



## MPVS Ultra Quick Start Guide

1. Unpack the hardware, software, and cables.
2. Inspect the equipment for any obvious signs of external and/or internal damage. If anything is missing or the equipment seems to be damaged in any way, contact Millar or the authorized Millar distributor in your area immediately.
3. Power up the computer that will be used to acquire and analyze the PV data and install the provided software (Millar MPVS Ultra Control Interface Software, Millar PVAN Ultra, DAQ Software).
4. Connect the MPVS Ultra to the computer that will be used to acquire and analyze the PV data using the USB cable provided.
5. Connect the Pressure, Composite Volume, Segmental Volume and ECG outputs on the front panel of the MPVS Ultra to the input channels on the data acquisition system using BNC-BNC cables or BNC cables that terminate at a connector that is compatible with the data acquisition system. Turn on the data acquisition system.
6. Connect the power cord to the power input jack on the back of the MPVS Ultra. Please ensure the power cord conforms to the standards in the country of operation. Millar provides standard U.S. and European style power cords with the hardware. The end user may be responsible for providing his own power cords if the cords supplied by Millar are not sufficient for the country of operation. Cords must connect to a grounded power outlet for safety.
7. Turn on the MPVS Ultra using the power switch located on the back panel. Ensure that the Power Indicator located on the front panel lights up.
8. Connect the combination pressure-volume cable (CEC-10E or similar) to the PV input connector on the front of the MPVS Ultra. Connect the second pressure input cable if desired.
9. Unpack a PV catheter. Handle it carefully.
10. Connect the pressure transducer and conductance/volume connectors on the PV catheter to the pressure-volume input cable (CEC-10E or similar).

11. Using a shallow dish, beaker, or syringe, soak the catheter tip in body temperature sterile water or saline for at least 30 minutes prior to insertion into the biological environment. If you will be measuring the blood resistivity using the Rho Cuvette, soak the cuvette in body temperature sterile water for 15 – 30 minutes as well. Be sure to keep the connector at the end of the Rho Cuvette cable out of the water.
12. Open the data acquisition software on the computer. Configure the data acquisition software according to user preferences so that it can effectively acquire, display, and record the P-V data produced by the MPVS Ultra. Open the MPVS Ultra Control Interface Software.
13. NOTE: If you see the message, “MPVS Ultra Data Acquisition Error”, check the connection between the MPVS Ultra and the computer.
14. The following steps outline the generic steps required to prepare the MPVS Ultra for use in an experiment. For more detailed information, please see the MPVS Ultra Training CD.
15. *Rho Cuvette Calibration* To convert the output of the MPVS Ultra from units of conductance to units of volume, measure the blood resistivity using the Rho Cuvette. Select the Rho Cuvette tab and choose the appropriate Rho Cuvette from the Millar Cuvette Selection. Remove the Rho Cuvette from the body temperature water, dry the cuvette, connect the cable to the Cuvette connector on the front the MPVS Ultra and fill the well with fresh heparinized blood. Select Measure on the Rho Cuvette tab. To export the measured value to the Catheter Configuration tab, click Export and then click Yes. Note: If you wish to record volume data in conductance units only, do not perform the Rho Cuvette Calibration.
16. *Catheter Configuration* Navigate to the Catheter Configuration tab and unlock the screen by clicking the Catheter Configuration Locked/Unlock Button. Select the appropriate catheter from the Catheter Selection window. If necessary, create a custom catheter configuration by manually adjusting the electrode values and clicking the Create New Catheter button. Select an approximate gain setting and Blood Resistivity value. Lock the Catheter Configuration tab by clicking the Catheter Configuration Locked/Unlock Button.
17. *Pressure Calibration Setup*: Follow the instructions in the data acquisition software user’s manual to perform a two-point calibration procedure. Use the transducer/calibration controls located on the Catheter Calibration tab in the MPVS Ultra Control Interface Software to provide fixed voltage signal references for pressure (0, 25, 100 mmHg) that may be used to quickly perform the two-point calibration procedure.
18. *Pressure Transducer Balancing*: After the catheter tip has soaked for at least 30 minutes, unlock the Balance Locked button and use the Offset Value controls in the Pressure area of the Catheter Calibration tab. Use the Offset Value controls to adjust the pressure transducer output while

dipping the transducer just below the surface of sterile water or saline (essentially a zero pressure environment). Adjust the controls until the output signal reads approximately 0 mmHg (as displayed by an indicator in the data acquisition software or similar monitor) then click the Lock button. Repeat the procedure if an additional pressure transducer is connected to the MPVS Ultra. Pressure calibration may be verified using an external manometer (digital or mercury).

For best stability and zero adjustment, shield the sensor from bright ambient light during the balancing procedure and allow the catheter tip to soak in body temperature sterile water or saline for 30 minutes prior to insertion into the biological environment. Zero balancing of the pressure transducer should be done prior to each catheterization procedure.

19. Prepare the experimental subject for catheter insertion according to the lab's established experimental protocols. When the experimental subject is ready, insert the catheter into the left ventricle and begin recording P-V data. Note: Millar recommends a data acquisition sampling rate of 1 kHz (1000 samples/second) in order to accurately capture all of the features of the PV waveforms produced by the fast beating hearts of mice and rats.
20. After the catheter has been properly placed within the ventricle, use the Catheter Configuration tab to optimize the volume signal on the maximum number of segments possible. It may be necessary to adjust the gain settings and catheter configuration in order to record volume data from each segment physically located within the ventricle.
21. *Volume Calibration* Perform the volume calibration procedure after the catheter has been inserted into the animal and the Catheter Configuration has been adjusted to optimize the volume signal on each segment. Follow the instructions in the data acquisition software user's manual to perform a two-point calibration procedure. Use the transducer/calibration controls located on the Catheter Calibration tab in the MPVS Ultra Control Interface Software to provide fixed voltage signal references for volume that may be used to quickly perform the two-point calibration procedure. Note: The volume values shown are dynamic and are dependent on the catheter model, the value entered for resistivity, and the gain value selected.
22. After the PV data has been collected by the data acquisition software, please refer to the PVAN Ultra software user's guide for instructions on how to export P-V data selections out of the data acquisition software to perform a comprehensive data analysis in PVAN Ultra.
23. When necessary, clean the MPVS Ultra hardware with a cloth and isopropyl alcohol or water. Do not allow liquids to enter the chassis, as this will damage the sensitive electronics housed inside. Air vents may be cleaned with suction (i.e. a vacuum cleaner). The MPVS Ultra hardware has not been tested for compatibility with any method of sterilization.