# PMI Logo

**Porous Materials Incorporated**

**20 Dutch Mill Road**

**Ithaca, NY 14850**

**1-800-TALK-PMI**

**Capillary Flow Porometer / Perm-Porometer**

**Instrument Testing Checklist, 14th Edition**

|  |  |
| --- | --- |
| **Customer:** | **PALL** |
| **Model #** | **CFP-1500ALC** |
| **Serial #** | **05232014-3132** |
|  |  |
| Software Version: | **CapWin # 6.74.71 Caprep # 6.74.26 Capgraph** # **1.8.8** |
| Hardware: | **Version** **# 9 Feature** # **912** |
| Flow Meters: | Low Flow - 100SCCM S/N: 6334600002 High Flow 1 – **200SLPM S/N 6860300006** |
| Pressure transducers: | HIGH – **500 PSIA S/N: 04221302**  COMPRESSION – 500 PSIA S/N: 04241273 |
| Additional : |  |
| Voltage: | **\_\_ 110 Volts \_X\_ 220 Volts** |
|  |  |
|  |  |
| Notes: |  |
|  |  |
| Test Date: | **6/6/2014** |
|  |  |
| Tested By: | **EWS** |

There are many different versions of the porometer. Many things will vary throughout these different versions, including boards and instrument components. If you have a question with any of the following procedures, the best thing to do is ask someone. If a component is not present in the instrument and thus you are unable to perform a particular step, mark “N/A.”

\_X\_\_ Required Tools

* DVM calibrated and capable of reading to 0.001 vdc and 1000 ohm
* Spring hook clips for DVM test leads (radio shack p/n 270-334)
* English open-end wrench set: 7/16 through 1 inch
* Small tip flat blade screwdriver
* Squirt bottle filled with soap water
* Drain Hose
* Ruler (or tape measure) marked in cm (Perm-Porometer Only)
* Fill Bottle (Perm-Porometer Only)
* Liquid Drain Hose (Perm-Porometer Only)
* Spanner Wrench
* Insert Puller

\_X\_\_ Inserts and O-rings

1. Locate all three sizes of inserts.
2. Get the following O-rings:

* 02-130 qty three
* 02-150 qty two

1. Inspect the O-rings for nicks and damage
2. Get a tube of vacuum grease

* Apply grease to index fingertip
* Slip each O-ring between index finger and thumb

1. Place a 02-130 into the bottom groove of the sample chamber(s)
2. On the insert for the sample chamber

* Install two 02-130 O-rings in the top and bottom grooves
* Install two 02-150 O-rings on the side grooves

\_X\_\_ Insert Fit Test

1. Place the insert into the sample chamber. Rotate the insert to align the mounting holes with the guide pins in the sample chamber. Press the insert down by hand until it is seated in the bottom of the chamber.
2. Firmly screw on the chamber lid then remove.

3) Remove the insert with the insert puller.

\_X\_\_ Cabinet Appearance

Top \_\_\_GOOD\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
  
Sides \_\_\_ GOOD \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
  
Trim \_\_\_\_\_ GOOD \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
  
Shroud \_\_\_\_\_ GOOD \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Comments \_\_\_ GOOD \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_X\_\_ Power-up the instrument

1. Check the voltage rating on the instrument (110v or 220v)
2. Connect the instrument to the correct voltage source using an appropriate power cord.
3. Turn on the instrument power switch
4. Check that the power light and 4 internal LED lights on electronics panel are lit.

The instrument needs to warm up for 30 minutes before calibration and final testing can begin.

\_X\_\_ Install or Upgrade CAPWIN software

**Most of the PMI Computers already have Capwin installed. To be sure you are using the newest version, you need to run the CAPWIN upgrade.**

1. Enter Fileserver1 > disks> Capwin >CAPWIN UPGRADE
2. Run upgrade.exe file
3. Under C:/Program Files , rename one of the Capwin folders (one for a machine that will no longer be used on that computer) as Capwin-xxxx. You will need to rename the application (.exe) and the folder in which it is contained. Make a shortcut to the desktop for ease of access.

**If you are using a computer on which the Capwin software has not been installed, you need to install it as follows:**

1) Enter Fileserver1 > disks > capwin > CAPWIN FULL INSTALL.

2) Copy and paste all the files into a temporary folder on the desktop.

1. Open the folder on the desktop and run the setup executable “setup.exe”.

4) Follow the prompts and complete the installation.

\_X\_\_ Create Customer Folders for Install Disks and Sintered Disk Testing Data

1. Go to \\**FILESERVER1\labdata\caplab\archive\disks\current year.**Create another customer folder named “customer name–xxxx” where xxxx is the last 4 digits of the instrument serial number. This folder will be used to store the customized calibration and data files for this instrument, which will be used to make install disks.
2. Go to \\**FILESERVER1\labdata\caplab\sales\current year.**Create a customer folder, just like the one in step 1 named “customer name-xxxx”. This folder will be used to store the data from sintered disk testing on the new instrument.

\_X\_\_ Copy the testing parameters default.tpf file and the Capwin.ini file:

1) Go to the directory \\**FILESERVER1\labdata\caplab\QualityControl\CFPConfigFiles**

1. Open the appropriate folder for the instrument, copy the *default.tpf and capwin.ini* files, and paste it to **C:\ProgramFiles\Capwin-xxxx.**

\_X\_\_ Capwin.ini file set up:

(Note: “file corrupted” window may pop up until calibrations are completed. If a “feature number mismatch” window pops up, the Rabbit Chip is wrong and needs to be corrected)

1. Open the CAPWIN.INI file by double clicking on the PMI logo on the main screen in CapWin. The ini file can also be opened in C:\ProgramFiles\Capwin-xxxx.
2. Set the appropriate values for the instrument using the table below and the following information:

Shown below is a table which maps the CAPWIN.INI file. Note that not every item shown in this table will always appear in the CAPWIN.INI file you are using. The first column, labeled “Field Contents”, shows the line labels in the CAPWIN.INI file.

The second column, labeled “Description”, gives a detailed description of each line label. If a default value shown in this column is preceded by the word “always”, that value will never change.

The third column, labeled “Value Entered” gives some information about what to enter, and sometimes indicates if the current line label is applicable. Use this column as a guide to set the values for the CAPWIN.INI file. For items labeled “N/A”, do not change.

If the instrument has Version 7 hardware, be aware of the following:

A - For Version 7.0 Hardware, the instrument uses a Triple BET interface board connected to a George CPU. The Windows software (CAPWIN) must be version 6.54.00 or higher. Each instrument has a secondary feature number that determines what features are in the machine.

B - For pressure Transducers – when only one pressure transducer is installed, it is designated P1 (main).

C - For Flow meters – when there is only one flowmeter in addition to the 30cc flow controller, the greater capacity flow meter is designated HF1.

1. Save any changes made to the ini file.

|  |  |  |
| --- | --- | --- |
| **Field Contents** | **Description** | **Value Entered** |
| [Capstuff] | Windows identifier | N/A |
| AIRTOP=Y | Indicates if the instrument is built for top-to-bottom or bottom-to-top flow in the sample chamber.  If the instrument was built for top-to-bottom flow (usually a hose connection), enter Y.  If the instrument was built for bottom-to-top flow (system and chamber are directly connected), enter N.  To determine, inspect plumbing configuration. | (Y or N – see description) |
| reg1pmax=80 | The maximum operating pressure of pressure gauge 1 if the instrument is rated for 500 PSI and has more than one pressure regulator (i.e. crossover). A value of 80 is recommended. | 500 PSI machine only (see description) |
| unitnumber=0 | Numbers the different machines if multiple units are being controlled by the same computer. A value of 0 is recommended (use 1, 2, 3 etc. for additional units). | (see description) |
| made\_for= | Name of customer. | (name of customer) |
| model\_number= | Model number of the machine. | (model number) |
| serial\_number= | Serial number of the machine. | (serial number) |
| capwin\_version= | Current, installed version. This number is displayed at the top bar of the window for the CAPWIN software – enter this number. | (CAPWIN version – see description) |
| caprep\_version= | Current, installed version. To find this number, open the *Report* menu from the CAPWIN software and select *Execute Report*. A dialog box will appear for the CAPREP software. The version number is displayed at the top bar of the dialog box – enter this number. | (CAPREP version – see description) |
| capgraph\_version= | Current, installed version. To find this number, open the *Report* menu from the CAPWIN software and select *Execute Report*. A dialog box will appear for the CAPREP software.  Click the button titled *Begin – Single*, another dialog box titled *Choose Porometer Data File* will appear. From *Choose Porometer Data File*, select and open a data file from a previously executed test (this will have .CFT filename extension. You should find some example files under C:\Program Files\CAPWIN\data\examples ).  A window with black text on gray background will appear – the CAPGRAPH version number is on the right of the title at the top of the window (Version of PMI/APP Graphics). | (CAPGRAPH version – see description) |
| VERSION= 7 | Instrument version. This number is listed on the title page of this document. | (usually 7, depends on instrument) |
| FEATURE= xx | Version 7 feature set used by the ROM in the instrument. To find this number, look at the George board. There should be a ROM with an adhesive stickier that has a number on it. The feature number is composed of the fourth through second-to-last characters.  Also, this number should match the feature number on the title page of this document. Enter this number. | (see description - this number should be listed on the title page) |
| EXTRAPG= Y | Indicates if a second pressure transducer was installed.  If a second pressure transducer was installed, enter Y.  If a second pressure transducer was not installed, enter N.  Also, if a second pressure transducer was not installed, the 8 lines in the CAPWIN.INI file for low pressure transducer setup are not used. | (Y or N – see description) |
| reg\_zero\_time= | Number of seconds valve 8 is open zeroing regulator  (This is applicable to instruments where the pressure regulator is controlled by a cascade circuit). | N/A |
| TEMPERATURE=N | Indicates the presence of temperature sensors, and quantity – if applicable.  If there no temperature sensors, enter N.  If there is one temperature sensor, enter 1.  If there are two temperature sensors, enter 2. | (N, 1 or 2 – see description) |
| FLUIDSENSOR=N | Indicates the presence of an auxillary fluid sensor.  If an auxillary fluid sensor is present, enter Y.  If an auxillary fluid sensor is not present, enter N. | Perm Porometer only  (Y or N – see description) |
| COMPRESSION=N | Indicates if the instrument was built to place the sample under hydraulic or pneumatic compression during testing.  If the instrument was built for compression, enter Y.  If the instrument was not built for compression, enter N.  Also, if the instrument was not built for compression (N), the 8 lines in the CAPWIN.INI file for compression pressure transducer setup are not used. | (Y or N – see description) |
| READAT = N | Programmer’s debugging variable; ignore | N/A |
| CHAMBERS=1 | Number of sample chambers installed in instrument. | (see description) |
| CFANAL=N | Indicates if the instrument is a complete filter analyzer.  If the instrument is a complete filter analyzer, enter Y.  If the instrument is not a complete filter analyzer, enter N. | (Y or N – see description) |
| five\_one\_reg=n | Indicates if the instrument was built with a 5 to 1 regulator.  If the instrument was built with a 5 to 1 regulator, enter Y.  If the instrument was not built with a 5 to 1 regulator, enter N.  To determine, inspect the inside of machine. Also refer to the title page of this document (they should match). | (Y or N – see description) |
| v2percent=25 | Percentage to open valve 2 for various test stages; smaller is better, but not too small. 25 is a good starting value. | N/A |
| 3wayvalve=y | Indicates if instrument has a 3-way valve  If the instrument has 2 regulators, it will have a 3 way valve.  (“Versa” valve – pneumatically actuated).  If the instrument has such a 3-way valve, enter Y.  If the instrument does not have such a 3-way valve, enter N.  Inspect plumbing of instrument to determine. | (Y or N – see description) |
| SqrPore=N | Indicates whether to enable square pore conversion in Autotest screen.  Unless otherwise specified on title page, default is “N”.  (To determine, see information related to purchse). | (Y or N – see description) |
| MAXLQFLOW= 10000 | Indicates the maximum liquid flow capability of instrument (Perm-Porometer only) in cc/min.  This number is set by the software during the max-liquid calibration routine. | N/A |
| MAXAIRFLOW= 10000 | Max. air flow capability of the instrument cc/min.  This number is set by the software during the Lohm and Max Air Flow calibration routine. | N/A |
| H2OPERM= N | Is a Penetrometer installed?  If the instrument is a Perm-Porometer enter Y.  If the instrument is a Capillary Flow Porometer enter N. | (Y or N – see description) |
| WESA=N | “Y” if machine can do WESA (envelope surface area) testing.  “E” if machine does only WESA testing.  “N” by default.  (To determine, see information related to purchase). | (Y ,N or E – see description) |
| HYDROHEAD=N | “Y” if machine is capable of hydro head testing.  (To determine, see information related to purchase). | (Y or N – see description) |
| External Hydrohead=N | “Y” if machine has external fixture for hydro head testing.  (To determine, see information related to purchase). | (Y or N – see description) |
| Second\_penetrometer=N | Indicates if the instrument has more than one penetrometer.  If the instrument has more than one penetrometer, Enter Y.  If the instrument does not have more than one penetrometer, Enter N. | Perm Porometer only (see description) |
| AUTOFILL= N | Indicates if the Perm Porometer AutoFill option installed?  If the AutoFill option is installed, enter Y.  If the Autofill option is not installed, enter N.  (Always enter N for Capillary Flow Porometers). | Perm Porometer only (see description) |
| TOPFILL=N | Indicates if the instrument is a top filling Perm Porometer.  If the instrument is a top filling Perm Porometer, enter Y.  If the instrument is not a top filling Perm Porometer, enter N. | Perm Porometer only (see description) |
| CLIMIT=2000 | Close limit counts for motorized valve (valve 2) (This is set in manual mode before doing valve calibration). | N/A |
| OLIMIT= 62000 | Open limit counts for motorized valve (valve 2) (This is set in manual mode before doing valve calibration). | N/A |
| PEN20500= | cm height of water column when penetrometer is almost empty. | Perm Porometer only (see description) |
| PEN500= | cm height of water column when penetrometer is almost full. | Perm Porometer only (see description) |
| CSECAREA= | cross sectional area of penetrometer, in square cm. | Perm Porometer only (see description) |
| PSIPERCM= 0.014209 | PSI per cm of water, usually based on the density of water. | N/A |
| DIFFPG=N | If a microflow analysis pressure transducer has been installed, enter Y.  If a microflow analysis pressure transducer was not installed, enter N. If it was not installed, the 8 lines in the CAPWIN.INI file for microflow pressure transducer setup are not used.  (To determine, see information related to purchase). | (Y or N – see description) |
| Diff\_Volume = | Differential volume of chamber – used by microflow and diffperm, set automatically by software. | N/A |
| debug=nfs | Programmer’s debug tool – ignore. | N/A |
|  | **For flow meters and pressure transducers circle the component value in the corresponding field** | N/A |
| ; | **low flow meter/flow controller (10, 30, or 100)** | N/A |
| FX1\_00 = 2000 | Min. counts for low flow meter/flow controller.  For version 6, always 500.  For version 7, always 2000. | N/A |
| FX2\_00 = 62000 | Max. counts for low flow meter/flow controller.  For version 6, always 20500.  For version 7, always 62000. | N/A |
| FY1\_00 = 0 | Zero value for low flow meter/flow controller (always 0). | N/A |
| \* FY2\_00 = 10 | Indicates the range of the low flow meter/flow controller (in cc/min).  Enter the range of the low flow meter/flow controller in cc/min (10, 30 or 100). Do not enter units.  If the instrument is a gas permeameter, enter 0. | (see description) |
| FX1\_01 = 2000 | Min. counts for low flow meter/flow controller.  For version 6, always 500.  For version 7, always 2000. | N/A |
| FX2\_01 = 62000 | Max. counts for low flow meter/flow controller.  For version 6, always 20500.  For version 7, always 62000. | N/A |
| FY1\_01 = 0 | Zero value for low flow meter/flow controller (always 0). | N/A |
| \* FY2\_01 = 4 | 2/5 of the range of the low flow meter/flow controller (in cc/min).  Corresponding to the range of the low flowmeter /flow controller (in cc/min), enter 2/5 of this range (4, 12, or 40).  If the instrument is a gas permeameter, enter –1. | (see description) |
| ; | **high flow transducer 1 (5000 or 10,000)** | N/A |
| FX1\_10 = 2000 | Min. counts for high flow meter 1.  For version 6, always 500.  For version 7, always 2000. | N/A |
| FX2\_10 = 62000 | Max. counts for high flow meter 1.  For version 6, always 20500.  For version 7, always 62000. | N/A |
| FY1\_10 = 0 | Zero value for high flow meter 1 (always 0). | N/A |
| \* FY2\_10 = 5000 | Indicates the range of the high flow meter in **cc/min.**  (Note: High Flow Meter is labeled in L/min. 1L=1000 cc)  For a 5000 cc/min. high flowmeter, enter 5000.  For a 10000 cc/min. high flowmeter, enter 10000.  For a bubble point tester, enter 0. | (see description) |
| FX1\_11 = 2000 | Min. counts for high flow meter 1.  For version 6, always 500.  For version 7, always 2000. | N/A |
| FX2\_11 = 62000 | Max. counts for high flow meter 1.  For version 6, always 20500.  For version 7, always 62000. | N/A |
| FY1\_11 = 0 | Zero value for high flow meter 1 (always 0). | N/A |
| \* FY2\_11 = 2000 | 2/5 of the the range of the high flow meter in cc/min.  For a 5000 cc/min. high flowmeter, enter 2000.  For a 10000 cc/min. high flowmeter, enter 4000.  For a bubble point tester, enter 0. | (see description). |
| ; | **high flow transducer 2 (200,000 or 500,000)** | N/A |
| FX1\_12 = 2000 | Min. counts for high flow meter 2.  For version 6, always 500.  For version 7, always 2000. | N/A |
| FX2\_12 = 62000 | Max. counts for high flow meter 2.  For version 6, always 20500.  For version 7, always 62000. | N/A |
| FY1\_12 = 0 | Zero value for high flow meter 2 (always 0). | N/A |
| \* FY2\_12 = 200000 | Indicates the range of high flow meter 2 in cc/min.  For a 200,000 cc/min. high flowmeter 2, enter 200000.  For a 500,000 cc/min. high flowmeter 2, enter 500000. | High flowmeter 2 only (see description) |
| FX1\_13 =2000 | Min. counts for high flow meter 2.  For version 6, always 500.  For version 7, always 2000. | N/A |
| FX2\_13 = 62000 | Max. counts for high flow meter 2.  For version 6, always 20500.  For version 7, always 62000. | N/A |
| FY1\_13 = 0 | Zero value for high flow meter 2 ( always 0). | N/A |
| \* FY2\_13 = 80000 | 2/5 the range of high flow meter 2 in cc/min.  For a 200,000 cc/min. high flowmeter 2, enter 80000.  For a 500,000 cc/min. high flowmeter 2, enter 200000. | High flowmeter 2 only (see description) |
| ; | **High flow transducer 3 (500,000 or 2,000,000)** |  |
| FX1\_14 = 2000 | Min. counts for high flow meter 3. | N/A |
| FX2\_14 = 62000 | Max. counts for high flow meter 3. | N/A |
| FY1\_14 = 0 | Zero value for high flow meter 4. | N/A |
| FY2\_14 = 500000 | Indicates the range of high flow meter 3 in cc/min. | N/A |
| FX1\_15 = 2000 | Min. counts for high flow meter 3. | N/A |
| FX2\_15 = 62000 | Max. counts for high flow meter 3. | N/A |
| FY1\_15 = 0 | Zero value for high flow meter 3. | N/A |
| FY2\_15 = 200000 | 2/5 the range of the high flow meter 3 in cc/min. | N/A |
| ; | High flow transducer () | N/A |
| FX1\_16 = 2000 | Min counts for high flow meter. | N/A |
| FX2\_16 = 62000 | Max counts for high flow meter. | N/A |
| FY1\_16 = 0 | Zero value for high flow meter. | N/A |
| FY2\_16 = 200000 | Indicates the range of the high flow meter. | N/A |
| FX1\_17 = 2000 | Min counts for high flow meter. | N/A |
| FX2\_17 = 62000 | Max counts for high flow meter. | N/A |
| FY1\_17 = 0 | Zero value for high flow meter. | N/A |
| FY2\_17 = 80000 | Indicates the range of the high flow meter. | N/A |
| ; | **main or high pressure transducer (110, 250, or 500 PSIA)** |  |
| PX1\_0 = 2000 | Min. counts for pressure transducer 1.  For version 6, always 500.  For version 7, always 2000. | N/A |
| PX2\_0 = 62000 | Max. counts for pressure transducer 1.  For version 6, always 20500.  For version 7, always 62000. | N/A |
| PY1\_0 = 0 | Zero value for pressure transducer 1 (usually 0, except when using differential pressure transducer, then it is atmospheric pressure in PSI). | (see description) |
| \* PY2\_0 = 110 | Range of pressure transducer 1 (in PSI). When using differential pressure transducer, should be absolute value for range (110, 250, or 500). | (see description) |
| PX1\_1 = 2000 | Min. counts for pressure transducer 1.  For version 6, always 500.  For version 7, always 2000. | N/A |
| PX2\_1 = 62000 | Max. counts for pressure transducer 1.  For version 6, always 20500.  For version 7, always 62000. | N/A |
| PY1\_1 = 0 | Zero value for pressure transducer 1 (usually 0, except when using differential pressure transducer, then it is atmospheric pressure in PSI). | (see description) |
| \* PY2\_1 = 22 | 1/5 range of pressure transducer 1 (in PSI). When using differential pressure transducer, should be absolute value for range (22, 50, or 100). | (see description) |
| ; | **low or extra pressure transducer (5 PSIG)** | N/A |
| PX1\_2 = 2000 | Min. counts for pressure transducer 2.  For version 6, always 500.  For version 7, always 2000. | N/A |
| PX2\_2 = 62000 | Max. counts for pressure transducer 2.  For version 6, always 20500.  For version 7, always 62000. | N/A |
| \* PY1\_2 = 14.7 | Zero value for pressure transducer 2  14.7 for differential.  0 for absolute. | Pressure Transducer 2 only (see description) |
| \* PY2\_2 = 19.7 | Range of pressure transducer 2 (in PSI). When using differential pressure transducer, should be range + atmospheric pressure. | Pressure Transducer 2 only (see description) |
| PX1\_3 = 2000 | Min. counts for pressure transducer 2.  For version 6, always 500.  For version 7, always 2000. | N/A |
| PX2\_3 = 62000 | Max. counts for pressure transducer 2.  For version 6, always 20500.  For version 7, always 62000. | N/A |
| \* PY1\_3 = 14.7 | Zero value for pressure transducer 2 (usually 0, except when using differential pressure transducer, then it is atmospheric pressure in PSI). | Pressure Transducer 2 only (see description) |
| \* PY2\_3 = 15.7 | 1/5 range of pressure transducer 2 (in PSI). When using differential pressure transducer, should be 1/5 range + atmospheric pressure.. | Pressure Transducer 2 only (see description) |
| ; | **micro flow pressure transducer (100 torr Differential)** | N/A |
| PX1\_4 = 2000 | Min. counts for micro pressure transducer.  For version 6, always 500.  For version 7, always 2000. | N/A |
| PX2\_4 = 62000 | Max. counts for micro pressure transducer.  For version 6, always 20500.  For version 7, always 62000. | N/A |
| PY1\_4 = 14.5 | Zero value for micro pressure transducer (atmospheric pressure for differential pressure gauge). | Microflow only (see description) |
| PY2\_4 = 16.4342 | Range for micro pressure transducer (scale + atmospheric pressure). | N/A |
| PX1\_5 = 2000 | Min. counts for micro pressure transducer.  For version 6, always 500.  For version 7, always 2000. | N/A |
| PX2\_5 = 62000 | Max. counts for micro pressure transducer.  For version 6, always 20500.  For version 7, always 62000. | N/A |
| PY1\_5 = 14.5 | Zero value for micro pressure transducer (atmospheric pressure for differential pressure gauge). | Microflow only (see description) |
| PY2\_5 = 14.8868 | 1/5 range of micro pressure transducer (add 0.386842 to PY1\_5). | N/A |
| ; | **Compression pressure transducer (110, 250 or 500 PSIG)** | N/A |
| PX1\_6 = 2000 | Min. counts for compression transducer.  For version 6, always 500.  For version 7, always 2000. | N/A |
| PX2\_6 = 62000 | Max. counts for compression transducer.  For version 6, always 20500.  For version 7, always 62000. | N/A |
| PY1\_6 = 0 | Zero value for compression transducer. | N/A |
| PY2\_6 = 250 | Range for compression transducer. | N/A |
| PX1\_7 = 2000 | Min. counts for compression transducer.  For version 6, always 500.  For version 7, always 2000. | N/A |
| PX2\_7 = 62000 | Max. counts for compression transducer.  For version 6, always 20500.  For version 7, always 62000. | N/A |
| PY1\_7 = 0 | Zero value for compression transducer. | N/A |
| PY2\_7 = 50 | 1/5 range of compression transducer. | N/A |
| PX1\_8=2000 | Min. counts for piston position transducer. | N/A |
| PX2\_8=62000 | Max counts for piston position transducer | N/A |
| PY1\_8=0 | Zero value for piston position transducer. | N/A |
| PY2\_8=110 | Range for piston position transducer. | N/A |
| ; | **Slurry tube pressure transducer** |  |
| PX1\_10 = 2000 | Min. counts for slurry tube transducer. | N/A |
| PX2\_10 = 62000 | Max counts for slurry tube transducer. | N/A |
| PY1\_10 = 0 | Zero value for slurry tube transducer. | N/A |
| PY2\_10 = 110 | Range for slurry tube transducer. | N/A |
| ; | **load cell transducer** | N/A |
| FSX0=2000 | Min. count value for load cell transducer.  For version 6, always 500.  For version 7, always 2000. | N/A |
| FSX1=62000 | Max. count value for load cell transducer.  For version 6, always 20500.  For version 7, always 62000. | N/A |
| FSY0=0 |  | N/A |
| FSY1=200 | Range of load cell. | N/A |
| FSUNIT=Grams |  |  |
| ; | **temperature transducer** | N/A |
| TSXO=2000 | Min. counts for temperature transducer.  For version 6, always 500.  For version 7, always 2000. |  |
| TSX1 = 62000 | Max. counts for temperature transducer.  For version 6, always 20500.  For version 7, always 62000. | N/A |
| TSY0 = 0 |  | N/A |
| TSY1 = 150 | maximum temperature, enables manual control, etc. | N/A |
| TSUNIT = Celsius | Units- this is text that gets displayed (Celsius or Fahrenheit). | N/A |
| safetyup=N | “Y” if machine has compression and is raising piston safely. “N” otherwise.  “A” for safety door | Compression only (see description) |
| safetydown=N | “Y” if machine has compression and is lowering piston safely.  “N” otherwise.  “A” for safety door | Compression only (see description) |
| LOOPINGDEMO=N | “Y” if machine should run a continuously looping BP or CFP test. Default is “N” | (see description) |
| debugh20perm=N | Programmers debug tool; ignore. | N/A |
| debugBP=N | Programmers debug tool; ignore. | N/A |
| recirculation=N | “Y” if recirculating liquid perm. option is on. | Perm Porometer only (see description) |
| doorlock=N | “Y” if system has a door lock. | (see description) |
| supervisor = Y | “Y” if CAPWIN is running in supervisor mode.  “N” for user mode. | N/A |
| motorized\_compression\_ regulator=N | Indicates if there is a regulator for controlling the piston.  “Y” if the machine was built for compression testing.  “N” if the machine was not built for compression testing. | Compression only (see description) |
| max\_bp\_pres\_dif=20 | Starting pressure differential for BP test (always 20). | N/A |
| reverse\_flow\_controller=0 | Indicates if the system has a reversed flow controller.  If it has a reversed flow controller, the value is 1.  If it does not have a reversed flow controller, the value is 0.  This can be determined by inspection (for a reversed flow controller, the controller is attached by cable to an external trimpot). | (1 or 0 – see description) |
| bottom\_fill\_point=0 | cm value for penetrometer initial fill. Only for auto fill systems. Mainly used on auto fill systems where the penetrometer is partway below and partway above the sample. Set this value so the sample isolation valve is shut  off after the sample is fully filled and starts leaking so the penetrometer can continue filling. Set to 0 to disable this and not shut off the sample isolation valve during filling. | Perm Porometers only (see description) |
| Sample\_zero\_point=0 | cm value for true zero point of sample. Usually 0. | Perm Porometers only (see description) |
| penetrometer\_start\_test\_point=49.4 | cm value for start of test. Defaults to pen500 value. No readings will be taken until the penetrometer level gets below this value. One possible cause of not taking any data points would be “penetrometer\_start\_test\_point”. If this is set too low, no data will be taken. | Perm Porometers only (see description) |
| max\_fill point=49.4 | cm value for stop of filling. Defaults to pen500 value. Only used on auto fill machines. | Perm Porometers only (see description) |
| minimum\_liquid\_test\_stop\_point=36.55 | cm value for minimum point on penetrometer when it is safe to stop the test. Defaults to half way between pen500 and pen20500. If the last data point is taken above this height value, the test will continue but not take any data until the penetrometer has gone below this height value. | Perm Porometers only (see description) |
| xignore=50 | Number of readings ignored before taking an actual reading. Not used in version 6 machines.  A value between 50 and 100 is acceptable (50 is recommended). | (see description) |
| Xmult=50 | Number of readings taken and averaged together; not used in version 6 machines.  A value between 50 and 100 is acceptable (50 is recommended). | (see description) |
| Compression\_pressure= | Pressure of compression currently being used; default is 20. | (see description) |
| SimpleQC= | “Y” if CAPWIN is running in QC mode; “N” otherwise. | (see description) |
| FrazierTester=N | “Y” sets the title screen label to an “Automated Frazier Tester” | Y or N |
| HasHumidityControls=N | Indicates whether the system contains humidity controls. | Y or N |
| HumidityGaugeNumber=8 | This is the gauge channel of the humidity sensor, corresponding to a location on the board. | (see description) |
| HumidityRegulatorPosition=3 | Indicates the analog position where the humidity regulator is connected to the board. | 1-4 |
| humiditySensorZeroCounts=2000 | Min. counts for humidity sensor. | N/A |
| humiditySensorFullCounts=31000 | Max counts for humidity sensor. | N/A |
| Autopiston=N | Indicates whether the system has a special autopiston clamping machine. | Y or N |
| Vacuum\_purge\_enable=N | Enables the Vacuum Purge menu from the Execute menu. | Y or N |
| Num\_vacuum\_purge\_cycles=1 | Determines the number of consecutive vaccum cycles that will be run for a purge. | N/A |
| bubbler\_enable=N | Indicates whether a bubble attachment is connected to the machine. | Y or N |
| BubblerLevelChannel=-1 | This is the gauge channel of the bubbler level sensor. A positive value is required for a bubbler sensor. | N/A |
| BubblerLevelZero=2000 | Min. counts for bubbler sensor. | N/A |
| BubblerLevelSpan=62000 | Max counts for bubbler sensor. | N/A |
| auto\_wet\_enable=N | Indicates whether the system has auto wetting hardware installed | Y or N |
| status\_lights\_enable=N | Indicates whether the system has a test running status light. | Y or N |
| pen\_max\_counts= DAC\_span \* 0.975 + DAC\_zero | Max counts for the penetrometer level sensor. When this value is reached, the penetrometer is empty. | N/A |
| pen\_min\_counts=DAC\_zero | Min counts for the penetrometer level sensor. When this value is reached, the penetrometer is full. | N/A |
| V22\_exists=N | Indicates whether the system has an extra recirculation valve. (only used for Ballard) | Y or N |
| piston\_position\_transducer\_exists=N | Indicates whether the system has a piston position transducer. | Y or N |
| slurry\_tube\_exists=N | Indicates whether the system has a slurry tube. | Y or N |
| valve\_limit\_offset=0 | This can be used to adjust the closed limit of the motor valve. Use this if the MV2 is getting stopped just before it is closed. | N/A |
| reg2\_high\_flow\_switch\_count=300 | This is a user-defined position to start the second regulator when switching to high flow but allowing it to maintain the same pressure | N/A |
| lvperm\_enable=N | Indicates if the system has a liquid vapor perm system installed. | N = No  Y = Yes  E = Only lvperm |
| aux\_p1\_span=100 | This is the adjusted span for the first auxiliary pressure gauge used in lvperm tests. | N/A |
| aux\_p2\_span=100 | This is the adjusted span for the second auxiliary pressure gauge used in lvperm tests. | N/A |
| lvperm\_numvalves=0 | Determines how many valves a lvperm machine has. | 5 = normal  6-9 = 9 valves |
| microflow\_extraChamber=0 | Indicates that microflow uses a separate chamber and will use valve 4 to switch to that chamber. | 1 or 0 |
| use\_time=N | Indicates that the system will log time information with all data points. | Y or N |
| external\_watlow\_com\_number=0 | Indicates the PC COM port that is connected to the watlow. Newer machines have the watlow connected to the board instead. | 1 or 0 |
| dryChamberTemperature=0 | Indicates how the dry chamber temperature sensor is connected on newer systems. | 0, G1, G2, R1A, R1B, R2A, C1A, C1B, C2A |
| wetChamberTemperature=0 | Indicates how the wet chamber temperature sensor is connected on newer systems. | 0, G1, G2, R1A, R1B, R2A, C1A, C1B, C2A |
| reservoirTemperature=0 | Indicates how the reservoir temperature sensor is connected on newer systems. | 0, G1, G2, R1A, R1B, R2A, C1A, C1B, C2A |
| mettler\_fluid\_min=0 | This is needed when using a balance instead of a penetrometer. Used in place of PEN500. | N/A |
| mettler\_fluid\_max=40 | This is needed when using a balance instead of a penetrometer. Used in place of PEN20500 | N/A |
| mettler\_fluid\_density=1.0 | This is required when using a balance instead of a penetrometer. | N/A |
| mettler\_negative\_counts\_offset=-100 | This is an initial offset for the auto test that will get the initial pen counts in range. | N/A |
| mettler\_fluid\_flow\_max=10 | This determines the maximum amount of flow in mL before stopping the test. | N/A |
| max\_liq\_pres=200 | This is the maximum liquid permeability pressure. | N/A |
| lperm\_initializeRegulatorPressure=0 | This is a new parameter for elevated liquid permeability tests. Defaults to 0.5 PSI even if the value is 0. | N/A |
| lperm\_regulatorIncrementSteps=0 | This is a new parameter for elevated liquid permeability tests. Defaults to 1 even if the value is 0. | N/A |
| lperm\_autoFillVentTime=-1 | This parameter determines how long the system will vent after auto filling. Defaults to 5 seconds if the value is -1. | N/A |
| 2PEN500=53.34 | Cm height of water column when second penetrometer is almost full. | N/A |
| 2PEN20500=27.94 | Cm height of water column when second penetrometer is almost empty. | N/A |
| 2CSEAREA=0.3166922 | Cross sectional area of second penetrometer, in square cm. | N/A |
| 2PSIPERCM=0.014209 | PSI per cm of water, usually based on density of water for the second penetrometer. | N/A |
| Second\_Penetrometer\_V9=9 | This is the valve position of the venting valve for the second penetrometer. | N/A |
| Second\_Penetrometer\_V12=12 | This is the valve position of the isolation valve for the second penetrometer. | N/A |
| Second\_Penetrometer\_V13=13 | This is the valve position of the fill valve for the second penetrometer. | N/A |
| MinBubFlow= 5 or 10 | This is the minimum flow for a bubble point test. Will default to 5 or 10 depending on what pressure gauges are installed. | N/A |
| Air\_Inlets=-42 | Determines how many air inlets there are for the machine. A default value of -42 is set to 1 inlet. | N/A |
| Air\_Inlet\_1\_Max\_P=-42 | Determines that pressure that the machine will switch to the second air inlet. A default value of -42 is set to 100. | N/A |
| second\_regulator\_starting\_point=0 | The number of counts on the second regulator that equals the 4000 count point of the first regulator.  Set this value after calibrating regulators:  Plug hose or insert a blank to allow pressure to build up.  Under Manual Control, select “air inlet 2” and “regulator 2”. Open valve 2 to 30-50%  Increase the regulator until just under 80 PSI.  Set second\_regulator\_starting\_point= to the number of counts of the regulator at just under 80 PSI. | N/A |
| switch\_high\_flow\_enabled=0 | Allows for the switching to the second high flow without moving V10. | 1 or 0 |
| network\_connection\_enabled=42 | Indicates that the machine can be connected to through a network connection. Default of 42 is changed to false. | 42, 1, 0 |
| Border=0000FF | This determines the color of the border for all forms. It is stored as three hexadecimal numbers representing RGB. | 000000-FFFFFF |
| penet\_refill\_delay=0 | This is an optional time delay before allowing pressure to hit the penetrometer after refilling. | 1 or 0 |
| CVRegInc=4 | This value is used for regulator incrementing during lohm calibrations. | N/A |
| Lohm\_Tolerance=50 | This value determines what is the maximum acceptable lohm calibration values to keep. | N/A |
| Penetrometer\_Select=1 | Determines which penetrometer is currently selected. | N/A |
| PSIPERCC=0 | This is the PSI/MIN increase per CC/MIN flow into the system during a hydrohead test. If this parameter is present, the hydro-head test will ask for the rate of pressure increase. If not present, it will ask for the flow rate. | N/A |
| Superpass=”” | This is the password for the super user account. | N/A |
| Debug\_button\_enable=N | This shows a debug button on the manual controls screen that can be used to create a debug.txt file with pressure and flow information in it. | Y or N |
| FrazierPressureGauge=N | Added support for external frazier pressure gauge if "FrazierPressureGauge" is "Y", the microflow pressure gauge is replaced by an external Frazier pressure gauge which is activated when the maxpress parameter is set less than or equal to the maximum pressure of the diffpg. If there is a Frazier pressure gauge, there is no microflow venting valve. | Y or N |
| Log\_comm=N | Determines if comm errors are to be logged. | Y or N |
| PDrop=N | Determines if this machine can run a gas permeability pressure drop test. | Y or N |
| CV=N | This variable is used to disable the lohm calibration calculations. | Y or N |
| Hflow1\_Disable=-1 | This variable disables high flow lohm calibration. | 0 or 1 |
| Xhflow\_meters=0 | Indicates how many extra high flow meters are in the machine. | 0, 1, 2 |
| Piston\_area = 1 | This is the compression piston cross sectional area. It defaults to 1 square inch. | N/A |
| Compression\_Increase\_Factor=0 | This is the amount to increase the compression pressure when testing to make sure there is more compression pressure than system pressure. | N/A |
| Fixed\_sample\_diameter\_cm=1 | This is the diameter of the sample if use\_fixed\_sample\_diameter\_cm is used. | N/A |
| Use\_fixed\_sample\_diameter\_cm=N | Indicates that the system has a fixed sample size. | Y or N |
| Servo\_table\_exists = N | This variable enables the servo controls in the Manual Control screen. | Y or N |
| Tank\_level\_exists = N | Indicates that a tank level sensor is installed in the machine. | Y or N |
| Min\_tank\_fill\_level = 80 | Determines at what level a fill procedure will stop filling the tank. | N/A |
| Tank\_level\_location = 38 | Indicates the gauge channel of the tank level sensor. | N/A |
| tankFullCounts = 63000 | This is the count value of the sensor for when the tank is full. | N/A |
| tankZeroCounts = 2000 | This is the count value of the sensor for when the tank is empty. | N/A |
| Slurry\_wash\_pump\_max\_flow\_cc = 2300 | This is used to calculate the flow. | N/A |
| Slurry\_tube\_almost\_empty\_counts = 20720 | This is the count value for when the slurry tube is almost empty. | N/A |
| Slurry\_tube\_almost\_empty\_cm = 2.54 | This is the cm value for when the slurry tube is almost empty. | N/A |
| Slurry\_tube\_almost\_full\_counts = 57000 | This is the count value for when the slurry tube is almost full. | N/A |
| Slurry\_tube\_almost\_full\_cm = 27.94 | This is the cm value for when the slurry tube is almost full. | N/A |
| WashTankVolume\_cc = 2839.0 | This is the volume of the slurry wash tank. | N/A |
| Dry\_Chambers = 1 | This is used in place of multi-chamber system for machines that have one wet chamber but several dry chambers. | N/A |
| Reg\_pulse\_min = 12 | This is used to control the increment for motorized regulators. | N/A |
| Reg\_pulse\_max = 12 | This is used to control the increment for motorized regulators. | N/A |
| MAXLQFLOW2 = 1000000 | Indicates the maximum liquid flow for the second penetrometer. | N/A |
| Liquid\_lohm = 0 | Used to properly correct for pressure drop based on liquid flow rate during liquid permeability tests. | N/A |
| Liquid\_lohm2 = 0 | Used to properly correct for pressure drop based on liquid flow rate during liquid permeability tests using the second penetrometer. | N/A |
| xjiffy = 6 | This is a time value used for pulsing motor valves. | N/A |
| ReserveTankLevelChannel = -1 | Indicates the position of the reserve tank level sensor. Positive values indicate that the sensor exists. | Numeric |
| ReserveTankLevelZero = 2000 | This is the zero point count value for the reserve tank level sensor. | Numeric |
| ReserveTankLevelSpan = 62000 | This is the span count value for the reserve tank level sensor. | Numeric |
| ReserveTankFillLightValve = -1 | This is the position of the valve that turns the fill light on and off. | Numeric |
| ReserveTankRefillPercent = 25 | This is the tank level percent that will trigger a refill operation | 0 – 100% |
| Valve\_23\_exists = N | Indicates whether the liquid drain valve exists. | Y or N |
| FrazierChamberValve = 0 | Indicates the position of the valve that needs to be opened to utilize the Frazier chamber. | Numeric |
| Debug\_menu\_visible = N | Indicates whether the debug menu is visible from the Title Screen. | Y or N |
| Piston\_delay\_time = 0 | This value is used to allow the chamber to seal for slow pistons. | Numeric |
| pneumaticSwitchValveForPiston = False | This determines if the piston is controlled by a pneumatic fast switching valve. | True or False |
| Pretreat\_time = 0 | This is the pretreatment time in seconds for dual stage regulators. | Numeric |
| Pretreat\_flow = 0 | This is the amount of flow for pretreatment in cc/min. | Numeric |
| First\_flow\_starting\_point\_percent = 100 | This parameter is used to determine start point of regulator (based on flow through flow controller) 100% means use SBPP. 10% means use SHFP. | 0 – 100% |
| Iso\_valve\_string = abcdefg | This is used in multi chamber systems to determine which chambers exists and according which valves will be used to select those chambers. | String |
| manualMultiChamber = N | Indicates whether a multi chamber system is manual or automatic chamber control. | Y or N |
| Safe\_temperature = 0 | This is a system wide safe temperature used with temperature control systems. | Numeric |
| Num\_sample\_pressure\_gauges = 0 | Used to store the number of sample pressure gauges. This is a new feature to switch between top pressure and inline pressure. | Numeric |
| Cartridge\_tester = N | Determines if the system is a dual sided cartridge tester. | Y or N |
| Cartridge\_tester\_side = 0 | Used to read what is the current side being tested. 0 = media. 1 = cartridge. | 0 or 1 |
| Num\_Microflow\_Volumes = 0 | Determines the number of microflow volumes being used. | Numeric |
| Current\_Microflow\_Volume\_Index = 1 | This indicates which volume is being used currently. | Numeric |
| microFlowUseAllVolumes | Determines if a microflow test should use all volumes by stepping from one to the next. | 1 or 0 |
| Microflow\_Volume2\_Valve = 22 | Indicates the valve position for switching to the second microflow volume. | Numeric |
| Diff\_Volume2 = 0 | Indicates the actual volume of the second microflow container. | Numeric |
| Microflow\_Volume3\_Valve = 23 | Indicates the valve position for switching to the third microflow volume. | Numeric |
| Diff\_Volume3 = 0 | Indicates the actual volume of the third microflow container. | Numeric |
| Resin\_Diverter\_Valve = 0 | This is the number of the valve used to switch to the resin system. A value of 0 means there is no resin system. | Numeric |
| Resin\_Fill\_Height = -4 | This is the level in cm that it will fill the chamber to. | Numeric |
| Resin\_Start\_Height = 0 | This is the level in cm that the test will start at. | Numeric |
| Resin\_Drain\_Seconds = 30 | This is how many seconds to leave the drain open. | Numeric |
| Resin\_Start\_Pressure = 0 | This is the pressure that the test will begin at. | Numeric |
| Resin\_Increment\_Pressure = 5 | This is the amount to increment the pressure between data points. | Numeric |
| Resin\_Number\_Points = 10 | This is the number of data points to take for each resin test. | Numeric |
| Resin\_Stable\_Seconds = 10 | This is the amount of time in seconds to wait for pressure to stabilize. | Numeric |
| SampleChamberDiverterValve = -1 | This is the valve position of the sample chamber diverter valve for an external chamber. A value of -1 means that there is no such valve. | Numeric |
| DivertSampleChamber = N | Determines if the machines is currently diverting away from the sample chamber. | Y or N |
| Top\_down\_lp = N | Indicates the flow pattern for liquid permeability tests. | Y or N |
| minFPT = 50 | Allows a user to define a minimum F/PT value, lower than the default 50. | Numeric |
| Test\_piston = N | Allows the use of a test piston dialog from the manual control screen. | Y or N |
| High\_temp\_pressure\_gauge = N | Indicates that the system has a high temp pressure gauge. These pressure gauges require a special calibration file sent from the manufacturer. | Y or N |
| Mv#1\_index\_char = B | This value is the control character that is sent to the control board in order to affect this motor valve. | Rabbit dependant |
| Has\_multiple\_mvs = N | Indicates that the system has more than one motor valve. | Y or N |
| Number\_of\_motor\_valves = 1 | Indicates how many motor valves are in the machine. Only needed if has\_multiple\_mvs is true. | Numeric |
| Mv#2\_index\_char = ‘ | This value is the control character that is sent to the control board in order to affect this motor valve. | Rabbit dependant |
| Mv#2\_start\_pos = 0 | This value indicates the starting regulator position when switching to this motor valve. | 0 – 4000 |
| Mv#3\_index\_char = S | This value is the control character that is sent to the control board in order to affect this motor valve. | Rabbit dependant |
| Mv#3\_start\_pos = 0 | This value indicates the starting regulatorposition when switching to this motor valve. | 0 - 4000 |
| CLIMIT2 = 2000 | The closed limit for the second motor valve. | Numeric |
| OLIMIT2 = 14000 | The open limit for the second motor valve. | Numeric |
| CLIMIT3 = 2000 | The closed limit for the third motor valve. | Numeric |
| CLIMIT3 = 14000 | The open limit for the third motor valve. | Numeric |
| Number\_of\_pistons = 1 | Determines how many pistons are in the machine. | Numeric |
| Piston\_valve\_1 = 15 | Indicates which valve is to be used for the first piston. | Numeric |
| Piston\_valve\_2 = 26 | Indicates which valve is to be used for the second piston. | Numeric |
| Piston\_valve\_3 = 27 | Indicates which valve is to be used for the third piston. | Numeric |
| Number\_of\_wetting\_valves = 0 | Determines how many wetting valves are in the machine. | Numeric |
| Wetting\_valve\_1 = 22 | Indicates which valve is to be used for the first wetting valve. | Numeric |
| Wetting\_valve\_2 = 23 | Indicates which valve is to be used for the second wetting valve. | Numeric |
| Wetting\_valve\_3 = 24 | Indicates which valve is to be used for the third wetting valve. | Numeric |
| No\_chamber\_bypass = 0 | When set to 1 it notes that you can't bypass the sample chamber when doing calibrations. | 0 or 1 |
| Wetting\_valves\_latch = Y | Determines if the wetting valves in the system are latching valves or not. | Y or N |
| Chamber\_Volume = -1 | Indicates the value of the volume of the chamber. | Numeric |
| Chamber\_Volume# = -1 | Indicates the value of the volume of the # chamber. | Numeric |
| Sequential\_testing\_enabled = N | Indicates that the multi-chamber system has the ability to do sequential testing. | Y or N |
| Second\_piston = 8 | This is the valve position for the second piston. | Numeric |
| Use\_second\_regulator\_only = N | Indicates that the system should only use the high regulator. | Y or N |
| CalibrateWindow = N | Determines if the calibrate menu will appear in manual control. | Y or N |
| Auto\_wet\_used = N | Indicates whether a system with auto wetting capabilities is using auto wetting. | Y or N |
| Xregstep = 10 | Determines the amount of regulator increase used during a diff perm test. | Numeric |
|  |  |  |
| [board.loc] |  |  |
| PA = 1 | Current serial port: port number (1,2,…). Use –1 for demo mode. | N/A |
| [UnitDefs] |  |  |
| unitdef1=--- | User-defined pressure units. |  |
| unitdef2=--- | User-defined pressure units. |  |
| unitdef3=--- | User-defined pressure units. |  |
| unitdef4=--- | User-defined pressure units. |  |
| unitdef1num=--- | Conversion factors for user-defined units. |  |
| unitdef2num=--- | Conversion factors for user-defined units. |  |
| unitdef3num=--- | Conversion factors for user-defined units. |  |
| unitdef4num=--- | Conversion factors for user-defined units. |  |
|  |  |  |
| [SimpleQC] |  |  |
| StartIndex | Starting number for display of tests; ignore. | N/A |

**Instrument Testing Procedure**

**NOTE: DURING THE TESTING PROCEDURE, YOU MAY NEED TO EXIT THE CAPWIN SOFTWARE AT VARIOUS TIMES TO PROPERLY SAVE. BE SURE TO DO THE FOLLOWING THREE STEPS EACH TIME BEFORE YOU EXIT THE CAPWIN SOFTWARE:**

1. Close ‘zero’ valve 2 (motorized valve) completely. From manual mode (you can go into manual mode in CAPWIN by opening the *Execute* menu and selecting *Manual Control.* A window titled *Manual Control* will appear) close valve 2 by pushing the ‘C’ key on the computer keyboard. In the upper left corner of the *Manual Control* window, an indicator will show the percentage that valve 2 is open. Wait until this indicates valve 2 is 0.00% open.
2. Close ‘zero’ the regulator. From manual mode in CAPWIN, close the regulator. This is done by right-clicking on the white circle representing the regulator in Manual Control. In the upper left corner of the *Manual Control* window, an indicator shows the number of counts that the motorized regulator is open. It should read zero.

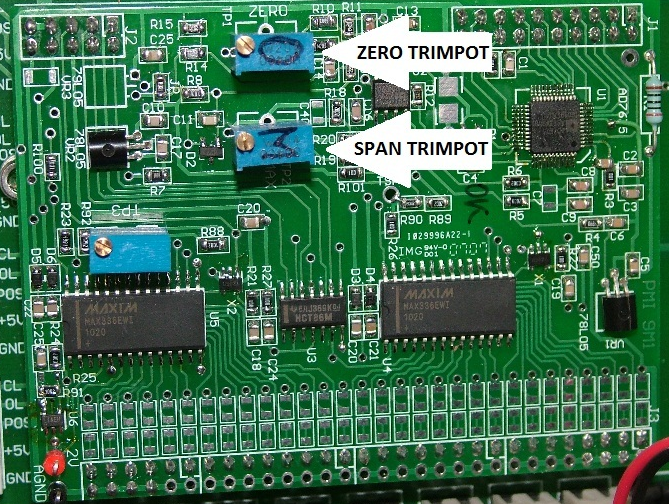
1. Make sure the system is not pressurized. From Manual Control (with the motorized valve and motorized regulator both closed), open the vent valve by clicking the vent valve symbol with the mouse (It will appear green when open, closed when red). In the upper left corner of the *Manual Control* window, an indicator will show the pressure gauge reading. Wait until the gauge is reading atmospheric pressure (approx.. 14.4 PSI). Close this valve by clicking the vent valve symbol again (it will now appear red).

\_X\_\_ 2 Volt, Zero, and Span Calibration

Inside the instrument, look at the small instrument board (this is a printed circuit board which

measures approximately 6-1/4” x 9-1/4” and has one or more printed circuit boards piggybacked

on top of it.) shown below.



Adjust the 2 Volt, Zero and Span trimpots with the following procedure:

1. Locate the trimpots. Using the picture shown above, locate the trimpots on the electronics board inside the instrument.
2. Go into manual control.
3. Open dialog box for PC Interface Board Calibration. From the *Manual Control* window, click the *Calibrate* button. A dialog box titled *PC Interface Board Calibration* will appear. From thisdialog box , you can select *Span*, *Zero* or *Both*. Select *Both.* However, do not click the *Exit* button (this window displays information which is needed to calibrate the zero and span).
4. Adjust the Slides. From the *PC Interface Board Calibration* dialog box, you will see two horizontal scrollbars titled *Delay* and *Average*. It is recommended that you adjust the scrollbars so that the displayed value is 180 for both.
5. Adjust the zero and span trimpots. On the *PC Interface Board Calibration* dialog box, you will

notice that the values for zero and span are displayed. Read through the rest of this step

before proceeding. The value on the screen for zero should be 2000 (+/- 100 counts). The

value on the screen for span should be 62000 (+/- 100 counts ). These values can be

changed by adjusting the zero and span trimpots on the small instrument board with a small

screwdriver.

Note: Although the tolerances for the zero and span are +/- 100 counts each,

it is strongly recommended that you try to get these numbers as close to

exact as possible.

1. Record the values for zero and span Zero \_\_2001\_\_counts, Span\_\_\_62003\_\_\_counts

\_X\_\_ Valve Limit Calibration to set the upper and lower limits of motorized valve 2.

Check that the motorized valve (Valve 2) close-limit is set correctly on the valve’s trimpots and

adjust (if needed) as follows:

1. Preset the open and close limits. (These limits are stored in the CAPWIN.ini file as a result).
   1. Go into Manual Control
   2. Fully open valve 2 by pressing “O” on the keyboard and wait until the valve is 100% open.
   3. Fully close valve 2 by pressing “C” on the keyboard and wait until the valve is fully closed, or 0% open.
   4. Exit Manual Control and close out of CapWin.
   5. Restart the Capwin Software.
2. Listen to the audible sound of valve 2 when closing. In Manual Control, open valve 2 somewhat (at least 10%). Then close valve 2. As valve 2 closes, the audible sound-frequency of the valve movement should decrease slightly before it stops. If you do not hear this decrease in audible sound frequency, the valve may not be closing enough and the close-limit needs to be adjusted.
3. Adjust the close limits of valve 2.

The motor valve should be open enough to allow air into the system between 2.5% and 3.5% open. This procedure will determine how far open valve 2 is when air enters the system, and adjust the open and close limits if necessary.

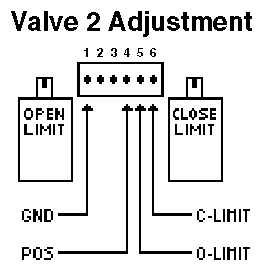
* 1. Insert a blank in the chamber or plug the outlet hose.
  2. Go into Manual Control
  3. Close valve 2 fully, if necessary, by pressing “C” on the keyboard.
  4. Open the pressure regulator to at least 1000 counts.
  5. Slowly pulse open the motor valve by clicking on the left side of the symbol in Manual Control, while monitoring the pressure output on the screen. You need to see the percentage open of the motor valve when the pressure just begins to rise.

If the pressure output rises when valve 2 is LESS THAN 2.5% open, the valve is not closing enough. Turn the close-limit trimpot on the valve counterclockwise.

If the pressure output rises when valve 2 is between 2.5% and 3.5% open, the close-limit for the valve is acceptable and does not need to be adjusted.

If the pressure output rises when valve 2 is MORE THAN 2.5% open, the valve is closing too much. Turn the close-limit trimpot on the valve clockwise.

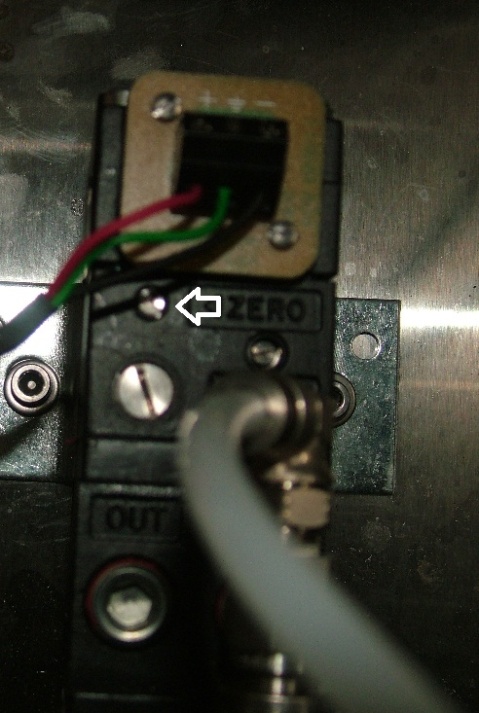
* 1. Locate the trimpots on the motor valve inside the machine.



* 1. Using a small flat head screwdriver, adjust the trimpot a small amount, perhaps a ¼ or ½ turn at a time. Once you do a couple adjustments, you can use your best judgement on how far to turn the trimpot to reach the desired limits.
  2. After each adjustment, you must
     1. zero the regulator
     2. close valve 2
     3. vent the system
     4. close out of CapWin and restart the software.

1. Repeat this procedure from step b, continue to adjust the trimpot until the pressure output begins to rise when the motor valve is between 2.5% and 3.5% open.

\_X\_\_ Manually check the start point of the pressure regulator.

The pressure regulator should begin putting out air at 80 counts. To set the start point, do the following:

1. Zero the pressure regulator in Manual Control.
2. Disconnect the hose from the regulator outlet. There are two hoses connected to the top of the pressure regulator, one labeled “IN” and one labeled “OUT”. Disconnect the “OUT” hose from either the fitting attached directly to the regulator, or the fitting on the opposite end of the hose.
3. Set the regulator to 80 counts in Manual Control
4. Adjust the zero trimpot. You want the air flow to begin at 80 counts, and will need to adjust the zero trimpot located on the regulator (see picture) so that airflow is just beginning.

If you hear air coming from the regulator at 80 counts, the regulator is opening too low. Using a screwdriver, turn the zero trimpot counterclockwise until you hear the air flow just beginning.

If you do not hear air coming from the regulator at 80 counts, the regulator is opening too high. Using a screwdriver, turn the zero trimpot clockwise until you hear the air flow just beginning.

1. Reconnect the hose to the regulator outlet. To make sure it is fully seated in the fitting, pull the collar of the fitting back as you push the hose in.
2. To check: Zero the regulator, open valve 2 to approx. 50%, open vent valve. Close vent and make sure there is no increase in pressure. Open regulator to set point and make sure there is an increase in pressure.)

**\_\_NA\_ Manually check the zero-limit of the motorized pressure regulator.**

**(Compression Only)**

1. Follow the same procedure for zeroing the regulator above.

\_\_X\_ Check that all valves respond correctly:

1. Using Manual Control, move each valve and check that they are in the position indicated on the screen (either opened or closed). When a solenoid valve is open (i.e. passage through it is possible), it is green. When the valve is closed (i.e. that path is blocked), it is red. The sound produced when the valves are opening is higher in pitch than when they are closing. For valves which are used to select flow for different pressure gauges or hi-flow meters, operate the valve by toggling between the respective pressure gauges or flow meters.
2. Check the valves that control the regulators (3-way valve). In Manual Control, select each of the following regulator and air inlet combinations, and make sure that the pressure reads as indicated below.
3. Make sure that the drain valve is working properly (in a machine so equipped).
4. To check valve 10: Open and close valve 10 with flow regulators. Visually check that the notch on the valve is in line with the plumbing when open, and perpendicular to the plumbing when closed (for 2-way valve).

\_X\_\_ Adjust the zero-flow positions of the flow meters:

1. Make sure the machine is warmed up. Inaccurate readings can result from insufficient time for the machine to stabilize its components.
2. Close valve 2, close vent, zero the regulator and plug the outlet hose or insert blank into sample chamber.
3. Execute Manual Control. Read the values of the flow meters in **low** range. (Switch between low range and high range by right or left clicking on the flow meter). Each should have a value of 2000 +/- 100 counts. If the values shown are outside this range, they can be adjusted by turning the zero-adjustment trimpot on the flow meters. Repeat this process for all the flow meters, including the integrity flow meter, if installed.

\_NA\_\_Check for proper "cross-over" values on the low flow and integrity flowmeters (for machines with integrity flowmeter only):

1) Install the large insert and screw on a cover with a quick connector. Connect a hose to the integrity flow meter. Open valves one and two. Make sure that either the vent is closed and the plug is open, or the vent is open and the hose is plugged. Increase the regulator until you get 62,000 counts +/- 1000 counts on the low flow meter. You may also use the flow meter jump to reach this count. Record the readings below and zero the regulator

\_\_NA\_ Check for proper "cross-over" values on the high flow meters:

1. In Manual Control, "zero" the regulator. Open the sample chamber. Open Valve 2 to between 3-10%. Select the lowest range of the high-flow meters. (Example: If the instrument includes two flow meters with ranges of 5 L/min. and 200 L/min., select the lower of these (the 5 L/min. meter), and on this one, select the lower of its two ranges (i.e. that which reads Lo-1.)).

Increase the output of the regulator slowly until high flow meter 1 reads 62,000 counts +/- 1000 counts in low range. Wait for stability. Write down the information below for low and high ranges for high flow meter 1.

1. Select the high range of high flow meter 1. Increase the output of the regulator until the flow meter reads 62,000 counts +/- 1000 counts in the high range. The low range is now in overrange at 63,400 counts. Write down the information below for the high range of high flow meter 1. Hold the Shift key and select the low range of high flow meter 2 and record the information. It may be necessary to open Valve 2 further to reach the maximum flow.
2. Select the low range of High Flow 2. Increase the output of the regulator until high flow meter 2 reads 62,000 counts +/- 1000 counts in low range. Wait for stability. Write down the information below for low and high ranges for high flow meter 2.

\_x\_\_ Adjust the zero on the pressure transducer

Make sure that all pressure gauges in the instrument read atmospheric pressure (14.4 PSI at PMI Headquarters) when the system is open to atmosphere.

1. In Manual Control, open the vent valve.
2. Remove the screw on the pressure gauge for the zero trimpot (marked “Z”)
3. Adjust the trimpot inside the gauge until the output reading in Manual Control is atmospheric pressure (about 14.4 PSI at PMI Headquarters).
4. Replace screw that covers the trimpot.
5. Repeat for any remaining pressure gauges in the machine, if so equipped.

\_X\_\_ Test Low-Pressure Transducer protection

Machines with a low-pressure gauge have a valve that should close off once the maximum pressure rating of the gauge is reached to protect it from higher pressures.

1. Go to Manual Control.
2. Select the high range of the low pressure transducer.
3. Seal the sample chamber with the non-porous disk, or plug the outlet hose.
4. With the motor valve open enough to allow air flow, increase the regulator to allow pressure to build slowly, while monitoring the pressure output.
5. The low-pressure solenoid valve should trip when the nominal rating of the low pressure transducer is exceeded (ex- for a 5 PSIG pressure gauge, the valve should close at about 19.4 PSI if atmospheric pressure is 14.4).

\_NA\_\_ Check the calibration of the motorized regulator

1. Plug the outlet hose, or use a blank disk in the sample chamber.
2. Go to Modify>Edit Auto Parms, and set the Lohm Calib Max Pres to the maximum pressure rating of the machine.
3. Save and Exit the menu
4. Run the Calibrate>Calibrate Regulator calibration from the CapWin main menu.
5. This program should run for about 2 minutes. Watch the display box. The pressure must read from zero to the maximum pressure of the machine for the calibration to work properly.
6. Copy the file **C:\ProgramFiles\Capwin-xxxx\Capwinrg.cal** file to

\\**FILESERVER1\labdata\caplab\archive\disks\***<current year>\<customer name>*

for install disk creation.

\_X\_ Check the calibration of the compression regulator

1. Run the Calibrate>Calibrate Comp. Reg. calibration from the CapWin main menu. Make sure that the door is all the way down.
2. This program should run for about 2 minutes. Watch the display box. The pressure must read from zero to the maximum pressure of the machine for the calibration to work properly.
3. Copy the file **C:\ProgramFiles\Capwin-xxxx\capwincompreg.cal** file to

\\**FILESERVER1\labdata\caplab\archive\disks\***<current year>\<customer name>*

for install disk creation.

\_\_NA\_ Check for proper "cross-over" values on the pressure transducers (if equipped)

Machines with more than one pressure gauge should have consistent readings on all gauges at a given pressure.

1. In manual control, open Valve 2 somewhat (maybe 10-15%).
2. Select the low range of the low pressure gauge. (ex- If the instrument has a 5 PSI and a 100 PSI gauge, select the low range of the 5 PSI gauge).
3. Insert a non-porous disk in the chamber, or plug the outlet hose.
4. Slowly increase the output of the regulator until pressure begins to rise. Go slowly as the low pressure transducer will max out quickly in its low range. If pressure is rising too rapidly, you may try closing valve 2 somewhat.

Try to get 62,000 counts (+/- 1,000 counts) on the low range of the low pressure gauge. Wait until readings are relatively stable. When trying to achieve stability, it may be useful to close valve 2 some when you near the counts you are trying to attain. You need to collect readings in the high and low range of both pressure gauges and record the information in the table below. All pressure values should be approximately equal.

Note: To view the readings of a gauge without switching to that gauge, hold the SHIFT key while clicking on the gauge in manual control.

5) Select the high range of the low pressure gauge. Increase the pressure to 62,000 counts +/- 1000 counts (If necessary, open motor valve 2 further). Wait until values are relatively stable. Collect readings from the high pressure gauge in the low and high range and record all values below. All pressure values should be approximately equal.

\_X\_ Manual Leak Check:

1. Inserting a non porous disk in the chamber, or plug the outlet hose.
2. Pressurize the system- fully increment the regulator (to 4,000 counts), open valve 2 until the machine is fully pressurized, then fully close valve 2.
3. Monitor the pressure reading. If the pressure output is decreasing steadily you have a leak.
4. Use Snoop (soap solution) to check for a leak. Using a squirt bottle, apply snoop around all fittings and connections between valve 2 and the sample chamber.
5. If there is a leak, bubbles will form from the soap solution at the fitting where air is escaping. Use a wrench to tighten until it is no longer leaking and the pressure output is steady.

\_X\_\_ Automated Leak Test:

1. In CapWin, select Execute > Leak Test
2. Insert a blank disk into the chamber or plug the outlet hose.
3. In the parameter file, set Leak Test Read Delay to at least 30 seconds.
4. You will prompted to enter the maximum pressure, step pressure and hold time between intervals.
   1. Maximum pressure- use slightly less than the maximu obtainable pressure (ex- for a 200 PSI instrument, set to 185 PSI)
   2. Step pressure- this is the difference in pressure between test intervals. Ex-You set the test to run to 150 PSI with 15 PSI step pressure. It will run 10 steps in 15 PSI increments until it reaches the maximum pressure. If you set it to the same as your maximum pressure, the test will only be one step.
   3. Hold time- this is the time to wait between steps. Allow at least 15 minutes at each step so the machine has time to stabilize. For a 1-step test, 30 minutes is preferable.
5. When the leak test is complete, open the file to view the collected data. The hourly leak rate should be less than 5%.
   1. If the leak rate is less than 5% per hour
   2. If the leak rate is greater than 20% per hour, the instrument has a significant leak. You need to repeat the manual leak check, and snoop all fittings and tighten any fittings that are leaking. Then do the automated leak test again. Repeat until leak rate is under 20%.
6. Copy the output leaktest<*date>*.asc file from C:\ProgramFiles\Capwin-xxxx to

\\**FILESERVER1\labdata\caplab\archive\disks\***<current year>\<customer name>*

\_X\_\_ Bubble Point Leak Test:

1. Insert a blank disk into the sample chamber or plug the outlet hose.
2. In CapWin, select AutoTest. Set up a Bubble Point test. The blank is your sample.
3. Run the test.
   1. If no bubble point is found, the machine does not have a significant leak.
   2. If a bubble point is found, the machine has a significant leak. Repeat the manual leak test, using snoop throughout the machine to find and fix the leak.

\_X\_\_ Adjust Flow Parameters Calibration

1) Load the sample chamber with just a spacing insert and attach lid and hose, or remove plug from outlet hose if present.

2) Open CapWin and select Calibrate>Adjust flow parameters

3) Run the calibration

4) The calibration should scale from 0 to 30 ccs of flow.

5) copy and save the **Capcal.d8a** file from C:\ProgramFiles\Capwin-xxxx to:

\\**FILESERVER1\labdata\caplab\archive\disks\***<current year>\<customer name>*

\_X\_\_ Lohm and Maximum Air Flow Calibration

1) Use the same sample chamber set up from the flow parameter calibration.

1. Open CapWin and select Calibrate>Lohm and Maximum Air Flow
2. Run the calibration
3. The calibration takes about 10 minutes, and should scale from zero flow to the highest possible flow of the machine.

When the program is finished, open Capwin.ini (in the directory) and record the following value

\_X\_\_ Maximum Liquid Flow Calibration (Perm-Porometer Only)

1. Place an insert into the liquid chamber (right side).
2. Screw on the lid and attach the quick connect hose.
3. Open capwin and select Calibrate>Maximum Liquid Flow.

4) Start the program and follow the prompts.

When the program is finished, open the Capwin.ini file and record the following value

\_X\_ Copy all customer files into the archive folder:

1) Open C:\ProgramFiles\Capwin-xxxx

2) Copy the following files:

* Capwin.ini
* Lohmtable.cal
* Capcal.d8a (this file you should have already copied).
* Leaktest.asc
* Default.tpf
* Capwinrg.cal
* any custom parameter and data files

3) Paste the files into:

\\**FILESERVER1\caplab\archive\ disks\***<current year>\<customer name*

These files are all required files for customer-specific install disk files.

\_X\_\_ Get a New Sintered Metal Disk

1. Using a permanent marker, write the last four digits of the serial number onto it, near the outer circumference. Make numbers large enough to read.

\_X\_\_ Gas Permeability Tests:

1. Load the sintered disk into the sample chamber. Be sure that it fully covers the o-ring seated in the bottom of the chamber.
2. Place the proper insert into the chamber and screw on the lid.
3. Open Capwin. Select AutoTest.
4. Set up the AutoTest and run three tests.
5. Put files in \\**FILESERVER1\caplab\sales\***<current year>\<customer name-SN>*
6. Use the format “**<SN>\_<Test Abbreviation>\_SINTEREDDISK\_001**”. The last three digits will automatically increment with each test.
7. Fill in all fields in the AutoTest window.
8. Compare the results for reproducibility. The best way to do this is by graphing the data on top of each other. In CapRep, select “File List,” add the data files to the list, and click done. Check the box “Graph up to # data sets simultaneously” and check the boxes for “Permeability Text Report” and “Permeability Graph”. Select “Begin-Multi,” and click through the reports until you are able to view the graph. The graphs should all lay directly on top of each other.

\_X\_\_ Bubble Point tests:

1. Select Execute, AutoTest.
2. Wet the sintered disk already in the chamber with Galwick
3. Set up the AutoTest in the same manner as the Gas Permeability test.
4. Run three Bubble Point tests on the disk.
5. Compare the results for reproducibility

For comparison fill in the table below, testing done on the sintered disk #1:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Test Number | 1 | 2 | 3 | 4 | 5 |
| Bubble Point Diameter (m) | 4.652 | 4.474 | 4.551 | 4.545 | 4.54 |
| Bubble Point Pressure (PSI) | 1.418 | 1.475 | 1.45 | 1.452 | 1.453 |

\_X\_\_ Run Capillary Flow Porometry tests:

1. Select Execute, AutoTest.
2. Set up the AutoTest Screen (making sure to select WetUp/DryUp, and set the maxflow in the auto parameter screen to 200,000 cc/m)
3. Wet the sample.
4. Execute the test and repeat for a total of three tests.

5) The results attained from the three tests should give similar results.

6) Record the data below.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Test Number | Sinter-1-002 | 1-003 | 1-005 | MEMBRANE |
| Mean Flow Pressure (PSI) | 6.979 | 6.614 | 6.517 | 41.88 |
| Mean Flow Diameter (m) | 0.9455 | 0.9976 | 1.0125 | 0.2204 |
| Bubble Point Pressure (PSI) | 1.45 | 1.452 | 1.453 | 31 |
| Bubble Point Diameter (m) | 4.551 | 4.545 | 4.54 | 0.298 |

\_\_X\_ Run Liquid Permeability tests (Perm/Porometer only):

1. Select Execute > Autotest.
2. Set up the Autotest screen
   1. Set Test Type to Liquid Permeability.
   2. Select Elevated Pressure Test.
   3. Fill in the rest of the Autotest form and click Start Test.
   4. Fill in the Liquid Permeametry Parameters and click OK to start test.
3. Repeat the test three times. Compare the results for reproducibility.

\_NA\_ Run the Integrity tests (if the instrument is equipped with an Integrity Meter):

Run 5 Integrity tests on the same sample used during the Capillary Flow Porometry tests. The

data attained from several tests should be similar.

\_\_X\_ Remove Sintered Disk:

1. Remove sintered metal disc from chamber and put it in a bag to be turned in to shipping.

\_\_X\_ Create two installation disks (CD’s):

Upon completion of testing transfer all of the installation files from the archive directory to a new capwin folder.

1. Insert a blank disk into the drive. Open the folder for the disk My Computer\CD-R Drive (or similar)
2. In a new window, go to FileServer1\Disks\CapWin\CAPWIN FULL INSTALL.
3. In a third window, open FileServer1\labdata\caplab\archive\disks\year\customer-xxxx that you created in page 3.
4. Copy all three items (capwin and system folders, and the setup) from CAPWIN FULL INSTALL and paste them into FileServer1\labdata\caplab\archive\disks\year\customer-xxxx.
5. Move all the files from the FileServer1\labdata\caplab\archive\disks\year\customer-xxxx into the capwin folder that you copied in step 4. Click “yes” when it asks if you want to replace the files.
6. Open the capwin folder created in step 4, and open the data folder. Copy all sintered disk data and any customer sample data from \\FILESERVER1\labdata\caplab\sales\current year\customer-xxxx into the Data folder .
7. Write files to the blank disk by closing the session.
8. Repeat with another blank disk so there will be two installation disks.
9. Request installation disk labels from the graphics department. You will need to submit the customer name, serial number and model number of the machine.
10. Place the labels on the installation disks and put them in their cases.
11. Turn one disk into shipping and one disk into the IT office for storage.

\_\_X\_ Make a copy the entire completed QC checklist and sintered disk data.

1. Print out a copy of at least one of each type of sintered disk test (ex- 1 gas permeability test, 1 bubble point test, and 1 Wet up/Dry up test)
2. Copy the entire checklist and data.
3. File in cabinet containing all completed checklists.