MRR Adjustable Remote Reservoir Coil Overs

Safety

Never heat, cut, weld or drill into shock absorbers as components are under high pressure.
These shock absorbers should only be installed by qualified and components persons and will require custom fabrication and mounting. It is the responsibility of the installer and designer/engineer to ensure suitable designs, fabrication methods, process's are used to ensure there are no mounting or suspension failures and that the vehicle is safe.
Always use suitable and relevant safety equipment and always follow safe & relevant workshop practices. Dobinsons Spring and Suspension accept no responsibility for the design and installation of these coil-overs. If raising the vehicle off the ground, always ensure the vehicle is jacked safely and vehicle support stands are used before getting under the vehicle. Ensure Preload is fully removed from coil overs before assembling coil over, if a spring compressor is required, extreme care should be taken, relevant procedures followed and performed only by qualified personell.

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Important Information & Steps for Parts Selection

IMPORTANT: Selection of the required coil over are to be determined by the vehicle/suspension builder, designer or fabricator. Complete custom suspension design and install is required for these coil-overs. Dobinsons recommend that coil-over selection, spring rate choice, suspension geometry, installation and tuning be performed ONLY by experienced suspension designers, fabricators or chassis builders using their experience and expertise. An experienced suspension designer, fabricator and tuner will always provide a far better setup and suspension tune than an inexperienced operated using this information supplied.

For vehicles intending to be road registered, consult your local relevant engineer and fabricator before proceeding to ensure the engineering and registration requirements can be met.
In the absence of chassis/suspension design and fabrication input, this manual can be use as an approximate guide only. Dobinsons Spring and Suspension take no responsibility for incorrectly selected, setup, installed or tuned coil-overs or springs or any adverse handling or vehicle safety characteristics.

Below is a rough guide on the overall process required to select and install coil-overs. Use the relevant sections of this manual

Step	Task	Manual Section	Checklist
1	Determine vehicle ride height and vehicle usage	Selection of Coil-overs, **Calculating Droop & Compression Travel, Installation & Assembly of Coil Overs**	
2	Determine coil-over droop/compression travel amounts and ratios to determine coil-over ride height length		
3	Determine mounting positions and which length coil over to uses (Checking all full compression clearance and full droop bind issues)		
4	Determine Sprung weights	**Calculating Sprung Weight**	
5	Determine Pre-load	**Determing Pre-Load**	
6	Use the above information to determine the required springs	Spring Selection	
7	Order required coil-overs and springs		
8	Fabricate/install mounts		
9	Install coil-overs without coils and cycle and confirm everything is correct	**Installation & Assembly of Coil Overs**	
10	Install coils to coil-overs		
11	Set preload		
12	Droop vehicle to ride height, set cross over sliders	**Tuning, Damping and Adjustment Of Coilovers**	
13	Test and tune		

Coil-Over Information

Dobinsons Spring and Suspensions range of 2.5" Adjustable Remote Reservoir Coil-overs have been designed and manufactured with the highest level of performance and reliability in mind.

Manufactured from high strength DOM 3mm wall steel tubing, Dobinsons Coil-overs utilize a 2.6"/66mm body with a 2.35"/60mm high-flow CNC machined T6 6061 piston, designed to be fitted with 3" inside diameter coil springs.

Dobinsons Coil-overs feature 3 way damping adjustment – high and low speed compression damping adjustments located on the top of the remote reservoir and rebound adjustment located at the base of the shock shaft on the lower mount.

Other Information:

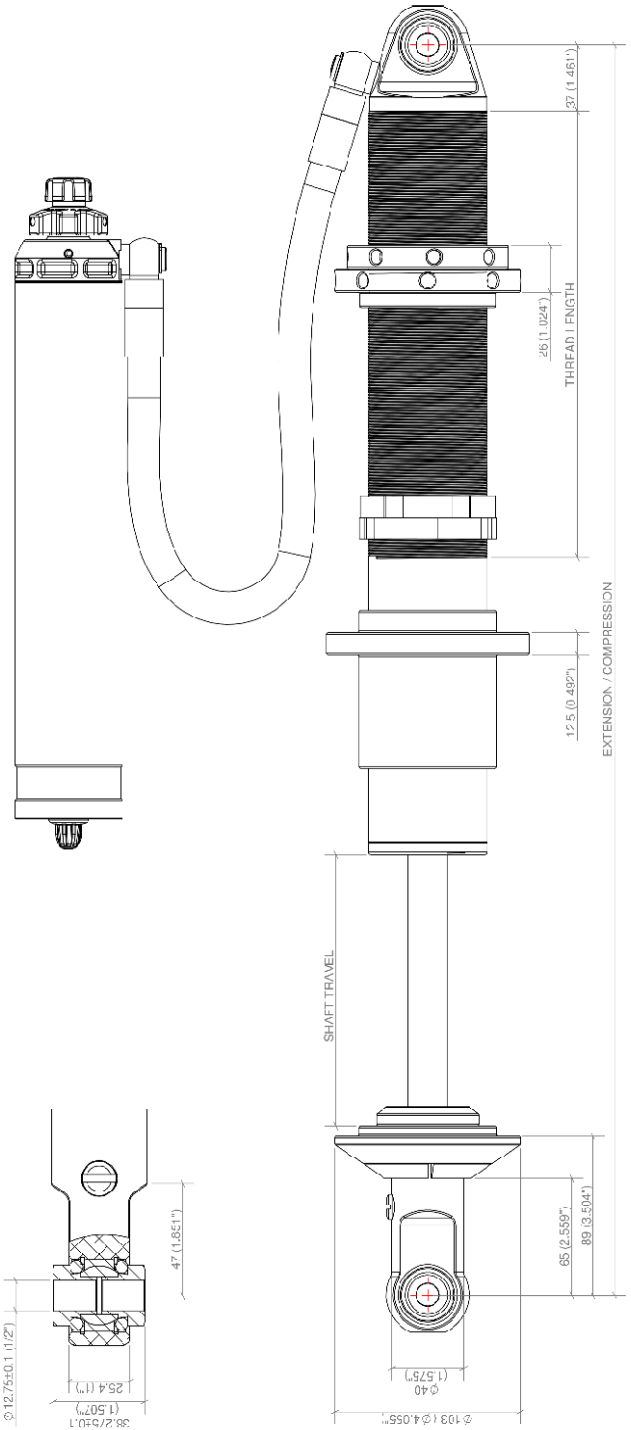
- 5140 HV900 Hard Chrome Plated, Heat treated 22mm Micro- Polished high strength Shock Shaft with a minimum tensile strength exceeding 700MPA/100 psi and hardness exceeding 46HRC
- Shock Body Precision Honed to +/- 0.04mm
- Parker™ Braided High Pressure Hoses
- Lightweight CNC Machined Low Friction floating piston
- 3 stage FMK+HNBR long life, low friction sealing system
- PTFE lined spherical bearings

Dobinsons Coil-overs are available in 3 lengths – 10" travel, 12" travel and 14" travel.

Part #	Extended (Inch/mm)	Compressed (Inch/mm)	Reservoir Length (Inch/mm)	Thread Length (Inch/mm)	Hose Length (Inch/mm)	Rod Diam. (mm)
MRA92-A2510	29.45"/750	19.48"/496	10"/250	8"/200	19.6/500	22
MRA92-A2512	33.42"/851	21.48"/547	12"/300	10"/250	19.6/500	22
MRA92-A2514	38.49"/980	24.00"/611	12"/300	12"/300	19.6/500	22

Mounting pattern – ½" bolt x 1 ½" wide

Shorter lower mounting legs are available to reduce the above ext/comp/ lengths by 20mm. to change this – degas the shock, screw the rebound adjuster right in and then right out and remove it completely, don't loose the bearing or spring and fit this to the new leg, screwed fully in.. Re-gas the shock (200psi). Clamp the shaft in soft jaws, apply some light head to the end of the shaft and end of the leg wear it meets the shaft. Use a bar to undo the original leg. Allow this to cool, clean shaft thread, apply red high strength Loctite and refit the new leg and tighten. Fully unscrew rebound adjuster ensuring it locks in its outward position.
Below are some dimensions shown



Selection Of Coil Overs

Selection of the required coil over are to be determined by the vehicle/suspension builder, designer or fabricator. Complete custom suspension design and install is required for these coil-overs.
Dobinsons recommend that experienced suspension designers, fabricators or chassis builders select the correct coil-overs, springs, setup and tuning using their experience and expertise. Where possible the longest coil-over to give the largest amount of suspension travel is generally desirable.

For vehicles intending to be road registered, consult your local relevant engineer and fabricator before proceeding to ensure the engineering and registration requirements can be met.

In the absence of chassis/suspension design and fabrication input, the below can be use as an approximate guide only.

Determine your desired vehicle ride height. Generally where possible the lower the vehicle ride height and centre of gravity the better for going faster and for stability, however this will come at the detriment of clearance.

Determine the desired amount of droop and compression travel (see next section). This will require cycling the suspension at full bump and full droop to check clearances and maximum droop lengths. This will require checking clearances on all contact areas such as BUT NOT LIMITED TO

- engine sump to diff housing, engine mount and component to diff housing (keeping in mind also that engine mounts will crush)
- Coil-over fully compressed measurement
- panhard rod to radius arm
- steering bind
- tire to guard
- desired ground clearance
- all other areas that may cause issues.
- This will also require checking of control arm, steering arm, brake line and drive shaft lengths and bind at full droop

In most cases, it is desirable to start by working out the vehicles fully compressed/full bump position where the wheels and axles are tucked up as high as possible where you are happy with the chassis to ground clearance as well as the other component clearances mentioned above. For production based vehicles, this usually is where the vehicle is sitting on the fully compressed factory bump stops, in most cases this generally cannot be exceeded without other modifications, but is possible.

Determine mounting locations for your coil overs – For linked/trailing arm mounted coilover/independent suspension this will require calculating the suspension motion ratio as the wheel will travel further than the coil-over. For solid axle vehicles - Where possible mounting the top coil over mount as high as practical is recommended for maintaining

sufficient compression travel and for vehicle stability. Try to keep the coil-overs mounted as far outward on the axle as possible. When mounting directly to the axle on solid axle vehicles, try to keep the coil-over within around 15° of vertical. Try to mount the coils at around a 5° incline at the top on solid axle vehicles

Using the desired amount of compression droop travel taken from the next section, the desired ride height, mounting positions and the coil over extended and compressed lengths, the minimum compressed lengths, maximum droop lengths and clearances cycle your suspension through its full travel to work out which lengths and mounting positions will work for your application. When the suspension is full compressed – add an additional ¾" to the compression coil-over length as your bottom measurements – this will leave the 3/8" bump stop and 3/8" visible shaft. Limit straps should be used to prevent the shocks topping out. If you are looking to install a longer coil-over and mounting the coil over will cause the coil-over to bottom out and the mounts cannot be moved to accommodate this, you may choose to extended the bump stops to raise the fully bottomed position of the vehicle.

If you are still unsure, generally for production based solid axles vehicles such as Jeep Wrangler/Gladiator, Landrover, Toyota Landcruiser 80/105 series and Nissan Patrol Y60/Y61/GQ/GU and similar the following will work.

- 10" coil overs - use for vehicles that are low – 0 – 2" lift or that are very tight on room.
- 12" coil-overs – use for most applications
- 14" Coil-overs – generally suited only to vehicles with long arm/ long travel setups
- Where more travel is desired, it is recommend to use an independent or trailing arm setup to induce a motion ratio

Calculating Droop & Compression Travel

Selection of the required droop and compression travel should also be determined by an experienced vehicle/suspension builder, designer or fabricator.
In the absence of chassis/suspension design and fabrication input, the below can be use as an approximate guide only.

Compression/Bump travel is the amount of travel the suspension will go through from ride height until full compression when the bump stops are fully compressed. More Compression travel generally allows for faster off road driving and Is better for soaking up large bumps at speed

Droop travel is the amount of travel the suspension will go through from ride height until full droop where the wheels are fully drooped down and the suspension fully extended. More droop travel allows the chassis and roll centre to remain lower and allows softer springs for better crawling flex and articulation
Calculating the required compression/droop travel amount or ratio is largely governed by the vehicle owners desired use of the vehicle.

Below is an approximate guide:

Target Vehicle Usage	10" Coil-over		12" Coil-over		14" Coil-over	
	Droop	Comp	Droop	Comp	Droop	Comp
Desert/Sand and higher speed off road racing/driving or for more comfort and ability to absorb larger impacts at speed	4-5"	5-6"	5-6"	6-7"	6-7"	7-8"
General Purpose / Multi-purpose / Mixed Crawling, off roading / fast	5"	5"	6"	6"	7"	7"
Rock Crawling and High articulation	6"	4"	7-8"	4-5"	8-9"	5-6"

*Droop should not exceed 9" (or 2/3rs of suspension travel for longer travel linked setups)
*Compression travel should not be less than 4". Generally 6" minimum for higher speed use
*Compression travel from ride height is equal to the amount of shock shaft showing / shaft travel at ride as per the drawing on page 4
*Between 1/3 and 2/3rds of the shock absorber travel should be for compression travel .
*Try to allow for 1 – 2" more compression travel in the rear than the front (or 20 – 30% on longer linked setups)
*When using hydraulic bump stops try to leave at least 3" gap from ride height before bump stops touch in the front and 4" in the rear.

Calculating Sprung Weight

The sprung weight for each spring on the front and rear is required for selecting the correct springs.
There are a number of options for measuring this. It is the installer/designer/fabricators/owners responsibility for selection of the correct springs.

A very important factor is that the coil over springs will also taken a small amount of the sprung weight (around 90 – 120lbs per coil over) due to the gas pressure acting on the shock shaft. Therefore unless you are checking the sprung weight using existing already gas-charged coil overs and coils, you will also need to subtract this from your calculated sprung weight to give the finished sprung weight
Furthermore, if there is also an additional bypass shock absorber on each corner, a bypass shock with a 7/8" shaft will take around a further 90-120lbs sprung weight or a bypass shock with a 1" shaft will take around a further 120- 150lbs sprung weight which will also need to be taken from your sprung weights.

Motion Ratio

For independent or Trailing arm type vehicles where the springs are mounted to a trailing or control arm there will be a motion ratio introduced. Also on solid axle vehicles where the coil-overs are mounted at an angle inward or outward or front to back this will also be the case, In simple terms because the coil-over is mounted onto a suspension arm or an an angle the wheel will travel further than the coil-over travels on a given road input. On very light vehicles it is recommended to try to introduce a motion ratio where possible. This is

calculated by dividing the wheel travel by the suspension travel. This is required if calculating sprung weights from known wheel corner weights.

Raise the vehicle to full droop and Measure the coil over length (eye to eye) and the centre of wheel to fender length – vertically. Lower the vehicle to ride height, or full bump if the springs are removed and take the same measurements. Subtract the Coil-over droop to ride height/full bump measurements to give coil over travel. Subtract the centre of wheel to fender droop to ride height/full bump measurements to give wheel travel. Divide wheel travel by coil-over travel

For example –
Coil over Dull Droop (COFD)– 29.45"
Coil Over Full Bump (COFB) -19.45"
Centre Wheel to Bottom Fender Full Droop (CWFD) – 38"
Centre Wheel to Bottom Fender Full Droop (CWFB) – 18"

Coil Over travel = COFD-COFB = 29.45-19.45 = 10"
Wheel Travel =CWFD – CWFB = 20"
Motion Ratio = Wheel travel / Coil Over Travel = 20 / 10 = 2

Scales

Use vehicle corner weight scales to weight the vehicle corner weights then subtract the unsprung weight from the corner weights (tire and wheel, half of the axle housing and diff centre weight for solid axle vehicles OR lower control arm weight for independent vehicles). Multiply this number by your motion ratio.

Using Existing Coil-Over Springs

For accurate weights you can also buy or borrow from a friend existing coil over springs with know spring rates and free lengths.

1. Install them to your installed coil overs. It is easiest using just 1 spring.
2. Bring down the cross over slide or spring seat so its just touching the springs and install.
3. Lower the vehicle down onto the springs and roll the vehicle backwards and forwards to settle
4. Ensure the vehicle is not bottomed out or coil bound or sitting on anything that is holding up weight
5. Measure the installed (static) height of the coil spring
6. Subtract the spring installed height from the spring free height.
7. Multiply the known spring rate by the difference in free height and installed height

For example – 3" i.d x 14" long x 300 lbs spring.
10" static length
14" free height minus 10" static height = 4" travel
4"travel * 300lbs per inch rate = 1200lbs sprung weight

If calculating using dual springs see below –
IMPORTANT : ENSURE CROSS OVER SLIDE IS NOT CONTACTING CROSS OVER RINGS

For example – 3" i.d x 14" long x 300 lbs spring bottom & 3" i.d x 12" long x 200 lbs spring top.
12" static length bottom spring and 8" static length top spring
Combined spring lengths Free and static = 26" free, 20" static
Combined spring rate (300 * 200) divided by (300+200) = 120lb/inch
26" free height minus 20" static height = 6" travel
6"travel * 120lbs per inch rate = 720 lbs sprung weight

Known Weights

Where the above methods are not possible below are some known approximate weights for reference only and are provided only as a starting point. These can be used in conjunction with vehicle scales to calculate sprung weights

Item	Weight Lbs/kgs	Item	Weight Lbs/kgs
Nissan Patrol Y60/Y61 Front Axle weight complete with hubs & Diff (excludes tires and wheels)	320/145	Method 16/17" Race Wheel Alloy	25/11.7
Nissan Patrol Y60/Y61 Rear Axle weight complete with hubs & Diff (excludes tires and wheels)	300/135	Sunraysia Style Steel Wheel 16 x 8	33/15
Toyota L/Cruiser 80/105 Front Axle weight complete with hubs & Diff (excludes tires and wheels)	285/130	37 x 12.5 R17" A/T or Mud Tyre	75/34
Toyota L/Cruiser 80/105 Rear Axle weight complete with hubs & Diff (excludes tires and wheels)	285/130	315/70r16 A/T or Mud Tyre	68/31
Nissan Patrol Y60 sprung corner weight Front Petrol	880-990/ 400-450	305/70r16 A/T or Mud Tyre	63/28.5
Nissan Patrol Y60 sprung corner weight Front Diesel	1170-1210/ 530-550	285/75r16 A/T or Mud Tyre	58/26.5
Nissan Patrol Y61 sprung corner weight Front Petrol	1100-1150/ 500-520	Jeep JL 4 Door sprung corner weight front	860-925/ 390-420
Nissan Patrol Y61 sprung corner weight Front Diesel	1100-1200/ 500-540	Jeep JL 4 Door sprung corner weight rear	750-815/ 340-370
Nissan Patrol Y60/Y61 sprung corner weight Rear Wagon	1170-1250/ 530-570	Jeep JT Glad. sprung corner weight front	1060/480
Nissan Patrol Y60/Y61 sprung corner weight Rear Pickup	840-1100/ 380-500	Jeep JT Glad. sprung corner weight rear	900-990/ 410-450

Toyota L/Cruiser 80/105 sprung corner weight Front Petrol	950/430	Toyota L/Cruiser 80/105 sprung corner weight Rear	1100-1170/ 500-530
Toyota L/Cruiser 80/105 sprung corner weight Front Diesel	1090/495	Toyota L/Cruiser VDJ70 sprung corner weight Front	1000/455

Where existing Dobinsons springs are already being used in a production vehicle, measure the spring length from tip of coil to tip of coil at ride height and supply this measurement to Dobinsons along with the coil spring part number for a sprung corner weight.

Determing Pre-Load

When deciding which springs to fit to your coil-overs, Coil Spring Preload is one of the required inputs and varying factors. Varying amounts of preload will alter the ride height and ride quality, however will not change the spring rate.

Preload is defined as “the amount of pre-tension or preload applied to the coil springs whilst the coil-over is in its fully extended position”.

“Zero Preload” is the point at which the top spring seat is adjusted down until the seat just makes contact with the top coil spring while the springs are fully assembled with both top and bottom coil-over, the coil slider and both springs seats; and when the springs are located correctly on the springs seats and the slider while the coil-over is at full extension.

Preload is then the amount at which the top spring seat is threaded down from the Zero preload position.

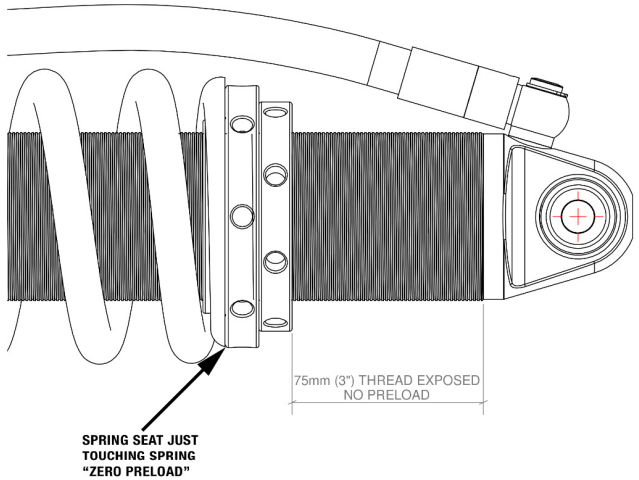
Usually to measure this, install the springs (the longer springs on the bottom) install the slider and cross over rings, align the springs to the seats and bring down the top spring seat until zero preload (when it just touches the top coil spring). Measure the thread exposed at the top of the body (3” in the example over the page – please note this is just an example measurement do not use this). Then adjust down the preload to the desired amount – for the example over page for 2” preload the top spring seat is threaded down a further 2” from zero preload to give 5” of exposed thread. This position is 2” preload.

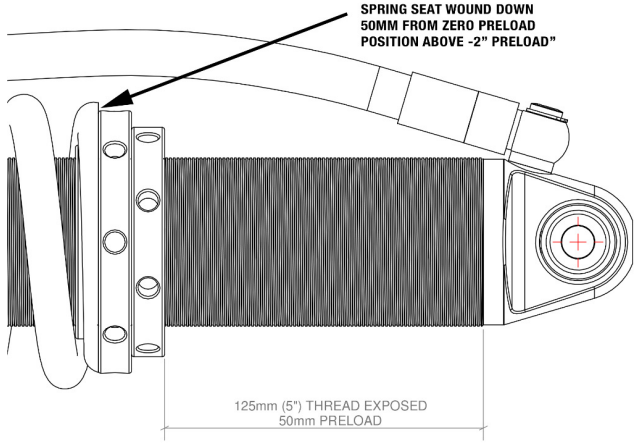
Selection of the required preload front and rear should also be determined by an experienced vehicle/suspension builder, designer or fabricator. In the absence of chassis/suspension design and fabrication input, the below can be use as an approximate guide only.

Front –
For solid axle vehicles with Coil-overs mounted to axle approximately 1-2” preload (closer to 2”)
For independent vehicles with motion ratios approximately 1-1.5” preload

Rear –

For the rear of most vehicles around 2 – 3” preload. For vehicles with axle mounted shocks and less compression travel closer to 2” is better and for vehicles with trailing arm style longer travel closer to 3” is better.





Spring Selection

Selection of the required springs should also be determined by an experienced vehicle/suspension builder, designer or fabricator. In the absence of chassis/suspension design and fabrication input, the below can be use as an approximate guide only.

Spring Lengths

The upper spring should generally be the same length as the coil over travel and the lower spring 2" longer than the coil over travel. i.e. for a 12" travel coil over use a 12" longer upper spring and 14" lower spring.

Spring Rates

When calculating the required spring rates you must first have determined/calculated the following information

- Ride Height
- Droop / Compression amounts or ratio
- Sprung corner weights
- Spring Pre-load

1 – Calculate Primary Spring rate

The first step is to calculate the required primary or the initial combined spring rate.
This is Sprung Weight / (droop travel + Preload).

For example 1000lbs sprung weight, 8" desired droop travel from ride height, 2" preload
This equals 1000 / (8+2) = 1000 / 10 = 100lbs/inch primary spring rate

2 – Determine step up ratio

The step up ratio is the amount of increase from primary spring rate (combined initial spring rates stated above) and the final spring (the spring rate of the lower spring) once the cross-over slider has engaged the lock rings and has stopped the upper spring from compressing.

Generally in most cases an increase of spring rate from the primary spring rate to the final spring rate is usually around 2x – 2.5x. For example a combined spring rate of 100lbs/inch and a final spring rate of 250lbs/inch is 2.5x.

3 – Calculate final spring rate

Multiply the primary spring rate by 2 or 2.5 to give the final spring rate. This will be the spring rate of your lower spring.

4 – Calculate the upper spring rate

The primary spring rate is not the spring rate of the upper spring, but infact the combined spring rates of the upper and lower. To calculate the upper spring rate use the formula below

(final spring rate * primary spring rate) / (final spring rate - primary spring rate)
For example – 100 lbs primary spring rate, 250 lbs final spring rate
Equals (250 * 100) – (250-100) = 25000 / 150 = 166lbs/inch upper spring

Use the required upper and lower spring rates and the charts below to work out which combinations will suit.

Below are some examples

Example A).

Vehicle - 1200lbs corner weight, axle mounted coil-over front, 1:1 ratio, 14" Coilover, 7" compression travel, 2" preload, 2.5x step up ratio

Sprung weight = 1200lbs – corner unsprung weight (half axle,tire wheel assembly weight)= 1000lbs
Primary rate = 1000 / (7+2) = 1000 / 9 = 111lbs/inch
Final rate (lower spring rate) – 111lbs/inch * 2.5 = 277
Upper Spring Rate (277* 111) – (277-111) = 30747 / 166 = 185lbs/inch upper spring

Option 1 - A 200lb/inch upper and 300/inch lower will give 120lb/inch initial rate and 300lb/inch final rate with 2.5x step up ratio and about 1.3" preload with a 14" upper and 16" lower long spring

Option 2 - A 200lb/inch upper and 250/inch lower will give 111lb/inch initial rate and 250lb/inch final rate with 2.25x step up ratio and about 2" preload with a 14" upper and 16" lower long spring

Example B).

Vehicle - 1150lbs corner weight, independent arm mount coil-over front 1.5:1 motion ratio, 12" Coilover, 6" coilover compression travel (9" wheel), 1" preload, 2.5x step up ratio

Wheel travel = Coil-over travel * motion ratio = 12" * 1.5 = 18"
Sprung weight = 1150lbs – corner unsprung weight (corner tire wheel assembly weight, hub & spindle)*motion ratio= (1150 – 150)*1.5 = 1500lbs
Primary rate = 1500 / (6+1) = 1500 / 7 = 214lbs/inch
Final rate (lower spring rate) – 214lbs/inch * 2.5 = 535
Upper Spring Rate (535* 214) – (535-214) = 114490 / 321 = 356lbs/inch upper spring

Option 1 - A 350lb/inch upper and 550/inch lower will give 214lb/inch initial rate and 550lb/inch final rate with 2.57x step up ratio and about 1" preload with a 12" upper and 14" lower long spring

Option 2 - A 350lb/inch upper and 500/inch lower will give 205lb/inch initial rate and 500lb/inch final rate with 2.04x step up ratio and about 1.3" preload with a 12" upper and 14" lower long spring

Example C).

Vehicle - 1400lbs corner weight, solid axle trailing arm coil-over mounted to arm rear, 2:1 motion ratio, 12" Coilover, 7" coilover compression travel (9" wheel), 3" preload, 2.5x step up ratio

Wheel travel = Coil-over travel * motion ratio = 12" * 2 = 24"
Sprung weight = 1400lbs – corner unsprung weight (half axle,tire wheel assembly weight)*motion ratio= (1400 – 200)*2 = 2400lbs
Primary rate = 2400 / (7+3) = 2400 / 10 = 240lbs/inch
Final rate (lower spring rate) – 240lbs/inch * 2.5 = 600
Upper Spring Rate (600* 240) – (600-240) = 144000 / 360 = 400lbs/inch upper spring

Option 1 - A 400lb/inch upper and 600/inch lower will give 240lb/inch initial rate and 600lb/inch final rate with 2.5x step up ratio and 3" preload with a 12" upper and 14" lower long spring

Spring Selection

Dobinsons 2.5" coil-overs can be fitted with any brand springs with 3" inside diameter suitable for use with coil over springs. Dobinsons also stock a range of 3.0" i.d. coil-over springs.

Part numbers are identified as below:

C92-3016300

All universal coil-over springs start with "C92" then the numbers after the dash give the inside diameter in inches, length in inches and spring rate in lbs/inch

C	92	30	16	300
"C" Coil For	92 – identifies coil as universal coil-over coil	Inside diameter in inches 25 = 2.5" 30 = 3.0" 37 = 3.75"	Spring free length in inches 16 = 16" long	Spring rate in lbs/inch 300 = 300lbs/inc

Available springs in 3.0" inside diameter

Part Number	Length inch	Rate Lbs/ inch	Solid Length Inch	Part Number	Length inch	Rate Lbs/ inch	Solid Length Inch
C92-3010100	10	100	3.29	C92-3010150	10	150	3.44
C92-3010200	10	200	3.84	C92-3010250	10	250	3.55
C92-3010300	10	300	4.00	C92-3010350	10	350	4.46
C92-3010400	10	400	4.21	C92-3010450	10	450	4.76
C92-3010500	10	500	4.37	C92-3010600	10	600	4.83
C92-3012150	12	150	3.64	C92-3012200	12	200	4.00
C92-3012250	12	250	4.39	C92-3012300	12	300	5.00
C92-3012350	12	350	4.95	C92-3012400	12	400	5.25
C92-3012450	12	450	5.27	C92-3012500	12	500	5.60
C92-3012600	12	600	4.83				
C92-3014150	14	150	4.87	C92-3014200	14	200	5.30
C92-3014250	14	250	5.90	C92-3014300	14	300	5.63
C92-3014350	14	350	5.87	C92-3014400	14	400	5.80
C92-3014450	14	450	6.13	C92-3014500	14	500	5.61
C92-3014550	14	550	5.85	C92-3014600	14	600	6.12
C92-3014600	14	600	6.35				
C92-3016200	16	200	5.59	C92-3016250	16	250	6.25
C92-3016300	16	300	6.70	C92-3014350	16	350	7.62
C92-3016400	16	400	6.78	C92-3014450	16	450	6.46
C92-3016500	16	500	6.67	C92-3014550	16	550	6.93
C92-3016600	16	600	7.67	C92-3016650	16	650	7.53
C92-3016700	16	700	7.44				

Combined Primary Spring Rate Chart

The chart below can be used to calculate the combined spring rate of the upper and lower spring.
Select a spring from the left column and the top row and then find the intersecting box to see the combined spring rate of the 2 springs.

	100	150	200	250	300	350	400	450	500	550	600	650	700
100	50	60	67	71	75	78	80	82	83	85	86	87	88
150	60	75	86	94	100	105	109	113	115	118	120	122	124
200	67	86	100	111	120	127	133	138	143	147	150	153	156
250	71	94	111	125	136	146	154	161	167	172	176	181	184
300	75	100	120	136	150	162	171	180	188	194	200	205	210
350	78	105	127	146	162	175	187	197	206	214	221	228	233
400	80	109	133	154	171	187	200	212	222	232	240	248	255
450	82	113	138	161	180	197	212	225	237	248	257	266	274
500	83	115	143	167	188	206	222	237	250	262	273	283	292
550	85	118	147	172	194	214	232	248	262	275	287	298	308
600	86	120	150	176	200	221	240	257	273	287	300	312	323
650	87	122	153	181	205	228	248	266	283	298	312	325	337
700	88	124	156	184	210	233	255	274	292	308	323	337	350

Installation & Assembly of Coil Overs

Installation and assembly of the coilovers should also be done by an experienced vehicle/suspension builder, designer or fabricator.

Assembly

Dobinsons coil-overs are supplied precharged with 150PSI of nitrogen gas. This can be released if required but the vehicle should not be driven whilst the coil-overs are decharged. Dobinsons Coil-overs must be gassed to between 150 and 250 psi using a no loss chuck.

1. Adjust the upper body end coil seat and lock rings to the top of the thread
2. Slide up the lower shaft end spring seat, remove the locking collars and remove the spring seat
3. Ensure the cross over slider lock rings are installed and move them about halfway up the body thread
4. Install the shorter of the 2 coil overs, locating them on the spring seat.
5. Install the cross over slider with the longer “snout” to the bottom shaft end and the shorter snout to the top. It is recommended to be fitted this way, it can be flipped in special circumstances if required but this may lead to premature failure.
6. Install the longer spring locating it on the cross over slider
7. Install the lower spring seat, install the locking collars, install the o ring to hold them in place then slide the coil seat back down onto the locking collars.
8. Align the springs with the cross over slider and spring seat

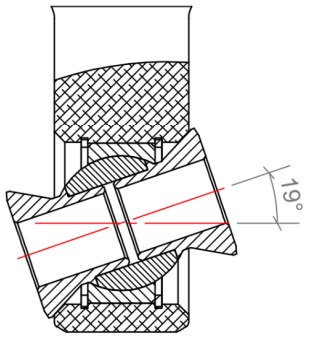
9. Align the ends of the coils on the slider so that they are at 180° to each other so that the ground flats on the coils are aligned
10. Wind down the upper spring seat until the spring seats and it just touches the top and both things are seated correctly on the slider and spring seat and the spring seat just touches the top spring in the zero preload position
11. Bring down the locking ring until it just touches.
12. Measure the exposed thread on the top of the body and then adjust the spring seat down from there to give you the desired preload
13. The cross over slider lock rings can be adjusted once on the vehicle.
14. The cross over slider lock rings can generally be set at around 0 – 3” gap from the cross over slider at ride height depending on the amount of up travel available. Start at around 1-1.5” gap in the front and 2-3” in the rear and tune from there.
15. Lock the 2 cross over slider lock rings together with a hammer and flat blade screw driver or similar

Installation

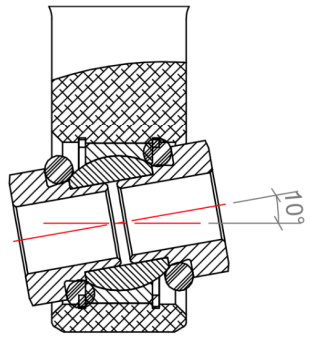
Below are some guidelines for installation

“IMPORTANT FITTING INSTRUCTION”

Bearings, Misalign Spacers and Mounts MUST NEVER BIND through full travel and articulation on both upper and lower mounts. Remove O-rings and Use high clearance misalign spacers for high angular travel applications.Binding of spacers, bearings or mounts will results in premature failure. Further Chamfering of bearing housing may be requiredif bind is still present with hi-angle spacers fitted.

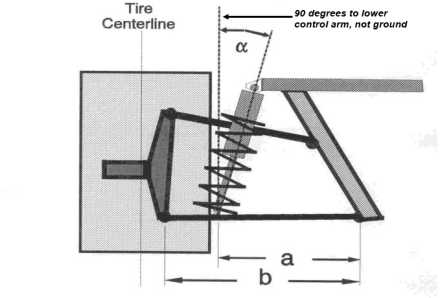


HIGH ANGULAR TRAVEL APPLICATIONS - O-RINGS REMOVED, HI-ANGLE SPACERS FITTED. MAX APPROX. 19°



LOW ANGULAR TRAVEL APPLICATIONS - STRAIGHT MISALIGN SPACERS & O-RINGS FITTED. MAX APPROX. 10°

- ½" high tensile mounting bolts must be used top and bottom
- Mounting tabs/clevis for shocks should be designed and fabricated from suitable gauge steel and designed to exceed forces generated by the coil-over damping and springs
- The coil-over shocks are not designed to have excessive extension force applied to them – use limiting straps to prevent excessive topping out
- The coil-over shocks must not be bottomed out – ensure suitable bump stops are used to prevent complete bottom out of the coil-over
- For solid axle vehicles - Where possible mounting the top coil over mount as high as practical is recommended for maintaining sufficient compression travel and for vehicle stability.
- Try to keep the coil-overs mounted as far outward on the axle as possible for stability
- When mounting directly to the axle on solid axle vehicles, try to keep the coil-over within around 15° of vertical.
- Try to mount the coils at around a 5° incline at the top on solid axle vehicles
- Try to avoid excessive motion ratios. Around 1.7 wheel to shock travel ratio should not be exceeded
- When mounting to independent arm or trailing arm setups try to setup so that the coil should finish at 90° to the lower control arm when the vehicle is bottomed out as per the picture below – this will introduce a rising rate motion ratio that will aid in reduce bottom out. This is not critical but will provide the best performance



- Ensure the reservoir hose is not under extensive compression or extension
- The reservoir can be mounted to existing tube work or mounts with worm drive hose clamps
- The reservoir should be positioned where possible in a position away from heat sources and with direct airflow for maximum cooling and performance
- Once the shocks mounts are tacked in, cycle the suspension to ensure the spherical bearings on each end don't bind and lock up, check for coil and shock clearances
- ***NOTE: The hose banjo fitting at the reservoir end is a 2-way swivel to allow the house to rotate and also twist. For piggyback type shock absorbers the reservoir adjustment knobs usually go to the bottom. ALWAYS align the shock absorber rod end so the rebound adjustment screw is accessible.***

Tuning, Damping and Adjustment Of Coilovers

Dobinsons Coilovers are designed with a lot of adjustment and tuning capability in mind. The following aspects can be adjusted:

- Coil Spring Rates – upper, lower, primary combined
- Coil Spring Preload
- Spring height and vehicle ride height
- Dual Rate Cross-over slider stopper ring height
- Low Speed Compression Reservoir adjustment
- High Speed Compression Reservoir adjustment
- Rebound Damping adjuster located on the shaft end of the coil-over
- Main Piston Compression Shim Stack
- Main Piston Free bleed
- Main Piston Rebound Shim Stack

Combine these adjustments with the vehicle suspension geometry, ride height, motion ratios, anti-squat and anti-dive percentages, scrub radius and other suspension geometry changes and there is an infinite amount of combinations, adjustments and setups that can be achieved.

For these reasons, as mentioned many times through-out this manual the tuning of the suspension should be performed by an experience shock or suspension tuner. The correct setup and tuned suspension will have an enormous effect on the vehicle handling, safety comfort and capability.

Where a tuner is unavailable or not used, the below information is a guide only that may help make some improvements to the suspension, however it is ultimately the responsibility of the suspension tuner to get the most out of the suspension.

Damper Adjustment Settings

Turn the adjusters to the softest position – completely out in the anti-clockwise direction and count the clicks in. These shock absorbers are a high-performance shock absorber designed and engineered to run warm and therefore you may experience a slightly firmer ride when cold. Gas pressures can be adjusted also if required – Minimum gas pressure 150psi. Maximum pressure for all shocks 250psi.

Start With Adjusters in softest position (fully out/anti clockwise) and count clicks in

Important: When adjusting the dials do not over toque the dials. Each dial should be able to be moved by hand or with the small adjustment tool provided. Do not over-torque the dials at the end of the dial travel as this may cause permanent damage to the components.

Compression

The compression adjusters operate by allowing a low speed bleed path combined with a high speed digressive shim stack to allow adjustments in both the low speed shaft movements and high speed shaft movements (note - this is not vehicle speed). It is important to note that due to the nature of the low speed bleed path bypassing the high speed compression stack that each adjuster does have a small effect on the other i.e. the low speed will have a small effect on the high speed and vice versa. Also, the higher the adjuster is set to, the more affect the opposing adjuster will have with each click.

IMPORTANT: it is recommended where possible to run the compression adjusters as low as possible. In cases where both compression adjusters are set to more than 3/4 in (compression damping at ¾ of maximum stiffness) the main piston compression damping be increased and the reservoir low and high speed compression adjusters reduced.

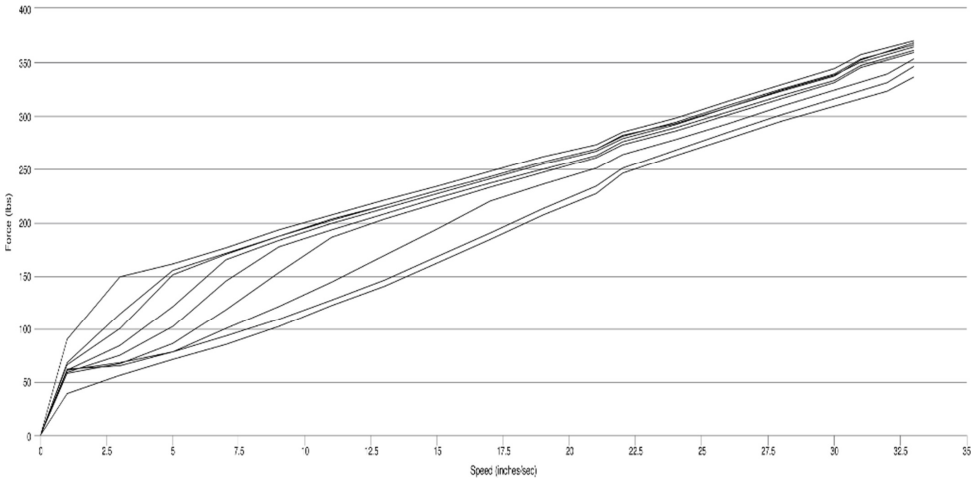
IMPORTANT: The reservoir high speed compression shim should not be altered. Altering this shim stack may permanently damage the coilover or cause accelerated wear or performance issues.

Low Speed Compression (LSC)

The low speed adjustment is increased by turning the smaller adjustment dial on the reservoir clockwise and is decreased by turning it anti-clockwise and has approximately 20 clicks.

Low speed compression primarily affects the compression damping during low speed shaft movements such as vehicle pitch, dive and roll, wheel traction and vehicle ride (harshness and plushness). Lower settings will provide a smoother more compliant ride but will sacrifice stability whilst higher settings will result in a firmer less compliant ride but provide better body control & stability. If unsure, choose a setting that you feel provides good vehicle body control and stability without excessiveness harshness.

If you are unable to achieve a firm enough setting you can increase the high speed adjustment to suit and if you are unable to achieve a soft enough setting then you may reduce the high speed adjustment. See the graphs below for a sweep of the low speed compression adjustments – NOTE: Every 2nd click has been omitted for clarity. High speed compression set at midpoint.

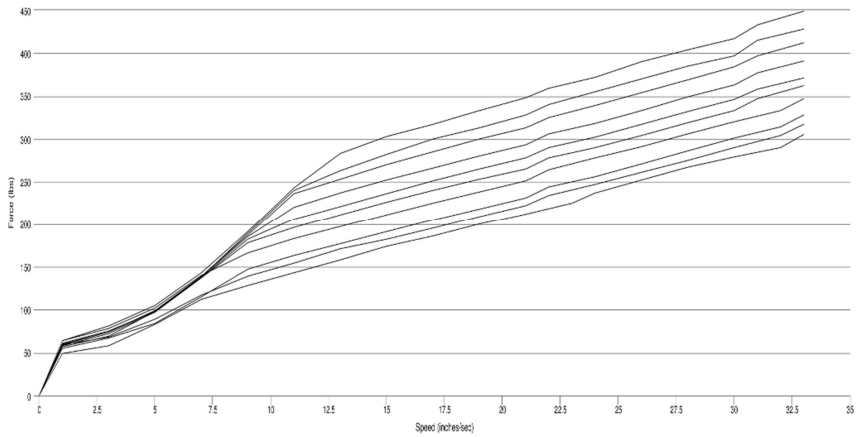


High Speed Compression (HSC)

The high speed adjustment is increased by turning the larger adjustment dial on the reservoir clockwise and is decreased by turning it anti-clockwise and has approximately 10 clicks. NOTE: Turning the dial clockwise will screw the adjustment assembly outward as it is a left-hand thread, this is normal. You can use the tool provided but do NOT apply a lot of pressure towards the end of the adjustment range as it may result in component damage.

High speed primarily affects the compression damping during high speed shaft movements such as harsh or square edge bumps and harsh vehicle landings. Lower settings will provide a slightly smoother ride but will be more prone to bottoming out, whilst higher settings will result in a firmer less compliant ride but reduce bottoming. It is recommended to choose a setting that is as low as possible whilst minimizing bottoming.

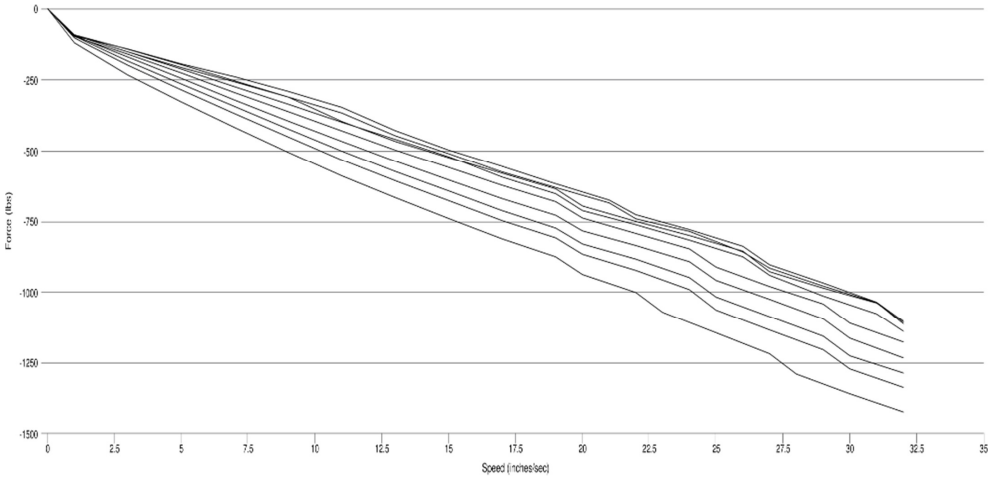
If you are unable to achieve a firm enough setting you can increase the low speed adjustment to suit and if you are unable to achieve a soft enough setting then you may reduce the low speed adjustment. See the graphs below for a sweep of the low speed compression adjustments. Low speed compression set at midpoint.



Rebound

The rebound adjustment is increased by turning the small grub screw/dial adjuster on the rod end clockwise and is decreased by turning it anti-clockwise. Coil-over shocks have around 12 clicks of rebound adjustment. You can use the tool provided to make adjustments on shocks or a stubby flat blade screw driver.

Rebound damping adjustment affects both high and low speed rebound valving and control the release of the stored energy from the springs. To little rebound damping can cause the vehicle to wallow, can cause the vehicle to kick up harshly after large bumps, dips or washouts and can cause frequent topping out. Too much rebound can cause a harsh ride and when driving over continued corrugations, bumps or whoops it can cause loss of traction, cause the vehicle to skip and steer erratically and can cause the suspension to pack down towards the bump stops.



Damper settings for different terrain

If you are spending extended periods of time on different terrains then you may wish to alter your damper settings to suit the particular terrain, they can be recorded on page 6. Some tips are below

- Road and highway settings can be set to you desired ride quality and vehicle stability compromise
- Hard pack corrugated dirt roads / Rough rocky terrains generally will require the vehicle to be more compliant and therefore both LSC and rebound may be on the lower side
- Sandy conditions will generally require firmer settings to prevent bottom and with the tyre pressures typically reduced, comfort will be less of an issue.

- For high speed repetitive corrugations/whoops/large bumps generally the rebound will need to be down quite low to maintain chassis stability and to prevent packing and the LSC on the lower side to allow suspension compliance

Shim Stacks and Free bleed

Dobinsons 2.5" coil-overs are supplied with a T6 6061 high flow, performance offroad racing piston.

The piston is supplied with 3 x threaded bleed holes with 1 x grub screw fitted. Removing or adding the additional grub screws will change the amount of free bleed

Dobinsons 2.5" coil-overs are supplied with 12mm inside diameter, 48 – 20mm outside diameter shims with thickness's of 0.2,0.3,0.4 and 0.5mm.

They can be shimmed in many different to provide different ride and handling characteristics.

Below is a chart of different shim stack combinations. The "F" is for a flutter stack, "C" for Compression and "R" for Rebound. The numbers then identify the stacks with their corresponding thickness's. These exact stacks do not need to be used, however if altering the shim stacks it is recommended to try to maintain a pyramid style stack with the outside diameters stepping down as below. Incorrectly setup shim stacks may cause shims to break or deform.

Dobinsons coil-overs are supplied with a C3, R3 shim stack combination as standard. They are also supplied with a spare FC1 and C5 stacks that can be used to make different compression or rebound stacks. This along with the 3-way adjustment feature allows large amounts of damping changes with the supplied coil-overs.

	Compression Stacks												
	Shim Thickness												
Stack #>	**FC1**	**FC2**	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**	**C9**	**C10**	**C11**
Shim O.D. v													
48	0.2	0.2	0.2	0.2	**0.2**	0.3	0.4	0.4	0.5	2x0.3	2x0.4	2x0.5	2x0.5
42	0.2	0.2	0.2	0.2	0.3	0.3	0.4	0.4	0.5	2x0.3	2x0.4	0.5	2x0.5
24 (f)	0.3	0.3											
38	0.2	0.3	0.2	0.2	0.3	0.3	0.4	0.4	0.5	0.5	0.5	0.5	0.5
32	0.2	0.3	0.2	0.3	0.3	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5
28	0.2	0.3	0.2	0.3	0.3	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5
24	0.2	0.3	0.2	0.3	0.3	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5
20	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
48	**RATE PLATE**												

	Rebound Stacks												
	Shim Thickness												
Stack #>	**FR1**	**FR2**	**R1**	**R2**	**R3**	**R4**	**R5**	**R6**	**R7**	**R8**	**R9**	**R10**	**R11**
Shim O.D. v													
42	0.2	0.2	0.2	0.2	0.3	0.3	0.4	0.4	0.5	2x0.3	2x0.4	2x0.5	2x0.5
38	0.2	0.3	0.2	0.2	0.3	0.3	0.4	0.4	0.5	2x0.3	2x0.4	0.5	2x0.5
24 (f)	0.3	0.3											
32	0.2	0.3	0.2	0.3	0.3	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5
28	0.2	0.3	0.2	0.3	0.3	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5
24	0.2	0.3	0.2	0.3	0.3	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5
20	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
25	**WASHER**												

Basic Tuning guide

There are infinite ways to tune a vehicles suspension and the below method can be used in the absence of suspension tuners. Use a small zip tie on the shock shafts to see how much travel is being used (ensure the shock will not bottom and damage seals!!). Use slow motion video cameras (available on most smart phones) to film the vehicle and suspension for more accurate analysis of what is occurring and diagnosis of issues. It is important to keep in mind the capability of the vehicle and suspension design used to know the vehicle limitations when determining how aggressive the terrain and driving style is you plan on using. A coil-over swapped production vehicle will not be able to encounter terrain a purpose built trophy truck can.

The goal is to use all the available suspension on the roughest terrain you plan on driving, to use as little compression damping as possible without bottoming out the vehicle frequently, keeping in mind that on large hits and g outs bottoming can be unavoidable and use as little rebound as possible to keep the wheels following the ground without the vehicle bucking up uncontrollably or handling poorly.

1. First ensure the correct spring rates, preload, ride height and compression/droop travel setup is used. Incorrect setups will make it nearly impossible to tune the vehicles suspension. Ensure tyres are set to required pressure – over inflated tyres can make the ride very harsh.

2. Set all adjusters fully out in their softest position. Set the crossover lock ride to slider gap at ride height to around 1-1.5" gap in the front and 2-3" in the rear and tune from there. Find a section of washboards and small whoops

3. Run the washboards and whoops slowly at first. Slowly increase speed and whoop size when your comfortable. Adjust the LSC, HSC and Rebound and cross-over lock ring gap as required (using the information in the next section) so that the chassis is running mostly flat through the whoops. Bring the cross-over ring lock rings down (if required) and increase the

compression (if required) so that the chassis is just rising through the whoops, you don't want it jumping up, harsh or packing down.

If the vehicle is harsh with adjusters set fully out, move the cross-over lock rings up and is still harsh change the piston shim stacks to softer stacks, increase bleed if required.

If the vehicle is good through the whoops but harsh on the washboards this may require softening the LSC or increasing the piston free bleed.

4. Once happy with the vehicle through the washboards and whoops find some G-Outs and jumps (suitable to the capability of your vehicle) to get the vehicle close to bottoming. Adjust the HSC to use all the travel but prevent harsh bottoming. Adjust the rebound so the vehicle sticks the landing and rises up past ride height and then settles but does not bounce up and down a few times after landing.

Trouble Shooting Tips & Ride Diagnostics

- Increasing piston free bleed will soften rebound damping much more than compression.
- Increasing piston free bleed is the most effective way to soften the ride on washboards and smaller sharper road inputs but will increase body movements (body roll, dive etc)
- Decreasing piston free bleed will do the opposite to above
- Flutter shim stacks are generally used only on very light vehicles
- Due to the heavy unsprung weight and inertia pushing the axles and wheels forward rather than following the terrain, solid axle vehicles will generally require less rebound to allow the springs to force the wheels into the terrain/whoops/dips
- Using less rebound or lighter rebound will make the rebound "faster" allowing the wheels to extend faster.
- If the chassis is falling or getting pulled into the dips/whoops, packing down over consecutive bumps, falls quickly on a drop off, is skatey, has loose traction or the engine snapping up in rpm during acceleration then it is likely there is to much rebound - decrease rebound.
- Using more Compression or increasing compression damping will reduce bottom-out
- Increasing Low speed compression damping while likely require a decrease in high speed rebound
- When using coil-overs in conjunction with bypass shocks, generally the coil-overs should have very light compression and rebound valving so the bypass shock can do most of the damping to give the best performance
- When tuning, find a section of terrain that allows repeatability and comparison of results with identical terrain inputs and speeds for the most accurate tuning and diagnosis
- Moving the cross over slider lock rings closer to the cross over slide at ride height will reduce body movements (body roll, pitch dive etc)
- Moving the cross over slider lock rings up or down, even by an inch or 2 can have a dramatic change in the vehicle handling characteristics

- Having sufficient droop travel at ride height is just as important as compression travel so that the wheels can follow the terrain and not fall away, allowing use of the full shock travel
- It is best to run swaybars on the vehicle also rather than trying to tune out body roll with the shock low speed rebound or compression as this may cause the vehicle to be harsh and cause other side affects
- IMPORTANT: Where large amounts of free bleed are used on junction with low settings on the rebound adjustment, this may cause undesirable affects due to large amounts of piston bypass. This may require a lighter rebound stack used with the rebound adjustment adjusted in most of the way

The table below serves only as a guide for users to achieve the optimal compromise suited to their desired outcome. Results & Symptoms are subjective and different users may desire different outcomes. Symptoms may require a combination of remedies to improve the issue. Adjustments made independently between front and rear may be required to rectify symptoms.

Symptom	Possible Cause	Remedy
Harsh Ride	Incorrect Spring Rates / preload	Check Pre-load amounts per manual and adjust spring rates accordingly
	Incorrect Cross-Over slider Position	Increase cross over slider gap to lock rings at ride height
	Insufficient compression travel	Increase compression travel
	Too much LSC Damping	Decrease LSC damping. IF LSC is at minimum reduce HSC damping
	Insufficient Piston free bleed	Increase piston free bleed
	Too Much Compression Damping	Change main piston compression shim stack to softer stack. Use flutter stack if required
	Too much Rebound damping	Decrease rebound damping
Suspension never bottoms out, not using all available travel	Incorrect Spring Rates / preload	Check Pre-load amounts per manual and adjust spring rates accordingly
	Incorrect Cross-Over slider Position	Increase cross over slider gap to lock rings at ride height
	Too much Compression Damping	Decrease HSC damping. IF HSC is at minimum reduce LSC damping
		Change main piston compression shim stack to softer stack. Use flutter stack if required
		Add additional 20 x 0.5mm shims under rate plate on compression stack

Coilover Settings

Setting 1

Front		Rear	
Dial	**Setting**	**Dial**	**Setting**
Spring Upper		Spring Upper	
Spring Lower		Spring Lower	
Cross-Over Gap @ ride		Cross-Over Gap @ ride	
Preload		Preload	
Shaft showing @ ride		Shaft showing @ Ride	
Compression Stack		Compression Stack	
Rebound Stack		Rebound Stack	
Bleed Holes Open		Bleed Holes Open	
HSC Adjuster Setting		HSC Adjuster Setting	
HSC Adjuster Setting		HSC Adjuster Setting	
Reb. Adjuster Setting		Reb. Adjuster Setting	

Setting 2

Front		Rear	
Dial	**Setting**	**Dial**	**Setting**
Spring Upper		Spring Upper	
Spring Lower		Spring Lower	
Cross-Over Gap @ ride		Cross-Over Gap @ ride	
Preload		Preload	
Shaft showing @ ride		Shaft showing @ Ride	
Compression Stack		Compression Stack	
Rebound Stack		Rebound Stack	
Bleed Holes Open		Bleed Holes Open	
HSC Adjuster Setting		HSC Adjuster Setting	
HSC Adjuster Setting		HSC Adjuster Setting	
Reb. Adjuster Setting		Reb. Adjuster Setting	

Setting 3

Front		Rear	
Dial	**Setting**	**Dial**	**Setting**
Spring Upper		Spring Upper	
Spring Lower		Spring Lower	
Cross-Over Gap @ ride		Cross-Over Gap @ ride	
Preload		Preload	
Shaft showing @ ride		Shaft showing @ Ride	
Compression Stack		Compression Stack	
Rebound Stack		Rebound Stack	
Bleed Holes Open		Bleed Holes Open	
HSC Adjuster Setting		HSC Adjuster Setting	
HSC Adjuster Setting		HSC Adjuster Setting	
Reb. Adjuster Setting		Reb. Adjuster Setting	

Product Care, Maintenance & Rebuild

Dobinsons coilovers should be kept clean, especially around the shaft seal and periodically inspected for any signs of issues including: Visible oil leaks, damage to the shock rod, hose damage or wear and any other obvious damage.

The coilovers can be cleaned with regular car wash and the bodies can periodically be waxed with automotive wax.

The nitrogen gas pressure should be checked prior to every race and should be set to around 200psi with the shock absorber at full droop. The pressure can be as low as 150psi for lightly valved shocks and upto a max of 250psi for heavy valved shocks. Gas pressure does not change the valving ride or spring rate, it is there to keep the shocks from cavitating only.

For street and partial offroad driven vehicles the coil-overs will not require servicing and rebuilding as the seal and oil systems are designed for long term use.

For mixed street and offroad driven vehicles the coil-overs can be serviced as required or every 70,000-100,000klms.

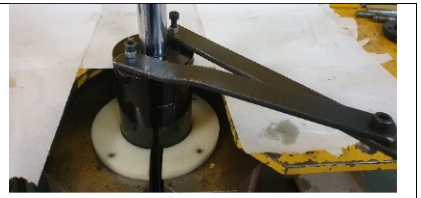
A high quality 5wt fully synthetic oil with the highest possible viscosity index should be used

For race vehicles the shock absorber rebuilt with new seals, shaft guides, wear bands, oil and a complete clean every 2000klms.

Rebuild Procedure

WARNING: Dobinsons shock absorbers are gas charged at extremely high pressure and are extremely dangerous. This guide is a basic guide for rebuilding MRR, MRA and IMS Monotube shocks. Recommended to only be rebuilt by experienced shock absorber rebuilders. It is the rebuilders responsibility to ensure all relevant safety equipment is used and safe work practices are followed. *Never hold the shock absorber shaft/rod directly in a vice or sharp edge or surface – use only the correct brass or soft aluminum soft jaws with half circle recess's to hold the shaft. To make these simply clamp 2 pieces of brass or aluminium 50 x 25mm or 2 x 1" together with the wider surfaces touching, and drill through the centre of both sections a hole (21mm for 22mm shaft.*

1. Set both compression adjusters fully out (anticlockwise)	
2. Remove dust cap grub screw with2.5mm allen ken and un-screw dust cap with pin spanner.	



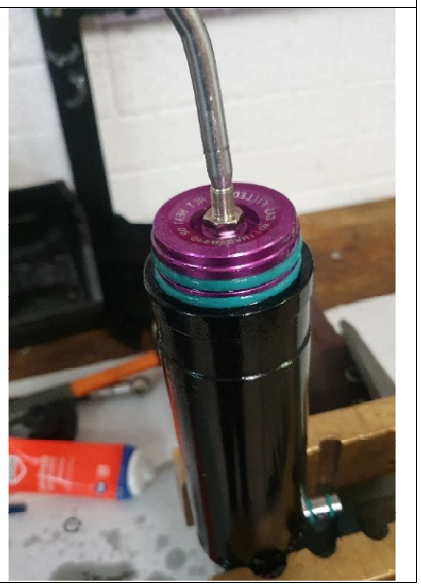
3. <u>DEGASS SHOCK (Shrader Valve or Needle Valve)</u>
   <u>IMPORTANT NOTE</u> If the floating piston D-Ring has failed, the oil chamber may become pressurized making it extremely difficult to open- this is evident by the seal cap popping back up as you try to push it down. In this case you will need to cover one of the hose fittings with a rag and very carefully crack the hose fitting to relieve the pressure.

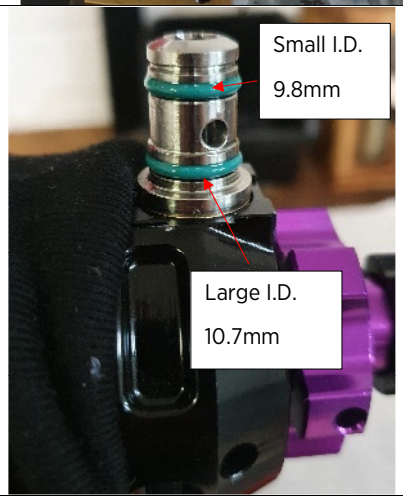
   For IMS shocks an assembly machine will be required as well as a cover for the seal assembly end to catch the pressurized oil.

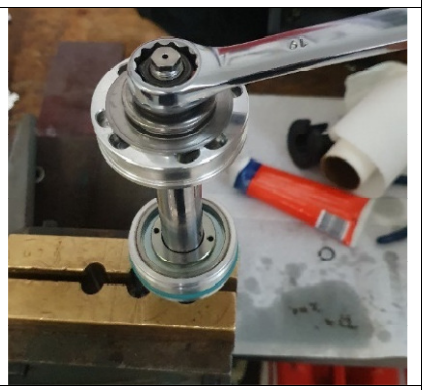
4. Push down seal head assembly. This is often very tight and may require a cut tube spacer between the rod end and seal head assembly while you use a rubber mallet to hammer down the rod end to push down the seal head assembly.
5. Alternatively use the assembly press and relevant tooling to attach to the rod end, install the cut tube spacer between the rod end and seal assembly and press down.

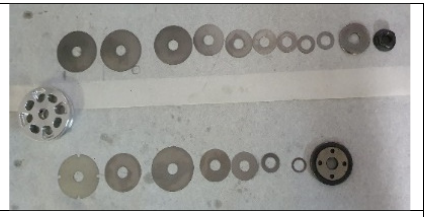
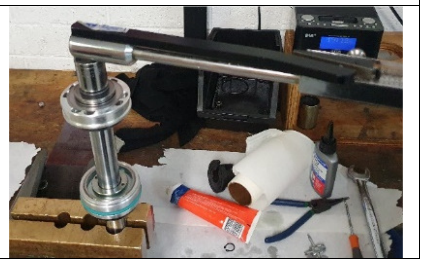
6. Remove circlip with a seal pick. <u>Apply some lubricant into the circlip groove</u>

7. Pull up the rod and seal head assembly together, wriggling as you go and remove from shock. This can also be quite difficult and may require you to pull it up, push it back down, regrease the circlip groove and try again or hold the rod end and shaft in softjaws vice while you tap the body down with a rubber mallet. Alternatively use the assembly machine to very slowly pull up the shaft assembly, wriggling it as you slide it up.	
8. When the main piston is almost out of the shock, remove the top attachment from the machine if using machine, and then slowly pull the piston up by hand, with your fingers around the wear band so it doesn't fall into the shock	
9. Tilt the piston on an angle about 30 or 40 degrees and rotate it around to drain the compression and rebound ports oil back into the shock	
10. If only re-shimming the shock or change the shaft seals or shaft then skip to step 29. Otherwise for other parts and oil replacement see the sections below	
11. Drain oil into suitable waste container, or clean container if re-using.	
Remote reservoir Part Replacement Steps 12 – 89. (hose, hose o-rings, floating piston or seals, oil, reservoir seals or end caps). If only re-shimming or changing shaft seals skip to **Step 30**	
12. Sit the reservoir on top of the vice so that the vice supports the hose end of the reservoir. For compression adjustable shocks support the shock by the <u>reservoir end housing</u> on the hose end – **do not put pressure on the low or high speed adjustment knobs**	

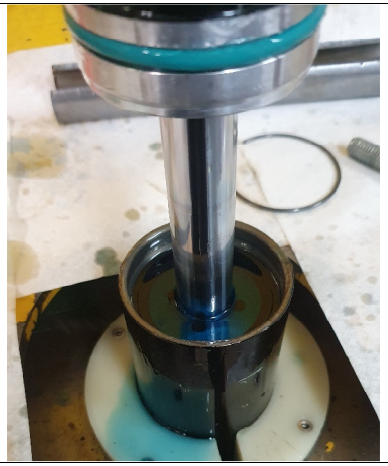
13. Remove the shrader valve inner valve core to allow free movement of the end cap and floating piston.	
14. Put a rubber or poly bush or similar on top of the shrader cap housing and tap down with a rubber mallet	
15. Remove circlip and apply lubricant to circlip groove	
16. Very carefully using a shrader valve puller tool remove the end cap. Alternatively use a compressed air gun to gently pressurize and pop the end cap up. TAKE EXTREME CARE. It can be a little difficult to get the D-Rings past the circlip groove – you may have to push the cap down and re-grease a few times, then use the compressed air to slowly bring up the cap whilst you use your hand to keep it square as it slides up.	

17. Regrease the circlip groove and remove the floating piston with a puller tool (22 x 1.5mm thread). Change seals or wear bands if required – inspect D-Ring to ensure it is not damaged.	
18. Change hose or hose fittings as required – use circlip pliers to remove the circlip, pop off the hose. Change the o-rings (the larger inside diameter O ring goes against the body/res and the smaller to the outside. Grease up and refit hose and circlip ensuring circlip is seated. *There are additional small i.d. O rings for use on the high speed adjustment shaft with MRA rebuild kits.*	
19. Replace end cap seals as required	
20. Clean shock body and reservoir as required	
21. Ensure the floating piston and end cap D Rings are not damaged and are orientated correctly with the round face to the outside. Apply lots of grease to the D rings and reservoir circlip groove.	
22. Hold the reservoir and shock body in a vice loosely with the specific jaws (DO NOT CLAMP THE SHOCK OR RESERVOIR BODY IN A VICE UNLESS YOU USE EXACT SIZE HALF CIRCLE CLAMPING SOFT JAWS AS THIS WILL SQUASH AND DAMAGE THE	

BODY OR RESERVOIR) or similar so the open ends are upright and they are at roughly the same height with the hose fittings at the bottom and the hose down	
23. Fill the reservoir with oil, it will run slowly down into the body until the reservoir is full to around the circlip groove. The oil in the shock body will also be level with the reservoir.	
24. Carefully install the floating piston – this will require you to work it around in a circular fashion as you push down. Push it down just enough so you can see the circlip groove.	
25. Remove the reservoir from the vice and hang it down, leaving the body in the vice	
26. With the reservoir open end down, and the hose running directly up to the body, push on the floating piston from underneath with the wooden handle end of a hammer to push the oil through the reservoir and hose into the body to bleed out all of the air until it touches the inner end of the reservoir.	
27. Re-install the shrader cap, circlip and shrader valve core.	
28. Fill the shock body with oil so its around 10mm below the circlip groove.	
Re-shimming and shaft seal changes	
29. Hold the shaft in soft jaws in the vice	
30. Remove the shim nut	
31. Carefully remove the nut and rebound stack retaining washer	
32. Remove the rebound shim stack and set down in its correct order on a clean surface	
33. Remove the piston noting the orientation	

34. Remove the compression shim stack and washer and set down in its correct order on a clean surface. (piston shown in picture for illustration purposes only and will differ)	
35. If replacing seals - seals A). Remove any aluminum spacers from the shaft B). Slide the seal assembly and dust cap off the shaft C). Install new dust cap if required in correct orientation D). Apply suitable silicone grease to the seals in the seal assembly and carefully re-install to the shaft, very slowly working the seal assembly in a circular motion over the shaft step ensuring it doesn't catch or tear. E). Re-install any aluminum spacers	
36. Change shim stacks or bleed as required. Ensure all shims and pistons are perfectly clean – use paper tool to clean if required.	
37. Reinstall the compression washer and compression side shim stack	
38. Re-install the piston in its correct orientation.	
39. Install the rebound shim stack and washer	
40. Apply high strength Red Loctite threadlock or equivalent to nut and reinstall – tighten to 30 ft/lbs with a torque wrench.	

Resetting Rebound needle position – If the rebound adjustment needle was pushed down to far releasing oil and gas then do the following A). Hold the shaft in softjaws and remove the rod end jet (piston end) with 10mm spacer B). Remove, tip upside down and catch the ball bearing and spring – noting the spring orientation (large side to the bearing). C). From the other end of the shaft push the push rod right in to push the rebound needle out of the piston end of the shaft. D). Inspect the small orings, replace if required. Grease the o-rings and carefully slide the needle back into the shaft E). Push the needle full home against the step inside the shaft – you should be able to see a little section through the 4 x rebound path holes above the piston base washer. F). Re-install the ball bearing, then spring in correct orientation. Hold your finger over the end of the shaft, hold the shaft with the piston side down (the spring and ball will want to fall out) and locate the spring onto the rod end jet. This is critical so the spring locates onto the jet. G). With the rod still piston side down and the spring still located on the rod end jet, tighten the rod end jet into the shaft with a bit of Loctite. Re-install the piston push rod into the shaft from the other end ensuring it locates into the needle.	
Assembly	
41. Apply lubricant to the body circlip groove and D ring on seal assembly and ensure the D-ring is seated in its correct position – with the half circle face of the D ring to the outside to seal against the inside of the shock body and not twisted or damaged – look closely for tears.	
42. Gas the reservoir to push the floating piston against the end of the reservoir and then release the gas pressure	

43. Slide the seal assembly upwards out of the way. Hold the wear band around the piston ensuring it seats properly and insert the piston and rod assembly into the shock body so the piston is an inch or 2 under the oil.	
44. With the piston a little under the oil, move it up and down a few times a small amount to bleed the air out.	
45. Pull the shaft up so that the compression side washer is just under the top of the oil level	
46. Top off the oil so it is around 5mm from the end of the shock	
47. Slide down the seal head assembly into the shock body until you see the circlip groove, a little bit of oil should spill over removing all the air, if not add a little more oil and re-do. This will then push the floating piston back in the reservoir a little into its correct position.	
48. Install the circlip	
49. Charge with nitrogen gas to the desired psi ensuring the seal assembly locates and seats correctly on the circlip and doesn't catch on the edge. Gas until shaft is full extended and hold for 5 seconds for the pressure to equalize.	
50. Check for leaks and clean the oil from the top of the seal assembly, install the dust cap, tighten (this does not need to be overly tight) and install locking grub screw.	

Warranty

Dobinsons Spring & Suspension™ at its sole discretion will repair or replace any products supplied by them that are found to be defective in either materials or workmanship providing that Dobinsons Spring & Suspension™ are actually notified in writing from the Client of the alleged defect within one years (1 years) from date of invoice for Coil-Overs. Any claim not made within this period shall conclusively be deemed waived by the Client. Repair or replacement is pre-conditioned on the examination of the goods which on instructions from Dobinsons Spring & Suspension™ on, should be returned for further inspection to Dobinsons Spring & Suspension™ or to an Approved Importer. Coil-overs have a 1 year warranty providing the vehicle does not have a modified exhaust system the produces additional heat on the shock absorbers and does not cover damage caused by rocks or accidental damage.

Dobinsons Spring & Suspension™ products are designed for normal use and are in no way, covered under warranty should the vehicle be used in any form of extreme sports, competition racing or produce lift of 50mm or more. It is the responsibility of the fitter, to ensure that the customer or the owner of the vehicle is aware of the warranty conditions under which the products have been sold. It is highly recommended that the words "Suspension Components Fitted are for Normal Use Only. Warranty Void if used in extreme conditions" is written on their receipt to avoid any confusion.

Dobinsons Spring & Suspension™ will not pay for costs incurred in forwarding or returning goods. This warranty does not cover and Dobinsons Spring & Suspension™ makes no warranty with respect to; (1) any merchandise that is abused, misused, misapplied, neglected or altered; or that is improperly or incorrectly installed or maintained or used; or that is subjected to abnormal conditions of use, temperature, moisture, dirt or corrosive matter; (2) Goods bought for industrial, mining or agricultural use; (3) Goods no longer required by Client; (4) Goods incorrectly chosen by Client; (5) Goods modified or altered by client; and (6) any merchandise, materials, parts or other components supplied by someone other than Dobinsons Spring & Suspension™.

Dobinsons Spring & Suspension™ shall not be liable for any expenses incurred by Client in order to remedy any defect in its product. Dobinsons Spring & Suspension™ shall not be liable for any freight, labour, consequential, special, indirect or contingent damage or expense arising Directly or Indirectly from any defect in its products or from use of any products.

Client agrees to indemnify and hold Dobinsons Spring & Suspension™ harmless from and against any loss, injury or damage, to person or property, that extends beyond the warranties set forth above, whether the claims against Dobinsons Spring & Suspension™ or the damages are incidental or consequential. Installation of after-market items to your vehicle may adversely affect, void or violate the Manufacturers terms of warranty on your vehicle. Review the terms of your vehicle warranty prior to purchase and/or installation of any after-market part or accessory. Dobinsons Spring & Suspension™ does not make any representations or warranties of any kind as to suitability or fitness for a particular vehicle or purpose. Dobinsons Spring & Suspension™ shall not be responsible or liable for direct or indirect damages as a result of the purchase and/or installation of these after-market products.

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