A six stage process was used to identify and remove EKG interference that may have been present in each channel of the EMG used in this data analysis. This process is an extension and improvement of the methodology used by Dr. Sandy Saavedra for her own thesis work.

In the first stage, the data analyst is presented with a graph of the EKG signal collected by the subject being processed. The user is asked to select an amplitude threshold to differentiate heartbeat signal from activity originating in the surrounding musculature. The polarity of the threshold selected determines if the particular peaks sought will be the Q (negative polarity) or R (positive polarity) of the EKG complex.

In the second stage, the EKG signal is examined forward from the beginning, looking for points that exceed the amplitude threshold set in the first stage. When such points are found, the forward examination continues, counting how long the signal stays above that threshold point. If this duration exceeds 7 ms, then the candidate is kept for further consideration. The value of 7ms was empirically determined to have the best performance when the algorithm was first implemented by Dr. Saavedra.

When a candidate point is discovered, the signal around it is explored for the peaks that complete the QRS complex, and the directionality of the search is determined by the polarity of the selected threshold. Once the complete QRS is found, ten milliseconds are added on to each end of the discovered points to note the time location of the entire PQRST complex.

This process continues until the search reaches 40ms before the end of the EKG signal. The search terminates here as any EKG signal that begins in these final 40ms is highly likely to be an incomplete PQRST complex.

In the third stage, the amplitude of each peak deemed valid above is averaged. Any PQRST regions whose peaks exceed this average by 2 Standard Deviations are discarded. The reasoning for deciding to remove candidates was that any abnormally large spikes in the EKG signal were likely to be due to either extended and powerful muscle contractions, or other unusual sources of electric interference.

In the fourth stage, each channel of EMG has an average EKG signature generated for it by averaging together the waveform found within each PQRST boundary deemed valid from the above stages. The Averaged EKG signal for that EMG channel is created by adding the average EKG signature within the PQRST time boundaries of an otherwise flat signal the same duration as the original EMG signals.

In the fifth stage, the data analyst is presented with three graphs for each EMG channel: the unaltered EMG signal, the Averaged EKG signal for that channel, and the EMG signal with the Average EKG signal subtracted. For each channel, the analyst is asked to choose whether the unaltered or subtracted signal is the better of the two. If the Averaged EKG signal selected is not of sufficient quality, the analyst has the option to return to the first stage and pick a new amplitude threshold.

Finally, in the sixth stage, the algorithm removes the Averaged EKG signal from those EMG channels the data analyst elected to remove it from, and processing on the EMG signals continues.