

Geoprobe® Pneumatic Slug Test Kit (GW1600)

Quik Start Guide for the USB System

Prepared October 2022

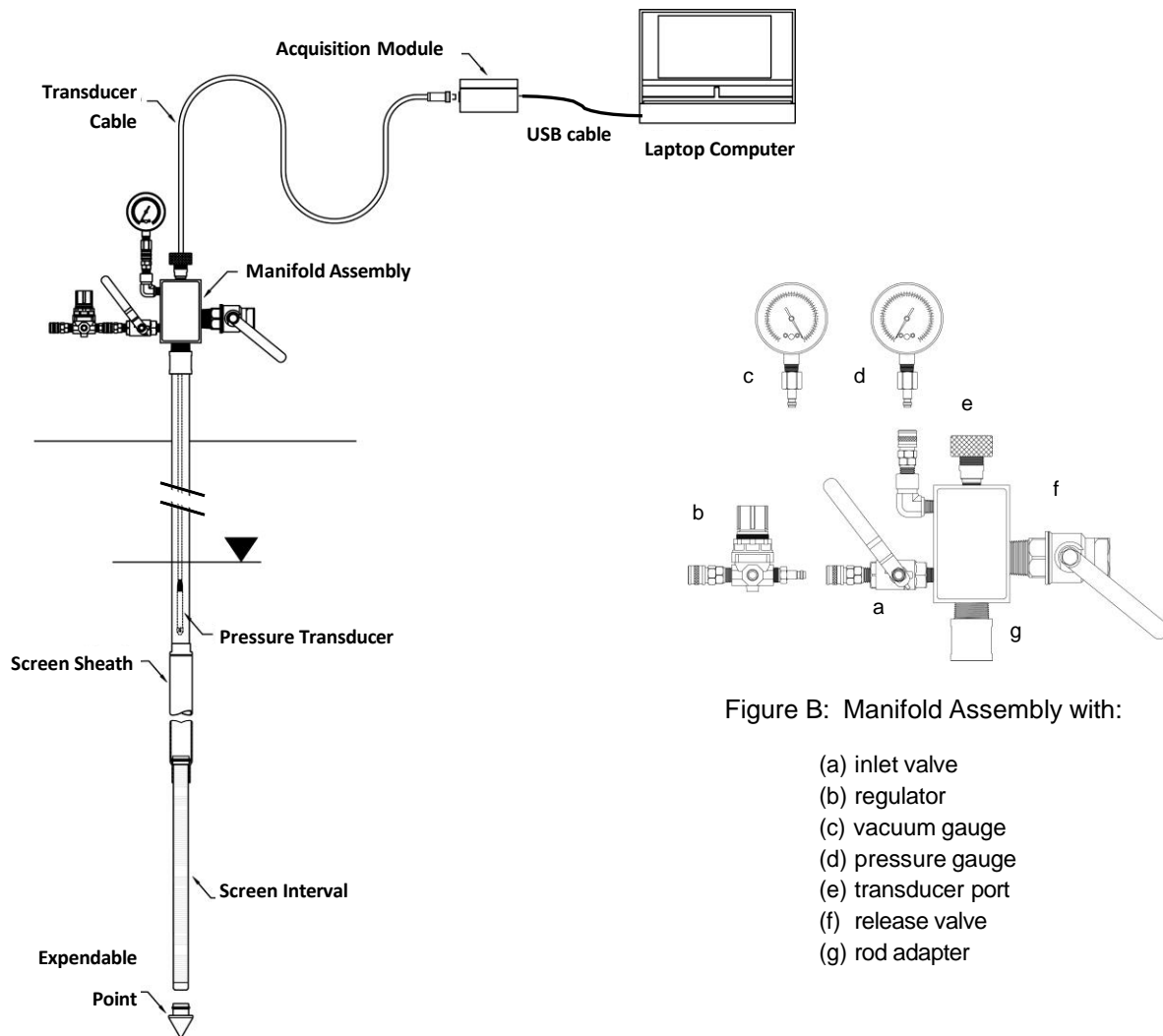


Figure A: Typical field setup with
SP16/19 groundwater sampler

Figure B: Manifold Assembly with:

- (a) inlet valve
- (b) regulator
- (c) vacuum gauge
- (d) pressure gauge
- (e) transducer port
- (f) release valve
- (g) rod adapter

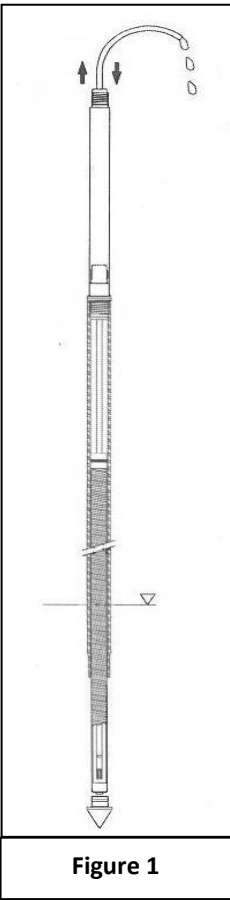


Figure 1

The groundwater sampler (Fig. 1) or monitoring well must be installed with O-rings or other materials to assure that all casing joints are air tight after installation. Development of an SP16 groundwater sampler may be done with a check valve (214061, 214062 or similar) by surging and purging. This may be conducted manually or the 12V Mechanical Actuator (214106) may be used when water levels are < 15ft/5m. Older wells may require redevelopment to obtain accurate slug test results. **Lack of proper development is the primary cause of poor-quality slug test results.** Verify the static water level (SWL) after development is completed. The SWL **must** be above the top of the screen for pneumatic testing.

Once development is completed the pneumatic head (Fig 2) is installed on the top of the probe rod or casing using the appropriate adapters. See below (Fig. 3) and Figure A above. Adapters for 0.5" to 2.0" PVC casing are available. See SOP for details. Either a pressure or vacuum gauge may be installed on the upright quick

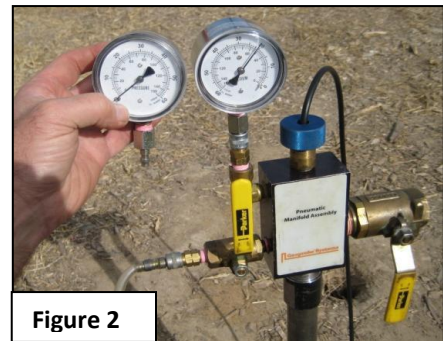


Figure 2

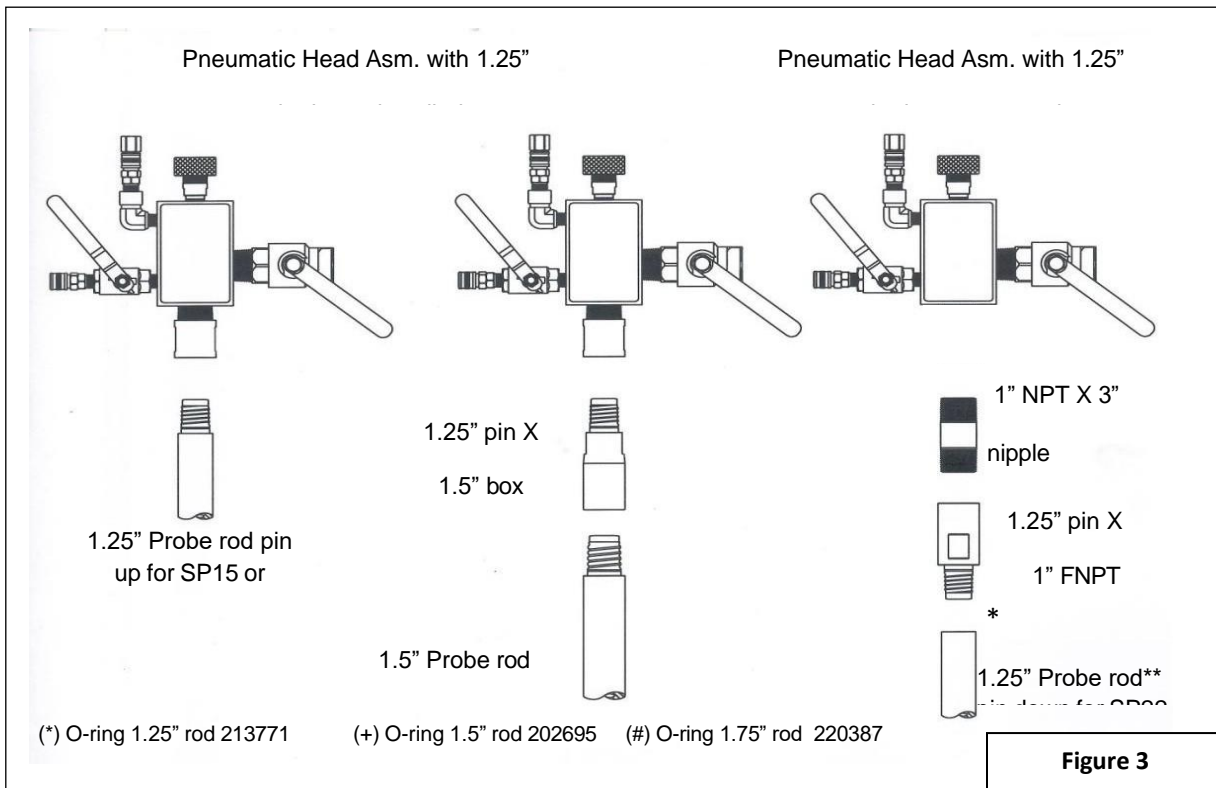


Figure 3

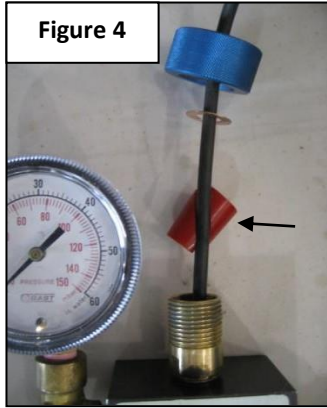


Figure 4

Once the pneumatic head is installed on the rod/casing remove the red poly bushing (Fig. 4) from the transducer port and replace the copper washer and blue knurled knob on the fitting. Next, lower the transducer down through the blue knurled fitting, washer, pneumatic head and rod/casing until it is submerged about a foot (30cm) in the groundwater. See Figure A above.

Attach the end of the transducer cable to the transducer port on the data acquisition module (DAM) (Figure 5). Then connect the DAM to your laptop computer with the water resistant USB cable (Figure 6).



Figure 5

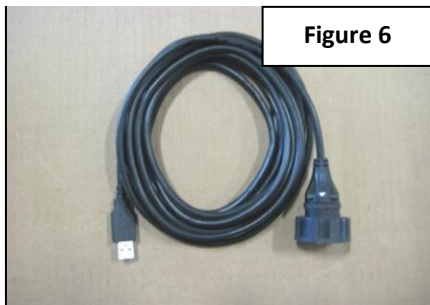


Figure 6

After connecting the DAM to the computer the Acquisition Software is started. When started the CONNECT icon pops up on the software window (Figure 7) and the software will automatically search for the com port where the DAM is connected with the USB cable. The CONNECTING icon flashes red while searching for the correct com port. The icon disappears when the connection to the correct com port is made. This search and connection usually

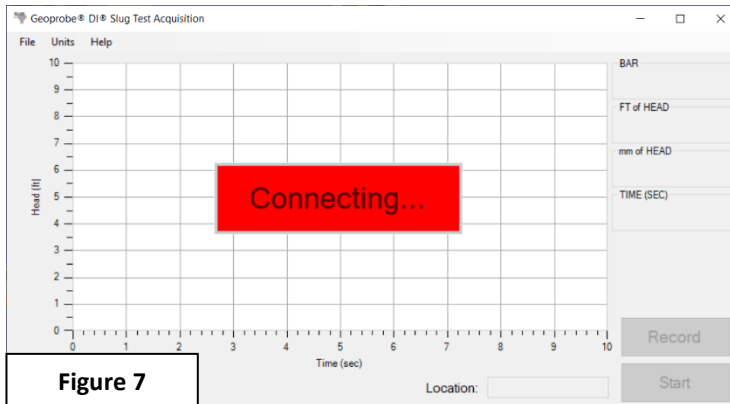
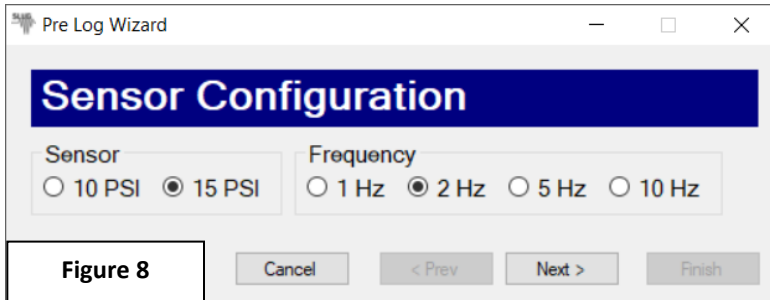
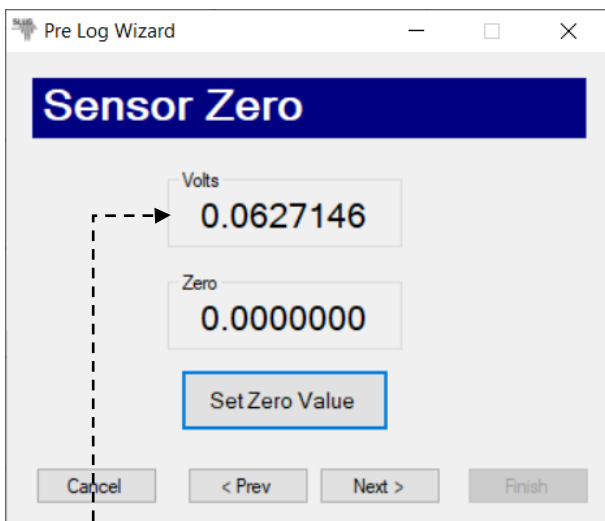


Figure 7

NOTE: Your computer provides power to the DAM and transducer for slug testing. The 12V power inverter in the kit may be used to charge your computer from your vehicle.



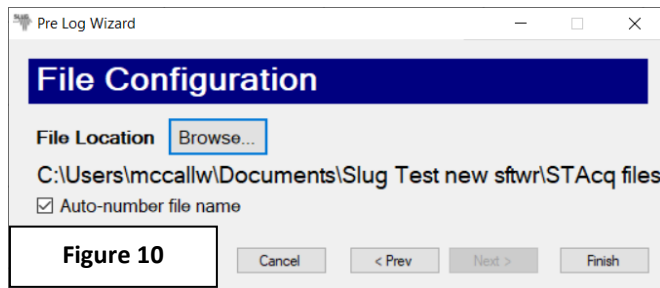
The **Sensor Configuration** window opens when the software starts (Figure 8). Check the transducer body or cable to verify if it is a 10psi or 15psi transducer and select the correct option. Next select the sample frequency that is appropriate for the expected speed of the slug test recovery. For slow recovering formations (several minutes or longer) 1 Hz or 2 Hz is usually sufficient. For formations that recover quickly or exhibit an oscillatory response a 5 Hz or 10 Hz setting should be selected. Higher sample rates result in more noise in the data and baseline and should only be used when needed.



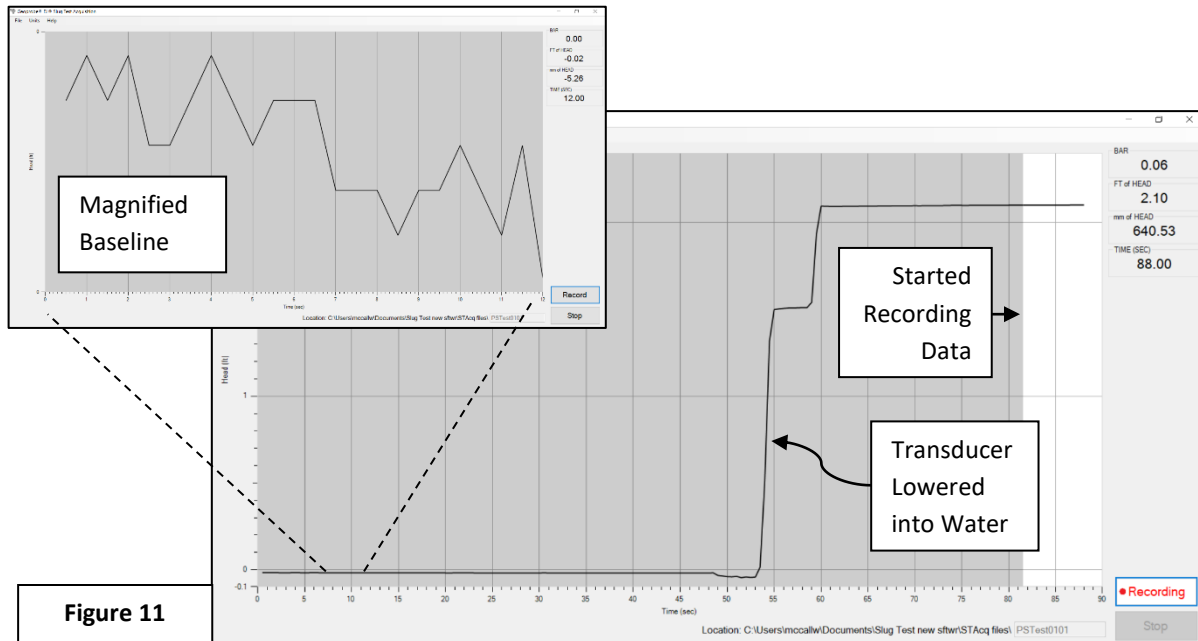
This is the “zero” voltage for this transducer in air. The zero voltage varies some from transducer to transducer. The voltage will increase when the transducer is submerged in the water.

Figure 9

Next the **Sensor Zero** window opens (Figure 9). Variation in the last 2 to 3 digits of the transducer voltage is typical baseline noise. At this time, raise and lower the transducer in the piezometer and observe the voltage readout. If the voltage does not vary significantly when lowered the transducer is still above the water level. Lower the transducer until the voltage increases, this indicates the transducer is submerged in the groundwater. Wait at least 3 to 5 minutes for the transducer to cool to ambient temperature in the water. At this point raise the transducer above the water level (voltage drops and then stabilizes as raised into air). Now click on the *Set Zero Value* icon. This zeros the transducer at atmospheric pressure. Zeroing in air will let you see the depth the transducer is lowered below the water level in the piezometer.



Next the **File Configuration** window opens (Figure 10). Browse to (or create) the desired folder and enter the name for the slug test file. If you want to run a series of slug tests on the piezometer click on the *Auto-number file name* option. For example, when using the auto-number option filename MW03 becomes MW03-01, MW03-02, MW03-03, etc. The file number augments each time you click on the *Record* icon when using the auto-number option.



When the active data screen first opens (Figure 11) the baseline may be magnified, simply lower the transducer into the water to reduce the apparent noise. When you are prepared to start saving data to the file click on *Record* to start recording data to the file. The screen changes from gray to white when data is being saved to the file. **The transducer is typically lowered 6ft (2m) below the water level for slug testing.** If the transducer is zeroed in the atmosphere the depth of the transducer below the water level is visible in the upper right corner of the active window.

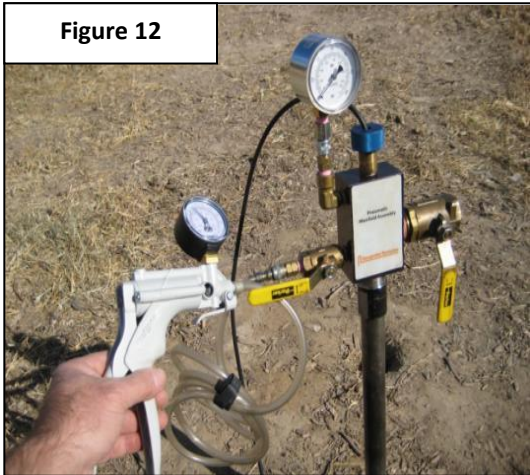


Figure 12

NOTE: For small diameter wells and piezometers the hand pump provides sufficient air flow volume. The foot pump provided with the kit may be used for larger wells. For larger diameter/deeper wells an alternate 12v pump may be used or clean compressed gas may be used. These alternatives are available but not included with the kit.

Setup for leak test and rising head tests with the pressure gauge and hand pump (Figure 12). The gauges are graduated in inches and centimeters of water pressure (outer and inner marks respectively). Pressurize the well head to 20 to 30 inches of water pressure on the gauge. Close the inlet valve after pressurizing. For fast recovering formations the pressure will drop some and stabilize quickly. For slow recovering formations the pressure will drop and stabilize slowly. If the gauge pressure continues to drop to zero there is a leak in the system. Use the leak test fluid provided with the kit to test all fittings and connections while under pressure. Snug lose fittings or add plumbers tape to connections and re-assemble as needed. Once the system is leak-free you are ready to perform slug tests.

Performing a rising head test and a falling head test (Figure 13). A: air pressurization peaks. B: rising head test. C: evacuation peaks. D: falling head test. E: stable baseline is about 6.4 ft (185 cm) for these tests, i.e. the static water level is that distance above the transducer. These are examples of under-damped (oscillatory) tests.

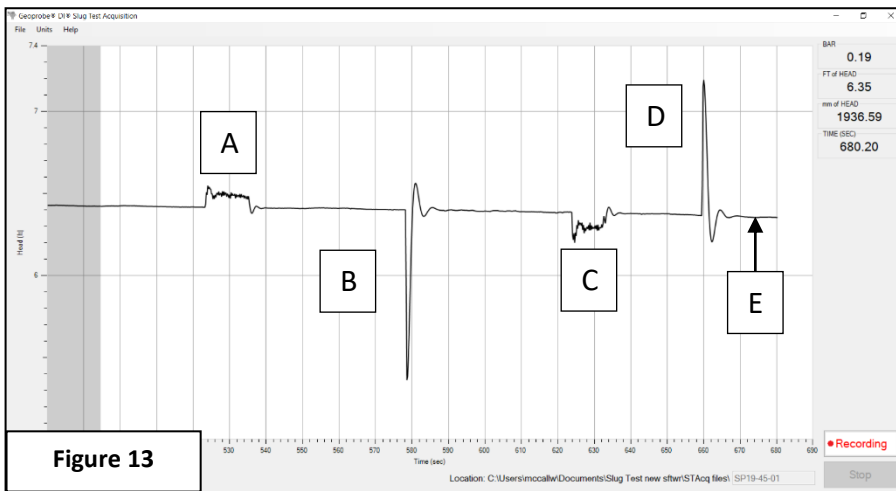
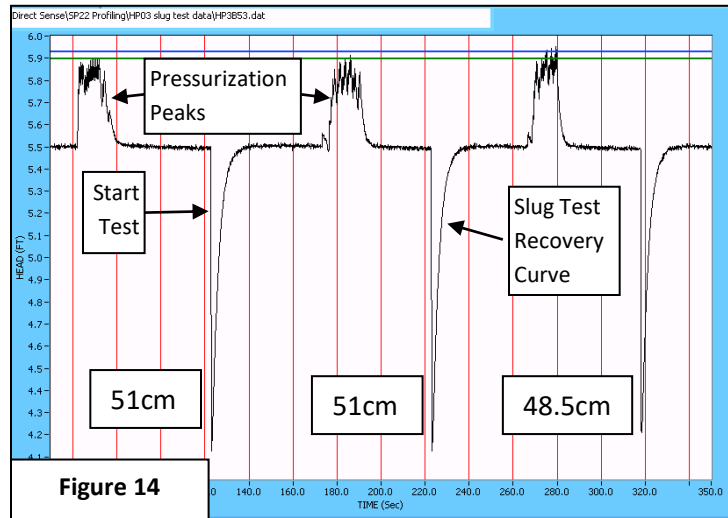


Figure 13

To perform a rising head test place the pressure gauge on the upright quick connect of the manifold (see Figure B on cover page) and set the hand pump to “pressure” and connect it to the inlet valve with the short hose and male quick connect from the kit. Pressurize the piezometer to the desired level (typically 10 to 30 inches of water). The pressure gauge will stay elevated (e.g. 20 inches of water) but the total pressure observed on the computer screen will return to baseline pressure. Let the baseline stabilize, then quickly open the release valve (See Figure B) to start the test. To perform a falling head test use the vacuum gauge and set the hand pump to “vacuum”.

Repeat of fast, overdamped, rising head, slug tests with approximately the same initial head (H_0) value (Figure 14). These tests can be used for basic field QC. The H_0 values were 20, 20 and 19 inches of water pressure respectively. The similarity of peak height, symmetry and recovery time indicates that good quality tests were obtained. If noticeable variations occur between repeat tests with the same H_0 , further well development may be required.



Geoprobe® provides the user-friendly Slug Test Analysis software package (MN 214042) on a USB drive with the kit. This is for modeling and calculation of the formation hydraulic conductivity (K) with the acquired slug test data. This package includes the Bouwer and Rice model (Bouwer and Rice, 1976) and the Hvorslev model (Hvorslev, 1951) for calculation of K. The software provides variants of these two basic models for confined or unconfined aquifers, partially or fully penetrating wells, and over or underdamped aquifer responses. A correction for oscillatory slug test responses in small-diameter wells also is included in the Geoprobe® analysis software. Other commercially available software packages also may be used to model the slug test recovery curves and calculate K.

To attach the pneumatic manifold to 2-inch PVC wells an adapter (MN 203153) is available (Figure 15). See the PST SOP for details and installation/operation instructions.

Note: The pressure regulator (see Figure B) provided with the kit may be used to control **small** leaks that occur downhole at PVC casing or rod joints. See the SOP for further details.

