V3D Operation manual

Safety Information

For your safety, read this manual thoroughly before operating the equipment.

The Aligner is intended for use by properly trained skilled automotive technicians. The safety messages presented in this section and throughout the manual are reminders to the operator to exercise extreme care when performing wheel alignments with this product.

There are many variations in procedures, techniques, tools, and parts for servicing vehicles, as well as the skill of the individual doing the work. Because of the vast number of vehicle applications and potential uses of the product, the manufacturer cannot possibly anticipate or provide advice or safety messages to cover every situation. It is the automotive technician's responsibility to be knowledgeable of the vehicle to be aligned. It is essential to use proper service methods and perform wheel alignments in an appropriate and acceptable manner that does not endanger your safety, the safety of others in the work area or the equipment or vehicle being serviced.

It is assumed that, prior to using the Aligner, the operator has a thorough understanding of the vehicle systems being serviced. In addition, it is assumed he has a thorough knowledge of the operation and safety features of the alignment rack or lift, and has the proper hand and power tools necessary to perform wheel alignments.

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

1.Read all instructions.
2.Care must be taken as burns can occur from touching hot parts.
3.Do not operate equipment with a damaged power cord or if the equipment has been dropped or damaged until it has been examined by a qualified serviceman.
4.Do not let cord hang over edge of table, bench or counter or come in contact with hot manifolds or moving fan blades.
5.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 than the equipment may overheat. Care should be taken to arrange the cord so that it will not be tripped over or pulled.
6.Always unplug equipment from electrical outlet when not in use. Never use the cord to pull the plug from the outlet. Grasp plug and pull to disconnect.
7.Let equipment cool completely before putting away. Loop cord loosely around equipment when storing.
8.To reduce the risk of fire, do not operate equipment in the vicinity of open containers of flammable liquids, such as gasoline.
9.Adequate ventilation should be provided when working on operating internal combustion engines.
10.Keep hair, loose clothing, fingers, and all parts of body away from moving parts.
11.To reduce the risk of electrical shock, do not use on wet surfaces or expose to rain.
12.Use only as described in this manual. Use only manufacturer's recommended attachments.
13.ALWAYS WEAR SAFETY GLASSES. Everyday eyeglasses only have impact resistant lenses, they are NOT safety glasses.

IMPORTANT!! SAVE THESE INSTRUCTIONS DO NOT DISCARD!!

Safety INSTRUCTIONS

IMPORTANT!! SAVE THESE INSTRUCTIONS

Risk of electrical shock.

- Do not operate equipment with a damaged power cord or if the equipment has been dropped or damaged, until it has been examined by a qualified service person.
- If an extension cord is necessary, a cord with a current rating equal to or greater than that of the equipment should be used. Cords rated for less current than the equipment can overheat.
- Unplug equipment from electrical outlet when not in use. Never use the cord to pull the plug from the outlet. Grasp plug and pull to disconnect.
- Do not expose the equipment to rain. Do not use on wet surfaces.
- Plug unit into correct power supply.
- Do not remove or bypass grounding pin.

Contact with high voltages can cause death or serious injury.

Risk of electrical shock. High voltages are present within the console unit.

- There are no user serviceable items within the console other than the keyboard and printer.
- Service on the unit must be performed by qualified personnel.
- Do not open any part of the console other than noted areas.
- Turn power switch off and unplug the unit before servicing.

Contact with high voltages can cause death or serious injury.

Risk of eye injury. Debris, dirt, and fluids may drop from vehicles.

- Knock off any loose debris. Clean surfaces as needed to avoid any materials from falling.
- Wear approved safety glasses when servicing.

Debris, dirt, and fluids can cause serious eye injury.

Risk of crushing. Vehicles may roll off alignment lift if not secured.

- Leave automatic transmission in park or manual transmission in gear unless equipment operation steps require vehicle in neutral.
- Apply parking brake unless equipment operation steps require wheel movement.
- Use wheel chocks whenever vehicle is positioned on the lift.
- Follow rack or lift manufacturer's safety recommendations when lifting a vehicle.

Vehicles rolling off lifts can cause death or serious injury.

	Risk of entanglement or crushing. There are moving parts on vehicle lifts during operation. □ Keep all persons clear of lifts. □ Read lift manufacturer's operation instructions carefully. □ Follow lift manufacturer's safety recommendations. *Contact with moving parts could cause injury.*
	Risk of pinching or crushing body parts when jacking vehicles. □ Keep hands and other body parts away from jacking surfaces. □ Do not use unapproved adapters (i.e. wooden blocks) when jacking a vehicle. □ Do not bypass any jack manufacturer's safety features. □ Read jack manufacturer's operation instructions carefully. □ Follow jack manufacturer's safety recommendations. *Improperly used or maintained jacks can cause injury.*
	Risk of burns. □ Do not touch hot exhaust systems, manifolds, engines, radiators, etc. □ Wear gloves whenever performing a service near hot components. *Hot components can cause burns.*
	Risk of injury. Tools may break or slip if improperly used or maintained. □ Use the correct tool for the task. □ Frequently inspect, clean, and lubricate (if recommended) all tools. □ Follow recommended procedures when performing vehicle services. *Tools that break or slip can cause injury.*

INTRODUCTION

The following chapters detail basic, advanced and platinum software features which may or may not be included in all aligner models. This document prima-rily is designed to cover software navigation and features with minimum regard to the hardware plat-form in which it resides. There are many variations of aligner models each of which may utilize different features of the base software package. References are often made to other sections of the Manual.

Assembly and Setup

Installation and setup of a new aligner must be handled by a qualified Technical Representative. If unsure of who to contact, refer to the back page of this manual.

All software is loaded onto the computer's hard drive. The Compact Disc shipped with the unit contains the alignment software as a backup, and is not needed when performing alignments.

Instructions for operational setup of the aligner pro- gram are covered in detail in Section 2 of this Operator's Manual. The setups for the PC hardware and Microsoft Windows® are preset at the factory and should not be altered.

Aligner Location

The Camera Assemblies must be centered in front of the alignment rack, placed a minimum of 90 inches from the center of the turntables, and perma- nently mounted to the floor. A "short bay" feature is possible when activated from the "System Setup" creen. The console is mobile, and can be placed in a location that provides the most convenience for the operator. Remember, visual contact with the monitor is necessary during most steps of a wheel alignment. Most shops position the aligner in front of the alignment lift between the cameras.

Power On Sequence

The main power switch is located on the back side of the Computer Console. Turn the computer console switch ON followed by pressing the on switch on the front of the PC to begin the power-on sequence. Make sure the monitor power switch and the computer's interface power switch (in lower cabinet) are left in the ON position at all times.

When the power switch is turned on, the unit initiates the computer boot-up. Text should appear on the screen as boot-up begins and counting numbers are shown as the memory of the unit is checked and verified. Many additional lines of computer configu-ration will appear on screen and scroll up as the computer completes the system boot sequence. The Logo screen will appear next as Windows finishes loading.

Click on the OK button to advance to the Home Alignment screen, indicating the Aligner is ready for operation. This boot sequence should take about three minutes. If any problems are encountered during the Power On boot-up sequence, consult the service representative in your area.

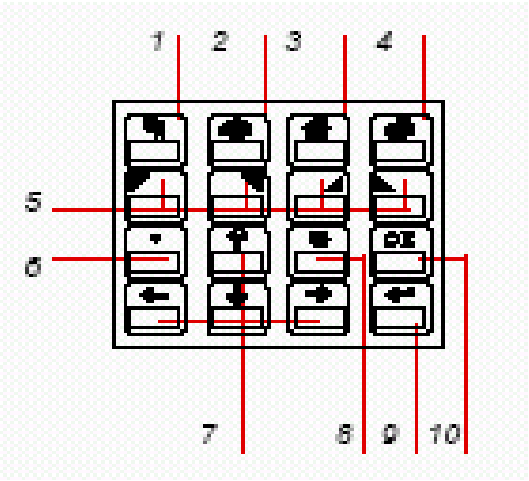
Software

There are several ways to control movement within the aligner program. First, each unit is shipped with a pointing device – a mouse. The unit is also equipped with a hand-held remote control whose various but- tons permit full aligner function. Models equipped with the optional remote display unit will also have a similar keypad. Study *Figure below* carefully to become familiar with the functions of each button.

As noted earlier, Windows is a point-and-click soft- ware environment. The Aligner software is a true Windows application, meaning it follows Windows navigation conventions. Use the pointing device to navigate through the software as you would with any Windows program. Most functions require a single mouse click to initiate, while a few require double- clicks. The right mouse button is not utilized within the alignment software.

A standard keyboard is included for data entry. All aligner functions can also be controlled from the keyboard as well as the remote. The function keys (F1 - F12) located on the top row of the keyboard have decals that are the equivalent of the remote and keypad buttons. Refer to the diagram for iden- tification of the icons and their respective functions.

In addition, the optional keyboard has a "Print Screen" key. When this key is pressed the currently dis- played screen will be captured and printed.



IMPORTANT NOTE!!
SHUTTING DOWN THE COMPUTER

To avoid damaging important files It is neces- sary to shut down Windows properly before turn- ing off or restarting the aligner or the computer.

Use the following steps to shut down the aligner from within the Alignment software:

1.Return to the Home Alignment screen.

2.Click on the “Shutdown Windows” button lo- cated in the lower left corner.

3.Answer “Yes” when prompted, the computer system will then shutdown automatically.

From the Windows desktop:

1.Close any programs or windows that may have been opened.

2.Click the Start button, and then click Shut Down.

3.On the Shut Down Windows box that appears, select “Shut down the computer?” Click “Yes” to proceed.

4.The computer will automatically shutdown, if not, a screen message lets you know when you can safely turn the power off to the aligner.

Remote Functions

1 - Tab Key: On certain screens, used to tab to next data field

2 - Meter: Jumps directly to the meter readings screens

3 - Home: Returns to the Home Alignment screen instantly

4 - Print: A results printout is generated when pressed

5 - #5 - #8 Buttons: These correspond to toolbar buttons

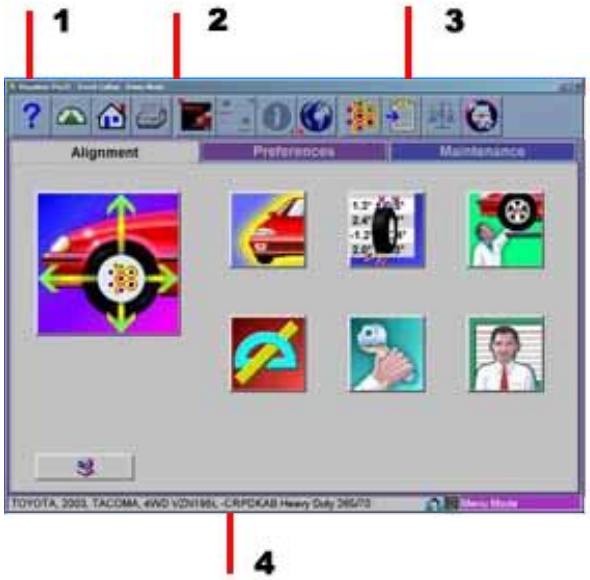
6 - Star:

7 - Arrow Keys: Moves through lists and selections

8 - Cancel: Same function as the on-screen Cancel button

9 - Enter: Accepts a selection and advances program to next step

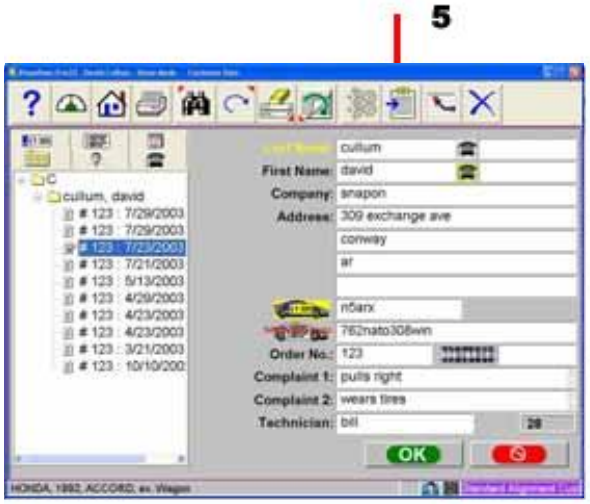
10 - OK: Same function as the on-screen OK button



Screen Layout and Navigation

The software features a common interface throughout its many screens. Becoming familiar with the various screen navigation functions is essential for efficient use of the aligner.

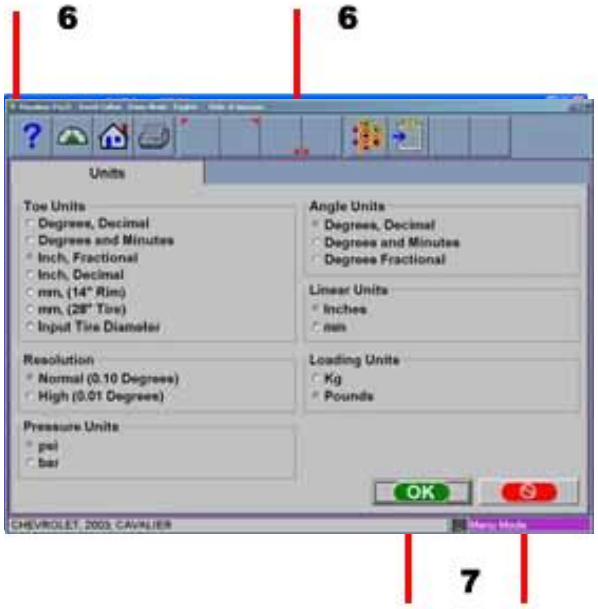
1-Toolbar – these buttons appear on every screen, and correspond to the F1-F12 keys on the keyboard, as well as the keys on the remote. The functions for F1-F4 are common to every screen, while the functions of F5-
F12 vary depending on the screen



2-Screen Tabs – these tabs move to other major areas of aligner operation. Each tab contains a new set of Function Icons to
perform functions related to the title on the tab

3-Function Icons – when the pointer is positioned over any function icon, a text pop- up appears describing its function. When the left mouse button is clicked, this function begins

4-Status Bar – contains aligner setup and information on the vehicle selected



5-Text Fields – some screens have text blocks that allow the user to type information

6-Radio Buttons – enables the selection of one item among a list. Click on the button to the left of the description to enable that function

7-OK and Cancel Buttons – most screens have these two buttons. OK saves the information and/or tells the software the user is ready to move to the next step. Cancel leaves the screen, losing the information and/ or moving back a step, or possibly skipping the step shown on-screen

Using the Wizard Procedure

The *Wizard* procedure sets the aligner to follow a certain process path resulting in a completed align- ment. Each re-programmed procedure, called a *Wizard* , sets the aligner up to perform certain func- tions in a predetermined order and determines whether certain functions can be skipped.

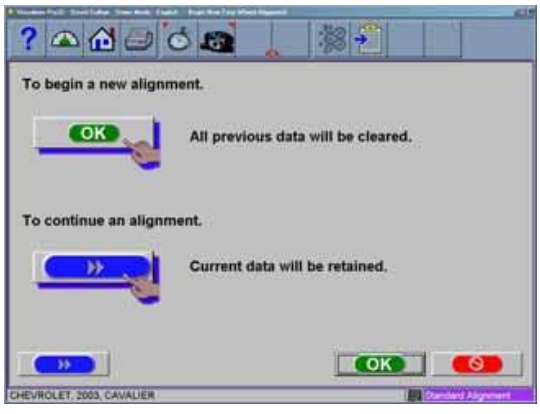
Wizard versus Manual Operation

When the Run Wizard icon is selected from the Home Alignment tab, the alignment process is per- formed using the Wizard that is currently selected. A technician can also choose to manually execute individual alignment functions directly from the Home Alignment tab by clicking on the appropriate icon, such as Measure. Generally, it is recommended to use the Wizard process to obtain the initialreadings.

Special Wizard Procedures (Platinum Option)

Several special procedures are pre-programmed to follow manufacturer's recommended alignment methods.

When the Aligner is turned on for the first time a "factory default" Wizard is in place. To change to an Special wizard, use the Wizard setup found on the Preferences tab. Special as well as OEM Wizards can be set to default.



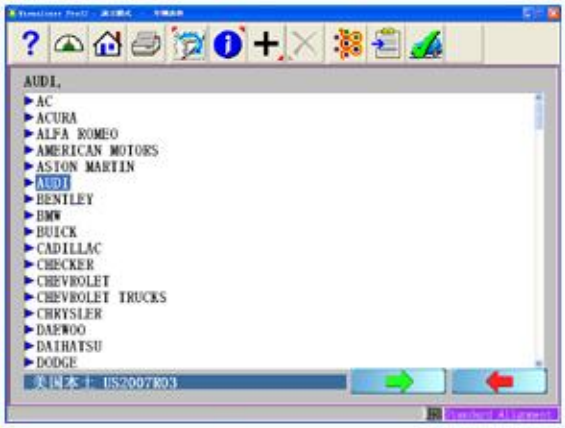
The following procedures are a sample of a Standard Alignment Wizard from start to finish.

Run Wizard

Click on the *Run Wizard* icon on the Home Alignment

Begin a New Alignment
This screen gives the choice to start a new alignment or continue with an alignment already in progress. If the "OK" icon is selected the computer memory of the previous alignment is erased allowing a new customer and vehicle to be setup. If the "Continue current alignment" icon is selected, all customer, vehicle, and alignment measurements are retained and the software returns to the alignment readings screens.

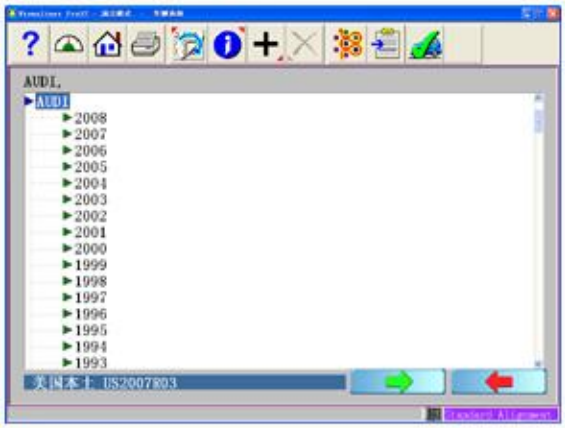
Select Vehicle Manufacturer, Year and Model



Vehicle Manufacturer

This screen shows the vehicle manufacturers in speci-fication database. The vertical scroll bar on the rightindicates there are additional choices further down thepage. Click on the down arrow on the scroll bar move down. Using the down arrow key on the keyboard also moves down the screen. Once the desired manufac-turer is in view, double-click on the name to expand out the model selections. Double-click again to contract. Also, the keyboard's right arrow key expands and the left arrow key contracts the list.

TIP: To move to the manufacturer selection quicker,using the keyboard, press the first letter of the manu-facturer name. This causes the selection bar to move directly to the first name starting with that letter (i.e. press "H" - moves to Honda).

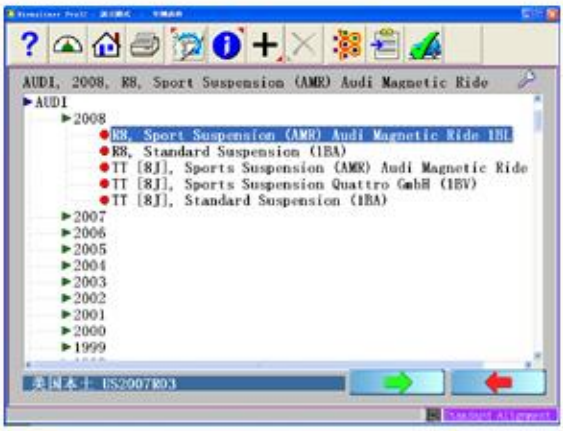


Vehicle Year

Select the year of manufacture using the up/down keys or pointing device on the scroll bar to move up or down to the desired year, then double-click or press the right arrow key to expand out the years this model was made.

Vehicle Model

Use the direction keys or pointing device to select the model of the vehicle, then select "OK", press Enter, or double click the selection.



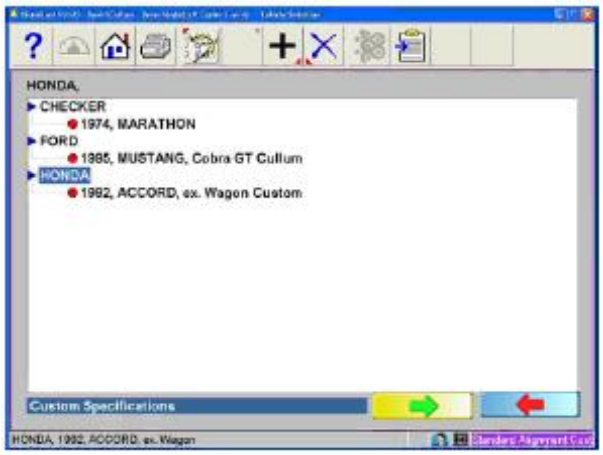
Custom Specifications

Alignment specifications that have been added by the operator reside in a special database. To retrieve these specifications go to the Vehicle Manufacturers screen and select Custom Specifications on the toolbar (F5). Any custom specifications that have been previ-ously added will be listed in a similar manner as the OEM specs. Click on F5 again to return to the OEM specification selection page.

Selecting a Default Make

To select a desired Make of Vehicle as "Default so it comes up first every time, highlight the Make then click on "F10" select default make Icon. This will anchor the selection. This is useful for dealership or shops that work on same makes the majority of the time.

Note:To move to the manufacturer selection quicker, using the keyboard, press the first letter of the manufacturer name. This causes the selection bar to move directly to the first name starting with that letter (i.e. press "H" - moves to Honda).



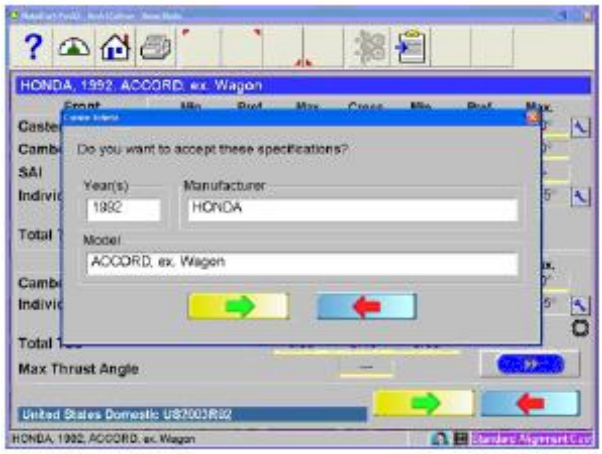
Additional custom specifications can be added by clicking on the "plus" button (F7) on the toolbar (see below for details). Records are deleted by first highlighting the record and then clicking on the "X" button (F8) on the toolbar.

View Specifications

This screen displays Year, Manufacturer, and Model of the selected vehicle with Minimum, Preferred and Maximum specifications for the front and rear wheels.Dashes in any position indicate there are no manu-facturer specifications for that wheel or angle. For angles not displayed on this screen, refer to the specification book included in the literature pack-age. A "wrench" icon to the right of the specifications field indicates the Aligner has assistance available for adjusting that angle. Clicking on the wrench launches the adjustment help features described on the next page. The Edit Specs toolbar button (F8) allows editing of the displayed specifications prior to beginning the measurements. This is useful if a Technical Bulletin has been issued that alters manufacturer's specifications. Pressing *"Ctrl-Alt-F8"* simultaneously allows specs to be viewed at any time from within the alignment process.

Editing Specifications

To edit the displayed specifications, click on toolbar button F8, Edit Specifications. The toolbar configu-ration will change, with a plus and minus sign dis-played (F6 and F7). Use the pointer to click on the specification to be edited (i.e. left camber). Once it is highlighted, use the plus and minus buttons to change the specification as needed. Notice that when the left value is changed the right value changes at the same time. Use the pointer to move to any other values to be changed. If any mistakes are made, or the user wants to return to manufacturer's specifications, click on Restore (F8). When all editing is complete, click on OK. Since these edited specs are now custom, a prompt appears to enter in a description of the new custom specification.



Adjustment Animations

Illustrations of adjustments specific to the selected vehicle can be viewed by clicking on the “wrench” icon to the right of the specifications field. Anima-tions are also accessible from the readings screens. An animation of the adjustment procedure will ap-pear on the screen. Animations can be paused, stopped and restarted at the operators preference by using the controls at the immediate bottom of the animation screen. Select “OK” or “Cancel” to return the operation to the current screen.

Additional Assistance

Included to the right of the animation window is a text box which illustrates three types of information re-garding the current alignment adjust procedure. In-formation is requested by clicking on the icon asso-ciated with the assistance. These icons are:

•Adjustment Instructions

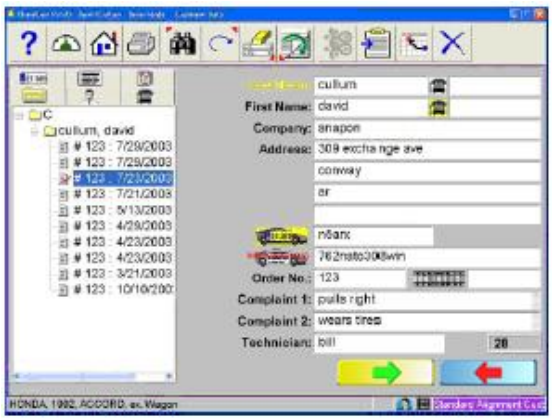
Adjustment instructions are provided by select-ing the first of three function buttons on the Animation screen.

•Parts Required

The center selection displays parts required to complete the alignment process, parts such as shims, eccentrics or other aftermarket supplied parts. The displayed parts are linked to the selected shim manufacturer setup in the “Pref-erences” section.

- **Special Tools**

The third icon button displays any special tools which may be required to perform the alignment properly.

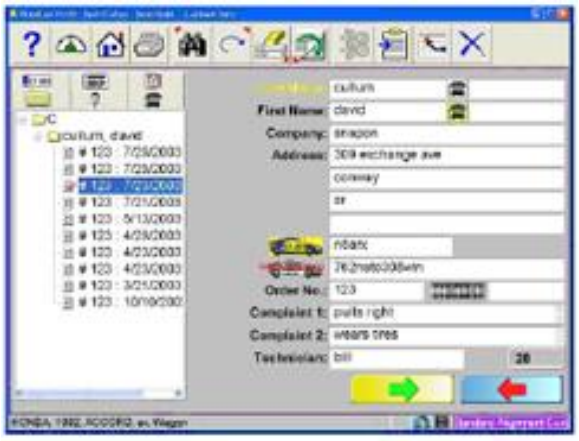


Enter Customer Data

The Customer Database feature allows entry of information about the customer and his vehicle.

With the database this information can be saved for later recall. In addition, the aligner stores this infor-mation along with the results of the wheel alignment service.

A *database* is a collection of information to be sorted and retrieved as needed for analysis. Available in-formation includes the car owner's name, address,phone number; the vehicle make/model/year, VIN number, and mileage; plus the date of service along with before and after alignment readings. This infor-mation is stored on the computer hard drive for later retrieval. Once retrieved, the information can be reviewed and can become the starting point for a new alignment.



Adding Customer Information

Using the pointing device or TAB key to move around each of the text blocks, the operator enters informa-tion about the customer and his vehicle using the keyboard. Selecting OK will save the record to file for later retrieval.

Selecting a Stored Record

Stored or existing records can be sorted and re-trieved in several different ways – drill down through data records, sort alphabetically by last name, by telephone number, vehicle license plate number,vehicle VIN number, by date or by listing of all records. Once the desired record is visible, clicking on the plus sign expands the list to bring up a particular data set. When selecting alphabetically,select the first letter of the customers name and highlight it using the pointing device. Double click with the left button when the desired record is high-lighted. The complete record will be displayed with stored data.

Adding a New Customer

A new record can be entered by clearing all informa-tion on the data window. Information is cleared by selecting Clear Fields on the toolbar (F7). Once the screen has been cleared, enter the new customer information as desired. If another record is desired for an existing customer, highlight his name as using the pointing device, and begin entering information at the blank screen.

Editing an Existing Record

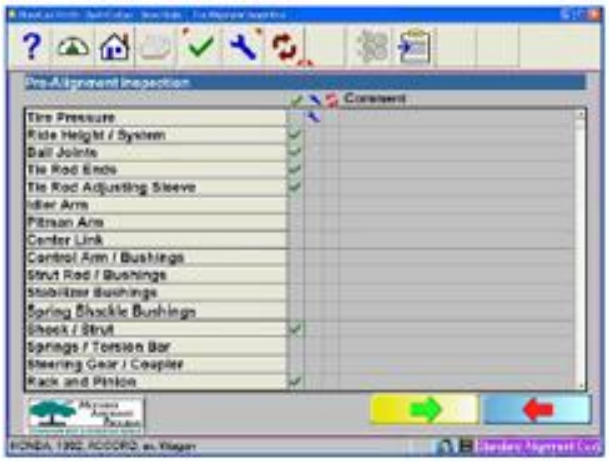
An existing record can be edited by selecting the desired customer record. Once the record is dis-played, move between information fields with the pointing device or TAB key. When the "I" bar is within the field to be edited, make the desired correc-tions. Data is saved when "OK" is entered.

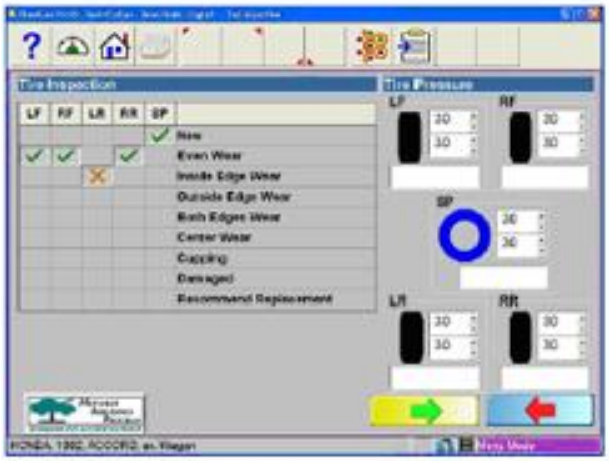
Backup and Restore

Datafiles can be backed-up for security and restored upon demand. See the "Maintenance" chapter for more information on this feature.

Using the Database Outside the Aligner Platform

The database is stored on the hard drive in a file called AlignmentData.mdb. This database file is compatible with several common database programs such as Microsoft Access (not supplied). See your office computer software representative for infor-mation regarding these programs.





Inspection

Inspection reports are a valuable tool for the report-ing of vehicle problem areas. Reports can be printed and retained for shop files or given to the customer to reinforce his comprehension of the work per-formed, or the work necessary before an alignment can be performed. In many cases worn or damaged components will affect the quality of the wheel align-ment.

A Wizard procedure can contain up to six vehicle inspection reports or lists. These lists are contained within the Wizard process or they can be selected manually selected from the Main Alignment tab.

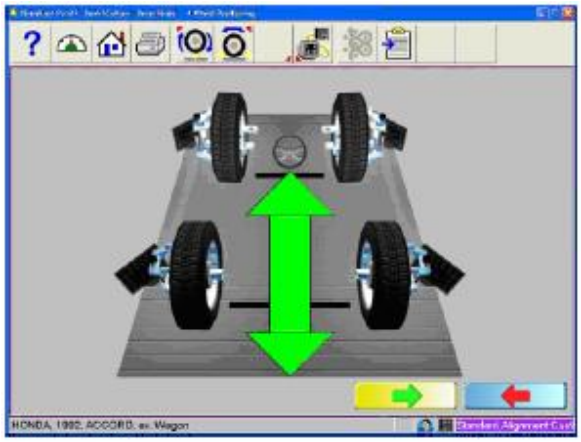
Areas to be inspected within each of the inspection forms are topically related. Any number of inspec-tions can be utilized during the alignment process.
The six inspection forms are:

The six inspection forms are:

- Pre-Alignment Inspection
- Tire Inspection
- Brake Inspection
- Under Car Inspection
- Under Hood Inspection
- Courtesy Inspection

Using Inspection Reports

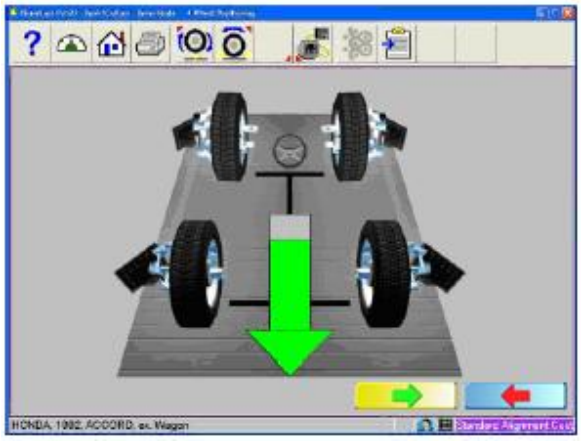
All inspection reports require the same operating procedures, with the exception of Tire Inspection.
When the desired inspection report is displayed, use the pointing device to select “Checked”, “Adjusted”,or “Replaced” in the column to the right of the component description. A comment relating to the component or repair needed can be typed in the space provided to the right by selecting Edit Com-ments on the toolbar (F8). After all inspections and comments have been made, choose “OK” to save these checks to the database and to the printer buffer for later printout. Selecting “Cancel” button takes the operator to the previous screen.



Vehicle Positioning Sequence

The next screen displayed is the *Target Acquisition* screen. This screen shows the status of each target and prompts the operator to proceed to the next step when all four targets have been acquired. The ve-hicle is then moved approximately 8" (20 cm) caus-ing the targets to rotate about the spindle. The computer compares the initial target positions with the final target positions to calculate the axis of rotation for each wheel.

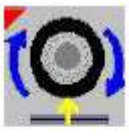
When the *Target Acquisition* screen is first dis-played the cameras search for the wheel targets.
The graphic images of each wheel target are shown away from the wheel and are displayed in red. As the cameras locate each of the wheel targets, the target graphics change from red to blue and appear in-stalled on the wheel. This means the target has been "acquired". When all four wheel targets are located, the first *Vehicle Positioning* screen is dis-played.



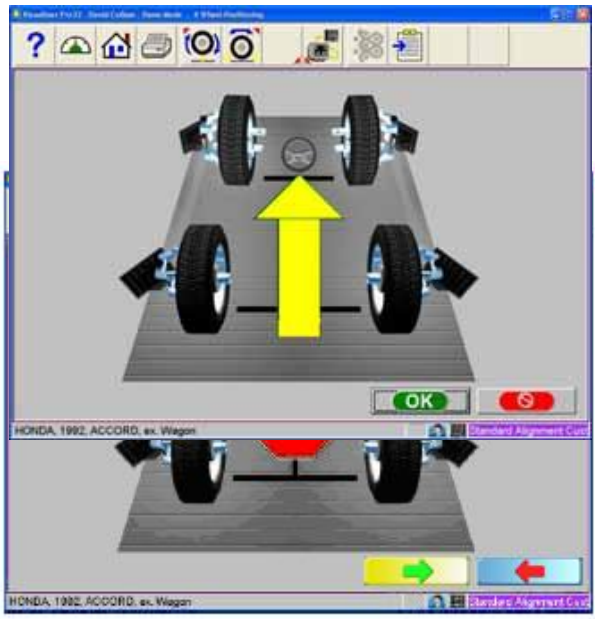
NOTE: If one or more targets are never acquired, chose the Camera View button (F8) on the toolbar to help determine the cause, such as blocked vi-sion.

The *Vehicle Positioning* screen displays arrows that prompt you to move the vehicle backwards, approxi-mately 8 inches (20 cm). Find a spot under the front of the car to push backwards. Some users prefer to use the left rear wheel to pull the vehicle back. The graphic image on the screen follows the vehicle's movement as you roll the vehicle backward.

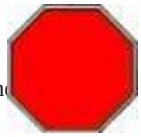
IMPORTANT!



If it is not possible to roll the vehicle back the required distance, select the Single Wheel Positioning button (F5) on the toolbar to perform positioning one wheel at a time with the wheels elevated..
A very long vehicle witch may be too long to roll back far enough for proper positioning can be compen-sated by selecting the "Split Position" button, (F6) from the tool bar. This allows the vehicle to be rolled a short distance forward then backward.

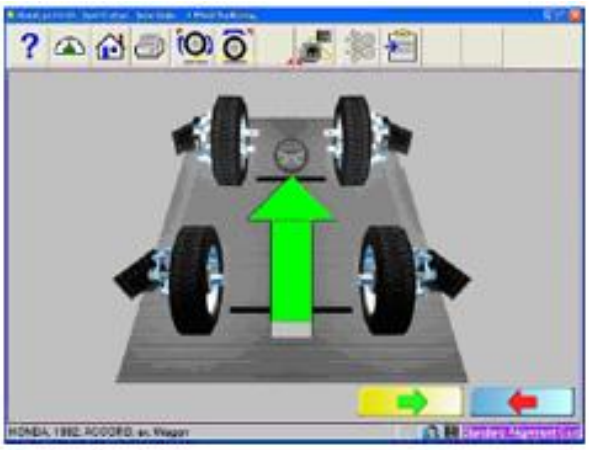


Too Far Back

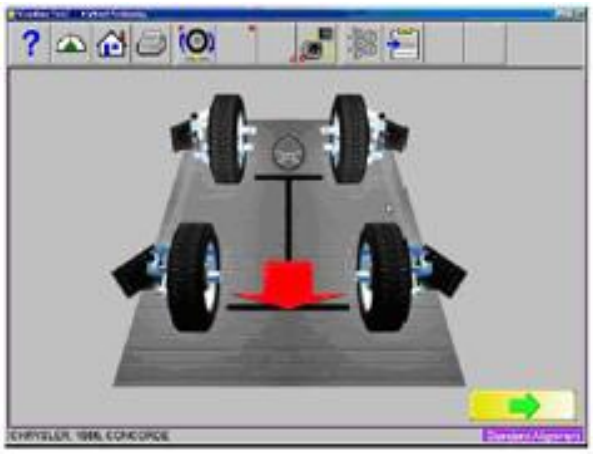


If the vehicle is moved too far in one direction, a yellow arrow will appear prompting you to move the vehicle the other direction a small amount.

A small red STOP sign will prompt you when the necessary backward wheel rotation has been reached. Hold the vehicle steady until the stop sign disappears.

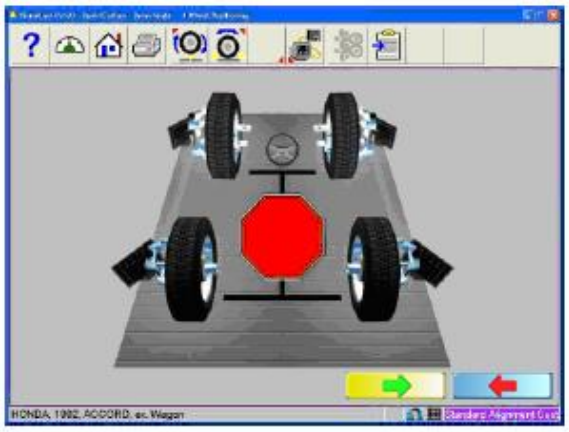


When the aligner is ready, the screen displays a green arrow to prompt you to move the vehicle forward and return it to its starting position Grab the vehicle where it is convenient and roll it forward onto the turntables where it began.



Positioning Assistant

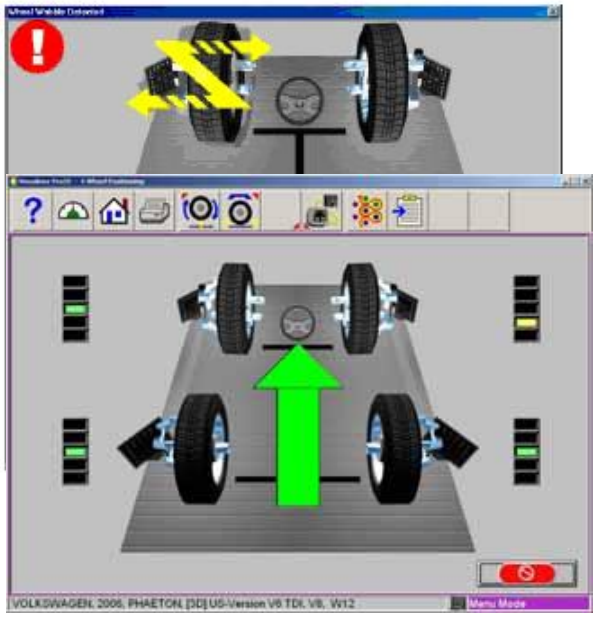
Once the stop appears and the vehicle does not stabilize withing 5 seconds the stability indicators appear. Green means the wheel is stable, yellow means close to stable, and read means unstabile Check the non green wheels for stability problems such as loose target, slightly rolling vehicle due to unlevel rack, running engine, and so forth.



A large red STOP sign will prompt you when the wheels have returned to their original start positions. Hold the vehicle steady until the stop sign disap-pears.

Wheel Wobble Message

The aligner may detect wheel wobble during posi-tioning. The screen indicates which wheel wobbled.
To ensure high accuracy, we recommend restarting the positioning sequence if wheel wobble is de-tected. Select the OK button to return to the *Target Acquisition* screen to repeat vehicle positioning. If the CANCEL button is selected the software will accept the out-of-tolerance positioning values and proceed.



CAUTION! ALIGNMENT READINGS ARE NOT ACCURATE UNLESS POSITIONING PASSES WITHOUT WHEEL WOBBLE.

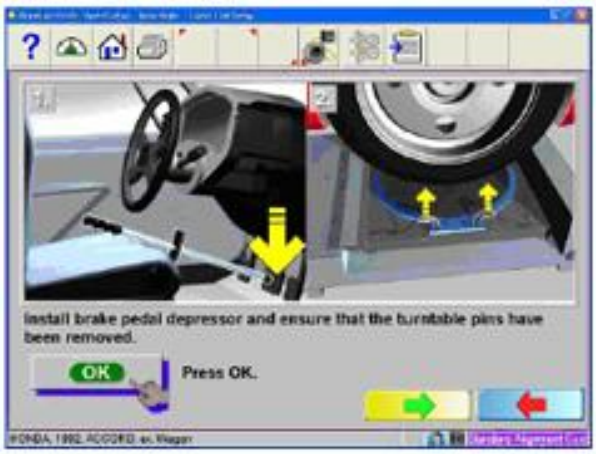
Here are some of the reasons for wheel wobble and tips for correction:
1.When driving the vehicle onto the alignment lift it is possible you turned the steering wheel to get centered on the turntables. This causes stresses to be built up in the linkage. As the vehicle is rolled back and forth during positioning, these stresses relax and cause the wheel to wobble. If you know the vehicle was steered before it
reached the turntables, roll the vehicle back and forth a few times before attempting the position-ing sequence.
2.Make sure the wheels do not experience any external disruptions as they move. Check for a gap or depression between the front

turntables and the runway surface. Check for items that may cause a “bump” as the wheels roll.

3.Check the wheel clamp mounting to make sure the claws are secured onto the wheel. Any looseness could result in wobble.

4.Avoid jacking the vehicle prior to performing ositioning. To check steering components, we recommend the "Dry Park Check" procedures (see *Appendix D*). If it is necessary to jack the vehicle, roll it back and forth a couple of times to allow the suspension to settle prior to the posi-tioning sequence.

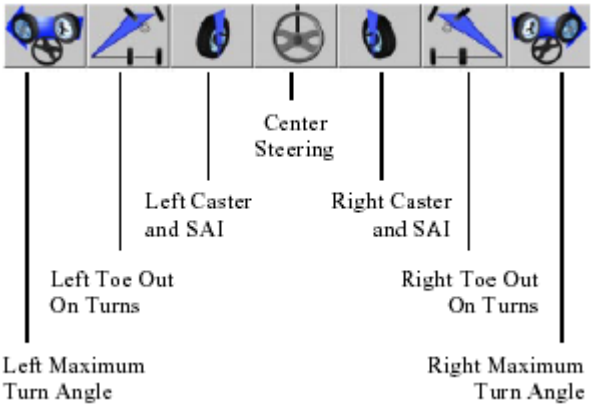
5.Make sure the front wheels are pointing straight ahead. If not, the wheels will tend to move towards the center position as the rock and forth, causing the wobble mes- sage.Install Brake Pedal Depressor and Pull Turntable and Slipplate Pins



Once positioning has been completed a prompt appears to install the brake pedal depressor This is done to prevent rolling of the wheel during the Caster/SAI swing. Wheel roll during the swing results in incorrect SAI measurements. It is sug-gested you repeat the swing unless it is known the vehicle is without caster or SAI problems

Perform Steering Angle Measurement

The Standard Wizard goes to the Steering Mea-surement screen before displaying any readings. It is also possible to begin steering measurements from any of the readings screens by simply rotating the steering wheel in either direction,



assuming this has been set up from Features on the Preferences tab. As you rotate the steering wheel, the aligner tracks the wheel targets. When the steering wheel is rotated more than 5 degrees, the *Steering Mea-surement* screen is automatically displayed.

Seven steering measurement position icons are displayed across the top of the screen, three icons for right-turn measurements, three icons for left-turn measurements, and a center steering wheel icon. The icons indicate the steering positions for measur-ing caster and steering axis inclination (SAl) simul-taneously, toe-out-on-turns (TOOT), and maximum steering angle. As you rotate the steering wheel toward each measurement position, a “cursor ball” at the top of the screen tracks the wheel movement, and a red status bar appears above the desired icon.The left and right caster and SAl measurement positions are at approximately +10 and -10 degrees,while the TOOT positions are at approximately +20 and -20 degrees. The maximum steering angle positions vary, depending on the vehicle.

Arrows adjacent to the steering wheel displayed in the lower portion of the screen prompt the correct direction to rotate the steering wheel. A numerical readout in the center of the steering wheel indicates the steering angle in degrees.

As the wheels approach each measurement posi-tion the cursor ball turns yellow indicating it is time to slow down. When the wheels reach the correct position, the ball turns green, and a red stop sign appears on a green background in the center of the

screen. As the measurement for each position is complete, a green box appears around that icon, the icon appears depressed, the status bar turns green,and the red stop sign disappears.

The Aligner prompts you where to stop, depending on which measurements you want. For example to measure caster and SAl only, move the wheels from one caster position to the other caster position, and then return to the center steering position. To mea-sure caster, SAl, and TOOT, move the wheels from the caster position to the adjacent TOOT position,then to the other caster and TOOT positions, and then return to the center steering position. You can even get

all four measurements in one side-to-side rotation sequence.

During steering measurements, the Aligner may briefly lose track of one or more wheel target. When this occurs, wheels displayed on the lower-left and lower-right will turn red to indicate the lost wheel targets. Losing the rear targets during steering angle measurements does not cause a problem. When the front wheel targets are lost, stop steering rotation until the aligner finds the lost targets. When centering the steering wheel at the end, the Aligner must see the rear in order to update toe and thrust angle. Stand clear of all targets when the stop sign appears to display the *Readings* screen.

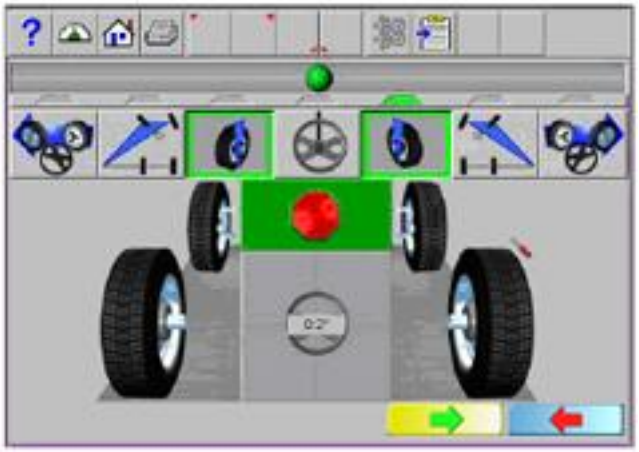
Measuring Steering Angles

1.To measure the various steering angles, use the following steps:

2.IMPORTANT: Firmly install the brake pedal depressor (if not previously installed) to lock the brakes to keep the wheels from rolling. It is advisable to start the car when locking the brakes to enable the power assist function. Set the parking brake.

3.Begin the measurement of steering angles by turning the wheels to the right or left. It is easier,faster, and more accurate to turn the wheels using the steering wheel as opposed to using the tire.

4.The screen automatically switches to the initial steering angle measurement screen.



Caster and SAI

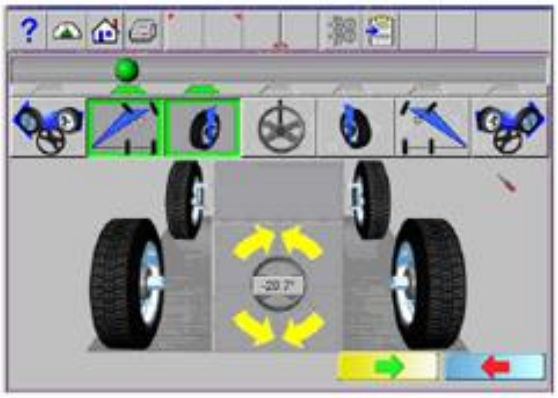
5. The status bar is positioned above the Caster/SAI icon first. The cursor ball turns from red to yellow as the angle approaches 10o. At approxi-mately 10o the ball turns green.

6.When the steering angle reaches 10o, a red stop sign appears above the steering wheel. Stop turning the wheel and hold steady for a few seconds. A green box appears around the Caster/SAI icon, the icon appears depressed,the status bar turns green, and the stop sign disappears when the measurement is complete.

7.If only caster/SAI is desired, turn the wheel the opposite direction. The software senses this action and places a red status bar above the caster/SAI icon on the opposite side . Follow the arrows to a 10o turn on that side. A stop sign appears at the proper spot – hold the wheel steady.

8.When the green box and depressed icon ap-pears the measurement on that side is com-plete. The software then places a red bar above the center steering icon.

9.Follow the arrow to the center until the stop sign appears, making sure the number displayed on the steering wheel in the center of the screen is between -0.2 and +0.2. Step out of the way so all 4 targets are visible to the cameras, and wait for the alignment readings screens to appear. Caster values are displayed on the *All Readings* screen and the *Front Meters* screen, while SAI is



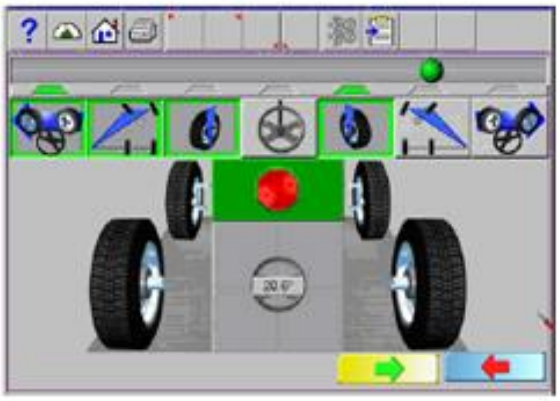
displayed only on the *All Readings* screen.

•••••*Toe-Out-on-Turns (TOOT)*

Toe-out-on-turns is another diagnostic measure-ment that is valuable in troubleshooting steering and handling problems.

TOOT or Turning Radius, as it is also known, is the difference in the turning angle between the inside and the outside wheel.

NOTE: The Aligner vehicle database does not contain specifications for toe-out-on-turns. Refer to an alignment specification book or the vehicle's shop manual.



10.After completing the Caster/SAI measurement on one side, continue to turn the wheel past 10o. The software senses this and places a red sta-tus bar over the TOOT icon.

11.Follow the arrow to a 20o turn. Once again, the cursor ball turns from red to yellow to green as the angle is approached.

12.When the stop sign appears hold the wheel steady until the green box/depressed icon ap-pears and the stop sign disappears, indicating completion of the measurement.

13.To measure toe-out-on-turns on the other side,turn the wheel the opposite direction. Note that the status bar appears over the caster/SAI icon first. It is always required to measure caster/SAI before TOOT.

14.Turn to the Caster/SAI position. When com-pleted, the red status bar appears over the toe-out-on-turns icon. Continue the turn to the TOOT position.

15.When complete, the software then places a red bar over the center steering icon. Follow the arrow to the center until the stop sign appears,Follow the arrow to the center until the stop signappears, making sure the number displayed on the steering wheel in the center of the screen is between -0.2 and +0.2. Then step out of the way so all 4 targets are visible to the cameras, and wait for the alignment readings screen to ap-pear. To view toe-out-on-turns values, advance

 to the *All Readings* screen.

•••••*Maximum Turn Angle (Lock to Lock)*

This routine is very similar to the Toe-Out-On-Turns feature. It allows the measurement of the "full lock" or maximum turn in each direction. Consult an alignment specification manual or shop service manual for manufacturers specifications for the maximum turn reference angle and the outside turn value.

16. After completing the caster/SAI and toe-out-on-turns measurements on one side, continue to turn the wheel past 20o. The software senses this and places a red status bar over the maxi-mum turns icon.

17. Continue turning the wheel as far as it will go to the full lock position on this side. Hold steady until the green box/depressed icon appears and the stop sign disappears, indicating the mea-surement is completed.

18. To measure maximum turn angle on the other side, begin to turn the wheel the opposite direc-tion. Note that the status bar appears over the caster/SAI icon first. It is always required to measure caster/SAI, then toe-out-on-turns be-fore maximum turn angle.

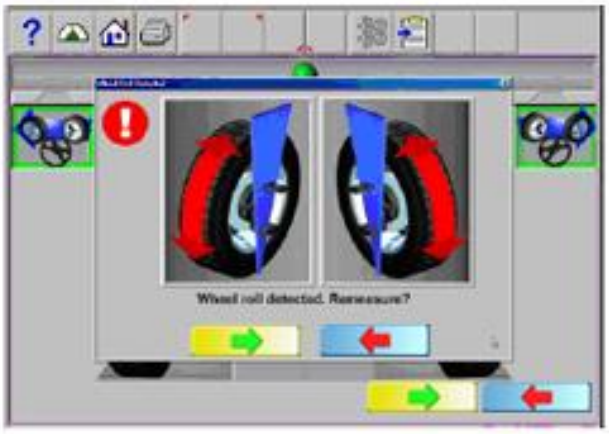
19. Perform caster steps and toe-out-on-turns steps,then continue turning out to measure at full steering lock.

20. Hold steady until the green box / depressed icon appears indicating the maximum turn angle mea-surement is completed.

21. The software then places a red bar over the center steering icon. Follow the arrow to the center until the stop sign appears.

NOTE: Step out of the way so all 4 targets are visible to the cameras. The software must see all targets in order to complete front and rear read-ings.

The next screen to appear is the *Readings* screen to appear. To view maximum turn angle values, ad-vance to the *All Readings* screen.

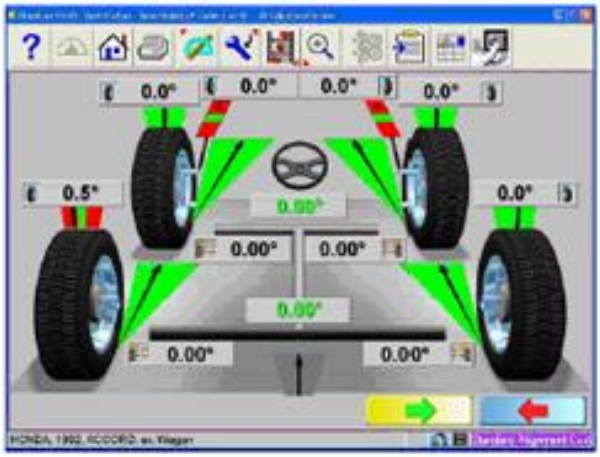


Wheel Roll Message

If the aligner detects any wheel roll during the steer-ing angle measurements, a error message appears.We recommend restarting the steering measure-ments if this occurs. Select OK and the software begins a new steering angle measurement sequence. Wheel roll can usually be corrected by firmly install-ing the brake pedal depressor. On many vehicles it is necessary to start the engine to enable the power brakes in order to keep the wheels from rolling.

NOTE: If Toe Out on Turns and Maximum Turn Angle have been measured, and "wheel roll" ap-pears, repeat only the caster/SAI measurement. The other angle values will not be lost.

When the desired steering measurements are com-pleted, the software prompts the operator to center and lock the steering wheel before performing any alignment adjustments. After a few seconds the *Aligner* automatically advances to the alignment readings screens if "Screen Timeouts" has been enabled..

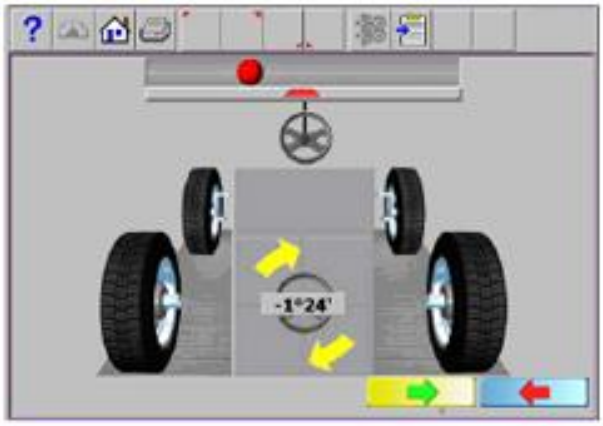


Readings Screen

The *Readings* screen displays the primary vehicle alignment information in an intuitive, three dimensional format. The screen appears as a vehicle with the body lifted off, viewed from the rear and above. Review the figure above to become familiar with the screen layout and functions.

Each wheel angle has a numeric reading as well as a graphical meter display indicating directional orientation and relationship to specifications. Camber meters, located along the top of each tire, have a line that indicates camber relative to the preferred specification. Toe meters, projected onto the ground in front of each tire, have an arrow that indicates the toe angle. Caster is represented by a meter in front of each wheel. The numeric value for caster is directly above the meter. When a meter is green, the reading is within specifications. When the arrow is centered within the green it is at the preferred value. A red meter indicates the reading is out of specification. The red meter contains a green band, indicating the direction of needed change. A gray meter indicates there is no specification for that angle.

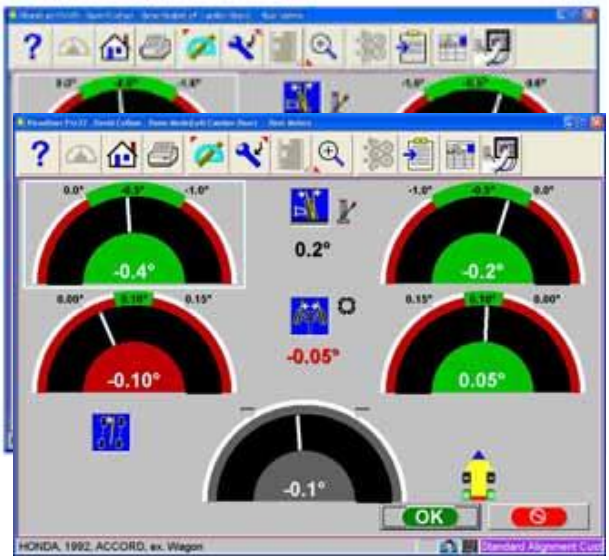
All numeric readings on this screen are actual live measurements, including caster. If any angles require correction, make sure the brake pedal depressor is engaged and the steering wheel is centered and locked, then simply begin the adjustment. As the angles change the display will update to reflect the new readings. The numeric values change and the meter indicators move in the direction of change. Click on OK to proceed to the next readings screen.



Turn Wheels Straight Ahead

The screen then changes to indicate the requirement to turn the wheels to the straight ahead position. Center-ing the steering allows the geometric center-line to be established for the rear readings which in turn will determine the thrust angle or rolling direction. Thrust Angle is the direction of the vehicle travel determined by the total toe of the rear wheels. The thrust angle is used as a reference when adjusting the front toe so that a straight steering wheel is the end result. Toe error on many rear wheel drive vehicles cannot be corrected, creating a dog tracking effect and/or a crooked steering wheel.

If the wheels are already straight ahead this screen will briefly appear and automatically proceed.



Rear Readings Screen

After the *All Readings* screen, the *Rear Meter Readings* screen appears. This screen displays, both in meter and numerical format, the angle measurements and information needed to determine if corrections are necessary. The display is divided into three rows: Camber, Toe and Thrust Angle. The columns represent the left and right side of the vehicle. The Camber and Toe meters have minimum and maximum specifications along the top, a numeric readout of live readings, and a color coding to indicate the relationship of live values to specification. Grey meters indicate no specification has been entered for this angle. Red meters indicate the angle is beyond manufacturer's specification. Green meters indicate live values are within specification. Elevated readings can be viewed by selecting the “Jack” icon located right of the cross values.

Adjust Front First

In the event this ICON appears on the readings screens, the front should be adjusted before rear correction.

Print Parts Report

Any time the Printer hot-key is highlighted the print parts report can be selected from the scroll down menu. All parts highlighted in the Shim screen will be shown as used for the alignment. Be sure to deselect any of those not used if to be provided to the customer.

Cross Values / Total Toe

The numeric value between the camber meters indicates cross values (side-to-side), the difference between left and right readings. This cross value is important on many vehicles for proper handling. The numeric value between the left and right toe meters indicates the rear Total Toe (sum of individual toe).

Readings Toolbar Buttons

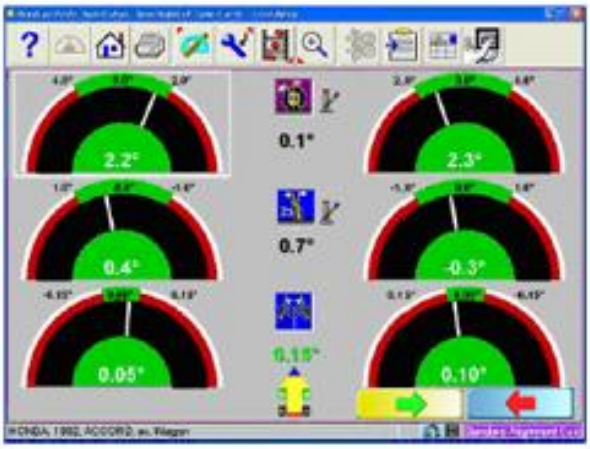
Buttons available on the Readings Screens toolbar from left to right are:

- •F1 Help – displays operation assistance for the screen presently open
- •F3 Home – returns the software to the opening Home Alignment tab
- •F4 Print – accesses the print report menu
- •F5 Measure – access to measuring additional angles
- •F6 Adjust – access to assistance for the techni-cian with angle corrections
- •F7 Animate – assists the technician with illustra-tions of each angle adjustment. There is a white box around one of the meters that can be moved around the screen using the arrow keys or by clicking on the meter with the pointing device.When the white box is around a particular meter, chose Animate. This runs the adjustment help for that angle.
- •F8 Zoom – brings any meter to full screen size to aide viewing
- •F10 Login – user Login or Logout
- •F11 Edit – allows editing of the vehicle selection, specifications, customer information, and in-spections within the current alignment
- •F12 Aligner Diagnostics – allows user to ob-serve “camera view” and manually adjust cam-eras up or down. Camera search mode can also be invoked here.

NOTE: If a toolbar button is “grayed out” it means the function is not available on that par-ticular screen.

Level and Lock Steering Wheel

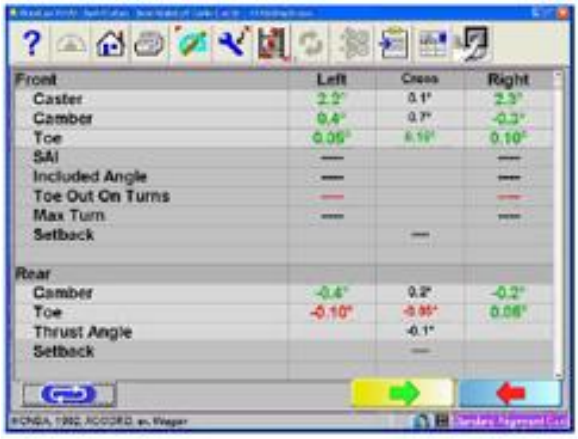
Before front readings are displayed it is necessary the level the steering wheel and lock it in place using the steering wheel holder. Once these steps are completed press “OK” to move forward.

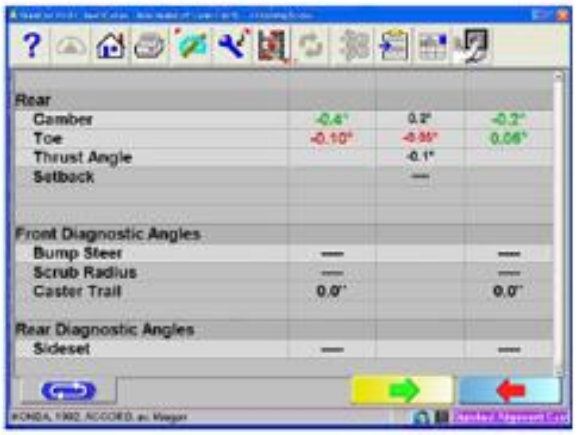


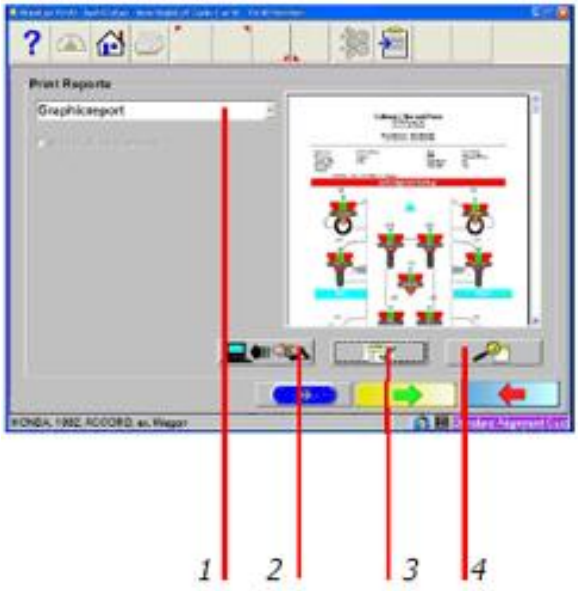
Front Meter Readings Screen

The *Front Meter Readings* screen is similar to the rear. Caster is displayed with the top meters. Cam-ber meters are located in the middle of the screen and toe meters are at the bottom. Caster, camber and toe are “live” displays which can be referenced while making adjustments. When measurements are within specification, the center portion of the meter is green. If red is displayed, the readings are outside of specifications. Grey meters indicate this angle has no specification. Elevated camber and caster readings can be viewed by selecting the “Jack” icon located right of the cross values.

All Screen







All Readings Screen

After *Front Readings* the final readings screen is *All Readings* . This screen shows all alignment readings numerically in a chart format. The numbers are color coded to indicate the reading's relationship to specifications.

A scroll bar on the right side of the screen indicates there is more information below. Click on the down arrow of the scroll bar to reveal Front and Rear Diagnostics values (if measured).

Loop Button

There are four possible "readings" screens – 3-D Readings, Rear, Front, and All Readings. These 4 screens can be "looped" from the All Readings screen. When the All Readings screen is displayed,the 3-D, Rear and Front Readings screens are re-trieved by pressing the "Loop" button located at the lower left corner of the screen.

NOTE: The Loop Button can be placed on any readings screen by editing the Wizard and saving as a "custom" wizard.

Print Results

Select Print on the toolbar (F4) on either the Front or Rear Readings screen to go to the Printer Menu screen. The options are:

1-Select Desired Alignment Report - Select the desired type of report to be printed from the drop down box

2 - Import from a disk - This selection allows a customized report or logo to be imported to the system directory. Custom reports must be created by Crystal Reports* by the user or authorized agent. A custom "BMP" logo can be imported as well.

3 - Set Default Report - Determine the desired report to be used as default and for one click printing.

4 - Zoom - Select this button to enhance the size of the displayed report. Click OK to continue printing or Cancel to go back to the print menu.

Measure

When the Measure icon is selected from the Home Screen or from the toolbar on any readings screen, a screen appears that allows the operator to measure any wheel alignment angle. The icons on this screen are defined in, and are explained below:

4 Wheel Positioning – repeats the rollback / roll-forward process that locates the vehicle spindles in 3 dimensional space.

•Measure Steering Angles – accesses the steer-ing angles measurement screen used to measurecaster, SAI, toe-out-on-turns, and maximum turn angle. This is done on the turntables (loaded suspension).

•Measure Caster/SAI Elevated – measure the Caster and SAI angles with the wheels elevated (unloaded)

•Measure Camber at Zero Toe – this process is recommended by some vehicle manufacturers,such as Mercedes Benz. It measures the camber of each front wheel separately with the wheels straight ahead (zero toe)

•Vehicle Dimensions – Provides additional infor-mation about the condition of the vehicle's frame,such as setback and axle offset.

•Single Wheel Positioning – instead of the rolling vehicle positioning sequence, the vehicle can be jacked to allow each wheel to be positioned inde-pendently. This is useful if a wheel must be removed during the alignment, for example to install a shim in the rear. It can also be used to align a long wheelbase vehicle on a short rack that does not allow rolling back 8" (20cm).

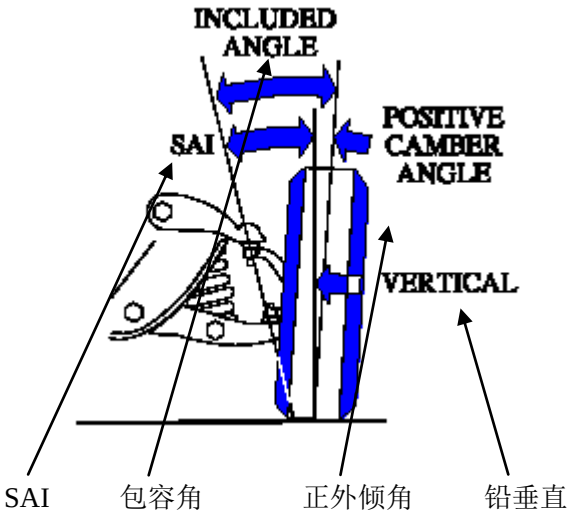
•Tire Diameter - this is a diagnostic which mea-sures the diameter of each tire. A positioning sequence must be performed to determine diam-eter values.

•Toe Curve Change – measure the individual wheel toe change as the suspension goes through jounce and rebound.

•Ride Height - use this screen to enter ride height values as measured per manufacturers instruc-tions. These values can be compared to specifica-tion to determine suspension conformance.

•ProAckerman™ - Steering Geometry is mea-sured and analyzed with the unique *ProAckerman*™ feature.

•Scrub Radius and Caster Trail - provides valu-able angular measurements critical to analyzing the steering geometry. pecially useful when examining aftermarket wheels and components.



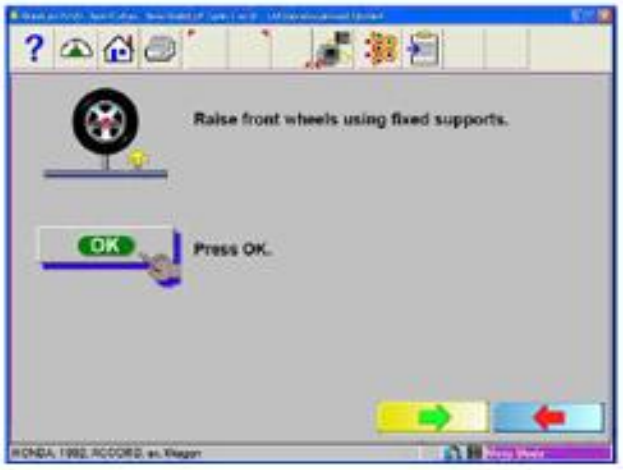
Measuring Steering Angles

Steering Axis Inclination (SAI) and Included Angle (IA)

These angles are powerful tools in diagnosing bent or damaged suspension parts. A bent spindle,control arm, strut, frame mounts, or a cradle shift problems can be identified. SAI is measured either vehicle weight loaded on the turntables or with the front wheels elevated. Included Angle is not actually an angle defined on the vehicle -- it is a mathematical formula. By definition, IA = SAI + CAMBER. Most late model vehicles have a specification for Included Angle, and a few for SAI. Compare the measured values to spec, but also compare side-to-side (cross)differences.

TIP: Cross differences for Included Angle should not exceed 1 to 1.5 degrees for most vehicles. If a high cross value is discovered, it may be creating a pull condition. Generally, the damaged part is on the side with the lower IA reading.

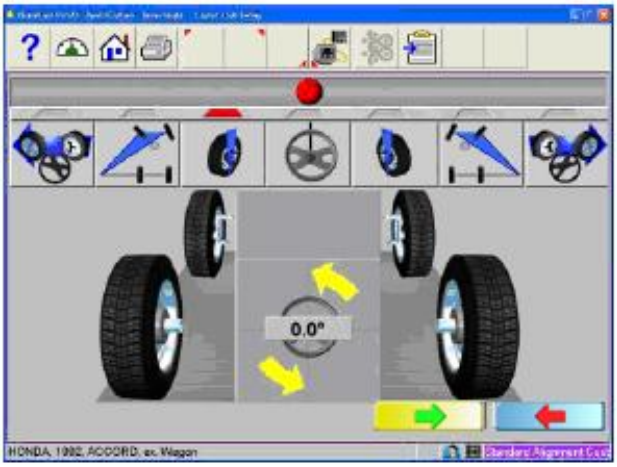
Measuring Caster, Steering Axis Inclination (SAI) and Included Angle Elevated



SAI and Included Angle are measured directly during the 20 degree sweep made when caster is measured. SAI can be measured either on the turntables (loaded) or with the front wheels elevated (unloaded). The results of loaded or unloaded will be similar, but some variation may occur due to the type of vehicle suspension. For accurate results follow the on-screen instructions carefully.

1.Whether measuring SAI on the turntables or elevated, it is mandatory to lock the vehicle's brakes. Start the car to initiate the power brakes and install the brake pedal depressor between the seat and the brake pedal.

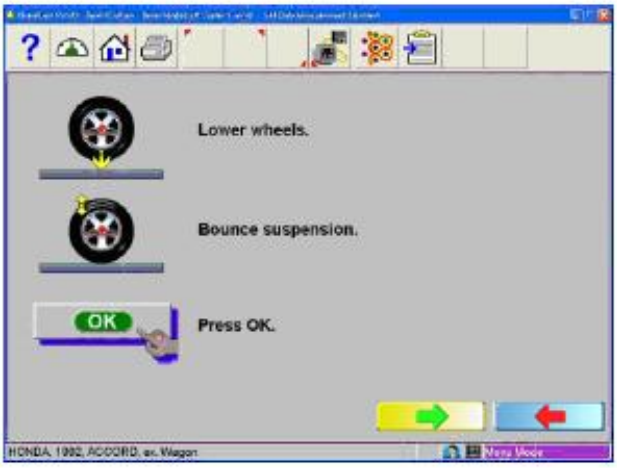
2.Follow the on-screen instructions. During the elevated measurement, the instruction say to raise the front wheels using rigid supports. This is typically done with a jack included with the alignment lift.



3.The turning sequence is identical to the process for obtaining steering angles on the turntables

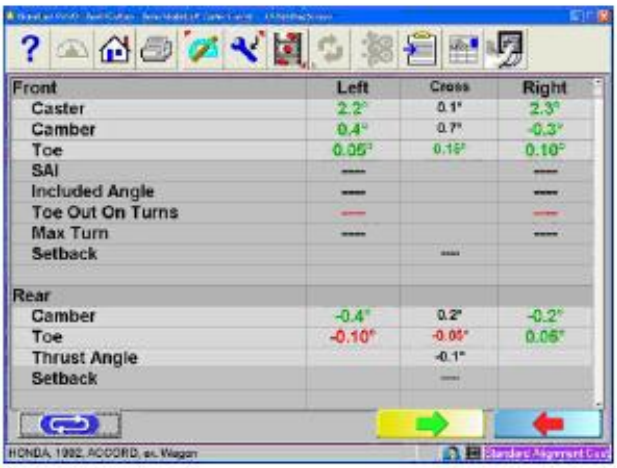
4.When measuring elevated SAI, the final instructions will be to lower the vehicle and jounce the suspension.

5.The SAI and Included Angle values are displayed on the All Readings screen. Caster is displayed on the All Readings screen as well as the Front Readings meter screen.



6.Use SAI and Included Angle to diagnose a handling problem or a bent part that is limiting the adjustment of camber.

NOTE: Not all vehicle manufacturers publish specifications for SAI or Included Angle. All available manufacturers' specifications are included in the Aligner database.



Camber at Zero Toe

This routine measures camber on the left and right front wheels individually at zero toe. This is the recommended procedure for vehicles with high caster specifications, such as Mercedes-Benz.

The procedure is as follows:

1.Select Camber at Zero Toe from Measure Screen

2.Using the on-screen meter, turn the left wheel towards the center until the meter turns green

3.Press OK to continue

4.Repeat this process for the right wheel. Click OK to continue

5.The software returns to the readings screen
