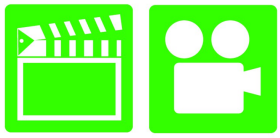
Automotive Maintenance and Light Repair, 1ST Edition

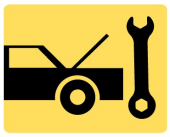
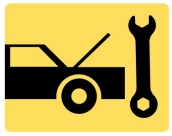
Chapter 52 WHEEL ALIGNMENT

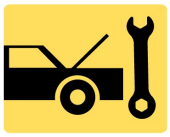
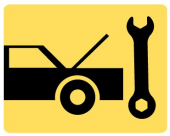
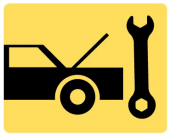
Opening Your Class

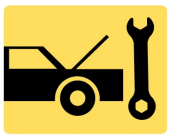
KEY ELEMENT	EXAMPLES
Introduce Content	This course or class covers **Automotive Maintenance and Light Repair.** It correlates material to task lists specified by ASE and NATEF.
Motivate Learners	Explain how the knowledge of how something works translates into the ability to use that knowledge to figure why the engine does not work correctly and how this saves diagnosis time, which translates into more money.
State the learning objectives for the chapter or course you are about to cover and explain this is what they should be able to do as a result of attending this session or class.	Explain the chapter learning objectives to the students. ⁀ Prepare for ASE Suspension and Steering (A4) certification test content area "D" (Wheel Alignment Diagnosis, Adjustment, & Repair). ⁀ List the many checks that should be performed before aligning a vehicle. ⁀ Describe the proper alignment setup procedure. ⁀ Explain how to correct for memory steer, torque steer, pull, drift (lead), and wander. ⁀ Describe the use of unit conversion and diagnostic charts. ⁀ Discuss tolerance alignment and how to check for accident damage.
Establish the Mood or Climate	Provide a *WELCOME,* Avoid put downs and bad jokes.
Complete Essentials	Restrooms, breaks, registration, tests, etc.
Clarify and Establish Knowledge Base	Do a round robin of the class by going around the room and having each student give their backgrounds, years of experience, family, hobbies, career goals, or anything they want to share.

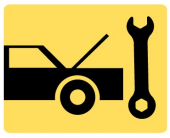
ICONS	Ch52 WHEEL ALIGNMENT
	1. SLIDE 1 CH52 WHEEL ALIGNMENT 2. SLIDES 2-3 EXPLAIN OBJECTIVES
	Check for ADDITIONAL VIDEOS & ANIMATIONS @ http://www.jameshalderman.com/ WEB SITE REGULARLY UPDATED
	**Alignment (31 Links)**
	SHOW ANIMATIONS: CAMBER WWW.MYAUTOMOTIVELAB.COM HTTP://MEDIA.PEARSONCMG.COM/PH/CHET/CHET_MYAUTOMOTIVELAB_2/ANIMATIONS/A4_ANIMATION/CHAPTER33_FIG_33_04/INDEX.HTM WHEEL ALIGNMENT, CAMBER
	"V" FOR VICTORY IS POSITIVE THING. THIS HELP YOU REMEMBER TIRES OUT AT TOP MAKE A "V," & THAT'S POSITIVE CAMBER.
	ANIMATION: CASTER WHEEL ALIGNMENT, CASTER
	PERSON WITH A NEGATIVE ATTITUDE DRAGS THEIR FEET. THIS HELPS REMEMBER THAT WHEN LOWER BALL JOINT (FEET) IS BEHIND UPPER BALL JOINT (HEAD), CASTER IS NEGATIVE
	SHOW ANIMATION: TOE WHEEL ALIGNMENT, TOE
	DEMONSTRATION: SHOW TIRES WITH WEAR CAUSED BY EXCESSIVE TOE-OUT. SHOW EXAMPLES OF TIRES WITH FEATHER-EDGE WEAR AND DIAGONAL WEAR. SHOW HOW TO ADJUST THE TOE ON FRONT OF A VEHICLE BY TURNING TIRE ROD SLEEVE
	DEMONSTRATION: SHOW HOW TO DETERMINE FEATHERED OR SAWTOOTH TREAD WEAR BY RUBBING HAND ACROSS TREAD OF TIRE

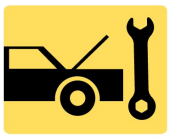
ICONS	Ch52 WHEEL ALIGNMENT
	A VEHICLE WITH EXCESSIVE TOE WILL "DART" TO THE SIDE THAT HAS TRACTION WHEN ONE FRONT TIRE LOSES TRACTION ON ICE.
	**WHEEL ALIGNMENT, STEERING AXIS INCLINATION & INCLUDED ANGLE**
	IF INCLUDED ANGLE IS HIGH ON ONE SIDE & LOW ON OTHER SIDE, SHIFTED CRADLE COULD BE PROBLEM
	**Wheel Alignment, Turning Radius**
	**Wheel Alignment, Setback**
	**Wheel Alignment, Thrust Angle**
	**Wheel Alignment, Track**
	4. SLIDES 4-5 EXPLAIN INTRODUCTION
	**DISCUSSION:** DISCUSS BENEFITS OF CORRECT WHEEL ALIGNMENT. WHAT PROBLEMS MAY RESULT FROM IMPROPER WHEEL ALIGNMENT?
	**DISCUSSION:** DISCUSS FOUR BASIC STEPS FOR CORRECTING ANY AUTOMOTIVE PROBLEM. HOW DO THEY RELATE TO WHEEL ALIGNMENT PROBLEMS? REMIND THE STUDENTS THAT A CAREFUL INSPECTION OF THE STEERING, SUSPENSION, AND TIRES SHOULD TAKE PLACE PRIOR TO ALIGNING A VEHICLE.

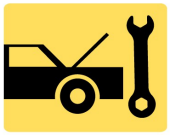
ICONS	Ch52 WHEEL ALIGNMENT
	6. **SLIDE 6 EXPLAIN Prealignment Correction Techniques** 7. **SLIDE 7 EXPLAIN FIGURE 52-1** owner of this Honda thought that all it needed was an alignment. Obviously, something more serious than an alignment caused this left rear wheel to angle inward at the top. 8. **SLIDE 8 EXPLAIN FIGURE 52–2** Magnetic bubble-type camber/caster gauge. To help it keep its strong magnetism, it is best to keep it stored stuck to a metal plate or metal tool box
	**DEMONSTRATION: SHOW HOW TO USE A MAGNETIC BUBBLE-TYPE CAMBER/ CASTER GAUGE FOR SETTING ALIGNMENT: FIGURE 52-2**
	**PART OF PREALIGNMENT CHECK ON TRUCK SHOULD INCLUDE FINDING OUT IF IT CARRIES LOAD. CHANGING RIDE HEIGHT WILL CHANGE ALIGNMENT.**
	**HANDS-ON TASK: HAVE STUDENTS PERFORM ALL NECESSARY PREALIGNMENT CHECKS ON A VEHICLE FIGURES 52-4 & 5**
 	**NATEF MLR TASK A4C1: PERFORM PREALIGNMENT INSPECTION AND MEASURE VEHICLE RIDE HEIGHT; PERFORM NECESSARY ACTION.**
	9. **SLIDES 9-11 EXPLAIN** PRE-ALIGNMENT CHECKS 12. **SLIDE 12 EXPLAIN FIGURE 52–3** Typical tire wear chart as found in a service manual. Abnormal tire wear usually indicates a fault in a steering or suspension component that should be corrected or replaced before an alignment is performed. 13. **SLIDE 13 EXPLAIN FIGURE 52–4** Measuring points for ride (trim) height vary by manufacturer. 14. **SLIDE 14 EXPLAIN FIGURE 52–5** Measuring to be sure the left and right sides of the vehicle are of equal height. If this measurement is not equal side-to-side by as little as 1/8 in. (3 mm), it can affect handling of vehicle

ICONS	Ch52 WHEEL ALIGNMENT
	15. **SLIDE 15 EXPLAIN Figure 52-6** bulge in this tire was not noticed until it was removed from the vehicle as part of a routine brake inspection. After replacing this tire, the vehicle stopped pulling and vibrating
	**DEMONSTRATION: SHOW THE STUDENTS TIRES WITH SHIFTED BELTS THAT COULD CAUSE A PULL**
	**HANDS-ON TASK: HAVE STUDENTS PERFORM STEPS TO DIAGNOSE A LEAD OR PULL CONDITION. SELECT A STUDENT TO REPORT THE RESULTS OF THE TEST TO THE CLASS.**
	16. **SLIDES 16-18 EXPLAIN Memory Steer Diagnosis** 19. **SLIDES 19-20 EXPLAIN Memory Steer Correction**
	**DISCUSSION: ASK THE STUDENTS TO DISCUSS MEMORY STEER & ITS CAUSES**
	21. **SLIDE 21 EXPLAIN** Torque Steer Diagnosis 22. **SLIDE 22 EXPLAIN Figure 52-7** Equal outer CV joint angles produce equal steer torque (toe-in). If one side receives more engine torque, that side creates more toe-in and the result is a pull toward one side, especially during acceleration.
	23. **SLIDES 23-26 EXPLAIN Torque Steer Correction** 27. **SLIDE 27 EXPLAIN Figure 52-8** Broken or defective engine or transaxle mounts can cause the powertrain to sag, causing unequal drive axle shaft CV joint angles.
	**HANDS-ON TASK: HAVE THE STUDENTS PERFORM THE STEPS TO TEST FOR MEMORY STEER.**
	**DISCUSSION: DISCUSS PROBLEM OF TORQUE STEER. WHAT CAUSES TORQUE STEER? HOW DO MANUFACTURERS ATTEMPT TO REDUCE TORQUE STEER WHEN DESIGNING THEIR VEHICLES?** **FIGURE 52-8**
	**HANDS-ON TASK: HAVE THE STUDENTS PERFORM THE NECESSARY STEPS TO DIAGNOSE A TORQUE STEER PROBLEM & THEN SUGGEST WAYS TO CORRECT IT FIGURE 52-8**

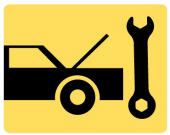
ICONS	Ch52 WHEEL ALIGNMENT
	28. SLIDES 28-30 EXPLAIN Alignment Specifications 32. SLIDE 32 EXPLAIN CHART 52-1 32. SLIDE 32 EXPLAIN FIGURE 52–9 This alignment chart indicates the preferred setting with a plus or minus tolerance
	**DEMONSTRATION: SHOW HOW TO DETERMINE MIDPOINT OF A MANUFACTURER'S ALIGNMENT SPECIFICATION, FIGURE 52-9**
	**HANDS-ON TASK: PERFORM THE ALIGNMENT SPECIFICATIONS STEPS OF THE HALDERMAN TEXT BEFORE BEGINNING WHEEL ALIGNMENT.**
	**DISCUSSION: ASK STUDENTS TO COMPARE THE TWO METHODS USED BY VEHICLE AND ALIGNMENT EQUIPMENT MANUFACTURERS TO SPECIFY ALIGNMENT ANGLES.**
	33. SLIDE 33 EXPLAIN Figure 52-10 Using the alignment rack hydraulic jacks, raise the tires off the rack so that they can be rotated as part of the compensating process & EXPLAIN Figure 52-11 This wheel sensor has a safety wire that screws to the valve stem to keep the sensor from falling onto the ground if the clamps slip on the wheel lip
	**DISCUSSION: ASK THE STUDENTS TO TALK ABOUT THE UNITS OF MEASURE USED IN ALIGNMENT SPECS & HOW TO CONVERT FROM MINUTES TO DEGREES**
	34. SLIDE 34 EXPLAIN Figure 52-12 If toe for an oversize tire is set by distance, the toe angle will be too small. Toe angle is the same regardless of tire size.
	**WHEEL ALIGNMENT, ADJUST TOE** **WHEEL ALIGNMENT, TOE**
	**DISCUSSION: ASK THE STUDENTS TO TALK ABOUT HOW TO DETERMINE TOE. WHY IS TOE ANGLE MORE ACCURATE THAN CENTER-TO-CENTER DISTANCE? FIGURE 52-12**

ICONS	Ch52 WHEEL ALIGNMENT
	35. **SLIDE 35 EXPLAIN Figure 52-13** protractor scale on the front turn plates allows the technician to test the turning radius by turning one wheel to an angle specified by the manufacturer and observing the angle of the other front wheel. Most newer alignment machines can display turning angle based on sensor readings, and therefore the protractor scale on the turn plate is not needed or used.
	**DISCUSSION: ASK THE STUDENTS TO DISCUSS THE MEANING OF TERM "CAMBER" AND HOW TO MEASURE IT. ASK THE STUDENTS TO TALK ABOUT HOW CASTER IS MEASURED & DISCUSS MEANING OF "CASTER SWEEP." FIGURE 52-13**
	**BE SURE TO CHECK FOR CLEARANCE ON FRONT OF ALIGNMENT WHEN DOING A CASTER SWEEP. SOMETIMES THE SENSORS WILL COLLIDE. CHECK THIS WHILE DOING SETUP TO SAVE TIME LATER.**
	**HANDS-ON TASK: HAVE THE STUDENTS PERFORM THE PROCEDURES TO SET UP AN ALIGNMENT**
	**DISCUSSION: DISCUSS HOW TO MEASURE TOE-OUT ON TURNS (TOOT). WHY IS THIS DIAGNOSTIC PROCEPROCEDURE RECOMMENDED? IF THE TOOT IS NOT CORRECT, WHAT ARE SYMPTOMS AND LIKELY CAUSES?**
	**DISCUSSION: DISCUSS HOW TO CHECK FRAME ALIGNMENT: FWD VEHICLES. HOW DOES FWD AFFECT SAI, INCLUDED ANGLE, & CAMBER?**
	36. **SLIDE 36 EXPLAIN FIGURE 52–14** By checking the SAI, camber, and included angle, a damaged suspension component can be determined by using this chart. 37. **SLIDE 37 EXPLAIN** Checking Frame Alignment of Front-wheel-drive Vehicles 38. **SLIDE 38 EXPLAIN Figure 52-15** In this example, both SAI and camber are far from being equal side-to-side. However, both sides have the same included angle, indicating that the frame may be out of alignment. An attempt to align this vehicle by adjusting the camber on both sides with either factory or aftermarket kits would result in a totally incorrect alignment. 39. **SLIDE 39 EXPLAIN Figure 52-16** This is the same

ICONS	Ch52 WHEEL ALIGNMENT
	vehicle as shown in **Figure 52–15** , except now the frame (cradle) has been shifted over and correctly positioned. Notice how both the SAI and camber become equal without any other adjustments necessary.
	**HANDS-ON TASK: FIGURE 52-14 TO MAKE A CARD FOR EACH ANGLE (CORRECT, < SPECS, > SPECS). PUT ALL SAI CARDS IN ONE BOX AND MAKE A SIMILAR BOX FOR CAMBER & INCLUDED ANGLE. HAVE STUDENTS DRAW A CARD FROM EACH BOX AND MATCH CARD THEY DREW TO THE DIAGNOSIS. YOU MAY WANT TO PLACE DIAGNOSIS CHOICES ON A BOARD VISIBLE TO WHOLE CLASS**
	**DISCUSSION: DISCUSS STEPS INVOLVED IN PERFORMING A FOUR-WHEEL ALIGNMENT. WHY IS FOUR-WHEEL ALIGNMENT THE MOST ACCURATE ALIGNMENT METHOD?**
	40. **SLIDE 40 EXPLAIN Figure 52-17** Geometric-centerline-type alignment sets the front toe readings based on the geometric centerline of the vehicle and does not consider the thrust line of the rear wheel toe angles 41. **SLIDE 41 EXPLAIN Figure 52-18** Thrust line alignment sets front toe parallel with the rear-wheel toe 42. **SLIDE 42 EXPLAIN Figure 52-19** Four-wheel alignment corrects for any rear-wheel toe to make the thrust line and the geometric centerline of the vehicle both the same
	**SEARCH INTERNET: SEARCH THE INTERNET TO RESEARCH WHEEL ALIGNMENT SERVICES. ASK THEM TO PREPARE TO DISCUSS THE TYPES OF WHEEL ALIGNMENT AVAILABLE, THEIR ADVANTAGES & DISADVANTAGES, AND THEIR PRICES. ASK STUDENTS TO INDICATE, BASED ON THEIR RESEARCH, WHICH SERVICE THEY WOULD RECOMMEND AND WHY.**
	**DISCUSSION: ASK STUDENTS TO DISCUSS WHY CAMBER HAS A GREATER PULL EFFECT THAN CASTER.**
	43. **SLIDE 43 EXPLAIN Figure 52-20** rear camber is adjustable on this vehicle by rotating the eccentric cam and watching the alignment machine display. 44. **SLIDE 44 EXPLAIN Figure 52-21** Some vehicles use a threaded fastener similar to a tie rod to adjust camber on

ICONS	Ch52 WHEEL ALIGNMENT
	the rear suspension. 45. **SLIDE 45 EXPLAIN Figure 52-22** Aftermarket alignment parts/kits are available to change rear camber.
	**DISCUSSION: DISCUSS PROCEDURES FOR ADJUSTING REAR TOE ON A VEHICLE. DOES THE VEHICLE ON WHICH THEY ARE WORKING REQUIRE AN AFTERMARKET KIT TO ADJUST REAR TOE? FIGURE 52-21**
	**HANDS-ON TASK: HAVE STUDENTS FIRST CHECK A VEHICLE FOR ACCIDENT DAMAGE & THEN PERFORM THE NECESSARY STEPS TO CHECK THE REAR CAMBER.**
	46. **SLIDE 46 EXPLAIN Figure 52-23** rear toe was easily set on this vehicle. Adjusting nuts were easy to get to and turn. Adjusting rear toe is not this easy on every vehicle.
	47. **SLIDE 47 EXPLAIN Figure 52-24** By moving various rear suspension members, the rear toe can be changed & **EXPLAIN Figure 52-25** The use of these plastic or metal shims requires that the rear wheel as well as the hub assembly and/or backing plate be removed. Proper torque during reassembly is critical to avoid damage to the shims.
	**Wheel Alignment, Camber Adjust, SLA** **Wheel Alignment, Camber Adjust, Strut**
	48. **SLIDE 48 EXPLAIN FIGURE 52–26** The use of these plastic or metal shims requires that the rear wheel as well as the hub assembly and/or backing plate be removed. Proper torque during reassembly is critical to avoid damage to the shims. 49. **SLIDE 49 EXPLAIN Figure 52-27** Many struts allow camber adjustment at the strut-to-knuckle fasteners. Here a special tool is being used to hold and move the strut into alignment with the fasteners loosened. Once the desired camber angle is achieved, the strut nuts are tightened and the tool is removed. 50. **SLIDE 50 EXPLAIN Figure 52-28** Some struts require modification of upper mount for camber adjustment.

ICONS	Ch52 WHEEL ALIGNMENT
	INCLUDE A CHECK POINT FOR REMOVAL OF ALL TOOLS IN YOUR ALIGNMENT ROUTINE. TOOL IN FIGURE 52–27 IS EASY TO FORGET IF AN EFFORT TO REMOVE IT HAS NOT BEEN MADE.
	51. **SLIDE 51 EXPLAIN Figure 52-29** example of the many methods that are commonly used to adjust front caster and camber
QUESTION	**DISCUSSION: REVIEW AND COMMENT ON THE CASTER AND CAMBER ADJUSTMENT METHODS ILLUSTRATED IN FIGURE 52–29**
	Wheel Alignment, Caster Adjust, SLA **Wheel Alignment, Caster**
	52. **SLIDE 52 EXPLAIN Figure 52-30** If there is a nut on both sides of the strut rod bushing, then the length of the rod can be adjusted to change caster.
	53. **SLIDE 53 EXPLAIN Figure 52-31** Placing shims between frame and the upper control arm pivot shaft is a popular method of alignment for many SLA suspensions. Both camber and caster can be easily changed by adding or removing shims.
QUESTION	**DISCUSSION: DISCUSS PROCEDURES FOR ADJUSTING CASTER & CAMBER BY USING SHIMS. WHY SHOULD THEY ADJUST CASTER & CAMBER BEFORE ADJUSTING TOE? FIGURE 52-31, 32**
	54. **SLIDE 54 EXPLAIN Figure 52-32** The general rule of thumb is that a 1/8-in. shim added or removed from both shim locations changes the camber angle about 1/2 degree. Adding or removing a 1/8-in. shim from one shim location changes the caster by about 1/4 degree
	55. **SLIDE 55 EXPLAIN Figure 52-33** Some SLA-type suspensions use slotted holes for alignment angle adjustments. When the pivot shaft bolts are loosened, the pivot shaft is free to move unless held by special clamps as shown. By turning the threaded portion of the clamps, the camber and caster can be set and checked before tightening the pivot shaft bolts.
	56. **SLIDE 56 EXPLAIN Figure 52-34** When the nut is loosened and the bolt on the eccentric cam is rotated, the upper control arm moves in and out. By adjusting both eccentric cams, both camber and caster can be adjusted.

ICONS	Ch52 WHEEL ALIGNMENT
	57. **SLIDE 57 EXPLAIN Figure 52-35** Typical shim alignment chart. As noted, 1/8-in. (0.125) shims can be substituted for 0.120-in. shims; 1/32-in. (0.0625) shims can be substituted for the 0.060-in. shims; and 1/32-in. (0.03125) shims can be substituted for 0.030-in. shims.
	**ONE OR TWO SHIMS WILL STAY IN PLACE BETTER THAN A STACK THE SAME THICKNESS. A SMALL MAGNET (TAKEN FROM A BAD WHEEL SPEED SENSOR) WILL HOLD SHIM STACK IN PLACE UNTIL THE NUT IS TIGHTENED. FIGURE 52-29, 30**
	**DEMONSTRATION: SHOW HOW TO USE THE CHART IN FIGURE 52–35.**
	**HANDS-ON TASK: HAVE THE STUDENTS QUIZ EACH OTHER ON SHIM SELECTION USING THE CHART IN FIGURE 52-35**
	58. **SLIDE 58 EXPLAIN Figure 52-36** Many procedures for setting toe specify that steering wheel be held in straight-ahead position using a steering wheel lock, as shown. One method recommended by Hunter Engineering sets toe without using steering wheel lock. 59. **SLIDE 59 EXPLAIN Figure 52-37** Adjusting toe by rotating the tie rod on a vehicle equipped with rack-and-pinion steering. 60. **SLIDE 60 EXPLAIN Figure 52-38** Toe is adjusted on a parallelogram-type steering linkage by turning adjustable tie rod sleeves. Special tie rod sleeve adjusting tools should be used that grip the slot in the sleeve and will not crush the sleeve while it is being rotated. 61. **SLIDE 61 EXPLAIN Figure 52-39** Special tie rod adjusting tools should be used to rotate the tie rod adjusting sleeves. The tool grips the slot in the sleeve and allows the service technician to rotate the sleeve without squeezing or damaging the sleeve.
	**WHEEL ALIGNMENT, ALIGN STEERING WHEEL 1** **WHEEL ALIGNMENT, ALIGN STEERING WHEEL 2**
	**VIDEO: 2 MINUTES: REMOVING STEERING WHEEL WWW.MYAUTOMOTIVELAB.COM** HTTP://MEDIA.PEARSONCMG.COM/PH/CHET/CHET_MYLABS/AKAMAI/TEMPLATE/VIDEO640X480.PHP?TITLE=REMOVING%20THE%20STEERING%20WHEEL%20&%20AIRBAG&CLIP=PANDC/CHET/2012/AUTOMOTIVE/UNDERCAR_SYSTEMS/A4T1.MOV&CAPTION=C

ICONS	Ch52 WHEEL ALIGNMENT
	HET/CHET_MYLABS/AKAMAI/2012/AUTOMOTIVE/UNDERCAR_SYSTEMS/XML/A411.XML **VIDEO: REMOVING STEERING WHEEL WITH AIR BAGS WWW.MYAUTOMOTIVELAB.COM** HTTP://MEDIA.PEARSONCMG.COM/PH/CHET/CHET_MYLABS/AKAMAI/TEMPLATE/VIDEO640X480.PHP?TITLE=R%20AND%20R%20THE%20STEERING%20WHEEL%20WITH%20AIRBAG&CLIP=PANDC/CHET/2012/AUTOMOTIVE/SUSPENSION_STEERING/RR_STEERING_WHEEL_W_AIRBAG.MOV&CAPTION=CHET/CHET_MYLABS/AKAMAI/2012/AUTOMOTIVE/SUSPENSION_STEERING/XML/RR_STEERING_WHEEL_W_AIRBAG.XML
	62. SLIDE 62 EXPLAIN Figure 52-40 Most vehicles have alignment marks made at the factory on the steering shaft and steering wheel to help the service technician keep the steering wheel in the center position.
	63. SLIDE 63 EXPLAIN Figure 52-41 puller being used to remove a steering wheel after the steering wheel retaining nut has been removed.
	64. SLIDE 64 EXPLAIN Figure 52-42 toe-in on the right wheel creates a turning force toward the right.
	65. SLIDES 65-67 EXPLAIN Tolerance Adjustment Procedure
	68. SLIDE 6 EXPLAIN Figure 52-43 (a) aftermarket camber shim added to change front camber on Honda.
	69. SLIDE 69 EXPLAIN Figure 52-44 An aftermarket kit for this Ford is installed at the top of the strut tower and allows more camber and caster adjustment than is possible with the factory adjustment
	70. SLIDE 70 EXPLAIN Figure 52-45 A typical tire temperature pyrometer. The probe used is a needle that penetrates about 1/4 inch (7 mm) into the tread of the tire for most accurate readings
	71. SLIDE 71 EXPLAIN Figure 52-46 Jig holes used at the assembly plant to locate suspension and drivetrain components. Check service information for the exact place to measure and the specified dimensions when checking for body or frame damage.
	72 SLIDES 72-89 OPTIONAL EXPLAIN ALIGNMENT
We Support NATEF	**ON-VEHICLE NATEF TASK: PREPARE VEHICLE FOR WHEEL ALIGNMENT ON THE ALIGNMENT MACHINE; PERFORM FOUR-WHEEL ALIGNMENT BY CHECKING AND ADJUSTING WHEEL_CASTER.**