1. **Overview**

1.1. This document describes the procedure for calibrating the HUMAC Auxiliary Outputs to a third-party data acquisition system.

2. **Setting the Auxiliary Outputs**

2.1. Start the HUMAC Program.

2.2. From the **Utilities** menus, select **Auxiliary Outputs**.

2.3. Enable the desired channels and set the **Gain** and **Offset**.

2.4. Click the **OK** button to save your changes.

3. **Torque Calibration**

3.1. Click the **Dashboard** button.

3.2. Select **Shoulder Ab/Ad Pattern.**

3.3. Set the **Mode** to **Isometric** with an **Angle** of 90 degrees.

3.4. Remove the input pad from the Knee/Hip adapter.

3.5. Install the Knee Hip adapter length to 45 (calibration position, where the pin locks in).

3.6. Move the input adapter to Horizontal and set the **Anatomical Zero** to 90.

3.7. Set the **Range of Motion** from at least ±10 degrees outside of the 90 degree (horizontal position).

3.8. Click the **Start** button and move the input adapter to Horizontal so it locks in-place (Isometric Mode).

3.9. Place 25 pounds (one calibration weight) on the input adapter and measure the voltage out with your data acquisition system (40.5 ft-lbs of torque). ***Note:*** *If your calibration weights are not 25 lbs, the formula for the torque in ft-lbs is (17.52/12*weight)+4.*

3.10. Place 100 pounds (four calibration weights) on the input adapter and measure the voltage out with your data acquisition system. (150 ft-lbs of torque).

3.11. From these two numbers you can compute the conversion factor for your system.

4. **Position Calibration**

4.1. Click the **Dashboard** button.

4.2. Open the Mechanical ROM stops.

4.3. Click the **Left** side then the **Right** side buttons to clear any ROM.

4.4. Remove any adapters from the dynamometer.

4.5. Position the input adapter at 6:00 (straight down) and measure the voltage out with your data acquisition system (0 degrees).

4.6.   Move the input adapter one full circle CW and position the input adapter at 6:00 (straight down) and measure the voltage out with your data acquisition system (360 degrees).

4.7.   From these two numbers you can compute the conversion factor for your system.

5.   Velocity Calibration

5.1.   Click the **Dashboard** button.

5.2.   Select **Shoulder Ab/Ad Pattern.**

5.3.   Set the **Mode** to **CPM** with a speed of 15 deg/sec.

5.4.   Remove any adapters from the dynamometer.

5.5.   Move the input adapter to 6:00 (straight down) and set the **Anatomical Zero** to 0.

5.6.   Set the **Range of Motion** for at least 180 degrees (straight down to straight up).

5.7.   Click the **Start** button to enter CPM mode.

5.8.   Measure the voltage out with your data acquisition system (15 deg/sec). ***Note:*** *The voltage will be roughly a square wave. Use the average height of the square wave top as the voltage measurement.*

5.9.   Using the Speed + buttons, increase the speed to 100 deg/sec. Measure the voltage out with your data acquisition system (100 deg/sec). ***Note:*** *The voltage will be roughly a square wave. Use the average height of the square wave top as the voltage measurement.*

5.10.   From these two numbers you can compute the conversion factor for your system.