

Developing a weight transfer spreadsheet

Spreadsheet Layout

Lateral Acceleration						
Measured Suspension Data		Calculated Suspension Data		Results		
MR fl	From WinGeo3	Ms fl	Front Left corner sprung mass [kg]	K ϕ f	Front Roll Stiffness [Nm/rad]	
MR fr	From WinGeo3	Ms fr	Front Right corner sprung mass [kg]	K ϕ r	Rear Roll Stiffness [Nm/rad]	
MR rl	From WinGeo3	Ms rl	Rear Left corner sprung mass [kg]	K ϕ t	Total Roll Stiffness [Nm/rad]	
MR rr	From WinGeo3	Ms rr	Rear Right corner sprung mass [kg]	Mot	Overturning moment [Nm]	
M fl	Front Left total measured static corner mass [kg]	Ms f	Total front sprung mass [kg]	Θ	Roll angle	
M fr	Front Right measured static corner mass [kg]	Ms r	Total rear sprung mass [kg]	WTsf	Front weight transfer due to sprung mass [N]	
M rl	Rear Left total measured static corner mass [kg]	Ks fl	Front Left Spring rate [N/mm]	WTsr	Rear weight transfer due to sprung mass [N]	
M rr	Rear Right total measured static corner mass [kg]	Ks fr	Front Right rspring rate [N/mm]	Remember this needs to incorporate the live rear axle adjustment		
Mus fl	Front Left unsprung mass [kg]	Ks rl	Rear Left Spring rate [N/mm]	WTsrcf	Sprung mass at RC Height	
Mus fr	Front Right total unsprung mass [kg]	Ks rr	Rear Right Spring Rate [N/mm]	WTsrcr	Sprung mass at RC Height	
Mus rl	Rear Left unsprung mass [kg]	Kw fl	Front Left wheel rate [N/mm]	Wtusf	Unsprung mass at wheel centre height	
Mus rr	Rear Right unsprung mass [kg]	Kw fr	Front Right wheel rate [N/mm]	Wtusr	Unsprung mass at wheel centre height	
Ks fl	Front Left Spring rate [lb/in]	Kes rl	Effective rear left spring rate [N/mm]			
Ks fr	Front Right Spring rate [lb/in]	Kes rr	Effective rear right spring rate [N/mm]	Fz fl	Left front vertical force [N]	
Ks rl	Rear Left Spring rate [lb/in]	b	distance of cg from front axle [m]	Fz fr	Front Right vertical force [N]	
Ks rr	Rear Right Spring rate [lb/in]	hr -hf	Rear -Front RC Height [m]	Fz rl	Rear Left vertical force [N]	
Tf	Front Track	z	Depth of triangle at CG [m]	Fz rr	Rear Right vertical force [N]	
Tr	Rear track	z+hf	Height of roll axis at CG [m]			
Ts	Rear Spring Track	Hsra	Height of CG above roll axis [m]		Total WT calculated by adding all Weight transfers	
L	Wheel base				Total Vehicle weight	
Rr	Rolling Radius					
Htot	Height of CG of total mass above ground					
Hs	Height of CG of sprung mass above ground					
hf	Height of Front roll centre above ground from Win Geo 3			WT	Total WT calculated for 'solid' car	
hr	Height of Rear roll centre above ground from Win Geo 3					

Measured Suspension Data		
MR fl	From WinGeo3	
MR fr	From WinGeo3	
MR rl	From WinGeo3	
MR rr	From WinGeo3	
M fl	Front Left total measured static corner mass [kg]	
M fr	Front Right measured static corner mass [kg]	
M rl	Rear Left total measured static corner mass [kg]	
M rr	Rear Right total measured static corner mass [kg]	
Mus fl	Front Left unsprung mass [kg]	
Mus fr	Front Right total unsprung mass [kg]	
Mus rl	Rear Left unsprung mass [kg]	
Mus rr	Rear Right unsprung mass [kg]	
Ks fl	Front Left Spring rate [lb/in]	
Ks fr	Front Right Spring rate [lb/in]	
Ks rl	Rear Left Spring rate [lb/in]	
Ks rr	Rear Right Spring rate [lb/in]	
Tf	Front Track	
Tr	Rear track	
Ts	Rear Spring Track	
L	Wheel base	
Rr	Rolling Radius	
Htot	Height of CG of total mass above ground	
Hs	Height of CG of sprung mass above ground	
hf	Height of Front roll centre above ground from Win Geo 3	
hr	Height of Rear roll centre above ground from Win Geo 3	

Calculated Suspension Data		
Ms fl	Front Left corner sprung mass [kg]	
Ms fr	Front Right corner sprung mass [kg]	
Ms rl	Rear Left corner sprung mass [kg]	
Ms rr	Rear Right corner sprung mass [kg]	
Ms f	Total front sprung mass [kg]	
Ms r	Total rear sprung mass [kg]	
Ks fl	Front Left Spring rate [N/mm]	
Ks fr	Front Right rspring rate [N/mm]	
Ks rl	Rear Left Spring rate [N/mm]	
Ks rr	Rear Right Spring Rate [N/mm]	
Kw fl	Front Left wheel rate [N/mm]	
Kw fr	Front Right wheel rate [N/mm]	
Kes rl	Effective rear left spring rate [N/mm]	
Kes rr	Effective rear right spring rate [N/mm]	
b	distance of cg from front axle [m]	
hr -hf	Rear -Front RC Height [m]	
z	Depth of triangle at CG [m]	
z+hf	Height of roll axis at CG [m]	
Hsra	Height of CG above roll axis [m]	

Results	
$K_{\phi f}$	Front Roll Stiffness [Nm/rad]
$K_{\phi r}$	Rear Roll Stiffness [Nm/rad]
$K_{\phi t}$	Total Roll Stiffness [Nm/rad]
Mot	Overturning moment [Nm]
Θ	Roll angle
WTsf	Front weight transfer due to sprung mass [N]
WTsr	Rear weight transfer due to sprung mass [N]
Remember this needs to incorporate the live rear axle adjustment	
WTsrcf	Sprung mass at RC Height
WTsrcr	Sprung mass at RC Height
Wtusf	Unsprung mass at wheel centre height
Wtusr	Unsprung mass at wheel centre height
Fz fl	Left front vertical force [N]
Fz fr	Front Right vertical force [N]
Fz rl	Rear Left vertical force [N]
Fz rr	Rear Right vertical force [N]
	Total WT calculated by adding all Weight transfers
	Total Vehicle weight
WT	Total WT calculated for 'solid' car

Rowley Load Split

Static						50.0%							
						LF+RF							
						4905.0			Actual				
					35.0%	LF	RF	15.0%					
Front Split	LF-RF	1962.0	1962.0	3433.5				1471.5					
	LF+LR	70.0%		6867	9810.0			2943.0		30.0%	RF+RR		
(LR-RR) -	(LF-RF)	0.0	0.0	35.0%			15.0%						
Rear Split	LR-RR	1962.0	1962.0	3433.5	LR		RR	1471.5					
LR-LF Split					0.0		4905.0		0.0		RR-RF Split		
Wedge					50.0%		LR+RR						
LR-RF Split					1962.0		50.0%						