Treball de Fi de Màster

Màster Universitari en Enginyeria Industrial

Model en Adams

ANNEX A – J

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Sumari

A. Definicions del sistema de referència i càlcul dels request

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Definicions d'eixos:

1. Obrir arxiu de configuració acar.cfg (C:\MSC.Software\Adams_x64\2014\acar)
2. Fer les següents modificacions:

```
! Default side left/right - affects dboxes radio boxes and guesses
ENVIRONMENT    MDI_ACAR_SIDE_PREF        left
!
! Global reference frame
ENVIRONMENT    MDI_ACAR_VEHICLE_REAR      -1,0,0
ENVIRONMENT    MDI_ACAR_VEHICLE_LEFT      0,1,0
```

D'aquesta manera els eixos són els mateixos que la ISO 8855

Per calcular els request:

1. Obrir arxiu de configuració acar.cfg (C:\MSC.Software\Adams_x64\2014\acar)
2. Fer les següents modificacions:

```
! The defaults for generating certain solver output files
ENVIRONMENT    MDI_ACAR_WRITE_GRA      no
ENVIRONMENT    MDI_ACAR_WRITE_NAM      no
ENVIRONMENT    MDI_ACAR_WRITE_OUT      no
ENVIRONMENT    MDI_ACAR_WRITE_REQ      yes
ENVIRONMENT    MDI_ACAR_WRITE_RES      yes
```

B. Front Suspension Double AArm

ADAMS - Template - _Front_Suspension_Double_AArm.tpl

B.1. Build --> Hardpoints

Suspensions Points	X	Y	Z	Units
hpl_Bellcrank_to_Chassis	-6.97	257.62	500.0	[mm]
hpl_Damper_to_Bellcrank	-6.97	261.39	559.19	[mm]
hpl_Damper_to_Chassis	-6.98	44.12	569.13	[mm]
hpl_Lower_Front	135.0	175.84	130.0	[mm]
hpl_Lower_Joint	3.21	560.84	150.0	[mm]
hpl_Lower_Rear	-102.29	258.81	128.99	[mm]
hpl_Prod_to_Bellcrank	-6.97	320.35	538.37	[mm]
hpl_Prod_Joint	-6.82	505.8	307.97	[mm]
hpl_Tierod_Joint	76.42	574.9	180.45	[mm]
hpl_Tierod_to_Rack	0.0	216.49	149.22	[mm]
hpl_Upper_Front	137.25	259.55	263.05	[mm]
hpl_Upper_Joint	-6.84	532.88	293.84	[mm]
hpl_Upper_Rear	-143.21	271.82	233.11	[mm]
hpl_Wheel_Center_ET_0	10	634.96	228.96	[mm]

B.2. Build --> Suspension Parameter --> Toe/Camber Values

	Left	Right
Toe	0^{o}	0^{o}
Camber	-1^{o}	-1^{o}

B.3. Build --> Parameter

Parameter

ET

Type	Single
Real Value	35.0

ETSEIB

Units	Length
Hide From Standard User	No

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B.4. Build --> Construction Frame

Construction Frame

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Wheel_Center_ET_0_Spin_Axis

Type	Left
Location Dependency	Delta location from coordinate
Coordiate Reference	hpl_Wheel_Center_ET_0
Location	0,0,0
Location in	Local
Orientation Dependency	Toe/Camber
Variable Type	Parameter Variables
Toe Parameter Variable	pvl_toe_angle
Camber Parameter Variable	pvl_camber_angle

Bellcrank_Spin_Axis

Type	Left
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Bellcrank_to_Chassis
Location	0,0,0
Location in	Local
Orientation Dependency	Oriented in plane
Coordinate Reference #1	hpl_Bellcrank_to_Chassis
Coordinate Reference #2	hpl_Prod_to_Bellcrank
Coordinate Reference #3	hpl_Damper_to_Bellcrank
Axes	XZ

Damper_to_Chassis_Joint

Type	Left
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Damper_to_Chassis
Location	0,0,25
Location in	Local
Orientation Dependency	User entered values
Orient Using	Euler Angles
Euler Angles	-180,0,0

Lower_Spring_Mount

Type	Left
Location Dependency	Located on a line
Coordinate Reference #1	hpl_Damper_to_Bellcrank
Coordinate Reference #2	hpl_Damper_to_Chassis
Relative Location	20
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hpl_Damper_to_Bellcrank
Coordinate Reference #2	hpl_Damper_to_Chassis
Axis	Z

Upper_Spring_Mount

Type	Left
Location Dependency	Delta location from coordinate
Coordinate Reference	cfl_Lower_Spring_Mount
Location	0.0,0.0,120
Location in	Local
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hpl_Damper_to_Bellcrank
Coordinate Reference #2	hpl_Damper_to_Chassis
Axis	Z

Wheel_Center

Type	Left
Location Dependency	Delta location from coordinate
Coordinate Reference	cfl_Wheel_Center_ET_0_Spin_Axis
Location	0.0, 0.0, (._Front_Suspension_Double_AArm.pvs_ET*-1)
Location in	Local
Orientation Dependency	Toe/Camber
Variable Type	Parameter Variable
Toe Parameter Variable	pvl_toe_angle
Camber Parameter Variable	pvl_camber_angle

Upright_Center

Type	Left
Location Dependency	Delta location from coordinate
Coordinate Reference	cfl_Wheel_Center_ET_0_Spin_Axis
Location	0.0, 0.0, -25.0
Location in	Local
Orientation Dependency	Toe/Camber
Variable Type	Parameter Variable

Toe Parameter Variable	pvl_toe_angle
Camber Parameter Variable	pvl_camber_angle

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B.5. Build --> Parts --> General Part

General Parts

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Lower_AArm

Type	Left
Location Dependency	Centered between coordinates
Centered Between	Three coordinates
Coordinate Reference #1	hpl_Lower_Front
Coordinate Reference #2	hpl_Lower_Joint
Coordinate Reference #3	hpl_Lower_Rear
Orientation	User entered values
Orient Using	Euler Angles
Euler Angles	0,0,0
Mass & Inertia	1E-9
Material	Steel

Upper_AArm

Type	Left
Location Dependency	Centered between coordinates
Centered Between	Three coordinates
Coordinate Reference #1	hpl_Upper_Front
Coordinate Reference #2	hpl_Upper_Joint
Coordinate Reference #3	hpl_Upper_Rear
Orientation	User entered values
Orient Using	Euler Angles
Euler Angles	0,0,0
Mass & Inertia	1E-9
Material	Steel

Prod

Type	Left
Location Dependency	Centered between coordinates
Centered Between	Two coordinates
Coordinate Reference #1	hpl_Prod_Joint
Coordinate Reference #2	hpl_Prod_to_Bellcrank
Orientation	Orient axis along line

Coordinate Reference #1	hpl_Prod_Joint
Coordinate Reference #2	hpl_Prod_to_Bellcrank
Axis	Z
Mass & Inertia	1E-9
Material	Steel

Tierod

Type	Left
Location Dependency	Centered between coordinates
Centered Between	Two coordinates
Coordinate Reference #1	hpl_Tierod_Joint
Coordinate Reference #2	hpl_Tierod_to_Rack
Orientation	Orient axis along line
Coordinate Reference #1	hpl_Tierod_Joint
Coordinate Reference #2	hpl_Tierod_to_Rack
Axis	Z
Mass & Inertia	1E-9
Material	Steel

Upright

Type	Left
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Wheel_Center_ET_0
Location	0,0,0
Location in	Local
Orientation	User entered values
Orient Using	Euler Angles
Euler Angles	0,0,0
Mass & Inertia	1E-9
Material	Steel

Damper_to_Bellcrank

Type	Left
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Damper_to_Bellcrank
Location	0,0,0
Location in	Local
Orientation	User entered values
Orient Using	Euler Angles
Euler Angles	0,0,0
Mass & Inertia	1E-9

Material	Steel

Damper_to_Chassis

Type	Left
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Damper_to_Chassis
Location	0,0,0
Location in	Local
Orientation	User entered values
Orient Using	Euler Angles
Euler Angles	0,0,0
Mass & Inertia	1E-9
Material	Steel

Bellcrank

Type	Left
Location Dependency	Centered between coordinates
Centered Between	Three coordinates
Coordinate Reference #1	hpl_Prod_to_Bellcrank
Coordinate Reference #2	hpl_Bellcrank_to_Chassis
Coordinate Reference #3	hpl_Damper_to_Bellcrank
Orientation	User entered values
Orient Using	Euler Angles
Euler Angles	0,0,0
Mass & Inertia	1E-9
Material	Steel

Hub

Type	Left
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Wheel_Center_ET_0
Location	0,0,0
Location in	Local
Orientation	Delta location from coordinate
Coordinate Reference	cfl_Wheel_Center_ET_0_Spin_Axis
Orientation	0,0,0
Mass & Inertia	1E-9
Material	Steel

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B.6. Build --> Geometry --> Link

Links

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Lower_Front

General Part	gel_Lower_AArm
Coordinate Reference #1	hpl_Lower_Joint
Coordinate Reference #2	hpl_Lower_Front
Radius	9
Mass	Not Calculate Mass Properties

Lower_Rear

General Part	gel_Lower_AArm
Coordinate Reference #1	hpl_Lower_Joint
Coordinate Reference #2	hpl_Lower_Rear
Radius	9
Mass	Not Calculate Mass Properties

Upper_Front

General Part	gel_Upper_AArm
Coordinate Reference #1	hpl_Upper_Joint
Coordinate Reference #2	hpl_Upper_Front
Radius	9
Mass	Not Calculate Mass Properties

Upper_Rear

General Part	gel_Upper_AArm
Coordinate Reference #1	hpl_Upper_Joint
Coordinate Reference #2	hpl_Upper_Rear
Radius	9
Mass	Not Calculate Mass Properties

Prod

General Part	gel_Prod
Coordinate Reference #1	hpl_Prod_Joint
Coordinate Reference #2	hpl_Prod_to_Bellcrank
Radius	9
Mass	Not Calculate Mass Properties

Tierod

General Part	gel_Tierod

Coordinate Reference #1	hpl_Tierod_Joint
Coordinate Reference #2	hpl_Tierod_to_Rack
Radius	7
Mass	Not Calculate Mass Properties

Upright_Upper

General Part	gel_Upright
Coordinate Reference #1	hpl_Upper_Joint
Coordinate Reference #2	cfl_Upright_Center
Radius	10
Mass	Not Calculate Mass Properties

Upright_Lower

General Part	gel_Upright
Coordinate Reference #1	cfl_Upright_Center
Coordinate Reference #2	hpl_Lower_Joint
Radius	10
Mass	Not Calculate Mass Properties

Steering_Arm

General Part	gel_Upright
Coordinate Reference #1	hpl_Tierod_Joint
Coordinate Reference #2	cfl_Upright_Center
Radius	6
Mass	Not Calculate Mass Properties

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B.7. Build --> Geometry --> Ellipsoid

Ellipsoid

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Lower_Front_Rodend

Coordinate Reference	hpl_Lower_Front
Method	By entering size
General Part	gel_Lower_AArm
X Radius	10
Y Radius	10
Z Radius	10
Mass	Not Calculate Mass Properties

Lower_Rear_Rodend

Coordinate Reference	hpl_Lower_Rear
Method	By entering size
General Part	gel_Lower_AArm
X Radius	10
Y Radius	10
Z Radius	10
Mass	Not Calculate Mass Properties

Upper_Front_Rodend

Coordinate Reference	hpl_Upper_Front
Method	By entering size
General Part	gel_Upper_AArm
X Radius	10
Y Radius	10
Z Radius	10
Mass	Not Calculate Mass Properties

Upper_Rear_Rodend

Coordinate Reference	hpl_Upper_Rear
Method	By entering size
General Part	gel_Upper_AArm
X Radius	10
Y Radius	10
Z Radius	10
Mass	Not Calculate Mass Properties

Prod_Joint_Rodend

Coordinate Reference	hpl_Prod_Joint
Method	By entering size
General Part	gel_Prod
X Radius	10
Y Radius	10
Z Radius	10
Mass	Not Calculate Mass Properties

Prod_to_Belllcrank_Rodend

Coordinate Reference	hpl_Prod_to_Bellcrank
Method	By entering size
General Part	gel_Prod
X Radius	10
Y Radius	10

Z Radius	10
Mass	Not Calculate Mass Properties

Tierod_Joint_Rodend

Coordinate Reference	hpl_Tierod_Joint
Method	By entering size
General Part	gel_Upright
X Radius	10
Y Radius	10
Z Radius	10
Mass	Not Calculate Mass Properties

Tierod_to_Rack_Rodend

Coordinate Reference	hpl_Tierod_to_Rack
Method	By entering size
General Part	gel_Tierod
X Radius	8
Y Radius	8
Z Radius	8
Mass	Not Calculate Mass Properties

Upright_Upper_Joint_Rodend

Coordinate Reference	hpl_Upper_Joint
Method	By entering size
General Part	gel_Upright
X Radius	15
Y Radius	15
Z Radius	15
Mass	Not Calculate Mass Properties

Upright_Lower_Joint_Rodend

Coordinate Reference	hpl_Lower_Joint
Method	By entering size
General Part	gel_Upright
X Radius	15
Y Radius	15
Z Radius	15
Mass	Not Calculate Mass Properties

Upright_Center

Coordinate Reference	cfl_Upright_Center

Method	By entering size
General Part	gel_Upright
X Radius	20
Y Radius	20
Z Radius	20
Mass	Not Calculate Mass Properties

Damper_to_Bellcrank_Rodend

Coordinate Reference	hpl_Damper_to_Bellcrank
Method	By entering size
General Part	gel_Damper_to_Bellcrank
X Radius	12.5
Y Radius	12.5
Z Radius	12.5
Mass	Not Calculate Mass Properties

Damper_to_Chassis_Rodend

Coordinate Reference	hpl_Damper_to_Chassis
Method	By entering size
General Part	gel_Damper_to_Chassis
X Radius	16
Y Radius	16
Z Radius	16
Mass	Not Calculate Mass Properties

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B.8. Build --> Geometry --> Cylinder

Cylinder

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Upright_Center_Spin_Axis

General Part	gel_Upright
Construction Frame	cfl_Upright_Center
Radius	20
Lenght in Positive Z	25
Length in Negative Z	0
Mass	Not Calculate Mass Properties

Hub

General Part	gel_Hub
Construction Frame	cfl_Wheel_Center_ET_0_Spin_Axis

Radius	12
Lenght in Positive Z	20
Length in Negative Z	0
Mass	Not Calculate Mass Properties

B.9. Build --> Geometry --> Arm

Arm

Bellcrank_Arm

General Part	gel_Bellcrank
Coordinate Reference #1	hpl_Prod_to_Bellcrank
Coordinate Reference #2	hpl_Bellcrank_to_Chassis
Coordinate Reference #3	hpl_Damper_to_Bellcrank
Thickness	10
Mass	Not Calculate Mass Properties

B.10. Build --> Forces --> Damper

Damper

Damper

I Part	gel_Damper_to_Chassis
J Part	gel_Damper_to_Bellcrank
I Coordinate Reference	hpl_Damper_to_Chassis
J Coordinate Reference	hpl_Damper_to_Bellcrank
Property File	
mdids://ETSEIB_Motorsport/dampers.tbl/Sachs_Original_Setup_Medium.dpr	
Diameter	15

B.11. Build --> Forces --> Spring

Spring

Spring

I Part	gel_Damper_to_Chassis
J Part	gel_Damper_to_Bellcrank
I Coordinate Reference	cfl_Upper_Spring_Mount
J Coordinate Reference	cfl_Lower_Spring_Mount

Use Hardpoints

Property File

mdids://ETSEIB_Motorsport/springs.tbl/Spring_K58_294kg_CAT09e.spr

Spring Diameter	40
Number of Coils	6

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B.12. Build --> Forces --> Bumpstop and Reboundstop

Bumpstop and Reboundstop

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Bump_Limit

I Part	gel_Damper_to_Chassis
J Part	gel_Damper_to_Bellcrank
I Coordinate Reference	hpl_Damper_to_Chassis
J Coordinate Reference	hpl_Damper_to_Bellcrank
Property File	mdids://ETSEIB_Motorsport/bumpstops.tbl/Bump_Limit.bum
Clearance	17.5
Diameter	20

Rebound_Limit

I Part	gel_Damper_to_Chassis
J Part	gel_Damper_to_Bellcrank
I Coordinate Reference	hpl_Damper_to_Chassis
J Coordinate Reference	hpl_Damper_to_Bellcrank

Property File

mdids://ETSEIB_Motorsport/reboundstops.tbl/Rebound_Limit.reb

Clearance	17.5
Diameter	10

.....

B.13. Build --> Parts --> Mount

Mount

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Lower_AArm_to_Chassis

Coordinate Reference	hpl_Lower_Rear
From Minor Role	Inherit

Upper_AArm_to_Chassis

Coordinate Reference	hpl_Upper_Rear

From Minor Role	Inherit

Bellcrank_to_Chassis

Coordinate Reference	hpl_Bellcrank_to_Chassis
From Minor Role	Inherit

Damper_to_Chassis

Coordinate Reference	hpl_Damper_to_Chassis
From Minor Role	Inherit

Tierod_to_Rack

Coordinate Reference	hpl_Tierod_to_Rack
From Minor Role	Inherit

B.14. Build --> Parts --> Switch

Switch Part

Prod_Pickup

Coordinate Reference	hpl_Prod_Joint
Parts List	._Front_Suspension_Double_AArm.gel_Upper_AArm
	._Front_Suspension_Double_AArm.gel_Lower_AArm
	._Front_Suspension_Double_AArm.gel_Upright
Switch to Part	._Front_Suspension_Double_AArm.gel_Upper_AArm

B.15. Build --> Attachment --> Joint

Attachment Joint

Lower_Rear

I Part	gel_Lower_AArm
J Part	mtl_Lower_AArm_to_Chassis
Type	Left
Joint Type	Spherical
Active	Kinematic mode
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Lower_Rear
Location	0,0,0
Location in	Local

Orientation	None

Upper_Rear

I Part	gel_Upper_AArm
J Part	mtl_Upper_AArm_to_Chassis
Type	Left
Joint Type	Spherical
Active	Kinematic mode
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Upper_Rear
Location	0,0,0
Location in	Local
Orientation	None

Lower_Front

I Part	gel_Lower_AArm
J Part	mtl_Lower_AArm_to_Chassis
Type	Left
Joint Type	Inline
Active	Kinematic mode
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Lower_Front
Location	0,0,0
Location in	Local
Orientation Dependency	Orient axis along line
Coorinate Reference #1	hpl_Lower_Front
Coorinate Reference #2	hpl_Lower_Rear
Axis	Z

Upper_Front

I Part	gel_Upper_AArm
J Part	mtl_Upper_AArm_to_Chassis
Type	Left
Joint Type	Inline
Active	Kinematic mode
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Upper_Front
Location	0,0,0
Location in	Local
Orientation Dependency	Orient axis along line
Coorinate Reference #1	hpl_Upper_Front

Coorinate Reference #2	hpl_Upper_Rear
Axis	Z

Bellcrank

I Part	gel_Bellcrank
J Part	mtl_Bellcrank_to_Chassis
Type	Left
Joint Type	Revolute
Active	Always
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Bellcrank_to_Chassis
Location	0,0,0
Location in	Local
Orientation Dependency	Parallel to axis
Construction Frame	cfl_Bellcrank_Spin_Axis
Axis on Entity	X
Axis on Frame	+Z

Lower_Joint

I Part	gel_Lower_AArm
J Part	gel_Upright
Type	Left
Joint Type	Spherical
Active	Always
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Lower_Joint
Location	0,0,0
Location in	Local
Orientation	None

Upper_Joint

I Part	gel_Upper_AArm
J Part	gel_Upright
Type	Left
Joint Type	Spherical
Active	Always
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Upper_Joint
Location	0,0,0
Location in	Local
Orientation	None

Prod_Joint

I Part	gel_Prod
J Part	swl_Prod_Pickup
Type	Left
Joint Type	Spherical
Active	Always
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Prod_Joint
Location	0,0,0
Location in	Local
Orientation	None

Tierod_Joint

I Part	gel_Tierod
J Part	gel_Upright
Type	Left
Joint Type	Spherical
Active	Always
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Tierod_Joint
Location	0,0,0
Location in	Local
Orientation	None

Tierod_to_Rack

I Part	gel_Tierod
J Part	mtl_Tierod_to_Rack
Type	Left
Joint Type	Convel
Active	Always
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Tierod_to_Rack
Location	0,0,0
Location in	Local
I-Part Axis	hpl_Tierod_Joint
J-Part Axis	hpr_Tierod_to_Rack

Prod_to_Bellcrank

I Part	gel_Prod
J Part	gel_Bellcrank

Type	Left
Joint Type	Convel
Active	Always
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Prod_to_Bellcrank
Location	0,0,0
Location in	Local
I-Part Axis	hpl_Prod_Joint
J-Part Axis	hpl_Bellcrank_to_Chassis

Hub

I Part	gel_Hub
J Part	gel_Upright
Type	Left
Joint Type	Revolute
Active	Always
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Wheel_Center_ET_0
Location	0,0,0
Locaton in	Local
Orientation Dependency	Delta orientation from coordinate
Construction Frame	cfl_Wheel_Center_ET_0_Spin_Axis
Orientation	0,0,0

Damper_to_Bellcrank

I Part	gel_Damper_to_Bellcrank
J Part	gel_Bellcrank
Type	Left
Joint Type	Convel
Active	Always
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Damper_to_Bellcrank
Location	0,0,0
Location in	Local
I-Part Axis	hpl_Damper_to_Chassis
J-Part Axis	hpl_Bellcrank_to_Chassis

Damper_to_Chassis

I Part	gel_Damper_to_Chassis
J Part	mtl_Damper_to_Chassis
Type	Left

Joint Type	Convel
Active	Always
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Damper_to_Chassis
Location	0,0,0
Location in	Local
I-Part Axis	hpl_Damper_to_Bellcrank
J-Part Axis	cfl_Damper_to_Chassis_Joint

Damper

I Part	gel_Damper_to_Bellcrank
J Part	gel_Damper_to_Chassis
Type	Left
Joint Type	Cylindrical
Active	Always
Location Dependency	Centered between coordinates
Centered Between	Two coordinates
Coordinate Reference #1	hpl_Damper_to_Bellcrank
Coordinate Reference #2	hpl_Damper_to_Chassis
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hpl_Damper_to_Bellcrank
Coordinate Reference #2	hpl_Damper_to_Chassis
Axis	Z

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B.16. Build --> Attachments --> Bushing

Bushing

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Lower_Rear

I Part	gel_Lower_AArm
J Part	mtl_Lower_AArm_to_Chassis
Type	Left
Inactive	Kinematic mode
Preload	0,0,0
Tpreload	0,0,0
Offset	0,0,0
Roffset	0,0,0
Geometry Length	20
Geometry Radius	15
Property File	mdids://ETSEIB_Motorsport/bushings.tbl/Rodend_Bushing.bus

Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Lower_Rear
Location	0,0,0
Location in	Local
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hpl_Lower_Rear
Coordinate Reference #2	hpl_Lower_Front
Axis	Z

Lower_Front

I Part	gel_Lower_AArm
J Part	mtl_Lower_AArm_to_Chassis
Type	Left
Inactive	Kinematic mode
Preload	0,0,0
Tpreload	0,0,0
Offset	0,0,0
Roffset	0,0,0
Geometry Length	20
Geometry Radius	15
Property File	mdids://ETSEIB_Motorsport/bushings.tbl/Rodend_Bushing.bus
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Lower_Front
Location	0,0,0
Location in	Local
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hpl_Lower_Front
Coordinate Reference #2	hpl_Lower_Rear
Axis	Z

Upper_Rear

I Part	gel_Upper_AArm
J Part	mtl_Upper_AArm_to_Chassis
Type	Left
Inactive	Kinematic mode
Preload	0,0,0
Tpreload	0,0,0
Offset	0,0,0
Roffset	0,0,0
Geometry Length	20
Geometry Radius	15

Property File	mdids://ETSEIB_Motorsport/bushings.tbl/Rodend_Bushing.bus
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Upper_Rear
Location	0,0,0
Location in	Local
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hpl_Upper_Rear
Coordinate Reference #2	hpl_Upper_Front
Axis	Z

Upper_Front

I Part	gel_Upper_AArm
J Part	mtl_Upper_AArm_to_Chassis
Type	Left
Inactive	Kinematic mode
Preload	0,0,0
Tpreload	0,0,0
Offset	0,0,0
Roffset	0,0,0
Geometry Length	20
Geometry Radius	15
Property File	mdids://ETSEIB_Motorsport/bushings.tbl/Rodend_Bushing.bus
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Upper_Front
Location	0,0,0
Location in	Local
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hpl_Upper_Front
Coordinate Reference #2	hpl_Upper_Rear
Axis	Z

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B.17. Build --> Suspension Parameters --> Characteristics Array

Suspension Parameters

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Array

Steer Axis Calculation	Geometric
Suspension Type	Independent
I Part	gel_Upper_AArm
J Part	gel_Lower_AArm

I Coordinate Reference	hpl_Upper_Joint
J Coordinate Reference	hpl_Lower_Joint

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B.18. Build --> Communicator --> Output

Output Comunicatior

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Suspension_Mount

Matching Name	Suspension_Mount
Type	Left
Entity	Mount
To Minor Role	Inherit
Part Name	gel_Hub

Suspension_Upright

Matching Name	Suspension_Upright
Type	Left
Entity	Mount
To Minor Role	Inherit
Part Name	gel_Upright

Wheel_Center

Matching Name	Wheel_Center
Type	Left
Entity	Location
To Minor Role	Inherit
Coordinate Reference	cfl_Wheel_Center

Tierod_to_Rack_Pickup

Matching Name	Tierod_to_Rack_Pickup
Type	Left
Entity	Location
To Minor Role	Inherit
Coordinate Reference	hpl_Tierod_to_Rack

Droplink_to_Bellcrank

Matching Name	Droplink_to_Bellcrank
Type	Left
Entity	Mount
To Minor Role	Inherit

Part Name	gel_Bellcrank

Left_Droplink_to_Bellcrank

Matching Name	Left_Droplink_to_Bellcrank
Type	Single
Entity	Mount
To Minor Role	Inherit
Part Name	gel_Bellcrank

Right_Droplink_to_Bellcrank

Matching Name	Right_Droplink_to_Bellcrank
Type	Single
Entity	Mount
To Minor Role	Inherit
Part Name	ger_Bellcrank

B.19. Build --> Communicator --> Test

Test Communicators

Model Names

__MDI_SUSPENSION_TESTRIG	any
__Front_Suspension_Double_AArm	front

B.20. Build --> Marker

Nota: eix Z és l'eix axial dels tubs

Marker

Lower_Rear_Local_Axes

Part	gel_Lower_AArm
Type	Left
Location Dependency	Centered between coordinates
Centered Between	Two coordinates
Coordinate Reference #1	hpl_Lower_Joint
Coordinate Reference #2	hpl_Lower_Rear
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hpl_Lower_Joint

Coordinate Reference #2	hpl_Lower_Rear
Axis	Z

Lower_Front_Local_Axes

Part	gel_Lower_AArm
Type	Left
Location Dependency	Centered between coordinates
Centered Between	Two coordinates
Coordinate Reference #1	hpl_Lower_Joint
Coordinate Reference #2	hpl_Lower_Front
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hpl_Lower_Joint
Coordinate Reference #2	hpl_Lower_Front
Axis	Z

Upper_Rear_Local_Axes

Part	gel_Upper_AArm
Type	Left
Location Dependency	Centered between coordinates
Centered Between	Two coordinates
Coordinate Reference #1	hpl_Upper_Joint
Coordinate Reference #2	hpl_Upper_Rear
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hpl_Upper_Joint
Coordinate Reference #2	hpl_Upper_Rear
Axis	Z

Upper_Front_Local_Axes

Part	gel_Upper_AArm
Type	Left
Location Dependency	Centered between coordinates
Centered Between	Two coordinates
Coordinate Reference #1	hpl_Upper_Joint
Coordinate Reference #2	hpl_Upper_Front
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hpl_Upper_Joint
Coordinate Reference #2	hpl_Upper_Front
Axis	Z

Prod_Local_Axes

Part	gel_Prod

Type	Left
Location Dependency	Centered between coordinates
Centered Between	Two coordinates
Coordinate Reference #1	hpl_Prod_to_Bellcrank
Coordinate Reference #2	hpl_Prod_Joint
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hpl_Prod_to_Bellcrank
Coordinate Reference #2	hpl_Prod_Joint
Axis	Z

Tierod_Local_Axes

Part	gel_Tierod
Type	Left
Location Dependency	Centered between coordinates
Centered Between	Two coordinates
Coordinate Reference #1	hpl_Tierod_to_Rack
Coordinate Reference #2	hpl_Tierod_Joint
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hpl_Tierod_to_Rack
Coordinate Reference #2	hpl_Tierod_Joint
Axis	Z

Upper_Joint_Local_Axes

Part	gel_Upright
Type	Left
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Upper_Joint
Location	0,0,0
Location in	Local
Orientation Dependency	Oriented in plane
Coordinate Reference #1	hpl_Upper_Joint
Coordinate Reference #2	hpl_Upper_Front
Coordinate Reference #3	hpl_Upper_Rear
Axes	ZX

Lower_Joint_Local_Axes

Part	gel_Upright
Type	Left
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Lower_Joint
Location	0,0,0

Location in	Local
Orientation Dependency	Oriented in plane
Coordinate Reference #1	hpl_Lower_Joint
Coordinate Reference #2	hpl_Lower_Front
Coordinate Reference #3	hpl_Lower_Rear
Axes	ZX

Bellcrank_Bushing_Local_Axes

Part	gel_Bellcrank
Type	Left
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Bellcrank_to_Chassis
Location	0,0,0
Location in	Local
Orientation Dependency	Oriented in plane
Coordinate Reference #1	hpl_Prod_to_Bellcrank
Coordinate Reference #2	hpl_Bellcrank_to_Chassis
Coordinate Reference #2	hpl_Damper_to_Bellcrank
Axes	ZX

Damper_Local_Axes

Part	gel_Damper_to_Chassis
Type	Left
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Damper_to_Chassis
Location	0,0,0
Location in	Local
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hpl_Damper_to_Chassis
Coordinate Reference #2	hpl_Damper_to_Bellcrank
Axis	Z

.....

B.21. Build --> Request

Requests

.....

jklsph_Lower_Rear_Left_Force_Kin

Comment	Force on Lower Rear Left Tube
Define Using Function Expresion	
F1	

F2

JOINT(._Front_Suspension_Double_AArm.jklsph_Lower_Rear,0,2, ._Front_Suspension_Double_AArm.gel_Lower_AArm.mal_Lower_Rear_Local_Axes)

F3

JOINT(._Front_Suspension_Double_AArm.jklsph_Lower_Rear,0,3, ._Front_Suspension_Double_AArm.gel_Lower_AArm.mal_Lower_Rear_Local_Axes)

F4

JOINT(._Front_Suspension_Double_AArm.jklsph_Lower_Rearl,0,4, ._Front_Suspension_Double_AArm.gel_Lower_AArm.mal_Lower_Rear_Local_Axes)

F5

F6

JOINT(._Front_Suspension_Double_AArm.jklsph_Lower_Rear,0,6, ._Front_Suspension_Double_AArm.gel_Lower_AArm.mal_Lower_Rear_Local_Axes)

F7

JOINT(._Front_Suspension_Double_AArm.jklsph_Lower_Rear,0,7, ._Front_Suspension_Double_AArm.gel_Lower_AArm.mal_Lower_Rear_Local_Axes)

F8

JOINT(._Front_Suspension_Double_AArm.jklsph_Lower_Rear,0,8, ._Front_Suspension_Double_AArm.gel_Lower_AArm.mal_Lower_Rear_Local_Axes)

Title

Result Set Name	jklsph_Lower_Rear_Left_Force_Kin
MAG	F_Magnitude
X	F_Radial_X
Y	F_Radial_Y
Z	F_Axial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

bkl_Lower_Rear_Left_Force

Comment Force on Lower Rear Left Tube

Define Using Function Expresion

F1

F2

FIELD(._Front_Suspension_Double_AArm.bkl_Lower_Rear.field,0,2, ._Front_Suspension_Double_AArm.gel_Lower_AArm.mal_Lower_Rear_Local_Axes)

F3

FIELD(._Front_Suspension_Double_AArm.bkl_Lower_Rear.field,0,3, ._Front_Suspension_Double_AArm.gel_Lower_AArm.mal_Lower_Rear_Local_Axes)

F4

FIELD(._Front_Suspension_Double_AArm.bkl_Lower_Rear.field,0,4, ._Front_Suspension_Double_AArm.gel_Lower_AArm.mal_Lower_Rear_Local_Axes)

F5

F6

FIELD(._Front_Suspension_Double_AArm.bkl_Lower_Rear.field,0,6, ._Front_Suspension_Double_AArm.gel_Lower_AArm.mal_Lower_Rear_Local_Axes)

F7

FIELD(._Front_Suspension_Double_AArm.bkl_Lower_Rear.field,0,7, ._Front_Suspension_Double_AArm.gel_Lower_AArm.mal_Lower_Rear_Local_Axes)

F8

FIELD(._Front_Suspension_Double_AArm.bkl_Lower_Rear.field,0,8, ._Front_Suspension_Double_AArm.gel_Lower_AArm.mal_Lower_Rear_Local_Axes)

Title

Result Set Name	bkl_Lower_Rear_Left_Force
MAG	F_Magnitude
X	F_Radial_X
Y	F_Radial_Y
Z	F_Axial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

jklinl_Lower_Front_Left_Force_Kin

Comment Force on Lower Front Left Tube

Define Using Function Expresion

F1

F2

JPRIM(._Front_Suspension_Double_AArm.jklinl_Lower_Front,0,2,._Front_Suspension_Double_AArm.gel_Lower_AArm.mal_Lower_Front_Local_Axes)

F3

JPRIM(._Front_Suspension_Double_AArm.jklinl_Lower_Front,0,3,._Front_Suspension_Double_AArm.gel_Lower_AArm.mal_Lower_Front_Local_Axes)

F4

JPRIM(._Front_Suspension_Double_AArm.jklinl_Lower_Front,0,4,._Front_Suspension_Double_AArm.gel_Lower_AArm.mal_Lower_Front_Local_Axes)

F5

F6

JPRIM(._Front_Suspension_Double_AArm.jklinl_Lower_Front,0,6,._Front_Suspension_Double_AArm.gel_Lower_AArm.mal_Lower_Front_Local_Axes)

F7

JPRIM(._Front_Suspension_Double_AArm.jklinl_Lower_Front,0,7,._Front_Suspension_Double_AArm.gel_Lower_AArm.mal_Lower_Front_Local_Axes)

F8

JPRIM(._Front_Suspension_Double_AArm.jklinl_Lower_Front,0,8,._Front_Suspension_Double_AArm.gel_Lower_AArm.mal_Lower_Front_Local_Axes)

Title

Result Set Name	jklinl_Lower_Front_Left_Force_Kin
MAG	F_Magnitude
X	F_Radial_X
Y	F_Radial_Y
Z	F_Axial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

bkl_Lower_Front_Left_Force

Comment Force on Lower Front Left Tube

Define Using Function Expresion

F1

F2

FIELD(._Front_Suspension_Double_AArm.bkl_Lower_Front.field,0,2, ._Front_Suspension_Double_AArm.gel_Lower_AArm.mal_Lower_Front_Local_Axes)

F3

FIELD(._Front_Suspension_Double_AArm.bkl_Lower_Front.field,0,3, ._Front_Suspension_Double_AArm.gel_Lower_AArm.mal_Lower_Front_Local_Axes)

F4

FIELD(._Front_Suspension_Double_AArm.bkl_Lower_Front.field,0,4, ._Front_Suspension_Double_AArm.gel_Lower_AArm.mal_Lower_Front_Local_Axes)

F5

F6

FIELD(._Front_Suspension_Double_AArm.bkl_Lower_Front.field,0,6, ._Front_Suspension_Double_AArm.gel_Lower_AArm.mal_Lower_Front_Local_Axes)

F7

FIELD(._Front_Suspension_Double_AArm.bkl_Lower_Front.field,0,7, ._Front_Suspension_Double_AArm.gel_Lower_AArm.mal_Lower_Front_Local_Axes)

F8

FIELD(._Front_Suspension_Double_AArm.bkl_Lower_Front.field,0,8, ._Front_Suspension_Double_AArm.gel_Lower_AArm.mal_Lower_Front_Local_Axes)

Title

Result Set Name bkl_Lower_Front_Left_Force

MAG	F_Magnitude
X	F_Radial_X
Y	F_Radial_Y
Z	F_Axial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

jklsph_Upper_Rear_Left_Force_Kin

Comment	Force on Upper Rear Left Tube
Define Using Function Expresion	
F1	
F2	JOINT(._Front_Suspension_Double_AArm.jklsph_Upper_Rear,0,2, ._Front_Suspension_Double_AArm.gel_Upper_AArm.mal_Upper_Rear_Local_Axes)
F3	JOINT(._Front_Suspension_Double_AArm.jklsph_Upper_Rear,0,3, ._Front_Suspension_Double_AArm.gel_Upper_AArm.mal_Upper_Rear_Local_Axes)
F4	JOINT(._Front_Suspension_Double_AArm.jklsph_Upper_Rear,0,4, ._Front_Suspension_Double_AArm.gel_Upper_AArm.mal_Upper_Rear_Local_Axes)
F5	
F6	JOINT(._Front_Suspension_Double_AArm.jklsph_Upper_Rear,0,6, ._Front_Suspension_Double_AArm.gel_Upper_AArm.mal_Upper_Rear_Local_Axes)
F7	JOINT(._Front_Suspension_Double_AArm.jklsph_Upper_Rear,0,7, ._Front_Suspension_Double_AArm.gel_Upper_AArm.mal_Upper_Rear_Local_Axes)
F8	JOINT(._Front_Suspension_Double_AArm.jklsph_Upper_Rear,0,8, ._Front_Suspension_Double_AArm.gel_Upper_AArm.mal_Upper_Rear_Local_Axes)
Title	
Result Set Name	jklsph_Upper_Rear_Left_Force_Kin
MAG	F_Magnitude
X	F_Radial_X
Y	F_Radial_Y
Z	F_Axial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y

R3 T_Z

bkl_Upper_Rear_Left_Force

Comment Force on Upper Rear Left Tube

Define Using Function Expresion

F1

F2

FIELD(._Front_Suspension_Double_AArm.bkl_Upper_Rear.field,0,2, ._Front_Suspension_Double_AArm.gel_Upper_AArm.mal_Upper_Rear_Local_Axes)

F3

FIELD(._Front_Suspension_Double_AArm.bkl_Upper_Rear.field,0,3, ._Front_Suspension_Double_AArm.gel_Upper_AArm.mal_Upper_Rear_Local_Axes)

F4

FIELD(._Front_Suspension_Double_AArm.bkl_Upper_Rear.field,0,4, ._Front_Suspension_Double_AArm.gel_Upper_AArm.mal_Upper_Rear_Local_Axes)

F5

F6

FIELD(._Front_Suspension_Double_AArm.bkl_Upper_Rear.field,0,6, ._Front_Suspension_Double_AArm.gel_Upper_AArm.mal_Upper_Rear_Local_Axes)

F7

FIELD(._Front_Suspension_Double_AArm.bkl_Upper_Rear.field,0,7, ._Front_Suspension_Double_AArm.gel_Upper_AArm.mal_Upper_Rear_Local_Axes)

F8

FIELD(._Front_Suspension_Double_AArm.bkl_Upper_Rear.field,0,8, ._Front_Suspension_Double_AArm.gel_Upper_AArm.mal_Upper_Rear_Local_Axes)

Title

Result Set Name bkl_Upper_Rear_Left_Force

MAG F_Magnitude

X F_Radial_X

Y F_Radial_Y

Z F_Axial_Z

AMAG T_Magnitude

R1 T_X

R2 T_Y

R3 T_Z

jklinl_Upper_Front_Left_Force_Kin

Comment Force on Upper Front Left Tube

Define Using Function Expresion

F1

F2

JPRIM(._Front_Suspension_Double_AArm.jklinl_Upper_Front,0,2, ._Front_Suspension_Double_AArm.gel_Upper_AArm.mal_Upper_Front_Local_Axes)

F3

JPRIM(._Front_Suspension_Double_AArm.jklinl_Upper_Front,0,3, ._Front_Suspension_Double_AArm.gel_Upper_AArm.mal_Upper_Front_Local_Axes)

F4

JPRIM(._Front_Suspension_Double_AArm.jklinl_Upper_Front,0,4, ._Front_Suspension_Double_AArm.gel_Upper_AArm.mal_Upper_Front_Local_Axes)

F5

F6

JPRIM(._Front_Suspension_Double_AArm.jklinl_Upper_Front,0,6, ._Front_Suspension_Double_AArm.gel_Upper_AArm.mal_Upper_Front_Local_Axes)

F7

JPRIM(._Front_Suspension_Double_AArm.jklinl_Upper_Front,0,7, ._Front_Suspension_Double_AArm.gel_Upper_AArm.mal_Upper_Front_Local_Axes)

F8

JPRIM(._Front_Suspension_Double_AArm.jklinl_Upper_Front,0,8, ._Front_Suspension_Double_AArm.gel_Upper_AArm.mal_Upper_Front_Local_Axes)

Title

Result Set Name	jklinl_Upper_Front_Left_Force_Kin
MAG	F_Magnitude
X	F_Radial_X
Y	F_Radial_Y
Z	F_Axial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

bkl_Upper_Front_Left_Force

Comment Force on Upper Front Left Tube

Define Using Function Expresion

F1

F2

FIELD(._Front_Suspension_Double_AArm.bkl_Upper_Front.field,0,2, ._Front_Suspension_Double_AArm.gel_Upper_AArm.mal_Upper_Front_Local_Axes)

F3

FIELD(._Front_Suspension_Double_AArm.bkl_Upper_Front.field,0,3, ._Front_Suspension_Double_AArm.gel_Upper_AArm.mal_Upper_Front_Local_Axes)

F4

FIELD(._Front_Suspension_Double_AArm.bkl_Upper_Front.field,0,4, ._Front_Suspension_Do

uble_AArm.gel_Upper_AArm.mal_Upper_Front_Local_Axes)

F5

F6

FIELD(._Front_Suspension_Double_AArm.bkl_Upper_Front.field,0,6, ._Front_Suspension_Double_AArm.gel_Upper_AArm.mal_Upper_Front_Local_Axes)

F7

FIELD(._Front_Suspension_Double_AArm.bkl_Upper_Front.field,0,7, ._Front_Suspension_Double_AArm.gel_Upper_AArm.mal_Upper_Front_Local_Axes)

F8

FIELD(._Front_Suspension_Double_AArm.bkl_Upper_Front.field,0,8, ._Front_Suspension_Double_AArm.gel_Upper_AArm.mal_Upper_Front_Local_Axes)

Title

Result Set Name	bkl_Upper_Front_Left_Force
MAG	F_Magnitude
X	F_Radial_X
Y	F_Radial_Y
Z	F_Axial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

jolsph_Prod_Left_Force

Comment Force on Prod Left

Define Using Function Expresion

F1

F2

JOINT(._Front_Suspension_Double_AArm.jolsph_Prod_Joint,0,2, ._Front_Suspension_Double_AArm.gel_Prod.mal_Prod_Local_Axes)

F3

JOINT(._Front_Suspension_Double_AArm.jolsph_Prod_Joint,0,3, ._Front_Suspension_Double_AArm.gel_Prod.mal_Prod_Local_Axes)

F4

JOINT(._Front_Suspension_Double_AArm.jolsph_Prod_Joint,0,4, ._Front_Suspension_Double_AArm.gel_Prod.mal_Prod_Local_Axes)

F5

F6

JOINT(._Front_Suspension_Double_AArm.jolsph_Prod_Joint,0,6, ._Front_Suspension_Double_AArm.gel_Prod.mal_Prod_Local_Axes)

F7

JOINT(._Front_Suspension_Double_AArm.jolsph_Prod_Joint,0,7, ._Front_Suspension_Double

_AArm.gel_Prod.mal_Prod_Local_Axes)

F8

JOINT(._Front_Suspension_Double_AArm.jolsph_Prod_Joint,0,8, ._Front_Suspension_Double_AArm.gel_Prod.mal_Prod_Local_Axes)

Title

Result Set Name	jolsph_Prod_Left_Force
MAG	F_Magnitude
X	F_Radial_X
Y	F_Radial_Y
Z	F_Axial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

jolsph_Tierod_Left_Force

Comment	Force on Tierod Left

Define Using Function Expresion

F1

F2

JOINT(._Front_Suspension_Double_AArm.jolsph_Tierod_Joint,0,2, ._Front_Suspension_Double_AArm.gel_Tierod.mal_Tierod_Local_Axes)

F3

JOINT(._Front_Suspension_Double_AArm.jolsph_Tierod_Joint,0,3, ._Front_Suspension_Double_AArm.gel_Tierod.mal_Tierod_Local_Axes)

F4

JOINT(._Front_Suspension_Double_AArm.jolsph_Tierod_Joint,0,4, ._Front_Suspension_Double_AArm.gel_Tierod.mal_Tierod_Local_Axes)

F5

F6

JOINT(._Front_Suspension_Double_AArm.jolsph_Tierod_Joint,0,6, ._Front_Suspension_Double_AArm.gel_Tierod.mal_Tierod_Local_Axes)

F7

JOINT(._Front_Suspension_Double_AArm.jolsph_Tierod_Joint,0,7, ._Front_Suspension_Double_AArm.gel_Tierod.mal_Tierod_Local_Axes)

F8

JOINT(._Front_Suspension_Double_AArm.jolsph_Tierod_Joint,0,8, ._Front_Suspension_Double_AArm.gel_Tierod.mal_Tierod_Local_Axes)

Title

Result Set Name	jolsph_Tierod_Left_Force
MAG	F_Magnitude

X	F_Radial_X
Y	F_Radial_Y
Z	F_Axial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

jolsph_Upper_Joint_Left_Force

Comment	Force on Upright Upper Joint Left
Define Using Function Expresion	
F1	
F2	JOINT(._Front_Suspension_Double_AArm.jolsph_Upper_Joint,1,2, ._Front_Suspension_Double_AArm.gel_Upright.mal_Upper_Joint_Local_Axes)
F3	JOINT(._Front_Suspension_Double_AArm.jolsph_Upper_Joint,1,3, ._Front_Suspension_Double_AArm.gel_Upright.mal_Upper_Joint_Local_Axes)
F4	JOINT(._Front_Suspension_Double_AArm.jolsph_Upper_Joint,1,4, ._Front_Suspension_Double_AArm.gel_Upright.mal_Upper_Joint_Local_Axes)
F5	
F6	JOINT(._Front_Suspension_Double_AArm.jolsph_Upper_Joint,1,6, ._Front_Suspension_Double_AArm.gel_Upright.mal_Upper_Joint_Local_Axes)
F7	JOINT(._Front_Suspension_Double_AArm.jolsph_Upper_Joint,1,7, ._Front_Suspension_Double_AArm.gel_Upright.mal_Upper_Joint_Local_Axes)
F8	JOINT(._Front_Suspension_Double_AArm.jolsph_Upper_Joint,1,8, ._Front_Suspension_Double_AArm.gel_Upright.mal_Upper_Joint_Local_Axes)
Title	
Result Set Name	jolsph_Upper_Joint_Left_Force
MAG	F_Magnitude
X	F_Radial_X
Y	F_Axial_Y
Z	F_Radial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

jolsph_Lower_Joint_Left_Force

Comment	Force on Upright Lower Joint Left
Define Using Function Expresion	
F1	
F2	JOINT(._Front_Suspension_Double_AArm.jolsph_Lower_Joint,1,2, ._Front_Suspension_Double_AArm.gel_Upright.mal_Lower_Joint_Local_Axes)
F3	JOINT(._Front_Suspension_Double_AArm.jolsph_Lower_Joint,1,3, ._Front_Suspension_Double_AArm.gel_Upright.mal_Lower_Joint_Local_Axes)
F4	JOINT(._Front_Suspension_Double_AArm.jolsph_Lower_Joint,1,4, ._Front_Suspension_Double_AArm.gel_Upright.mal_Lower_Joint_Local_Axes)
F5	
F6	JOINT(._Front_Suspension_Double_AArm.jolsph_Lower_Joint,1,6, ._Front_Suspension_Double_AArm.gel_Upright.mal_Lower_Joint_Local_Axes)
F7	JOINT(._Front_Suspension_Double_AArm.jolsph_Lower_Joint,1,7, ._Front_Suspension_Double_AArm.gel_Upright.mal_Lower_Joint_Local_Axes)
F8	JOINT(._Front_Suspension_Double_AArm.jolsph_Lower_Joint,1,8, ._Front_Suspension_Double_AArm.gel_Upright.mal_Lower_Joint_Local_Axes)
Title	
Result Set Name	jolsph_Lower_Joint_Left_Force
MAG	F_Magnitude
X	F_Radial_X
Y	F_Axial_Y
Z	F_Radial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

jolrev_Bellcrank_to_Chassis_Left_Force

Comment	Force on Bellcrank Left
Define Using Function Expresion	
F1	
F2	JOINT(._Front_Suspension_Double_AArm.jolrev_Bellcrank,0,2, ._Front_Suspension_Double_

AArm.gel_Bellcrank.mal_Bellcrank_Bushing_Local_Axes)

F3

JOINT(._Front_Suspension_Double_AArm.jolrev_Bellcrank,0,3, ._Front_Suspension_Double_AArm.gel_Bellcrank.mal_Bellcrank_Bushing_Local_Axes)

F4

JOINT(._Front_Suspension_Double_AArm.jolrev_Bellcrank,0,4, ._Front_Suspension_Double_AArm.gel_Bellcrank.mal_Bellcrank_Bushing_Local_Axes)

F5

F6

JOINT(._Front_Suspension_Double_AArm.jolrev_Bellcrank,0,6, ._Front_Suspension_Double_AArm.gel_Bellcrank.mal_Bellcrank_Bushing_Local_Axes)

F7

JOINT(._Front_Suspension_Double_AArm.jolrev_Bellcrank,0,7, ._Front_Suspension_Double_AArm.gel_Bellcrank.mal_Bellcrank_Bushing_Local_Axes)

F8

JOINT(._Front_Suspension_Double_AArm.jolrev_Bellcrank,0,8, ._Front_Suspension_Double_AArm.gel_Bellcrank.mal_Bellcrank_Bushing_Local_Axes)

Title

Result Set Name	jolrev_Bellcrank_to_Chassis_Left_Force
MAG	F_Magnitude
X	F_Radial_X
Y	F_Axial_Y
Z	F_Radial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

jolcon_Damper_to_Chassis_Left_Force

Comment Force on Chassis Damper Joint Left

Define Using Function Expresion

F1

F2

JOINT(._Front_Suspension_Double_AArm.jolcon_Damper_to_Chassis,1,2, ._Front_Suspension_Double_AArm.gel_Damper_to_Chassis.mal_Damper_Local_Axes)

F3

JOINT(._Front_Suspension_Double_AArm.jolcon_Damper_to_Chassis,1,3, ._Front_Suspension_Double_AArm.gel_Damper_to_Chassis.mal_Damper_Local_Axes)

F4

JOINT(._Front_Suspension_Double_AArm.jolcon_Damper_to_Chassis,1,4, ._Front_Suspension_Double_AArm.gel_Damper_to_Chassis.mal_Damper_Local_Axes)

F5

F6

JOINT(._Front_Suspension_Double_AArm.jolcon_Damper_to_Chassis,1,6, ._Front_Suspension_Double_AArm.gel_Damper_to_Chassis.mal_Damper_Local_Axes)

F7

JOINT(._Front_Suspension_Double_AArm.jolcon_Damper_to_Chassis,1,7, ._Front_Suspension_Double_AArm.gel_Damper_to_Chassis.mal_Damper_Local_Axes)

F8

JOINT(._Front_Suspension_Double_AArm.jolcon_Damper_to_Chassis,1,8, ._Front_Suspension_Double_AArm.gel_Damper_to_Chassis.mal_Damper_Local_Axes)

Title

Result Set Name	jolcon_Damper_to_Chassis_Left_Force
MAG	F_Magnitude
X	F_Radial_X
Y	F_Radial_Y
Z	F_Axial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

Motion_Ratio_Left

Define Using Subroutin

User Function

903.0,0.0,0.0,(._Front_Suspension_Double_AArm.dal_Damper.i_marker[1].adams_id),(._Front_Suspension_Double_AArm.dal_Damper.j_marker[1].adams_id),(._Front_Suspension_Double_AArm.gel_Hub.jxl_joint_i_11.adams_id),0.0

Title

Routine	acarSDM::req903
Result Set Name	Motion_Ratio_Left
MAG	Motion_Ratio_Left
X	Motion_Ratio_Left_X
Y	Motion_Ratio_Left_Y
Z	Motion_Ratio_Left_Z
AMAG	
R1	
R2	
R3	

jkrsph_Lower_Rear_Right_Force_Kin

Comment	Force on Lower Rear Right Tube

Define Using Function Expresion

F1

F2

JOINT(._Front_Suspension_Double_AArm.jkrsph_Lower_Rear,0,2, ._Front_Suspension_Double_AArm.ger_Lower_AArm.mar_Lower_Rear_Local_Axes)

F3

JOINT(._Front_Suspension_Double_AArm.jkrsph_Lower_Rear,0,3,._Front_Suspension_Double_AArm.ger_Lower_AArm.mar_Lower_Rear_Local_Axes)

F4

JOINT(._Front_Suspension_Double_AArm.jkrsph_Lower_Rear,0,4, ._Front_Suspension_Double_AArm.ger_Lower_AArm.mar_Lower_Rear_Local_Axes)

F5

F6

JOINT(._Front_Suspension_Double_AArm.jkrsph_Lower_Rear,0,6, ._Front_Suspension_Double_AArm.ger_Lower_AArm.mar_Lower_Rear_Local_Axes)

F7

JOINT(._Front_Suspension_Double_AArm.jkrsph_Lower_Rear,0,7, ._Front_Suspension_Double_AArm.ger_Lower_AArm.mar_Lower_Rear_Local_Axes)

F8

JOINT(._Front_Suspension_Double_AArm.jkrsph_Lower_Rear,0,8, ._Front_Suspension_Double_AArm.ger_Lower_AArm.mar_Lower_Rear_Local_Axes)

Title

Result Set Name	jkrsph_Lower_Rear_Right_Force_Kin
MAG	F_Magnitude
X	F_Radial_X
Y	F_Radial_Y
Z	F_Axial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

bkr_Lower_Rear_Right_Force

Comment Force on Lower Rear Right Tube

Define Using Function Expresion

F1

F2

FIELD(._Front_Suspension_Double_AArm.bkr_Lower_Rear.field,0,2, ._Front_Suspension_Double_AArm.ger_Lower_AArm.mar_Lower_Rear_Local_Axes)

F3

FIELD(._Front_Suspension_Double_AArm.bkr_Lower_Rear.field,0,3, ._Front_Suspensio

n_Double_AArm.ger_Lower_AArm.mar_Lower_Rear_Local_Axes)

F4

FIELD(._Front_Suspension_Double_AArm.bkr_Lower_Rear.field,0,4, ._Front_Suspension_Double_AArm.ger_Lower_AArm.mar_Lower_Rear_Local_Axes)

F5

F6

FIELD(._Front_Suspension_Double_AArm.bkr_Lower_Rear.field,0,6, ._Front_Suspension_Double_AArm.ger_Lower_AArm.mar_Lower_Rear_Local_Axes)

F7

FIELD(._Front_Suspension_Double_AArm.bkr_Lower_Rear.field,0,7, ._Front_Suspension_Double_AArm.ger_Lower_AArm.mar_Lower_Rear_Local_Axes)

F8

FIELD(._Front_Suspension_Double_AArm.bkr_Lower_Rear.field,0,8, ._Front_Suspension_Double_AArm.ger_Lower_AArm.mar_Lower_Rear_Local_Axes)

Title

Result Set Name	bkr_Lower_Rear_Right_Force
MAG	F_Magnitude
X	F_Radial_X
Y	F_Radial_Y
Z	F_Axial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

jkrinl_Lower_Front_Right_Force_Kin

Comment Force on Lower Front Right Tube

Define Using Function Expresion

F1

F2

JPRIM(._Front_Suspension_Double_AArm.jkrinl_Lower_Front,0,2, ._Front_Suspension_Double_AArm.ger_Lower_AArm.mar_Lower_Front_Local_Axes)

F3

JPRIM(._Front_Suspension_Double_AArm.jkrinl_Lower_Front,0,3,._Front_Suspension_Double_AArm.ger_Lower_AArm.mar_Lower_Front_Local_Axes)

F4

JPRIM(._Front_Suspension_Double_AArm.jkrinl_Lower_Front,0,4, ._Front_Suspension_Double_AArm.ger_Lower_AArm.mar_Lower_Front_Local_Axes)

F5

F6

JPRIM(._Front_Suspension_Double_AArm.jkrinl_Lower_Front,0,6, ._Front_Suspension_Doubl

e_AArm.ger_Lower_AArm.mar_Lower_Front_Local_Axes)

F7

JPRIM(._Front_Suspension_Double_AArm.jkrinl_Lower_Front,0,7, ._Front_Suspension_Double_AArm.ger_Lower_AArm.mar_Lower_Front_Local_Axes)

F8

JPRIM(._Front_Suspension_Double_AArm.jkrinl_Lower_Front,0,8, ._Front_Suspension_Double_AArm.ger_Lower_AArm.mar_Lower_Front_Local_Axes)

Title

Result Set Name	jkrinl_Lower_Front_Right_Force_Kin
MAG	F_Magnitude
X	F_Radial_X
Y	F_Radial_Y
Z	F_Axial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

bkr_Lower_Front_Right_Force

Comment Force on Lower Front Right Tube

Define Using Function Expresion

F1

F2

FIELD(._Front_Suspension_Double_AArm.bkr_Lower_Front.field,0,2, ._Front_Suspension_Double_AArm.ger_Lower_AArm.mar_Lower_Front_Local_Axes)

F3

FIELD(._Front_Suspension_Double_AArm.bkr_Lower_Front.field,0,3, ._Front_Suspension_Double_AArm.ger_Lower_AArm.mar_Lower_Front_Local_Axes)

F4

FIELD(._Front_Suspension_Double_AArm.bkr_Lower_Front.field,0,4, ._Front_Suspension_Double_AArm.ger_Lower_AArm.mar_Lower_Front_Local_Axes)

F5

F6

FIELD(._Front_Suspension_Double_AArm.bkr_Lower_Front.field,0,6, ._Front_Suspension_Double_AArm.ger_Lower_AArm.mar_Lower_Front_Local_Axes)

F7

FIELD(._Front_Suspension_Double_AArm.bkr_Lower_Front.field,0,7, ._Front_Suspension_Double_AArm.ger_Lower_AArm.mar_Lower_Front_Local_Axes)

F8

FIELD(._Front_Suspension_Double_AArm.bkr_Lower_Front.field,0,8, ._Front_Suspension_Double_AArm.ger_Lower_AArm.mar_Lower_Front_Local_Axes)

Title
Result Set Name bkr_Lower_Front_Right_Force
MAG F_Magnitude
X F_Radial_X
Y F_Radial_Y
Z F_Axial_Z
AMAG T_Magnitude
R1 T_X
R2 T_Y
R3 T_Z

jkrsph_Upper_Rear_Right_Force_Kin

Comment Force on Upper Rear Right Tube
Define Using Function Expresion
F1
F2
JOINT(._Front_Suspension_Double_AArm.jkrsph_Upper_Rear,0,2, ._Front_Suspension_Double_AArm.ger_Upper_AArm.mar_Upper_Rear_Local_Axes)
F3
JOINT(._Front_Suspension_Double_AArm.jkrsph_Upper_Rear,0,3, ._Front_Suspension_Double_AArm.ger_Upper_AArm.mar_Upper_Rear_Local_Axes)
F4
JOINT(._Front_Suspension_Double_AArm.jkrsph_Upper_Rear,0,4, ._Front_Suspension_Double_AArm.ger_Upper_AArm.mar_Upper_Rear_Local_Axes)
F5
F6
JOINT(._Front_Suspension_Double_AArm.jkrsph_Upper_Rear,0,6, ._Front_Suspension_Double_AArm.ger_Upper_AArm.mar_Upper_Rear_Local_Axes)
F7
JOINT(._Front_Suspension_Double_AArm.jkrsph_Upper_Rear,0,7, ._Front_Suspension_Double_AArm.ger_Upper_AArm.mar_Upper_Rear_Local_Axes)
F8
JOINT(._Front_Suspension_Double_AArm.jkrsph_Upper_Rear,0,8, ._Front_Suspension_Double_AArm.ger_Upper_AArm.mar_Upper_Rear_Local_Axes)
Title
Result Set Name jkrsph_Upper_Rear_Right_Force_Kin
MAG F_Magnitude
X F_Radial_X
Y F_Radial_Y
Z F_Axial_Z
AMAG T_Magnitude

R1	T_X
R2	T_Y
R3	T_Z

bkr_Upper_Rear_Right_Force

Comment	Force on Upper Rear Right Tube
Define Using Function Expresion	
F1	
F2	FIELD(._Front_Suspension_Double_AArm.bkr_Upper_Rear.field,0,2, ._Front_Suspension_Double_AArm.ger_Upper_AArm.mar_Upper_Rear_Local_Axes)
F3	FIELD(._Front_Suspension_Double_AArm.bkr_Upper_Rear.field,0,3, ._Front_Suspension_Double_AArm.ger_Upper_AArm.mar_Upper_Rear_Local_Axes)
F4	FIELD(._Front_Suspension_Double_AArm.bkr_Upper_Rear.field,0,4, ._Front_Suspension_Double_AArm.ger_Upper_AArm.mar_Upper_Rear_Local_Axes)
F5	
F6	FIELD(._Front_Suspension_Double_AArm.bkr_Upper_Rear.field,0,6, ._Front_Suspension_Double_AArm.ger_Upper_AArm.mar_Upper_Rear_Local_Axes)
F7	FIELD(._Front_Suspension_Double_AArm.bkr_Upper_Rear.field,0,7, ._Front_Suspension_Double_AArm.ger_Upper_AArm.mar_Upper_Rear_Local_Axes)
F8	FIELD(._Front_Suspension_Double_AArm.bkr_Upper_Rear.field,0,8, ._Front_Suspension_Double_AArm.ger_Upper_AArm.mar_Upper_Rear_Local_Axes)
Title	
Result Set Name	bkr_Upper_Rear_Right_Force
MAG	F_Magnitude
X	F_Radial_X
Y	F_Radial_Y
Z	F_Axial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

jkrinl_Upper_Front_Right_Force_Kin

Comment	Force on Upper Front Right Tube
Define Using Function Expresion	

F1

F2

JPRIM(._Front_Suspension_Double_AArm.jkrinl_Upper_Front,0,2, ._Front_Suspension_Double_AArm.ger_Upper_AArm.mar_Upper_Front_Local_Axes)

F3

JPRIM(._Front_Suspension_Double_AArm.jkrinl_Upper_Front,0,3, ._Front_Suspension_Double_AArm.ger_Upper_AArm.mar_Upper_Front_Local_Axes)

F4

JPRIM(._Front_Suspension_Double_AArm.jkrinl_Upper_Front,0,4, ._Front_Suspension_Double_AArm.ger_Upper_AArm.mar_Upper_Front_Local_Axes)

F5

F6

JPRIM(._Front_Suspension_Double_AArm.jkrinl_Upper_Front,0,6, ._Front_Suspension_Double_AArm.ger_Upper_AArm.mar_Upper_Front_Local_Axes)

F7

JPRIM(._Front_Suspension_Double_AArm.jkrinl_Upper_Front,0,7, ._Front_Suspension_Double_AArm.ger_Upper_AArm.mar_Upper_Front_Local_Axes)

F8

JPRIM(._Front_Suspension_Double_AArm.jkrinl_Upper_Front,0,8, ._Front_Suspension_Double_AArm.ger_Upper_AArm.mar_Upper_Front_Local_Axes)

Title

Result Set Name	jkrinl_Upper_Front_Right_Force_Kin
MAG	F_Magnitude
X	F_Radial_X
Y	F_Radial_Y
Z	F_Axial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

bkr_Upper_Front_Right_Force

Comment Force on Upper Front Right Tube

Define Using Function Expresion

F1

F2

FIELD(._Front_Suspension_Double_AArm.bkr_Upper_Front.field,0,2, ._Front_Suspension_Double_AArm.ger_Upper_AArm.mar_Upper_Front_Local_Axes)

F3

FIELD(._Front_Suspension_Double_AArm.bkr_Upper_Front.field,0,3, ._Front_Suspension_Double_AArm.ger_Upper_AArm.mar_Upper_Front_Local_Axes)

F4

FIELD(._Front_Suspension_Double_AArm.bkr_Upper_Front.field,0,4, ._Front_Suspension_Double_AArm.ger_Upper_AArm.mar_Upper_Front_Local_Axes)

F5

F6

FIELD(._Front_Suspension_Double_AArm.bkr_Upper_Front.field,0,6, ._Front_Suspension_Double_AArm.ger_Upper_AArm.mar_Upper_Front_Local_Axes)

F7

FIELD(._Front_Suspension_Double_AArm.bkr_Upper_Front.field,0,7, ._Front_Suspension_Double_AArm.ger_Upper_AArm.mar_Upper_Front_Local_Axes)

F8

FIELD(._Front_Suspension_Double_AArm.bkr_Upper_Front.field,0,8, ._Front_Suspension_Double_AArm.ger_Upper_AArm.mar_Upper_Front_Local_Axes)

Title

Result Set Name	bkr_Upper_Front_Right_Force
MAG	F_Magnitude
X	F_Radial_X
Y	F_Radial_Y
Z	F_Axial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

jorsph_Prod_Right_Force

Comment Force on Prod Right

Define Using Function Expresion

F1

F2

JOINT(._Front_Suspension_Double_AArm.jorsph_Prod_Joint,0,2, ._Front_Suspension_Double_AArm.ger_Prod.mar_Prod_Local_Axes)

F3

JOINT(._Front_Suspension_Double_AArm.jorsph_Prod_Joint,0,3,._Front_Suspension_Double_AArm.ger_Prod.mar_Prod_Local_Axes)

F4

JOINT(._Front_Suspension_Double_AArm.jorsph_Prod_Joint,0,4, ._Front_Suspension_Double_AArm.ger_Prod.mar_Prod_Local_Axes)

F5

F6

JOINT(._Front_Suspension_Double_AArm.jorsph_Prod_Joint,0,6, ._Front_Suspension_Double_AArm.ger_Prod.mar_Prod_Local_Axes)

F7

JOINT(._Front_Suspension_Double_AArm.jorsph_Prod_Joint,0,7, ._Front_Suspension_Double_AArm.ger_Prod.mar_Prod_Local_Axes)

F8

JOINT(._Front_Suspension_Double_AArm.jorsph_Prod_Joint,0,8, ._Front_Suspension_Double_AArm.ger_Prod.mar_Prod_Local_Axes)

Title

Result Set Name	jorsph_Prod_Right_Force
MAG	F_Magnitude
X	F_Radial_X
Y	F_Radial_Y
Z	F_Axial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

jorsph_Tierod_Right_Force

Comment Force on Tierod Right

Define Using Function Expresion

F1

F2

JOINT(._Front_Suspension_Double_AArm.jorsph_Tierod_Joint,0,2, ._Front_Suspension_Double_AArm.ger_Tierod.mar_Tierod_Local_Axes)

F3

JOINT(._Front_Suspension_Double_AArm.jorsph_Tierod_Joint,0,3, ._Front_Suspension_Double_AArm.ger_Tierod.mar_Tierod_Local_Axes)

F4

JOINT(._Front_Suspension_Double_AArm.jorsph_Tierod_Joint,0,4, ._Front_Suspension_Double_AArm.ger_Tierod.mar_Tierod_Local_Axes)

F5

F6

JOINT(._Front_Suspension_Double_AArm.jorsph_Tierod_Joint,0,6, ._Front_Suspension_Double_AArm.ger_Tierod.mar_Tierod_Local_Axes)

F7

JOINT(._Front_Suspension_Double_AArm.jorsph_Tierod_Joint,0,7, ._Front_Suspension_Double_AArm.ger_Tierod.mar_Tierod_Local_Axes)

F8

JOINT(._Front_Suspension_Double_AArm.jorsph_Tierod_Joint,0,8, ._Front_Suspension_Double_AArm.ger_Tierod.mar_Tierod_Local_Axes)

Title

Result Set Name	jorsph_Tierod_Right_Force
MAG	F_Magnitude
X	F_Radial_X
Y	F_Radial_Y
Z	F_Axial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

jorsph_Upper_Joint_Right_Force

Comment	Force on Upright Upper Joint Right

Define Using Function Expresion

F1

F2

JOINT(._Front_Suspension_Double_AArm.jorsph_Upper_Joint,1,2, ._Front_Suspension_Double_AArm.ger_Upright.mar_Upper_Joint_Local_Axes)

F3

JOINT(._Front_Suspension_Double_AArm.jorsph_Upper_Joint,1,3, ._Front_Suspension_Double_AArm.ger_Upright.mar_Upper_Joint_Local_Axes)

F4

JOINT(._Front_Suspension_Double_AArm.jorsph_Upper_Joint,1,4, ._Front_Suspension_Double_AArm.ger_Upright.mar_Upper_Joint_Local_Axes)

F5

F6

JOINT(._Front_Suspension_Double_AArm.jorsph_Upper_Joint,1,6, ._Front_Suspension_Double_AArm.ger_Upright.mar_Upper_Joint_Local_Axes)

F7

JOINT(._Front_Suspension_Double_AArm.jorsph_Upper_Joint,1,7, ._Front_Suspension_Double_AArm.ger_Upright.mar_Upper_Joint_Local_Axes)

F8

JOINT(._Front_Suspension_Double_AArm.jorsph_Upper_Joint,1,8, ._Front_Suspension_Double_AArm.ger_Upright.mar_Upper_Joint_Local_Axes)

Title

Result Set Name	jorsph_Upper_Joint_Right_Force
MAG	F_Magnitude
X	F_Radial_X
Y	F_Axial_Y
Z	F_Radial_Z
AMAG	T_Magnitude
R1	T_X

R2 T_Y

R3 T_Z

jorsph_Lower_Joint_Right_Force

Comment Force on Upright Lower Joint Right

Define Using Function Expresion

F1

F2

JOINT(._Front_Suspension_Double_AArm.jorsph_Lower_Joint,1,2, ._Front_Suspension_Double_AArm.ger_Upright.mar_Lower_Joint_Local_Axes)

F3

JOINT(._Front_Suspension_Double_AArm.jorsph_Lower_Joint,1,3,._Front_Suspension_Double_AArm.ger_Upright.mar_Lower_Joint_Local_Axes)

F4

JOINT(._Front_Suspension_Double_AArm.jorsph_Lower_Joint,1,4, ._Front_Suspension_Double_AArm.ger_Upright.mar_Lower_Joint_Local_Axes)

F5

F6

JOINT(._Front_Suspension_Double_AArm.jorsph_Lower_Joint,1,6, ._Front_Suspension_Double_AArm.ger_Upright.mar_Lower_Joint_Local_Axes)

F7

JOINT(._Front_Suspension_Double_AArm.jorsph_Lower_Joint,1,7, ._Front_Suspension_Double_AArm.ger_Upright.mar_Lower_Joint_Local_Axes)

F8

JOINT(._Front_Suspension_Double_AArm.jorsph_Lower_Joint,1,8, ._Front_Suspension_Double_AArm.ger_Upright.mar_Lower_Joint_Local_Axes)

Title

Result Set Name jorsph_Lower_Joint_Right_Force

MAG F_Magnitude

X F_Radial_X

Y F_Axial_Y

Z F_Radial_Z

AMAG T_Magnitude

R1 T_X

R2 T_Y

R3 T_Z

jorrev_Bellcrank_to_Chassis_Right_Force

Comment Force on Bellcrank Right

Define Using Function Expresion

F1

F2

JOINT(._Front_Suspension_Double_AArm.jorrev_Bellcrank,0,2, ._Front_Suspension_Double_AArm.ger_Bellcrank.mar_Bellcrank_Bushing_Local_Axes)

F3

JOINT(._Front_Suspension_Double_AArm.jorrev_Bellcrank,0,3, ._Front_Suspension_Double_AArm.ger_Bellcrank.mar_Bellcrank_Bushing_Local_Axes)

F4

JOINT(._Front_Suspension_Double_AArm.jorrev_Bellcrank,0,4, ._Front_Suspension_Double_AArm.ger_Bellcrank.mar_Bellcrank_Bushing_Local_Axes)

F5

F6

JOINT(._Front_Suspension_Double_AArm.jorrev_Bellcrank,0,6, ._Front_Suspension_Double_AArm.ger_Bellcrank.mar_Bellcrank_Bushing_Local_Axes)

F7

JOINT(._Front_Suspension_Double_AArm.jorrev_Bellcrank,0,7, ._Front_Suspension_Double_AArm.ger_Bellcrank.mar_Bellcrank_Bushing_Local_Axes)

F8

JOINT(._Front_Suspension_Double_AArm.jorrev_Bellcrank,0,8, ._Front_Suspension_Double_AArm.ger_Bellcrank.mar_Bellcrank_Bushing_Local_Axes)

Title

Result Set Name	jorrev_Bellcrank_to_Chassis_Right_Force
MAG	F_Magnitude
X	F_Radial_X
Y	F_Axial_Y
Z	F_Radial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

jorcon_Damper_to_Chassis_Right_Force

Comment Force on Chassis Damper Joint Right

Define Using Function Expresion

F1

F2

JOINT(._Front_Suspension_Double_AArm.jorcon_Damper_to_Chassis,1,2, ._Front_Suspension_Double_AArm.ger_Damper_to_Chassis.mar_Damper_Local_Axes)

F3

JOINT(._Front_Suspension_Double_AArm.jorcon_Damper_to_Chassis,1,3, ._Front_Suspension_Double_AArm.ger_Damper_to_Chassis.mar_Damper_Local_Axes)

F4

JOINT(._Front_Suspension_Double_AArm.jorcon_Damper_to_Chassis,1,4, ._Front_Suspension_Double_AArm.ger_Damper_to_Chassis.mar_Damper_Local_Axes)

F5

F6

JOINT(._Front_Suspension_Double_AArm.jorcon_Damper_to_Chassis,1,6, ._Front_Suspension_Double_AArm.ger_Damper_to_Chassis.mar_Damper_Local_Axes)

F7

JOINT(._Front_Suspension_Double_AArm.jorcon_Damper_to_Chassis,1,7, ._Front_Suspension_Double_AArm.ger_Damper_to_Chassis.mar_Damper_Local_Axes)

F8

JOINT(._Front_Suspension_Double_AArm.jorcon_Damper_to_Chassis,1,8, ._Front_Suspension_Double_AArm.ger_Damper_to_Chassis.mar_Damper_Local_Axes)

Title

Result Set Name	jorcon_Damper_to_Chassis_Right_Force
MAG	F_Magnitude
X	F_Radial_X
Y	F_Radial_Y
Z	F_Axial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

Motion_Ratio_Right

Define Using Subroutin

User Function

903.0,0.0,0.0,(._Front_Suspension_Double_AArm.dar_Damper.i_marker[1].adams_id),(._Front_Suspension_Double_AArm.dar_Damper.j_marker[1].adams_id),(._Front_Suspension_Double_AArm.ger_Hub.jxr_joint_i_11.adams_id),0.0

Title

Routine	acarSDM::req903
Result Set Name	Motion_Ratio_Right
MAG	Motion_Ratio_Right
X	Motion_Ratio_Right_X
Y	Motion_Ratio_Right_Y
Z	Motion_Ratio_Right_Z
AMAG	
R1	
R2	
R3	

.....

C. Rear Suspension Double AArm

ADAMS - Template - _Rear_Suspension_Double_AArm.tpl

C.1. Build --> Hardpoints

Suspensions Points	X	Y	Z	Units
hpl_Bellcrank_to_Chassis	-1533.54	216.75	450.20	[mm]
hpl_Damper_to_Bellcrank	-1536.39	126.23	485.59	[mm]
hpl_Damper_to_Chassis	-1327.49	112.08	544.44	[mm]
hpl_Lower_Front	-1515.47	270.13	145.33	[mm]
hpl_Lower_Joint	-1600	548.85	148.28	[mm]
hpl_Lower_Rear	-1685.3	251.15	145.22	[mm]
hpl_Prod_to_Bellcrank	-1600.21	202.65	438.84	[mm]
hpl_Prod_Joint	-1600	481.57	323.26	[mm]
hpl_Tierod_Joint	-1647	548.85	148.28	[mm]
hpl_Tierod_to_Chassis	-1733.92	245.77	145.07	[mm]
hpl_Upper_Front	-1466.93	282.9	284.43	[mm]
hpl_Upper_Joint	-1600	520.87	306.96	[mm]
hpl_Upper_Rear	-1716.77	245.72	280.86	[mm]
hpl_Wheel_Center_ET_0	-1600	609.93	229.96	[mm]
hpl_Inner_Tripot_Center	-1627.53	140.96	224.04	[mm]

C.2. Build --> Suspension Parameter --> Toe/Camber Values

	Left	Right
Toe	0^{o}	0^{o}
Camber	-1^{o}	-1^{o}

C.3. Build --> Parameter

Parameter

ET

Type Single

Real Value	35.0
Units	Length
Hide From Standard User	No

Driveline_Active

Type	Single
Integer Value	1
Units	No units
Hide From Sandard User	No

Wheel_Center_ET_0_to_Outer_Tripot_Center

Type	Single
Real Value	59.78
Units	Length
Hide From Sandard User	No

.....

C.4. Build --> Construction Frame

Construction Frame

.....

Wheel_Center_ET_0_Spin_Axis

Type	Left
Location Dependency	Delta location from coordinate
Coordiate Reference	hpl_Wheel_Center_ET_0
Location	0,0,0
Location in	Local
Orientation Dependency	Toe/Camber
Variable Type	Parameter Variables
Toe Parameter Variable	pvl_toe_angle
Camber Parameter Variable	pvl_camber_angle

Bellcrank_Spin_Axis

Type	Left
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Bellcrank_to_Chassis
Location	0,0,0
Location in	Local
Orientation Dependency	Oriented in plane
Coordinate Reference #1	hpl_Bellcrank_to_Chassis
Coordinate Reference #2	hpl_Prod_to_Bellcrank

Coordinate Reference #3	hpl_Damper_to_Bellcrank
Axes	XZ

Damper_to_Chassis_Joint

Type	Left
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Damper_to_Chassis
Location	0,0,25
Location in	Local
Orientation Dependency	User entered values
Orient Using	Euler Angles
Euler Angles	-180,0,0

Lower_Spring_Mount

Type	Left
Location Dependency	Located on a line
Coordinate Reference #1	hpl_Damper_to_Bellcrank
Coordinate Reference #2	hpl_Damper_to_Chassis
Relative Location	20
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hpl_Damper_to_Bellcrank
Coordinate Reference #2	hpl_Damper_to_Chassis
Axis	Z

Upper_Spring_Mount

Type	Left
Location Dependency	Delta location from coordinate
Coordinate Reference	cfl_Lower_Spring_Mount
Location	0.0,0.0,120
Location in	Local
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hpl_Damper_to_Bellcrank
Coordinate Reference #2	hpl_Damper_to_Chassis
Axis	Z

Wheel_Center

Type	Left
Location Dependency	Delta location from coordinate
Coordinate Reference	cfl_Wheel_Center_ET_0_Spin_Axis
Location	0.0, 0.0, (._Rear_Suspension_Double_AArm.pvs_ET*-1)
Location in	Local

Orientation Dependency	Toe/Camber
Variable Type	Parameter Variable
Toe Parameter Variable	pvl_toe_angle
Camber Parameter Variable	pvl_camber_angle

Upright_Center

Type	Left
Location Dependency	Delta location from coordinate
Coordinate Reference	cfl_Wheel_Center_ET_0_Spin_Axis
Location	0.0, 0.0, -25.0
Location in	Local
Orientation Dependency	Toe/Camber
Variable Type	Parameter Variable
Toe Parameter Variable	pvl_toe_angle
Camber Parameter Variable	pvl_camber_angle

Outer_Tripot_Center

Type	Left
Location Dependency	Located along an axis
Construction Frame	cfl_Wheel_Center_ET_0_Spin_Axis
Distance	
	(-._Rear_Suspension_Double_AArm.pvs_Wheel_Center_ET_0_to_Outer_Tripot_Center)
Axis	Z
Orientation Dependency	User entered values
Orient Using	Euler Angles
Euler Angles	0,0,180

Inner_Tripot_Center

Type	Left
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Inner_Tripot_Center
Location	0.0, 0.0, 0.0
Location in	Local
Orientation Dependency	Orient axis to point
Coordinate Reference	cfr_Inner_Tripot_Center
Axis	Z

.....

C.5. Build --> Parts --> General Part

General Parts

.....

Lower_AArm

Type	Left
Location Dependency	Centered between coordinates
Centered Between	Three coordinates
Coordinate Reference #1	hpl_Lower_Front
Coordinate Reference #2	hpl_Lower_Joint
Coordinate Reference #3	hpl_Lower_Rear
Orientation	User entered values
Orient Using	Euler Angles
Euler Angles	0,0,0
Mass & Inertia	1E-9
Material	Steel

Upper_AArm

Type	Left
Location Dependency	Centered between coordinates
Centered Between	Three coordinates
Coordinate Reference #1	hpl_Upper_Front
Coordinate Reference #2	hpl_Upper_Joint
Coordinate Reference #3	hpl_Upper_Rear
Orientation	User entered values
Orient Using	Euler Angles
Euler Angles	0,0,0
Mass & Inertia	1E-9
Material	Steel

Prod

Type	Left
Location Dependency	Centered between coordinates
Centered Between	Two coordinates
Coordinate Reference #1	hpl_Prod_Joint
Coordinate Reference #2	hpl_Prod_to_Bellcrank
Orientation	Orient axis along line
Coordinate Reference #1	hpl_Prod_Joint
Coordinate Reference #2	hpl_Prod_to_Bellcrank
Axis	Z
Mass & Inertia	1E-9
Material	Steel

Tierod

Type	Left
Location Dependency	Centered between coordinates
Centered Between	Two coordinates
Coordinate Reference #1	hpl_Tierod_Joint
Coordinate Reference #2	hpl_Tierod_to_Chassis
Orientation	Orient axis along line
Coordinate Reference #1	hpl_Tierod_Joint
Coordinate Reference #2	hpl_Tierod_to_Chassis
Axis	Z
Mass & Inertia	1E-9
Material	Steel

Upright

Type	Left
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Wheel_Center_ET_0
Location	0,0,0
Location in	Local
Orientation	User entered values
Orient Using	Euler Angles
Euler Angles	0,0,0
Mass & Inertia	1E-9
Material	Steel

Damper_to_Bellcrank

Type	Left
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Damper_to_Bellcrank
Location	0,0,0
Location in	Local
Orientation	User entered values
Orient Using	Euler Angles
Euler Angles	0,0,0
Mass & Inertia	1E-9
Material	Steel

Damper_to_Chassis

Type	Left
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Damper_to_Chassis
Location	0,0,0

Location in	Local
Orientation	User entered values
Orient Using	Euler Angles
Euler Angles	0,0,0
Mass & Inertia	1E-9
Material	Steel

Bellcrank

Type	Left
Location Dependency	Centered between coordinates
Centered Between	Three coordinates
Coordinate Reference #1	hpl_Prod_to_Bellcrank
Coordinate Reference #2	hpl_Bellcrank_to_Chassis
Coordinate Reference #3	hpl_Damper_to_Bellcrank
Orientation	User entered values
Orient Using	Euler Angles
Euler Angles	0,0,0
Mass & Inertia	1E-9
Material	Steel

Outer_Tripot

Type	Left
Location Dependency	Delta location from coordinate
Coordinate Reference	cfl_Outer_Tripot_Center
Location	0,0,0
Location in	Local
Orientation	Delta orientation from coordinate
Construction Frame	cfl_Outer_Tripot_Center
Orientation	0,0,0
Mass & Inertia	1E-9
Material	Steel

Drive_Shaft

Type	Left
Location Dependency	Centered between coordinates
Centered Between	Two coordinates
Coordinate Reference #1	cfl_Outer_Tripot_Center
Coordinate Reference #2	cfl_Inner_Tripot_Center
Orientation	Orient axis along line
Coordinate Reference #1	cfl_Outer_Tripot_Center
Coordinate Reference #2	cfl_Inner_Tripot_Center

Axis	Z
Mass & Inertia	1E-9
Material	Steel

Hub

Type	Left
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Wheel_Center_ET_0
Location	0,0,0
Location in	Local
Orientation	Delta location from coordinate
Coordinate Reference	cfl_Wheel_Center_ET_0_Spin_Axis
Orientation	0,0,0
Mass & Inertia	1E-9
Material	Steel

.....

C.6. Build --> Geometry --> Link

Links

.....

Lower_Front

General Part	gel_Lower_AArm
Coordinate Reference #1	hpl_Lower_Joint
Coordinate Reference #2	hpl_Lower_Front
Radius	9
Mass	Not Calculate Mass Properties

Lower_Rear

General Part	gel_Lower_AArm
Coordinate Reference #1	hpl_Lower_Joint
Coordinate Reference #2	hpl_Lower_Rear
Radius	9
Mass	Not Calculate Mass Properties

Upper_Front

General Part	gel_Upper_AArm
Coordinate Reference #1	hpl_Upper_Joint
Coordinate Reference #2	hpl_Upper_Front
Radius	9
Mass	Not Calculate Mass Properties

Upper_Rear

General Part	gel_Upper_AArm
Coordinate Reference #1	hpl_Upper_Joint
Coordinate Reference #2	hpl_Upper_Rear
Radius	9
Mass	Not Calculate Mass Properties

Prod

General Part	gel_Prod
Coordinate Reference #1	hpl_Prod_Joint
Coordinate Reference #2	hpl_Prod_to_Bellcrank
Radius	9
Mass	Not Calculate Mass Properties

Tierod

General Part	gel_Tierod
Coordinate Reference #1	hpl_Tierod_Joint
Coordinate Reference #2	hpl_Tierod_to_Chassis
Radius	7
Mass	Not Calculate Mass Properties

Upright_Upper

General Part	gel_Upright
Coordinate Reference #1	hpl_Upper_Joint
Coordinate Reference #2	cfl_Upright_Center
Radius	10
Mass	Not Calculate Mass Properties

Upright_Lower

General Part	gel_Upright
Coordinate Reference #1	cfl_Upright_Center
Coordinate Reference #2	hpl_Lower_Joint
Radius	10
Mass	Not Calculate Mass Properties

Steering_Arm_

General Part	gel_Upright
Coordinate Reference #1	hpl_Tierod_Joint
Coordinate Reference #2	cfl_Upright_Center
Radius	6

Mass	Not Calculate Mass Properties

Drive_Shaft

General Part	gel_Drive_Shaft
Coordinate Reference #1	cfl_Outer_Tripot_Center
Coordinate Reference #2	cfl_Inner_Tripot_Center
Radius	10
Mass	Not Calculate Mass Properties

Drive_Shaft_Outer_End

General Part	gel_Outer_Tripot
Coordinate Reference #1	cfl_Outer_Tripot_Center
Coordinate Reference #2	cfl_Wheel_Center_ET_0_Spin_Axis
Radius	15
Mass	Not Calculate Mass Properties

C.7. Build --> Geometry --> Ellipsoid

Ellipsoid

Lower_Front_Rodend

Coordinate Reference	hpl_Lower_Front
Method	By entering size
General Part	gel_Lower_AArm
X Radius	10
Y Radius	10
Z Radius	10
Mass	Not Calculate Mass Properties

Lower_Rear_Rodend

Coordinate Reference	hpl_Lower_Rear
Method	By entering size
General Part	gel_Lower_AArm
X Radius	10
Y Radius	10
Z Radius	10
Mass	Not Calculate Mass Properties

Upper_Front_Rodend

Coordinate Reference	hpl_Upper_Front
Method	By entering size

General Part	gel_Upper_AArm
X Radius	10
Y Radius	10
Z Radius	10
Mass	Not Calculate Mass Properties

Upper_Rear_Rodend

Coordinate Reference	hpl_Upper_Rear
Method	By entering size
General Part	gel_Upper_AArm
X Radius	10
Y Radius	10
Z Radius	10
Mass	Not Calculate Mass Properties

Prod_Joint_Rodend

Coordinate Reference	hpl_Prod_Joint
Method	By entering size
General Part	gel_Prod
X Radius	10
Y Radius	10
Z Radius	10
Mass	Not Calculate Mass Properties

Prod_to_Belllcrank_Rodend

Coordinate Reference	hpl_Prod_to_Bellcrank
Method	By entering size
General Part	gel_Prod
X Radius	10
Y Radius	10
Z Radius	10
Mass	Not Calculate Mass Properties

Tierod_Joint_Rodend

Coordinate Reference	hpl_Tierod_Joint
Method	By entering size
General Part	gel_Upright
X Radius	10
Y Radius	10
Z Radius	10
Mass	Not Calculate Mass Properties

Tierod_to_Chassis_Rodend

Coordinate Reference	hpl_Tierod_to_Chassis
Method	By entering size
General Part	gel_Tierod
X Radius	8
Y Radius	8
Z Radius	8
Mass	Not Calculate Mass Properties

Upright_Upper_Joint_Rodend

Coordinate Reference	hpl_Upper_Joint
Method	By entering size
General Part	gel_Upright
X Radius	15
Y Radius	15
Z Radius	15
Mass	Not Calculate Mass Properties

Upright_Lower_Joint_Rodend

Coordinate Reference	hpl_Lower_Joint
Method	By entering size
General Part	gel_Upright
X Radius	15
Y Radius	15
Z Radius	15
Mass	Not Calculate Mass Properties

Upright_Center

Coordinate Reference	cfl_Upright_Center
Method	By entering size
General Part	gel_Upright
X Radius	20
Y Radius	20
Z Radius	20
Mass	Not Calculate Mass Properties

Damper_to_Bellcrank_Rodend

Coordinate Reference	hpl_Damper_to_Bellcrank
Method	By entering size
General Part	gel_Damper_to_Bellcrank

X Radius	12.5
Y Radius	12.5
Z Radius	12.5
Mass	Not Calculate Mass Properties

Damper_to_Chassis_Rodend

Coordinate Reference	hpl_Damper_to_Chassis
Method	By entering size
General Part	gel_Damper_to_Chassis
X Radius	16
Y Radius	16
Z Radius	16
Mass	Not Calculate Mass Properties

Inner_Tripot

Coordinate Reference	cfl_Inner_Tripot_Center
Method	By entering size
General Part	gel_Drive_Shaft
X Radius	15
Y Radius	15
Z Radius	15
Mass	Not Calculate Mass Properties

Outer_Tripot

Coordinate Reference	cfl_Outer_Tripot_Center
Method	By entering size
General Part	gel_Outer_Tripot
X Radius	15
Y Radius	15
Z Radius	15
Mass	Not Calculate Mass Properties

.....

C.8. Build --> Geometry --> Cylinder

Cylinder

.....

Upright_Center_Spin_Axis

General Part	gel_Upright
Construction Frame	cfl_Upright_Center
Radius	20

Lenght in Positive Z	25
Length in Negative Z	0
Mass	Not Calculate Mass Properties

Drive_Shaft_Inner_End

General Part	gel_Drive_Shaft
Construction Frame	cfl_Inner_Tripot_Center
Radius	15
Lenght in Positive Z	25
Length in Negative Z	0
Mass	Not Calculate Mass Properties

Hub

General Part	gel_Hub
Construction Frame	cfl_Wheel_Center_ET_0_Spin_Axis
Radius	12
Lenght in Positive Z	20
Length in Negative Z	0
Mass	Not Calculate Mass Properties

C.9. Build --> Geometry --> Arm

Arm

Bellcrank

General Part	gel_Bellcrank
Coordinate Reference #1	hpl_Prod_to_Bellcrank
Coordinate Reference #2	hpl_Bellcrank_to_Chassis
Coordinate Reference #3	hpl_Damper_to_Bellcrank
Thickness	10
Mass	Not Calculate Mass Properties

C.10. Build --> Forces --> Damper

Damper

Damper

I Part	gel_Damper_to_Chassis
J Part	gel_Damper_to_Bellcrank

I Coordinate Reference	hpl_Damper_to_Chassis
J Coordinate Reference	hpl_Damper_to_Bellcrank
Property File	
mdids://ETSEIB_Motorsport/dampers.tbl/Sachs_Original_Setup_Medium.dpr	
Diameter	15

.....

C.11. Build --> Forces --> Spring

Spring

.....

Spring

I Part	gel_Damper_to_Chassis
J Part	gel_Damper_to_Bellcrank
I Coordinate Reference	cfl_Upper_Spring_Mount
J Coordinate Reference	cfl_Lower_Spring_Mount
Use Hardpoints	
Property File	
mdids://ETSEIB_Motorsport/springs.tbl/Spring_K79_294kg_CAT09e.spr	
Spring Diameter	40
Number of Coils	6

.....

C.12. Build --> Forces --> Bumpstop and Reboundstop

Bumpstop and Reboundstop

.....

Bump_Limit

I Part	gel_Damper_to_Chassis
J Part	gel_Damper_to_Bellcrank
I Coordinate Reference	hpl_Damper_to_Chassis
J Coordinate Reference	hpl_Damper_to_Bellcrank
Property File	mdids://ETSEIB_Motorsport/bumpstops.tbl/Bump_Limit.bum
Clearance	17.5
Diameter	20

Rebound_Limit

I Part	gel_Damper_to_Chassis
J Part	gel_Damper_to_Bellcrank
I Coordinate Reference	hpl_Damper_to_Chassis
J Coordinate Reference	hpl_Damper_to_Bellcrank

Property File
mdids://ETSEIB_Motorsport/reboundstops.tbl/Rebound_Limit.reb
Clearance 17.5
Diameter 10

C.13. Build --> Parts --> Mount

Mount

Lower_AArm_to_Chassis
Coordinate Reference hpl_Lower_Rear
From Minor Role Inherit

Upper_AArm_to_Chassis
Coordinate Reference hpl_Upper_Rear
From Minor Role Inherit

Bellcrank_to_Chassis
Coordinate Reference hpl_Bellcrank_to_Chassis
From Minor Role Inherit

Damper_to_Chassis
Coordinate Reference hpl_Damper_to_Chassis
From Minor Role Inherit

Tierod_to_Chassis
Coordinate Reference hpl_Tierod_to_Chassis
From Minor Role Inherit

Tripot_to_Differential
Coordinate Reference hpl_Inner_Tripot_Center
From Minor Role Inherit

C.14. Build --> Parts --> Switch

Switch Part

Prod_Pickup
Coordinate Reference hpl_Prod_Joint

Parts List	._Rear_Suspension_Double_AArm.gel_Upper_AArm
	._Rear_Suspension_Double_AArm.gel_Lower_AArm
	._Rear_Suspension_Double_AArm.gel_Upright
Switch to Part	._Rear_Suspension_Double_AArm.gel_Upper_AArm

.....

C.15. Build --> Attachment --> Joint

Attachment Joint

.....

Lower_Rear

I Part	gel_Lower_AArm
J Part	mtl_Lower_AArm_to_Chassis
Type	Left
Joint Type	Spherical
Active	Kinematic mode
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Lower_Rear
Location	0,0,0
Location in	Local
Orientation	None

Upper_Rear

I Part	gel_Upper_AArm
J Part	mtl_Upper_AArm_to_Chassis
Type	Left
Joint Type	Spherical
Active	Kinematic mode
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Upper_Rear
Location	0,0,0
Location in	Local
Orientation	None

Lower_Front

I Part	gel_Lower_AArm
J Part	mtl_Lower_AArm_to_Chassis
Type	Left
Joint Type	Inline
Active	Kinematic mode
Location Dependency	Delta location from coordinate

Coordinate Reference	hpl_Lower_Front
Location	0,0,0
Location in	Local
Orientation Dependency	Orient axis along line
Coorinate Reference #1	hpl_Lower_Front
Coorinate Reference #2	hpl_Lower_Rear
Axis	Z

Upper_Front

I Part	gel_Upper_AArm
J Part	mtl_Upper_AArm_to_Chassis
Type	Left
Joint Type	Inline
Active	Kinematic mode
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Upper_Front
Location	0,0,0
Location in	Local
Orientation Dependency	Orient axis along line
Coorinate Reference #1	hpl_Upper_Front
Coorinate Reference #2	hpl_Upper_Rear
Axis	Z

Bellcrank

I Part	gel_Bellcrank
J Part	mtl_Bellcrank_to_Chassis
Type	Left
Joint Type	Revolute
Active	Always
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Bellcrank_to_Chassis
Location	0,0,0
Location in	Local
Orientation Dependency	Parallel to axis
Construction Frame	cfl_Bellcrank_Spin_Axis
Axis on Entity	X
Axis on Frame	+Z

Lower_Joint

I Part	gel_Lower_AArm
J Part	gel_Upright

Type	Left
Joint Type	Spherical
Active	Always
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Lower_Joint
Location	0,0,0
Location in	Local
Orientation	None

Upper_Joint

I Part	gel_Upper_AArm
J Part	gel_Upright
Type	Left
Joint Type	Spherical
Active	Always
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Upper_Joint
Location	0,0,0
Location in	Local
Orientation	None

Prod_Joint

I Part	gel_Prod
J Part	swl_Prod_Pickup
Type	Left
Joint Type	Spherical
Active	Always
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Prod_Joint
Location	0,0,0
Location in	Local
Orientation	None

Tierod_Joint

I Part	gel_Tierod
J Part	gel_Upright
Type	Left
Joint Type	Spherical
Active	Always
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Tierod_Joint

Location	0,0,0
Location in	Local
Orientation	None

Tierod_to_Chassis

I Part	gel_Tierod
J Part	mtl_Tierod_to_Chassis
Type	Left
Joint Type	Convel
Active	Always
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Tierod_to_Rack
Location	0,0,0
I-Part Axis	hpl_Tierod_Joint
J-Part Axis	hpr_Tierod_to_Chassis

Prod_to_Bellcrank

I Part	gel_Prod
J Part	gel_Bellcrank
Type	Left
Joint Type	Convel
Active	Always
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Prod_to_Bellcrank
Location	0,0,0
Location in	Local
I-Part Axis	hpl_Prod_Joint
J-Part Axis	hpl_Bellcrank_to_Chassis

Hub

I Part	gel_Hub
J Part	gel_Upright
Type	Left
Joint Type	Revolute
Active	Always
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Wheel_Center_ET_0
Orientation Dependency	Delta orientation from coordinate
Construction Frame	cfl_Wheel_Center_ET_0_Spin_Axis
Orientation	0,0,0

Damper_to_Bellcrank

I Part	gel_Damper_to_Bellcrank
J Part	gel_Bellcrank
Type	Left
Joint Type	Convel
Active	Always
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Damper_to_Bellcrank
Location	0,0,0
Location in	Local
I-Part Axis	hpl_Damper_to_Chassis
J-Part Axis	hpl_Bellcrank_to_Chassis

Damper_to_Chassis

I Part	gel_Damper_to_Chassis
J Part	mtl_Damper_to_Chassis
Type	Left
Joint Type	Convel
Active	Always
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Damper_to_Chassis
Location	0,0,0
Location in	Local
I-Part Axis	hpl_Damper_to_Bellcrank
J-Part Axis	cfl_Damper_to_Chassis_Joint

Damper

I Part	gel_Damper_to_Bellcrank
J Part	gel_Damper_to_Chassis
Type	Left
Joint Type	Cylindrical
Active	Always
Location Dependency	Centered between coordinates
Centered Between	Two coordinates
Coordinate Reference #1	hpl_Damper_to_Bellcrank
Coordinate Reference #2	hpl_Damper_to_Chassis
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hpl_Damper_to_Bellcrank
Coordinate Reference #2	hpl_Damper_to_Chassis
Axis	Z

Outer_Tripot_to_Hub

I Part	gel_Outer_Tripot
J Part	gel_Hub
Type	Left
Joint Type	Translational
Active	Always
Location Dependency	Delta location from coordinate
Coordinate Reference	cfl_Outer_Tripot_Center
Location	0,0,0
Location in	Local
Orientation Dependency	Orient to zpoint-xpoint
Coordinate Reference #1	cfl_Outer_Tripot_Center
Coordinate Reference #2	cfl_Wheel_Center_ET_0_Spin_Axis
Axes	ZX

Outer_Tripot_to_Drive_Shaft

I Part	gel_Outer_Tripot
J Part	gel_Drive_Shaft
Type	Left
Joint Type	Convel
Active	Always
Location Dependency	Delta location from coordinate
Coordinate Reference	cfl_Outer_Tripot_Center
Location	0,0,0
Location in	Local
I-Part Axis	cfl_Wheel_Center_ET_0_Spin_Axis
J-Part Axis	cfl_Inner_Tripot_Center

Inner_Tripot_Differential

I Part	gel_Drive_Shaft
J Part	mtl_Tripot_to_Differential
Type	Left
Joint Type	Convel
Active	Always
Location Dependency	Delta location from coordinate
Coordinate Reference	cfl_Inner_Tripot_Center
Location	0,0,0
Location in	Local
I-Part Axis	cfl_Outer_Tripot_Center
J-Part Axis	cfr_Inner_Tripot_Center

.....

C.16. Build --> Attachments --> Bushing

Bushing

.....

Lower_Rear

I Part	gel_Lower_AArm
J Part	mtl_Lower_AArm_to_Chassis
Type	Left
Inactive	Kinematic mode
Preload	0,0,0
Tpreload	0,0,0
Offset	0,0,0
Roffset	0,0,0
Geometry Length	20
Geometry Radius	15
Property File	mdids://ETSEIB_Motorsport/bushings.tbl/Rodend_Bushing.bus
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Lower_Rear
Location	0,0,0
Location in	Local
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hpl_Lower_Rear
Coordinate Reference #2	hpl_Lower_Front
Axis	Z

Lower_Front

I Part	gel_Lower_AArm
J Part	mtl_Lower_AArm_to_Chassis
Type	Left
Inactive	Kinematic mode
Preload	0,0,0
Tpreload	0,0,0
Offset	0,0,0
Roffset	0,0,0
Geometry Length	20
Geometry Radius	15
Property File	mdids://ETSEIB_Motorsport/bushings.tbl/Rodend_Bushing.bus
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Lower_Front
Location	0,0,0

Location in	Local
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hpl_Lower_Front
Coordinate Reference #2	hpl_Lower_Rear
Axis	Z

Upper_Rear

I Part	gel_Upper_AArm
J Part	mtl_Upper_AArm_to_Chassis
Type	Left
Inactive	Kinematic mode
Preload	0,0,0
Tpreload	0,0,0
Offset	0,0,0
Roffset	0,0,0
Geometry Length	20
Geometry Radius	15
Property File	mdids://ETSEIB_Motorsport/bushings.tbl/Rodend_Bushing.bus
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Upper_Rear
Location	0,0,0
Location in	Local
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hpl_Upper_Rear
Coordinate Reference #2	hpl_Upper_Front
Axis	Z

Upper_Front

I Part	gel_Upper_AArm
J Part	mtl_Upper_AArm_to_Chassis
Type	Left
Inactive	Kinematic mode
Preload	0,0,0
Tpreload	0,0,0
Offset	0,0,0
Roffset	0,0,0
Geometry Length	20
Geometry Radius	15
Property File	mdids://ETSEIB_Motorsport/bushings.tbl/Rodend_Bushing.bus
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Upper_Front

Location	0,0,0
Location in	Local
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hpl_Upper_Front
Coordinate Reference #2	hpl_Upper_Rear
Axis	Z

C.17. Build --> Suspension Parameters --> Characteristics Array

Suspension Parameters

Array

Steer Axis Calculation	Geometric
Suspension Type	Independent
I Part	gel_Upper_AArm
J Part	gel_Lower_AArm
I Coordinate Reference	hpl_Upper_Joint
J Coordinate Reference	hpl_Lower_Joint

C.18. Build --> Communicator --> Output

Output Comunicatior

Suspension_Mount

Matching Name	Suspension_Mount
Type	Left
Entity	Mount
To Minor Role	Inherit
Part Name	gel_Hub

Suspension_Upright

Matching Name	Suspension_Upright
Type	Left
Entity	Mount
To Minor Role	Inherit
Part Name	gel_Upright

Wheel_Center

Matching Name	Wheel_Center

Type	Left
Entity	Location
To Minor Role	Inherit
Coordinate Reference	cfl_Wheel_Center

Diff_Tripot

Matching Name	Tripot_to_Differential
Type	Left
Entity	Location
To Minor Role	Inherit
Part Name	hpl_Inner_Tripot_Center

Driveline_Active

Matching Name	Driveline_Active
Type	Single
Entity	Parameter integer
To Minor Role	Inherit
Parameter Variable Name	pvs_Driveline_Active

Droplink_to_Bellcrank

Matching Name	Droplink_to_Bellcrank
Type	Left
Entity	Mount
To Minor Role	Inherit
Part Name	gel_Bellcrank

Left_Droplink_to_Bellcrank

Matching Name	Left_Droplink_to_Bellcrank
Type	Single
Entity	Mount
To Minor Role	Inherit
Part Name	gel_Bellcrank

Right_Droplink_to_Bellcrank

Matching Name	Right_Droplink_to_Bellcrank
Type	Single
Entity	Mount
To Minor Role	Inherit
Part Name	ger_Bellcrank

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C.19. Build --> Communicator --> Test

Test Communicators

.....

Model Names

__MDI_SUSPENSION_TESTRIG	any
__Rear_Suspension_Double_AArm	rear

.....

C.20. Build --> Marker

Nota: eix Z és l'eix axial dels tubs

Marker

.....

Lower_Rear_Local_Axes

Part	gel_Lower_AArm
Type	Left
Location Dependency	Centered between coordinates
Centered Between	Two coordinates
Coordinate Reference #1	hpl_Lower_Joint
Coordinate Reference #2	hpl_Lower_Rear
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hpl_Lower_Joint
Coordinate Reference #2	hpl_Lower_Rear
Axis	Z

Lower_Front_Local_Axes

Part	gel_Lower_AArm
Type	Left
Location Dependency	Centered between coordinates
Centered Between	Two coordinates
Coordinate Reference #1	hpl_Lower_Joint
Coordinate Reference #2	hpl_Lower_Front
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hpl_Lower_Joint
Coordinate Reference #2	hpl_Lower_Front
Axis	Z

Upper_Rear_Local_Axes

Part	gel_Upper_AArm

Type	Left
Location Dependency	Centered between coordinates
Centered Between	Two coordinates
Coordinate Reference #1	hpl_Upper_Joint
Coordinate Reference #2	hpl_Upper_Rear
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hpl_Upper_Joint
Coordinate Reference #2	hpl_Upper_Rear
Axis	Z

Upper_Front_Local_Axes

Part	gel_Upper_AArm
Type	Left
Location Dependency	Centered between coordinates
Centered Between	Two coordinates
Coordinate Reference #1	hpl_Upper_Joint
Coordinate Reference #2	hpl_Upper_Front
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hpl_Upper_Joint
Coordinate Reference #2	hpl_Upper_Front
Axis	Z

Prod_Local_Axes

Part	gel_Prod
Type	Left
Location Dependency	Centered between coordinates
Centered Between	Two coordinates
Coordinate Reference #1	hpl_Prod_to_Bellcrank
Coordinate Reference #2	hpl_Prod_Joint
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hpl_Prod_to_Bellcrank
Coordinate Reference #2	hpl_Prod_Joint
Axis	Z

Tierod_Local_Axes

Part	gel_Tierod
Type	Left
Location Dependency	Centered between coordinates
Centered Between	Two coordinates
Coordinate Reference #1	hpl_Tierod_to_Chassis
Coordinate Reference #2	hpl_Tierod_Joint

Orientation Dependency	Orient axis along line
Coordinate Reference #1	hpl_Tierod_to_Chassis
Coordinate Reference #2	hpl_Tierod_Joint
Axis	Z

Upper_Joint_Local_Axes

Part	gel_Upright
Type	Left
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Upper_Joint
Location	0,0,0
Location in	Local
Orientation Dependency	Oriented in plane
Coordinate Reference #1	hpl_Upper_Joint
Coordinate Reference #2	hpl_Upper_Front
Coordinate Reference #3	hpl_Upper_Rear
Axes	ZX

Lower_Joint_Local_Axes

Part	gel_Upright
Type	Left
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Lower_Joint
Location	0,0,0
Location in	Local
Orientation Dependency	Oriented in plane
Coordinate Reference #1	hpl_Lower_Joint
Coordinate Reference #2	hpl_Lower_Front
Coordinate Reference #3	hpl_Lower_Rear
Axes	ZX

Bellcrank_Bushing_Local_Axes

Part	gel_Bellcrank
Type	Left
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Bellcrank_to_Chassis
Location	0,0,0
Location in	Local
Orientation Dependency	Oriented in plane
Coordinate Reference #1	hpl_Prod_to_Bellcrank
Coordinate Reference #2	hpl_Bellcrank_to_Chassis

Coordinate Reference #2	hpl_Damper_to_Bellcrank
Axes	ZX

Damper_Local_Axes

Part	gel_Damper_to_Chassis
Type	Left
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Damper_to_Chassis
Location	0,0,0
Location in	Local
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hpl_Damper_to_Chassis
Coordinate Reference #2	hpl_Damper_to_Bellcrank
Axis	Z

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C.21. Build --> Request

Requests

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jklsph_Lower_Rear_Left_Force_Kin

Comment: Force on Lower Rear Left Tube

Define Using Function Expresion

F1

F2

JOINT(._Rear_Suspension_Double_AArm.jklsph_Lower_Rear,0,2, ._Rear_Suspension_Double_AArm.gel_Lower_AArm.mal_Lower_Rear_Local_Axes)

F3

JOINT(._Rear_Suspension_Double_AArm.jklsph_Lower_Rear,0,3, ._Rear_Suspension_Double_AArm.gel_Lower_AArm.mal_Lower_Rear_Local_Axes)

F4

JOINT(._Rear_Suspension_Double_AArm.jklsph_Lower_Rearl,0,4, ._Rear_Suspension_Double_AArm.gel_Lower_AArm.mal_Lower_Rear_Local_Axes)

F5

F6

JOINT(._Rear_Suspension_Double_AArm.jklsph_Lower_Rear,0,6, ._Rear_Suspension_Double_AArm.gel_Lower_AArm.mal_Lower_Rear_Local_Axes)

F7

JOINT(._Rear_Suspension_Double_AArm.jklsph_Lower_Rear,0,7, ._Rear_Suspension_Double_AArm.gel_Lower_AArm.mal_Lower_Rear_Local_Axes)

F8

JOINT(._Rear_Suspension_Double_AArm.jklsph_Lower_Rear,0,8, ._Rear_Suspension_Double_AArm.gel_Lower_AArm.mal_Lower_Rear_Local_Axes)

Title

Result Set Name	jklsph_Lower_Rear_Left_Force_Kin
MAG	F_Magnitude
X	F_Radial_X
Y	F_Radial_Y
Z	F_Axial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

bkl_Lower_Rear_Left_Force

Comment Force on Lower Rear Left Tube

Define Using Function Expresion

F1

F2

FIELD(._Rear_Suspension_Double_AArm.bkl_Lower_Rear.field,0,2, ._Rear_Suspension_Double_AArm.gel_Lower_AArm.mal_Lower_Rear_Local_Axes)

F3

FIELD(._Rear_Suspension_Double_AArm.bkl_Lower_Rear.field,0,3, ._Rear_Suspension_Double_AArm.gel_Lower_AArm.mal_Lower_Rear_Local_Axes)

F4

FIELD(._Rear_Suspension_Double_AArm.bkl_Lower_Rear.field,0,4, ._Rear_Suspension_Double_AArm.gel_Lower_AArm.mal_Lower_Rear_Local_Axes)

F5

F6

FIELD(._Rear_Suspension_Double_AArm.bkl_Lower_Rear.field,0,6, ._Rear_Suspension_Double_AArm.gel_Lower_AArm.mal_Lower_Rear_Local_Axes)

F7

FIELD(._Rear_Suspension_Double_AArm.bkl_Lower_Rear.field,0,7, ._Rear_Suspension_Double_AArm.gel_Lower_AArm.mal_Lower_Rear_Local_Axes)

F8

FIELD(._Rear_Suspension_Double_AArm.bkl_Lower_Rear.field,0,8, ._Rear_Suspension_Double_AArm.gel_Lower_AArm.mal_Lower_Rear_Local_Axes)

Title

Result Set Name	bkl_Lower_Rear_Left_Force
MAG	F_Magnitude
X	F_Radial_X
Y	F_Radial_Y

Z	F_Axial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

jklinl_Lower_Front_Left_Force_Kin

Comment	Force on Lower Front Left Tube
Define Using Function Expresion	
F1	
F2	JPRIM(._Rear_Suspension_Double_AArm.jklinl_Lower_Front,0,2,._Rear_Suspension_Double_AArm.gel_Lower_AArm.mal_Lower_Front_Local_Axes)
F3	JPRIM(._Rear_Suspension_Double_AArm.jklinl_Lower_Front,0,3,._Rear_Suspension_Double_AArm.gel_Lower_AArm.mal_Lower_Front_Local_Axes)
F4	JPRIM(._Rear_Suspension_Double_AArm.jklinl_Lower_Front,0,4,._Rear_Suspension_Double_AArm.gel_Lower_AArm.mal_Lower_Front_Local_Axes)
F5	
F6	JPRIM(._Rear_Suspension_Double_AArm.jklinl_Lower_Front,0,6,._Rear_Suspension_Double_AArm.gel_Lower_AArm.mal_Lower_Front_Local_Axes)
F7	JPRIM(._Rear_Suspension_Double_AArm.jklinl_Lower_Front,0,7,._Rear_Suspension_Double_AArm.gel_Lower_AArm.mal_Lower_Front_Local_Axes)
F8	JPRIM(._Rear_Suspension_Double_AArm.jklinl_Lower_Front,0,8,._Rear_Suspension_Double_AArm.gel_Lower_AArm.mal_Lower_Front_Local_Axes)
Title	
Result Set Name	jklinl_Lower_Front_Left_Force_Kin
MAG	F_Magnitude
X	F_Radial_X
Y	F_Radial_Y
Z	F_Axial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

bkl_Lower_Front_Left_Force

Comment Force on Lower Front Left Tube
Define Using Function Expresion
F1
F2
FIELD(._Rear_Suspension_Double_AArm.bkl_Lower_Front.field,0,2, ._Rear_Suspension_Double_AArm.gel_Lower_AArm.mal_Lower_Front_Local_Axes)
F3
FIELD(._Rear_Suspension_Double_AArm.bkl_Lower_Front.field,0,3, ._Rear_Suspension_Double_AArm.gel_Lower_AArm.mal_Lower_Front_Local_Axes)
F4
FIELD(._Rear_Suspension_Double_AArm.bkl_Lower_Front.field,0,4, ._Rear_Suspension_Double_AArm.gel_Lower_AArm.mal_Lower_Front_Local_Axes)
F5
F6
FIELD(._Rear_Suspension_Double_AArm.bkl_Lower_Front.field,0,6, ._Rear_Suspension_Double_AArm.gel_Lower_AArm.mal_Lower_Front_Local_Axes)
F7
FIELD(._Rear_Suspension_Double_AArm.bkl_Lower_Front.field,0,7, ._Rear_Suspension_Double_AArm.gel_Lower_AArm.mal_Lower_Front_Local_Axes)
F8
FIELD(._Rear_Suspension_Double_AArm.bkl_Lower_Front.field,0,8, ._Rear_Suspension_Double_AArm.gel_Lower_AArm.mal_Lower_Front_Local_Axes)
Title
Result Set Name bkl_Lower_Front_Left_Force
MAG F_Magnitude
X F_Radial_X
Y F_Radial_Y
Z F_Axial_Z
AMAG T_Magnitude
R1 T_X
R2 T_Y
R3 T_Z

jklsph_Upper_Rear_Left_Force_Kin

Comment Force on Upper Rear Left Tube
Define Using Function Expresion
F1
F2
JOINT(._Rear_Suspension_Double_AArm.jklsph_Upper_Rear,0,2, ._Rear_Suspension_Double_AArm.gel_Upper_AArm.mal_Upper_Rear_Local_Axes)
F3

JOINT(._Rear_Suspension_Double_AArm.jklsph_Upper_Rear,0,3, ._Rear_Suspension_Double_AArm.gel_Upper_AArm.mal_Upper_Rear_Local_Axes)

F4

JOINT(._Rear_Suspension_Double_AArm.jklsph_Upper_Rear,0,4, ._Rear_Suspension_Double_AArm.gel_Upper_AArm.mal_Upper_Rear_Local_Axes)

F5

F6

JOINT(._Rear_Suspension_Double_AArm.jklsph_Upper_Rear,0,6, ._Rear_Suspension_Double_AArm.gel_Upper_AArm.mal_Upper_Rear_Local_Axes)

F7

JOINT(._Rear_Suspension_Double_AArm.jklsph_Upper_Rear,0,7, ._Rear_Suspension_Double_AArm.gel_Upper_AArm.mal_Upper_Rear_Local_Axes)

F8

JOINT(._Rear_Suspension_Double_AArm.jklsph_Upper_Rear,0,8, ._Rear_Suspension_Double_AArm.gel_Upper_AArm.mal_Upper_Rear_Local_Axes)

Title

Result Set Name	jklsph_Upper_Rear_Left_Force_Kin
MAG	F_Magnitude
X	F_Radial_X
Y	F_Radial_Y
Z	F_Axial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

bkl_Upper_Rear_Left_Force

Comment Force on Upper Rear Left Tube

Define Using Function Expresion

F1

F2

FIELD(._Rear_Suspension_Double_AArm.bkl_Upper_Rear.field,0,2, ._Rear_Suspension_Double_AArm.gel_Upper_AArm.mal_Upper_Rear_Local_Axes)

F3

FIELD(._Rear_Suspension_Double_AArm.bkl_Upper_Rear.field,0,3, ._Rear_Suspension_Double_AArm.gel_Upper_AArm.mal_Upper_Rear_Local_Axes)

F4

FIELD(._Rear_Suspension_Double_AArm.bkl_Upper_Rear.field,0,4, ._Rear_Suspension_Double_AArm.gel_Upper_AArm.mal_Upper_Rear_Local_Axes)

F5

F6

FIELD(._Rear_Suspension_Double_AArm.bkl_Upper_Rear.field,0,6, ._Rear_Suspension_Double_AArm.gel_Upper_AArm.mal_Upper_Rear_Local_Axes)

F7

FIELD(._Rear_Suspension_Double_AArm.bkl_Upper_Rear.field,0,7, ._Rear_Suspension_Double_AArm.gel_Upper_AArm.mal_Upper_Rear_Local_Axes)

F8

FIELD(._Rear_Suspension_Double_AArm.bkl_Upper_Rear.field,0,8, ._Rear_Suspension_Double_AArm.gel_Upper_AArm.mal_Upper_Rear_Local_Axes)

Title

Result Set Name	bkl_Upper_Rear_Left_Force
MAG	F_Magnitude
X	F_Radial_X
Y	F_Radial_Y
Z	F_Axial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

jklinl_Upper_Front_Left_Force_Kin

Comment Force on Upper Front Left Tube

Define Using Function Expresion

F1

F2

JPRIM(._Rear_Suspension_Double_AArm.jklinl_Upper_Front,0,2, ._Rear_Suspension_Double_AArm.gel_Upper_AArm.mal_Upper_Front_Local_Axes)

F3

JPRIM(._Rear_Suspension_Double_AArm.jklinl_Upper_Front,0,3, ._Rear_Suspension_Double_AArm.gel_Upper_AArm.mal_Upper_Front_Local_Axes)

F4

JPRIM(._Rear_Suspension_Double_AArm.jklinl_Upper_Front,0,4, ._Rear_Suspension_Double_AArm.gel_Upper_AArm.mal_Upper_Front_Local_Axes)

F5

F6

JPRIM(._Rear_Suspension_Double_AArm.jklinl_Upper_Front,0,6, ._Rear_Suspension_Double_AArm.gel_Upper_AArm.mal_Upper_Front_Local_Axes)

F7

JPRIM(._Rear_Suspension_Double_AArm.jklinl_Upper_Front,0,7, ._Rear_Suspension_Double_AArm.gel_Upper_AArm.mal_Upper_Front_Local_Axes)

F8

JPRIM(._Rear_Suspension_Double_AArm.jklinl_Upper_Front,0,8, ._Rear_Suspension_Double

_AArm.gel_Upper_AArm.mal_Upper_Front_Local_Axes)

Title

Result Set Name jklinl_Upper_Front_Left_Force_Kin

MAG F_Magnitude

X F_Radial_X

Y F_Radial_Y

Z F_Axial_Z

AMAG T_Magnitude

R1 T_X

R2 T_Y

R3 T_Z

bkl_Upper_Front_Left_Force

Comment Force on Upper Front Left Tube

Define Using Function Expresion

F1

F2

FIELD(._Rear_Suspension_Double_AArm.bkl_Upper_Front.field,0,2, ._Rear_Suspension_Double_AArm.gel_Upper_AArm.mal_Upper_Front_Local_Axes)

F3

FIELD(._Rear_Suspension_Double_AArm.bkl_Upper_Front.field,0,3, ._Rear_Suspension_Double_AArm.gel_Upper_AArm.mal_Upper_Front_Local_Axes)

F4

FIELD(._Rear_Suspension_Double_AArm.bkl_Upper_Front.field,0,4, ._Rear_Suspension_Double_AArm.gel_Upper_AArm.mal_Upper_Front_Local_Axes)

F5

F6

FIELD(._Rear_Suspension_Double_AArm.bkl_Upper_Front.field,0,6, ._Rear_Suspension_Double_AArm.gel_Upper_AArm.mal_Upper_Front_Local_Axes)

F7

FIELD(._Rear_Suspension_Double_AArm.bkl_Upper_Front.field,0,7, ._Rear_Suspension_Double_AArm.gel_Upper_AArm.mal_Upper_Front_Local_Axes)

F8

FIELD(._Rear_Suspension_Double_AArm.bkl_Upper_Front.field,0,8, ._Rear_Suspension_Double_AArm.gel_Upper_AArm.mal_Upper_Front_Local_Axes)

Title

Result Set Name bkl_Upper_Front_Left_Force

MAG F_Magnitude

X F_Radial_X

Y F_Radial_Y

Z F_Axial_Z

AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

jolsph_Prod_Left_Force

Comment	Force on Prod Left
Define Using Function Expresion	
F1	
F2	JOINT(._Rear_Suspension_Double_AArm.jolsph_Prod_Joint,0,2, ._Rear_Suspension_Double_AArm.gel_Prod.mal_Prod_Local_Axes)
F3	JOINT(._Rear_Suspension_Double_AArm.jolsph_Prod_Joint,0,3, ._Rear_Suspension_Double_AArm.gel_Prod.mal_Prod_Local_Axes)
F4	JOINT(._Rear_Suspension_Double_AArm.jolsph_Prod_Joint,0,4, ._Rear_Suspension_Double_AArm.gel_Prod.mal_Prod_Local_Axes)
F5	
F6	JOINT(._Rear_Suspension_Double_AArm.jolsph_Prod_Joint,0,6, ._Rear_Suspension_Double_AArm.gel_Prod.mal_Prod_Local_Axes)
F7	JOINT(._Rear_Suspension_Double_AArm.jolsph_Prod_Joint,0,7, ._Rear_Suspension_Double_AArm.gel_Prod.mal_Prod_Local_Axes)
F8	JOINT(._Rear_Suspension_Double_AArm.jolsph_Prod_Joint,0,8, ._Rear_Suspension_Double_AArm.gel_Prod.mal_Prod_Local_Axes)
Title	
Result Set Name	jolsph_Prod_Left_Force
MAG	F_Magnitude
X	F_Radial_X
Y	F_Radial_Y
Z	F_Axial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

jolsph_Tierod_Left_Force

Comment	Force on Tierod Left

Define Using Function Expresion

F1

F2

JOINT(._Rear_Suspension_Double_AArm.jolsph_Tierod_Joint,0,2, ._Rear_Suspension_Double_AArm.gel_Tierod.mal_Tierod_Local_Axes)

F3

JOINT(._Rear_Suspension_Double_AArm.jolsph_Tierod_Joint,0,3, ._Rear_Suspension_Double_AArm.gel_Tierod.mal_Tierod_Local_Axes)

F4

JOINT(._Rear_Suspension_Double_AArm.jolsph_Tierod_Joint,0,4, ._Rear_Suspension_Double_AArm.gel_Tierod.mal_Tierod_Local_Axes)

F5

F6

JOINT(._Rear_Suspension_Double_AArm.jolsph_Tierod_Joint,0,6, ._Rear_Suspension_Double_AArm.gel_Tierod.mal_Tierod_Local_Axes)

F7

JOINT(._Rear_Suspension_Double_AArm.jolsph_Tierod_Joint,0,7, ._Rear_Suspension_Double_AArm.gel_Tierod.mal_Tierod_Local_Axes)

F8

JOINT(._Rear_Suspension_Double_AArm.jolsph_Tierod_Joint,0,8, ._Rear_Suspension_Double_AArm.gel_Tierod.mal_Tierod_Local_Axes)

Title

Result Set Name	jolsph_Tierod_Left_Force
MAG	F_Magnitude
X	F_Radial_X
Y	F_Radial_Y
Z	F_Axial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

jolsph_Upper_Joint_Left_Force

Comment Force on Upright Upper Joint Left

Define Using Function Expresion

F1

F2

JOINT(._Rear_Suspension_Double_AArm.jolsph_Upper_Joint,1,2, ._Rear_Suspension_Double_AArm.gel_Upright.mal_Upper_Joint_Local_Axes)

F3

JOINT(._Rear_Suspension_Double_AArm.jolsph_Upper_Joint,1,3, ._Rear_Suspension_Double

_AArm.gel_Upright.mal_Upper_Joint_Local_Axes)

F4

JOINT(._Rear_Suspension_Double_AArm.jolsph_Upper_Joint,1,4, ._Rear_Suspension_Double_AArm.gel_Upright.mal_Upper_Joint_Local_Axes)

F5

F6

JOINT(._Rear_Suspension_Double_AArm.jolsph_Upper_Joint,1,6, ._Rear_Suspension_Double_AArm.gel_Upright.mal_Upper_Joint_Local_Axes)

F7

JOINT(._Rear_Suspension_Double_AArm.jolsph_Upper_Joint,1,7, ._Rear_Suspension_Double_AArm.gel_Upright.mal_Upper_Joint_Local_Axes)

F8

JOINT(._Rear_Suspension_Double_AArm.jolsph_Upper_Joint,1,8, ._Rear_Suspension_Double_AArm.gel_Upright.mal_Upper_Joint_Local_Axes)

Title

Result Set Name	jolsph_Upper_Joint_Left_Force
MAG	F_Magnitude
X	F_Radial_X
Y	F_Axial_Y
Z	F_Radial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

jolsph_Lower_Joint_Left_Force

Comment Force on Upright Lower Joint Left

Define Using Function Expresion

F1

F2

JOINT(._Rear_Suspension_Double_AArm.jolsph_Lower_Joint,1,2, ._Rear_Suspension_Double_AArm.gel_Upright.mal_Lower_Joint_Local_Axes)

F3

JOINT(._Rear_Suspension_Double_AArm.jolsph_Lower_Joint,1,3, ._Rear_Suspension_Double_AArm.gel_Upright.mal_Lower_Joint_Local_Axes)

F4

JOINT(._Rear_Suspension_Double_AArm.jolsph_Lower_Joint,1,4, ._Rear_Suspension_Double_AArm.gel_Upright.mal_Lower_Joint_Local_Axes)

F5

F6

JOINT(._Rear_Suspension_Double_AArm.jolsph_Lower_Joint,1,6, ._Rear_Suspension_Double

_AArm.gel_Upright.mal_Lower_Joint_Local_Axes)

F7

JOINT(._Rear_Suspension_Double_AArm.jolsph_Lower_Joint,1,7, ._Rear_Suspension_Double _AArm.gel_Upright.mal_Lower_Joint_Local_Axes)

F8

JOINT(._Rear_Suspension_Double_AArm.jolsph_Lower_Joint,1,8, ._Rear_Suspension_Double _AArm.gel_Upright.mal_Lower_Joint_Local_Axes)

Title

Result Set Name	jolsph_Lower_Joint_Left_Force
MAG	F_Magnitude
X	F_Radial_X
Y	F_Axial_Y
Z	F_Radial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

jolrev_Bellcrank_to_Chassis_Left_Force

Comment Force on Bellcrank Left

Define Using Function Expresion

F1

F2

JOINT(._Rear_Suspension_Double_AArm.jolrev_Bellcrank,0,2, ._Rear_Suspension_Double_A Arm.gel_Bellcrank.mal_Bellcrank_Bushing_Local_Axes)

F3

JOINT(._Rear_Suspension_Double_AArm.jolrev_Bellcrank,0,3, ._Rear_Suspension_Double_A Arm.gel_Bellcrank.mal_Bellcrank_Bushing_Local_Axes)

F4

JOINT(._Rear_Suspension_Double_AArm.jolrev_Bellcrank,0,4, ._Rear_Suspension_Double_A Arm.gel_Bellcrank.mal_Bellcrank_Bushing_Local_Axes)

F5

F6

JOINT(._Rear_Suspension_Double_AArm.jolrev_Bellcrank,0,6, ._Rear_Suspension_Double_A Arm.gel_Bellcrank.mal_Bellcrank_Bushing_Local_Axes)

F7

JOINT(._Rear_Suspension_Double_AArm.jolrev_Bellcrank,0,7, ._Rear_Suspension_Double_A Arm.gel_Bellcrank.mal_Bellcrank_Bushing_Local_Axes)

F8

JOINT(._Rear_Suspension_Double_AArm.jolrev_Bellcrank,0,8, ._Rear_Suspension_Double_A Arm.gel_Bellcrank.mal_Bellcrank_Bushing_Local_Axes)

Title
Result Set Name jolrev_Bellcrank_to_Chassis_Left_Force
MAG F_Magnitude
X F_Radial_X
Y F_Axial_Y
Z F_Radial_Z
AMAG T_Magnitude
R1 T_X
R2 T_Y
R3 T_Z

jolcon_Damper_to_Chassis_Left_Force

Comment Force on Chassis Damper Joint Left
Define Using Function Expresion
F1
F2
JOINT(._Rear_Suspension_Double_AArm.jolcon_Damper_to_Chassis,1,2, ._Rear_Suspension_Double_AArm.gel_Damper_to_Chassis.mal_Damper_Local_Axes)
F3
JOINT(._Rear_Suspension_Double_AArm.jolcon_Damper_to_Chassis,1,3, ._Rear_Suspension_Double_AArm.gel_Damper_to_Chassis.mal_Damper_Local_Axes)
F4
JOINT(._Rear_Suspension_Double_AArm.jolcon_Damper_to_Chassis,1,4, ._Rear_Suspension_Double_AArm.gel_Damper_to_Chassis.mal_Damper_Local_Axes)
F5
F6
JOINT(._Rear_Suspension_Double_AArm.jolcon_Damper_to_Chassis,1,6, ._Rear_Suspension_Double_AArm.gel_Damper_to_Chassis.mal_Damper_Local_Axes)
F7
JOINT(._Rear_Suspension_Double_AArm.jolcon_Damper_to_Chassis,1,7, ._Rear_Suspension_Double_AArm.gel_Damper_to_Chassis.mal_Damper_Local_Axes)
F8
JOINT(._Rear_Suspension_Double_AArm.jolcon_Damper_to_Chassis,1,8, ._Rear_Suspension_Double_AArm.gel_Damper_to_Chassis.mal_Damper_Local_Axes)
Title
Result Set Name jolcon_Damper_to_Chassis_Left_Force
MAG F_Magnitude
X F_Radial_X
Y F_Radial_Y
Z F_Axial_Z
AMAG T_Magnitude

R1 T_X

R2 T_Y

R3 T_Z

Motion_Ratio_Left

Define Using Subroutin

User Function

903.0,0.0,0.0,(._Rear_Suspension_Double_AArm.dal_Damper.i_marker[1].adams_id),(._Rear_Suspension_Double_AArm.dal_Damper.j_marker[1].adams_id),(._Rear_Suspension_Double_AArm.gel_Hub.jxl_joint_i_14.adams_id),0.0

Title

Routine acarSDM::req903

Result Set Name Motion_Ratio_Left

MAG Motion_Ratio_Left

X Motion_Ratio_Left_X

Y Motion_Ratio_Left_Y

Z Motion_Ratio_Left_Z

AMAG

R1

R2

R3

jkrsph_Lower_Rear_Right_Force_Kin

Comment Force on Lower Rear Right Tube

Define Using Function Expresion

F1

F2

JOINT(._Rear_Suspension_Double_AArm.jkrsph_Lower_Rear,0,2, ._Rear_Suspension_Double_AArm.ger_Lower_AArm.mar_Lower_Rear_Local_Axes)

F3

JOINT(._Rear_Suspension_Double_AArm.jkrsph_Lower_Rear,0,3,._Front_Suspension_Double_AArm.ger_Lower_AArm.mar_Lower_Rear_Local_Axes)

F4

JOINT(._Rear_Suspension_Double_AArm.jkrsph_Lower_Rear,0,4, ._Rear_Suspension_Double_AArm.ger_Lower_AArm.mar_Lower_Rear_Local_Axes)

F5

F6

JOINT(._Rear_Suspension_Double_AArm.jkrsph_Lower_Rear,0,6, ._Rear_Suspension_Double_AArm.ger_Lower_AArm.mar_Lower_Rear_Local_Axes)

F7

JOINT(._Rear_Suspension_Double_AArm.jkrsph_Lower_Rear,0,7, ._Rear_Suspension_D

ouble_AArm.ger_Lower_AArm.mar_Lower_Rear_Local_Axes)

F8

JOINT(._Rear_Suspension_Double_AArm.jkrsph_Lower_Rear,0,8, ._Rear_Suspension_Double_AArm.ger_Lower_AArm.mar_Lower_Rear_Local_Axes)

Title

Result Set Name	jkrsph_Lower_Rear_Right_Force_Kin
MAG	F_Magnitude
X	F_Radial_X
Y	F_Radial_Y
Z	F_Axial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

bkr_Lower_Rear_Right_Force

Comment	Force on Lower Rear Right Tube

Define Using Function Expresion

F1

F2

FIELD(._Rear_Suspension_Double_AArm.bkr_Lower_Rear.field,0,2, ._Rear_Suspension_Double_AArm.ger_Lower_AArm.mar_Lower_Rear_Local_Axes)

F3

FIELD(._Rear_Suspension_Double_AArm.bkr_Lower_Rear.field,0,3, ._Front_Suspension_Double_AArm.ger_Lower_AArm.mar_Lower_Rear_Local_Axes)

F4

FIELD(._Rear_Suspension_Double_AArm.bkr_Lower_Rear.field,0,4, ._Rear_Suspension_Double_AArm.ger_Lower_AArm.mar_Lower_Rear_Local_Axes)

F5

F6

FIELD(._Rear_Suspension_Double_AArm.bkr_Lower_Rear.field,0,6, ._Rear_Suspension_Double_AArm.ger_Lower_AArm.mar_Lower_Rear_Local_Axes)

F7

FIELD(._Rear_Suspension_Double_AArm.bkr_Lower_Rear.field,0,7, ._Front_Suspension_Double_AArm.ger_Lower_AArm.mar_Lower_Rear_Local_Axes)

F8

FIELD(._Rear_Suspension_Double_AArm.bkr_Lower_Rear.field,0,8, ._Rear_Suspension_Double_AArm.ger_Lower_AArm.mar_Lower_Rear_Local_Axes)

Title

Result Set Name	bkr_Lower_Rear_Right_Force
MAG	F_Magnitude

X	F_Radial_X
Y	F_Radial_Y
Z	F_Axial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

jkrinl_Lower_Front_Right_Force_Kin

Comment	Force on Lower Front Right Tube
Define Using Function Expresion	
F1	
F2	JPRIM(._Rear_Suspension_Double_AArm.jkrinl_Lower_Front,0,2, ._Rear_Suspension_Double_AArm.ger_Lower_AArm.mar_Lower_Front_Local_Axes)
F3	JPRIM(._Rear_Suspension_Double_AArm.jkrinl_Lower_Front,0,3,._Front_Suspension_Double_AArm.ger_Lower_AArm.mar_Lower_Front_Local_Axes)
F4	JPRIM(._Rear_Suspension_Double_AArm.jkrinl_Lower_Front,0,4, ._Rear_Suspension_Double_AArm.ger_Lower_AArm.mar_Lower_Front_Local_Axes)
F5	
F6	JPRIM(._Rear_Suspension_Double_AArm.jkrinl_Lower_Front,0,6, ._Rear_Suspension_Double_AArm.ger_Lower_AArm.mar_Lower_Front_Local_Axes)
F7	JPRIM(._Rear_Suspension_Double_AArm.jkrinl_Lower_Front,0,7, ._Rear_Suspension_Double_AArm.ger_Lower_AArm.mar_Lower_Front_Local_Axes)
F8	JPRIM(._Rear_Suspension_Double_AArm.jkrinl_Lower_Front,0,8, ._Rear_Suspension_Double_AArm.ger_Lower_AArm.mar_Lower_Front_Local_Axes)
Title	
Result Set Name	jkrinl_Lower_Front_Right_Force_Kin
MAG	F_Magnitude
X	F_Radial_X
Y	F_Radial_Y
Z	F_Axial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

bkr_Lower_Front_Right_Force

Comment	Force on Lower Front Right Tube
Define Using Function Expresion	
F1	
F2	FIELD(._Rear_Suspension_Double_AArm.bkr_Lower_Front.field,0,2, ._Rear_Suspension_Double_AArm.ger_Lower_AArm.mar_Lower_Front_Local_Axes)
F3	FIELD(._Rear_Suspension_Double_AArm.bkr_Lower_Front.field,0,3, ._Front_Suspension_Double_AArm.ger_Lower_AArm.mar_Lower_Front_Local_Axes)
F4	FIELD(._Rear_Suspension_Double_AArm.bkr_Lower_Front.field,0,4, ._Rear_Suspension_Double_AArm.ger_Lower_AArm.mar_Lower_Front_Local_Axes)
F5	
F6	FIELD(._Rear_Suspension_Double_AArm.bkr_Lower_Front.field,0,6, ._Rear_Suspension_Double_AArm.ger_Lower_AArm.mar_Lower_Front_Local_Axes)
F7	FIELD(._Rear_Suspension_Double_AArm.bkr_Lower_Front.field,0,7, ._Front_Suspension_Double_AArm.ger_Lower_AArm.mar_Lower_Front_Local_Axes)
F8	FIELD(._Rear_Suspension_Double_AArm.bkr_Lower_Front.field,0,8, ._Rear_Suspension_Double_AArm.ger_Lower_AArm.mar_Lower_Front_Local_Axes)
Title	
Result Set Name	bkr_Lower_Front_Right_Force
MAG	F_Magnitude
X	F_Radial_X
Y	F_Radial_Y
Z	F_Axial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

jkrsph_Upper_Rear_Right_Force_Kin

Comment	Force on Upper Rear Right Tube
Define Using Function Expresion	
F1	
F2	JOINT(._Rear_Suspension_Double_AArm.jkrsph_Upper_Rear,0,2, ._Rear_Suspension_Double

_AArm.ger_Upper_AArm.mar_Upper_Rear_Local_Axes)

F3

JOINT(._Rear_Suspension_Double_AArm.jkrsph_Upper_Rear,0,3, ._Front_Suspension _Double_AArm.ger_Upper_AArm.mar_Upper_Rear_Local_Axes)

F4

JOINT(._Rear_Suspension_Double_AArm.jkrsph_Upper_Rear,0,4, ._Rear_Suspension_Double _AArm.ger_Upper_AArm.mar_Upper_Rear_Local_Axes)

F5

F6

JOINT(._Rear_Suspension_Double_AArm.jkrsph_Upper_Rear,0,6, ._Rear_Suspension_Double _AArm.ger_Upper_AArm.mar_Upper_Rear_Local_Axes)

F7

JOINT(._Rear_Suspension_Double_AArm.jkrsph_Upper_Rear,0,7, ._Rear_Suspension_D ouble_AArm.ger_Upper_AArm.mar_Upper_Rear_Local_Axes)

F8

JOINT(._Rear_Suspension_Double_AArm.jkrsph_Upper_Rear,0,8, ._Rear_Suspension_Double _AArm.ger_Upper_AArm.mar_Upper_Rear_Local_Axes)

Title

Result Set Name	jkrsph_Upper_Rear_Right_Force_Kin
MAG	F_Magnitude
X	F_Radial_X
Y	F_Radial_Y
Z	F_Axial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

bkr_Upper_Rear_Right_Force

Comment Force on Upper Rear Right Tube

Define Using Function Expresion

F1

F2

FIELD(._Rear_Suspension_Double_AArm.bkr_Upper_Rear.field,0,2, ._Rear_Suspension_Doub le_AArm.ger_Upper_AArm.mar_Upper_Rear_Local_Axes)

F3

FIELD(._Rear_Suspension_Double_AArm.bkr_Upper_Rear.field,0,3, ._Front_Suspensio n_Double_AArm.ger_Upper_AArm.mar_Upper_Rear_Local_Axes)

F4

FIELD(._Rear_Suspension_Double_AArm.bkr_Upper_Rear.field,0,4, ._Rear_Suspension_Doub le_AArm.ger_Upper_AArm.mar_Upper_Rear_Local_Axes)

F5

F6

FIELD(._Rear_Suspension_Double_AArm.bkr_Upper_Rear.field,0,6, ._Rear_Suspension_Double_AArm.ger_Upper_AArm.mar_Upper_Rear_Local_Axes)

F7

FIELD(._Rear_Suspension_Double_AArm.bkr_Upper_Rear.field,0,7, ._Front_Suspension_Double_AArm.ger_Upper_AArm.mar_Upper_Rear_Local_Axes)

F8

FIELD(._Rear_Suspension_Double_AArm.bkr_Upper_Rear.field,0,8, ._Rear_Suspension_Double_AArm.ger_Upper_AArm.mar_Upper_Rear_Local_Axes)

Title

Result Set Name	bkr_Upper_Rear_Right_Force
MAG	F_Magnitude
X	F_Radial_X
Y	F_Radial_Y
Z	F_Axial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

jkrinl_Upper_Front_Right_Force_Kin

Comment Force on Upper Front Right Tube

Define Using Function Expresion

F1

F2

JPRIM(._Rear_Suspension_Double_AArm.jkrinl_Upper_Front,0,2, ._Rear_Suspension_Double_AArm.ger_Upper_AArm.mar_Upper_Front_Local_Axes)

F3

JPRIM(._Rear_Suspension_Double_AArm.jkrinl_Upper_Front,0,3,._Front_Suspension_Double_AArm.ger_Upper_AArm.mar_Upper_Front_Local_Axes)

F4

JPRIM(._Rear_Suspension_Double_AArm.jkrinl_Upper_Front,0,4, ._Rear_Suspension_Double_AArm.ger_Upper_AArm.mar_Upper_Front_Local_Axes)

F5

F6

JPRIM(._Rear_Suspension_Double_AArm.jkrinl_Upper_Front,0,6, ._Rear_Suspension_Double_AArm.ger_Upper_AArm.mar_Upper_Front_Local_Axes)

F7

JPRIM(._Rear_Suspension_Double_AArm.jkrinl_Upper_Front,0,7, ._Rear_Suspension_Double_AArm.ger_Upper_AArm.mar_Upper_Front_Local_Axes)

F8

JPRIM(._Rear_Suspension_Double_AArm.jkrinl_Upper_Front,0,8, ._Rear_Suspension_Double_AArm.ger_Upper_AArm.mar_Upper_Front_Local_Axes)

Title

Result Set Name	jkrinl_Upper_Front_Right_Force_Kin
MAG	F_Magnitude
X	F_Radial_X
Y	F_Radial_Y
Z	F_Axial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

bkr_Upper_Front_Right_Force

Comment	Force on Upper Front Right Tube

Define Using Function Expresion

F1

F2

FIELD(._Rear_Suspension_Double_AArm.bkr_Upper_Front.field,0,2, ._Rear_Suspension_Double_AArm.ger_Upper_AArm.mar_Upper_Front_Local_Axes)

F3

FIELD(._Rear_Suspension_Double_AArm.bkr_Upper_Front.field,0,3, ._Front_Suspension_Double_AArm.ger_Upper_AArm.mar_Upper_Front_Local_Axes)

F4

FIELD(._Rear_Suspension_Double_AArm.bkr_Upper_Front.field,0,4, ._Rear_Suspension_Double_AArm.ger_Upper_AArm.mar_Upper_Front_Local_Axes)

F5

F6

FIELD(._Rear_Suspension_Double_AArm.bkr_Upper_Front.field,0,6, ._Rear_Suspension_Double_AArm.ger_Upper_AArm.mar_Upper_Front_Local_Axes)

F7

FIELD(._Rear_Suspension_Double_AArm.bkr_Upper_Front.field,0,7, ._Front_Suspension_Double_AArm.ger_Upper_AArm.mar_Upper_Front_Local_Axes)

F8

FIELD(._Rear_Suspension_Double_AArm.bkr_Upper_Front.field,0,8, ._Rear_Suspension_Double_AArm.ger_Upper_AArm.mar_Upper_Front_Local_Axes)

Title

Result Set Name	bkr_Upper_Front_Right_Force
MAG	F_Magnitude
X	F_Radial_X

Y	F_Radial_Y
Z	F_Axial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

jorsph_Prod_Right_Force

Comment	Force on Prod Right
Define Using Function Expresion	
F1	
F2	JOINT(._Rear_Suspension_Double_AArm.jorsph_Prod_Joint,0,2, ._Rear_Suspension_Double_AArm.ger_Prod.mar_Prod_Local_Axes)
F3	JOINT(._Rear_Suspension_Double_AArm.jorsph_Prod_Joint,0,3,._Front_Suspension_Double_AArm.ger_Prod.mar_Prod_Local_Axes)
F4	JOINT(._Rear_Suspension_Double_AArm.jorsph_Prod_Joint,0,4, ._Rear_Suspension_Double_AArm.ger_Prod.mar_Prod_Local_Axes)
F5	
F6	JOINT(._Rear_Suspension_Double_AArm.jorsph_Prod_Joint,0,6, ._Rear_Suspension_Double_AArm.ger_Prod.mar_Prod_Local_Axes)
F7	JOINT(._Rear_Suspension_Double_AArm.jorsph_Prod_Joint,0,7, ._Rear_Suspension_Double_AArm.ger_Prod.mar_Prod_Local_Axes)
F8	JOINT(._Rear_Suspension_Double_AArm.jorsph_Prod_Joint,0,8, ._Rear_Suspension_Double_AArm.ger_Prod.mar_Prod_Local_Axes)
Title	
Result Set Name	jorsph_Prod_Right_Force
MAG	F_Magnitude
X	F_Radial_X
Y	F_Radial_Y
Z	F_Axial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

jorsph_Tierod_Right_Force

Comment	Force on Tierod Right
Define Using Function Expresion	
F1	
F2	JOINT(._Rear_Suspension_Double_AArm.jorsph_Tierod_Joint,0,2, ._Rear_Suspension_Double_AArm.ger_Tierod.mar_Tierod_Local_Axes)
F3	JOINT(._Rear_Suspension_Double_AArm.jorsph_Tierod_Joint,0,3, ._Front_Suspension _Double_AArm.ger_Tierod.mar_Tierod_Local_Axes)
F4	JOINT(._Rear_Suspension_Double_AArm.jorsph_Tierod_Joint,0,4, ._Rear_Suspension_Double_AArm.ger_Tierod.mar_Tierod_Local_Axes)
F5	
F6	JOINT(._Rear_Suspension_Double_AArm.jorsph_Tierod_Joint,0,6, ._Rear_Suspension_Double_AArm.ger_Tierod.mar_Tierod_Local_Axes)
F7	JOINT(._Rear_Suspension_Double_AArm.jorsph_Tierod_Joint,0,7, ._Rear_Suspension_ Double_AArm.ger_Tierod.mar_Tierod_Local_Axes)
F8	JOINT(._Rear_Suspension_Double_AArm.jorsph_Tierod_Joint,0,8, ._Rear_Suspension_Double_AArm.ger_Tierod.mar_Tierod_Local_Axes)
Title	
Result Set Name	jorsph_Tierod_Right_Force
MAG	F_Magnitude
X	F_Radial_X
Y	F_Radial_Y
Z	F_Axial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

jorsph_Upper_Joint_Right_Force

Comment	Force on Upright Upper Joint Right
Define Using Function Expresion	
F1	
F2	JOINT(._Rear_Suspension_Double_AArm.jorsph_Upper_Joint,1,2, ._Rear_Suspension_Double_AArm.ger_Upright.mar_Upper_Joint_Local_Axes)

F3

JOINT(._Rear_Suspension_Double_AArm.jorsph_Upper_Joint,1,3, ._Front_Suspension _Double_AArm.ger_Upright.mar_Upper_Joint_Local_Axes)

F4

JOINT(._Rear_Suspension_Double_AArm.jorsph_Upper_Joint,1,4, ._Rear_Suspension_Double_AArm.ger_Upright.mar_Upper_Joint_Local_Axes)

F5

F6

JOINT(._Rear_Suspension_Double_AArm.jorsph_Upper_Joint,1,6, ._Rear_Suspension_Double_AArm.ger_Upright.mar_Upper_Joint_Local_Axes)

F7

JOINT(._Rear_Suspension_Double_AArm.jorsph_Upper_Joint,1,7, ._Rear_Suspension_ Double_AArm.ger_Upright.mar_Upper_Joint_Local_Axes)

F8

JOINT(._Rear_Suspension_Double_AArm.jorsph_Upper_Joint,1,8, ._Rear_Suspension_Double_AArm.ger_Upright.mar_Upper_Joint_Local_Axes)

Title

Result Set Name	jorsph_Upper_Joint_Right_Force
MAG	F_Magnitude
X	F_Radial_X
Y	F_Axial_Y
Z	F_Radial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

jorsph_Lower_Joint_Right_Force

Comment Force on Upright Lower Joint Right

Define Using Function Expresion

F1

F2

JOINT(._Rear_Suspension_Double_AArm.jorsph_Lower_Joint,1,2, ._Rear_Suspension_Double_AArm.ger_Upright.mar_Lower_Joint_Local_Axes)

F3

JOINT(._Rear_Suspension_Double_AArm.jorsph_Lower_Joint,1,3,._Front_Suspension_ Double_AArm.ger_Upright.mar_Lower_Joint_Local_Axes)

F4

JOINT(._Rear_Suspension_Double_AArm.jorsph_Lower_Joint,1,4, ._Rear_Suspension_Double_AArm.ger_Upright.mar_Lower_Joint_Local_Axes)

F5

F6

JOINT(._Rear_Suspension_Double_AArm.jorsph_Lower_Joint,1,6, ._Rear_Suspension_Double_AArm.ger_Upright.mar_Lower_Joint_Local_Axes)

F7

JOINT(._Rear_Suspension_Double_AArm.jorsph_Lower_Joint,1,7, ._Rear_Suspension_Double_AArm.ger_Upright.mar_Lower_Joint_Local_Axes)

F8

JOINT(._Rear_Suspension_Double_AArm.jorsph_Lower_Joint,1,8, ._Rear_Suspension_Double_AArm.ger_Upright.mar_Lower_Joint_Local_Axes)

Title

Result Set Name	jorsph_Lower_Joint_Right_Force
MAG	F_Magnitude
X	F_Radial_X
Y	F_Axial_Y
Z	F_Radial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

jorrev_Bellcrank_to_Chassis_Right_Force

Comment Force on Bellcrank Right

Define Using Function Expresion

F1

F2

JOINT(._Rear_Suspension_Double_AArm.jorrev_Bellcrank,0,2, ._Rear_Suspension_Double_AArm.ger_Bellcrank.mar_Bellcrank_Bushing_Local_Axes)

F3

JOINT(._Rear_Suspension_Double_AArm.jorrev_Bellcrank,0,3, ._Front_Suspension_Double_AArm.ger_Bellcrank.mar_Bellcrank_Bushing_Local_Axes)

F4

JOINT(._Rear_Suspension_Double_AArm.jorrev_Bellcrank,0,4, ._Rear_Suspension_Double_AArm.ger_Bellcrank.mar_Bellcrank_Bushing_Local_Axes)

F5

F6

JOINT(._Rear_Suspension_Double_AArm.jorrev_Bellcrank,0,6, ._Rear_Suspension_Double_AArm.ger_Bellcrank.mar_Bellcrank_Bushing_Local_Axes)

F7

JOINT(._Rear_Suspension_Double_AArm.jorrev_Bellcrank,0,7, ._Rear_Suspension_Double_AArm.ger_Bellcrank.mar_Bellcrank_Bushing_Local_Axes)

F8

JOINT(._Rear_Suspension_Double_AArm.jorrev_Bellcrank,0,8, ._Rear_Suspension_Double_AArm.ger_Bellcrank.mar_Bellcrank_Bushing_Local_Axes)

Title

Result Set Name	jorrev_Bellcrank_to_Chassis_Right_Force
MAG	F_Magnitude
X	F_Radial_X
Y	F_Axial_Y
Z	F_Radial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

jorcon_Damper_to_Chassis_Right_Force

Comment Force on Chassis Damper Joint Right

Define Using Function Expresion

F1

F2

JOINT(._Rear_Suspension_Double_AArm.jorcon_Damper_to_Chassis,1,2, ._Rear_Suspension_Double_AArm.ger_Damper_to_Chassis.mar_Damper_Local_Axes)

F3

JOINT(._Rear_Suspension_Double_AArm.jorcon_Damper_to_Chassis,1,3, ._Front_Suspension_Double_AArm.ger_Damper_to_Chassis.mar_Damper_Local_Axes)

F4

JOINT(._Rear_Suspension_Double_AArm.jorcon_Damper_to_Chassis,1,4, ._Rear_Suspension_Double_AArm.ger_Damper_to_Chassis.mar_Damper_Local_Axes)

F5

F6

JOINT(._Rear_Suspension_Double_AArm.jorcon_Damper_to_Chassis,1,6, ._Rear_Suspension_Double_AArm.ger_Damper_to_Chassis.mar_Damper_Local_Axes)

F7

JOINT(._Rear_Suspension_Double_AArm.jorcon_Damper_to_Chassis,1,7, ._Rear_Suspension_Double_AArm.ger_Damper_to_Chassis.mar_Damper_Local_Axes)

F8

JOINT(._Rear_Suspension_Double_AArm.jorcon_Damper_to_Chassis,1,8, ._Rear_Suspension_Double_AArm.ger_Damper_to_Chassis.mar_Damper_Local_Axes)

Title

Result Set Name	jorcon_Damper_to_Chassis_Right_Force
MAG	F_Magnitude
X	F_Radial_X
Y	F_Radial_Y

Z	F_Axial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

Motion_Ratio_Right

Define Using Subroutin

User Function

903.0,0.0,0.0,(._Rear_Suspension_Double_AArm.dar_Damper.i_marker[1].adams_id),(._Rear_Suspension_Double_AArm.dar_Damper.j_marker[1].adams_id),(._Rear_Suspension_Double_AArm.ger_Hub.jxr_joint_i_14.adams_id),0.0

Title

Routine	acarSDM::req903
Result Set Name	Motion_Ratio_Right
MAG	Motion_Ratio_Right
X	Motion_Ratio_Right_X
Y	Motion_Ratio_Right_Y
Z	Motion_Ratio_Right_Z
AMAG	
R1	
R2	
R3	

Outer_Tripot_Displacement

Comment	Tripot Displacement Inside Hub

Define Using Function Expresion

F1

F2

DZ(._Rear_Suspension_Double_AArm.gel_Outer_Tripot.jxl_joint_i_16, ._Rear_Suspension_Double_AArm.gel_Hub.jxl_joint_j_16, ._Rear_Suspension_Double_AArm.gel_Outer_Tripot.jxl_joint_i_16)

F3

DZ(._Rear_Suspension_Double_AArm.ger_Outer_Tripot.jxr_joint_i_16, ._Rear_Suspension_Double_AArm.ger_Hub.jxr_joint_j_16, ._Rear_Suspension_Double_AArm.ger_Outer_Tripot.jxr_joint_i_16)

F4

F5

F6

F7

F8

Title

Result Set Name Outer_Tripot_Displacement

MAG

X Tripot_Displacement_Left

Y Tripot_Displacement_Right

Z

AMAG

R1

R2

R3

.....

D. Steering System

ADAMS - Template - _Steering_System.tpl

D.1. Build --> Hardpoints

Steering System Points	X	Y	Z	Units
hps_Steering_Wheel_Center	-426.38	0.00	489.82	[mm]
hps_Steering_Rear_Bushing_Center	-309.51	0.00	484.27	[mm]
hps_Steering_Front_Bushing_Center	-270.56	0.00	482.42	[mm]
hps_Rear_Hooke_Center	-227.61	0.00	480.39	[mm]
hps_Front_Hooke_Center	-197.04	0.00	461.37	[mm]
hps_Pinion_Center	-18.81	0.00	138.82	[mm]
hpl_Rack _Bushing_Center	0.00	133.00	149.22	[mm]
hpl_Rack _Housing_to_Chassis	0.00	133.00	149.22	[mm]

D.2. Build --> Parts --> General Part

General Parts

Steering_Wheel

Type	Single
Location Dependency	Delta location from coordinate
Coordinate Reference	hps_Steering_Wheel_Center
Location	0,0,0
Location in	Local
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hps_Rear_Hooke_Center
Coordinate Reference #2	hps_Steering_Wheel_Center
Mass & Inertia	1E-9
Material	Steel

Steering_Shaft

Type	Single
Location Dependency	Centered between coordinates
Centered Between	Two coordinates
Coordinate Reference #1	hps_Rear_Hooke_Center

Coordinate Reference #2	hps_Steering_Wheel_Center
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hps_Rear_Hooke_Center
Coordinate Reference #2	hps_Steering_Wheel_Center
Mass & Inertia	1E-9
Material	Steel

Intermediate_Shaft

Type	Single
Location Dependency	Centered between coordinates
Centered Between	Two coordinates
Coordinate Reference #1	hps_Front_Hooke_Center
Coordinate Reference #2	hps_Rear_Hooke_Center
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hps_Front_Hooke_Center
Coordinate Reference #2	hps_Rear_Hooke_Center
Axis	Z
Mass & Inertia	1E-9
Material	Steel

Steering_Column

Type	Single
Location Dependency	Centered between coordinates
Centered Between	Two coordinates
Coordinate Reference #1	hps_Pinion_Center
Coordinate Reference #2	hps_Front_Hooke_Center
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hps_Pinion_Center
Coordinate Reference #2	hps_Front_Hooke_Center
Axis	Z
Mass & Inertia	1E-9
Material	Steel

Steering_Column_Support

Type	Single
Location Dependency	Centered between coordinates
Centered Between	Two coordinates
Coordinate Reference #1	hps_Steering_Front_Bushing_Center
Coordinate Reference #2	hps_Steering_Rear_Bushing_Center
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hps_Steering_Front_Bushing_Center

Coordinate Reference #2	hps_Steering_Rear_Bushing_Center
Axis	Z
Mass & Inertia	1E-9
Material	Steel

Pinion

Type	Single
Location Dependency	Delta location from coordinate
Coordinate Reference	hps_Pinion_Center
Location	0,0,0
Location in	Local
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hps_Pinion_Center
Coordinate Reference #2	hps_Front_Hooke_Center
Axis	Z
Mass & Inertia	1E-9
Material	Steel

D.3. Build --> Communicator --> Input

Input Communicator

Tierod_to_Rack_Pickup

Matching Name	Tierod_Rack_Pickup
Entity	Location
From Minor Role	Inherit
Initial Value	0.0, 216.49, 149.22

D.4. Build --> Construction Frame --> New

Construction Frame

Tierod_to_Rack

Type	Left
Location Dependency	Location input communicator
Input Communicator	cil_Tierod_to_Rack_Pickup
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hpl_Rack_Bushing_Center
Coordinate Reference #2	hpr_Rack_Bushing_Center

Axis	Z

Pinion_Spin_Axis

Type	Single
Location Dependency	Delta location from coordinate
Coordinate Reference	hps_Pinion_Center
Location	0,0,0
Location in	Local
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hps_Pinion_Center
Coordinate Reference #2	hps_Front_Hooke_Center
Axis	Z

Rack_Center

Type	Single
Location Dependency	Centered between coordinates
Centered Between	Two coordinates
Coordinate Reference #1	cfl_Tierod_to_Rack
Coordinate Reference #2	cfr_Tierod_to_Rack
Orientation Dependency	Orient axis along line
Coordinate Reference #1	cfl_Tierod_to_Rack
Coordinate Reference #2	cfr_Tierod_to_Rack
Axis	Z

Rack_Housing_Center

Type	Single
Location Dependency	Centered between coordinates
Centered Between	Two coordinates
Coordinate Reference #1	hpl_Rack_Bushing_Center
Coordinate Reference #2	hpr_Rack_Bushing_Center
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hpl_Rack_Bushing_Center
Coordinate Reference #2	hpr_Rack_Bushing_Center
Axis	Z

Steering_Column_Support_Center

Type	Single
Location Dependency	Centered between coordinates
Centered Between	Two coordinates
Coordinate Reference #1	hps_Steering_Front_Bushing_Center
Coordinate Reference #2	hps_Steering_Rear_Bushing_Center

Orientation Dependency	Orient axis along line
Coordinate Reference #1	hps_Steering_Front_Bushing_Center
Coordinate Reference #2	hps_Steering_Rear_Bushing_Center
Axis	Z

D.5. Build --> Parts --> General Part --> New

General Parts

Rack_Housing

Type	Single
Location Dependency	Centered between coordinates
Centered Between	Two coordinates
Coordinate Reference #1	hpl_Rack_Bushing_Center
Coordinate Reference #2	hpr_Rack_Bushing_Center
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hpl_Rack_Bushing_Center
Coordinate Reference #2	hpr_Rack_Bushing_Center
Axis	Z
Mass & Inertia	1E-9
Material	Aluminium

Rack

Type	Single
Location Dependency	Centered between coordinates
Centered Between	Two coordinates
Coordinate Reference #1	cfl_Tierod_Rack_Pickup
Coordinate Reference #2	cfr_Tierod_Rack_Pickup
Orientation Dependency	Orient axis along line
Coordinate Reference #1	cfl_Tierod_Rack_Pickup
Coordinate Reference #2	cfr_Tierod_Rack_Pickup
Axis	Z
Mass & Inertia	1E-9
Material	Steel

D.6. Build --> Parts --> Mount

Mount

Steering_Column_Support_to_Chassis

Coordinate Reference	cfs_Steering_Column_Support_Center
From Minor Role	Inherit

Rack_Housing_to_Chassis

Coordinate Reference	cfs_Rack_Center
From Minor Role	Inherit

.....

D.7. Build --> Geometry --> Link

Links

.....

Rack

General Part	ges_Rack
Coordinate Reference #1	cfl_ Tierod_to_Rack
Coordinate Reference #2	cfr_ Tierod_to_Rack
Radius	10
Mass	Not Calculate Mass Properties

Rack_Housing

General Part	ges_Rack_Housing
Coordinate Reference #1	hpl_Rack _Bushing_Center
Coordinate Reference #2	hpr_Rack _Bushing_Center
Radius	15
Mass	Not Calculate Mass Properties

Steering_Column

General Part	ges_Steering_Column
Coordinate Reference #1	hps_Pinion_Center
Coordinate Reference #2	hps_Front_Hooke_Center
Radius	10
Mass	Not Calculate Mass Properties

Intermediate_Shaft

General Part	ges_Intermediate_Shaft
Coordinate Reference #1	hps_Front_Hooke_Center
Coordinate Reference #2	hps_Rear_Hooke_Center
Radius	10
Mass	Not Calculate Mass Properties

Steering_Shaft

General Part	ges_Steering_Shaft
Coordinate Reference #1	hps_Rear_Hooke_Center
Coordinate Reference #2	hps_Steering_Wheel_Center
Radius	10
Mass	Not Calculate Mass Properties

Steering_Column_Support

General Part	ges_Steering_Column_Support
Coordinate Reference #1	hps_Steering_Front_Bushing_Center
Coordinate Reference #2	hps_Steering_Rear_Bushing_Center
Radius	15
Mass	Not Calculate Mass Properties

.....

D.8. Build --> Geometry --> Ellipsoid

Ellipsoid

.....

Front_Hooke_Center

Coordinate Reference	hps_Front_Hooke_Center
Method	By entering size
General Part	ges_Intermediate_Shaft
X Radius	12
Y Radius	12
Z Radius	12
Mass	Not Calculate Mass Properties

Rear_Hooke_Center

Coordinate Reference	hps_Rear_Hooke_Center
Method	By entering size
General Part	ges_Intermediate_Shaft
X Radius	12
Y Radius	12
Z Radius	12
Mass	Not Calculate Mass Properties

Rack_End

Coordinate Reference	cfl_Tierod_to_Rack
Method	By entering size
General Part	ges_Rack

X Radius	10
Y Radius	10
Z Radius	10
Mass	Not Calculate Mass Properties

D.9. Build --> Geometry --> Cylinder

Cylinder

Pinion_Housing

General Part	ges_Rack_Housing
Construction Frame	cfs_Pinion_Spin_Axis
Radius	15
Lenght in Positive Z	30
Length in Negative Z	5
Mass	Not Calculate Mass Properties

D.10. Build --> Attachment --> Joint

Attachment Joint

Steering_Wheel_to_Steering_Column_Support

I Part	ges_Steering_Wheel
J Part	ges_Steering_Column_Support
Type	Single
Joint Type	Revolute
Active	Always
Location Dependency	Delta location from coordinate
Coordinate Reference	hps_Steering_Wheel_Center
Location	0,0,0
Location in	Local
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hps_Steering_Wheel_Center
Coordinate Reference #2	hps_Rear_Hooke_Center

Steering_Shaft_to_Steering_Column_Support

I Part	ges_Steering_Shaft
J Part	ges_Steering_Column_Support
Type	Single

Joint Type	Cylindrical
Active	Always
Location Dependency	Centered between coordinates
Centered Between	Two coordinates
Coordinate Reference #1	hps_Steering_Wheel_Center
Coordinate Reference #2	hps_Rear_Hooke_Center
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hps_Steering_Wheel_Center
Coordinate Reference #2	hps_Rear_Hooke_Center

Steering_Column_Support_to_Chassis

I Part	ges_Steering_Column_Support
J Part	mts_Steering_Column_Support_to_Chassis
Type	Single
Joint Type	Fixed
Active	Always
Location Dependency	Delta location from coordinate
Coordinate Reference	cfs_Steering_Column_Support_Center
Location	0,0,0
Location in	Local

Rack_Housing_to_Chassis

I Part	ges_Rack_Housing
J Part	mts_Rack_Housing_to_Chassis
Type	Single
Joint Type	Fixed
Active	Kinematic mode
Location Dependency	Delta location from coordinate
Coordinate Reference	cfs_Rack_Housing_Center
Location	0,0,0
Location in	Local

Pinion_to_Steering_Column

I Part	ges_Pinion
J Part	ges_Steering_Column
Type	Single
Joint Type	Fixed
Active	Kinematic mode
Location Dependency	Delta location from coordinate
Coordinate Reference	hps_Pinion_Center
Location	0,0,0

Location in	Local

Rear_Hooke

I Part	ges_Steering_Shaft
J Part	ges_Intermediate_Shaft
Type	Single
Joint Type	Hooke
Active	Always
Location Dependency	Delta location from coordinate
Coordinate Reference	hps_Rear_Hooke_Center
Location	0,0,0
Location in	Local
I-Part Axis	hps_Steering_Wheel_Center
J-Part Axis	hps_Front_Hooke_Center

Front_Hooke

I Part	ges_Intermediate_Shaft
J Part	ges_Steering_Column
Type	Single
Joint Type	Hooke
Active	Always
Location Dependency	Delta location from coordinate
Coordinate Reference	hps_Front_Hooke_Center
Location	0,0,0
Location in	Local
I-Part Axis	hps_Rear_Hooke_Center
J-Part Axis	hps_Pinion_Center

Rack_to_Rack_Housing

I Part	ges_Rack
J Part	ges_Rack_Housing
Type	Single
Joint Type	Translational
Active	Always
Location Dependency	Delta location from coordinate
Coordinate Reference	cfs_Rack_Center
Location	0,0,0
Location in	Local
Orientation Dependency	Orient axis along line
Coordinate Reference #1	cfl_Tierod_to_Rack
Coordinate Reference #2	cfr_Tierod_to_Rack

Axis	Z

Pinion_to_Rack_Housing

I Part	ges_Pinion
J Part	ges_Rack_Housing
Type	Single
Joint Type	Revolute
Active	Always
Location Dependency	Delta location from coordinate
Coordinate Reference	hps_Pinion_Center
Location	0,0,0
Location in	Local
Orientation Dependency	Delta orientation from coordinate
Construction Frame	cfs_Pinion_Spin_Axis
Orientation	0,0,0

Torsion_Bar

I Part	ges_Pinion
J Part	ges_Steering_Column
Type	Single
Joint Type	Revolute
Active	Always
Location Dependency	Delta location from coordinate
Coordinate Reference	hps_Pinion_Center
Location	0,0,0
Location in	Local
Orientation Dependency	Delta orientation from coordinate
Construction Frame	cfs_Pinion_Spin_Axis
Orientation	0,0,0

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D.11. Build --> Attachments --> Bushing

Bushing

.....

Rack_Housing_Bushing

I Part	ges_Rack_Housing
J Part	mts_Rack_Housing_to_Chassis
Type	Left
Inactive	Kinematic mode
Preload	0,0,0

Tpreload	0,0,0
Offset	0,0,0
Roffset	0,0,0
Geometry Length	20
Geometry Radius	20
Property File	mdids://acar_shared/bushings.tbl/mdi_0001.bus
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Rack_Housing_to_Chassis
Location	0,0,0
Location in	Local
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hpl_Rack_Bushing_Center
Coordinate Reference #2	hpr_Rack_Bushing_Center
Axis	Z

Torsion_Bar

I Part	ges_Pinion
J Part	ges_Steering_Column
Type	Single
Inactive	Kinematic mode
Preload	0,0,0
Tpreload	0,0,0
Offset	0,0,0
Roffset	0,0,0
Geometry Length	20
Geometry Radius	20
Property File	mdids://acar_shared/bushings.tbl/mdi_steering_tbar.bus
Location Dependency	Delta location from coordinate
Coordinate Reference	hps_Pinion_Center
Location	0,0,0
Location in	Local
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hps_Pinion_Center
Coordinate Reference #2	hps_Front_Hooke_Center
Axis	Z

.....

D.12. Build --> Gears --> Reduction Gears

Reduction Gears

.....

Steering_Wheel_to_Steering_Shaft

Input Joint	josrev_Pinion_to_Rack_Housing_Revolute
Input Type of Freedom	Rotational
Output Joint	jostra_Steering_Rack_to_Rack_Housing_Translational
Output Type of Freedom	Rotational
Reduction Ratio	1
Invert Direction	No
Active	Always

Pinion_to_Rack

Input Joint	josrev_Pinion_to_Rack_Housing_Revolute
Input Type of Freedom	Rotational
Output Joint	jostra_Steering_Rack_to_Rack_Housing_Translational
Output Type of Freedom	Translational
Reduction Ratio	0.061842
Invert Direction	Yes
Active	Always

.....

D.13. Build --> Parameter

Parameter

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Max_Steering_Torque

Type	Single
Real Value	1.0E+005
Units	Torque
Hide From Standard User	No

Max_Steering_Angle

Type	Single
Real Value	90
Units	Angle
Hide From Standard User	No

Max_Rack_Force

Type	Single
Real Value	1.0E+005
Units	Force
Hide From Standard User	No

Max_Rack_Displacement

Type	Single
Real Value	24.5
Units	Length
Hide From Standard User	No

.....

D.14. Build --> Communicator --> Output

Output Comunicatior

.....

Steering_Rack_Joint

Matching Name	Steering_Rack_Joint
Type	Single
Entity	Joint for motion
To Minor Role	Inherit
Joint Name	jostra_Rack_to_Rack_Housing_Translational

Steering_Wheel_Joint

Matching Name	Steering_Wheel_Joint
Type	Single
Entity	Joint for motion
To Minor Role	Inherit
Joint Name	josrev_Steering_Wheel_to_Steering_Column_Support_Revolute

Max_Rack_Displacement

Matching Name	Max_Rack_Displacement
Type	Single
Entity	Parameter real
To Minor Role	Inherit
Parameter Variable Name	pvs_Max_Rack_Displacement

Max_Rack_Force

Matching Name	Max_Rack_Force
Type	Single
Entity	Parameter real
To Minor Role	Inherit
Parameter Variable Name	pvs_Max_Rack_Force

Max_Steering_Angle

Matching Name	Max_Steering_Angle

Type	Single
Entity	Parameter real
To Minor Role	Inherit
Parameter Variable Name	pvs_Max_Steering_Angle

Max_Steering_Torque

Matching Name	Max_Steering_Torque
Type	Single
Entity	Parameter real
To Minor Role	Inherit
Parameter Variable Name	pvs_Max_Steering_Torque

Tierod_to_Rack

Matching Name	Tierod_to_Rack
Type	Left
Entity	Mount
To Minor Role	Inherit
Part Name	ges_Rack

.....

D.15. Build --> Marker

Nota: eix Z és l'eix axial dels tubs

Marker

.....

Steering_Wheel_Local_Axes

Part	ges_Steering_Wheel
Type	Single
Location Dependency	Delta location from coordinate
Coordinate Reference	hps_Steering_Wheel_Center
Location	0,0,0
Location in	Local
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hps_Rear_Hooke_Center
Coordinate Reference #2	hps_Steering_Wheel_Center
Axis	Z

Steering_Shaft_Local_Axes

Part	ges_Steering_Shaft
Type	Single

Location Dependency	Centered between coordinates
Centered Between	Two coordinates
Coordinate Reference #1	hps_Rear_Hooke_Center
Coordinate Reference #2	hps_Steering_Wheel_Center
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hps_Rear_Hooke_Center
Coordinate Reference #2	hps_Steering_Wheel_Center
Axis	Z

Intermediate_Shaft_Local_Axes

Part	ges_Intermediate_Shaft
Type	Single
Location Dependency	Centered between coordinates
Centered Between	Two coordinates
Coordinate Reference #1	hps_Front_Hooke_Center
Coordinate Reference #2	hps_Rear_Hooke_Center
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hps_Front_Hooke_Center
Coordinate Reference #2	hps_Rear_Hooke_Center
Axis	Z

Steering_Column_Local_Axes

Part	ges_Steering_Column
Type	Single
Location Dependency	Centered between coordinates
Centered Between	Two coordinates
Coordinate Reference #1	hps_Pinion_Center
Coordinate Reference #2	hps_Front_Hooke_Center
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hps_Pinion_Center
Coordinate Reference #2	hps_Front_Hooke_Center
Axis	Z

Pinion_Center_Local_Axes

Part	ges_Rack_Housing
Type	Single
Location Dependency	Delta location from coordinate
Coordinate Reference	hps_Pinion_Center
Location	0,0,0
Location in	Local
Orientation Dependency	Orient axis along line

Coordinate Reference #1	hps_Pinion_Center
Coordinate Reference #1	hps_Front_Hooke_Center
Axis	Z

Rack_Center_Local_Axes

Part	ges_Rack_Housing
Type	Single
Location Dependency	Delta location from coordinate
Coordinate Reference	cfs_Rack_Housing_Center
Location	0,0,0
Location in	Local
Orientation Dependency	Delta orientation from coordinate
Construction Frame	cfs_Rack_Housing_Center
Orientation	0,0,0

.....

D.16. Build --> Request

Requests

.....

Steering_Wheel_Data

Comment

Define Using Function Expresion

F1

F2

AZ(._Steering_System_Double_Hooke.ges_Steering_Wheel.jxs_joint_i_1, ._Steering_System_Double_Hooke.ges_Steering_Column_Support.jxs_joint_j_1)

F3

JOINT(._Steering_System_Double_Hooke.josrev_Steering_Wheel_to_Steering_Column_Support,1,8, ._Steering_System_Double_Hooke.ges_Steering_Wheel.mas_Steering_Wheel_Local_Axes)

F4

DZ(._Steering_System_Double_Hooke.ges_Rack.jxs_joint_i_7, ._Steering_System_Double_Hooke.ges_Rack_Housing.jxs_joint_j_7, ._Steering_System_Double_Hooke.ges_Rack_Housing.jxs_joint_j_7)

F5

F6

AZ(._Steering_System_Double_Hooke.ges_Pinion.jxs_joint_i_8, ._Steering_System_Double_Hooke.ges_Rack_Housing.jxs_joint_j_8)

F7

F8

Title
Result Set Name Steering_Wheel_Data
MAG
X Steering_Wheel_Angle
Y Driver_Torque
Z Rack_Displacement
AMAG
R1 Pinion_Rotational_Displacement
R2
R3

josfix_Steering_Column_Support_Force

Comment Steering Column Support Force on Chassis
Define Using Function Expresion
F1
F2
JOINT(._Steering_System_Double_Hooke.josfix_Steering_Column_Support_to_Chassis, 1, 2, 0)
F3
JOINT(._Steering_System_Double_Hooke.josfix_Steering_Column_Support_to_Chassis, 1, 3, 0)
F4
JOINT(._Steering_System_Double_Hooke.josfix_Steering_Column_Support_to_Chassis, 1, 4, 0)
F5
F6
JOINT(._Steering_System_Double_Hooke.josfix_Steering_Column_Support_to_Chassis, 1, 6, 0)
F7
JOINT(._Steering_System_Double_Hooke.josfix_Steering_Column_Support_to_Chassis, 1, 7, 0)
F8
JOINT(._Steering_System_Double_Hooke.josfix_Steering_Column_Support_to_Chassis, 1, 8, 0)
Title
Result Set Name josfix_Steering_Column_Support_Force
MAG F_Magnitude
X F_X_Global
Y F_Y_Global
Z F_Z_Global
AMAG T_Magnitude

R1 T_X_Global

R2 T_Y_Global

R3 T_Z_Global

joshoo_Rear_Hooke_Force

Comment Force on Steering Shaft

Define Using Function Expresion

F1

F2

JOINT(._Steering_System_Double_Hooke.joshoo_Rear_Hooke,0,2, ._Steering_System_Double_Hooke.ges_Steering_Shaft.mas_Steering_Shaft_Local_Axes)

F3

JOINT(._Steering_System_Double_Hooke.joshoo_Rear_Hooke,0,3, ._Steering_System_Double_Hooke.ges_Steering_Shaft.mas_Steering_Shaft_Local_Axes)

F4

JOINT(._Steering_System_Double_Hooke.joshoo_Rear_Hooke,0,4, ._Steering_System_Double_Hooke.ges_Steering_Shaft.mas_Steering_Shaft_Local_Axes)

F5

F6

JOINT(._Steering_System_Double_Hooke.joshoo_Rear_Hooke,0,6, ._Steering_System_Double_Hooke.ges_Steering_Shaft.mas_Steering_Shaft_Local_Axes)

F7

JOINT(._Steering_System_Double_Hooke.joshoo_Rear_Hooke,0,7, ._Steering_System_Double_Hooke.ges_Steering_Shaft.mas_Steering_Shaft_Local_Axes)

F8

JOINT(._Steering_System_Double_Hooke.joshoo_Rear_Hooke,0,8, ._Steering_System_Double_Hooke.ges_Steering_Shaft.mas_Steering_Shaft_Local_Axes)

Title

Result Set Name joshoo_Rear_Hooke_Force

MAG F_Magnitude

X F_Radial_X

Y F_Radial_Y

Z F_Axial_Z

AMAG T_Magnitude

R1 T_X

R2 T_Y

R3 T_Z

joshoo_Front_Hooke_Force

Comment Force on Intermediate Shaft

Define Using Function Expresion

F1

F2

JOINT(._Steering_System_Double_Hooke.joshoo_Front_Hooke,0,2, ._Steering_System_Double_Hooke.ges_Intermediate_Shaft.mas_Intermediate_Shaft_Local_Axes)

F3

JOINT(._Steering_System_Double_Hooke.joshoo_Front_Hooke,0,3, ._Steering_System_Double_Hooke.ges_Intermediate_Shaft.mas_Intermediate_Shaft_Local_Axes)

F4

JOINT(._Steering_System_Double_Hooke.joshoo_Front_Hooke,0,4, ._Steering_System_Double_Hooke.ges_Intermediate_Shaft.mas_Intermediate_Shaft_Local_Axes)

F5

F6

JOINT(._Steering_System_Double_Hooke.joshoo_Front_Hooke,0,6, ._Steering_System_Double_Hooke.ges_Intermediate_Shaft.mas_Intermediate_Shaft_Local_Axes)

F7

JOINT(._Steering_System_Double_Hooke.joshoo_Front_Hooke,0,7, ._Steering_System_Double_Hooke.ges_Intermediate_Shaft.mas_Intermediate_Shaft_Local_Axes)

F8

JOINT(._Steering_System_Double_Hooke.joshoo_Front_Hooke,0,8, ._Steering_System_Double_Hooke.ges_Intermediate_Shaft.mas_Intermediate_Shaft_Local_Axes)

Title

Result Set Name	joshoo_Front_Hooke_Force
MAG	F_Magnitude
X	F_Radial_X
Y	F_Radial_Y
Z	F_Axial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

josrev_Pinion_to_Rack_Housing_Force

Comment Force on Rack Housing

Define Using Function Expresion

F1

F2

JOINT(._Steering_System_Double_Hooke.josrev_Pinion_to_Rack_Housing,1,2, ._Steering_System_Double_Hooke.ges_Rack_Housing.mas_Pinion_Center_Local_Axes)

F3

JOINT(._Steering_System_Double_Hooke.josrev_Pinion_to_Rack_Housing,1,3, ._Steering_System_Double_Hooke.ges_Rack_Housing.mas_Pinion_Center_Local_Axes)

F4

JOINT(._Steering_System_Double_Hooke.josrev_Pinion_to_Rack_Housing,1,4, ._Steering_System_Double_Hooke.ges_Rack_Housing.mas_Pinion_Center_Local_Axes)

F5

F6

JOINT(._Steering_System_Double_Hooke.josrev_Pinion_to_Rack_Housing,1,6, ._Steering_System_Double_Hooke.ges_Rack_Housing.mas_Pinion_Center_Local_Axes)

F7

JOINT(._Steering_System_Double_Hooke.josrev_Pinion_to_Rack_Housing,1,7, ._Steering_System_Double_Hooke.ges_Rack_Housing.mas_Pinion_Center_Local_Axes)

F8

JOINT(._Steering_System_Double_Hooke.josrev_Pinion_to_Rack_Housing,1,8, ._Steering_System_Double_Hooke.ges_Rack_Housing.mas_Pinion_Center_Local_Axes)

Title

Result Set Name	josrev_Pinion_to_Rack_Housing_Force
MAG	F_Magnitude
X	F_Radial_X
Y	F_Radial_Y
Z	F_Axial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

jksfix_Rack_Housing_to_Chassis_Force

Comment Force on Chassis

Define Using Function Expresion

F1

F2

JOINT(._Steering_System_Double_Hooke.jksfix_Rack_Housing_to_Chassis, 1, 2, 0)

F3

JOINT(._Steering_System_Double_Hooke.jksfix_Rack_Housing_to_Chassis, 1, 3, 0)

F4

JOINT(._Steering_System_Double_Hooke.jksfix_Rack_Housing_to_Chassis, 1, 4, 0)

F5

F6

JOINT(._Steering_System_Double_Hooke.jksfix_Rack_Housing_to_Chassis, 1, 6, 0)

F7

JOINT(._Steering_System_Double_Hooke.jksfix_Rack_Housing_to_Chassis, 1, 7, 0)

F8

JOINT(._Steering_System_Double_Hooke.jksfix_Rack_Housing_to_Chassis, 1, 8, 0)

Title
Result Set Name jksfix_Rack_Housing_to_Chassis_Force
MAG F_Magnitude_Global
X F_X_Global
Y F_Y_Global
Z F_Z_Global
AMAG T_Magnitude_Global
R1 T_X_Global
R2 T_Y_Global
R3 T_Z_Global

bkl_Rack_Housing_Bushing_Left_Force

Comment Force on Chassis
Define Using Function Expresion
F1
F2
FIELD(._Steering_System_Double_Hooke.bkl_Rack_Housing_Bushing.field, 1, 2, 0)
F3
FIELD(._Steering_System_Double_Hooke.bkl_Rack_Housing_Bushing.field, 1, 3, 0)
F4
FIELD(._Steering_System_Double_Hooke.bkl_Rack_Housing_Bushing.field, 1, 4, 0)
F5
F6
FIELD(._Steering_System_Double_Hooke.bkl_Rack_Housing_Bushing.field, 1, 6, 0)
F7
FIELD(._Steering_System_Double_Hooke.bkl_Rack_Housing_Bushing.field, 1, 7, 0)
F8
FIELD(._Steering_System_Double_Hooke.bkl_Rack_Housing_Bushing.field, 1, 8, 0)
Title
Result Set Name bkl_Rack_Housing_Bushing_Left_Force
MAG F_Magnitude_Global
X F_X_Global
Y F_Y_Global
Z F_Z_Global
AMAG T_Magnitude_Global
R1 T_X_Global
R2 T_Y_Global
R3 T_Z_Global

bkr_Rack_Housing_Buhsing_Right_Force

Comment Force on Chassis

Define Using Function Expresion

F1

F2

FIELD(._Steering_System_Double_Hooke.bkr_Rack_Housing_Bushing.field, 1, 2, 0)

F3

FIELD(._Steering_System_Double_Hooke.bkr_Rack_Housing_Bushing.field, 1, 3, 0)

F4

FIELD(._Steering_System_Double_Hooke.bkr_Rack_Housing_Bushing.field, 1, 4, 0)

F5

F6

FIELD(._Steering_System_Double_Hooke.bkr_Rack_Housing_Bushing.field, 1, 6, 0)

F7

FIELD(._Steering_System_Double_Hooke.bkr_Rack_Housing_Bushing.field, 1, 7, 0)

F8

FIELD(._Steering_System_Double_Hooke.bkr_Rack_Housing_Bushing.field, 1, 8, 0)

Title

Result Set Name	bkr_Rack_Housing_Bushing_Right_Force
MAG	F_Magnitude_Global
X	F_X_Global
Y	F_Y_Global
Z	F_Z_Global
AMAG	T_Magnitude_Global
R1	T_X_Global
R2	T_Y_Global
R3	T_Z_Global

jostra_Rack_to_Rack_Housing_Force

Comment Force on Rack Housing

Define Using Function Expresion

F1

F2

JOINT(._Steering_System_Double_Hooke.jostra_Rack_to_Rack_Housing,1,2, ._Steering_System_Double_Hooke.ges_Rack_Housing.mas_Rack_Center_Local_Axes)

F3

JOINT(._Steering_System_Double_Hooke.jostra_Rack_to_Rack_Housing,1,3, ._Steering_System_Double_Hooke.ges_Rack_Housing.mas_Rack_Center_Local_Axes)

F4

JOINT(._Steering_System_Double_Hooke.jostra_Rack_to_Rack_Housing,1,4, ._Steering_System_Double_Hooke.ges_Rack_Housing.mas_Rack_Center_Local_Axes)

F5

F6

JOINT(._Steering_System_Double_Hooke.jostra_Rack_to_Rack_Housing,1,6, ._Steering_System_Double_Hooke.ges_Rack_Housing.mas_Rack_Center_Local_Axes)

F7

JOINT(._Steering_System_Double_Hooke.jostra_Rack_to_Rack_Housing,1,7, ._Steering_System_Double_Hooke.ges_Rack_Housing.mas_Rack_Center_Local_Axes)

F8

JOINT(._Steering_System_Double_Hooke.jostra_Rack_to_Rack_Housing,1,8, ._Steering_System_Double_Hooke.ges_Rack_Housing.mas_Rack_Center_Local_Axes)

Title

Result Set Name	jostra_Rack_to_Rack_Housing_Force
MAG	F_Magnitude
X	F_Radial_X
Y	F_Radial_Y
Z	F_Axial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

.....

E. Antirollbar UBar

ADAMS - Template - _Antirollbar_UBar.tpl

E.1. Build --> Hardpoints

Steering System Points	X	Y	Z	Units
hpl_Droplink_to_Bellcrank	-1594.46	186.12	484.76	[mm]
hpl_Droplink_to_Blade	-1818.78	185.00	420.28	[mm]
hpl_Blade_to_ARB	-1818.78	185.00	365.28	[mm]
hpl_ARB_Bushing_Center	-1818.78	145.25	365.28	[mm]

E.2. Build --> Construction Frame

Construction Frame

ARB_Middle

Type	Single
Location Dependency	Centered between coordinates
Centered Between	Two coordinates
Coordinate Reference #1	hpl_Blade_to_ARB
Coordinate Reference #2	hpr_Blade_to_ARB
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hpl_Blade_to_ARB
Coordinate Reference #2	hpr_Blade_to_ARB
Axis	Z

ARB_Bushing_Center

Type	Left
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_ARB_Bushing_Center
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hpl_ARB_Bushing_Center
Coordinate Reference #2	hpr_ARB_Bushing_Center
Axis	Z

E.3. Build --> Parts --> General Part

General Parts

.....

Droplink

Type	Left
Location Dependency	Centered between coordinates
Centered Between	Two coordinates
Coordinate Reference #1	hpl_Droplink_to_Bellcrank
Coordinate Reference #2	hpl_Droplink_to_Blade
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hpl_Droplink_to_Bellcrank
Coordinate Reference #2	hpl_Droplink_to_Blade
Axis	Z
Mass & Inertia	1E-9
Material	Steel

Blade

Type	Left
Location Dependency	Centered between coordinates
Centered Between	Two coordinates
Coordinate Reference #1	hpl_Droplink_to_Blade
Coordinate Reference #2	hpl_Blade_to_ARB
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hpl_Droplink_to_Blade
Coordinate Reference #2	hpl_Blade_to_ARB
Axis	Z
Mass & Inertia	1E-9
Material	Steel

Half_ARB

Type	Left
Location Dependency	Centered between coordinates
Centered Between	Two coordinates
Coordinate Reference #1	hpl_Blade_to_ARB
Coordinate Reference #2	cfs_ARB_Middle
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hpl_Blade_to_ARB
Coordinate Reference #2	cfs_ARB_Middle
Axis	Z
Mass & Inertia	1E-9

Material	Steel

ARB_Support

Type	Left
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_ARB_Bushing_Center
Location	0,0,0
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hpl_ARB_Bushing_Center
Coordinate Reference #2	cfs_ARB_Middle
Axis	Z
Mass & Inertia	1E-9
Material	Steel

E.4. Build --> Parts --> Mount

Mount

ARB_Support_to_Chassis_UBar

Coordinate Reference	hpl_ARB_Bushing_Center
From Minor Role	Inherit

Droplink_to_Bellcrank

Coordinate Reference	hpl_Droplink_to_Bellcrank
From Minor Role	Inherit

E.5. Build --> Geometry --> Link

Links

Droplink

General Part	gel_Droplink
Coordinate Reference #1	hpl_Droplink_to_Bellcrank
Coordinate Reference #2	hpl_Droplink_to_Blade
Radius	7
Mass	Not Calculate Mass Properties

Blade

General Part	gel_Blade

Coordinate Reference #1	hpl_Droplink_to_Blade
Coordinate Reference #2	hpl_Blade_to_ARB
Radius	7
Mass	Not Calculate Mass Properties

Half_ARB

General Part	gel_Half_ARB
Coordinate Reference #1	hpl_Blade_to_ARB
Coordinate Reference #2	cfs_ARB_Middle
Radius	6
Mass	Not Calculate Mass Properties

E.6. Build --> Geometry --> Ellipsoid

Ellipsoid

Droplink_to_Bellcrank_Rodend

Coordinate Reference	hpl_Droplink_to_Bellcrank
Method	By entering size
General Part	gel_Droplink
X Radius	8
Y Radius	8
Z Radius	8
Mass	Not Calculate Mass Properties

Droplink_to_Blade_Rodend

Coordinate Reference	hpl_Droplink_to_Blade
Method	By entering size
General Part	gel_Droplink
X Radius	8
Y Radius	8
Z Radius	8
Mass	Not Calculate Mass Properties

Blade_to_ARB

Coordinate Reference	hpl_Blade_to_ARB
Method	By entering size
General Part	gel_Blade
X Radius	8
Y Radius	8

Z Radius	8
Mass	Not Calculate Mass Properties

E.7. Build --> Geometry --> Cylinder

Cylinder

ARB_Support

General Part	gel_ARB_Support
Construction Frame	cfl_ ARB_Bushing_Center
Radius	9
Lenght in Positive Z	10
Length in Negative Z	10
Mass	Not Calculate Mass Properties

E.8. Build --> Attachment --> Joint

Attachment Joint

Droplink_to_Bellcrank

I Part	gel_Droplink
J Part	mtl_Droplink_to_Bellcrank
Type	Left
Joint Type	Spherical
Active	Always
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Droplink_to_Bellcrank
Location	0,0,0
Location in	Local
Orientation	None

Droplink_to_Blade

I Part	gel_Droplink
J Part	gel_Blade
Type	Left
Joint Type	Convel
Active	Always
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Droplink_to_Blade

Location	0,0,0
Location in	Local
I-Part Axis	hpl_Droplink_to_Bellcrank
J-Part Axis	hpl_Blade_to_ARB

Blade_to_Half_ARB

I Part	gel_Blade
J Part	gel_Half_ARB
Type	Left
Joint Type	Fixed
Active	Always
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Blade_to_ARB
Location	0,0,0
Location in	Local

Half_ARB

I Part	gel_Half_ARB
J Part	ger_Half_ARB
Type	Single
Joint Type	Cyilindrical
Active	Always
Location Dependency	Delta location from coordinate
Coordinate Reference	cfs_ARB_Middle
Location	0,0,0
Location in	Local
Orientation Dependency	Delta orientation from coordinate
Construction Frame	cfs_ARB_Middle
Orientation	0,0,0

ARB_Support_to_Chassis

I Part	geL_ARB_Support
J Part	mtl_ARB_Support_to_Chassis
Type	Left
Joint Type	Fixed
Active	Always
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_ARB_Bushing_Center
Location	0,0,0
Location in	Local

Half_ARB_to_ARB_Support

I Part	gel_Half_ARB
J Part	gel_ARB_Support
Type	Left
Joint Type	Spherical
Active	Always
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_ARB_Bushing_Center
Location	0,0,0
Location in	Local
Orientation	Using two axes
I-Part Axis	hpl_ARB_Bushing_Center
J-Part Axis	hpr_ARB_Bushing_Center

E.9. Build --> Parameter

Parameter

Torsional_Spring_Stiffness

Type	Single
Real Value	4170
Units	Torsion stiffness
Hide From Standard User	No

E.10. Build --> Actuators --> Joint Force

Joint Force

ARB_Torsion_Spring

Joint	joscyl_Half_ARB_Cyilindrical
Type of Freedom	Rotational
Function	-(._Antirollbar_Ubar.pvs_Torsional_Spring_Stiffness)*AZ (._Antirollbar_UBar.gel_Half_ARB.jxs_joint_i_1, ._Antirollbar_UBar.ger_Half_ARB.jxs_joint_j_1)
Active	On

E.11. Build --> Marker

Nota: eix Z és l'eix axial dels tubs

Marker

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Droplink_Local_Axes

Part	gel_Droplink
Type	Left
Location Dependency	Centered between coordinates
Centered Between	Two coordinates
Coordinate Reference #1	hpl_Droplink_to_Blade
Coordinate Reference #2	hpl_Droplink_to_Bellcrank
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hpl_Droplink_to_Blade
Coordinate Reference #2	hpl_Droplink_to_Bellcrank
Axis	Z

ARB_Bushing_Center_Local_Axes

Part	gel_ARB_Support
Type	Left
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_ARB_Bushing_Center
Location	0,0,0
Location in	Local
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hpl_ARB_Bushing_Center
Coordinate Reference #2	hpr_ARB_Bushing_Center
Axis	Z

.....

E.12. Build --> Request

Requests

.....

jolsph_Half_ARB_to_ARB_Support_Left_Force

Comment	Force on ARB Support Left
Define Using Function Expresion	
F1	
F2	

JOINT(._Antirollbar_UBar.jolsph_Half_ARB_to_ARB_Support,1,2, ._Antirollbar_UBar.gel_ARB

_Support.mal_ARB_Bushing_Center_Local_Axes)

F3

JOINT(._Antirollbar_UBar.jolsph_Half_ARB_to_ARB_Support,1,3, ._Antirollbar_UBar.gel_ARB _Support.mal_ARB_Bushing_Center_Local_Axes)

F4

JOINT(._Antirollbar_UBar.jolsph_Half_ARB_to_ARB_Support,1,4, ._Antirollbar_UBar.gel_ARB _Support.mal_ARB_Bushing_Center_Local_Axes)

F5

F6

JOINT(._Antirollbar_UBar.jolsph_Half_ARB_to_ARB_Support,1,6, ._Antirollbar_UBar.gel_ARB _Support.mal_ARB_Bushing_Center_Local_Axes)

F7

JOINT(._Antirollbar_UBar.jolsph_Half_ARB_to_ARB_Support,1,7, ._Antirollbar_UBar.gel_ARB _Support.mal_ARB_Bushing_Center_Local_Axes)

F8

JOINT(._Antirollbar_UBar.jolsph_Half_ARB_to_ARB_Support,1,8, ._Antirollbar_UBar.gel_ARB _Support.mal_ARB_Bushing_Center_Local_Axes)

Title

Result Set Name	jolsph_Half_ARB_to_ARB_Support_Left_Force
MAG	F_Magnitude
X	F_Radial_X
Y	F_Radial_Y
Z	F_Axial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

jorsph_Half_ARB_to_ARB_Support_Right_Force

Comment	Force on ARB Support Right

Define Using Function Expresion

F1

F2

JOINT(._Antirollbar_UBar.jorsph_Half_ARB_to_ARB_Support,1,2, ._Antirollbar_UBar.ger_ARB _Support.mar_ARB_Bushing_Center_Local_Axes)

F3

JOINT(._Antirollbar_UBar.jorsph_Half_ARB_to_ARB_Support,1,3, ._Antirollbar_UBar.ge r_ARB_Support.mar_ARB_Bushing_Center_Local_Axes)

F4

JOINT(._Antirollbar_UBar.jorsph_Half_ARB_to_ARB_Support,1,4, ._Antirollbar_UBar.ger_ARB _Support.mar_ARB_Bushing_Center_Local_Axes)

F5

F6

JOINT(._Antirollbar_UBar.jorsph_Half_ARB_to_ARB_Support,1,6, ._Antirollbar_UBar.ger_ARB_Support.mar_ARB_Bushing_Center_Local_Axes)

F7

JOINT(._Antirollbar_UBar.jorsph_Half_ARB_to_ARB_Support,1,7, ._Antirollbar_UBar.ger_ARB_Support.mar_ARB_Bushing_Center_Local_Axes)

F8

JOINT(._Antirollbar_UBar.jorsph_Half_ARB_to_ARB_Support,1,8, ._Antirollbar_UBar.ger_ARB_Support.mar_ARB_Bushing_Center_Local_Axes)

Title

Result Set Name	jolsph_Half_ARB_to_ARB_Support_Right_Force
MAG	F_Magnitude
X	F_Radial_X
Y	F_Radial_Y
Z	F_Axial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

jolsph_Droplink_to_Bellcrank_Left_Force

Comment	Force on Droplink Left

Define Using Function Expresion

F1

F2

JOINT(._Antirollbar_UBar.jolsph_Droplink_to_Bellcrank,0,2, ._Antirollbar_UBar.gel_Droplink.mal_Droplink_Local_Axes)

F3

JOINT(._Antirollbar_UBar.jolsph_Droplink_to_Bellcrank,0,3, ._Antirollbar_UBar.gel_Droplink.mal_Droplink_Local_Axes)

F4

JOINT(._Antirollbar_UBar.jolsph_Droplink_to_Bellcrank,0,4, ._Antirollbar_UBar.gel_Droplink.mal_Droplink_Local_Axes)

F5

F6

JOINT(._Antirollbar_UBar.jolsph_Droplink_to_Bellcrank,0,6, ._Antirollbar_UBar.gel_Droplink.mal_Droplink_Local_Axes)

F7

JOINT(._Antirollbar_UBar.jolsph_Droplink_to_Bellcrank,0,7, ._Antirollbar_UBar.gel_Droplink.mal_Droplink_Local_Axes)

F8

JOINT(._Antirollbar_UBar.jolsph_Droplink_to_Bellcrank,0,8, ._Antirollbar_UBar.gel_Droplink.mal_Droplink_Local_Axes)

Title

Result Set Name	jolsph_Droplink_to_Bellcrank_Left_Force
MAG	F_Magnitude
X	F_Radial_X
Y	F_Radial_Y
Z	F_Axial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

jorsph_Droplink_to_Bellcrank_Right_Force

Comment Force on Droplink Right

Define Using Function Expresion

F1

F2

JOINT(._Antirollbar_UBar.jorsph_Droplink_to_Bellcrank,0,2, ._Antirollbar_UBar.ger_Droplink.mar_Droplink_Local_Axes)

F3

JOINT(._Antirollbar_UBar.jorsph_Droplink_to_Bellcrank,0,3, ._Antirollbar_UBar.ger_Droplink.mar_Droplink_Local_Axes)

F4

JOINT(._Antirollbar_UBar.jorsph_Droplink_to_Bellcrank,0,4, ._Antirollbar_UBar.ger_Droplink.mar_Droplink_Local_Axes)

F5

F6

JOINT(._Antirollbar_UBar.jorsph_Droplink_to_Bellcrank,0,6, ._Antirollbar_UBar.ger_Droplink.mar_Droplink_Local_Axes)

F7

JOINT(._Antirollbar_UBar.jorsph_Droplink_to_Bellcrank,0,7, ._Antirollbar_UBar.ger_Droplink.mar_Droplink_Local_Axes)

F8

JOINT(._Antirollbar_UBar.jorsph_Droplink_to_Bellcrank,0,8, ._Antirollbar_UBar.ger_Droplink.mar_Droplink_Local_Axes)

Title

Result Set Name	jorsph_Droplink_to_Bellcrank_Right_Force
MAG	F_Magnitude
X	F_Radial_X

Y	F_Radial_Y
Z	F_Axial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

.....

F. Antirollbar TBar

ADAMS - Template - _Antirollbar_TBar.tpl

F.1. Build --> Hardpoints

Steering System Points	X	Y	Z	Units
hps_Left_Droplink_to_Bellcrank	27.75	261.70	530.73	[mm]
hps_Rigth_Droplink_to_Bellcrank	-41.68	-261.70	530.73	[mm]
hps_Left_Droplink_to_Blade	47.94	0.00	601.13	[mm]
hps_Rigth_Droplink_to_Blade	-61.89	0.00	601.13	[mm]
hps_ARB_to_Chassis	150.00	0.00	558.13	[mm]
hps_ARB_to_Link_Arm	50.00	0.00	558.13	[mm]
hps_Blade_Bushing_Center	-6.975,	0.00	600.00	[mm]
hps_ARB_Front_Bushing_Center	13.02	0.00	558.13	[mm]
hps_ARB_Rear_Bushing_Center	-26.98	0.00	558.13	[mm]

F.2. Build --> Construction Frame

Construction Frame

ARB_Middle

Type	Single
Location Dependency	Centered between coordinates
Centered Between	Two coordinates
Coordinate Reference #1	hps_ARB_to_Chassis
Coordinate Reference #2	hps_ARB_to_Link_Arm
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hps_ARB_to_Chassis
Coordinate Reference #2	hps_ARB_to_Link_Arm
Axis	Z

Lower_Center_Link_Arm

Type	Single
Location Dependency	Centered between coordinates
Centered Between	Two coordinates
Coordinate Reference #1	hps_ARB_Front_Bushing_Center

Coordinate Reference #2	hps_ARB_Rear_Bushing_Center
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hps_ARB_Front_Bushing_Center
Coordinate Reference #2	hps_ARB_Rear_Bushing_Center
Axis	Z

Blade_Center

Type	Single
Location Dependency	Centered between coordinates
Centered Between	Two coordinates
Coordinate Reference #1	hps_Left_ Droplink_to_Blade
Coordinate Reference #2	hps_Right_ Droplink_to_Blade
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hps_Left_ Droplink_to_Blade
Coordinate Reference #2	hps_Right_ Droplink_to_Blade
Axis	X

Blade_Side

Type	Left
Location Dependency	Located along an axis
Construction Frame	cfs_Blade_Center
Distance	(-0.4*DX(._Antirollbar_TBar.ground.hps_Left_Droplink_to_Blade, ._Antirollbar_TBar.ground.cfs_Blade_Center, ._Antirollbar_TBar.ground. cfs_Blade_Center))
Axis	Y
Orientation Dependency	User entered values
Orient Using	Euler Angles
Euler Angles	0,0,0

ARB_Support_to_Chassis

Type	Single
Location Dependency	Delta location from coordinate
Coordinate Reference	hps_ARB_to_Chassis
Location	0,0,0
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hps_ARB_to_Chassis
Coordinate Reference #2	hps_ARB_to_Link_Arm
Axis	Z

ARB_Front_Bushing_Center

Type	Single

Location Dependency	Delta location from coordinate
Coordinate Reference	hps_ARB_Front_Bushing_Center
Location	0,0,0
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hps_ARB_Front_Bushing_Center
Coordinate Reference #2	hps_ARB_Rear_Bushing_Center
Axis	Z

ARB_Rear_Bushing_Center

Type	Single
Location Dependency	Delta location from coordinate
Coordinate Reference	hps_ARB_Rear_Bushing_Center
Location	0,0,0
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hps_ARB_Rear_Bushing_Center
Coordinate Reference #2	hps_ARB_Front_Bushing_Center
Axis	Z

ARB_to_ARB_Support_Joint

Type	Single
Location Dependency	Delta location from coordinate
Coordinate Reference	hps_ARB_to_Chassis
Location	0,0,25
Location in	Local
Orientation Dependency	User entered values
Orient Using	Euler Angles
Euler Angles	-180,0,0

.....

F.3. Build --> Parts --> General Part

General Parts

.....

Left_Droplink

Type	Single
Location Dependency	Centered between coordinates
Centered Between	Two coordinates
Coordinate Reference #1	hps_Left_Droplink_to_Bellcrank
Coordinate Reference #2	hps_Left_Droplink_to_Blade
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hps_Left_Droplink_to_Bellcrank

Coordinate Reference #2	hps_Left_Droplink_to_Blade
Axis	Z
Mass & Inertia	1E-9
Material	Steel

Rigth_Droplink

Type	Single
Location Dependency	Centered between coordinates
Centered Between	Two coordinates
Coordinate Reference #1	hps_Right_Droplink_to_Bellcrank
Coordinate Reference #2	hps_Right_Droplink_to_Blade
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hps_Right_Droplink_to_Bellcrank
Coordinate Reference #2	hps_Right_Droplink_to_Blade
Axis	Z
Mass & Inertia	1E-9
Material	Steel

Link_Arm

Type	Single
Location Dependency	Delta location from coordinate
Coordinate Reference	cfs_Lower_Center_Link_Arm
Location	0,0,0
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hps_ARB_Front_Bushing_Center
Coordinate Reference #2	hps_ARB_Rear_Bushing_Center
Axis	Z
Mass & Inertia	1E-9
Material	Steel

Blade

Type	Single
Location Dependency	Delta location from coordinate
Coordinate Reference	cfs_Blade_Center
Location	0,0,0
Orientation Dependency	Delta orientation from coordinate
Construction Frame	cfs_Blade_Center
Orientation	0,0,0
Mass & Inertia	1E-9
Material	Steel

Half_ARB_Front

Type	Single
Location Dependency	Centered between coordinates
Centered Between	Two coordinates
Coordinate Reference #1	hps_ARB_to_Chassis
Coordinate Reference #2	cfs_ARB_Middle
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hps_ARB_to_Chassis
Coordinate Reference #2	cfs_ARB_Middle
Axis	Z
Mass & Inertia	1E-9
Material	Steel

Half_ARB_Rear

Type	Single
Location Dependency	Centered between coordinates
Centered Between	Two coordinates
Coordinate Reference #1	cfs_ARB_Middle
Coordinate Reference #2	hps_ARB_to_Link_Arm
Orientation Dependency	Orient axis along line
Coordinate Reference #1	cfsARB_Middle
Coordinate Reference #2	hps_ARB_to_Link_Arm
Axis	Z
Mass & Inertia	1E-9
Material	Steel

ARB_Support

Type	Single
Location Dependency	Delta location from coordinate
Coordinate Reference	cfs_ARB_to_Chassis_Support
Location	0,0,0
Orientation Dependency	Delta orientation from coordinate
Construction Frame	cfs_ARB_to_Chassis_Support
Orientation	0,0,0
Mass & Inertia	1E-9
Material	Steel

.....

F.4. Build --> Parts --> Mount

Mount

.....

ARB_Support_to_Chassis_TBar

Coordinate Reference	hps_ARB_to_Chassis
From Minor Role	Inherit

Left_Droplink_to_Bellcrank

Coordinate Reference	hps_Left_Droplink_to_Bellcrank
From Minor Role	Inherit

Right_Droplink_to_Bellcrank

Coordinate Reference	hps_Right_Droplink_to_Bellcrank
From Minor Role	Inherit

.....

F.5. Build --> Geometry --> Link

Links

.....

Left_Droplink

General Part	ges_Left_Droplink
Coordinate Reference #1	hps_Left_Droplink_to_Bellcrank
Coordinate Reference #2	hps_Left_Droplink_to_Blade
Radius	7
Mass	Not Calculate Mass Properties

Right_Droplink

General Part	ges_Right_Droplink
Coordinate Reference #1	hps_Right_Droplink_to_Bellcrank
Coordinate Reference #2	hps_Right_Droplink_to_Blade
Radius	7
Mass	Not Calculate Mass Properties

Vertical_Link_Arm

General Part	ges_Link_Arm
Coordinate Reference #1	hps_Blade_Bushing_Center
Coordinate Reference #2	cfs_Lower_Center_Link_Arm
Radius	7
Mass	Not Calculate Mass Properties

Horizontal_Link_Arm

General Part	ges_Link_Arm
Coordinate Reference #1	hps_ARB_to_Link_Arm
Coordinate Reference #2	hps_ARB_Rear_Bushing_Center
Radius	7
Mass	Not Calculate Mass Properties

Half_ARB_Front

General Part	ges_Half_ARB_Front
Coordinate Reference #1	hps_ARB_to_Chassis
Coordinate Reference #2	cfs_ARB_Middle
Radius	6
Mass	Not Calculate Mass Properties

Half_ARB_Rear

General Part	ges_Half_ARB_Rear
Coordinate Reference #1	cfs_ARB_Middle
Coordinate Reference #2	hps_ARB_to_Link_Arm
Radius	6
Mass	Not Calculate Mass Properties

.....

F.6. Build --> Geometry --> Arm

Arm

.....

Left_Blade

General Part	ges_Blade
Coordinate Reference #1	hps_Left_Droplink_to_Blade
Coordinate Reference #2	cfl_Blade_Side
Coordinate Reference #3	hps_Right_Droplink_to_Blade
Thickness	10
Mass	Not Calculate Mass Properties

Right_Blade

General Part	ges_Blade
Coordinate Reference #1	hps_Left_Droplink_to_Blade
Coordinate Reference #2	cfr_Blade_Side
Coordinate Reference #3	hps_Right_Droplink_to_Blade
Thickness	10

Mass	Not Calculate Mass Properties

F.7. Build --> Geometry --> Ellipsoid

Ellipsoid

Left_Droplink_to_Bellcrank_Rodend

Coordinate Reference	hps_Left_Droplink_to_Bellcrank
Method	By entering size
General Part	ges_Left_Droplink
X Radius	8
Y Radius	8
Z Radius	8
Mass	Not Calculate Mass Properties

Right_Droplink_to_Bellcrank_Rodend

Coordinate Reference	hps_Right_Droplink_to_Bellcrank
Method	By entering size
General Part	ges_Right_Droplink
X Radius	8
Y Radius	8
Z Radius	8
Mass	Not Calculate Mass Properties

Left_Droplink_to_Blade_Rodend

Coordinate Reference	hps_Left_Droplink_to_Blade
Method	By entering size
General Part	ges_Left_Droplink
X Radius	8
Y Radius	8
Z Radius	8
Mass	Not Calculate Mass Properties

Right_Droplink_to_Blade_Rodend

Coordinate Reference	hps_Right_Droplink_to_Blade
Method	By entering size
General Part	ges_Right_Droplink
X Radius	8
Y Radius	8
Z Radius	8

Mass	Not Calculate Mass Properties

F.8. Build --> Geometry --> Cylinder

Cylinder

ARB_Front_Bushing_Support

General Part	ges_ARB_Support
Construction Frame	cfs_ARB_Front_Bushing_Center
Radius	10
Lenght in Positive Z	6
Length in Negative Z	6
Mass	Not Calculate Mass Properties

ARB_Rear_Bushing_Support

General Part	ARB_Support
Construction Frame	cfs_ARB_Rear_Bushing_Center
Radius	10
Lenght in Positive Z	6
Length in Negative Z	6
Mass	Not Calculate Mass Properties

ARB_Support

General Part	ges_ARB_Support
Construction Frame	ARB_to_Monocoque_Support
Radius	10
Lenght in Positive Z	0
Length in Negative Z	20
Mass	Not Calculate Mass Properties

F.9. Build --> Attachment --> Joint

Attachment Joint

Left_Droplink_to_Bellcrank

I Part	ges_Left_Droplink
J Part	mts_Left_Droplink_to_Bellcrank
Type	Single
Joint Type	Spherical

Active	Always
Location Dependency	Delta location from coordinate
Coordinate Reference	hps_Left_Droplink_to_Bellcrank
Location	0,0,0
Location in	Local
Orientation	None

Right_Droplink_to_Bellcrank

I Part	ges_Right_Droplink
J Part	mts_Right_Droplink_to_Bellcrank
Type	Single
Joint Type	Spherical
Active	Always
Location Dependency	Delta location from coordinate
Coordinate Reference	hps_Right_Droplink_to_Bellcrank
Location	0,0,0
Location in	Local
Orientation	None

Left_Droplink_to_Blade

I Part	ges_Left_Droplink
J Part	ges_Blade
Type	Single
Joint Type	Convel
Active	Always
Location Dependency	Delta location from coordinate
Coordinate Reference	hps_Left_Droplink_to_Blade
Location	0,0,0
Location in	Local
I-Part Axis	hps_Left_Droplink_to_Bellcrank
J-Part Axis	hps_Right_Droplink_to_Blade

Right_Droplink_to_Blade

I Part	ges_Right_Droplink
J Part	ges_Blade
Type	Single
Joint Type	Convel
Active	Always
Location Dependency	Delta location from coordinate
Coordinate Reference	hps_Right_Droplink_to_Blade
Location	0,0,0

Location in	Local
I-Part Axis	hps_Right_Droplink_to_Bellcrank
J-Part Axis	hps_Left_Droplink_to_Blade

Blade_to_Link_Arm

I Part	ges_Blade
J Part	ges_Link_Arm
Type	Single
Joint Type	Revolute
Active	Always
Location Dependency	Delta location from coordinate
Coordinate Reference	hps_Blade_Bushing_Center
Location	0,0,0
Location in	Local
Orientation Dependency	Delta orientation from coordinate
Construction Frame	cfs_Blade_Center
Orientation	0,0,0

Half_ARB_Rear_to_Link_Arm

I Part	ges_Half_ARB_Rear
J Part	ges_Link_Arm
Joint Type	Convel
Active	Always
Location Dependency	Delta location from coordinate
Coordinate Reference	hps_ARB_to_Link_Arm
Location	0,0,0
Location in	Local
I-Part Axis	cfs_ARB_Middle
J-Part Axis	hps_ARB_Rear_Bushing_Center

Half_ARB_Front_to_ARB_Support

I Part	ges_Half_ARB_Front
J Part	ges_ARB_Support
Joint Type	Convel
Active	Always
Location Dependency	Delta location from coordinate
Coordinate Reference	hps_ARB_to_Chassis
Location	0,0,0
Location in	Local
I-Part Axis	cfs_ARB_Middle
J-Part Axis	cfs_ARB_to_ARB_Support_Joint

Half_ARB

I Part	ges_Half_ARB_Front
J Part	ges_Half_ARB_Rear
Type	Single
Joint Type	Revolute
Active	Always
Location Dependency	Delta location from coordinate
Coordinate Reference	cfs_ARB_Middle
Location	0,0,0
Location in	Local
Orientation Dependency	Delta orientation from coordinate
Construction Frame	cfs_ARB_Middle
Orientation	0,0,0

ARB_Support_to_Chassis

I Part	ges_ARB_Support
J Part	mts_ARB_Support_to_Chassis
Type	Single
Joint Type	Fixed
Active	Always
Location Dependency	Delta location from coordinate
Coordinate Reference	cfs_ARB_Support_to_Chassis
Location	0,0,0
Location in	Local

ARB_Front_Bushing_to_ARB_Support

I Part	ges_Link_Arm
J Part	ges_ARB_Support
Type	Single
Joint Type	Inline
Active	Always
Location Dependency	Delta location from coordinate
Coordinate Reference	hps_ARB_Front_Bushing_Center
Location	0,0,0
Location in	Local
Orientation Dependency	Delta orientation from coordinate
Construction Frame	cfs_ARB_Front_Bushing_Center
Orientation	0,0,0

ARB_Rear_Bushing_to_ARB_Support

I Part	ges_Link_Arm
J Part	ges_ARB_Support
Type	Single
Joint Type	Inline
Active	Always
Location Dependency	Delta location from coordinate
Coordinate Reference	hps_ARB_Rear_Bushing_Center
Location	0,0,0
Location in	Local
Orientation Dependency	Delta orientation from coordinate
Construction Frame	cfs_ARB_Rear_Bushing_Center
Orientation	0,0,0

F.10. Build --> Parameter

Parameter

Torsional_Spring_Stiffness

Type	Single
Real Value	5755
Units	Torsion stiffness
Hide From Standard User	No

F.11. Build --> Actuators --> Joint Force

Joint Force

ARB_Torsion_Spring

Joint	josrev_Half_ARB_Revolute
Type of Freedom	Rotational
Function	(._Antirollbar_TBar.pvs_Torsional_Spring_Stiffness)*AZ (._Antirollbar_TBar.ges_Half_ARB_Front.jxs_joint_i_8, ._Antirollbar_TBar.ges_Half_ARB_Rear .jxs_joint_j_8)
Active	On

F.12. Build --> Marker

Nota: eix Z és l'eix axial dels tubs

Marker

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Left_Droplink_Local_Axes

Part	ges_Left_Droplink
Type	Single
Location Dependency	Centered between coordinates
Centered Between	Two coordinates
Coordinate Reference #1	hps_Left_Droplink_to_Blade
Coordinate Reference #2	hps_Left_Droplink_to_Bellcrank
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hps_Left_Droplink_to_Blade
Coordinate Reference #2	hps_Left_Droplink_to_Bellcrank
Axis	Z

Right_Droplink_Local_Axes

Part	ges_Right_Droplink
Type	Single
Location Dependency	Centered between coordinates
Centered Between	Two coordinates
Coordinate Reference #1	hps_Right_Droplink_to_Blade
Coordinate Reference #2	hps_Right_Droplink_to_Bellcrank
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hps_Right_Droplink_to_Blade
Coordinate Reference #2	hps_Right_Droplink_to_Bellcrank
Axis	Z

Blade_Bushing_Center_Local_Axes

Part	ges_Blade
Type	Single
Location Dependency	Delta location from coordinate
Coordinate Reference	hps_Blade_Bushing_Center
Location	0,0,0
Location in	Local
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hps_Left_Droplink_to_Blade
Coordinate Reference #2	hps_Right_Droplink_to_Blade
Axis	X

ARB_Support_to_Chassis_Local_Axes

Part	ges_ARB_Support
Type	Single

Location Dependency	Delta location from coordinate
Coordinate Reference	hps_ARB_to_Chassis
Location	0,0,0
Location in	Local
Orientation Dependency	Orient axis along line
Coordinate Reference #1	hps_ARB_to_Chassis
Coordinate Reference #2	hps_ARB_to_Link_Arm
Axis	Z

.....

F.13. Build --> Request

Requests

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joscon_ARB_to_ARB_Support_Force

Comment	Force on ARB Support
Define Using Function Expresion	
F1	
F2	JOINT(._Antirollbar_TBar.joscon_Half_ARB_Front_to_ARB_Support,1,2, ._Antirollbar_TBar.ges_ARB_Support.mas_ARB_Support_to_Chassis_Local_Axes)
F3	JOINT(._Antirollbar_TBar.joscon_Half_ARB_Front_to_ARB_Support,1,3, ._Antirollbar_TBar.ges_ARB_Support.mas_ARB_Support_to_Chassis_Local_Axes)
F4	JOINT(._Antirollbar_TBar.joscon_Half_ARB_Front_to_ARB_Support,1,4, ._Antirollbar_TBar.ges_ARB_Support.mas_ARB_Support_to_Chassis_Local_Axes)
F5	
F6	JOINT(._Antirollbar_TBar.joscon_Half_ARB_Front_to_ARB_Support,1,6, ._Antirollbar_TBar.ges_ARB_Support.mas_ARB_Support_to_Chassis_Local_Axes)
F7	JOINT(._Antirollbar_TBar.joscon_Half_ARB_Front_to_ARB_Support,1,7, ._Antirollbar_TBar.ges_ARB_Support.mas_ARB_Support_to_Chassis_Local_Axes)
F8	JOINT(._Antirollbar_TBar.joscon_Half_ARB_Front_to_ARB_Support,1,8, ._Antirollbar_TBar.ges_ARB_Support.mas_ARB_Support_to_Chassis_Local_Axes)
Title	
Result Set Name	joscon_ARB_to_ARB_Support_Force
MAG	F_Magnitude
X	F_Radial_X

Y	F_Radial_Y
Z	F_Axial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

josinl_ARB_Front_Bushing_Force

Comment	Force on ARB Support Right

Define Using Function Expresion

F1

F2

JPRIM(._Antirollbar_TBar.josinl_ARB_Front_Bushing_to_ARB_Support,1,2, ._Antirollbar_TBar .ges_ARB_Support.mas_ARB_Support_to_Chassis_Local_Axes)

F3

JPRIM(._Antirollbar_TBar.josinl_ARB_Front_Bushing_to_ARB_Support,1,3, ._Antirollbar_TBar .ges_ARB_Support.mas_ARB_Support_to_Chassis_Local_Axes)

F4

JPRIM(._Antirollbar_TBar.josinl_ARB_Front_Bushing_to_ARB_Support,1,4, ._Antirollbar_TBar .ges_ARB_Support.mas_ARB_Support_to_Chassis_Local_Axes)

F5

F6

JPRIM(._Antirollbar_TBar.josinl_ARB_Front_Bushing_to_ARB_Support,1,6, ._Antirollbar_TBar .ges_ARB_Support.mas_ARB_Support_to_Chassis_Local_Axes)

F7

JPRIM(._Antirollbar_TBar.josinl_ARB_Front_Bushing_to_ARB_Support,1,7, ._Antirollbar_TBar .ges_ARB_Support.mas_ARB_Support_to_Chassis_Local_Axes)

F8

JPRIM(._Antirollbar_TBar.josinl_ARB_Front_Bushing_to_ARB_Support,1,8, ._Antirollbar_TBar .ges_ARB_Support.mas_ARB_Support_to_Chassis_Local_Axes)

Title

Result Set Name	josinl_ARB_Front_Bushing_Force
MAG	F_Magnitude
X	F_Radial_X
Y	F_Radial_Y
Z	F_Axial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

josinl_ARB_Rear_Bushing_Force

Comment	Force on ARB Support Right
Define Using Function Expresion	
F1	
F2	JPRIM(._Antirollbar_TBar.josinl_ARB_Rear_Bushing_to_ARB_Support,1,2, ._Antirollbar_TBar.ges_ARB_Support.mas_ARB_Support_to_Chassis_Local_Axes)
F3	JPRIM(._Antirollbar_TBar.josinl_ARB_Rear_Bushing_to_ARB_Support,1,3, ._Antirollbar_TBar.ges_ARB_Support.mas_ARB_Support_to_Chassis_Local_Axes)
F4	JPRIM(._Antirollbar_TBar.josinl_ARB_Rear_Bushing_to_ARB_Support,1,4, ._Antirollbar_TBar.ges_ARB_Support.mas_ARB_Support_to_Chassis_Local_Axes)
F5	
F6	JPRIM(._Antirollbar_TBar.josinl_ARB_Rear_Bushing_to_ARB_Support,1,6, ._Antirollbar_TBar.ges_ARB_Support.mas_ARB_Support_to_Chassis_Local_Axes)
F7	JPRIM(._Antirollbar_TBar.josinl_ARB_Rear_Bushing_to_ARB_Support,1,7, ._Antirollbar_TBar.ges_ARB_Support.mas_ARB_Support_to_Chassis_Local_Axes)
F8	JPRIM(._Antirollbar_TBar.josinl_ARB_Rear_Bushing_to_ARB_Support,1,8, ._Antirollbar_TBar.ges_ARB_Support.mas_ARB_Support_to_Chassis_Local_Axes)
Title	
Result Set Name	josinl_ARB_Rear_Bushing_Force
MAG	F_Magnitude
X	F_Radial_X
Y	F_Radial_Y
Z	F_Axial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

jossph_Droplink_to_Bellcrank_Left_Force

Comment	Force on Droplink Left
Define Using Function Expresion	
F1	
F2	JOINT(._Antirollbar_TBar.jossph_Left_Droplink_to_Bellcrank,0,2, ._Antirollbar_TBar.ges_Left_Droplink.mas_Left_Droplink_Local_Axes)

F3

JOINT(._Antirollbar_TBar.jossph_Left_Droplink_to_Bellcrank,0,3, ._Antirollbar_TBar.ges_Left_Droplink.mas_Left_Droplink_Local_Axes)

F4

JOINT(._Antirollbar_TBar.jossph_Left_Droplink_to_Bellcrank,0,4, ._Antirollbar_TBar.ges_Left_Droplink.mas_Left_Droplink_Local_Axes)

F5

F6

JOINT(._Antirollbar_TBar.jossph_Left_Droplink_to_Bellcrank,0,6, ._Antirollbar_TBar.ges_Left_Droplink.mas_Left_Droplink_Local_Axes)

F7

JOINT(._Antirollbar_TBar.jossph_Left_Droplink_to_Bellcrank,0,7, ._Antirollbar_TBar.ges_Left_Droplink.mas_Left_Droplink_Local_Axes)

F8

JOINT(._Antirollbar_TBar.jossph_Left_Droplink_to_Bellcrank,0,8, ._Antirollbar_TBar.ges_Left_Droplink.mas_Left_Droplink_Local_Axes)

Title

Result Set Name	jossph_Droplink_to_Bellcrank_Left_Force
MAG	F_Magnitude
X	F_Radial_X
Y	F_Radial_Y
Z	F_Axial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

jossph_Droplink_to_Bellcrank_Right_Force

Comment Force on Droplink Right

Define Using Function Expresion

F1

F2

JOINT(._Antirollbar_TBar.jossph_Right_Droplink_to_Bellcrank,0,2, ._Antirollbar_TBar.ges_Right_Droplink.mas_Right_Droplink_Local_Axes)

F3

JOINT(._Antirollbar_TBar.jossph_Right_Droplink_to_Bellcrank,0,3, ._Antirollbar_TBar.ges_Right_Droplink.mas_Right_Droplink_Local_Axes)

F4

JOINT(._Antirollbar_TBar.jossph_Right_Droplink_to_Bellcrank,0,4, ._Antirollbar_TBar.ges_Right_Droplink.mas_Right_Droplink_Local_Axes)

F5

F6

JOINT(._Antirollbar_TBar.jossph_Right_Droplink_to_Bellcrank,0,6, ._Antirollbar_TBar.ges_Right_Droplink.mas_Right_Droplink_Local_Axes)

F7

JOINT(._Antirollbar_TBar.jossph_Right_Droplink_to_Bellcrank,0,7, ._Antirollbar_TBar.ges_Right_Droplink.mas_Right_Droplink_Local_Axes)

F8

JOINT(._Antirollbar_TBar.jossph_Right_Droplink_to_Bellcrank,0,8, ._Antirollbar_TBar.ges_Right_Droplink.mas_Right_Droplink_Local_Axes)

Title

Result Set Name	jossph_Droplink_to_Bellcrank_Right_Force
MAG	F_Magnitude
X	F_Radial_X
Y	F_Radial_Y
Z	F_Axial_Z
AMAG	T_Magnitude
R1	T_X
R2	T_Y
R3	T_Z

.....

G. Wheels and Tires

ADAMS - Template - _Wheels_and_Tires.tpl

G.1. Build --> Communicator --> Input

Input Communicator

Wheel_Center

Type	Left
Matching Name	Wheel_Center
Entity	Location
From Minor Role	Inherit
Initial Value	0.0,600.0,228.6

G.2. Build --> Construction Frame

Construction Frame

Wheel_Spin_Axis

Type	Left
Location Dependency	Location input communicator
Input Communicator	cil_Wheel_Center
Orientation Dependency	Toe/Camber
Variable Type	Input communicators
Toe Input Communicator	cil_Toe_Angle
Camber Input Communicator	cil_Camber_Angle

G.3. Build --> Wheel

Wheel

Wheel

Type	Left
Cm Offset	0.0
Mass	8.5
Ixx Iyy	5.0E+004

Izz	1.0E+004
Wheel Center Offset	
Property File	mdids://ETSEIB_Motorsport/tires.tbl/Hoosier_LCO_6_Inch.tir
Wheel Configuration	Single/Dual Outside
Outside Wheel	
Location Dependency	Delta location from coordinate
Coordinate Reference	cfl_Wheel_Spin_Axis
Location	0,0,0
Location In	Local
Orientation Dependency	Delta orientation from coordinate
Construction Frame	cfl_Wheel_Spin_Axis
Orientation	0,0,0

G.4. Build --> Parts --> Mount

Mount

Suspension_Upright

Coordinate Reference	cfl_Wheel_Spin_Axis
From Minor Role	Inherit

Suspension_Mount

Coordinate Reference	cfl_Wheel_Spin_Axis
From Minor Role	Inherit

G.5. Build --> Data Elements --> Array

Array

Tire_Forces_Array_Left

Solver ID	0
Type	Initial Conditionc (IC)
Numbers	(._Wheels_and_Tires.tire_fx_left.adams_id),(._Wheels_and_Tires.tire_fy_left.adams_id),(._Wheels_and_Tires.tire_tx_left.adams_id),(._Wheels_and_Tires.tire_ty_left.adams_id),(._Wheels_and_Tires.tire_tz_left.adams_id)

Tire_Forces_Array_Left

Solver ID	0

Type	Initial Conditionc (IC)
Numbers	(._Wheels_and_Tires.tire_fx_right.adams_id),(._Wheels_and_Tires.tire_fy_right.adams_id),(._Wheels_and_Tires.tire_tx_right.adams_id),(._Wheels_and_Tires.tire_ty_right.adams_id),(._Wheels_and_Tires.tire_tz_right.adams_id)

.....

G.6. Build --> Communicator --> Output

Output Comunicatior

.....

Tire_Forces_Array_Left

Matching Name	Tire_Forces_Array_Left
Type	Single
Entity	Array
To Minor Role	Inherit
Array Name	Tire_Forces_Array_Left

Tire_Forces_Array_Right

Matching Name	Tire_Forces_Array_Right
Type	Single
Entity	Array
To Minor Role	Inherit
Array Name	Tire_Forces_Array_Right

Tire_Force

Matching Name	Tire_Force
Type	Left
Entity	Force
To Minor Role	Inherit
Force Name	til_Wheel.force

Rotor_to_Wheel

Matching Name	Rotor_to_Wheel
Type	Left
Entity	Mount
To Minor Role	Inherit
Part Name	Wheel

Wheel_Orientation

Matching Name	Wheel_Orientation
Type	Left
Entity	Orientation
To Minor Role	Inherit
Part Name	cfl_Wheel_Spin_Axis

G.7. Build --> Parts --> General Part

General Parts

Wheel_Geometry

Type	Left
Location Dependency	Delta location from coordinate
Coordinate Reference	cfl_Spin_Axis
Location	0,0,0
Location in	Local
Orientation Dependency	Delta orientation from coordinate
Construction Frame	cfl_Spin_Axis
Orientation	0,0,0
Mass & Inertia	1E-9
Material	Steel

G.8. Build --> Attachment --> Joint

Attachment Joint

Geometry_to_Wheel

I Part	gel_Wheel_Geometry
J Part	whl_Wheel
Type	Left
Joint Type	Fixed
Active	Always
Location Dependency	Delta location from coordinate
Coordinate Reference	cfs_Spin Axis
Location	0,0,0
Location In	Local

H. Brake System

ADAMS - Template - _Brake_System.tpl

H.1. Build --> Communicator --> Input

Input Communicator

.....

Front_Wheel_Center

Type	Left
Matching Name	Wheel_Center
Entity	Location
From Minor Role	Front
Initial Value	10, 634.96, 228.96

Rear_Wheel_Center

Type	Left
Matching Name	Wheel_Center
Entity	Location
From Minor Role	Rear
Initial Value	-1600, 609.93, 229.96

Front_Toe_Angle

Type	Left
Matching Name	Toe_Angle
Entity	Parameter real
From Minor Role	Front
Initial Value	0.0

Rear_Toe_Angle

Type	Left
Matching Name	Toe_Angle
Entity	Parameter real
From Minor Role	Rear
Initial Value	0.0

Front_Camber_Angle

Type	Left

Matching Name	Camber_Angle
Entity	Parameter real
From Minor Role	Front
Initial Value	0.0

Rear_Camber_Angle

Type	Left
Matching Name	Camber_Angle
Entity	Parameter real
From Minor Role	Rear
Initial Value	0.0

Brake_Demand

Type	Single
Matching Name	Brake_Demand
Entity	Solver variable
From Minor Role	Any

Brake_Demand_Adams_Id

Type	Single
Matching Name	Brake_Demand_Adams_Id
Entity	Solver variable
From Minor Role	Any

Front_Tire_Force

Type	Left
Matching Name	Tire_Force
Entity	Force
From Minor Role	Front

Front_Tire_Force_Adams_Id

Type	Left
Matching Name	Tire_Force_Adams_Id
Entity	Force
From Minor Role	Front

Rear_Tire_Force

Type	Left
Matching Name	Tire_Force
Entity	Force
From Minor Role	Rear

Rear_Tire_Force_Adams_Id

Type	Left
Matching Name	Tire_Force_Adams_Id
Entity	Force
From Minor Role	Rear

.....

H.2. Build --> Parameter

Parameter

.....

Front_Rotor_Hub_Wheel_Offset

Type	Single
Real Value	20
Units	Length
Hide From Standard User	No

Rear_Rotor_Hub_Wheel_Offset

Type	Single
Real Value	20
Units	Length
Hide From Standard User	No

Front_Rotor_Width

Type	Single
Real Value	15
Units	Length
Hide From Standard User	No

Rear_Rotor_Width

Type	Single
Real Value	15
Units	Length
Hide From Standard User	No

Front_Rotor_Hub_Width

Type	Single
Real Value	15
Units	Length
Hide From Standard User	No

Max_Brake_Value

Type	Single
Real Value	100
Units	Force
Hide From Standard User	No

Front_Brake_Mu

Type	Single
Real Value	0.6
Units	No units
Hide From Standard User	No

Rear_Brake_Mu

Type	Single
Real Value	0.6
Units	No units
Hide From Standard User	No

Front_Piston_Area

Type	Single
Real Value	981.8
Units	Area
Hide From Standard User	No

Rear_Piston_Area

Type	Single
Real Value	490.9
Units	Area
Hide From Standard User	No

Front_Brake_Bias

Type	Single
Real Value	0.5847
Units	No units
Hide From Standard User	No

Front_Effective_Piston_Radius

Type	Single
Real Value	77.75
Units	Length

Hide From Standard User	No

Rear_Effective_Piston_Radius

Type	Single
Real Value	80.0
Units	Length
Hide From Standard User	No

.....

H.3. Build --> Communicator --> Output

Output Communicator

.....

Max_Brake_Value

Type	Single
Matching Name	Max_Brake_Value
Entity	Parameter real
To Minor Role	Inherit
Parameter Variable Name	pvs_Max_Brake_Value

.....

H.4. Build --> Construction Frame

Construction Frame

.....

Front_Wheel_Center

Type	Left
Location Dependency	Location input communicator
Input Communicator	cil_Front_Wheel_Center
Orientation Dependency	Toe/Camber
Variable Type	Input communicators
Toe Input Communicator	cil_Front_Toe_Angle
Camber Input Communicator	cil_Front_Camber_Angle

Rear_Wheel_Center

Type	Left
Location Dependency	Location input communicator
Input Communicator	cil_Rear_Wheel_Center
Orientation Dependency	Toe/Camber
Variable Type	Input communicators
Toe Input Communicator	cil_Rear_Toe_Angle

Camber Input Communicator	cil_Rear_Camber_Angle

Front_Rotor_Spin_Axis

Type	Left
Location Dependency	Delta location from coordinate
Coordinate Reference	cfl_Front_Wheel_Center
Location	0.0, 0.0, (._Brake_System.pvs_Front_Rotor_Hub_Wheel_Offset)
Location In	Local
Orientation Dependency	Toe/Camber
Variable Type	Input communicators
Toe Input Communicator	cil_Front_Toe_Angle
Camber Input Communicator	cil_Front_Camber_Angle

Rear_Rotor_Spin_Axis

Type	Left
Location Dependency	Delta location from coordinate
Coordinate Reference	cfl_Rear_Wheel_Center
Location	0.0, 0.0, (._Brake_System.pvs_Rear_Rotor_Hub_Wheel_Offset)
Location In	Local
Orientation Dependency	Toe/Camber
Variable Type	Input communicators
Toe Input Communicator	cil_Rear_Toe_Angle
Camber Input Communicator	cil_Rear_Camber_Angle

Front_Rotor_1

Type	Left
Location Dependency	Delta location from coordinate
Coordinate Reference	cfl_Front_Rotor_Spin_Axis
Location	0.0, 0.0, (._Brake_System.pvs_Front_Rotor_Hub_Width)
Location In	Local
Orientation Dependency	User entered values
Euler Angles	0,0,0

Front_Rotor_2

Type	Left
Location Dependency	Delta location from coordinate
Coordinate Reference	cfl_Front_Rotor_Spin_Axis
Location	0,0,(._Brake_System.pvs_Front_Rotor_Hub_Width+._Brake_System.pvs_Front_Rotor_Width)
Location In	Local
Orientation Dependency	User entered values

Euler Angles	0,0,0

Rear_Rotor_1

Type	Left
Location Dependency	Delta location from coordinate
Coordinate Reference	cfl_Rear_Rotor_Spin_Axis
Location	0.0, 0.0, (._Brake_System.pvs_Rear_Rotor_Hub_Width)
Location In	Local
Orientation Dependency	User entered values
Euler Angles	0,0,0

Rear_Rotor_2

Type	Left
Location Dependency	Delta location from coordinate
Coordinate Reference	cfl_Rear_Rotor_Spin_Axis
Location	0,0,(._Brake_System.pvs_Rear_Rotor_Hub_Width+ ._Brake_System.pvs_Front_Rear_Width)
Location In	Local
Orientation Dependency	User entered values
Euler Angles	0,0,0

Front_Rotor_Spin_Axis

Type	Right
Location Dependency	Delta location from coordinate
Coordinate Reference	cfr_Front_Wheel_Center
Location	0.0, 0.0,(-._Brake_System.pvs_Front_Rotor_Hub_Wheel_Offset)
Location In	Local
Orientation Dependency	Toe/Camber
Variable Type	Input communicators
Toe Input Communicator	cir_Front_Toe_Angle
Camber Input Communicator	cir_Front_Camber_Angle

Rear_Rotor_Spin_Axis

Type	Right
Location Dependency	Delta location from coordinate
Coordinate Reference	cfr_Rear_Wheel_Center
Location	0.0, 0.0,(-._Brake_System.pvs_Rear_Rotor_Hub_Wheel_Offset)
Location In	Local
Orientation Dependency	Toe/Camber
Variable Type	Input communicators
Toe Input Communicator	cir_Rear_Toe_Angle

Camber Input Communicator	cir_Rear_Camber_Angle

Front_Rotor_1

Type	Right
Location Dependency	Delta location from coordinate
Coordinate Reference	cfr_Front_Rotor_Spin_Axis
Location	0.0, 0.0, (-._Brake_System.pvs_Front_Rotor_Hub_Width)
Location In	Local
Orientation Dependency	User entered values
Euler Angles	0,0,0

Front_Rotor_2

Type	Right
Location Dependency	Delta location from coordinate
Coordinate Reference	cfr_Front_Rotor_Spin_Axis
Location	0,0,(-(._Brake_System.pvs_Front_Rotor_Hub_Width+ ._Brake_System.pvs_Front_Rotor_ Width))
Location In	Local
Orientation Dependency	User entered values
Euler Angles	0,0,0

Rear_Rotor_1

Type	Right
Location Dependency	Delta location from coordinate
Coordinate Reference	cfr_Rear_Rotor_Spin_Axis
Location	0.0, 0.0,(-._Brake_System.pvs_Rear_Rotor_Hub_Width)
Location In	Local
Orientation Dependency	User entered values
Euler Angles	0,0,0

Rear_Rotor_2

Type	Right
Location Dependency	Delta location from coordinate
Coordinate Reference	cfr_Rear_Rotor_Spin_Axis
Location	0.0,0.0,(-(._Brake_System.pvs_Rear_Rotor_Hub_Width+ ._Brake_System.pvs_Front_Rear_ Width))
Location In	Local
Orientation Dependency	User entered values
Euler Angles	0,0,0

Front_Tire_Spin_Axis

Type	Left
Location Dependency	Delta location from coordinate
Coordinate Reference	cfl_Front_Wheel_Center
Location	0,0,0
Location In	Local
Orientation Dependency	Delta orientation from coordinate
Construction Frame	cfl_Front_Rotor_Spin_Axis
Orientation	0,180,0

Rear_Tire_Spin_Axis

Type	Left
Location Dependency	Delta location from coordinate
Coordinate Reference	cfl_Rear_Wheel_Center
Location	0,0,0
Location In	Local
Orientation Dependency	Delta orientation from coordinate
Construction Frame	cfl_Rear_Rotor_Spin_Axis
Orientation	0,180,0

.....

H.5. Build --> Parts --> Mount

Mount

.....

Front_Rotor_to_Wheel

Coordinate Reference	cfl_Front_Wheel_Center
From Minor Role	Front

Rear_Rotor_to_Wheel

Coordinate Reference	cfl_Rear_Wheel_Center
From Minor Role	Rear

Front_Suspension_Upright

Coordinate Reference	cfl_Front_Wheel_Center
From Minor Role	Front

Rear_Suspension_Upright

Coordinate Reference	cfl_Rear_Wheel_Center
From Minor Role	Rear

H.6. Communicators Input Folder --> Modify

Communicator Input

Front_Rotor_to_Wheel

Matching Name	Rotor_to_Wheel

Rear_Rotor_to_Wheel

Matching Name	Rotor_to_Wheel

Front_Suspension_Upright

Matching Name	Suspension_Upright

Rear_Suspension_Upright

Matching Name	Suspension_Upright

H.7. Build --> Actuators --> Point Torque

Point Torque

Front_Brake_Torque

I Part	mtl_Front_Rotor_to_Wheel
J Part	mtl_Front_Suspension_Upright
Type	Left
Application	Front_Brake_Torque
Identifier	Single_Component_Force

Left Function

```
2.0*._Brake_System.pvs_Front_Piston_Area*._Brake_System.pvs_Front_Brake_Bias*VARVAL(._Brake_System.cis_Brake_Demand_Adams_Id)*._Brake_System.demand_to_authority_scale*._Brake_System.force_to_pressure_cnvt*._Brake_System.pvs_Front_Brake_Mu*._Brake_System.pvs_Front_Effective_Piston_Radius*STEP(VARVAL(._Brake_System.left_front_wheel_omega),-10D,1,10D,-1)
```

Right Function

```
2.0*._Brake_System.pvs_Front_Piston_Area*._Brake_System.pvs_Front_Brake_Bias*VARVAL(._Brake_System.cis_Brake_Demand_Adams_Id)*._Brake_System.demand_to_authority_scale*._Brake_System.force_to_pressure_cnvt*._Brake_System.pvs_Front_Brake_Mu*._Brake_System.pvs_Front_Effective_Piston_Radius*STEP(VARVAL(._Brake_System.right_front_wheel_omega),-10D,1,10D,-1)
```

Force Limits	-1.0E+007,1.0E+007
Displacement Limits	-1.0E+007,1.0E+007
Velocity Limits	-1.0E+007,1.0E+007
Acceleration Limits	-1.0E+007,1.0E+007
Units	Torque
Active	On
Location Dependency	Centered between coordinates
Centered Between	Two coordinates
Coordinate Reference #1	cfl_Front_Rotor_2
Coordinate Reference #2	cfl_Front_Rotor_2
Orientation Dependency	Parallel to axis
Axis on Entity	Z
Axis on Frame	+Z

Rear_Brake_Torque

I Part	mtl_Rear_Rotor_to_Wheel
J Part	mtl_Rear_Suspension_Upright
Type	Left
Application	Rear_Brake_Torque
Identifier	Single_Component_Force

Left Function

```
2.0*._Brake_System.pvs_Rear_Piston_Area*(1.0-._Brake_System.pvs_Rear_Brake_Bias)*
VARVAL(._Brake_System.cis_Brake_Demand_Adams_Id)*._Brake_System.demand_to_autho
rity_scale*._Brake_System.force_to_pressure_cnvt*._Brake_System.pvs_Rear_Brake_Mu*._
Brake_System.pvs_Rear_Effective_Piston_Radius*STEP(VARVAL(._Brake_System.left_rear_w
heel_omega),-10D,1,10D,-1)
```

Right Function

```
2.0*._Brake_System.pvs_Rear_Piston_Area*(1.0-._Brake_System.pvs_Rear_Brake_Bias)*
VARVAL(._Brake_System.cis_Brake_Demand_Adams_Id)*._Brake_System.demand_to_autho
rity_scale*._Brake_System.force_to_pressure_cnvt*._Brake_System.pvs_Rear_Brake_Mu*._
Brake_System.pvs_Rear_Effective_Piston_Radius*STEP(VARVAL(._Brake_System.right_rear_
wheel_omega),-10D,1,10D,-1)
```

Force Limits	-1.0E+007,1.0E+007
Displacement Limits	-1.0E+007,1.0E+007
Velocity Limits	-1.0E+007,1.0E+007
Acceleration Limits	-1.0E+007,1.0E+007
Units	Torque
Active	On
Location Dependency	Centered between coordinates
Centered Between	Two coordinates
Coordinate Reference #1	cfl_Front_Rotor_2

Coordinate Reference #2	cfl_Front_Rotor_2
Orientation Dependency	Parallel to axis
Axis on Entity	Z
Axis on Frame	+Z

.....

H.8. Build --> Request

Requests

.....

Brake_Torques

Define Using Function Expresion	
F1	
F2	VARVAL(._Brake_System.cis_brake_demand_adams_id)
F3	VARVAL(._Brake_System.left_front_brake_torque_VAR)
F4	VARVAL(._Brake_System.right_front_brake_torque_VAR)
F5	
F6	VARVAL(._Brake_System.left_rear_brake_torque_VAR)
F7	VARVAL(._Brake_System.right_rear_brake_torque_VAR)
F8	
Title	
Result Set Name	Brake_Torques
MAG	
X	Brake_Demand
Y	Front_Left_Brake_Torque
Z	Front_Right_Brake_Torque
AMAG	
R1	Rear_Left_Brake_Torque
R2	Rear_Right_Brake_Torque
R3	

Brake_Line_Pressures

Define Using Function Expresion	
F1	
F2	VARVAL(._Brake_System.cis_brake_demand_adams_id)
F3	VARVAL(._Brake_System.left_front_brake_line_pressure)
F4	VARVAL(._Brake_System.right_front_brake_line_pressure)
F5	
F6	VARVAL(._Brake_System.left_rear_brake_line_pressure)
F7	VARVAL(._Brake_System.right_rear_brake_line_pressure)
F8	

Title	
Result Set Name	Brake_Line_Pressures
MAG	
X	Brake_Demand
Y	Front_Left_Line_Pressure
Z	Front_Right_Line_Pressure
AMAG	
R1	Rear_Left_Line_Pressure
R2	Rear_Right_Line_Pressure
R3	

.....

H.9. Build --> Geometry --> Link

Links

.....

Rotor

General Part	mtl_Front_Rotor_to_Wheel
Coordinate Reference #1	cfl_Front_Rotor_1
Coordinate Reference #2	cfl_Front_Rotor_2
Radius	135.0
Mass	Not Calculate Mass Properties

Rear_Rotor

General Part	mtl_Rear_Rotor_to_Wheel
Coordinate Reference #1	cfl_Rear_Rotor_1
Coordinate Reference #2	cfl_Rear_Rotor_2
Radius	135.0
Mass	Not Calculate Mass Properties

Rotor_Hub

General Part	mtl_Front_Rotor_to_Wheel
Coordinate Reference #1	cfl_Front_Rotor_Spin_Axis
Coordinate Reference #2	cfl_Front_Rotor_1
Radius	50.0
Mass	Not Calculate Mass Properties

Rear_Rotor_Hub

General Part	mtl_Rear_Rotor_to_Wheel
Coordinate Reference #1	cfl_Rear_Rotor_Spin_Axis
Coordinate Reference #2	cfl_Rear_Rotor_1

Radius	135.0
Mass	Not Calculate Mass Properties

.....

H.10. Build --> Marker

Switch to Adams View mode

Marker

.....

Rvref_1

Add to part mtl_Front_Suspension_Upright

Location

(LOC_ALONG_LINE(._Brake_System.ground.cfl_Front_Rotor_1, ._Brake_System.ground.cfl_Front_Rotor_2, 50.0 / 100 * DM(._Brake_System.ground.cfl_Front_Rotor_1, ._Brake_System.ground.cfl_Front_Rotor_2)))

Orientation

(ORI_RELATIVE_TO({0, 0, 0}, ._Brake_System.ground.cfl_Front_Rotor_Spin_Axis))

Rvref_1

Add to Part mtl_Rear_Suspension_Upright

Location

(LOC_ALONG_LINE(._Brake_System.ground.cfl_Rear_Rotor_1, ._Brake_System.ground.cfl_Rear_Rotor_2, 50.0 / 100 * DM(._Brake_System.ground.cfl_Rear_Rotor_1, ._Brake_System.ground.cfl_Rear_Rotor_2)))

Orientation

(ORI_RELATIVE_TO({0, 0, 0}, ._Brake_System.ground.cfl_Rear_Rotor_Spin_Axis))

.....

H.11. Build --> Geometry --> Link

Switch to Adams View mode

Revolution

.....

F_Calliper_Revolution

Reference Marker	rvref_1
Relative to	rvref_1
Angle Extent	-50
Number of Sides	10
Profile Points	

0.0, (-._Brake_System.pvs_Front_Effective_Piston_Radius - 10mm), (ABS(._Brake_System.pvs_Front_Rotor_Width) / 2 + 10.0mm),0.0, (-._Brake_System.pvs_Front_Effective_Piston_Radius - 10mm), (-ABS(._Brake_System.pvs_Front_Rotor_Width) / 2 - 10mm),0.0, (-._Brake_System.pvs_Front_Effective_Piston_Radius + 55mm), (-ABS(._Brake_System.pvs_Front_Rotor_Width) / 2 - 10mm),0.0, (-._Brake_System.pvs_Front_Effective_Piston_Radius + 55mm), (ABS(._Brake_System.pvs_Front_Rotor_Width) / 2 + 10.0mm),0.0, (-._Brake_System.pvs_Front_Effective_Piston_Radius - 10mm), (ABS(._Brake_System.pvs_Front_Rotor_Width) / 2 + 10mm)

R_Calliper_Revolution

Reference Marker rvref_1
Relative to rvref_1
Angle Extent -50
Number of Sides 10
Profile Points

0.0, (-._Brake_System.pvs_Rear_Effective_Piston_Radius - 10mm), (ABS(._Brake_System.pvs_Rear_Rotor_Width) / 2 + 10.0mm),0.0, (-._Brake_System.pvs_Rear_Effective_Piston_Radius - 10mm), (-ABS(._Brake_System.pvs_Rear_Rotor_Width) / 2 - 10mm),0.0, (-._Brake_System.pvs_Rear_Effective_Piston_Radius + 55mm), (-ABS(._Brake_System.pvs_Rear_Rotor_Width) / 2 - 10mm),0.0, (-._Brake_System.pvs_Rear_Effective_Piston_Radius + 55mm), (ABS(._Brake_System.pvs_Rear_Rotor_Width) / 2 + 10.0mm),0.0, (-._Brake_System.pvs_Rear_Effective_Piston_Radius - 10mm), (ABS(._Brake_System.pvs_Rear_Rotor_Width) / 2 + 10mm)

.....

I. Powertrain System

ADAMS - Template - _Powertrain_System.tpl

I.1. Build --> Hardpoints

Powertrain Points	X	Y	Z	Units
hps_Graphics_Reference	-1400	90	300	[mm]
hpl_Front_Engine_Mount	300	300	0	[mm]
hpl_Rear_Engine_Mount	-300	300	0	[mm]

I.2. Build --> Communicator --> Input

Input Communicator

SSE_Diff1_Adams_Id

Type	Single
Matching Name	SSE_Diff1_Adams_Id
Entity	Diferential equation
From Minor Role	Inherit

SSE_Diff1

Type	Single
Matching Name	SSE_Diff1
Entity	Diferential equation
From Minor Role	Inherit

Tire_Force_Adams_Id

Type	Left
Matching Name	Tire_Force_Adams_Id
Entity	Force
From Minor Role	Inherit

Tire_Force

Type	Left
Matching Name	Tire_Force

Entity	Force
From Minor Role	Inherit

Initial_Engine_RPM

Type	Single
Matching Name	Initial_Engine_RPM
Entity	Parameter real
From Minor Role	Any
Initial Value	

Diff_Tripot

Type	Left
Matching Name	Tripot_to_Differential
Entity	Location
From Minor Role	Inherit
Initial Value	

Clutch_Demand_Adams_Id

Type	Single
Matching Name	Clutch_Demand_Adams_Id
Entity	Solver variable
From Minor Role	Inherit

Clutch_Demand

Type	Single
Matching Name	Clutch_Demand
Entity	Solver variable
From Minor Role	Inherit

Transmission_Demand_Adams_Id

Type	Single
Matching Name	Transmission_Demand_Adams_Id
Entity	Solver variable
From Minor Role	Inherit

Transmission_Demand

Type	Single
Matching Name	Transmission_Demand
Entity	Solver variable
From Minor Role	Inherit

Throttle_Demand_Adams_Id

Type	Single
Matching Name	Throttle_Demand_Adams_Id
Entity	Solver variable
From Minor Role	Inherit

Throttle_Demand

Type	Single
Matching Name	Throttle_Demand
Entity	Solver variable
From Minor Role	Inherit

I.3. Build --> Parameter

Parameter

Oil_Dump_Throttle_Off

Type	Single
Real Value	1.0
Units	No units
Hide From Standard User	No

Oil_Dump_Residual

Type	Single
Real Value	0.1
Units	No units
Hide From Standard User	No

Oil_Dump_Threshold

Type	Single
Real Value	0.1
Units	No units
Hide From Standard User	No

Shift_Cycle_Time

Type	Single
Real Value	0.5
Units	Time
Hide From Standard User	No

Torque_Tau

Type	Single
Real Value	
Units	Time
Hide From Standard User	No

Max_Engine_Torque

Type	Single
Real Value	
Units	Torque
Hide From Standard User	No

Min_Engine_Torque

Type	Single
Real Value	
Units	Torque
Hide From Standard User	No

Max_Engine_Power

Type	Single
Real Value	1.0
Units	No units
Hide From Standard User	No

Powertrain_Type

Type	Single
Integer Value	1
Hide From Standard User	Yes

Gear_Upshift_Thlds

Type	Single
Real Value	60.0, 90.0
Units	No units
Hide From Standard User	No

Gear_Downshift_2

Type	Single
Real Value	1000.0
Units	No units
Hide From Standard User	No

Gear_Downshift_3

Type	Single
Real Value	1000.0
Units	No units
Hide From Standard User	No

Gear_Downshift_4

Type	Single
Real Value	1000.0
Units	No units
Hide From Standard User	No

Gear_Downshift_5

Type	Single
Real Value	1000.0
Units	No units
Hide From Standard User	No

Gear_Downshift_6

Type	Single
Real Value	1000.0
Units	No units
Hide From Standard User	No

Gear_Upshift_1

Type	Single
Real Value	6000.0
Units	No units
Hide From Standard User	No

Gear_Upshift_2

Type	Single
Real Value	6000.0
Units	No units
Hide From Standard User	No

Gear_Upshift_3

Type	Single
Real Value	6000.0
Units	No units
Hide From Standard User	No

Gear_Upshift_4

Type	Single
Real Value	6000.0
Units	No units
Hide From Standard User	No

Gear_Upshift_5

Type	Single
Real Value	6000.0
Units	No units
Hide From Standard User	No

Clutch_Tau

Type	Single
Real Value	5.0E-2
Units	Time
Hide From Standard User	No

Clutch_Open

Type	Single
Real Value	0.75
Units	No units
Hide From Standard User	No

Clutch_Close

Type	Single
Real Value	0.25
Units	No units
Hide From Standard User	No

Clutch_Capacity

Type	Single
Real Value	1.0E+6
Units	Torque
Hide From Standard User	No

Max_Throttle

Type	Single
Real Value	100
Units	No units

Hide From Standard User	No

EMS_Max_Throttle

Type	Single
Real Value	100
Units	No units
Hide From Standard User	No

Max_Gears

Type	Single
Integer Value	6
Hide From Standard User	No

Clutch_Damping

Type	Single
Real Value	1.0E+4
Units	Torsion Damping
Hide From Standard User	No

Clutch_Stiffness

Type	Single
Real Value	1.0E+6
Units	Torsion Stiffness
Hide From Standard User	No

EMS_Gain

Type	Single
Real Value	5.0E-3
Units	No units
Hide From Standard User	No

Engine_Rev_Limit

Type	Single
Real Value	7000.0
Units	No units
Hide From Standard User	No

Engine_Idle_Speed

Type	Single
Real Value	1000.0
Units	No units

Hide From Standard User	No

Engine_Stall_Speed

Type	Single
Real Value	750.0
Units	No units
Hide From Standard User	No

Engine_Inertia

Type	Single
Real Value	7.0E+4
Units	Inertia
Hide From Standard User	No

Final_Drive

Type	Single
Real Value	1.0
Units	No units
Hide From Standard User	No

Gear_Ratio_1

Type	Single
Real Value	3.231
Units	No units
Hide From Standard User	No

Gear_Ratio_2

Type	Single
Real Value	2.571
Units	No units
Hide From Standard User	No

Gear_Ratio_3

Type	Single
Real Value	2.125
Units	No units
Hide From Standard User	No

Gear_Ratio_4

Type	Single
Real Value	1.789

Units	No units
Hide From Standard User	No

Gear_Ratio_5

Type	Single
Real Value	1.55
Units	No units
Hide From Standard User	No

Gear_Ratio_6

Type	Single
Real Value	1.0
Units	No units
Hide From Standard User	No

.....

I.4. Build --> Communicator --> Output

Output Comunicatior

.....

Powertrain_Type

Matching Name	gse_Powertrain_Type
Type	Single
Entity	Parameter integer
To Minor Role	Inherit
Parameter Variable Name	phs_Powertrain_Type

Powertrain_Gse

Matching Name	Powertrain_Gse
Type	Single
Entity	Parameter integer
To Minor Role	Inherit
Parameter Variable Name	

Max_Engine_Braking_Torque

Matching Name	Engine_Maximum_Braking_Torque
Type	Single
Entity	Solver variable
To Minor Role	Inherit
Solver Variable Name	Max_Braking_Torque

Max_Engine_Driving_Torque

Matching Name	Engine_Maximum_Driving_Torque
Type	Single
Entity	Solver variable
To Minor Role	Inherit
Solver Variable Name	Max_Driving_Torque

Transmission_Input_Omega

Matching Name	Transmission_Input_Omega
Type	Single
Entity	Solver variable
To Minor Role	Inherit
Solver Variable Name	Transmission_Input_Omega

Clutch_Displacement_IC

Matching Name	Clutch_Displacement_IC
Type	Single
Entity	Solver variable
To Minor Role	Inherit
Solver Variable Name	Clutch_Displacement_IC

Output_Torque

Matching Name	Output_Torque
Type	Right
Entity	Force
To Minor Role	Inherit
Force Name	jfr_Output_Torque.Force

Output_Torque

Matching Name	Output_Torque
Type	Left
Entity	Force
To Minor Role	Inherit
Force Name	jfl_Output_Torque.Force

Max_Thottle

Matching Name	Max_Throttle
Type	Single
Entity	Parameter real
To Minor Role	Inherit
Parameter Variable Name	pvs_Max_Throttle

Engine_Map

Matching Name	Engine_Map
Type	Single
Entity	Spline
To Minor Role	Inherit
Spline Name	gss_Engine_Torque

Transmission_Spline

Matching Name	Transmission_Spline
Type	Single
Entity	Spline
To Minor Role	Inherit
Spline Name	Transmission_Data

Engine_RevLimit_Rpm

Matching Name	Engine_RevLimit_Rpm
Type	Single
Entity	Parameter real
To Minor Role	Inherit
Parameter Variable Name	pvs_Engine_Rev_Limit

Engine_Stall_Rpm

Matching Name	Engine_Stall_Rpm
Type	Single
Entity	Parameter real
To Minor Role	Inherit
Parameter Variable Name	pvs_Engine_Stall_Speed

Max_Gears

Matching Name	Max_Gears
Type	Single
Entity	Parameter integer
To Minor Role	Inherit
Parameter Variable Name	pvs_Max_Gears

Engine_Stall_Rpm

Matching Name	Engine_Stall_Rpm
Type	Single
Entity	Parameter real
To Minor Role	Inherit

Parameter Variable Name	pvs_Engine_Stall_Speed

Diff_Ratio

Matching Name	Diff_Ratio
Type	Single
Entity	Parameter real
To Minor Role	Inherit
Parameter Variable Name	pvs_Final_Drive

Engine_Speed

Matching Name	Engine_Speed
Type	Single
Entity	Solver variable
To Minor Role	Inherit
Solver Variable Name	Engine_Speed

Engine_Rpm

Matching Name	Engine_Rpm
Type	Single
Entity	Solver variable
To Minor Role	Inherit
Solver Variable Name	Engine_Rpm

Tripot_to_Differential

Matching Name	Tripot_to_Differential
Type	Left
Entity	Mount
To Minor Role	Inherit
Part Name	gel_Diff_Output

Tripot_to_Differential

Matching Name	Tripot_to_Differential
Type	Right
Entity	Mount
To Minor Role	Inherit
Part Name	ger_Diff_Output

.....

I.5. Build --> Construction Frame

Construction Frame

.....

Graphics_Reference

Type	Single
Location Dependency	Delta location from coordinate
Coordinate Reference	hps_Graphics_Reference
Location	0,0,0
Location In	Local
Orientation Dependency	User entered values
Orient Using	Euler Angles
Euler Angles	0,0,0

Differential_Output

Type	Left
Location Dependency	Location input communicator
Input Communicator	cil_Diff_Tripot
Orientation Dependency	User entered values
Orient using	Euler Angles
Euler Angles	0,90,0

Differential_Output

Type	Right
Location Dependency	Location input communicator
Input Communicator	cir_Diff_Tripot
Orientation Dependency	User entered values
Orient using	Euler Angles
Euler Angles	180,90,180

Diff_Output_Orient

Type	Single
Location Dependency	Delta location from coordinate
Coordinate Reference	cfr_Differential_Output
Location	0,0,0
Location In	Local
Orientation Dependency	User entered values
Orient using	Euler Angles
Euler Angles	0,90,0

Powertrain_to_Body

Type	Single
Location Dependency	Centered between coordinates
Centered Between	Two coordinates

Coordinate Reference #1	cfl_Differential_Output
Coordinate Reference #2	cfr_Differential_Output
Orientation Dependency	User entered values
Orient Using	Euler Angles
Euler Angles	0,0,0

I.6. Build --> Parts --> General Part

General Parts

Powertrain

Type	Single
Location Dependency	Delta location from coordinate
Coordinate Reference	
Location	
Location In	Local
Orientation Dependency	User entered values
Orient Using	Euler Angles
Euler Angles	
Mass & Inertia	1E-9
Material	Steel

Diff_Output

Type	Left
Location Dependency	Delta location from coordinate
Coordinate Reference	cfl_Differential_Output
Location	0,0,0
Location In	Local
Orientation Dependency	Delta orientation from coordinate
Construction Frame	cfl_Differential_Output
Orientation	0,0,0
Mass & Inertia	1E-9
Material	Steel

I.7. Build --> Parts --> Mount

Mount

Powertrain_to_Body

Coordinate Reference	cfs_Powertrain_to_Body
From Minor Role	Inherit

I.8. Build --> Attachment --> Joint

Attachment Joint

Diff_Output_Revolute

I Part	gel_Diff_Output
J Part	ges_Powertrain
Type	Left
Joint Type	Revolute
Active	Always
Location Dependency	Delta location from coordinate
Coordinate Reference	cfl_Differential_Output
Location	0,0,0
Location In	Local
Orientation Dependency	cfl_Differential_Output
Construction Frame	cfs_Diff_Output_Orient
Orientation	0,0,0

Engine_Mount_Fix

I Part	ges_Powertrain
J Part	mts_Powertrain_to_Body
Type	Single
Joint Type	Fixed
Active	
Location Dependency	Delta location from coordinate
Coordinate Reference	cfs_Powertrain_to_Body
Location	0,0,0
Location In	Local

I.9. Build --> Bushing--> Joint

Bushing

Front_Engine_Bushing_Mount

I Part	ges_Powertrain
J Part	mts_Powertrain_to_Body

Type	Left
Inactive	
Preload	0,0,0
Tpreload	0,0,0
Offset	0,0,0
Roffset	0,0,0
Geometry Length	25
Geometry Radius	40
Property File	
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Front_Engine_Mount
Location	0,0,0
Location In	Local
Orientation Dependency	User entered values
Orient Using	Euler Angles
Euler Angles	0,0,0

Front_Engine_Bushing_Mount

I Part	ges_Powertrain
J Part	mts_Powertrain_to_Body
Type	Left
Inactive	
Preload	0,0,0
Tpreload	0,0,0
Offset	0,0,0
Roffset	0,0,0
Geometry Length	25
Geometry Radius	40
Property File	
Location Dependency	Delta location from coordinate
Coordinate Reference	hpl_Rear_Engine_Mount
Location	0,0,0
Location In	Local
Orientation Dependency	User entered values
Orient Using	Euler Angles
Euler Angles	0,0,0

.....

I.10. Build --> Actuators --> Joint Force

Joint Force

.....

Output_Torque

Joint	jolrev_Diff_Output
Type of Freedom	Rotational
Application	Output_Torque
Identifier	Single_Component_Force

Left Function

0.5*(VARVAL(._Powertrain_System.total_axle_torque)-VARVAL(._Powertrain_System.differential_torque))

Right Function

-0.5*(VARVAL(._Powertrain_System.total_axle_torque)+VARVAL(._Powertrain_System.differential_torque))

Force Limits	-1.0E+006,1.0E+006
Displacement Limits	-1.0E+006,1.0E+006
Velocity Limits	-1.0E+006,1.0E+006
Acceleration Limits	-1.0E+006,1.0E+006
Units	Torque
Active	On

.....

I.11. Build --> Request

Requests

.....

Differential_Torques

Define Using Function Expresion

F1

F2

0.5*(VARVAL(._Powertrain_System.total_axle_torque)-VARVAL(._Powertrain_System.differential_torque))

F3

0.5*(VARVAL(._Powertrain_System.total_axle_torque)+VARVAL(._Powertrain_System.differential_torque))

F4

VARVAL(._Powertrain_System.differential_torque)

F5

F6

(0.5*(VARVAL(._Powertrain_System.total_axle_torque)-ARVAL(._Powertrain_System.differential_torque)))*
VARVAL(._Powertrain_System.halfshaft_omega_left)*._Powertrain_System.ucf_watt_to_hp

F7

(0.5*(VARVAL(._Powertrain_System.total_axle_torque)+VARVAL(._Powertrain_System.differential_torque)))*V
ARVAL(._Powertrain_System.halfshaft_omega_right)*._Powertrain_System.ucf_watt_to_hp

F8

VARVAL(._Powertrain_System.differential_torque)*(VARVAL(._Powertrain_System.halfshaft_omega_left)-
VARVAL(._Powertrain_System.halfshaft_omega_right))*._Powertrain_System.ucf_watt_to_hp

Title
Result Set Name Differential_Torques
MAG
X Halfshaft_Torque_Left
Y Halfshaft_Torque_Right
Z Halfshaft_Torque_Delta
AMAG
R1 Halfshaft_Power_Left_HP
R2 Halfshaft_Power_Right_HP
R3 Power_Loss_HP

Differential_Speeds

Define Using Function Expresion
F1
F2
VARVAL(._Powertrain_System.halfshaft_omega_left)
F3
VARVAL(._Powertrain_System.halfshaft_omega_left)
F4
VARVAL(._Powertrain_System.halfshaft_omega_left)-VARVAL(._Powertrain_System.halfshaft_omega_right)
F5
F6
VARVAL(._Powertrain_System.halfshaft_omega_left)*._Powertrain_System.ucf_radian_per_second_to_RPM
F7
VARVAL(._Powertrain_System.halfshaft_omega_right)*._Powertrain_System.ucf_radian_per_second_to_RPM
F8
(VARVAL(._Powertrain_System.halfshaft_omega_left)-
VARVAL(._Powertrain_System.halfshaft_omega_right))*(._Powertrain_System.ucf_radian_per_second_to_RPM)
Title
Result Set Name Differential_Speeds
MAG
X Halfshaft_Omega_Left
Y Halfshaft_Omega_Right
Z Halfshaft_Omega_Delta
AMAG
R1 Halfshaft_RPM_Left
R2 Halfshaft_RMP_Right
R3 Halfshaft_RPM_Delta

Transmission

Define Using Function Expresion

F1

F2

VARVAL(._Powertrain_System.cis_transmission_demand_adams_id)

F3

AKISPL(MIN(MAX(0,VARVAL(._Powertrain_System.cis_transmission_demand_adams_id)),6),0,._Powertrain_System.gear_ratio_spline)*(._Powertrain_System.pvs_final_drive)

F4

VARVAL(._Powertrain_System.transmission_input_omega)

F5

F6

VARVAL(._Powertrain_System.transmission_input_omega)*(._Powertrain_System.ucf_radian_per_second_to_RPM)

F7

(VARVAL(._Powertrain_System.halfshaft_omega_left)+VARVAL(._Powertrain_System.halfshaft_omega_right))/2.0

F8

Title

Result Set Name	Transmission
MAG	
X	Gear
Y	Gear_Ratio_Overall
Z	Input_Omega
AMAG	
R1	Input_RPM
R2	Output_Omega
R3	Output_RPM

Clutch

Define Using Function Expresion

F1

F2

ARYVAL(._Powertrain_System.powertrain_output_array,3)

F3

ARYVAL(._Powertrain_System.powertrain_output_array,4)

F4

ARYVAL(._Powertrain_System.powertrain_output_array,4)*(._Powertrain_System.ucf_radian_per_second_to_RPM)

F5

F6

IF(VARVAL(._Powertrain_System.analysis_type)-

0.5:(MAX(0,DIF(._Powertrain_System.cis_sse_diff1_adams_id))/(._Powertrain_System.pvs_final_drive)
/AKISPL(MAX(1,MIN(VARVAL(._Powertrain_System.cis_transmission_demand_adams_id),(._Powertrain_Syste
m.pvs_max_gears))),0,._Powertrain_System.gear_ratio_spline)),0.0,(ARYVAL(._Powertrain_System.powertrain_
output_array,6)))

F7

IF(VARVAL(._Powertrain_System.analysis_type)-
0.5:(MAX(0,DIF(._Powertrain_System.cis_sse_diff1_adams_id))/(._Powertrain_System.pvs_final_drive)
/AKISPL(MAX(1,MIN(VARVAL(._Powertrain_System.cis_transmission_demand_adams_id),(._Powertrain_Syste
m.pvs_max_gears))),0,._Powertrain_System.gear_ratio_spline)),0.0,(ARYVAL(._Powertrain_System.powertrain_
output_array,6)))*ARYVAL(._Powertrain_System.powertrain_output_array,4)*(._Powertrain_System.ucf_watt_
to_hp)

F8

IF(VARVAL(._Powertrain_System.analysis_type)-
0.5:(MAX(0,DIF(._Powertrain_System.cis_sse_diff1_adams_id))/(._Powertrain_System.pvs_final_drive)
/AKISPL(MAX(1,MIN(VARVAL(._Powertrain_System.cis_transmission_demand_adams_id),(._powertrain
fsae.pvs_max_gears))),0,._Powertrain_System.gear_ratio_spline)),0.0,(ARYVAL(._Powertrain_System.powertrai
n_output_array,6)))*ARYVAL(._Powertrain_System.powertrain_output_array,4)*(._Powertrain_System.ucf_wa
tt_to_PS)

Title

Result Set Name	Clutch
MAG	
X	Slip
Y	Slip_Speed
Z	Slip_Speed_RPM
AMAG	
R1	Torque
R2	Power_HP
R3	Power_PS

Engine

Define Using Function Expresion

F1

F2

MAX(0,ARYVAL(._Powertrain_System.powertrain_output_array,2))

F3

MAX(0,ARYVAL(._Powertrain_System.powertrain_output_array,2))*(._Powertrain_System.ucf_radian_per_sec
ond_to_RPM)

F4

IF(VARVAL(._Powertrain_System.analysis_type)-
0.5:(MAX(0,DIF(._Powertrain_System.cis_sse_diff1_adams_id))/(._Powertrain_System.pvs_final_drive)
/AKISPL(MAX(1,MIN(VARVAL(._Powertrain_System.cis_transmission_demand_adams_id),(._Powertrain_Syste

m.pvs_max_gears))),0,._Powertrain_System.gear_ratio_spline)),0.0,(ARYVAL(._Powertrain_System.powertrain_output_array,5)))

F5

F6

IF(VARVAL(._Powertrain_System.analysis_type)-0.5:(MAX(0,DIF(._Powertrain_System.cis_sse_diff1_adams_id))/(._Powertrain_System.pvs_final_drive)/AKISPL(MAX(1,MIN(VARVAL(._Powertrain_System.cis_transmission_demand_adams_id),(._Powertrain_System.pvs_max_gears))),0,._Powertrain_System.gear_ratio_spline)),0.0,(ARYVAL(._Powertrain_System.powertrain_output_array,5)))*MAX(0,ARYVAL(._Powertrain_System.powertrain_output_array,2))*(._Powertrain_System.ucf_watt_to_hp)

F7

IF(VARVAL(._Powertrain_System.analysis_type)-0.5:(MAX(0,DIF(._Powertrain_System.cis_sse_diff1_adams_id))/(._Powertrain_System.pvs_final_drive)/AKISPL(MAX(1,MIN(VARVAL(._Powertrain_System.cis_transmission_demand_adams_id),(._Powertrain_System.pvs_max_gears))),0,._Powertrain_System.gear_ratio_spline)),0.0,(ARYVAL(._Powertrain_System.powertrain_output_array,5)))*MAX(0,ARYVAL(._Powertrain_System.powertrain_output_array,2))*(._powertrain_fsae.ucf_watt_to_PS)

F8

ARYVAL(._Powertrain_System.powertrain_output_array,1)

Title

Result Set Name	Engine
MAG	
X	Omega
Y	RPM
Z	Torque
AMAG	
R1	Power_ HP
R2	Power_PS
R3	Throttle

.....

I.12. Build --> Data Elements --> Array

Array

.....

Ptype_Robot_Parameters

Solver ID	0
Type	Initial Conditions (IC)

Numbers

(._Powertrain_System.transmission_data.adams_id),(._Powertrain_System.pvs_torque_tau),(._Powertrain_System.pvs_shift_cycle_time)

Ptype_Auto_Parameters

Solver ID 0

Type Initial Conditions (IC)

Numbers

(._Powertrain_System.gss_torque_ratio.adams_id),(._Powertrain_System.gss_capacity_factor.adams_id),(._Powertrain_System.transmission_data.adams_id),(._Powertrain_System.pvs_shift_cycle_time),(._Powertrain_System.pvs_oil_dump_threshold),(._Powertrain_System.pvs_oil_dump_residual),(._Powertrain_System.pvs_oil_dump_throttle_off)

Ptype_Simple_Parameters

Solver ID 0

Type Initial Conditions (IC)

Numbers

(._Powertrain_System.pvs_max_engine_power),(._Powertrain_System.pvs_min_engine_torque),(._Powertrain_System.pvs_torque_tau),(._Powertrain_System.pvs_max_engine_torque)

Powertrain_Input_Array

Solver ID 0

Type U (Inputs)

Variables

(._Powertrain_System.cis_throttle_demand),(._Powertrain_System.cis_clutch_demand),(._Powertrain_System.transmission_output_omega),(._Powertrain_System.cis_transmission_demand),(._Powertrain_System.analysis_type)

Powertrain_Discrete_State_Array

Solver ID 0

Type X (States)

Size

Powertrain_State_Array

Solver ID 0

Type X (States)

Size

Powertrain_Output_Array

Solver ID 0

Type Y (Outputs)

Size

Powertrain_IC_Robot

Solver ID 0
Type Initial Conditions (IC)
Numbers 0.0

Powertrain_IC_Auto

Solver ID 0
Type Initial Conditions (IC)
Numbers
(._Powertrain_System.cis_initial_engine_rpm/_Powertrain_System.ucf_radian_per_second_to_RPM)

Powertrain_IC_Simple

Solver ID 0
Type Initial Conditions (IC)
Numbers 0.0

Powertrain_IC_Manual

Solver ID 0
Type Initial Conditions (IC)
Numbers
(._Powertrain_System.cis_initial_engine_rpm/._Powertrain_System.ucf_radian_per_second_to_RPM),0.0

EMS_Parameters

Solver ID 0
Type Initial Conditions (IC)
Numbers
(._Powertrain_System.pvs_engine_idle_speed),(._Powertrain_System.pvs_ems_gain),(._Powertrain_System.pvs_ems_max_throttle),(._Powertrain_System.pvs_max_throttle)

Engine_Parameters

Solver ID 0
Type Initial Conditions (IC)
Numbers
(._Powertrain_System.pvs_engine_inertia/._Powertrain_System.ucf_gc),(._Powertrain_System.pvs_engine_rev_limit),(._Powertrain_System.gss_engine_torque.adams_id),(._Powertrain_System.ucf_angle_to_radians),(COLS(._Powertrain_System.transmission_data.x))

Ptype_Manual_Parameters

Solver ID 0
Type Initial Conditions (IC)
Numbers
(._Powertrain_System.pvs_clutch_capacity),(._Powertrain_System.pvs_clutch_stiffness/._Powertrain_System.u

cf_angle_to_radians),(._Powertrain_System.pvs_clutch_damping/._Powertrain_System.ucf_angle_to_radians),(._Powertrain_System.pvs_clutch_open),(._Powertrain_System.pvs_clutch_close),(._Powertrain_System.pvs_clutch_tau),(._Powertrain_System.transmission_data.adams_id)

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I.13. Build --> System Elements --> General State Equation

General State Equation

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Solver ID	0
U Array (Inputs)	._Powertrain_System.powertrain_input_array
Y Array (Outputs)	._Powertrain_System.powertrain_output_array
User Function Parameters	

777.0,(._Powertrain_System.phs_powertrain_type),(._Powertrain_System.powertrain_state_array.adams_id),(._Powertrain_System.powertrain_input_array.adams_id),(ADAMS_ID(._Powertrain_System.engine_type_inputs[._Powertrain_System.phs_powertrain_type])),(._Powertrain_System.engine_parameters.adams_id),(._Powertrain_System.ems_parametersadams_id)

Interface Function Names	

"abgVDM::Gse777_deriv", "abgVDM::Gse777_output", "abgVDM::Gse777_update"

States	Sampled
X Array (Continuous)	._Powertrain_System.powertrain_state_array
IC Arrays (Continuous)	

(._Powertrain_System.gse_type_ic[._Powertrain_System.phs_powertrain_type])

Static Hold	Off
X Array (Discrete)	._Powertrain_System.powertrain_discrete_state_array
IC Array (Discrete)	
First Sample Time	
Sample Function	1.0E10

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J. Rigid Chassis

ADAMS - Template - _Rigid_Chassis.tpl

J.1. Build --> Hardpoints

Rigid Chassis Points	X	Y	Z	Units
hps_Path_Reference	0.00	0.00	0.00	[mm]
hps_Trim_Dummy	-800.00	0.00	275.00	[mm]

J.2. Build --> Construction Frame

Construction Frame

Ground_Height_Reference

Type	Single
Location Dependency	Location input communicator
Input Communicator	cis_Std_Tire_Ref
Orientation Dependency	User entered values
Orient Using	Euler Angles
Euler Angles	0,0,0

Aero_Force_Reference

Type	Single
Location Dependency	Delta location from coordinate
Coordinate Reference	cfs_Ground_Height_Reference
Location	0,0,0
Location in	Local
Orientation Dependency	User entered values
Orient Using	Euler Angles
Euler Angles	90,90,180

Driver_Reference

Type	Single
Location Dependency	Delta location from coordinate
Coordinate Reference	hps_Path_Reference
Location	0,0,0

Location in	Local
Orientation Dependency	User entered values
Orient Using	Euler Angles
Euler Angles	-180,0,0

Path_Reference

Type	Single
Location Dependency	Delta location from coordinate
Coordinate Reference	hps_Path_Reference
Location	0,0,0
Location in	Local
Orientation Dependency	User entered values
Orient Using	Euler Angles
Euler Angles	0,0,0

J.3. Build --> Parts --> General Part

General Parts

Chassis

Type	Single
Location Dependency	User entered location
Location Values	0,0,0
Orientation Dependency	User entered values
Orient Using	Euler Angles
Euler Angles	180,0,0
Mass	90.71
Ixx	2.2+008
Iyy	1.0+009
Izz	1.1rE+009
CM Location Relative to Part	-800,0,275
Material	Steel

Trim_Mass

Type	Single
Location Dependency	Delta location from coordinate
Coordinate Reference	hps_Trim_Dummy
Location	0,0,0
Location in	Local
Orientation Dependency	User entered values

Orient Using	Euler Angles
Euler Angles	180,0,0
Mass & Inertia	1E-9
CM Location Relative to Part	0,0,0
Material	Steel

.....

J.4. Build --> Attachment --> Joint

Attachment Joint

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Trim_Mass

I Part	ges_Trim_Mass
J Part	ges_Chassis
Type	Single
Joint Type	Fixed
Active	Always
Location Dependency	Delta location from coordinate
Coordinate Reference	ges_Chassis.cm
Location	0,0,0
Location in	Local

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J.5. Build --> Geometry --> Ellipsoid

Ellipsoid

.....

CG_Graphip

Coordinate Reference	ges_Chassis.cm
Method	Scaled
General Part	ges_Chassis
X Scale Factor	100
Y Scale Factor	100
Z Scale Factor	100
Mass	Not Calculate Mass Properties

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J.6. Build --> Geometry --> Cylinder

Cylinder

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Mass_Graphic

General Part	ges_Rack_Housing
Construction Frame	cfs_Pinion_Spin_Axis
Radius	100
Lenght in Positive Z	20
Length in Negative Z	0
Mass	Not Calculate Mass Properties

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J.7. Build --> Parameter

Parameter

.....

Aero_Drag_Active

Type	Single
Integer Value	1
Units	No units
Hide From Standard User	No

Air_Density

Type	Single
Real Value	1.22E-9
Units	Density
Hide From Standard User	No

Drag_Coefficient

Type	Single
Real Value	0.0
Units	No Units
Hide From Standard User	No

Downforce_Coefficient

Type	Single
Real Value	0.0
Units	No Units
Hide From Standard User	No

Aero_Frontal_Area

Type	Single
Real Value	1
Units	No Units
Hide From Standard User	No

J.8. Build --> Communicator --> Input

Input Communicator

Std_Tire_Ref

Matching Name	Std_Tire_Ref
Entity	Location
From Minor Role	Inherit
Initial Value	0.0,0.0,0.0

J.9. Build --> Communicator --> Output

Output Comunicatior

Powertrain_to_Body

Matching Name	Powertrain_to_Body
Type	Single
Entity	Mount
To Minor Role	Inherit
Part Name	ges_Chassis

Rack_Housing_to_Chassis

Matching Name	Rack_Housing_to_Chassis
Type	Single
Entity	Mount
To Minor Role	Inherit
Part Name	ges_Chassis

Steering_Column_Support_to_Chassis

Matching Name	Steering_Column_Support_to_Chassis
Type	Single
Entity	Mount
To Minor Role	Inherit
Part Name	ges_Chassis

ARB_Support_to_Chassis_TBar

Matching Name	ARB_Support_to_Chassis_TBar
Type	Single

Entity	Mount
To Minor Role	Inherit
Part Name	ges_Chassis

ARB_Support_to_Chassis_UBar

Matching Name	ARB_Support_to_Chassis_UBar
Type	Left
Entity	Mount
To Minor Role	Any
Part Name	ges_Chassis

Tierod_to_Chassis

Matching Name	Tierod_to_Chassis
Type	Left
Entity	Mount
To Minor Role	Any
Part Name	ges_Chassis

Damper_to_Chassis

Matching Name	Damper_to_Chassis
Type	Left
Entity	Mount
To Minor Role	Any
Part Name	ges_Chassis

Bellcrank_to_Chassis

Matching Name	Bellcrank_to_Chassis
Type	Left
Entity	Mount
To Minor Role	Any
Part Name	ges_Chassis

Upper_AArm_to_Chassis

Matching Name	Upper_AArm_to_Chassis
Type	Left
Entity	Mount
To Minor Role	Any
Part Name	ges_Chassis

Lower_AArm_to_Chassis

Matching Name	Lower_AArm_to_Chassis

Type	Left
Entity	Mount
To Minor Role	Any
Part Name	ges_Chassis

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