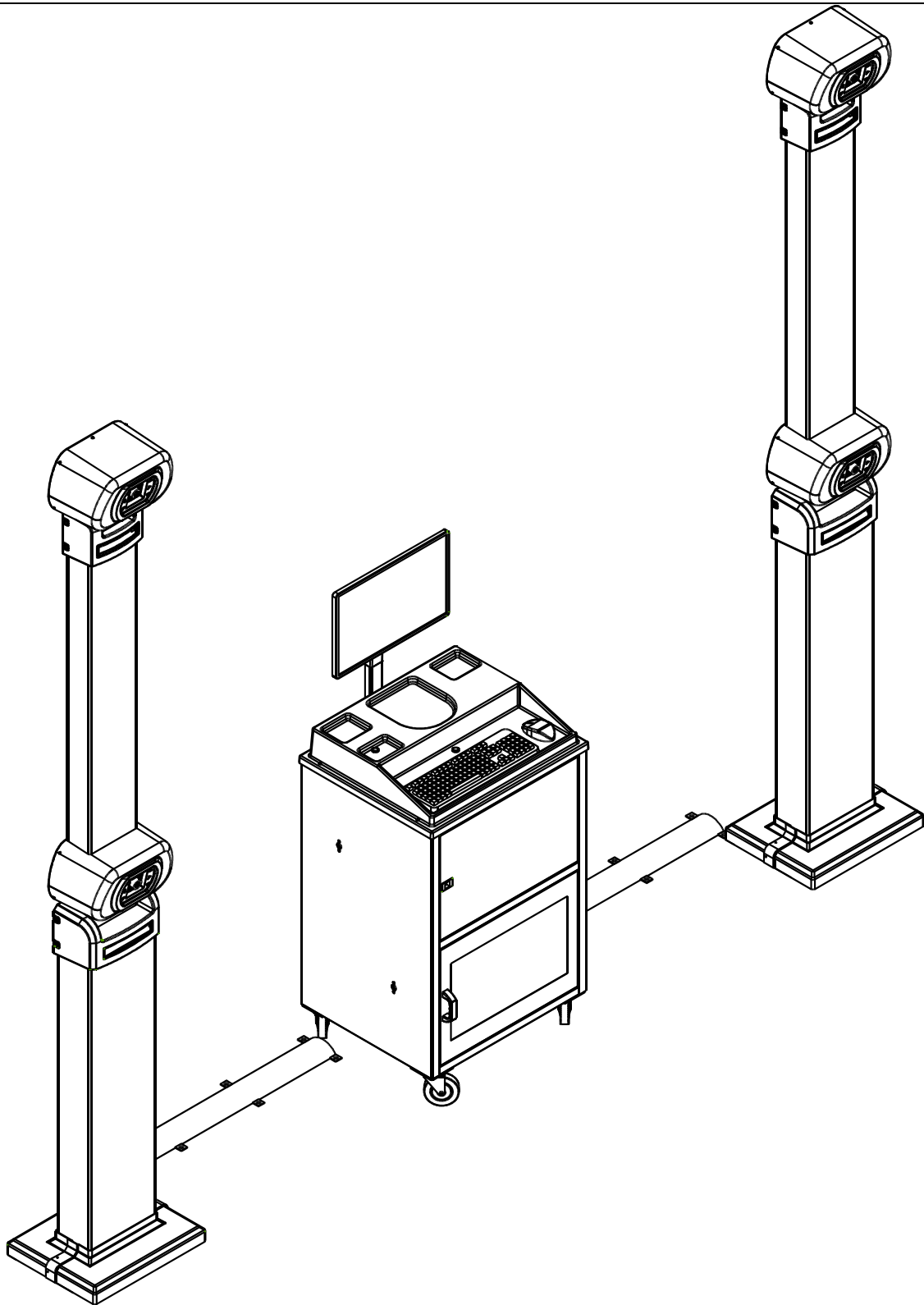


3D WHEEL ALIGNER

HCV model



OPERATING MANUAL
(Ver.1.7)

Dear Customer,

Congratulations, for selecting **3D Wheel aligner** as your Wheel alignment computer. Our Wheel aligners are user friendly system which can be used effectively to correct all the alignment angles of four wheelers.

We take special care to ensure that every Wheel aligner leaving our Factory is in the best operating condition. This **OPERATING MANUAL** has been prepared to help you in getting the best performance out of the equipment. Still, if you have any doubt, please do not hesitate to contact us.



Read the Operating manual carefully before starting to use the equipment

Every attempt is made in this manual to guide the User on the effective use of the Equipment. Any suggestion may please be sent to us for improvement.

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1. WARRANTY – STATUTORY CLAUSE

Equipment is provided with one year Warranty from the date of installation or thirteen months from the date of dispatch which ever is earlier (International warranty up to fifteen months from date of dispatch) against any manufacturing defect. Warranty is subject to following conditions:

1. Ensure that proper power supply with protective Earthing is provided to equipment. Any high voltage may damage the components, leading to system failure or electrical hazards.

Power supply:

230V operation: Single Phase, 230V AC \pm 10%, 50/60 Hz + N + PE (or)

110V operation: Single Phase, 110V AC \pm 10%, 60/60 Hz + N + PE

(The Potential difference between N – Neutral & PE – Protective Earth should be below 3V)

Laser printer should be connected in a separate power supply. Machine power socket should not be used for this purpose. The Laser printers consumes more power.

Warranty ceases if this condition is not satisfied

2. Power supply to the equipment should be connected only through a CVT of 1KVA capacity and then through an UPS of minimum 1KVA capacity with AVR (Automatic Voltage Regulator) circuit. The system must be shut down before the UPS power trips OFF (due to limited battery backup time). Failing to comply may lead to operating system / software corruption.

Warranty ceases if this condition is not satisfied

3. Do not attempt to open or service the equipment under any circumstances. Risk of electric shock may happen. Only authorized / qualified service personnel should trouble shoot the equipment.

Warranty ceases if the equipment is opened/tampered or serviced by un-authorized personnel

4. ***Warranty ceases if this equipment is used for any purpose other than intended use.***

5. The equipment must be installed Indoor away from direct Sunlight or reflected Sunlight through any object or rain / moist areas.

Warranty ceases if the equipment is exposed to Sunlight, Rain / Water

6. Do not attempt to load any other Application software (Audio, Video etc.) under any circumstances, other than the alignment program loaded in the Factory.

Warranty ceases if the system is loaded with any other Application software

7. If transportation, lifting, unpacking, installation, assembly, start up, testing, repair and maintenance have been performed by un-authorized personnel, the manufacturer shall not be responsible for injury to personnel or damage to objects.

8. DO NOT remove or modify any parts of the equipment as this could compromise the equipment's intended use. For any modifications / repairs consult the Manufacturer.

9. The Vehicle specification data must be entered by End user only. **MANUFACTURER IS NOT RESPONSIBLE FOR ANY INCORRECT OR INCOMPLETE VEHICLE SPECIFICATIONS ENTERED INTO THE SYSTEM.** No claim is entertained for any damage or loss.

10. Follow the Alignment lift manufacturer's safety recommendations when lifting a vehicle.

MANUFACTURER IS NOT LIABLE FOR ANY DAMAGES CAUSED due to non-compliance

11. Make the warranty registration by duly signing the Installation, Commissioning & Training report.

Manufacturer does not warrant third party products / software added to our Wheel aligner through our Factory integration system. The below listed Third party products / peripherals / software are covered under the warranties provided by the respective OEM. Third party manufacturer's warranty may vary from product to product. Consult the respective product documentation for warranty information:

1. Desktop computer with Monitor
2. Printer
3. Keyboard
4. Mouse
5. Multimedia speakers
6. Operating system software

2. SAFETY




Thoroughly read all Safety labels and Manual instructions before installing, operating and maintaining the Wheel aligner. They are provided to remind the operator to exercise extreme care while performing wheel alignment with this product to prevent personal injury and property damage. Replace any label unreadable or missing on the Wheel aligner. Refer Part No. given for each Labels for ordering.

It is the Operator's responsibility to have sufficient knowledge on the vehicle to be aligned and to use proper service methods and perform wheel alignment in an appropriate and acceptable manner that does not endanger safety of the Operator / others in the work area or the equipment or vehicle being serviced.

Always keep the Manual in a prominent place for quick reference.

Injury to personnel and damage to property incurred due to non-compliance with these safety instructions are not covered by the product liability regulations.

SYMBOLS

	Failure to comply with instructions could result in personal injury
	Failure to comply with instructions could result in property damage
	Important information

2.1. INTENDED USE

- Use the Aligner as described in this Operating manual only.
- Use only the Accessories recommended by the manufacturer.
- Carryout alignment by positioning the vehicle to be aligned on the Alignment pit / Alignment lift only.

2.2. SAFETY INSTRUCTIONS FOR COMMISSIONING

1. Only Authorized service personnel are allowed to install and commission the Wheel aligner.
2. Aligner should not be installed outdoors or in moist rooms (nearer to car washing).
3. To reduce the risk of fire, the equipment should not be installed at hazardous locations or in the vicinity of explosives or flammable liquids.
4. The Aligner should be installed with adequate ventilation in case of working on vehicles with internal combustion engines.
5. Keep the System away from high capacity Transformers, Electric motors and other strong magnetic fields.
6. Use proper handling tools while installation of Aligner for safety of equipment.
7. The electrical main supply to the Aligner must be connected through a CE certified Two pole, Type C, 6A MCB (Miniature Circuit Breaker). Proper Earthing must be provided.
8. If an Extension power cord is required, a cord with correct rating equal to or more than that of the equipment should be used.
9. Care should be taken to route the Power mains cord properly so that it is not tipped over or pulled.
10. The Cables from both the vertical columns should be routed through the cable duct and connected to the Cabinet.
11. During installation of Third party products (like Desktop computer, Monitor, Printer, Keyboard, Mouse, Speakers, Operating system software etc.) follow the safety instructions provided in the respective OEM's Installation document.
12. Ensure the disposal of ecologically harmful substances in accordance with the appropriate regulations.

2.3. SAFETY INSTRUCTIONS FOR OPERATION

1. Read the Operating manual thoroughly.
2. Only permit qualified personnel to operate, maintain or service the Aligner.
3. The operator should have thorough understanding of the vehicle systems being serviced & sufficient knowledge on the operation & safety features of alignment.
4. Always keep the Aligner and the surrounding work area clean and free of Tools, Parts, Debris, and Grease etc.
5. Do not operate, if the equipment has been dropped or damaged until it has been examined by qualified service personnel.
6. Do not operate the equipment with damaged / twisted power cord.
7. **Do not operate the equipment under direct sunlight. Even reflected sunlight from Target plate reaching the camera will result in erratic readings and the system will display *Target error* indication.**



8. Air blowing equipments like Pedestal Fan, Room heater should not be in the close proximity of Camera assembly & targets as it will disturb the Beam & affect the reading stability.
9. Always unplug the equipment from electrical outlet when not in use. Do not pull on the cable; always pull the plug directly out of socket.
10. Handle the Target plates carefully. Rough handling / shocks may cause damage. Ensure the patterned surface of Target plates is always clean from dust & scratches. Use soft & dry cloth to clean the surface. Prevent deep scratches on the reflecting surface of the target plate.
11. Do not move or turn the equipment while the System is in power up condition.
12. Ensure the Rotary plates are locked with locking pins before parking the vehicle.
13. Ensure gap filling spacers are located on Rotary plates before parking vehicle.
14. Do not keep heavy objects over the equipment.
15. Do not hammer or hit any part of the equipment with Tools when the equipment is in ON condition.
16. Ensure that the Caster wheel of Main cabinet is locked while it is stationary. While moving the Cabinet, release the lock & then proceed. Do not lean over the Cabinet as it may disturb the assembly & cause damage to personnel / product.
17. Keep hair, loose clothing, fingers & all parts of body away from rotating / moving parts.
18. Always wear Eye Safety glasses & Ear plugs (noisy environment >70db) while doing under chassis adjustments / corrections from the Alignment pit or Alignment lift to avoid oil drops / dust particles falling on to Eye. Use hand Gloves to avoid fire hazards from the hot surfaces of vehicle.
19. Always comply with the applicable accident prevention regulations.

2.4. SAFETY INSTRUCTIONS FOR SERVICING

1. Inspect the Wheel aligner on daily basis.
2. Only authorized personnel are allowed to service the Aligner.
3. Turn OFF MCB & unplug the Aligner before doing any maintenance or repair.
4. Only certified engineers are allowed to service the parts of the equipment.
5. Do not remove / disable / override any safety device / assemblies.
6. Third party products should be serviced only by the OEM's authorized service personnel. Refer the respective service policies provided.
7. The use of cleaning agents which attack coating or sealing materials could result in equipment damage.
8. Use Manufacturer spare parts only to guarantee the reliable function and to ensure safety of the equipment.

2.5. SAFETY FEATURES

2.5.1. POWER FAILURE DATA RECOVERY

During alignment, if the power goes off & resumes, the system has the facility to resume the previous job without redoing the entire alignment again.

When the power goes off, system will operate in UPS mode. Press Ctrl+S to save the job and shut down the PC. After the power resumes, the system will prompt the following message “Resume previous Job?”. If the previous job need to be continued, press **YES** button to continue with the old job or else, press **NO** to start a new job.


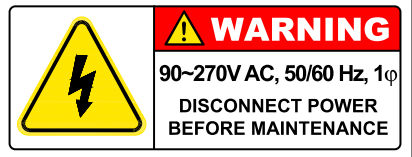

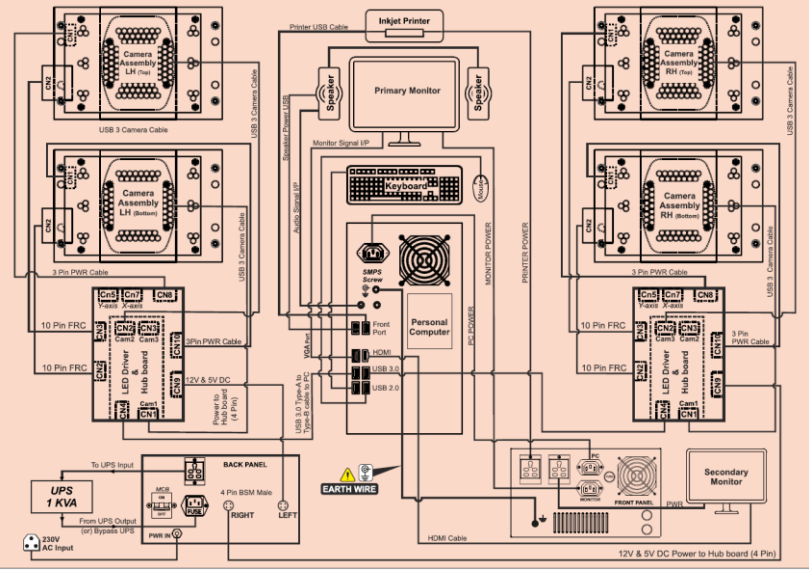
2.5.2. CONTROL FUSES

Control fuses are incorporated to protect the electronic components against high current. The Fuse holders are mounted on the Interface box (F1 & F2) which can be easily accessed from outside for replacing the blown fuse. Always replace the Control fuse with same type and rating of CE marked Fuse.

2.5.3. HIGH VOLTAGE PROTECTION

Power to the equipment should be routed through Un-interrupted Power Supply (UPS) with Automatic Voltage Regulator (AVR) function. This will maintain output voltage within limit to avoid Electronic boards & components against failure due to high Voltage.

2.6. SAFETY LABEL INFORMATION

	<p>← Sticker, “Caution-AC O/P From UPS” (Part No. H3594)</p>
	<p>← Sticker, Sticker, Electrical safety, 90-270V (Part No. B8473)</p>
	<p>← Sticker, “Power Output” (Part No. H3610)</p>
	<p>← Sticker, Connection details (Part No. B8425)</p>

3. FEATURES & SPECIFICATIONS

Sl. No.	Description	6A	5A	4A	3A
I	Features				
1	Suitable for alignment of Buses, Trucks, Dolly, Trailers & Cars	✓	✓	✓	✓
2	Compatible with Multi-axles (up to 16 wheel vehicles)	✓	✓	✓	✓
3	Simultaneous alignment of 6 axles using 4 Cameras & 12 Targets	✓	NA	NA	NA
4	Simultaneous alignment of 5 axles using 4 Cameras & 10 Targets	NA	✓	NA	NA
5	Simultaneous alignment of 4 axles using 4 Cameras & 8 Targets	NA	NA	✓	NA
6	Simultaneous alignment of 3 axles using 4 Cameras & 6 Targets	NA	NA	✓	✓
7	Simultaneous alignment of 2 axles using 2 Cameras & 4 Targets	NA	NA	✓	✓
8	Sequential alignment of 6 axles	NA	NA	NA	NA
9	Aligns Multi-axle Buses & Trucks upto 6 Axles	✓	✓	NA	NA
10	Aligns Multi-axle Buses & Trucks upto 5 Axles	✓	✓	NA	NA
11	Aligns Multi-axle Buses & Trucks upto 4 Axles	✓	✓	✓	NA
12	Aligns Multi-axle Buses & Trucks upto 3 Axles	✓	✓	✓	✓
13	Simultaneous alignment of Trailers up to 3 Axles in forward parking & 8 axles in reverse parking by 2 steps	✓	✓	✓	NA
14	Simultaneous alignment of Trailers up to 3 Axles in forward parking & reverse parking	✓	✓	✓	✓
15	Sequential alignment of Trailers up to 3 axles by reverse parking	NA	NA	✓	NA
16	High performance SI (Scientific Imaging) camera and 3D Imaging technology for measurement of angles using Align+ software	✓	✓	✓	✓
17	Windows & Embedded Standard OS based Alignment program	✓	✓	✓	✓
18	LED primary display unit	✓	✓	✓	✓
19	LED secondary display unit (to view from the Pit)	✓	✓	✓	✓
20	Live correction facility for Camber, Caster, Toe, Thrust & Scrub angle	✓	✓	✓	✓
21	Automatic tracking of Left and Right turns for Caster / Kingpin	✓	✓	✓	✓
22	One shot Caster swing of twin front axles (Simultaneous measurement of caster & Kingpin in single turn left & right operation)	✓	✓	✓	NA
23	Simultaneous Push-Pull Runout compensation of all Axles by driving the vehicle	✓	✓	✓	✓
24	Excessive Runout measurement warning	✓	✓	✓	✓
25	Redo Runout option by Vehicle drive	✓	✓	✓	✓
26	Display of Thrust angle, Scrub angle & Front twin Axle parallelism readings in single screen	✓	✓	✓	✓
27	Scrub and Thrust angle compensation	✓	✓	✓	✓
28	Display of Front & Rear Total Toe readings	✓	✓	✓	✓
29	Excess Toe indication	✓	✓	✓	✓
30	Measurement of Difference in Track width	✓	✓	✓	✓
31	Included angle in printout	✓	✓	✓	✓
32	Single Tie rod adjustment	✓	✓	✓	✓
33	Customer address in printout	✓	✓	✓	✓
34	Customer data edit option provided before taking printout	✓	✓	✓	✓
35	Provision for Backup / Restoration of factory set Calibration data	✓	✓	✓	✓
36	Calibration history & Certificate	✓	✓	✓	✓
37	Export option for reports (PDF format)	✓	✓	✓	✓
38	Advanced Alignment Measurements with Reading/Specification and Cross Value	✓	✓	✓	✓
39	Export option for Data manager reports	✓	✓	✓	✓

Sl. No.	Description	6A	5A	4A	3A	
40	Option for selection of Vehicle specifications during alignment	✓	✓	✓	✓	
41	Multiple User Log-In	✓	✓	✓	✓	
42	Power failure data protection (Resuming of current job in which stage the power failure happened)	✓	✓	✓	✓	
43	Save & Proceed option (CTRL+S) during UPS power condition	✓	✓	✓	✓	
44	Software up gradation through CD drive	✓	✓	✓	✓	
II	Special features					
1	Facility for enabling the Optional features in the field itself	✓	✓	✓	✓	
2	Data Manager software for storing Alignment results	✓	✓	✓	✓	
3	Two color bar display for adjustment of all angles (Red/Green)*	✓	✓	✓	✓	
4	Two color printout for indicating alignment condition (Red/Green)*	✓	✓	✓	✓	
5	Multiple print formats (Initial / Final)	✓	✓	✓	✓	
6	Customized printout for Total toe, Parallelism, Thrust & Scrub angle	✓	✓	✓	✓	
7	Unlimited databank of Indian / International vehicle specifications	✓	✓	✓	✓	
8	Custom (User defined) vehicle specifications	✓	✓	✓	✓	
9	Self diagnostic program for alignment system	✓	✓	✓	✓	
10	Zoom-in option for Live parameters	✓	✓	✓	✓	
11	Selectable functions					
11.1	Display of Toe in "degree min"/ "degree"/ "mm"/ "inch"/"mm/mtr" & other angles in "degree"/ "degree min" deg fraction(i.e:1 ½°)	✓	✓	✓	✓	
11.2	Multi-lingual program	✓	✓	✓	✓	
III	Optional features					
1	International Vehicle data update (Autodata) – Standard for Exports	✓	✓	✓	✓	
2	Indian vehicle data update	✓	✓	✓	✓	
IV	Technical specification					
1	Rim size	12" – 24" (305 – 610mm)	✓	✓	NA	✓
		15" – 28" (380 – 711mm)	OPT	OPT	OPT	OPT
2	Wheel Diameter	20" – 44" (508 – 1118mm)	✓	✓	✓	✓
3	Track width	48" – 96" (1220 – 2435mm)	✓	✓	✓	✓
4	Wheel Base (Front axle to extreme Rear axle)	19mtr	✓	✓	✓	✓
		13mtr	NA	NA	NA	NA
5	Distance between Camera Tower and Front Rotary plate center	110.2" (2800mm)	✓	✓	✓	✓
6	Push-Pull Runout movement	30° - 32°	✓	✓	✓	✓
	Measurement parameters	Range	Accuracy			
1	Camber (Front / Rear)	± 15° 00'	± 00° 02'	✓	✓	✓
2	Caster	± 28° 00'	± 00° 05'	✓	✓	✓
3	Kingpin	± 25° 00'	± 00° 05'	✓	✓	✓
4	Toe (Front / Rear)	± 20° 00'	± 00° 02'	✓	✓	✓
5	Total Toe	± 40° 00'	± 00° 04'	✓	✓	✓
6	Wheel Setback (Front / Rear)	± 25mm	± 2mm	✓	✓	✓
7	Scrub / Thrust angle	± 10° 00'	± 00° 02'	✓	✓	✓
8	Runout (Front / Rear)	± 10° 00'	± 00° 02'	✓	✓	✓
9	Included angle	± 40° 00'	± 00° 05'	✓	✓	✓
10	Track width difference	± 150mm	± 2mm	✓	✓	✓
11	Toe Out on Turns (Optional)	± 20° 00'	± 00° 20'	OPT	OPT	OPT
12	Lock Angle (Optional)	± 60° 00'	± 00° 20'	OPT	OPT	OPT

Sl. No.	Description	6A	5A	4A	3A
V	Electrical specification				
1	Power supply : Stabilised UPS (AVR Built-in) & CVT (1KVA) 230VAC ±10%, Single phase, 50Hz, +N +PE 110VAC ±10%, Single phase, 60Hz, +N +PE	✓	✓	✓	✓
2	Power consumption : 250W	✓	✓	✓	✓
3	Rated current : 1A	✓	✓	✓	✓
VI	General specification				
1	Desktop computer dimension (WxDxH) : 155x275x350mm	✓	✓	✓	✓
2	Operating temperature : 0° to 50°C	✓	✓	✓	✓
3	Humidity : RH upto 90% Non condensing	✓	✓	✓	✓
4	Machine dimension – Unpacked (WxDxH)				
	Vertical column (2 Nos.) : 420x302x2893mm	✓	✓	✓	✓
	Main cabinet : 770x695x1170mm	✓	✓	✓	✓
5	Machine dimension – Packed (WxDxH)				
	Vertical column (2 Nos.) : 3015x510x531mm	✓	✓	✓	✓
	Main cabinet : 780x750x1310mm	✓	✓	✓	✓
6	Accessories – Box 1 : 1240x550x612mm (Rotary plate, wheel bracket, PC & monitor)	✓	✓	✓	✓
	Accessories – Box 2 (Spacers) : 1150x410x170mm	✓	✓	✓	✓
	Accessories – Box 3 (Wheel Bracket holders) : 1200x320x505mm	✓	✓	✓	✓
7	Machine weight – Unpacked				
8	Machine weight – Packed				

NOTE:

- * - Red - Out of specification range
Green - Within specification range

4. INSTALLATION

4.1. INSTALLATION REQUIREMENTS

Wheel aligner installation should be done only by qualified Service personnel.



Provision of handling means such as Forklifts etc. is the owner's responsibility

4.2. LOCATION

The Wheel aligner should not be installed outdoors, in moist rooms, at hazardous locations, or in the vicinity of explosives or flammable liquids.

The location should have adequate ventilation in case of working on vehicles with internal combustion engines.



Choice of a suitable location is the owner's responsibility

4.3. SPACE REQUIREMENTS

- Installation area should have roof.
- Floor should be of good concrete flooring and should be leveled surface.



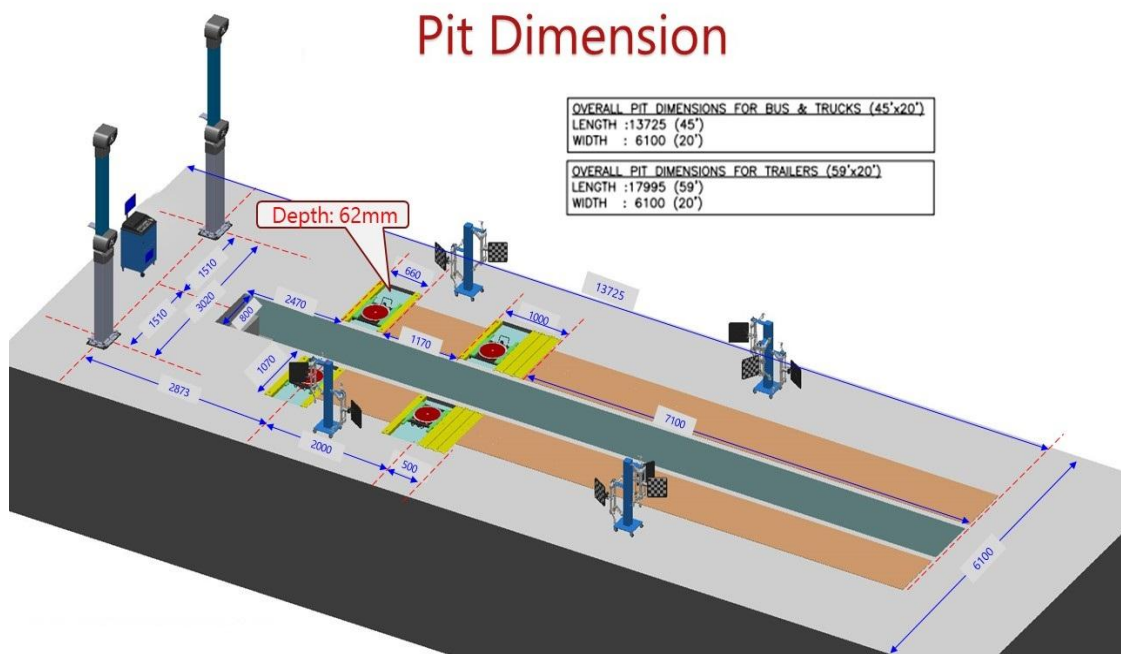
Proof of safe floor load capacity is the owner's responsibility

- The clearances from side walls and roof should be adequate for the operator to move around and perform wheel alignment / maintenance.
- Minimum roof height should be 22'.
- Alignment should be carried out on Alignment pit only.



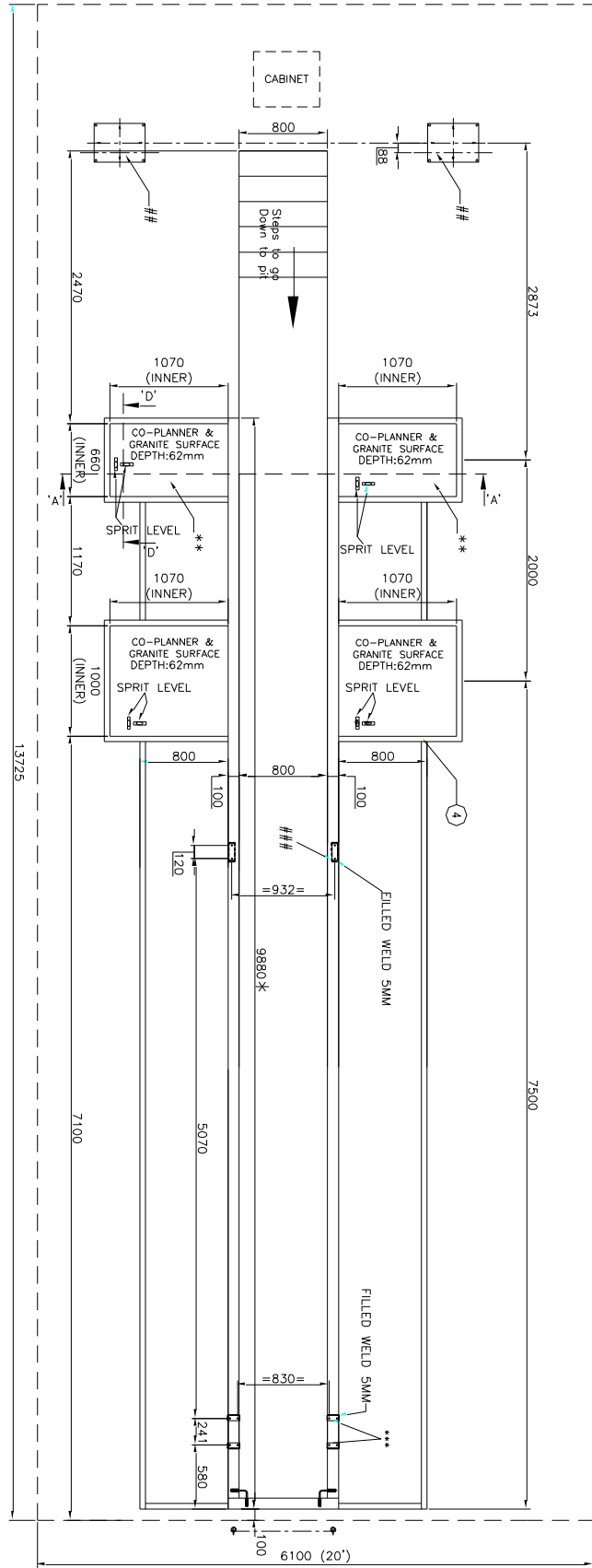
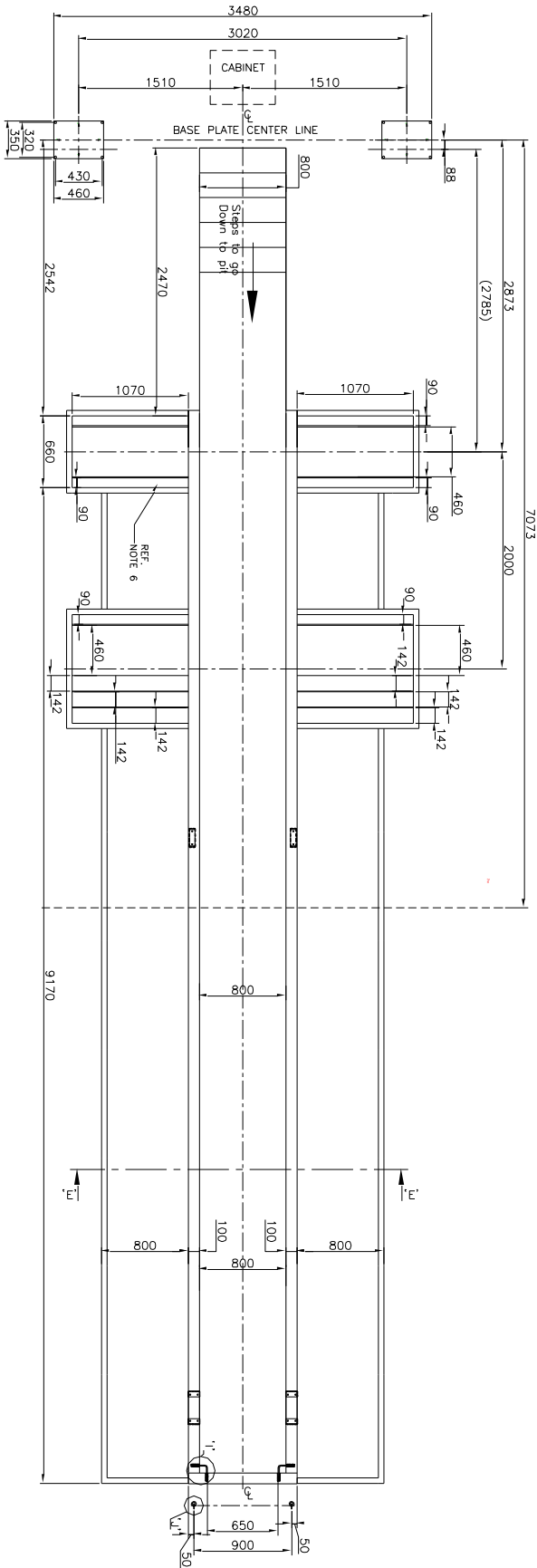
Choice of suitable alignment platform is the owner's responsibility

4.3.1. ALIGNMENT PIT DIMENSIONS (Minimum 13 mtrs / maximum 18 mtrs)



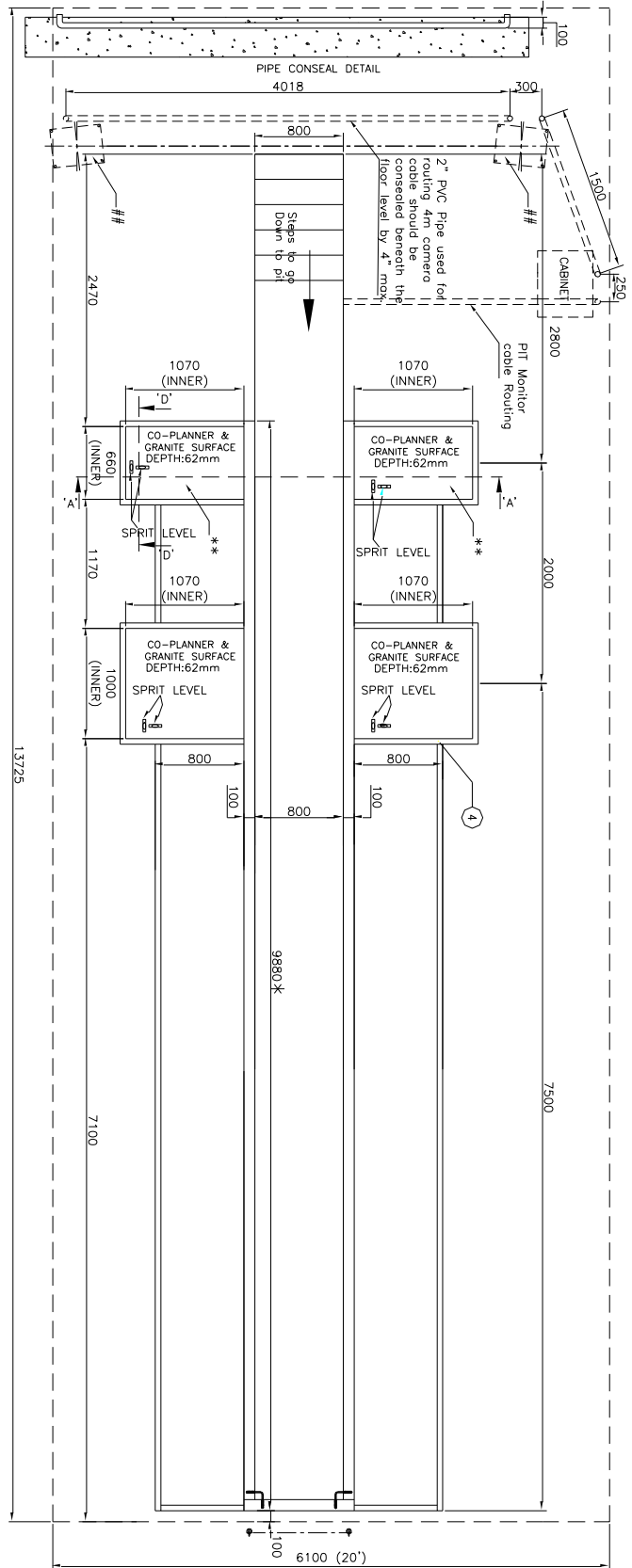
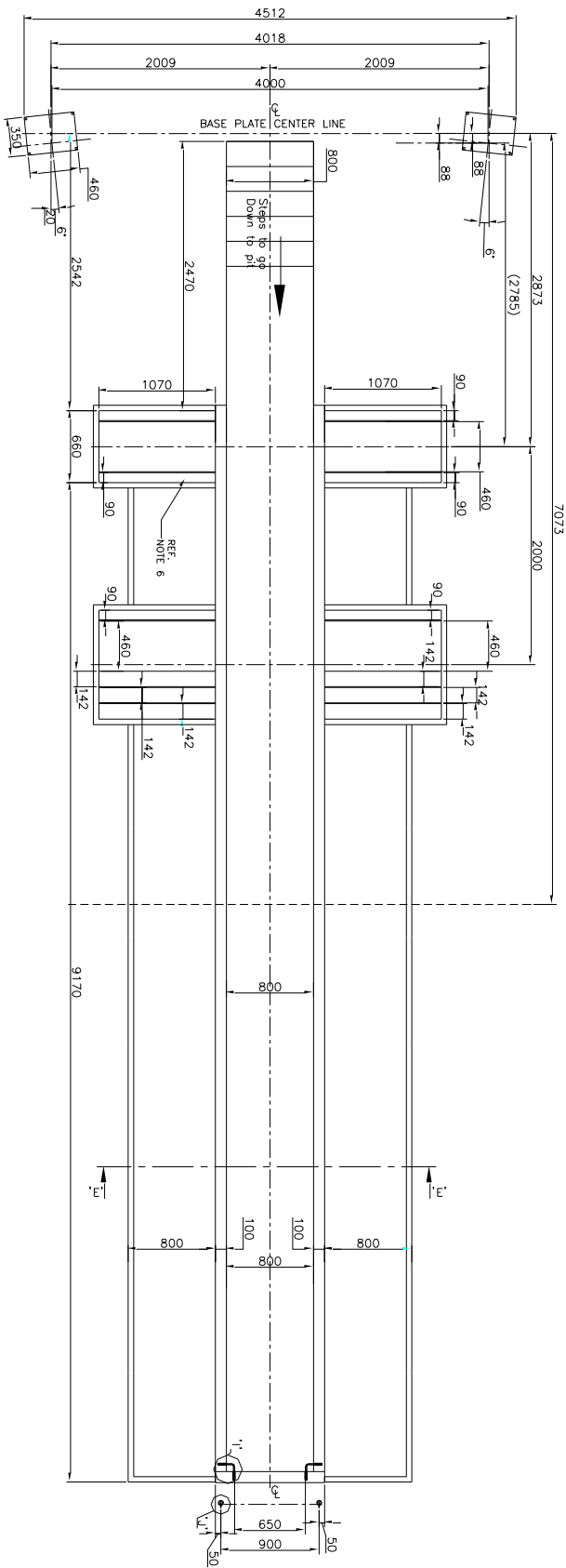
Disclaimer: The Pit diagram Shown here is for doing the alignment without load. If alignment is to be done with load, take consultancy from the construction agency.

OVERALL PIT DIMENSIONS FOR BUS & TRUCKS (45'x20')
LENGTH : 13725 (45')
WIDTH : 6100 (20')
OVERALL PIT DIMENSIONS FOR TRAILERS (59'x20')
LENGTH : 17995 (59')
WIDTH : 6100 (20')
MINIMUM ROOF HEIGHT - 22'



Drive Through model

OVERALL PIT DIMENSIONS FOR BUS & TRUCKS (45'x20')
LENGTH : 13725 (45')
WIDTH : 6100 (20')
OVERALL PIT DIMENSIONS FOR TRAILERS (59'x20')
LENGTH : 17995 (59')
WIDTH : 6100 (20')
MINIMUM ROOF HEIGHT - 22'



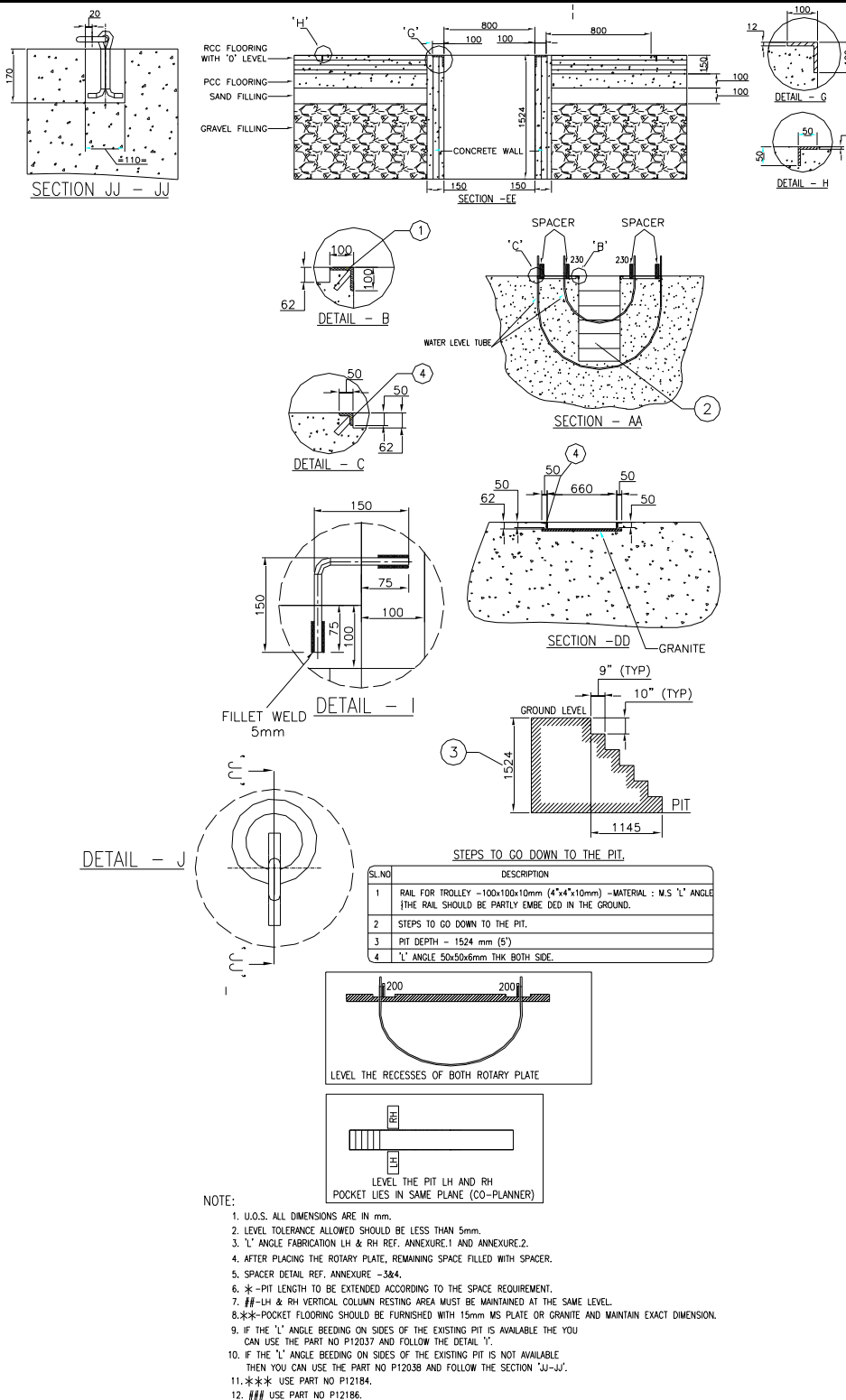


Fig. 1

4.4. POWER REQUIREMENT

230VAC, Single Phase, 50/60Hz +N +PE (or)
110VAC, Single Phase, 50/60Hz +N +PE

Supply should be connected only through a CVT of 1KVA capacity and then through an UPS of minimum 1KVA capacity with AVR (Automatic Voltage Regulator) circuit using a CE certified Two Pole, Type C, 6A MCB. Proper Earthing must be provided. Also ensure that live phase is on the right side point of the wall socket.



Neutral to Line Voltage should be 230V AC $\pm 10\%$ (or) 110V AC $\pm 10\%$
 Line to Earth voltage should be 230V AC $\pm 10\%$ (or) 110V AC $\pm 10\%$
 Neutral to Earth leakage should be less than 3V AC

It is strongly recommended to use CVT & UPS (with AVR) for the aligner.
 Note: For Laser Printer, separate power source should be used.

5. WHEEL ALIGNMENT PARAMETERS

WHEEL ALIGNMENT refers to a set of wheel angles which are responsible to distribute the weight of the automobile over the suspension system and the four wheels uniformly when the vehicle is in motion. Proper distribution of the weight results in uniform tyre wear and effective steering control. Every vehicle manufacturer furnishes the Wheel Alignment specification for the vehicles manufactured by them.

The process of bringing and adjusting the vehicle's Geometric angles and common adjustable parameters such as Caster, Camber and Toe to its original position as per the vehicle manufacturer specification is called **Wheel alignment**.

WHEEL ALIGNMENT ANGLES

- i) **CAMBER** _____
 - ii) **TOE** _____
 - iii) **CASTER** _____
 - iv) **KINGPIN INCLINATION** _____
 - v) **THRUST ANGLE** _____
 - vi) **FRONT WHEEL SETBACK** _____
 - vii) **REAR WHEEL SETBACK** _____
 - viii) **WHEEL RUNOUT** _____
 - ix) **INCLUDED ANGLE**
 - x) **TRACK WIDTH DIFFERENCE**
 - xi) **LOCK ANGLE**
 - xii) **TOE OUT ON TURNS**
- Wheel angles
- Steering axis angles
- These are unwanted angles which sometimes prevail in a vehicle

Each wheel alignment angle has a specific purpose and function. If they are not set properly, the effects will be uneven tyre wear, loss of steering control, pulling to one side while driving, jerking on travel, etc.

It may not be possible to correct all the above angles in a vehicle. Depending upon the design of suspension, some angles are adjustable at workshop level and some are not adjustable (Set in Factory) which may require parts replacement to get the specified value.



The Parameters Wheel Runout, Set Back & Thrust Angle will affect the wheel angles ie., Camber & Toe. Therefore, it is very important to identify, measure and correct or compensate these angles. Otherwise, proper Wheel alignment cannot be achieved. System takes all the above factors into consideration in its design and offers total solution by compensation in the respective parameters

5.1. CAMBER

The **CAMBER** angle will affect the wear on the inner or outer edge of the tyre. Camber is the inclination of the centerline of the wheel from the vertical as viewed from the front of the vehicle. Camber angle is measured in positive or negative degrees.

POSITIVE CAMBER is the outward tilt of the top of the tyre.

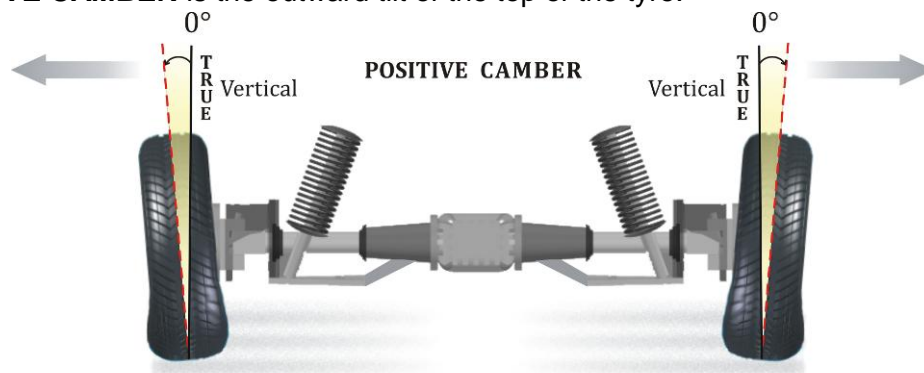


Fig. 2

NEGATIVE CAMBER is the inward tilt of the tyre at the top.

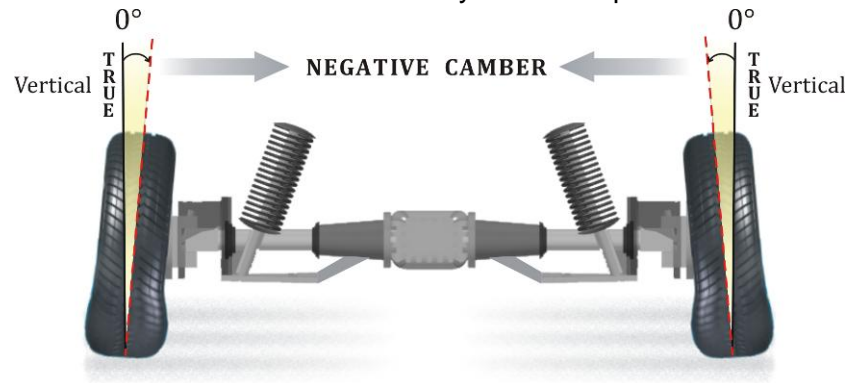


Fig. 3

If a tyre was absolutely vertical, the degree of camber would be zero. Unlike the Caster angle, Camber will change with vehicle load and ride height. With the weight of the driver in the vehicle, front left Camber will increase and front right Camber will decrease and vice versa for left hand steering vehicle. As rough road conditions are encountered, the downward thrust of the vehicle body will cause front Camber to go negative. As the vehicle body movement returns upward, front Camber will go positive. A tyre with Positive Camber can influence the vehicle with a directional pull. The vehicle will go towards the side that has the tyre with the most Positive Camber.

It is the normal tendency of the tyre to roll around the center of a circle when the top of the tyre is inclined towards the center of that circle. Positive Camber tends to place the tyre-to-road contact area nearer the point of load. This assists in easier steering and forces the thicker inner portion of the spindle to carry most of the load. Modern suspension design has reduced the need for considerable Positive Camber. Many manufacturers specify a slight amount of Negative Camber. Some manufacturers recommend an additional 1/4 to 1/2 degree Positive Camber on the right wheel to compensate for road crown. The car will then pull toward the side with greater Positive Camber. This will offset the pull effect of the road crown. Always set Camber within specifications.

Rear Camber Angle - Front Wheel Drive

Rear wheel Camber angle is being relied on for improved steering and general handling performance. In the past FWD vehicles and independent rear suspension vehicles were most likely to have adjustable rear Camber. On vehicles currently being produced, rear Camber adjustment capabilities are being found on all types of models (Note : Always use full-floating tables under wheels whenever alignment is being done. When alignment problems are reported on vehicles with fixed rear axles and no rear wheel Camber adjustment capabilities, a thorough inspection of the rear suspension should be made. Damaged or worn components can cause alignment and / or steering problems. Replacing or repairing the defective components should bring the rear wheel assemblies into specification.

On vehicles where rear wheel Camber is adjustable, all previous precautions apply. If Camber adjustment requirements are excessive, a thorough inspection must be performed. Replacing any defective components could bring the Camber into specification and adjustment may become unnecessary. As with the front suspension, DO NOT perform alignment on vehicles with damaged or worn components.

Rear Camber Angle - Rear Wheel Drive

On RWD vehicles, where rear Camber is usually not adjustable, Camber will normally be fixed at zero. Even though this angle cannot be changed through adjustment, if rear suspension abnormalities exist, a thorough inspection must be made. Not to be overlooked are the rear springs. Worn or weak rear springs will alter riding height and because of a reduction in tension, will bring the shock absorbers out of the optimum range of their dampening ability. The result will be excessive tire movement. This condition reduces operator control and contributes to abnormal tire wear. As in FWD vehicles, replacing worn or defective components may bring rear wheels within specification.

5.2. TOE

Unlike Caster and Camber, which are measured in degrees, Toe is most frequently measured in fractional Inches, Millimeters or Decimal degrees. An incorrect Toe setting is one of the main alignment factors that cause excessive tyre wear. Front and rear Toe are the same in definition, with the adjustment capabilities and procedures being the only actual difference. **TOE** is the difference between the leading edge (or front) and trailing edge (or rear) of the tyres.

TOE-IN is the measurement in fractions of an Inch, Millimeters or Decimal of degrees that the tyres are closer together in the front than they are in the back.

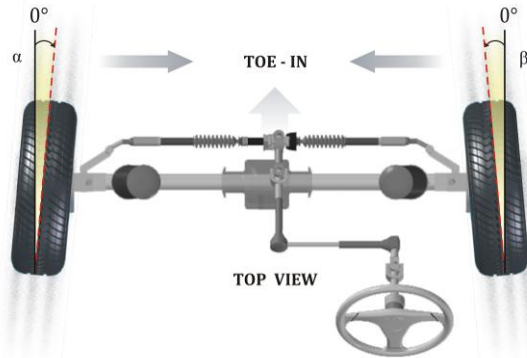


Fig. 4

TOE-OUT is the same measurement, except the tyres are further apart in the front than in the rear.

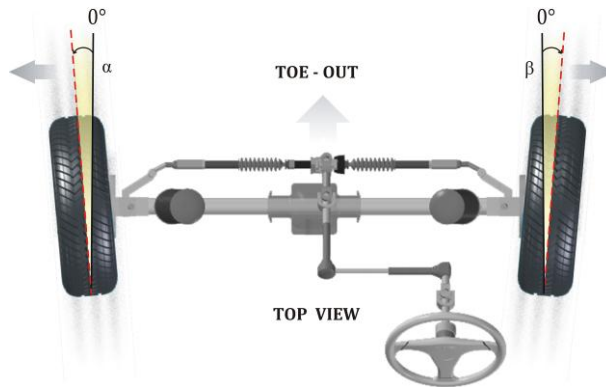


Fig. 5

Slight Toe-in is preferred to Toe-out on most vehicles because steering is aligned while vehicle is stationary. When the vehicle is moving, linkage components flex causing a change in alignment angles. This is classified as “Running Toe”. Running Toe should be zero to maximize tyre life and achieve least rolling resistance.

The usual tendency is for the tyres to turn outward while the vehicle is in motion, so most vehicles are designed with a static Toe-in setting. The static Toe-in setting will become zero as the linkage flexes when the vehicle is in motion. Always set Toe to the manufacturer’s specifications. On vehicles with Toe adjustment capability on the rear, an alignment specialist can go beyond manufacturer’s specifications according to vehicle usage and customer requirements. With the proper equipment, the rear axle can be adjusted to perform aggressively toward demanding load and road conditions. Vehicles with FWD and independent rear suspensions are more likely to have adjustable rear Toe. As with rear Camber, properly adjusted rear Toe will contribute to improved steering & handling characteristics. Full floating tables (Rotary plates) must be used under rear tyres whenever Toe is to be adjusted. If rear Toe is out of spec a thorough inspection must be done, whether or not rear Toe is adjustable.

Components found to be defective must be replaced. On vehicles that do not have rear Toe adjustment capability and Toe is not within specifications, replacing defective components may bring Toe within specifications.



Normally TOE is specified in ‘mm’ or ‘inch’. That is by how much the front of the Wheel Rim is IN or OUT compared to the rear side of the Wheel Rim. But, System follows the unit of Degrees and Minutes. Even, if the TOE is entered in ‘mm’ or ‘inch’, it converts the same into corresponding Degrees and Minutes

5.3. CASTER

CASTER is the angle between an imaginary line drawn through the upper and lower steering pivots and a line perpendicular to the road surface (viewed from side of vehicle). If the top of the line tilts rearward, the vehicle is said to have **POSITIVE CASTER**.

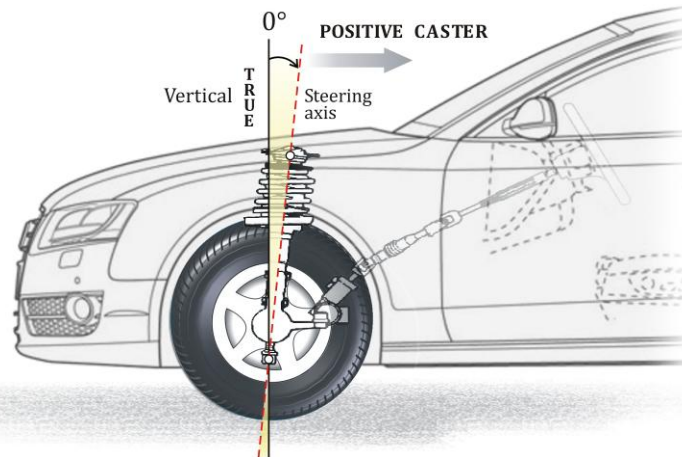


Fig. 6

If the top of the line tilts forward, the vehicle is said to have **NEGATIVE CASTER**.

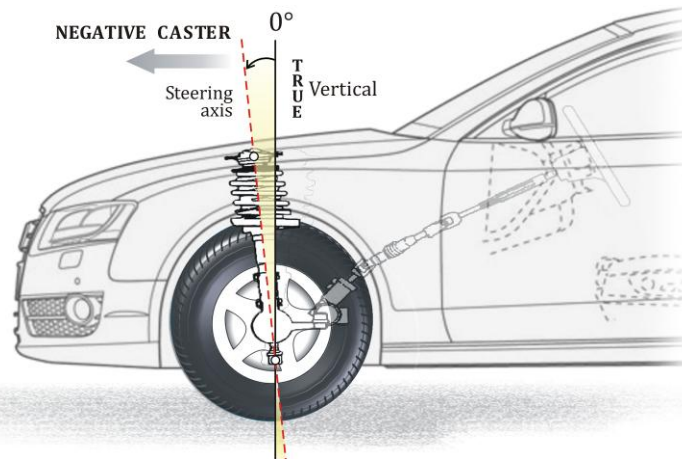


Fig. 7

Positive Caster can also be defined as when the spindle is tipped so that the pivot support centerline intersects the road surface at a point in front of the initial tire contact. Negative Caster would then be the center line intersection to the road surface behind the initial tire contact.

Most vehicles produced today do not have adjustable Caster angle. Many early model vehicles have adjustable Caster in which road crown is compensated for (along with Camber). By setting the Caster angle on the Driver's side 1/2 degree less than the passenger side for Positive Caster specifications or 1/2 degree more for Negative Caster specifications, the road crown should not cause vehicle pull in either direction. Vehicles equipped with manual Steering use very little Positive or Negative Caster. This helps reduce the Steering effort at the Steering wheel.

The advantage of Caster adjusted toward Negative is greater maneuverability. however, direction stability on open road driving is reduced. The advantage of Positive Caster is the strong directional stability and the ease of returning the steering to a straight ahead position. Caster will not cause tyre wear unless extreme mis-adjustment or worn parts are involved. Always set Caster (if adjustable) to specifications and within 1/2 degree from side to side. Keep road crown in mind and adjust as necessary if a pull is present after a proper alignment has been completed.

5.4. KINGPIN INCLINATION (Steering axis inclination)

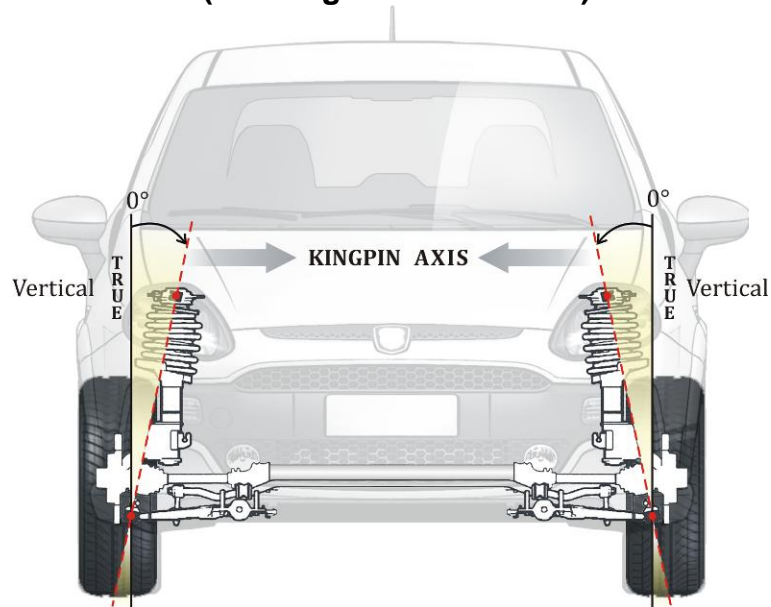


Fig. 8

KINGPIN Inclination (also referred to as the ball joint angle or Steering Axis Inclination-SAI) can be a difficult angle to understand. The easiest way to understand Kingpin Inclination is to first define Steering axis. The steering axis is an imaginary line intersecting the spindle support. In a conventional steering system, the spindle supports are the upper and lower ball joints or the Kingpins. With MacPherson strut systems, Steering axis is the angle beginning at the ball joint and extended through the strut assembly. Viewed from the front of the vehicle, Kingpin Inclination is the angle between the Steering axis and a true vertical line established through the tyre. The Kingpin Inclination is a stability angle and is measured in degrees.

If these imaginary lines were extended to road surface, the area covered between them would be identified as the point of load or scrub radius. The vehicle body will be closest to the road surface when the wheels are pointed Straight Ahead as a result of Kingpin Inclination.

A spindle with Kingpin Inclination will have the outer end of that spindle at the highest point when the wheels are pointed Straight Ahead. Therefore, as the weight of the vehicle pushes downward, the spindle will always attempt to move upward to return the wheels to a Straight Ahead position. After a turn, the Kingpin Inclination helps to return the tyres to Straight Ahead position. Kingpin Inclination also aids in vehicle directional stability by resisting road irregularities that attempt to turn the wheels away from the Straight-ahead position. This angle produces many of the same benefits that improve steering stability as Positive Caster. Correct engineering of Kingpin Inclination can reduce the need for high Positive Camber. The effect of Kingpin Inclination on directional stability is usually greater than that of Caster. Some vehicles with Power steering require a greater amount of steering wheel returning force than those with manual steering. Kingpin Inclination is often used with Positive Caster on power steering equipped vehicles to assist in steering wheel returnability.

5.5. THRUST ANGLE

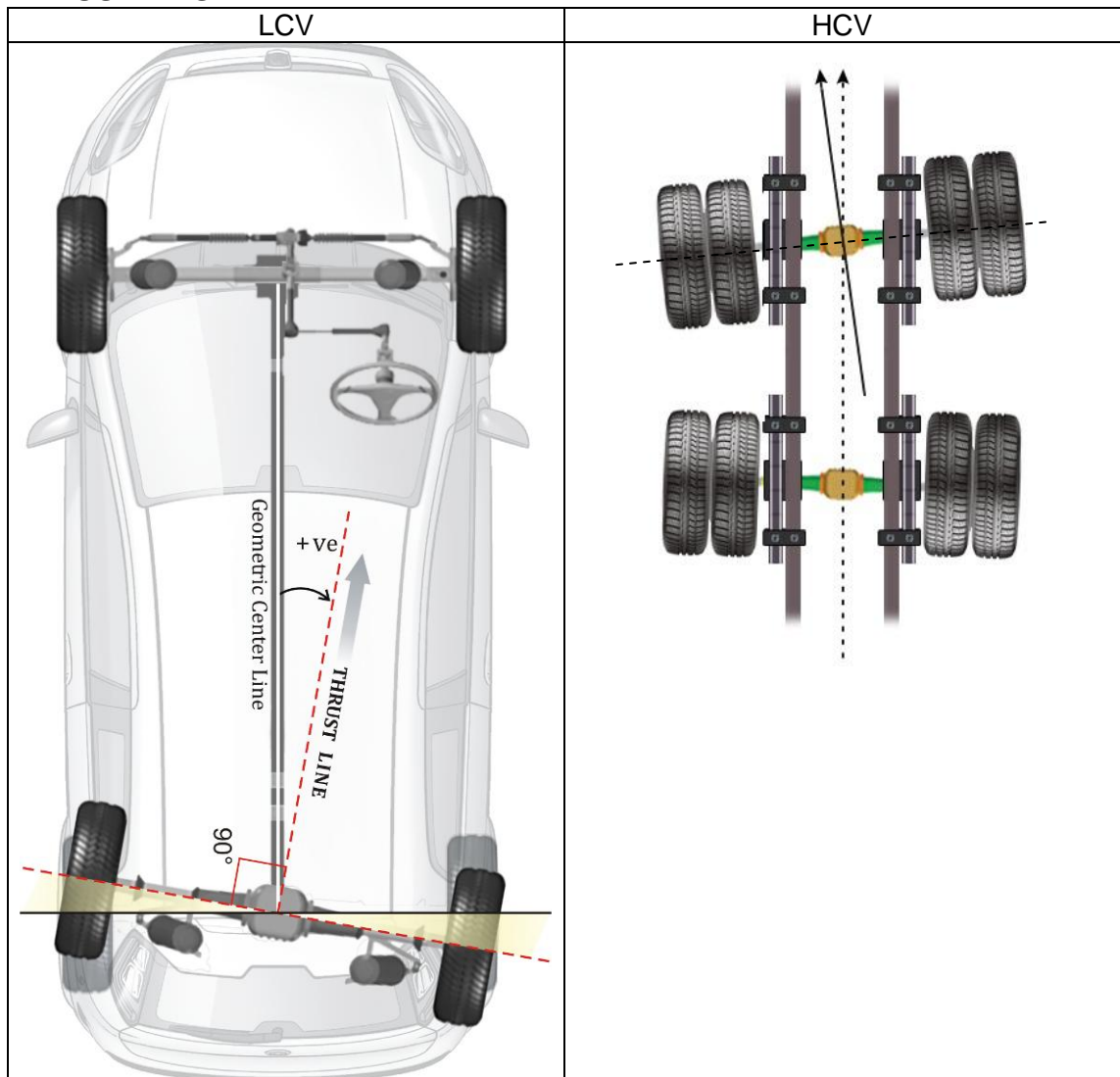


Fig. 9

THRUST ANGLE is the line that divides the total angle of the rear wheels. The rear tyres are not just following the front tyres, they are actually establishing direction of the vehicle. In doing so, a direction of thrust is developed. The Thrust angle created by the rear wheels is used as a reference for aligning the front wheels. Ideally, the Thrust angle should be identical to the geometric centerline of the vehicle. If Thrust angle and geometric centerline are identical, the position of the tires would then form an absolute rectangle and the front tyres could be aligned to the rear tyres, resulting in a perfectly centered steering wheel. Because of unitized construction, factory tolerances and a varying degree of damage and / or wear, it is increasingly unlikely that the axles will be parallel. When the rear axle projects a different angle than the front axle, the driver will need to turn the steering wheel to compensate in order to drive in a straight line.

On situations where the thrust line and geometric centerline are not identical, a thorough inspection of the rear axle and suspension system must be done. Replacing defective components should aid in positioning Thrust angle close to the geometric centerline. If the Thrust angle is not identical to the geometric centerline and there are no defective components, align the vehicle using the Thrust angle instead of the geometric centerline. Aligning the front wheels to the Thrust angle is preferred to aligning to the geometric centerline. The ability to do this is a significant advantage of four wheel alignment. The result should be a straight steering wheel as the vehicle moves straight-ahead.

5.6. SCRUB ANGLE (HCV)

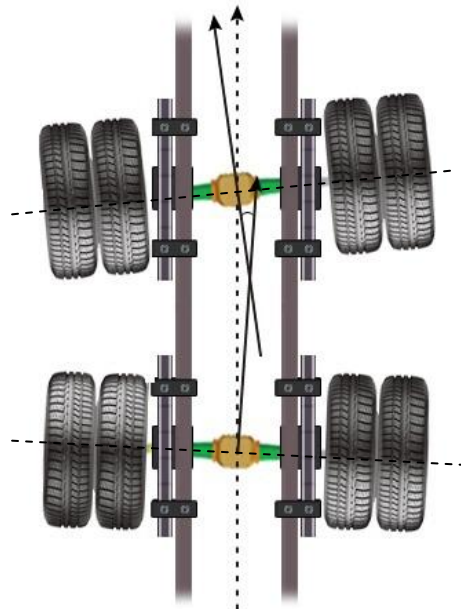


Fig. 10

SCRUB ANGLE is the angle formed at the intersection of the thrust lines of both the Drive axle and Tandem/Dummy axle in a Multi-Axle vehicle.

5.7. PARALLELISM (HCV)

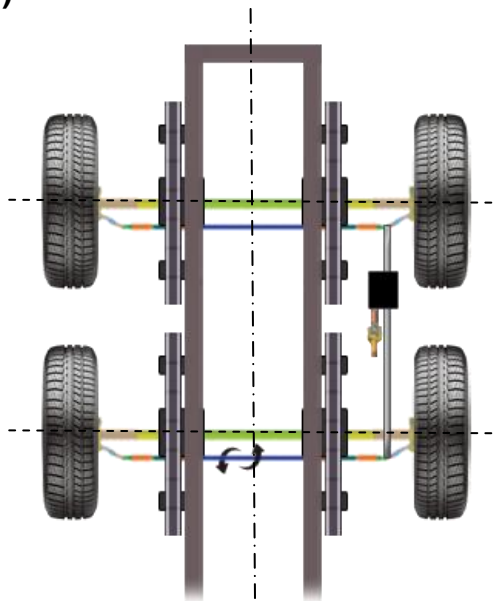


Fig. 11

PARALLELISM is the perpendicularity of the twin steerable axle's centre with respect to the Geometric centre line of the vehicle

Axes are determined to be parallel, thus minimizing tire wear, if measurements between twin steerable axles are equal at both ends of the axle.

5.8. FRONT WHEEL SETBACK

FRONT WHEEL SETBACK or front end squareness is a condition in which one wheel is rearward of the other. If Setback is present the turning radius will not be correct when the vehicle turns. With this condition, the tyres will wear very much in the same manner as if they were under inflated. Generally, Setback is the result of collision damage. It is preferable to have the front tyres square with each other before alignment is done. The most accurate way of checking is with four wheel alignment equipment.

The measured angle will be displayed as Negative Front wheel Setback, if the Right Front wheel leads the Left Front wheel.

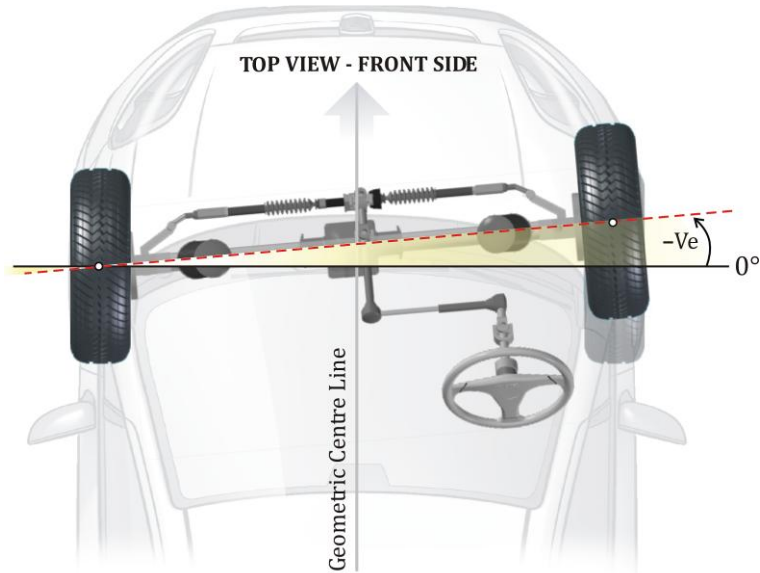


Fig. 12

The measured angle will be displayed as Positive Front wheel Setback, if the Right Front wheel is behind with respect to the Left Front wheel.

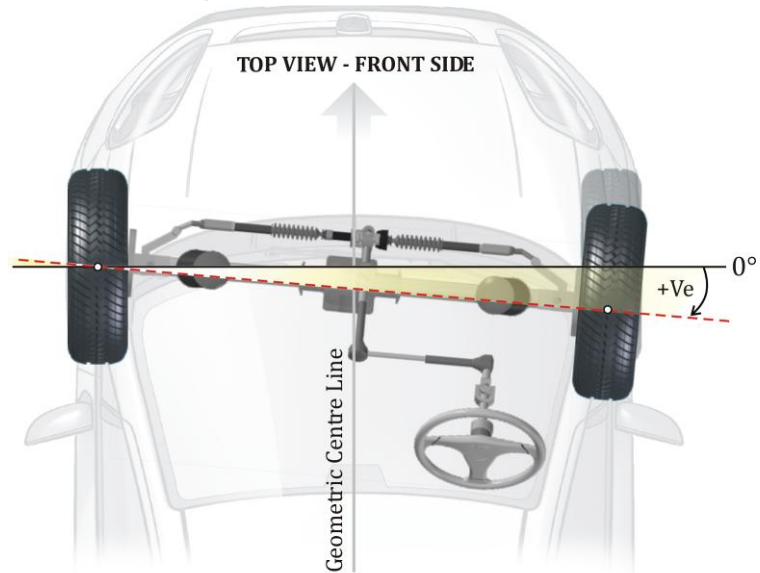


Fig. 13

5.9. REAR WHEEL SETBACK

It is the condition of Rear axle with respect to the Geometric centre line i.e., one of the Rear wheel is rearward or forward with respect to the other wheel. The Rear Wheel Setback is the angle between a line drawn through both the wheel resting points. A line perpendicular to the vehicle geometrical line (thrust line) will be measured in angles.

The measured angle will be displayed as Negative Rear wheel Setback, if the Right Rear wheel leads the Left Rear wheel.

TOP VIEW - REAR SIDE

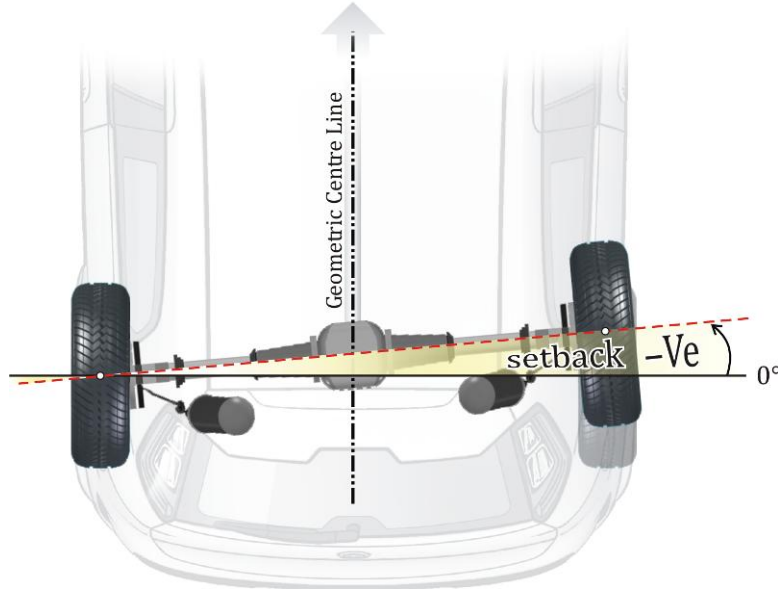


Fig. 14

The measured angle will be displayed as Positive Rear wheel Setback, if the Right Rear wheel is behind with respect to the Left Rear wheel.

TOP VIEW - REAR SIDE

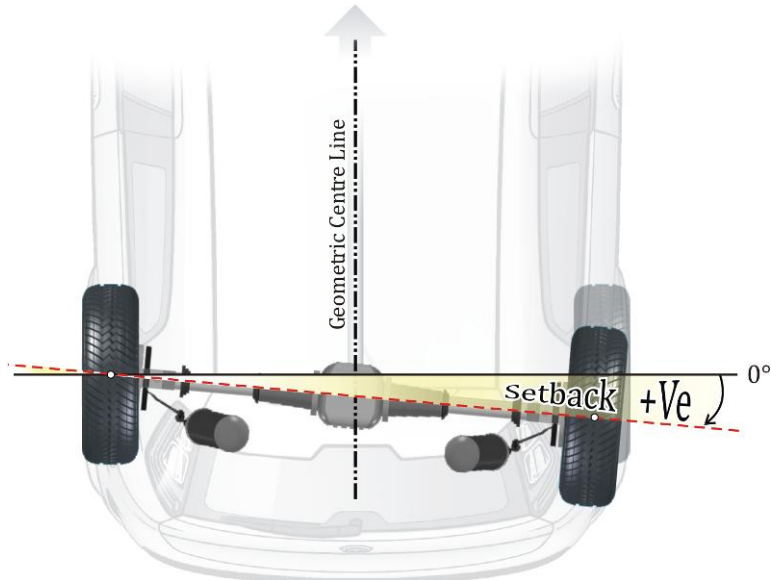
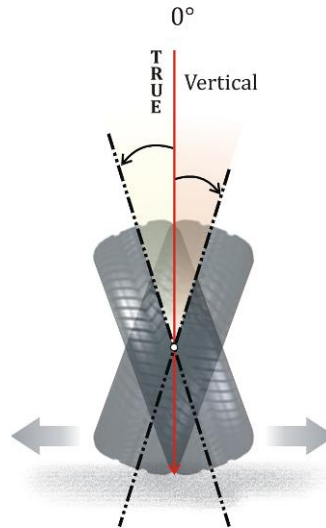


Fig. 15

5.10. WHEEL RUNOUT



RUNOUT
Fig. 16

RUNOUT is one of the important factor which affects a good wheel alignment. Hence Runout compensation is a critical parameter in wheel alignment.

Runout is the wobbling of wheel with respect to neutral axis i.e., vertical axis of Camber and the axis parallel to Geometric centre line in case of Toe. This wobbling affects the Camber and Toe parameters. Runout exists even in new vehicles. But it will be more in old vehicles due to wear and tear. Now let us see how Runout affects the Camber:

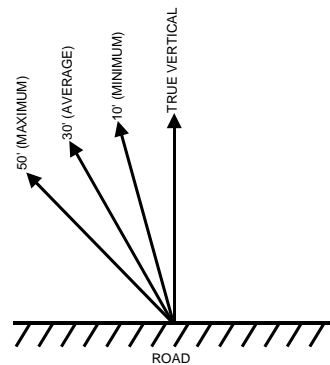


Fig. 17

Assume that there is a wobbling of 10' to 50' in a wheel and Runout is 40' (max. – min. reading). This means, when the vehicle is in motion, the wheel will have a varying Camber of 10' to 50' during every rotation. This is inevitable. Logically the average point has to be taken as the real Camber (i.e., 30' in this case).

If the specified Camber for a vehicle is 55', then adjustments must be made in the shims / Cam mechanism suitably to affect a wobbling movement of 25' to achieve the average Camber of 55' (i.e., 30' + 25' = 55').

After the adjustment, Average Camber = 55' (required)
Minimum Camber = 35'
Maximum Camber = 75'

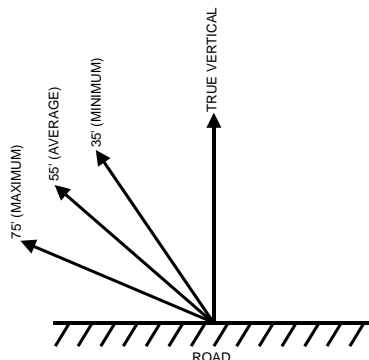


Fig. 18

Due to the above adjustments, Camber variations will be equally distributed in the vehicle (in motion) at any point of time. The process of bringing the Camber to average Runout position is called Runout compensation.

The equipment does the Runout compensation automatically without the knowledge of technician.

In Jacked up Runout method, the Technician has to simply rotate the wheel as guided by equipment for 90° and drop the wheel on Rotary plate.

In Roll-on Runout method, the wheel has to be rotated only at 90° backward from the parked position.

Rest of the calculations is automatic and average Runout compensation is achieved.

Above theory is also applicable for achieving the average Runout compensation in Toe setting.

Once Camber & Toe Runout are compensated, best results can be expected in terms of wheel alignment.

5.11. INCLUDED ANGLE

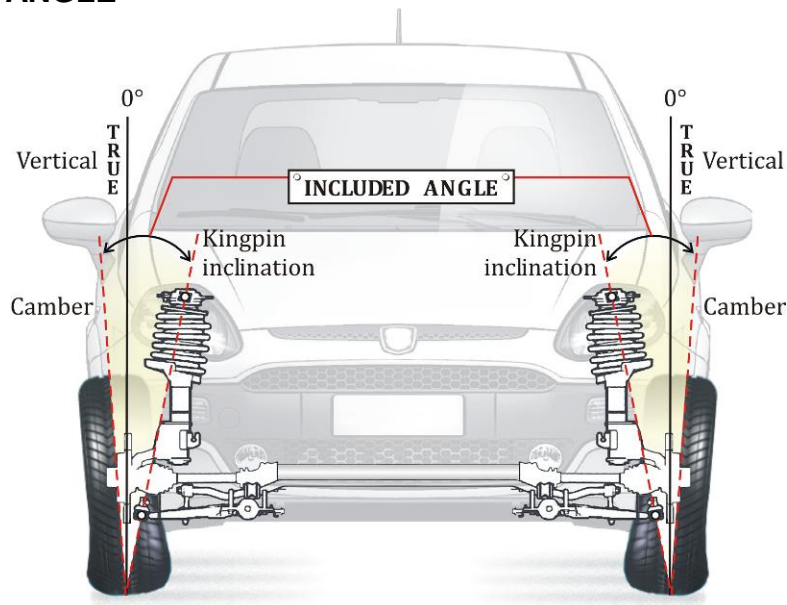


Fig. 19

INCLUDED ANGLE is the angle formed between the Kingpin inclination and the Camber. Included angle is not directly measurable. To determine the Included angle, Kingpin Inclination is added to the Camber. If the Camber is negative, then the Included angle will be less than the Kingpin Inclination. If the Camber is positive, it will be greater. The Included angle must be the same from side to side even if the Camber is different. If it is not the same, then something is bent, most likely the steering knuckles.

5.12. TRACK WIDTH DIFFERENCE

Track width difference is the angle between Front Left wheel resting point to Rear Left wheel resting point & Front Right wheel resting point to Rear Right wheel resting point.

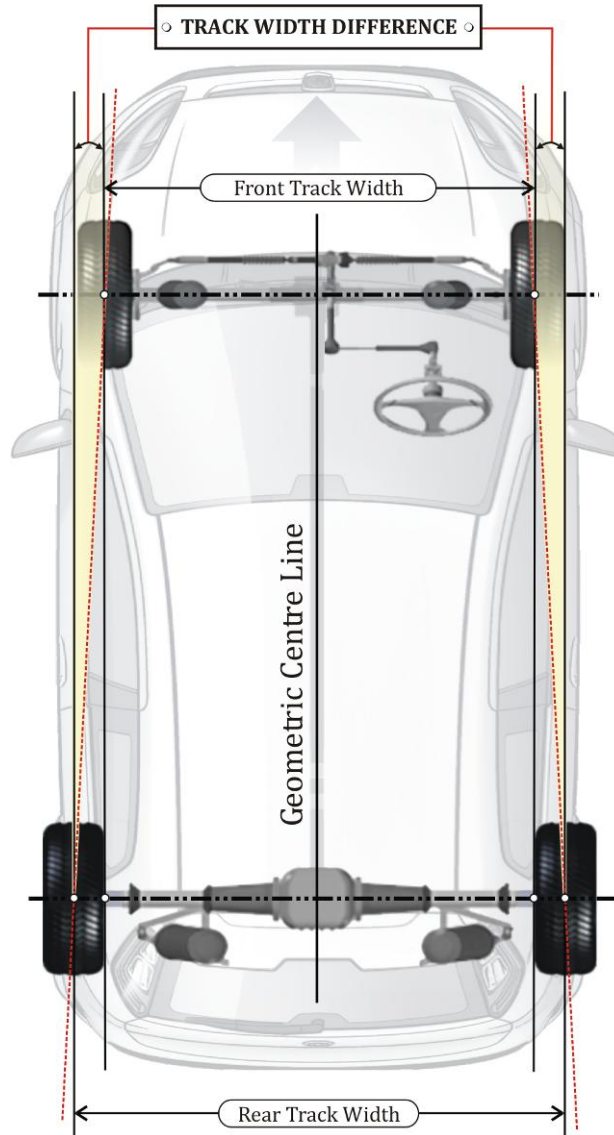


Fig. 20

The measured angle will be displayed as Positive angle, if the Rear Track width is more than the Front Track width.

The measured angle will be displayed as Negative angle, if the Front Track width is more than the Rear Track width.

5.13. LOCK ANGLE

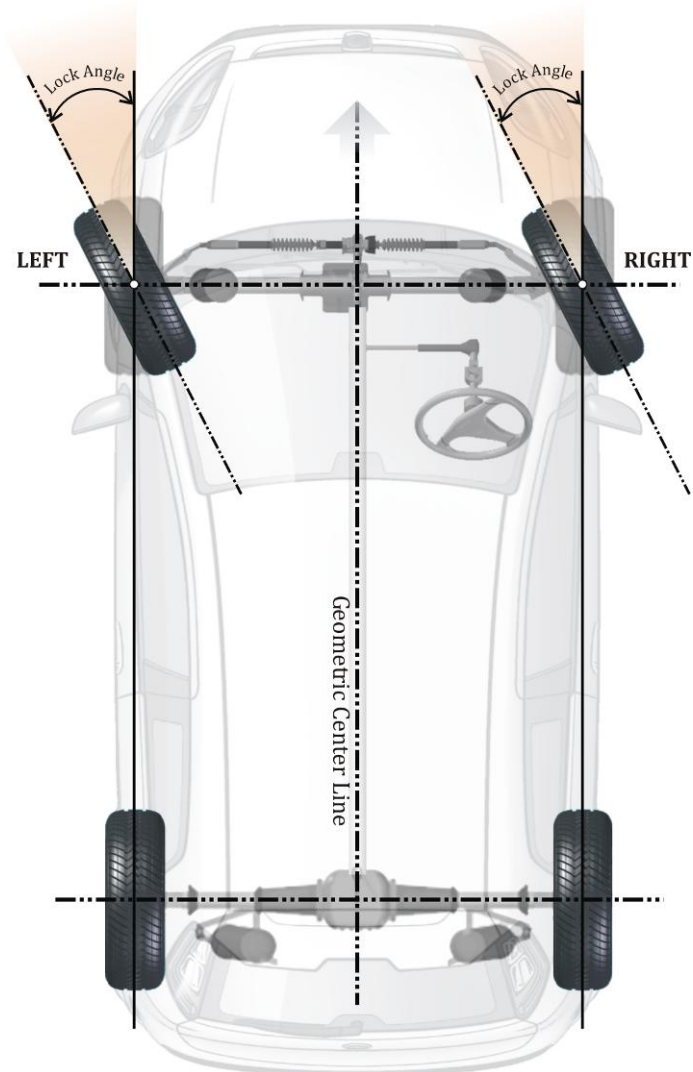


Fig. 21

LOCK ANGLE is the angle measured in degrees by which the front wheels of a vehicle move to the extreme left or right from the straight ahead position when steered.

Left wheel Lock Angle (Internal) : The maximum degrees to which the left front wheel can turn when the wheels are steered to the left side.

Left wheel Lock Angle (External) : The angle turned by left wheel when the right wheel is steered to max. right is called Lock Angle External (Left).

Right wheel Lock Angle (Internal) : The maximum degrees to which the right front wheels can turn when the wheels are steered to the right side.

Right wheel Lock Angle (External) : The angle turned by right wheel when the left wheel is steered to max. left is called Lock Angle External (Right).

Lock angles for the right and left side are controlled by stoppers provided on both sides. Lock angle also determines the minimum turning radius of a vehicle.

The Lock angle varies from 35° to 42° depending upon the make of the vehicle. The Lock angles may get disturbed due to the following factors:

- i. When Steering linkages are bent due to the vehicle meeting with any accident.
- ii. Improper adjustments of stoppers.
- lii. Incorrect setting of steering rack, pitman arm and tie rod lengths.

Lock angles are measured to ensure that the front wheels turn equally on both sides (right & left) as per manufacturer's specification.

5.14. TOE OUT ON TURNS

When the front wheels of a vehicle are steered to left or right, the angle turned by each wheel at any instant is not equal. When the left wheel is turned towards left side by 20° from the Straight ahead position the right side wheel would have turned lesser than 20° . If the Toe is measured at this instant, it will always be in 'Toe-out' condition.

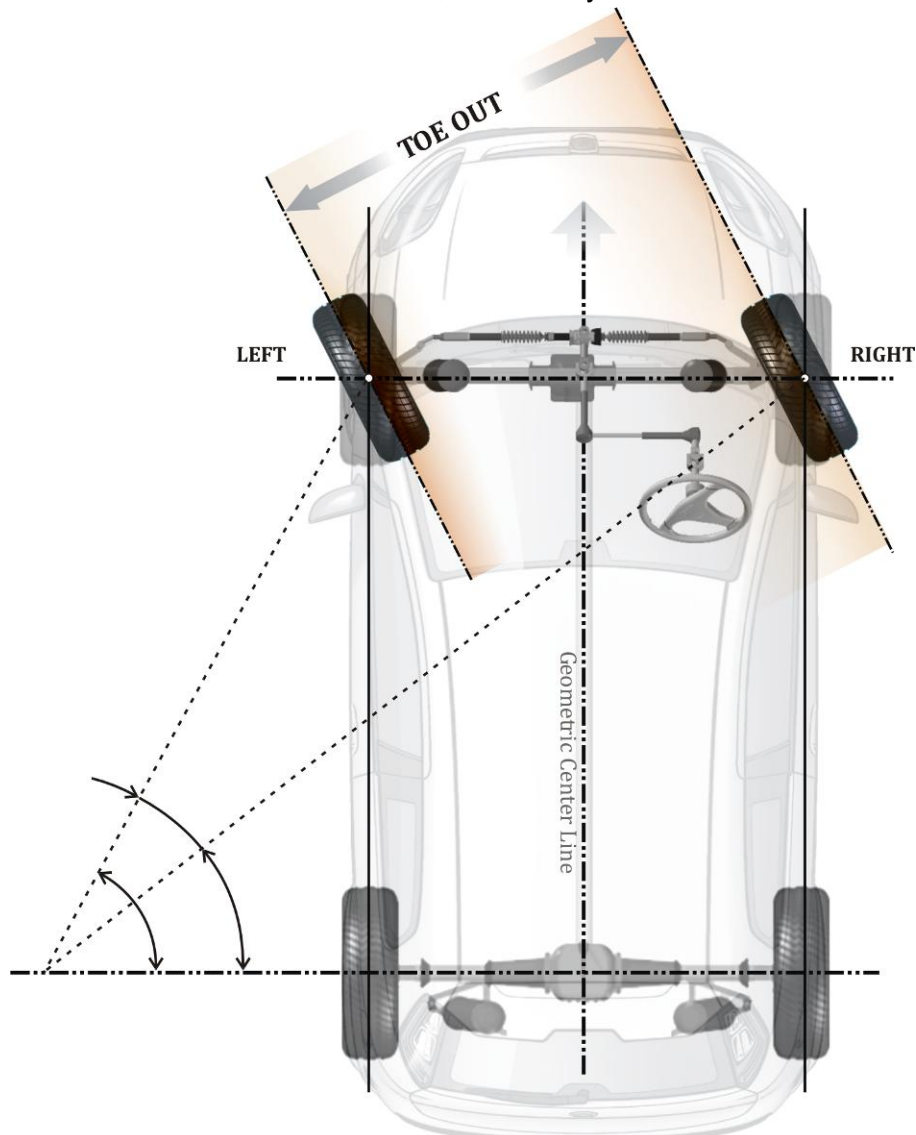


Fig. 22

The difference between the angle turned by left and right wheel is responsible for the Toe-out condition.

Let a = the angle turned by left wheel. i.e., the angle made by the rear axle centre line produced and a line drawn perpendicular to the plane of the left wheel from its centre.

Let b = the angle turned by right wheel. i.e., the angle made by the rear axle centre line produced and a line drawn perpendicular to the plane of the right wheel from its centre.

$(a - b) = r_L$ is the difference in angle turned by left and right wheels.

Similarly when the right front wheel is turned 20° towards right side, the left side wheel would have turned less than 20° because of the Ackerman principle employed in the steering system.

The difference in angle turned by the front wheels during left turns (r_L) and right turns (r_R) should be equal or within allowable tolerance.

If r_L & r_R are not equal or not within limits, then it indicates

- i. Bent Steering link
- ii. Wrong positioning of pitman arm in the Steering box
- iii. Not centralizing the rack in the steering box in the straight ahead position

6. DESCRIPTION OF MAIN PARTS

The equipment consists of a pair of Vertical columns (Left & Right) with Camera systems, Interface box & Target plates. A Main cabinet is provided to hold the Interface box, Computer & Peripherals. Movable Wheel bracket holding posts are provided to hold the Integrated Wheel bracket & Target plates. For Standard accessories & Computer/Peripherals, refer scope of supply. The Optional accessories indicated will be supplied only against order.

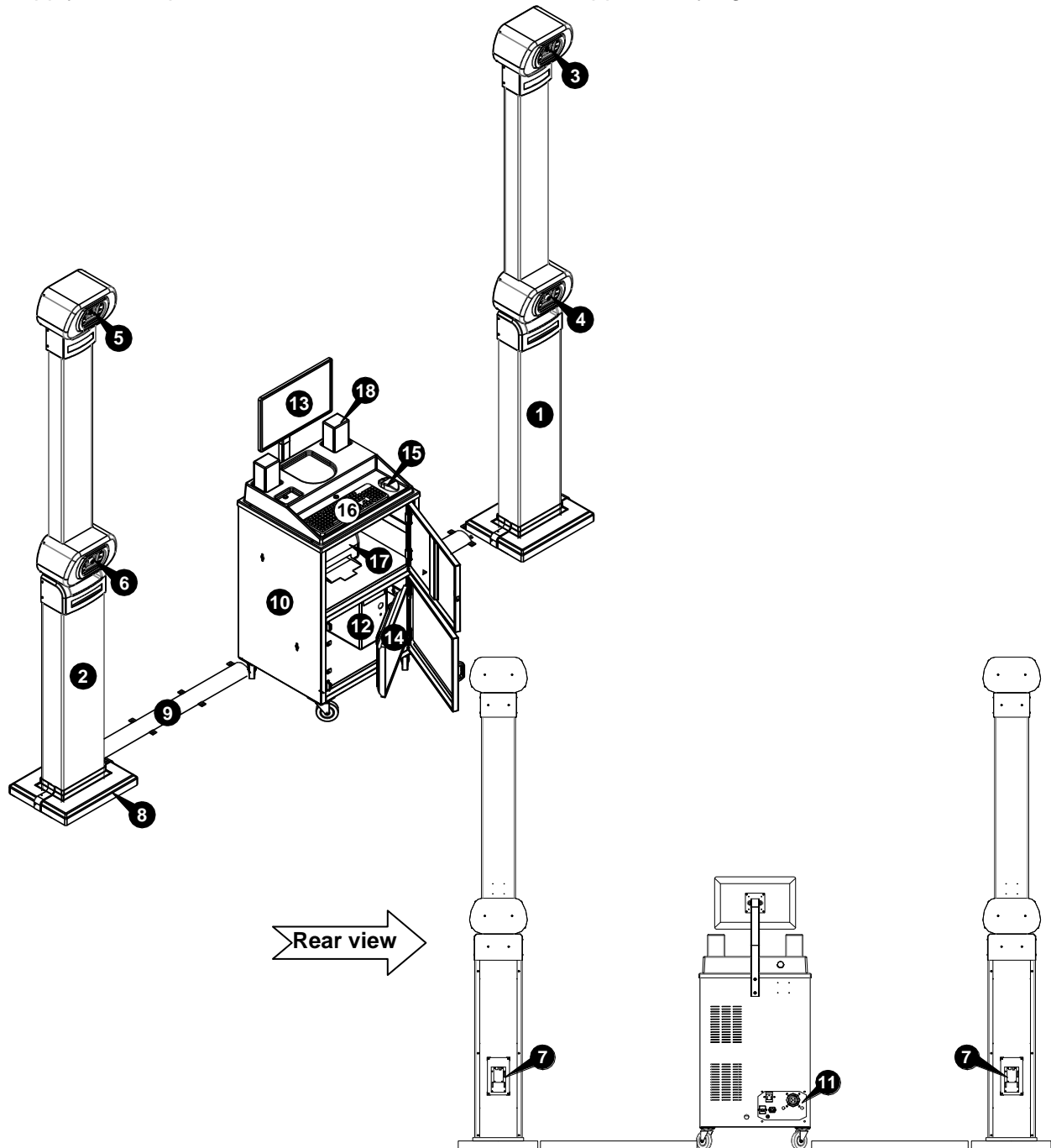


Fig. 23






SI.No.	Description	SI.No.	Description
1	Vertical Column Right	10	Main cabinet
2	Vertical Column Left	11	Interface box
3	Camera, Top, RH	12	Desktop computer (refer scope of supply)
4	Camera, Bottom, RH	13	Primary Display unit (refer scope of supply)
5	Camera, Top, LH	14	Secondary Display unit (ref. scope of supply)
6	Camera, Bottom, LH	15	Mouse (refer scope of supply)
7	LED Driver & Hub board panel	16	Keyboard (refer scope of supply)
8	Base cover	17	Printer (refer scope of supply)
9	Cable protection ramp	18	Speaker (refer scope of supply)

6.1. VERTICAL COLUMN (Left & Right)

Both the Left side & Right side Vertical Columns contain a pair of High performance SI (Scientific Imaging) Camera system positioned to illuminate the respective patterned Targets mounted on the Wheels and capture the reflected incident rays.

A LED Driver board & Hub board are fixed at the rear side of both the vertical columns for control and transmission of data between Camera assembly and Desktop computer.

The Vertical columns are mounted on leveled Base plates.

	DO NOT apply any external pressure or load on the Vertical which may affect the calibration settings and results in alignment errors
	Do not allow anyone to climb on the column. Do not cover the ventilation holes.
	DO NOT rest or lean on the Vertical columns while doing alignment which will disturb the settings and the readings will oscillates
	DO NOT adjust or open the Camera assemble which may affect the overall calibration
	Critical electronic assemblies are housed in Vertical column and hence necessary precautions should be followed by protecting it from moisture.

6.2. INTERFACE BOX

Interface box is located in the Main cabinet for distributing & regulating power supply required for the Aligner. Power outlets are provided in the panel for PC, Peripherals, & Camera.

A High voltage cutoff MCB is also provided to protect the electronic assemblies from high voltage. It can be used to switch OFF complete power to the system after shutdown of the PC.

Following Control fuses are available in the Interface box as described below:

Control fuse - F1 is provided for protection of all electronic components in PC unit
Specifications – 3A, Dia 5mm x 20mm, Slow blow type Glass fuse
The Fuse will blow in 5 seconds (max.) for maximum current of 3A

Control fuse - F2 is provided for protection of Monitor, Printer & Speaker
Specifications – 5A, Dia 5mm x 20mm, Slow blow type Glass fuse
The Fuse will blow in 5 seconds (max.) for maximum current of 5A

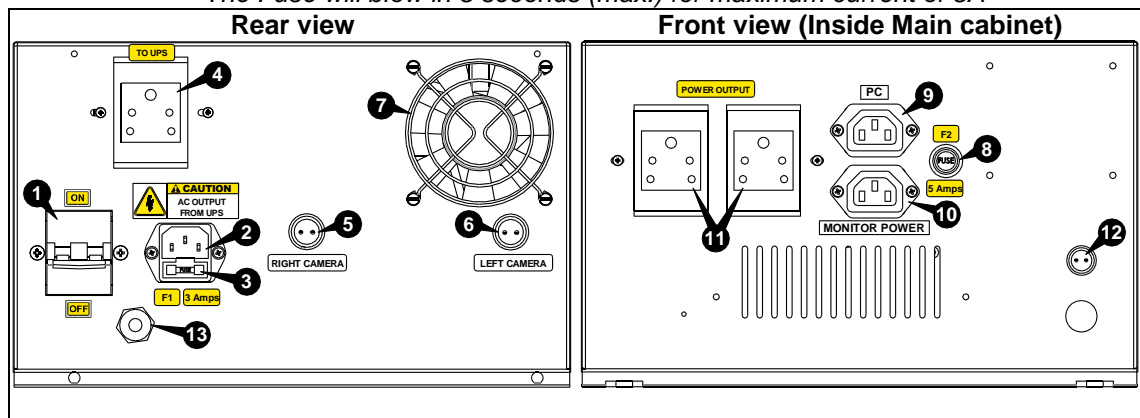


Fig. 24

Sl. No.	Description
1	MCB
2	AC input from UPS for the equipment
3	Fuse (F1) - For Interface box
4	AC output to UPS
5	DC power to Right Camera
6	DC power to Left Camera

Sl. No.	Description
7	SMPS Fan
8	Fuse (F2) - For PC peripherals
9	AC output for PC
10	AC output for Monitor
11	AC output for Secondary Monitor & Printer
12	DC power to Cooling Fan
13	AC input to the machine (from Mains)

6.3. TARGET PLATE

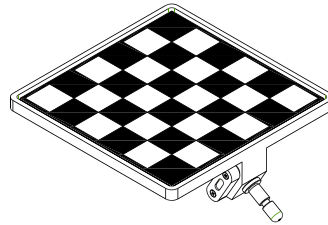




Fig. 25

The Target plates contain patterned IR reflecting media to reflect the incident rays from the Camera assembly.

A Spirit level is provided in each Target plates to ensure its horizontality while mounting it on the wheel bracket.

	Handle the Target plates carefully. Rough handling / shocks may cause damage to the Target plates
	Dropping / rough handling may cause deviation in calibration. User should take utmost care to handle and maintain the Targets in good condition
	<p>Clean the Target plates using compressed air to remove dust particles and then wipe the surface of the plate with soft cloth. Clean the reflecting surface with the help of cleaning agent (Glass cleaner/ Colin) weekly once, using micro fiber cloth (soft cloth).</p> <div style="display: flex; justify-content: space-around;">   </div>
	The target plates are having ID stickers for its mounting location. Do not interchange the plate while fixing it on the axles

Target plates are integrated with Wheel bracket as a single unit to reduce the preparation time. The integrated units should be rested over the clamps in respective Wheel bracket holding posts that are positioned near the wheels under alignment when it is not in use.

6.4. MAIN CABINET (refer scope of supply)

Main cabinet is the housing for Desktop computer & peripherals. The Primary display unit is mounted on a Monitor column over the top of Main cabinet. Secondary display unit is fixed in the bottom rack with a see-through door. Keyboard, Mouse & Multimedia speakers (Optional) are located on the respective cavities in Top cover.






Interface box will be located in the bottom of Main cabinet. An Exhaust Fan is fixed in the rear side of Main cabinet to dissipate the heat generated by the equipment.

6.5. DESKTOP COMPUTER (refer scope of supply)

The Desktop computer is a Commercial branded computer used for processing the images acquired from Camera assembly to execute the alignment program and data storage.

The location of Desktop devices and peripherals connection ports may vary depending upon the manufacturer. However the following user end devices and connection ports available commonly in all models are used for our application:

Device / connection ports	Location	Purpose
Optical drive	Front side	For loading / upgrading software
3 Pin AC socket (Male)	Rear side	AC input to Desktop
VGA / DP / HDMI	Rear side	For Monitor
USB 2.0 ports	Front / Rear side	For communication with Keyboard, Mouse, Printer, Speakers
USB 3.0 ports		For Communication with Cameras and Hub board.
Audio output	Front / Rear side	For Multimedia Speaker

	Keep the Desktop away from radiators and heat sources
	Desktop contains Optical drives which have built-in laser devices. To prevent any risk of exposure to laser radiation, do not open the desktop / drives
	Ensure that none of the system air vents are blocked. Blocking them would cause serious thermal problems
	Clean the Desktop with a soft & clean cloth using water and then remove moisture from the surface quickly. Long term exposure to moisture may damage the surface
	The location / functions of Desktop devices / connections may vary depending upon the make of Desktop supplied. Refer Desktop manual / Soft media

Follow the procedure given below to transfer the Warranty & Ownership of Dell PC in case if supplied along with our Wheel aligner for claiming global Warranty:

Ensure Internet is established in the PC.

Note the information provided in the Service tag affixed on top the PC cabinet and feed the same in respective field by accessing the below link as shown below:

<https://www.dell.com/support/assets-transfer/in/en/inbsd1/Transfer/Index#/Identify>

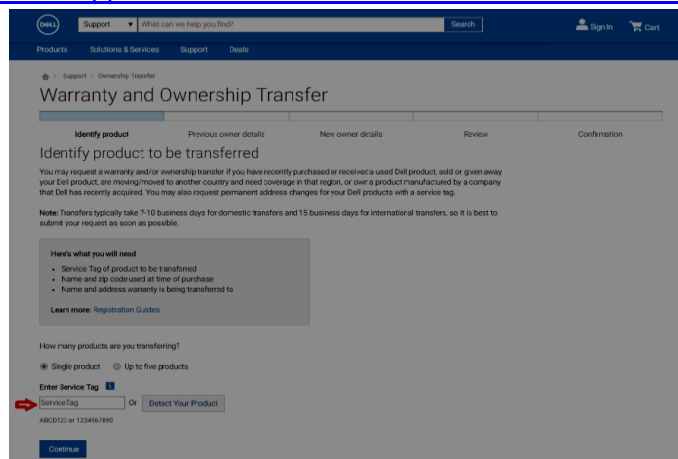


Fig. 26

NOTE: Press “Detect Your Product” for obtaining the Service tag details automatically Press “**Continue**” button. Following screen will appear prompting the user to enter the previous Owner details:

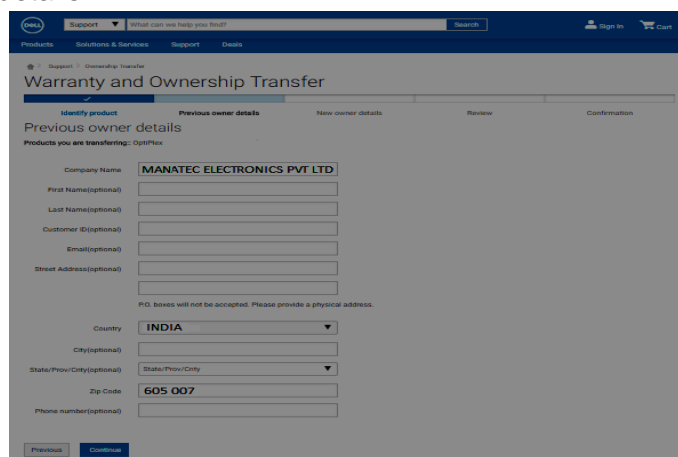


Fig. 27

Key-in the below details and press “**Continue**” button:

Company Name: MANATEC ELECTRONICS PVT LTD

Country : India

Pin Code : 605007

Select “**Commercial/Office**” option from the Drop down menu of “**Intended use**” as shown below and press “**Continue**” button:

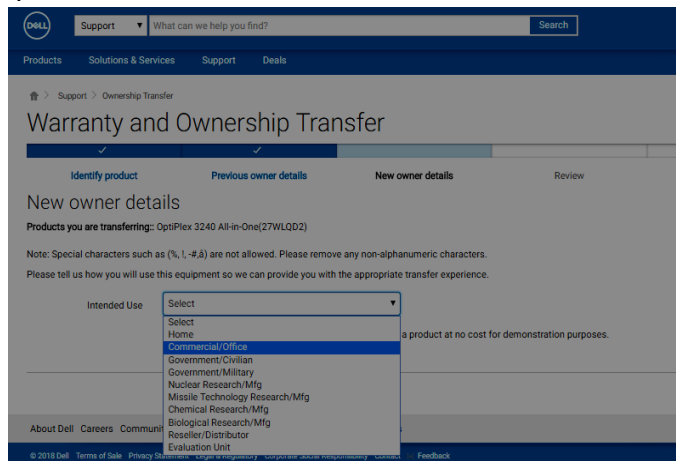


Fig. 28

Now enter the user’s Owner details and press “**Continue**” button:

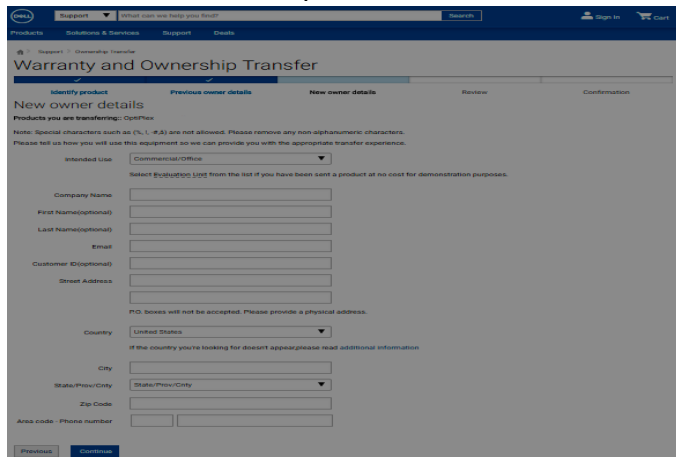


Fig. 29

Go through the instructions displayed and click “**Continue**” button.

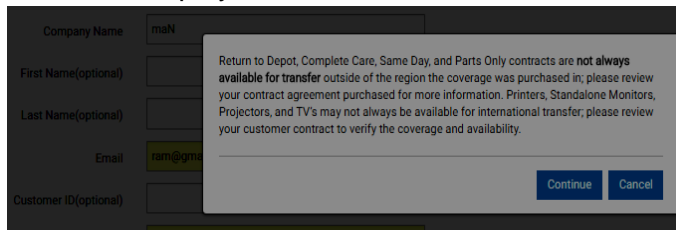


Fig. 30

Review the informations provided so far before agreeing to the Terms & Conditions. Use “**Previous**” button to make changes if any.

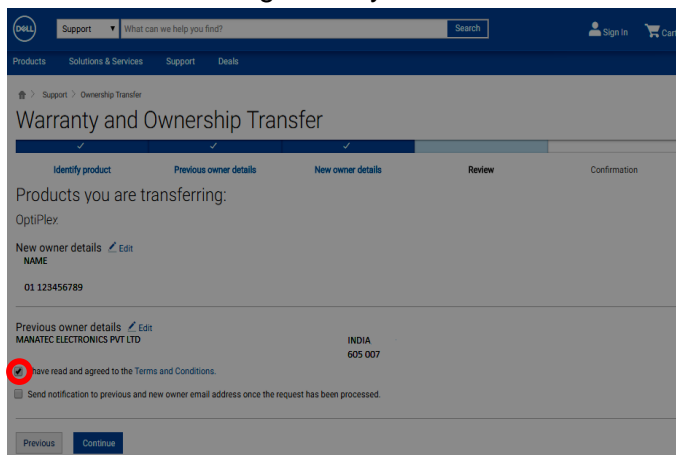


Fig. 31

Finally tick mark to Agree to the Terms & Conditions and press “**Continue**” button for submitting the Owner Transfer request.

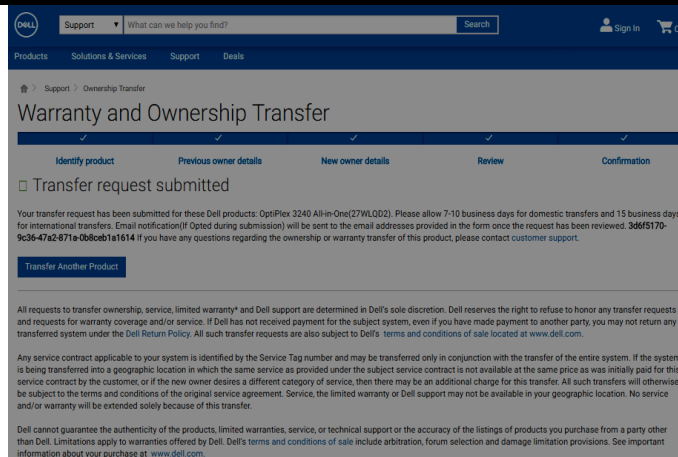


Fig. 32

NOTE: Typically Dell will take 15 business days for international transfers. Hence is advisable to convert the details at the time of installation itself.

6.6. DISPLAY UNIT – Primary & Secondary (refer scope of supply)

The Display unit is a High resolution Color Monitor to display the alignment screens and functions. It contains a Power indicator LED, Power ON/OFF switch and various adjustments. Refer the Monitor manual / soft media provided along with the equipment for adjustments.

	Ensure that none of the Monitor air vents are blocked. Blocking them would cause serious thermal problems
	Clean the Monitor with a soft & clean cloth using glass cleaning agent. Remove moisture from the display quickly and keep the display dry. Long term exposure to moisture may damage the display
	The location of Monitor power indicator and controls may change depending upon the make of the Monitor supplied. Refer the Monitor manual / Soft media

6.7. KEYBOARD (refer scope of supply)

A standard USB or PS/2 Keyboard is connected to Desktop computer and placed over the Keyboard tray. The Keyboard is provided for operating / navigating and giving inputs during the alignment program.

	The location of Indicators and functions of Keys may change depending upon the make of the Keyboard supplied. Refer Keyboard manual / Soft media
--	---

6.8. MOUSE (refer scope of supply)

A standard Optical Mouse is connected to Desktop computer and placed over the keyboard tray itself. The Mouse is provided for operating / navigating and giving inputs during the alignment program.

	The location / functions of Keys may change depending upon the make of the Mouse supplied. Refer Mouse manual / Soft media
--	---

6.9. STANDARD ACCESSORIES (refer scope of supply)



Use only the Accessories recommended by the manufacturer and handle it carefully. Failure to comply may cause injury to Operator



Frequently inspect the accessories and clean and lubricate

6.9.1. WHEEL BRACKET (HCV) – 12" to 24"

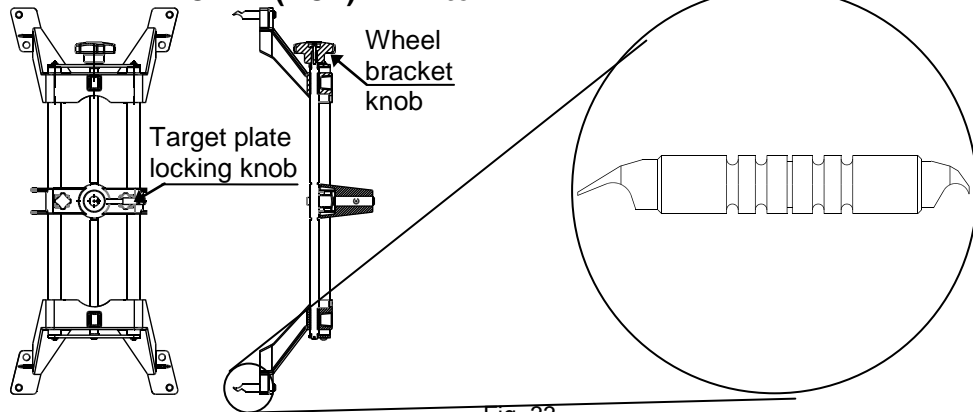


Fig. 33

This is a Self centering type Wheel bracket with quick clamping feature for mounting the Target plates to Wheel rims. The Wheel bracket is a versatile design to accommodate LCV Wheel rims ranging from 12" to 24" of diameter. The Inner PCD holes will cover from 12" to 20" sizes of rim & Outer PCD holes will cover from 16" to 24" sizes of rim.

An Adapter is also provided with the Wheel bracket to use it along with the required profiles of Rim locking pin to clamp Bus tyre rims (front axle), Pusher and Tag axles.

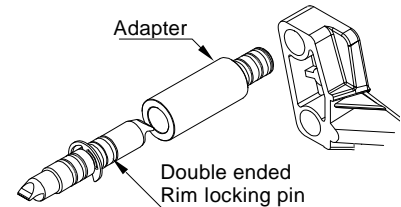


Fig. 34



Handle the Wheel bracket with care. The Locating pins may have sharp edges

Clamping of Alloy wheels

1. Outer clamping is advised for Alloy wheel. Extend the clamp outward to a size larger than the rim by turning the Wheel bracket knob in Anti-clockwise direction.
2. Place the upper Locking pins on the outside of the top of the rim. Push the Locking pin in between the Tyre bead and the rim. It may be necessary to "pop" the upper portion of the Wheel bracket with the palm of your hand to seat well. Note that it is not necessary for the Wheel bracket to be mounted perfectly vertical on the wheel.
3. Push lower Locking pins into place. Again, it may be necessary to pop them in further for security. Continue tightening knob until it is secured.
4. Tighten the Wheel bracket by turning the knob in clockwise direction until the lower Locking pins engage the rim.
5. Ensure the mounting by pulling the Wheel bracket outwards. If it comes off easily, re-mount the Wheel bracket properly.

Clamping of ordinary steel rim wheels

To clamp the wheel from the inside out using the outer lip of the rim, use the following steps:

1. Extend the Wheel bracket inwards to a size smaller than the rim by turning the Wheel bracket knob in clockwise direction.
2. Place the lower locking pins on the wheel lip at the bottom of the wheel. It is not necessary to be perfectly vertical.
3. Tighten the Bracket by turning the knob in anti-clockwise direction until the upper Locking pins engage the rim. Continue to tighten until the Wheel bracket is secure.
4. Test the security by pulling the Wheel bracket outwards. If it comes off easily, re-mount the Wheel bracket.

6.9.2. ROTARY PLATE (7 ton)

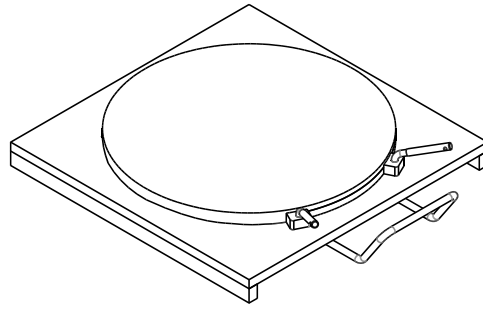


Fig. 35

The Rotary plate consists of a freely rotating plate with load capacity of 7 ton in each Rotary plate suitable for HCVs. The front wheels of the vehicle being aligned should rest on these plates. The Rotary plate helps to free up the wheels from the friction and relaxing the ball joint to its original condition. Lock pins are provided to arrest the movement of rotation while parking the vehicle over the plate for alignment. The Locking pins must be removed while taking measurements.

The Rotary plates enable Left turn and Right turn movement required for measuring Caster & Kingpin angles.



Ensure the Top plate of Rotary plates are locked with Locking pins before parking the vehicle



The Rotary plate must be maintained properly by user free from dust

6.9.3. ROTARY PLATE SEGMENT PLATE

Rotary plate segment plates are provided to fill the gap between the Rotary top plate and the pit edge of wheel rolling side to facilitate proper wheel movement during Runout operation.

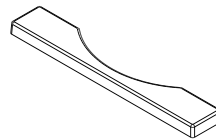


Fig. 36

6.9.4. FRONT TARGET PLAT EXTENSION SPACER, 150mm Lg.

These spacers are provided to extend the Target plates for vehicles with smaller track width (like Cars & LCVs) to bring it within the Camera line of sight. Also to bring the target plates to camera vision where the vehicle body is too much protrude out from the wheel.

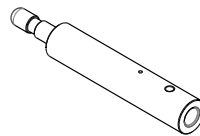


Fig. 37

6.9.5. WHEEL STOPPER

Wheel stoppers are provided to arrest the movement of Wheel beyond required location during alignment process.

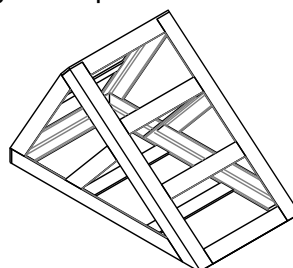


Fig. 38

6.9.6. LCV STEERING LOCK

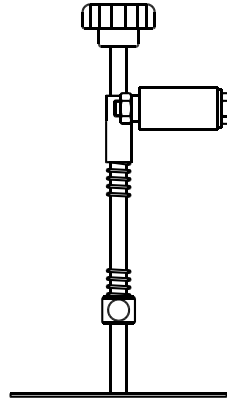


Fig. 39

Steering lock is used to arrest the movement / rotation of Steering wheel, while performing Runout measurement & Toe adjustment.



Do not keep your head nearer to the Steering while locking with Steering lock to avoid get hit due to the spring tension

6.9.7. HCV STEERING LOCK

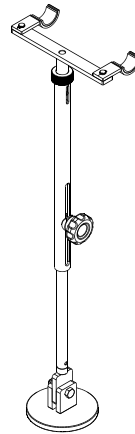


Fig. 40

Steering lock is used to arrest the movement/rotation of Steering wheel, while performing Runout measurement & Toe adjustment.



Do not keep your head nearer to the Steering while locking with Steering lock to avoid get hit due to the spring tension

6.9.8. LCV BRAKE PEDAL LOCK

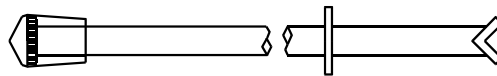


Fig. 41

Brake pedal lock is used to keep the Vehicle Brake in pressed condition (applied), so that the vehicle will not move during the Turn Left and Turn Right programs, which is very important to measure the Caster and Kingpin.



Ensure the Brake pedal lock is pressed against the vehicle brake



Ensure the Brake pedal lock is pressed against the vehicle brake during Caster & Kingpin swing to acquire readings

6.9.9. HCV BRAKE PEDAL LOCK

The HCV Brake pedal lock is suitable for HCV vehicles to lock the wheel while carrying out Caster & Kingpin measurement.

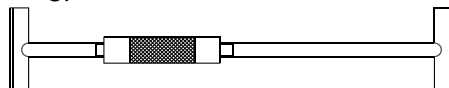


Fig. 42

6.9.10. WHEEL BRACKET HOLDING POST, 3 HOLDER

Movable Post provided to hold 3 Nos. of Integrated Wheel bracket & Target plate units near the respective left & right side Wheels under alignment, when not in use and for quick access during alignment.

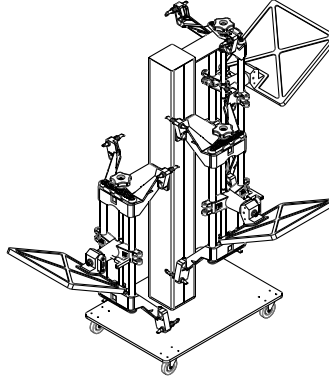


Fig. 43

6.9.11. WHEEL BRACKET HOLDING POST, 2 HOLDER

Movable Post provided to hold 2 Nos. of Integrated Wheel bracket & Target plate units near the respective left & right side Wheels under alignment, when not in use and for quick access during alignment.

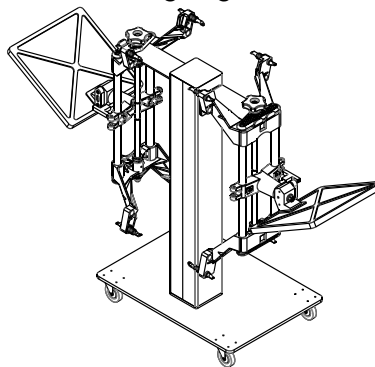


Fig. 44

6.9.12. ROTARY PLATE PIT SPACERS

Pits spacers of following types are provided to arrest the movement of Rotary plates within its pit. In case of increase in Wheel base of F1 & F2, these Spacers can be rearranged to accommodate the wheel centre.

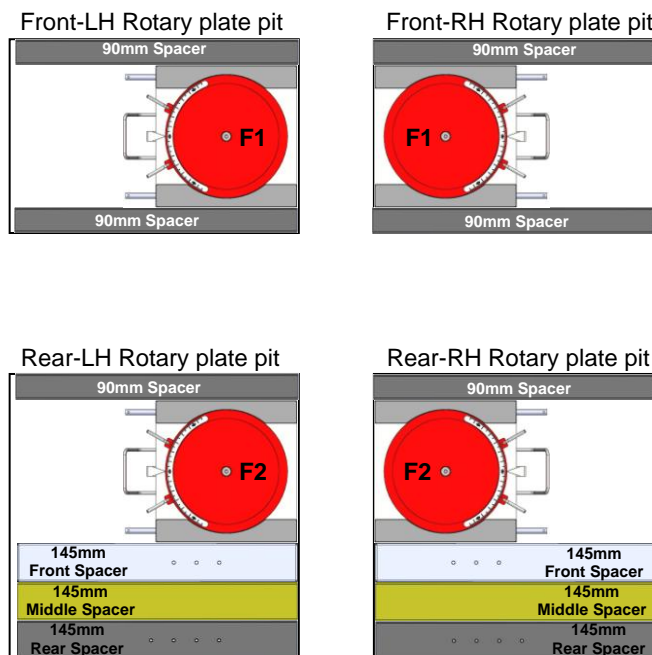


Fig. 45

Rear Rotary plate & its pit is not applicable for 3A model

6.9.13. RATCHET WITH CHAIN BLOCK

This accessory is provided for adjusting the Thrust angle in HCV vehicles with single rear axle.

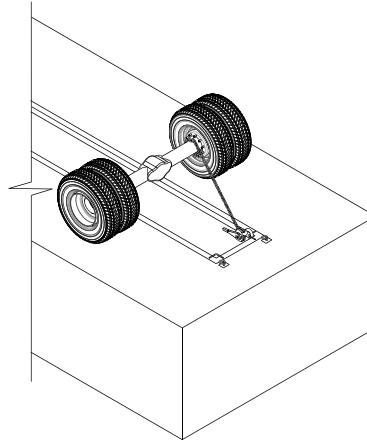


Fig. 46

6.9.14. PLASTIC TOOL BOX & ORGANIZER

A box is provided to store the Rim locking pins and adapters safely without damaging it when not in use.

6.9.15. DATA MANAGER SOFTWARE

Data manager is a smart customized software package available with alignment program for monitoring the condition of various vehicles aligned by the equipment and the performance of Wheel alignment centre on the whole. Reminder letters are automatically generated for existing customer base periodically, which helps in increasing the revenue for the garage.

6.10. OPTIONAL ACCESSORIES (Refer scope of supply)

6.10.1. WHEEL BRACKET (HCV) – 15” to 28”

The Wheel bracket is a versatile design to accommodate Wheel rims ranging from 15” to 28” of diameter.

6.10.2. WHEEL BRACKET EXTENSION ADAPTER

This Adapter is very useful for clamping wheel rims of 24” to 30” dia., while using along with Wheel bracket (whose clamping range is 12”-24” dia). This adapter can cover wheel rims upto 34” dia also, if used along with Wheel bracket with 28” clamping range. This adapter eliminates requirement of a separate Wheel bracket for HCV wheels.

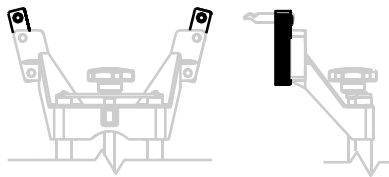


Fig. 47

6.10.3. RIM LOCKING PIN – Double sided (for Steel cast rims)

This Rim locking pin of 90mm Lg. is developed for clamping different kind of HCV Steel cast rim profiles, compatible with 24” Wheel bracket.



Fig. 48

6.10.4. RIM LOCKING PIN – Double sided (for Low contour steel rims)

This Rim locking pin of 90mm Lg. is developed for clamping different kind of HCV Low contour steel rim profiles, compatible with 24” Wheel bracket.

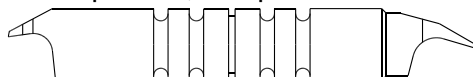


Fig. 49

6.10.5. RIM LOCKING PIN – Double sided (for Run flat tyre rims & Fancy disc)

This Rim locking pin of 64mm Lg. is developed for clamping different kind of LCV Run flat tyre rim profiles, compatible with 24" Wheel bracket.

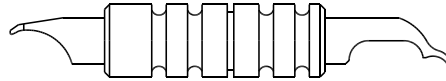


Fig. 50

6.10.6. RIM LOCKING PIN – Double sided (for Standard & Steel rims)

This Rim locking pins of 64mm Lg. is developed for clamping different kind of LCV Steel rims with fancy disc, compatible with 24" Wheel bracket.

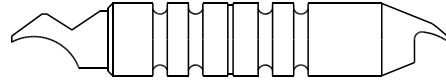


Fig. 51

6.10.7. TYRE CATCHING 3POINT CLAMP

This accessory can be used for clamping the Wheel targets with Vehicle Tyre instead of Rim in order to avoid damages / scratches to the Alloy rims. This 3Point clamp can be used for clamping tyres with diameter range of 470mm to 1100mm & comes with centre hole $\varnothing 15\text{mm}$ suitable for holding Target plates.



Fig. 52

6.10.8. LONGER SLIDER

This Longer slider facilitates easy adjustment of Rear wheel Camber / Toe and also to accommodate Toe correction upto 5° .

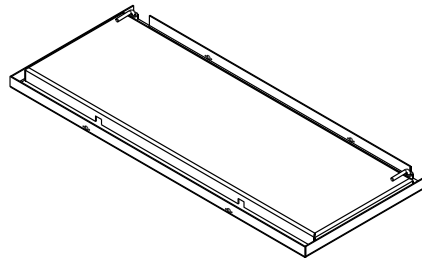


Fig. 53

6.10.9. AXLE OFFSET GAUGE

This gauge is used to measure the gap between the Wheel and Axle frame

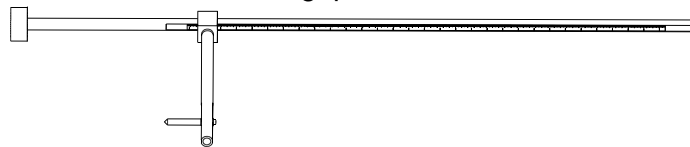


Fig. 54

6.10.10. TYRE DIA GAUGE

This gauge is used to measure the diameter of the HCV wheels

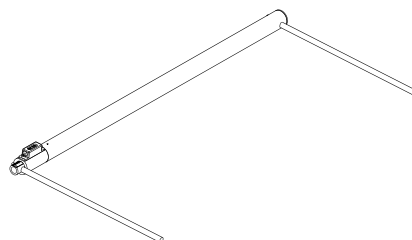


Fig. 55

6.10.11. FRAME REFERENCE GAUGE FOR TRUCKS & BUSES

This is a reference gauge used for computing the wheel alignment parameters by adjusting the position of axles either with reference to the geometric center line or Frame (Chassis) center line in a longitudinal direction. The frame center line will be calculated by taking input at four positions on the chassis sequentially in the order of Front Left, Front Right, Rear Left & Rear Right.

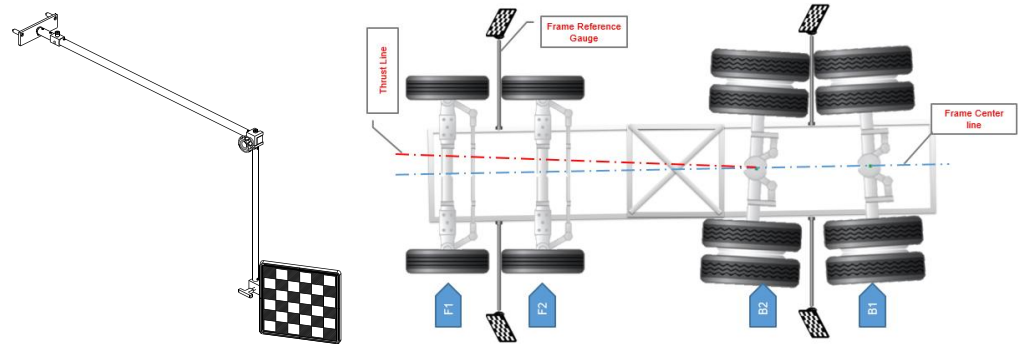


Fig. 56

6.10.12. DRAWBAR (TOW BAR) GAUGE FOR FULL TRAILER

This gauge is used for conducting wheel alignment for Full trailer. This Gauge will be mounted with the Tow bar ring of swiveling axle after detaching the Jeep / Tractor upon completion of Push Pull Runout. The Drawbar gauge will have provision to mount the Target plates in both LH & RH side. The B1 axle will be aligned first followed by Drawbar gauge SA position. Then the B2 axle will be aligned with respect to perpendicularity of Drawbar.

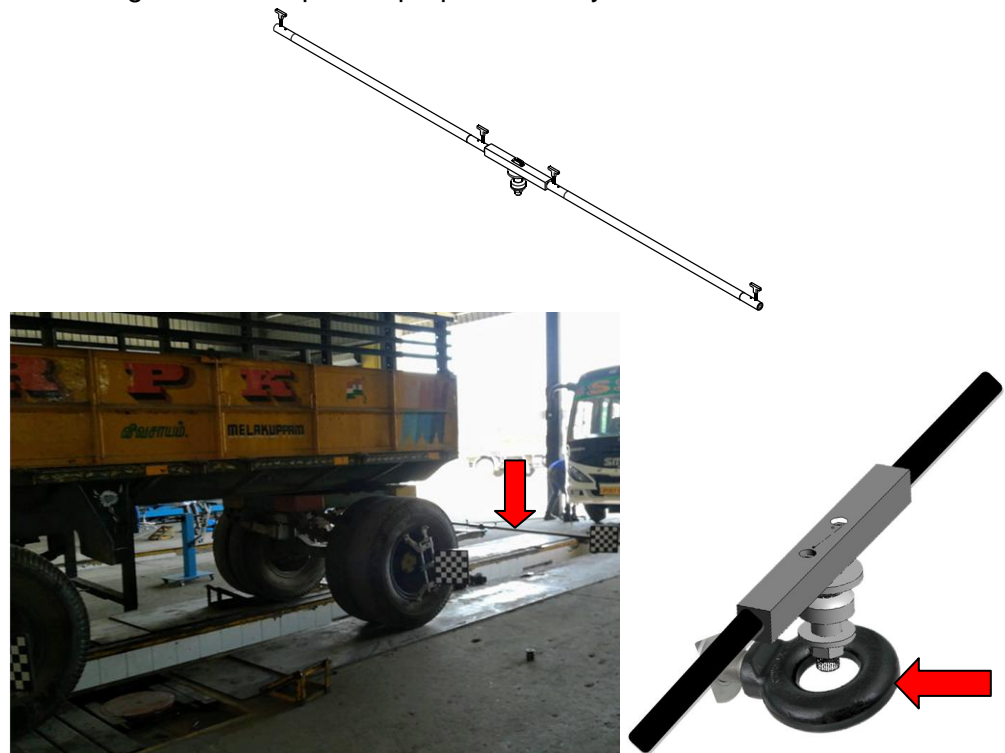


Fig. 57

6.10.13. FOUR SHAFT CALIBRATION KIT WITH 300mm SPACER

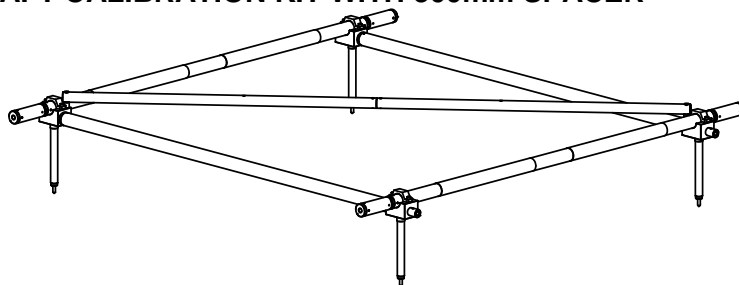


Fig. 58

Calibration kit is a simplified tool meant for calibrating the all the Target plates simultaneously and if necessary to correct it.



Calibration is a very important function. During this process, the Calibration stand should not be jerked or moved during calibration process

6.10.14. HCV ROTARY PLATE, SLIM TYPE

This HCV Rotary plate with slim design facilitates proper measurement & adjustment of Toe angle in HCVs with Pusher axle while conducting alignment on a rough surface.

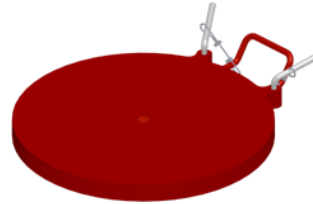


Fig. 59

6.10.15. HCV ROTARY PLATE RAMPS

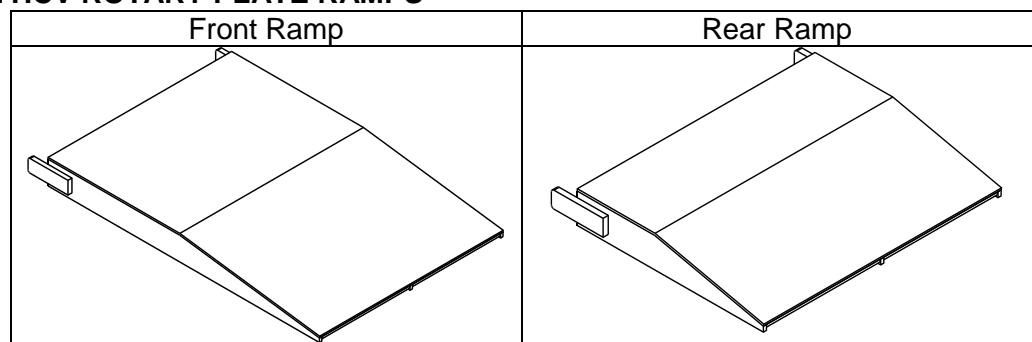


Fig. 60

Ramps are provided to facilitate Push-Pull (Roll-On) Runout wherever recess (Pit) is not available for Rotary plates in the Alignment bay. Ramps are to be located at Front side and Rear side of Rotary plates so that the Vehicle can be rolled forward / backward easily over the Rotary plates placed over a plain surface. The Front and Rear Ramps are to be placed near the Rotary plates as shown below:

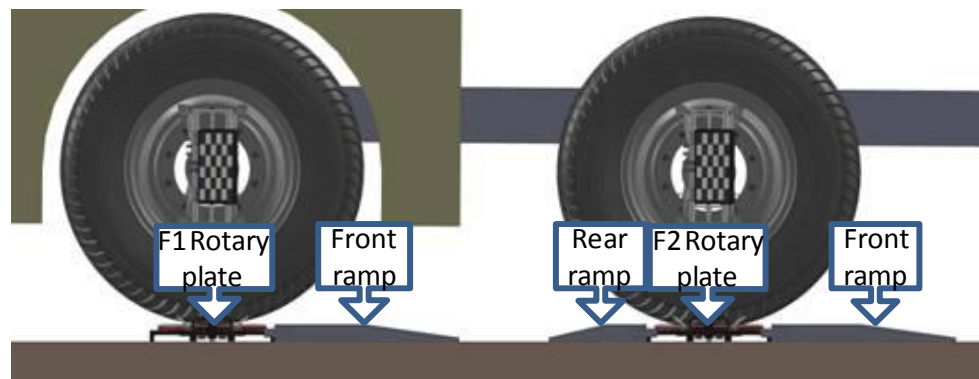


Fig. 61



The Rotary plate ramps must be maintained properly by user free from dust

6.10.16. WINCH (5443kg)

The Winch can be used for measuring Wheel runout accurately in Articulated buses wherein the Vehicle drive (Engine drive) on this particular bus is generating too much axle jerks without load and the drive axle slippages on the ground is noticed. The axles are not rolling, instead it is slipping and the wheels alone turns backwards and the targets are flipped back from the camera views. This winch is operated using 12VDC. The winch has a DC motor with gear box and a spool with steel wire rope wounded on it.

The steel rope will be tied to any of the rear axle (ideally drive axle) and the winch will be operated. The winch will pull the vehicle backward. To move the vehicle forward direction, a pulley with shaft mechanism installed on the pit (next to the F2 Rotary plate) will push the vehicle forward.

Note: To operate the winch, customer should have 12Volts/100AH battery and suitable battery charger this battery.



Fig. 62

6.10.17. EARTHING ROD

Earth rod is provided to interface the product to ground in all soil conditions in order to achieve satisfactory earthing systems in overhead and underground electricity distribution and transmission networks.

6.10.18. PRINTER

A Printer option is provided with the equipment for printing the alignment reports in ISO A4 size paper. The User is provided with options for printing the alignment reports in Ordinary or in 3D Graphical format as per the requirement.

	If Laser printer is used with the equipment, the AC power should be given separately for the PRINTER. If the panel output is used, the FUSE will blow.
	Use only original ink cartridge, by indicating the respective Cartridge Model No., Printer Make and Model No. to the supplier. Failing to comply may lead to Printer head damage / improper printout
	Use only standard ISO A4 size papers (210 x 297 mm) recommended by the Printer manufacturer and always ensure sufficient quantities of paper is loaded in the Printer tray. Failing to comply may lead to Improper printing / Paper jam / Printer head damage
	Clean the Printer with a soft & clean cloth using water and then remove moisture from the surface quickly. Long term exposure to moisture may damage the surface
	Location of Indicators and Control buttons may change depending upon the make of Printer supplied. Refer Printer manual / Soft media

6.10.19. MULTIMEDIA SPEAKER









Multimedia speakers (2 Nos.) are used for providing voice prompts to guide the operator throughout the alignment program.

	Location of Indicators and Control buttons may change depending upon the make of Speaker supplied. Refer Printer manual / Soft media
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6.10.20. INTERNATIONAL VEHICLE DATA (refer scope of supply)

This is an Optional feature to be activated via Built-in Hardware lock by purchasing at extra cost. The readily available vehicle specifications that are compiled and released by Third parties with License can be directly uploaded in our system. These vehicle specifications are updated & released twice every year at extra cost


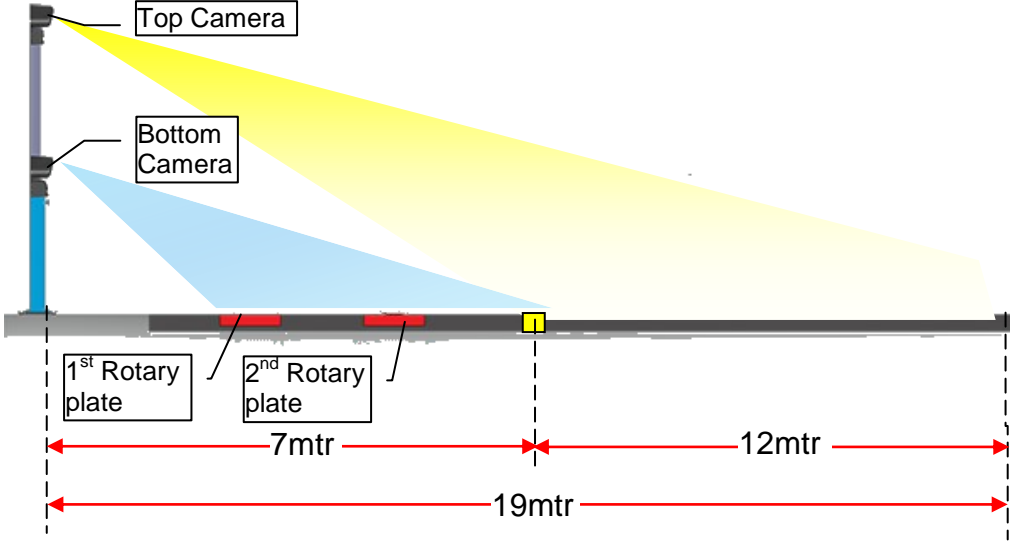

7. OPERATION

	Only permit qualified & trained personnel to operate, maintain or repair the Aligner
	Ensure the Top plate of Rotary plates are locked with Locking pins before parking the vehicle. Always use rotary plate spacer for proper Runout measurement.
	Always comply with the applicable accident prevention regulations
	Avoid exhaust smoke directly falling on the Target plates
	Do not hammers or hit any part of the equipment with service Tools
	Do not operate the equipment under direct sunlight. Even reflected sunlight reaching the camera will result in errors
	Air blowing equipments like Pedestal Fan should not be in the close proximity of Camera assembly as it will disturb the camera path affect the reading stability
	Handle the Target plate carefully. Rough handling / shocks may cause damage to the Target plates

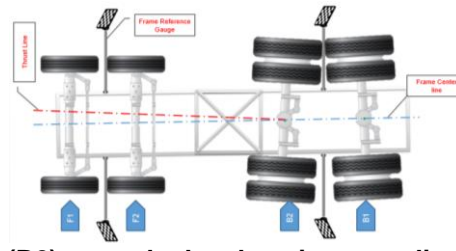
7.1. DEFECTS / MALFUNCTIONS

	In case of defects or malfunctions such as etc., turn OFF the mains and contact qualified Service personnel
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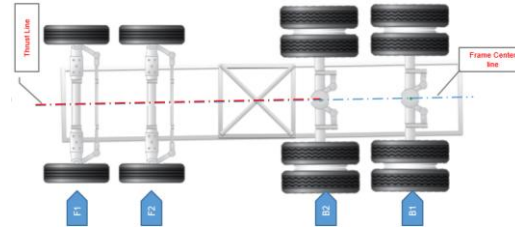
7.2. PRELIMINARY ALIGNMENT PREPARATION

	<p>The Bottom Camera is located in the Vertical column to measure the parameters of wheels positioned upto 7mtr distance from Camera and the Top Camera is located to measure the parameters of wheels positioned between 7mtr & 19mtr distance from Camera</p> 
	<p>By default, the system will support the adjustment of Axle position with reference to Geometric center line. To switch over to Frame based alignment, select "<i>Frame Measurement</i>" from the "Model configurations" option in <i>Settings</i> screen (Refer Chapter 8.5 in Service manual)</p>

Using Frame reference gauge, the centre line of Truck chassis is identified (Refer blue line) by capturing the readings at all 4 positions. The mis-aligned Drive axle (B2) is indicated in Red line



Adjust the Drive axle (B2) towards the chassis centre line (Blue line). Followed by this, adjust the remaining axles also with reference to the chassis centre line as per on-screen guidance. Now, all axles are aligned with respect to frame (Chassis).



1. It is vital to collect the required information / complaint on the vehicle being aligned from vehicle owner prior to diagnosis for conducting a perfect alignment.
2. Perform a test drive to verify owner's complaint.
3. Ensure that Top plate of Rotary plates is locked with locking pins.
4. Ensure the Rotary plates are without sag or tilt while moving the vehicle over the Rotary plate.
5. Ensure the Rotary plate pit spacer and Segment plates are without shake and with fits compactly. Pit gap to be filled with spacer without any gap in front and rear side. Filling spacer level to be equal with rotary plate top plate.
6. The Vehicle wheel rolling area should not have any undulations. This will affect the true Runout measurement.
7. The Vehicle should not be jerked while acquiring the data i.e., a STOP symbol will be displayed on the screen.

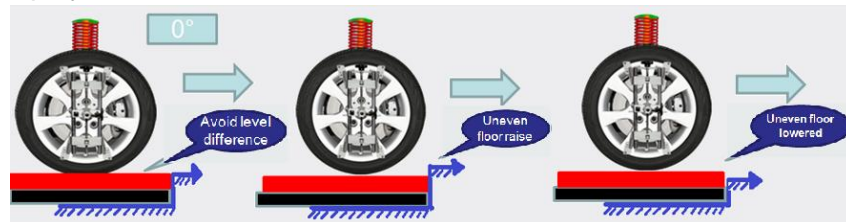


Fig. 63

8. Position the vehicle on Alignment pit as explained below:
 - For Multi-Axle vehicle, both the Front axle wheels should rest on exact centre of Rotary plates as well as center of pit for twin steer axle.
 - For Trucks with 1 Front axle & 1 Rear axle having Wheel base more than 4mtr, park the Front steer axle at 1st Rotary plate.

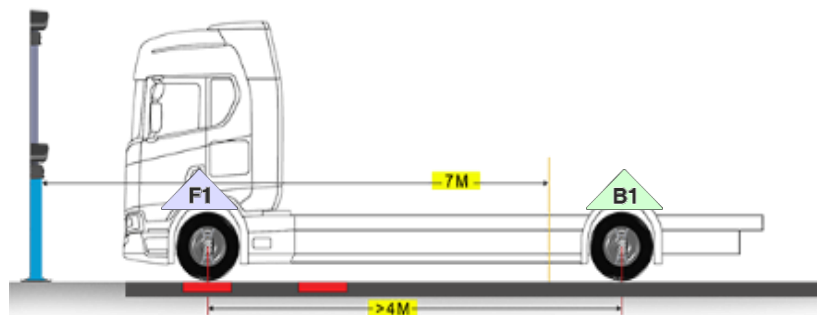


Fig. 64

NOTE: Use F1 Target plates for Front axle wheels & B1 Target plates for Rear axle wheels.

- For Trucks with 1 Front axle & 1 Rear axle having Wheel base less than 4mtr, park the Front steer axle at 2nd Rotary plate.

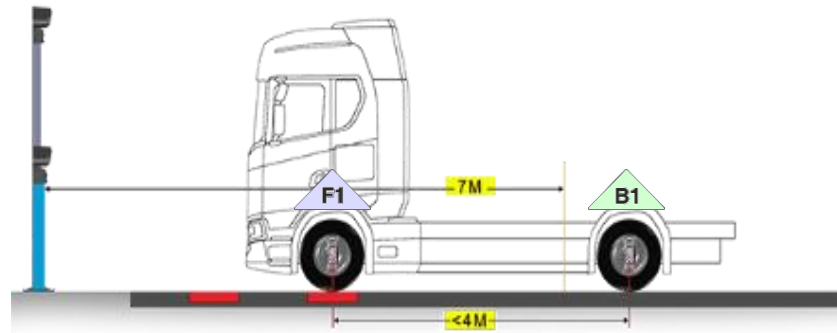


Fig. 65

NOTE: Use F1 Target plates for Front axle wheels & B1 Target plates for Rear axle wheels.

- For Trucks with 1 Front axle & 2 Rear axles having its nearest wheel base less than 4mtr, park the Front steer axle at 2nd Rotary plate.

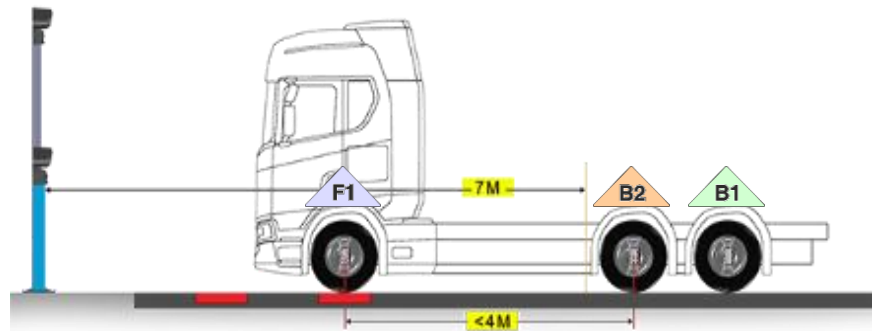


Fig. 66

NOTE: Use F1 Target plates for Front axle wheels, B2 & B1 Target plates for the respective Rear axle wheels.

- For Trucks with 1 Front pusher axle & 2 Rear axles having Wheel base less than 4mtr, park the Front steer axle at 2nd Rotary plate.

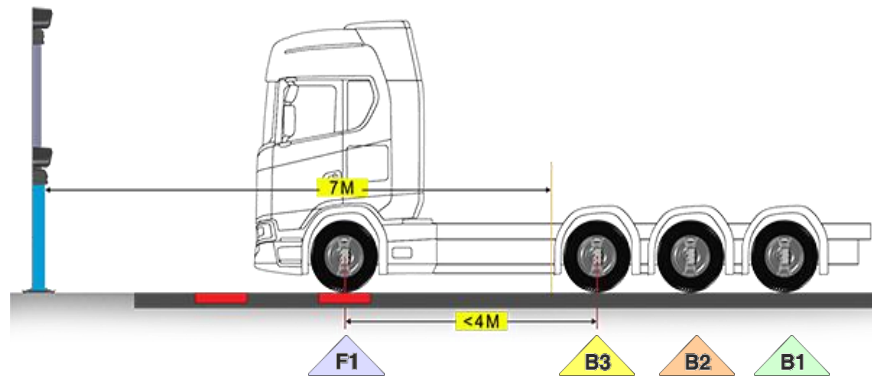


Fig. 67

- For Buses with 1 Front axle & 1 Rear axle having Wheel base more than 4mtr, park the Front steer axle at 1st Rotary plate.

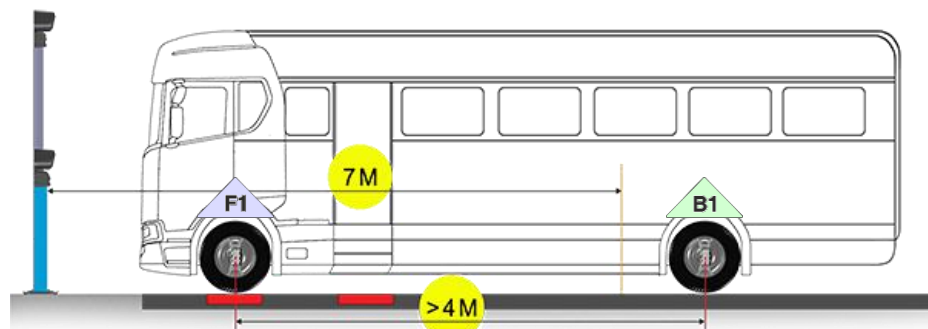


Fig. 68

NOTE: Use F1 Target plates for Front axle wheels & B1 Target plates for Rear axle wheels.

- For Buses with 1 Front axle & 1 Rear axle having Wheel base less than 4mtr, park the Front steer axle at 2nd Rotary plate.

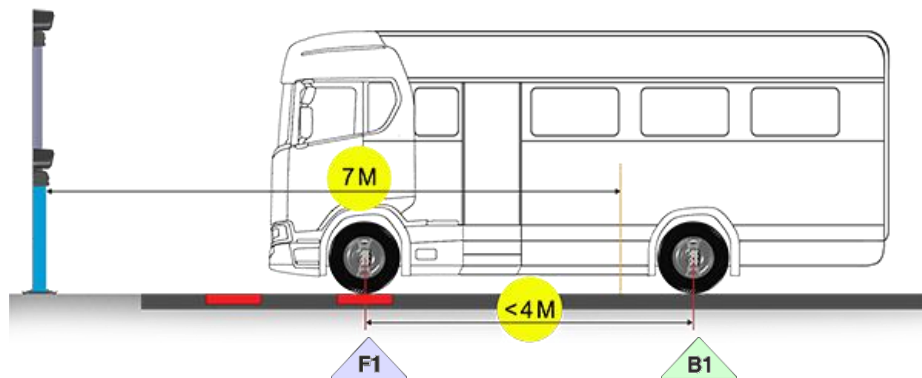


Fig. 69

NOTE: Use F1 Target plates for Front axle wheels & B1 Target plates for Rear axle wheels.

- For LCVs like Car/Light truck with wheel base <4mtr & Wheel diameter ≥ 24 ", park the Front wheels (F1) on Front Rotary plate.

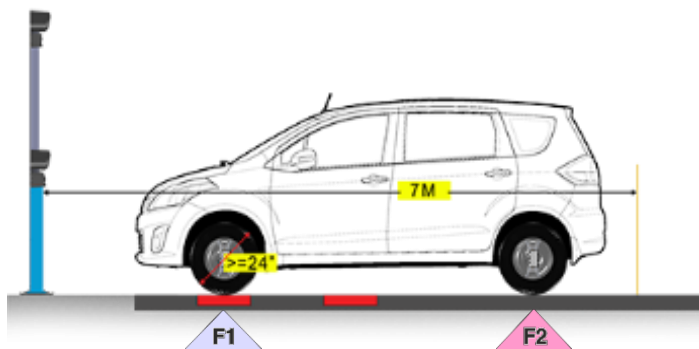


Fig. 70

NOTE: Use 150mm spacers between wheel bracket & Target plates for LCVs with track width less than 1.8mtr.

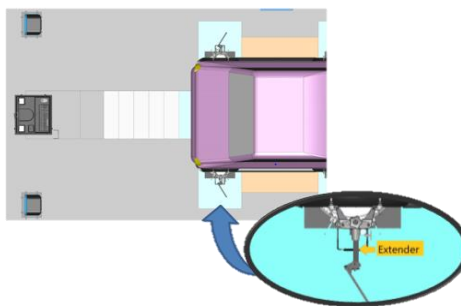


Fig. 71

- For LCVs like Car / Light truck with wheel base less than 4mtr and Wheel diameter less than 24", park the Front wheels (F1) on the Rear Rotary plate.

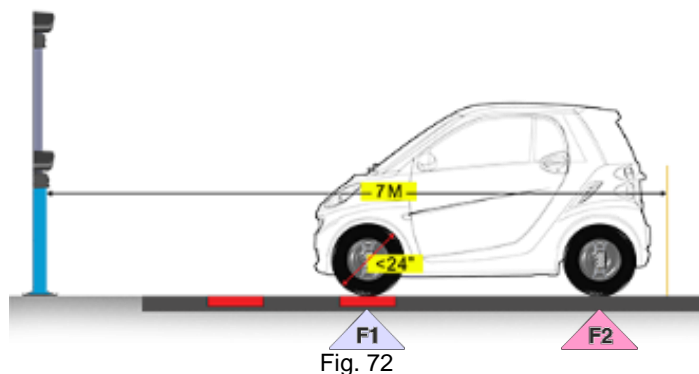


Fig. 72

NOTE: Use F1 Target plates for Front wheels & F2 Target plates for Rear wheels. Using any other Target plates may cause error in measurements.

- For F1B3 Tag axle and F2B3 Tag axle Trucks, use Wheel bracket rim pin adaptor while fixing wheel brackets in B1 tag axle for target plates visibility.
- For Single and Double axle tippers, park the Front 1st axle wheels on F2 Rotary plates.

































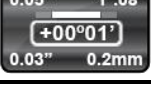





9. Inspect the Vehicle tyres for correct size & for any abnormal wear & tear.
10. Always check for correct tyre pressure in all wheels. The tyre pressure must be uniform for both front wheels and for other wheels as per the specification.



Unequal Tyre pressure may lead to improper alignment

11. Inspect the vehicle parts like Front & Rear suspensions, Bearings, Steering, Ball joints, Tie rod etc., thoroughly for any play / looseness / wear & tear. Replace the defective parts if any.
12. Ensure that there is no excessive free play in steering mechanism Kingpin play and linkages etc.
13. Adjust the Wheel bearings if required.
14. Ensure that there is no excessive Runout in the wheels.
15. Place the Test loads in vehicle (if specified in Vehicle manual).
16. Mount the required Target plates on the wheels appropriately with respective ID using Wheel brackets.
17. Ensure all required Target plates are visible in screen by pressing **CAMERA** button.
18. Re-center the Steering wheel and re-adjust Front Toe if needed – crooked Steering wheels are the leading cause of customer dissatisfaction with wheel alignments.
19. Take a printout for comparing the results before and after alignment.
20. Balancing of the wheels is also recommended before alignment.
21. Do not change the wheel location (Tyre rotation) after wheel alignment. The alignment will go wrong.

SCREEN BUTTONS & ITS FUNCTIONS

	To go to previous screen		To redo Caster
	To go to next screen		To view additional parameter of Rear wheels
	To skip the current operation		To view additional parameter of Front wheels
	To go to Welcome screen		To view Vehicle specifications
	To save the data		To view vehicle data
	To print Data / Report		To add new Vehicle data
	To view the Report		To edit existing vehicle data
	To export as PDF document		To export vehicle data
	Help		To save Vehicle data
	Camera view		To delete existing vehicle data
	To select the Vehicle		To add User name & password
	To enter the Vehicle data		To edit User name & password
	To view / edit Vehicle Inspection		To save User name & password
	To redo alignment		To delete User name & password
	To perform Runout		Thrust / Scrub angle correction
	Adjustment of F1, F2 & Parallism		Option to search vehicle data in all database
	To choose unit of measurements		To view all parameters screen
	To choose Truck configuration selection for alignment		To choose Trailer configuration selection for alignment
	Adjustment of Thrust & Scrub Angle		To choose Full Trailer configuration selection for alignment

7.3. MAIN MENU

When the equipment is switched ON, Windows Operating System will boot up and then the system will initialize all the devices. Execute the Aligner software from the desktop. A **Welcome** screen will be displayed with following options:



Fig. 73

START



To conduct Wheel alignment program as per the axle configuration is selected. To conduct Four wheel alignment. First, existing condition of Rear wheels will be measured and displayed. Then Rear wheel parameters are corrected & Thrust angle is compensated in Front Toe during Front wheel alignment. Here, the drive axle is taken as reference. It reduces Tyre wear & improves vehicle performance.

Refer Chapter 7.4

SETTINGS



To go to **Special options**. Special Options is to perform all system related activities, such as Vehicle specification entry etc. Since this a critical function dealing with alignment specifications, etc., a Password (Default password: supervisor) is given to the customer to access Special options. Normally this Password must be kept as a secret by a responsible person, say the Owner of the Shop. If by chance the Password has come to other's knowledge, a Password modification provision is also given, using which the owner can change Password.

Refer Chapter 7.6

HELP



On-line help. This option can also be selected by pressing **F1** key



Online help can be accessed from all the screens by pressing F1 key to guide the user while performing alignment and to know about the active keys available in that particular screen

LANGUAGE SETTINGS



To enter into Language settings

User can select the preferred language out of available options so as to display alignment screens in their regional languages.

Refer Chapter 7.7

DATA MANAGER



To enter into Data Manager Program

Data manager is smart customised software for monitoring condition of various vehicles aligned by the equipment and the performance of the Wheel alignment centre on the whole.

Refer Chapter 7.5

SHUT DOWN



To avoid damaging important files, it is necessary to shut down Windows properly before turning OFF or restarting the aligner

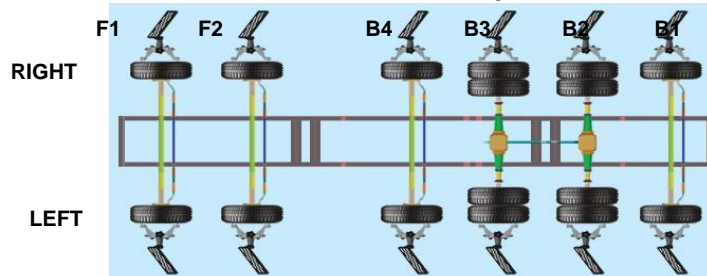
7.4. ALIGNMENT



Keep hands & other body parts away from jacking surfaces. Follow jack manufacturer's safety recommendations during tyre location change. Failure to comply may lead to injury



The Target plates are configured with an exclusive identification name (F1, F2, B4, B3, B2, & B1) depending on the axle location as given below. The location of plates is not changeable. If altered, alignment will go wrong (B4 Not Applicable for 5A model & F2/B3 are common plates in 4A model)



If required, Press CTRL+S to save the data and come to Desktop during alignment sequence any point of time

If **START ALIGNMENT** button is pressed in **Welcome** screen, user will be prompted to select the Vehicle type i.e., Car/Light Truck (or) HCV Truck (or) Bus with the required Axle configurations as given below:

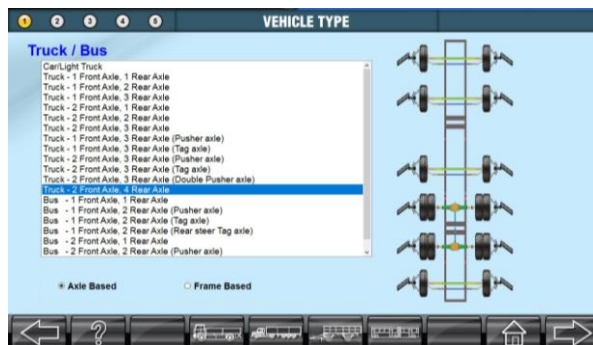
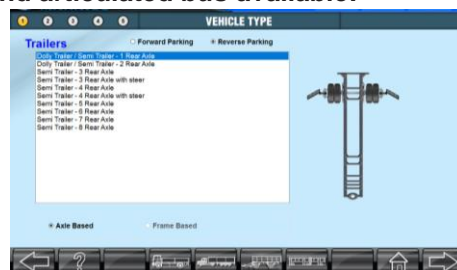


Fig. 74

Select the axle configuration by scrolling the cursor to choose the correct configuration of vehicle being parked on the wheel aligner bay.



Press  &  &  button to toggle & view the Axle configurations of Trailers / Full trailer and articulated bus available:



Once the Vehicle type is selected, **User Login** screen will be displayed:



Fig. 75

Select the required User & key-in the password to enter into **Vehicle selection** screen.
 NOTE: If user ID is not created, use **Default user** for further operation.

7.4.1. VEHICLE SELECTION

Select the required Vehicle databank from the following options in the screen:

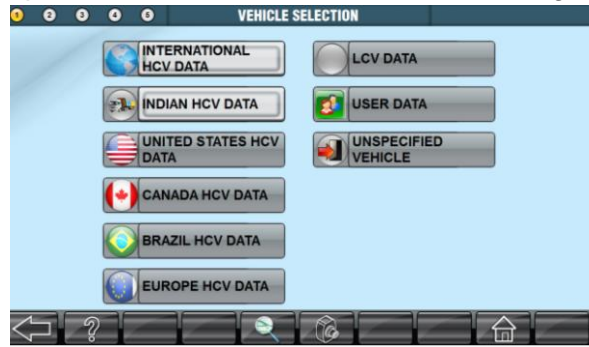


Fig. 76

If LCV databank is selected, the following screen will be displayed:



On selection of required Vehicle databank, following screen will be displayed to select the Vehicle manufacturer:

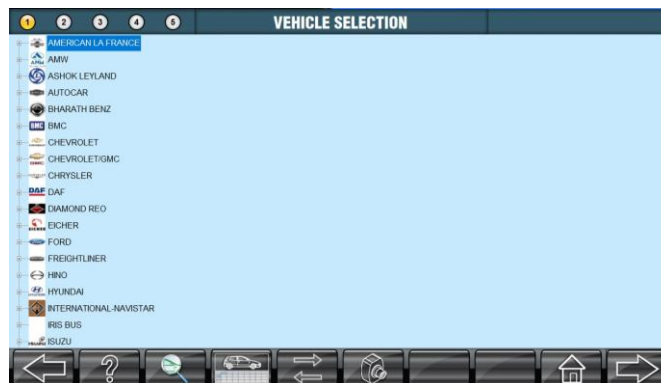


Fig. 77

On selection of required Vehicle Manufacturer, following screen will be displayed to select the vehicle model:

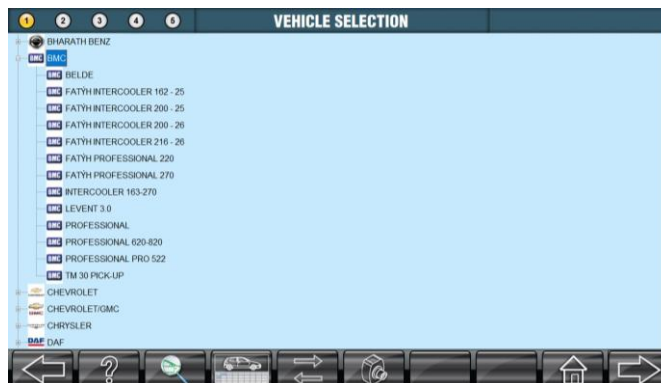


Fig. 78


User can also search & select the required vehicle quickly by pressing VEHICLE SEARCH button by providing the Vehicle Make, Model & Database as input, instead of going through standard selection process



Vehicle specifications can be selected at Initial stage and "Alignment completed" screens

7.4.1.1 NORMAL VEHICLE SELECTION

The alignment sequence is explained below by considering a Truck with 2 Front axles and 3 Rear axles, ie., 5 Axles at a time. For other Axle configurations refer Chapter 7.4.2.

By pressing  button, specifications of selected vehicle can be viewed.

Required specifications for the particular model can be viewed by selecting respective Tabs.

(i) F1 & B1 Axle specification:

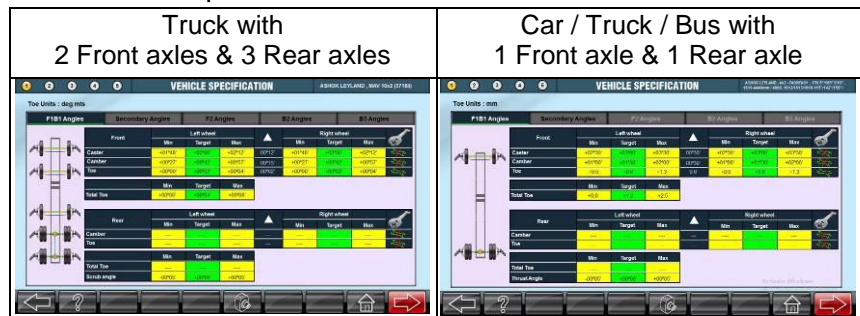


Fig. 79

(ii) Secondary angles:

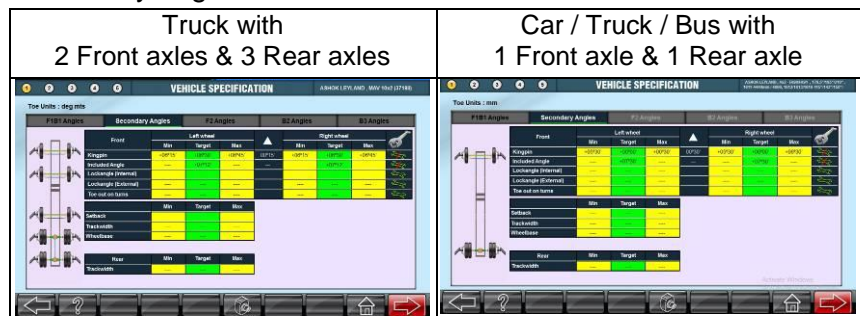


Fig. 80

(iii) F2 steer Axle specification:

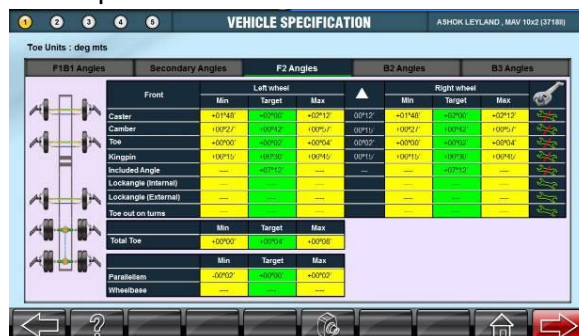


Fig. 81

(iv) B2 Axle specification:



Fig. 82

(V) B3 Axle specification:

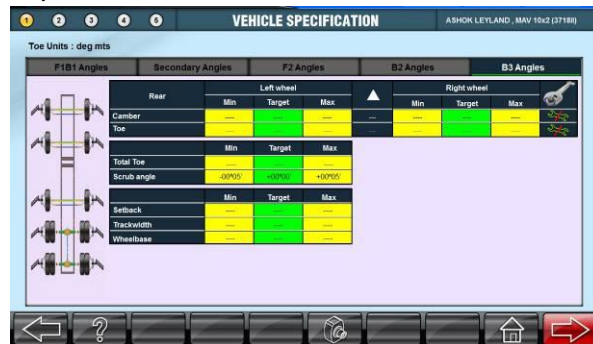


Fig. 83

Check the condition of each parameters of the Vehicle and select the required data to record in the Alignment report.




In case of HCVs with Multi-axes, Check & ensure the Frame gap of both Left & Right sides are equal or within a difference of 5mm. If not, achieve the same by loosening the 'U' clamps and re-fitting it in the work shop:








LFG – Left Frame Gap
RFG – Right Frame Gap

Press **NEXT SCREEN** button to conduct **Wheel Runout**. Press **PREVIOUS SCREEN** button to go back to previous screen.

7.4.2. WHEEL RUNOUT

The purpose of this program is to find out the Wheel Runout (wobbling) and effect the "Runout compensation" automatically in the subsequent programs while Camber and Toe are measured / adjusted.

-  **While doing Runout, do not jerk the Vehicle or the Target plates which may cause abnormal Runout. Ensure Steering lock is fixed firmly to avoid unwanted steering rotation.**
-  **Ensure the Vehicle is in neutral position with Hand brake released**
-  **Lock the Rotary plates with Locking pins before parking the Vehicle over the Rotary plate. The rotary plate spacers must be placed**

	Place Wheel stoppers 0.5metre before the Front wheels and 0.5metre behind the Rear wheels to arrest excessive movement of vehicle while carrying out the Push-Pull Runout
	Level all the Target plates & lock knobs before Runout measurement
	Make the Gear lever to Neutral position if the vehicle being aligned is Rear wheel drive
	The pushes axle or Tag axle should be disabled from lifting function (load sensor) in the vehicle for carrying out the Push-Pull runout
	While driving the vehicle for Push-Pull Runout, Steering wheel must be in straight position with respect to the front wheels. Vehicle drive should be very controlled & constant movement. Avoid sudden brake which will affect the measurement. Steering lock must be applied
	While moving the Vehicle in Forward / Backward direction as guided by the screen, DO NOT move the vehicle beyond the target region to avoid from rolling off. Manufacturer is not responsible for any damage or loss due to non-compliance
	While doing Runout, DO NOT jerk the Vehicle or the Target plates which may cause abnormal Runout

Following screen will be displayed to mount Wheel brackets & Target plates to its respective location. Enter the odometer readings in to the windows.

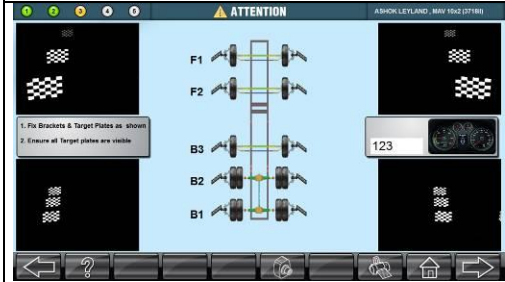
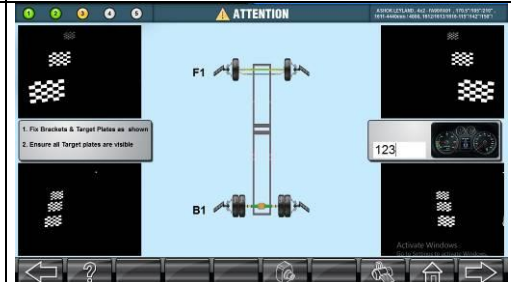

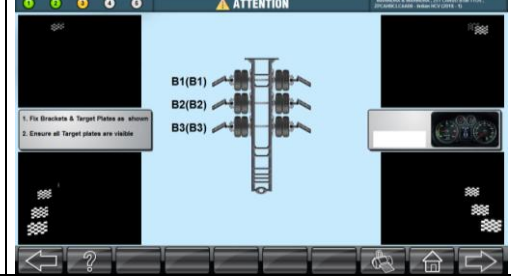

<p style="text-align: center;">Truck with 2 Front axles & 3 Rear axles</p> 	<p style="text-align: center;">Truck / Bus with 1 Front axle & 1 Rear axle</p> 
<p style="text-align: center;">Trailer With 3 Axles (Forward parking)</p> 	<p style="text-align: center;">Trailer With 3 Axles (Reverse parking)</p> 
<p style="text-align: center;">Car with 1 Front axle & 1 Rear axle</p> 	

Fig. 84

7.4.2.1. CUSTOMER DATA INPUT

After Vehicle selection, following screen will be displayed:



Fig. 85

Enter required input. All the above data will be recorded in the Alignment report which can be printed after completing alignment. While feeding the customer data, the machine will be searching the targets in the background of the program. Therefore, the camera vision path should not be obstructed by any objects / person movements.

	<p>System will not proceed further without input of Vehicle Registration number in <i>Customer data input</i> screen</p>
	<p>Customer data or Vehicle specifications can be edited or selected respectively between "<i>Initial measurement completed</i>" and "<i>Alignment completed</i>" screens</p>

Press **NEXT SCREEN** after entering all the data.

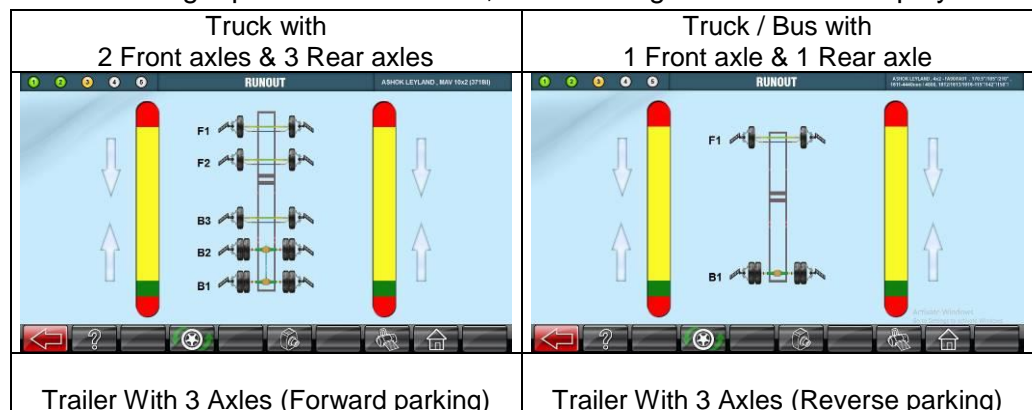
In Push-Pull (Roll-on) Runout, Vehicle should be driven towards backward slowly with engine drive by 30°. The screen will guide the operator where to stop the vehicle. Once the readings are acquired at 30° position, the screen will guide to drive the vehicle forward to reach its home position.

Press **NEXT SCREEN** button to proceed. The system will identify the Target plates mounted on the wheels as shown below:



Fig. 86

Once the Target plates are identified, the following screen will be displayed:



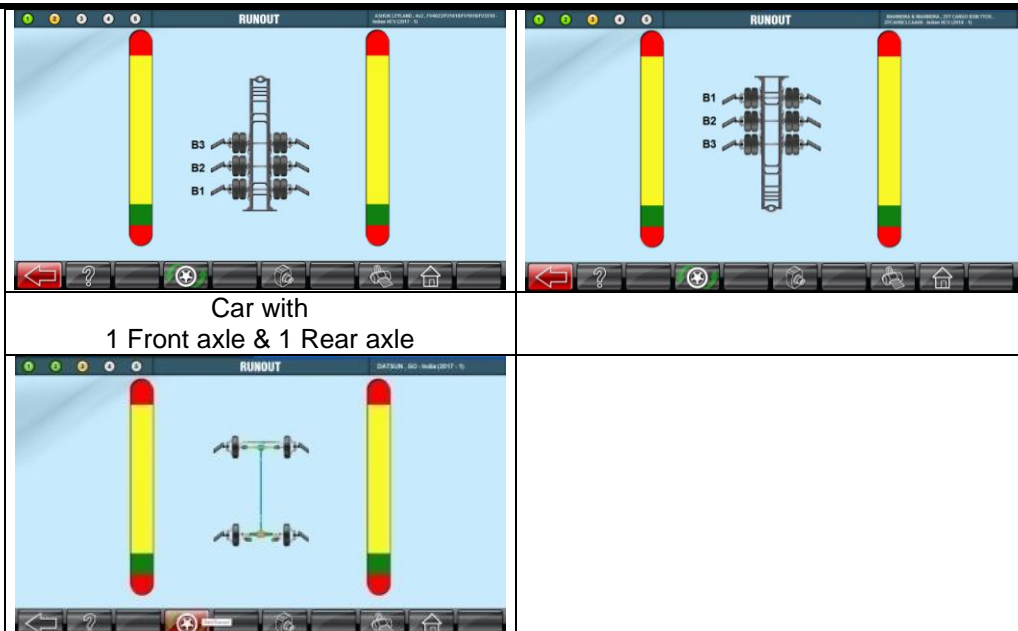


Fig. 87

Press **RUNOUT** button to carryout Push-Pull Runout measurement. The following screen will be displayed. Drive the vehicle backwards until the ball matches the green region in screen.

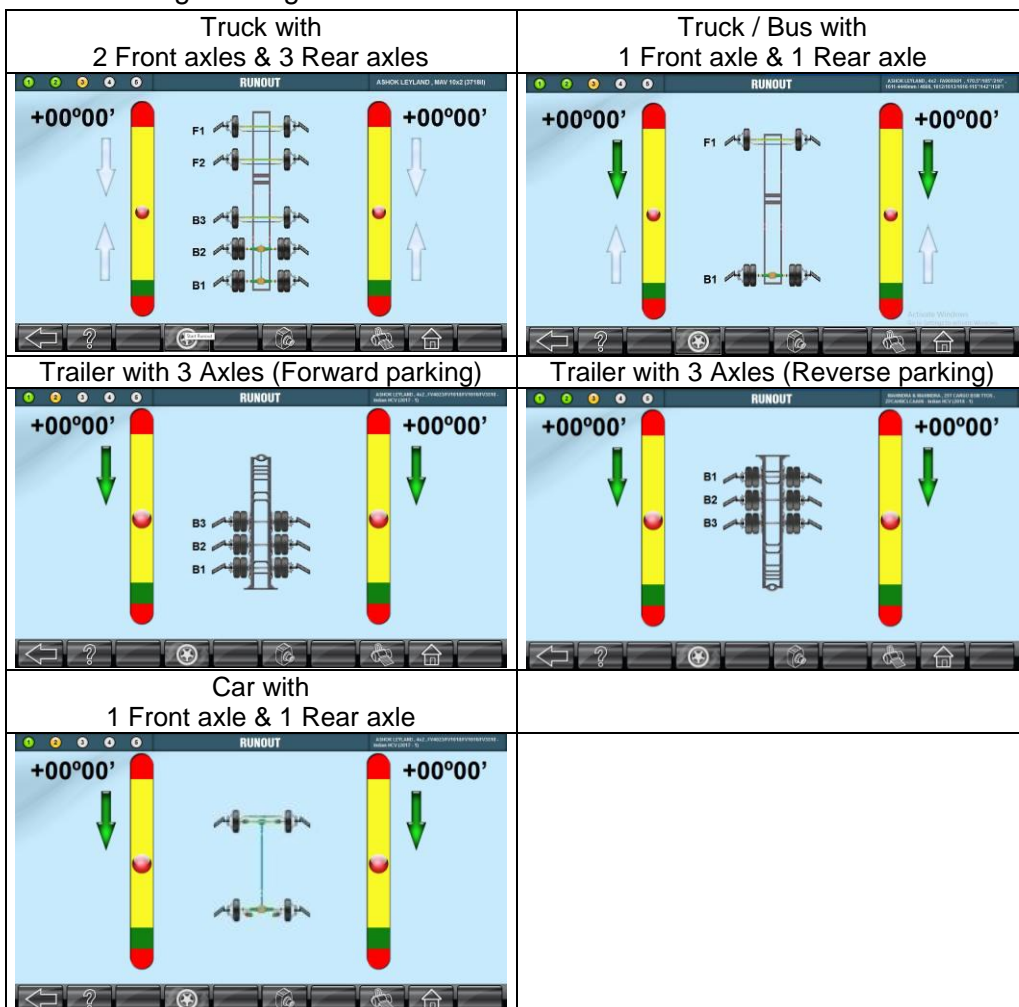


Fig. 88

The stop display will be prompted at 30° of roll. Apply brake gently and wait for the reading acquisition and till **STOP** symbol goes off.

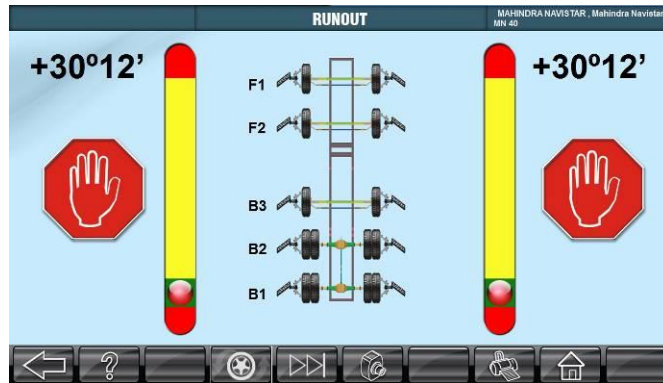


Fig. 89

Now drive the vehicle forward and to reach the home position. Then Stop the engine.

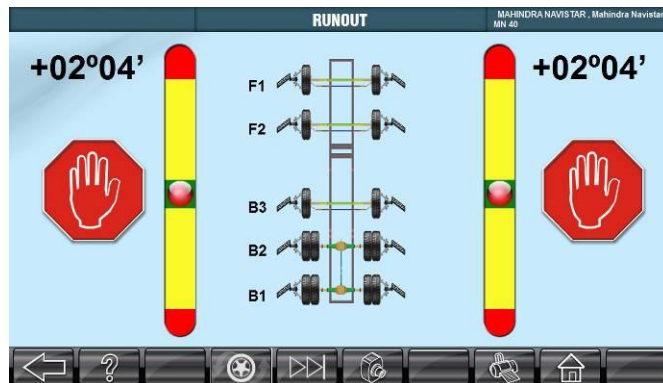


Fig. 90

Completion of Runout will be indicated by a **Tick mark** as shown below:



Fig. 91

Runout values will be displayed by pressing of Ctrl+F9 key.



Fig. 92



If any of the Runout value is abnormal, repeat the Runout again

If any of the wheels have abnormal value ie, above $1^{\circ}30'$, a warning message will be displayed. Press **REDO RUNOUT** to redo Runout after ensuring the proper mounting of Wheel bracket. Otherwise proceed further.

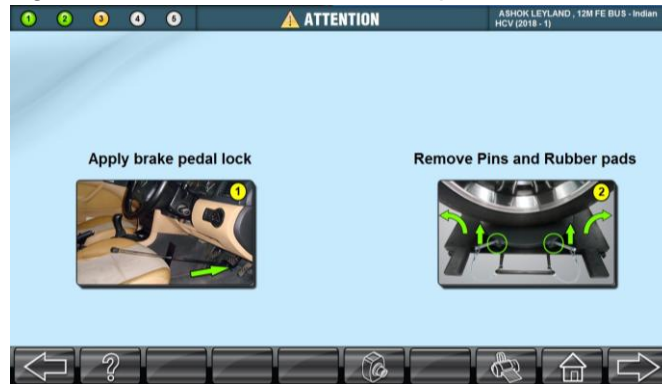


Fig. 93



Remove the Locking pins from the Rotary plates and apply Brake pedal lock once the Runout is completed

7.4.3. CASTER & KINGPIN SWING

Caster & Kingpin angles are differential angles & cannot be measured directly. Hence a sequence of procedure is required to measure these parameters.



Do not jerk or shake the Steering wheel during data acquisition



Hold the Steering wheel at the end of each move to acquire stable measurement of Caster / Kingpin. Do not rush into turns



While working on Power steering vehicles, switch ON the engine before fixing the Steering wheel lock in Straight ahead position (ensure that Gear is in neutral position). The engine may be switched "OFF" after Straight ahead is completed



Ensure that the Brake pedal lock has been fixed properly

7.4.3.1. TURN LEFT

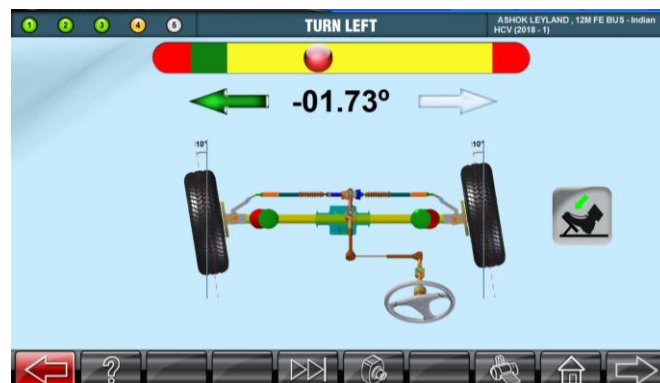


Fig. 94

In this screen, a Steering diagram can be seen and a Flashing arrow will indicate the direction in which the wheel is to be turned.

Steer the wheels to left until the moving BALL fully matches the left GREEN region. After reaching the Left Green region, the system will display "**Stop**" icon and measures the parameters.

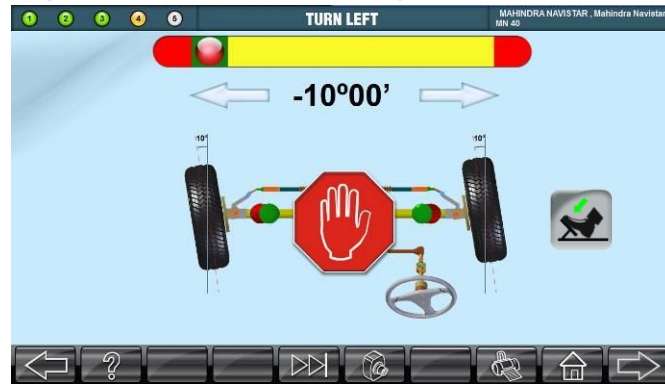


Fig. 95

After data acquisition, system will automatically go to **Turn Right** screen.

7.4.3.2. TURN RIGHT

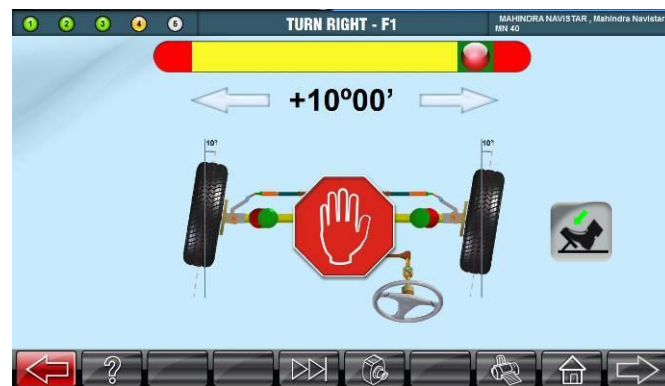


Fig. 96

Steer the wheels to right until the moving BALL fully matches the right GREEN region. After reaching the Right Green region, the system will display "**Stop**" icon and measures the parameters. After data acquisition, system will automatically go to **Straight ahead** screen.

7.4.3.3. STRAIGHT AHEAD

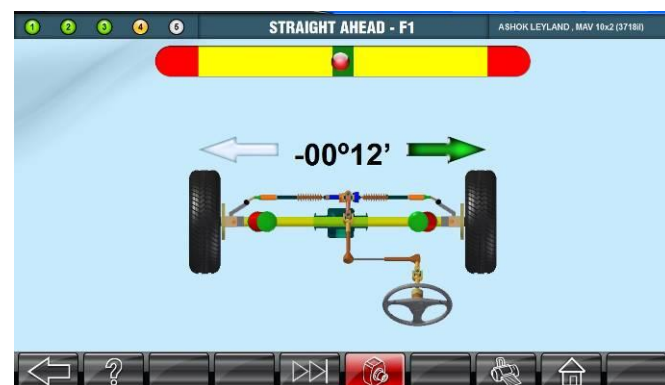


Fig. 97

This screen is to instruct the User to bring the Front wheels to Straight ahead position. Steer wheels until the moving BALL fully matches the centre GREEN region.

When Straight ahead position is achieved, "**Stop**" symbol will appear and stop turning the Steering wheel.

If the Straight ahead is disturbed, the symbol will vanish and the arrows will blink and guides to indicate in which direction to turn the Steering wheel to get back the Straight ahead position.

Now adjust the Steering wheel straight manually for fine adjustment till the Red ball in the Green region reaches the centre white region, followed by a "Stop" symbol and then goes to next screen.

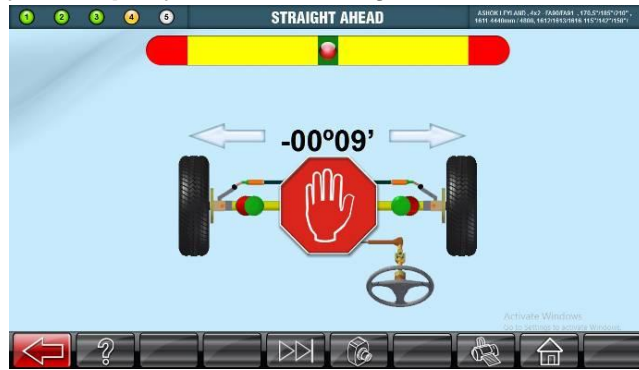


Fig. 98

Lock the Steering wheel in straight position visually and then press **NEXT SCREEN** button as shown below to record Initial measurements of all parameters for printout:



Fig. 99

Now steer the Steering wheel to achieve zero in the following screen:



Fig. 100




Fig. 101

Once zero is achieved, "STOP" symbol will be displayed as shown above and the system will display the Alignment results of existing condition of the vehicle in Live mode.

 In Straight ahead condition, If horizontality of any one of Target plate is disturbed, don't adjust it

7.4.4. ALIGNMENT PARAMETERS & RESULTS

Following procedure needs to be carried out for the adjustments as per vehicle Manufacturer's specification.

	TWO COLOR REPRESENTATION	
	While doing Caster, Camber & Toe correction, the pointing Arrow sliding over the Horizontal bar indicates specification range using different colors as indicated below:	
	Color	Indication
	Red	<i>Reading is not within the required specification</i>
	Green	<i>Reading is within specification & preferred value</i>
White	<i>Specification is not available/required for parameter</i>	

Initial measurement results of existing vehicle condition will be displayed:

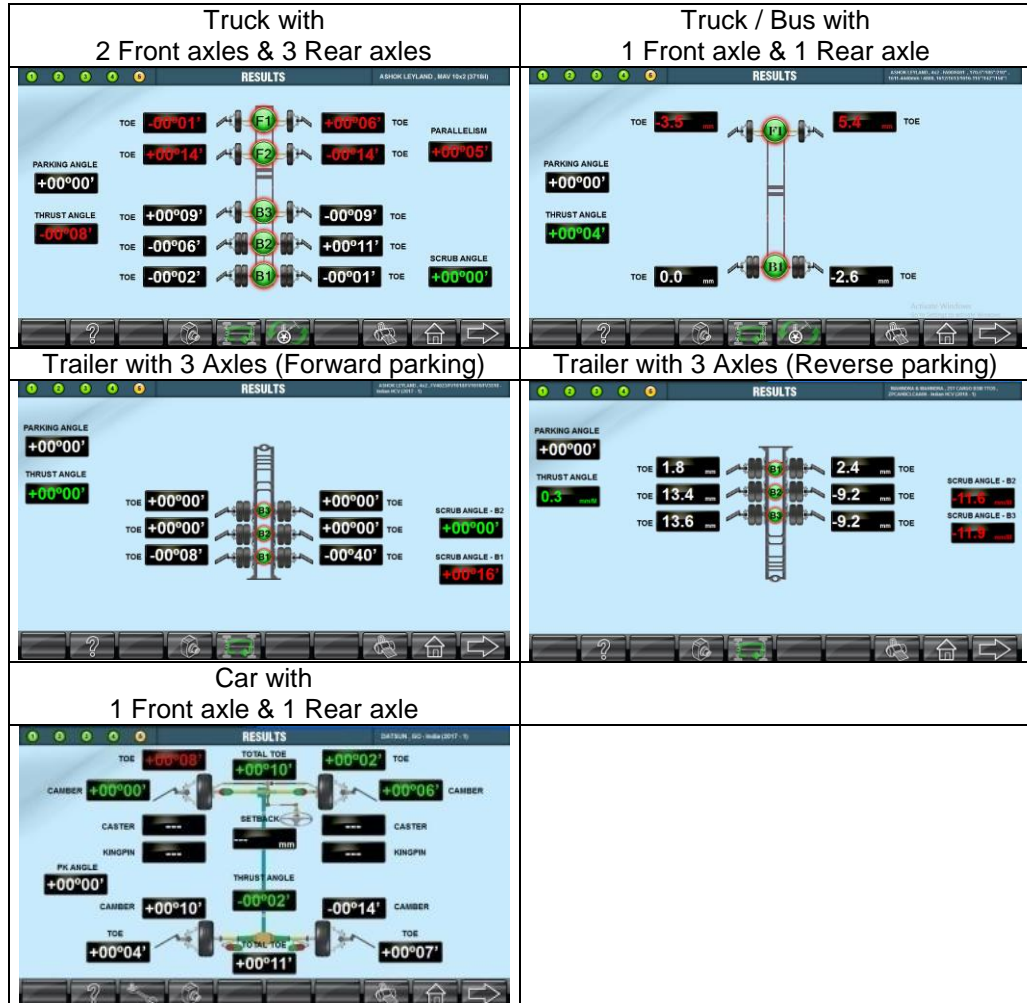


Fig. 102

Printout of the measurement results can be taken by pressing **PRINT** button. Press **NEXT SCREEN** button to go to **Rear wheel parameters** screen.

7.4.4.1. THRUST ANGLE ADJUSTMENT

Press **NEXT** button to view & adjust the Thrust angle & the tilt direction of Axle. By feeding the distance of the Spring plates or Track width, the amount of the movement towards the direction will be indicated. Now adjust the Thrust angle to 0° as per On-screen guidance & as explained below:

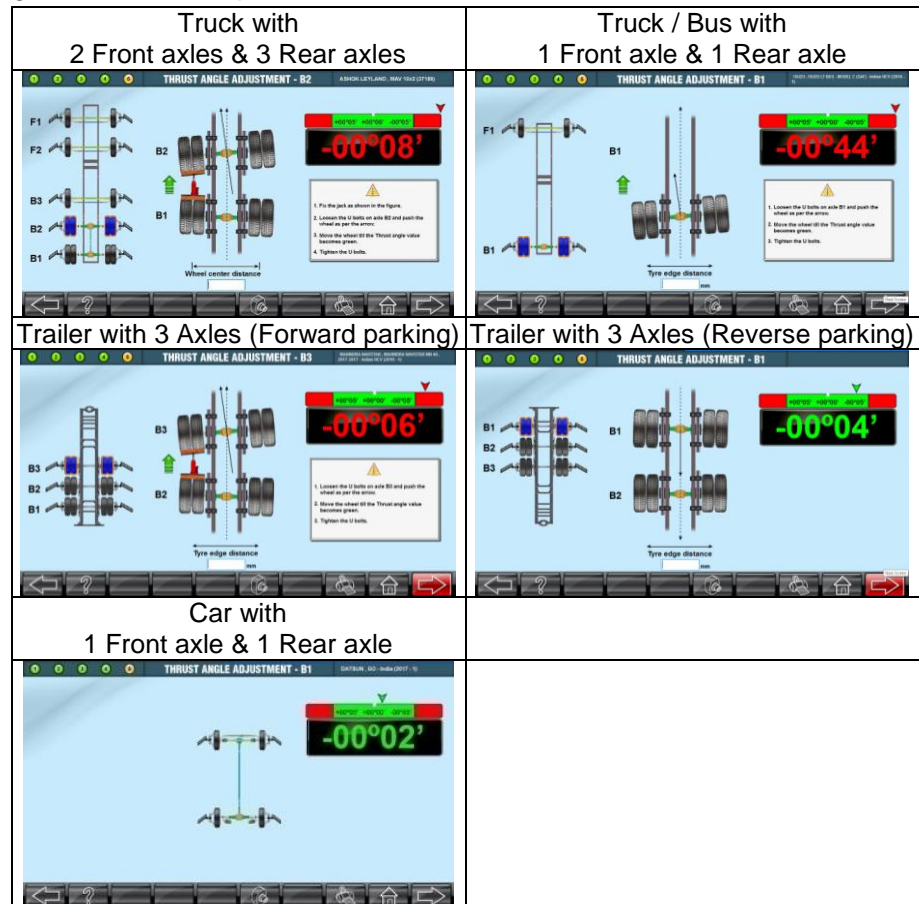


Fig. 103

- Fix the Screw jack in between the two Axles as shown above.
- Loosen 'U' bolts on B2 Axle using Power tools & raise Screw jack in such a way that B2 tyre is pushed as shown above.
- Push the wheel until the thrust angle reaches zero or within the tolerance. Now tighten the 'U' bolts firmly using Power tools.

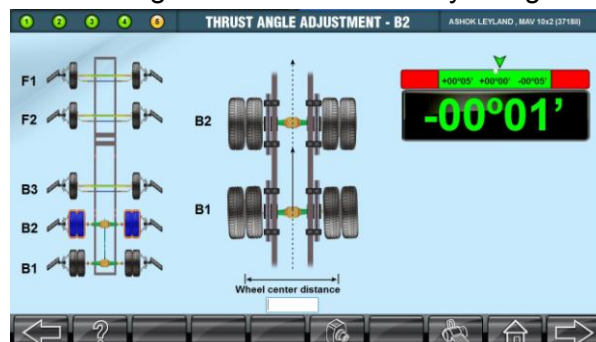


Fig. 104

- Press **NEXT** button after adjustment of Thrust angle

7.4.4.2. REAR WHEEL PARAMETERS

 By pressing REDO ALIGNMENT button, complete alignment sequence from *Wheel runout* screen can be repeated

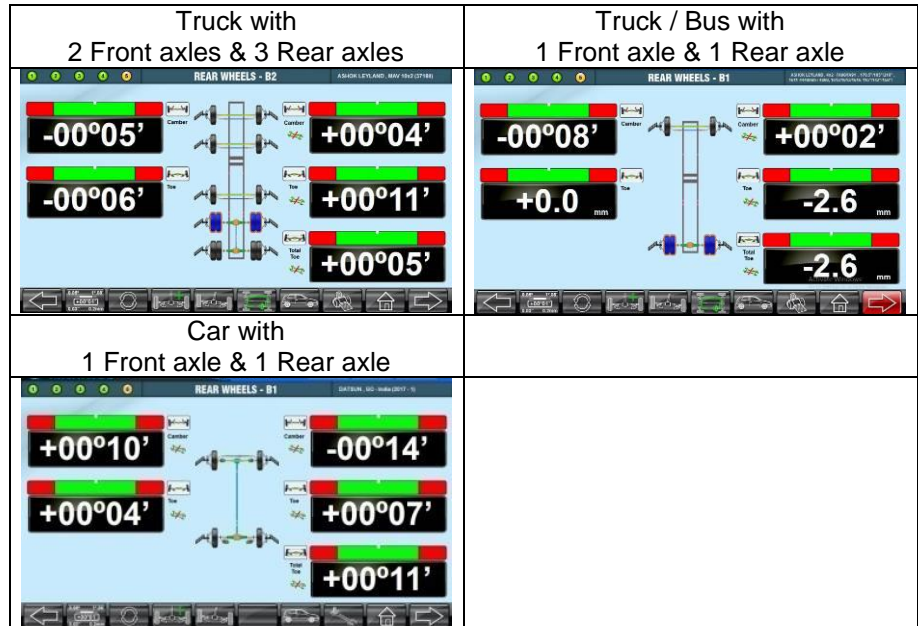


Fig. 105

In this screen, Live readings of Rear wheel (Rear 1st Axle – B2) Camber, Toe & Total Toe will be displayed.

Press **ADDITIONAL PARAMETER** button to view the Track width difference as shown in the following screen.



Fig. 106

The Track width difference will be displayed as Positive angle, if the Rear Track width is more than the Front Track width and as negative angle if the Front Track width is more than the Rear Track width.

7.4.4.3. FRONT WHEEL PARAMETERS

 By pressing REDO ALIGNMENT button, complete alignment sequence from *Wheel runout* screen can be repeated

For adjustment of Front Total Toe, follow the On-screen instructions:



Fig. 107



Fig. 108

Adjust the front wheel Toe for F1 axle as per specification & lock the tie rod. Pres **NEXT** button to view all other parameters of front axle.



Fig. 109

This screen displays the Live readings of Caster, Camber and Toe. Effect the corrections in the Front wheels until the GREEN color at the Horizontal bar with the Arrow point to that region.

Press **ADDITIONAL PARAMETER** button to view, Kingpin & Setback values. Out of these three, Runout & Setback are having compensation with Camber and Toe respectively.

7.4.4.4. DIFFERENTIAL TOE ADJUSTMENT

Press **NEXT** button to adjust the **Differential Toe adjustment**. The **Differential Toe adjustment** screen will display the F1 straight position, F2 Front axle Toe values and the present parallelism condition of the F1 & F2 axles as shown below:



Fig. 110

- Steer the Steering wheel to reach the F1 straight position.
- Adjust the F2 Toe values to the required specification & lock it.

- After achieving the F2 Toe, adjust the Drag link to make adjustment of differential Toe as guided by the screen. After achieving the differential toe to zero, now tighten the Drag link pinch clamps.



Fig. 111

- After adjustment of F2 Total toe & Differential toe, press **NEXT** button go to **Parallelism Adjustment** screen. After achieving the differential toe value of F2 axle to zero, the parallelism value will become zero.

7.4.4.5. PARALLELISM ADJUSTMENT

Press **NEXT** button to adjust the **Parallelism**. The **Parallelism** screen will display the F1 straight position, F2 Front axle Toe values and the present parallelism condition of the F1 & F2 axles as shown below:

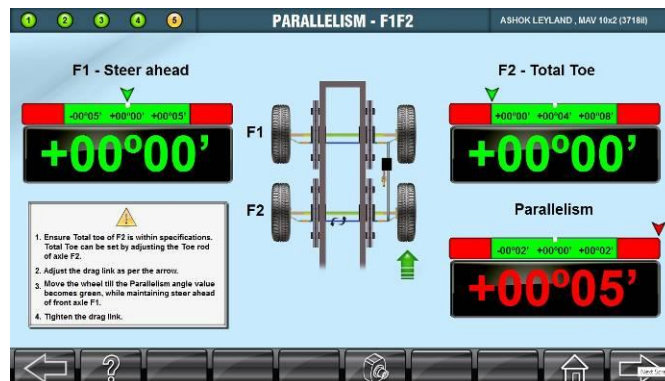


Fig. 112

- Steer the Steering wheel to reach the F1 straight position.
- Adjust the F2 Toe values to the required specification & lock it.
- After achieving the F2 Toe, adjust the Drag link to make both Axles parallel as guided by the screen. After achieving the parallelism to zero, now tighten the Drag link pinch clamps.

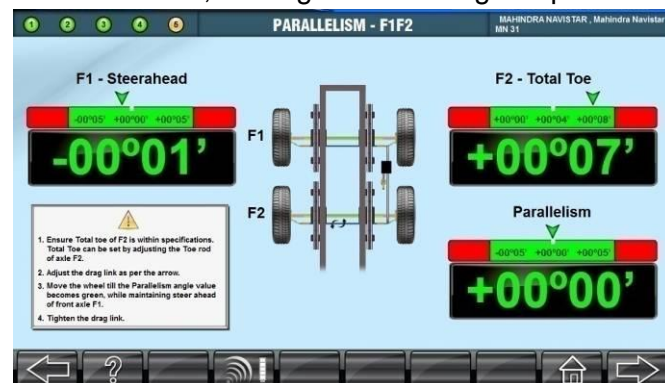


Fig. 113

- After adjustment of F2 toe & parallelism, press next button to read F2 axle other parameters.



Fig. 114

Press **NEXT** button to carry out Toe adjustment of Pusher axle.

7.4.4.6. **PUSHER AXLE ADJUSTMENT (Single Tie rod)**

Following procedure should be carried out to adjust Pusher Axle Toe:

- Steer the Steering wheel until the Straight ahead reading reaches zero and then hold it.
- Make the Pusher axle reading to zero by pushing or pulling the wheels externally.
- In this condition, adjust the Pusher axle tie rod to achieve the required Toe and lock it.



Fig. 115



Fig. 116

- After adjustment of B3 Toe, press **NEXT** button to read other parameters of B3 Axle.



Fig. 117

7.4.4.7. SCRUB ANGLE ADJUSTMENT

Press **NEXT** button to view & adjust **Scrub angle** & the tilt direction of Axle. By feeding the distance of the Spring plates or Track width, the amount of the movement towards the direction will be indicated. Now adjust the Scrub angle to 0° as per On-screen guidance & as explained below:

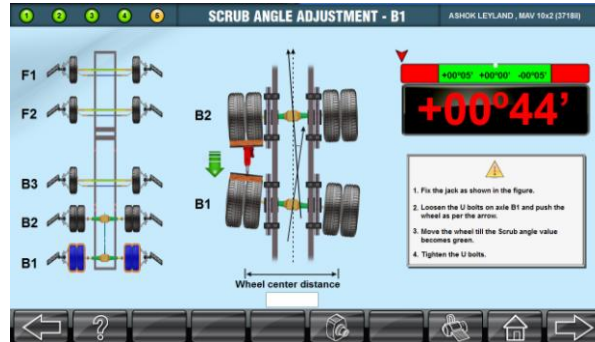


Fig. 118

- Fix the Screw jack in between the two Axles as shown above.
- Loosen the 'U' bolts on the B1 Axle using Power tools and raise the Screw jack in such a way that the B1 tyre is pushed as shown above direction guided by the screen.
- Push the wheel until the Scrub angle reaches zero or within the tolerance. Now tighten the 'U' bolts firmly using Power tools.

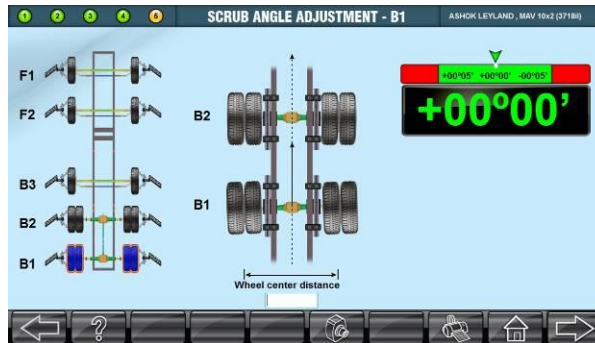


Fig. 119

- After adjustment of B1 scrub angle, press NEXT button to read other parameters of B1 Axle.

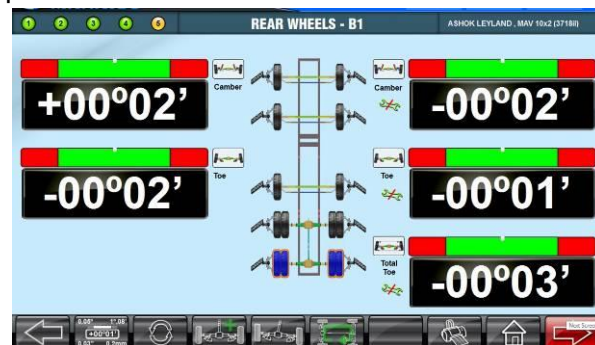


Fig. 120



Fig. 121

7.4.4.8. TAG AXLE ADJUSTMENT

Following procedure should be carried out to adjust Toe of Tag Axle:



Fig. 122

- Adjust the Axle (B1) to zero.
- In this condition, adjust the Tag axle tie rods to achieve the required Toe and lock it.



Fig. 123

7.4.4.9. CAM / BUSH / SHIM ADJUSTMENT

Following procedure should be carried out to adjust Caster & Camber on wheel free mode. The actual values of Caster & Camber have to get replicated on wheel free mode, for online adjustment:

- Carryout the wheel alignment measurement as per the regular procedure. Click the ADJUSTMENT button in **Front wheel / Rear wheels adjustment** screen:

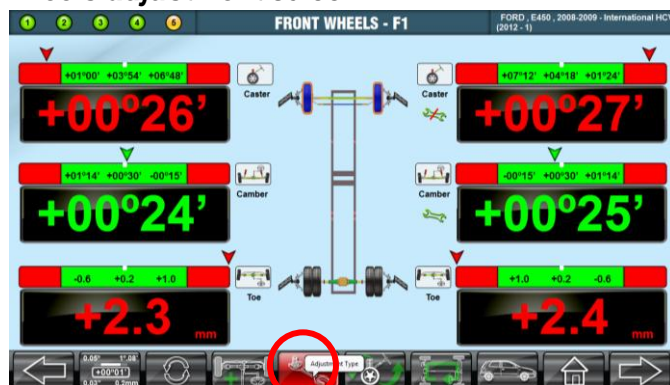


Fig. 124

- Select the Vehicle Make and Model of car using the Drop down menu and click **NEXT** button:

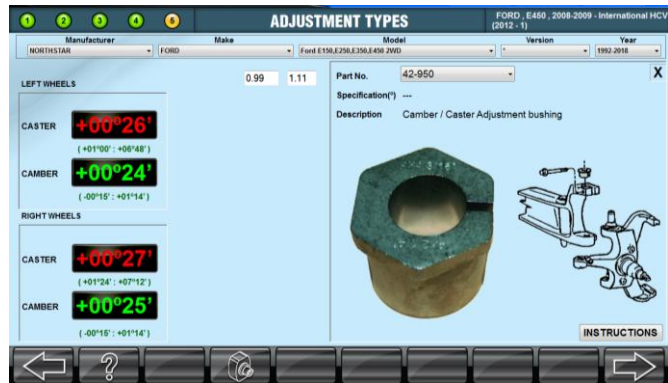


Fig. 125



If required, the Make of CAM / Bush can be selected from the Drop down menu

- System will prompt the user to choose the adjustment methods and the sequence for adjustment as shown below:

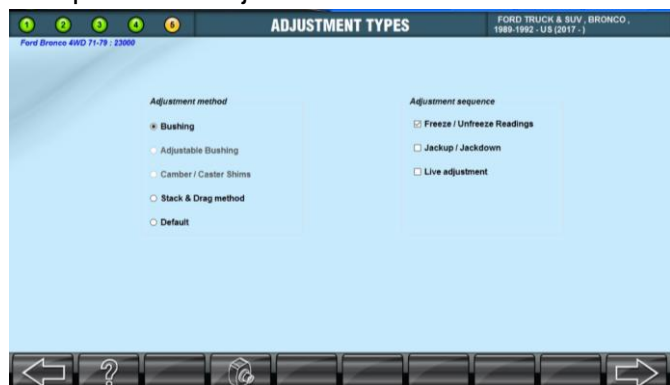


Fig. 126

- **Details of “Adjustment Methods”**
BUSHING

In this method, the system displays the actual Caster & Camber on Wheel free mode. Now, user has to enter the existing size of bush (LA & RA) and its angle positioned (LB & RB) in the car.

Based on this input, system will automatically calculate & display the required type of Bush and position for achieving both Caster & Camber within the specified value. With this methodology, the Trial & Error will be eliminated completely and saves time to get the alignment done on Wheel free mode:

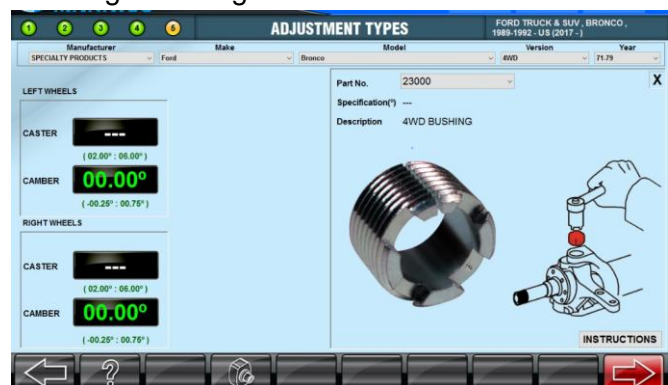


Fig. 127



Fig. 128

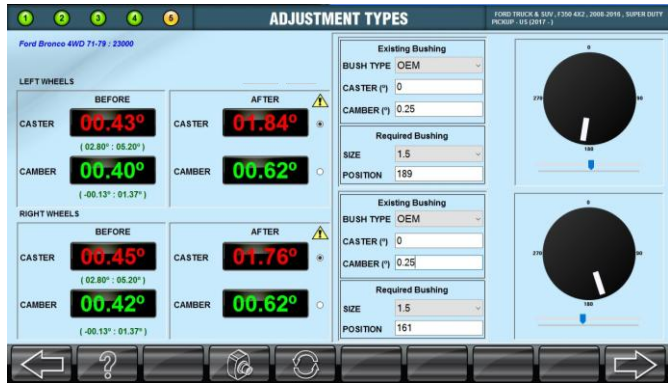


Fig. 129

ADJUSTABLE BUSHING

In this method, User can adjust the Bush online to achieve the required Camber & Caster instead of replacing the new Bush, so that the user can save time:

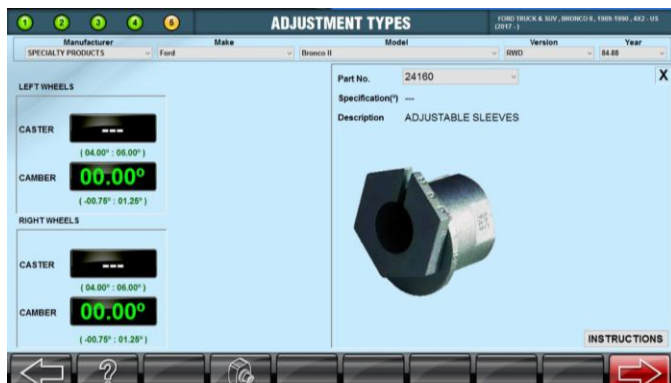


Fig. 130



Fig. 131

CAMBER / CASTER SHIMS

In this method, System guides the user to perform online adjustment for Caster & Camber. User can select the required shim size for replacement and perform adjustment to achieve the Camber & Caster within specified value:

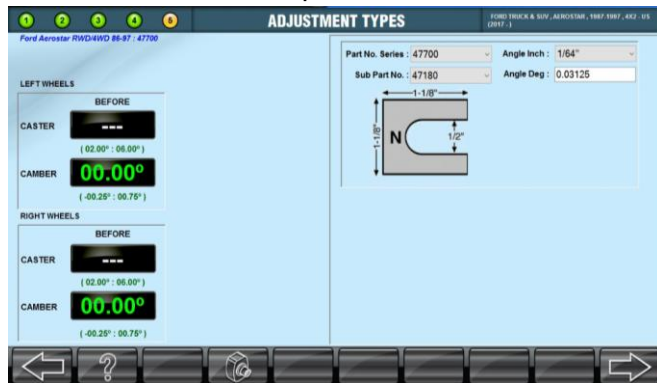


Fig. 132



Fig. 133

STACK & DRAG METHOD

In this method, user can adjust the CAM lock plate with respect to corresponding position to achieve the Camber within specification:



Fig. 134

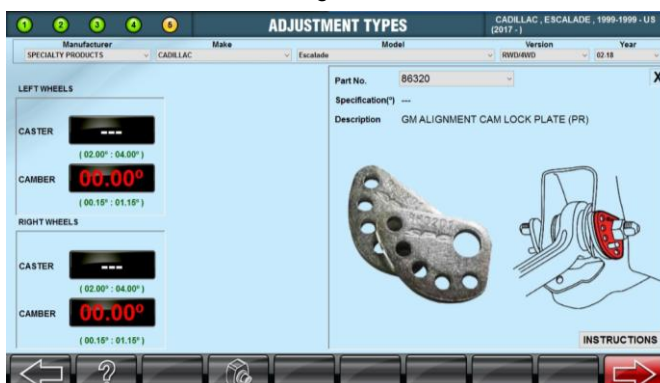


Fig. 135

REAR ADJUSTMENTS

In this method, user can select the required shims for rear wheel and perform adjustment to achieve the Camber & Toe within the specification:



Fig. 136




Fig. 137

DEFAULT

In this option, user can select the required Bush for the replacement in upper control arm and perform adjustment to achieve the Camber within specification:



Fig. 138

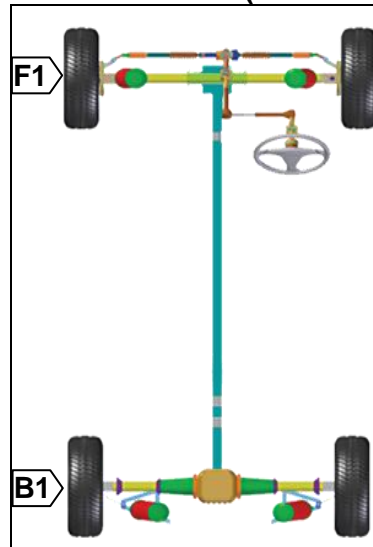


Steering lock & Brake pedal lock are mandatory to apply BEFORE JACKING UP vehicle for adjustment in order to obtain correct result

Once all the adjustments are completed, press **NEXT** button to view result printout of all Axles.

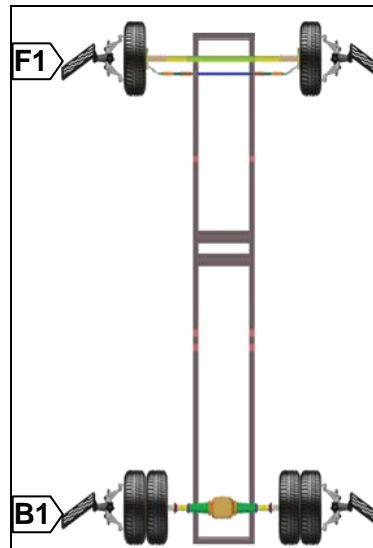
7.4.5. MULTI-AXLE CONFIGURATIONS & APPLICABLE SEQUENCE (Drive Axle Reference)

7.4.5.1. CARS and LCVs (6A/5A/4A)



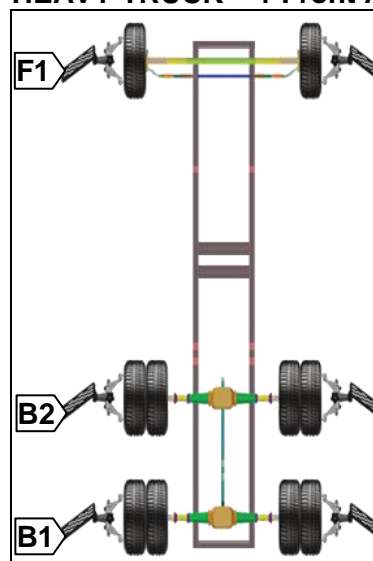
1. Mount Front F1 labeled Target plates with Front axle (F1)
 2. Mount Front F2 labeled Target plates with Rear axle (B1)
 3. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)
 4. Carryout Caster / KP swing for F1 (Ref. Chapter 7.4.4)
 5. Carry out measurement as guided by the screen
 6. Apply Steering lock at straight ahead position (F1)
 7. If Adjust Rear axle camber and toe only the adjustable provided vehicles (B1)
 8. Adjust Front axle (F1)
- For adjustments refer Chapter 7.4.5

7.4.5.2. HEAVY TRUCK – 1 Front Axle & 1 Rear Axle (6A/5A/4A)



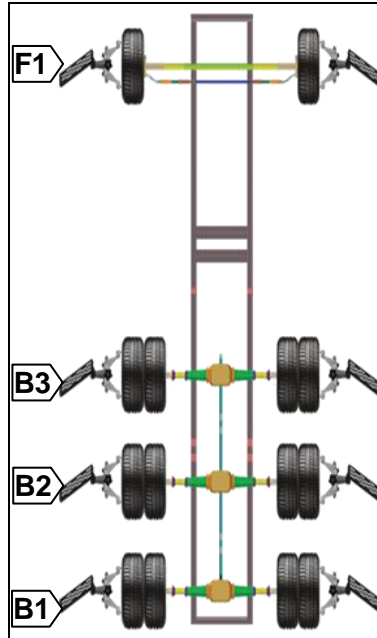
1. Mount Front Target plates with Front axle (F1)
 2. Mount Rear Target plates with Rear axle (B1)
 3. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)
 4. Carryout Caster / KP swing for F1 (Ref. Chapter 7.4.4)
 5. Carry out measurement as guided by the screen
 6. Apply Steering lock at straight ahead position (F1)
 7. Adjust Rear axle (B1)
 8. Adjust Front axle (F1)
- For adjustments refer Chapter 7.4.5

7.4.5.3. HEAVY TRUCK – 1 Front Axle & 2 Rear Axles (6A/5A/4A)



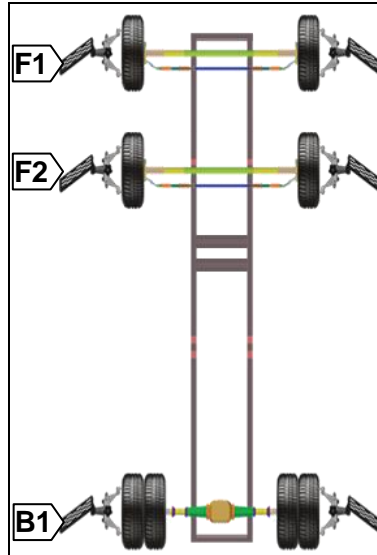
1. Mount Front Target plates with Front axle (F1)
 2. Mount Rear Target plates with Rear axles (B2 & B1)
 3. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)
 4. Carryout Caster / KP swing for F1 (Ref. Chapter 7.4.4)
 5. Carry out measurement as guided by the screen
 6. Apply Steering lock at straight ahead position (F1)
 7. Adjust Rear 2nd axle (B2)
 8. Adjust Front axle (F1)
 9. Adjust Rear 1st axle (B1)
- For adjustments refer Chapter 7.4.5

7.4.5.4. HEAVY TRUCK – 1 Front Axle & 3 Rear Axles (6A/5A/4A)



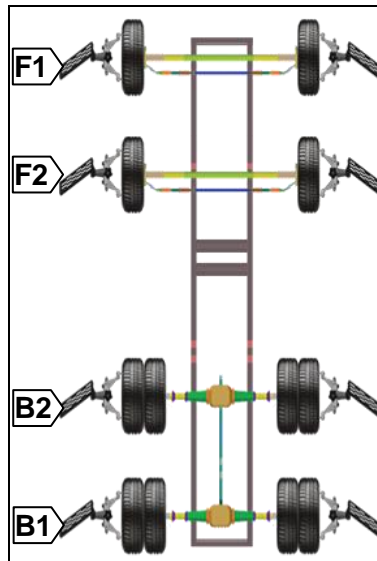
1. Mount Front Target plates with Front axle (F1)
 2. Mount Rear Target plates with Rear axles (B3, B2 & B1). For 4A model use F2/B3 labeled Target plates
 3. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)
 4. Carryout Caster / KP swing for F1 (Ref. Chapter 7.4.4)
 5. Carry out measurement as guided by the screen
 6. Apply Steering lock at straight ahead position (F1)
 7. Adjust Rear 3rd axle (B3)
 8. Adjust Front axle (F1)
 9. Adjust Rear 2nd axle (B2)
 10. Adjust Rear 1st axle (B1)
- For adjustments refer Chapter 7.4.5

7.4.5.5. HEAVY TRUCK – 2 Front Axles & 1 Rear Axle (6A/5A/4A)



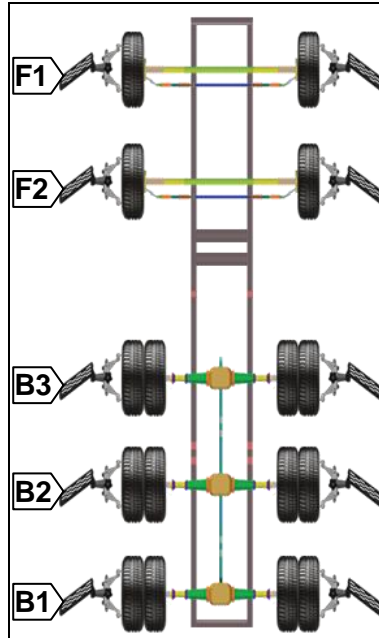
1. Mount Front Target plates with Front axles (F1 & F2)
 2. Mount Rear Target plates with Rear axle (B1)
 3. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)
 4. Carryout Caster / KP swing for F1 & F2 (Ref. Chapter 7.4.4)
 5. Carry out measurement as guided by the screen
 6. Apply Steering lock at straight ahead position (F1)
 7. Adjust Rear axle (B1)
 8. Adjust Front 1st axle (F1)
 9. Adjust Front 2nd axle (F2)
 10. Adjust parallelism
- For adjustments refer Chapter 7.4.5

7.4.5.6. HEAVY TRUCK – 2 Front Axles & 2 Rear Axles (6A/5A/4A)



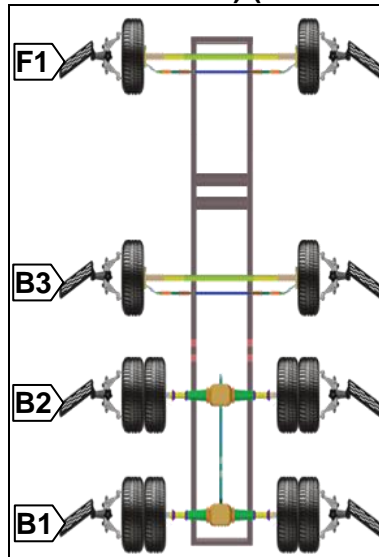
1. Mount Front Target plates with Front axles (F1 & F2)
 2. Mount Rear Target plates with Rear axles (B2 & B1)
 3. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)
 4. Carryout Caster / KP swing for F1 & F2 (Ref. Chapter 7.4.4)
 5. Carry out measurement as guided by the screen
 6. Apply Steering lock at straight ahead position (F1)
 7. Adjust Rear 2nd axle (B2)
 8. Adjust Front 1st axle (F1)
 9. Adjust Front 2nd axle (F2)
 10. Adjust parallelism of F1 & F2
 11. Adjust Rear 1st axle (B1)
- For adjustments refer Chapter 7.4.5

7.4.5.7. HEAVY TRUCK – 2 Front Axles & 3 Rear Axles (6A/5A)



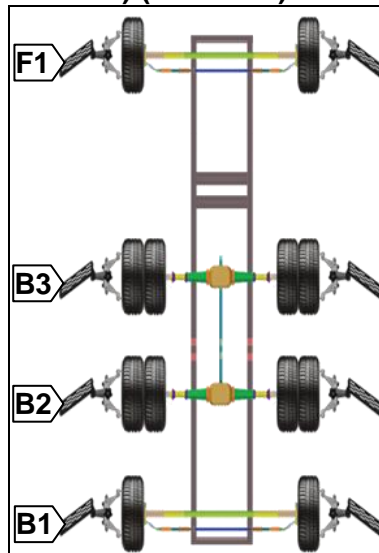
1. Mount Front Target plates with Front axles (F1 & F2)
 2. Mount Rear Target plates with Rear axles (B3, B2 & B1)
 3. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)
 4. Carryout Caster / KP swing for F1 & F2 (Ref. Chapter 7.4.4)
 5. Carry out measurement as guided by the screen
 6. Apply Steering lock at straight ahead position (F1)
 7. Adjust Rear 3rd axle (B3)
 8. Adjust Front 1st axle (F1)
 9. Adjust Front 2nd axle (F2)
 10. Adjust parallelism of F1 & F2
 11. Adjust Rear 2nd axle (B2)
 12. Adjust Rear 1st axle (B1)
- For adjustments refer Chapter 7.4.5

7.4.5.8. HEAVY TRUCK – 1 Front Axle & 3 Rear Axles (including 1 Pusher 3rd Axle) (6A/5A/4A)



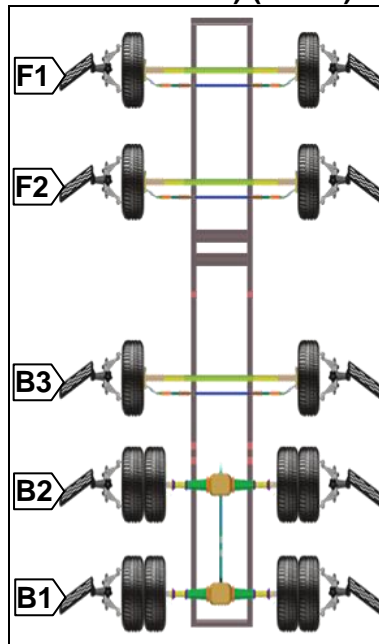
1. Mount Front Target plates with Front axle (F1)
 2. Mount Rear Target plates with Rear axles (B3, B2 & B1). For 4A model use F2/B3 labeled Target plates
 3. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)
 4. Carryout Caster / KP swing for F1 (Ref. Chapter 7.4.4)
 5. Carry out measurement as guided by the screen
 6. Apply Steering lock at straight ahead position (F1)
 7. Adjust Rear 2nd axle (B2)
 8. Adjust Front axle (F1)
 9. Adjust Rear 3rd axle (B3)
 10. Adjust Rear 1st axle (B1)
- For adjustments refer Chapter 7.4.5

7.4.5.9. HEAVY TRUCK – 1 Front Axle & 3 Rear Axles (including 1 Tag 1st Axle) (6A/5A/4A)



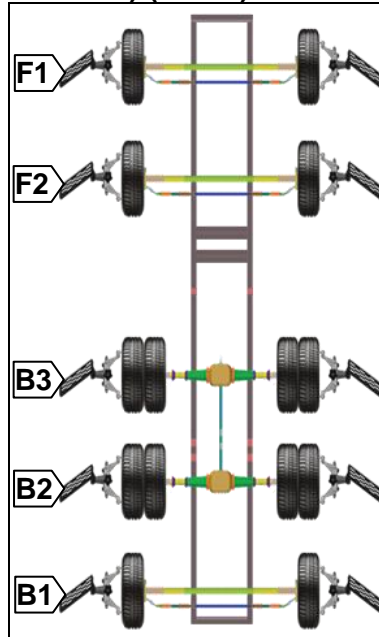
1. Mount Front Target plates with Front axle (F1)
 2. Mount Rear Target plates with Rear axles (B3, B2 & B1). For 4A model use F2/B3 labeled Target plates
 3. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)
 4. Carryout Caster / KP swing for F1 (Ref. Chapter 7.4.4)
 5. Carry out measurement as guided by the screen
 6. Apply Steering lock at straight ahead position (F1)
 7. Adjust Rear 3rd axle (B3)
 8. Adjust Front axle (F1)
 9. Adjust Rear 2nd axle (B2)
 10. Adjust Rear 1st axle (B1)
- For adjustments refer Chapter 7.4.5

7.4.5.10. HEAVY TRUCK – 2 Front Axles & 3 Rear Axles (including 1 Pusher 3rd Axle) (6A/5A)



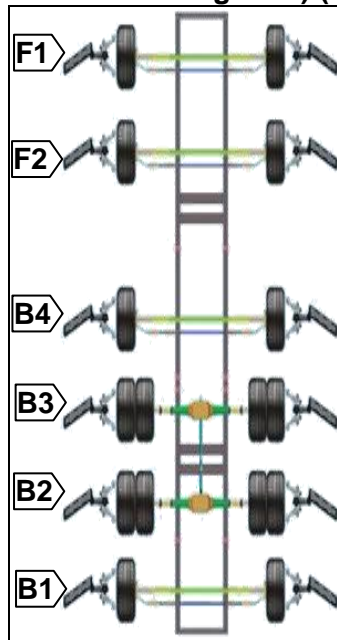
1. Mount Front Target plates with Front axles (F1 & F2)
 2. Mount Rear Target plates with Rear axles (B3, B2 & B1)
 3. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)
 4. Carryout Caster / KP swing for F1 & F2 (Ref. Chapter 7.4.4)
 5. Carry out measurement as guided by the screen
 6. Apply Steering lock at straight ahead position (F1)
 7. Adjust Rear 2nd axle (B2)
 8. Adjust Front 1st axle (F1)
 9. Adjust Front 2nd axle (F2)
 10. Adjust parallelism of F1 & F2
 11. Adjust Rear Pusher 3rd axle (B3)
 12. Adjust Rear 1st axle (B1)
- For adjustments refer Chapter 7.4.5

7.4.5.11. HEAVY TRUCK – 2 Front Axles & 3 Rear Axles (including 1 Tag 1st Axle) (6A/5A)



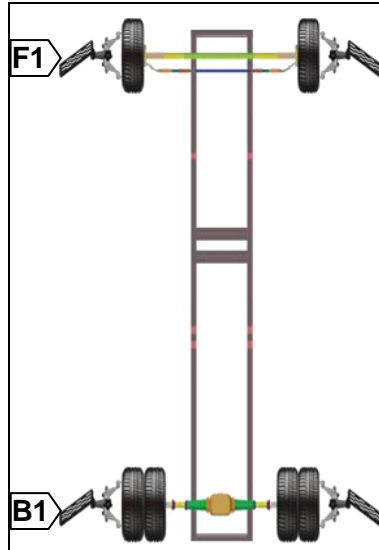
1. Mount Front Target plates with Front axles (F1 & F2)
 2. Mount Rear Target plates with Rear axles (B3, B2 & B1)
 3. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)
 4. Carryout Caster / KP swing for F1 & F2 (Ref. Chapter 7.4.4)
 5. Carry out measurement as guided by the screen
 6. Apply Steering lock at straight ahead position (F1)
 7. Adjust Rear 3rd axle (B3)
 8. Adjust Front 1st axle (F1)
 9. Adjust Front 2nd axle (F2)
 10. Adjust parallelism of F1 & F2
 11. Adjust Rear 2nd axle (B2)
 12. Adjust Rear 1st axle (B1)
- For adjustments refer Chapter 7.4.5

7.4.5.12. HEAVY TRUCK – 2 Front Axles & 4 Rear Axles (including 1 Pusher & 1 Tag Axle) (6A)



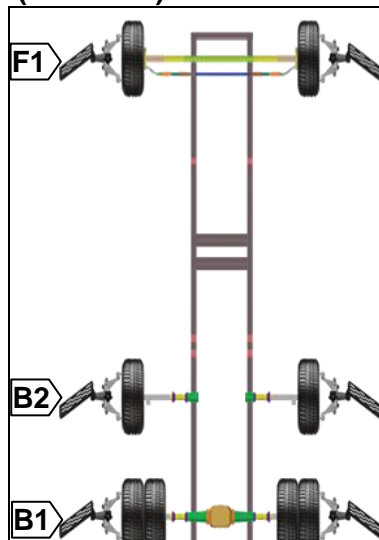
1. Mount Front Target plates with Front axles (F1 & F2)
 2. Mount Rear Target plates with Rear axles (B4,B3, B2 & B1)
 3. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)
 4. Carryout Caster / KP swing for F1 & F2 (Ref. Chapter 7.4.4)
 5. Carry out measurement as guided by the screen
 6. Apply Steering lock at straight ahead position (F1)
 7. Adjust Rear 3rd axle (B3)
 8. Adjust Front 1st axle (F1)
 9. Adjust Front 2nd axle (F2)
 10. Adjust Rear 3rd axle (B4)
 11. Adjust parallelism of F1 & F2
 12. Adjust Rear 2nd axle (B2)
 13. Adjust Rear 1st axle (B1)
- For adjustments refer Chapter 7.4.5

7.4.5.13. BUS – 1 Front Axle & 1 Rear Axle (6A/5A/4A)



1. Mount Front Target plates with Front axle (F1)
 2. Mount Rear Target plates with Rear axle (B1)
 3. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)
 4. Carryout Caster / KP swing for F1 (Ref. Chapter 7.4.4)
 5. Carry out measurement as guided by the screen
 6. Apply Steering lock at straight ahead position (F1)
 7. Adjust Rear axle (B1)
 8. Adjust Front axle (F1)
- For adjustments refer Chapter 7.4.5

7.4.5.14. BUS – 1 Front Axle & 2 Rear Axles (including 1 Pusher Axle) (6A/5A/4A)



1. Mount Front Target plates with Front axle (F1)
 2. Mount Rear Target plates with Rear axles (B2 & B1)
 3. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)
 4. Carryout Caster / KP swing for F1 (Ref. Chapter 7.4.4)
 5. Carry out measurement as guided by the screen
 6. Apply Steering lock at straight ahead position (F1)
 7. Adjust Rear 1st axle (B1)
 8. Adjust Front axle (F1)
 9. Adjust Rear 2nd axle (B2)
- For adjustments refer Chapter 7.4.5

7.4.5.15. BUS – 1 Front Axle & 2 Rear Axles (including 1 Tag Axle) (6A/5A/4A)

	<ol style="list-style-type: none"> 1. Mount Front Target plates with Front axle (F1) 2. Mount Rear Target plates with Rear axles (B2 & B1) 3. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3) 4. Carryout Caster / KP swing for F1 (Ref. Chapter 7.4.4) 5. Carry out measurement as guided by the screen 6. Apply Steering lock at straight ahead position (F1) 7. Adjust Rear 2nd axle (B2) 8. Adjust Front axle (F1) 9. Adjust Rear 1st axle (B1) <p>For adjustments refer Chapter 7.4.5</p>
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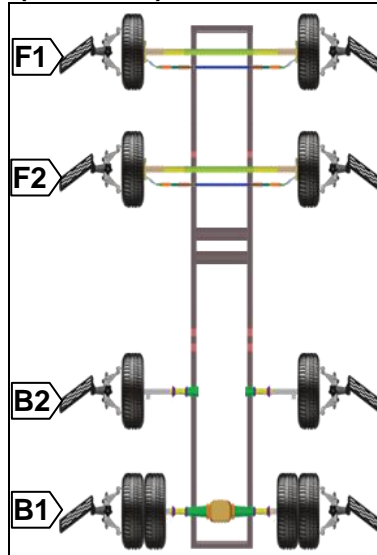
7.4.5.16. BUS – 1 Front Axle & 2 Rear Axles (including 1 Rear Steering Tag Axle) (6A/5A/4A)

	<ol style="list-style-type: none"> 1. Mount Front Target plates with Front axle (F1) 2. Mount Rear Target plates with Rear axles (B2 & B1) 3. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3) 4. Carryout Caster / KP swing for F1 (Ref. Chapter 7.4.4) 5. Carry out measurement as guided by the screen 6. Apply Steering lock at straight ahead position (F1) 7. Adjust Rear 2nd axle (B2) 8. Adjust Front axle (F1) 9. Adjust Rear 1st axle (B1) <p>For adjustments refer Chapter 7.4.5</p>
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7.4.5.17. BUS – 2 Front Axles & 1 Rear Axle (6A/5A/4A)

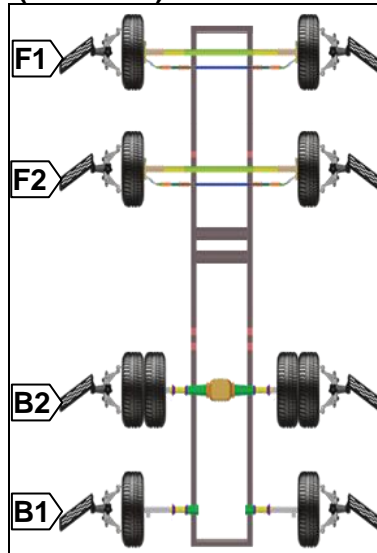
	<ol style="list-style-type: none"> 1. Mount Front Target plates with Front axles (F1 & F2) 2. Mount Rear Target plates with Rear axle (B1) 3. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3) 4. Carryout Caster / KP swing for F1 & F2 (Ref. Chapter 7.4.4) 5. Carry out measurement as guided by the screen 6. Apply Steering lock at straight ahead position (F1) 7. Adjust Rear 1st axle (B1) 8. Adjust Front 1st axle (F1) 9. Adjust Front 2nd axle (F2) 10. Adjust Parallelism of F1 & F2 <p>For adjustments refer Chapter 7.4.5</p>
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**7.4.5.18. BUS – 2 Front Axles & 2 Rear Axles (including 1 Pusher Axle)
(6A/5A/4A)**



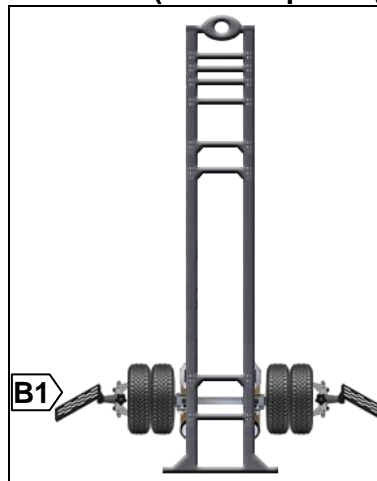
1. Mount Front Target plates with Front axles (F1 & F2)
 2. Mount Rear Target plates with Rear axles (B2 & B1)
 3. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)
 4. Carryout Caster / KP swing for F1 & F2 (Ref. Chapter 7.4.4)
 5. Carry out measurement as guided by the screen
 6. Apply Steering lock at straight ahead position (F1)
 7. Adjust Rear 1st axle (B1)
 8. Adjust Front 1st axle (F1)
 9. Adjust Front 2nd axle (F2)
 10. Adjust Parallelism of F1 & F2
 11. Adjust Rear 2nd axle (B2)
- For adjustments refer Chapter 7.4.5

**7.4.5.19. BUS – 2 Front Axles & 2 Rear Axles (including 1 Tag Axle)
(6A/5A/4A)**



1. Mount Front Target plates with Front axles (F1 & F2)
 2. Mount Rear Target plates with Rear axles (B2 & B1)
 3. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)
 4. Carryout Caster / KP swing for F1 & F2 (Ref. Chapter 7.4.4)
 5. Carry out measurement as guided by the screen
 6. Apply Steering lock at straight ahead position (F1)
 7. Adjust Rear 2nd axle (B2)
 8. Adjust Front 1st axle (F1)
 9. Adjust Front 2nd axle (F2)
 10. Adjust Parallelism of F1 & F2
 11. Adjust Rear 1st axle (B1)
- For adjustments refer Chapter 7.4.5

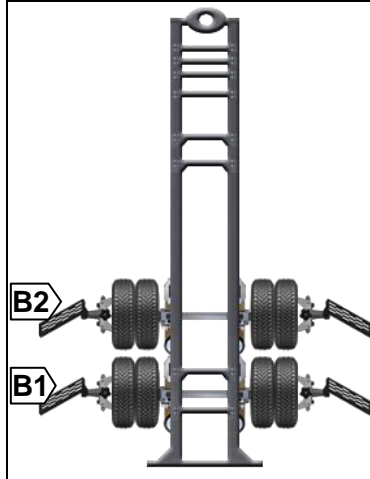
7.4.5.20. TRAILER (Forward parking) – 1 Rear Axle (6A/5A/4A)



1. Mount Rear Target plates with Rear axle (B1)
2. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)
3. Carryout measurement as guided by the screen
4. Adjust Rear axle (B1)

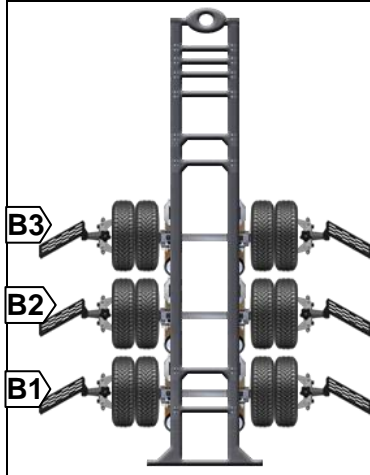
For adjustments refer Chapter 7.4.5

7.4.5.21. TRAILER (Forward parking) – 2 Rear Axles (6A/5A/4A)



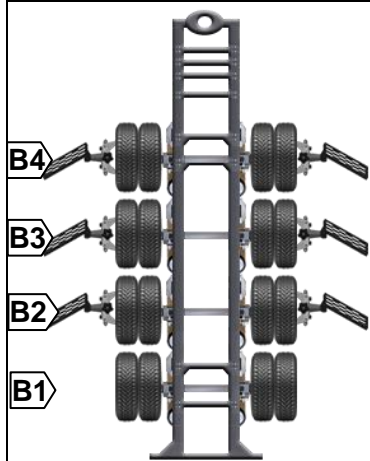
1. Mount Rear Target plates with Rear 1st axle (B1)
 2. Mount Rear Target plates with Rear 2nd axle (B2)
 3. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)
 4. Carryout measurement as guided by the screen
 5. Adjust Rear 2nd axle (B2)
 6. Adjust Rear 1st axle (B1)
- For adjustments refer Chapter 7.4.5

7.4.5.22. TRAILER (Forward parking) – 3 Rear Axles (6A/5A/4A)

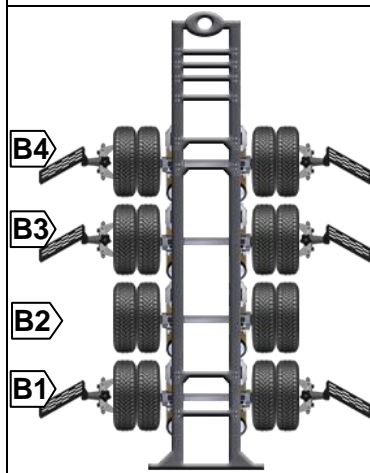


1. Mount Rear Target plates with Rear 1st axle (B1)
 2. Mount Rear Target plates with Rear 2nd axle (B2)
 3. Mount Rear Target plates with Rear 3rd axle (B3). For 4A model use F2/B3 labeled Target plates
 4. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)
 5. Carryout measurement as guided by the screen
 6. Adjust Rear 3rd axle (B3)
 7. Adjust Rear 2nd axle (B2)
 8. Adjust Rear 1st axle (B1)
- For adjustments refer Chapter 7.4.5

7.4.5.23. TRAILER (Forward parking) – 4 Rear Axles (6A/5A/4A)

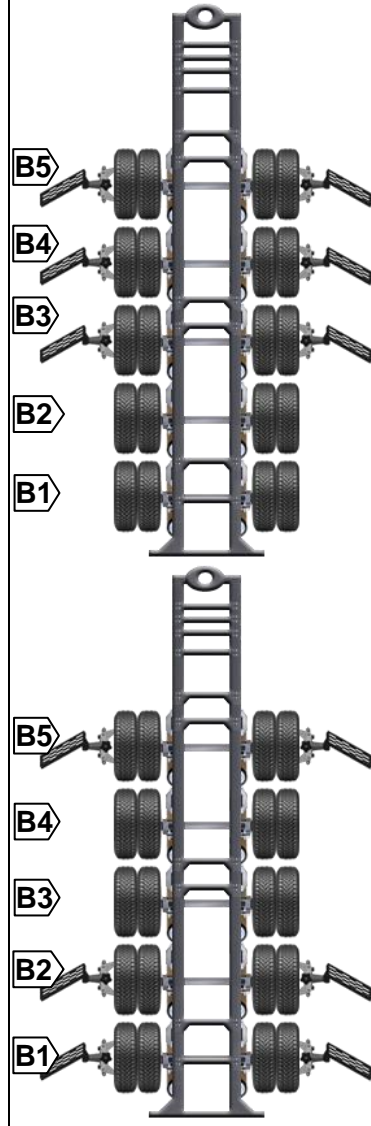


1. Mount Rear (B1) Target plates with Rear 2nd axle (B2)
2. Mount Rear (B2) Target plates with Rear 3rd axle (B3)
3. Mount Rear (B3) Target plates with Rear 4th axle (B4). For 4A model use F2/B3 labeled Target plates
4. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)
5. Carry out measurement as guided by the screen
6. Adjust Rear 4th axle (B4)
7. Adjust Rear 3rd axle (B3)
8. Adjust Rear 2nd axle (B2)



9. Remove Rear (B1) Target plates from Rear 2nd axle (B2) and mount it with Rear 1st axle (B1)
10. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)
11. Carry out measurement as guided by the screen
12. Adjust Rear 1st axle (B1)
13. For adjustments refer Chapter 7.4.5

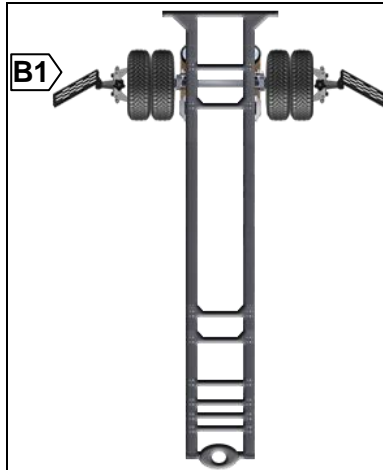
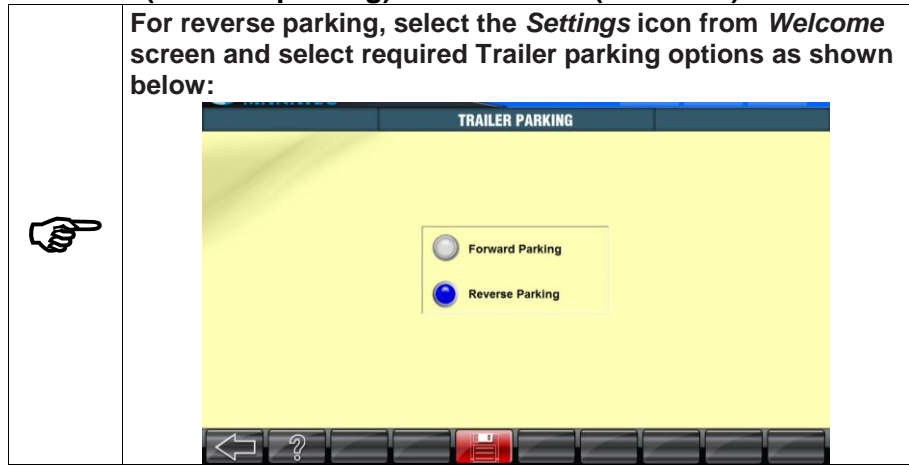
7.4.5.24. TRAILER (Forward parking) – 5 Rear Axles (6A/5A/4A)



1. Mount Rear (B1) Target plates with Rear 3rd axle (B3)
 2. Mount Rear (B2) Target plates with Rear 4th axle (B4)
 3. Mount Rear (B3) Target plates with Rear 5th axle (B5). For 4A model use F2/B3 labeled Target plates
 4. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)
 5. Carry out measurement as guided by the screen
 6. Adjust Rear 5th axle (B5)
 7. Adjust Rear 4th axle (B4)
 8. Adjust Rear 3rd axle (B3)
 9. Remove Rear (B1) Target plates from Rear 3rd axle (B3) and mount it with Rear 1st axle (B1)
 10. Remove Rear (B2) target plates in Rear 4th axle (B4) and mount it with Rear 2nd axle (B2)
 11. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)
 12. Carry out measurement as guided by the screen
 13. Adjust Rear 2nd axle (B2)
 14. Adjust Rear 1st axle (B1)
- For adjustments refer Chapter 7.4.5

7.4.5.25. TRAILER (Reverse parking) – 1 Rear Axle (6A/5A/4A)

For reverse parking, select the *Settings* icon from *Welcome* screen and select required Trailer parking options as shown below:

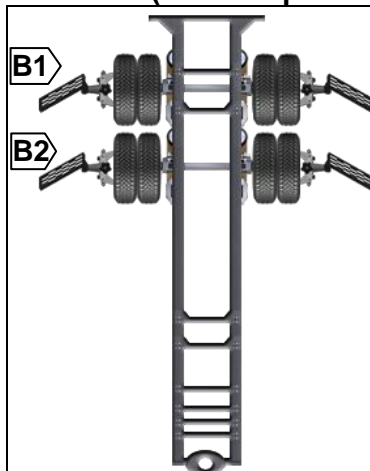


Ensure the B1 axle is parked at 7mtr from the Camera reference line

1. Mount Rear Target plates with Rear axle (B1)
2. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)
3. Carryout measurement as guided by the screen
4. Adjust Rear axle (B1)

For adjustments refer Chapter 7.4.5

7.4.5.26. TRAILER (Reverse parking) – 2 Rear Axles (6A/5A/4A)

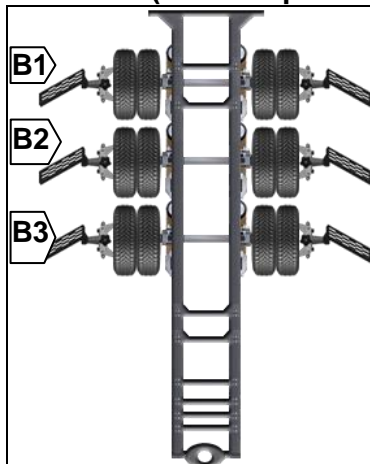


Ensure the B1 axle is parked at 7mtr from the Camera reference line

1. Mount Rear Target plates with Rear 1st axle (B1)
2. Mount Rear Target plates with Rear 2nd axle (B2)
3. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)
4. Carryout measurement as guided by the screen
5. Adjust Rear 1st axle (B1)
6. Adjust Rear 2nd axle (B2)

For adjustments refer Chapter 7.4.5

7.4.5.27. TRAILER (Reverse parking) – 3 Rear Axles (6A/5A/4A)

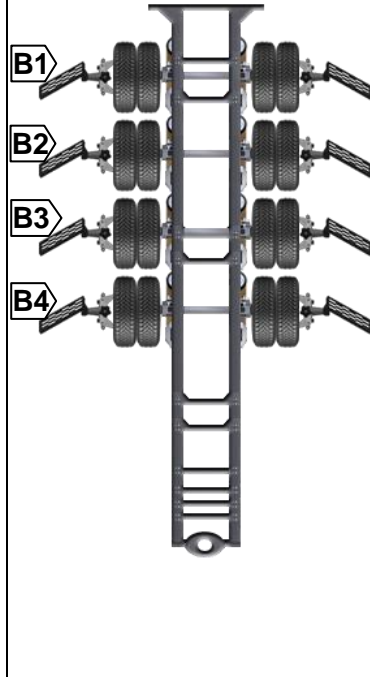


Ensure the B1 axle is parked at 7mtr from the Camera reference line

1. Mount Rear Target plates with Rear 1st axle (B1)
2. Mount Rear Target plates with Rear 2nd axle (B2)
3. Mount Rear Target plates with Rear 3rd axle (B3). For 4A model use F2/B3 labeled Target plates
4. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)
5. Carryout measurement as guided by the screen
6. Adjust Rear 1st axle (B1)
7. Adjust Rear 2nd axle (B2)
8. Adjust Rear 3rd axle (B3)

For adjustments refer Chapter 7.4.5

7.4.5.28. TRAILER (Reverse parking) – 4 Rear Axles (6A/5A/4A)

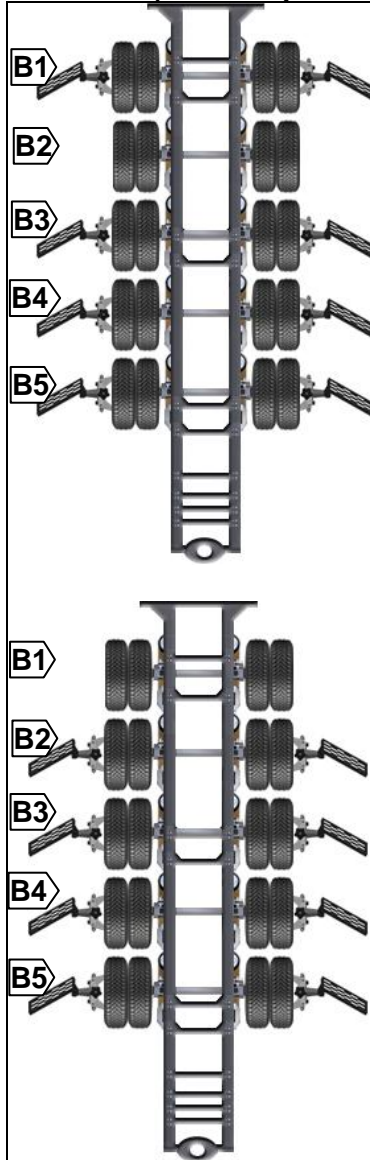


Ensure the B1 axle is parked at 5.5mtr from the Camera reference line

1. Mount Rear (F1) Target plates with Rear 1st axle (B1)
2. Mount Rear (B1) Target plates with Rear 2nd axle (B2)
3. Mount Rear (B2) Target plates with Rear 3rd axle (B3)
4. Mount Rear (B3) Target plates with Rear 4th axle (B4). For 4A model use F2/B3 labeled Target plates
5. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)
6. Carry out measurement as guided by the screen
7. Adjust Rear 1st axle (B1)
8. Adjust Rear 2nd axle (B2)
9. Adjust Rear 3rd axle (B3)
10. Adjust Rear 4th axle (B4)

For adjustments refer Chapter 7.4.5

7.4.5.29. TRAILER (Reverse parking) – 5 Rear Axles (6A/5A/4A)

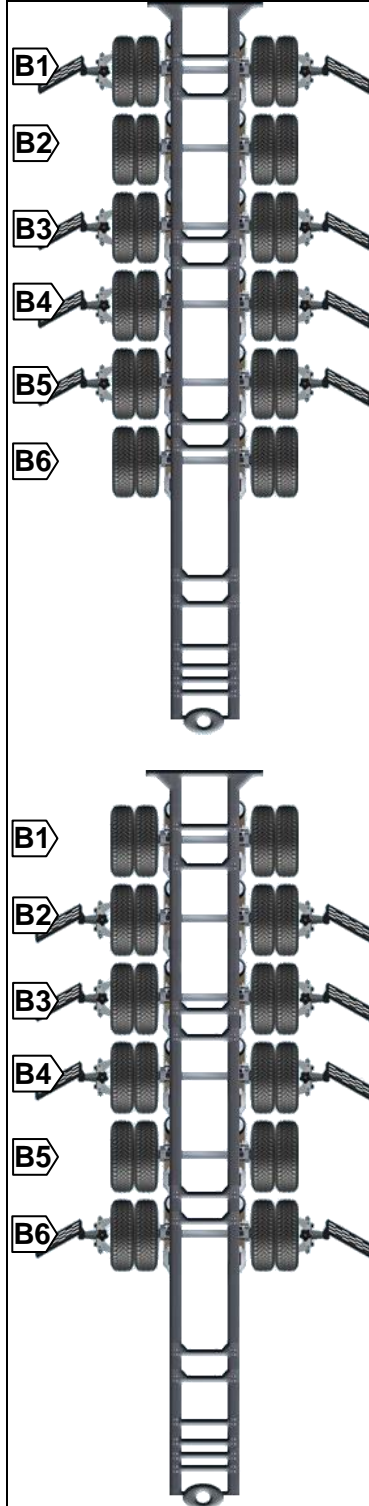


Ensure the B1 axle is parked at 4mtr from the Camera

1. Mount Rear (F1) Target plates with Rear 1st axle (B1)
2. Mount Rear (B1) Target plates with Rear 3rd axle (B3)
3. Mount Rear (B2) Target plates with Rear 4th axle (B4)
4. Mount Rear (B3) Target plates with Rear 5th axle (B5). For 4A model use F2/B3 labeled Target plates
5. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)
6. Carry out measurement as guided by the screen
7. Adjust Rear 1st axle (B1)
8. Adjust Rear 3rd axle (B3)
9. Adjust Rear 4th axle (B4)
10. Adjust Rear 5th axle (B5)
11. Remove Rear (F1) Target plates from Rear 1st axle (B1) and mount it with Rear 2nd axle (B2)
12. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)
13. Carry out measurement as guided by the screen
14. Adjust Rear 2nd axle (B2)

For adjustments refer Chapter 7.4.5

7.4.5.30. TRAILER (Reverse parking) – 6 Rear Axles (6A/5A/4A)

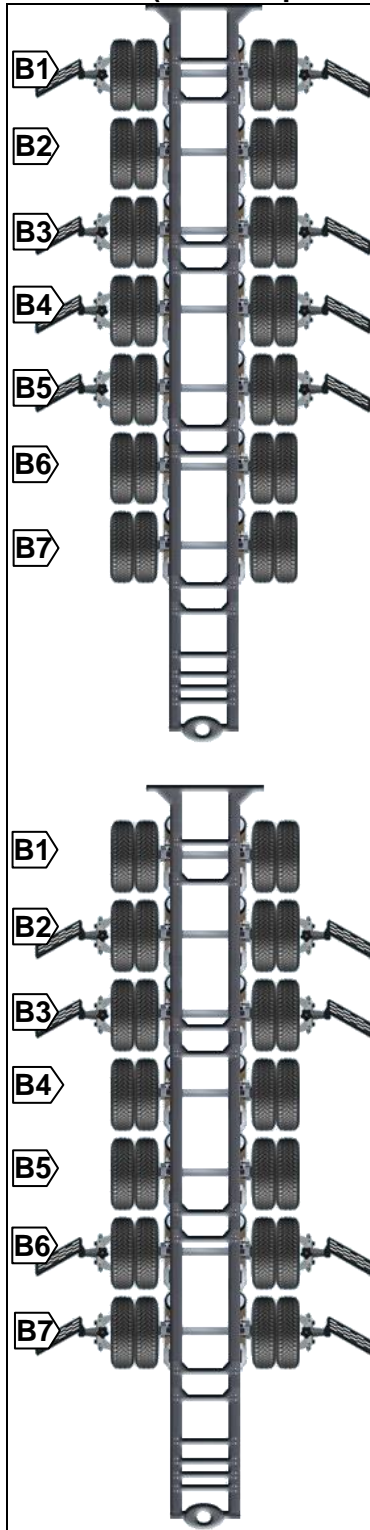


Ensure the B1 axle is parked at 4mtr from the Camera

1. Mount Rear (F1) Target plates with Rear 1st axle (B1)
2. Mount Rear (B1) Target plates with Rear 3rd axle (B3)
3. Mount Rear (B2) Target plates with Rear 4th axle (B4)
4. Mount Rear (B3) Target plates with Rear 5th axle (B5). For 4A model use F2/B3 labeled Target plates
5. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)
6. Carry out measurement as guided by the screen
7. Adjust Rear 1st axle (B1)
8. Adjust Rear 3rd axle (B3)
9. Adjust Rear 4th axle (B4)
10. Adjust Rear 5th axle (B5)
11. Remove Rear (F1) Target plates from Rear 1st axle (B1) and mount it with Rear 2nd axle (B2)
12. Remove Rear (B3) Target plates from Rear 5th axle (B5) and mount it with Rear 6th axle (B6)
13. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)
14. Carry out measurement as guided by the screen
15. Adjust Rear 2nd axle (B2)
16. Adjust Rear 6th axle (B6)

For adjustments refer Chapter 7.4.5

7.4.5.31. TRAILER (Reverse parking) – 7 Rear Axles

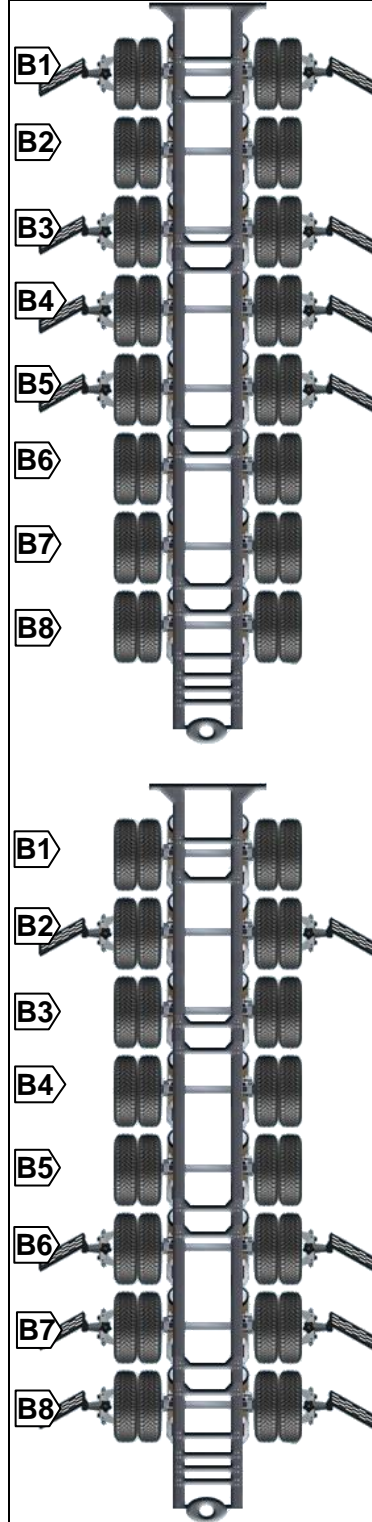


Ensure the B1 axle is parked at 4mtr from the Camera

1. Mount Rear (F1) Target plates with Rear 1st axle (B1)
2. Mount Rear (B1) Target plates with Rear 3rd axle (B3)
3. Mount Rear (B2) Target plates with Rear 4th axle (B4)
4. Mount Rear (B3) Target plates with Rear 5th axle (B5)
5. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)
6. Carry out measurement as guided by the screen
7. Adjust Rear 1st axle (B1)
8. Adjust Rear 3rd axle (B3)
9. Adjust Rear 4th axle (B4)
10. Adjust Rear 5th axle (B5)
11. Remove Rear (F1) Target plates from Rear 1st axle (B1) and mount it with Rear 2nd axle (B2)
12. Remove Rear (B2) Target plates from Rear 4th axle (B4) and mount it with Rear 6th axle (B6)
13. Remove Rear (B3) Target plates from Rear 5th axle (B5) and mount it with Rear 7th axle (B7)
14. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)
15. Carry out measurement as guided by the screen
16. Adjust Rear 2nd axle (B2)
17. Adjust Rear 6th axle (B6)
18. Adjust Rear 7th axle (B7)

For adjustments refer Chapter 7.4.5

7.4.5.32. TRAILER (Reverse parking) – 8 Rear Axles



Ensure the B1 axle is parked at 4mtr from the Camera

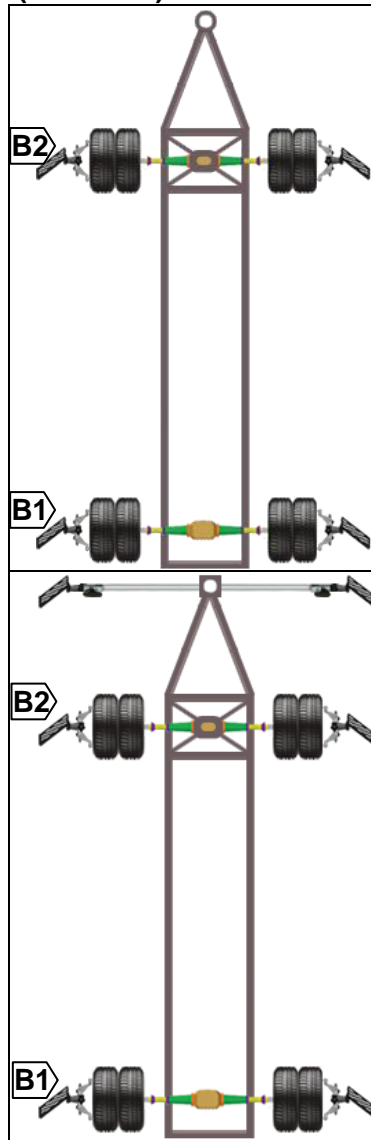
1. Mount Rear (F1) Target plates with Rear 1st axle (B1)
2. Mount Rear (B1) Target plates with Rear 3rd axle (B3)
3. Mount Rear (B2) Target plates with Rear 4th axle (B4)
4. Mount Rear (B3) Target plates with Rear 5th axle (B5). For 4A model use F2/B3 labeled Target plates
5. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)
6. Carry out measurement as guided by the screen
7. Adjust Rear 1st axle (B1)
8. Adjust Rear 3rd axle (B3)
9. Adjust Rear 4th axle (B4)
10. Adjust Rear 5th axle (B5)
11. Remove Rear (F1) Target plates from Rear 1st axle (B1) and mount it with Rear 2nd axle (B2)
12. Remove Rear (B1) Target plates from Rear 3rd axle (B3) and mount it with Rear 6th axle (B6)
13. Remove Rear (B2) Target plates from Rear 4th axle (B4) and mount it with Rear 7th axle (B7)
14. Remove Rear (B3) Target plates from Rear 5th axle (B5) and mount it with Rear 8th axle (B8)
15. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)
16. Carry out measurement as guided by the screen
17. Adjust Rear 2nd axle (B2)
18. Adjust Rear 6th axle (B6)
19. Adjust Rear 7th axle (B7)
20. Adjust Rear 8th axle (B8)

For adjustments refer Chapter 7.4.5



Trailers can be aligned if the Axles are within the distance of 19mtr from the Camera

7.4.5.33. FULL TRAILER (Forward parking) – 1 Front Axle & 1 Rear Axle (6A/5A/4A)

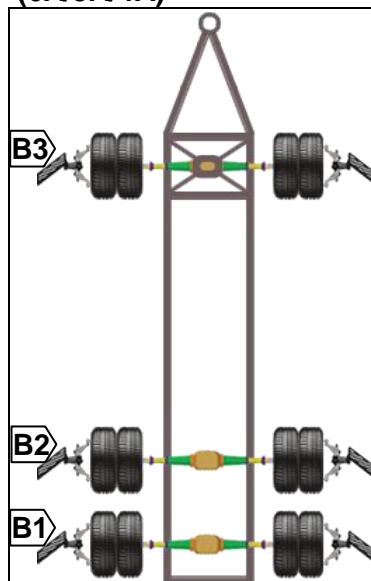


- Ensure the B1 axle is parked from 7mtr from Camera
1. Mount (B1) Target plates with Rear 1st axle (B1)
 2. Mount Front (F2) Target plates with Rear 2nd axle (B2)
 3. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)

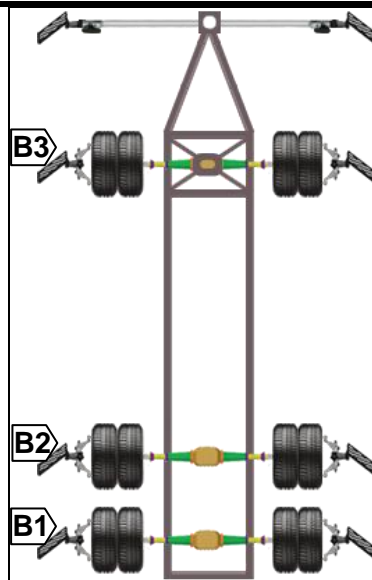
4. Fix drawbar gauge and mount the Front (F1) Target plates
5. Adjust Rear 1st axle (B1)
6. Swivel the Dolly as guided to center.
7. Adjust Rear 2nd axle (B2) and also ensure the Drawbar gauge values are within specification.

For adjustments refer Chapter 7.4.5

7.4.5.34. FULL TRAILER (Forward parking) – 1 Front Axle & 2 Rear Axles (6A/5A/4A)



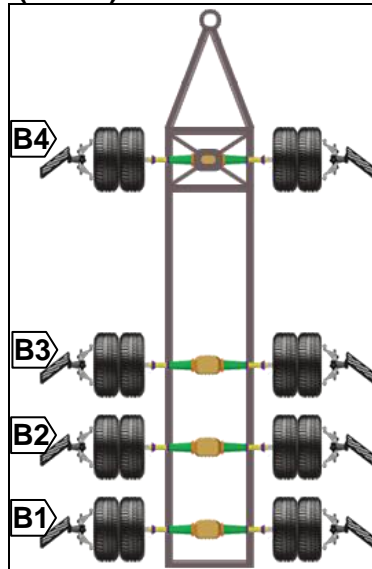
- Ensure the B2 axle is parked at 7mtr from Camera
1. Mount Rear (B1) Target plates with Rear 1st axle (B1)
 2. Mount Rear (B2) Target plates with Rear 2nd axle (B2)
 3. Mount Front (F2) Target plates with Rear 3rd axle (B3). For 4A model use F2/B3 labeled Target plates
 4. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)



5. Fix drawbar gauge and mount the Front (F1) Target plates
6. Adjust Rear 1st axle (B1)
7. Swivel the Dolly as guided to center.
8. Adjust Rear 2nd axle (B2)
9. Adjust Rear 3rd axle (B3) and also ensure the Drawbar gauge values are within specification.

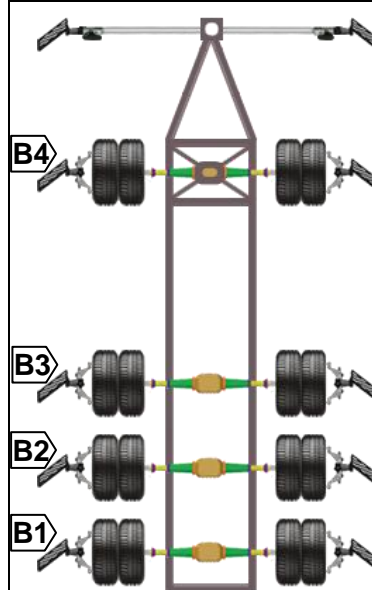
For adjustments refer Chapter 7.4.5

7.4.5.35. FULL TRAILER (Foward parking) – 1 Front Axle & 3 Rear Axles (6A/5A)



Ensure the B3 axle is parked at 7mtr from Camera

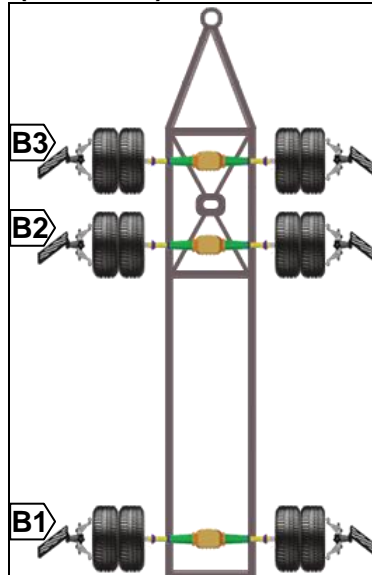
1. Mount Rear (B1) Target plates with Rear 1st axle (B1)
2. Mount Rear (B2) Target plates with Rear 2nd axle (B2)
3. Mount Rear (B3) Target plates with Rear 3rd axle (B3)
4. Mount Front (F2) Target plates with Rear 4th axle (B4)
5. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)



6. Fix drawbar gauge and mount the Front (F1) Target plates
7. Adjust Rear 1st axle (B1)
8. Swivel the Dolly as guided to center.
9. Adjust Rear 2nd axle (B2)
10. Adjust Rear 3rd axle (B3)
11. Adjust Rear 4th axle (B4) and also ensure the Drawbar gauge values are within specification.

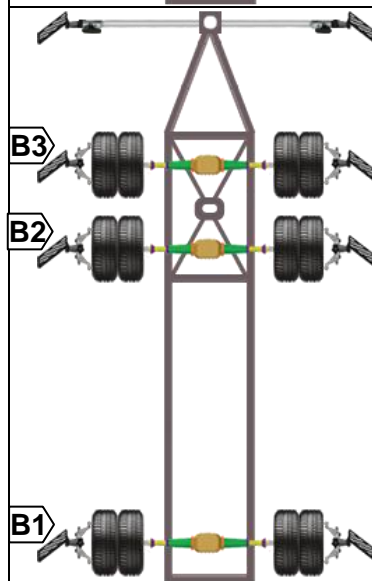
For adjustments refer Chapter 7.4.5

7.4.5.36. FULL TRAILER (Forward parking) – 2 Front Axles & 1 Rear Axle (6A/5A/4A)



Ensure the B1 axle is parked at 7mtr from Camera

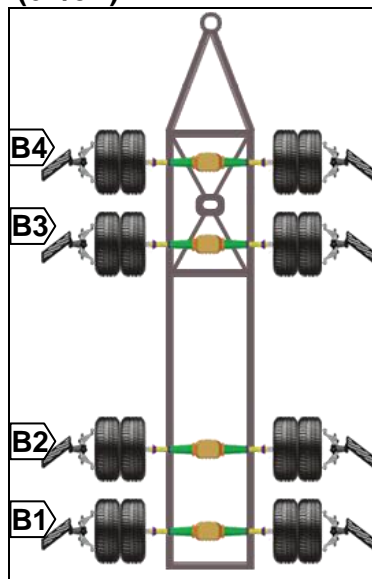
1. Mount Rear (B1) Target plates with Rear 1st axle (B1)
2. Mount Front (B4) Target plates with Rear 2nd axle (B2)
3. Mount Front (F2) Target plates with Rear 3rd axle (B3). For 4A model use F2/B3 labeled Target plates
4. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)



5. Fix drawbar gauge and mount the Front (F1) Target plates
6. Adjust Rear 1st axle (B1)
7. Swivel the Dolly as guided to center.
8. Adjust Rear 2nd axle (B2)
9. Adjust Rear 3rd axle (B3) and also ensure the Drawbar gauge values are within specification.

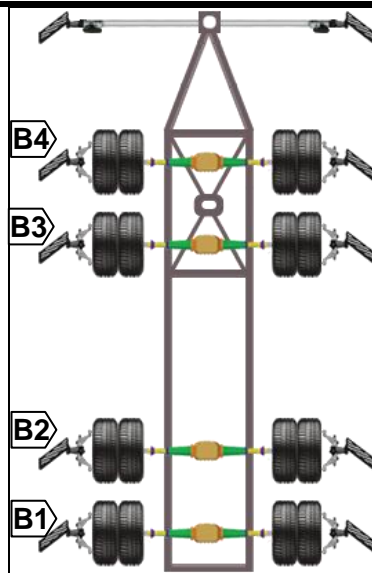
For adjustments refer Chapter 7.4.5

7.4.5.37. FULL TRAILER (Forward parking) –2 Front Axles & 2 Rear Axles (6A/5A)



Ensure the B2 axle is parked at 7mtr from Camera

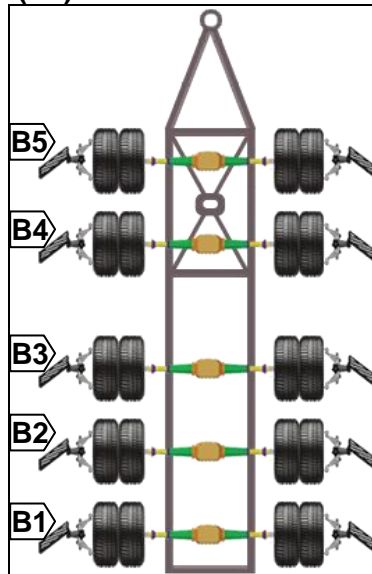
1. Mount Rear (B1) Target plates with Rear 1st axle (B1)
2. Mount Rear (B2) Target plates with Rear 2nd axle (B2)
3. Mount Front (B4) Target plates with Rear 3rd axle (B3)
4. Mount Front (F2) Target plates with Rear 4th axle (B4)
5. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)



6. Fix drawbar gauge and mount the Front (F1) Target plates
7. Adjust Rear 1st axle (B1)
8. Swivel the Dolly as guided to center.
9. Adjust Rear 2nd axle (B2)
10. Adjust Rear 3rd axle (B3)
11. Adjust Rear 4th axle (B4) and also ensure the Drawbar gauge values are within specification.

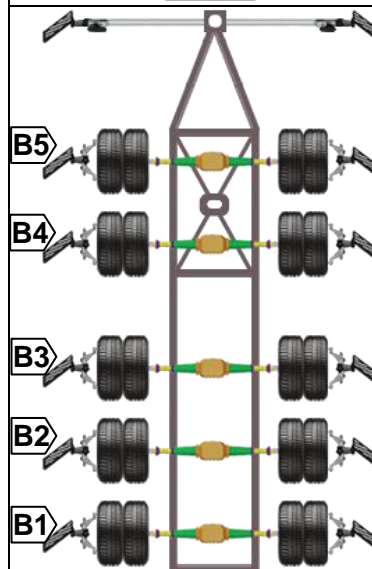
For adjustments refer Chapter 7.4.5

7.4.5.38. FULL TRAILER (Forward parking) –2 Front Axles & 3 Rear Axles (6A)



Ensure the B3 axle is parked at 7mtr from Camera

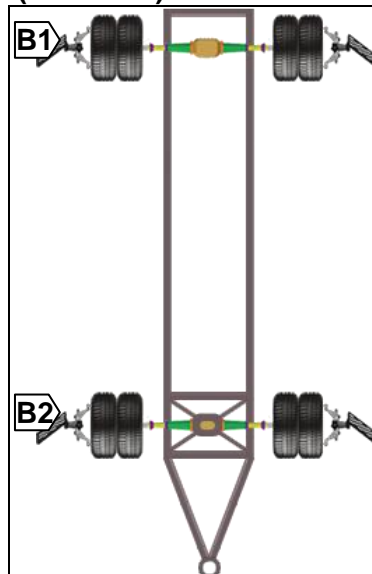
1. Mount Rear (B1) Target plates with Rear 1st axle (B1)
2. Mount Rear (B2) Target plates with Rear 2nd axle (B2)
3. Mount Rear (B3) Target plates with Rear 3rd axle (B3)
4. Mount Front (B4) Target plates with Rear 4th axle (B4)
5. Mount Front (F2) Target plates with Rear 5th axle (B5)
6. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)



7. Fix drawbar gauge and mount the Front (F1) Target plates
8. Adjust 1st axle (B1)
9. Swivel the Dolly as guided to center.
10. Adjust Rear 2nd axle (B2)
11. Adjust Rear 3rd axle (B3)
12. Adjust Rear 4th axle (B4)
13. Adjust Rear 5th axle (B5) and also ensure the Drawbar gauge values are within specification.

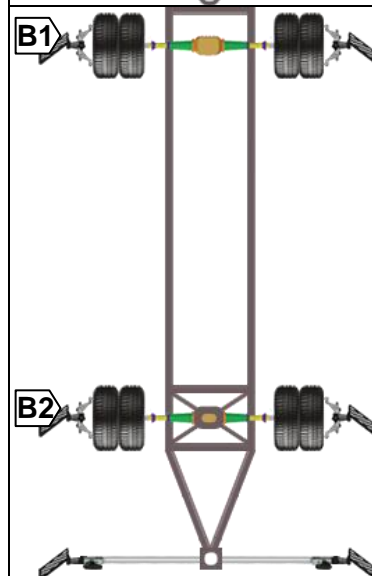
For adjustments refer Chapter 7.4.5

7.4.5.39. FULL TRAILER (Reverse parking) – 1 Front Axle & 1 Rear Axle (6A/5A/4A)



Ensure the B1 axle is parked at 4.5mtr from Camera

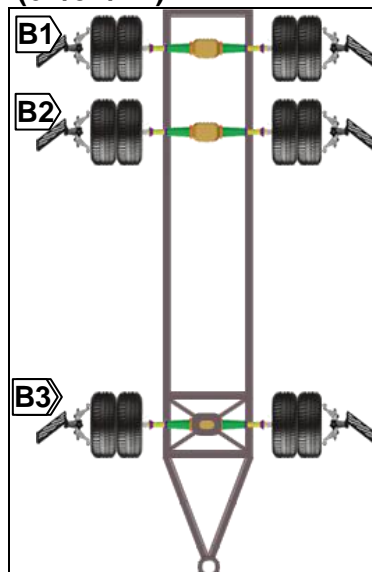
1. Mount Front (F1) Target plates with Rear 1st axle (B1)
2. Mount Rear (B1) Target plates with Rear 2nd axle (B2)
3. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)



4. Fix drawbar gauge and mount the Rear (B2) Target plates
5. Adjust Rear 1st axle (B1)
6. Swivel the Dolly as guided to center.
7. Adjust Rear 2nd axle (B2) and also ensure the Drawbar gauge values are within specification.

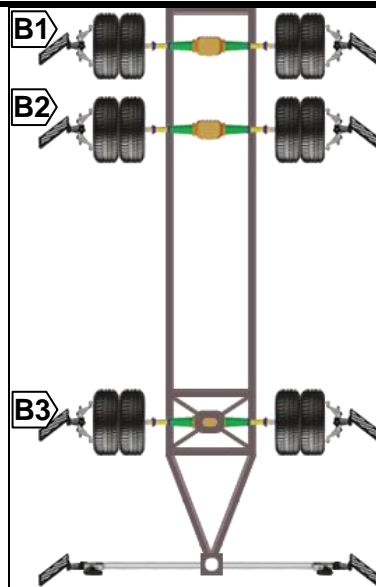
For adjustments refer Chapter 7.4.5

7.4.5.40. FULL TRAILER (Reverse parking) – 1 Front Axle & 2 Rear Axles (6A/5A/4A)



Ensure the B1 axle is parked at 4.5mtr from Camera

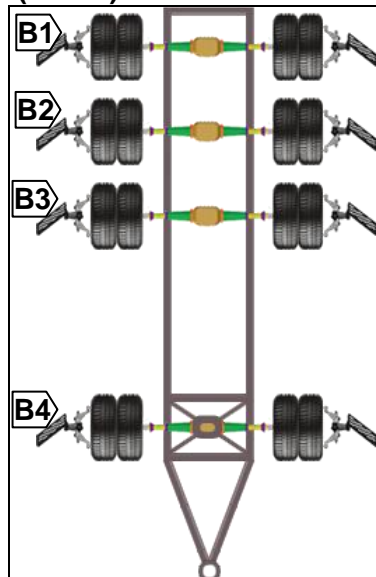
1. Mount Front (F1) Target plates with Rear 1st axle (B1)
2. Mount Front (F2) Target plates with Rear 2nd axle (B2). For 4A model use F2/B3 labeled Target plates
3. Mount Rear (B1) Target plates with Rear 3rd axle (B3)
4. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)



5. Fix drawbar gauge and mount the Rear (B2) Target plates
6. Adjust Rear 1st axle (B1)
7. Swivel the Dolly as guided to center.
8. Adjust Rear 2nd axle (B2)
9. Adjust Rear 3rd axle (B3) and also ensure the Drawbar gauge values are within specification.

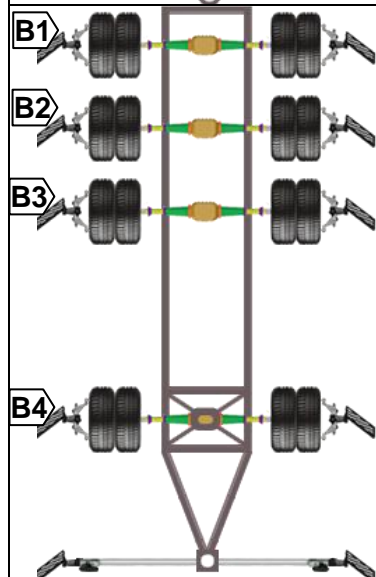
For adjustments refer Chapter 7.4.5

7.4.5.41. FULL TRAILER (Reverse parking) – 1 Front Axle & 3 Rear Axles (6A/5A)



Ensure the B1 axle is parked at 5.5mtr from Camera

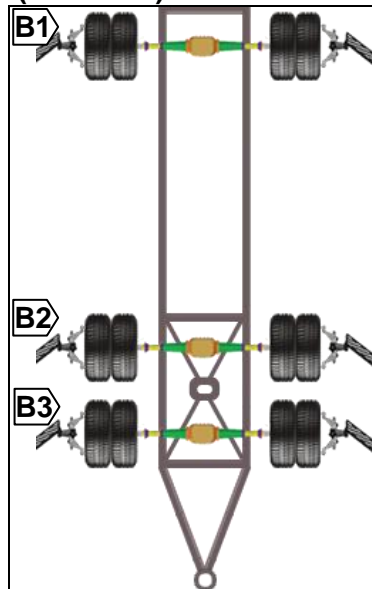
1. Mount Front (F1) Target plates with Rear 1st axle (B1)
2. Mount Front (F2) Target plates with Rear 2nd axle (B2)
3. Mount Rear (B1) Target plates with Rear 3rd axle (B3). For 4A model use F2/B3 labeled Target plates
4. Mount Rear (B2) Target plates with Rear 4th axle (B4)
5. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)



6. Fix drawbar gauge and mount the Rear (B3) Target plates
7. Adjust Rear 1st axle (B1)
8. Swivel the Dolly as guided to center.
9. Adjust Rear 2nd axle (B2)
10. Adjust Rear 3rd axle (B3)
11. Adjust Rear 4th axle (B4) and also ensure the Drawbar gauge values are within specification.

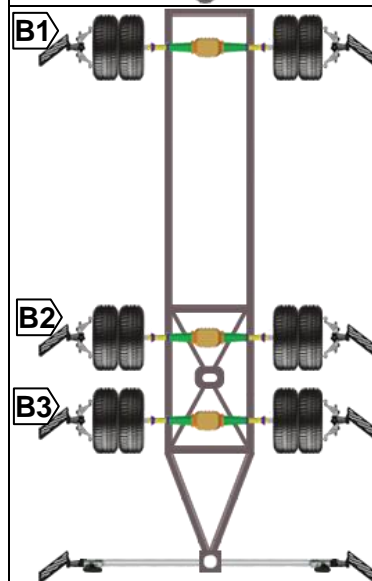
For adjustments refer Chapter 7.4.5

7.4.5.42. FULL TRAILER (Reverse parking) – 2 Front Axles & 1 Rear Axle (6A/5A/4A)



Ensure the B1 axle is parked at 4.5mtr from Camera

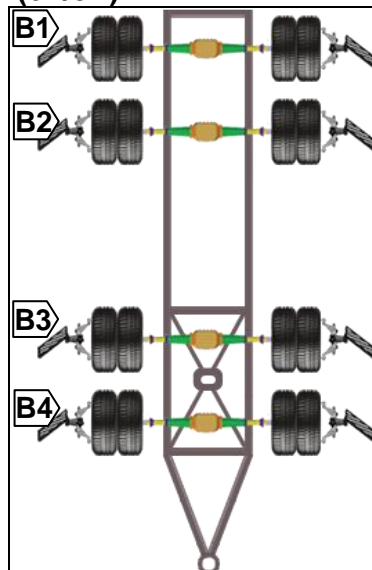
1. Mount Front (F1) Target plates with Rear 1st axle (B1)
2. Mount Rear (B1) Target plates with Rear 2nd axle (B2)
3. Mount Rear (B2) Target plates with Rear 3rd axle (B3)
4. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)



5. Fix drawbar gauge and mount the Rear (B3) Target plates
6. Adjust Rear 1st axle (B1)
7. Swivel the Dolly as guided to center.
8. Adjust Rear 2nd axle (B2)
9. Adjust Rear 3rd axle (B3) and also ensure the Drawbar gauge values are within specification.

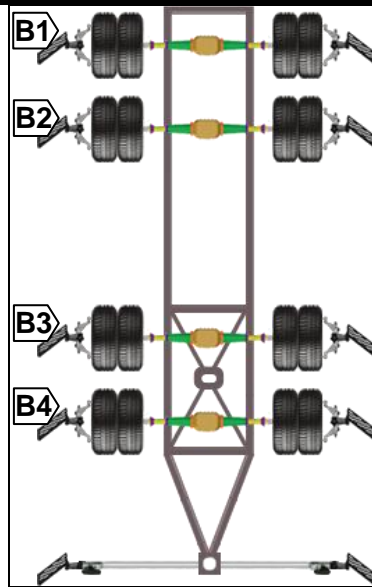
For adjustments refer Chapter 7.4.5

7.4.5.43. FULL TRAILER (Reverse parking) – 2 Front Axles & 2 Rear Axles (6A/5A)



Ensure the B1 axle is parked at 4.5mtr from Camera

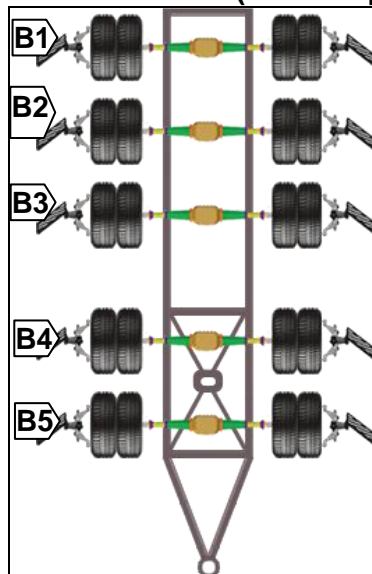
1. Mount Front (F1) Target plates with Rear 1st axle (B1)
2. Mount Front (F2) Target plates with Rear 2nd axle (B2)
3. Mount Rear (B1) Target plates with Rear 3rd axle (B3)
4. Mount Rear (B2) Target plates with Rear 4th axle (B4)
5. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)



6. Fix drawbar gauge and mount the Rear (B3) Target plates
7. Adjust Rear 1st axle (B1)
8. Swivel the Dolly as guided to center.
9. Adjust Rear 2nd axle (B2)
10. Adjust Rear 3rd axle (B3)
11. Adjust Rear 4th axle (B4) and also ensure the Drawbar gauge values are within specification.

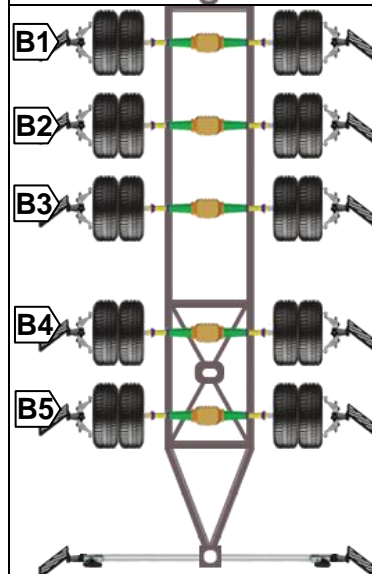
For adjustments refer Chapter 7.4.5

7.4.5.44. FULL TRAILER (Reverse parking) – 2 Front Axles & 3 Rear Axles



Ensure the B1 axle is parked at 2.8mtr from Camera

1. Mount Front (F1) Target plates with Rear 1st axle (B1)
2. Mount Front (F2) Target plates with Rear 2nd axle (B2)
3. Mount Rear (B4) Target plates with Rear 3rd axle (B3)
4. Mount Rear (B1) Target plates with Rear 4th axle (B4)
5. Mount Rear (B2) Target plates with Rear 5th axle (B5)
6. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)



7. Fix drawbar gauge and mount the Rear (B3) Target plates
8. Adjust Rear 1st axle (B1)
9. Swivel the Dolly as guided to center.
10. Adjust Rear 2nd axle (B2)
11. Adjust Rear 3rd axle (B3)
12. Adjust Rear 4th axle (B4)
13. Adjust Rear 5th axle (B5) and also ensure the Drawbar gauge values are within specification.

For adjustments refer Chapter 7.4.5

7.4.5.45. FULL TRAILER FORWARD PARKING ALIGNMENT PROCEDURE (6A Model)

Select the **Full Trailer Configuration**  button in the **Vehicle type** selection screen:

Select the required model configuration of the Full trailer. (Forward Parking)

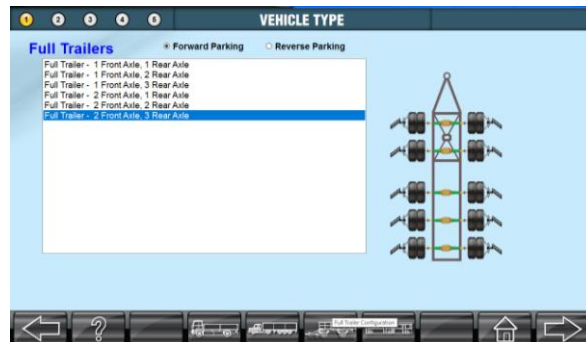


Fig. 139

Park the Full trailer in Forward parking as shown below in such a way that the B1 axle is at a distance above 7 meter from Camera and press **NEXT** button.

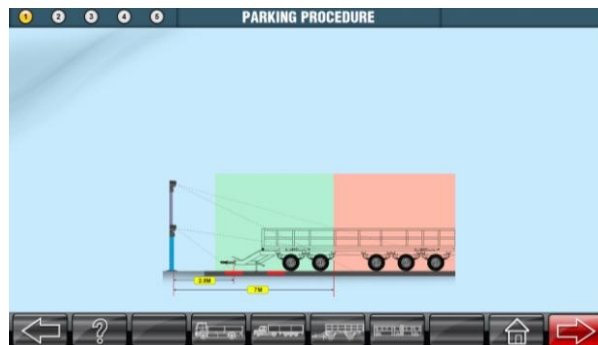


Fig. 140

Select the required User & key-in the password to enter into **Vehicle selection** screen.

Select the required Vehicle databank, then the Vehicle Manufacturer and finally the respective Model as explained in Chapter

Fix the Wheel brackets (with Target plate) as shown in the **Attention** screen. Ensure the targets are visible in the preview screen. The Target plate ID is shown within brackets (ID).

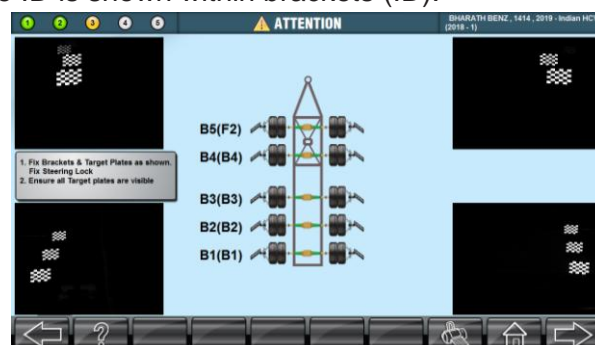


Fig. 141

Note: Do not interchange the Target IDs with Axle IDs

Enter required input in the **Vehicle details** screen and press **NEXT** button.

The system will identify the Target plates mounted on the wheels as shown below:

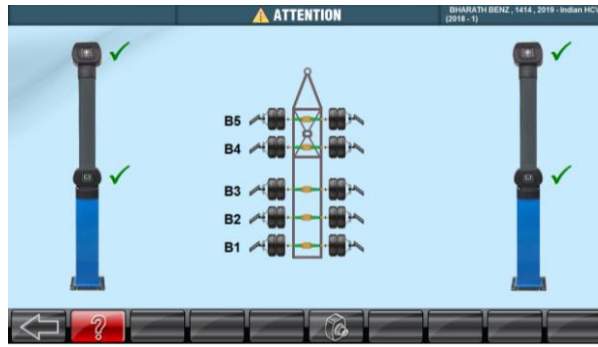


Fig. 142

Press **RUNOUT** button to carryout Push-Pull Runout measurement. The following screen will be displayed:

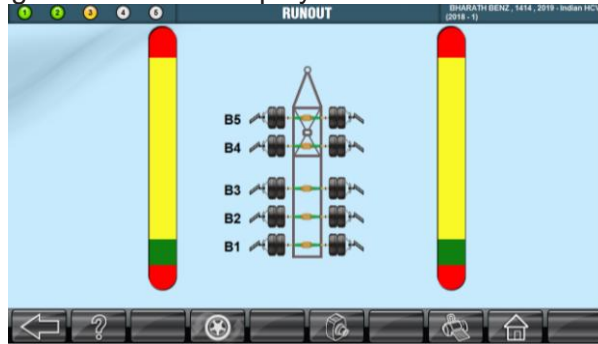


Fig. 143

Push the Full trailer backwards by 30° away from Camera by driving the vehicle or pushing manually, until the ball matches the green region in screen.

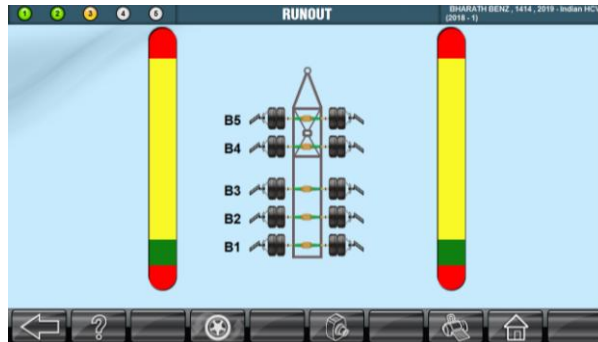


Fig. 144

The stop display will prompted at 30° of roll. Apply brake gently and wait for the reading acquisition and till **STOP** symbol goes off.

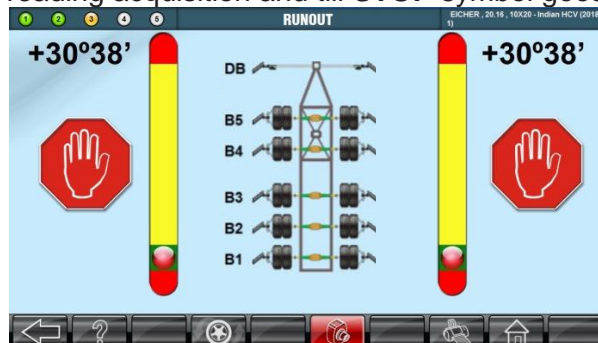


Fig. 145

Now drive the vehicle forward to reach the home position. Then Stop the engine.

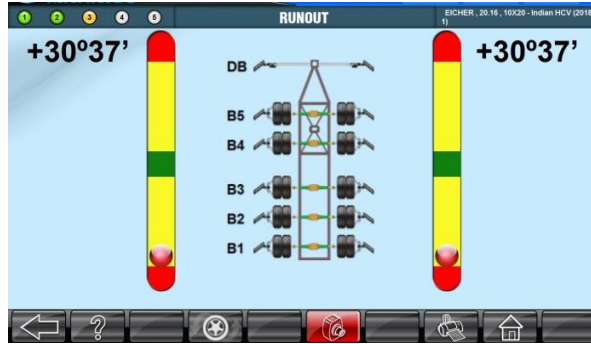


Fig. 146

Once the Stop symbol is displayed, the system will proceed to next screen automatically.

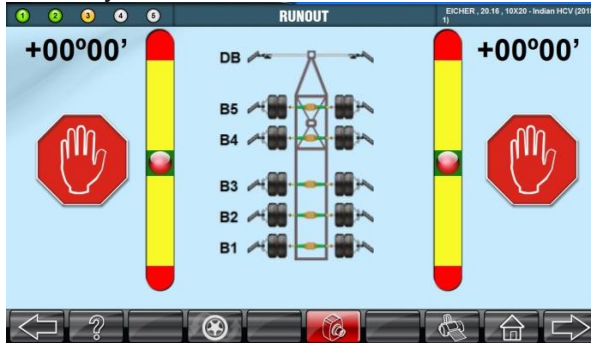


Fig. 147

Runout values will be displayed. Press NEXT button to proceed further.



Fig. 148

Fix the Drawbar in such a way that its Pointer is perpendicular to the axle as shown below. Fix the Target plate & press NEXT button.

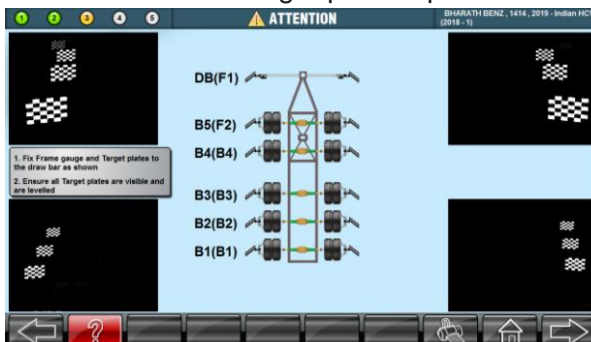


Fig. 149

Initial values will be displayed as shown below:

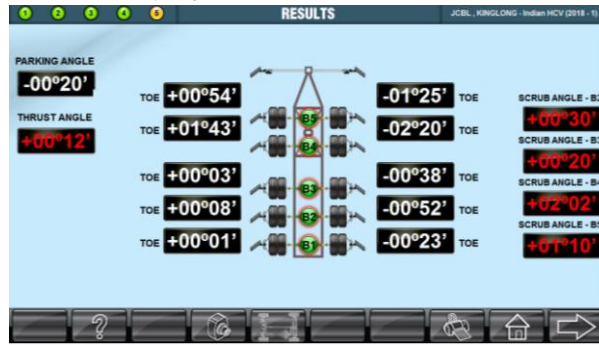


Fig. 150

Adjust the B1 axle (Thrust angle) as per screen guidance and press **NEXT** button after completion:

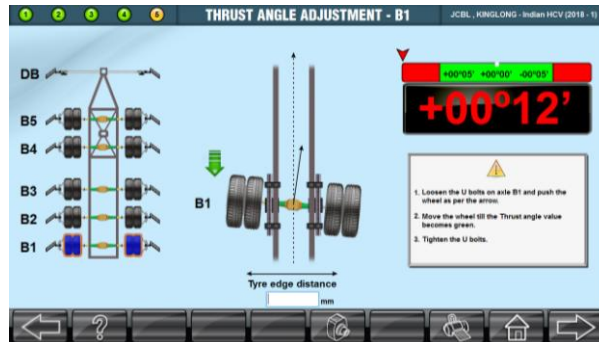


Fig. 151

Individual parameters of B1 axle will be displayed. Press **NEXT** button to proceed:

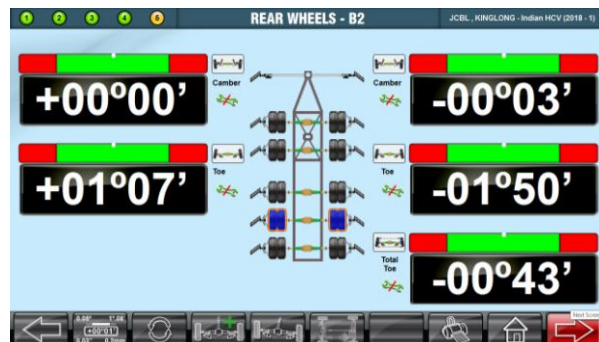


Fig. 152

Adjust the Dolly by swiveling it as per the arrow indicated on screen. After achieving the value within range, press **NEXT** button.

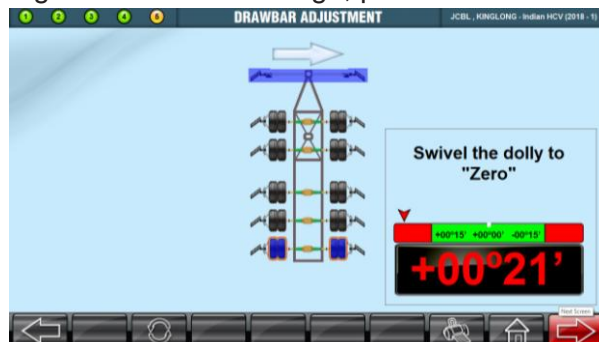


Fig. 153

Adjust the B2 axle and press **NEXT** button.

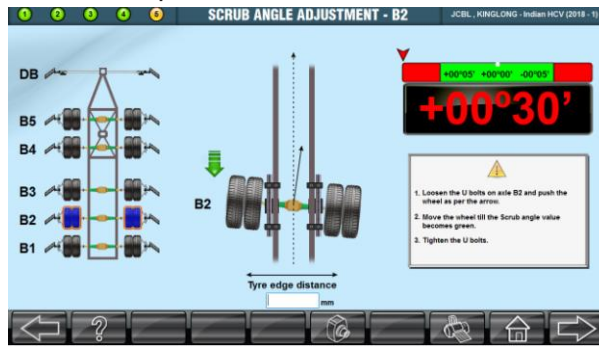


Fig. 154

Individual parameters of B2 axle will be displayed. Press **NEXT** button to proceed:

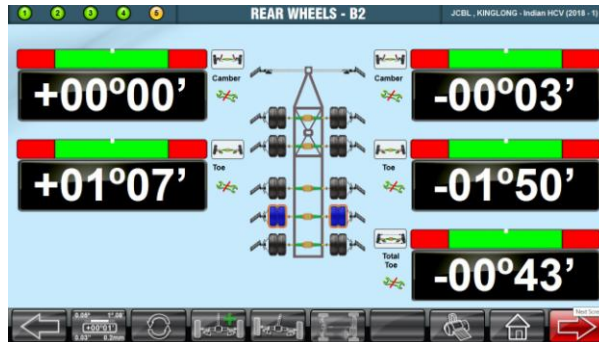


Fig. 155

Adjust the B3 axle and press **NEXT** button.

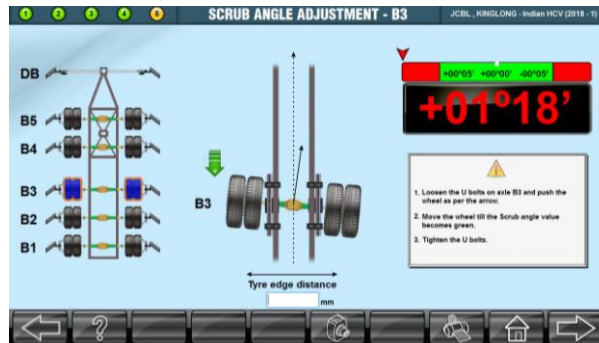


Fig. 156

Individual parameters of B3 axle will be displayed. Press **NEXT** button to proceed:

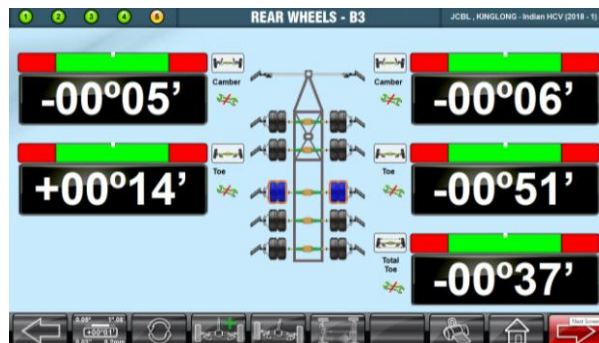


Fig. 157

Adjust the B4 axle and press **NEXT** button.

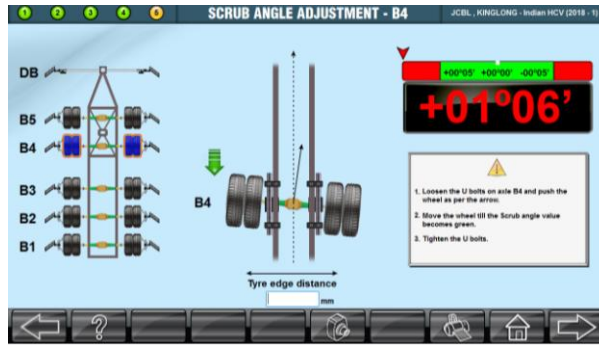


Fig. 158

Individual parameters of B4 axle will be displayed. Press **NEXT** button.

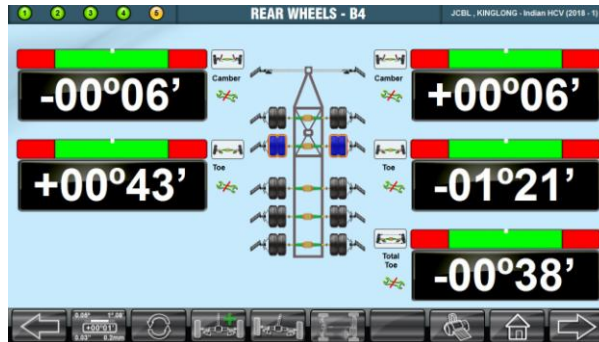


Fig. 159

Both the B5 axle's Scrub angle and Drawbar's straight ahead will be displayed simultaneously.

Adjust both the parameters to achieve the target values and press **NEXT** Button

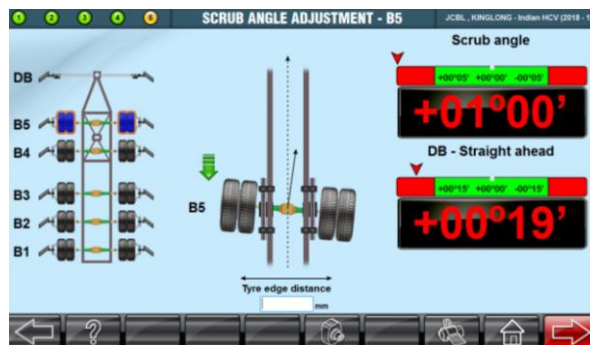


Fig. 160

Individual parameters of B5 axle will be displayed. Press **NEXT** button to proceed:

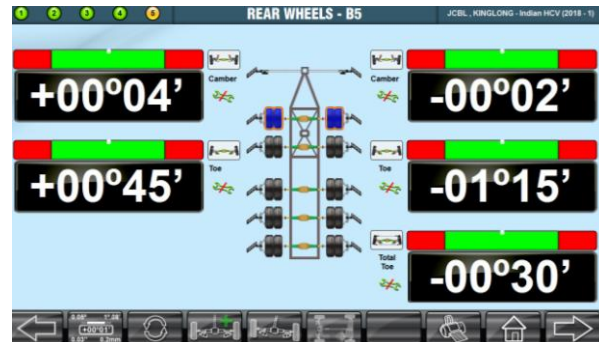


Fig. 161

Alignment report will be generated and displayed:



Fig. 162

Press **HOME** button to save the job.

7.4.5.46. FULL TRAILER REVERSE PARKING ALIGNMENT PROCEDURE

Select the **Full Trailer Configuration**  button in the **Vehicle type** selection screen:

Select the required model configuration of the Full trailer.

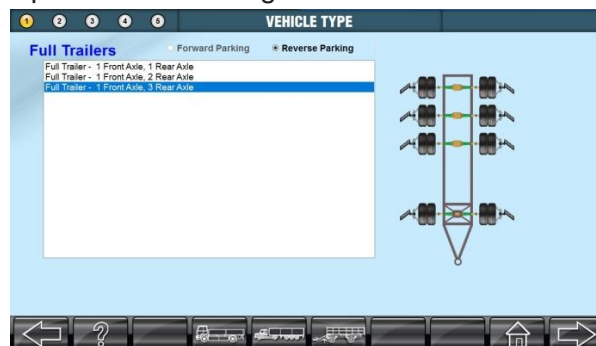


Fig. 163

Park the Full trailer in reverse parking as shown below in such a way that the B1 axle is at a distance of 4.5 meter from Camera and press **NEXT** button.

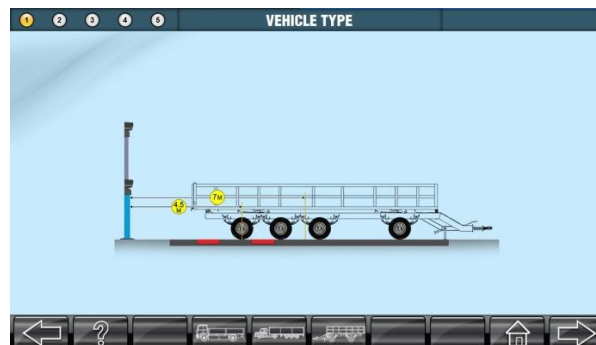


Fig. 164

Select the required User & key-in the password to enter into **Vehicle selection** screen.

Select the required Vehicle databank, then the Vehicle Manufacturer and finally the respective Model as explained in Chapter 7.4.1.

Fix the Wheel brackets (with Target plate) as shown in the **Attention** screen. Ensure the targets are visible in the preview screen. The Target plate ID is shown within brackets (ID).

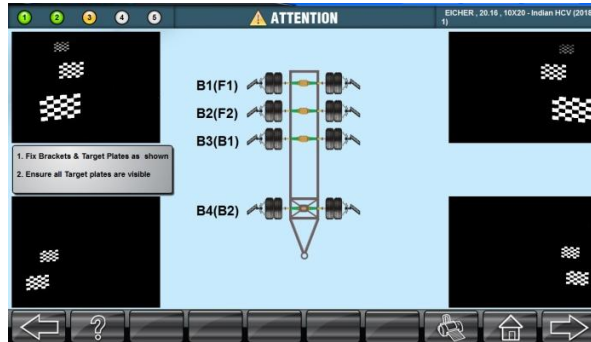


Fig. 165

Note: Do not interchange the Target IDs with Axle IDs
Enter required input in the **Vehicle details** screen and press **NEXT** button. The system will identify the Target plates mounted on the wheels as shown below:

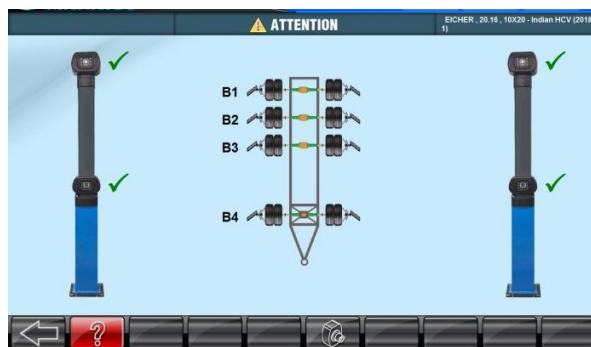


Fig. 166

Press **RUNOUT** button to carryout Push-Pull Runout measurement. The following screen will be displayed:

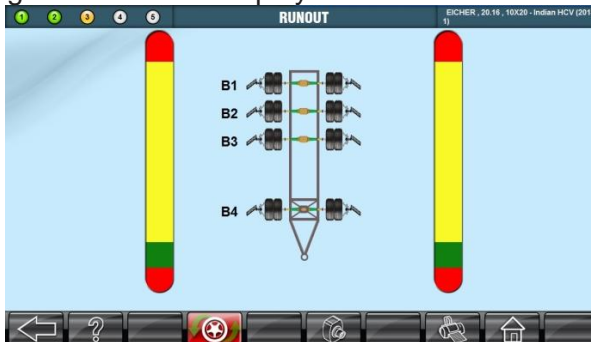


Fig. 167

Push the Full trailer backwards by 30° away from Camera by driving the vehicle or pushing manually, until the ball matches the green region in screen.

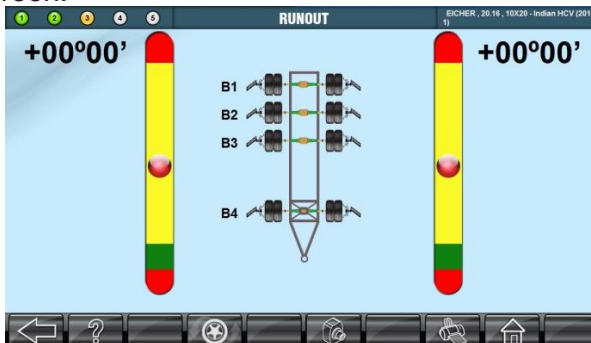


Fig. 168

The stop display will be prompted at 30° of roll. Apply brake gently and wait for the reading acquisition and till **STOP** symbol goes off.

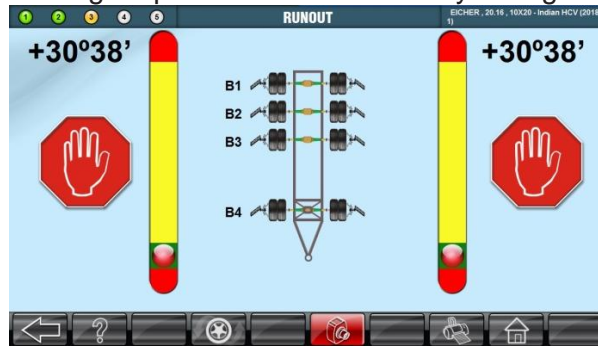


Fig. 169

Now drive the vehicle forward to reach the home position. Then Stop the engine.

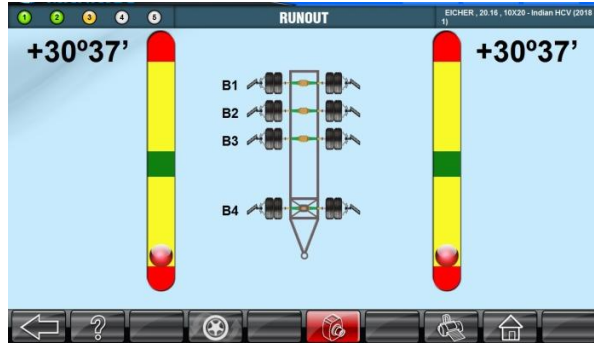


Fig. 170

Once the Stop symbol is displayed, the system will proceed to next screen automatically.

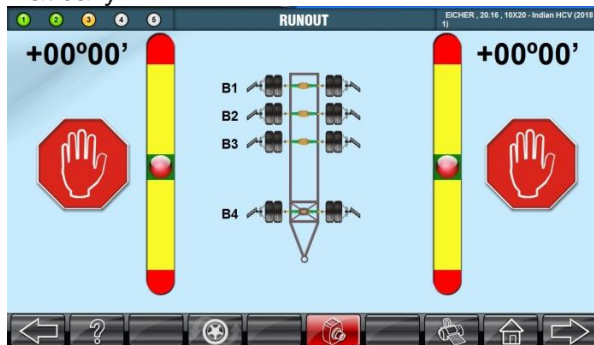


Fig. 171

Runout values will be displayed. Press NEXT button to proceed further.



Fig. 172

Fix the Drawbar in such a way that its Pointer is perpendicular to the axle as shown below. Fix the Target plate & press **NEXT** button.

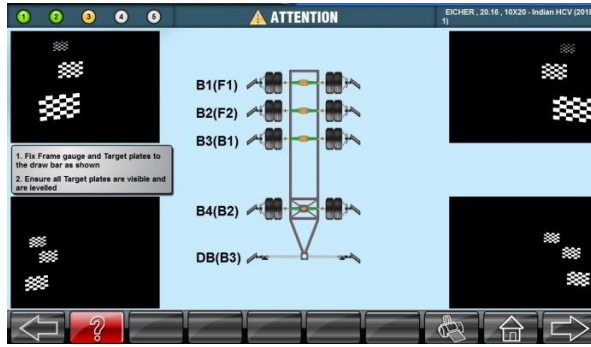


Fig. 173

Initial values will be displayed as shown below:

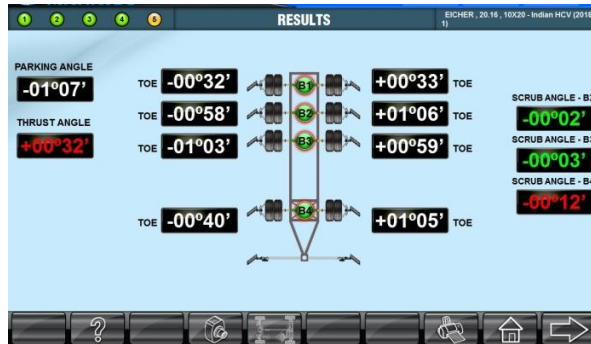


Fig. 174

Adjust the B1 axle (Thrust angle) as per screen guidance and press **NEXT** button after completion:

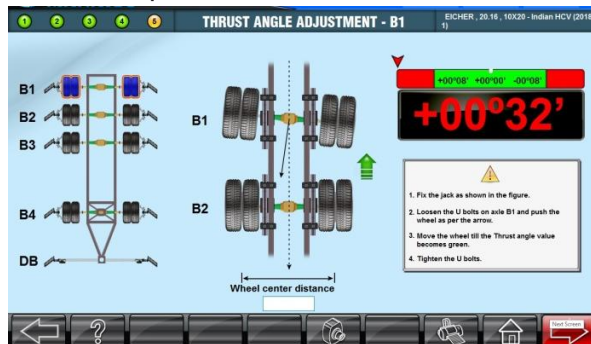


Fig. 175

Individual parameters of B1 axle will be displayed. Press **NEXT** button to proceed:

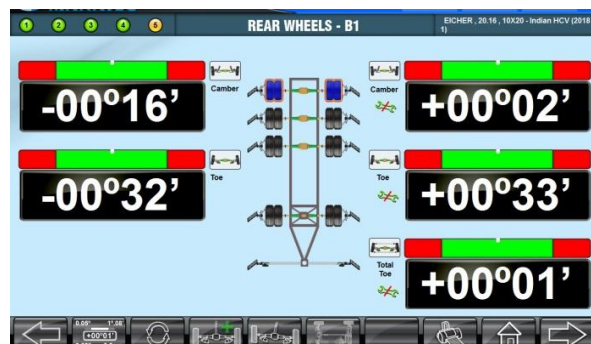


Fig. 176

Adjust the Dolly by swiveling it as per the arrow indicated on screen. After achieving the value within range, press **NEXT** button.

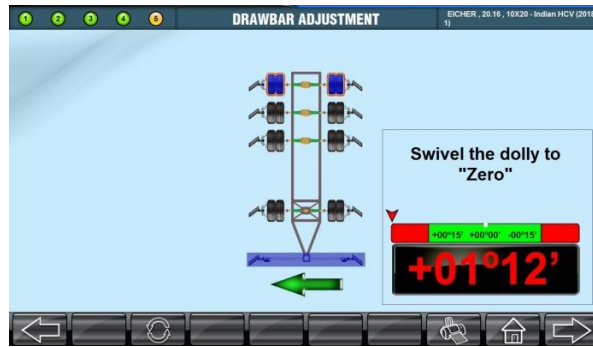


Fig. 177

Adjust the B2 axle and press **NEXT** button.

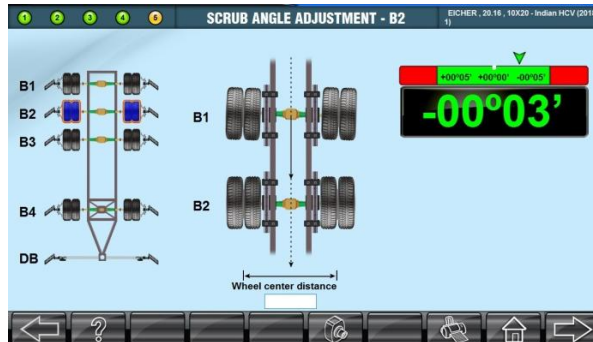


Fig. 178

Individual parameters of B2 axle will be displayed. Press **NEXT** button to proceed:

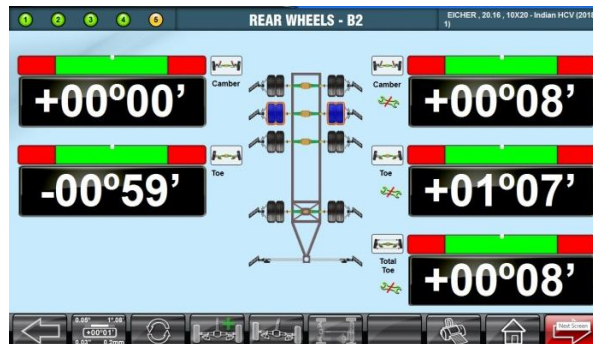


Fig. 179

Adjust the B3 axle and press **NEXT** button.

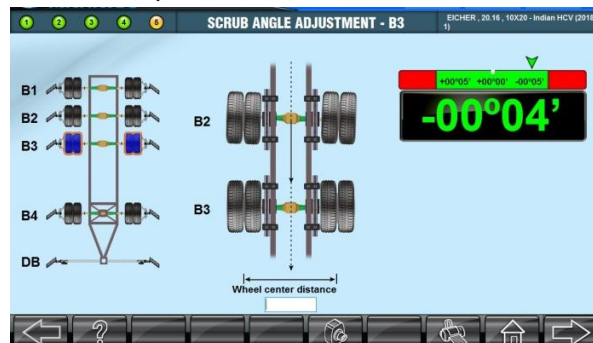


Fig. 180

Individual parameters of B3 axle will be displayed. Press **NEXT** button to proceed:



Fig. 181

Both the B4 axle's Scrub angle and Drawbar's straight ahead will be displayed simultaneously.

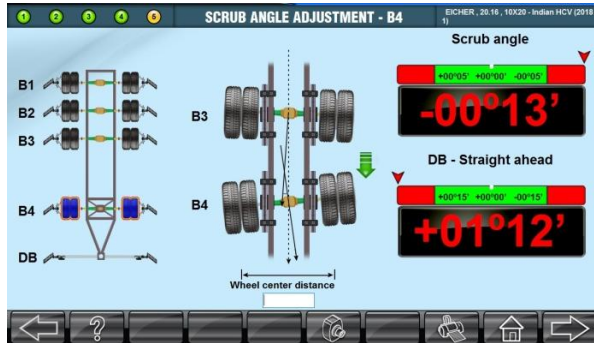


Fig. 182

Adjust both the parameters to achieve the target values and press **NEXT** button.

Individual parameters of B4 axle will be displayed. Press **NEXT** button.

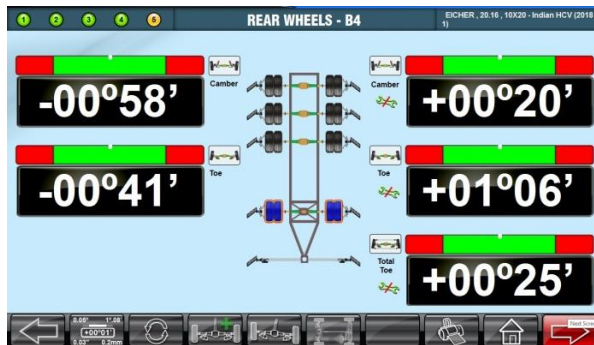


Fig. 183

Alignment report will be generated and displayed:

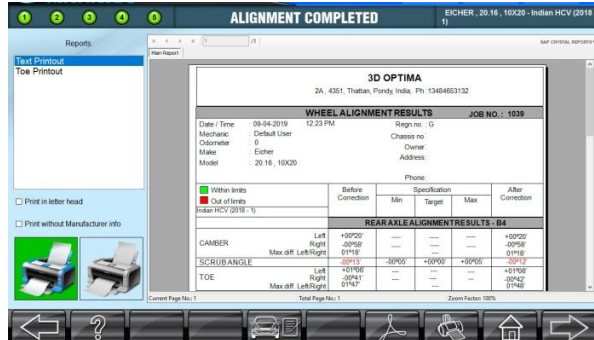


Fig. 184

Press **HOME** button to save the job.

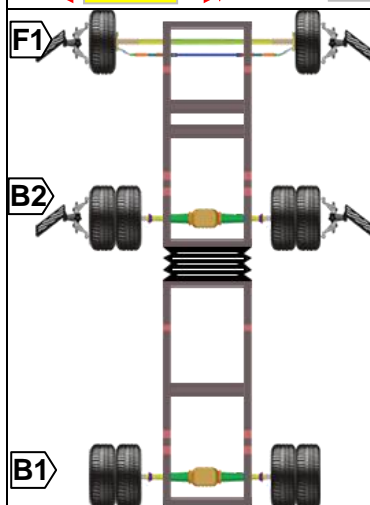
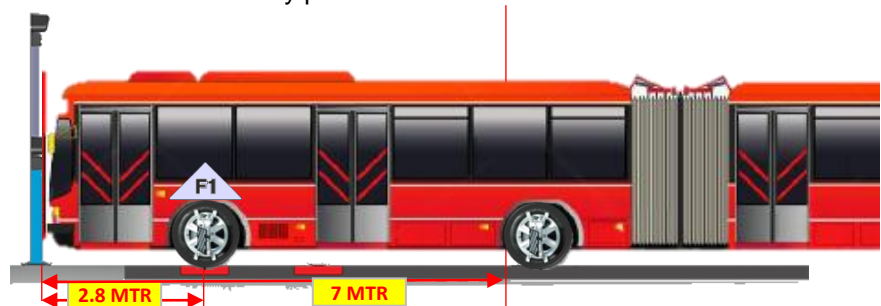
7.4.5.47. ARTICULATED BUS – 1 Front Axle & 2 Rear Axles



Reverse parking alignment is not possible for Articulated buses & can be done only in Drive through model

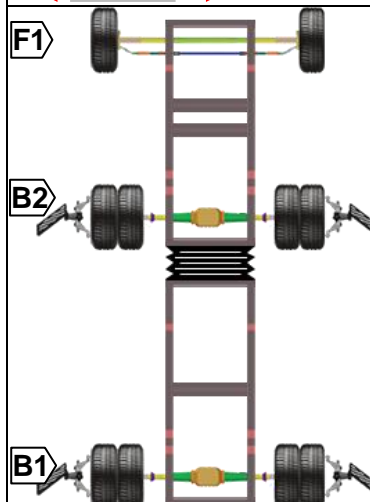
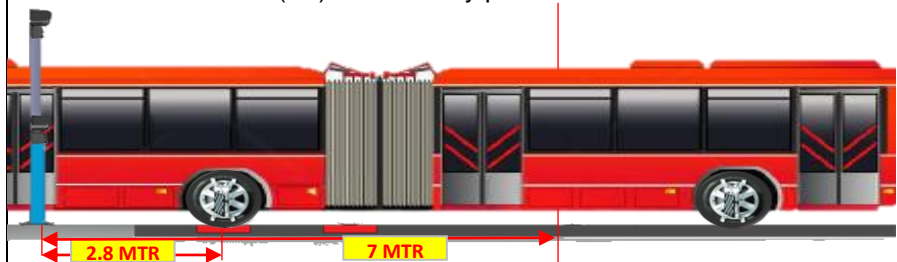


Park the Bus on a straight line by ensuring the Front (F1) axle is at 2.8mtr from Camera in 1st Rotary plate



1. Mount Front (F1) Target plates with Front 1st axle (F1)
2. Mount Rear (B1) Target plates with Rear 2nd axle (B2)
3. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)
4. Carryout Caster / Kingpin swing for F1 (Ref. Chapter 7.4.4)
5. Carry out measurement as guided by the screen
6. Apply Steering lock at straight ahead position (F1)
7. Adjust Rear 2nd Axle (B2)
Adjust Front 1st Axle (F1)

Park the Rear 2nd axle (B2) in 1st Rotary plate



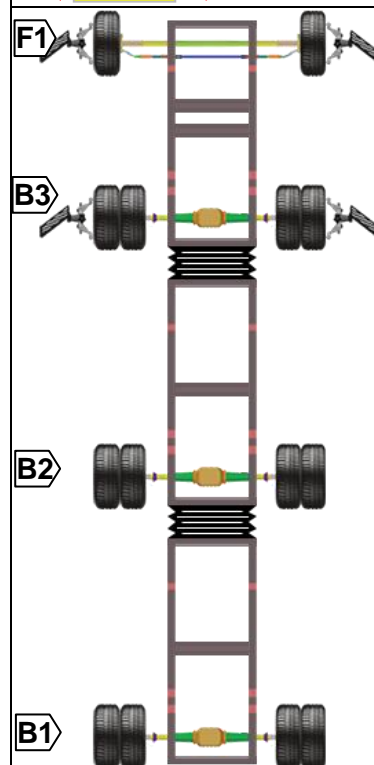
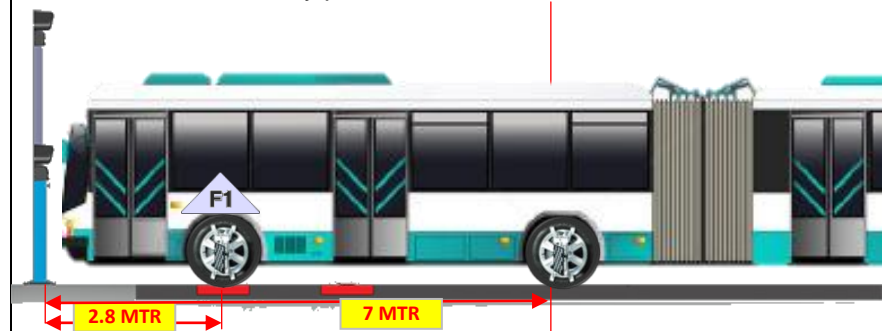
8. Remove Front (F1) Target plates from Front 1st axle (F1) and mount it with Rear 2nd axle (B2)
9. Remove Rear (B1) Target plates from Rear 2nd axle (B2) and mount it with Rear 1st axle (B1)
10. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)
11. Carry out measurement as guided by the screen
12. Adjust Rear 1st axle (B1)

For adjustments refer Chapter 7.4.5

7.4.5.48. ARTICULATED BUS – 1 Front Axle & 3 Rear Axles

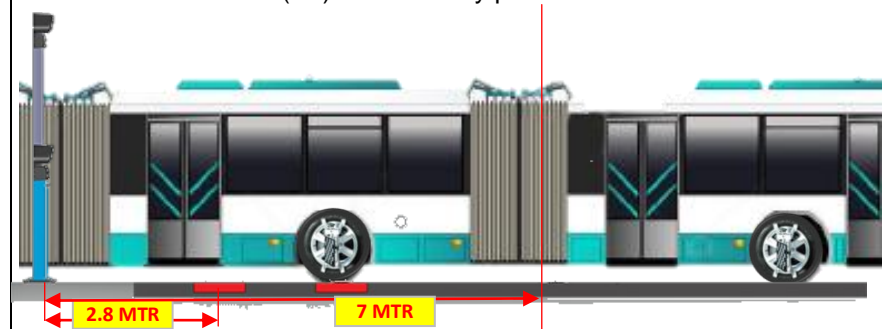


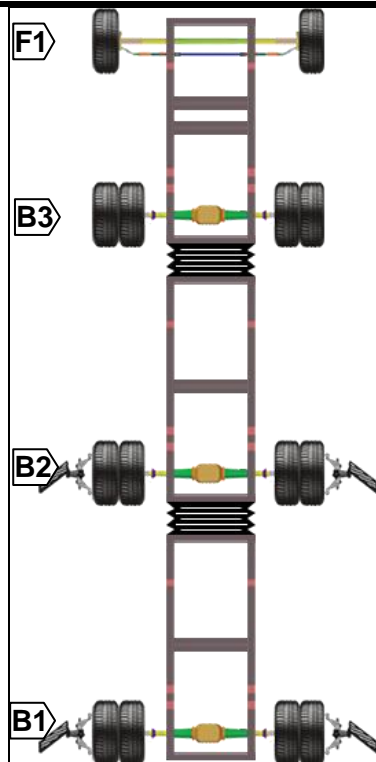
Park the Bus on a straight line by ensuring the Front (F1) axle is at 2.8mtr from Camera in 1st Rotary plate



1. Mount Front (F1) Target plates with Front 1st axle (F1)
2. Mount Rear (B1) Target plates with Rear 3rd axle (B3)
3. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)
4. Carryout Caster / Kingpin swing for F1 (Ref. Chapter 7.4.4)
5. Carry out measurement as guided by the screen
6. Apply Steering lock at straight ahead position (F1)
7. Adjust Rear 3rd Axle (B3)
8. Adjust Front 1st Axle (F1)

Park the Rear 2nd axle (B2) in 2nd Rotary plate



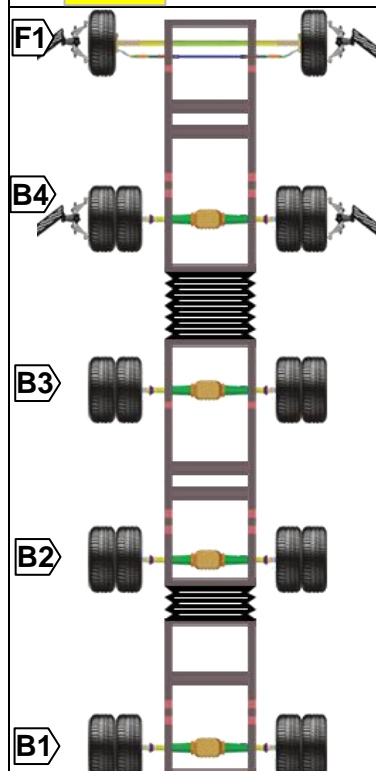
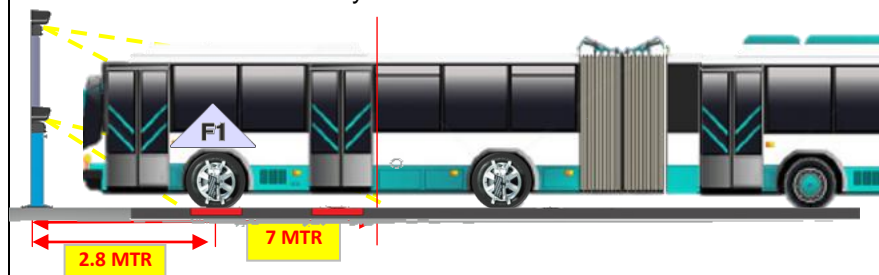


9. Remove Front (F1) Target plates from Front 1st axle (F1) and mount it with Rear 2nd axle (B2)
10. Remove Rear (B1) Target plates from Rear 3rd axle (B3) and mount it with Rear 1st axle (B1)
11. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)
12. Carry out measurement as guided by the screen
13. Adjust Rear 2nd axle (B2)
14. Adjust Rear 1st axle (B1)

For adjustments refer Chapter 7.4.5

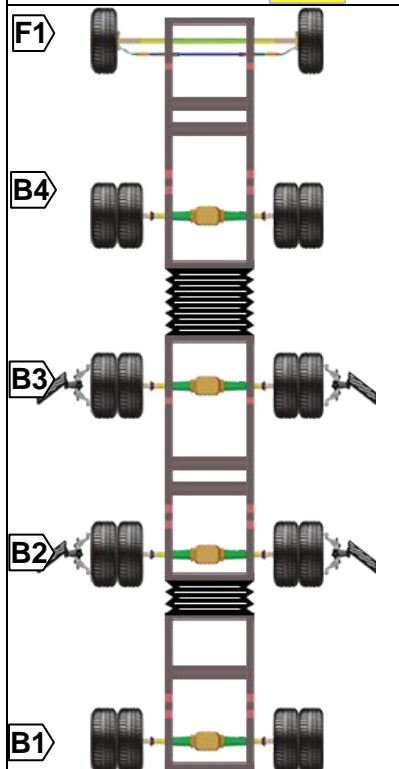
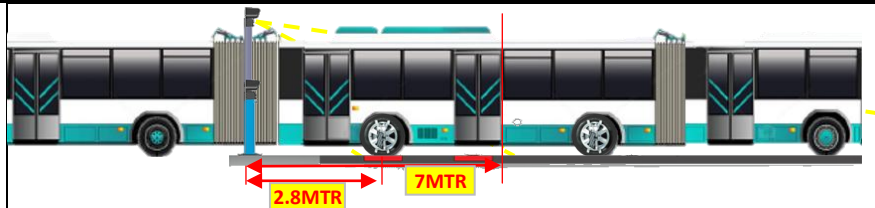
7.4.5.49. ARTICULATED BUS – 1 Front Axle & 4 Rear Axles

Park the Bus on a straight line by ensuring the Front (F1) axle is at 2.8mtr from Camera in 1st Rotary plate. F1 axle should be within 7mtr distance from Camera and Rear 4th axle beyond 7mtr distance



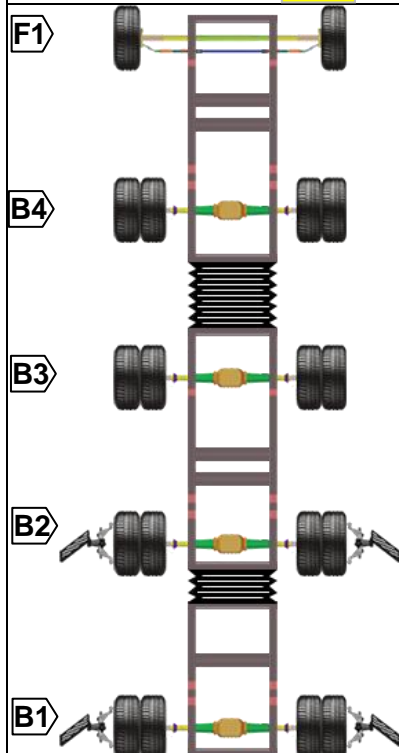
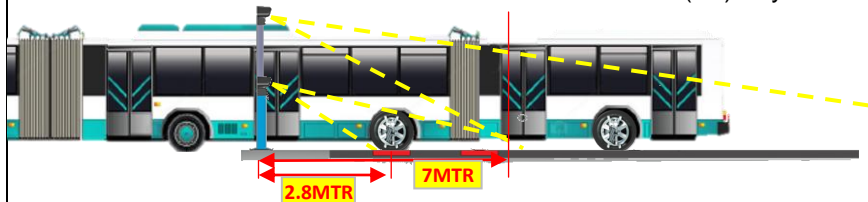
1. Mount Front (F1) Target plates with Front 1st axle (F1)
2. Mount Rear (B1) Target plates with Rear 4th axle (B4)
3. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)
4. Carryout Caster / Kingpin swing for F1 (Ref. Chapter 7.4.4)
5. Carry out measurement as guided by the screen
6. Apply Steering lock at straight ahead position (F1)
7. Adjust Rear 4th Axle (B4)
8. Adjust Front 1st Axle (F1)

Move the Bus forward & park Rear 3rd axle (B3) in 1st Rotary plate. B3 axle should be within 7mtr distance from Camera & Rear axle (B2) beyond 7mtr



9. Remove Front (F1) Target plates from Front 1st axle (F1) and mount it with Rear 3rd axle (B3)
10. Remove Rear (B1) Target plates from Rear 4th axle (B4) and mount it with Rear 2nd axle (B2)
11. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)
12. Carry out measurement as guided by the screen
13. Adjust Rear 3rd Axle (B3)
14. Adjust Rear 2nd Axle (B2)



Move the Bus forward & park Rear 2nd axle (B2) in 1st Rotary plate. B2 axle should be within 7mtr distance from Camera & Rear axle (B1) beyond 7mtr



15. Remove Front (F1) Target plates from Rear 3rd axle (B3) and mount it with Rear 2nd axle (B2)
16. Remove Rear (B1) Target plates from Rear 2nd axle (B2) and mount it with Rear 1st axle (B1)
17. Carryout Push-Pull Runout by driving vehicle (Ref. Chapter 7.4.3)
18. Carry out measurement as guided by the screen
19. Adjust Rear 1st Axle (B1)

For adjustments refer Chapter 7.4.5

7.5. DATA MANAGER

-  This software will work only on Wheel aligner machine
-  Data from alignment results are forwarded to the Wheel aligner Data Manager only at the end of wheel alignment in the *Alignment completed* screen

Data Manager is smart software developed for the purpose of managing alignment results which are generated by Wheel aligner. This software runs under Windows platform and provides menu driven, user friendly Graphical User Interface.

This software is designed to retrieve the stored alignment results and to generate reports. The following screen is the Opening screen of this software.

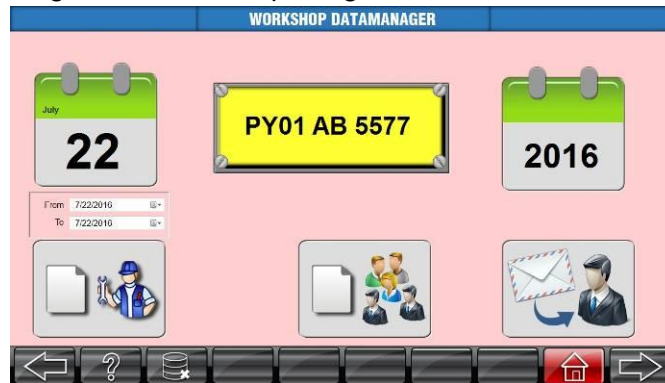


Fig. 185

Four options will be displayed:

1. Date based Alignment report
2. Registration Number based Alignment report
3. Year based Alignment report
4. Technician based Alignment report
5. Customer database
6. Reminder to Customer

7.5.1. DATE BASED ALIGNMENT REPORT

Upon selection of *Date based Alignment report*, a Date window will appear:



Fig. 186

Select the required "From" and "To" date between which Alignment results have to be viewed and press **NEXT SCREEN** button.

Following screen will be displayed:

7/22/2016 - 7/22/2016		WORKSHOP DATAMANAGER		ALIGNMENT RESULTS				
		Front	Rear	Initial	Min	target	Max	Final
		Angles						
Job number	1	Caster	Left	+0°15'	+0°10'	+0°10'	+0°10'	+0°10'
Alignment By	Default user	Right		+0°10'	+0°10'	+0°10'	+0°10'	+0°10'
Registration number	TECST	Left		+0°10'	+0°10'	+0°10'	+0°10'	+0°10'
Date	7/22/2016	Right		+0°10'	+0°10'	+0°10'	+0°10'	+0°10'
Time	6:10:00 PM	Left		+0°30'	+0°30'	+0°30'	+0°30'	+0°30'
Make	Achek L yaland	Right		+0°30'	+0°30'	+0°30'	+0°30'	+0°30'
Model	Bison	Left		+1°42'	---	+0°00'	---	+1°45'
Odometer reading	1	Right		+1°19'	+0°00'	+0°20'	+0°20'	+1°16'
Owner		Left		+0°00'	+0°00'	+0°20'	+0°20'	+0°00'
Door no & Street		Right		1mm	---	---	---	1mm
City		Left		+0°18'	---	---	---	+0°18'
State		Right		0°02'	---	---	---	0°02'
		Left		---	---	---	---	---
		Right		---	---	---	---	---
		Left		---	---	---	---	---
		Right		---	---	---	---	---
		Trackball		1704mm	---	---	---	1704mm
		Wheelbase		2394mm	---	---	---	2394mm

Fig. 187



Fig. 188

The list of alignments conducted within the provided date will be displayed Job number wise. By selecting tab of respective axle in the screen, results of respective wheel parameters can be viewed.

Press **VIEW** button to view the Date based reports as shown below:

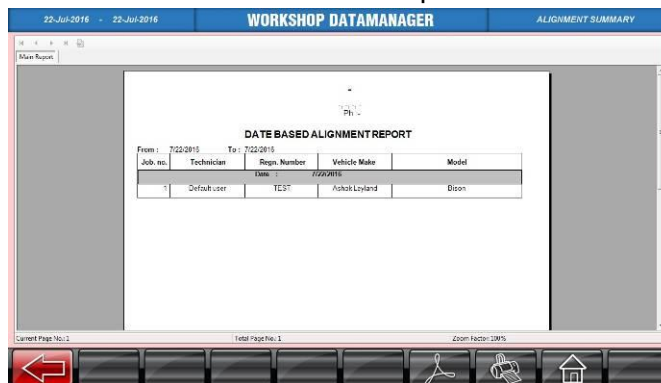


Fig. 189

Press **PRINT** button to print the report.

7.5.2. REGISTRATION NUMBER BASED ALIGNMENT REPORT

This report helps the user in deciding the frequency of the alignment made for the selected vehicle.

Upon selection of **Registration number based Alignment report** icon, a Pull down list of Vehicle Registration Numbers for which alignment carried out so far will be displayed as shown below:

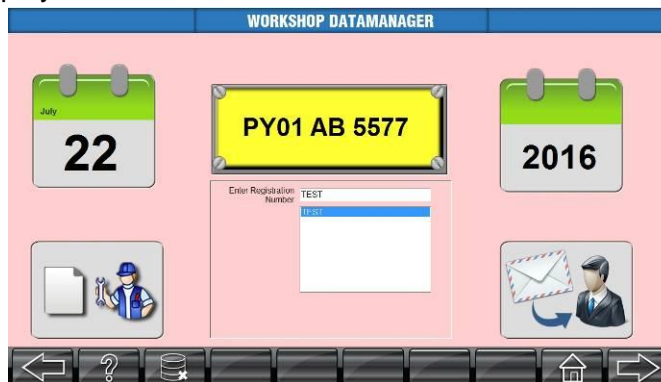


Fig. 190

Select the required Vehicle Registration number and press **NEXT SCREEN** button. Following screen will be displayed:

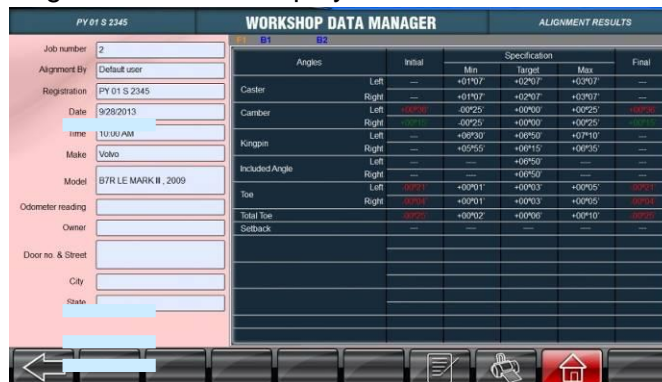


Fig. 191

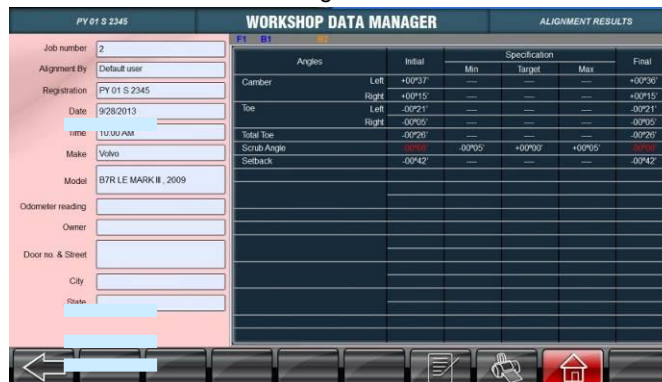


Fig. 192

The list of alignments conducted for the selected Vehicle registration number will be displayed based on Job number. By selecting tab of respective axle in the screen, results of respective wheel parameters can be viewed.

Press **VIEW** button to view Registration No. based reports as shown below:



Fig. 193

Press **PRINT** button to print the report.

7.5.3. YEAR BASED ALIGNMENT REPORT

Upon selection of **Year based alignment report** icon, a Pull down list of year for which alignment carried out so far will be displayed as shown below:



Fig. 194

Select the required Year and press **NEXT SCREEN** button.

Press **VIEW** button to view the Year based alignment report as shown below which helps the user in getting the No. of alignments achieved in a year (Month wise):

Month	No. of jobs
January	0
February	0
March	0
April	0
May	0
June	22
July	0
August	0
September	0
October	0
November	0
December	0

Fig. 195

Press **PRINT** button to print the report.

7.5.4. TECHNICIAN BASED ALIGNMENT REPORT

Upon selection of **Technician based alignment report** icon, the available User's list will be displayed:



Fig. 196

Select the required User, "From" & "To" date and then press **NEXT SCREEN** button. Then press **VIEW** button to view the number of alignments (consolidated) conducted by the selected User as shown below:

Job No.	Date	Regn. Number	Vehicle Make	Vehicle Model
135	29-Jun-2012	4756	Dmer	3 Series (E70) Cabrio
1	16-Jun-2012	321312364	Kiaaris	929 L Series
2	18-Jun-2012	JJJ	Hyundai	Santro / Xing
3	18-Jun-2012	PV 01 ARI 1391	Audi	100 Quattro Sport
4	18-Jun-2012	3748	Hyundai	Santro / Xing

Fig. 197



Operator can also choose **ALL USER** to view the number of alignments (consolidate) conducted by each user

Press **PRINT** button to print the report.

7.5.5. CUSTOMER DATABASE

Upon selection of **Customer database** icon, a Date window will be displayed. Select the required "From" and "To" date and press **NEXT SCREEN** button:



Fig. 198

Press **VIEW** button to view the date based Customer details as shown below:



Fig. 199

Press **PRINT** button to print the report.

7.5.6. REMINDER TO CUSTOMER

This option is provided to the user to generate Reminder letters to his customers on daily basis. The system followed is, when he runs this option on a particular date, the system will automatically generate Reminder letter for the vehicles aligned exactly 90 days back.



Fig. 200

Press **PRINT** button to print the report.









7.6. SETTINGS

You can enter into this Option by clicking **SETTINGS** in the *Welcome* Screen and by providing the Password.



Fig. 202

The following Menu will be displayed:

 Vehicle specifications Ref. Chapter 7.6.1	 Measurement units Ref. Chapter 7.6.2	 Alignment data Ref. chapter 7.6.3	 Workshop information Ref. Chapter 7.6.4	 Calibration history Ref. chapter 7.6.5
 Multi-user Ref. Chapter 7.6.6	 Backup & Restore factory calibration Ref. chapter 7.6.7	 Reset Job number Ref. Chapter 7.6.8	 Settings password Ref. chapter 7.6.9	Refer Service manual for other Settings



7.6.1. VEHICLE SPECIFICATIONS



The Vehicle specification data must be entered by End user only. **MANUFACTURER IS NOT RESPONSIBLE FOR ANY INCORRECT OR INCOMPLETE VEHICLE SPECIFICATIONS ENTERED / AVAILABLE IN THE SYSTEM.** No claim is entertained for any damage or loss



Vehicle data can be exported to User data for modifying the data while doing alignment for customised vehicles

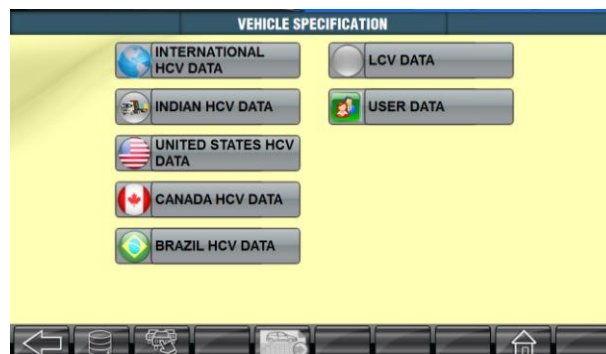


Fig. 203

7.6.1.1. INTERNATIONAL HCV DATA

The readily available vehicle specifications that are compiled and released by Third parties with License can be directly uploaded in our system. These vehicle specifications are updated & released twice every year at extra cost. These data are non editable but the User can select the required vehicles from the list & export it by pressing **EXPORT TO USER DATA** button to User data for edit & customizing the specification.

7.6.1.2. INDIAN HCV DATA

The Indian data contains specifications of known vehicles collected by Manufacturer with update available at the time of dispatch. However Manufacturer is not responsible for any incorrect or incomplete vehicle specifications available in the Indian data.

7.6.1.3. UNITED STATES HCV DATA

The readily available vehicle specifications that are compiled and released by Third parties with License can be directly uploaded in our system. These vehicle specifications are updated & released twice every year at extra cost. These data are non editable but the User can select the required vehicles from the list & export it by pressing **EXPORT TO USER DATA** button to User data for edit & customizing the specification.

7.6.1.4. INDIAN LCV DATA

The readily available vehicle specifications that are compiled and released by manufacturer in our system. These vehicle specifications are updated & released twice every year. These data are non editable but the User can select the required vehicles from the list & export it by pressing **EXPORT TO USER DATA** button to User data for edit & customizing the specification.

7.6.1.5. USER DEFINED VEHICLE DATA

The vehicle specifications collected by the User can be added / modified / viewed using this option as given below:

SPECIFICATION ENTRY						
CONF	VEHICLE MAKE	VEHICLE MODEL	VERSION	YEAR	TEST LOAD	BODY CODE
418	AMRV	2518 CP	-	-	0	-
417	AMRV	4018 1K	-	-	0	-
419	AMRV	2518 HL	-	-	0	-
420	AMRV	2518 TM	-	-	0	-
421	AMRV	2518 TP	-	-	0	-
422	AMRV	2523 TP	-	-	0	-
423	AMRV	4023 TR	-	-	0	-
424	AMRV	4023 TR	-	-	0	-
425	AMRV	4023 TR	-	-	0	-
416	AMRV	AMRV 2523 TP	-	-	0	-
485	ASHOK LEYLAND	MANV 6x2 (D7180)	-	-	0	-
380	ASHOK LEYLAND	MANV 6x2 FA91	-	-	0	2514 240' 001
388	ASHOK LEYLAND	SIABO AXLE	-	-	0	-
381	ASHOK LEYLAND	MANV 6x2 FA91	-	-	0	25181 260' ...
382	ASHOK LEYLAND	MANV 6x4 - 5T axle	-	-	0	25181 150' ...
383	ASHOK LEYLAND	MANV 6x4 - 5T axle	-	-	0	25162 150' ...
384	ASHOK LEYLAND	MANV 6x4 - 6T axle	-	-	0	2518T 160' ...
385	ASHOK LEYLAND	MANV 6x4 FA91	-	-	0	25184 150' ...
386	ASHOK LEYLAND	comp 3800	-	-	0	Ecomet 912
387	ASHOK LEYLAND	CARGO 5000	-	-	0	Ecomet 1112
389	ASHOK LEYLAND	4x2 - F60WFA91	176.0'1985'1210"	-	0	1811.444mm...
390	ASHOK LEYLAND	4x2 - ST Axle	176.0'1985'1210"	-	0	18201965'131...
391	ASHOK LEYLAND	Tractor(4x2) - ST Axle	-	-	0	3814.355% ...
392	ASHOK LEYLAND	Tractor(4x2) - FA91	-	-	0	3814.381% ...
378	ASHOK LEYLAND	BOSS	-	2015	-	8 1001
395	ASHOK LEYLAND	CHEETAH 4x2	-	-	0	160178' 20...
394	ASHOK LEYLAND	4x2	-	-	0	F60W355'131...

Fig. 204

Following options are provided:

Add specification - *To add new Vehicle specifications*

Edit specification - *To modify the existing vehicle specifications*

Delete specification - *To delete the existing vehicle specifications*

Select the required options based on specifications to be entered:

SPECIFICATION ENTRY																																																																			
Vehicle Code	754	Make	DAF	Version	-	Angle Units	Deg/min																																																												
Model	4923	Year	-	Year	-	Toe Units	mm/100																																																												
BodyCode	-	Input Mode	Manual	Input Mode	Manual	Parallellism	mm/100																																																												
Asie Type	Truck - F2 B3 (Pusher axle)	Input Mode	Manual	Input Mode	Manual	Thrust Units	mm/100																																																												
		<table border="1"> <thead> <tr> <th colspan="2">Primary Angles</th> <th>Min</th> <th>Target</th> <th>Max</th> <th>Unit</th> </tr> </thead> <tbody> <tr> <td rowspan="2">Caster</td> <td>Left</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Right</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td rowspan="2">Camber</td> <td>Left</td> <td>1.2</td> <td>1.3</td> <td>1.4</td> <td></td> </tr> <tr> <td>Right</td> <td>1.2</td> <td>1.3</td> <td>1.4</td> <td></td> </tr> <tr> <td rowspan="2">Toe</td> <td>Left</td> <td>0</td> <td>0.7</td> <td>1.4</td> <td></td> </tr> <tr> <td>Right</td> <td>0</td> <td>0.7</td> <td>1.4</td> <td></td> </tr> <tr> <td>Total Toe</td> <td></td> <td>0</td> <td>1.4</td> <td>2.8</td> <td></td> </tr> <tr> <td>Track Width</td> <td></td> <td></td> <td></td> <td></td> <td>mm</td> </tr> <tr> <td>WheelBase</td> <td></td> <td></td> <td></td> <td></td> <td>mm</td> </tr> </tbody> </table>					Primary Angles		Min	Target	Max	Unit	Caster	Left					Right					Camber	Left	1.2	1.3	1.4		Right	1.2	1.3	1.4		Toe	Left	0	0.7	1.4		Right	0	0.7	1.4		Total Toe		0	1.4	2.8		Track Width					mm	WheelBase					mm				
Primary Angles		Min	Target	Max	Unit																																																														
Caster	Left																																																																		
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Track Width					mm																																																														
WheelBase					mm																																																														
<table border="1"> <thead> <tr> <th colspan="2">Secondary Angles</th> <th>Min</th> <th>Target</th> <th>Max</th> <th>Unit</th> </tr> </thead> <tbody> <tr> <td rowspan="2">Kingpin/SAI</td> <td>Left</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Right</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td rowspan="2">Included Angle</td> <td>Left</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Right</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td rowspan="2">Lock Angle Internal</td> <td>Left</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Right</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td rowspan="2">Lock Angle External</td> <td>Left</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Right</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td rowspan="2">Toe Out on Turns</td> <td>Left</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Right</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>		Secondary Angles		Min	Target	Max	Unit	Kingpin/SAI	Left					Right					Included Angle	Left					Right					Lock Angle Internal	Left					Right					Lock Angle External	Left					Right					Toe Out on Turns	Left					Right									
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	Right																																																																		
Toe Out on Turns	Left																																																																		
	Right																																																																		

Fig. 205

By selecting this option, screen displays the following Data sheet in which the details of specifications are to be filled:

The user has to keep ready all these information before starting to add any Vehicle specifications.

1. VEHICLE MAKE

Type Vehicle makes and press **ENTER** to go to the next window.

2. VEHICLE MODEL

Type Vehicle model and press **ENTER** to go to next window.

3. TOE IN DEGREES / MM / INCHES (D,M,I) ?

The TOE values of the vehicle can be entered in "degree" (or) "mm" (or) "inch". To intimate the system about the TOE input unit, enter "D" for Degrees, "M" for mm and "I" for inches.

Press **ENTER** to move to next window. This window cannot be left blank. A beep sound will be heard if attempted.

4. RIM DIAMETER

If the Toe unit is entered as "mm" or "inch", then the Rim Diameter of the vehicle has to be entered. If this window is not filled, the system will not allow you to proceed further.

Alignment specifications

Each and every angle has been provided with four data entry windows. First two for the Front wheels and other two for Rear wheels. Two windows are given for each wheel to enter the Maximum and the Minimum permissible reading.

5. CASTER

Enter the Minimum allowable Caster for that vehicle in first data window. Enter the Maximum allowable Caster in second window. As Caster is not applicable for Rear wheels, system will prompt "N/A" in the other two Rear wheel windows, so you can't enter any data in these windows.

6. KINGPIN

Follow the same procedure as done in Caster. Kingpin is also not applicable for Rear wheels, so "N/A" will be displayed in the Rear wheel windows.


7. CAMBER

Enter Camber readings as per procedure for both Front & Rear wheels.

8. TOE

There are three options for entering Toe readings. Any one of the options can be chosen according to the requirement. i.e., if 'D' is entered in "Toe in degree / mm / inch (D,M,I) ?" Data window, then Cursor will be taken to Toe in Degrees Data window. If "M" is entered, then the cursor will be placed in the Toe in MM data window and for "I", it will be Toe in Inches data window. The windows other than the selected will have "----".

	If the Toe / Total Toe values are entered in "mm" "Inches", the system will convert it to "degree & minutes"
---	---

	If Toe values are entered first, then Total Toe will be calculated by the system itself from the entered Toe value & displayed in Total Toe window and vice versa if Total Toe value is entered first
---	--



7.6.2. MEASUREMENT UNITS

This option is used to change the measurement units like “degree min” / “degree” / “mm” / “inch” and other angles in “degree” / “degree min”, “kg” “lb” .

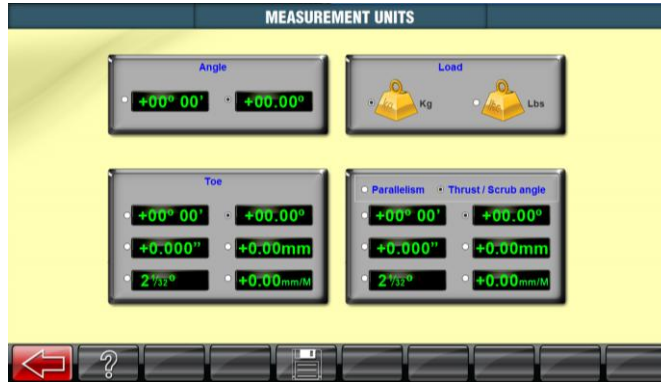


Fig. 206



7.6.3. ALIGNMENT DATA

This option is provided to view the results of a particular job to analyse / trouble shoot.

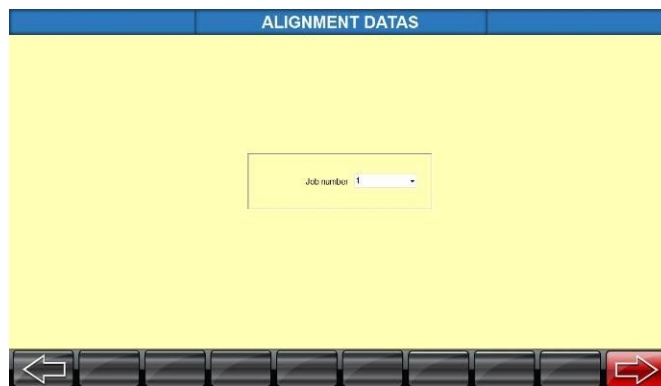


Fig. 207



7.6.4. WORKSHOP INFORMATION

This Option is used to enter the Customer Name and address of the Alignment Centre and password settings. Customer can also add Logo of their Service centre to appear on the top left corner of the printout. Also, option is provided to add the Distributor Logo which will appear at the bottom of result printout.

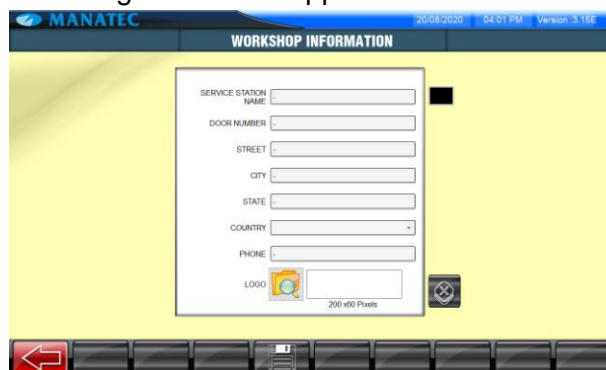


Fig. 208

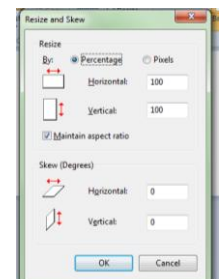
Preparation of Logo (Size: 200x60):

Locate the Logo file in the Desktop of wheel aligner PC.

Right click the Logo file and choose “Open with” option. Choose “Paint” application from the list.


Select “Resize” Option from the **Home** menu and choose “Pixels” as resize method. Disable (uncheck) the “Maintain aspect ratio”.

Provide “200” as Horizontal dimension and “60” as Vertical dimension in the respective window.



Now choose "Save as" from the **File** menu and provide a relevant name and then select "JPEG" as file type.

Adding Logo

After providing the Workshop information, click on the Logo box  provided at the bottom. System will prompt to choose the Logo file from the PC. Choose the relevant JPEG file and press **SAVE** button in the screen to include the Work shop Information & Logo in Result printout.

Choose the  option to delete the Logo provided already.



7.6.5. CALIBRATION HISTORY

The details of Target plate calibration done so far can be viewed in Calibration history. To take a printout, press **PRINT** button or to save it in the system, press **SAVE TO PDF** icon in the screen.

CALIBRATION HISTORY												
S.No.	Date	Time	Target Plates						Calibrated By			
			BOTTOM CAMERA			TOP CAMERA						
			F1L	F1R	F2L	F2R	B1L	B1R	B2L	B2R	B3R	
1	2022/07/12	22:52:08.88	NO	NO	NO	NO	YES	YES	YES	YES	YES	1
			BOTTOM CAMERA			TOP CAMERA						
DISTANCE		LINK	FIELD		DISTANCE		LINK	FIELD				
LEFT	RIGHT	LEFT	RIGHT	LEFT	RIGHT	LEFT	RIGHT	LEFT	RIGHT	LEFT	RIGHT	
V/A	-11.51	-4.37	-11.08	-4.35	-13.30	-4.37	-13.24	-4.18	-11.28	-4.24	-13.12	-4.18
V/A (mm)	0.00	0.88	-1.86	1.86	0.88	0.00	0.80	0.00	0.00	0.80	0.88	0.00
			F1L	F1R	F2L	F2R	B1L	B1R	B2L	B2R	B3R	
X			7	-8	2	-10	7	-15	14	-15	12	-5
Y			-6	-2	-6	6	-6	8	-8	1	-8	-2

Fig. 209



7.6.6. MULTI-USER

This option is used to create User accounts to operate the system. In this we can also edit or delete the existing accounts.

MULTIUSER

User List

	<input type="text"/>
	<input type="text"/>
	<input type="text"/>

Fig. 210



7.6.7. BACKUP & RESTORE FACTORY CALIBRATION

This option is provided to backup/restore the Calibration & User defined vehicle data between alignment units, if the existing files are modified or corrupted or during re-installation.

Following are the options provided:

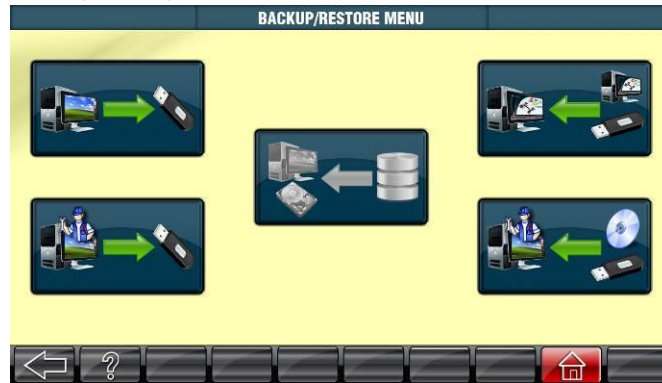


Fig. 211

7.6.7.1. BACKUP CALIB DATA FROM PC TO OTHER LOCATION

This option is used to backup the Calibration data from Desktop Computer to other locations. Also a backup is stored in local HDD of Personal computer.

Choose the location in which the data is to be saved and click **SAVE** button.

7.6.7.2. RESTORE CALIB DATA FROM OTHER LOCATION TO PC

This option is used to restore the Calibration data in Desktop computer.

The system will prompt to locate the source of calibration files for restoration. The files are provided along with the Aligner in Optical media format. Also a backup is stored in local HDD of Personal computer.

Once the data are restored, values will be displayed as below:

RESTORE FACTORY DATA				
	FL	FR	RL	RR
Camera ID	TH102075	TH102115	TH102075	TH102115
Constant	1	1	1	1
Zero-Offset	0	0	0	0

Fig. 212

7.6.7.3. BACKUP USER DATA FROM PC TO OTHER LOCATION

This option is used to backup the User defined vehicle data from Desktop computer to other locations.

Choose the location in which the data is to be saved and click **SAVE** button.

7.6.7.4. RESTORE USER DATA FROM OTHER LOCATION TO PC

This option is used to restore the User defined vehicle data in Desktop computer.

The system will prompt to locate the source for restoration, where the backup was previously stored.



7.6.8. RESET JOB NUMBER

The Job Number is a Serial number which is automatically generated by the system for each alignment job. This option is useful to reset the Job number to 0001. If this option is selected, confirmation will be requested to reset the Job Number. If **YES** is selected, the Job number will be reset. Press **NO** to skip the current operation.



Fig. 213



7.6.9. SETTINGS PASSWORD

This option is provided to activate the optional features from field and to reset the User password

7.6.9.1. LOCK DETAILS

The Optional features available in the alignment programs are controlled using built-in hardware lock. The user himself can activate the required Optional feature by paying additional cost and sending the Hardware lock number along with Machine Serial Number. Upon receiving the Serial key code from Manufacturer, select the respective feature in the screen and enter the Serial key code and then press **SAVE** button.

For enabling HCV Vehicle data



Fig. 214

For enabling LCV alignment in HCV model



Fig. 215

For enabling LCV Vehicle data



Fig. 216

For upgrading to 6A alignment



Fig. 217

For enabling Software lock



Fig. 218

7.6.9.2. RESET PASSWORD

On selecting this option, the operator will be prompted to enter the current password. If entered password is not correct "Invalid Password" message will be displayed. If the entered password is correct, the operator will be prompted to enter the New password. Then re-enter the new password once again to confirm.

If the re-entered password is not correct, "Re-enter password again" message will be displayed.

After re-entering the new password correctly, click **SAVE** to save the password (Factory set default password is "supervisor").



Fig. 219

7.7. LANGUAGE SETTINGS

The User can select the preferred language out of the available options so as to display the alignment screens and Voice prompts in their regional languages. Press **LANGUAGE** button in the **Welcome** screen and select the language as shown below:



Fig. 220

After setting the language, press **SAVE** button.

8. MAINTENANCE

The equipment requires only minor maintenance to keep the equipment operating properly. We recommend attention to the following points for getting maximum benefit out of the equipment.

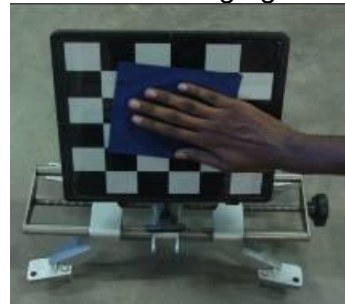
1. Keep the area around the Aligner clean. Remove any tools or other items that are leaning against the Aligner.
2. Use only recommended Accessories / Spares. Accessories from other manufacturer may not fit or function properly and may damage the equipment.
3. For continuous protection against fire hazard replace the Control fuses only with same type and rating of CE marked Fuse.
Control fuse F1 – 3A, Dia 5 mm x 20 mm, Slow blow type Glass fuse
Control fuse F2 – 5A, Dia 5 mm x 20 mm, Slow blow type Glass fuse

4. Protect the System from direct sunlight.
5. Do not attempt to open the System cabinet or Interface box for any reason as you may spoil the Electronic circuit and components. In case of any fault, please call Service Engineer.
6. Protect the Rotary plates from dust. Foreign particles / dust may affect the rotation, leading to wrong Caster / Kingpin readings. Service the Rotary plates once in 3 months.
7. Clean the Wheel Brackets periodically and lubricate for smooth functioning. Also Clean the Screw rod and guide shafts with oil.
8. Target plate is a sensitive reflecting surface to reflect the IR light to the Camera received from the IR source. Therefore, it is the responsibility of User to keep the Target plate clean and free from dust & scratches.

The following tips will help the end user to maintain the Target plates in good condition. Improper usage will damage the target plate permanently.

- DO NOT touch the reflecting surface of the Target plate with dirty (Oil /Grease) hands.
- Handle the Target plates along with the Wheel brackets only. DO NOT detach the plates from the Wheel bracket.
- Hold only the outer frame of Target plate while leveling the spirit bubble.
- Clean the Target plates using compressed air to remove dust particles and then wipe the surface of the plate with soft cloth. Clean the reflecting surface with the help of cleaning agent (Glass cleaner/ Colin) weekly once, using micro fiber cloth (soft cloth).

Caution: Never use Acid / Thinner / Detergent based cleaning agent.



- Cover the Target plates using dust cover when not in use to prevent foreign particles settling on it.
 - DO NOT drop the Target plates.
 - DO NOT make any identification mark (Shop name, bay name etc.) on the reflecting surface.
 - Store the Target plates in closed area (DO NOT expose it to sunlight) when not in use.
 - To increase the life of Target plate, a scratch guard (used in Mobile phones / Laptops) can be pasted on the front surface.
 - DO NOT soak the Plate in rain / snow.
 - DO NOT store the Target plates near any heat emitting equipments.
 - Do not interchange the Target plate from front to rear or vice versa.
9. Keep the System covered when not in use to avoid dust.
 10. Keep the System away from Moisture.

9. TROUBLE SHOOTING

The common troubles and error messages which can be attended by the users are listed in the table given below.

For Troubles and Error messages other than that are listed in the table contact the Service Engineer for Trouble shooting.



The Service Engineer may ask for information to help in diagnosing the service concern. Conveying this information to the Service Engineer prior to servicing can help to expedite service to your equipment

9.1. ALIGNMENT LCV

Sl. No.	Trouble	Causes	Remedies
1	Car pulling towards one side	Misaligned Rear axle (ie., unequal Rear Toe). Rear axle is not perpendicular to Geometric Centre Line	Check the Rear suspension for worn out control arm bushings or sagged springs
		Setback	Check the position of the Front wheels are in line
		Improper Camber setting. Car pulls sideway with more positive Camber	Check for worn out ball joints or control arm bushings and sagged or broken springs
		Uneven tyre pressure. Car pulls sideway with low inflation	Check both tyres are with same pressure
		Mismatched tyre sizes. Steering pull due to mixing of Radial & Normal tyres and cross ply	Both Front tyres must be of same size, same design & should have approx. same amount of thread wear
		Incorrect Caster setting	Caster must be same on Front wheels Check for worn out Control arm worn strut rod bushings
		Dragging brakes and car pulls sideway	Check for corroded brake caliper piston and misadjusted emergency brake cable
		Power steering problem	Check for uneven Steering balance of Front wheels in jacked up condition and run the engine. The steering should not turn one side due to leak in Control valve. The steering effort should also be equal in both directions
	Steering problem with tyre	Check for faulty tyre construction	
2	Car wanders	Loose steering parts	Inspect Tie rod ends, Idler arm and steering gear mountings
		Worn out steering gear	Adjust if possible. Else replace it
		Vehicle skids while applying brake	Check for worn out strut or Control arm bushings
		Loose Wheel bearings	Remove the loose bearing and inspect for damages. If so, replace it
3	Steering wheel not centered	Toe not adjusted equally	Make the length of Tie rods equal
		Misaligned Rear axle	Check the rear axle alignment, worn out Rear axle mountings, Sagging springs or collision damage
		<ol style="list-style-type: none"> 1. If "Runout Compensation" skipped. 2. If "Ride Height" Value skipped. 3. After Caster adjustment, Redo process not carried out 	<ol style="list-style-type: none"> 1. Runout compensation to be done compulsorily 2. "Ride Height" Value should be entered 3. After Caster adjustment Redo process should be carried out compulsorily

Sl. No.	Trouble	Causes	Remedies
4	Tilt in Steering wheel even after alignment	Wheel bracket not fixed properly	<ol style="list-style-type: none"> 1. Ensure wheel bracket rim locking pins are clamped properly 2. All the Wheel brackets should be clamped uniformly either at inner or outer side of Rim <p>Ensure the wheel bracket is fixed on the rim at 12 o clock position (While the wheel bracket center block is slide down).</p>
		Wheel bracket may be defective	<ol style="list-style-type: none"> 1. If Screw rod is found to be bent, replace the Wheel bracket 2. Fix all the Wheel brackets one by one in another Wheel rim and ensure the bracket motion is proper. If not, replace the particular Wheel bracket 3. Fix all the Wheel brackets in a particular wheel one by one and ensure the readings are similar
		Uneven pit level	<ol style="list-style-type: none"> 1. Pit must be leveled properly within the tolerance of $\pm 2\text{mm}$ 2. Zero level should be ensured diagonally (ie., between Front Left & Rear Right and Front Right & Rear Left) without deviation
5	Other symptoms	Tyre wear on outside shoulder due to excessive positive Camber	Inflate the tyre to recommended pressure and adjust the Camber as per the specifications
		Tyre wear on inside shoulder due to excessive negative Camber	Inflate the tyre to recommended pressure and adjust the Camber as per the specifications
		Tyre wear on both shoulders due to under inflated tyres	Check the tyre pressure is as per recommended specifications
		Saw tooth tyre wear due to too much of Toe-in or Toe-out	Adjust the Toe as per specifications
		Abnormal tyre wear due to loose Steering system, misaligned Front or Rear wheels, defective suspension system or car is overloaded	Correct the Steering system, align Front & Rear wheels and correct the suspension system. If necessary replace the parts
		Hard steering due to low or uneven Tyre pressure, more positive Caster or tight Steering system or defective Power steering	Check & inflate the tyre as per recommended pressure and adjust the Steering system or replace the Power steering
		Tyre squeal on turns due to wrong Toe Out on Turn angle from misaligned Tie rod, or bent Steering arm. Low or uneven tyre inflation	Align the Tie rod and adjust the Lock angle and check the tyre pressure
		Unstable at high Speed due to incorrect Front or Rear Toe or worn out steering components	Adjust the Toe or replace the worn out steering components

9.2. ALIGNMENT HCV

Sl. No.	Trouble	Causes	Remedies
1	Vehicle pulling towards one side	Misaligned Rear axle (ie., unequal Rear Toe). Rear axle is not perpendicular to Geometric Centre Line	Check the Rear suspension
		Setback	Check the position of Front wheels are in line
		Uneven tyre pressure. Car pulls sideway with low inflation	Check both tyres are with same pressure
		Mismatched tyre sizes. Steering pull due to mixing of Radial & Normal tyres and cross ply	Both Front tyres must be of same size, same design & should have approx. same amount of thread wear
		Dragging brakes and car pulls sideway	Check for corroded brake caliper piston and misadjusted emergency brake cable
		Power steering problem	Check for uneven Steering balance of Front wheels in jacked up condition and run the engine. The steering should not turn one side due to leak in Control valve. Steering effort should also be equal in both directions
			Ensure the wheel bracket is fixed on the rim at 12 o clock position (While the wheel bracket center block is slide down).
		Wheel bracket may be defective	<ol style="list-style-type: none"> If Screw rod is found to be bent, replace the Wheel bracket Fix all the Wheel brackets one by one in another Wheel rim and ensure the bracket motion is proper. If not, replace the particular Wheel bracket Fix all the Wheel brackets in a particular wheel one by one and ensure the readings are similar
	<ol style="list-style-type: none"> Pit must be leveled properly within the tolerance of $\pm 2\text{mm}$ Zero level should be ensured diagonally (ie., between Front Left & Rear Right and Front Right & Rear Left) without deviation 		
2	Other symptoms	Tyre wear on outside shoulder due to excessive positive Camber	Inflate the tyre to recommended pressure and adjust the Camber as per the specifications
		Tyre wear on inside shoulder due to excessive negative Camber	Inflate the tyre to recommended pressure and adjust the Camber as per the specifications
		Tyre wear on both shoulders due to under inflated tyres	Check the tyre pressure is as per recommended specifications
		Saw tooth tyre wear due to too much of Toe-in or Toe-out	Adjust the Toe as per specifications
		Abnormal tyre wear due to loose Steering system, misaligned Front or Rear wheels, defective suspension system or car is overloaded	Correct the Steering system, align Front & Rear wheels and correct the suspension system. If necessary replace the parts
		Hard steering due to low or uneven Tyre pressure, more positive Caster or tight Steering system or defective Power steering	Check & inflate the tyre as per recommended pressure and adjust the Steering system or replace the Power steering

Sl. No.	Trouble	Causes	Remedies
		<i>Tyre squeal on turns due to wrong Toe Out on Turn angle from misaligned Tie rod, or bent Steering arm. Low or uneven tyre inflation</i>	<i>Align the Tie rod and adjust the Lock angle and check the tyre pressure</i>
		<i>Unstable at high Speed due to incorrect Front or Rear Toe or worn out steering components</i>	<i>Adjust the Toe or replace the worn out steering components</i>

9.3. DESKTOP COMPUTER & PERIPHERALS

Sl. No.	Trouble	Causes	Remedies
1	When System is switched ON, no beep sound and No display	Power socket problem or loose connection in the Power socket plug point	Insert the equipment's Power cord to another Plug point's power socket & check it
	Still problem persists	UPS may be defective. i.e, No output from the UPS	Connect a Test lamp at the output socket of UPS and ensure whether UPS is OK. If not replace the UPS
		Loose connection in Fuse / Fuse may be blown off.	Check the status of Fuse and replace it
	All the external parameters have been checked. But the display problem remains as it is	ON/OFF Switch or Power supply board may be faulty	Get the problem solved through Service Engineer
2	When equipment is switched ON, only Audio sound is noticed. But no display in Monitor	Monitor may be switched OFF or Power supply to Monitor may got disconnected.	Switch ON the Monitor and Check the Power LED is ON. If not, replace the Power cord.
	Monitor Power LED blinking in Standby mode. But no display	Loose connection in the Monitor data cable	Switch OFF the system, remove the 15 Pin data cable and reconnect it to the system with correct polarity
	No loose connection in Data cable. Still the display problem persists	Monitor may be defective	Replace a monitor from other computer and check for it
		Computer's Internal system may be defective	Get the problem solved through Service Engineer
3	Electrical Shock observed in the system	No Earthing or loose contact in the Earthing point of switch board	Get the problem solved through Qualified personnel
		Earthing terminal in Power cord with intermediate cut	Replace the Power cord
4	Keyboard error message displayed when system is switched ON	Any keys in the Keyboard may be in pressed condition	Switch OFF the system and release the struck keys and again switch it ON
		Keyboard may be defective	Replace with any other PS/2 type keyboard or get the problem solved by Service Engineer
5	Multimedia speaker not working	Input supply to speaker may be disconnected	Remove the plug point and re-fix it properly and ensure that the Green light in the Speaker is switched ON
		Speaker defective	Replace the Speaker
6	Demo mode message displayed in Alignment screen	USB cable from the horizontal beam may be disconnected Camera is not detected	Re-connect it properly. USB port in the Motherboard may be defective. Connect to other available USB port and check. USB cable may got damaged.

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