



**HYUNDAI** | NEW THINKING.  
NEW POSSIBILITIES.

## Technical Service Bulletin

GROUP	NUMBER
<b>CHASSIS</b>	<b>13-SS-001</b>
DATE	MODEL(S)
<b>JANUARY 2013</b>	<b>ALL</b>

**SUBJECT** ALIGNMENT SPECIFICATIONS - 2013MY

**Description:** This bulletin provides the 2013 model year alignment specifications.



### \* NOTE

- The data sheet at the end of this TSB is **REQUIRED** to be stored with the RO for ALL warranty claims for ALL models and model years.
- Additionally, if an alignment is performed, a before and after printout from the machine is also **REQUIRED** to be stored with the RO for ALL warranty claims for ALL models and model years.
- Dealers and Sublet Vendors must adhere to the Vehicle Drift/Pull Repair Flowchart described below.
- Test drives should be completed with no passengers or excessive cargo in the vehicle.
- For vehicles equipped with electric power steering (MDPS), perform an absolute steering position (ASP) calibration using GDS after an alignment is completed.
- To perform proper vehicle drift or pull diagnosis, access to a **Hunter GSP 9700** equipped with **StraightTrak** is necessary. If you do not have access to such equipment, it may be located through the Hunter website ([www.gsp9700.com](http://www.gsp9700.com)).
- For information about the purchase of a **Hunter GSP 9700** equipped with **StraightTrak** and Hyundai's special pricing, please visit website (<http://hyundai.spx.com>).

### Warranty Information:

Model	Op Code	Operation	Op Time	Causal Part #	Nature Code	Cause Code
ALL	56800A00	Toe In (2 Wheel) – Adjust	0.4	56820-xxxxx	N31	C40
	52903A00	Alignment Diagnosis/Repair	1.1			

For all vehicle drift, pull and/or alignment warranty claims, the Vehicle Drift/Pull Data Sheet must be filled out as completely as possible and attached to the repair order.

If an alignment is performed, the alignment data sheet showing before and after measurements must also be attached to the repair order, and included in the technician's comment section of the warranty claim.

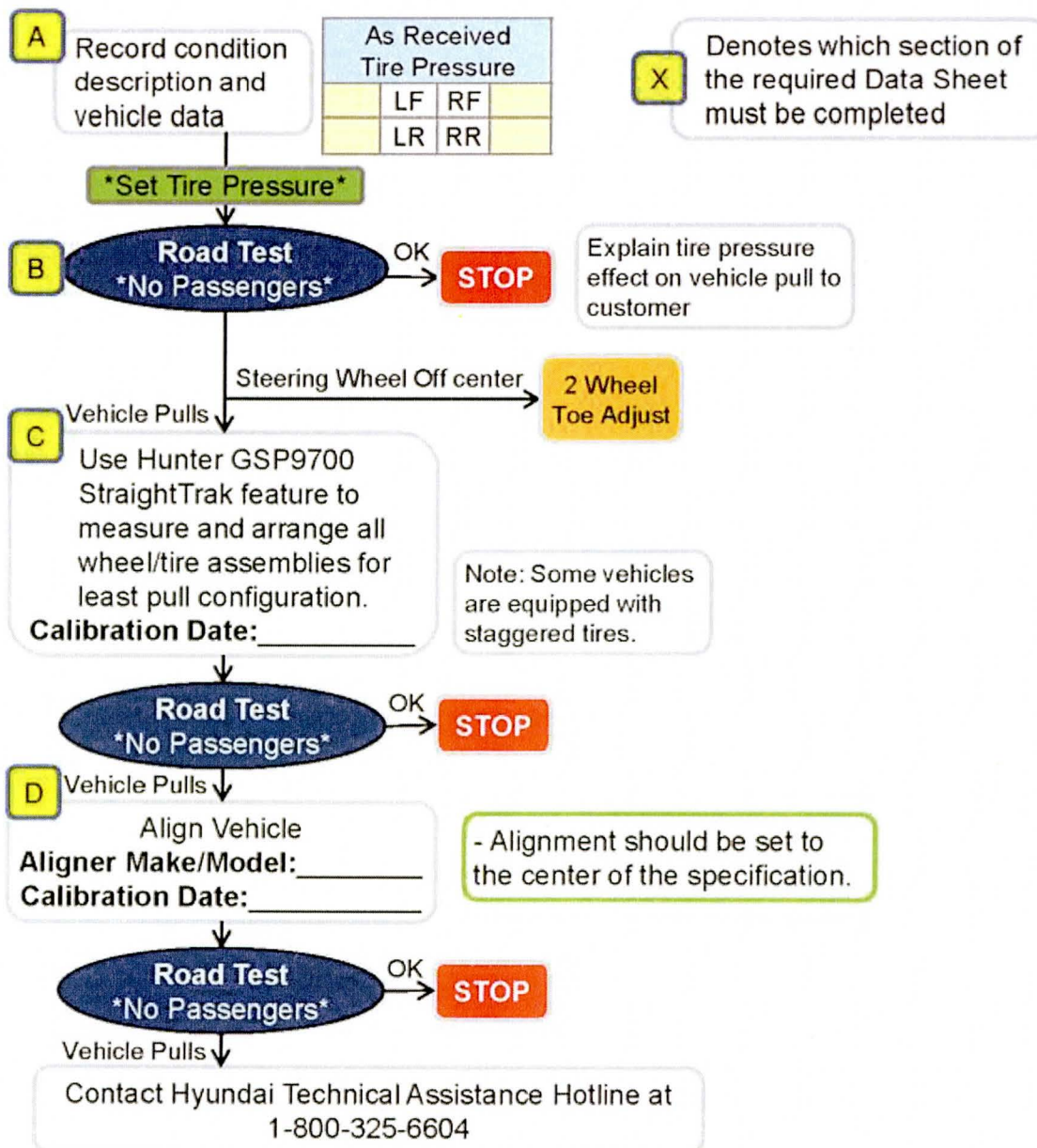
Circulate To: General Manager, Service Manager, Parts Manager, Warranty Manager, Service Advisors, Technicians, Body Shop Manager, Fleet Repair

Drift/Pull Diagnosis and Repair Workflow

**\* NOTE**

- When a vehicle is received with a drift/pull condition the service writer should document the customer comments using the Vehicle Drift or Pull Data Sheet.
- Many issues can contribute to vehicle drift or pull, such as tire pressure, tire uniformity, wheel alignment, brake drag, road crown, cross winds, spring sag resulting in ride height differences, cargo load/weight distribution, and more.
- It is important to consider all potential effects when diagnosing and confirming a vehicle drift or pull condition.

Drift/Pull Diagnosis and Repair Workflow.



Alignment Specifications

2013 Model	Item	Front	Rear
Accent (RB)	Camber	-0.5 ± 0.5°	-1.5 ± 0.5°
	Caster	4.1 ± 0.5°	
	Toe, total	0.15 ± 0.2°	0.5 (+0.4 / -0.5°)
	Toe, individual	0.075 ± 0.1°	0.25 (+0.2 / -0.25°)
Elantra Sedan and Coupe (UD/MD/JK)	Camber	-0.5 ± 0.5°	-1.5 ± 0.5°
	Caster	4.24 ± 0.5°	
	Toe, total	0.0 ± 0.2°	0.50 ± 0.30°
	Toe, individual	0.0 ± 0.1°	0.25 ± 0.15°
Elantra GT (GD)	Camber	-0.5 ± 0.5°	-1.5 ± 0.5°
	Caster	4.24 ± 0.5°	
	Toe, total	0.12 ± 0.2°	0.5 (+0.5 / -0.4°)
	Toe, individual	0.06 ± 0.1°	0.25 (+0.25 / -0.2°)
Sonata (YF)	Camber	-0.5° ± 0.5°	-1.0° ± 0.5°
	Caster	4.44° ± 0.5°	
	Toe, total	0.16° ± 0.2°	0.17° ± 0.2°
	Toe, individual	0.08° ± 0.1°	0.085° ± 0.1°
Sonata Hybrid (YF HEV)	Camber	-0.5° ± 0.5°	-1.0° ± 0.5°
	Caster	4.34° ± 0.5°	
	Toe, total	0.16° ± 0.2°	0.17° ± 0.2°
	Toe, individual	0.08° ± 0.1°	0.085° ± 0.1°
Azera (HG)	Camber	-0.5 ± 0.5°	-1.0 ± 0.5°
	Caster	4.38 ± 0.5°	
	Toe, total	0.08 ± 0.2°	0.17 ± 0.2°
	Toe, individual	0.04 ± 0.1°	0.085 ± 0.1°
Genesis (BH)	Camber	-0.53 ± 0.5°	-1.43 ± 0.5°
	Caster	7.78 ± 0.75°	
	Toe, total	0.1 ± 0.2°	0.4 ± 0.2°
	Toe, individual	0.05 ± 0.1°	0.2 ± 0.1°

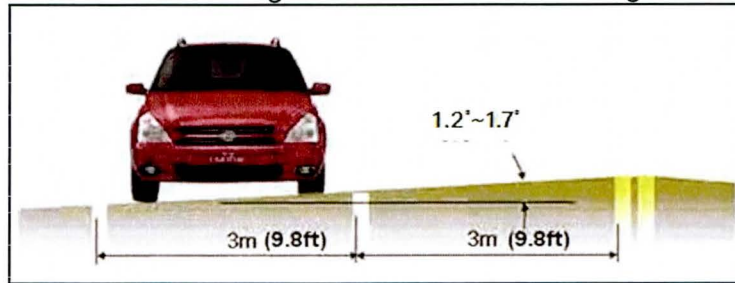
2013 Model	Item	Front	Rear
Equus (VI)	Camber	$-0.55 \pm 0.5^\circ$	$-1.45 \pm 0.5^\circ$
	Caster	$7.80 \pm 0.75^\circ$	
	Toe, total	$0.0 \pm 0.2^\circ$	$0.4 \pm 0.2^\circ$
	Toe, individual	$0.0 \pm 0.1^\circ$	$0.2 \pm 0.1^\circ$
Genesis Coupe (BK)	Camber	$-0.7 \pm 0.5^\circ$	$-1.5 \pm 0.5^\circ$
	Caster	$7.45 \pm 0.5^\circ$	
	Toe, total	$0.28 \pm 0.2^\circ$	$0.16 \pm 0.2^\circ$
	Toe, individual	$0.14 \pm 0.1^\circ$	$0.08 \pm 0.1^\circ$
Santa Fe (AN/NC)	Camber	$-0.5 \pm 0.5^\circ$	$-1.0 \pm 0.5^\circ$
	Caster	$4.14 \pm 0.5^\circ$	
	Toe, total	$0.1 \pm 0.2^\circ$	$0.2 \pm 0.2^\circ$
	Toe, individual	$0.05 \pm 0.1^\circ$	$0.1 \pm 0.1^\circ$
Tucson (LM)	Camber	$-0.5 \pm 0.5^\circ$	$-1.0 \pm 0.5^\circ$
	Caster	$4.02 \pm 0.5^\circ$	
	Toe, total	$0.0 \pm 0.2^\circ$	$0.2 \pm 0.2^\circ$
	Toe, individual	$0.0 \pm 0.1^\circ$	$0.1 \pm 0.1^\circ$
Veloster (FS)	Camber	$-0.5 \pm 0.5^\circ$	$-1.5 \pm 0.5^\circ$
	Caster	$4.22 \pm 0.5^\circ$	
	Toe, total	$0.1 \pm 0.2^\circ$	$0.5 (+0.5 / -0.4^\circ)$
	Toe, individual	$0.05 \pm 0.1^\circ$	$0.25 (+0.25 / -0.2^\circ)$

Vehicle Drift/Pull Test Procedure

**\* NOTE**

Perform road testing with no passengers (driver only) and without carrying excessive weight.

1. Locate an acceptable road for testing which meets the following criteria:



Recommendations	<ul style="list-style-type: none"> <li>- One or more lane road.</li> <li>- Road is straight for at least 250m (820 ft).</li> <li>- Road grade: 1.2 to 1.7 degrees maximum. The flatter the better.</li> <li>- Lane width: 3 to 3.5 meters (10-11.5 feet).</li> </ul>
Cautions	<ul style="list-style-type: none"> <li>- Conduct the test on a smooth, even road without bumps or grooves.</li> <li>- Do not test on a road with excessive grade/crown.</li> <li>- Conduct the test on an uncrowded road.</li> <li>- Ensure there is not a strong wind present during testing.</li> </ul>

2. Before test driving, verify that all tires are OEM, correctly installed (directional tires, correct placement for staggered sizes, etc) and set to the correct inflation pressure.

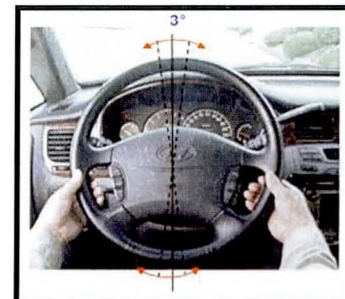
**\* NOTE**

For the best accuracy, it is recommended to use the GDS to measure tire pressures under Current Data within TPMS system.

3. Approach the test road section and drive through at 40 MPH. Center the steering wheel, then slightly turn (~3 degrees) it to the left and to the right to get a feel for the steering center. Hold the steering wheel with a light touch on center.

**\* NOTE**

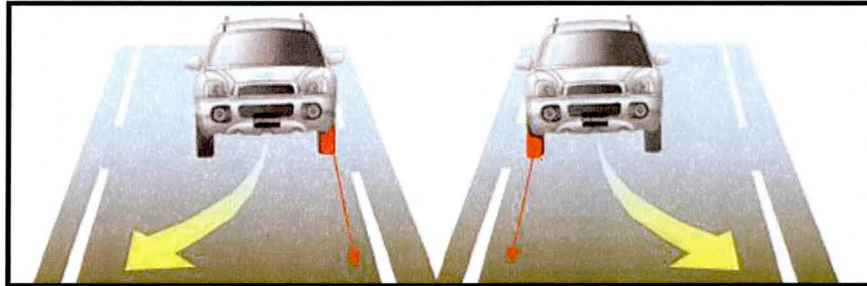
If the vehicle drives straight but the steering wheel is off-center, it is required to perform an alignment to correct the condition.



- Note which direction the vehicle has a tendency to drift towards. If the vehicle tends to go left, place the vehicle on the right side of the lane. If the vehicle tends to go right, place the vehicle on the left side of lane, as shown.

**\* NOTE**

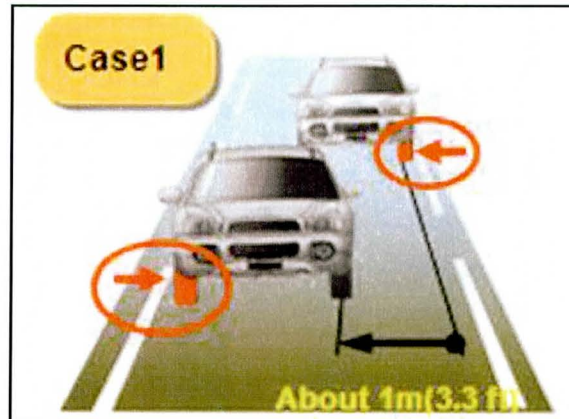
To ensure accuracy, it is recommended that the test be repeated with the vehicle travelling in the opposite direction on the same road.



<Drifting or Pulling to the Right>      <Drifting or Pulling to the Left>

- Take time measurements to see time how long it takes for the vehicle to move from one edge to the other (case 1), as shown. Use the conditions in the table below to confirm drifting or pulling condition.

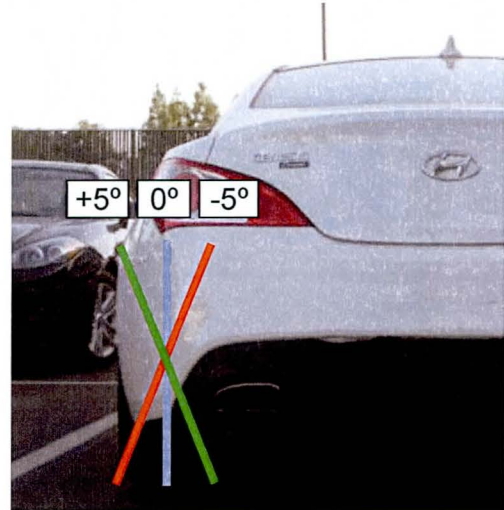
#	Condition	Drift/Pull Criteria
Case 1	The vehicle moves from one edge of the lane to the other (about 1m or 3.3 feet).	It takes 6 seconds or less at 40 MPH.



### Alignment Angle Definitions

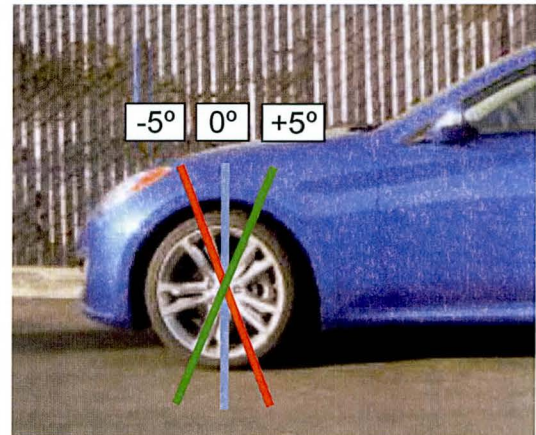
**Camber** Angle between the vertical axis of the wheel and the vertical axis of the vehicle when viewed from the front or rear.

- **Positive** (green line): The upper sidewall of the tire is tilted outwards away from the center of the vehicle.
- **Negative** (red line): The upper sidewall of the tire is tilted towards the center of the vehicle.



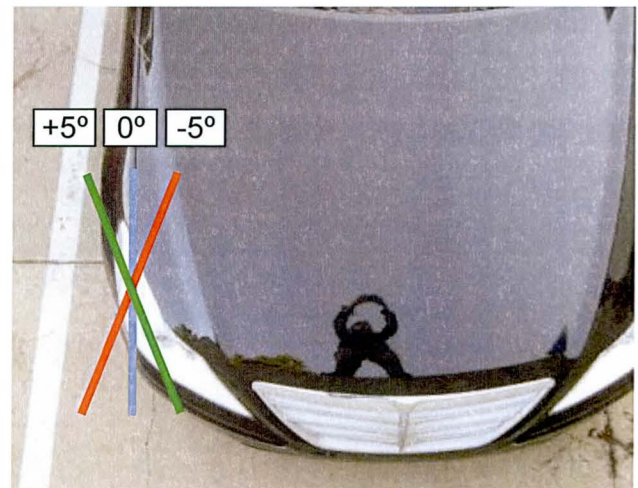
**Caster** When viewing a car from the side, the angle of the vehicle's steering axis is defined by drawing a line through the upper and lower ball joints (for a double wishbone front suspension), or through the strut tower mount and the lower ball joint (for a MacPherson strut front suspension).

- **Positive** (green line): The line leans towards the rear of the car.
- **Negative** (red line): The line leans towards the front of the car.



**Toe** The amount the tires point inwards or outwards when viewing the car from above.

- **Positive** (green line): Toe-in, the tires point inwards towards the center of the vehicle.
- **Negative** (red line): Toe-out, the tires point outwards away from the center of the vehicle.



### Factors that Influence Vehicle Drift/Pull

Vehicle drift or pull can be attributed to several factors. Understanding what can affect it is imperative for anyone repairing a vehicle with a drift or pull condition.

**Air pressure** - Low front tire pressure can cause a vehicle to drift or pull towards that tire.

#### Alignment

- **Camber** - A vehicle will drift or pull towards the side with more positive front camber. As a rule of thumb, the camber difference between the front tires should be less than 0.5 degrees.
- **Caster** - A vehicle will tend to drift or pull towards the side with less positive caster.
- **Steering Axis Inclination (SAI)** - The angle formed by the line drawn through the steering pivot axis and a line at true vertical when viewed from the front of the vehicle. SAI is designed into a vehicle's suspension and aids straight-line stability. This angle can be measured by the alignment machine. For Hunter units, it is measured during the caster sweep process. It is useful for checking for damaged components when the SAI difference between left and right sides is more than 1 degree. If SAI is lower on one side of the vehicle it may indicate a bent lower control arm. If SAI is higher on one side of the vehicle it may indicate damage to the upper strut mount.
- **Thrust angle** - This is the direction the rear axle is pointing as a result of the rear toe angles and results in the steering wheel being off-center. To avoid this situation, rear camber and toe should be adjusted before the front when performing a four wheel alignment. After the rear is set, center the steering wheel, lock it in place, then adjust the front camber, caster, and toe (if applicable).

**Tires** - Tires can have a significant effect on vehicle drift or pull. Arranging tires on a vehicle according to StraightTrak can help improve a vehicle drift or pull condition. Tires contribute to vehicle drift or pull in the following ways:

- **Ply steer** - Ply steer is an inherent characteristic in a tire which results in a lateral force as the tire rolls. Rotating the tires may aid in cancelling out the effects of ply steer.
- **Conicity** - Tire conicity refers to the shape of the tire, and how cone-shaped it is. This can influence vehicle drift or pull. Conicity can be present in a new tire due to manufacturing, or in a used tire due to camber wear.

**Weight** - The amount of weight and where the weight is placed alters a vehicle's alignment angles, thus changing the drift/pull tendency. It is important to consider this when diagnosing a vehicle drift or pull.

**Road Crown** - Every vehicle will have a tendency to follow road crown towards the low side of the crown.

**Brake Drag** - If one side of a vehicle's brakes are dragging, the vehicle can have a drift or pull tendency towards that side. Inspect the brake system to ensure brake drag is kept to a minimum on all four wheels.

**Cross Winds** - Cross winds can push a vehicle towards one side of the road. It is important to conduct road testing by driving a vehicle in opposite directions to verify the effects of cross winds.



## Proper Alignment Rack Usage and Maintenance

## ★ NOTE

- These tips apply to Hunter Engineering alignment racks and wheel balancers that feature StraightTrak.
- It is imperative that the following items be followed to ensure accurate alignment readings.

**Aligner Calibration/Maintenance Schedule** - It is required that all dealer alignment racks be calibrated by a representative every 6 months. This allows the representative to update vehicle specs and inspect and maintain equipment.

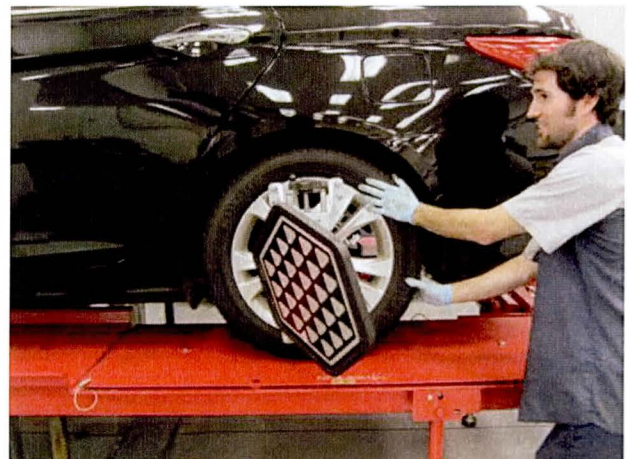
**Rolling Compensation** - The rolling compensation procedure is critical to ensuring an accurate alignment. When performing the rolling compensation, be sure to do the following:

1. Set tire pressure to factory specification.
2. Verify that the vehicle is not excessively loaded. Remove any heavy items.
3. Ensure the lift is level so vehicle's suspension and steering are in a neutral position.
4. Set the target levels before rolling compensation. After completing the compensation, do not re-level the targets.

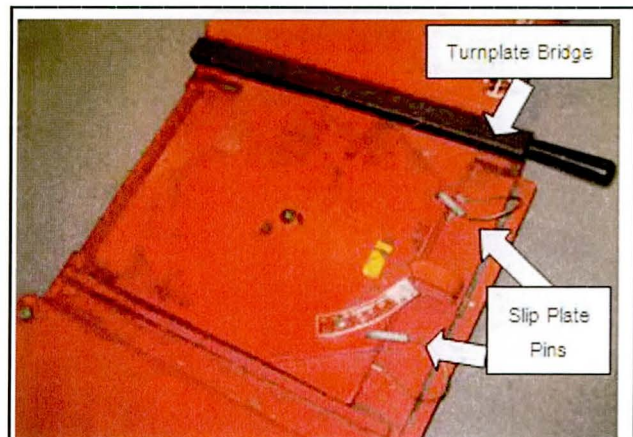
Roll the vehicle by turning the left rear tire. This will not disturb the vehicle's suspension and steering systems.

## ★ NOTE

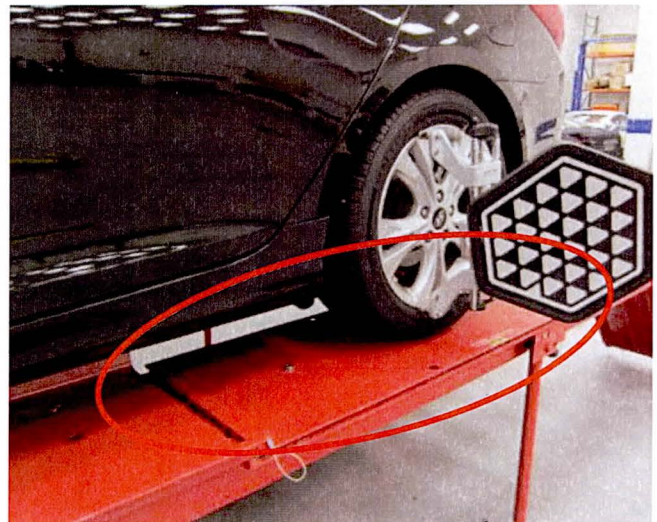
Do not roll the vehicle by pushing or pulling on body parts, bumpers, etc.



Ensure the pins are in the slip plates, and the turnplate bridge is flush with the rolling surface to minimize the vehicle's suspension movement.



**Slip Plates** - The slip plates of a Hunter alignment rack are designed to move smoothly and freely to provide accurate measurements. Before pulling a vehicle onto the rack, check that they move freely and do not bind. Periodically clean the area underneath the slip plates by blowing compressed air through to remove any debris. If this does not free a binding plate, contact your local Hunter representative for cleaning and lubrication recommendations.

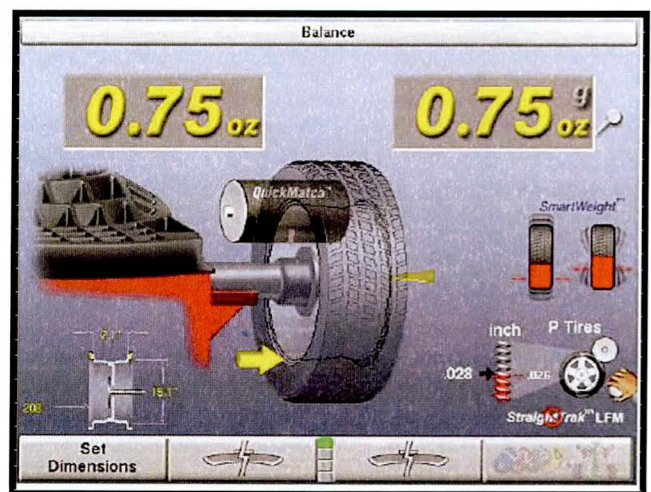


**StraightTrak LFM feature** - StraightTrak is a required feature for Hunter's GSP9700 wheel balancer. This feature measures lateral force of a tire due to ply steer, conicity, and other issues which may contribute to vehicle drift or pull. This can be a useful tool for vehicles with a tracking condition.

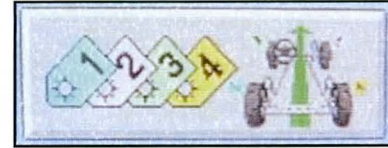


Use StraightTrak to arrange the 4 wheel/tire assemblies of a vehicle in a configuration which will result in the lowest drifting or pulling force by doing the following:

1. Remove all wheel/tire assemblies from the vehicle.
2. Balance the front left assembly on the Hunter GSP9700 with StraightTrak feature. An icon located in the lower right corner will show whether or not StraightTrak is enabled.

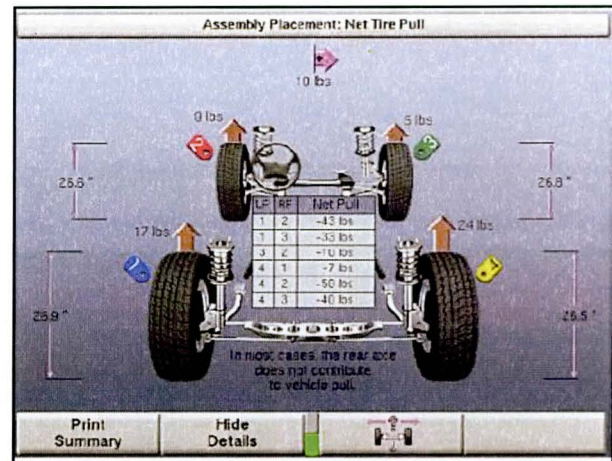
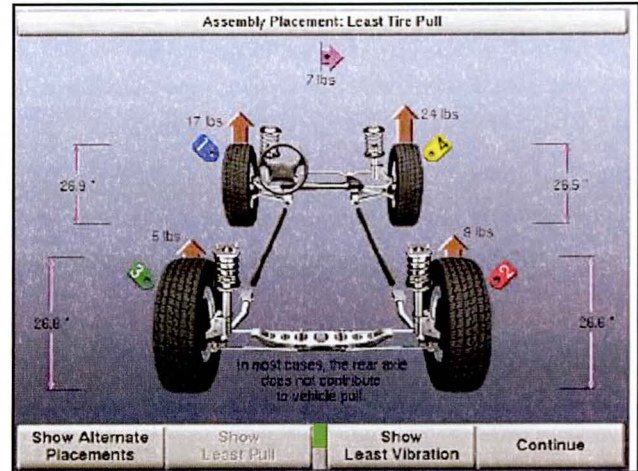


3. After balancing, press the tire tag button located at the bottom right of the screen to assign a number to that assembly. Label the assembly accordingly with a tag or chalk mark.



4. Continue to balance and tag all four assemblies. After all are completed, the screen will show tire positioning and the effect on vehicle drift/pull or vibration. The purple horizontal arrow at the top of the screen shows overall pulling force and direction due to tires. The brown vertical arrows above each tire show the RFV of each assembly.

- Select “Show Least Pull” for lowest tire effects on pulling.
- Select “Show Least Vibration” for the smoothest ride.
- Select “Show Alternate Placements” for other configurations.



**\* NOTE**

Some vehicles have staggered size tires front vs. rear, and have limited tire rotation options.

**Vehicle Drift or Pull Data Sheet**



**A** Record condition description and vehicle data

As Received Tire Pressure			
LF	RF		
LR	RR		

**A** Date: \_\_\_\_\_ VIN: \_\_\_\_\_

Dealer Code: \_\_\_\_\_ Mileage: \_\_\_\_\_

Technician: \_\_\_\_\_ Prod Date: \_\_\_\_\_

**\*Set Tire Pressure\***

**B** **Road Test**  
**\*No Passengers\***

OK → **STOP**

Explain tire pressure effect on vehicle pull to customer

Customer Comments: \_\_\_\_\_

Tire Wear/Vehicle Condition Comments: \_\_\_\_\_

Steering Wheel Off center → **2 Wheel Toe Adjust**

Vehicle Pulls ↓

**C** Use Hunter GSP9700 StraightTrak feature to measure and arrange all wheel/tire assemblies for least pull configuration.

Calibration Date: \_\_\_\_\_

**B** Initial Test Drive

PASS / NO PASS	LEFT / RIGHT
CASE 1   40 MPH	Time: _____ sec

OK → **STOP**

Vehicle Pulls ↓

**C** Tire Lateral Force (from Straight Trak)

Before: _____ lbs L / R	After: _____ lbs L / R
PASS / NO PASS	LEFT / RIGHT
CASE 1   40 MPH	Time: _____ sec

**D** Align Vehicle

Aligner Make/Model: \_\_\_\_\_

Calibration Date: \_\_\_\_\_

**D** Alignment Readings (degrees):

Initial	Front	Rear	
Camber			
Caster		N/A	
Toe			
Final	Front	Rear	
Camber			
Caster		N/A	
Toe			
CASE 1	40 MPH	Time _____	L / R

OK → **STOP**

Vehicle Pulls ↓

Contact Hyundai Technical Assistance Hotline at 1-800-325-6604

Final Repair Comments: \_\_\_\_\_

Service Manager (print name): \_\_\_\_\_

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

**Road Test Case #1 – 3.3 ft**

**Repair Procedure Notes**

- This data sheet is **REQUIRED** to be filled out completely and stored with the RO.
- Perform all road testing using Road Test Case #1 criteria, at 40 MPH and with no passengers or excessive cargo in the vehicle.
- Following an alignment, ASP calibration must be performed on vehicles equipped with electric power steering.

**\*\*\*THIS DATA SHEET IS REQUIRED TO BE COMPLETED AND STORED WITH THE RO FOR ALL TRACKING CLAIMS\*\*\***