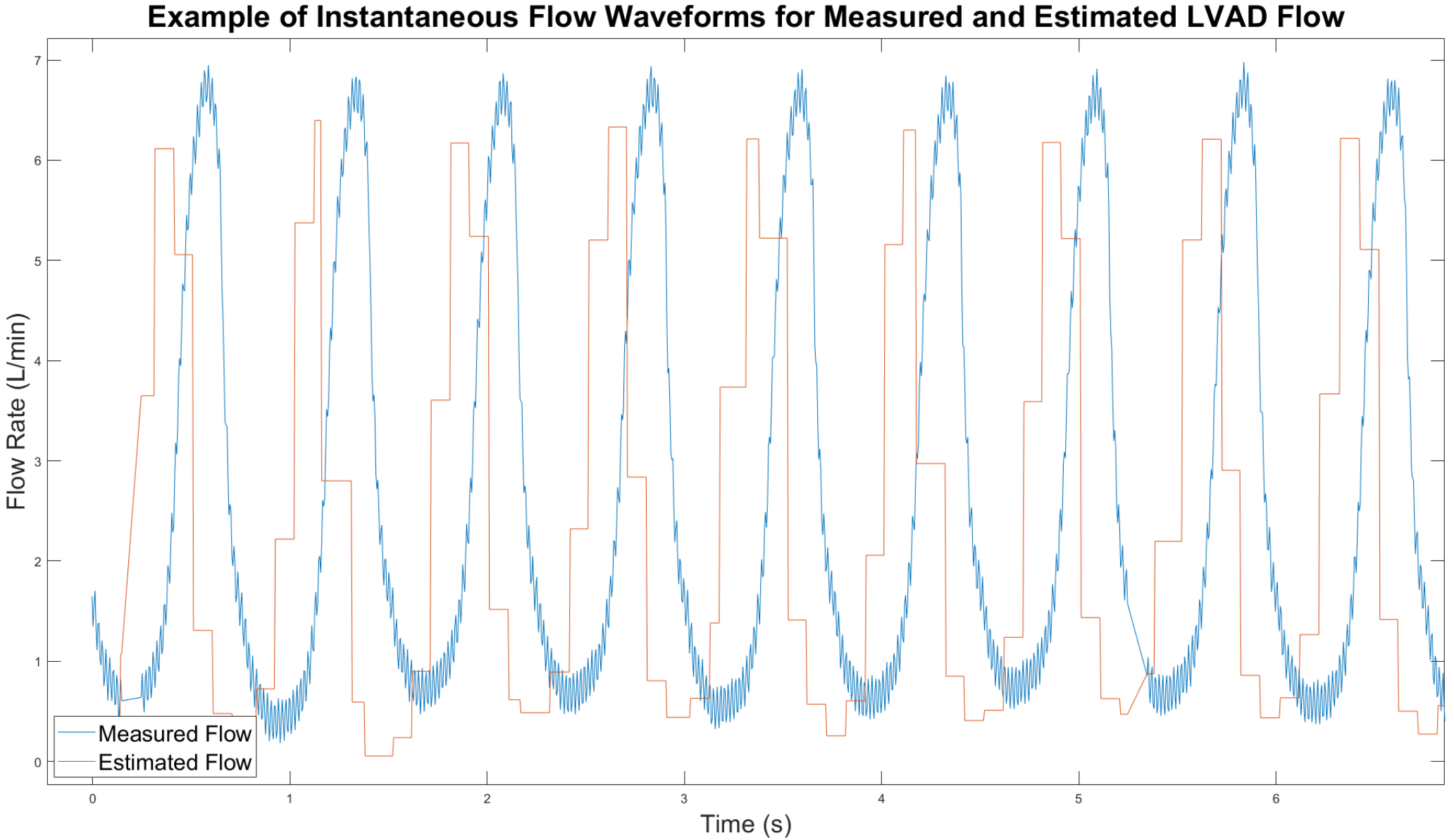
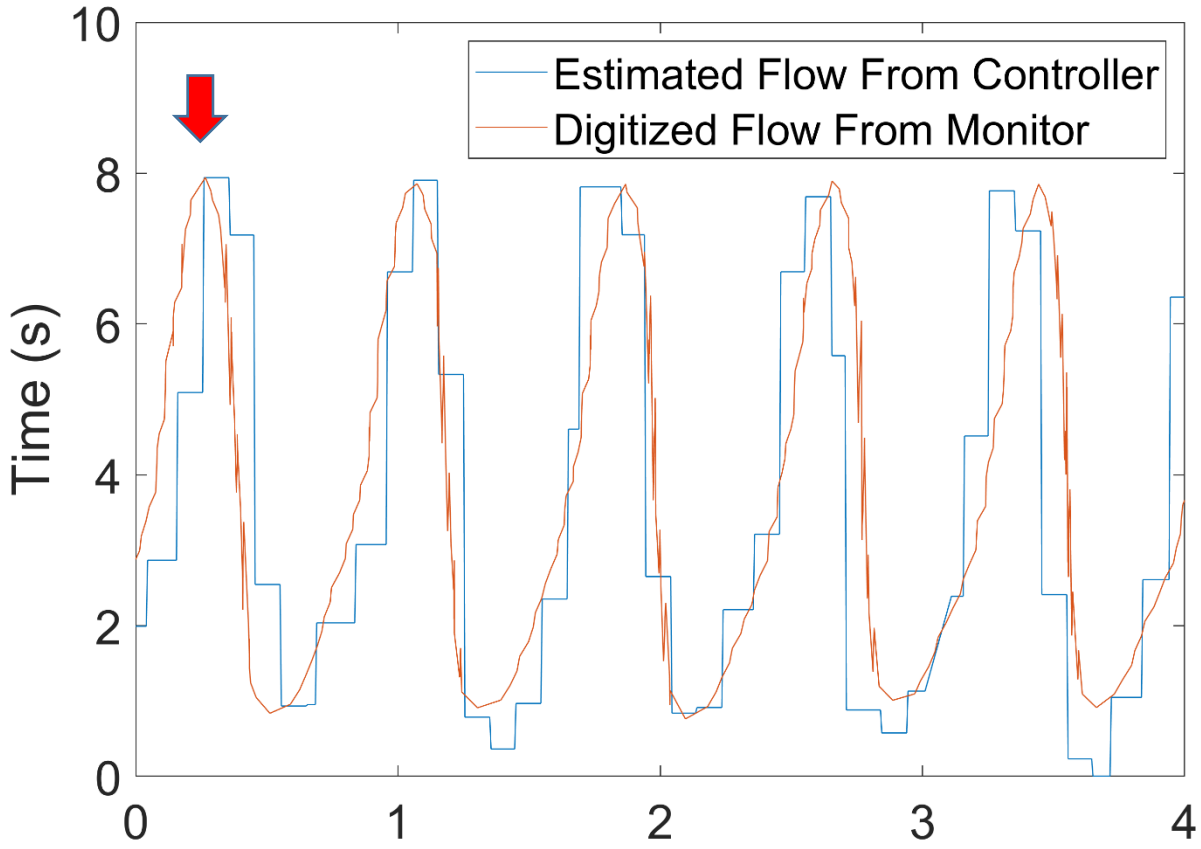
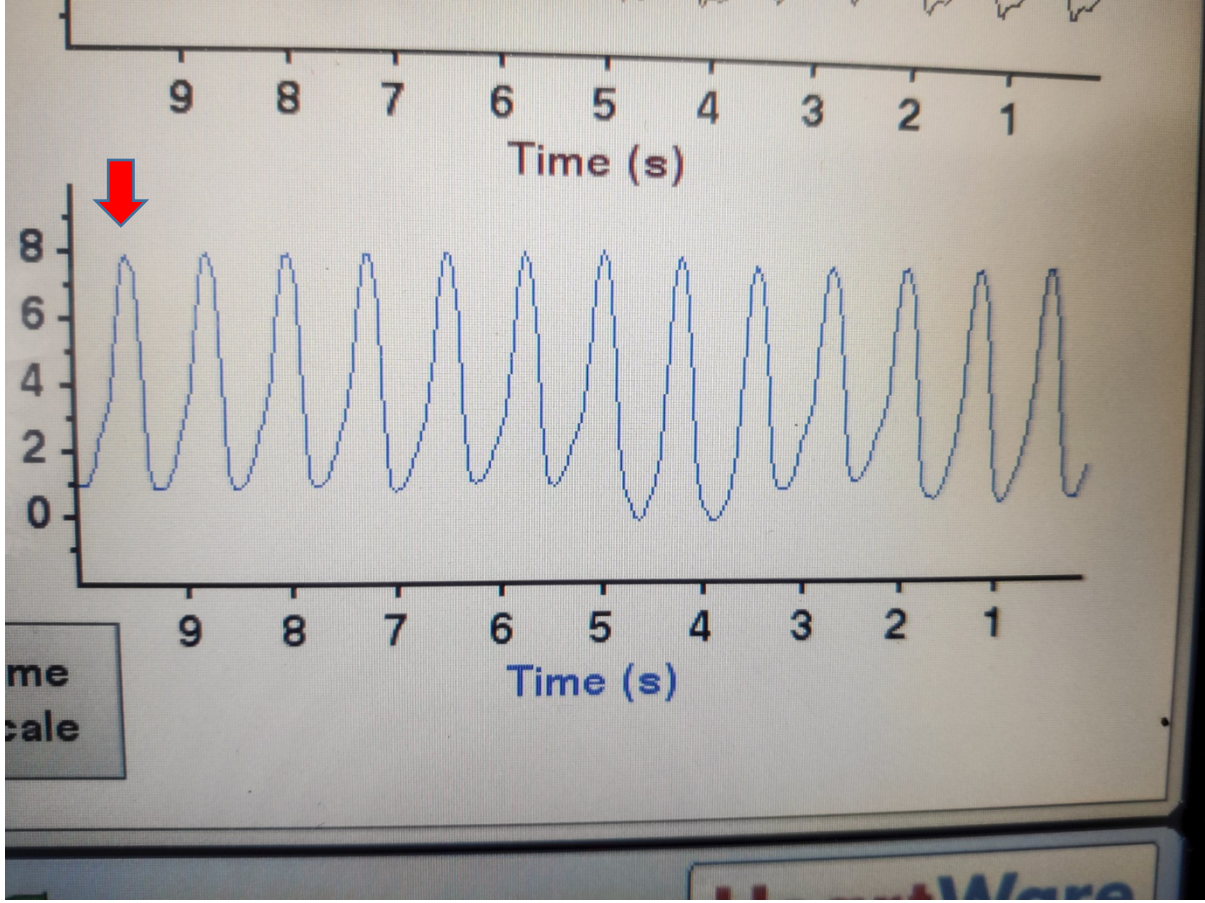
# Supplemental Figures

**HeartWare HVAD Flow Estimator Accuracy for Left and Right Ventricular Support**

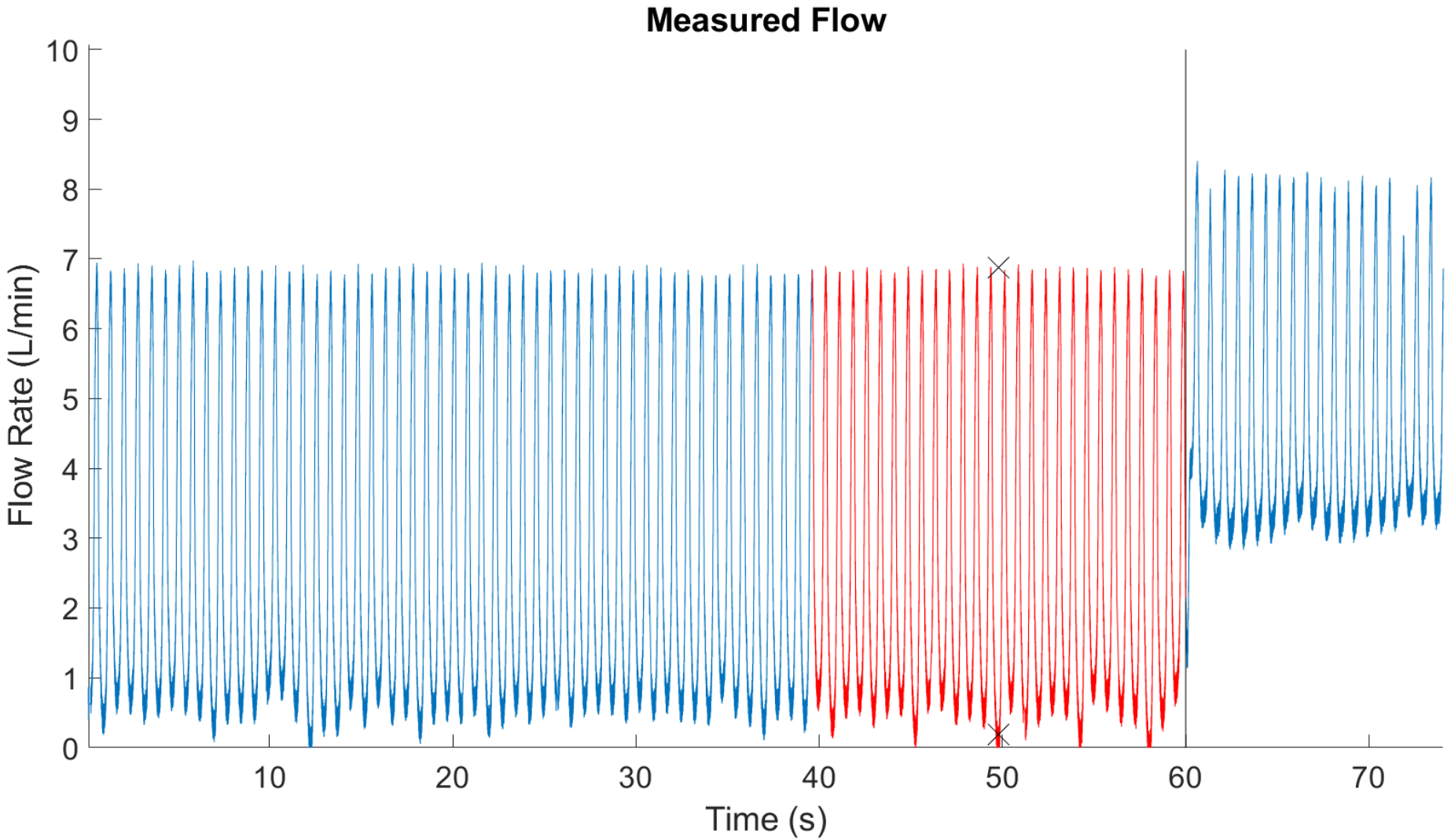



An example of the raw instantaneous flow waveforms for measured and estimated LVAD flow at 80 beats per minute, SVR 1300, PVR 100, CVP 12, LVAD speed 2500 rpm. Note the sampling rate is the same between the two signals, but the estimated signal updated from the controller at a lower frequency ~ 20 Hz

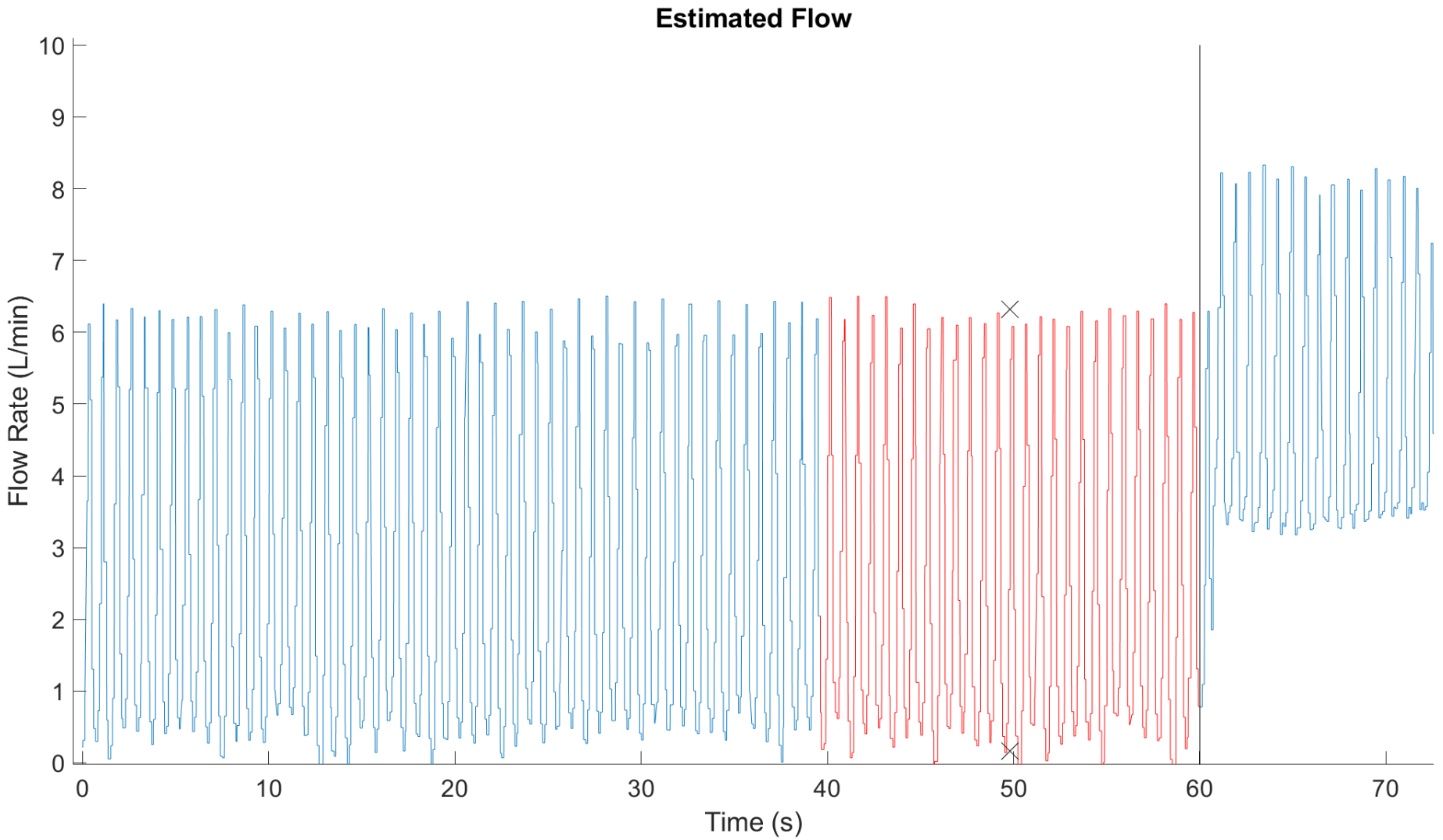



As noted in the manuscript, the LVAD flow estimator had a lower sampling rate (20 Hz) than the flow sensor (200 Hz), this was due to the communications protocol used to extract data directly from the HVAD controller for analysis. It may be argued that this decreased sampling rate would not be adequate to capture the peaks and troughs. A brief comparison between the a digitized output from the HVAD monitor (left) and what was captured by our controller shows minimal differences in the peaks and troughs captured by our controller and those displayed on the monitor (note: these are two separate captures of the same steady-state, due to the inability of the HVAD monitor and dSPACE to read from the controller at the same time). Furthermore the resolution of the HVAD monitor's (right) readout, with only 1 L/min decrements, means that the small discrepancies between our captured data and the interpreted monitor readout would be clinically insignificant. The red arrow denotes the same heartbeat between the two figures




An example showing the instantaneous measured waveform (blue) and the portion of the waveform analysed by the peak and trough detector (red). The average peaks and trough levels are given by the black crosses




An example showing the instantaneous estimated waveform (blue) and the portion of the waveform analysed by the peak and trough detector (red). The average peaks and trough levels are given by the black crosses