OPERATION INSTRUCTIONS

Form 5983-T, 02-18c
Supersedes Form 5983-T, 11-15b

ProAlign® Wheel Alignment Systems

Version 2

HUNTER Engineering Company

CONTENTS

Hunter Alignment Machine - Equipment Training Report

Hunter Technical & Training Representative: Rep #:

Customer: Order #:

Equipment Model #:

Technicians Trained: *Please Print*
Technician 1: Technician 2:

Technician 3: Technician 4:

Please have trained technicians initial each training item:

Aligner Training Task	Tech 1	Tech 2	Tech 3	Tech 4
Safety Precautions, Proper Power On/Off Procedures				
Overview of Controls (K-Keys, Handheld Remote, Reset, etc.)				
Vehicle Specs (Spec List)				
Sensors (Install, Correct Position, Roll and jacking comp, Cleaning)				
Caster Measurement (Brakes Locked During Faster Caster)				
Alignment Measurement and Adjustment Display Overview				
Bar Graph Screen Operation				
Adjustment Help Options				
Overview of Shim Select II, CAMM				
WinToe Operation				

Installation & Training Acknowledgement: I, the undersigned, do hereby acknowledge that my Hunter Engineering Alignment Machine has been installed and is operational. I also acknowledge that the above technicians have been trained to my satisfaction in those areas of safety and operation as indicated above.

Management Name (print): Date:

Management Signature:

WARRANTY INFORMATION

Hunter Engineering Company warrants new equipment to be free from defects in material and workmanship under normal conditions of use for a period of one (1) year* from the date of installation. Exceptions to this warranty are listed below.

- All circuit boards are warranted for a period of three (3) years.
- PC's and options installed inside the PC are warranted for a period of three (3) years.* (**)
- CRT's and LCD's (except 111 Aligners) are warranted for a period of three (3) years.
- Power supplies are warranted for a period of three (3) years.
- Transducers*** are warranted for a period of three (3) years.
- Wheel Balancer motors are warranted for a period of three (3) years.
- Wheel Balancer shafts are warranted for a period of three (3) years.
- Tire Changers are fully warranted for a period of three (3) years with the exception of consumable parts.
- All lift and Hunter TCR1 power units are warranted for a period of two (2) years.
- Normal wear items are not covered with the exception of batteries, which are covered for a period of six (6) months.
- Replacement parts purchased through the Hunter Service Center and no longer covered by machine warranty are warranted for a period of six (6) months.

Field labor is covered under this warranty for a period of six months.

This warranty does not include normal wear items and does not apply to any product which has been subject to abuse, misuse, alterations, accident, exposure to the elements, tampering, unreasonable use, or failure to provide reasonable and necessary maintenance.

In case of any warranty claim it will be necessary to contact your local authorized Hunter Service Representative. To have an item considered for warranty it must be returned to Hunter Engineering Company for inspection and evaluation. This must be done on a freight prepaid basis. If after our inspection the product proves to be defective, and is within the time frame specified, we will repair or replace the item at no additional cost.

This is Hunter Engineering Company's only warranty with respect to new equipment. Hunter Engineering Company disclaims all other warranties to the extent permitted by law. This express warranty and any implied warranties of merchantability and fitness for a particular purpose shall not extend beyond the warranty period. Hunter Engineering is not responsible for any incidental or consequential damages, including, but not limited to, loss of business.

We do not authorize any person to assume for us any other liabilities with our products. Any remaining warranty may be transferred to subsequent purchasers by forwarding the purchaser's name, address, phone number and equipment serial number to:

Hunter Engineering Company
Customer Service Department
11250 Hunter Drive
Bridgeton, MO 63044
(800) 448-6848

* *During the first 30 days complete PC's will be replaced at no charge under warranty with Repair Lab approval. After 30 days they will be repaired at no charge under warranty. All internal PC components will be replaced at no charge for a period of 3 years from the date of installation.*

** *Printers may be exchanged for the first 90 days with Repair Lab approval, then may be repaired for an additional 9 months.*

*** *Transducers include camber cells, brake tester load and weight cells, suspension analyzer pickups, hall effect sensors and balancer force transducers.*

1. GETTING STARTED

1.1 Introduction

This manual provides instructions and information required to operate the Hunter Alignment Systems with ProAlign® Alignment Software.

References

This manual assumes the technician is familiar with the basics of wheel alignment.

The first section provides basic information needed to operate the aligner. The following sections contain detailed information about equipment operation and procedures.

"Italics" are used to refer to specific parts of this manual that provide additional information or explanation. For example, *refer to "Vehicle Specifications."* These references should be read for additional information to aid in the comprehension of the instructions being presented.

Corporate Information

- **Hunter Engineering Company**

  11250 Hunter Drive

  Bridgeton, MO 63044 U.S.A.

  Phone: 314-731-3020 / **Fax**: 314-73

1.2 For Your Safety

Hazard Definitions

Watch for these symbols:

⚠ **CAUTION:**	Hazards or unsafe practices which could result in minor personal injury or product or property damage.

⚠ **WARNING:**	**Hazards or unsafe practices which could result in severe personal injury or death.**

⚠ **DANGER:**	**Immediate hazards that will result in severe personal injury or death.**

These symbols identify situations that could be detrimental to your safety and/or cause equipment or vehicle damage.

Important Safety Instructions

Read all instructions.

Read and follow all caution and warning labels affixed to your equipment and tools. Misuse of this equipment can cause personal injury and shorten the life of the aligner.

Always use wheel chocks in front of and behind the left rear wheel after positioning a vehicle on the rack.

Use caution when jacking the vehicle.

Adequate ventilation should be provided when working on operating internal combustion engines.

ALWAYS WEAR OSHA APPROVED SAFETY GLASSES. Eyeglasses that only have impact resistant lenses are NOT safety glasses.

Wear non-slip safety footwear when performing an alignment.

Never stand on the aligner.

Do not wear jewelry or loose clothing when performing an alignment.

Wear proper back support when lifting or removing wheels.

Do not operate equipment with a damaged cord or equipment that has been dropped or damaged until a Hunter Service Representative has examined it.

Never use the cord to pull the plug from the outlet. Grasp plug and pull to disconnect.

If an extension cord is necessary, a cord with a current rating equal to or more than that of the equipment should be used. Cords rated for less current than the equipment may overheat. Care should be taken to arrange the cord so that it will not be tripped over or pulled.

Verify the electrical supply circuit and the receptacle is properly grounded.

To reduce the risk of electrical shock, do not use on wet surfaces or expose to rain.

Verify the appropriate electrical supply circuit is the same voltage and amperage ratings as marked on the aligner before operating.

Always unplug equipment from electrical outlet when not in use. Never use the cord to pull the plug from the outlet. Grasp plug and pull to disconnect.

To reduce the risk of fire, do not operate equipment in the vicinity of open containers of flammable liquids (gasoline).

Keep all instructions permanently with the unit.

Keep all decals, labels, and notices clean and visible.

To prevent accidents and/or damage to the aligner, use only Hunter recommended accessories.

Use equipment only as described in this manual.

SAVE THESE INSTRUCTIONS

⚠ WARNING: This equipment generates, uses, and can radiate radio frequency energy. If not installed and used in accordance with the instruction manual, it may cause interference with electronic devices. Operation of this equipment in a residential area may cause interference in which case the user, at his own expense, will be required to take whatever measures may be required to correct the interference.

⚠ WARNING: DO NOT ALTER THE ELECTRICAL PLUG. Plugging the electrical plug into an unsuitable supply circuit will damage the equipment and may result in personal injury.

Precautions for Systems Equipped with XF2 (or newer) pod

The following precautions apply to the XF cordless sensor option and the XF cordless Remote Indicator option.

XF transceivers are located in the aligner console, cordless alignment sensors and cordless Remote Indicator.

Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interferences that may cause undesired operation of the device.

⚠ WARNING: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

⚠ WARNING: Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

Specific Precautions/Power Source

NORTH AMERICA:

The aligner is intended to operate from a power source that will apply 120 VAC (nominal) 50/60 Hz between the supply conductors of the power cord.

OTHER REGIONS:

The aligner is intended to operate from a power source that will apply 100 to 240 Volts AC (nominal) 50/60 Hz between the supply conductors of the power cord. The power supply cord, supplied with this equipment, may need modification to allow connection to the power supply mains. Your Hunter service representative will install the proper plug for your location.

⚠ CAUTION: A protective ground connection, through the grounding conductor in the power cord, is essential for safe operation. Use only a power cord that is in good condition.

FUSING:

To avoid fire hazard, use only the fuse specified for your product.

EQUIPMENT SERVICE:

This equipment contains no user serviceable parts. All repairs must be referred to a qualified Hunter Service Representative.

PROVISIONS FOR LIFTING AND CARRYING:

No provision has been made for lifting or carrying this equipment. The unit must be moved by rolling it on its casters.

Equipment Specifications

Electrical

VOLTAGE:	120/230 volts (nominal)
AMPERAGE:	6/3 amps
WATTAGE:	720 watts

Atmospherics

TEMPERATURE:	+32°F to +122°F (0°C to +50°C)
RELATIVE HUMIDITY:	Up to 95% Non-condensing
ALTITUDE:	Up to 10000 ft. (3048 m)

Safety Summary

Explanation of Symbols

These symbols appear on the equipment.

Alternating current.


Earth ground terminal.


Protective conductor terminal.

I ON (supply) condition.


OFF (supply) condition.


RISK of electrical shock.


Stand-by switch.


Not intended for connection to public telecommunications network.

1.3 Operating the Console

Turning Power On

Turn the aligner “ON” by pressing the power switch located on the rear of the aligner cabinet. The system requires a period of time to “boot up.”

NOTE:	The “Date and Time Not Set” screen will appear the first time the console is “booted up.” Press “Set Date and Time” and the “Set Date and Time” screen appears. Enter the correct time and date using the keyboard and mouse. Press “OK” to accept entries. *Refer to Chapter 2, “Aligner Set-up” for complete instructions.*

The “Start-up” screen appears and indicates that the unit is ready for use.

Turning Power Off

First, turn off the printer by pressing the power button on the printer.

Next, turn off the PC by pressing the power button on the front of the PC

Lastly, turn off power to the console and cameras by turning off the power to the console by switching the power switch on the rear of the console to the “OFF” position (this step is optional).

Using “Softkeys” to Select Menu Choices

The four menu labels that appear at the bottom of each screen are referred to as the softkey labels.

These labels indicate the action that the program will take when the corresponding softkey (K1, K2, K3, or K4) is pressed. These keys are identified as:

K1	K1 key
K2	K2 key
K3	K3 key
K4	K4 key

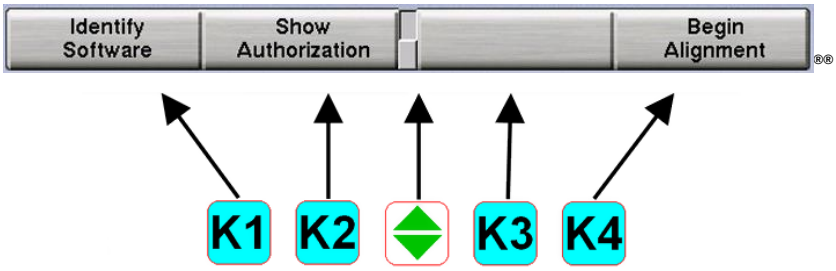
The vertically stacked squares between the K2 and K3 labels indicate how many levels of menus are available. Six levels of menus are possible. The box that appears to be pressed indicates the menu level that is currently displayed. The menu level is changed by pressing the menu shift key, .

NOTE:	Zoom key (), backward key (), and forward key () do not perform a function on the PA200 Alignment Console.

Using the Keyboard or Remote Control to Select "Softkeys"

Unique keys located on the keyboard and also on the remote control provide operator control of the program.

The four softkeys (K1, K2, K3, and K4) correspond to the four softkey labels that appear at the bottom of each screen.



NOTE:	Pressing either of the two "Enter" keys on the keyboard is equivalent to pressing the "OK" softkey.

The menu level is changed by pressing the menu shift key, . When this key is pressed, the menu labels will change to the next level "down." If the last menu level is currently displayed, the next step will be to the first menu level.

Using the Mouse to Select "Softkeys"

A softkey can also be selected moving the cursor over the desired softkey label and then pressing the click-select button (typically the button on left-side of mouse).

The menu level can be changed by moving the cursor over one of the vertically stacked squares between the K2 and K3 labels and then pressing the click-select button. The softkey labels will change to that of the selected menu level.

Resetting the Program

The alignment program may be reset at any time during an alignment by using the R (Esc) key, located at the upper left-hand corner of the keyboard.
A "Confirmation" screen will appear to verify the reset button was pressed intentionally.

From the "Confirmation" screen, press the R (Esc) key again, "Save Work Order" or "Cancel."

Press the R (Esc) key again to reset ProAlign® Alignment software. When the aligner is reset, the information collected for the alignment in progress is erased, the sensor compensation is removed, and the display returns to the “Start-up” screen.

If you have a Data Drive installed, “Save Work Order” will appear. Press this softkey to save the customer identification, vehicle identification and alignment measurements collected during the alignment process. *Refer to Section 3.2, “Customer Identification” for complete instructions.* The display returns to the “Start-up” screen with ProAlign® reset and ready to begin another alignment.

Press “Cancel” to return to the current alignment.

⚠ WARNING: THE SENSOR COMPENSATION PROCEDURE MUST BE PERFORMED ON A SENSOR EVERY TIME IT IS MOUNTED TO THE WHEEL! Mounting sensors and re-using the previous compensation will result in inaccurate, non-repeatable alignment measurements, crooked steering wheels, tire wear, and customer complaints. Sensor compensation may be bypassed if special adaptors are used instead of universal self-centering adaptors.

2. ALIGNER SET-UP

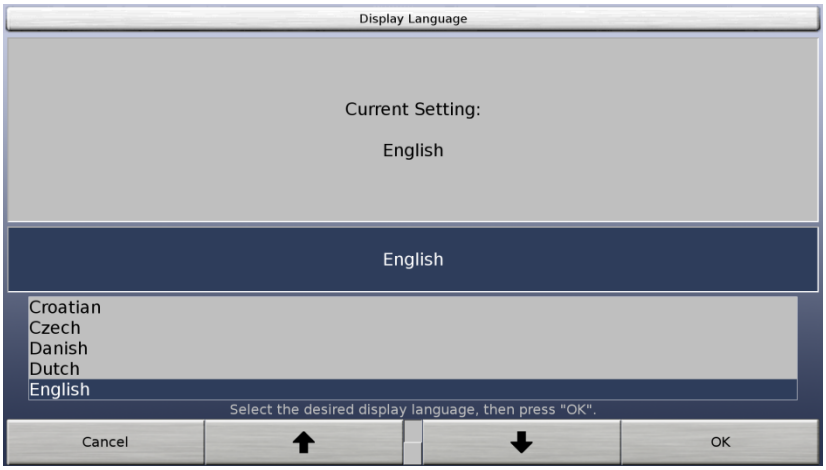
2.1 Default Aligner Settings

Set-up Item	Default Setting
Display Language	English
Keyboard	English - US
Print Language	English
Printout Format	Standard Format
Printout Label	(blank)
Printout Paper Size Selection	Letter (8.5” x 11”)
Print Preview	Enabled
Customer ID Prompt Sequence	Include customer ID in prompt sequence
Save “Before” Measurements Reminder	Include the reminder
Customer ID Prompt Sequence Format	Work Order ID, Name, Address, City, Telephone, First Reg., Vehicle (VIN), License, Odometer, Technician
Recall Work Order Selection	Work Order ID – Name – Date and Time - Model
Sensor Type	DSP706
Toe-Out-On-Turns Device	DSP700-Series Sensors
Alignment Type	Total Alignment
Alignment Measurement Units and Formats	Camber/Caster: 1.1° (degrees) Toe: 1.01° (degrees) Thrust Angle: 1.01° (degrees) WB & Track Width: 1.1” (inches)
Rear Shim Default Brand	Hunter STD
Rear Shim Display Size	(on screen display)
Caster Measurement Selection	Caster Only
Update Sensor Software	
Cordless Channel Selection	Console Channel: 0
Set Date And Time	Date
Light / Heavy Duty	Light Duty
Install Hunter Package	None

2.2 Typical Set-up Procedure

NOTE:	The screen for display language is used in the example, but many of the other items use this typical set-up procedure.

Choose Set-up Item



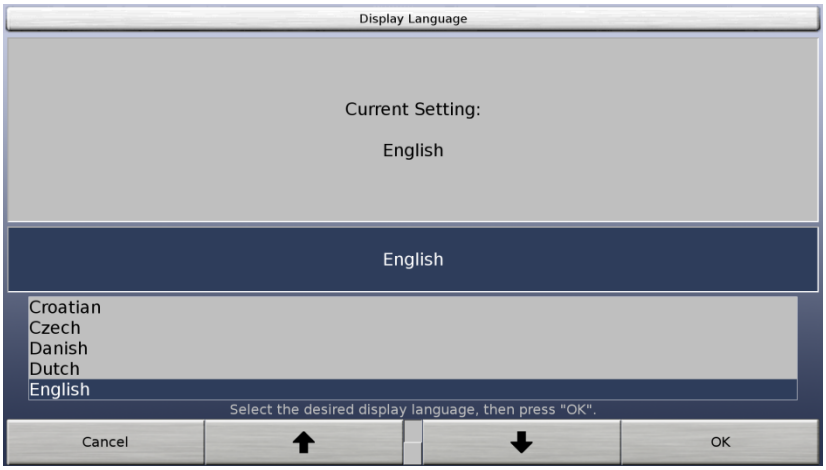
This screen is displayed by pressing “Set-up Aligner” on the start-up screen. It contains a scrolling list of all items that may be set-up.

Press ⬆ or ⬇, or use the mouse to highlight the selected item to set-up.

Press “Set-up Selected Item” to open the screen to set-up the selected item.

Choose Desired Set-up Choice for the Item

The set-up screen appears with the current setting on the screen and all available choices.



NOTE:	Set-up for items that deviate from this single-choice format is explained in detail within the next section.

To select a choice from the list, press ⬆ or ⬇ until the desired choice is highlighted. When a selection is highlighted, a brief explanation of that selection appears in the dark blue region in the center of the screen.

Press “OK” to accept the selection.

Completing Set-up

After all the items have been set-up as desired, press “Store Set-up” to store in memory. The set-up information is stored in memory and the system changes to the logo screen.

To abandon the set-up operation without actually changing the set-up, press “Cancel” or simply reset the system.

NOTE:	The set-up information is not stored until the “Store Set-up” key is pressed on the “Aligner Set-up” screen.

2.3 HunterNET® Alignment ShopResults®

The “HunterNET® Alignment ShopResults” screen enables permanent storage of alignment results on the internet. Results can be reviewed from any PC with an internet connection. Contact your service rep to set up HunterNET®; login credentials and an internet connection are required.

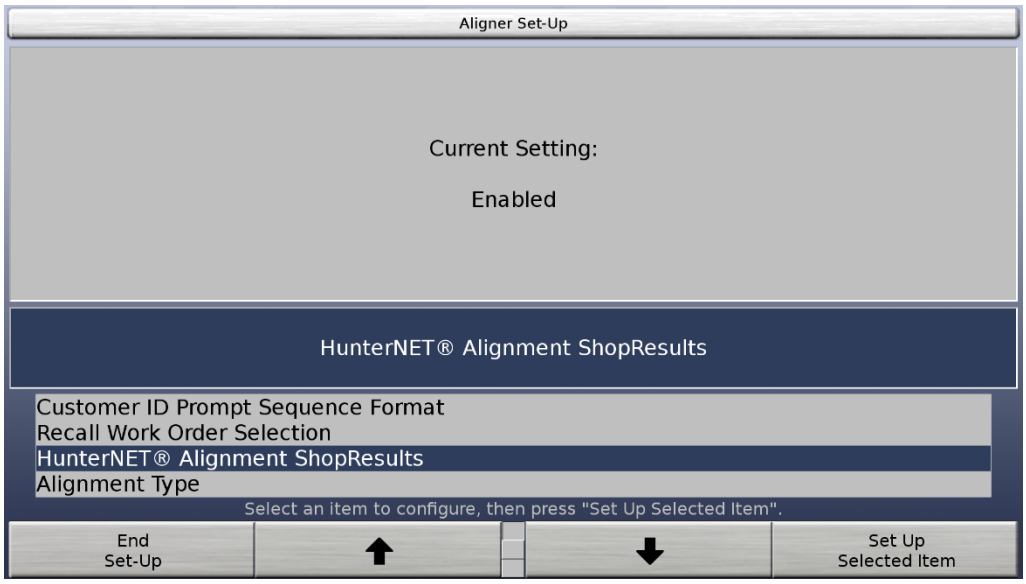
NOTE:	A separate PC with internet connection is required to perform initial HunterNet account setup and to view the ShopResults generated by the alignments performed. There is no web browsing capability built into ProAlign.

Refer to Form 6488-T for HunterNet operation instructions.

2.4 HunterNET® Setup Instructions-PA200

Note:	Currently only Shop Results data is available in HunterNet for PA200 aligners. After an alignment has been performed and printed, users may view results on a PC using their HunterNet log in.

While connected to the shop’s network, go to **Set Up>HunterNET® Alignment ShopResults>Set Up Selected Item**.



Enter the HunterNet logon and password in the appropriate fields. Enter the PC serial number as well. Select **OK** to store to the setting.

Test the set up by checking HunterNet after performing and printing an alignment. From a different PC, log in to HunterNet at www.hunternetwork.com. Use the same credentials as the aligner. Under the “Alignment ShopResults” tab, users can look at the alignment printout.

2.5 Customization

Custom Logo Screen

A custom logo screen can be displayed by use of a file on a Data drive.

Create a custom logo in the following format:

- Must be PNG (Portable Network Graphic) format.
- Must be named ‘logo.png” exactly, all lower-case.
- Must be set to 16 million colors.

Place the file on the root directory of the Data drive.

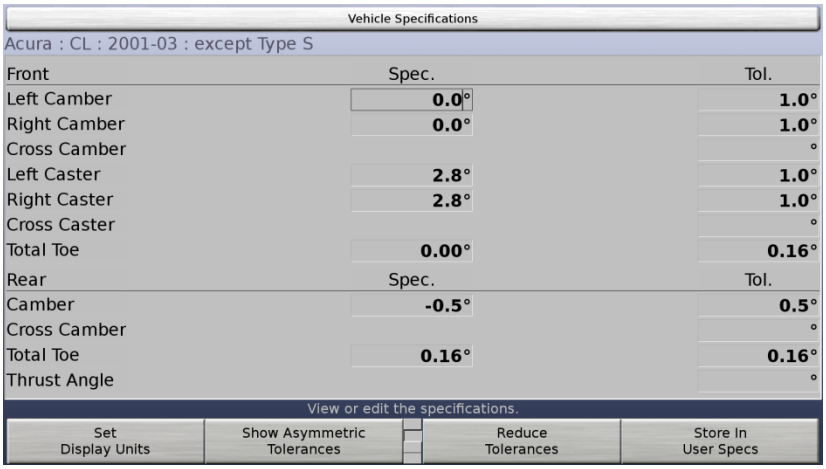
Connect the Data drive to the PA200 series aligner.

The custom logo should appear on the logo screen.

3. DETAILED OPERATION INFORMATION

3.1 Vehicle Specifications

The “Vehicle Specifications” screen shows the vehicle identification and its alignment specifications.



Use this screen to:

view the identification of the vehicle

view the specifications of the vehicle

manually enter or edit the specifications of the vehicle

Other screens are available from this screen for the following purposes:

to recall vehicle specifications from the specification memory

to set the display units and formats for specifications and measurements

About Specifications

The “specifications” for an alignment parameter include the following:

- the specification value (the preferred value for the measurement)
- the tolerances (the allowed deviations from the specification for the value)

“Symmetric” specifications have equal plus (+) and minus (-) tolerances. The tolerance allows an equal deviation each side of the preferred value. This allows a single value to be entered for use as both the plus (+) and minus (-) tolerance. For example, a camber specification might be:

$1.0° \pm 0.5°$

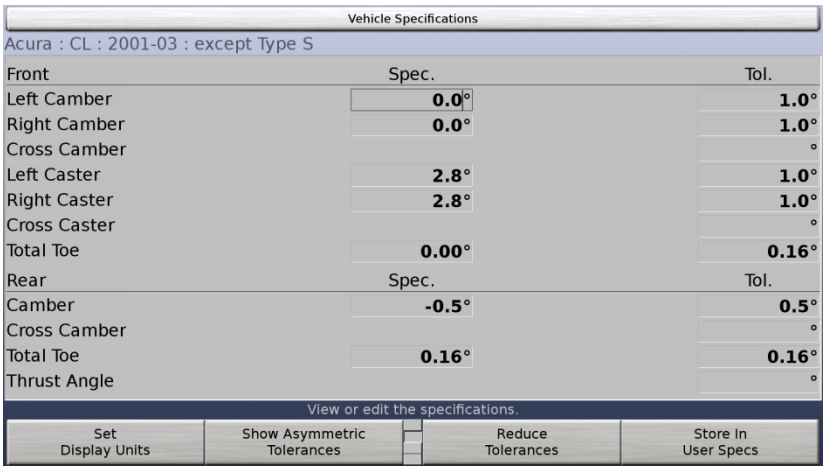
This specification allows an “in spec” range of 0.5° to 1.5° with a preferred value of 1.0°. The screen shown above uses the “symmetric” format.

“Non-Symmetric” specifications have unequal plus (+) and minus (-) tolerances; that is, the tolerance allows an unequal deviation each side of the preferred value. This

requires two values to be entered for the tolerances. For example, a camber specification might be:

1.0° +1.0° -0.5°

This specification allows an “in spec” range of 0.5° to 2.0° with a preferred value of 1.0°. If the screen shown above is switched to the “non-symmetric” format, it appears as follows:



You can toggle between the “symmetric” format and “non-symmetric” format by pressing “Show Symmetric Tolerances” and “Show Asymmetric Tolerances.”

NOTE:	If the format is asymmetric and the plus (+) and minus (-) tolerances are unequal for at least one tolerance pair, then the screen cannot be changed to the symmetric format. If this is the case, the “Show Symmetric Tolerances” key will be gray and will not respond.

Primary, Secondary, and Symmetry Specification Groups

The specifications and tolerances are shown in three different groups:

“Primary specifications” are the usual camber, caster, total toe, and thrust angle specifications and tolerances.

“Secondary specifications” are S.A.I., toe-out-on-turn, and maximum steering angle specifications and tolerances.

“Symmetry specifications” are set back, wheelbase, track width, and lateral offsets.

You may select any of these groups by pressing “Show Secondary Specifications,” “Show Symmetry Specifications,” and “Show Primary Specifications”.

Specification Details

For a more complete explanation of alignment parameters, refer to the glossary.

The “Individual Toe” specifications and tolerances are derived by dividing in half the corresponding “Total Toe” specifications and tolerances, thus no entry fields appear for the individual toe values.

The “Cross Camber” and “Cross Caster” specifications are zero and may not be changed, thus no entry field appears for these values.

The “Cross Camber” and “Cross Caster” tolerances are always treated as symmetric tolerances, thus only one entry field appears for each of these values, even when the “non-symmetric” format is shown.

The “Thrust Angle” specification is zero and may not be changed, thus no entry field appears for this value.

The “Thrust Angle” tolerance is always treated as a symmetric tolerance, thus only one entry field appears for this value, even when the “non-symmetric” format is shown.

The “Included Angle” specifications and tolerances are derived by adding the corresponding specifications and tolerances for “S.A.I.” and “Camber,” thus no entry fields appear for these values.

The “Turn Reference” specification is the value used as the “steering target” when measuring toe-out-on-turns. A negative value means “this is the target for steering the inside wheel” while a positive value means “this is the target for steering the outside wheel.”

The “Left Turn Difference” specification is the specification for the difference in toe between the wheels when they are steered to the left during measurement of toe-out-on-turns. The “Right Turn Difference” specification is the specification when the wheels are steered to the right. In each case, the specification applies when the “target wheel” is steered to the “Turn Reference” angle, as explained above. Note that the corresponding tolerances are shown on the display as being common to both specifications.

The “Maximum Left Steer - Left” specification is the specification for the left wheel when the wheels are steered to the left during measurement of maximum steering angles. The “Maximum Right Steer - Left” specification applies when the left wheel is steered to the right. Similar specifications are used for the right wheel. Note that the corresponding tolerances are shown on the display as being common to all four specifications.

The “Set Back” specification is zero and may not be changed, thus no entry field appears for this value.

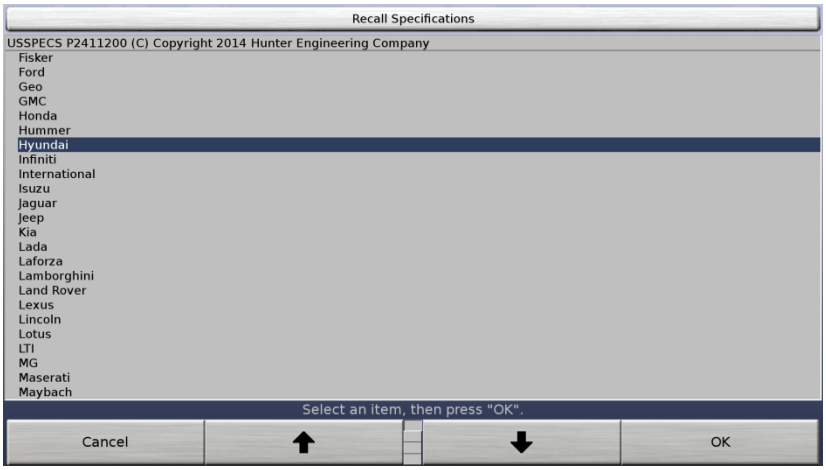
The “Set Back” tolerance is always treated as a symmetric tolerance, thus only one entry field appears for this value, even when the “non-symmetric” format is shown.

The “Wheelbase” and “Track Width” specifications are entered as distances, and tolerances do not apply. These values are used to compute the “Wheelbase Difference Distances,” “Track Width Difference Distances,” “Set Back Distances,” and “Lateral Offset Distances” from the corresponding angular measurements.

The “Wheelbase Difference,” “Track Width Difference,” “Left Lateral Offset,” and “Right Lateral Offset” specification and tolerances are entered as “angles.” The corresponding measurements are explained further in the glossary.

Recalling Specifications

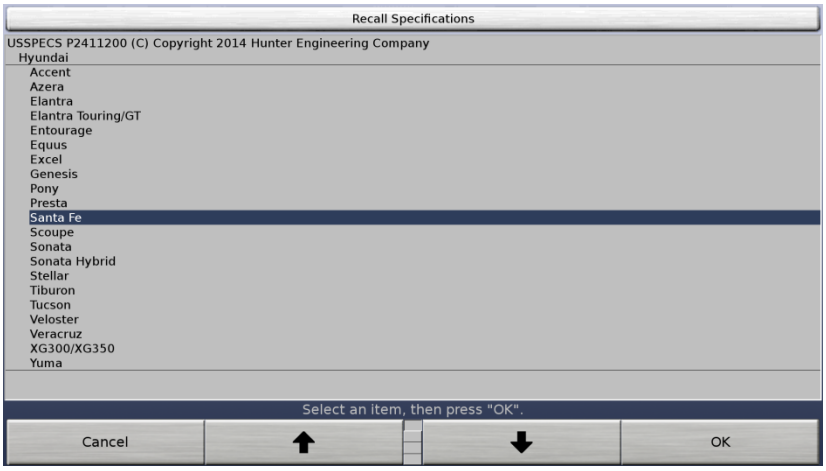
The “Recall Specifications” screen allows you to recall vehicle specifications from the specification database.



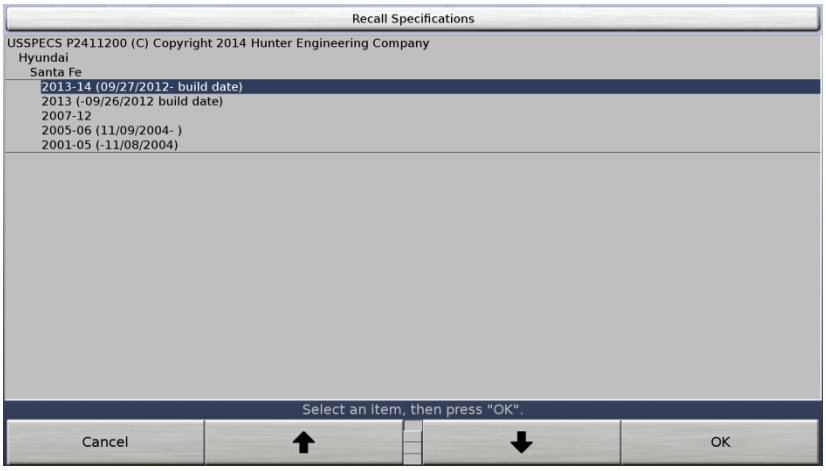
This screen is displayed by pressing “Recall Specifications” on the “Vehicle Specifications” screen.

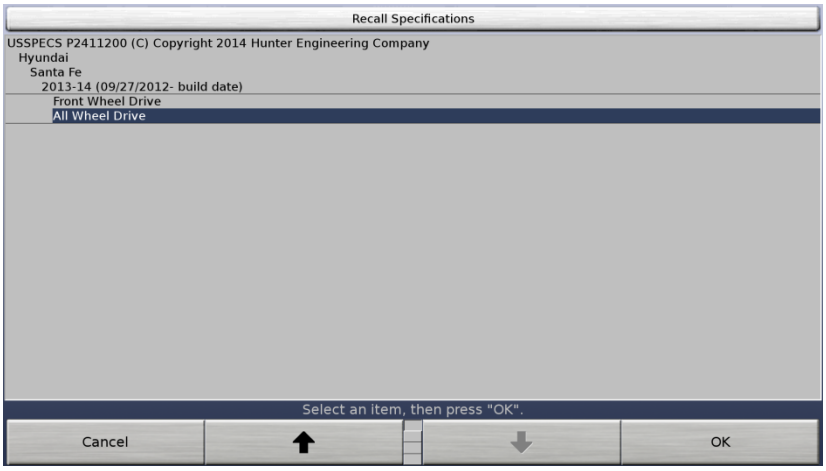
The procedure begins by showing a list of the vehicle manufacturers, as shown above. By scrolling through the softkeys there will also be a selection for “User Specs” entered by the technician and stored on the aligner. For more information refer to the section “Recalling User Specifications.”

Press ↑ or ↓ to move the highlight to the manufacturer of the vehicle being aligned, or press ↑↑ or ↓↓ to move a full page at a time. Press “OK” to select that manufacturer. The screen changes to show the models available for the selected manufacturer.

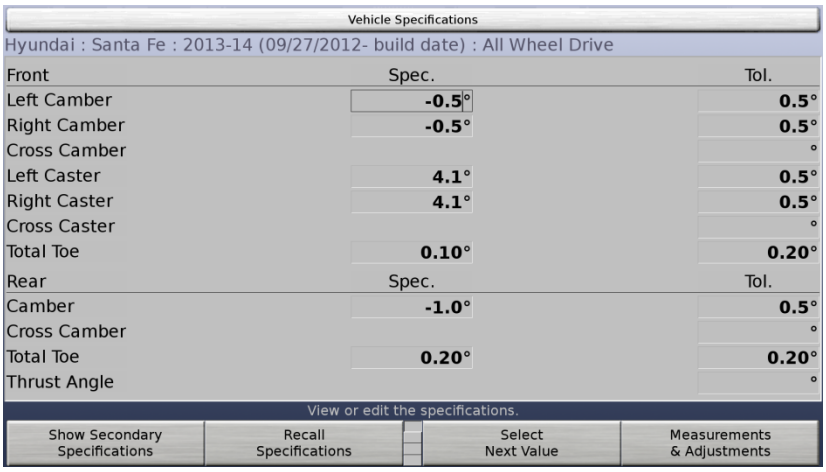


Again, press ↑ or ↓ to move the highlight to the year and model of the vehicle being aligned, or press ↑↑ or ↓↓ to move a full page at a time. Some vehicles will have multiple sub-menus.





Press “OK” to select that year and model, at which time the specifications are recalled.



Specifications may be recalled at any time during the alignment. The recalled specifications replace all specifications currently shown on the “Vehicle Specifications” screen.

If the toe units are “inches @ reference diameter” or “mm @ reference diameter,” and the specification database does not contain the required reference diameter, then a prompt to manually enter the reference diameter will appear BEFORE recalling the specifications.

NOTE:	Although the factory specification database is extensive, some vehicle manufacturers and/or specific models may not be included. If necessary, locate the alignment data in the alignment specification book or the vehicle manufacturer’s service manual and manually enter the specifications on the “Vehicle Specifications” display, as described next.

Editing and Storing Specifications

Entering and Editing Specifications

Specifications might have to be entered or edited manually on the “Vehicle Specifications” screen. The reasons for this are:

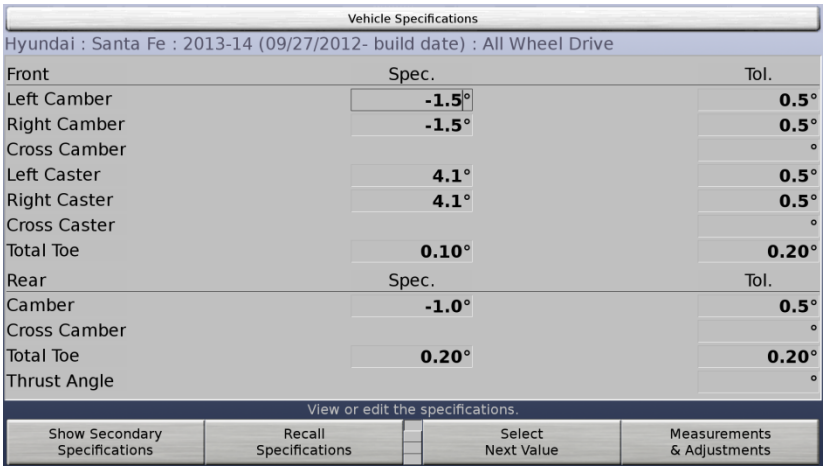
The specifications for the vehicle cannot be found in the specification database.

The specifications must be altered from the settings found in the specification database.

Use the following procedure for editing or entering a specification or tolerance value:

Press “Select Next Value” or use the mouse to advance the entry window to the location of the value. With the mouse, move the cursor over the desired field and press the click-select button.

Key-in the new value.



NOTE:	If you edit a specification or tolerance value, the identification of the vehicle which was recalled from the database is removed from the screen. Only unaltered specifications are identified as being found in the database.

Specifications may be entered in the following formats:

whole numbers

decimal numbers

fractions

whole numbers and fractions

degrees and minutes

The rules for keying in values are as follows:

Use the “Space” key to separate whole numbers and fractions. For example, “2 1/2” would be entered as

Press [2] [ ] [1] [/] [2] “Enter Value”

Use the “Space” key to separate degrees and minutes. For example, 2° 15’ would be entered as,

Press [2] [ ] [1] [5] “Enter Value”

If the degrees and minutes specification is less than 1°, enter a “0” for degrees. For example, 6’ would be entered as,

Press [0] [ ] [6] “Enter Value”

NOTE:	Tolerances cannot be set to zero. The system will not accept a zero tolerance.

NOTE:	Tolerances must be positive. The system will not accept a negative tolerance.

NOTE:	Specifications are assumed to be positive unless the minus (-) sign is keyed in before the specification value.

NOTE:	To change the display units (i.e. degrees, inches, minutes, etc.), refer to the section on “Selecting Display Units.”

Specifications and tolerances may be changed at any time during the alignment process. Simply change to the “Vehicle Specifications” screen and change the necessary value as described above.

Storing “User Specifications”

The program can store vehicle specifications entered and named by the user. Specifications can be created or modified for vehicles that have been modified, such as custom cars, or have specific requirements, such as always loaded construction vehicles.

These specifications can take two forms:

They can be manually entered onto a blank specification screen. To get a blank specification screen, press “Cancel” to exit the recall specifications screen.

OR

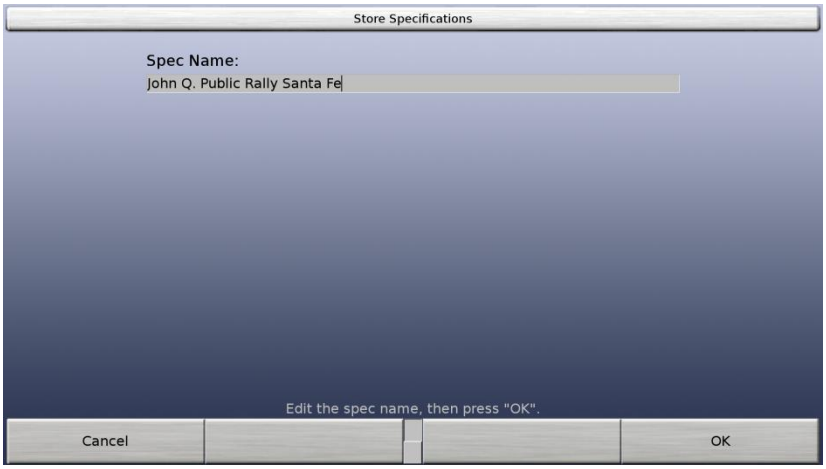
They can be derived from a factory specification by recalling and then editing the specifications for a vehicle.

These specs are stored in a separate user specs database. The User Spec database has slots for up to 100 user-entered specs. When the 101st spec is entered the screen will prompt to delete a specific spec or to delete the oldest spec entered.

To store a specification:

Complete a blank specification or edit an existing specification.

When the specifications are ready to store, press “Store In User Specs.” The “Store Specification” screen will appear.



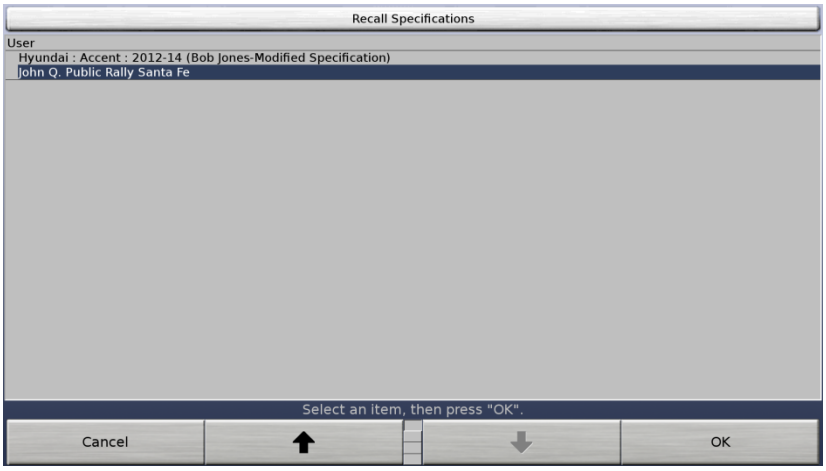
Use the keyboard to enter the appropriate name to identify this stored spec for future reference. Select “OK” when the information is complete.

User Specs will be saved in a separate user’s specs database. These specs are not merged with the standard spec database.

Recalling User Specifications

The system can store user-entered specifications in addition to those contained in the factory specification memory. These specifications may be recalled and used during an alignment.

To recall specifications from the User specification memory, the “Recall Specifications” screen must be currently displayed. Press “User Specs” to display a list of stored user specs.



Press ↑ or ↓ to highlight the desired user spec, and select “OK.”

The vehicle specifications will be retrieved from the “User” specification memory. When the specifications have been retrieved, the screen will change to display those specifications.

Reducing Tolerances

Tolerances that are too large may allow a less than desirable alignment while tolerances that are too small may make adjustments difficult. Reduce certain tolerances to pre-defined small values by using a single keystroke.

The procedure for reducing tolerances is as follows:

Press “Reduce Tolerances.”

Front and rear camber tolerances are reduced to ± 0.25° (1/4°).

Front caster tolerances are reduced to ± 0.50° (1/2°).

Front and rear total toe tolerances are reduced to ± 0.06” (1/16”, 0.13° or 1.5mm depending upon toe units selected).

NOTE:	Only tolerances greater than these will be reduced, and so the manufacturer’s recommended tolerances are not exceeded. Only tolerances are altered; the specifications are left unchanged.

Printing the Specifications

The vehicle specifications are printed along with the alignment measurements from the “Print Alignment Summary” screen. See the section on “Printing the Measurements.”

Selecting the Alignment Type

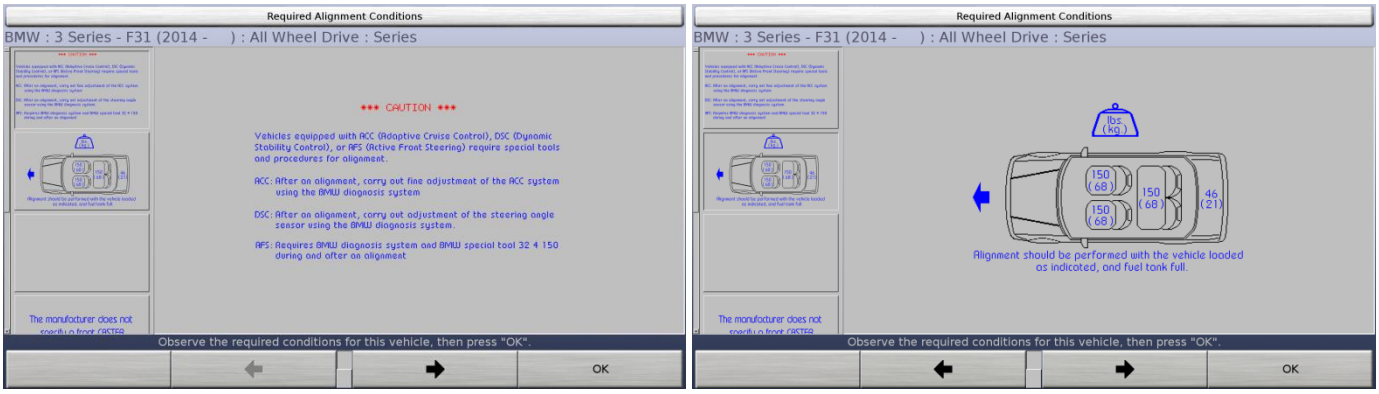
The “Alignment Type Selection” screen enables the alignment type to be used.

If the alignment type is changed from “Total Alignment” to “Centerline Alignment” during the course of a job, the compensation of the rear sensors will be reset, and will not allow the rear sensors to be compensated from that point onward.

If the alignment type is changed from “Centerline Alignment” to “Total Alignment” during the course of a job, the compensation of the rear sensors will be allowed, and will require compensation of the rear sensors before measurements will be shown.

Viewing the Required Alignment Conditions

The “Required Alignment Conditions” screen illustrates the vehicle conditions required by the vehicle manufacturer for correct wheel alignment. It also displays any adjustment illustrations that may be available for that vehicle.



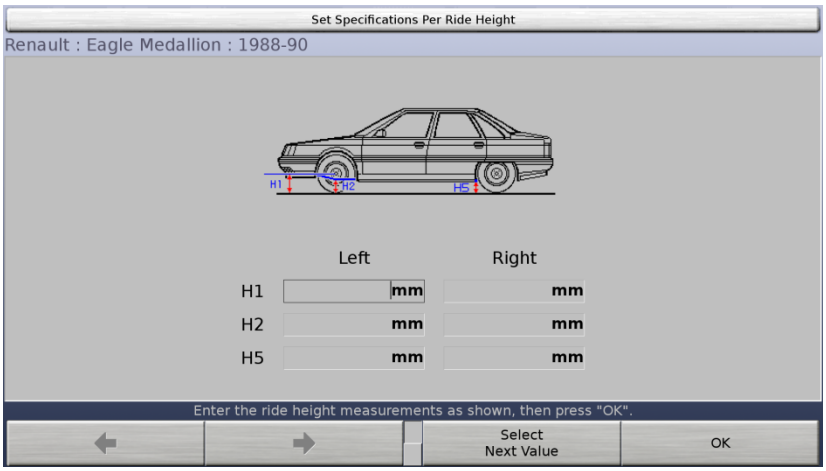
This screen is displayed automatically after the specifications of the vehicle are recalled, if such illustrations are available for that vehicle. It is also displayed when “Illustrate Adjustments” is pressed on the “Vehicle Specifications” or “Vehicle Measurements and Adjustments” screen.

Press ← or → to show the previous or next illustrations, respectively. The ← key is “grayed out” when the first illustration is shown, and the → is “grayed out” when the last illustration is shown.

After all of the “Required Alignment Conditions” screens have been viewed, press “OK” and the “vehicle Specifications” screen will appear.

Selecting Specifications Per Ride Height Measurements

The “Set Specifications Per Ride Height” screen permits setting certain specifications by entering measurements of ride height.



If ride height specifications are available for the recalled vehicle, “Required Alignment Conditions” screens explaining vehicle height measurements and then the “Set Specifications Per Ride Height” screen is displayed automatically. It is also displayed when “Set Specs Per Ride Height” is pressed on the “Vehicle Specifications” screen.

NOTE:	The “Set Specs Per Ride Height” key is “grayed out” if the current vehicle does not have any such specifications.

To set specifications by ride height, view the illustrations within the “Required Alignment Conditions” screens to determine how the measurements are to be made. Press ← or → to show the previous and next illustrations, respectively.

The ← key is “grayed out” when the first illustration is shown, and the → is “grayed out” when the last illustration is shown.

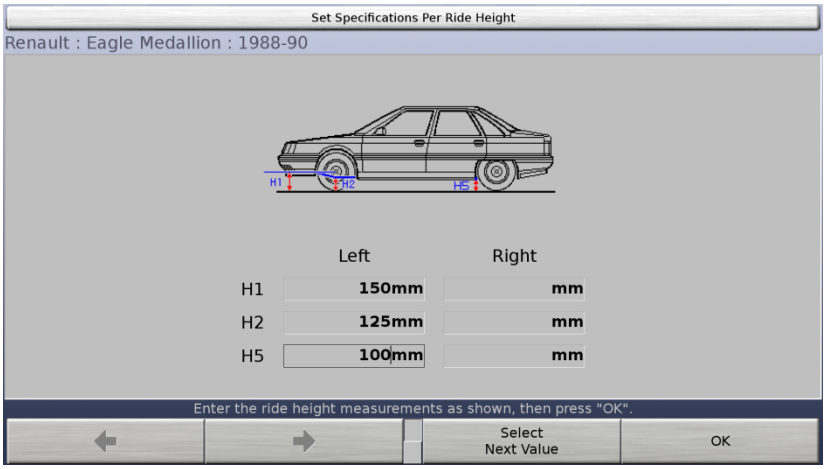
After all of the “Required Alignment Conditions” screens have been viewed, press “OK” and the “Set Specifications Per Ride Height” screen will appear.

Key-in the first ride height measurement and press “Select Next Value.” The value is then “entered” and the entry point advances to the next value. The tab key or mouse can also be used to advance to the next field on the “Set Specifications Per Ride Height” screen.

Key-in the remaining values in the same manner.

Press “OK” to accept the values. The system will determine the specifications corresponding to the ride height measurements and will enter those specifications on the “Vehicle Specifications” screen.

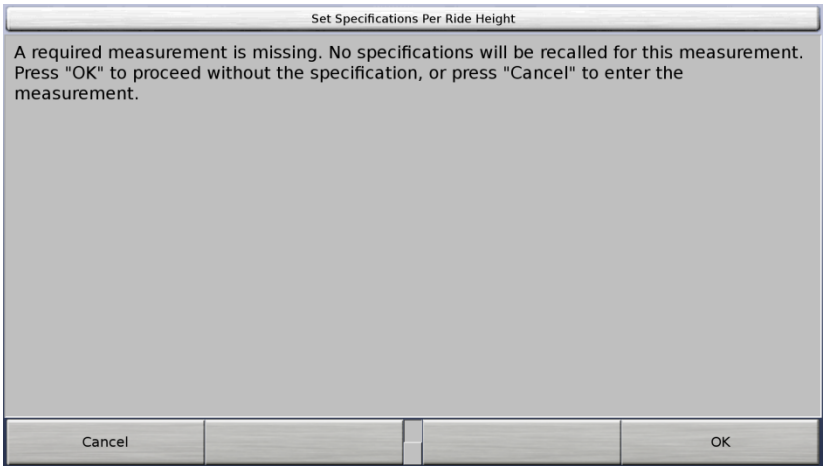
It is recommended to measure and key in both “left” and “right” values for a particular ride height. The system will then average the two values. If you enter only the left or right value the system will warn you, as shown:



> **⚠ CAUTION:** If both sides of the vehicle are not measured, and the vehicle is not evenly loaded or has sagging springs, incorrect values may be entered.

If the warning appears, press “Cancel,” to continue editing the values. Press “OK,” to use whatever values entered.

If the values entered are outside the allowed range, a warning will appear, as shown:



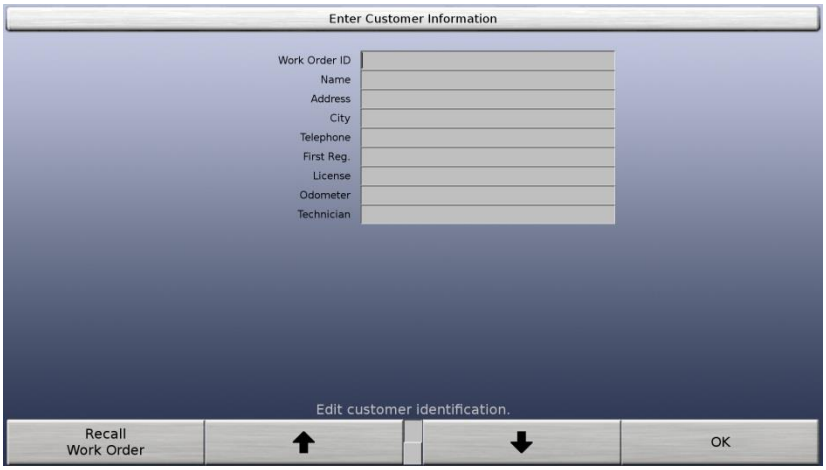
If the warning appears and “Cancel” is pressed, the values may be edited. Press “OK,” to use those values which are within the allowed range.

⚠ **CAUTION:**	If you enter values outside of the allowed range, certain specifications will not be entered.

3.2 Customer Identification

Entering Customer Identification

The “Edit Customer Identification” screen provides detailed information to be associated with a specific work order and to be included on the printout.



The customer information fields displayed are chosen during aligner setup. Refer to Chapter 2, “Aligner Set-up” for complete instructions.

The entry procedure is:

Use the keyboard to enter customer information.

Advance to the next field with the mouse or by pressing ⬇.

Continue until all of the desired fields are completed.

Press “OK” to store entries.

Work Management Database

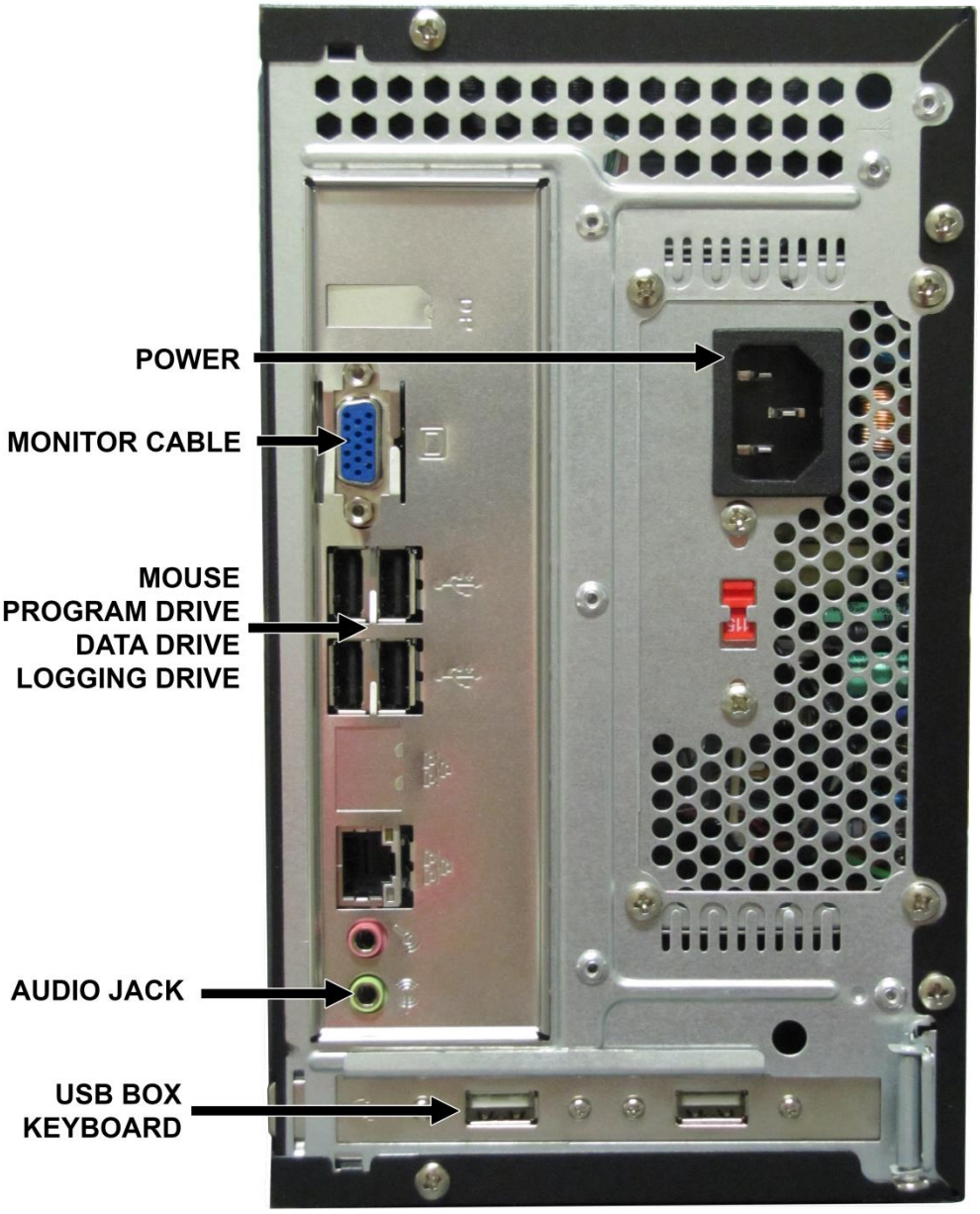
Work Management provides a database for storing work orders, customer identification, and vehicle identification. Work Management also provides methods to store and recall customer and vehicle identification.

Data Drive

⚠ **CAUTION:**	The console must be “off” when the Data Drive is installed or removed. The PA200 does not support plug and play.

NOTE:	The Data Drive is required to store and retrieve Work Management records.

With the console “off,” insert the Data Drive into one of the USB ports located on the back of the PC in the console. Then turn the console “on.”

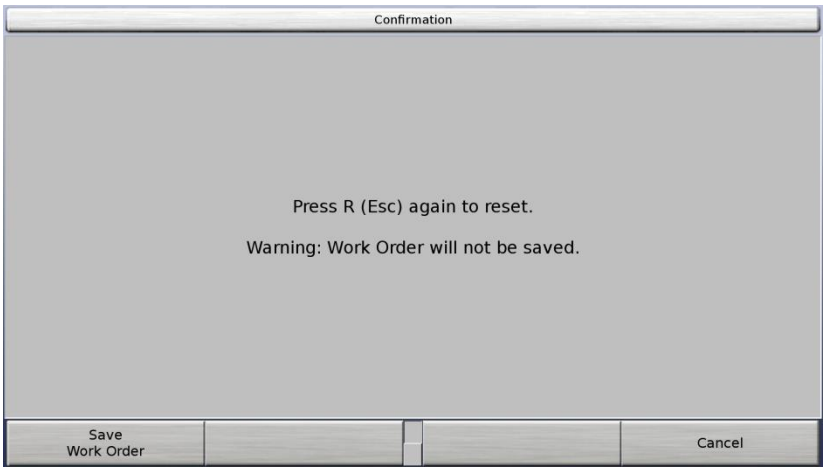


Storing a Work Order to the Work Management Database

To create a record within the work management database, press “Save Work Order” from the “Confirmation” screen when the alignment program is reset as follows:

At the end of the alignment, press the R (Esc) key located in the upper, left corner of the keyboard.

From the “Confirmation” screen, press “Save Work Order.”

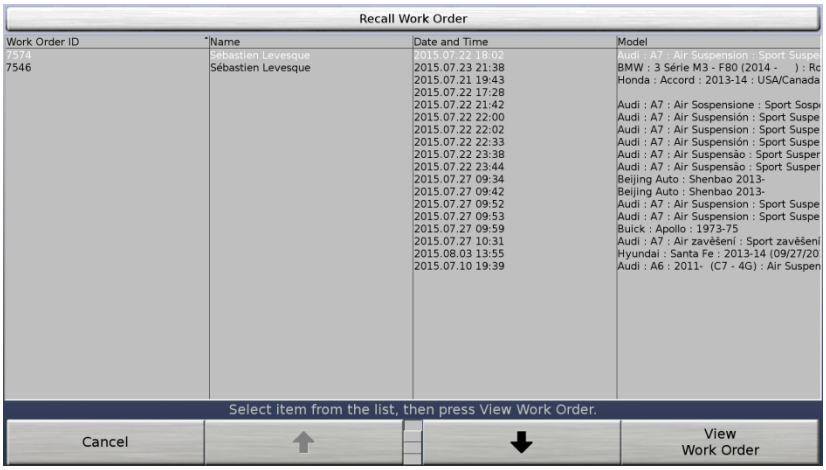


The customer identification, vehicle identification, and alignment measurements collected during the alignment process are stored on the Data drive and the display returns to the “Start-up” screen.

Recalling Customer Information from Work Management

NOTE:	The Data Drive must be installed for this feature.

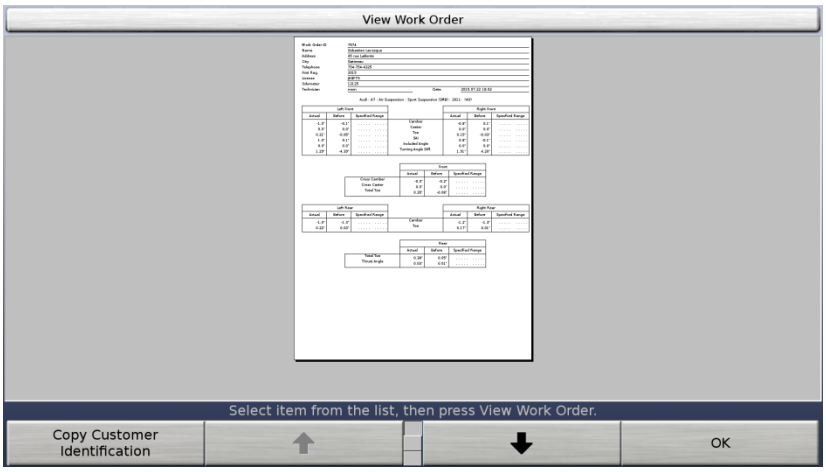
From the “Edit Customer Identification” screen, press “Recall Work Order” to open the “Recall Work Order” screen.



The “Recall Work Order” screen displays the work management records. The individual records are identified by the four fields chosen during aligner setup.

The recalled work orders can be organized by sorting the database by any of the four fields. Pressing “Sort Column 1,” “Sort Column 2,” “Sort Column 3,” or “Sort Column 4” to sort the work orders accordingly.

Once the desired work order or customer has been located with the work management database, press ⬆ or ⬇ to highlight (text changes to white) the desired record and then press “View Work Order.”



NOTE:	Customer information can be changed after it is imported to the current work order. Customer information within a recalled work order cannot be changed.

After confirming that the customer information is correct, press “Copy Customer Information” to import the stored customer. The “Edit Customer Identification” screen will appear with the copied customer information placed in the appropriate fields.

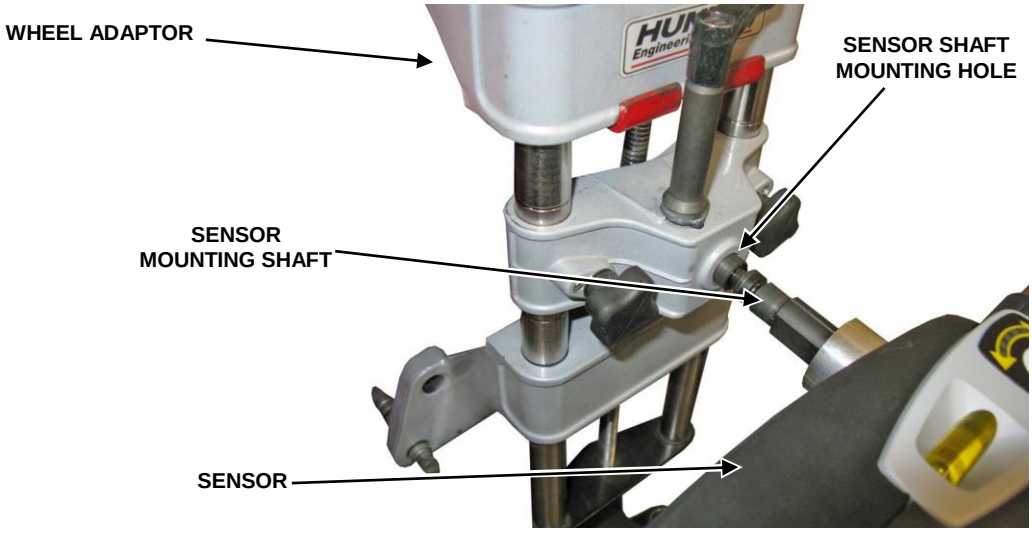
3.3 Sensors and Targets

Mounting Sensors or Targets onto Wheel Adaptors Using Self Centering Adaptors

Sensors or targets may be mounted on the wheel adaptors before mounting the wheel adaptors on the vehicle. In some cases, it may be easier to mount the wheel adaptor without the sensor or target (Either method may be used).

⚠ **CAUTION:**	Hand tighten center casting lock knobs as tight as possible (DO NOT USE TOOLS TO TIGHTEN).

Insert the sensor or target mounting shaft into the mounting hole in the middle of the center casting.



With the sensor or target tightly against the surface of the wheel adaptor, lock the sensor shaft into place with the adaptor's racket locking lever. *Refer to following section regarding the locking ratchet locking lever.*

The locking lever should be rotated until firm hand pressure is applied. Tools should not be used to force the locking lever.

⚠ **CAUTION:**	When mounting sensors or targets to the wheel adaptors, the sensor or target shaft must be fully seated. Make certain that there is no play or looseness between the sensor or target shaft and the wheel adaptor. Sensors or targets must fit tightly against the surface of the wheel adaptor or the lock may not hold.

NOTE:	Sensor and targets should not be re-positioned on the wheel adaptors at any time during the alignment. If the sensor, target or wheel adaptor is removed from the wheel during the alignment, it will need re-compensated using jacking compensation.

Operation of Ratchet Locking Lever

Adjusting Ratchet Locking Lever

Insert the mounting shaft into the sensor or target mounting hole in the middle of the center casting.

Rotate locking lever clockwise to tighten. If upper casting prevents rotation of lever, either expand adaptor to move upper casting or re-position the lever by lifting lever up to disengage, rotating counter-clockwise, and lowering to re-engage.

Proceed until the shaft is locked tight to adaptor.

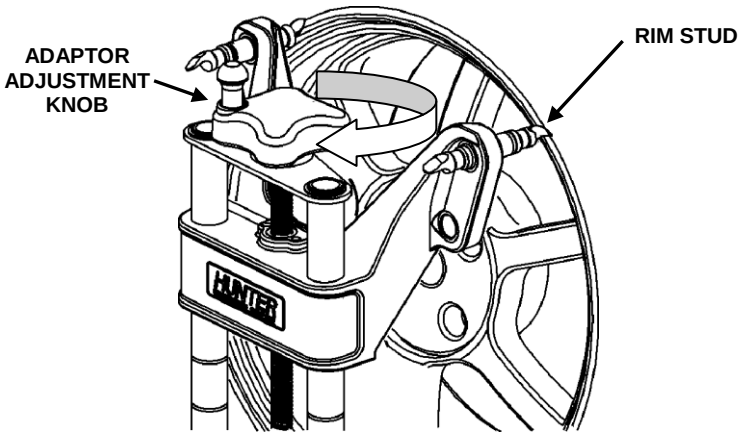
With shaft fully locked, re-position the lever to the 9 o'clock position by lifting lever up to disengage, rotating to 9 o'clock, and lowering to re-engage.

Mounting Wheel Adaptors onto Wheels

Typical Installation (Grasping the Outside of Rim Lip)

NOTE:	Rim studs are reversible. Use the spade end that best fits the rim. The two wheel adaptors on the front wheels or back wheels need to be uniform with same end of the rim studs engaged onto the rim.

Position the wheel adaptor with the two upper rim studs on the outside of the wheel rim lip.



Turn the adaptor adjustment knob as needed to expand the adaptor to fit the rim.

Align the two lower rim studs to grasp the outside of the rim.

Turn the adaptor adjustment knob to firmly grip the adaptor onto the wheel.

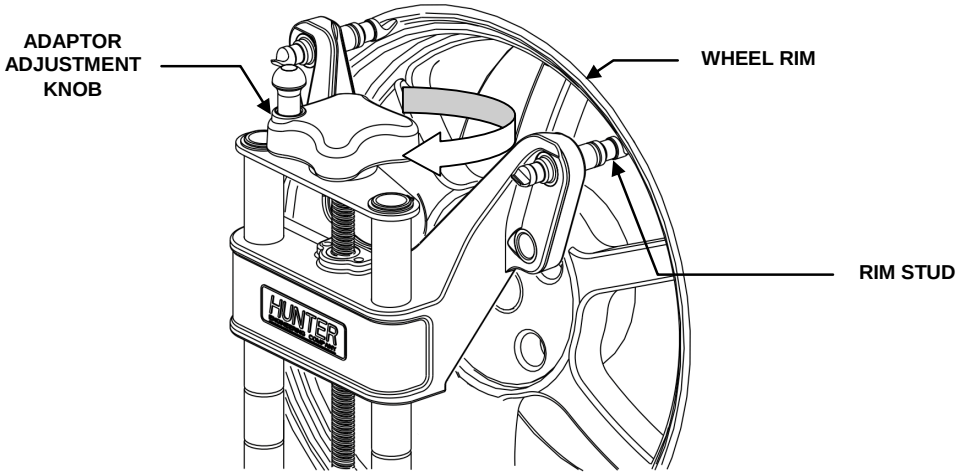
Test the security of the installation by lightly tugging on the wheel adaptor.

Attaching to Inner Rim Lip

Position the wheel adaptor with the two lower rim studs engaging the inner portion of the rim lip.

Turn the adaptor adjustment knob as needed to compress the adaptor to fit within the lip of the rim.

Align the two upper rim studs to grasp the wheel rim lip.



Turn the adaptor adjustment knob to expand the adaptor against the inner portion of the rim lip.

Test the security of the installation by lightly tugging on the wheel adaptor.

Compensating DSP700 Series Sensors

The sensors must be compensated to eliminate errors in angle measurements caused by runout of the wheel, wheel adaptor, and sensor shaft.

The sensors must be “ON” to compensate.

Do not disturb the sensor until the two outer LED’s respond.

Sensors may be compensated in any order; however, these precautions must be followed:

If a sensor is removed from a wheel, that sensor must be re-compensated when reinstalled. The other sensors do not need re-compensation.

During two-point compensation and normal operation, be certain no obstructions are blocking the infrared beams between the sensors. When compensating sensors that are mounted to the vehicle drive wheels, place the transmission in NEUTRAL.

The lift/rack should be level and on the leveling legs, if so equipped.

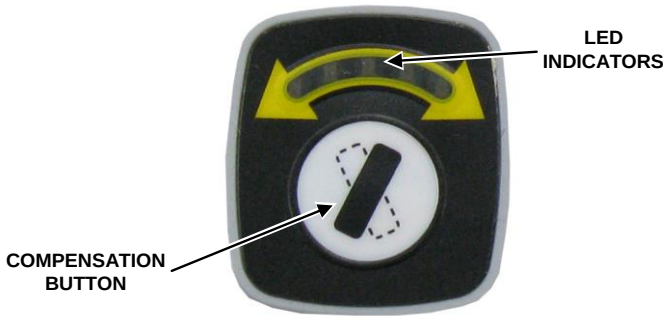
3-Point Compensation

All sensors need not be mounted before starting compensation.

Raise either the front or rear axles, or both, while remembering to use the safety on all jacks.

⚠ **WARNING:**	**If only one axle is to be raised, chock wheels on the axle that is not being raised (before raising), to prevent the vehicle from rolling.**

Turn sensors on and select any one of the sensors for compensation. The starting position of the wheel adaptor does not matter. The middle LED will be on.



Hand-tighten the sensor lock knob.

Rotate the wheel until the sensor is level (as indicated by the spirit level on top of the sensor).

Press the compensate button. Do not disturb the sensor until the two outer LED’s begin to blink and the middle LED turns off, indicating that the measurements have been stored.

Loosen the sensor lock knob and rotate the wheel 120°, clockwise or counter clockwise, until the middle LED turns on. Hand tighten the sensor lock knob and rotate the wheel to level the sensor.

NOTE:	It is recommended that the front wheels of front wheel drive vehicles be rotated in the forward direction to reduce disturbing the sensor on the opposite front wheel.

With the middle compensate LED on, press the compensate button. Do not disturb the sensor until the two outer LED's begin to blink faster and the middle compensate LED turns off to indicate that the measurements have been stored.

Loosen the sensor lock knob and rotate the wheel 120° more, until the middle LED turns on. Hand tighten the sensor lock knob and rotate the wheel to level the sensor.

With the middle LED on, press the compensate button. Do not disturb the sensor. Wait for the sensor to save the measurement. The two outer LED's and the middle LED will stay on.

Loosen the sensor lock knob.

The sensor is now compensated. Repeat this procedure for the remaining sensor(s).

After three-point compensation, the wheel may be rotated to any position without affecting the alignment measurements.

NOTE:	All sensors should be level, but unlocked to minimize tilt of the sensors. Avoid rapid steering motion that may cause sensors to swing vertically, which can cause them to come into contact with the rack, or even dislodged from the wheel.

Remove the lock pins from the turning angle gauges and rear slip plates.

Apply the parking brake and place the transmission in park if applicable.

Lower the vehicle onto the rack.

Jounce the vehicle.

Continue the alignment procedure.

For three-point compensation, if a previously compensated sensor should require re-compensation, pressing the sensor compensate button twice within four seconds will restart the compensation procedure and retake the first reading for that sensor at this position.

Compensating Camera Based Targets

General Compensation

The camera based sensors must be compensated to eliminate errors in angle measurements caused by runout of the wheel, wheel adaptor, and target shaft.

The default setting for the alignment console is rolling compensation. Jacking compensation may be selected from the compensation screen.

When using Jacking Compensation, targets may be compensated in any order; however, these precautions must be followed:

If a target is removed from a wheel, that target must be re-compensated when reinstalled. The other targets do not need re-compensation.

When compensating targets that are mounted to the vehicle drive wheels, place the transmission in NEUTRAL.

The lift rack should be level on the leveling legs when the legs are present on the lift.

The lock pins must be in place on the turnplates and rear slip plates during rolling target compensation.

About Rolling Compensation

When performing rolling compensation with Hunter Camera Based Targets (or any alignment sensors), follow these guidelines to obtain the best results.

Perform a vehicle inspection before beginning alignment

Inspect vehicle for loose or worn parts that may prevent proper alignment.

ProAlign® software will notify the operator if the vehicle has excessive total toe with Roll-Check®. Excessive total toe is a good indication of loose or worn parts.

Do not perform the procedure on a vehicle that has uneven or out-of-round tires.

Changing to Live Planes within ProAlign® software will compensate for uneven tires during the alignment. The vehicle's on-road performance will still be adversely affected by uneven tires.

Properly set tire pressure before performing procedure.

Changing to Live Planes within ProAlign® software will compensate for improperly set tire pressure during the alignment. The vehicle's on-road performance will still be adversely affected by improper tire pressure.

Practices to follow for best results

Have the wheels in the straight-ahead position, as the wheels typically are after driving the vehicle onto the lift.

ProAlign® software will notify the operator if the vehicle is not steered straight-ahead. Roll-Check screen appears and helps the operator straighten the wheels.

Watch for changes in the steering direction as the vehicle is rolled. If steering direction changes are noticed, re-compensate using a steering wheel holder.

On Hunter Lifts, position a turnplate bridge, Kit 20-1471-1, within the gap behind each turnplate to create a smooth rolling surface.

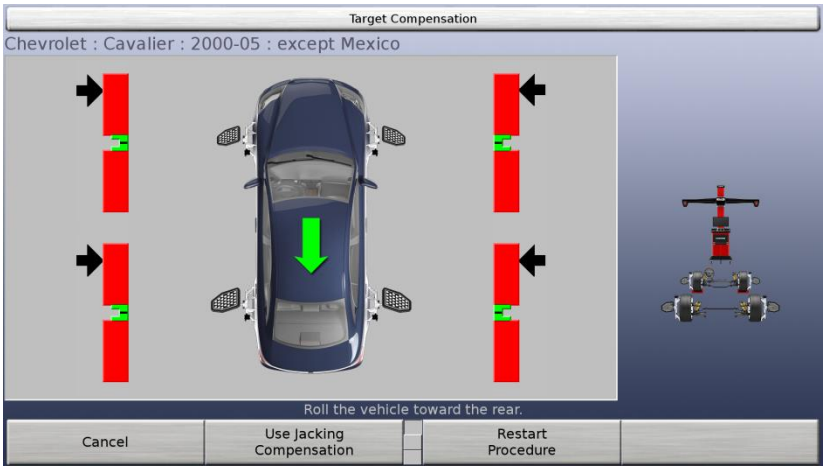
The alignment lift should be level to place the vehicle's suspension and steering systems in their neutral positions.

Changing to Live Planes within ProAlign® software will compensate for an alignment lift that is not level.

Roll the vehicle by rotating the left rear tire. Changes in the vehicles path and ride height are avoided by moving the vehicle with the left rear tire.

Rolling Compensation

The default setting for Camera Based compensation is rolling compensation. With this setting the compensation screen will automatically proceed to rolling compensation. Rolling compensation is performed using bar graphs.



Verify that the pins are in the turnplates and slip plates. Position a turnplate bridge in each pocket behind the turnplate so the runway surface and the bar surface are flush. Rotate the bridges so they are taller than wide.

Place wheel chocks that limit rearward motion approximately 15 inches behind rear wheel(s).

Steer ahead.

Mount the targets and wheel adaptors on the wheels. Refer to "Mounting Sensors or Targets Onto Wheel Adaptors."

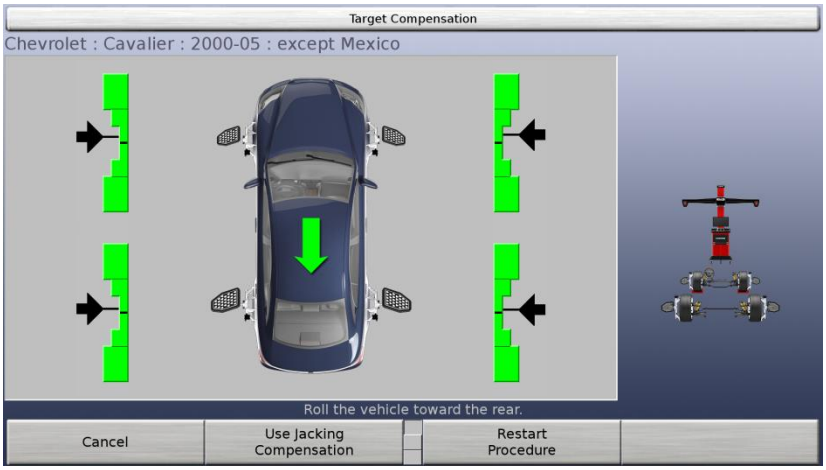
NOTE:	Once the targets are leveled (for compensation), they should not be re-leveled at any time during the alignment. If the target is removed from the wheel or adaptor during the alignment, it must be re-leveled and re-compensated, using jacking compensation.

NOTE:	Beginning the rolling compensation procedure removes any previous compensation from the targets.

NOTE:	It is recommended to roll the vehicle by rotating the left rear tire. Do not push or pull the vehicle by the front (steering axle) tires or wheels during rolling compensation. Do not push or pull on spoilers, fascia moldings, or other trim accessories.

As needed, manually move cameras up or down to bring all four targets in view of the cameras.

The screen instructs you to roll the vehicle rearward. Release parking brake and put transmission in neutral. Roll the vehicle rearward until the bar graph turns green.

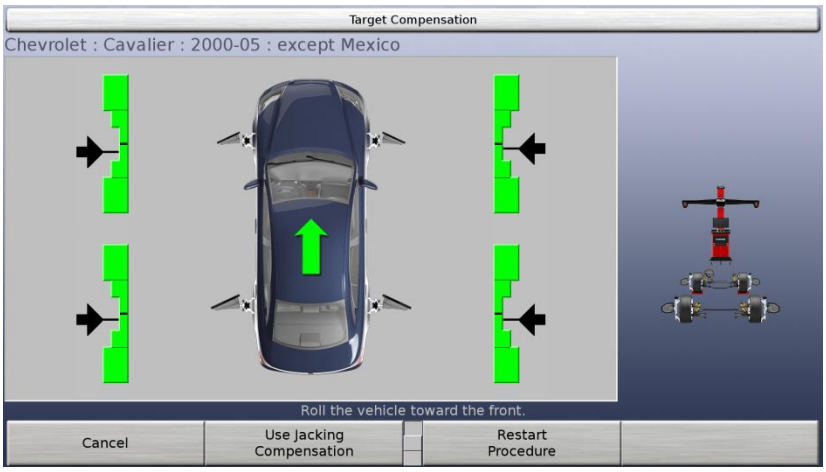


NOTE:	A vehicle with 28 inch diameter tires will require approximately 12-14 inches of movement. Smaller diameter tires will require less movement, while larger diameter tires will require more.

Stop rearward movement of the vehicle after the bar graph turns green. The bar graph (arrow) will disappear for a moment.

If a remote indicator is used, indicators for all four wheels will be flashing, indicating to roll forward.

When the compensation bar graph (arrow) reappears, roll the vehicle toward the front until the bar graphs are green.

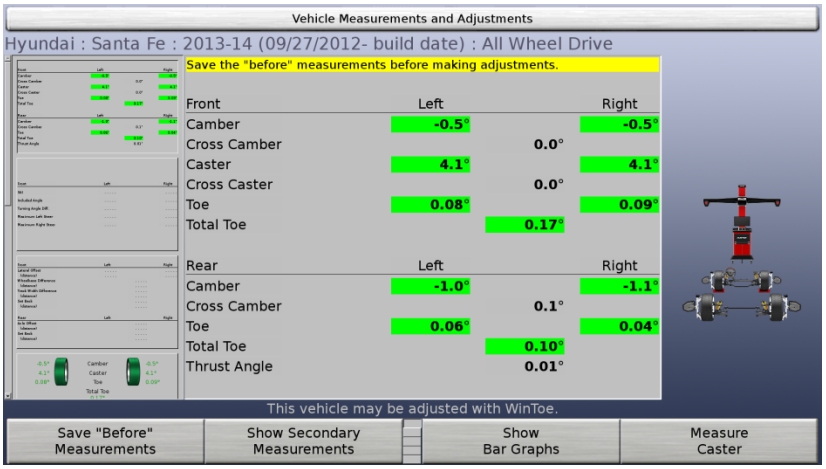


When all four targets have been compensated, apply the vehicle parking brake and place the transmission in park, if applicable. On standard transmission vehicles, the transmission should be placed in neutral.

Position chocks at the front and rear of the left rear tire to keep the vehicle from rolling.

NOTE:	The rolling compensation procedure **MUST** end with the vehicle in the proper position to check and adjust the alignment. The targets are **NOT** allowed to rotate after the procedure is performed.

After the targets have been compensated, the Vehicle Measurements and Adjustments screen will appear.



If not already done, block the wheels, then remove the pins from the turnplates and slip plates.

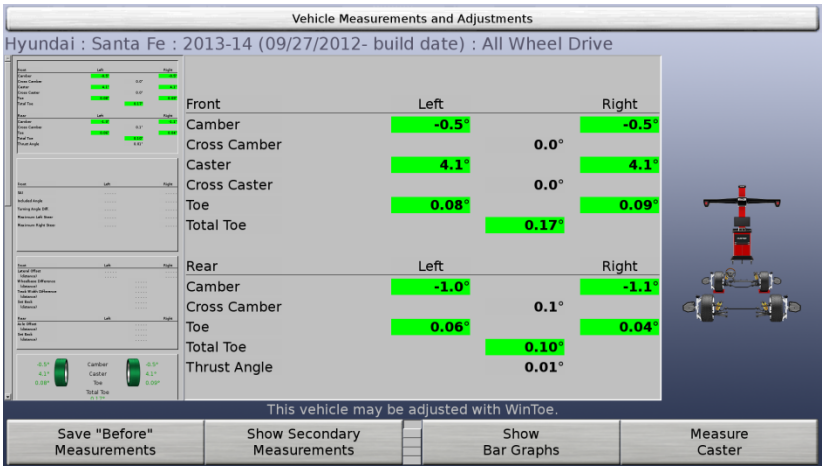
Remove or rotate the turnplate bridges so they are wider than tall.

NOTE:	On Hunter lift racks, the turnplate bridges can be stored in the same gap behind the turnplates. Rotate the bridges so they are wider than tall. Rotating the bridges is necessary to prevent interference with turnplate movement.

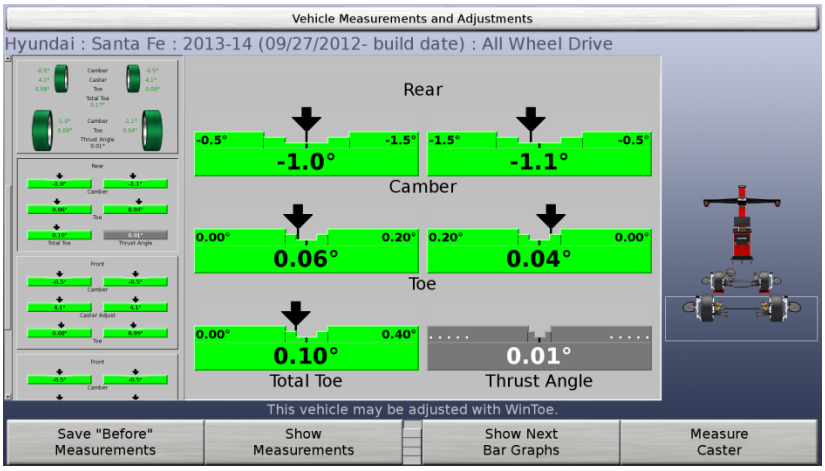
Rolling compensation is complete.

3.4 Vehicle Measurements

The “Vehicle Measurements and Adjustments” screen shows the alignment measurements of the vehicle.



This screen is displayed by pressing “Vehicle Measurements and Adjustments.”



This screen is used to:

- view the alignment measurements of the vehicle
- compare the alignment measurements to the corresponding specifications
- adjust the alignment to match the specifications

Other screens are available from this screen to:

- measure caster, S.A.I., and included angle
- measure set back and other symmetry angles
- measure toe-out-on-turn angles
- measure maximum steering angles
- save the “Before” measurements
- jack up the axles
- adjust rear camber and toe using full-contact shims
- adjust front camber and caster using shims
- adjust front camber and caster using cams or slots
- adjust front toe using WinToe

This screen shows a prompt just above the softkeys identifying any specialized adjustment screens that are available for the vehicle recalled from the specification database. This will be some combination of the following:

front shim adjustments

front cam adjustments

front slot adjustments

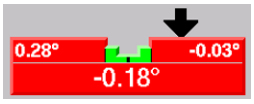
rear shim adjustments

front WinToe adjustments

About Alignment Measurements

Alignment measurements are measured by the sensors and can be compared to the corresponding specifications and tolerances. They can be shown in two different formats:

Measurements are shown numerically. The value may indicate the actual measured value (i.e. “adjust to actual value”) or the difference between the measured value and the specification (i.e. “adjust to zero”).



Bar Graphs are shown in a “bar graph” format as a comparison of the tolerances to the difference between the measured value and the specification. Below the bar graph, a number shows the actual measured value (i.e. “adjust to actual value”) or the difference between the measured value and the specification (i.e. “adjust to zero”).

Measurement Details

For a more complete explanation of alignment parameters, refer to the glossary.

A red value indicates the value is out of tolerance, green indicates the value is within tolerance. A black value indicates that either no specification or no tolerance is entered; therefore, the value is not compared to a specification.

The “Cross Camber” values are the differences between the left and right camber measurements on the same axle.

The “Cross Caster” value is the difference between the left and right caster measurements on the same axle.

A negative toe value means the wheel is “toed-out.”

A negative thrust angle value means the thrust line points to the left of the centerline.

The “Included Angle” values are the fixed values measured during the caster/S.A.I./included angle measurement procedure.

“Turning Angle Difference” is the fixed value measured during the toe-out-on-turns measurement procedure. The “target wheel” is steered to the “Turn Reference” specification, at which time the “Turning Angle Difference” is measured as the difference between the left and right toe angles. The “Left” value is measured when the wheels are steered to the left, and the “Right” value is measured when the wheels are steered to the right.

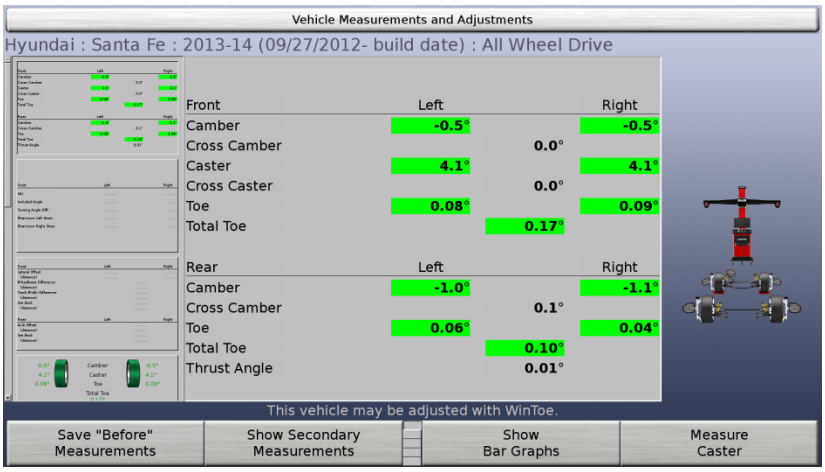
“Maximum Left Steer” is the fixed value measured during the maximum steering angle measurement procedure. The wheels are steered as far as possible to the left, at which time the left and right toe angles are measured. The “Left” value is measured at the left wheel, and the “Right” value is measured at the right wheel. The “Maximum Right Steer” value is similarly measured when the wheels are steered as far as possible to the right.

"Wheelbase Difference," "Track Width Difference," "Left Lateral Offset," and "Right Lateral Offset" specifications and tolerances are measured as "angles." The corresponding distances are computed from the measured angles and the specifications for the wheelbase and track width. These measurements are explained further in the glossary.

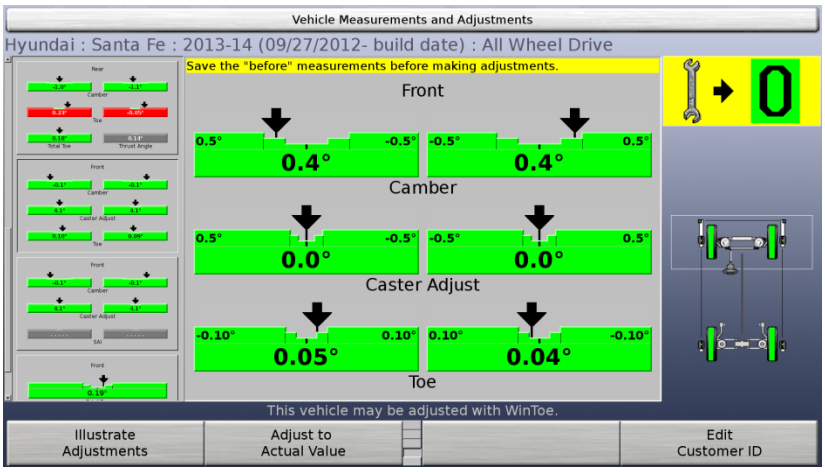
Showing Measurements

If the "Vehicle Measurements and Adjustments" screen is showing bar graphs, press "Show Measurements" to switch to the measurements format.

When shown in the "adjust to actual value" format, this display is normally used to view the current alignment condition of the vehicle.



When shown in the "adjust to zero" format, this display is normally used to make adjustments to the vehicle. You can toggle between the "adjust to zero" and "adjust to actual value" formats by pressing "Adjust to Zero" and "Adjust to Actual Value."



> **⚠ CAUTION:** Do not confuse the "adjust to zero" and "adjust to actual value" formats. The displays are different to help prevent this. Note especially the large "adjust to zero" icon that appears at the upper right corner when the "adjust to zero" format is used.

> NOTE: These measurements should not be used to diagnose or adjust the vehicle until the vehicle is lowered, jounced and the wheels are in a "straight ahead" position.

Primary, Secondary, Symmetry and Show Vehicle Measurement Groups

When showing measurements in the “adjust to actual value” format, the alignment measurements are shown in four different groups:

“Primary measurements” are camber, caster, toe, and thrust angle measurements. Caster measurements are fixed values measured during the caster measurement procedure.

“Secondary measurements” are S.A.I., included angle, turning angle difference, and maximum steering angle measurements (left and right).

“Symmetry measurements” are lateral offsets, wheelbase differences, track width differences, and set back.

“Show Vehicle” presents a virtual view of the vehicle showing tires that are red, green or gray depending on the in-spec/out-of-spec condition of the associated measurements.

Select any of these groups by pressing “Show Secondary Specifications,” “Show Symmetry Specifications,” “Show Primary Specifications” and “Show Vehicle”.

Front and Rear Measurement Groups

When showing measurements in the “adjust to zero” format, the alignment measurements are shown in two different groups:

“Front Axle” measurements are the usual camber, caster, and toe measurements of the front axle. The “sensor status indicator” highlights the front axle to illustrate this. The caster measurements are “live,” allowing for caster adjustments using this display.

“Rear Axle” measurements are the usual camber, toe, and thrust angle measurements. The “sensor status indicator” highlights the rear axle to illustrate this.

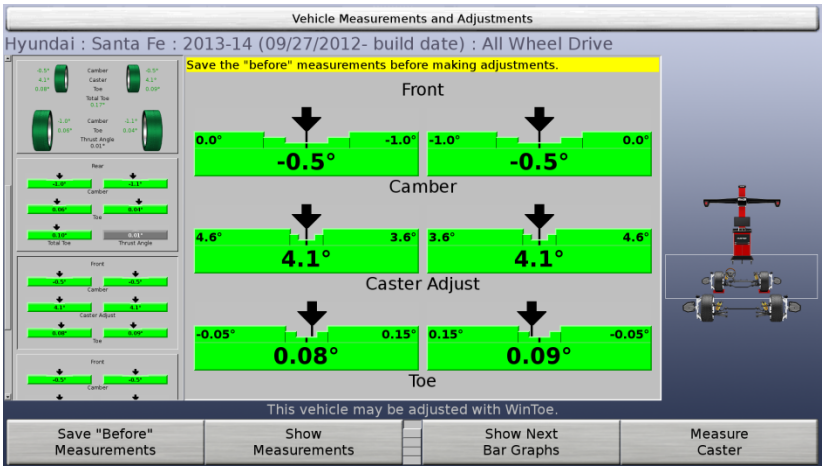
You may toggle between these axles by pressing “Show Rear Axle” and “Show Front Axle.”

Showing Bar Graphs

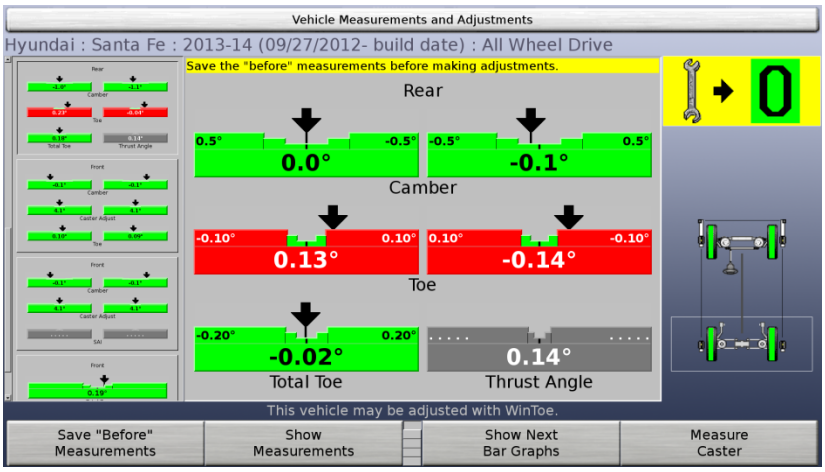
If the “Vehicle Measurements and Adjustments” screen is showing measurements, press “Show Bar Graphs” to switch to the bar graphs format.

This display is usually used to make adjustments to the vehicle. Each bar graph shows a comparison of the allowed tolerances to the difference between the actual measurement of the vehicle and the corresponding specification. The “ideal” or “preferred” adjustment would find the indicator arrow centered over the bar.

When using the “adjust to actual value” format, the number below the bar graph is the actual measured value and the numbers at each end are the in-tolerance limits.



When using the “adjust to zero” format, the number below the bar graph is the difference between the measured value and the specification. The numbers at each end are the tolerances.



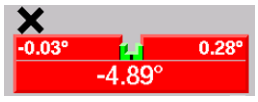
You can toggle between the “adjust to zero” and “adjust to actual value” formats by pressing “Adjust to Zero” and “Adjust to Actual Value.”

Bar Graph Appearance

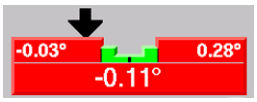
A red bar graph indicates the measurement is out of tolerance. An “X” indicates the measurement is beyond the indicating range of the bar graph in the direction shown. The “X” changes to an arrow indicator when the measurement is adjusted into indicating range of the bar graph.

As the vehicle is adjusted, the indicator moves in the direction of the adjustment. As the adjustment approaches the “in spec” range, the center “target” area of the bar graph grows. When the adjustment is “in spec,” the bar graph changes to green. The tolerances determine the size of the center target: a large tolerance provides a large target while a small tolerance provides a small target.

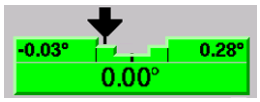
The following examples illustrate how to use the bar graphs (the specification in this example is 0.13°):



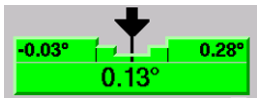
Out Of Tolerance - beyond range of the bar graph



Out Of Tolerance



Acceptable Adjustment (within tolerance)

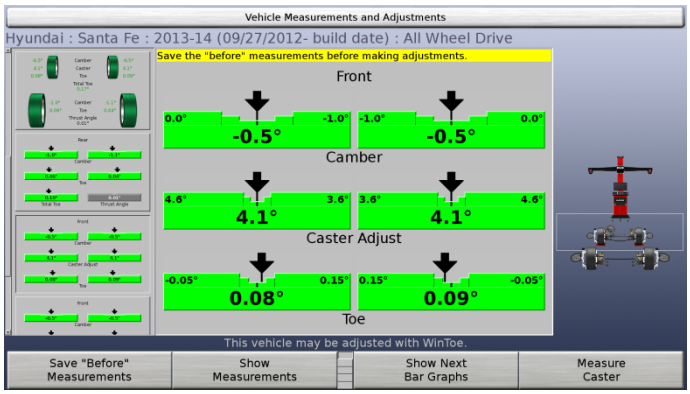


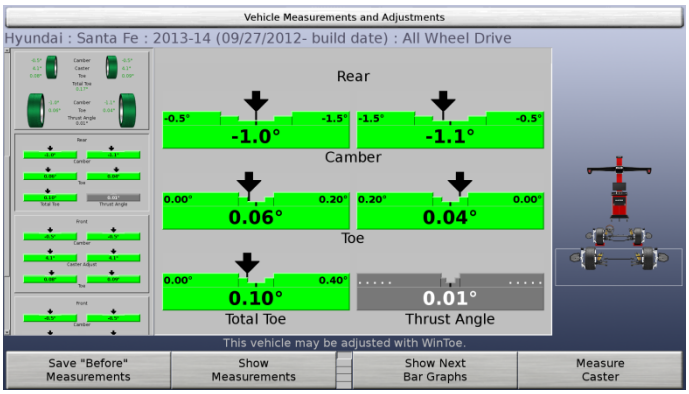
Preferred Adjustment

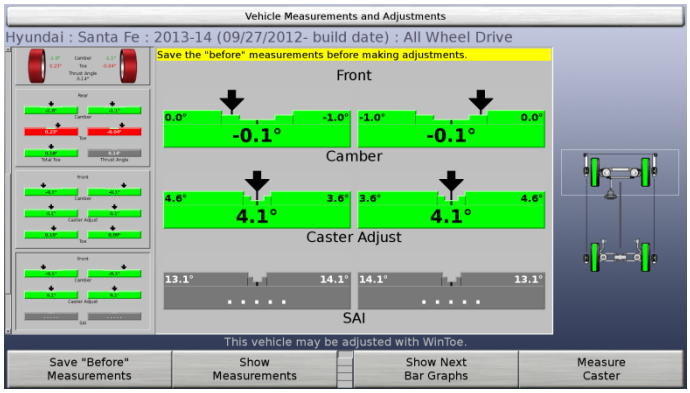
If the bar graph color is gray, either no specification or no tolerance is entered for that angle, or the sensors are experiencing some problem which prevents measurements, such as: the sensor is unplugged, uncompensated, or the toe beam is blocked.

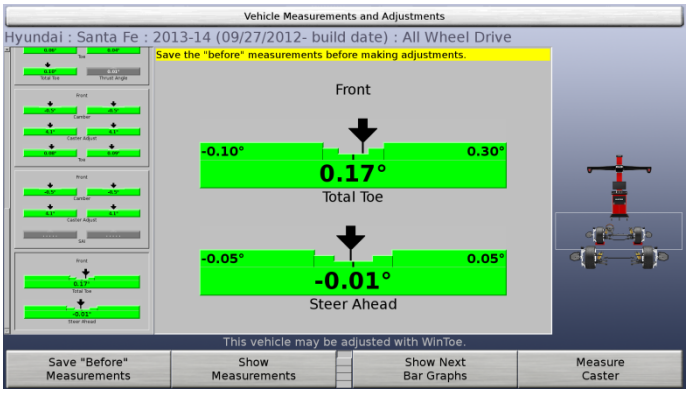
Bar Graph Groups

The bar graphs can be viewed in four groups. Examples are shown below.





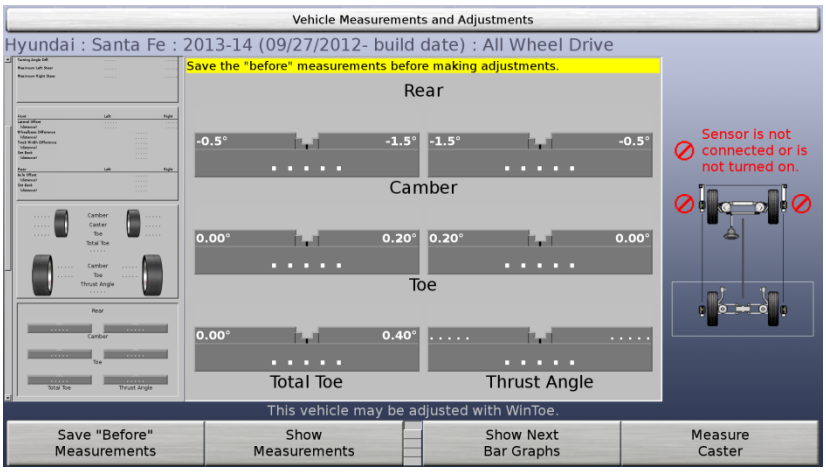




You may select any of these groups by pressing “Show Next Bar Graph Group.”

Showing Sensor Status

The “Vehicle Measurements and Adjustments” screen and some other screens show a “Sensor Status Indicator” in the form of a graphic illustration of a vehicle frame with the alignment sensors mounted to the wheels. An example display showing status problems is shown below:



The indicator appears on the display when:

the screen actively uses the sensors to measure or adjust the alignment

The indicator shows:

to which axle of the vehicle the current display applies

the highest priority problem with the set of sensors

the highest priority problem with each individual sensor

any detectable blockage of a line of sight between sensors

Conventional Sensor Troubleshooting

If a sensor has a problem, an “icon” appears next to the sensor to indicate the problem. If the sensor has multiple problems, the icon representing the highest priority problem appears.

The highest priority problem with the set of sensors is shown above the Sensor Status Indicator, as both an icon and as text. The icon is duplicated next to the sensor or sensors which experience the problem.

Note that different sensors may experience different problems at the same time. For example, the left front sensor might require compensation, while the right front sensor might have a problem with a camber transducer. An icon meaning “the sensor requires compensation for runout” would appear next to the left front sensor, while an icon meaning “the sensor has a transducer problem” would appear next to the right front sensor. The compensation problem has a higher priority than a transducer problem, and so the icon and text above the Sensor Status Indicator would show the same icon as the left front sensor along with the text “Sensor requires compensation.”

The icons that may be found next to the sensors in the sensor status plan view, and the text that would appear with the icon above the plan view, are as follows:

 "Sensor is not connected."

 "Sensor has communication problem."

 "Sensor is an unknown type."

 "Sensor has self-test error."

 "Sensor is mismatched with others."

 "Sensor is not calibrated." (Cal-Check® Sensor Calibration Accuracy Feature)

 "Sensor has calibration errors."

 "Sensor requires compensation."

 "Caster adjust transducer has problems."

 "Camber transducer has problems."

 "Transverse toe transducer has problems."

 "Longitudinal toe transducer has problems."

 "Sensor has excessive runout."

 "Turn encoder has miscounted."

 "Sensor is not level." (Level Reminder®)

 "Unlock and tilt sensors to recall comp"

 "Toe transducers may require re-calibration."

The following icons can appear overlaying the line of sight from one sensor to another:

 "Transverse toe beam is blocked."

 "Longitudinal toe beam is blocked."

Showing Target Status

In the sensor status screen, either of the two icons (shown below) identifies target identification problems. The text would appear with the icon above the plan view.

 (red) "Target not found."

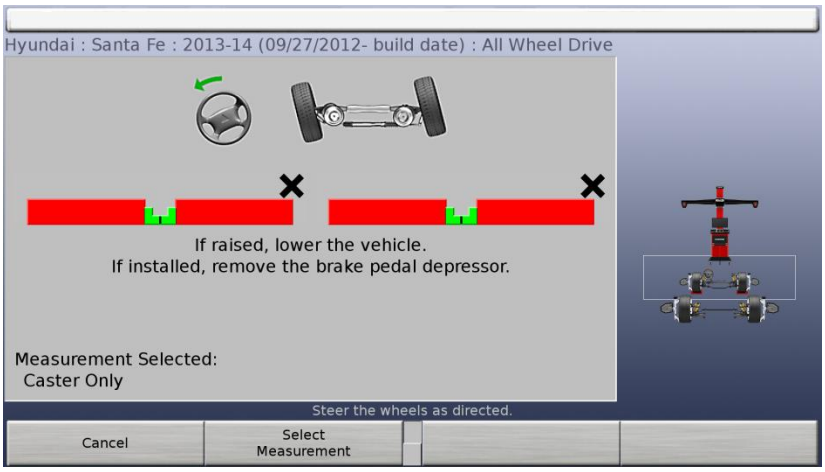
 (black) "Target is found by camera, but not measured."

During vehicle alignments, manually move cameras up or down as needed to bring all four targets in view of the cameras.

Noticeable dirt build-up, oil or grease can cause target identification problems. Either of the two icons (shown above) may identify targets that possibly need cleaned.

Measuring Caster, S.A.I., and Included Angle

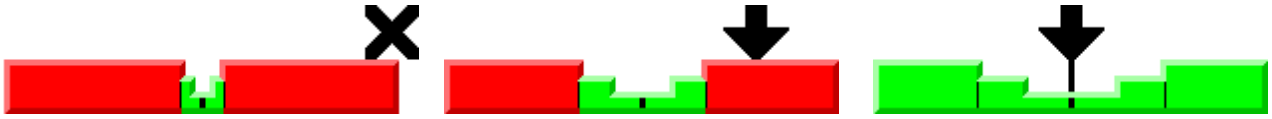
The “Measure Caster” screen allows caster, S.A.I., and included angle to be measured.



This screen is displayed by pressing “Measure Caster” on the “Vehicle Measurements and Adjustments” screen.

About Measuring Caster

When measuring caster, S.A.I., and included angle, bar graphs are used as “steering indicators” to guide you through the process of steering the wheels and making the measurements. The bar graph indicator will be left of center if the corresponding wheel is steered too far to the left, right of center if the wheel is steered too far to the right, or in the center of the bar graph if the wheel is steered correctly. An “X” as a position indicator means that the wheel is steered beyond the range of the bar graph in the direction indicated. For example:



Steered beyond range of bar graph **Steered to the right** **Steered correctly (“centered”)**

NOTE:	Steer the wheels using only the steering wheel. Do NOT manually push or pull the wheels to steer them.

NOTE:	It is not necessary to perfectly center the indicator in the bar graph when steering to measure caster, caster and S.A.I./I.A., or S.A.I./I.A. The steering position is acceptable when the indicator is positioned within the center area of the bar graph and the bar graph is green.

When this screen appears, the lower left corner of the display indicates what is to be measured: caster only - caster and S.A.I./IA – or - S.A.I./IA only.

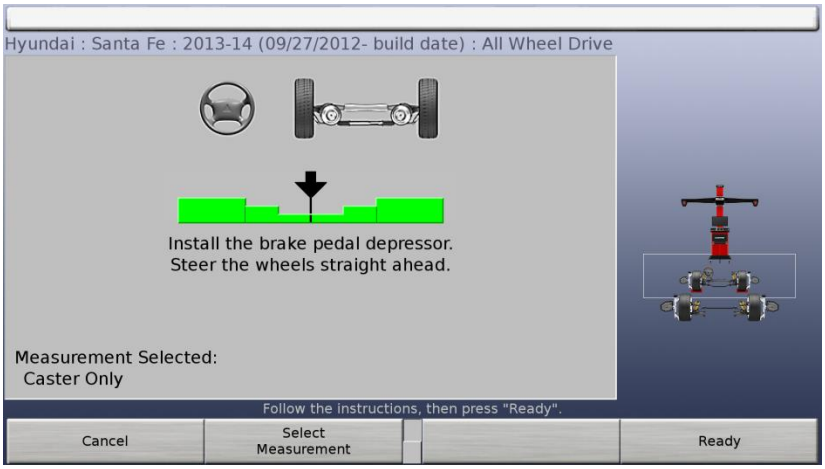
Usually, only caster is measured. S.A.I. and included angle may be measured if desired, and may be of some use in diagnosing damaged suspension or steering components.

Select any of these procedures by pressing “Select Measurement.” The display will change to show the next selection, and the procedure will restart.

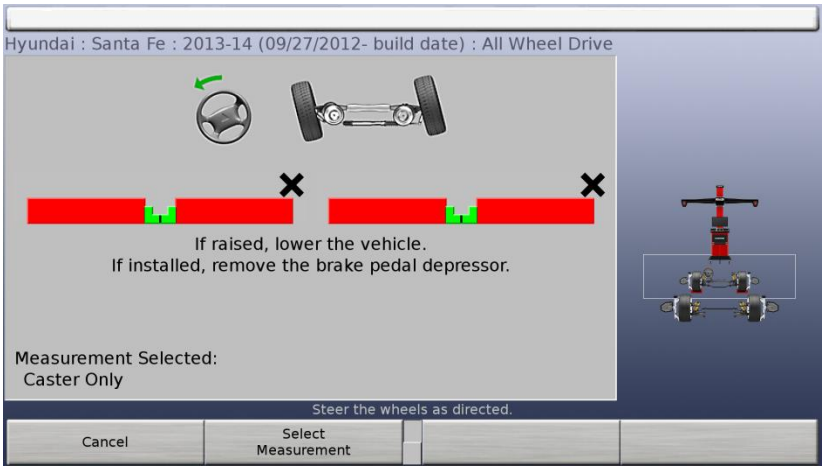
NOTE:	This selection will not change the default setting. When the aligner is reset, the default settings will be applied. See the section on “Aligner Set-up” to change the default setting.

Measuring Caster

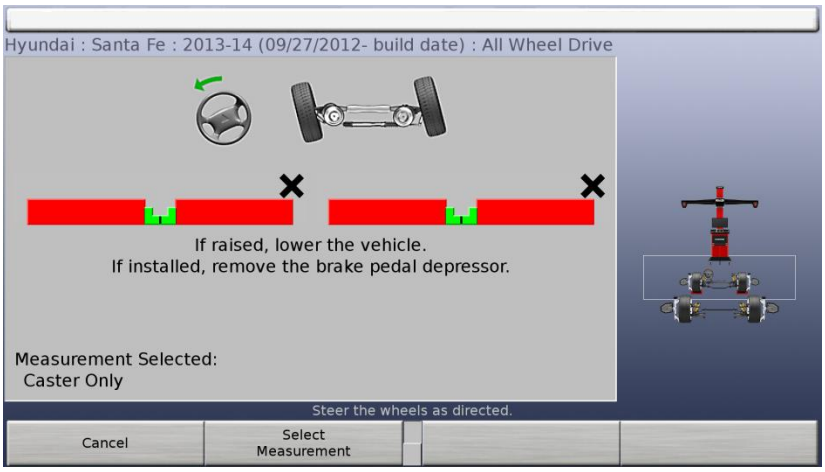
Loosen the front sensor lock knobs, making sure that the sensors are allowed to hang freely. Observe the single bar graph and steer the front wheels until the bar graph is “centered.” Hold the steering wheel steady and allow the system to take a “snapshot” of the measurements.



When the “straight ahead” measurements have been stored, the display changes to show two bar graphs and prompts to steer to the left. The left bar graph shows the left wheel while the right bar graph shows the right wheel.

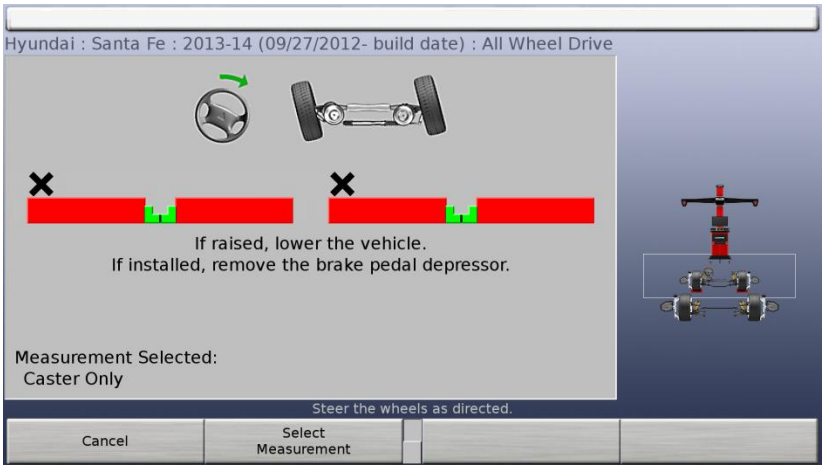


Steer the wheels to the left. Once the bar graph turns green it will take a snapshot of the position and the bar graph will disappear.



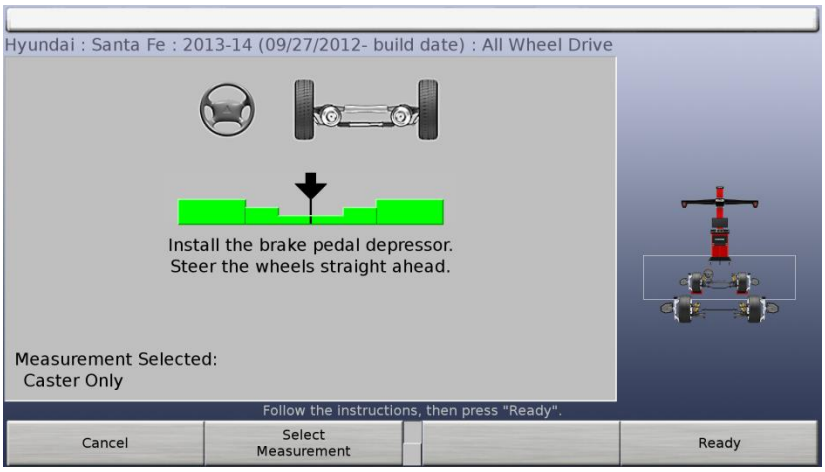
When one of the bar graphs is centered, hold the steering wheel steady and allow the system to take a “snapshot” of the measurements. The bar graph disappears when the measurements are stored. Then slowly steer the other wheel until its bar graph is centered, and again hold the steering wheel steady to allow the system to take a “snapshot” of the measurements.

When the “steered left” measurements have been stored, the display changes to show the two bar graphs again and prompts you to steer to the right (approximately 10°). Again, the left bar graph shows the steering of the left wheel while the right bar graph shows the steering of the right wheel.



Steer the wheels to the right. When one of the bar graphs is centered, hold the steering wheel steady and allow the system to take a “snapshot” of the measurements. The bar graph disappears when the measurements are stored. Then slowly steer the other wheel until its bar graph is centered, and again hold the steering wheel steady to allow the system to take a “snapshot” of the measurements.

When the “steered right” measurements have been stored, the display changes to show a single bar graph again and prompts to steer straight ahead.



Install the brake pedal depressor. Steer the wheels straight ahead until the bar graph is “centered.” Then level and lock the sensors. Then press “Ready” and allow the system to take a “snapshot” of the measurements.

At this point, caster is measured and the screen closes. The new caster measurements are shown on the “Vehicle Measurements and Adjustments” screen.

Do not remove the brake pedal depressor, or unlock the sensors, until all caster adjustments are finished.

Measuring S.A.I. And Included Angle

The procedure for measuring S.A.I. and included angle separately from measuring caster is nearly identical to that for measuring caster. It is the preferred method for measuring S.A.I. and Included Angle because the sensors are less likely to contact the lift rack during the procedure.

The procedure is as follows:

Lock the front brakes using a brake pedal depressor.

Raise the front wheels by the frame until they clear the turnplates and support the vehicle securely.

Level and lock the sensors.

Steer approximately straight ahead and press “Ready.”

Follow the prompts and steer exactly as described on the screen.

Lower the vehicle.

At this point, S.A.I. and included angle are measured and the screen returns to the “Vehicle Measurements and Adjustments” screen, that displays the new S.A.I. and included angle measurements.

NOTE:	While lowering the vehicle, camber and S.A.I. measurements are “live” and will change. The included angle measurements are “snapshots,” just as are the caster measurements, and so remain constant.

Measuring Caster and S.A.I./I.A. Simultaneously

The procedure for measuring caster, S.A.I., and included angle simultaneously is nearly identical to that for measuring S.A.I. and included angle separately.

Lock the front brakes using a brake pedal depressor.

Do NOT raise the vehicle.

Level and lock the sensors.

Steer approximately straight ahead and press “Ready.”

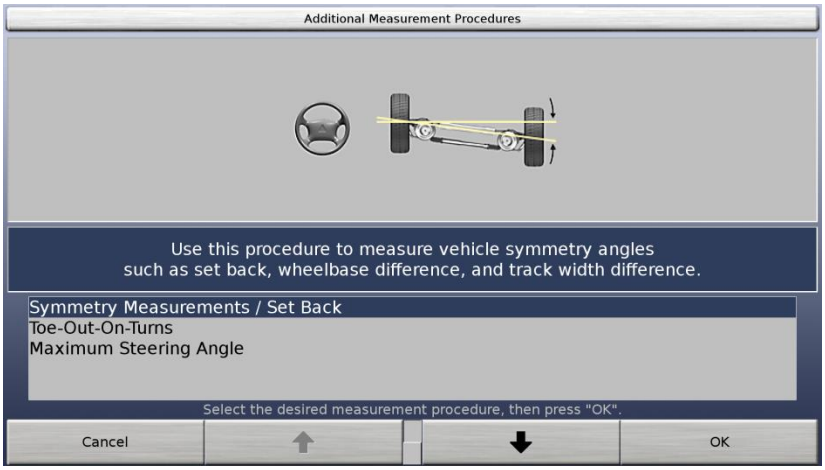
Follow the prompts and steer exactly as described on the screen.

At this point, caster, S.A.I., and included angle are measured and the screen returns to the “Vehicle Measurements and Adjustments” screen, that displays the new caster, S.A.I. and included angle measurements.

Do not remove the brake pedal depressor, or unlock the brakes, until all caster adjustments are finished.

Additional Measurement Procedures

The “Additional Measurement Procedures” screen enables an additional alignment angle for measurement.



This screen is displayed by pressing “Make Additional Measurements” on the “Vehicle Measurements and Adjustments” screen.

The additional measurements available are:

Symmetry Measurements / Set Back

Toe-Out-On-Turns

Maximum Steering Angle

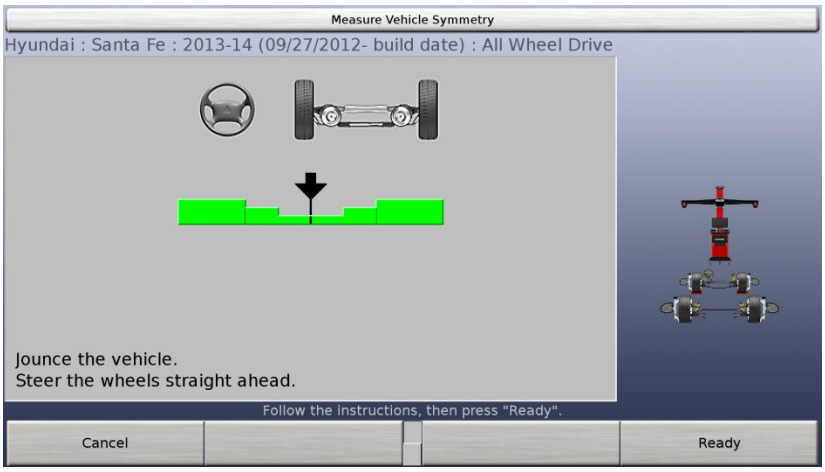
VW/AUDI – Toe Adjustment with Vehicle Raised
(only available for specific VW and Audi vehicles)

To begin the measurement procedure, press ↑ or ↓ to select the desired procedure, then press “OK.”

Measuring Vehicle Symmetry

NOTE:	Which vehicle symmetry measurements produce values depends on the type of sensor used.

The “Measure Vehicle Symmetry” screen enables measurement of the symmetry angles of the vehicle.

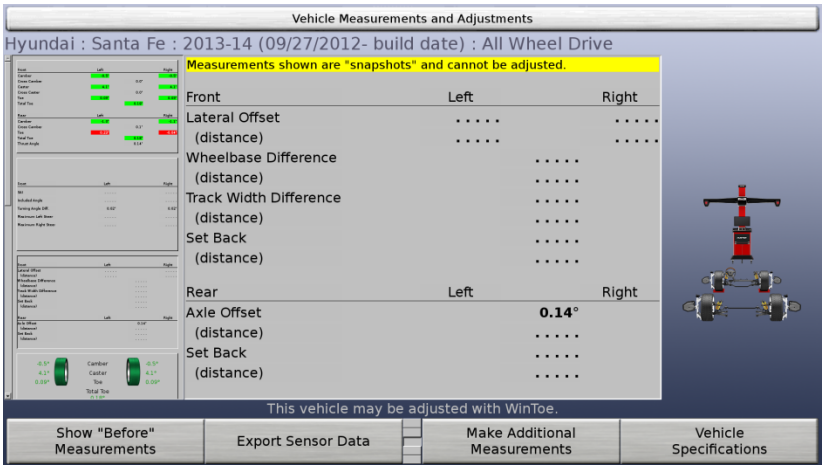


NOTE:	If the center casting is not centered check that the wheel adaptor is at the 12 o’clock position.

Jounce the vehicle.

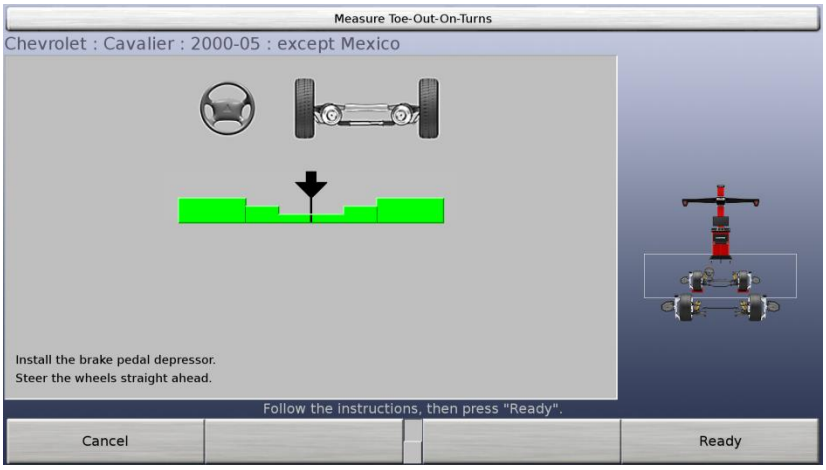
Steer the wheels straight ahead.

Press “Ready” and allow the system to take a “snapshot” of the measurements. When the measurements are taken, the new measurements appear.



Measuring Toe-Out-On-Turns

The “Measure Toe-Out-On-Turns” screen measures the turning angle differences of the vehicle.



When the wheels are steered in a turn, the “inside” wheel is steered more than the “outside” wheel. This allows all four wheels to steer about the same point and thereby avoid scrubbing the tires. “Turning angle difference” is a measurement of the difference between the steering angles of the wheels when one of the wheels is steered to a “turn reference” angle. The “left” turning angle difference is measured when the wheels are steered to the left while the “right” turning angle difference is measured when the wheels are steered to the right.

The convention is that a negative turn reference angle means “steer the inside wheel to the turn reference angle and then snapshoot both steer angles,” while a positive turn reference means “steer the outside wheel to the turn reference angle and then snapshoot both steer angles.” This is because the inside wheel is steered to a negative (i.e. toe out) angle while the outside wheel is steered to a positive (i.e. toe in) angle. The “turning angle difference” is thus computed as the sum of the steering angles when they are properly steered.

For example, if the wheels are steered to the left, the “left” steering and measurements might be:

Turn Reference	20.00°	meaning steer outside wheel
Left Wheel Steer	-21.15°	meaning steered to the left
Right Wheel Steer	20.05°	meaning steered to the left
Turning Angle Difference	-1.10°	sum of the steering angles

Note that special instrumentation must be used to measure toe-out-on-turns. Three choices are available:

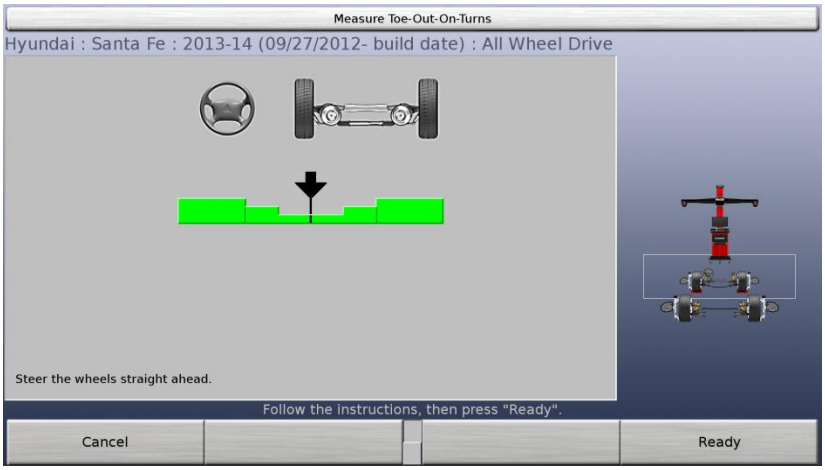
> “Electronic Turnplates” are available which use optical encoders mounted in the turnplates. The turnplates are connected to special connectors on the front sensors.

The type of sensor used must be specified. See the section on “Setting Up the Sensor Type For Toe-Out-On-Turns.”

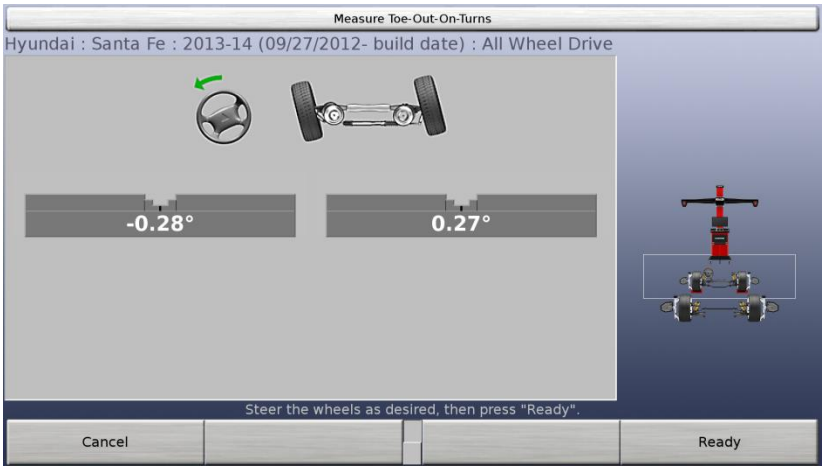
If the instrumented turnplates are used, connect them to the front sensors.

Steer the wheels straight ahead. A single bar graph is provided for this.

Press Ready and allow the system to take a “snapshot” of the measurements.



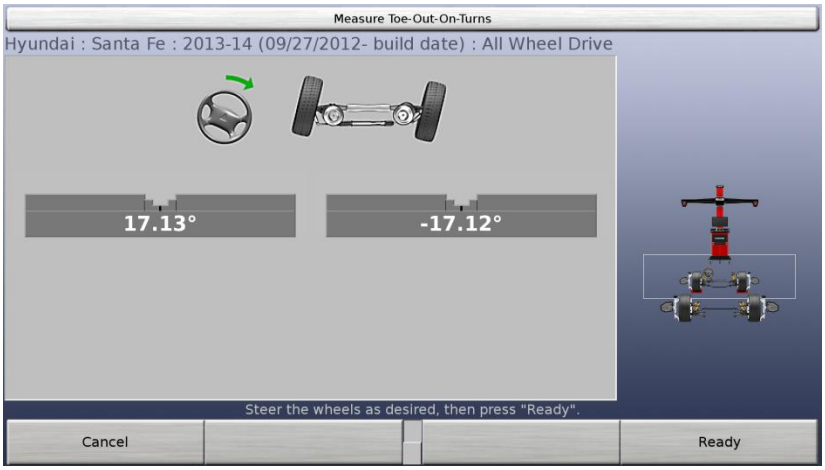
When the “steered straight ahead” measurements have been stored, the display changes to show two bar graphs and prompts to steer to the left.



The left bar graph shows the steering of the left wheel while the right bar graph shows the steering of the right wheel. One bar graph will be color-coded and will be labeled “Steer This Wheel.” The other bar graph will be gray. Each bar graph shows the steering angle of the corresponding wheel if specs are available.

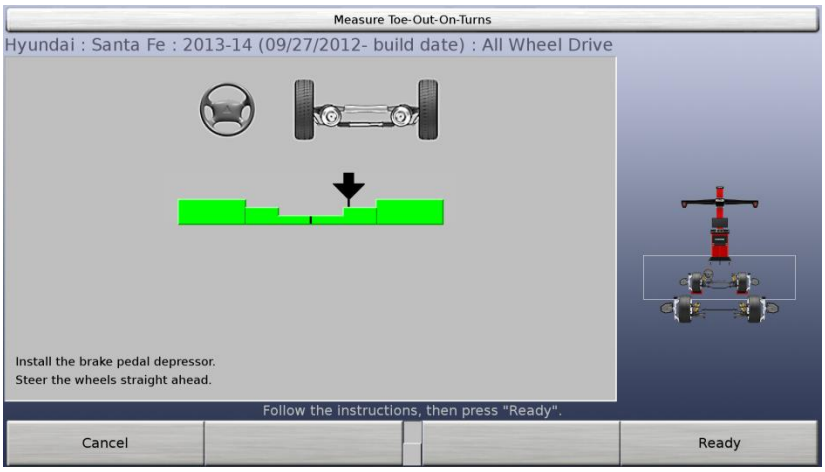
Steer the wheels to the left to center the bar graph labeled “Steer This Wheel.” Hold the steering wheel steady and allow the system to take a “snapshot” of the measurements. The example shown above uses the outside wheel as the reference.

When the “steered left” measurements have been stored, the display changes to show two bar graphs and prompts you to steer to the right.



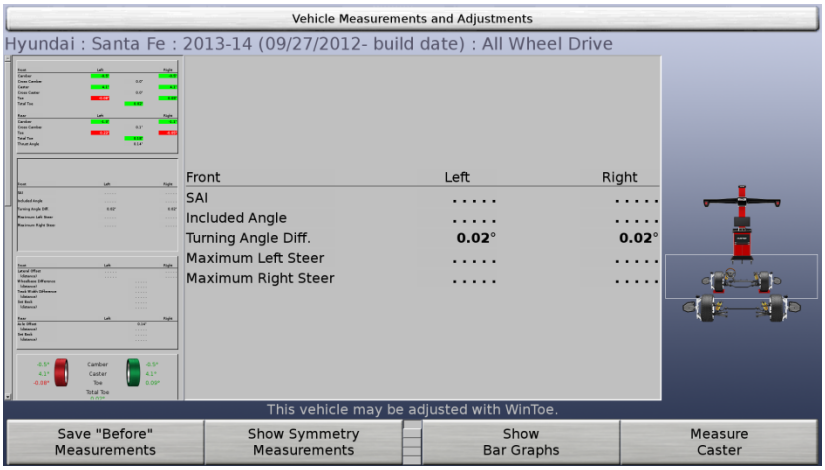
Steer the wheels to the right to center the bar graph labeled “Steer This Wheel.” Hold the steering wheel steady and allow the system to take a “snapshot” of the measurements. The example shown above uses the outside wheel as the reference.

When the “steered right” measurements have been stored, the display changes to show a single bar graph and prompts you to steer straight ahead.



Steer the wheels straight ahead until the bar graph is “centered.” Then hold the steering wheel steady and allow the system to take a “snapshot” of the measurements.

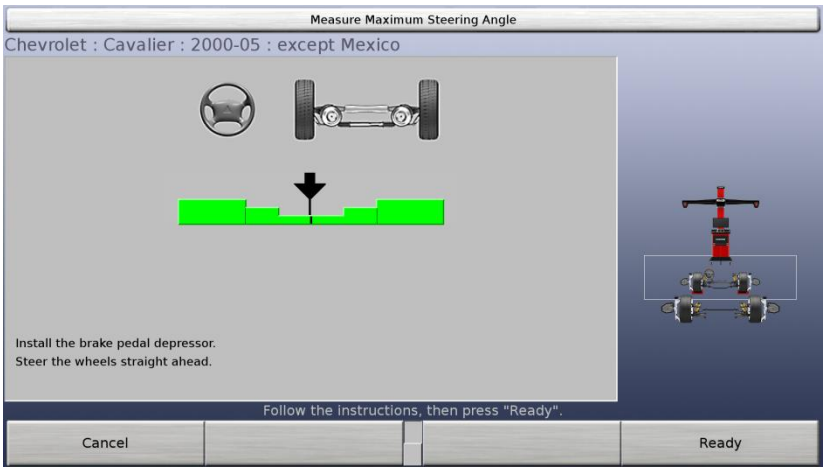
At this point, the turning angle differences are measured. The new measurements are shown on the “Vehicle Measurements and Adjustments” screen.



Note that some vehicles in the specification database do not specify a turn reference angle. Toe-out-on-turns can still be measured. When steering to the left and right, the bar graphs are not color-coded and neither is labeled “Steer This Wheel.” When steering to the left and right, you must steer the wheels as desired, then press “Ready” to make a snapshot of the measurements.

Measuring Maximum Steering Angle

The “Measure Maximum Steering Angle” screen enables measuring the maximum steering angles of the vehicle.

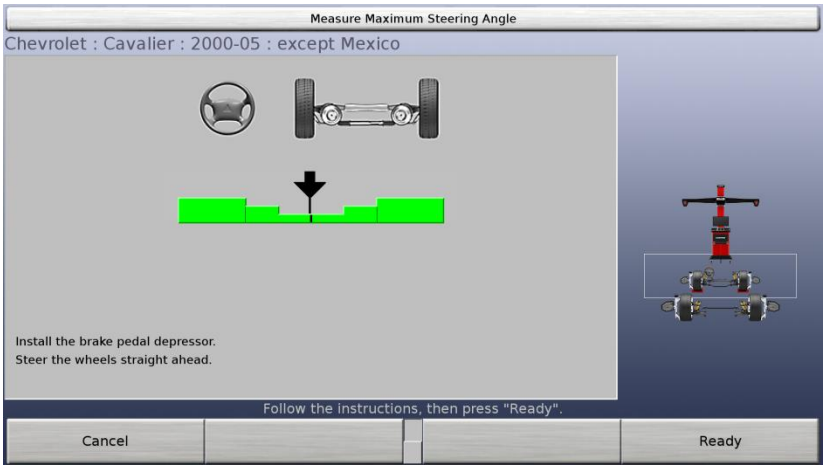


You must specify which type of sensor is used. See “Setting Up the Sensor Type For Toe-Out-On-Turns.”

Measuring Maximum Steering Angles

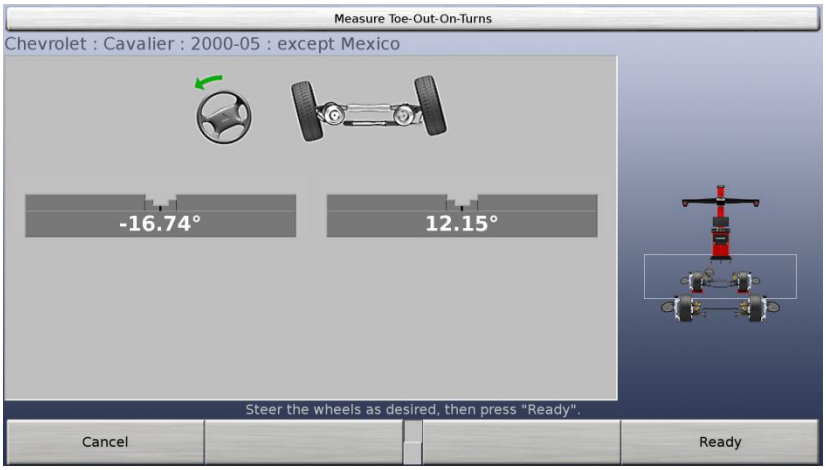
If the electronic turnplates are used, connect them to the front sensors.

Steer the wheels straight ahead. A single bar graph is provided for this.



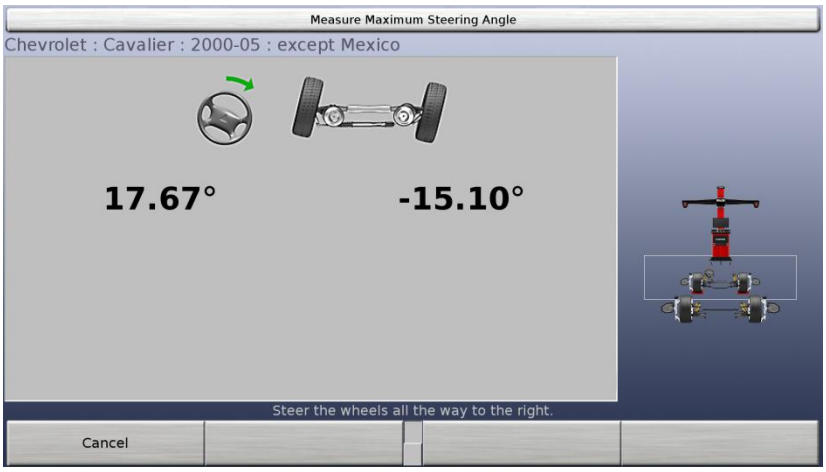
Press Ready and allow the system to take a “snapshot” of the measurements.

When the “steered straight ahead” measurements have been stored, the display changes to show numbers and prompts you to steer to the left. These numbers show the steering angles of the wheels.

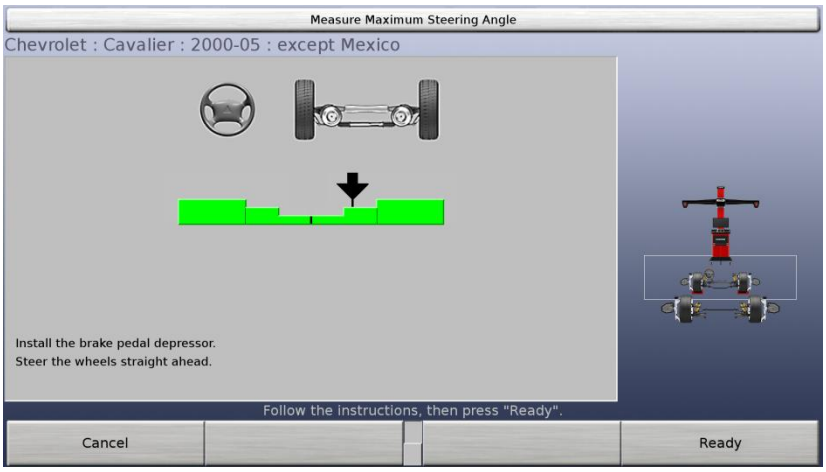


Steer the wheels to the left as far as they will go. Press “Ready” and allow the system to take a “snapshot” of the measurements.

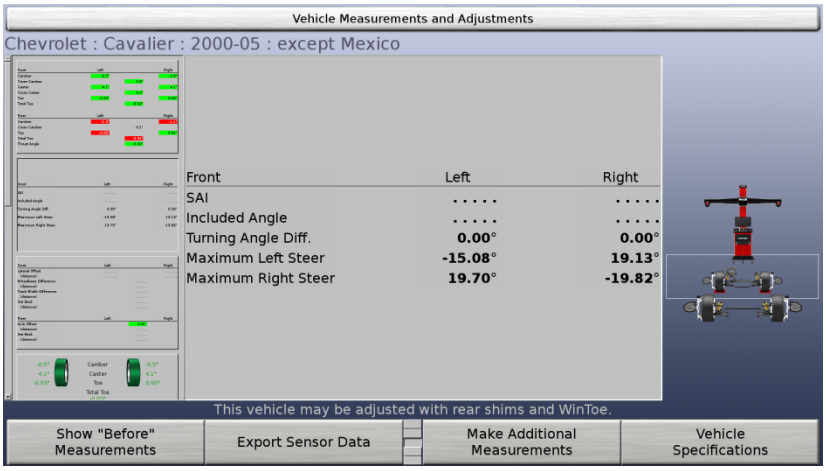
When the “steered left” measurements have been stored, the display changes to show two numbers and prompts you to steer to the right.



Steer the wheels to the right as far as they will go. Press “Ready” and allow the system to take a “snapshot” of the measurements. When the “steered right” measurements have been stored, the display changes to show a single bar graph and prompts to steer straight ahead.



Steer the wheels straight ahead until the bar graph is “centered.” Then hold the steering wheel steady and allow the system to take a “snapshot” of the measurements. At this point, the maximum steering angles are measured. The new measurements are shown on the “Vehicle Measurements and Adjustments” screen.



3.5 Vehicle Adjustments

Adjustment Procedure

The vehicle should be adjusted in the following sequence:

rear camber (if adjustable)

rear toe (if adjustable)

front camber and caster (if adjustable)

front toe

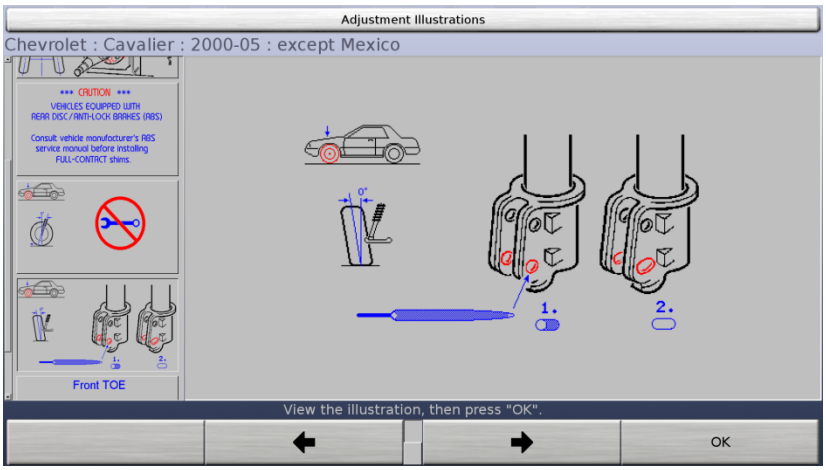
Illustrating Vehicle Adjustments

ProAlign® software contains illustrations for adjustments. These illustrations are drawings of the Original Equipment Manufacturer's method of adjustments. They also provide instructions or information necessary to make the adjustments.

To view illustrations:

Press "Illustrate Adjustments" on the "Vehicle Specifications" screen or the "Vehicle Measurements and Adjustments" screen.

The screen will change to show an adjustment illustration for the vehicle.



Any additional information required for the adjustment will also be shown.

Press "Previous Illustrations" or "Next Illustrations" to show the previous or next illustrations, respectively. The "Previous Illustrations" key is "grayed out" when the first illustration is shown and the "Next Illustrations" is "grayed out" when the last illustration is shown.

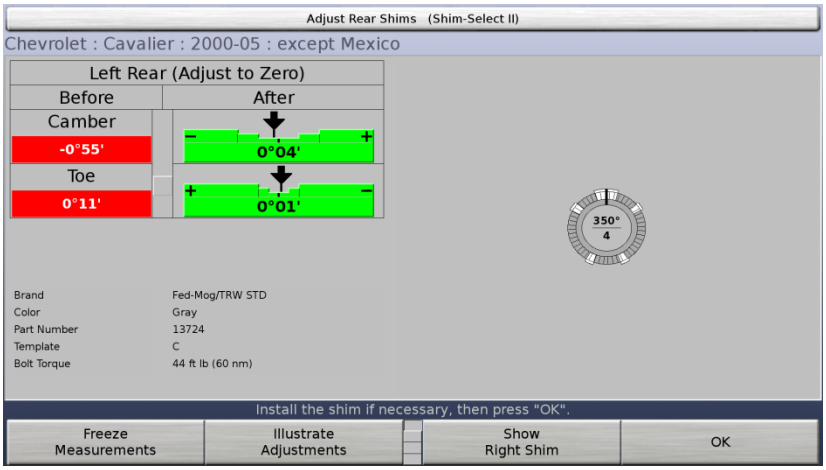
NOTE:	Printouts of the photographic images and illustrations are useful only if using a color printer.

Press "OK" after viewing illustrations. The screen will return to the screen where "Illustrate Adjustments" was pressed.

Rear Shim Adjustments

> **⚠ WARNING:** **Consult vehicle manufacturer's service publications and the aftermarket part manufacturer's instructions before installing aftermarket rear shims on any vehicle. Vehicles equipped with rear disc brakes and/or ABS present additional considerations for rear shims.**

The "Adjust Rear Shims" screen illustrates how to adjust the camber and toe of the rear wheels by installing a full-contact shim.



This screen is displayed by pressing "Adjust With Rear Shims" on the "Vehicle Measurements and Adjustments" screen. This softkey is available only if the specification database identifies the vehicle as having this type of adjustment.

About Rear Shims

The shim is mounted between the hub/spindle assembly and the rear axle flange. The shim is tapered, which changes the angle between the spindle and the axle, thereby adjusting rear individual toe and/or camber.

> **⚠ WARNING:** **Do not use a full contact shim on vehicles with rear disc brakes unless the brake caliper is mounted to the spindle backing plate, not to the axle assembly. The rotor and caliper must move together when installing a shim in the rear.**

The screen opens showing the shim requirements for the left rear wheel. Press "Show Right Shim" to toggle to the right wheel, and press "Show Left Shim" to toggle back to the left wheel.

The changes required in camber and toe are shown in the "Before" column at the upper left. For example, a change of "0.13°" for camber means that "camber must be made 0.13° more positive."

The shim required to make the changes is illustrated at the right. For one-piece shims, the size and orientation information is shown in the center of the shim. For two-piece shims, the orientation information for each piece is shown in the center of the shim.

The shim is shown in the actual size and color so that the display can be used as a template. If necessary, the display sizes can be adjusted using the "Aligner Set-up" displays. In addition, a life-sized paper shim template can be printed by pressing "Print Shim Template."

The “After” column at the upper left shows the residual errors that will remain in camber and toe after installing the shim as it is shown. These residual values are also shown in bar graph form so that the quality of the adjustments can be quickly gauged.

Press “Freeze Measurements” to freeze the measurements shown in the “Before” column. The screen then displays “Measurements are frozen!” Freezing the measurements allows the sensors to be removed from the wheels while the display continues to show the shim requirements. Press “Unfreeze Measurements” to return the display to normal “live” operation.

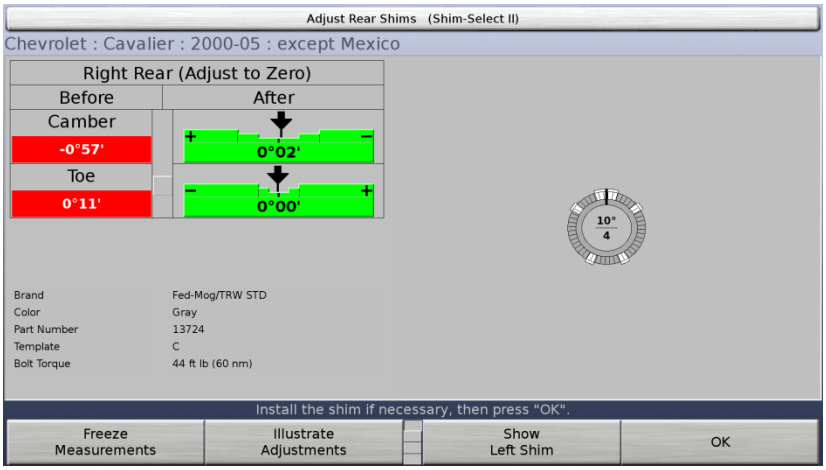
The brand, color, part number, and bolt torque value are listed below the “Before” and “After” bar graphs. Several shim brands are supported. Press “Change Shim Brand” to show the next brand.

> **WARNING:** **The listed torque value may vary from the manufacturer’s recommendation. Refer to the manufacturer’s service manual for the exact torque value.**

When adjustments are complete, press “OK,” and the screen closes.

Using One-Piece Shims

One-piece shims are available with tapers in fixed increments. Shim-Select will normally pick the correct taper and orientation to provide the best adjustments possible. For example, a shim with a 3/4-degree taper at an orientation angle of 352 degrees might be recommended.



The procedure for using this shim type is as follows:

Use the screen as a template or print a paper template. Place the shim over the template and orient it such that it matches the template.

Mark the top of the shim.

Remove any segments or cutouts necessary to clear the mounting bolts or other parts of the vehicle.

Install the shim with the top mark UP.

Tighten the bolts carefully to the required torque.

Such shims almost never adjust both camber and toe perfectly, and often require a compromise between camber and toe adjustments. The bar graphs in the “After” column show the quality of the adjustments provided by the indicated shim by showing the residual errors for camber and toe. For example, camber might show an “after” residual error of 0.05 degrees with toe showing 0.01 degree.

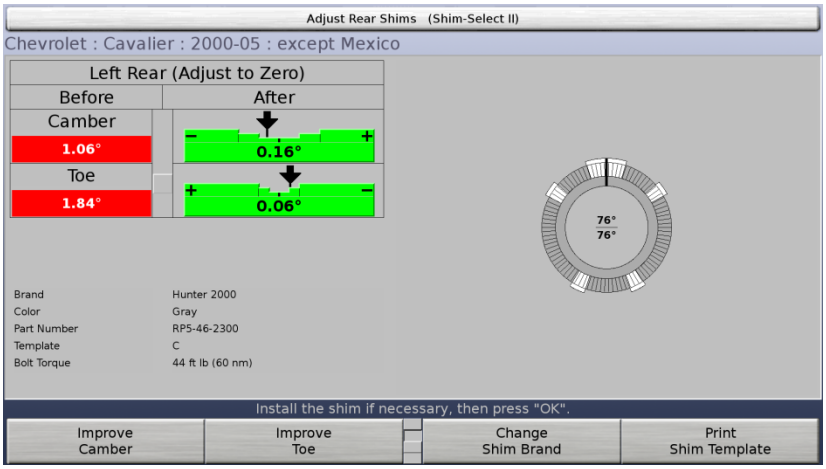
To improve camber at the expense of toe, press “Improve Camber.” To improve toe at the expense of camber, press “Improve Toe.” The “scroll bar” at the left of the bar

graphs shows how the residual errors are divided between toe and camber. Using this method, the recommended shim can be “fine-tuned” as desired.

NOTE:	The adjustments of the left shim can be “fine-tuned” independently of the adjustments of the right shim.

Using Two-Piece Shims

Two-piece shims have two layers which can be rotated, one relative to the other, such that the shim has the correct taper. The entire shim is then installed at the correct orientation angle. Such shims normally provide very good adjustments, provided the changes required are not so large that the shim cannot provide enough change.



The procedure for using this shim type is as follows:

Use the screen as a template or print a paper template. Place the shim over the template and adjust it such that the “ears” on the shim pieces match the “ears” on the template.

Mark the top of the shim.

Remove any segments or cutouts necessary to clear the mounting bolts or other parts of the vehicle.

Install the shim with the top mark UP.

Tighten the bolts carefully to the required torque.

When such a shim brand is used, the “Improve Camber” and “Improve Toe” softkeys are not available, since they are not needed. The scroll bar that is used to indicate the camber and/or toe fit is not shown.

If the changes required are beyond the range of the Hunter 2000 shim (not the Specialty Products shim), it is shown adjusted to its maximum taper and is then treated as a non-adjustable shim. In this case, the “Improve Camber” and “Improve Toe” softkeys reappear, as does the scroll bar.

Overriding the Recommended Shim

The recommended shim taper and the orientation angle can be overridden. The procedure is as follows:

Press “Rotate Shim Right” to rotate the shim to the right to a new orientation angle.

Press “Rotate Shim Left” to rotate the shim to the left to a new orientation angle.

Press “Increase Shim Taper” to change the shim to the next larger taper.

Press “Decrease Shim Taper” to decrease the shim to the next smaller taper.

When the shim computations are overridden in this manner, the shim taper and the orientation angle is highlighted yellow on the screen and the bar graphs at the left changes to show the quality of adjustments that would be made by the shim. A softkey labeled “Compute Shim Automatically” also appears. Press this key to remove the override and allow the system to compute the required shim.

NOTE:	The left shim can be overridden independently of the right shim. If desired, one can be overridden while the other is computed automatically.

NOTE:	When using Hunter two-piece shims, if the required correction causes the shim to appear as a non-adjustable shim, then that shim is oriented to provide the best possible correction. In this case, the “size” cannot be altered, but the orientation angle can be changed as for a one-piece shim.

Contacting Shim Manufacturers

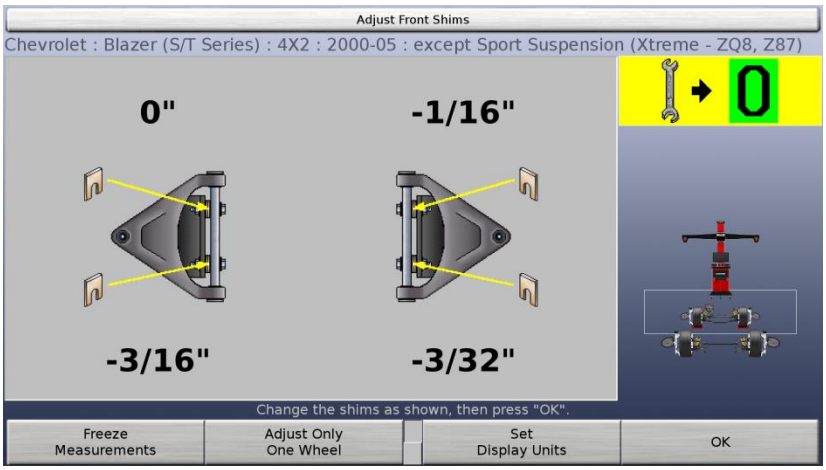
For help with Hunter shims, call toll-free 1-800-828-0255.

For help with Specialty Products shims, call toll-free 1-800-525-6505.

Front Shim Adjustments

The “Adjust Front Shims” screen allows you to adjust the camber and caster of the front wheels by shimming the front control arms.

This screen is displayed by pressing “Adjust with Front Shims” on the “Vehicle Measurements and Adjustments” screen. This softkey is available only if the specification database identifies the vehicle as having this type of adjustment.



About Front Shims

Some vehicles with SLA-type suspensions have shims placed between the vehicle frame and the pivot arm of the upper control arm. Placing the correct amount of shims at each pivot arm mounting point simultaneously adjusts both camber and caster of the wheel. It is difficult to compute the required shim changes, especially when the upper control arm is not symmetric. The specification database includes information which allows the system to correctly compute the shim changes required, even for non-symmetric upper control arms.

Making the Shim Adjustments

After measuring the caster, press “Adjust with Front Shims.”

Steer straight ahead.

Observe the required shim changes as shown on the screen. A negative number means that the indicated shim thickness must be removed from the corresponding position, while a positive number indicates that the shim thickness must be added.

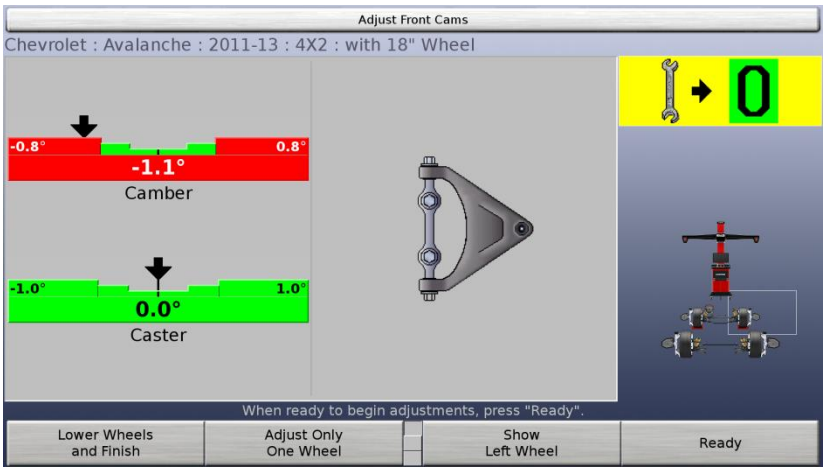
If desired, press “Freeze Measurements.” The screen then shows “Measurements are frozen!” and “freezes” the displayed shim changes required. The pivot arm can be unbolted to change the shims without “losing” the display of the changes required. To “unfreeze” the measurements and return to “live” operation, press “Unfreeze Measurements.”

When adjustments are complete, press “OK,” and the screen closes.

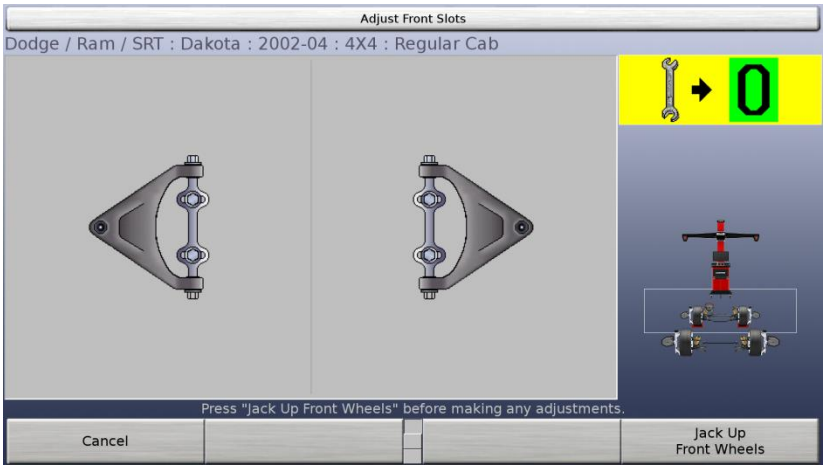
Front Cam and Slot Adjustments

The “Adjust Front Cams” screen displays the camber and caster of the front wheels while adjusting with eccentric cams on the pivot bar of the control arm. This screen is displayed by pressing “Adjust Front Cams” on the “Vehicle Measurements and

Adjustments” screen. This softkey is available only if the specification database identifies the vehicle as having this type of adjustment.



The “Adjust Front Slots” screen displays the camber and caster of the front wheels while adjusting the pivot bar of the control arm using the elongated slots through which the mounting bolts pass. This screen is displayed by pressing “Adjust Front Slots” on the “Vehicle Measurements and Adjustments” screen. This softkey is available only if the specification database identifies the vehicle as having this type of adjustment.



About Front Cams and Slots

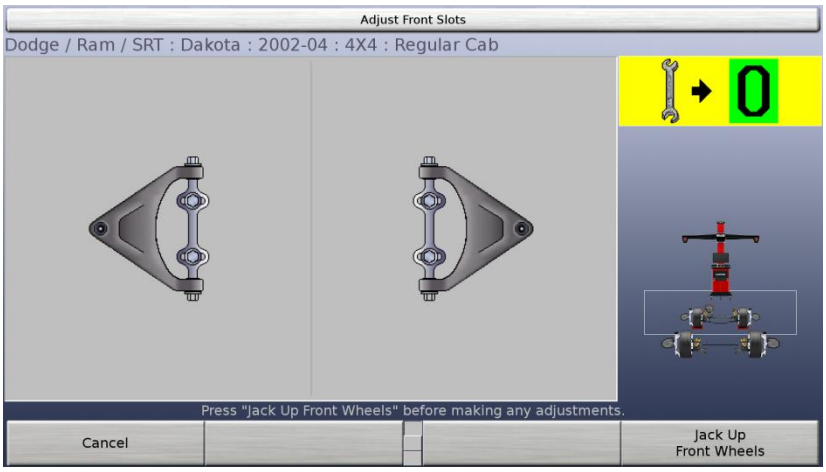
Some vehicles with SLA-type suspensions have eccentric cams which locate the upper control arm relative to the pivot arm. Others mount the pivot arm to the frame by passing bolts through elongated slots. Rotating the eccentric cams or moving the arm with the slots simultaneously adjusts both camber and caster of the wheel. It is difficult to move one end of the control arm the correct amount, yet it is even more difficult to move both ends simultaneously. The specification database includes information which allows the system to guide the technician through a simple procedure which moves each end of the control arm the correct amount. The procedure works properly even on vehicles which have eccentric cams on the lower control arm.

Making the Cam and Slot Adjustments

These two screens operate identically. The illustrations shown below are for the “slot” type adjustment.

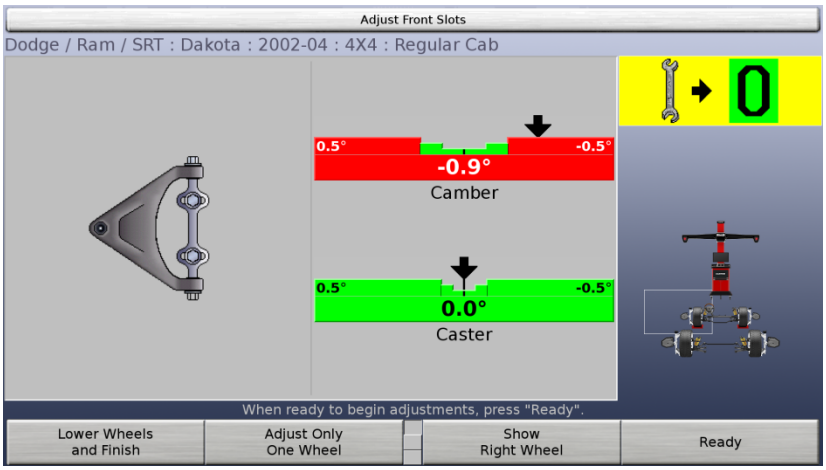
Measure the caster, and then press “Adjust Front Slots.”

The screen opens showing the slot adjustments for the left front wheel. Press “Show Right Wheel” to toggle to the right wheel, and press “Show Left Wheel” to toggle back to the left wheel.

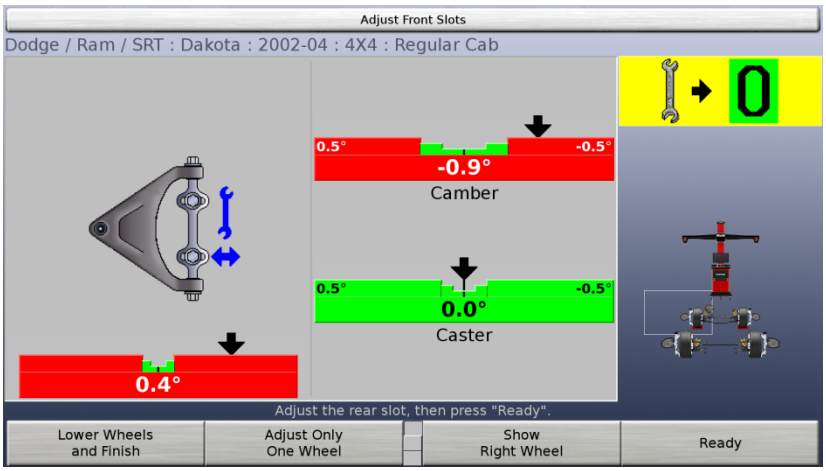


These adjustments must be made with the front axle jacked up. A softkey labeled “Jack Up Front Wheels” is provided to accomplish this. Press this key and follow the instructions to jack up the front wheels, as described in the section on “Adjusting With Axles Raised.”

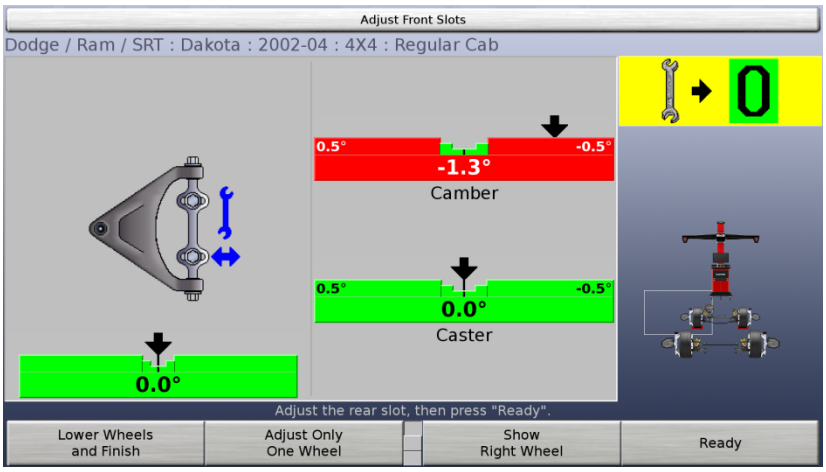
After jacking up the front wheels, you are ready to begin the adjustments.



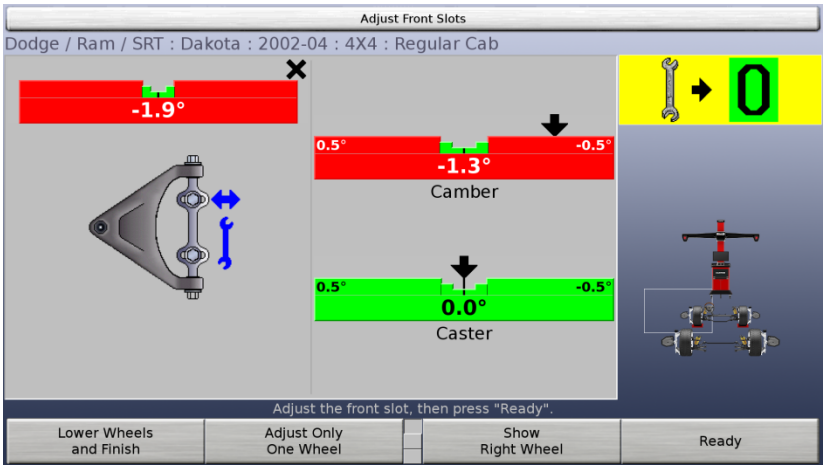
Press “Ready” and allow the system to take a “snapshot” of the current measurements. A bar graph appears below the control arm.



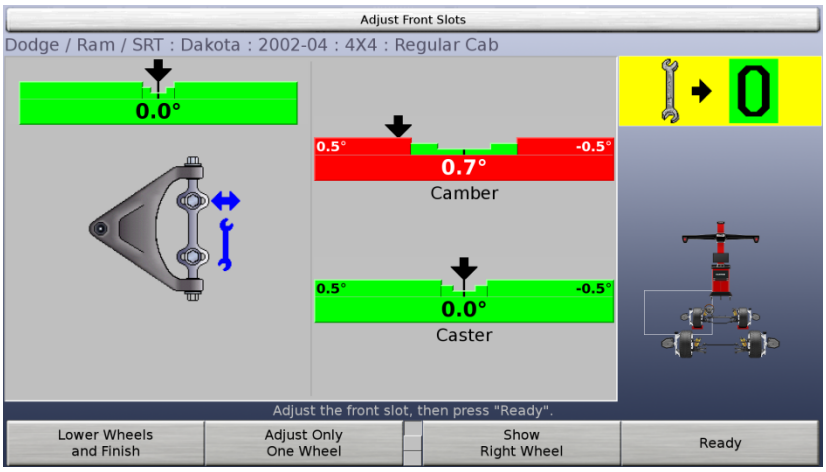
Adjust the rear slot until the indicator is as close to the center of the bar graph as possible.



Press “Ready” and allow the system to take a “snapshot” of the current measurements. A bar graph appears above the control arm.



Adjust the front slot until the indicator is as close to the center of the bar graph as possible.



If necessary, continue to adjust and press “Ready” to toggle between the forward and rearward slot to refine the adjustments. Each time “Ready” is pressed, the aligner reanalyzes the changes required before switching to the other slot and showing the bar graph.

NOTE:	This operation assumes that the control arm has a symmetric configuration. If the control has this configuration, the adjustments will be correct the first time. If the control arm does not have this configuration, the adjustments can still be made using this display, but refinements to the initial adjustments may be required, as described above.

When adjustments are complete, press “Lower Wheels and Finish.”

One-Sided Front Shim, Cam, and Slot Adjustments

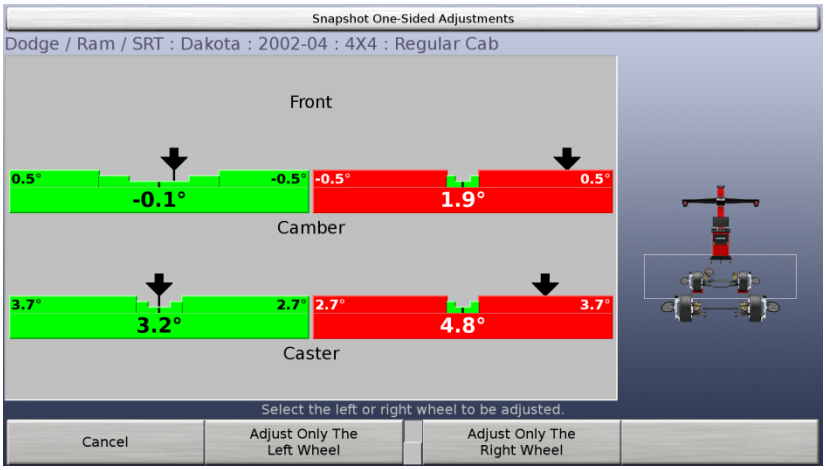
Sometimes it is preferable to adjust camber and caster of only one wheel. For example:

If the camber and caster of one wheel are within tolerances but not exactly on specification, it may be acceptable to leave those measurements unchanged.

If the camber and caster adjustments on one wheel do not have sufficient range to allow adjustment exactly to specification, it may be acceptable to make the maximum adjustment as possible.

In such cases, it is important that the camber and caster adjustments be symmetric side-to-side. The system allows you to adjust camber and caster of one wheel to match the camber and caster measurements of the other wheel, thereby achieving symmetric measurements, even if those measurements are not on the specification.

The “Snapshot One-Sided Adjustments” screen allows you to take a “snapshot” of the measurements of the camber and caster of one front wheel to be used as “temporary specifications” for the other side.



This screen is displayed by pressing “Adjust Only One Side” on the “Adjust With Front Shims” or the “Adjust Front Cams and Slots” screens.

The procedure is as follows:

If you wish to adjust the left wheel and leave the right wheel unadjusted, press “Adjust Only The Left Wheel.”

OR

If adjusting the right wheel only, and leaving the left wheel unadjusted, press “Adjust Only The Right Wheel.”

When the camber and caster measurements are stable on the wheel that will remain unadjusted, the system saves those measurements to be used as the targets for adjusting the other wheel, and then the “Snapshot One-Sided Adjustments” screen closes.

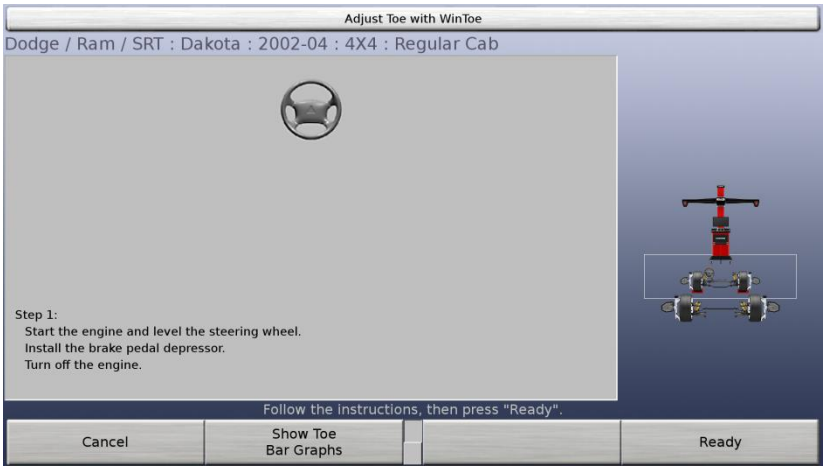
If only one wheel is to be adjusted the softkey which would allow the other wheel to be adjusted is disabled. The changes shown for the wheel are the adjustments required to make the camber and caster of that wheel match the camber and caster of the other wheel.

To return to adjusting both wheels, press “Adjust Both Wheels.”

NOTE:	You may adjust one wheel as well as it can be adjusted, then press “Adjust Only One Side” and follow the above procedure to make the other wheel match it.

Adjusting Toe with WinToe® Toe Adjustment System

The WinToe® Toe Adjustment System screen allows you to adjust the front individual tie rods without having to hold the steering wheel steady during the adjustments. This can make toe adjustments much easier when you have to steer the front wheels left or right to get access to the tie rod adjustments.

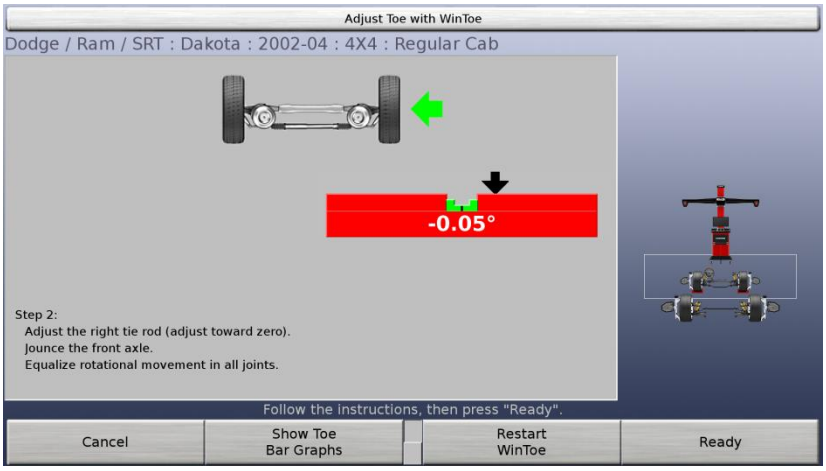


This screen is displayed by pressing “Adjust Toe with WinToe” on the “Vehicle Measurements and Adjustments” screen.

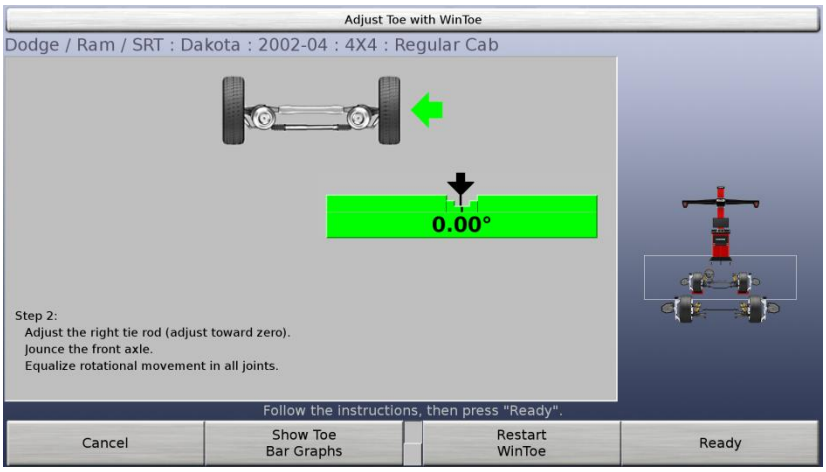
STEP 1: Level the steering wheel. Don’t forget to start the engine and use power steering if the vehicle is so equipped. Rock the steering wheel back and forth in decreasing amounts until the wheel is finally level. It is not necessary to lock the steering wheel.

Press “Ready” and allow the system to take a “snapshot” of the current toe measurements.

STEP 2: The screen changes to show a bar graph corresponding to the right wheel.

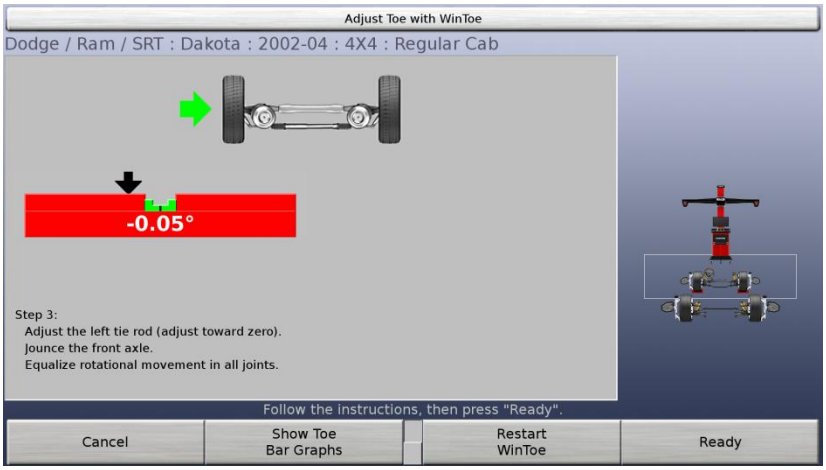


Follow the on-screen instructions and adjust the right tie rod until the right bar graph is centered.



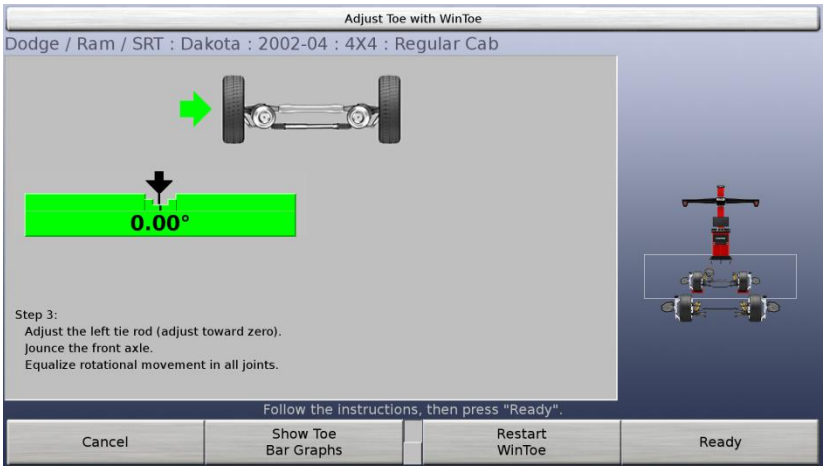
Press “Ready” and allow the system to take a “snapshot” of the new toe measurements.

STEP 3: The screen changes to show a bar graph corresponding to the left wheel. Follow the on-screen instructions and adjust the left tie rod until the left bar graph is centered.



Press “Ready.”

STEP 4: The screen changes to show a single bar graph. Steer straight ahead and verify that the steering wheel is level when the bar graph is centered.



Press “Ready” to complete WinToe procedure.

Adjusting with Axles Raised

A vehicle may require that the wheels be raised to make an adjustment to front camber and caster or to rear camber. As the wheels are raised, the wheels and sensors move and the measured angles change. The system is able to compensate for the movement of the wheels and sensors to allow accurate adjustments in spite of these changes.

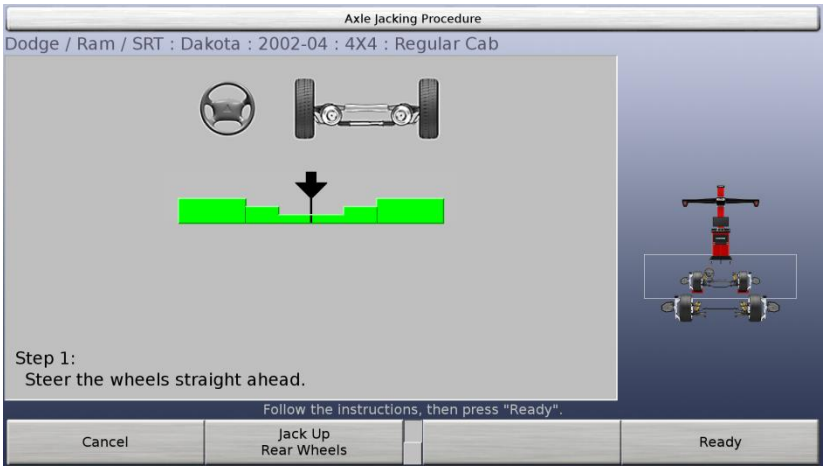
NOTE:	When either axle is jacked up, the system disables the softkeys which allow measurements to be made which should not be made with the axles jacked up. These softkeys include “Measure Caster,” “Adjust Rear Shims,” “Adjust Front Shims,” “Adjust Toe With WinToe,” and “Save ‘Before’ Measurements.”

NOTE:	This procedure is not useful for installing rear shims, front wedges, etc. when the adjustment requires the removal of the sensor and wheel assembly.

⚠ **WARNING:**	**Do not use this procedure to adjust toe with the axles raised! Toe MUST be adjusted with the vehicle lowered onto the rack. When an axle is jacked up, the displays of toe are not color-coded by comparing them to the corresponding specifications.**

Axle Jacking Procedure

The “Axle Jacking Procedure” screen measures the changes which occur when an axle is jacked up, and to discard those changes when the axle is lowered.



This screen is displayed by pressing “Jack Up or Lower Axles” on the “Vehicle Measurements and Adjustments” screen, or on the “Adjust Front Cams and Slots” screen at the beginning of the adjustment procedure.

The procedure to jack up an axle is as follows:

Begin with the vehicle in the normal position on the rack.

Press “Jack Up Front Wheels” or “Jack Up Rear Wheels” to select the appropriate axle.

If jacking up the front wheels, then steer the wheels straight ahead.

Press “Ready” and allow the system to take a “snapshot” of the current measurements.

Raise the selected axle and lower it securely onto supports.

If jacking up the front wheels, then steer the wheels straight ahead.

Press “Ready” and again allow the system to take a “snapshot” of the current measurements.

The screen closes.

If the front axle is jacked up, the system compensates for the changes in front camber and caster caused by raising the wheels. If the rear axle is jacked up, the system compensates for the changes in rear camber.

The procedure to lower an axle is as follows:

Press “Select Front Axle” or “Select Rear Axle” to select the appropriate axle.

Lower the axle.

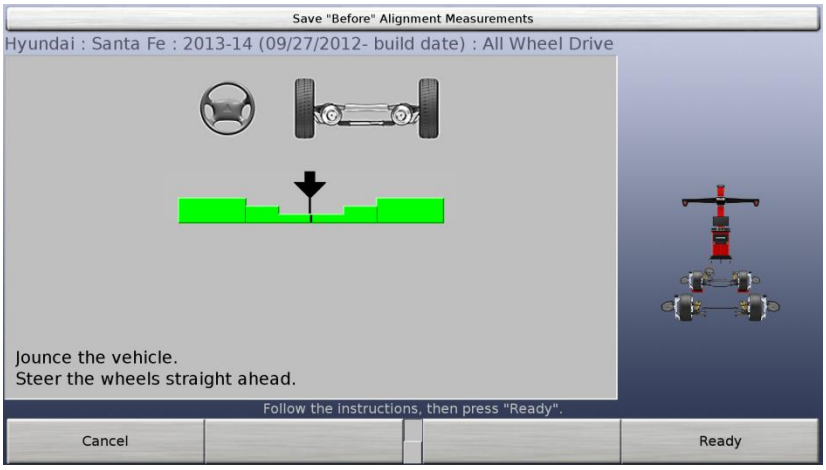
Jounce the vehicle.

Press “Ready.” The screen closes.

NOTE:	When lowering an axle, “Ready” may be pressed either before or after lowering the axle. No measurements are “snapshot” when an axle is lowered.

Saving “Before” Measurements

The “Save ‘Before’ Alignment Measurements” screen saves the initial or “before” measurements of the vehicle before making any adjustments.



This screen is displayed by pressing “Save Measurements” on the “Vehicle Measurements and Adjustments” screen.

The procedure is as follows:

Steer the wheels straight ahead as indicated by the bar graph on the screen.

Press “Ready” and allow the system to take a “snapshot” of the “before” measurements.

The screen closes.

Showing “Before” Measurements

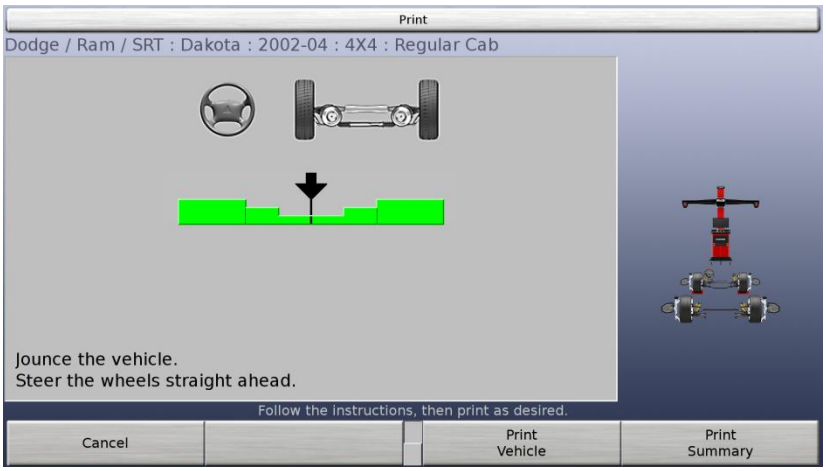
Normally, the “Current” measurements are shown on the “Vehicle Measurements and Adjustments” screen. The “Before” measurements can be shown by pressing “Show ‘Before’ Measurements.” The screen displays “Showing the ‘Before’ measurements. You may view these measurements in numerical, adjust to zero, or bar graph form.

These are “snapshot” values. No adjustments can be made while the “Before” measurements are shown. The softkeys allowing measurements or adjustments to be made, such as “Measure Caster” or “Adjust Rear Shims,” are “grayed” and inoperable.

To return to displaying the current measurements of the vehicle, press “Show ‘Current’ Measurements.” The “Vehicle Measurements and Adjustments” screen returns to normal “live” operation.

Printing the Measurements

The “Print Alignment Summary” screen prints the “before” and “after” alignment measurements along with the specifications.



This screen is displayed by pressing “Print Summary” on the “Vehicle Measurements and Adjustments” screen or the “Vehicle Specifications” screen.

Steer the wheels straight ahead following the bar graph on the screen.

Press “Ready” and allow the system to take a “snapshot” of the “after” measurements.

The printer begins printing and screen closes. You may change screens and continue working while printing continues.

4. EQUIPMENT INFORMATION

4.1 Sensors

Care and Cleaning of the Conventional Sensors

When cleaning the sensors, use a mild window cleaning solution to wipe off the sensors and adaptors.

> ⚠ **CAUTION:** Do not hose down or submerge the sensors. Do not spray cleaner on sensor. This could cause damage to the electrical system and optical components.

Keep wheel adaptor rods cleaned and lubricated. Lubricate as needed with a coating of light lubricant such as WD-40.

> ⚠ **CAUTION:** Do not lubricate center screw shaft.

4.2 Sensor Diagnostics

Sensor Diagnostics is a feature for authorized Hunter Service Personnel only.

Select “Sensor Diagnostics” from the startup screen to automatically run a check on all the sensors at once, individual sensors, or even specific angles.

If areas on the screen appear in red a signal is not being picked up by the sensor.

4.3 Conventional Sensor Calibration

Sensor Calibration is a feature for authorized Hunter Service Personnel only.

Press the menu shift key, ⇕, until the “Calibrate Sensors” softkey is displayed.

Select “Calibrate Sensors” to bring up the Sensor Calibration screen.

The screen displays the sensor type, what is to be calibrated, and the calibration procedure.

For specific information on sensor calibration, refer to Form 6844-T.

Calibration must be completed prior to operation of the sensors. Failure to successfully complete the calibration procedure will inhibit all of the alignment functions of the system. The calibration data for the sensors is stored in the sensors. Replacing the transducer control circuit board in a sensor will require the sensor to be re-calibrated.

Sensors are calibrated in sets and should be kept in sets so that unnecessary recalibration is not required. If, however, the front or rear sensors of one set are used with the front or rear sensors of another set, “Zero Only” calibration must be performed on the new set.

The calibration procedures must be followed carefully. An accurate calibration will not be obtained if procedure performance is rushed.

4.4 Target Maintenance

Dirty Targets can Hinder Sensor Performance

The target incorporates a precision pattern that is analyzed by camera software to determine the location and orientation of the wheels of the vehicle. It is apparent that the targets will get dirty with daily use and the software is tolerant to a reasonable amount of pattern obstruction. When the dirt build up gets severe enough, the software will reject the target and declare it “not found”. Cleaning the target will restore proper functionality.

Cleaning the targets, as described below, should be the first step in troubleshooting any target acquisition problem.

Target Cleaning Instructions

NOTE:	Use of shop towels or rags is **not recommended** as the fibers trap grease which will be deposited back on the target in a thin film as wiping continues.

Armor All® Glass Wipes is the preferred cleaning product, chosen for the film-free results after the cleaning solution evaporates.

Completely wipe the entire face of target.

With an unused portion of the wipe (such as the opposite side), completely wipe the face a second time.

The target is ready for use in 30 to 60 seconds, after the cleaning solution completely evaporates.

NOTE:	If targets are heavily soiled or greasy, use an all-purpose cleaner, such as Weiman® Cook Top Quick Wipes, Formula 409® or Fantastik®. With the spray cleaners, spray the cleaner on a quality paper towel, such as Bounty® or Brawny®, and then wipe the target. All-purpose cleaners can leave a slight film on the target surface that could hinder target recognition. Follow the removal of heavy soil and grease with Armor All® Glass Wipes, as described.

4.5 Target Diagnostics

The camera’s image of each target is visible through the sensor diagnostic screens. Sensor performance issues (such as dirty targets) can be better analyzed by viewing the camera’s image of each target.

In the same manner as performing an alignment, place a typical vehicle on the alignment rack, raise to alignment height and place targets on the vehicle.

Open the “Sensor Diagnosis” screens as follows:

At the logo screen or measurement screen, press the menu shift key  , until the “Sensor Diagnostics” label appears.

Press “Sensor Diagnostics.”

Press the menu shift key  , until “Left Image” and “Right Image” labels appear.

Press the softkey associated with the camera of interest and a screen of the camera’s view of the target will appear.

Analyze Image of Target

The targets will fill the screen when the camera has successfully found the target.

Identify any thing blocking the camera's view of the target, such as drop lights or air hoses.

Identify any inconsistency within the pattern on the image of the target:

Try concentrating cleaning efforts at areas appearing dirty.

Darker or lighter areas typically near the bottom of the target due to "wicking" caused by improper cleaning procedures.

Check for glare on targets due to lighting conditions.

4.6 Camera Maintenance

All maintenance of the camera should be referred to an authorized Hunter Service Representative. Keep hands and tools away from the camera lens area.

DO NOT attempt to clean the camera lens with standard window cleaner and a cloth, or by blowing on them with shop air. If cleaning ever becomes necessary, it should be done with special optical cleaning fluid (such as lens cleaner available at camera stores) and/or canned air (available at computer stores).

4.7 Wheel Adaptors Maintenance

Keep wheel adaptor rods cleaned and lubricated. Lubricate as needed with a coating of light lubricant such as WD-40.

⚠ **CAUTION:**	Do not lubricate the center screw shaft or target shaft hole on the wheel adaptors.

4.8 Remote Indicator

The Remote Indicator allows the technician to be "mobile" in the bay while making adjustments to the vehicle. The Operation Instructions for the Icon and Plus Remote Indicators is Form 5328-T.

Icon model, 30-419-1, is not capable of wireless communication.

Cordless Icon model, 30-421-1, is capable of wireless communication. Wireless communication requires a XF2 (or newer) pod, 232-201-1.

Cordless Plus model, 30-418-1, is capable of wireless communication. Wireless communication requires a XF2 (or newer) pod, 232-201-1.

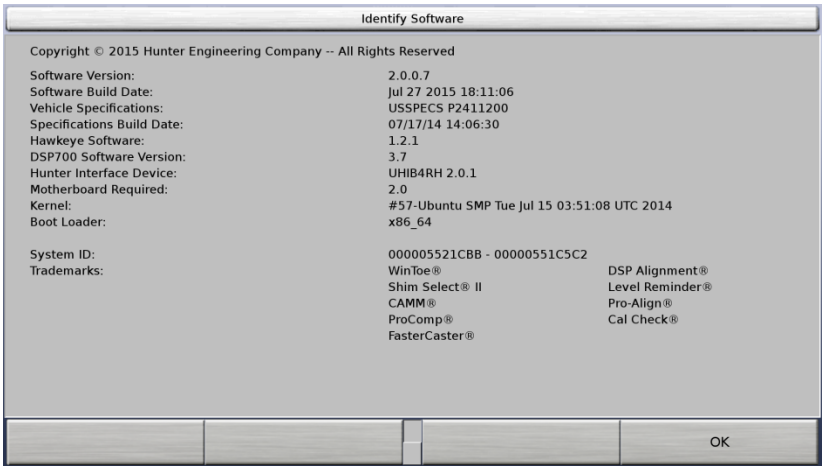
4.9 Remote Control Transmitter

If the remote control transmitter fails to operate properly, the battery may have to be replaced. A nine-volt alkaline battery is required.

NOTE:	An alkaline battery is required to provide the proper current for remote transmitter operation.

4.10 Software Identification

The “Identify Software” screen allows you to identify the software currently installed on the system.



This screen is displayed by pressing “Identify Software” on the “Reset” screen. The contents of the screen are self-explanatory.

5. APPENDIX

5.1 Cradle Adjustment

Although many aspects of alignment have changed due to the design of newer vehicles, one of the major issues is the presence of a subframe assembly often referred to as a “cradle.”

Many of the FWD, unibody vehicles are equipped with little, if any, front camber and/or caster adjustments. This lack of adjustment has created a need to find additional methods to adjust alignment angles to within the manufacturer’s specifications.

One of the methods discovered, which may work on some vehicles, is to reposition the cradle assembly forward, rearward or side-to-side.

Indications of Possible Improper Cradle Position

The position of the cradle assembly may be incorrect due to collision, improper mounting bolt torque, or incorrect placement after having been removed for engine or transaxle repair.

Inspect the cradle rails and cross members for damage. Bent or damaged cradle assembly components are good indicators that the cradle may have moved. Improperly torqued mounting bolts may allow the cradle to reposition itself during acceleration and braking.

It is possible for the cradle assembly to be secured in a position which is slightly off to one side or slightly forward or rearward of the intended position. This is due to the enlarged frame holes in the cradle rails

The inability to adjust camber or caster to preferred specification on either side of the vehicle is another sign that the cradle may be out of position. S.A.I. measurements are also quite helpful in determining cradle position. A further indicator is when a significant amount of setback accompanies a low caster reading.

An improperly positioned front cradle assembly can affect front camber, caster, setback and S.A.I./IA. The result may be:

- incorrect alignment
- insufficient alignment adjustment range
- premature tire wear
- vehicle instability
- improper drive line angles

An improperly positioned rear cradle may also affect rear camber, toe and thrust angle. The result may be:

- dog-tracking
- premature tire wear

Cradle Adjustment and Camber, Caster, S.A.I., and Set Back Angles

Cradle Position Effect on Camber and S.A.I.

Since the front cradle assembly controls the lower control arm position, incorrect placement side-to-side will affect front camber and Steering Axis Inclination (S.A.I.).

When the cradle assembly is moved sideways, one lower control arm is moved outward, thereby decreasing camber and increasing S.A.I. The other lower control arm moves inward, thereby increasing camber and decreasing S.A.I.

An incorrect side-to-side position of the rear cradle assembly will affect rear camber in the same manner.

Procedures for Properly Positioning a Cradle Assembly

The procedures differ from manufacturer to manufacturer, however the concept behind shifting the cradle assembly and the affect it has on alignment angles, tire wear, suspension components, driveline components and steering components remains constant throughout the industry.

⚠ **WARNING:**	**The cradle assembly has one and only one correct position, which is generally determined by alignment holes between the cradle assembly and the body of the vehicle. Adjusting the cradle by a procedure that differs from the manufacturer's recommended procedure is an assumed liability and should not be taken lightly, as the results may be costly and dangerous.**

⚠ **WARNING:**	**The information contained in this section is not intended to be a substitute for the vehicle manufacturer's service information regarding the cradle assembly.**

In general, the position of the cradle in respect to the unibody must be at a location which provides proper driveline, suspension and steering alignment. The exact position of the cradle assembly is normally documented in the manufacturer's service manual.

5.2 Work Management File Details

Work Management saves a tab delimited "workdata.txt" file on a Data drive when the Work Management feature is used. It can be opened with any spreadsheet program. Other files are also located on the Data drive and are not readable by any system or program other than the PA200.

⚠ **WARNING:**	**Do not modify the "workdata.txt" file. Any modification will prevent the PA200 from properly accessing the file. Saving the file after viewing in a spreadsheet program will modify the file.**

NOTE:	Hunter Engineering Company does not offer any support when using this file outside of the PA200 environment.

The "workdata.txt" file contains information needed to reproduce a printout. It does not include vehicle specifications.

In any given work order, there are 4 rows of data for a 2 axle vehicle. The first two rows are the “Before” measurements for axles 1 and 2, the next two rows are the “After” measurements for axles 1 and 2.

Below is the description of the contents of each field in the “workdata.txt” file.

1. Customer Address.
2. Customer Address Line 2.
3. Work Order ID Number.
4. Customer Name.
5. Customer Phone Number.
6. Vehicle ID Number.
7. License Plate Number.
8. First Registration Date.
9. Vehicle Mileage.
10. Technician Name.
11. Custom user information.
12. Custom user information.
13. Custom user information.
14. Custom user information.
15. Custom user information.
16. Custom user information.
17. Custom user information.
18. Custom user information.
19. Work management version (such as WM~001.0).
20. Valid (T=record valid, F=record deleted).
21. Date and Time.
22. Reserved.
23. Vehicle Model.
24. Light Duty (TRUE) Heavy Duty (FALSE).
25. Before Measurement (0) After Measurement (1).
26. Number of Axles.
27. Axle for this record (0,1,2,....).
28. Reference Axle (TRUE or FALSE).
29. Wheelbase, stored in the frontmost axle.
30. Track width.
31. Camber, left.
32. Camber, right.
33. Camber, cross.
34. Caster, left.
35. Caster, right.
36. Caster, cross.
37. Caster adjust, left.
38. Caster adjust, right.
39. Caster adjust, cross.
40. Caster adjust offset, left.
41. Caster adjust offset, right.
42. Included angle, left.
43. Included angle, right.
44. SAI, left.

45. SAI, right.
46. Toe, left.
47. Toe, right.
48. Toe, total.
49. Steer-ahead or thrust angle.
50. Steer or thrust angle, relative to sensor center line.
51. Set back, angle, snapshot.
52. Set back, angle, live.
53. Set back, distance, snapshot.
54. Lock to lock steer, left wheel, left steer.
55. Lock to lock steer, left wheel, right steer.
56. Lock to lock steer, right wheel, left steer.
57. Lock to lock steer, right wheel, right steer.
58. Toe out on turns, reference wheel spec.
59. Toe out on turns, measured wheel difference, left steer.
60. Toe out on turns, measured wheel difference, right steer.
61. Wheelbase difference, angle, snapshot.
62. Wheelbase difference, angle, live.
63. Wheelbase difference, distance, snapshot.
64. Track width difference, angle, snapshot.
65. Track width difference, angle, live.
66. Track width difference, distance, snapshot.
67. Lateral offset difference, angle, left, snapshot.
68. Lateral offset difference, angle, left, live.
69. Lateral offset difference, distance, left, snapshot.
70. Lateral offset difference, angle, right, snapshot.
71. Lateral offset difference, angle, right, live.
72. Lateral offset difference, distance, right, snapshot.
73. Axle offset, angle, snapshot.
74. Axle offset, distance, snapshot.
75. Wheelbase averaged from left and right direct measurements, distance.
76. Toe, Audi raised procedure, left.
77. Toe, Audi raised procedure, right.
78. Toe, Audi raised procedure, total.
79. Toe, Audi raised procedure, cross (side-to-side).
80. VAG raised toe side-to-side spec.
81. VAG preadjust raise toe spec.
82. Scrub angle, thrust angle relative to the thrust angle of the scrub reference.

One or more of the following appear if a measurement was not taken:

“E” - Measurement DOES NOT EXIST.
”V” - Measurement NOT VALID.
”S” - Measurement NOT STABLE.

The following unit designations are used (dg stands for degrees):

1.1dg; 1.01dg; 1,1dg; 1,01dg; 1 1/32dg; 1dg05'; 1dg
1.1mm; 1.01mm; 1,1mm; 1,01mm; 1.1mmR; 1.1"R