

4.3 Quarter Car Suspension System Analysis

One of the systems which is often used to illustrate the value of frequency analysis is the automobile suspension system. Since in conventional suspension systems, each wheel incorporates the same control system, only one wheel must be evaluated (quarter car suspension system). To illustrate the frequency analysis capability of HyPneu, the quarter car suspension as shown in the schematic was analyzed. As can be seen in this schematic, the automobile body, the shock absorber, the spring, and the tire are all included.

If the following parameters are selected the results of the frequency analysis will be as shown in the curves:

- 1/4 car weight = 1220 LBf
- Tire weight = 90 LBf
- Viscous coefficient (body to tire) = 12 LBf sec/in
- Mechanical spring stiffness = 130 LBf/in
- Tire stiffness = 100 Lbf/in

The amplitude ratio is the body displacement divided by the road profile. It should be noted that HyPneu permits evaluation of up to nine (plus time) outputs for each input. Therefore, several amplitude ratios could be plotted in Bode format for each simulation

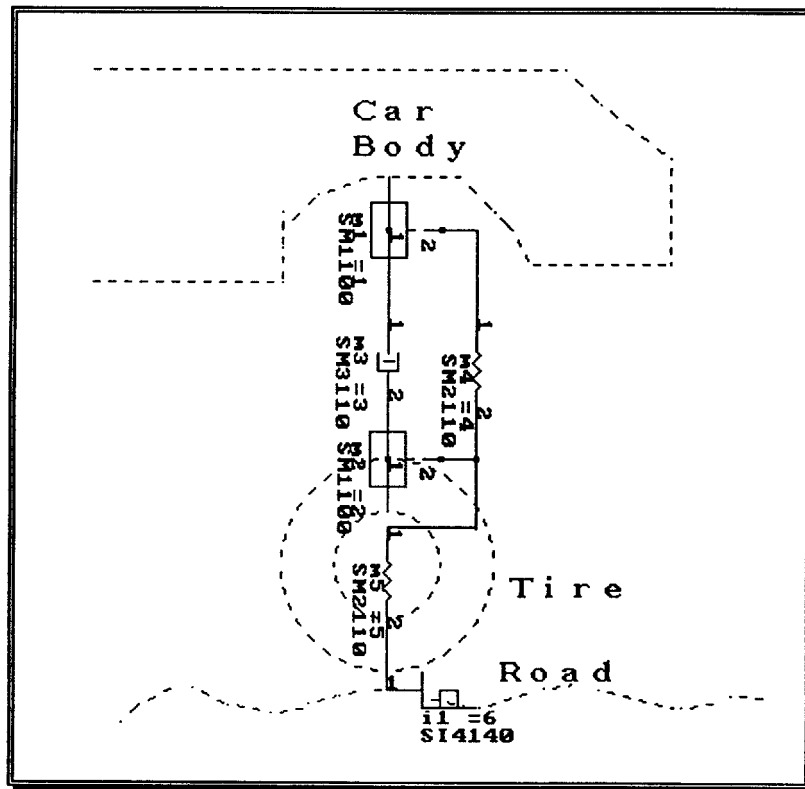


Figure 4.3a. Quarter Car Suspension System Schematic.

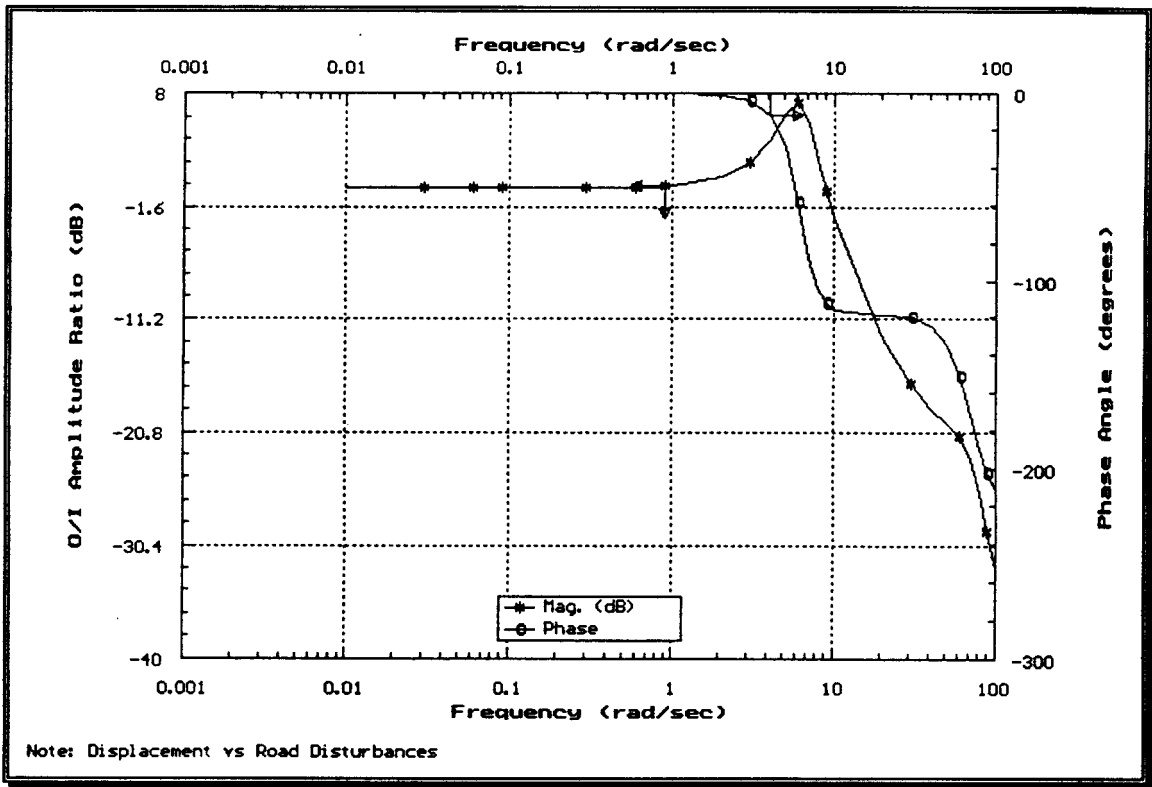


Figure 4.3b. Quarter Car Suspension System Analysis—Displacement vs Road Disturbances.

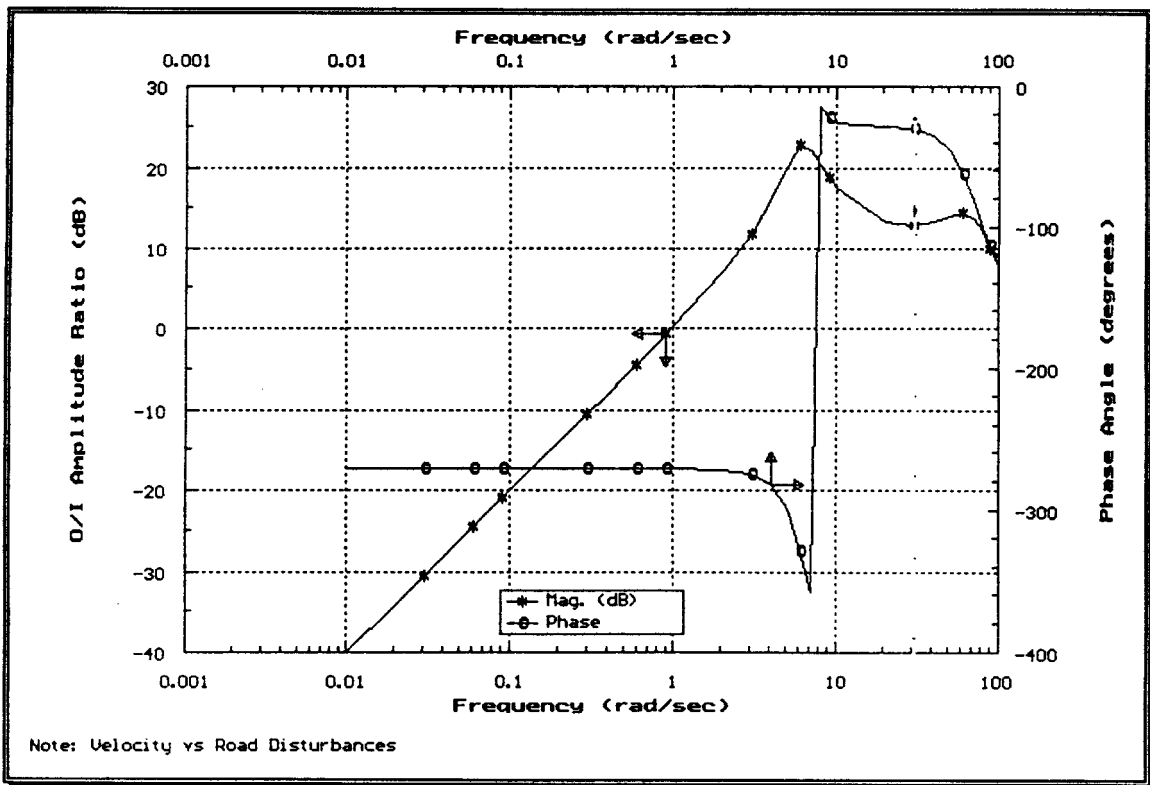


Figure 4.3c. Quarter Car Suspension System Analysis—Velocity vs Road Disturbances.