranges established in Setup: Analog. Lo limits only trigger after first being exceeded. This allows control of the process from an external detector.

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

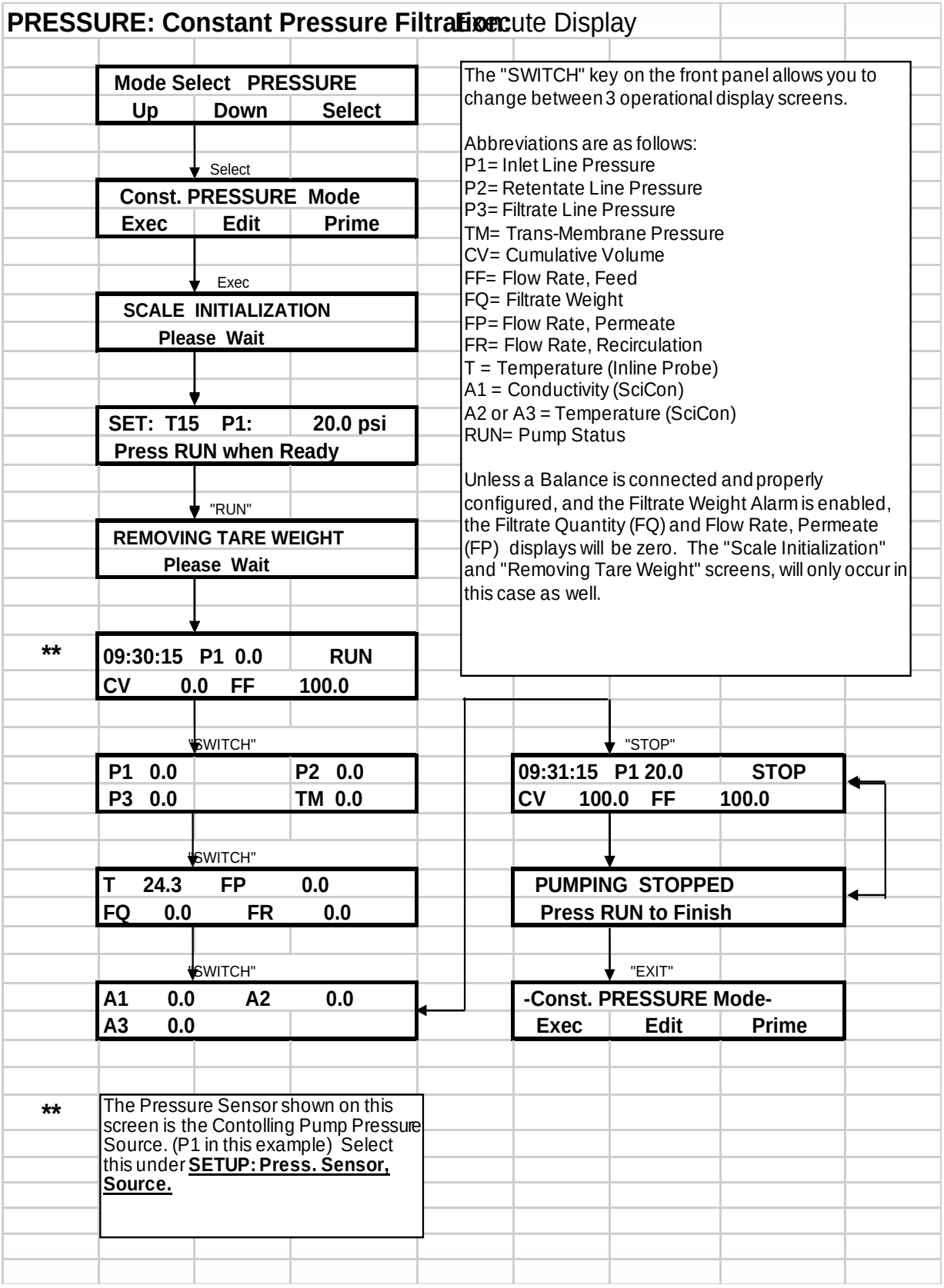
**LO-FLOW** (LC): For constant pressure filtration, this represents a critical alarm condition. The Lo-Flow parameter (ml/min) represents lowest pump rate before the pump shuts down. The Lo-Flow parameter should be set just below the desired minimum feed flow rate.

**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 system leak, i.e. pump tubing has slipped off the filter connection. This is usually a critical alarm and should be set to Pump Stop.

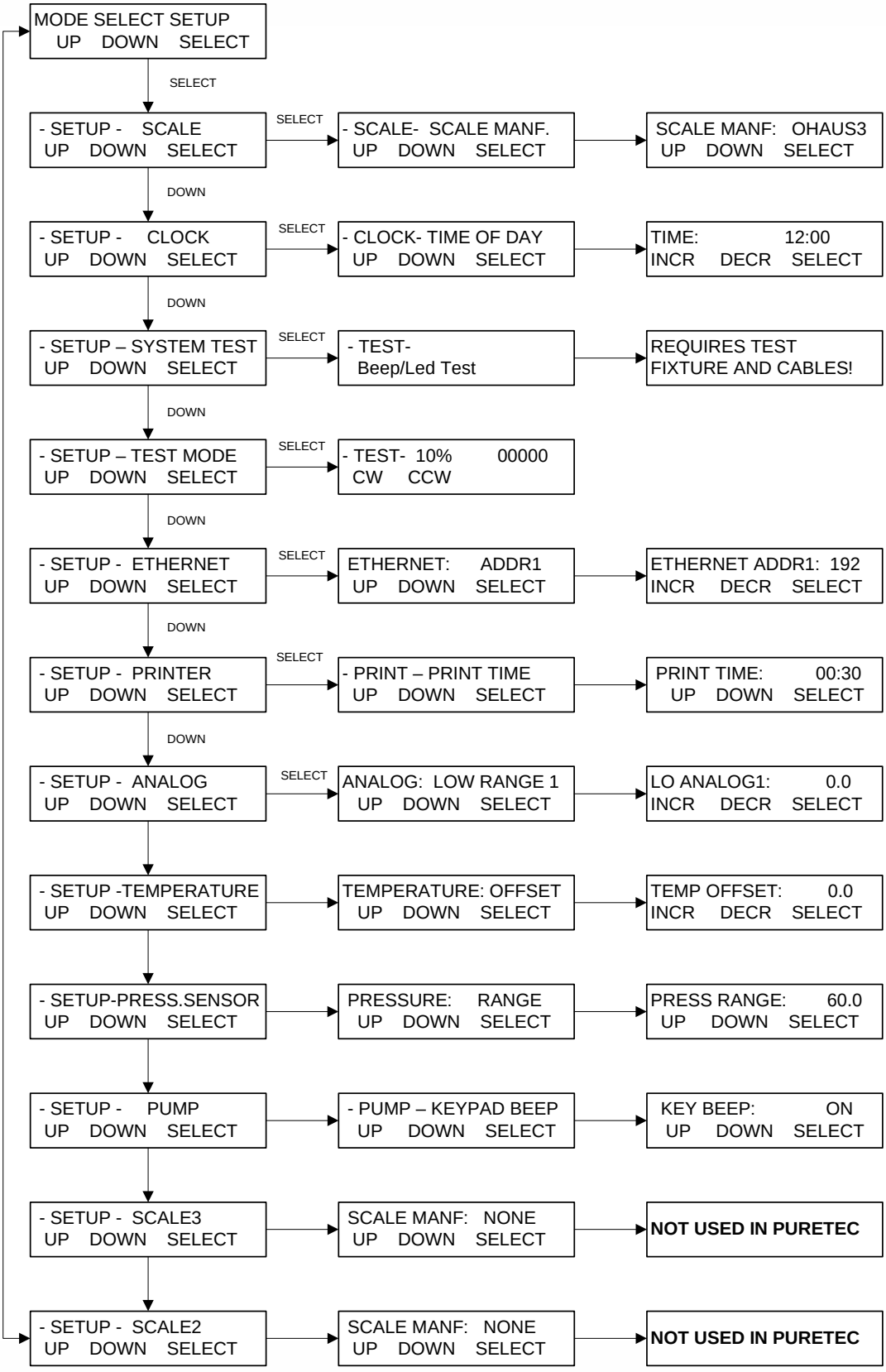
**FILTRATE WGT** (FQ): The PureTec comes with a top-loading balance. Enter the filtrate / permeate weight (grams) to collect, and the PureTec will either alarm or stop the pump when the desired filtrate / permeate weight has been collected. Set this value to 0.0 or beyond the capacity of the scale to keep it from triggering during normal use.

**NOTE: This alarm must be enabled in at least “alarm only” mode in order for the FQ (Filtrate Weight) and FP (Flow Rate, Permeate) to be obtained or displayed.**

## PRESSURE: Constant Pressure Filtration Execute Display



## 4.0 SETUP


MODE SELECT SETUP
UP DOWN SELECT
SELECT
- SETUP - SCALE
UP DOWN SELECT
SELECT
- SCALE- SCALE MANF.
UP DOWN SELECT
SCALE MANF: OHAUS3
UP DOWN SELECT
DOWN
- SETUP - CLOCK
UP DOWN SELECT
SELECT
- CLOCK- TIME OF DAY
UP DOWN SELECT
TIME: 12:00
INCR DECR SELECT
DOWN
- SETUP – SYSTEM TEST
UP DOWN SELECT
SELECT
- TEST-
Beep/Led Test
REQUIRES TEST
FIXTURE AND CABLES!
DOWN
- SETUP – TEST MODE
UP DOWN SELECT
SELECT
- TEST- 10% 00000
CW CCW
DOWN
- SETUP - ETHERNET
UP DOWN SELECT
SELECT
ETHERNET: ADDR1
UP DOWN SELECT
ETHERNET ADDR1: 192
INCR DECR SELECT
DOWN
- SETUP - PRINTER
UP DOWN SELECT
SELECT
- PRINT – PRINT TIME
UP DOWN SELECT
PRINT TIME: 00:30
UP DOWN SELECT
DOWN
- SETUP - ANALOG
UP DOWN SELECT
SELECT
ANALOG: LOW RANGE 1
UP DOWN SELECT
LO ANALOG1: 0.0
INCR DECR SELECT
- SETUP -TEMPERATURE
UP DOWN SELECT
TEMPERATURE: OFFSET
UP DOWN SELECT
TEMP OFFSET: 0.0
INCR DECR SELECT
- SETUP-PRESS.SENSOR
UP DOWN SELECT
PRESSURE: RANGE
UP DOWN SELECT
PRESS RANGE: 60.0
UP DOWN SELECT
- SETUP - PUMP
UP DOWN SELECT
- PUMP – KEYPAD BEEP
UP DOWN SELECT
KEY BEEP: ON
UP DOWN SELECT
- SETUP - SCALE3
UP DOWN SELECT
SCALE MANF: NONE
UP DOWN SELECT
NOT USED IN PURETEC
- SETUP - SCALE2
UP DOWN SELECT
SCALE MANF: NONE
UP DOWN SELECT
NOT USED IN PURETEC

# 4.0 Setup

**SUMMARY:** The Setup Menu consists of the following items; the following sections provide further explanation:

**SCALE:** The following electronic scale is recommended for the PureTec and will ship with most systems: **Ohaus Adventurer Pro.** Proper communications are set by selecting Ohaus 3 as the Scale Manuf. Other scales, Mettler, Ohaus or Sartorius may be used. Submenu allows setting of Scale Manuf., Units, Alarm, and Tare. Default = “Ohaus3”.

**CLOCK:** Set the time of day (military), **day**, **month**, and **year**. **Print Enable** allows choice of Time of Day, or Relative (Run) Time for printout and display. In most cases the clock will be set at the factory for the destination time zone. Default = Time of Day.

**SYSTEM TEST:** Allows testing of the I/O’s of the PureTec, requires purchase of IQ/OQ Document. Use Test Mode if needed for trouble shooting.

**TEST MODE:** Allows independent testing of the PureTec I/O’s. Motor, Keypad, Scale, Pressure, Temperature, Valves, Analog, TTL switches.

**ETHERNET:** Allows setting of the IP Address, Subnet Mask and Gateway values for Modbus TCP/IP communication via the Ethernet Port.

**PRINTER:** Select communications parameters for SciLog printer (P/N 080-095) or PC. Default settings are **Print Time** (Default = 30 sec.), **Type** (Seiko), **Baud Rate** (9600), **Stop Bits** (2), **Parity** (None), **Word Length** (8), **Print Delay** (0 sec).

**ANALOG:** Allows setting of Hi and Lo Range, as well zeroing of all three available 4-20 ma analog inputs.

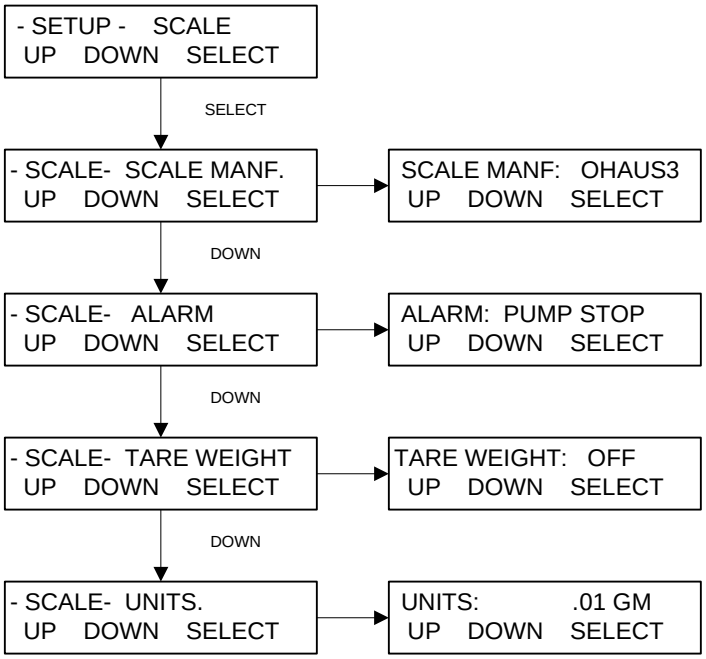
**TEMPERATURE:** Select an Offset for the SciTemp Temperature sensor if needed.

**PRESS. SENSOR:** Allows user to **Zero** all three SciPres pressure sensors. (**Span** is used for factory calibration.) **Source** is used to select the desired sensor for related alarms and control in all modes. **Units**: Choose from Psi (default), Bar, or Kpa. **Range:** Default is 60, can be set lower, will require re-calibration of the input. Contact SciLog Customer Service for assistance.

**PUMP:** Select the following user preferences: **Keypad Beep:** (On/Off), **Switch Configuration:** (Level / Pulse), **Switch Polarity:** (Normal/Inverted), **TTL1:On-Off:** (Yes/No), **Motor Start:** (Hard / Soft-Ramp), **Motor RPM:** (3400, 600, 160, 8), **Pump Head:** (Peristaltic/RH1/RH0/RH00), **Pump Tubing:** (13/14/16/25/17/18/15/24/35), **Power Up:** (Mode/Menu/Run), **External Run-Stop:** (Pulse/Level), **ASCII Feedback** (On / Off), **Factory Reset:** (Resets all variable parameters to their original factory defaults).

**SCALE2 AND SCALE3:** Not utilized with the PureTec. Must remain set to “None”. Do not remove the covers on the unused scale ports.

# 4.1 Setup: Scale




- **Scale Manuf:** Select the appropriate value for the scale in use. Options: Ohaus, Ohaus2, Ohaus3, Mettler, Metler2, Sartor, Sartor2. Default = Ohaus3. Proper configuration of the scale's parameters is required, as well as correct interface cable.
    - Ohaus3: Adventurer Pro.
    - Ohaus2: Adventurer, Explorer, Explorer Pro.
    - Mettler: Viper, Series 4, IND560.
    - Metler2: Speedweigh, Panther.
    - Sartor2: Current default Sartorius setting, all series.
- **Alarm:** Triggered if communication with the scale is lost. Options: Pump Stop, Alarm Only or Off. Default = Pump Stop.
- **Tare Weight:** Determines if the system tares the scale upon pressing Execute and Run in the main operational modes. This is counterintuitive. Options: On, Off. Default = OFF, which causes the system to tare the scale. ON will cause the tare to not occur.
- **Units:** Select from: .001 gm, .01 gm, 0.1 gm, Kg, T, Lbs, OzT, Oz, C, Dwt. Default = .01 gm.

**An Ohaus Adventurer Pro AV8101 scale is normally sent with the system when purchased. If a different scale is required, please contact SciLog for configuration information.**

## 4.1.1 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. Press the Tare button to exit the menu.

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 | Off |

**Content**

| | |
|---|---|
| Num Only | Off |
| Header | Off |
| Gross | Off |
| Net | Off |
| Tare | Off |
| Reference | Off |
| Result | On |
| GLP | Off |

**Layout**

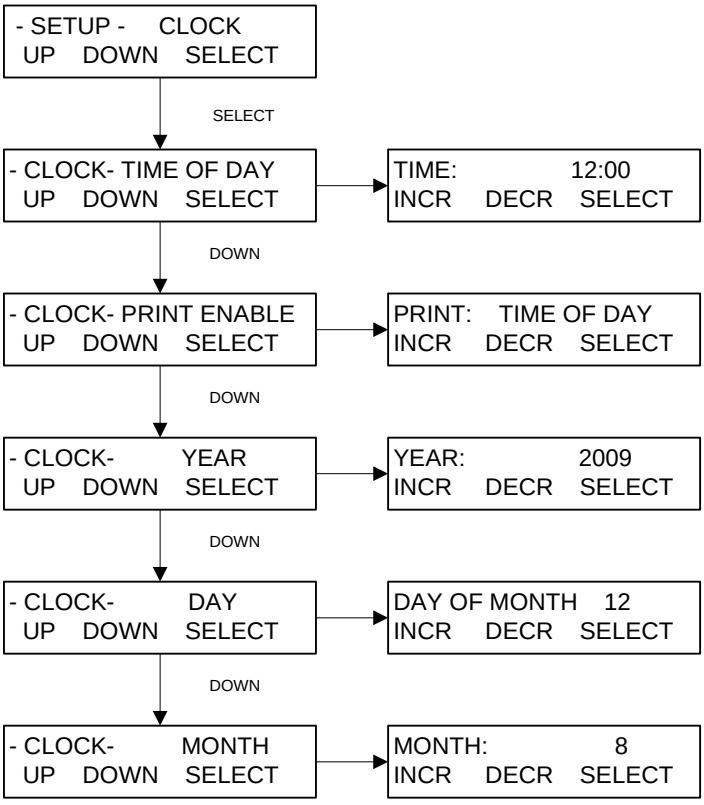
| | |
|---|---|
| Line Format | Multi |

**RS232-1**

| | |
|---|---|
| Baud | 9600 |
| Parity | 7 No Parity |
| Handshake | Off |

In the Setup Mode, Scale Manuf., select “OHAUS3”. By making this selection, the PureTec will implement the correct parameters for communicating with the Adventurer Pro Series balance. You will also need SciLog P/N 080-067PGS, Balance Cable. (Note: The 080-066 SciLog Ohaus Balance cable will not work with this balance series.)

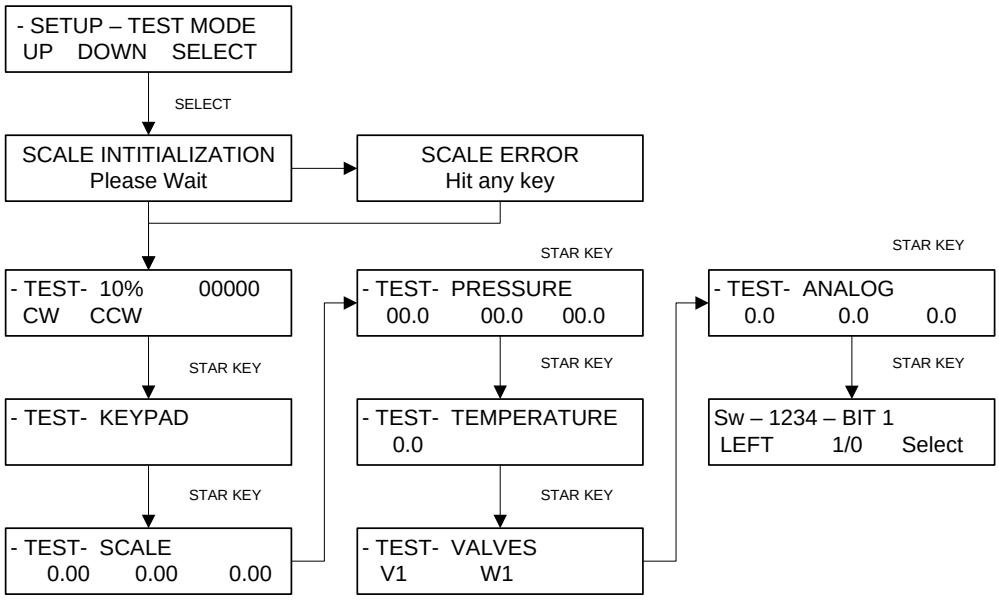
# 4.2 Setup: Clock




**Clock** is used to set the Date and Time in the PureTec real time clock, and control the displayed and output time format.

- **Time of Day:** Press Select and use the Incr. and Decr. buttons to set the current time in 24 hour format. This should be preset by the factory prior to shipping.
- **Print Enable:** Controls displayed and output time. Choose between Time of Day and Relative Time. Time of Day yields current time, and Relative Time starts at 00:00:00 at the beginning of a processing run. Default = Time of Day.
- **Year:** Press Select and use Incr. and Decr. to set the current year.
- **Day of Month:** Press Select and use Incr. and Decr. to set the current day of the month.
- **Month**: Press Select and use Incr. and Decr. to set the current month.

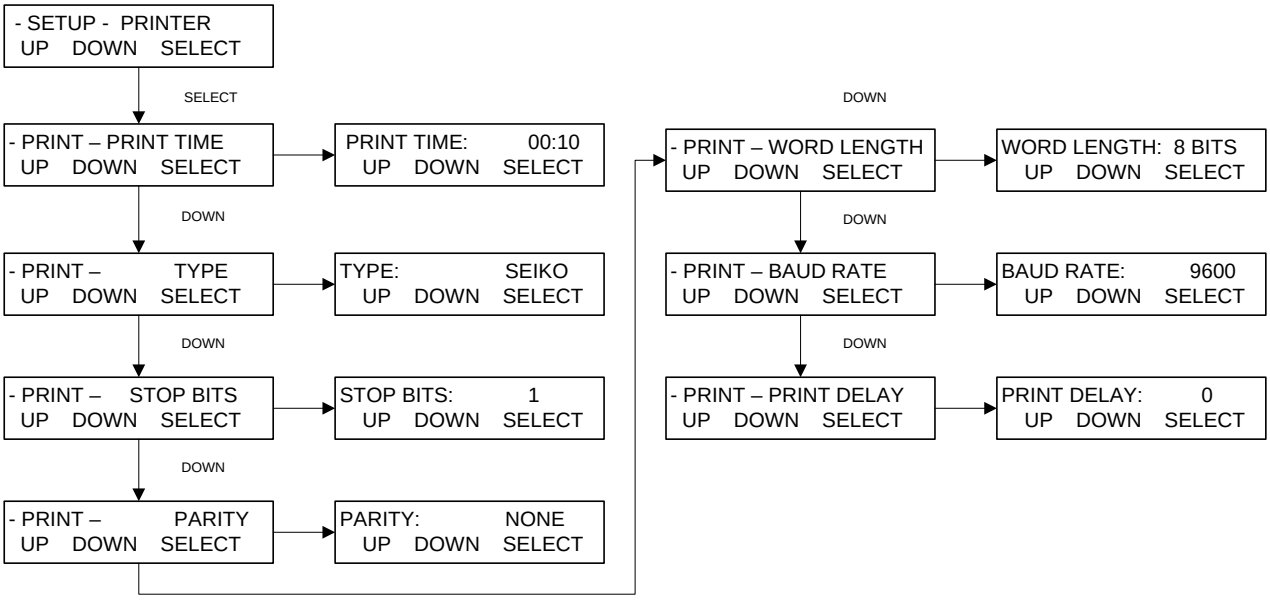
# 4.3 Setup: Test Mode:




**Test Mode** provides the ability to test the inputs and outputs (I/O's) of the PureTec outside of the normal operational modes. Upon pressing Select, the PureTec will attempt Scale Initialization. If it passes, the next Test appears. If it fails, press any key and the next Test appears. Use the Star (*) button to move between tests.

- **Motor**: This tests the motor. Use the Rate/Pressure button to change the motor speed. Use the Run / Stop buttons, and the CW / CCW keys to exercise the motor. The encoder pulses/second is displayed.
- **Keypad**: This tests the keypad. Press the buttons in any order, and an appropriate number is displayed. Left to right, top to bottom, they are numbered 1 through 0, the Star key passes if it moves to the next test.
- **Scale**: If a scale is connected and is communicating properly, the value here will match that of the scale. (There are three shown, due to the three interfaces, but only one is used with the FilterTec.)
- **Pressure**: If SciPres Disposable Pressure Sensors are connected, they will display the measured pressure, P1, P2, P3. By pressing the A, B, or C keys, the sensors may be zeroed. If there is no sensor connected, **--.-** will be displayed.
- **Temperature**: If a SciTemp Disposable Pressure Sensor is connected, the measured temperature in ºC will be displayed. If no sensor is connected, 0.0 is displayed.
- **Valves**: If Valve V or W is connected, press the A or B button to test them.
- **Analog**: Displays the analog value for Channels 1, 2 and 3 based upon input and Hi/Lo range settings.
- **TTL Switches:** By using Left and 1/0 to change the BIT setting, the TTL outputs may be tested. You must have a DMM connected to measure the voltage, it will be 0.0 if Switch is set to 0, and 5.0 Vdc if set to 1. (The display is 1234 if all are high, 0000 if all are low)

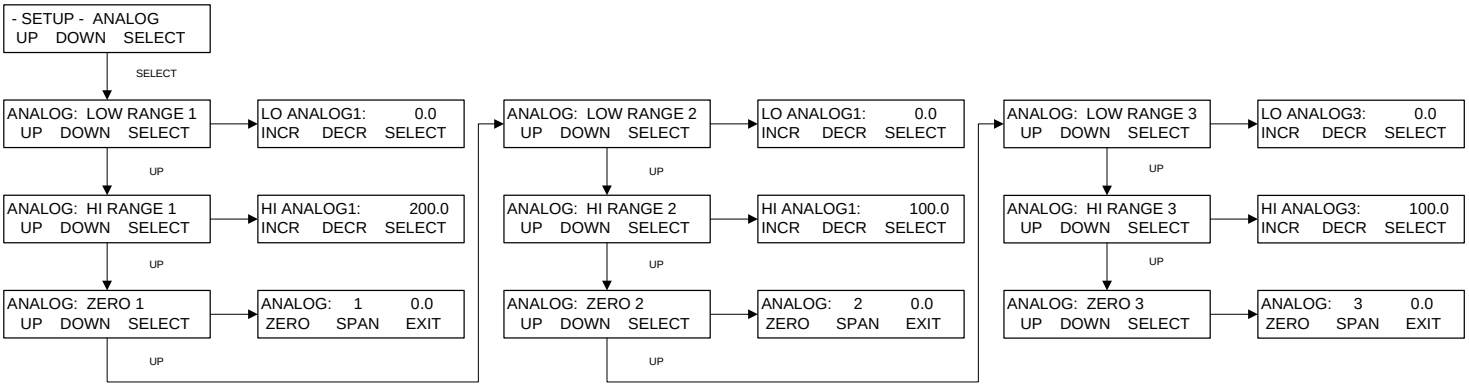
# 4.4 Setup: Printer




**Printer** allows the setting of RS-232 communication parameters needed for connection to a SciLog serial printer or to a PC for data collection.

- **Print Time:** Controls how fast the FilterTec sends data points in Minutes: Seconds. Max is 30:00 minutes; Min is 00:05 seconds. Default = 00:30 seconds.
- **Type:** Allows use of two styles of small serial printers, Seiko, a thermal unit, and Starr, a dot matrix. For all other printers, and PC communication, Seiko setting is used and is the default.
- **Stop Bits:** Select 1 or 2. Default = 1.
- **Parity:** Select Even, Odd or None. Default = None.
- **Word Length:** Select 7 or 8 Bits. Default = 8 Bits.
- **Baud Rate:** Select 300, 600, 1200, 2400, 4800, 9600, or 38.4. Default = 9600
- **Print Delay:** Used to slow down the output for printers with small buffers. Select 0 – 5 seconds. Default = 0 seconds.

# 4.5 Setup: Analog

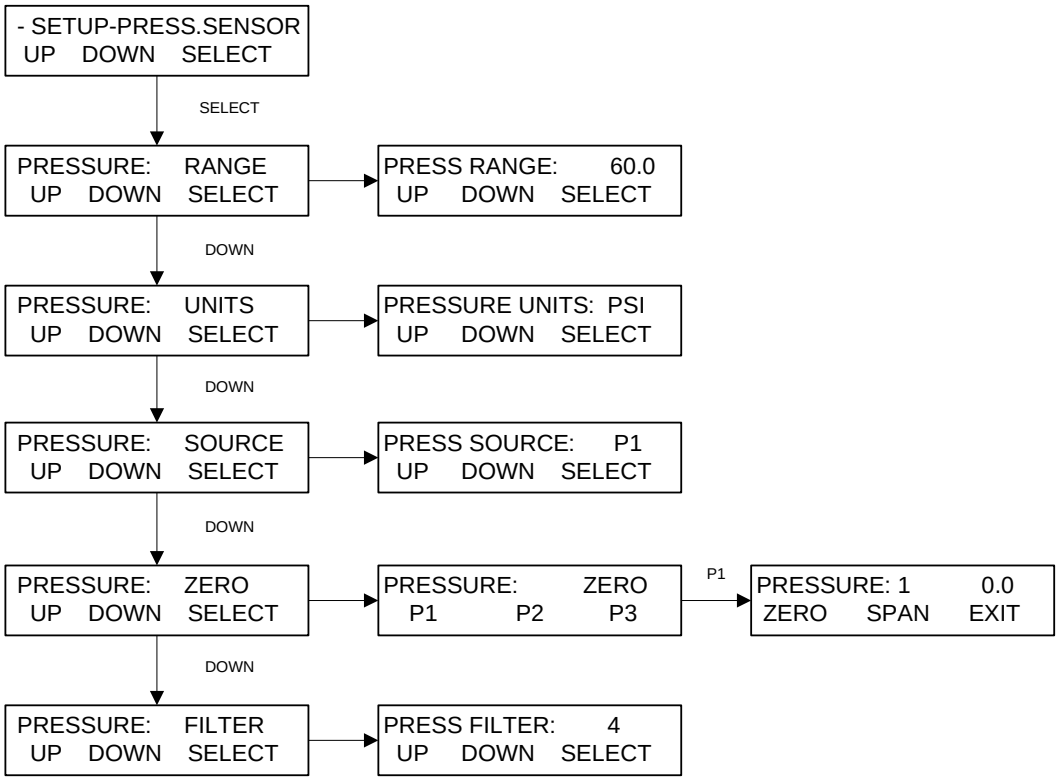



**Analog** provides for configuration of the three available 4-20 mA Analog inputs. The Hi/Lo Range values can be set, the signal can be calibrated via a Zero/Span function, and Hi/Lo Alarms and Limits can be set for any or all three of the inputs.

- **Lo Range 1:** Set the value for the 4 mA input on Channel 1. Default = 0.0
- **Hi Range 1:** Set the value for the 20 mA input on Channel 1. Default = 200.0
- **Zero 1:** Provides for calibration of the Analog Channel 1 input. Provide a 4 mA signal and press “Zero”. Provide a 20 mA signal and press “Span”. Press Exit to finish. The device being interfaced or a source traceable to NIST should be used for this procedure.
- **Lo Range 2:** Set the value for the 4 mA input on Channel 2. Default = 0.0
- **Hi Range 2:** Set the value for the 20 mA input on Channel 2. Default = 100.0
- **Zero 2:** Provides for calibration of the Analog Channel 2 input. Provide a 4 mA signal and press “Zero”. Provide a 20 mA signal and press “Span”. Press Exit to finish. The device being interfaced or a source traceable to NIST should be used for this procedure.
- **Lo Range 3:** Set the value for the 4 mA input on Channel 3. Default = 0.0
- **Hi Range 3:** Set the value for the 20 mA input on Channel 3. Default = 100.0
- **Zero 3:** Provides for calibration of the Analog Channel 1 input. Provide a 4 mA signal and press “Zero”. Provide a 20 mA signal and press “Span”. Press Exit to finish. The device being interfaced or a source traceable to NIST should be used for this procedure.

**Note:** Maximum range value for any channel is 9999.9.

# 4.6 Setup: Pressure Sensor




**Pressure Sensor** is used to configure settings related to the SciPres Disposable Pressure Sensors. The following can be configured; Range, Units, Source (control and alarms), Filter (signal noise) and Zero/Span.

- **Range:** Set the overall pressure range, the Default is 60.0 psi, and is the maximum. Changing this setting requires re-calibration of the sensor signals.
- **Units:** Select between Psi, Bar, and KPA. Default = Psi.
- **Source:** Controls the source pressure sensor for control in Constant Pressure Mode, • and for all pressure alarms. Select between P1, P2, P3, or TM. Default = P1
- **Zero:** Used to “Zero” the sensors to establish the zero offset cause by the circuitry and any inherent hydraulic pressure in your tubing beyond the pump head. Connect the sensor, and remove any pressure from the system. Select the sensor, P1, P2 or P3 and press “Zero”. You are prompted to confirm the action. “Span” should not be used on a routine basis, as it sets the max input value. NOTE: Do not Zero P1, P2 or P3 unless a sensor is connected. The display should read “--.-“ with no sensor connected. If it reads 0.0 in this state, connect the sensor and re-zero it.
- **Filter:** This feature filters out the pulsations in the pressure signal due to the peristaltic nature of the pump head. This provides better control and easier to read values, as well as improved graphed data. Select from 1 to 7, 1 = no signal filter, 7 = maximum filter. Default = 4.

# 4.7 Setup: Pressure Sensor, Calibration

The FilterTec has built in calibration curves for the SciPres 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 follows.

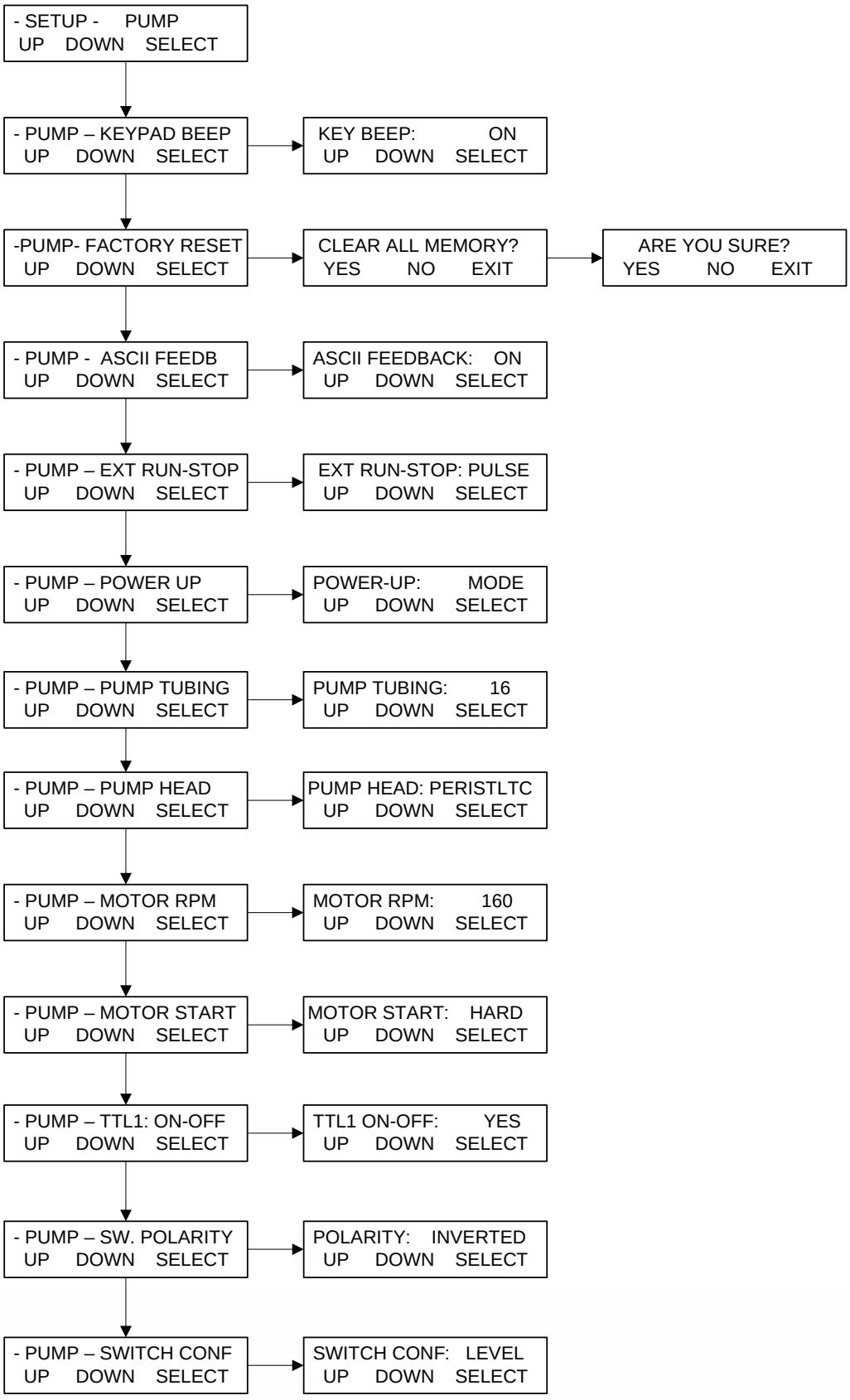
**To calibrate the PureTec / SciPres Disposable Sensors:**

1. Obtain a NIST traceable regulated source of compressed gas (i.e. air, nitrogen) and pressure gauge.
2. Go to Mode Select; Setup; Pressure Sensor, then to Pressure: Range, and note the range specified, change if desired. (Default is 60 psi.)
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 carefully increase to match range noted in step 2.

**NOTE**: Pressurizing the SciPres Sensors beyond 60 psi can damage the sensor.

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 SciPres 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.

# 4.8 Setup: Pump



# 4.8 Setup: Pump, continued:

**Setup: Pump** provides configuration of global settings related to the pump. Generally, the default values here do not need to be changed. Any changes required for a particular system will be made at the factory, and would only need to be modified if a "Factory Reset" is performed.

- **Keypad Beep:** Determines if the buttons "beep" when pressed. Default = ON.
- **Factory Reset:** Resets the system to the factory default settings for all menus. Requires pressing "YES" to both the "Clear All Memory?" and "Are You Sure?" prompts.
- **ASCII Feedback:** Controls responses sent to a PC upon receipt of a remote command. Default = ON.
- **External Run-Stop:** Controls action of the Footswitch connection, which is part of the External I/O DB37 connector (pins 19 and 37). Choose Pulse for footswitch type control where the contacts are closed and then opened. Choose Level for contact closure control where closed = Run and open = Stop. Run key is disabled when this is set to Level except in Manual Mode. Default = Pulse.
- **Power-Up:** Controls the action of the system upon power-up. Choose from Menu, Mode, or Run. Menu = the system returns to the top of the Menu. Mode = the system returns to the last Mode it was in. Run = the system returns to the last Mode it was in and starts the process.
- **Pump Tubing:** If Pump Head is set to Peristaltic, all nine standard tubing sizes can be chosen. Used with Motor RPM setting to determine proper calibration curve. Default = 16.
- **Pump Head:** Choose between Peristaltic, RH1, RH0, RH00, Mag 201, Mag 122, Mag 120, and Mag 040. Used to access the proper calibration curve. Default = Peristaltic.
- **Motor RPM:** Choose between 8, 160, 600 and 2400 rpm, matching the motor installed in the system. This will be set at the factory. It will need to be reset after a Factory Reset if other than the default. Default = 160.
- **Motor Start:** Controls how fast the motor starts. Hard is fast, Soft is slow. Default = Hard.
- **TTL 1 On-Off:** Controls action of TTL Switch 1, used for Master/Slave control of another system or device with TTL input control. Set to Yes, TTL 1 changes states from High to Low when the system is told to run the motor. Set to No, it does not. Default = Yes.
- **Switch Polarity:** Controls the polarity of the TTL switches. Inverted = High when not activated, Low when activated. Normal = Low when not activated, High when activated. Default = Inverted to allow for proper Master/Slave control.
- **Switch Configuration:** Sets the action of the TTL switches. Choose between Level and Pulse. Default = Level to allow for proper Master/Slave control.

# 5.0 Manual:

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

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

When in **Manual** mode, the pump speed and/or pressure can be adjusted in terms of % motor speed while the pump is running. Just press the “RATE” key, make the appropriate adjustment, and press “SELECT”.

# 6.0 Data Acquisition:

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

Either the Printer Port or USB Port may be used for data collection. The instructions for installing the USB driver appear at the beginning of this manual. The PureTec Printer Port is required for use with a SciLog serial printer, and both Thermal and Dot Matrix are available. By using both ports, the data can be simultaneously captured on a PC and a Printer.

When a PC is connected, all data generated in RATE and PRESSURE Modes can be sent to the PC for archiving. Please use the SciLog SciDoc Data Collection Software described below. Alternatively, a PC running “HyperTerminal”, a program that comes with Windows, may be used to capture the data. The HyperTerminal settings are provided for you in section 6.2 entitled “PC HyperTerminal Settings.” When interfacing with a PC you will need a separate RS-232 cable (P/N: 080-073) or USB cable (P/N: 090-158).

**NOTE:** For a successful hook-up with your PC, the PureTec 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 for HyperTerminal below or the default values.

The PureTec is also equipped with a USB port that can be connected to your PC. You will find the driver for this connection on the CD this manual came on. You will need to look in Device Manager on your PC to determine the Com Port number assigned to the PureTec.

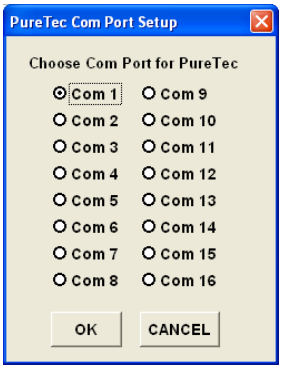
The PureTec is also equipped with an Ethernet Port. Settings for the Ethernet connection are described in an earlier section. This is for communication via Modbus TCP/IP, and when the register list is available, it will be added to the manual as an appendix.

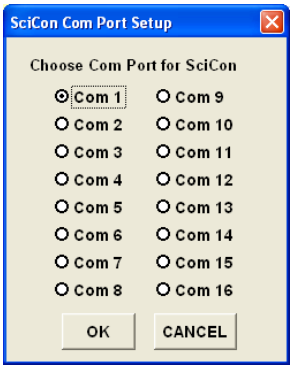
# 6.1 PureTec SciDoc Data Collection Software:

SciDoc is a software package that captures the data output of the PureTec and places it in an Excel spreadsheet. It is also configured to capture data from a SciCon Conductivity / Temperature Monitor at the same time. 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) or USB cable, (P/N: 090-158) to connect your PureTec to an available Com Port on your PC.

Minimum system requirements for are Windows 98 and Excel 2000. WinWedge32 v3.4 is included in the package and is Vista compatible. Installation instructions are included with the package.

Once installed, click on the shortcut for the spreadsheet, and the following dialog box is presented, followed by a similar one for the SciCon:



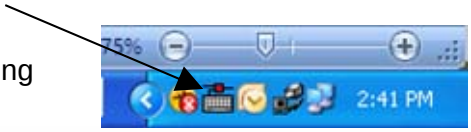




If you do not get this screen, you will need to change the Macro Security settings in Excel.

If it does not prompt to enable macros or does not prompt for the COM port, the security level is too high.

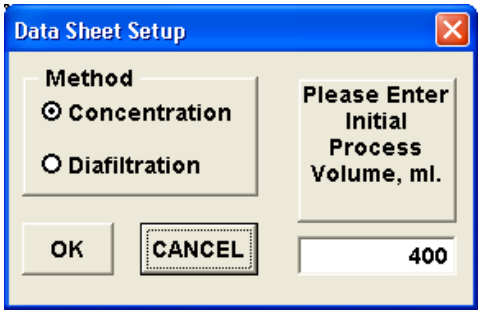
1. If using a version of Office older than 2007, from the Excel menu bar, click on Tools, Macros, and Security. Set it to Medium, close the spreadsheet and re-launch it.
2. If using Office 2007, from the Excel window, click on the Office logo in the upper left corner. Then click on Excel Options in the lower left of this window. Highlight the Trust Center, and click on Trust Center Settings in the lower left.
    a. In this window you have two options:
        i. Click on Trusted Locations, then Add new location, browsing to the Winwedge folder where the spreadsheet is located and making it a trusted location.
        ii. Click on Macro Settings, and choose Enable all macros.

Choose the Com Port the PureTec is connected to.
Click on the OK button and WinWedge32 will start, showing itself as an icon in your system tray.



Repeat this for the SciCon, or choose “Cancel” if not using a SciCon. If you chose cancel on the Setup dialog box, WinWedge32 won’t be in the system tray, and you will need to click on the “Com Port Setup” button to complete this task in order for data collection to be possible.

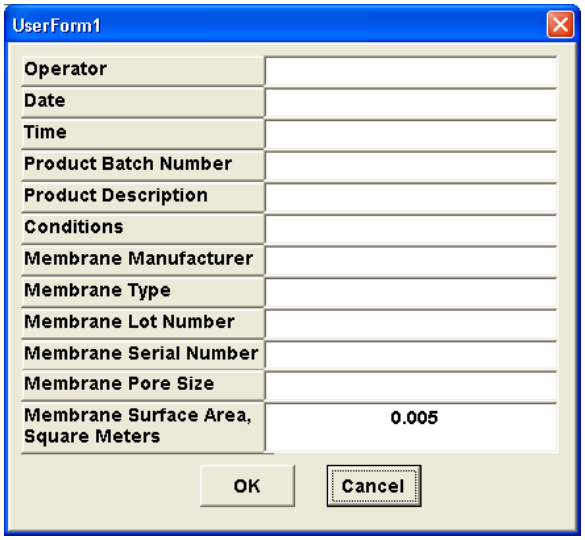
The next screen will prompt you for a choice between Concentration and Diafiltration, as well as the Initial Process Volume, used in Concentration Factor and Volume Exchange calculations.




Decide whether you are performing a Diafiltration or Concentration, and click on the appropriate button.

**If concentrating a solution, be sure to enter the Initial Process Volume where indicated, or the Concentration Factor will not be accurately calculated for you.** A default value of 400 ml is entered in this box automatically.

Once this is complete, you will have the next dialog box:

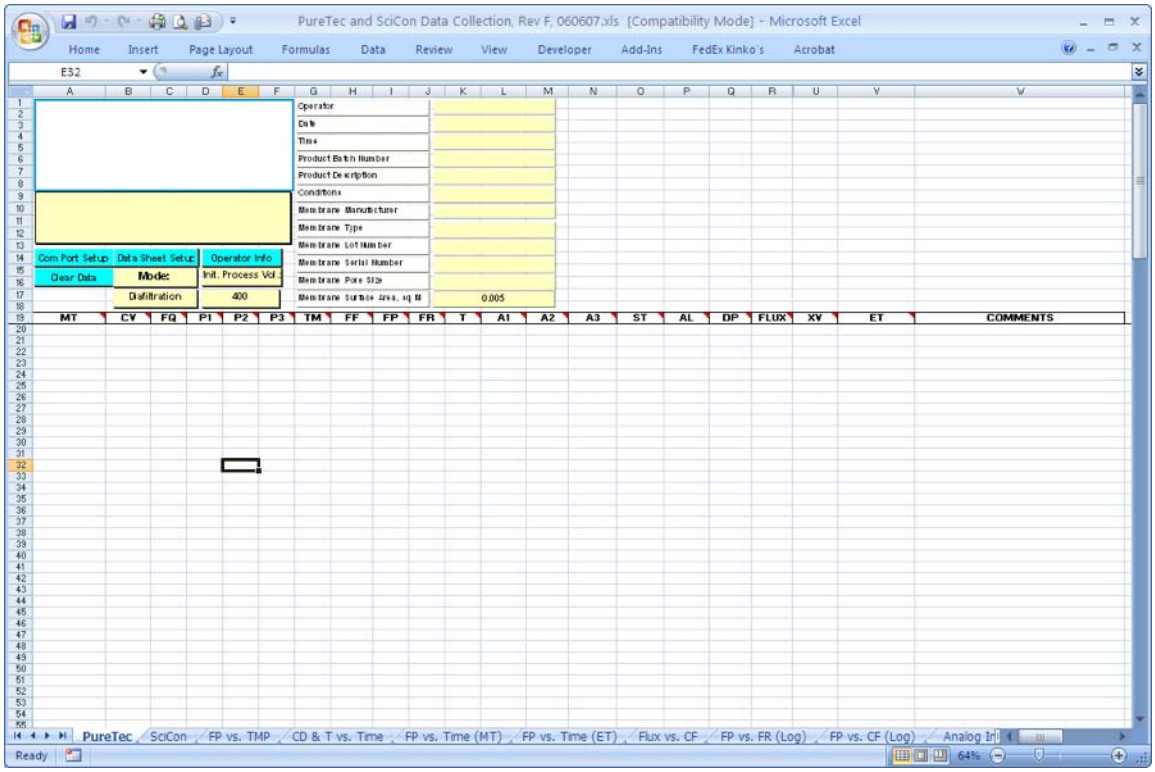



Enter the operator’s information and that of the filter and sample being run and press “OK”.

**The Membrane area in square meters is a mandatory field, and must be filled in for Flux calculations to function properly.**

Please note: the “Clear Data” button does not affect the information in these fields. You may click on the “Operator Info” button and update these fields as needed.

Clicking on “OK” leaves you with this screen, ready to start collecting data from the PureTec.




When ready, press Exec on the PureTec, and then RUN after the balance has initialized. If using a SciCon, press the On/Stby button to power it up at the same time. The data generated by one or both will automatically be placed in the cells of the spreadsheets, and the charts populated with the same data. The text box in the upper right of the spreadsheet contains the header information that is generated by the PureTec. This will list the Operational Mode, the date and time, all operating parameters, alarm settings and alarm limits. A similar text box exists on the SciCon tab, and its data appears on that tab as well.

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:

Permeate Flow Rate (FP) vs. Trans-Membrane Pressure (TMP)

Permeate Flow Rate (FP) vs. Time

Flux (FX) vs. Concentration Factor (CF)

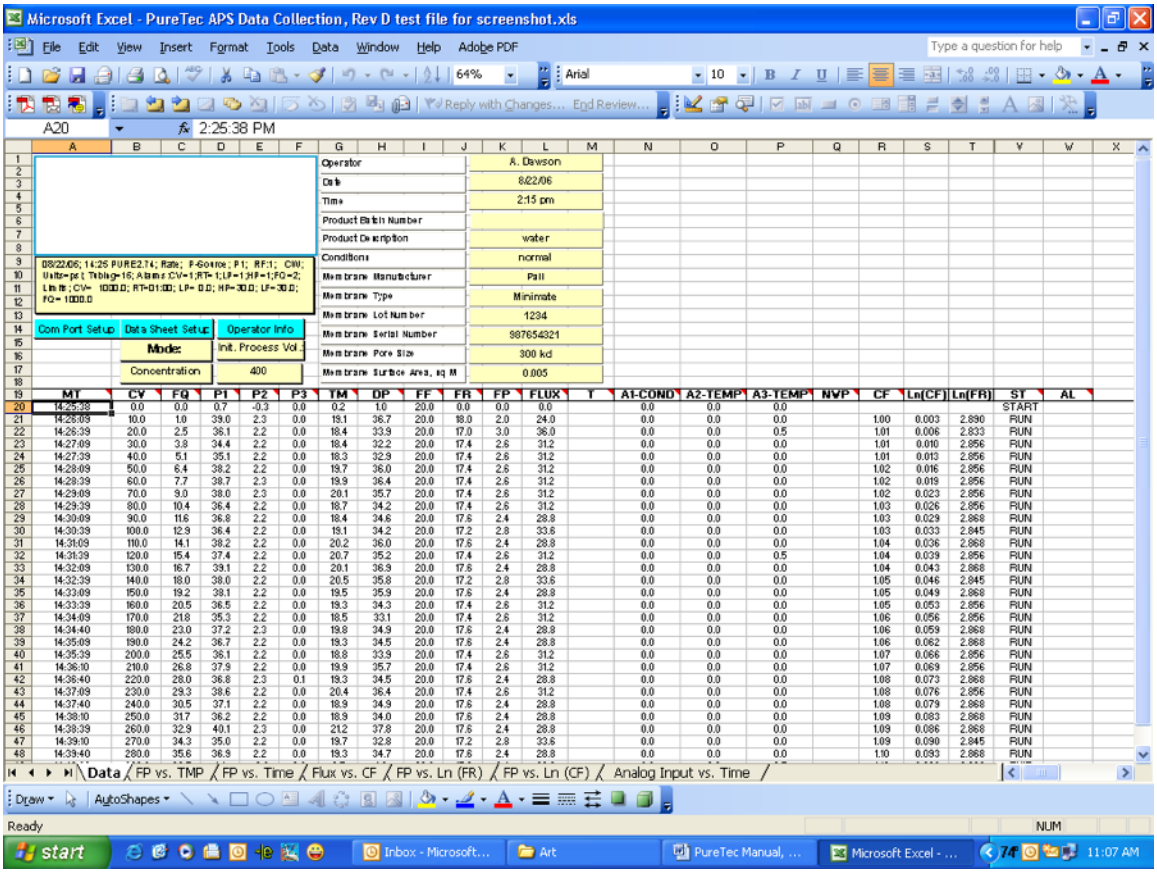
Permeate Flow Rate (FP) vs. Ln {Retentate Flow Rate (FR)}

Permeate Flow Rate (FP) vs. Ln {Concentration Factor (CF)}

Conductivity vs. Time (based upon the SciCon Data)

You may, of course, create your own charts or modify those included by adding trend lines, changing titles, etc.

When you are finished with a run, your screen will look similar to the one on the following page:




**A couple items of Note:** The columns that are visible on the spreadsheet will change based on the mode. When finished with a run, click on File-Save as: and choose an appropriate file name. For another run, simply press the "Clear Data" button, or close and re-open the file.

- The **STOP** and **RUN** keys on the PureTec may be used 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 or START 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 PureTec allows the Rate or Pressure to be changed 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 a process. When this key is pressed, the PureTec will stop sending data to the worksheet until approx 15 seconds after having pressed the "Select" button on the front panel to finalize the choice. As the process is continuing while this is done, the data will reflect the change.

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

# 6.2 PC HyperTerminal Settings:

**PureTec to PC:** For PC Connections via the Printer Port a SciLog RS-232 Cable (P/N: 080-073) is needed. When not using the SciLog printer, this allows process data to be "dumped" into a 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". Alternatively, the USB port may be used. The driver for the USB connection is on the CD this manual is on, and may be downloaded from www.scilog.com.

The following terminal setting procedure is intended for PCs with a **Window 98/XP** software installation: Press the **START** button in the lower left corner of your screen, select **"Programs"** then select and open **"Accessories",** select **"Hyper Terminal".**

If using **Vista**, HyperTerminal Personal Edition can be downloaded from the internet at: http://www.hilgraeve.com/hyperterminal.html

From the **"Connection Description"** screen, select an icon and enter a file name, i.e. FilterTec. **Press "Ok"**

From the **"Connect To"** screen, select **"Direct to Com 1"** in the box labeled "Connect Using" or the Com Port assigned to the FilterTec and **Press "Ok".**

From the **"Com 1 Property"** screen, select the following parameters

| | |
|---|---|
| Bits per Second: | 9600 |
| Data Bits: | 8 |
| Parity: | None |
| Stop Bits: | 1 |
| Flow Control: | None |

Press "Ok"

**Press "Ok"** at the bottom of the "FilterTec Setup" screen.

A window with a blinking cursor will be presented, and the data stream from the FilterTec will be displayed as it occurs.

# Appendix A: Application Examples

# **PureTec Application Example**:
## Concentration of Protein Solution

**Equipment used:**

PureTec CP200 w/ Tandem 1082 peristaltic head.

#15 Pharmed and #16 Tygon tubing.

Pall Centramate Omega 10K filter Cartridge, 0.2 Meter$^2$ Area

**Hardware Setup:**

Using #15 Pharmed tubing, connect from the outlet of the Solution Reservoir thru the Tandem 1082 head and to the Tee that connects to the inlet port of the Centramate and pressure sensor P1. Connect from the Tee on the retentate port and sensor P2 to the retentate return port of the reservoir using this same tubing. (Both of the reservoir's ports should be equipped with valves.) Place the pinch clamp provided with the PureTec on this piece of tubing, but do not tighten yet. Place a valve on the Tee that connects the filtrate (permeate) port of the Centramate and sensor P3. Connect #16 Tygon tubing (or Pharmed if you prefer) to this valve and place it in or above the filtrate collection vessel on the balance.

**Procedure:**

1. Close the valve on the filtrate line at P3, and the air vent and exchange buffer ports on the solution reservoir.
2. Open the valves on the solution outlet and retentate return lines on the solution reservoir.
3. If using the Documentation software, place your initial process volume in the appropriate box on the form.
4. On the PureTec, enter the Constant Rate mode. Edit the parameters as follows: Tubing: #15, Pump rate 140 ml/min, Alarm Enable and Limits as desired. (Suggested: Run Time: OFF, Cumulative Volume: OFF, Hi-Pressure: Pump Stop, 30 psi limit, Lo-Pressure: Pump Stop or Beep Only, 5 psi limit.)
5. Keeping the filtrate valve closed, press Exec and then the Run button on the PureTec. The system will initialize and tare the balance, and begin running at the selected rate.
6. Check all connections at this time for leaks.
7. The pressure at P1 at this time should be about 15 psi. Adjust the pinch clamp on the retentate tubing to provide backpressure of approx. 4 psi at P2.
8. At this time, open the filtrate port valve and the air vent valve. Make any adjustments needed to the pinch clamp to maintain the 4 psi setting. This should yield a Trans-membrane pressure of approx. 9.5 psi with P3 remaining around 0 psi.
9. Continue recirculating solution until the desired concentration level has been achieved. This may be automated by setting the Filtrate Weight Alarm to an appropriate value, i.e. given a 400 ml initial volume, 10x concentration, set the Filtrate Weight Alarm Limit to 360 gm, Filtrate Weight Alarm Enable to Pump Stop, and system will stop with 40 ml of solution remaining in the reservoir.

# PureTec Application Example:
## Diafiltration of a Concentrated Protein Solution

**Equipment used:**

PureTec CP120 w/ Tandem 1081 peristaltic head.

#16 Pharmed and #16 Tygon tubing.

Millipore PelliconXL Filter Cartridge, 0.05 Meter$^2$. Area

**Hardware Setup:**

Using #16 Pharmed tubing, connect from the outlet of the Solution Reservoir thru the Tandem 1081 head and to the Tee that connects to the inlet port of the Pellicon and pressure sensor P1. Connect from the Tee on the retentate port and sensor P2 to the retentate return port of the reservoir using this same tubing. (Both of the reservoir's ports should be equipped with valves.) Place the pinch clamp provided with the PureTec on this piece of tubing, but do not tighten yet. Place a valve on the Tee that connects the filtrate (permeate) port of the Pellicon and sensor P3. Connect #16 Tygon tubing (or Pharmed if you prefer) to this valve and place it in or above the filtrate collection vessel on the balance. Connect another piece of #16 Tygon to the exchange buffer port and it's valve on the top of the reservoir.

**Procedure:**

1. Close the valve on the filtrate line at P3, and the air vent and exchange buffer ports on the solution reservoir.
2. Open the valves on the solution outlet and retentate return lines on the solution reservoir.
3. On the PureTec, enter the Constant Rate mode. Edit the parameters as follows: Tubing: #16, Pump rate 35 ml/min, Alarm Enable and Limits as desired. (Suggested: Run Time: OFF, Cumulative Volume: OFF, Hi-Pressure: Pump Stop, 30 psi limit, Lo-Pressure: Pump Stop or Beep Only, 5 psi limit.)
4. Keeping the filtrate valve closed, press Exec and then the Run button on the PureTec. The system will initialize and tare the balance, and begin running at the selected rate.
5. Check all connections at this time for leaks.
6. The pressure at P1 at this time should be about 15 psi. Adjust the pinch clamp on the retentate tubing to provide backpressure of approx. 4-5 psi at P2.
7. At this time, open the filtrate port valve and the exchange buffer valve, making sure to keep the air vent valve closed. Make any adjustments needed to the pinch clamp to maintain the 4-5 psi setting. This should yield a Trans-membrane pressure of approx. 9-10 psi with P3 remaining around 0 psi.
8. Continue processing solution until the desired concentration level has been achieved. This may be automated by setting the Filtrate Weight Alarm to an appropriate value, i.e. given a 40 ml initial volume, 10x diafiltration, set the Filtrate Weight Alarm Limit to 400 gm, Filtrate Weight Alarm Enable to Pump Stop, and system will stop when 400 gm of filtrate has been collected.

# PureTec Settings & Parmeters Worksheet

**Settings for the previous two examples:**

## Concentration

| | | |
|---|---|---|
| Filter Cartridge | tramate Omega 10K | |
| Filter Area, sq M | 0.2 | |
| Initial Volume | 400 ml | |
| Concentration Factor | 10x | |
| Desired Final Volume | 40 | |
| ml/min/ sq meter, approx.) | 140 ml/min | |

## Diafiltration

| | | |
|---|---|---|
| Filter Cartridge | | |
| Filter Area, sq M | | |
| Initial Volume | | |
| Diafilt. Volumes | | |
| Total Wash Volume | | |
| ml/min/ sq meter, approx.) | | |

## Constant Rate Mode

| | | |
|---|---|---|
| Pump Tubing | 15 | |
| Pump Rate | 140 ml/min | |
| **Alarm Enable / Limits** | **Enable** | **Limit** |
| Cumulative Volume | Off | 1000 |
| Filtrate Weight | Pump Stop | 360 |
| Run Time | Off | 1:00 |
| Hi Pressure | Pump Stop | 30 |
| Low Pressure | Pump Stop | 5 |

## Constant Pressure Mode

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

## Concentration

| | |
|---|---|
| Filter Cartridge | |
| Filter Area, sq M | |
| Initial Volume | |
| Concentration Factor | |
| Desired Final Volume | |
| Flow Rate (700 ml/min/ sq meter, | |

## Diafiltration

| | |
|---|---|
| Filter Cartridge | MP Pellicon XL |
| Filter Area, sq M | 0.05 |
| Initial Volume | 40ml |
| Diafilt. Volumes | 10 |
| Total Wash Volume | 400 ml |
| Flow Rate (700 ml/min/ sq meter, | 35 ml/min |

## Constant Rate Mode

| | | |
|---|---|---|
| Pump Tubing | 16 | |
| Pump Rate | 35 ml/min | |
| **Alarm Enable / Limits** | **Enable** | **Limit** |
| Cumulative Volume | Off | 1000 |
| Filtrate Weight | Pump Stop | 400 |
| Run Time | Off | 1:00 |
| Hi Pressure | Pump Stop | 30 |
| Low Pressure | Pump Stop | 5 |

## Constant Pressure Mode

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

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# PureTec Settings & Parameters Worksheet

| Concentration | | |
|---|---|---|
| Filter Cartridge | | |
| Filter Area, sq M | | |
| Initial Volume | | |
| Concentration Factor | | |
| Desired Final Volume | | |
| ml/min/ sq meter, approx.) | | |

| Diafiltration | |
|---|---|
| Filter Cartridge | |
| Filter Area, sq M | |
| Initial Volume | |
| Diafilt. Volumes | |
| Total Wash Volume | |
| ml/min/ sq meter, approx.) | |

| Constant Rate Mode | | |
|---|---|---|
| Pump Tubing | | |
| Pump Rate | | |
| **Alarm Enable / Limits** | **Enable** | **Limit** |
| Cumulative Volume | | |
| Filtrate Weight | | |
| Run Time | | |
| Hi Pressure | | |
| Low Pressure | | |

| Constant Pressure Mode | | |
|---|---|---|
| Pump Tubing | | |
| Pump Pressure | | |
| Response Factor | | |
| **Alarm Enable / Limits** | **Enable** | **Limit** |
| Cumulative Volume | | |
| Filtrate Weight | | |
| Run Time | | |
| Low Flow | | |
| Low Pressure | | |

| Concentration | | |
|---|---|---|
| Filter Cartridge | | |
| Filter Area, sq M | | |
| Initial Volume | | |
| Concentration Factor | | |
| Desired Final Volume | | |
| Flow Rate (700 ml/min/ sq meter, | | |

| Diafiltration | |
|---|---|
| Filter Cartridge | |
| Filter Area, sq M | |
| Initial Volume | |
| Diafilt. Volumes | |
| Total Wash Volume | |
| Flow Rate (700 ml/min/ sq meter, | |

| Constant Rate Mode | | |
|---|---|---|
| Pump Tubing | | |
| Pump Rate | | |
| **Alarm Enable / Limits** | **Enable** | **Limit** |
| Cumulative Volume | | |
| Filtrate Weight | | |
| Run Time | | |
| Hi Pressure | | |
| Low Pressure | | |

| Constant Pressure Mode | | |
|---|---|---|
| Pump Tubing | | |
| Pump Pressure | | |
| Response Factor | | |
| **Alarm Enable / Limits** | **Enable** | **Limit** |
| Cumulative Volume | | |
| Filtrate Weight | | |
| Run Time | | |
| Low Flow | | |
| Low Pressure | | |

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# 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. | Does “Check Pump Head” occur with no tubing in the head? | If it occurs with no tubing in the head, call SciLog. You may need a new motor. |
| | Confirm the tubing sizes you are using. | 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. | Check the tubing size and pump head type, as you may be using the wrong size for that head. | 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. |
| | Tubing Size is ok | 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 |
|---|---|---|
| When “Scale Error” “Hit any key” shows on your screen. | Is your scale turned on, and are the cables tight? | Press any key to clear the error, tighten the cables, turn on the scale, and try it again. |
| | Ok, the scale is on, cables are ok, and it still won’t work? | Refer to 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. |
| | Ok, the scale is chosen correctly, and it still doesn’t work. Now what? | Either refer to the same manual section mentioned above to check the scale settings, or call SciLog tech support for help correcting them if you are not using the default scale. |
| When the pump is acting weird. The flows and pressures are all wrong; it gets data from the balance, but slows down way to early; etc. | Has someone messed with your PureTec? | If someone other than yourself or your supervisor has changed the settings without your knowledge, you can to return them to their original settings.<br><br>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.<br><br>Call SciLog tech support if needed. |
| | Have you had electrical problems in the building lately? | |

## B. Piston and Magnetic Gear Heads

| When this occurs: | Check the following: | Possible Solution |
|---|---|---|
| When “Check Pump Head” error occurs with your piston or magnetic gear head. | When was the last time you had the head serviced? | 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. |
| | Are you pumping a gritty solution, or one that can crystallize if allowed to dry out? | 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. |
| When your piston pump head seems to turn and the motor runs, but no fluid flows. | Either the piston is broken, or the coupler is loose. | Contact SciLog for tech support or to arrange for service for your pump and RGA# |
| When your magnetic pump head seems to turn and the motor runs, but no fluid flows. | Has the unit run dry? | 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. |
| | Is it a high viscosity fluid? | 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. |

## C. SciDoc Documentation Software

| When this occurs: | Check the following: | Possible Solution |
|---|---|---|
| When you get a “Device Error, Com Port Not Available” error from your computer. | 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 | 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?<br>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.<br>Known devices/programs that cause this error:<br>• Installed but not used Serial Mouse.<br>• RS-232 bar code reader installed on the same Com port.<br>• Hot Sync or Synchronize program for your PDA.<br>• 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. | There is no communication between the spreadsheet and the FilterTec. Check that you are using the correct cable, and that it’s installed correctly | The RS-232 cable for the PC can look nearly identical to that used for the balance. They should be labeled. |
| | WinWedge may not be running. | 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. |
| | WinWedge may not be able to access the Com Port. | You will find a button on the Taskbar indicating a “Device Error”, refer to the previous troubleshooting subject for help with Com Port errors. |

## D. PureTec 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. | Is it connected and configured correctly? | Review suggestions for the "Scale Error" problem listed above. If your not getting this error, see #2 that follows. |
| | Did you turn the Filtrate Weight Alarm off? | 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.<br><br>The lack of "Scale Initialization" occurring is a good clue. Set this alarm to either Alarm 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. |
| The pressure reading is always 0.0, even when the sensor is disconnected. | This occurs when the sensor is Zeroed when not connected, or Span is pressed instead of Zero, thereby setting the max input to a zero value. | You must perform a Factory Reset to correct this.<br><br>Following the Reset, verify the Motor RPM setting, and be sure to only Zero the sensors when they are connected!<br><br>Do not use the Span button unless the Pressure Sensor inputs are being calibrated. |

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