CHAPTER 3
CHECKOUT, CALIBRATION AND MAINTENANCE

GENERAL

An efficient and proper troubleshooting method of repair is to analyze the logical order of events. Recognition of symptoms which naturally occur in a certain sequence (depending on failure) will aid in the quick location of system errors. This method of logical deduction has been used for years by the most successful technicians.
During the power up sequence the aligner is first a computer, the software load transforms the machine into an alignment instrument. Even as an aligner, things must execute in a certain fashion. When this order is known we can determine the system malfunction easily by observing the symptoms.

The following checks (in order) will aid in determining which section of the aligner a failure occurs.

UNIT CHECKOUT PROCEDURE ALL VERSIONS

1. Check for 115VAC power at the wall outlet and at the terminal strip inside the back door assembly.
2. Power on check, listen for fail code beeps, system messages the unit should begin the boot up process and load the alignment software.

NOTE: THE ROM BIOS ALSO CONTAINS A SIMPLE SYSTEM CHECK PROGRAM WHICH EXECUTES JUST AFTER TURN-ON. DOS/WINDOWS DIAGNOSTICS SOFTWARE. THIS IS A VERY GOOD AS WELL AS THOROUGH MICROPROCESSOR DIAGNOSTIC TOOL.

3. Check 115VAC power at the Power Supply PCB inside the USB HIB Box P1 pins 1 and 2.
4. Check 10VDC power at the Power Supply PCB P2 pins 1, 2 and 3.
5. Aligner software download. Check to make sure that the alignment software loads both the HIB USB support and the alignment database.
6. Communications..Assuming all console display functions are OK, go to the **Maintenance - Measurements Data - Raw Values Only** screen. Monitor the activity of the heads by plugging 1 sensor at a time into the interconnect PCB on the back of the console. If the unit fails to report a wheel sensor try another receptacle on the back of the unit each run in parallel and will accept any sensor. If the unit still fails to report the wheel sensor try a different cable.
7. Continue to plug in all 4 wheel sensors until communication has been established with each one.
8. Set the calibration hardware up on the front of the alignment rack with the numbers on the bar on the left side of the rack.
9. Valid camber. With the heads on the calibration bar, check for valid camber. With the sensors mounted on the calibration bar the camber output on the Raw Values only screen should not exceed ± 1.50 degrees.
10. Move one end of the calibration bar to the lower cutout on the calibration stands. Verify that the camber reading changes 4 degrees in the direction of camber change. Repeat this step with the opposite side.
11. Valid SAI. With the heads on the calibration bar, check for valid SAI. With the sensors mounted and leveled on the calibration bar the SAI output on the Raw Values only screen should not exceed ±3.00 degrees. Tilting the wheel sensor up should make the values go negative and tilting it down should make the values go positive.
11. Valid CrossToe. Again with both front sensors mounted on the calibration bar check for a good cross toe reading. Using the raw values only screen, and a level bar. The raw value should not exceed ± 2.00 degrees.
12. Valid Track Toe. Remove each wheel sensor from the calibration bar and mount the sensors on the bar 90 degrees from the original location. The raw value should not exceed ± 1.50 degrees.
13. Mechanical - Wheel clamps and turntables. Check for variances in camber readings as the clamps are rotated. Note any camber change. Using the same wheel sensor mount a different wheel clamp to the same tire and wheel in the same location and rotate the assembly 360 degrees and note any camber change. Complete this procedure with all 4 wheel clamps using the process of elimination.

ALIGNMENT SOFTWARE INSTALLATION

1. Software Components required:
   - Alignment Software CD
   - Brand “Key Disk” floppy
   - Platinum Options “Key Disk” floppy
   - Specification CD
   - Specification “Key Disk” floppy

2. Boot the aligner to the Windows desktop. (Figure 3-1)

3. Insert the CD labeled Alignment software. If “Auto insert” is turned on the alignment software will automatically begin the installation process.

4. The install program will first install the EZ Shim software. After EZ Shim has been installed the unit will automatically re-boot.

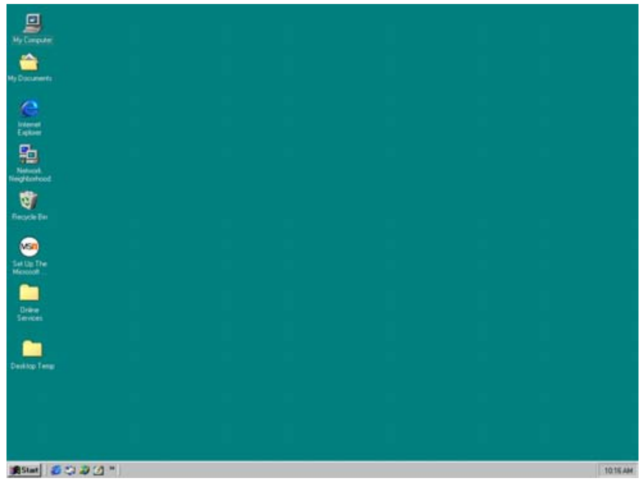


Figure 3-1

5. After re-booting the unit will install Acrobat® Reader. After Acrobat® has been loaded the unit will once again re-boot. (Figure 3-2)

NOTE: IF THE UNIT DOES NOT RE-BOOT AFTER THE INSTALLATION OF ACROBAT®, THE UNIT WILL NEED TO BE RESTARTED BY RE-INSERTING THE ALIGNMENT PROGRAM BACK INTO THE CD DRIVE.

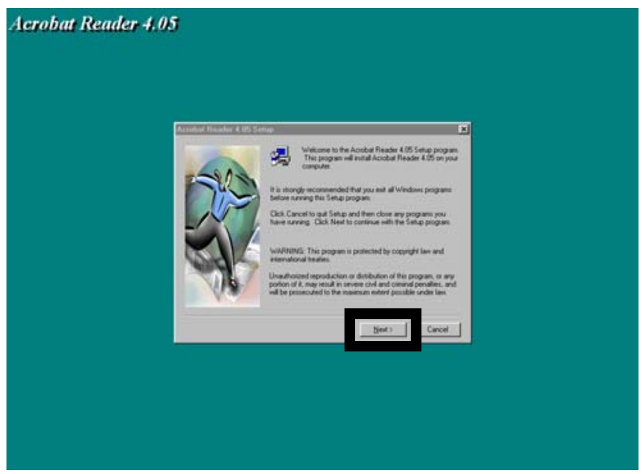


Figure 3-2

6. After rebooting, the alignment program will run and begin to load the alignment software. The install Wizard is the first screen to appear. Press **<NEXT>** to begin the installation. (Figure 3-3)

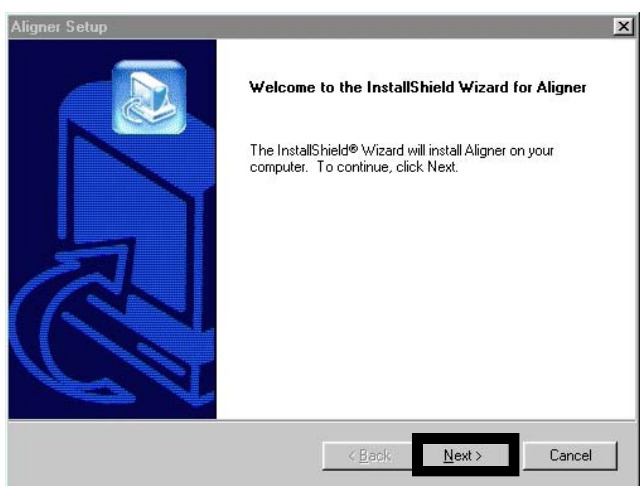


Figure 3-3

7. Read the License Agreement, if you agree click on **<YES>**. Clicking on **<NO>** will abort the installation process. (Figure 3-4)

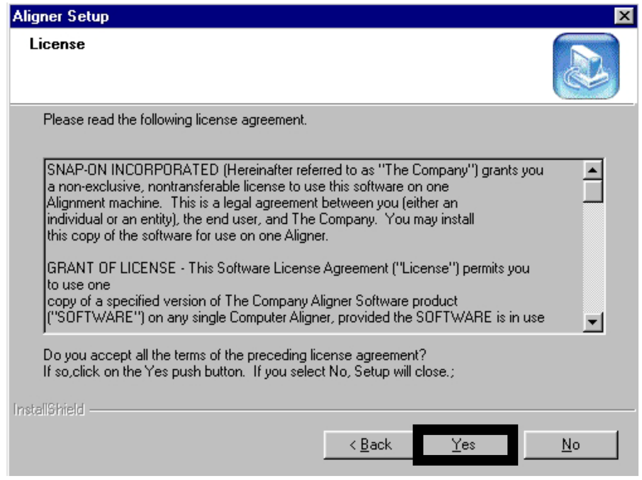


Figure 3-4

8. The alignment CD is not sensor or brand specific, the operator must choose which type of alignment software is to be loaded. Click on the icon button to choose the alignment software that you would like to install and click **<NEXT>** to proceed. (Figure 3-5)

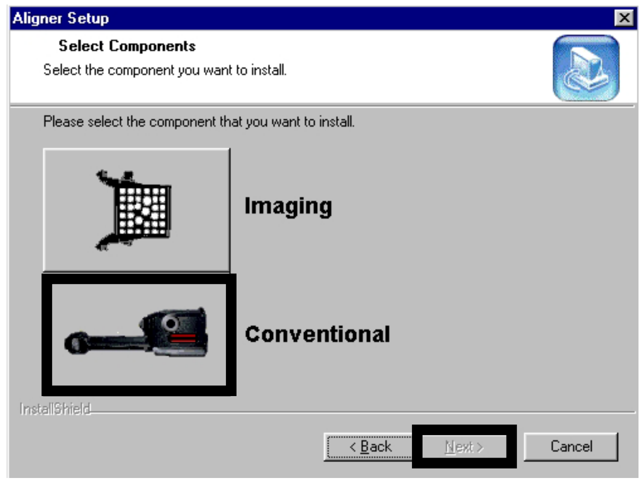


Figure 3-5

9. The default designation for the alignment software is "**C:\Program Files\Snap-on Technologies\Aligner"** click on **<NEXT>** to proceed with software installation. (Figure 3-6)

NOTE: THE INSTALLER SHOULD ALWAYS USE THE SOFTWARE DEFAULT DESIGNATED PATH.

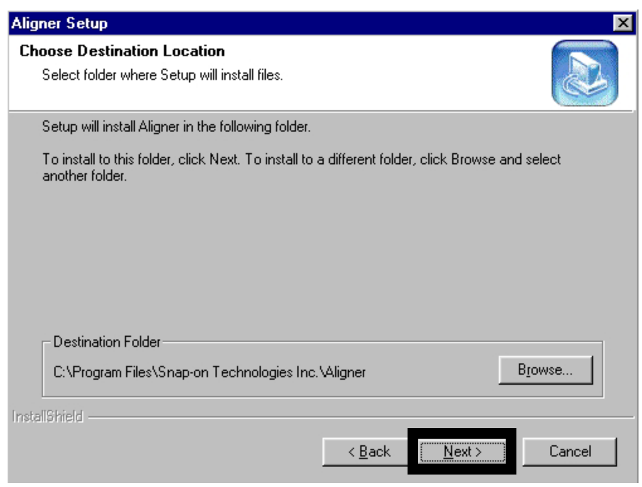


Figure 3-6

10. The next screen to appear is the language selection screen. The aligner has many different languages for easy user interface. Select the languages for this installation and then click **<NEXT>**. (Figure 3-7)

Figure 3-7

11. The aligner confirms the languages that have been chosen. Click on **<NEXT>** to proceed with the installation. If a language is not chosen, the operator can click on **<BACK>** to step back a screen the select additional languages. (Figure 3-8)

NOTE: AFTER INSTALLATION A USER CAN ADD ADDITIONAL LANGUAGES AT ANY TIME BY RE-INSTALLING THE SOFTWARE. THIS PROCESS WILL NOT OVERWRITE ANY PREFERENCES ALREADY SETUP BY OTHER USERS IF THE DEFAULT DESIGNATION WAS CHOSEN IN STEP 9.

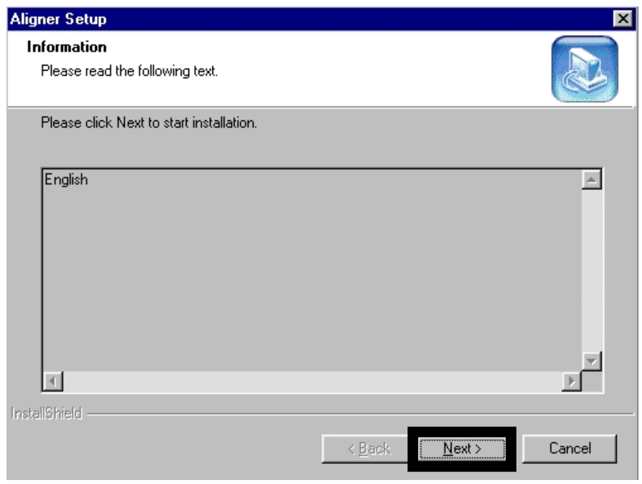


Figure 3-8

12. After a successful installation the Install Shield Wizard will display a installation complete. The unit will need to be re-booted before you can use the program, click on **<FINISH>** to re-boot the aligner. (Figure 3-9)

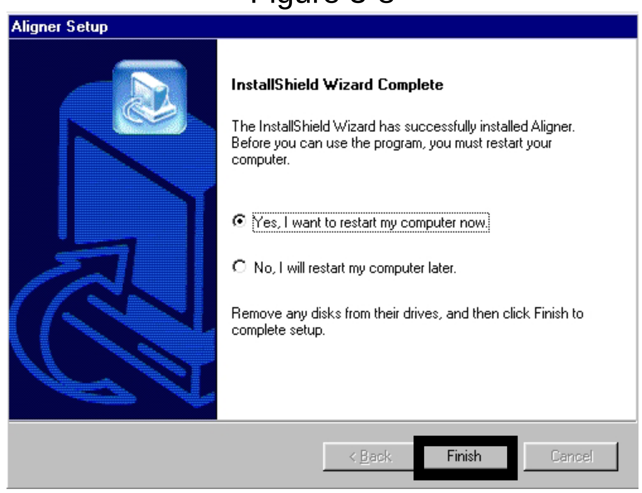


Figure 3-9

13. During the re-booting process a screen will appear asking the user to insert the “Key Disk” for branding. Insert the brand specific “Key Disk” into the floppy drive and click on **<OK>**. Once the “Key Disk” has been loaded the disk is branded rendering it useless for installations on other units. Store the disk in the cabinet for future installations for this unit only. (Figure 3-10)

Figure 3-10

14. By default the logo screen is the first screen to appear after the alignment software loads. To access the alignment software click on the **<OK>** button in the lower right hand corner of the screen. (Figure 3-11)

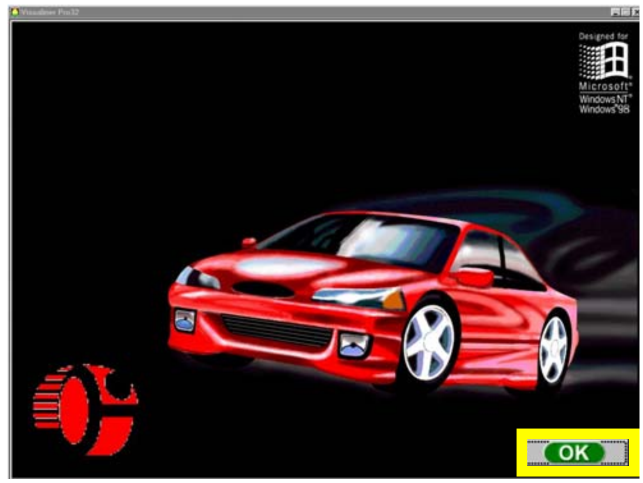


Figure 3-11

SOFTWARE INSTALLATION COMPLETED

SPECIFICATION INSTALLATION

1. Choose the **<PREFERENCES>** tab from the main menu of the alignment software. (Figure 3-12)

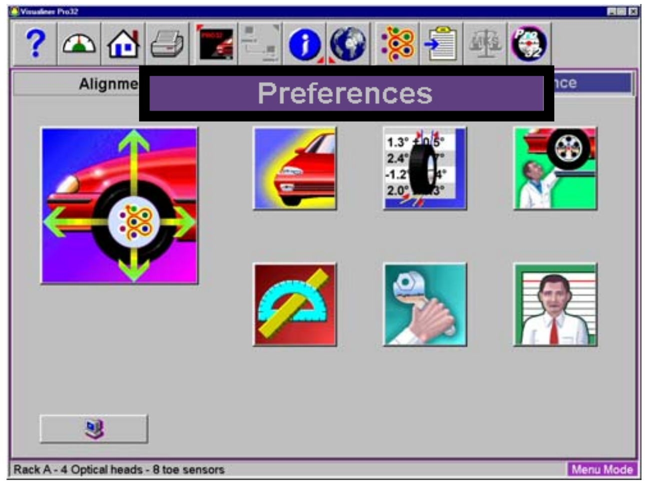


Figure 3-12

2. From the Preference menu select the **"USER INTERACTION"** icon. (Figure 3-13)

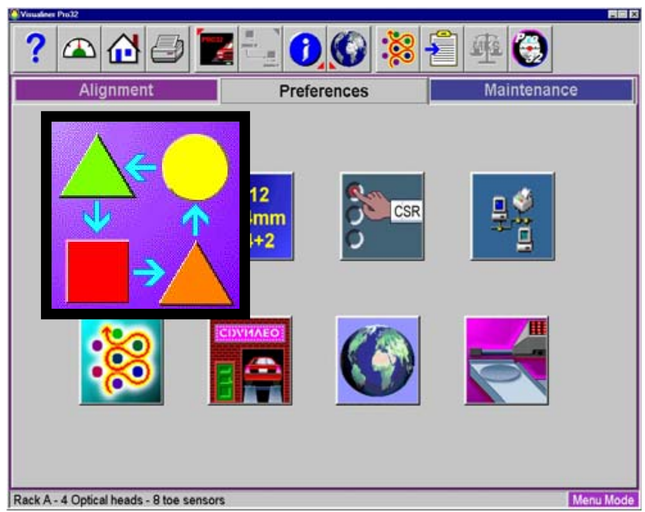


Figure 3-13

3. From the User Interaction menu select the **<SECURITY>** tab. (Figure 3-14)

Figure 3-14

4. From the Security Menu select the **“KEY DISK”** radio button. Insert the “SPECIFICATION KEY DISK” into the floppy drive and select **<APPLY>**. Once the “Key Disk” has been loaded the disk is branded rendering it useless for installations on other units. Store the disk in the cabinet for future installations for this unit only. (Figure 3-15)

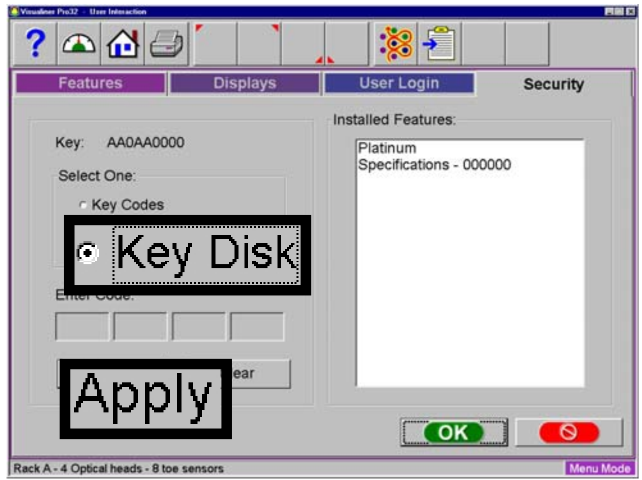


Figure 3-15

5. Jump back to the Main Alignment menu by clicking on the “HOME” key in the upper left hand corner. (Figure 3-16)

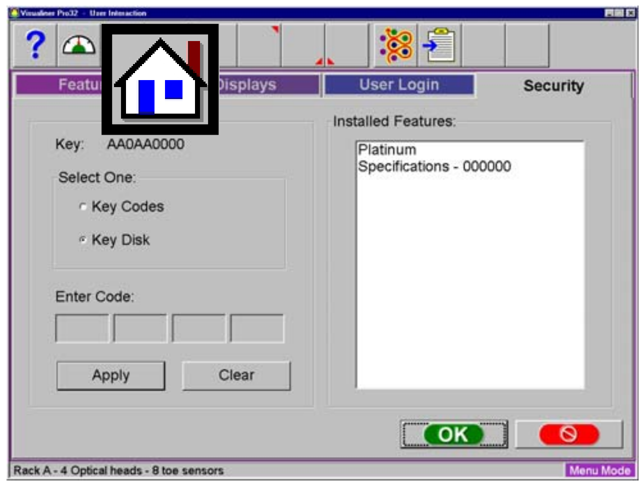


Figure 3-16

6. Choose the <Maintenance> tab from the Main Menu. (Figure 3-17)

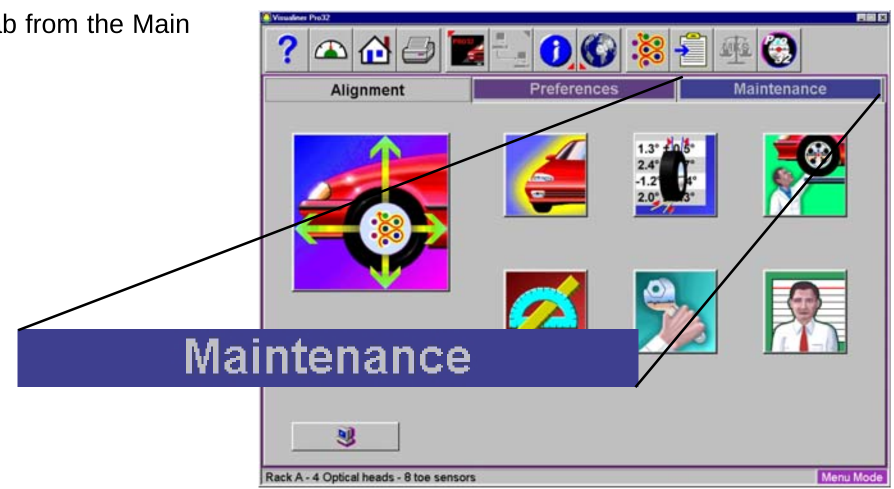


Figure 3-17

7. Choose the "Windows Utilities" icon from the Maintenance Menu. (Figure 3-18)

Figure 3-18

8. Double click on the "Install" icon from the Windows Utilities. (Figure 3-19)

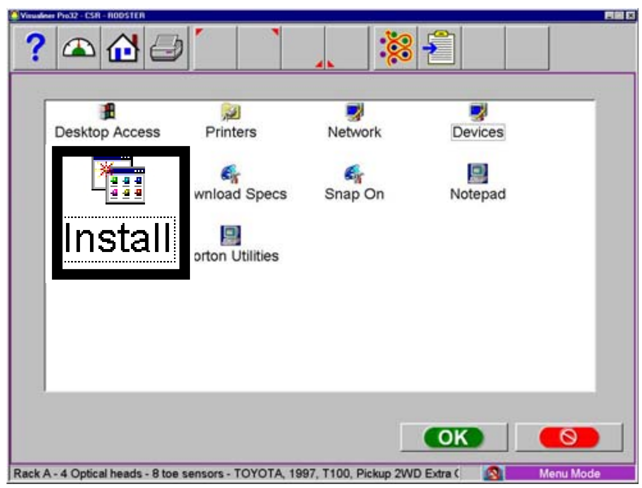


Figure 3-19

9. Insert the specification CD in the DVD drive and choose the "Install from CD" radio button and click on <OK>. (Figure 3-20)

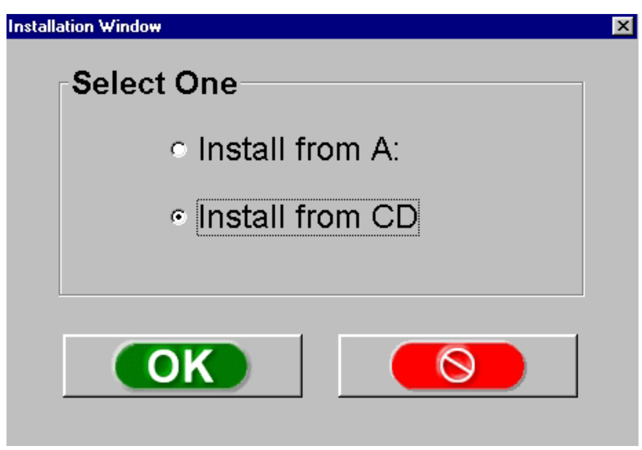


Figure 3-20

10. Choose the language for installation. This does not choose a particular specification database. This language selection onlly changes the dialogue for the installation of the software. (Figure 3-20.1)

Figure 3-20.1

11. Follow all on screen instructions using the default directory for installation. When prompted re-boot the aligner. (Figure 3-21)

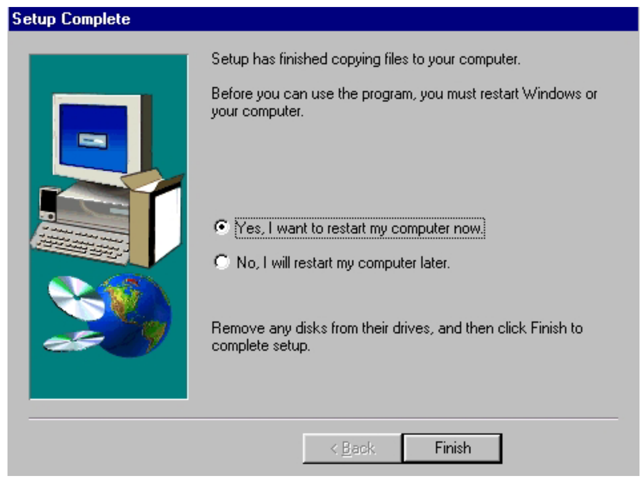


Figure 3-21

SPECIFICATION INSTALLATION COMPLETED

PLATINUM SOFTWARE INSTALLATION

1. Choose the **<PREFERENCES>** tab from the main menu of the alignment software. (Figure 3-22)

Figure 3-22

2. From the Preference menu select the **"USER INTERACTION"** icon. (Figure 3-23)

Figure 3-23

3. From the User Interaction menu select the **<SECURITY>** tab. (Figure 3-24)

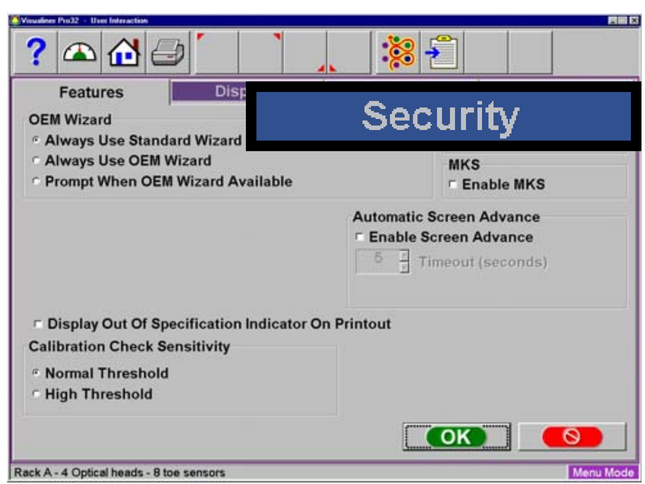


Figure 3-24

4. From the Security Menu select the **"KEY DISK"** radio button. Insert the "PLATINUM KEY DISK" into the floppy drive and select **<APPLY>**. Once the "Key Disk" has been loaded the disk is branded rendering it useless for installations on other units. Store the disk in the cabinet for future installations for this unit only. (Figure 3-25)

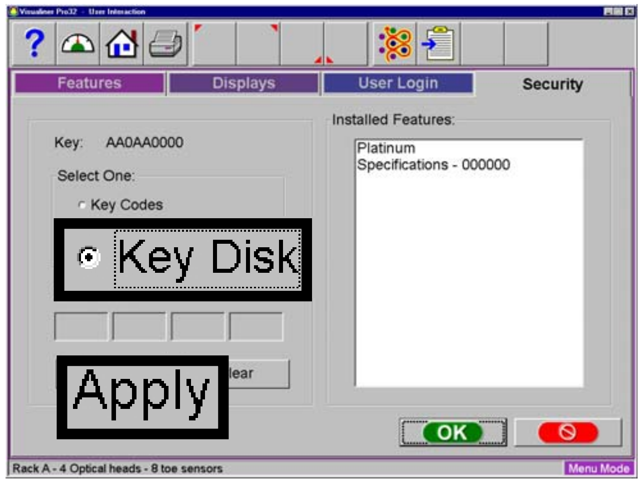


Figure 3-25

PLATINUM INSTALLATION COMPLETED

MAINTENANCE MENU

This screen is the hub of all *Pro32*™ service and maintenance. (Figure 3-26) Icon selections are:

Calibration – the software that enables the measuring heads to be calibrated using the optional Customer Calibration Kit

Measurement Data – primarily for service personnel, this allows access to measuring sensor direct output.

Figure 3-26

Preventative Maintenance – a software feature that guides the equipment operator through recommended periodic aligner maintenance.

Demo Mode - A program used primarily by sales representatives and training personnel. This is program that demonstrates the capabilities of the aligner software without actually having measuring heads or a vehicle available. It is a useful tool for training new or experienced users about machine features.

Windows Utilities – Allows access to the Windows Desktop and also allows the operator to perform routine installation of printers, software, etc.

Database Utilities – The feature is used for backing up and restoring alignment based data files, customer data, etc.

Speaker Training – Optional Hardware / Software package that allows and end-user to control the aligner through voice commands.

CALIBRATION MENU

CAMBER/SAI/CROSS TOE CALIBRATION

Calibration of the measuring heads requires the Customer Calibration Kit. This kit consists of a steel-tube bar approximately 5 feet long and a pair of stands, (with screw/knob assemblies). Make sure these items are present before proceeding with the calibration. There are three separate subsystems that must be calibrated – cross toe, track toe, and camber/SAI sensors. Cross toe measures wheel angles across the front or back of the vehicle. Camber and SAI sensors measure wheel tilt angles. Cross toe and Camber/SAI and Track toe calibration is performed by placing the heads on the calibration bar and stands. Each head has a toe system that measures angles from the front to rear. (Figure 3-27)

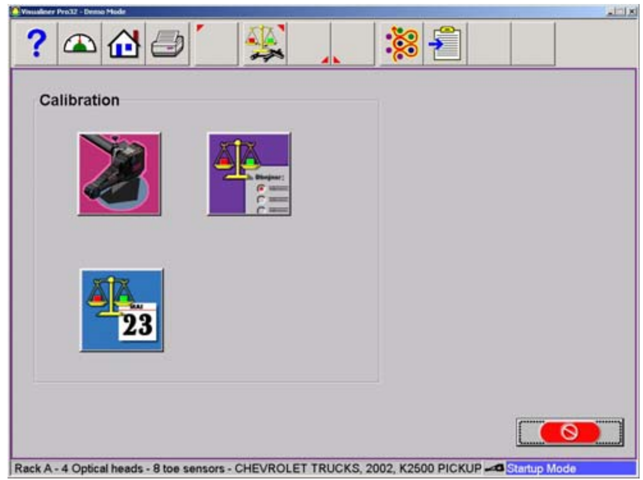


Figure 3-27

CALIBRATION FACTORS

The calibration factors can be viewed at anytime by selecting the Calibration Factors icon from the Calibration Menu. These factors are referenced each time an alignment is performed. Notice there are three sets of camber factors for the three alignment surfaces. (Figure 3-28)

Figure 3-28

CALIBRATION HISTORY

The past 10 calibrations of the Visualiner can be viewed by selecting the Calibration History icon on the Calibration Screen. It gives a graphical presentation of the calibration factors of any head selected, allowing a visual tracking of any problem areas. Selecting any of the buttons below the head selection brings up the calibration information for all 4 heads, along with dates the calibrations were performed. (Figure 3-29)

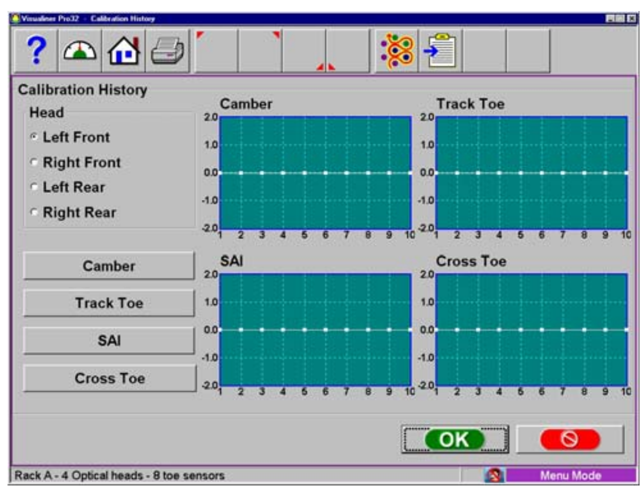


Figure 3-29

CAMBER, SAI, CROSS TOE AND TRACK TOE CALIBRATION PROCEDURES

NOTE: FOLLOW ALL ON-SCREEN INSTRUCTIONS CAREFULLY TO ENSURE QUALITY RESULTS.

1. Click on the Camber/SAI Calibration icon on the Calibration screen. The first screen to appear is shown in (Figure 3-30)

2. Select whether the front or rear sensors are to be calibrated by clicking on the proper radio button.

3. Choose the rack that the calibration is to be performed on. Up to 3 alignment surfaces can be utilized, and each must be calibrated independently. In most shops, Rack A is the primary alignment surface – choices are Rack A, Rack B, or Floor.

4. Set the calibration stands on the front (turn plates) with the open end of the stands facing the rear of the alignment lift. Set the calibration bar into the notched sections of the stands with the numbers that are printed on the bar on the left hand side. Click on the **"OK"** button in the lower right hand corner.

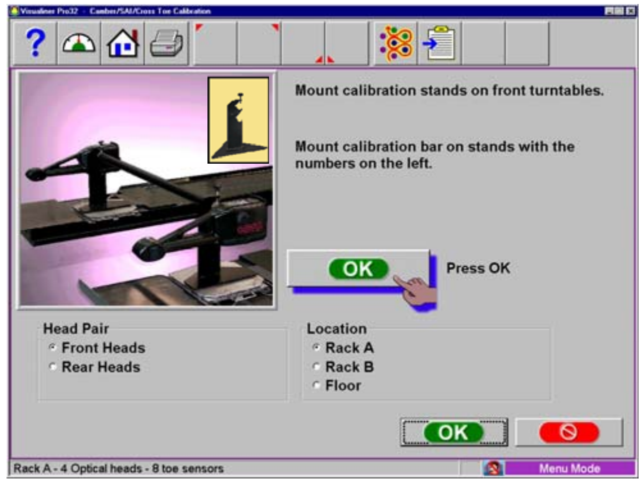


Figure 3-30

NEXT STEP

1. Rotate the bar forward until the #4 is at 12:00.

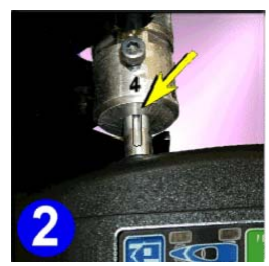
2. Slide both the left and right front sensors into the calibration bar with the groove on the stub shaft facing up.

3. Hand tighten the left and right thumb screws on the calibration bar.

4. Rotate the bar forward until the #1 is at the 12:00 position.

5. Level and lock both sensors using the level vial that is mounted on the outside shell of the sensor. This procedure automatically sets the electronic level inside the sensor.

6. Gently press the **"runout"** key on one of the front sensors.



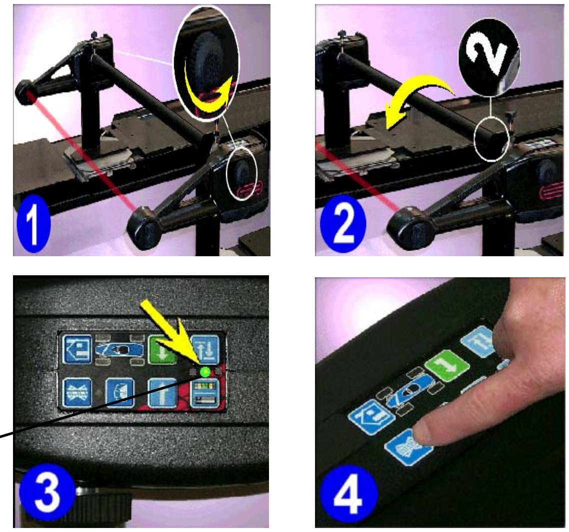
NEXT STEP

1. Un-lock both the left and right sensors by turning the knob counter clockwise.

2. Rotate the bar forward until the #2 is at 12:00.

3. Using the electronic level on the keypad, level both the left and right sensors and lock them using the sensor locking knob.

NOTE: IF A HEAD IS NOT LEVEL DURING THIS STEP A MESSAGE IS DISPLAYED ON SCREEN INDICATING TO LEVEL THE HEADS.



4. Gently press the runout button.

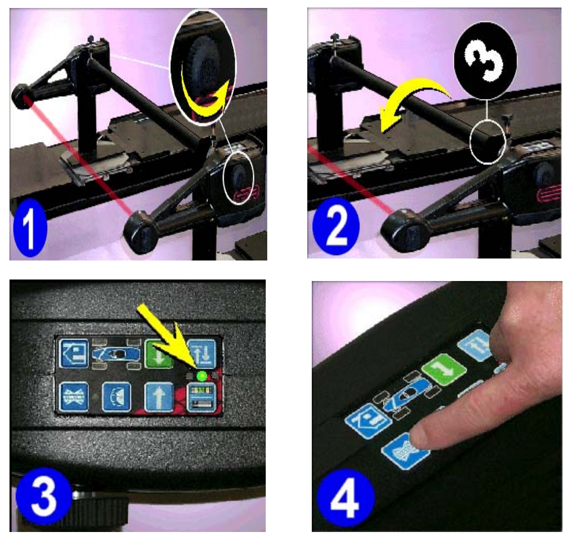
NEXT STEP

1. Un-lock both the left and right sensors by turning the knob (counter clockwise).

2. Rotate the bar forward until the #3 is at 12:00.

3. Using the electronic level on the keypad, level both the left and right sensors and lock them using the sensor locking knob.

4. Gently press the runout button.



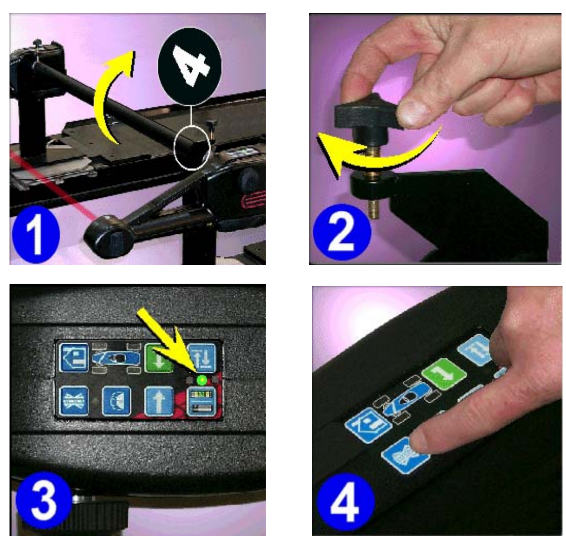
NEXT STEP

1. Un-lock both the left and right sensors by turning the knob counter clockwise. Rotate the bar backwards to position number "4".

2. Lock the calibration bar by tightening the hand screw on the calibration stands.

3. Using the electronic level on the keypad, level both the left and right sensors and lock them using the sensor locking knob.

4. Gently press the runout button.



NEXT STEP

1. Swap the entire assembly from left to right so that the left sensor is on the RH side facing rearward and the right sensor is on the LH side facing rearward. The calibration bar must also be rotated so that the numbers are on the RH side of the alignment lift.

2. Rotate the calibration bar so that the number “4” is in the 12:00 position.

3. Using the electronic level on the keypad, level both the left and right sensors and lock them using the sensor locking knob.

4. Gently press the runout button.

NEXT STEP

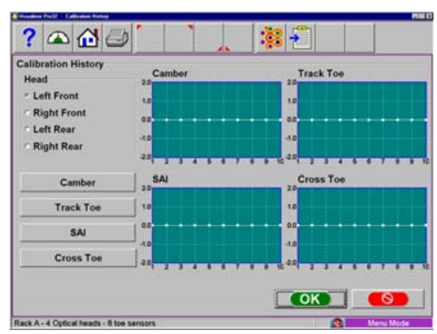
1. Remove the wheel sensors from the bar and orient them so that both rear toe sensors are facing each other.

2. Using the electronic level on the keypad, level both the left and right sensors and lock them using the sensor locking knob.

3. Gently press the runout button.

NEXT STEP

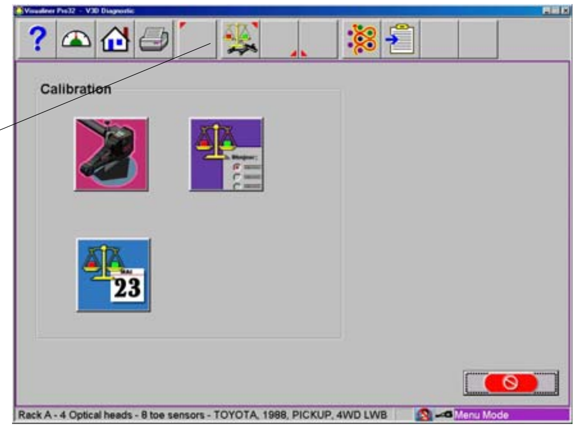
After the calibration a screen will appear displaying the calibration factors of all systems within the front sensors. The screen has three columns of numbers. The first column “New” displays the calibration factors that were just obtained. The second column “Current” displays the calibration factors that were obtained from the previously performed calibration. The last column “Change” shows the total amount of change between the two calibrations. Should a factor exceed the usable limit, a warning will be displayed which indicates a possible problem and will recommend that a service technician be called. Clicking on the “Cancel” button will reject the new calibration factors and return to the Calibration Screen. Clicking on the “OK” button will accept the new factors and use them to perform alignments. A fourth column called “Comments” allows the operator to enter any notes about why the calibration was performed.

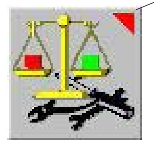


Repeat the calibration process for the rear sensors by choosing “Rear Heads” from the calibration menu. The rear wheel sensors must be mounted at the rear of the alignment rack for this process.

CALIBRATION COMPLETE

CALIBRATION AND PREFERENCE BACKUP





This feature is only available on software revision 3.4 or greater. All alignment machines are unique in their own way. Each aligner has different calibration factors and preferences. CCP alignment software also offers users many different options in the way of looks and feel. Each user spends many hours customizing the alignment software for his/her look and feel. Each alignment shop may have a different logo that may show up on a printout of each printed alignment result. Calibration and Preference backup offers the user or technician a way of backing up all customized options and alignment calibration to a 1.44mb floppy diskette. Should an alignment machine require a hard drive replacement the user or technician can simply restore all data from a saved floppy diskette back on to the newly installed hard drive. From the ***Main Menu*** click on the ***Maintenance Tab*** click on the ***Calibration*** icon and then click on the ***Calibration Utilities*** icon on the toolbar as illustrated above.

Backup - It is recommended after every calibration that the user backup the new data in case of a PC or Hard Drive failure. This enables the user to quickly restore the alignment system's calibration and preference data after the operating system has been restored. It is recommended that each time the system is backed up that the same disk be used and dated on the floppy disk label. A 1.44mb formatted floppy diskette is required to perform this operation. If the floppy diskette being used contains any information the system will automatically prompt the user to format the diskette using the operating systems format command.

Restore - Should a hard drive failure occur, simply install the last known alignment calibration and preference data disk and restore the aligner back to the user's prefered preference.

NOTE: IF THE OPERATOR IS NOT SURE IF THE SAVED DATA ON THE FLOPPY DISKETTE IS NOT CURRENT IT IS RECOMMENDED THAT A CALIBRATION BE PERFORMED. FAILURE TO HAVE ACCURATE CALIBRATION DATA CAN AND WILL CAUSE EXCESSIVE TIRE WEAR.

CALIBRATION FACTORS

The chart below lists the calibration limits of the aligner. It is possible for an aligner to exceed the limits and process a good alignment however the range at which the component inside the wheel sensor will greatly be reduced until the component has been replaced and re-calibrated.

	LF	RF	LR	RR
Cross Toe	**0 ± 2.00**	**0 ± 2.00**	**0 ± 2.00**	**0 ± 2.00**
Track Toe	**0 ± 2.00**	**0 ± 2.00**	**0 ± 2.00**	**0 ± 2.00**
Camber	**0 ± 3.00**	**0 ± 3.00**	**0 ± 3.00**	**0 ± 3.00**
Rack A	**0 ± 1.50**	**0 ± 1.50**	**0 ± 1.50**	**0 ± 1.50**
Rack B	**0 ± 1.50**	**0 ± 1.50**	**0 ± 1.50**	**0 ± 1.50**
Floor	**0 ± 1.50**	**0 ± 1.50**	**0 ± 1.50**	**0 ± 1.50**
SAI	**0 ± 3.00**	**0 ± 3.00**	**0 ± 3.00**	**0 ± 3.00**

CALIBRATION FACTORS EXCEED LIMITS

During normal use of the aligner it is possible that components inside the wheel sensors become unstable and no longer able to hold a tolerance. During the calibration procedure the operator can receive a return error indicating that a problem exist. The operator should first determine the severity of the error. Most errors that arise during calibration are normally operator errors and can be easily corrected by recalibrating the wheel sensors. However if after a re-calibration the error still exists, the operator will receive the returned error (Figure 3-31)

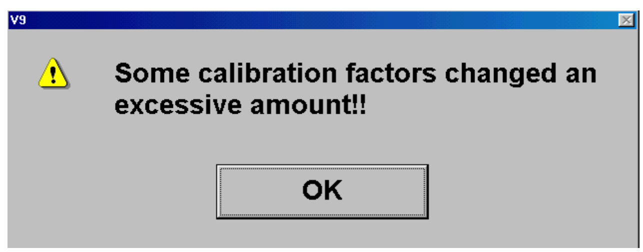


Figure 3-31

After clicking on the **<OK>** button, the next screen indicates which component has exceeded the limits and signals the operator to call customer service to determine the error. (Figure 3-32) The red box around the data indicates which component is out of tolerance. There are NO ADJUSTMENTS that can be made inside the wheel sensor to correct such problems and will require that a component be changed to correct the problem. The illustration to the right indicates that a Camber Tilt Sensor has exceeded the limits and will require replacement. After replacing the "Tilt Sensor" a calibration will be required to bring the unit back to Factory Specifications.

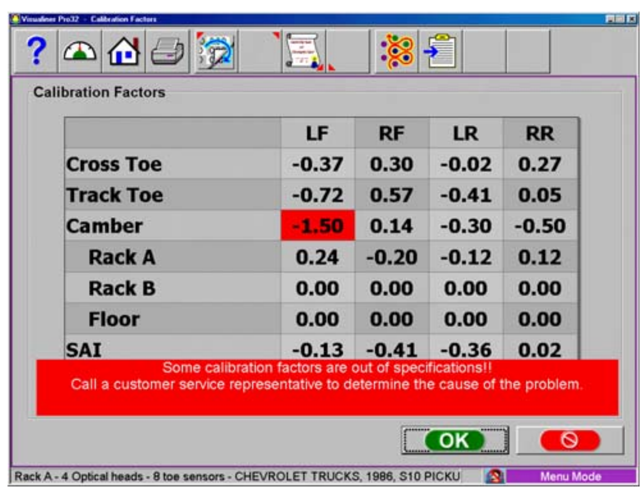


Figure 3-32

CALIBRATION CHANGE

The aligner has a built in safety net to alert the operator of an exceeded amount of change. The aligner looks at the calibration factors that are stored into the unit and compares them with the new factors that were generated from the completed calibration. Should this amount of change exceed the limits the operator is alerted with a “red” box around the data. The illustration (Figure 3-33) indicates which component inside the wheel sensor has the exceeded change. This change does not indicate a problem with the unit, it alerts the operator that an exceeded change has taken place. If the operator is sure that the calibration was performed correctly click on <OK> to accept the new factors. These new factors will replace the current factors. If the problem is persistent to a particular wheel sensor and component, it may indicate that a component inside the wheel sensor is un-stable. Replace the defective component and re-calibrate.

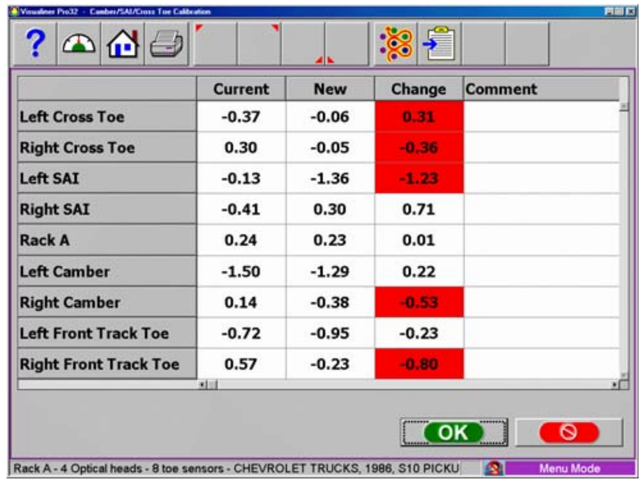


Figure 3-33

Should a component execeed it’s limit the operator will receive an “Exceeded Change” message. This change looks at the “Current Factor” and compares it to the “New Factor”. Refer to the chart below for the amount of change needed to flag an operator during calibration.

LF	RF	LR	RR	
Cross Toe	**± .25**	**± .25**	**± .25**	**± .25**
Track Toe	**± .25**	**± .25**	**± .25**	**± .25**
Camber	**± .25**	**± .25**	**± .25**	**± .25**
Rack A	**± .25**	**± .25**	**± .25**	**± .25**
Rack B	**± .25**	**± .25**	**± .25**	**± .25**
Floor	**± .25**	**± .25**	**± .25**	**± .25**
SAI	**± 1.00**	**± 1.00**	**± 1.00**	**± 1.00**

CALIBRATION HISTORY

The calibration history displays the last 10 calibrations performed on the aligner. The chart is graphed, the X factor is numbered 1 thru 10 (last 10 calibrations) 1 being the calibration just performed and the Y factor is numbered -2.0 thru +2.0 (Raw Data).

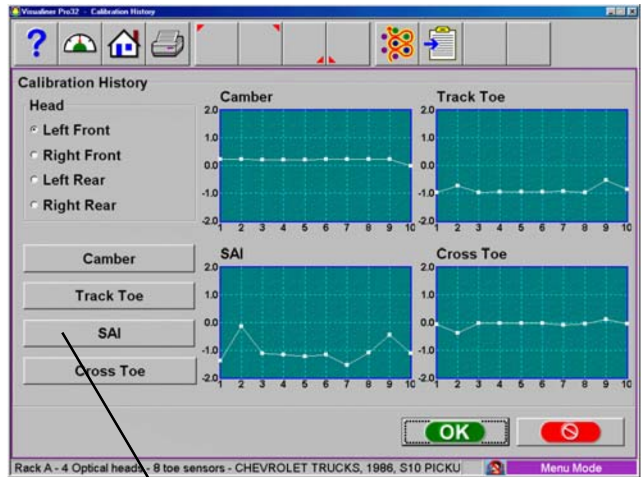
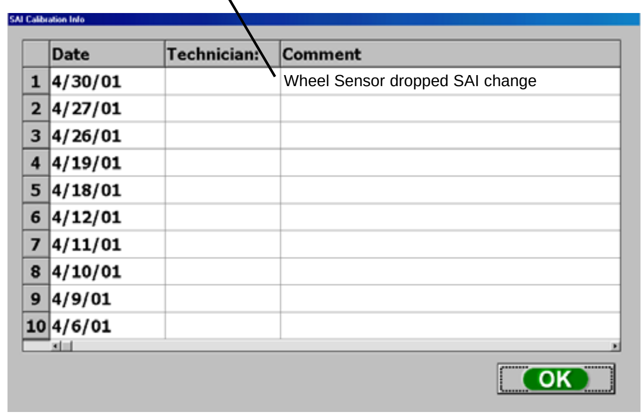


Figure 3-34

By selecting the radio button under the “Head” the unit will return a graph for that Wheel Sensor and display the last 10 calibrations for each component inside the wheel sensor. (Figure 3-34) The operator also may view any notes that may have been entered by selecting the buttons in the lower half of the screen. Each time a calibration is performed the 10th calibration history and notes are purged and the history is moved 1 becomes 2 and 2 becomes 3 and so on up through 10.

Example

(Figure 3-35) displays the Calibration Notes for the LF SAI Wheel Sensor. By selecting the “SAI” button the operator can view any notes that may have been added for that particular calibration. The operator can choose either Camber, Track Toe, SAI and Cross Toe



SAI Calibration Info

	Date	Technician:	Comment
1	4/30/01		Wheel Sensor dropped SAI change
2	4/27/01		
3	4/26/01		
4	4/19/01		
5	4/18/01		
6	4/12/01		
7	4/11/01		
8	4/10/01		
9	4/9/01		
10	4/6/01		

OK

Figure 3-35

MEASUREMENT DATA

These screens are primarily used by Service personnel in diagnosing equipment problems. This information displays the direct output of the various measurement sensors used to determine the wheel alignment angles.

Click on the Measurement Data icon from the Maintenance tab. There are two screens to view sensor outputs: (Figure 3-36)

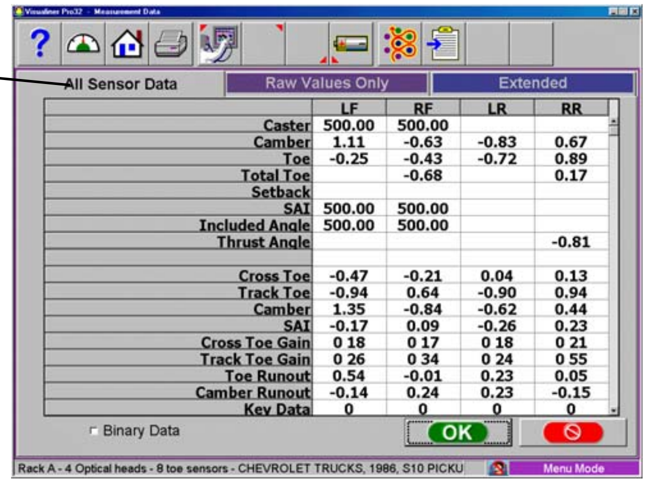


Figure 3-36

ALL SENSOR DATA

Has a myriad of system information for advanced diagnostic capabilities. The upper readings represent the data that is generated from the wheel sensors minus the rack. The bottom readings represent the data with the rack.

CASTER
The calculated data generated directly from the wheel sensors with the runout factors applied. This data is not live, it is updated after each Caster measurement.

CAMBER
The calculated data generated directly from the wheel sensors with the runout factors applied. This data is live, it updates directly as the wheel sensor is tilted in the Camber plane.

TOE
The calculated data generated from the CCD within the wheel sensor with the runout factors applied. This information is very useful in determining if the CCD sensor is able to produce information.

TOTAL TOE
The amount the total toe RAW data amount generated from an alignment. This data is only present while an alignment is being done using the aligner.

SETBACK
The amount setback RAW data amount generated from an alignment. This data is only present while an alignment is being done using the aligner.

SAI
The raw data generated directly from the wheel sensors. This data is live, it updates directly as the wheel sensor is tilted in the SAI plane.

INCLUDED ANGLE
The amount RAW data generated from an alignment. This data is only present while an alignment is being done using the aligner.

THRUST ANGLE
The amount RAW data generated from an alignment. This data is only present while an alignment is being done using the aligner.

CROSS TOE
The amount the cross toe RAW data generated from an alignment. This data is generated from the CCD in the respective wheel sensor.

TRACK TOE

The amount the track toe RAW data generated from an alignment. This data is generated from the CCD in the respective wheel sensor.

CAMBER

A direct raw value generated from the camber tilt sensor with the rack factors applied.

SAI

A direct raw value generated from the camber tilt sensor.

CROSS TOE GAIN

Toe flags indicate the toe sensor error status: (Figure 3-37) This is a very useful tool in diagnosing possible problems. The first digit indicates the status and the second two digits indicate the actual gain of the LED.

0	No errors
1	Low signal
2	High noise level
4	Bad shape (template error)
8	Unknown error
10	Sensor disabled/invalid

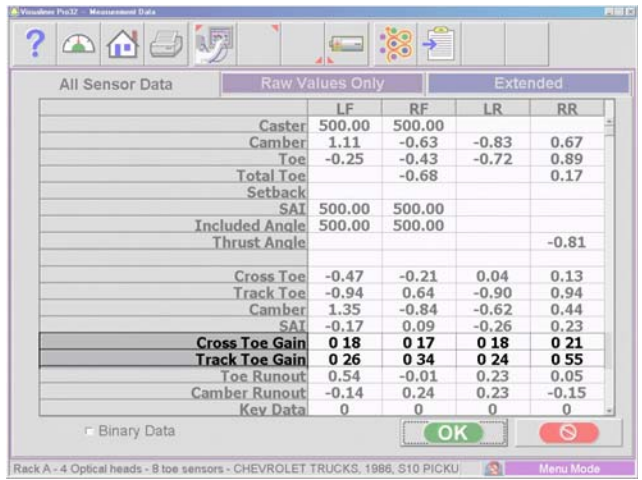


Figure 3-37

TRACK TOE GAIN

Toe flags indicate the toe sensor error status: (Figure 3-37) This is a very useful tool in diagnosing possible problems. The first digit indicates the status and the second two digits indicate the actual gain of the LED.

0	No errors
1	Low signal
2	High noise level
4	Bad shape (template error)
8	Unknown error
10	Sensor disabled/invalid

TOE RUNOUT

The amount of toe runout generated from the wheel sensor.

CAMBER RUNOUT

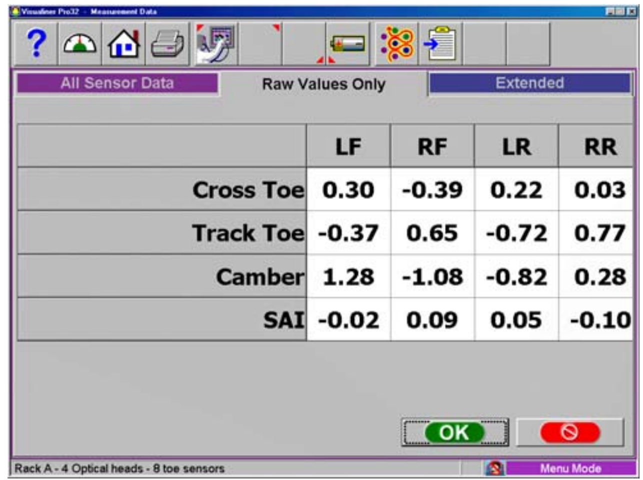
The amount of toe runout generated from the wheel sensor.

KEY DATA

When a key from a wheel sensor is pressed the key data will display the key that is being pressed.

RAW VALUES ONLY

The Raw Value screen is used to determine if all of the components inside the Wheel Sensors are communicating with the Main Console. The data generated from each component is RAW DATA only. The runout factors or rack factors are not used to generate this data. This screen is very useful for determining that good communication and data is available before proceeding with a calibration. (Figure 3-38)



	LF	RF	LR	RR
Cross Toe	0.30	-0.39	0.22	0.03
Track Toe	-0.37	0.65	-0.72	0.77
Camber	1.28	-1.08	-0.82	0.28
SAI	-0.02	0.09	0.05	-0.10

Figure 3-38

Place the Wheel Sensors on the calibration bar as shown in (Figure 3-39). Using the table on page 4-17 determine if any of the components inside the Wheel Sensors are out of tolerance. If all of the data is within the table the unit will pass the calibration with no errors. If any of the components exceed the tolerances allowed, the unit will flag calibration indicating that there is a problem inside one of the sensors that need to be corrected. This same test applies to the rear Wheel Sensors, however the operator must place the calibration assembly on the rear of the alignment rack.

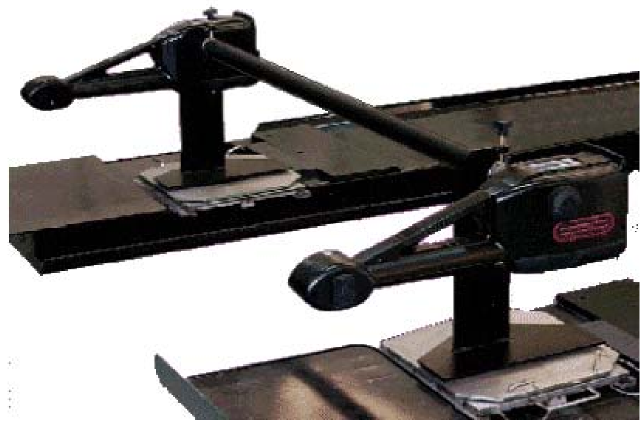
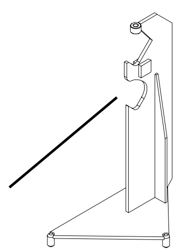
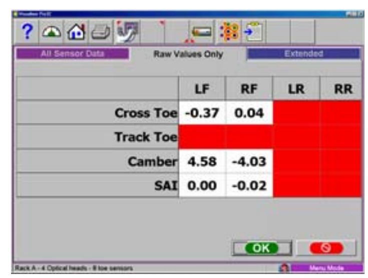


Figure 3-39

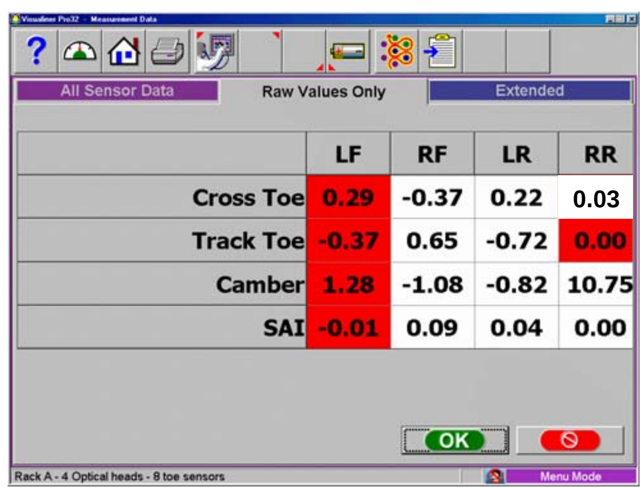
The calibration stands have a 4 degree cutouts below the calibration cutouts. Moving one of the Wheel Sensors down into the 4 degree cutout will display a camber change in both Wheel Sensors of 4 degrees.





	LF	RF	LR	RR
Cross Toe	-0.37	0.04		
Track Toe				
Camber	4.58	-4.03		
SAI	0.00	-0.02		

If any of the Wheel Sensors become disconnected with the HIB USB Box, the column under that Wheel Sensor will turn to red. The data that was last generated from that Wheel Sensor will remain on the screen; however, this will not be live data.



	LF	RF	LR	RR
Cross Toe	0.29	-0.37	0.22	0.03
Track Toe	-0.37	0.65	-0.72	0.00
Camber	1.28	-1.08	-0.82	10.75
SAI	-0.01	0.09	0.04	0.00

Figure 3-40

EXTENDED DATA

The aligner stores information from each Wheel Sensor in the System Registry on the computer. In the alignment process, the HIB downloads information from each Wheel Sensor. The information downloaded includes the serial number of each component inside each Wheel Sensor. During the alignment process the console checks each serial number that was downloaded by the HIB from the Wheel Sensors and compares them to each of the serial numbers written to the systems registry. If any of the serial numbers do not match the aligner returns a “Calibrated Serial Number Mismatch”. The operator must then calibrate the unit. Once the calibration factors have been accepted during calibration, the console will re-write the Serial Numbers of each component to the system’s registry for the next alignment. (Figure 3-41)

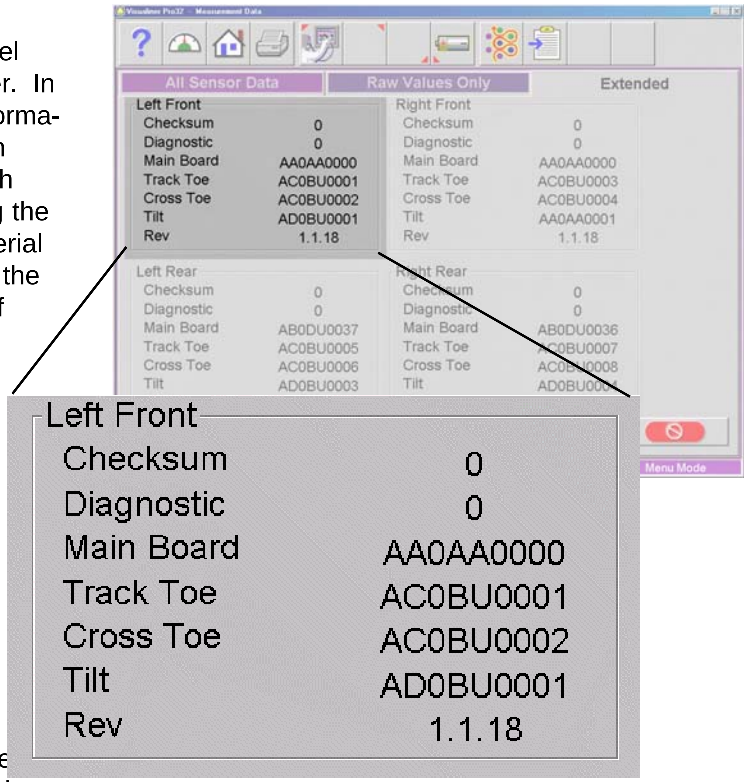


Figure 3-41

CHECKSUM

Checksum flag indicates if the checksum of the EEPROM data is correct. The data generated is hexadecimal, it is possible for the checksum to return more errors than one. Example: a return checksum of 50 would indicate a checksum error of the Track Toe CCD and the Tilt Board.

0	No errors
1	Toe Board EEPROM page 0 checksum error
2	Toe Board EEPROM page 1 checksum error
4	Toe Board EEPROM page 2 checksum error
8	Toe Board EEPROM page 3 checksum error
10	Track Toe board EEPROM checksum error
20	Cross Toe board EEPROM checksum error
40	Tilt board EEPROM checksum error

DIAGNOSTIC

Diagnostic flags indicate error status caught by start-up diagnostic routines. The data generated is hexadecimal, it is possible for the checksum to return more errors than one.

0	No errors
1	Vd (digital power supply) error
2	Va (analog power supply) error
4	Val (main power supply) error
8	CCD ADC error
10	Vtt (turntable power supply) error
20	VCCD (CCD power supply) error

HEAD DIAGNOSTICS

Applicable to all units

The aligner comes with built in Diagnostic Software to aid the technician in troubleshooting possible problems. This software can only be accessed through the “Measurement” Data screen and clicking on the “Head Diagnostic” icon on the toolbar. Once accessed the technician can easily choose the Wheel Sensor and component inside the Wheel Sensor. (Figure 3-42)

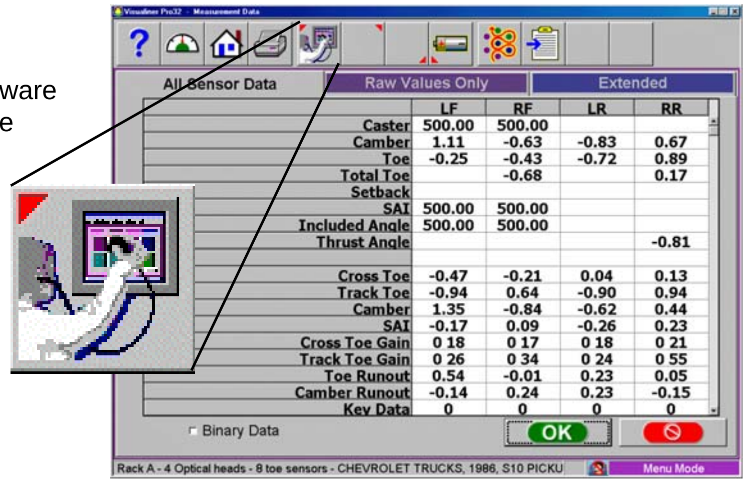


Figure 3-42

CROSS TOE / TRACK TOE DIAGNOSTICS

Applicable to all units

The Y axis is A/D ouptput of the CCD inside the Wheel Sensor the range is from 0 to 256 the height is dependant on amount of distance between the LF and RF CCD. The X axis is the CCD that is reporting back to the main console there are a total of 2048 pixels available 1024 being the center pixel. The CCD shown is dependant on the directions that the wheels are turned. If the Wheel Sensors were mounted on the calibration bar the output should read approximately an amplitude of 160.0 on the Y axis and 1024 on the X axis. Depending on which way the sensor is turned the Y axis should remain the same while the X axis would change. (Figure 3-43)

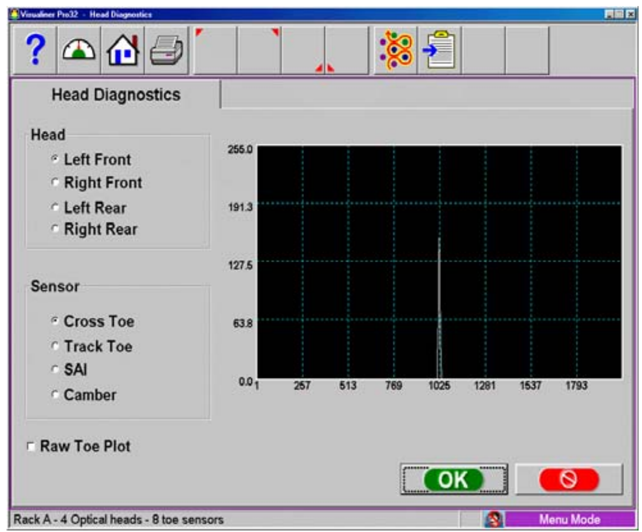


Figure 3-43

CAMBER / SAI DIAGNOSTICS

Applicable to all units

The Y axis is A/D ouptput of the tilt sensor inside the wheel sensor. The range is from 0 to 4096 the height is dependant on amount of Camber/SAI that the wheel sensors are tilted in the perspective plane. The X axis is time. If the Wheel Sensors were mounted on the calibration bar the output should read approximately an amplitude of 2048 on the Y axis and should be a clean steady output along the X axis. As the wheel sensor is tilted in a positive camber plane the output should increase on the Y axis and vice versa it should decrease as the sensor is tilted in the negative plane. As the wheel sensor is tilted in a positive SAI plane the output should decrease on the Y axis and vice versa it should increase as the sensor is tilted in the negative plane. (Figure 3-44)

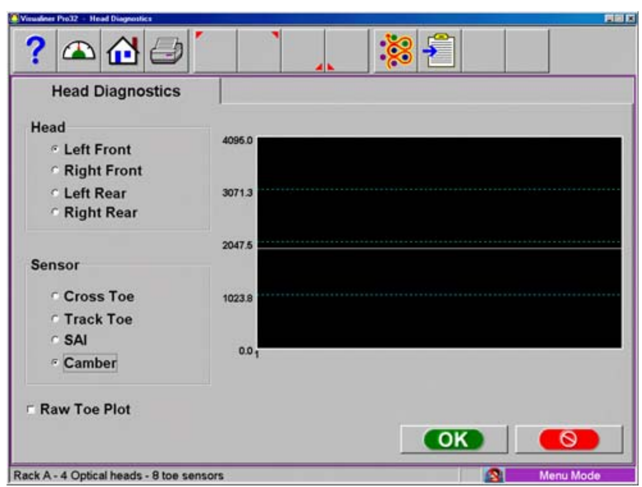


Figure 3-44

WINDOWS UTILITIES

The Windows® operating system is transparent to the operator. Without having access to Windows®, the user would not be able to perform some of the needed functions to maintain the aligner. The Windows utility menu offers all of the needed access to Windows® while maintaining the Windows® environment integrity.

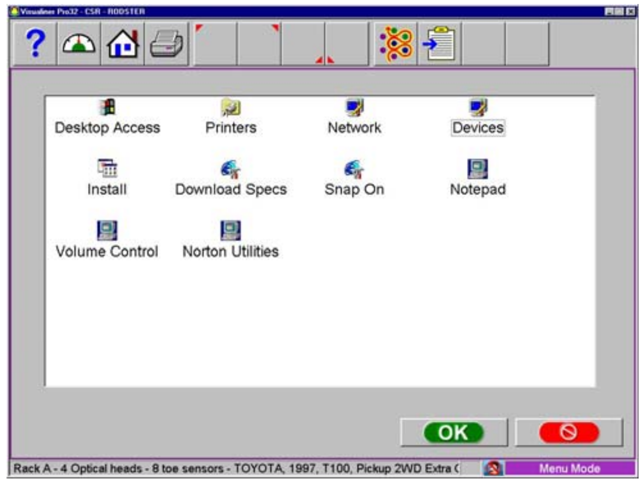


Figure 3-45

Desktop Access - Allows access to the Windows® desktop in emergency situations. Disables access to the Windows® Desktop.

Printer - Allows installation of printers and printer maintenance functions.

Network - Allows the operator access to Windows® networking utilities.

Devices - Allows the operator access to Windows® system properties.

Install - Used to Install Alignment Software upgrades and Specification updates.

Download Specs - Future expansion that will allow the customer to download specification updates from the internet.

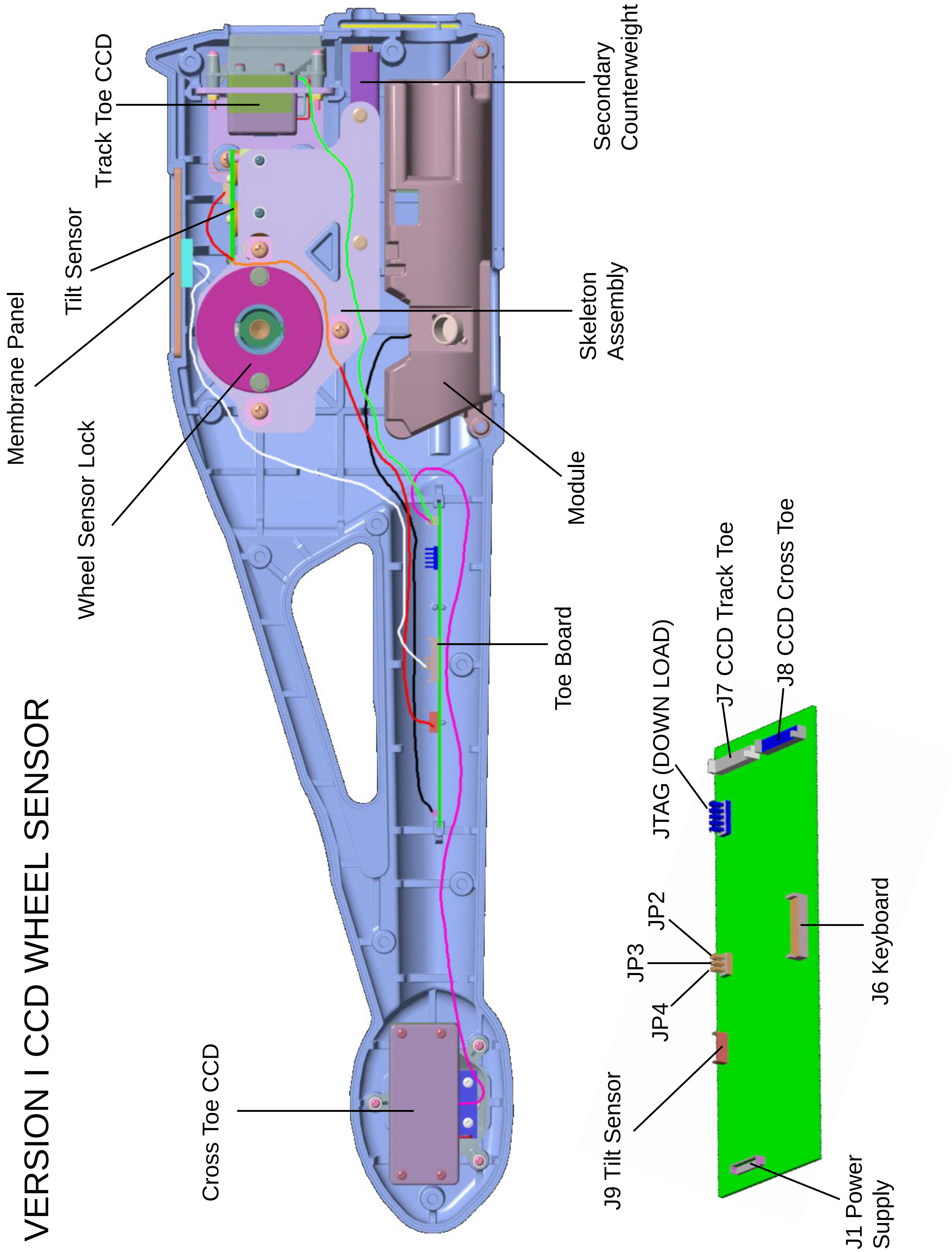
Snap-on - Hyperlink to Snap-on and subsidiary companies of Snap-on. Use F5 to back page.

Notepad - Allows access to Windows Notepad.

Volume - Allows access to control the volume output of the speakers.

Norton Utilities - A stand alone software program to allow the operator to troubleshoot problem PC's. (See manual that is supplied with the software)

VERSION I CCD WHEEL SENSOR



HEAD ASSEMBLY

TRACK TOE CCD MODULE INSTALLATION

Slide the Track Toe CCD module assembly into the channels as shown until the “D” holes in the bracket fit over the “D” shaped protrusions of the Wheel Sensor cover. (Figure 3-46)

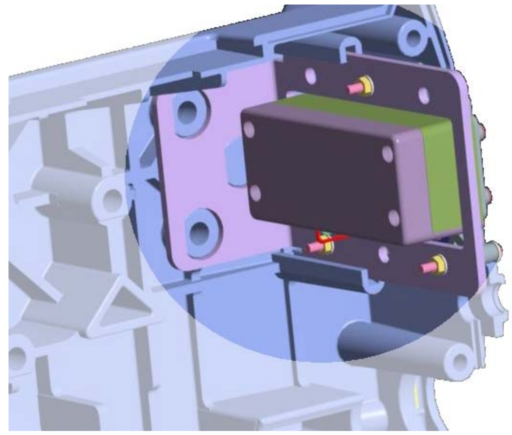


Figure 3-46

Place the fixed counter weight over the track toe CCD assembly, and secure with one screw. Tighten the screws to a torque spec. of 10 – 15 in-lbs.. (Figure 3-47)

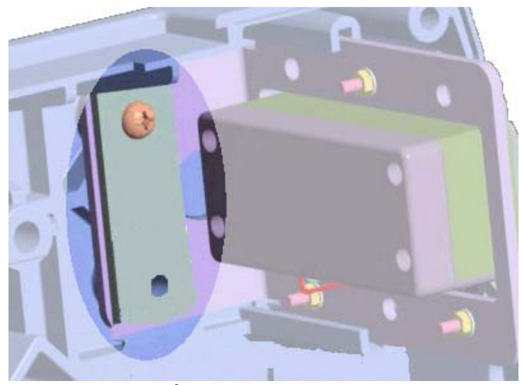


Figure 3-47

Place the secondary counter weight into the cover as shown; making sure that the counter weight is as far back as possible. Secure by placing the retainer plate over the secondary counter weight and align it with the lower hole of the counter weight as shown. Secure with another screw and tighten to a torque spec. of 10 –15 in-lbs. (Figure 3-48)

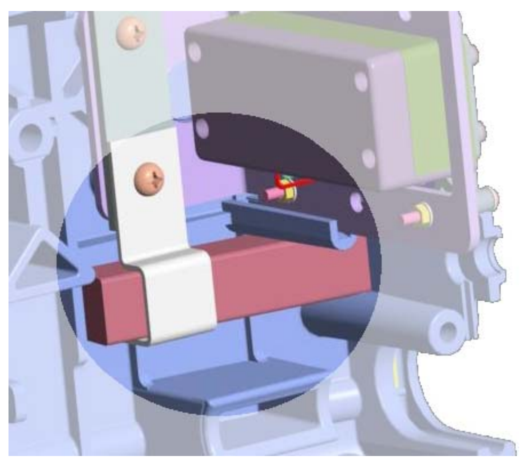


Figure 3-48

Route all wiring through skeleton assembly and plug the track toe CCD assembly into J7 of the Toe PCB. (Figure 3-49)

Complete customer calibration.

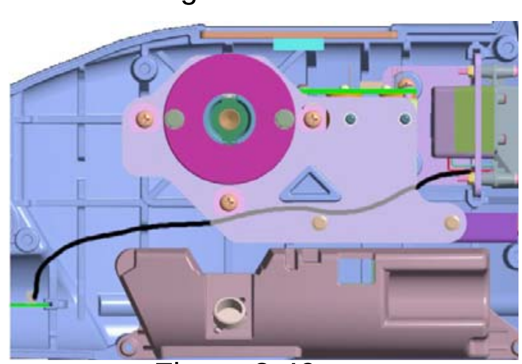


Figure 3-49

CROSS TOE CCD MODULE INSTALLATION

Install the cross toe assembly into the three matching receptacle bosses in the head cover as shown. Make sure that the 5 degree tapered protrusions fit securely into the receptacle bosses. The protrusions are NOT to be raised up, but held flat against the receptacle bosses. Ensure that the rectangular viewing area of the CCD assembly fits with out interference into the rectangular open area of the head cover. Secure this assembly to the head cover with the screws. Tighten the screws to a torque spec. of 10 – 15 in-lbs. (Figure 3-50)

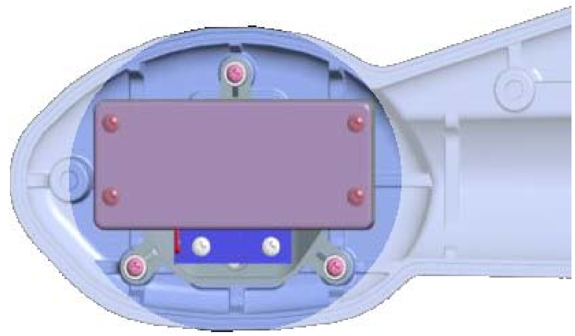


Figure 3-50

Route the wiring harness as shown in (Figure) and plug the cross toe CCD assembly into J8 of the Toe PCB. (Figure 3-51)

Complete customer calibration.

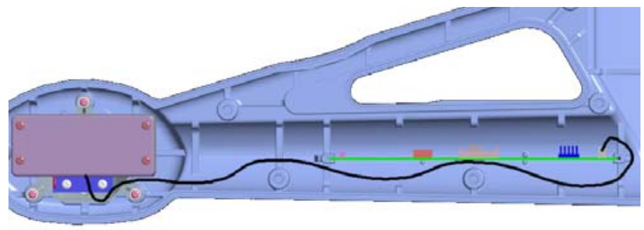


Figure 3-51

BRAKE SHOE INSTALLATION

Install the brake shoes by placing the left side, over the dowel pin first as shown. The brake shoe is symmetrical in design so the other brake shoe is simply rotated 180 degrees and placed over the remaining portion of the dowel pin. It is very IMPORTANT that the angle side (braking side) of the brake shoe always be to the outside for both brake shoes. When installed, the opening will get larger as you go outward from the shaft end. Install the spring over the tabs of the brake shoes as shown. This spring keeps the brake shoes spread out to prevent the locking knob from pressing straight down onto the brake shoes, thus decreasing the effectiveness of the braking system. (Figure 3-52)

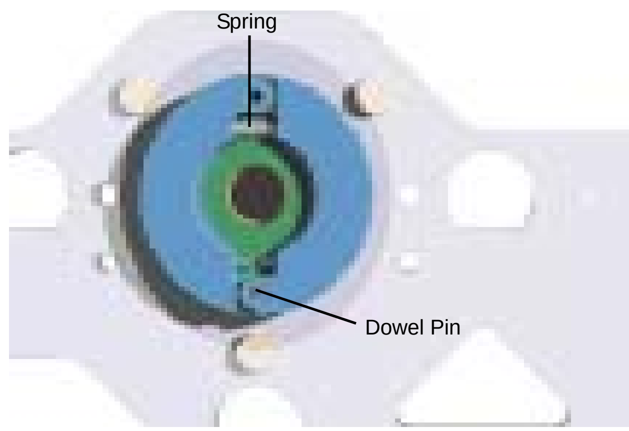


Figure 3-52

Place the skeleton collar over the braking system, and mount with the hardware as shown. The screw is a thread rolling screw, and is used to prevent striping out the 1/8 thick skeleton plates. Tighten to a torque spec. of 40-50 in-lb. (Figure 3-53

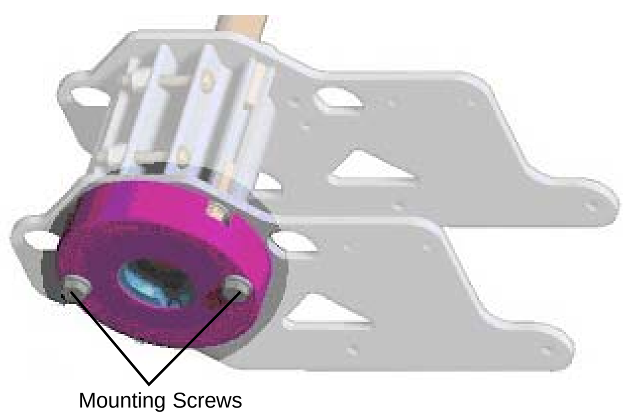


Figure 3-53

SECONDARY COUNTERWEIGHT INSTALLATION

Apply a thin coat of high pressure high lubricant such as “Moly-coat” lubricant to the fine counter weight screw prior to installation. Insert the fine counter weight screw into the counter weight bracket as well as the fine counter weight at the same time as shown. Be sure of the orientation of the counter weight bracket in the relationship to the screw weight as shown. (Figure 3-54)
Install the ESNA nut to the end of the screw as shown and tighten until the esna nut touches the bracket.

NOTE: DO NOT OVER TIGHTEN - THE COUNTER WEIGHT MUST BE ALLOWED TO MOVE BACK AND FORTH SMOOTHLY.

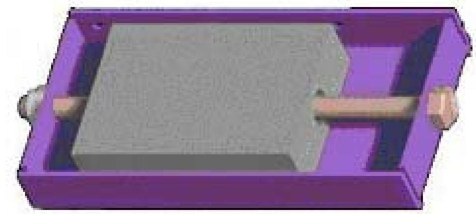


Figure 3-54

Install the counter weight assembly between the skeleton plates as shown, (Figure 3-55) and attach with four screws, tighten to a torque spec. of 15-20 in-lb. DO NOT over tighten these screws.

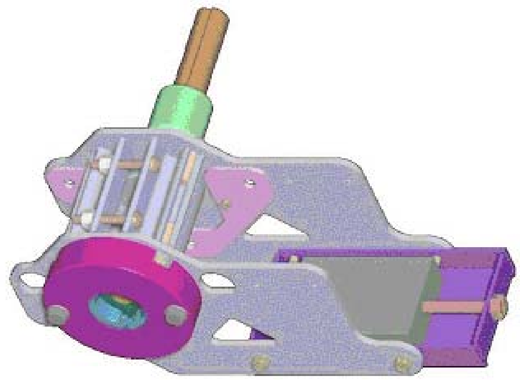


Figure 3-55

TILT SENSOR ASSEMBLY / INSTALLATION

Insert the tilt sensor PCB into the tilt bracket making sure that the spacers are between the PCB Assembly and the bracket. Secure the tilt sensor PCB to the bracket with screws and washers as shown in (Figure 3-56)

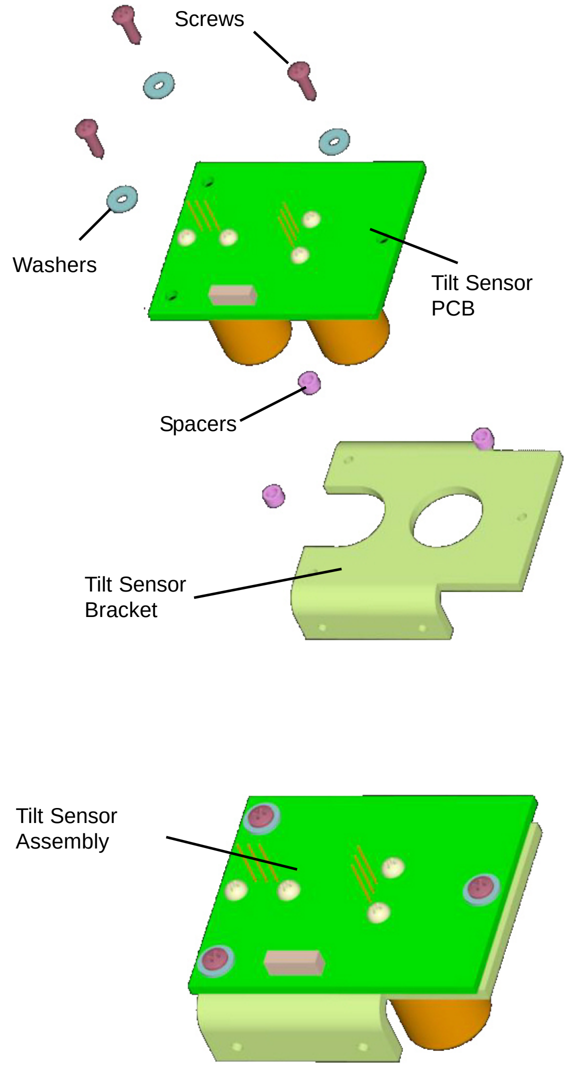


Figure 3-56

Attach the tilt sensor assembly into the skeleton assembly and secure with screws and lock washers. Torque the screws to 5-10 in-lbs. (Figure 3-57) Connect the cable from the tilt sensor (not shown) to the J9 tilt connector on the toe PCB.

Complete customer calibration.

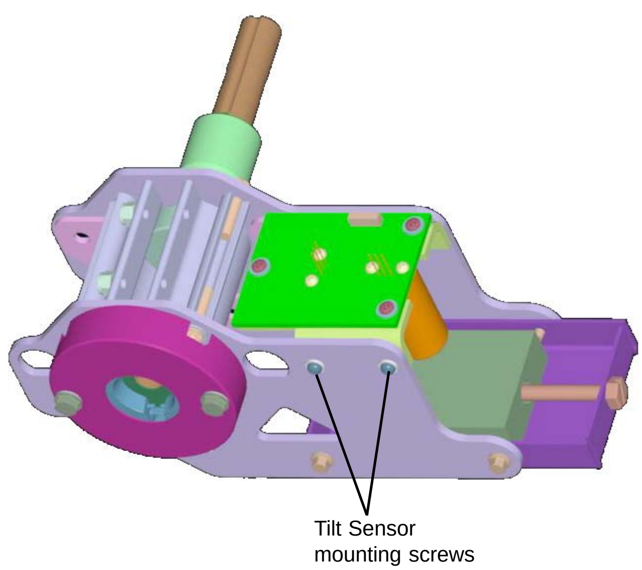


Figure 3-57

SKELETON ASSEMBLY INSTALLATION

NOTE: The head cover comes equipped with brass ultra-sonic welded inserts that have an internal nylon elastic lock washer built into the insert. NO other lock washers are needed unless noted.

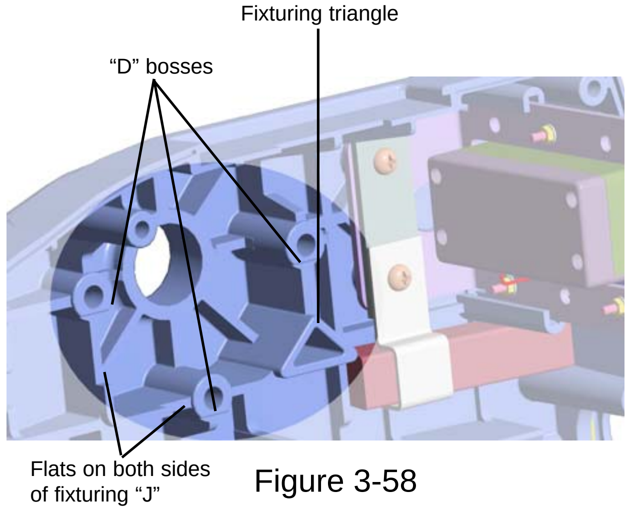


Figure 3-58

Install the skeleton assembly into the head cover make sure that the skeleton fits over and onto the three "D" shaped mounting bosses. Make sure that the triangle cutout in the skeleton assembly plates fit over the "fixturing triangle" in the head cover, and that the edges of the same skeleton plates locate up to the edges of the "J" shaped protrusion as shown in (Figure 3-58). The skeleton assembly MUST reside flat, and not be raised up at any point. (Figure 3-58)

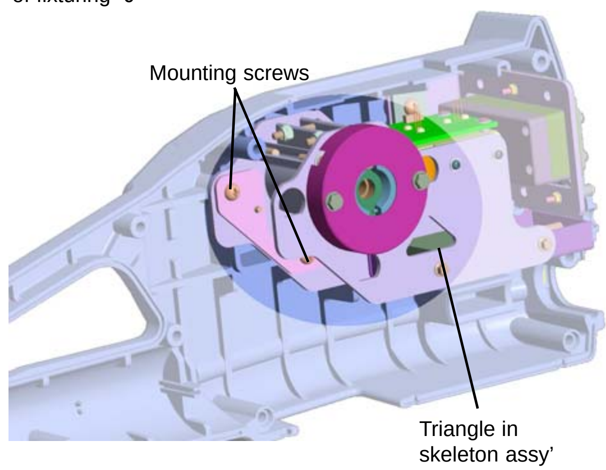


Figure 3-59

Secure the skeleton assembly to the head cover with three screws as shown. Tighten the screws to torque spec. 10 – 15 in-lbs. (Figure 3-59)

TOE BOARD INSTALLATION

	LF/RR	RF/LR
JP2	open	close
JP3	close	open

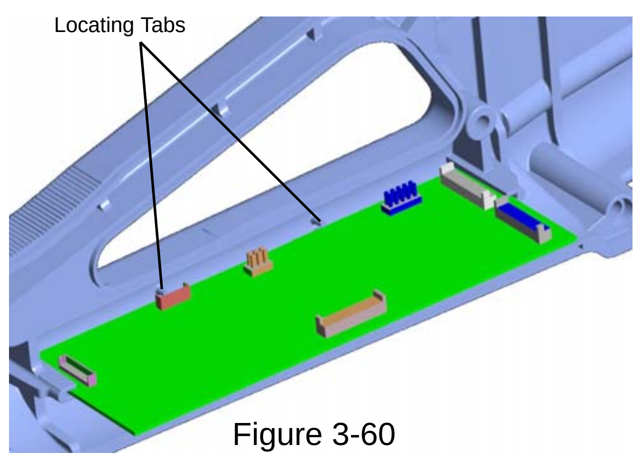


Figure 3-60

Slide toe board into the slide protrusions of the head cover as shown – NOTE the orientation of toe PCB as shown. Make sure that the edge of the PCB is between the four locating tabs in the head cover as shown. (Figure 3-60)

Connect the cable from the tilt sensor to the J9 connector on the toe PCB. Route this cable down and under the bearing extrusion of the skeleton assembly to the toe PCB. Connect the flat cable from the CCD Track Toe to the J7 connector on the toe PCB. Route this cable down and under the tilt sensor assembly through the skeleton assembly to the toe PCB. Connect the flat cable from the CCD Cross Toe to the J8 connector on the toe PCB. Route this cable down the boom tube part of the head cover to the toe PCB. Route the keyboard cable to J6 connector on the toe PCB.

Check for Sensor Updates & Complete customer calibration.

MODULE INSTALLATION

Install the cable assembly into the module as shown. (Figure 3-61)

NOTE: MAKE SURE THAT THE SMALL TRIANGLE RECEPTACLE IS ORIENTED AS SHOWN.

Install the screws through receptacle and the module. Tighten the screws to a torque spec. of 5 – 10 in-lbs.

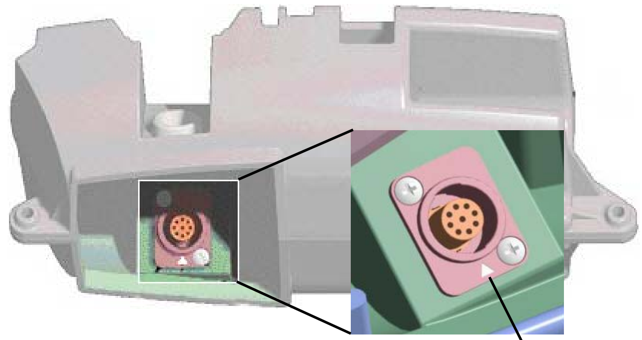


Figure 3-61

Install the hole plug as shown. Peel off overlay of the label cover and place “side down” over the rectangular opening formed when the modules are joined together. (Figure 3-62)

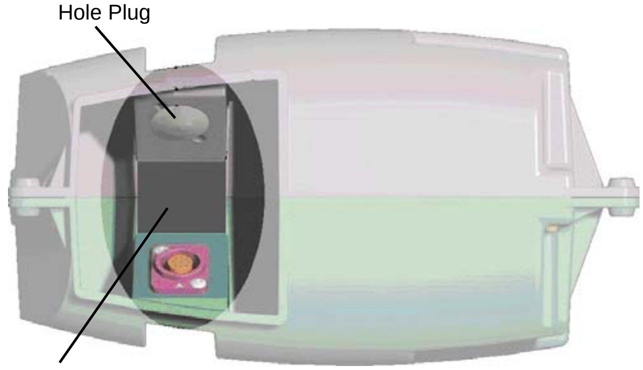


Figure 3-62

Install the module assembly into the head cover by aligning the groove in the module assembly with the locating protrusion in the head cover (Figure 3-63).

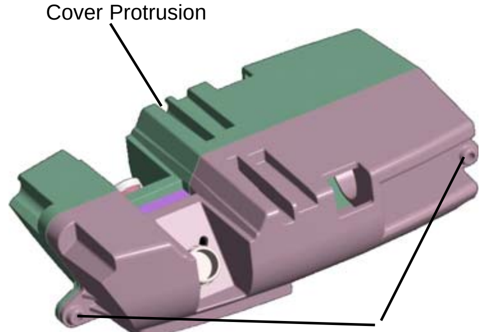


Figure 3-63

Slide the module assembly down into the head cover until the tapered mtg. protrusions of the module are located in the tapered recess bosses of the head covers. Make sure that you have the correct RF/ Module assembly for the correct left or right head assembly. The connector should always be pointing inwards towards the center of the sensor as shown. (Figure 3-64)

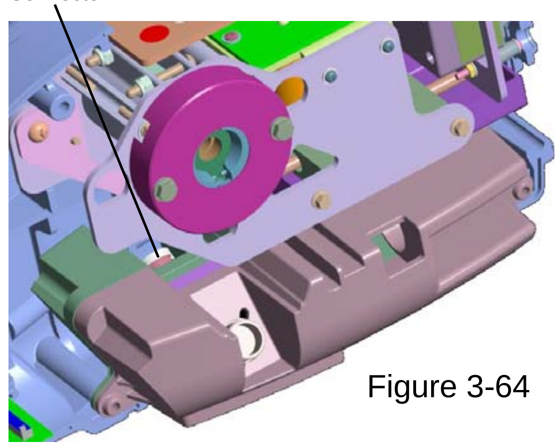


Figure 3-64

REAR COVER INSTALLATION

Secure a fixed counter weight to the rear cover with the provided screws and the esna nut . Tighten the screws to torque spec. of 10 – 15 in-lbs.. Place three 1” seal strips onto the rear cover approximately as shown. Slide the rear cover into the groove in the cover as shown. (Figure 65)

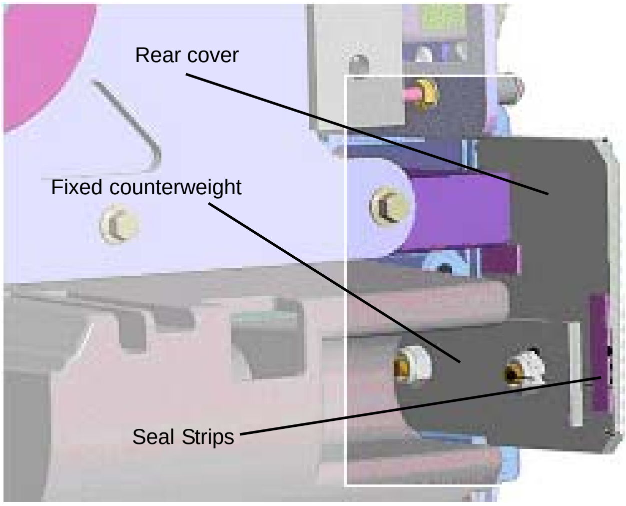


Figure 3-65

Place three hex nuts - item (29) into the small pockets in the lower lip of the head cover as shown. Be sure that the flat of the hex nut is flush to the inside of the pocket as shown. (Figure 66)

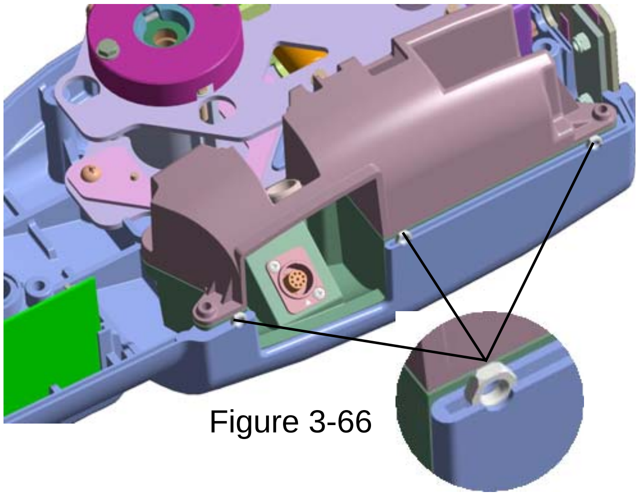


Figure 3-66

Install the fixed counter weight and the secondary counter weight into the cover as shown. Make sure that the secondary counter weight is as far back as possible. Secure by placing the retainer plate over the secondary counter weight and align it with the lower hole of the counter weight as shown.
(Figure 3-67)
Secure with another screw and tighten to a torque spec. of 10 –15 in-lbs.

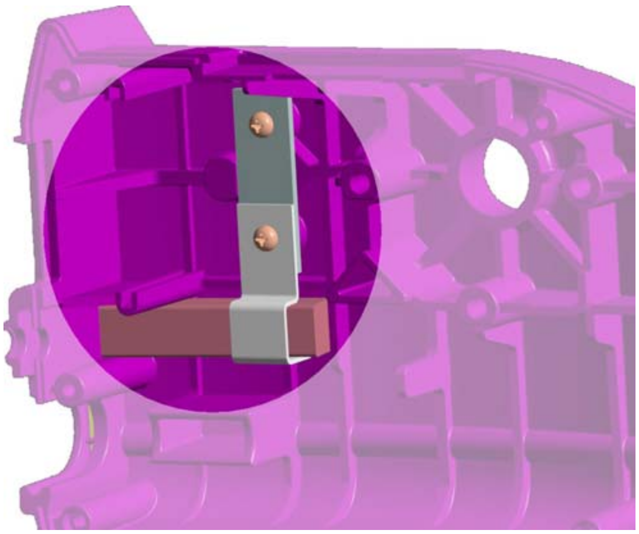


Figure 3-67

HEAD COVER ASSEMBLY

Place the opposite head cover onto the other master head cover by aligning the grooves for the rear CCD assembly, the toe PCB, and the keypad. Gently push the covers together. The head covers should slide together with the skeleton mounting protrusions mating to the cutouts in the prior mounted skeleton assembly. Ensure that no cables are pinched or misalign any groove of the head covers to the toe PCB, keypad, or CCD track assembly. If the head covers do not mount flush to one another – check to see what is causing the interference and correct. Attach the two head covers to one another with 11 screws as shown. Tighten the screws to a torque spec. of 5 – 10 in-lbs. DO NOT overtighten the mounting screws. Press the bumper cover into the rectangular opening in the head cover until the rubber prongs are secured to the head cover. Press the level vial into the pocket located on the front of the head cover as shown. Peel away the carrier paper from the brand label, and center it into the recess pocket of the wheel sensor cover. (Figure 68)

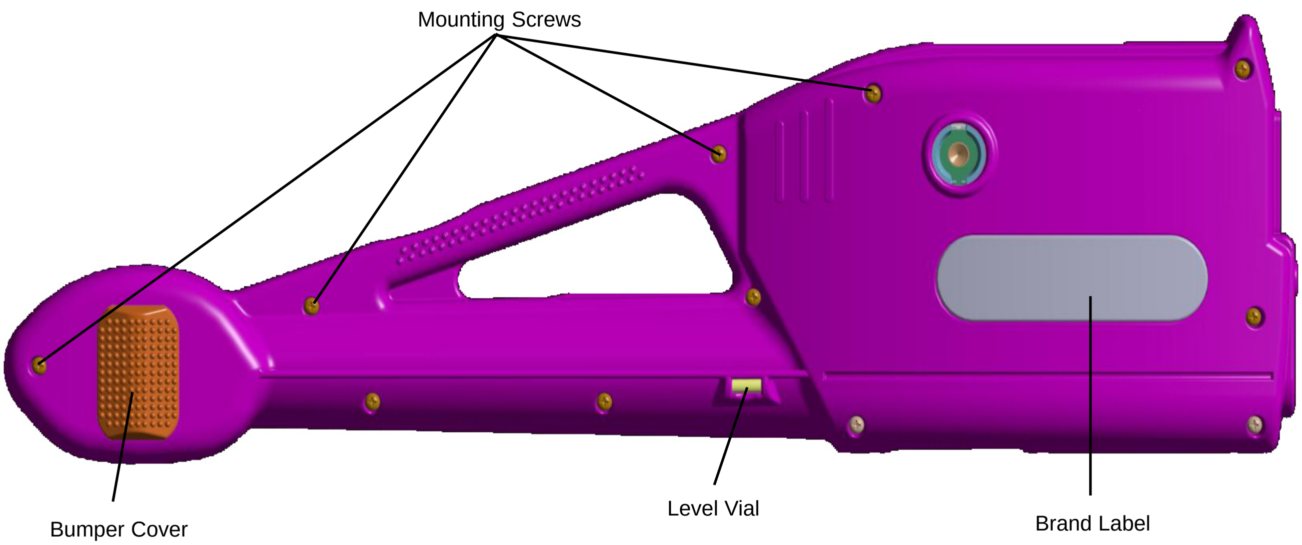


Figure 3-68

Attach the lower bumper cover to the assembled head by stretching the bumper around the bottom of the head covers until the lip in the bumper is aligned with the recess lip in the head covers. Press both sides of the bumper's lip into the recess lip of the head covers. Insert three screws into the holes of the lower bumper cover and tighten to a torque spec. of 5-10 in-lbs.. Insert the brake knob assembly into the opening of the assembled wheel sensor and tighten into the skeleton assembly. (Figure 69)

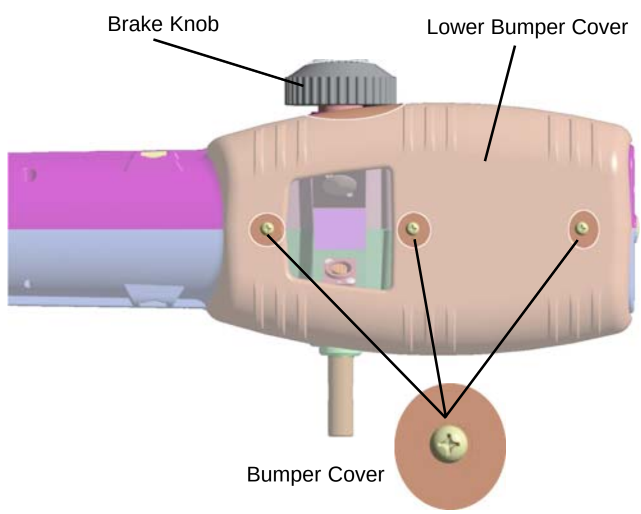


Figure 3-69

ZERO ADJUST

Place the head into a clamp (or assembly fixture), and check the level of the head. Place a level vial onto the "zero" draft level pad as shown. (Figure 3-70)

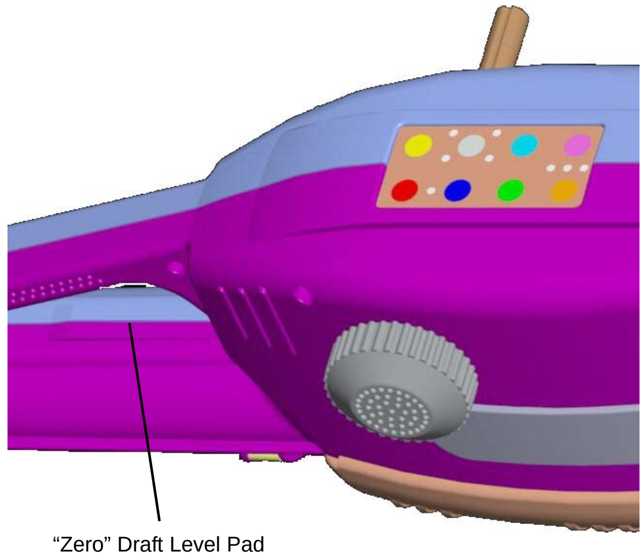


Figure 3-70

To fine adjust the level of the head – insert a flat head screw-driver into the opening in the back of the head assembly as shown. Turning the screw-driver clockwise will bring the counter weight to the rear of the head assembly, causing the head to tilt backwards. Likewise turning the screw-driver counter clockwise will cause the weight to move forward in the head causing the head to tilt forward. Adjust the head until the level vial on the "zero" degree draft pad is level. (Figure 3-71)

NOTE: THE LEVEL VIAL IN THE BOOM TUBE IS USED TO APPROXIMATE THE LEVEL OF THE HEAD WHEN IT IS RAISED UP ON A LIFT WHERE THE OPERATOR CAN NOT SEE THE LEVEL INDICATOR ON THE KEYPAD.

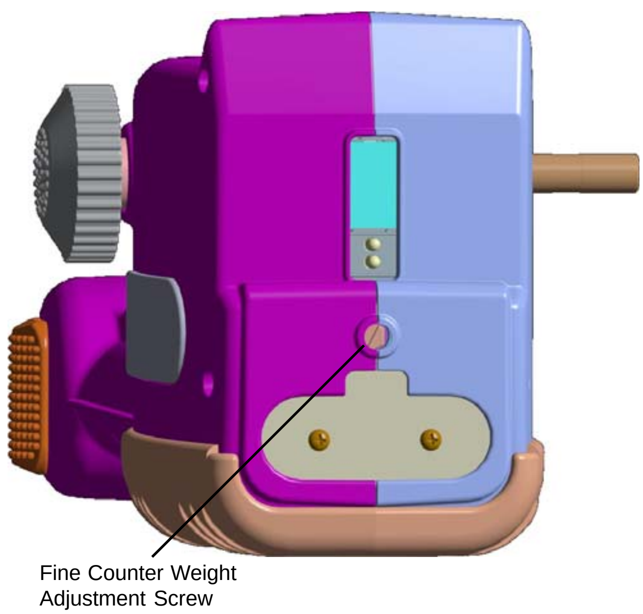
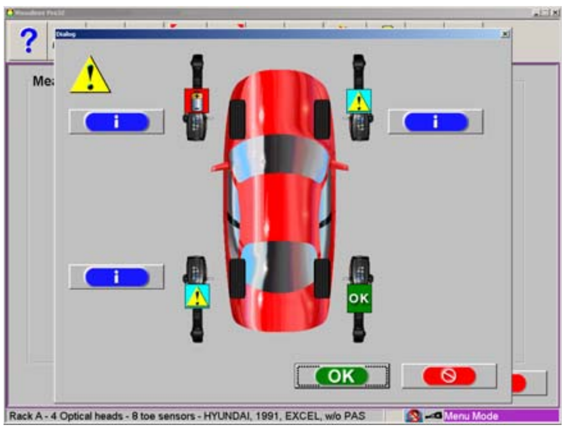


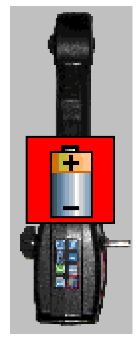
Figure 3-71

SENSOR FAILURE INDICATOR

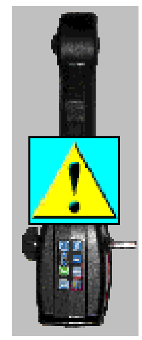
This feature is only available on software revision 3.4 or higher. Before the design of this software it was possible for a customer to perform and complete alignments with a inoperable component inside any of the wheel sensors. If the user was not aware of this it could/would cause inaccurate alignments and lead to premature tire wear. This software is designed to flag the user should a component inside a wheel sensor completly fail. A sensor diagnostic check is performed everytime the user chooses to perform a new wheel alignment from the Main Menu. The Main unit (PC) checks for proper Battery voltage providing the unit is a cordless. It also checks both the cross toe and track toe CCD assemblies, it also checks the tilt sensor for failures. Should a failure occur a dialogue box will appear with a display of each wheel sensor and it's status. An information box will appear beside each wheel sensor and the user or technician can simply click on the information icon to determine which component inside the wheel sensor is at fault. The fault component will only show up as a failure if sensor is completely dead, any marginal sensors will not cause the unit to flag an error. If the user chooses to press "OK" to bypass this "Flag" the dialogue box will not reappear until the user chooses to begin a new alignment.



OK

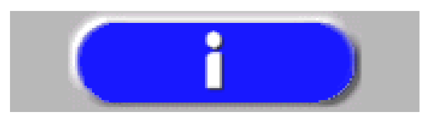


Battery failure



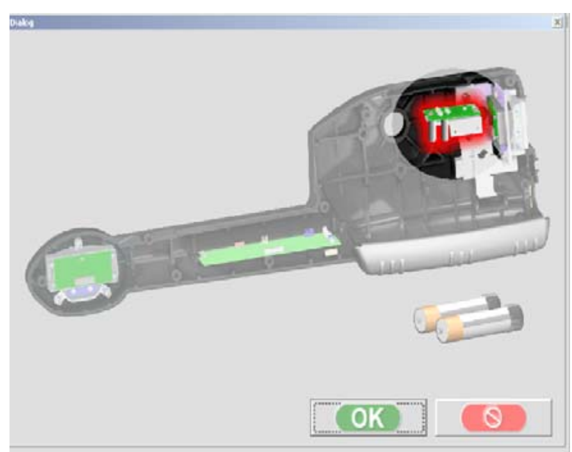
Component failure

The illustration above has flagged 3 wheel sensors with suspected problems. There are three possible senarios of display for each sensor. Each wheel sensor that flags a suspected problem will be evident with either an "Explanation Point" or a "Battery" icon. Click on the information button to see a dialogue illustration of the suspected component that has failed.

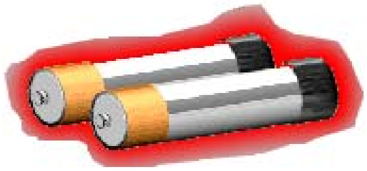


Information button

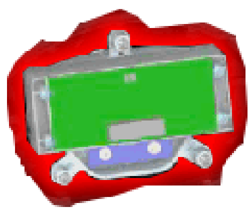
The figure to the right illustrates a failure to the tilt sensor assemby. See tilt sensor assembly and installation in this chapter for the the replacement procedures.



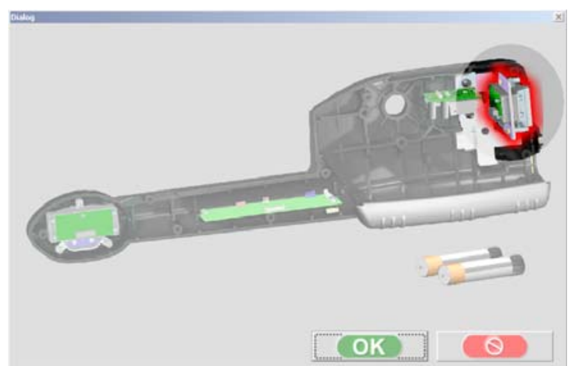
The figure to the right illustrates a failure to the batteries. See the Cordless chapter in this manual for battery replacement.



The figure to the right illustrates a failure to the cross toe CCD sensor assemby. See CCD sensor assembly and installation in this chapter for the the replacement procedures.



The figure to the right illustrates a failure to the tilt sensor assemby. See tilt sensor assembly and installation in this chapter for the the replacement procedures.



FIRMWARE UPDATES

NOTE: THIS FEATURE IS APPLICABLE TO VERSION I CCD WHEEL SENSORS!

Changes are made to the firmware to take advantage of the new features of the PRO32 Aligner software update. If a download is needed for a sensor for the new software, it will be indicated on the "Sensor Update" screen by the absence of a check mark. Firmware changes may also be made to the HIB PCB however these updates are made automatically during the software installation. Firmware updates may include power save options for cordless, time delays for wired lifts or some of the many other features offered in the CCD units. Firmware updates to the wheel sensors are not automatic and will require a small amount of maintenance. Should any of these updates to the wheel sensor require the downloads before proper operation, the user will be instructed of this during the installation of the software. If a Main Processor inside a wheel sensor is exchanged the technician should proceed to the Firmware Download page to determine if that Main Processor should be updated. Re-calibration of the unit is not required once an update takes place, if calibration is required the user will be instructed of this during the software installation. All sensor updates should be made with the unit corded. At no time should a user attempt to complete a sensor update with the cordless option.

Determining the Sensor/HIB Revision level.

1 Power up the aligner.

2 From the Main Menu click on the Maintenance tab.

3 From the Maintenance Menu click on the Measurement Data icon. Plug in all wheel sensors and verify that all wheel sensors are sending/receiving data from the HIB box.

4 Click on the "Extended Data" tab.

5 Check each of the Revision levels of the Main Processors inside the wheel sensors. Verify that each are operating at the same revision level.

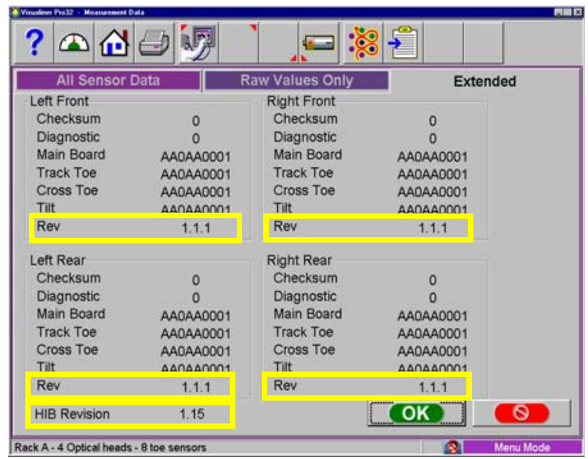


Figure 3-72

Determining if Sensors should be updated

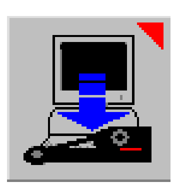
1 Power up the aligner.

2 Using the cables supplied with the unit plug all 4 wheel sensors into the HIB box.

NOTE: NEVER USE THE CORDLESS OPTION TO UPDATE FIRMWARE.

3 From the Main Menu click on the Maintenance tab.

4 From the Maintenance Menu click on the Measurement Data icon. Verify that all wheel sensors are sending/receiving data from the HIB box.



5 Click on the "Sensor Update" (F6) icon on the toolbar.

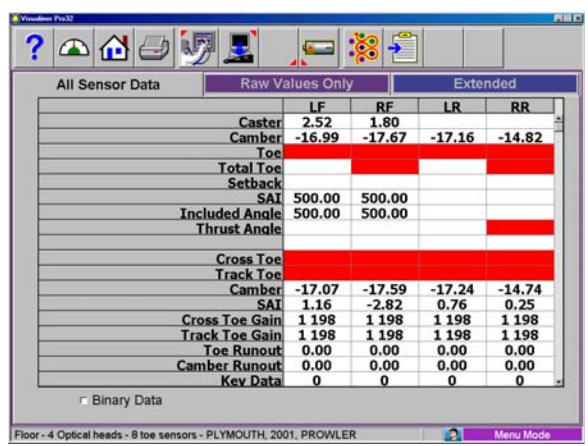


Figure 3-73

6. If the Sensors are updated with the latest Firmware each wheel sensor button will have a “Check Mark”.

7. If a newer revision of Firmware is available for any of the wheel sensors, the wheel sensor button will have an active icon.

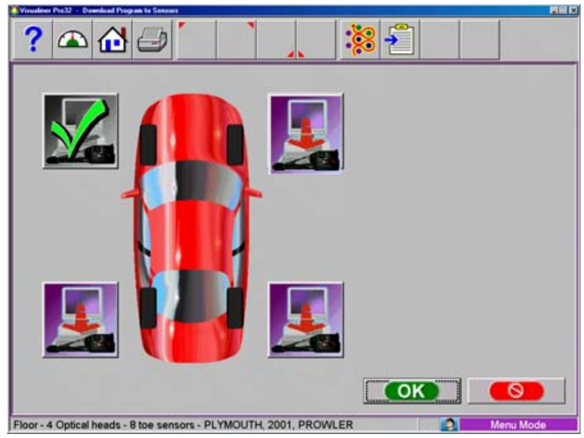


Figure 3-74

NOTE: IT IS VERY IMPORTANT THAT ONCE THE FIRMWARE DOWNLOAD IS TAKING PLACE, THAT THE WHEEL SENSOR IS NOT UN-PLUGGED UNTIL THE DOWNLOAD FINISHES. A CHECK MARK ON THE WHEEL SENSOR BUTTON WILL INDICATE THAT THE PROCESS HAS BEEN COMPLETED.

8. Continue the Firmware upgrade by clicking on each active sensor button one at a time until each wheel sensor’s button is highlighted with a check mark.

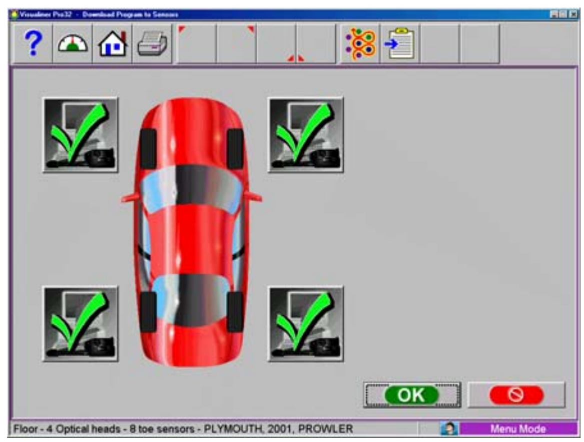


Figure 3-75

9. After completing all updates the user must completely exit the “Measurement Data” menu and return to the extended data page to check that all Main Processors inside each wheel sensor are at the same revision level. Failure to completely exit will not report firmware changes.

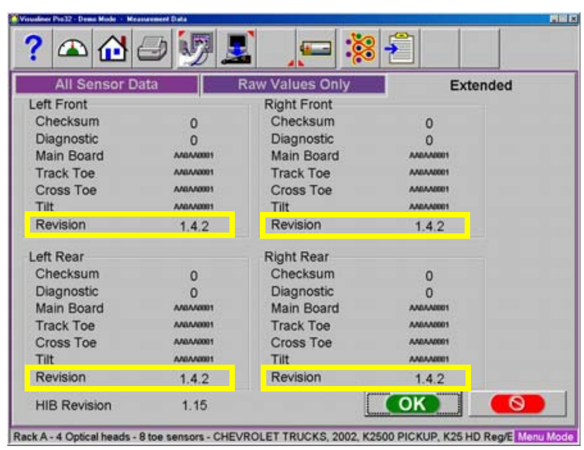


Figure 3-76

NOTE: IT IS NOT NECESSARY TO RESTART THE ALIGNMENT SOFTWARE AFTER THE FIRMWARE UPDATE.

NOTE: AFTER REPLACING A MAIN PROCESSOR INSIDE ANY WHEEL SENSOR, THE TECHNICIAN SHOULD CHECK FOR AVAILABLE UPDATES.

TROUBLESHOOTING GUIDE

Symptom Communication LOSS ALL HEADS (CORDED / CORDLESS) Cordless heads require additional testing.

Question	Possible Causes	Suggested Test or Repair
Is the HIB LED on? NO	HIB power cord not plugged in.	Make sure power cord is plugged in at the HIB box and power strip.
	HIB box power switch bad or not turned on.	Turn on switch or replace defective switch.
	HIB box external fuses bad.	Replace fuse if fuses have more than 1 Ohm of resistance. Replace broken or defective fuse holder.
	Bad or no incoming power.	Test A/C power into and out of power strip, check polarity and ground of the power cord and source.
	Bad power supply fuse.	Replace fuse if fuses have more than 1 Ohm of resistance. Replace power supply board if fuse holder is broken.
	Bad power supply	Test power supply for 9/10 Vdc +/- 5%, Replace if there is no or low voltage.
Is HIB box LED on? YES	USB cable disconnected.	Reconnect USB cable at PC and HIB box.
	Poor connection of USB cable.	Try another port or USB cable.
	Bad power Supply.	Test power supply for 9/10 Vdc +/- 5% Replace if there is no or low voltage.
	Loose or broken cables in HIB box.	Check and replace if needed.
	Missing USB drivers.	Reinstall USB HIB drivers.
	Bad HIB board.	Replace HIB board.

Symptom Intermittent communication loss or communication loss with one or more sensor. (Corded)

Question	Possible Causes	Suggested Test or Repair
Will the unit work with any/some heads and/or dropping communication? **YES**	Head to console or rack cable, broken or loose connections.	Ohm cable(s), Replace with known good cable(s).
	Broken connector at head, or pins pushed in.	Visually check connector, pin(s), pull each wire to see if it pulls out of connector.
	Poor or broken connections internal to the head.	Wiggle internal cables. See TSB# WA-1017 for testing procedures.
	Outdated software.	Check software revision, should be at least 3.2.0., Check APP.HEX file should be dated 6/19/02 or later.
	Rack wiring bad.	Try a known good port, check for broken cable(s), swap pin locations (ports) on

Symptom Intermittent communication loss or communication loss with one or more sensor. (cordless)

Question	Possible Causes	Suggested Test or Repair
Will the unit work with any/some heads and/or dropping communication? **YES**	Outdated software	interface PCBs. Check software revision, should be at least 3.2.0., Check APP.HEX file should be dated 6/19/02 or later.
	Poor or broken connections internal to head.	Wiggle internal cables. See TSB# WA-1017 for testing procedures.
	Poor or loose connections internal module.	Without splitting module, check ribbon cables seen through access holes.
	Are head switches on?	Turn on switches, possible defective switches.
	Poor battery connections.	Rotate head +/- 45 degrees in camber and SAI planes and watch for heads to reset.
	Bad or weak head module(s)	Check sensor signal strength, should be above 140
	Poor location of radio pod.	Move radio pod until signal is maximized, should be above 140
	Radio pod interface board.	Check for updated interface board TSB# WA-1020 for reference. Replace board and all head modules if not updated.

Continued Intermittent communication loss or communication loss with one or more sensor. (cordless)

Question	Possible Causes	Suggested Test or Repair
Will unit work with cables but not in cordless mode? **YES**	Are head switches on?	Turn on switches possible defective switches.
	Poor battery connections	Rotate head +/- 45 degrees in camber and SAI planes and watch for heads to reset.
	Bad batteries.	Test battery voltages should be more than 3.8 Vdc. A fully charged battery should be 4.25 Vdc. Replace with known fully charged battery. *(See battery charger section for battery charger problems)*
	Poor location of radio pod	Move radio pod till signal is maximized, console signal should be no less than 140.
	Radio interface board.	Check for updated interface board TSB# - 1020 for reference. Replace board and all heads modules with update.
	Bad console radio pod.	Console signal should not be less than 140. Replace console radio pod.
	Poor connections internally. (heads)	Check internal cables for poor or broken connection. See TSB# WA-1017 for testing procedures.
	Voice control module interference.	Disconnect power from voice module and remove battery from remote. Move voice module away from radio pod.
	Dip switch setting.	Try changing dip switches. (Dip switches must match in all sensors)

Symptom Batteries not charging or low voltage after removing batteries from the charger.

Question	Possible Causes	Suggested Test or Repair
Are battery voltages at least 4.25Vdc or higher? **NO**	Power switch off or bad switch.	Turn on switch or replace switch.
	No A/C power to charger.	Test incoming voltages, Ohm external fuses.
	Bad fuses on power supply board or no 9Vdc from power supply.	Replace fuses if they have more than 1 Ohm of resistance, replace power supply if less than 9/10Vdc +/- 5% output.
	Fuses bad on battery charger board.	Replace fuses if they have more than 1 Ohm of resistance.
	Bad battery charger board.	If all the tests above are good, test charger board, should be above 6Vdc and floating without a load.
Are LED's lights on flashing?	Battery charger.	Has the charger been updated with mylar strips? Install strips, Replace charger board, Replace charger.
YES	No A/C power to charger.	Test incoming voltage, Ohm external fuses.
Is charger LED's Lighting up?	Bad fuses on power supply board or no 9Vdc from power supply.	Replace fuses if they have more than 1 Ohm resistance, replace power supply if less than 9Vdc +/- 5% output.
	Fuses bad on battery charger board.	Replace fuses if they have more than 1 Ohm of resistance.
	Bad battery charger board.	If all the tests above are good, test charger board, should be above 6Vdc and floating without a load.
	Bad or weak batteries.	Replace batteries.
	Bad LED board.	Replace LED board.
	HIB power cord not plugged in.	Make sure power cord is plugged in at

Symptom PRO 32 always loads into the DEMO mode

Question	Possible Causes	Suggested Test or Repair
NO Is the HIB LED light on? **NO**	HIB box power switch not turned on.	the HIB box and power strip. Turn on switch or replace defective switch.
	HIB external fuses bad.	Replace fuses if they have more than 1 Ohm of resistance. Replace broken or defective fuse holder.
	Bad or no incoming power.	Test A/C power into and out of power strip, check polarity and ground of power cord and source.
	Bad power supply fuse.	Replace fuses if they have more than 1 Ohm of resistance. Replace broken of defective fuse.
	Bad power supply.	Test power supply for 9/10Vdc +/-5% Replace if there is no voltage or voltage is low.
	Bad HIB board.	Replace HIB.
	USB cable disconnected.	Reconnect USB cable at PC and HIB box.
Is the HIB LED light on? **YES**	Poor connection of USB cable.	Try another port or USB cable.
	Bad power supply.	Test power supply for 9/10Vdc +/-5%, Replace if there is no voltage or voltage is low.
	Missing USB HIB drivers.	Reinstall USB HIB drivers
	Bad HIB board.	Replace HIB board
	Blocked toe path, Bad CCD camera,	

Symptom Unit failed calibration with error messages

Error Message	Possible Causes	Suggested Test or Repair
Toe beam blocked or head disconnected.	Bad or broken cables, Poor communication	Check to make sure toe path(s) are not blocked. Check Raw sensor data for toe readings and/or bad CCD cameras. Check broken or poor internal connections see TSB# WA-1017. Check head cable(s) connections (swap cables) Update APP.HEX file (Cordless)
Runout cross check failed.	Bent stub shafts, Bent Calibration bar, Loose skeleton, Unstable tilt sensor,	Check stub shafts, Check calibration bar, Check skeleton assembly for looseness. Check 4 degree camber change on bar make sure that camber ranges. Check camber on calibration for unstable readings. Rotate calibration bar watch for excessive change. Replace tilt sensor.
Level the sensor	Sensor not level, Bad or broken vial, bad tilt sensor	Check level for Accuracy with small level. Check SAI tilt sensor for change and range. Check SAI sensor for stability
Calibration camera memory read failed.	Bad communication, poor cable(s) connections, cordless communications drop, Bad toe board	Redo calibration. Try different cables. Bad toe board. (Cordless units) Use cords for calibration
**Some calibration factors are out of specifications!	Bad or unstable CCD camera and or tilt sensors.	Reject, and redo calibration to confirm error, replace affected Component(s)
**Some calibration factors changed an excessive amount!	Bad or unstable CCD camera and or tilt sensors.	Reject, and redo calibration to confirm error, replace affected Component(s)
Call a customer service representative to determine the cause of the problem	See the above with **	