OPERATION INSTRUCTIONS

Form 5615-T, 02-18c
Supersedes Form 5615-T, 11-15b

Hunter PT200 Heavy Duty

Pro-Align® HD Wheel Alignment System

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				
Axle Offset Measurement				
Frame Offset Measurement				

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

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 PT200 Heavy Duty Alignment System with Pro-Align HD® Software.

The owner of the PT200 Heavy Duty Aligner is solely responsible for arranging technical training. Only a qualified, trained technician should operate the PT200 Heavy Duty Aligner. Maintaining records of personnel trained is solely the responsibility of the owner and management.

References

This manual assumes that the technician is familiar with the basics of heavy duty vehicle 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 "3.1 Vehicle Specifications," page 12.* These references should be read for additional information to aid in the understanding of the instructions being presented.

NOTE:	Some options, procedures, and software screens shown in this manual may not be available on individual systems.

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

When using your garage equipment, basic safety precautions should always be followed, including the following:

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 or pit.

Use caution when jacking the vehicle.

ALWAYS WEAR OSHA APPROVED SAFETY GLASSES. Eyeglasses that have only 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 are properly grounded.

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

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

To reduce the risk of fire, do not operate equipment near open containers of flammable liquids (gasoline or diesel fuel).

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.

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.

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.

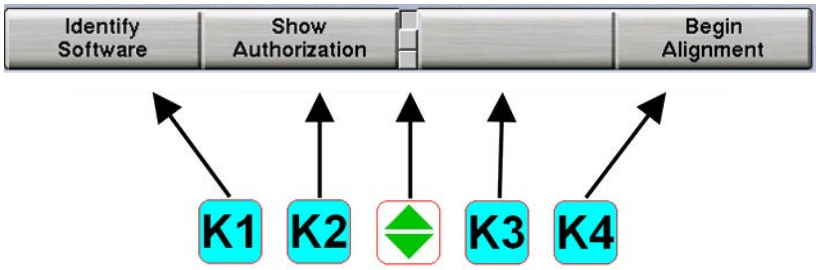
The vertically stacked squares between the K2 and K3 labels indicate how many levels of menus are available. The box that appears to be pressed indicates the menu level that is currently displayed. The menu level is changed by pressing the menu shift key, ⇕.

NOTE:	Zoom key (), backward key (), and forward key () do not perform a function on the PT200 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 Pro-Align® 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.

Press “Save Work Order” 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 Pro-Align 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.

2. ALIGNER SET UP

2.1 Default Aligner Settings

Display Language	English
Printout Language	English
Printout Paper Size Selection	Letter (8.5” x 11”)
Print Preview	Enable
Printout Label	(blank)
Put Customer ID in Prompt Sequence	Include customer ID in prompt sequence
Sensor Type	DSP740T
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)
Caster Measurement Selection	Caster Only

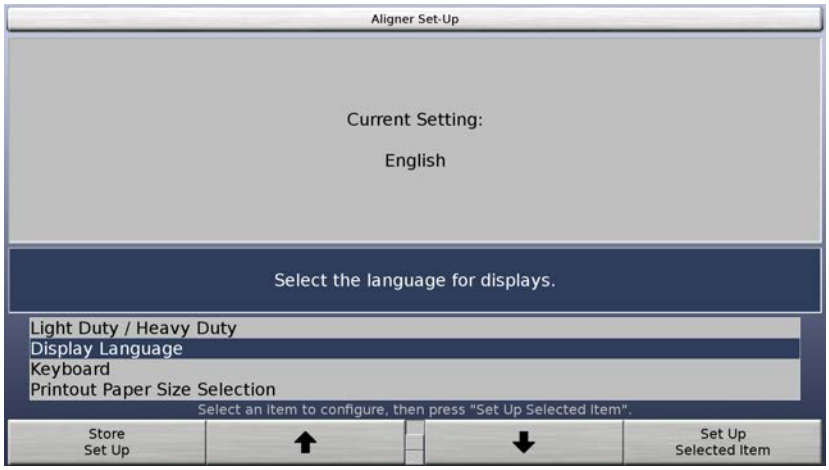
NOTE:	Within the set-up program, you will find set-up options for rear alignment shims. This option is used only for European applications and does not currently apply to US delivery vehicles.

NOTE:	During machine operation, you may see a “K-3” key noted as “Special Adaptors.” This key does not apply to US delivery vehicles and will turn grey when selected. This will not affect machine operation.

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



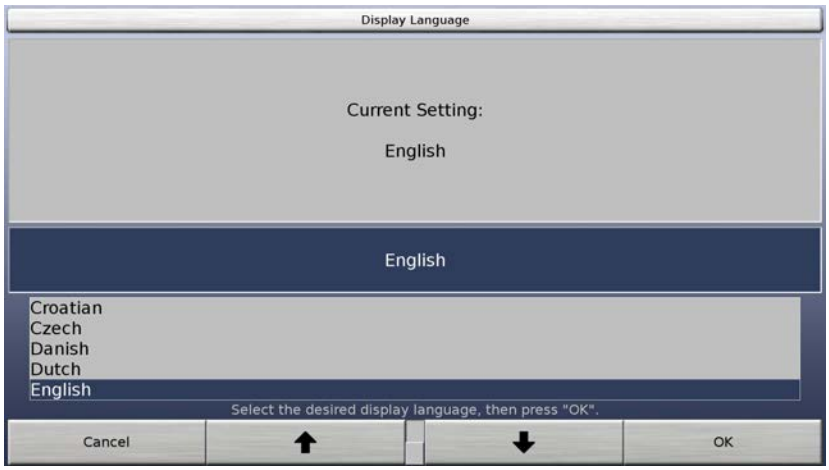
This screen is displayed by pressing “Set Up Aligner” on the start-up screen. It contains a scrolling list of all items that may be set up.

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 the set up 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.

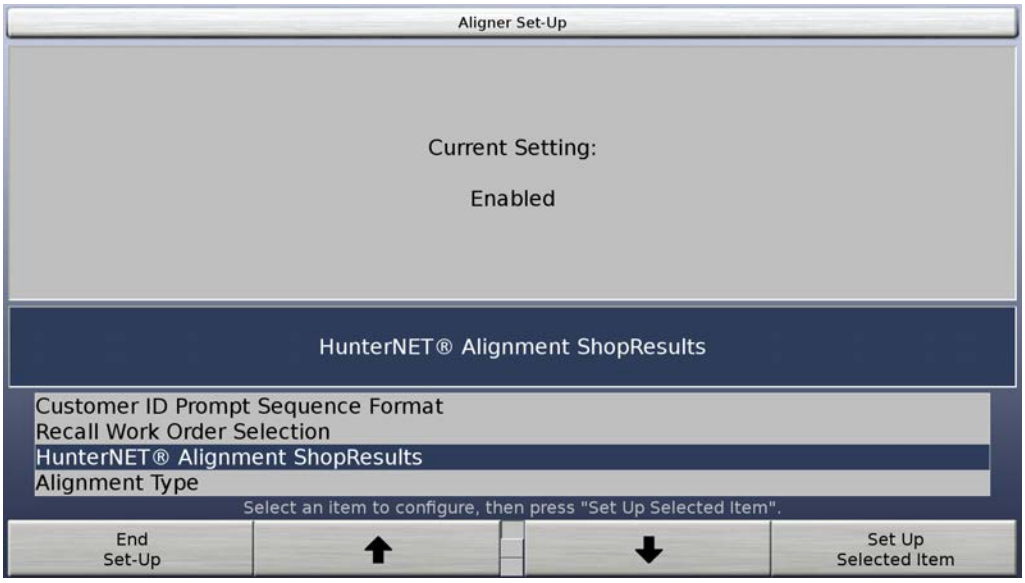
NOTE:	A separate PC with internet connection is required to perform initial HunterNet account setup and to view the ShopResults generated by the alignments performed. There is no web browsing capability built into ProAlign.

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**.



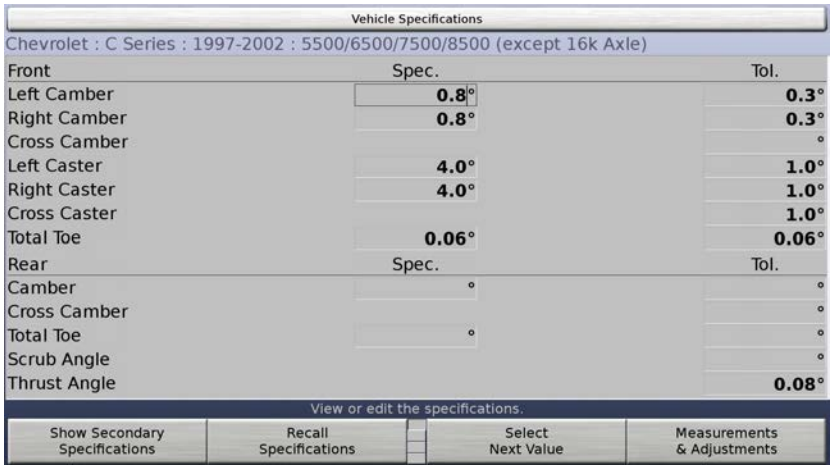
Enter the HunterNet logon and password in the appropriate fields. Enter the PC serial number as well. Select **OK** to store to the setting.

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.

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

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 degree $\pm$ 0.5 degree

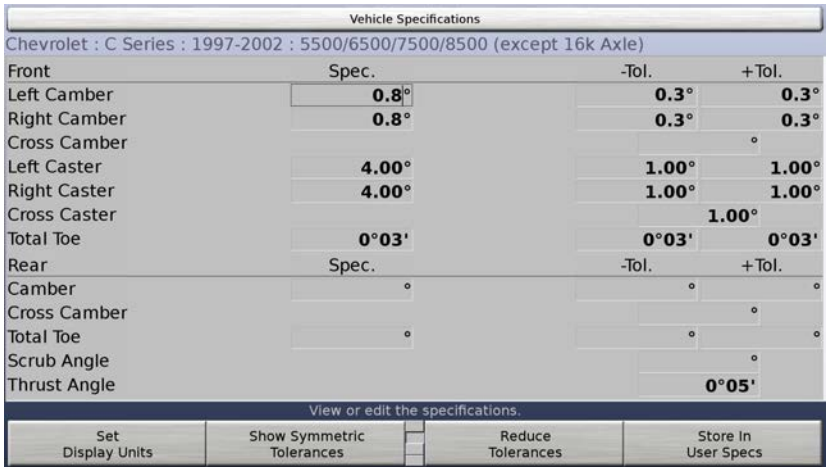
which allows an “in spec” range of 0.5 degree to 1.5 degrees with a preferred value of 1.0 degree. The screen shown above uses the “symmetric” format.

"Asymmetric" 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 degree +1.0 degree -0.5 degree

which allows an "in spec" range of 0.5 degree to 2.0 degrees with a preferred value of 1.0 degree. If the screen shown above is switched to the "asymmetric" format, it appears as follows:



You can toggle between the "symmetric" format and "asymmetric" 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-turns, 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

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 "asymmetric" 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 “asymmetric” 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.

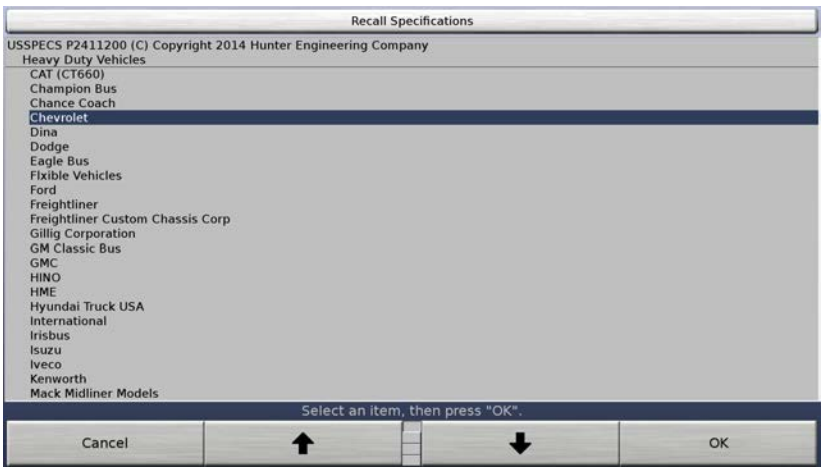
The “Set Back” tolerance is always treated as a symmetric tolerance, thus only one entry field appears for this value, even when the “asymmetric” format is shown.

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

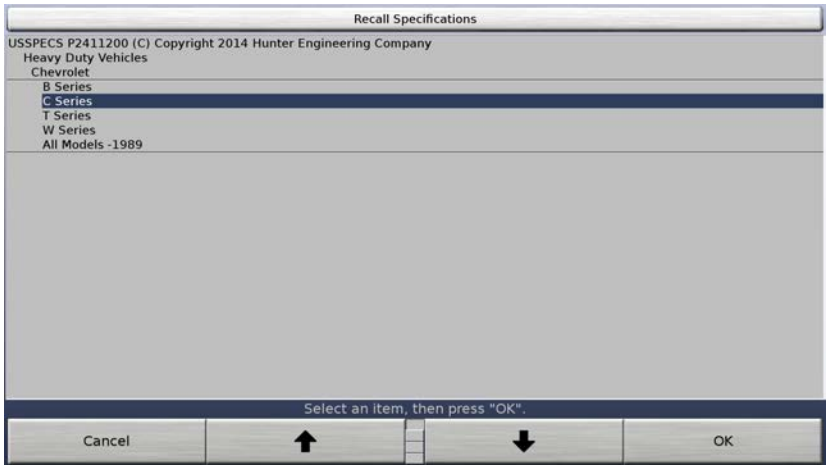
The “Recall Specifications” screen allows you to recall vehicle specifications from the specification database.



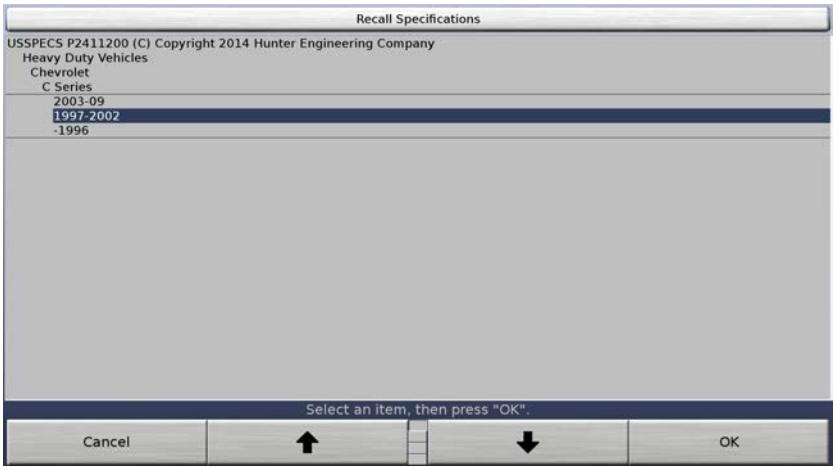
It is displayed by pressing “Recall Specifications” on the “Vehicle Specifications” screen.

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. *Refer to “Recalling User Specifications,” page 18.*

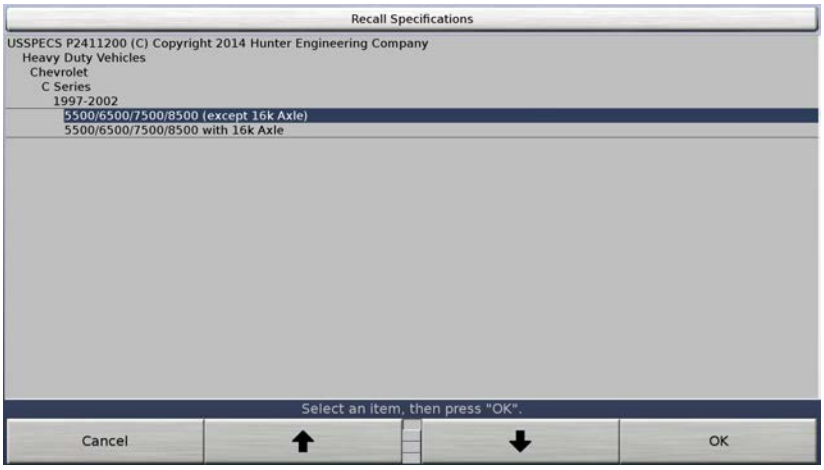
Press ↑ or ↓ to move the highlight to the manufacturer of the vehicle being aligned, or press ↑↑ or ↓↓ to move a full page at a time. Press “OK” to select that manufacturer. The screen changes to show the models available for the selected manufacturer.



Again, press ↑ or ↓ to move the highlight to the model of the vehicle being aligned, or press ↑↑ or ↓↓ to move a full page at a time. Press “OK” to select that model. The screen changes to show the model year selection



Again, press ↑ or ↓ to move the highlight to the model sub-category of the vehicle being aligned, or press ↑↑ or ↓↓ to move a full page at a time. Press “OK” to select that sub-category.



The specifications are recalled and the screen closes.

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 “millimeters @ reference diameter,” and the specification database does not contain the required reference diameter, then the reference diameter is not changed by recalling the specifications. In this case, you will be prompted to manually enter the reference diameter after 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. *Refer to “Entering and Editing Specifications,” page 16.*

Editing and Storing Specifications

Entering and Editing Specifications

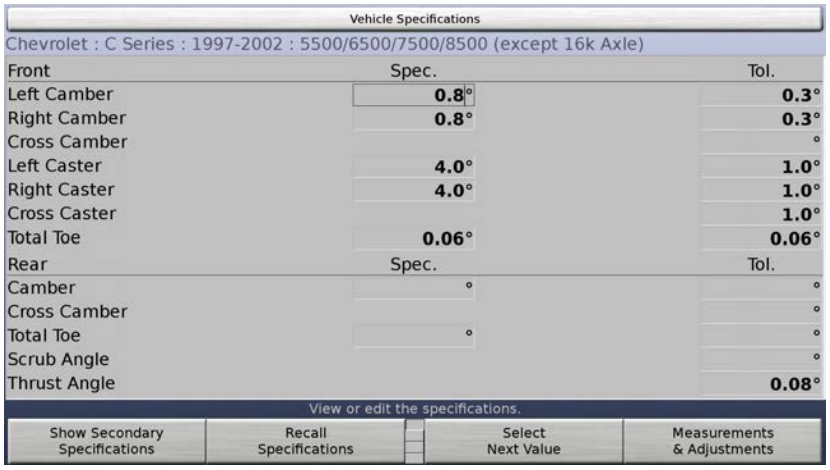
Specifications might have to be entered or edited manually on the “Vehicle Specifications” screen. The reasons for this are:

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 “Tab” key to advance the entry window to the location of the value. 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]

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

Press [2] [ ] [1] [5]

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

Press [0] [ ] [6]

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 positive unless the minus (-) sign is keyed in before the specification value.

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 previously.

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 construction vehicles that are always loaded.

These specifications can take two forms:

They can be manually entered onto a blank specification 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.

To store a specification:

On the “Vehicle Specifications” screen, press “Clear All Specifications.” Then manually enter the specifications in the usual manner.

OR

Recall the vehicle specifications from the specification memory. Then manually edit the specifications as needed. This derives the specifications from the factory specifications.

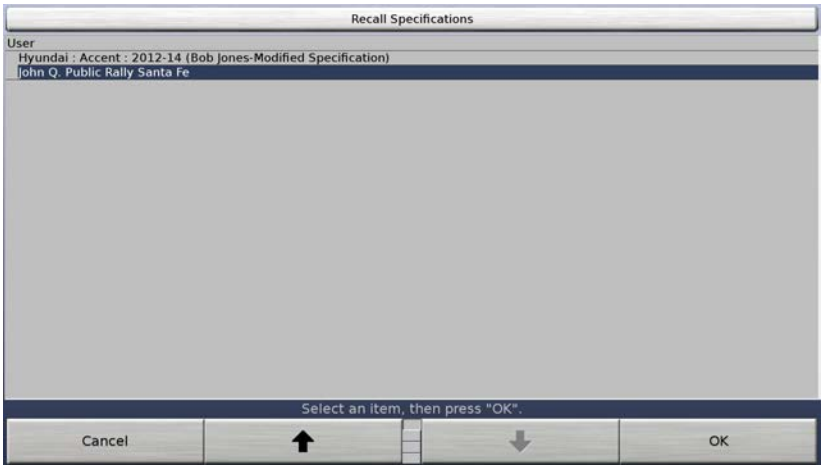
When the specifications are ready to store, press “Store Specifications.” The “Store Specifications” screen will appear.

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

To recall specifications from the “User” specification memory, the “Recall Specifications” screen must be currently displayed.



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

Large tolerances 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 degree (1/4 degree).

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

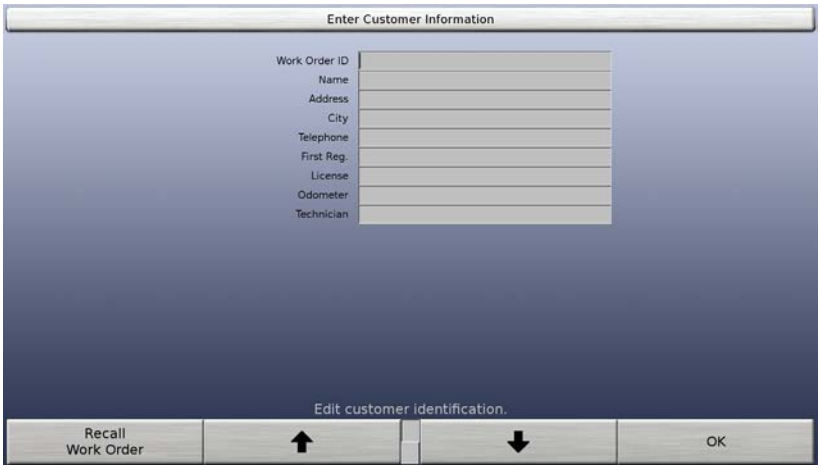
Front and rear total toe tolerances are reduced to ± 0.06 inches (1/16 inch, 0.13 degree, or 1.5mm depending upon toe units selected).

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

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.

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:

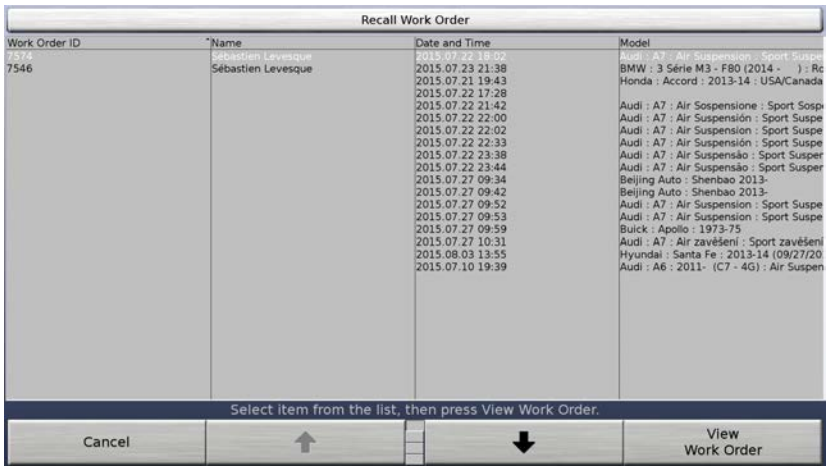
At the end of the alignment, press the R (Esc) key located in the upper, left corner of the keyboard.

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

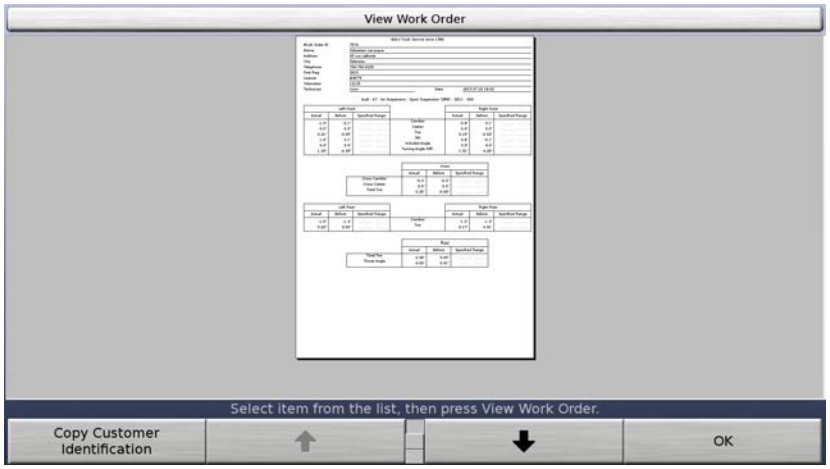
From the “Edit Customer Identification” screen, press “Recall Work Order” to open the “Recall Work Order” screen.



The “Recall Work Order” screen displays the work management records. The individual records are identified by the four fields chosen during aligner setup. *Refer to Chapter 2. Aligner Set Up, for complete instructions.*

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.”

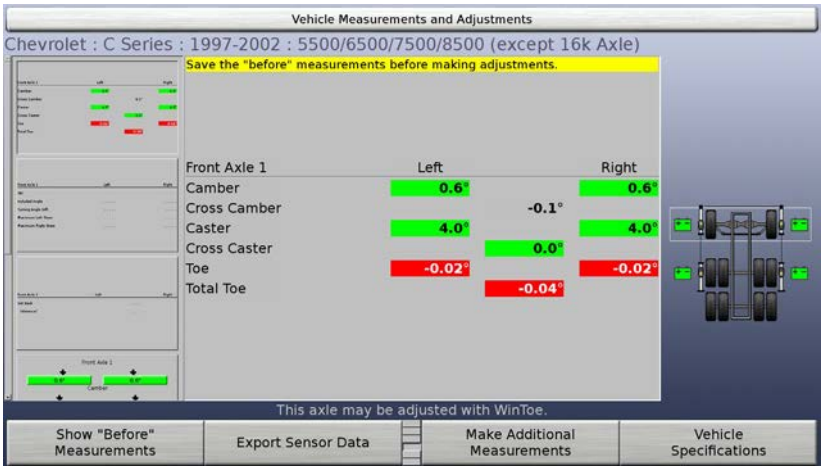


NOTE:	Customer information can be changed after it is imported to the current work order. Customer information within a recalled work order cannot be changed.

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 Vehicle Measurements and Adjustments

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



It is displayed by pressing “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

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

This screen shows a prompt just above the softkeys identifying any specialized adjustment screens that are available for the current axle. This will be some combination of the following:

- Thrust angle adjustment
- Scrub angle adjustment

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”).

Measurements can also be 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

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.

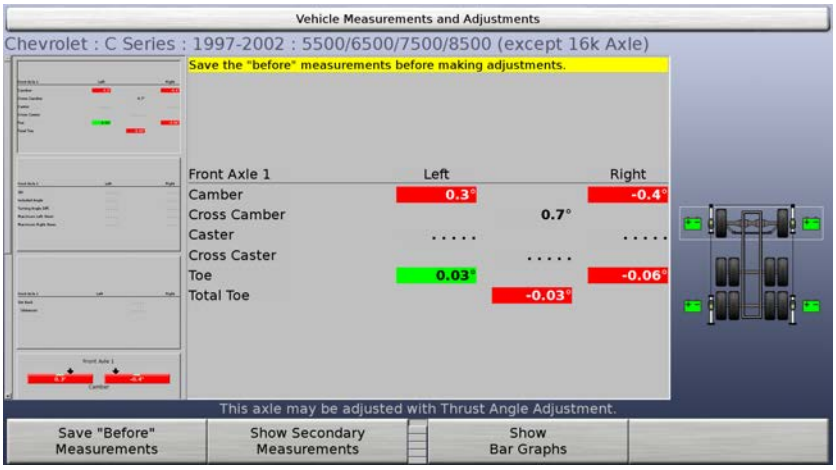
“Maximum Left Steer” is the fixed value measured during the maximum steering angle measurement procedure. The wheels are steered as far as possible to the left, at which time the left and right toe angles are measured. The “Left” value is measured at the left wheel, and the “Right” value is measured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

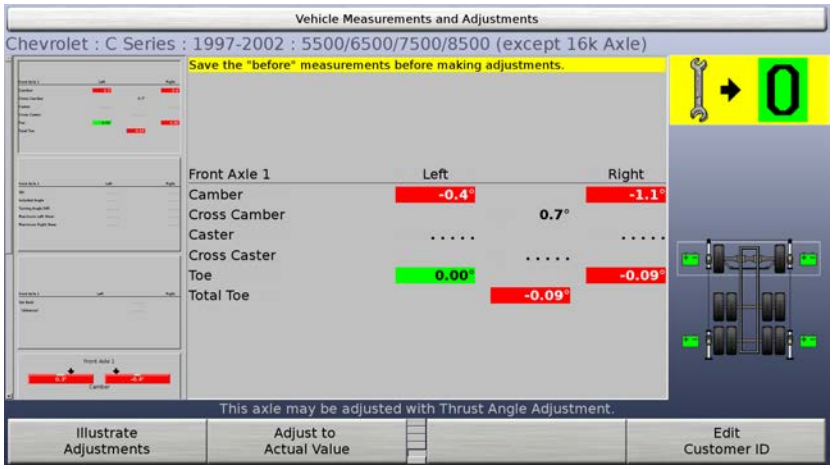
Showing Measurements

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 and the wheels are in a “straight ahead” position.

Primary, Secondary, and Symmetry Measurement Groups

When showing measurements in the “adjust to actual value” format, the alignment measurements are shown in three 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, toe-out-on-turn, and maximum steering angle measurements.

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

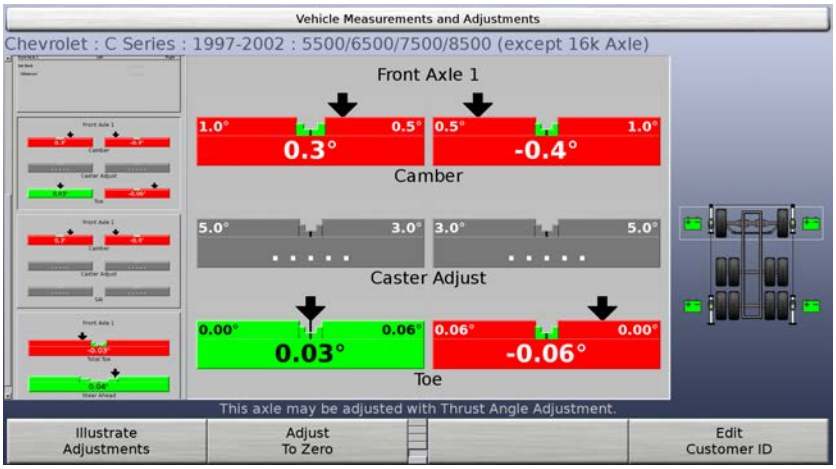
Select any of these groups by pressing "Show Secondary Measurements," "Show Symmetry Measurements," or "Show Primary Measurements."

Showing Bar Graphs

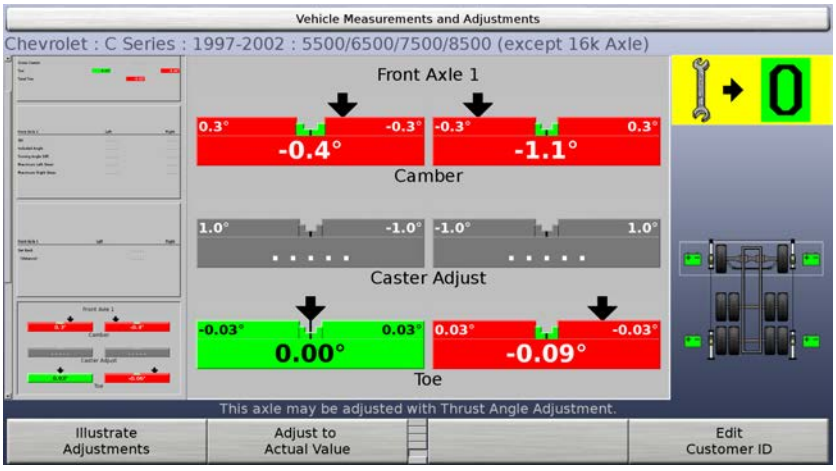
If the "Vehicle Measurements and Adjustments" screen is showing measurements, press "Show Bar Graphs" to switch to the bar graphs format.

This display is usually used when making 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.



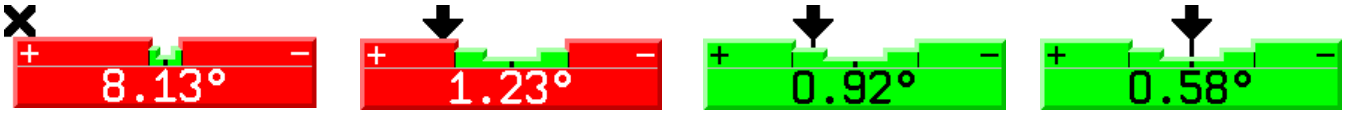
When using the "adjust to zero" format, the number below the bar graph is the difference between the measured value and the specification. You can toggle between the "adjust to zero" and "adjust to actual value" formats by pressing "Adjust to Zero" and "Adjust to Actual Value."



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 the 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 0.58 degree):



Out Of Tolerance - beyond range of the bar graph | **Out Of Tolerance** | **Acceptable Adjustment (within tolerance)** | **Preferred Adjustment**

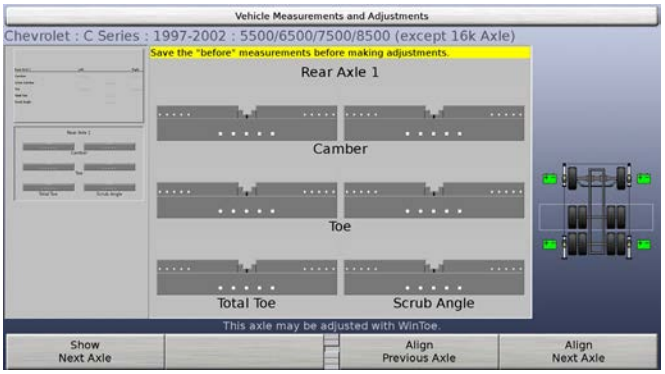
If the bar graph color is gray, either no specification or tolerance is entered for that angle, or the sensors are experiencing some problem which prevents measurements, such as: the sensor is unplugged, uncompensated, or the toe beam is blocked.

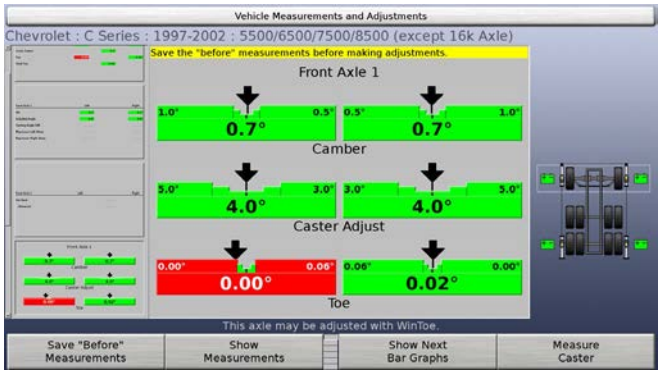
NOTE:	These measurements should not be used to diagnose or adjust the vehicle until the vehicle is lowered and the wheels are in a “straight ahead” position.

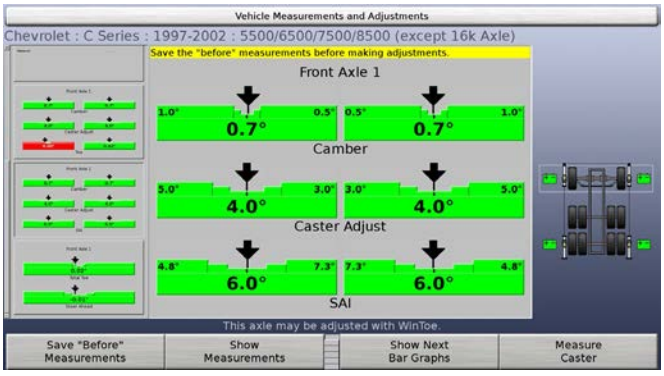
⚠ **CAUTION:**	Do not confuse the “adjust to zero” and “adjust to actual value” formats. The displays are different to help prevent this. Note especially the large “adjust to zero” icon that appears at the upper right corner when this format is used.

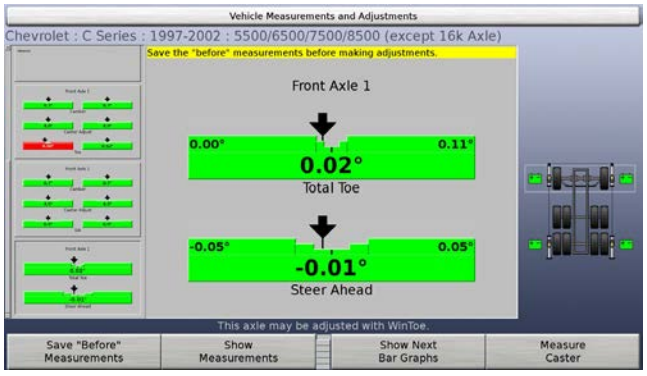
Bar Graph Groups

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.

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

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 that 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 screen, 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 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.”
- “Toe transducers may require re-calibration.”
- “Battery requires recharging.”

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.”

Alignment Procedures

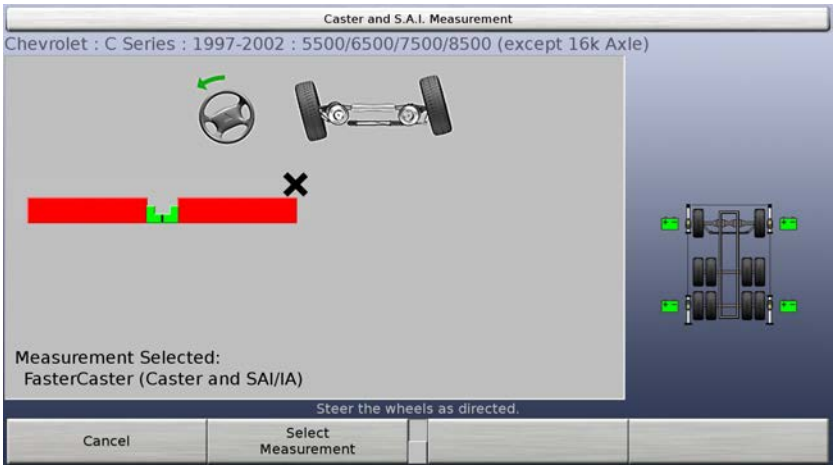
The vehicle should be adjusted in the following sequence:

Rear camber (if adjustable)
Rear toe (if adjustable)
Thrust angle
Front camber and caster (if adjustable)
Front toe
Scrub angle

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

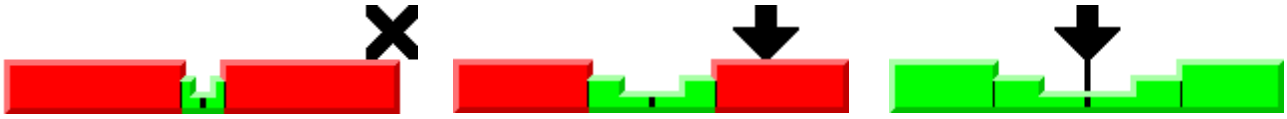
The “Measure Caster” screen measures caster, S.A.I., and included angle.

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**

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 one of the following measurements:

Caster only
Caster and S.A.I./IA
S.A.I./IA only

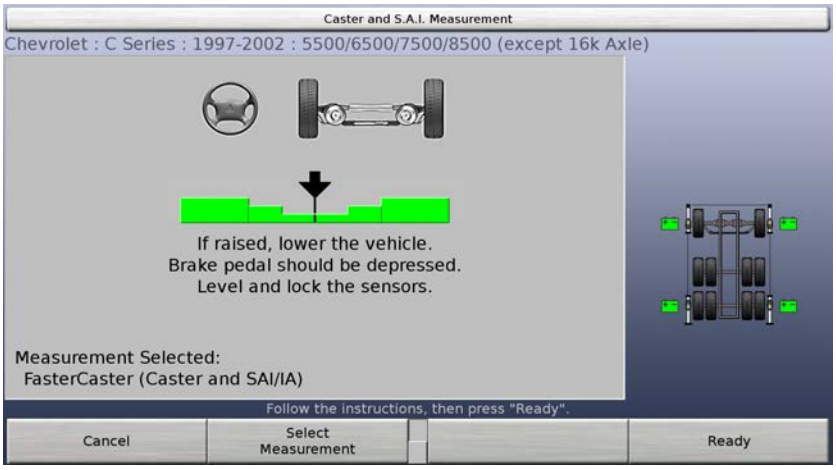
Usually, only caster is measured. S.A.I. and included angle may be measured if desired, and may be of some use in diagnosing damaged suspension or steering components.

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

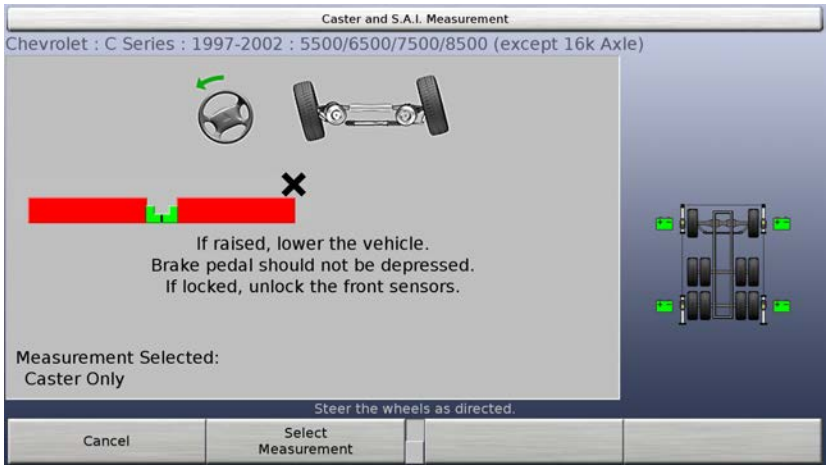
NOTE:	This selection will not change the default setting. When the aligner is reset, the default settings will be applied. *Refer to “Aligner Set Up,” page 8.*

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.



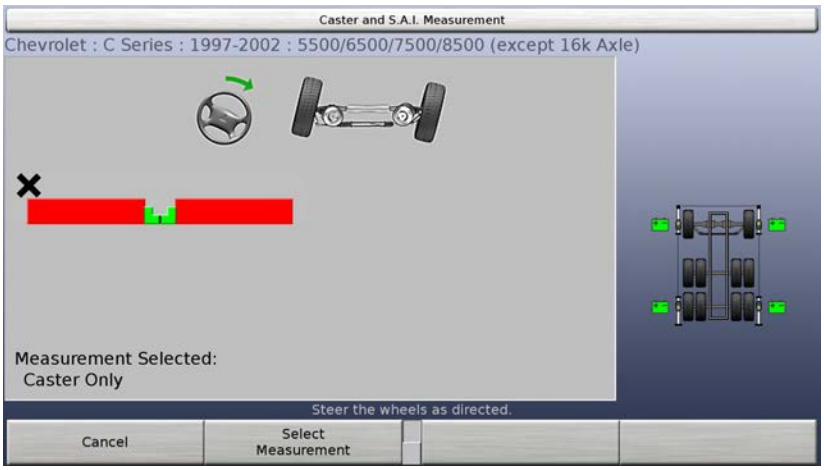
When the “straight ahead” measurements have been stored, the display changes to show two bar graphs and prompts to steer to the left. The left bar graph shows the left wheel while the right bar graph shows the right wheel.



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.

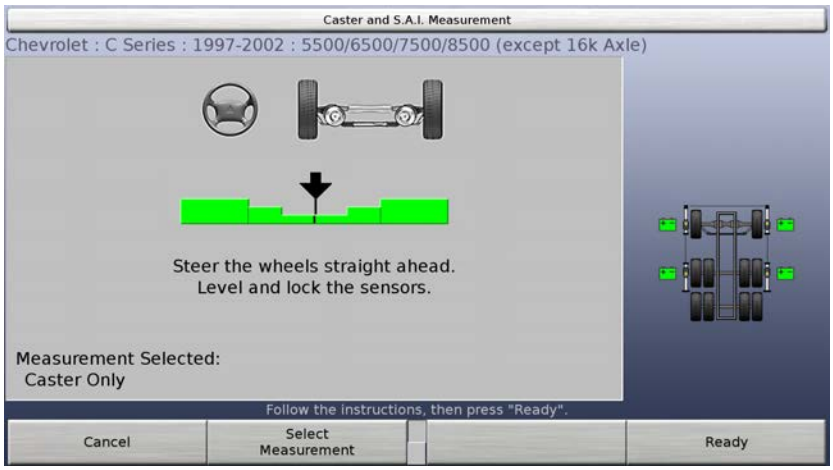
When one of the bar graphs is centered, hold the steering wheel steady and allow the system to take a “snapshot” of the measurements. The bar graph disappears when the measurements are stored. Then slowly steer the other wheel until its bar graph is centered, and again hold the steering wheel steady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



Depress the brake pedal and steer the wheels straight ahead until the bar graph is centered. 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 closes. The new S.A.I. and included angle measurements are shown on the “Vehicle Measurements and Adjustments” screen.

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.”

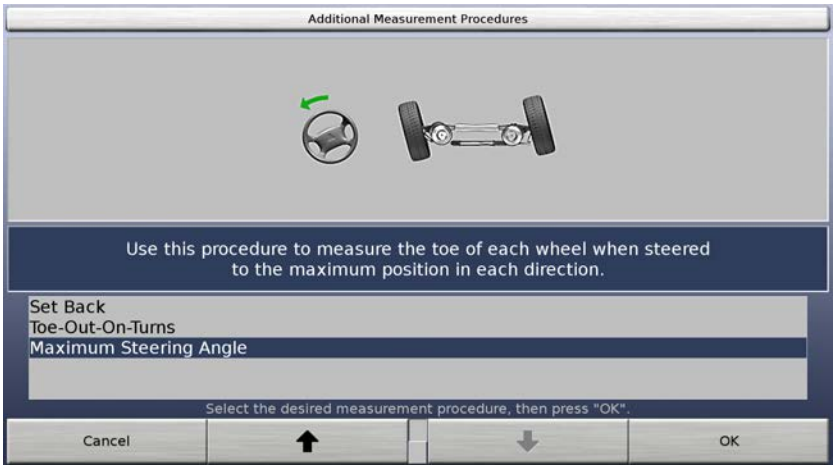
Follow the prompts and steer exactly as described on the screen.

At this point, caster, S.A.I., and included angle are measured and the screen closes. The new caster, S.A.I., and included angle measurements are shown on the “Vehicle Measurements and Adjustments” screen.

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 additional alignment measurements.



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

The additional measurements available are:

Symmetry Measurements / Set Back

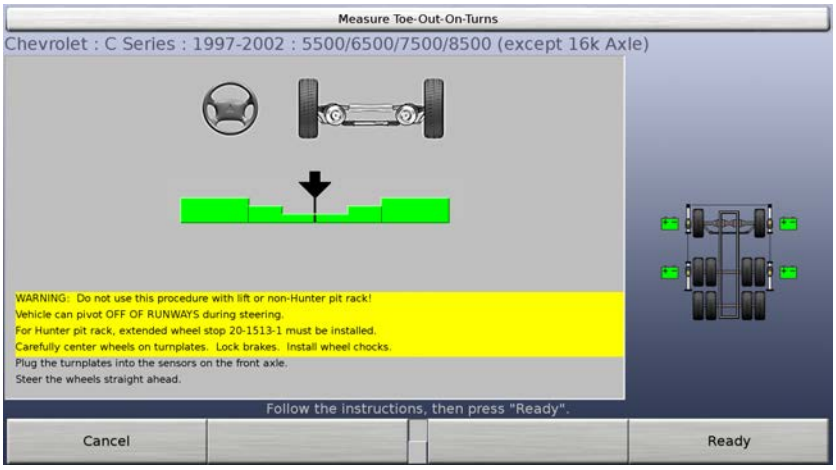
Toe-Out-On-Turns

Maximum Steering Angle

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

Measuring Toe-Out-On-Turns

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



It is displayed when selected on the “Additional Measurement Procedures” screen.

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 take a snapshot of both steer angles,” while a positive turn reference means “steer the outside wheel to the turn reference angle and then take a snapshot of 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. Two choices are available:

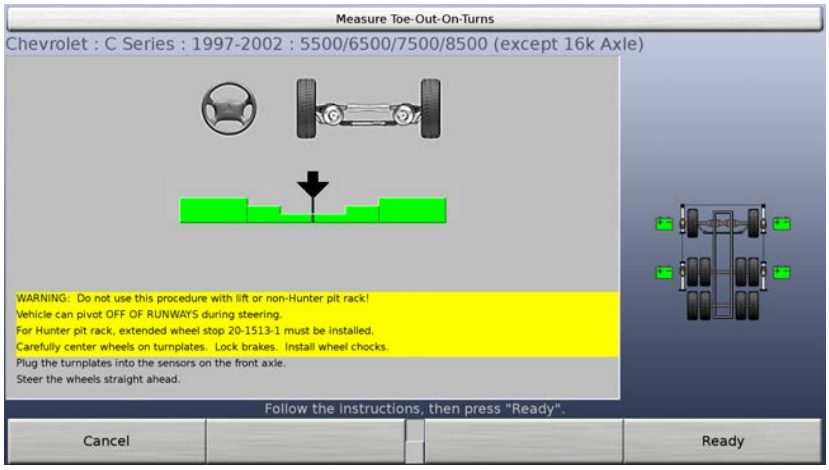
> “Electronic Turnplates Connected to DSP Sensors” are available, which use encoders mounted in the turnplates. The turnplates are connected to special connectors on the front sensors.
>
> “DSP500 Series Sensors” which measures toe out on turns (up to +/-25 degrees) without additional hardware.

The type of sensor used must be specified. *Refer to “Setting Up the Sensor Type for Toe-Out-On-Turns,” page* ***Error! Bookmark not defined.****.*

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.

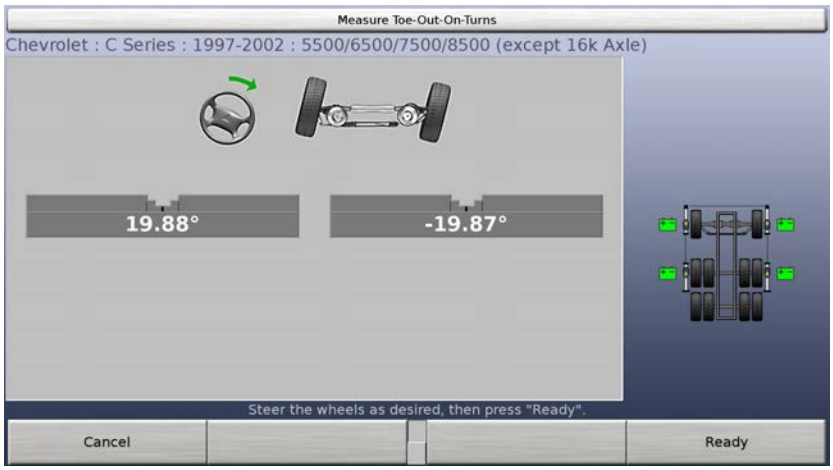


When the “steered straight ahead” measurements have been stored, the display changes to show two bar graphs and prompts to steer to the left.

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.

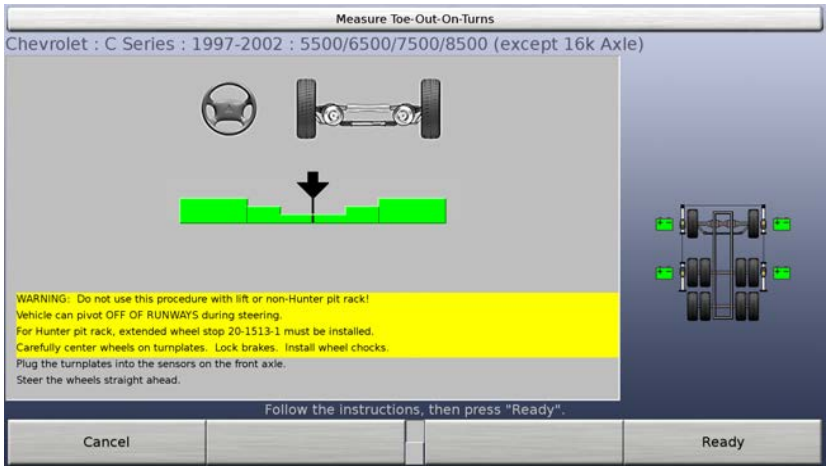
Steer the wheels to the left to center the bar graph labeled “Steer This Wheel.” Hold the steering wheel steady and allow the system to take a “snapshot” of the measurements. The example shown above uses the outside wheel as the reference.

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.



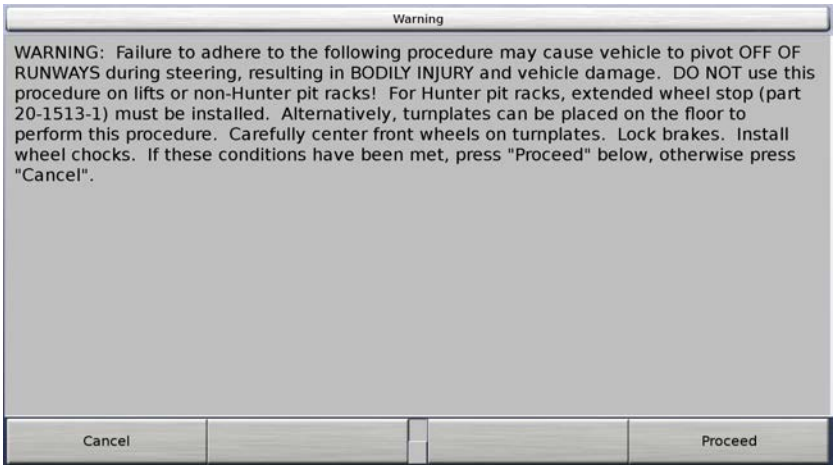
Steer the wheels straight ahead until the bar graph is centered. Then hold the steering wheel steady and allow the system to take a “snapshot” of the measurements.

At this point, the turning angle differences are measured and the screen closes. 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 take a snapshot of the measurements.

Measuring Maximum Steering Angle

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



It is displayed when selected on the “Additional Measurement Procedures” screen.

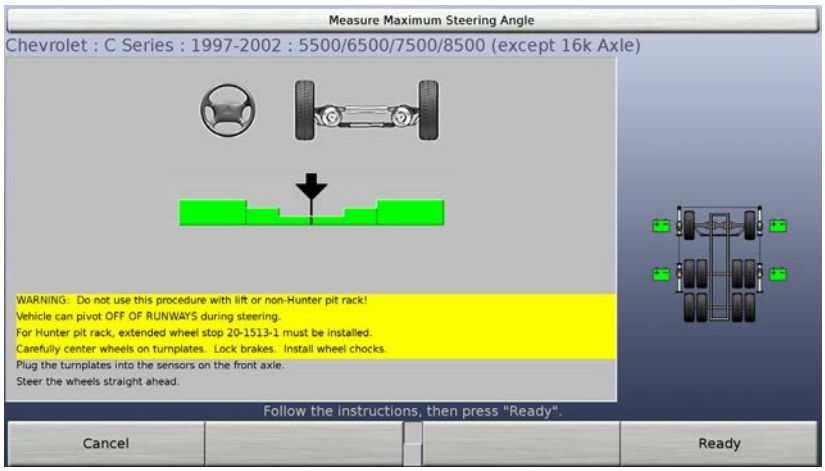
Note that special instrumentation must be used to measure maximum steering angles. “Electronic Turnplates Connected to DSP Sensors” are available, which use encoders mounted in the turnplates. The turnplates are connected to special connectors on the front sensors.

You must specify which type of sensor is used. The procedure for measuring maximum steering angles is as follows:

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.

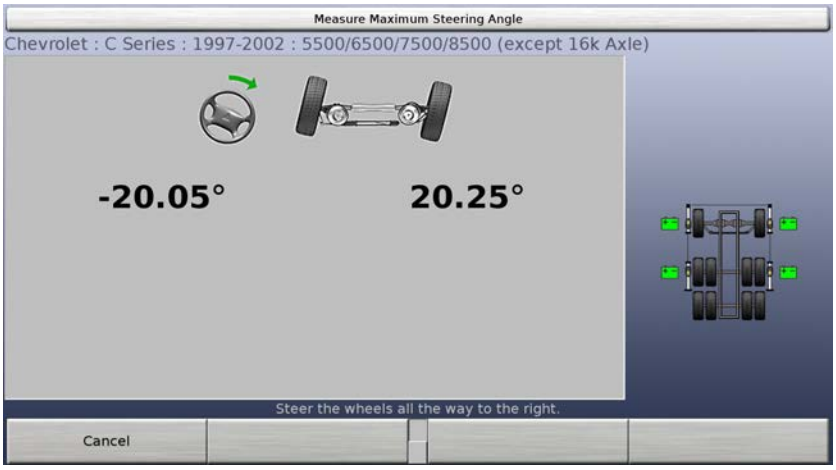
Press Ready and allow the system to take a “snapshot” of the measurements.



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

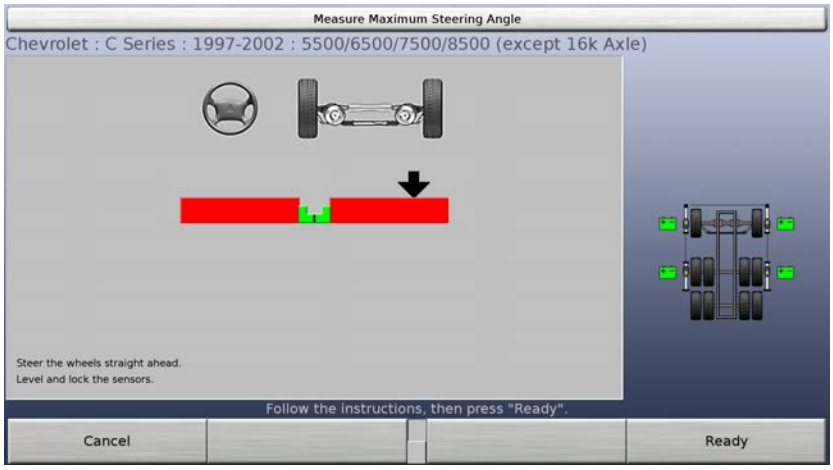
Steer the wheels to the left as far as they will go. Press “Ready” and allow the system to take a “snapshot” of the measurements.

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.

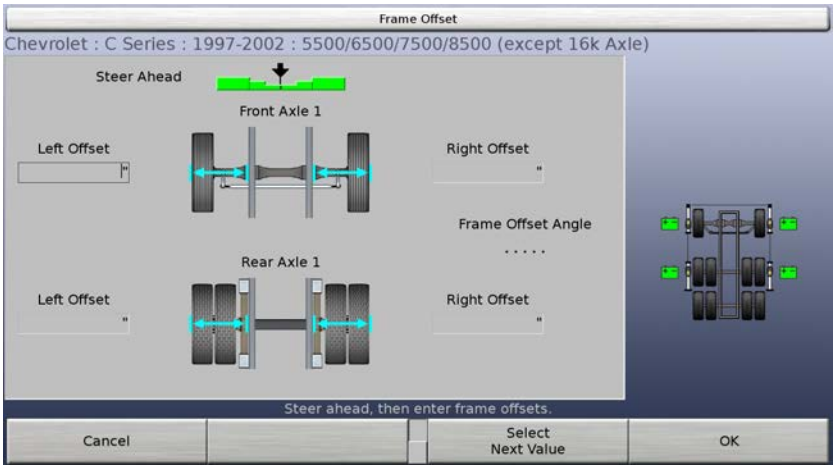


Steer the wheels straight ahead until the bar graph is centered. Then hold the steering wheel steady and allow the system to take a “snapshot” of the measurements.

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

Frame Offset

To input frame offset, select “Frame Offset” from the “Vehicle Measurements and Adjustments” screen.



Secure the frame offset tool, 221-646-1, to a flat face of the truck’s frame with the magnetic end of the gage.

NOTE:	The frame offset should be measured on the reference axle. The actual location is not as critical as verifying that the gage is mounted to the frame at similar locations on each side. The frame offset tool should not be mounted on spring shackles, mounting tabs, or any other surfaces that are not the actual frame rails.

NOTE:	While measuring offset at the axles to make sure they are centered properly is always advisable, frame offset should only be used if you intend to perform a frame reference alignment. The recommended alignment is a geometric alignment which does not require frame offset to be entered. *Refer to “5.1 Alignment Types” on page 47*

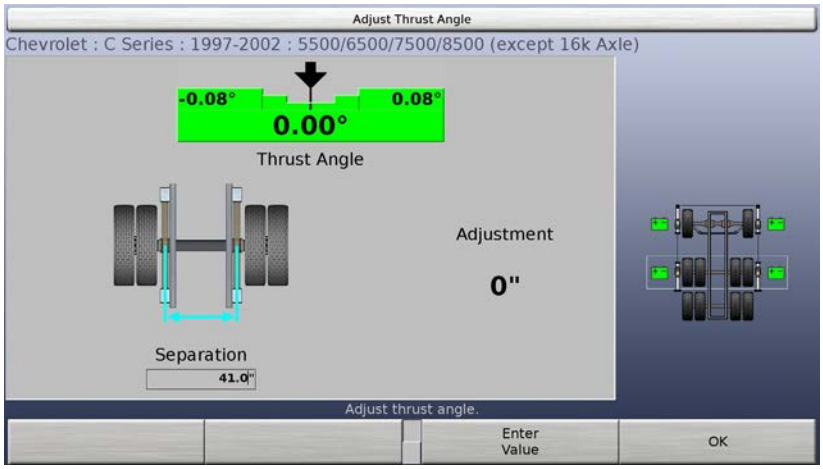
Slide the pointer assembly over the frame offset gage and rotate to the position where the frame offset locator touches the lip of the rim.

Read the dimension at the location where the frame offset gage protrudes from the pointer assembly tube.

NOTE:	It does not matter which end of the pointer assembly tube is used to read the measurement, as long as the dimension is read consistently from side to side.

Thrust Angle

To adjust thrust angle, select “Adjust Thrust Angle” from the “Vehicle Measurements and Adjustments” screen.



Measure the distance between the reference axle adjustment points. Type in this separation distance, then press “OK” to accept the separation distance, or press “Enter Value” to enter a different value.

3.4 Sensors

Mounting Sensors onto Wheel Adaptors

Sensors 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 first and then mount the sensor or target onto the adaptor. Either method may be used.

Center the wheel adaptor center casting between the upper and lower castings.

Tighten both center casting lock knobs very firmly. This will prevent the center casting from slipping down when the sensor is attached.

> ⚠ **CAUTION:** Hand-tighten center casting lock knobs as tight as possible, (do not use tools to tighten).

Attach sensor to wheel adaptor by inserting the sensor mounting shaft (at the rear of the sensor) into the sensor mounting hole in the middle of the center casting.

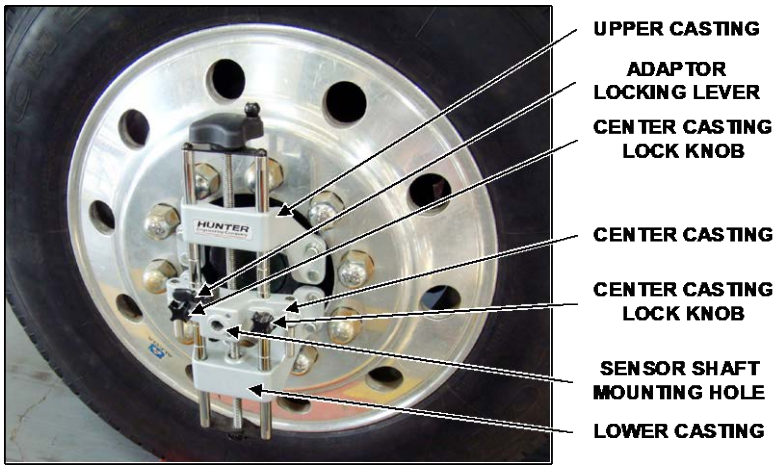
Swing the sensor locking lever clockwise to the locked position.

> ⚠ **CAUTION:** When mounting sensors 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. Rotate the wheel while holding the target. Listen and feel for movement between the sensor or target and wheel adaptor. Runout compensation and alignment accuracy could be adversely affected if there is any movement between the sensor or target and wheel adaptor. Sensors must fit tightly against the surface of the wheel adaptor or the lock may not hold. This could allow the sensor to fall and be damaged.

When the sensor or target is mounted, the locking lever should be rotated until firm hand pressure is applied. Tools should not be used to force the locking lever.

Mounting Wheel Adaptors onto Wheels

The mini self-centering truck wheel adaptors, 175-284-1, may be mounted in the center opening of the truck wheel (steel or alloy).



MINI SELF-CENTERING TRUCK WHEEL ADAPTOR

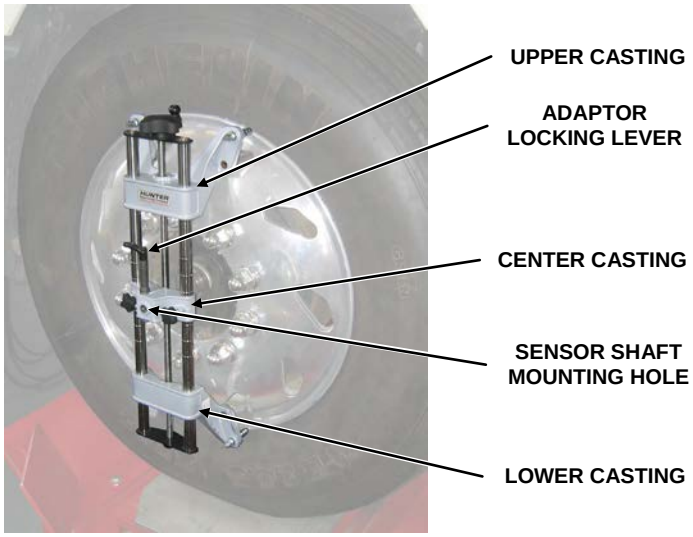
The standard self-centering truck wheel adaptors, 175-377-1, must be mounted to the outside of the rim on alloy wheels.

NOTE:	If the rim/tire profile does not accept the adaptor rim studs, install spade sleeves over the rim studs. If spade sleeves are needed on one front wheel, they must be used on both front wheels. If spade sleeves are needed on one rear wheel, they must be used on both rear wheels.

Tighten both center casting lock knobs firmly. This will prevent the center casting from slipping down when the sensor is attached.

⚠ **CAUTION:**	Hand-tighten center casting lock knobs as tight as possible, (do not use tools to tighten).

⚠ **CAUTION:**	If the center casting lock knobs are not firmly tightened, runout compensation and alignment accuracy will be adversely affected.

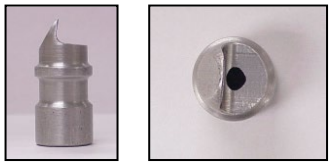


STANDARD SELF-CENTERING TRUCK WHEEL ADAPTOR

If detached, attach the sensor to the wheel adaptor by inserting the sensor mounting shaft (at the rear of the sensor) into the sensor mounting hole in the middle of the center casting.

NOTE:	The sensor shaft must be fully inserted into the sensor shaft mounting hole.

NOTE:	Using the standard adapter, long side, on aluminum wheels and wide base tire technology such as the Michelin X-One, can result in inaccurate wheel compensation as the adapter will reposition itself on the rim when the tire is lowered to the ground as the tire will push the adapter away from the rim. The 106-129-2, spade sleeves included with the wheel adapter will prevent this from happening.



106-129-2 SPADE SLEEVE

⚠ CAUTION:	When mounting sensors to the wheel adaptors, the sensor shaft must be fully seated. Make certain that there is no play or looseness between the sensor shaft and the wheel adaptor. Rotate the wheel while holding the sensor. Listen and feel for movement between the sensor and wheel adapter. Runout compensation and alignment accuracy will be adversely affected if there is any movement between the sensor and wheel adapter. Sensors must fit tightly against the surface of the wheel adaptor or the lock may not hold. A loose fitting adaptor could allow the sensor to fall, and become damaged.

When the sensor is mounted, the sensor locking lever should be rotated using firm hand pressure. Tools should not be used to force the locking lever.

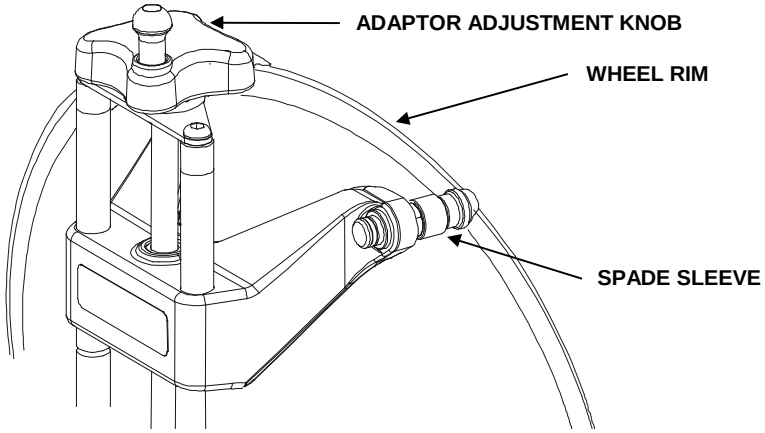
Wheels with No Rim Lip (Attaching to Outer Rim Lip)

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

Align the two lower, external rim studs on the outside of the wheel rim and check that all four rim studs will engage the outside of the wheel rim.

NOTE:	If the rim/tire profile does not accept the adaptor rim studs, install spade sleeves over the rim studs. Part number 20-831-1 includes spade sleeves that will accommodate four wheel adapters. If spade sleeves are needed on one front wheel, they must also be used on the other wheel on that axle. If spade sleeves are needed on one rear wheel/set of dual wheels, they must be used on the other rear wheel/set of dual wheels on that axle.

Turn the adaptor adjustment knob to firmly attach the adaptor to the wheel.



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

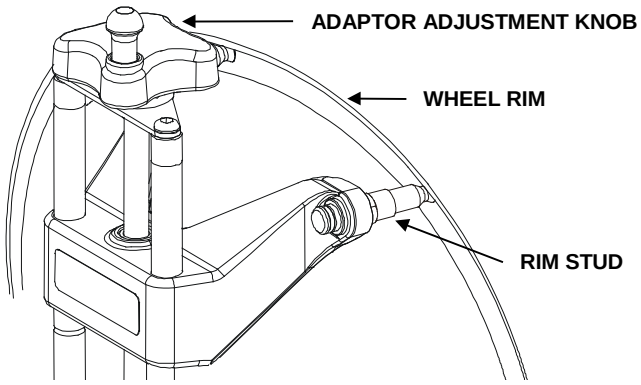
⚠ **CAUTION:**	Do not allow the rim studs to slip on the wheel. Runout compensation and alignment accuracy will be adversely affected if the wheel adapter is allowed to slip on the wheel.

Wheels with Rim Lip (Attaching to Inner Rim Lip)

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

Align the two upper rim studs with the upper wheel rim lip and check that all four studs will engage the inner portion of the rim lip.

Turn the adaptor adjustment knob to firmly attach the adaptor to the wheel.



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

⚠ **CAUTION:**	Do not use rim studs on alloy or clear-coated wheels. Rim studs can damage these wheels.

⚠ **CAUTION:**	Do not allow the rim studs to slip on the wheel. Runout compensation and alignment accuracy will be adversely affected if the wheel adapter is allowed to slip on the wheel.

Connecting Conventional Sensor Cables

Connect the two rear sensors to the front sensors using sensor cables.

Connect the two front sensors to the console using sensor cables.

Compensating Conventional Sensors

General Compensation of Conventional Sensors

The sensors must be compensated to eliminate error in angle measurements caused by runout of the wheel and wheel adaptor.

The default setting for the alignment console is set for 3-point compensation.

If a sensor that has been compensated should require re-compensation, pressing the compensate button twice within four seconds will begin the new procedure.

When pressing the sensor compensate button, momentarily depress (do not hold the compensate button). Also, do not disturb the sensor until the red LED responds.

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

NOTE:	If for any reason you must lower or raise the sensor on the wheel adaptor to avoid obstructions, (i.e. air dam blocking toe readings or sensors hitting an alignment rack on smaller tires) both sensors on an axle must be positioned at the same position on the wheel adaptors and *compensation must be performed in this final position.*

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

When compensating sensors mounted to the vehicle drive wheels, place the transmission in NEUTRAL.

The lift rack should be level on leveling legs or leveling locks if available.

3-Point Compensation

Not all sensors need to be mounted before starting compensation. The sensors may be mounted and compensated individually or compensation may be performed on 1, 2, 3, or all 4 sensors at once.

Raise either the front or rear wheels.

⚠ **WARNING:**	**Chock wheels on axle not being raised during compensation to prevent vehicle from rolling.**

Select any one of the sensors for compensation. The starting position of the wheel adaptor does not matter. The green LED will be lit.

Snug down the sensor lock knob.

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

Press the compensate button. Do not disturb sensor until the LED turns red and the green LED turns off, indicating that the measurements have been stored.

Loosen the sensor lock knob.

Rotate the wheel 120 degrees until the green LED comes on. Snug down 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 keep from disturbing the sensor on the opposite front wheel.

With the green LED on, press the compensate button. Do not disturb the sensor until the second LED turns red and the green LED turns off to indicate that the measurements have been stored.

Loosen the sensor lock knob.

Rotate the wheel 120 degrees more until the green LED comes on. Snug down the sensor lock knob and rotate the wheel to level the sensor.

With the green LED lit, press the compensate button. Do not disturb the sensor. Wait for sensor to save measurement. The red LED and the green LED will stay lit.

Loosen the sensor lock knob.

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

NOTE:	All sensors should be level, but unlocked, with cables hanging straight down to minimize tilt of the sensors during caster sweep. Avoid rapid steering motion that may cause sensors to swing vertically, which can cause them to contact the rack or even dislodge from the wheel.

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

Apply the parking brake and place the transmission in neutral.

Lower the vehicle onto the turning angle gauges.

3-Point compensation is complete. The green LED and red LED on each sensor will be lit.

After 3-point compensation, the wheel may be rotated to any position without affecting the alignment measurements. Continue the alignment procedure.

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 single 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 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 Remote Indicator, Hunter part number 30-419-1, is Form 5382T.

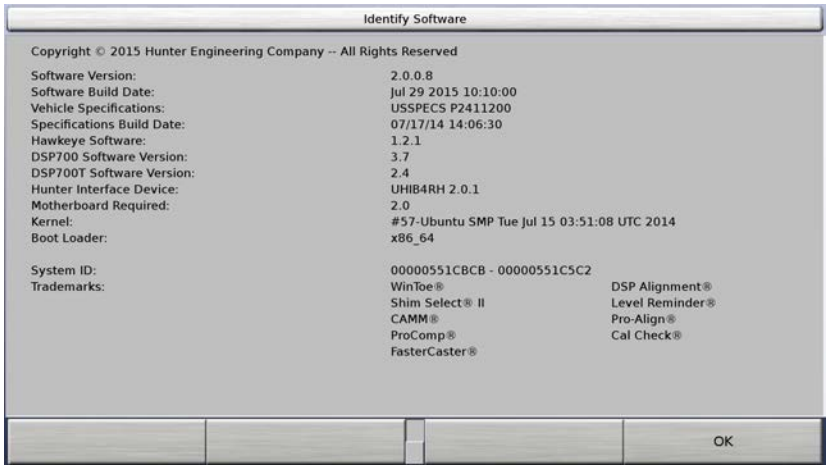
4.5 Remote Control Transmitter

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.

4.6 Software Identification

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



NOTE:	This screen does not necessarily reflect your software.

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

5. GLOSSARY

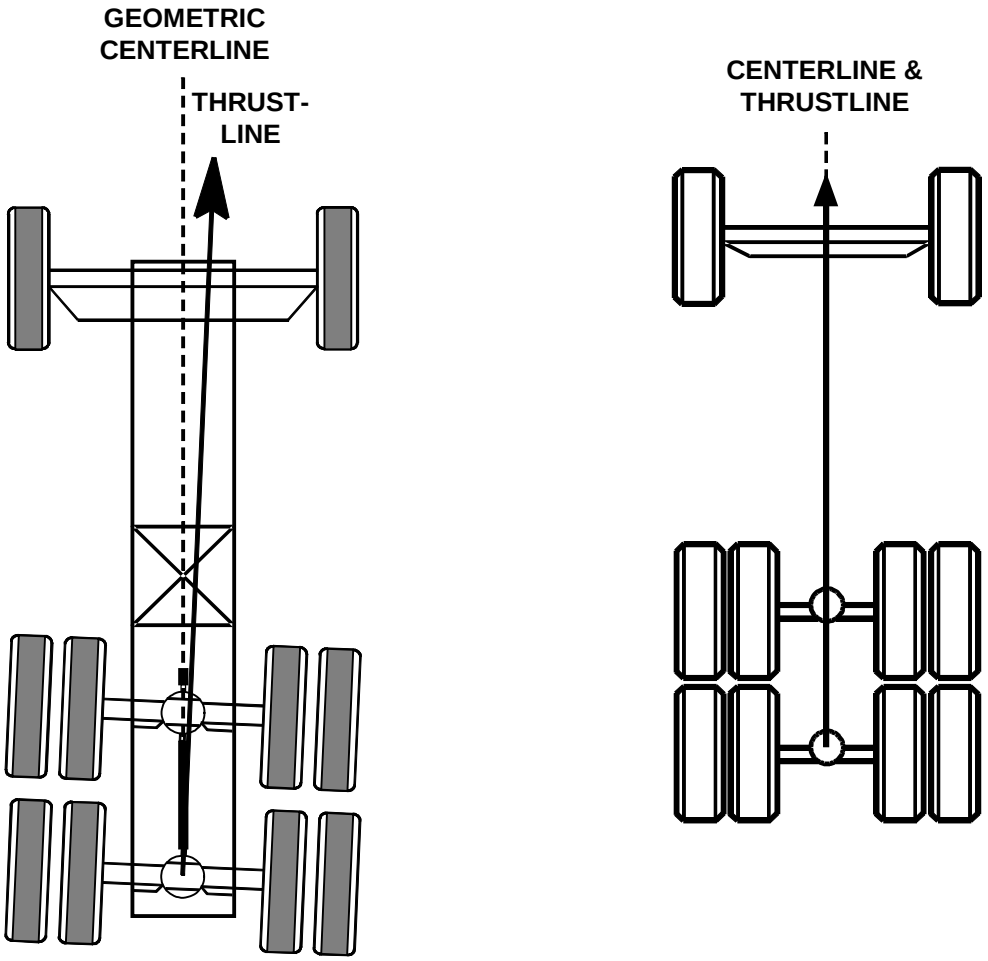
5.1 Alignment Types

Front Centerline Alignment

Toe on each front wheel is measured and adjusted, using the geometric centerline of the vehicle as a reference.

Geometric centerline alignment has been used for many years and may provide a satisfactory alignment if the rear wheels are positioned squarely with the geometric centerline of the vehicle.

However, if the vehicle's rear wheels (either solid axle or independent suspension) create a thrust line that is not parallel to the geometric centerline, the front end steering geometry will be off center as the vehicle moves in a straight direction.



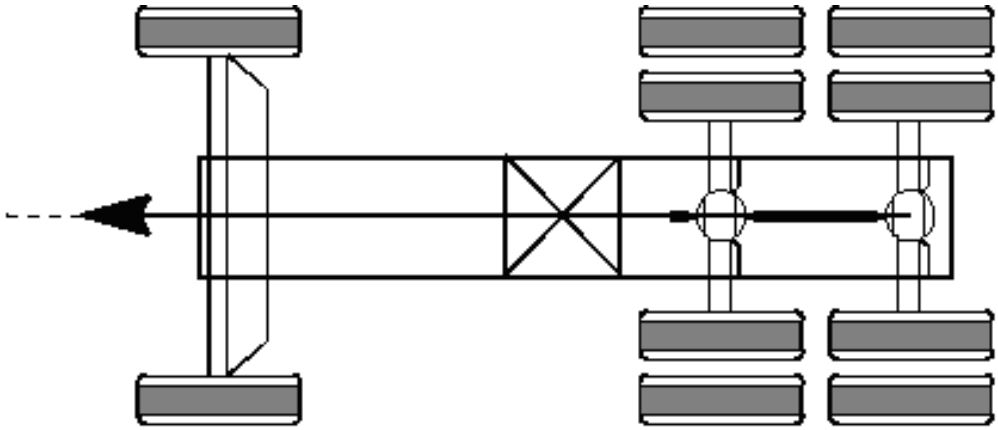
Total (All Wheel) Alignment

Total all wheel alignment is the ultimate wheel alignment service. The reference axle thrust angle is measured, and then adjusted. This adjustment brings the thrust line of the reference axle parallel to the geometric centerline.

The front wheels are then aligned to the reference axle thrust line.

If applicable, the remaining rear axles are then measured and adjusted.

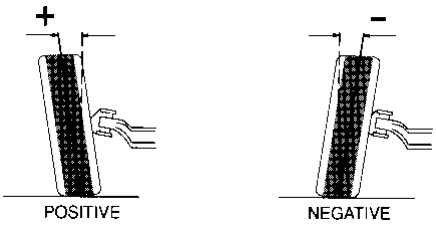
Total all wheel alignment results in all wheels being parallel and the steering geometry being centered as the vehicle moves in a straight line.



CENTERLINE AND THRUSTLINE

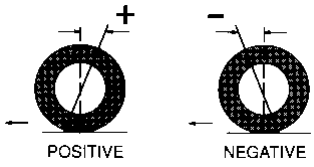
5.2 Alignment Angles and Measurements

Camber



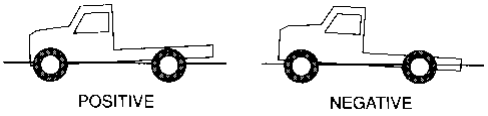
Camber is the angle, as viewed from the front, between the plane of the wheel and the vertical. This angle is measured and displayed in degrees. Camber is positive when the wheel is tilted outward at the top and is negative when the wheel is tilted inward at the top.

Caster



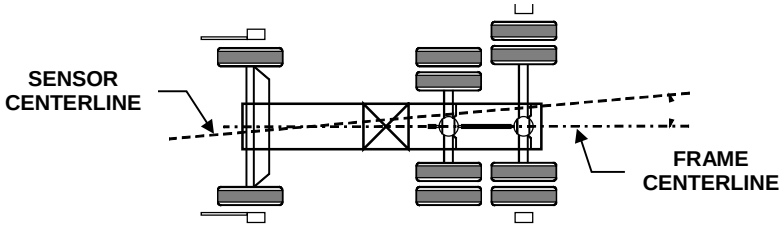
Caster is the angle, as viewed from the side, between the steering axis and the vertical. This angle is measured and displayed in degrees. Caster is positive when the top of the steering axis is tilted rearward and is negative when the top of the steering axis is tilted forward.

Frame Angle



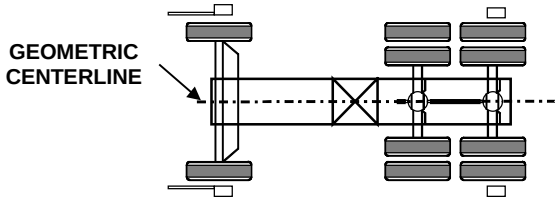
The frame angle is the angle, as viewed from the side, between the plane of the frame and the horizontal. The frame angle is positive when the frame is higher at the rear and is negative when the frame is lower at the rear. The frame angle is not measured by the aligner.

Frame Offset Angle



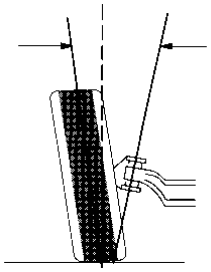
The angle of the frame referenced to the sensor centerline. Frame offset angle is calculated by the aligner when the requested measurements, as shown on the display, are entered into the aligner.

Geometric Centerline



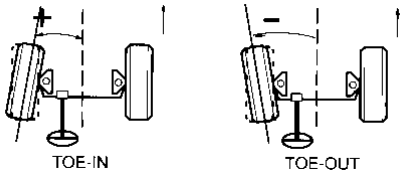
The geometric centerline is (approximately) a line drawn through the midpoints of the front and rear axles.

Included Angle (I.A.)



Included angle is the angle, as viewed from the front, between the plane of the wheel and the steering axis. This angle is measured and displayed in degrees. It is computed as the sum of S.A.I. and camber.

Individual Toe

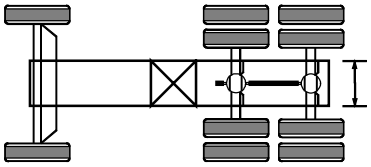


Individual toe is the angle, as viewed from above, between the plane of the wheel and the reference line of the vehicle. For the front wheels, the reference line is the thrust line of the rear wheels. For the rear wheels, the reference line is the geometric centerline. Individual toe is measured in degrees but may be displayed in degrees, inches or millimeters. Toe is positive (toed-in) when the front of the wheel is closer to the reference axis than the rear of the wheel. Toe is negative (toed-out) when the rear of the wheel is closer to the reference axis than the front of the wheel.

Maximum Steering Angle

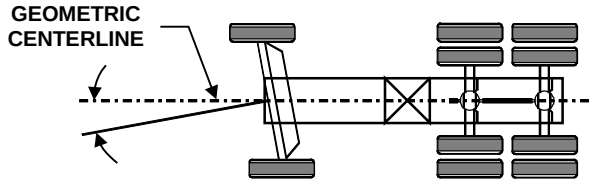
The amount that the front wheels can be turned in either direction due to mechanical limitations.

Separation



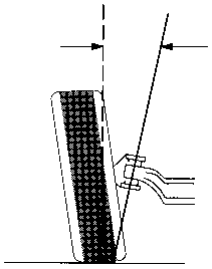
The distance between the reference axle adjustment points. This distance may be measured and entered into the aligner before adjusting thrust angle to allow the aligner to calculate how much the axle must be moved at the adjustment point.

Set Back



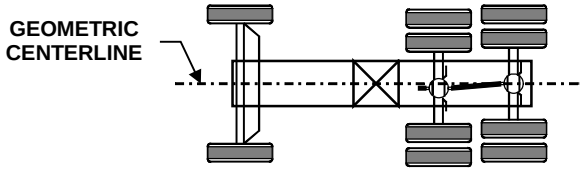
The angle formed by the geometric centerline and a line drawn perpendicular to the front axle. Set back is positive when the right wheel is behind the left wheel. Set back is negative when the left wheel is behind the right wheel. A set back condition will not affect the accuracy of the system.

Steering Axis Inclination (S.A.I)



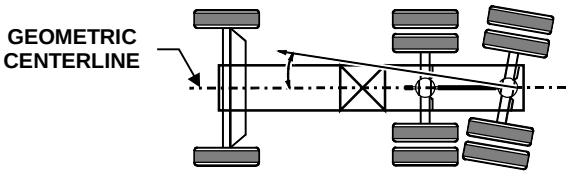
S.A.I. is the angle, as viewed from the front, between the steering axis and the vertical. S.A.I. is measured and displayed in degrees.

Tandem Lateral Offset



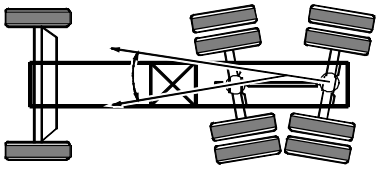
When the geometric centerline does not cross the midpoint of all axles. Negative Tandem Lateral Offset is when the geometric centerline is to the right of the axle midpoint. Positive Tandem Lateral Offset is when the geometric centerline is to the left of the axle midpoint. A tandem lateral offset condition or tread width variation will not affect the accuracy of the system.

Thrust Angle



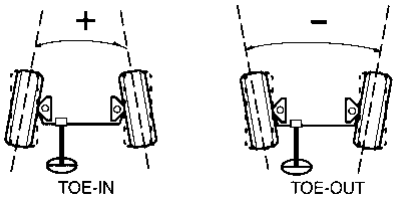
Thrust angle is the angle, as viewed from above, between the geometric centerline and the thrust line of the rear axle. This angle is measured and displayed in degrees.

Thrust Line and Tandem Scrub Angle



Thrust Line is the bisector of total toe angle of the axle. **Tandem Scrub Angle** is the angle formed by the two thrust lines of a tandem.

Total Toe

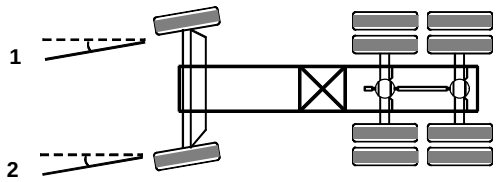


Total toe is the angle, as viewed from above, between the planes of the wheels on an axle. Total toe is measured in degrees but may be displayed in degrees, inches or millimeters. Toe is positive (toed-in) when the front edges of the wheels are closer to the each other than the rear edges of the wheels. Toe is negative (toed-out) when the rear edges of the wheels are closer to the each other than the front edges of the wheels.

Track Width Difference

The track width difference angle is a measure of the angle defined by the “lines of sight” of the longitudinal toe sensors. If the wheelbase specification is known, the difference between the front and rear track widths can be computed.

Turning Angle



Turning angle is the difference between the toe angles of the front wheels when one of the wheels is steered to a specified turn angle. The two wheels are not parallel to each other due to total toe and to “Ackerman steering.” Ideally, all four wheels steer about the same point.

Wheelbase Difference

The wheelbase difference angle is a measure of the angle defined by the “lines of sight” of the transverse toe sensors. If the track width specifications are known, the difference between the left and right wheelbases can be computed.