

Teleliner
Operations
Manual

600 Series

INTRODUCTION

This manual is designed to be used with the Bear Total Wheel Alignment Handbook. Together they cover the theory of wheel alignment, the proper inspection and repair procedures, and step-by-step instructions for using and calibrating the Bear Telatronic Alignment System.

The Telatronic Alignment system incorporates the latest in electronic technology to make wheel alignment as simple as 1, 2, 3. The Toe-Tal Toe System gives you a centered steering wheel every time. Customer satisfaction is easier; trial and error are a thing of the past. The color coded, push button operation and the Computrack memory circuits give you quick and accurate total wheel alignment every time. That means more money in less time.

Welcome to the new breed of professional wheel alignment specialists who are using the very finest in quality equipment.

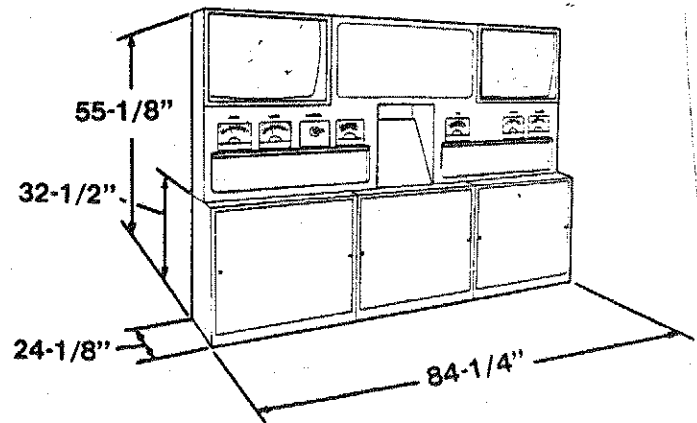
TABLE OF CONTENTS

Introduction	1	Calibration	19
Table of Contents	2	Calibration Fixture Set-up	20
Specifications	3	Toe Calibration Check Procedure	20
Identification (Component Features)	5	Calibration-Caster/Camber Right Unit	22
Meter Unit	5	Calibration-Caster/Camber Left Unit	23
Wheel Unit	6	Toe Calibration	24
Wheel Clamp	7	Final Toe Calibration Check	26
Tracking Mirror	7	Tracking	27
Theory of Operation	7	Checking Calibration Fixture	29
Operation	9	Maintenance	30
Inspection	9	Toe Head Bulb Replacement	30
Wheel Clamps	9	Meter Bulb Replacement	31
Eliminating Wheel Runout	10	Cleaning and Lubrication	32
Camber-Caster	11	Product Service	33
Set-up	11	Warranty	33
Left Side Camber-Caster	12		
Right Side Camber-Caster	12		
Steering Axis Inclination (SAI)	13		
Turning Radius	13		
Toe and Track	13		
Set-up	14		
Toe Procedure (Left)	15		
Toe Procedure (Right)	16		
Rear Wheel Alignment	17		
Rear Clamps	17		
Camber	18		
Toe	18		
Total Rear Toe	19		

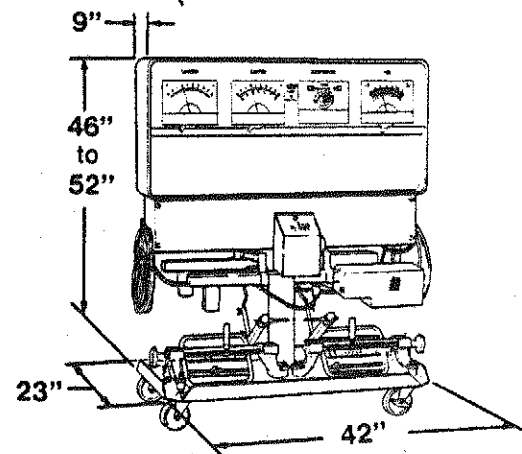
SPECIFICATIONS

METER UNIT

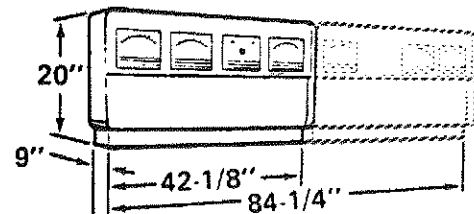
(Service Center)



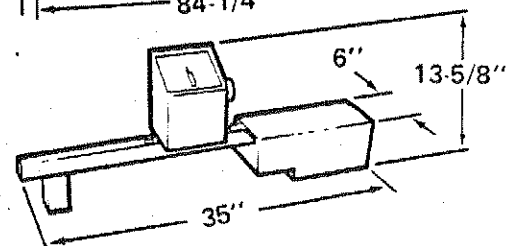
(Mobile Cart)



(Track or Wall)



WHEEL UNIT



SPECIFICATIONS (Continued)

ELECTRICAL

115 VAC 60 Hz. Single Phase	
15 Ampere Service	
Voltage to Wheel unit	12.5 V.A.C.
Right/Left Indicator Bulb	No. 120PSB, type 32072-0
Meter Bulb	75 Watt Max. Clear Incandescent
Wheel Unit Bulb	12V 60/55 Watt Quartz Halogen (Phillips 12342PH4 or equiv.)
Fluorescent Display Bulb	36 inch Cool White
Wheel Unit to Meter Unit Cable	30 Feet
AC Electrical Cord	12 Feet
Fuses:	
Toe lamps	10 Amp. Slo-blow
Input Line	5 Amp. (Dual Console) 3 Amp. (Single Console)

ALIGNMENT CAPABILITIES

Camber Range (Red pointer)	-3° to +6°
Caster Range (Blue pointer)	-6° to +12° (-3° to +6°)
Toe Range (Yellow pointer)	5/16" out to 5/8" in 8mm out to 14mm in 30' (1/2°) out to 60' (1°) in
Rim Diameter	10 inch to 17 inch
Steering Axis Inclination	-18° to +18°

IDENTIFICATION (COMPONENT FEATURES)

METER UNIT

The meter unit contains the display meters and the electronic circuit boards for the alignment system. The meters are illuminated when their function is selected and each meter has two color coded Limit Reminders to set vehicle specification limits into the meter. ①

Camber Meter

The camber meter displays the camber of the particular wheel selected. The camber meter Limit Reminders are color coded Red to correspond with red camber button on the wheel unit. ②

Caster Meter

The caster meter displays the caster of the particular wheel selected. The caster meter is zeroed by the caster zero knob on each of the wheel units. Caster Limit Reminders are color coded Blue to correspond with the blue caster button on the wheel unit. ②

Toe Meter

The toe meter is used in conjunction with the toe head section of the wheel unit. The toe head displays the individual wheel toe of wheel selected, total side toe and total toe of all wheels. The toe meter is controlled through the turret knob located on the toe head. The toe meter has yellow color coded Limit Reminders. ②

Computrac Control Drawer

The control drawer contains the circuit boards for the complete system. The drawer slides out making the circuit boards easily accessible. ③

Wheel Diameter Selector

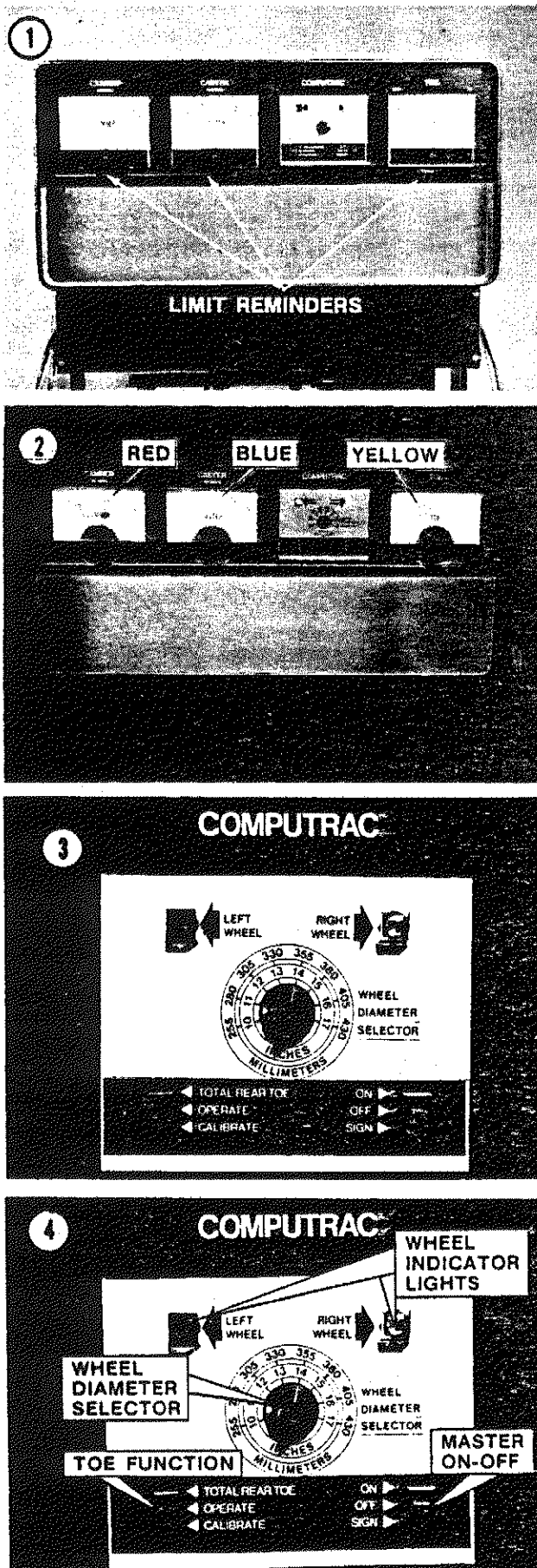
The wheel diameter selector is located on the control drawer. The selector is calibrated in inches for domestic vehicles and millimeters for import vehicles. The wheel size of the vehicle to be aligned is selected with the selector knob. ④

Left and Right Wheel Indicator

The left and right wheel indicator is used on the single console model to indicate which wheel unit is in operation. They are color coded Green for left and Amber for right. ④

Master On-Off Switch

The Master ON-OFF switch is located on the control drawer and turns 115V, 60 Hz power to the system on-or-off. ④



Toe Function Switch

The toe switch is located on the control drawer and controls the function of the toe head. The toe function switch has three positions, total rear toe, operate and calibrate. "Operate" is used for normal front toe setting. "Total rear toe" is used to read rear toe. Calibrate is used to calibrate the toe head. Calibrate is also used for front toe without use of rear wheel mirrors.

4

WHEEL UNIT

The wheel unit contains the push buttons for the alignment functions, toe head, steering axis inclination vial, levels and counter weight.

5

The locking knob on the wheel unit locks the unit onto the wheel clamp spindles. The counter weight is used to balance the wheel unit using the levels as a guide during wheel alignment.

The caster zero knob is used to zero the caster meter during wheel alignment.

The camber, caster and toe push buttons select the meter and function to be performed during wheel alignment.

Located within the wheel unit beam is the steering axis inclination (S.A.I.) vial for measuring the S.A.I. angle.

6

Toe Head

The toe head contains the beam projection lamps and adjustable lens, the projection screens for front toe and rear tracking and the push button function controls and turret knob. The controls are positioned so all toe functions can be accomplished from under front of vehicle and between the front wheels.

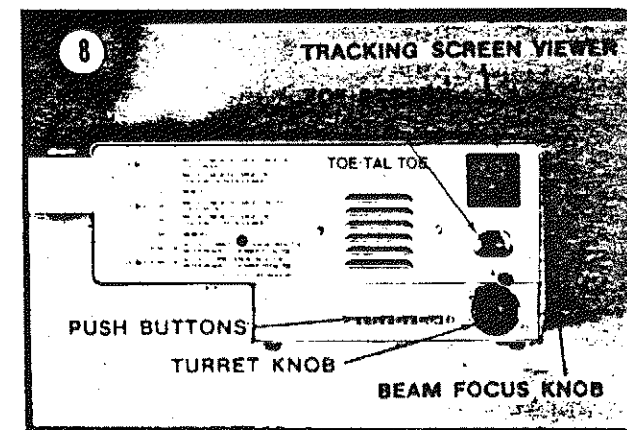
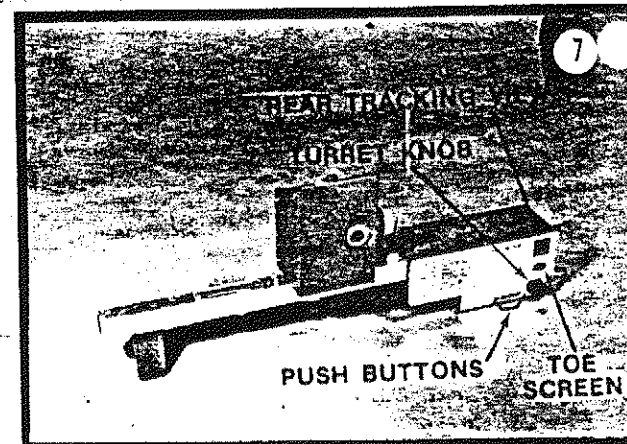
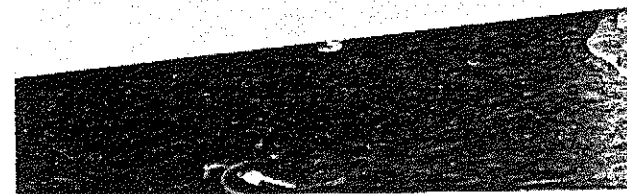
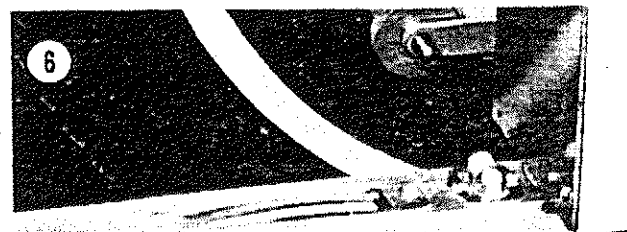
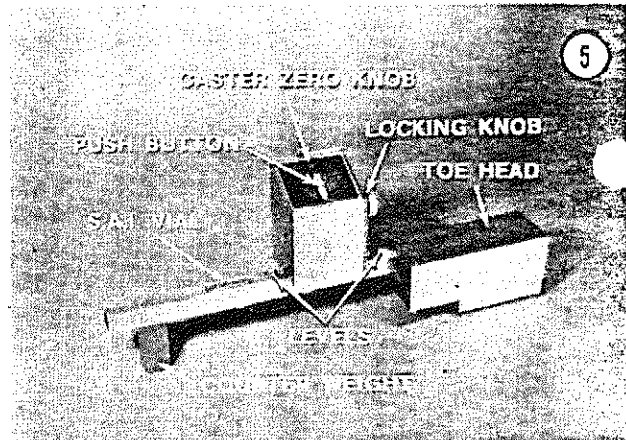
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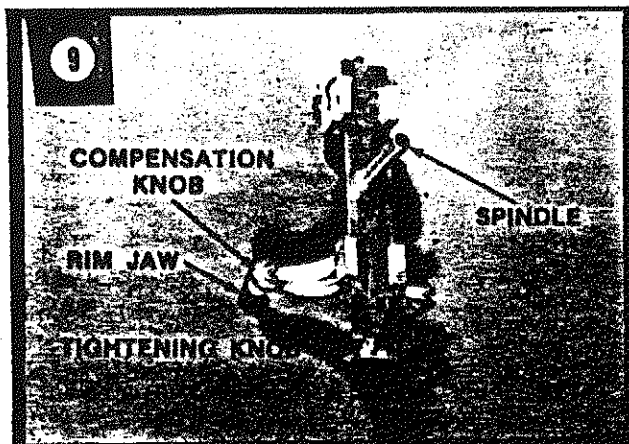
The first three push buttons on the toe head control the input to the toe meter and memory circuit. The L/R button switches the meter function from left to right wheel unit and vice versa.

8

The turret knob is used to place desired toe into the system and to align projected beams during toe adjustment. The beam focus knob focuses the projected beam on the receiving screens. Refer to figure 18 for part identification.

8

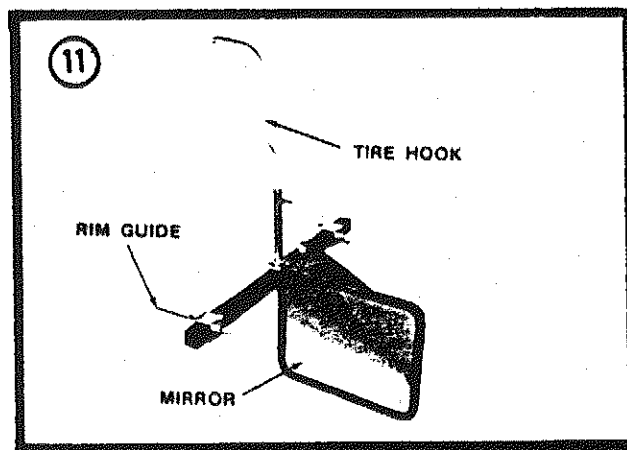
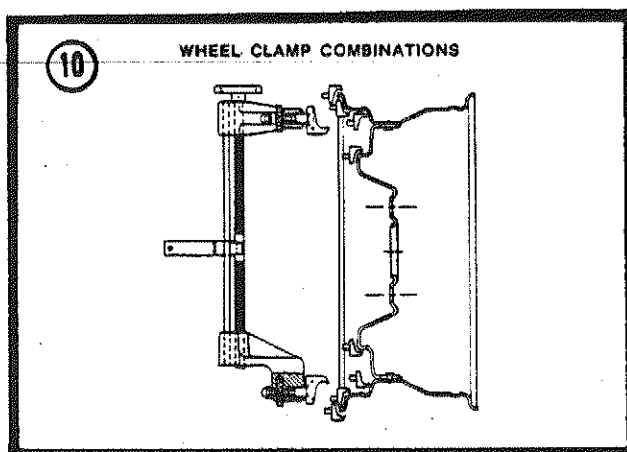




WHEEL CLAMP

The wheel clamp is fully adjustable to desired rim size and the spindle is self centering. The rim jaws are reversible for non marring on sport rims. Three runout compensation knobs are used to remove wheel runout prior to alignment. **9**

Because of the many types of rims on the market today, the rim jaws have been designed to grip the rim in several different ways. Refer to figure 20, which shows only four of the many ways possible to attach the wheel clamp. **10**



TRACKING MIRROR

The tracking mirror is adjustable to wheel size by adjusting the tire hook and the rim guides. The mirror is not unbreakable so use care when storing and using. **11**

THEORY OF OPERATION

Camber

A pendulum is located inside the wheel unit, and will tilt an amount equal to wheel camber. As the pendulum tilts, a voltage from the exciter coil is induced (transferred) to the pick up coils on either side of the exciter coil in an amount equal to the pendulum angle. This voltage which represents the amount of camber is routed to the camber meter where it is read as camber angle.

NOTE: The voltage is processed through the electronic circuits of the telatron for rectification and amplification.

At different angles the pendulum will produce different voltages in the pick up coil and therefore, produce different readings on the camber meter.

Caster

Caster is a pendulum position change, over a 20 degree turn. The voltage change is used to determine the amount of caster. With the wheel turned in ten degrees, the caster zero knob adjusts the voltage from the pendulum so that the meter reading is zero.

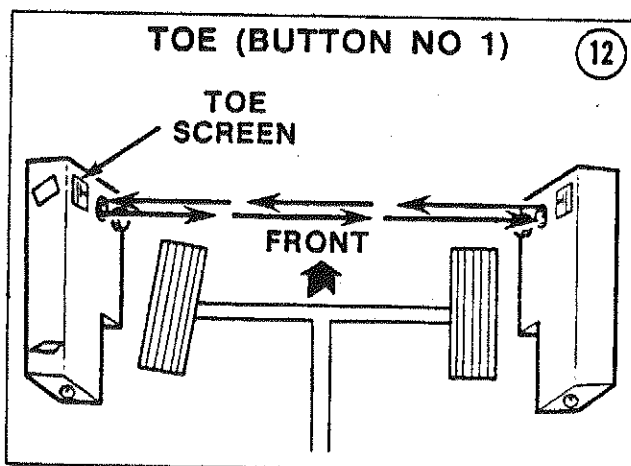
NOTE: This is the zero reference.

When the wheel is turned from ten degrees IN to ten degrees OUT, the pendulum moves an amount equal to the wheel caster and a voltage is induced from the exciter coil to the pick up coil in an amount equal to the pendulum angle. This voltage which represents the amount of caster is routed to the caster meter where it is read as caster angle.

NOTE: This voltage also goes through the electronic circuits of the telatron for rectification and amplification.

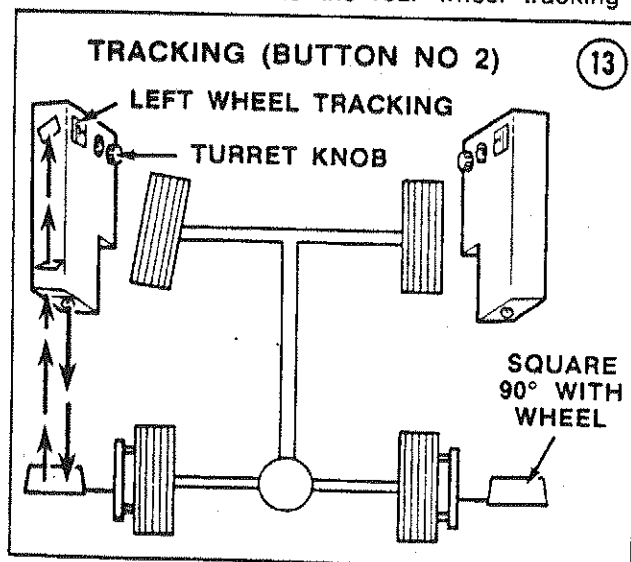
Toe

When button 1 is pressed and the left and right toe beams are aligned so they project onto the right and left toe screens, the relative position of the wheels may be observed. When the turret knob is turned so that the projected line aligns with the target on the toe screen, the electrical voltage established by the turning of the turret knob will be routed to the computrac unit.



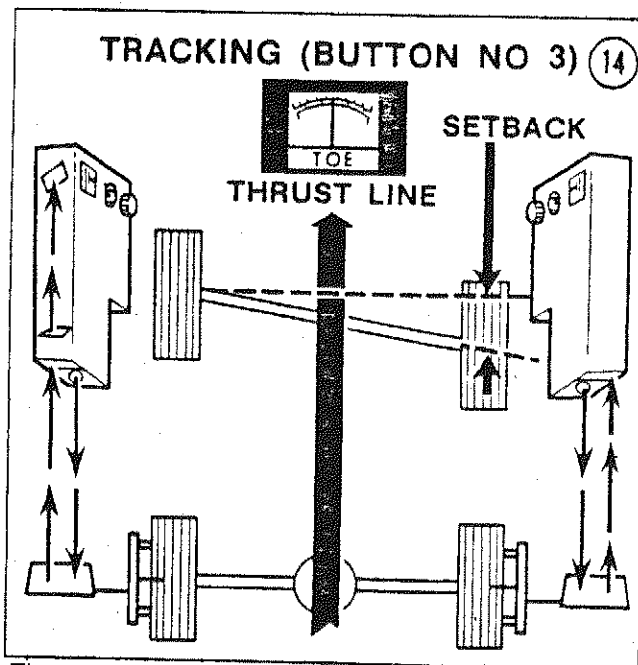
Track

When button 2 is pushed, the toe information within the computrac units is placed into memory and the rear tracking beam is turned on. The rear tracking beam projects from the wheel unit toe head back to the rear wheel tracking

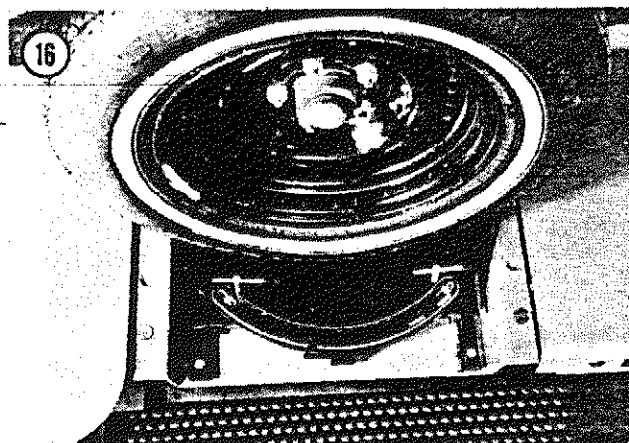
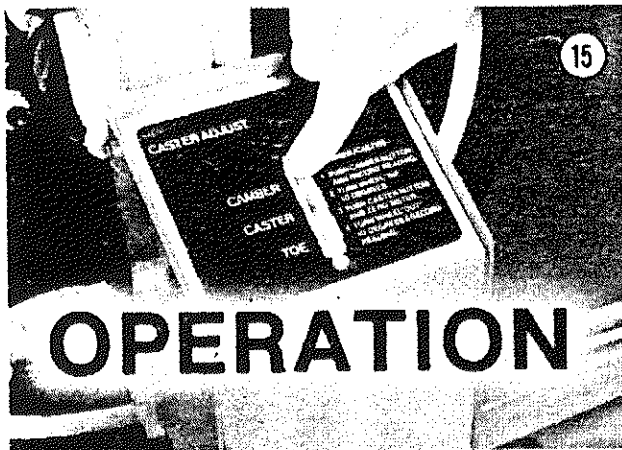


mirror, where the beam is reflected forward to the tracking screen, and may be viewed through the tracking screen viewer. The rear tracking mirrors are positioned on the rear wheels exactly 90 degrees square with the wheel. The turret knob is then turned until the projected hair line aligns with the tracking screen target from the rear mirror. A potentiometer on the turret then indicates an electrical voltage equal to rear wheel position. When both toe heads are aligned in this manner, and the toe function switch is placed in the "total rear toe" position, total rear toe will appear on the toe meter. When button 3 is pressed, the information voltage relative to the rear wheel position from button 2 is then placed into memory.

When the L-R button is pushed, it activates the left or right toe indicator circuits. Memory has taken button 1 and button 2 information and divided by 2. The result is a "corrective signal" which represents rear wheel thrust line, correction for set back and existing front wheel toe. The toe meter will react to this reading. The turret is physically moved by the turret knob a distance equal to the "corrective signal" plus or minus the desired toe. The meter is used as an indicator for the desired toe. The tracking light beam now represents the amount of correction necessary to align the vehicle to the desired toe as set into the system. Any error difference indicated on the tracking screen can now be adjusted with the tie rods so the tracking cross hairs align. At this time it is possible to go back and recheck the toe set into the system by pushing buttons 1, 2 and 3 first on the left side and then on the right side. The projected cross hairs should align in the tracking screen and the toe meter should indicate the desired toe set into the system and the cross hairs will remain aligned.



The system incorporates the latest in electronic logic, but, for simplification and understanding we will not cover the electronics which are involved.



17

INSPECT



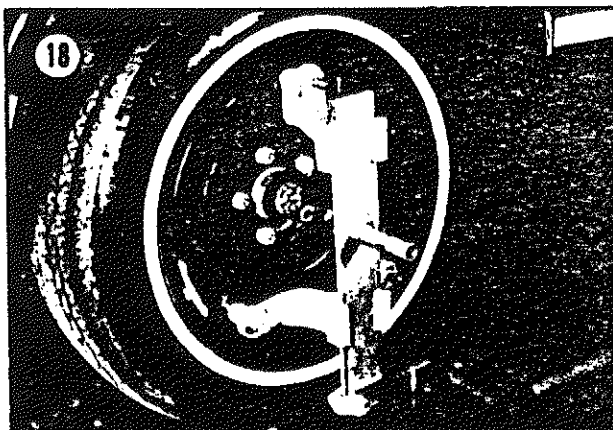
CORRECT TIRE PRESSURE



WORN OR LOOSE
STEERING &
SUSPENSION PARTS



FRONT WHEEL BEARINGS



OPERATION

1. Make sure pins are installed in turning radius plates.

2. Drive vehicle onto alignment track. Front wheel spindle must be located in line with center of turning radius plate.

16



WARNING:

REAR WHEELS MUST BE BLOCKED
AS SOON AS VEHICLE IS MOVED
ON TO RACK.

INSPECTION

1. Inspect vehicle for;
 - a. Correct tire pressure — will affect camber, caster.
 - b. Correct front suspension height — will affect camber, caster, toe.
 - c. Worn or loose steering and suspension parts — will affect all alignment angles.

17

WHEEL CLAMPS

1. Using an air jack on jacking beam, raise front of vehicle off radius plates.

18



WARNING:

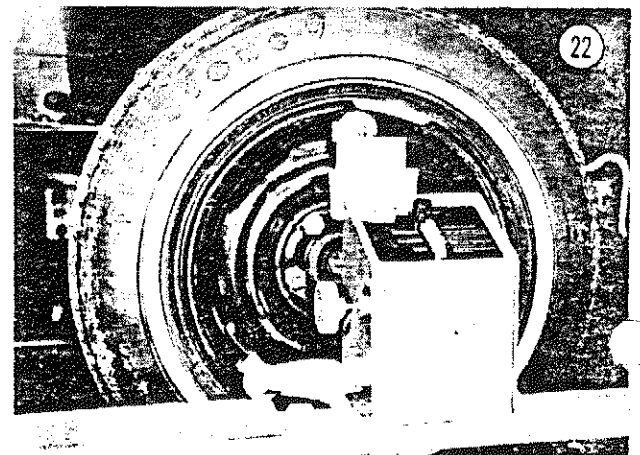
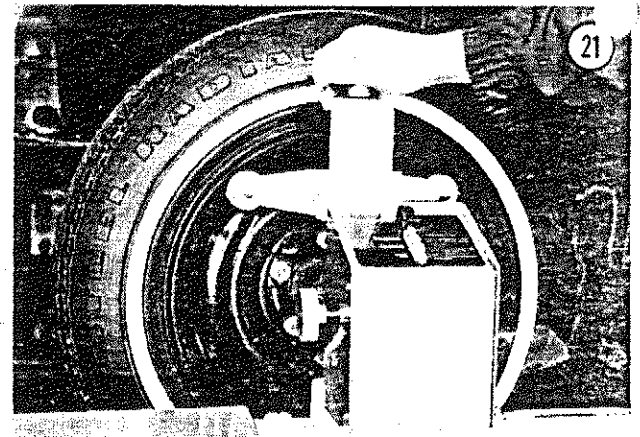
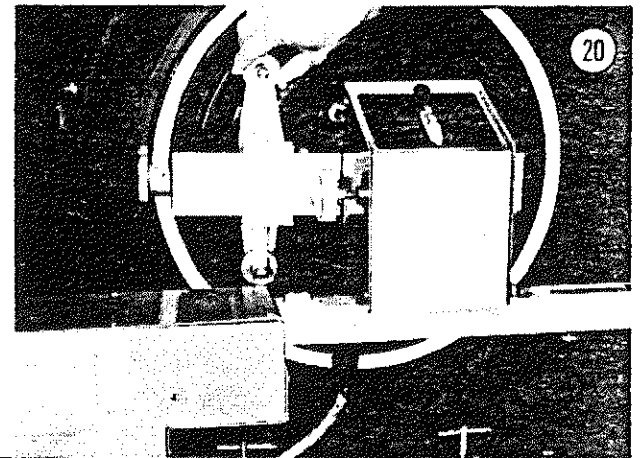
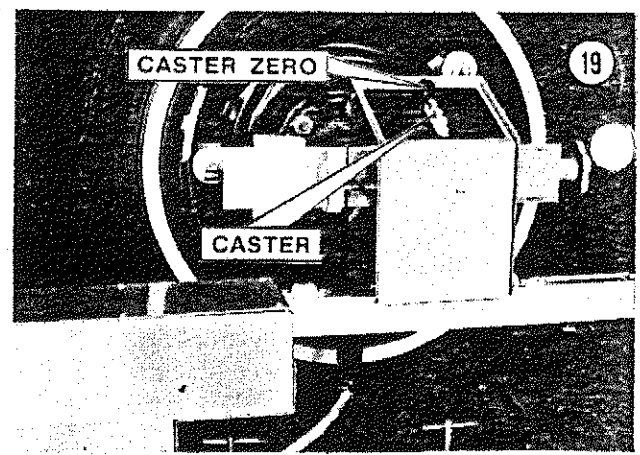
SUPPORT VEHICLE WITH CAR
STANDS OR EQUIVALENT
BLOCKING.

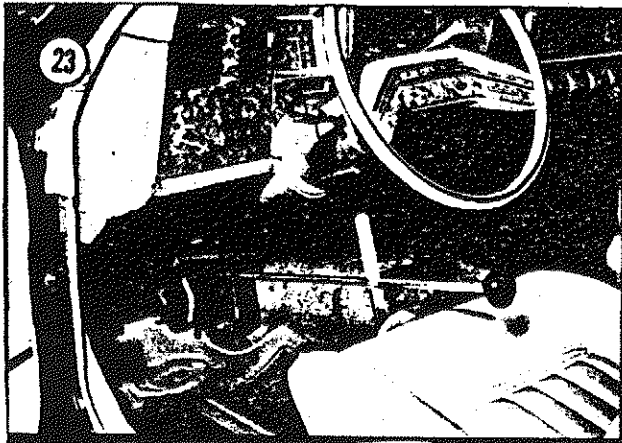
2. Pull wheel covers if necessary and install the self-centering wheel clamps to the front wheels. Pull on clamp to make sure it is on rim tight.
3. Install wheel units onto clamp spindles.

ELIMINATING WHEEL RUNOUT

NOTE: It is necessary to eliminate wheel runout before checking alignment.

1. Turn wheel so wheel clamp support beam is in the horizontal position and single clamp is to the front. (19)
2. Push CASTER button. Caster meter will illuminate.
3. Turn ZERO knob to zero caster meter.
4. Rotate wheel 180° so that single clamp is to the rear. Note reading on Caster meter. (20)
5. Turn one of the front two compensation knobs until caster meter reads $\frac{1}{2}$ the meter reading. (Split the reading)
6. Rotate wheel 90° so single clamp is to bottom. (21)
7. Turn ZERO knob to zero Caster meter.
8. Rotate wheel 180° so that single clamp is to the top. Note reading on Caster meter. (22)
9. Turn top compensation knob (single clamp) until Caster meter reads $\frac{1}{2}$ the meter reading. (Split the reading)
10. Press camber button. Rotate wheel 360°. If camber meter moves more than $\frac{1}{8}^\circ$ total, repeat steps 2 thru 10 until $\frac{1}{8}^\circ$ total runout is obtained.
11. Perform Runout Compensation on opposite wheel.
12. Rotate wheel so wheel clamp is in the vertical position, with clamp knob to the top.





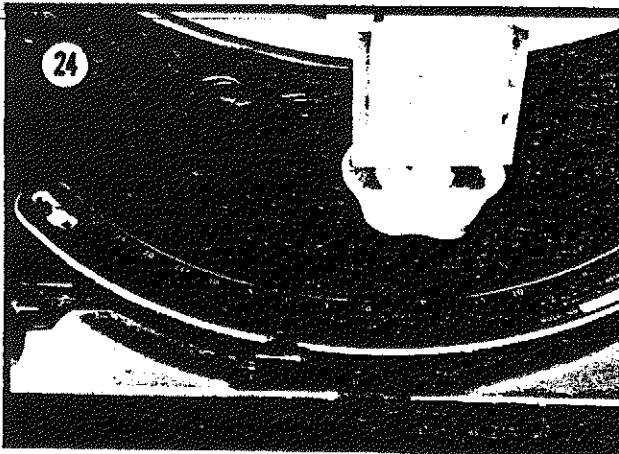
13. Lower front wheel to turning radius plate.

14. Install brake pedal depressor. (23)

CAMBER-CASTER

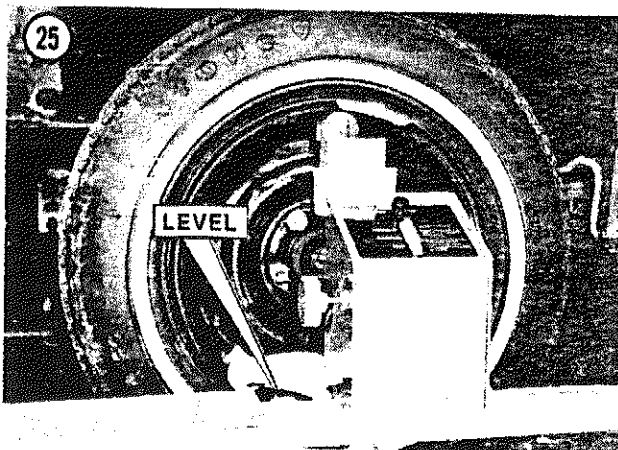
Set-up

Before checking caster, camber and turning radius readings, the front wheels of the vehicle should be in straight ahead position with the turning radius gauge pointers on zero.



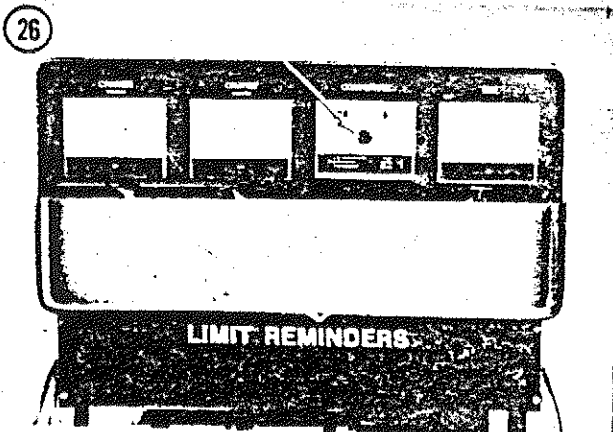
(24)

NOTE: To save time and steps, the camber and caster will be checked on one wheel before proceeding to the next wheel.



1. Remove turning radius pins.
2. Settle vehicle on turning radius plates by bouncing vehicle up and down.
3. Level wheel unit. Lock into position with lock knob.

(25)



4. Select wheel diameter with wheel diameter selector on computrac drawer and set Limit Reminders to manufacturers minimum and maximum specifications.

(26)

LEFT SIDE CAMBER-CASTER

5. Starting with the left hand wheel, push CAMBER button. Camber meter will illuminate. Record camber meter reading. (27)

NOTE: Camber meter is divided in $\frac{1}{4}^{\circ}$ graduations.

6. Turn front of wheel IN until turning radius gauge scale reads 10° .

7. Push CASTER button. Caster meter will illuminate.

NOTE: Make sure meter is reading left hand wheel.

8. Turn caster ZERO knob to zero caster meter. (28)

9. Turn front of wheel OUT until turning radius gauge scale reads 10° . Record caster meter reading.

NOTE: Caster meter is divided in $\frac{1}{4}^{\circ}$ graduations.

RIGHT SIDE CAMBER-CASTER

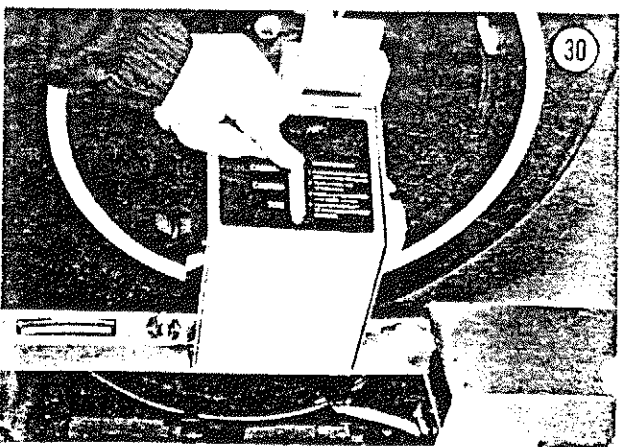
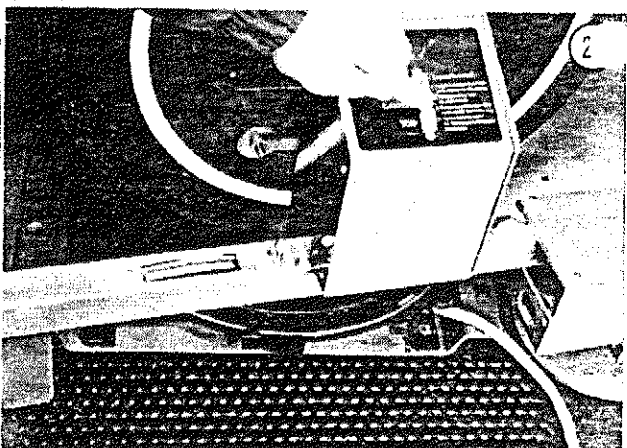
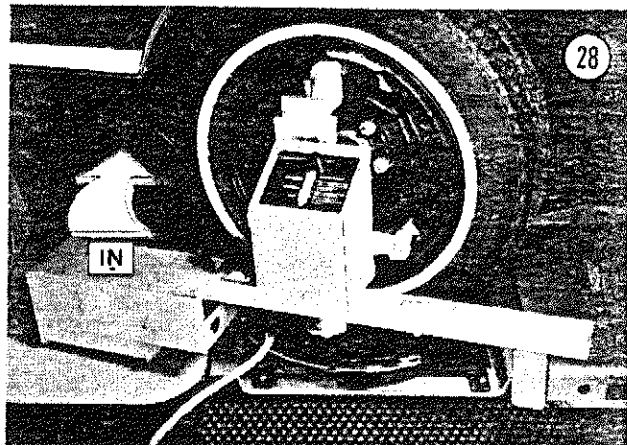
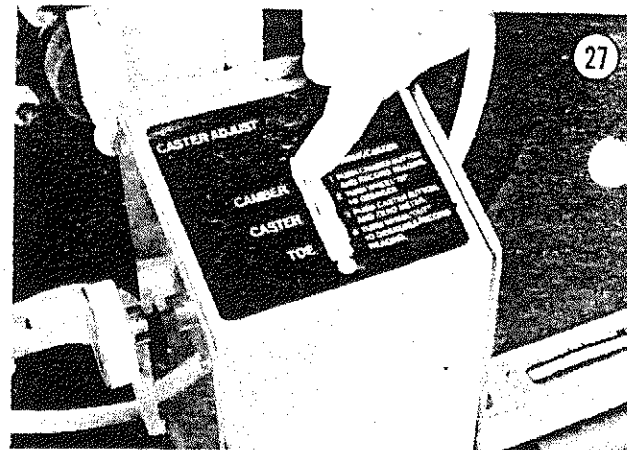
10. On the Right hand wheel, turn front of wheel IN until turning radius gauge scale reads 10° . (29)

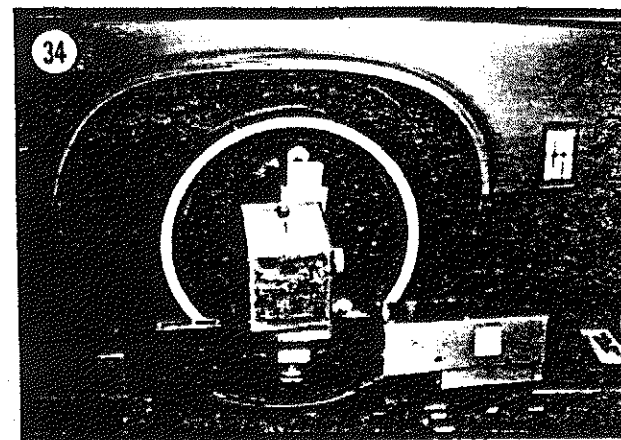
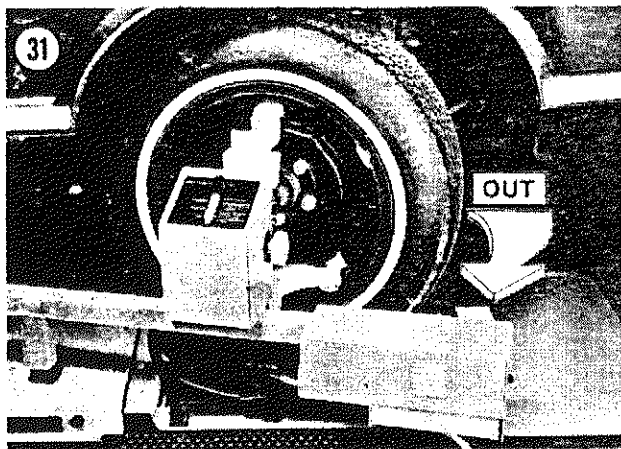
11. If single console is used, push right wheel CASTER button to transfer meter to read right side caster.

12. Turn ZERO knob to zero caster meter.

13. Turn front of right wheel OUT until turning radius gauge scale reads 0° . (30)

14. Push CAMBER button. Camber meter will illuminate. Record camber meter reading.





15. Turn front of right wheel OUT until turning radius gauge scale reads 10°. (31)
16. Push CASTER button. Caster meter will illuminate. Record caster meter reading.
17. Check meter readings against vehicle manufacturers specifications and make any necessary Camber and Caster adjustments.

STEERING AXIS INCLINATION (SAI)

1. With the wheels on the turning radius plates, position the wheels straight ahead and set turning radius gauge pointer to read zero.
2. Turn wheel IN until turning radius scale reads 10 degrees.
3. Turn thumbscrew, located under steering axis inclination gauge until bubble reads zero. (32)
4. Turn wheel OUT until turning radius scale reads 10 degrees. Read steering axis inclination on steering axis inclination scale. (33)

5. Repeat procedure for opposite wheel.

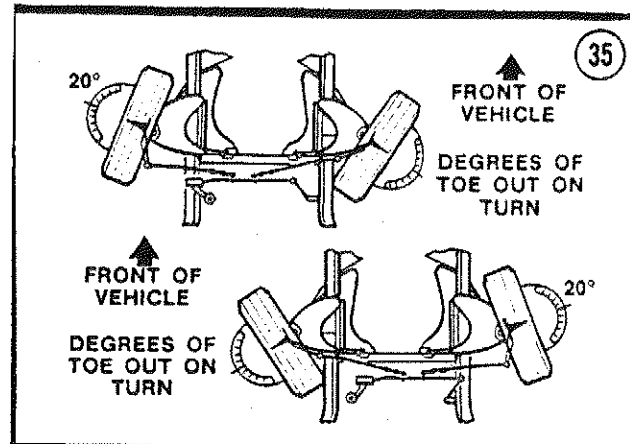
Note: To read SAI properly, the camber angle must also be considered. To arrive at the actual SAI:

1. Record the steering axis inclination reading.
2. Add the camber reading, if positive, to the SAI reading.
3. Subtract the camber reading, if negative, from the SAI reading.

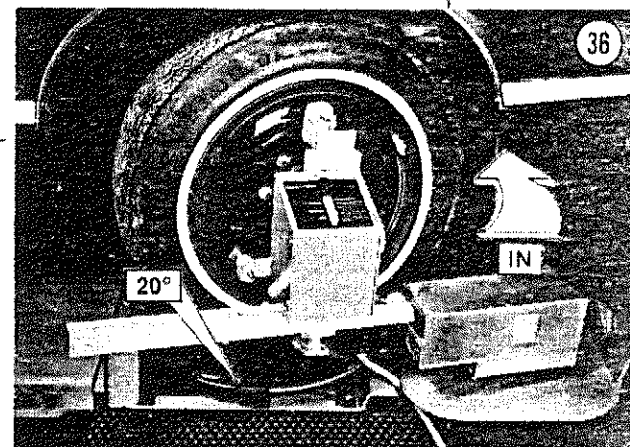
TURNING RADIUS

1. Brakes must be held firmly with brake pedal depressor. Make sure front wheels are in straight ahead position and turning radius gauge reads 0°.

- Turn left front wheel IN until turning radius gauge scale reads 20°. On opposite (right) turning radius gauge scale, record reading of right wheel, toe out on turn. Refer to vehicle manufacturers specifications. (34) (35)



- Turn right front wheel IN until turning radius gauge scale reads 20°. On opposite (left) turning radius gauge scale, record reading of left wheel, toe out on turn. Refer to vehicle manufacturers specifications. (36)



TOE AND TRACK

Set-up

WARNING: Make sure vehicle rear wheels are blocked and car is in neutral.

- Center steering wheel in straight ahead position and remove brake pedal depressor.

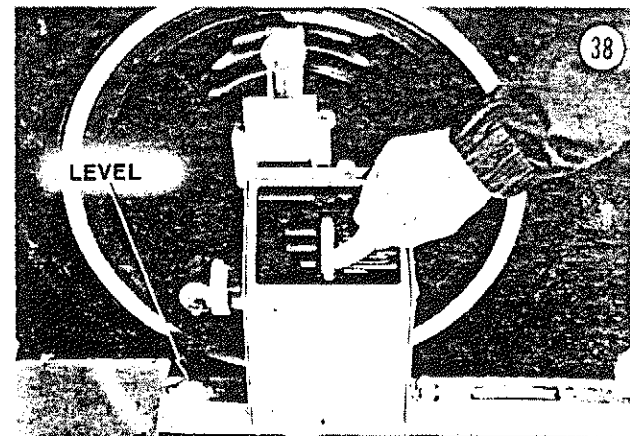
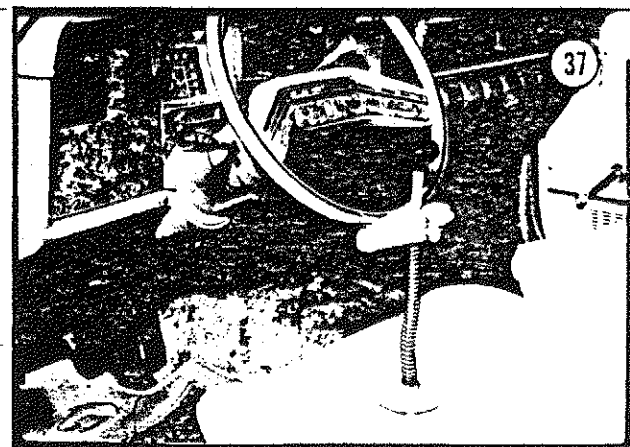
NOTE: If vehicle is equipped with power steering, start engine and center steering wheel exactly.

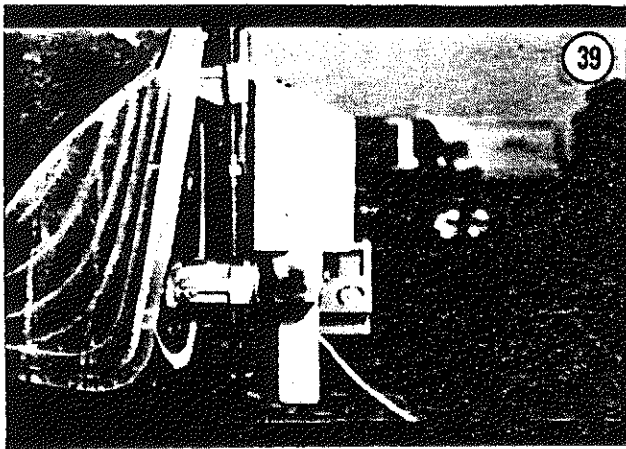
- Install a Bear steering wheel holder. (37)

NOTE: Stop engine, if started.

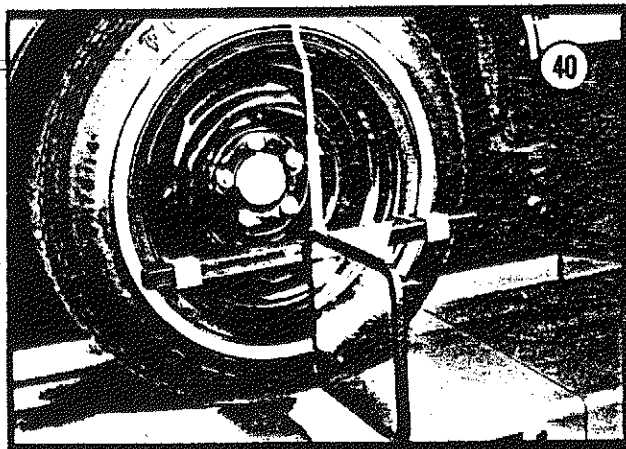
- Check wheel units to make sure they are level. Relevel as required. Periodically check level during set up.

- Push TOE button on wheel unit to illuminate toe meter. (38)





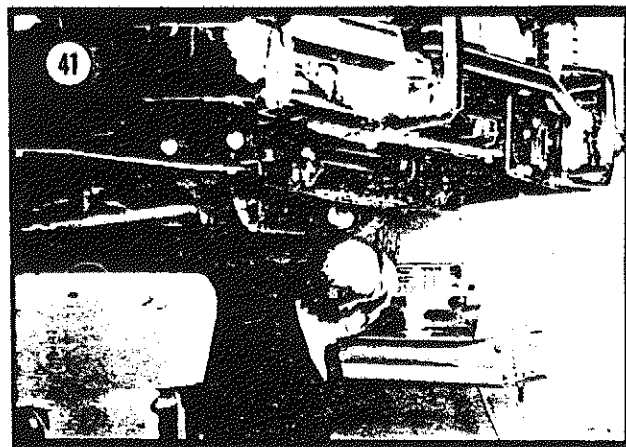
5. On left toe head, push button No. 3 to illuminate tracking beam. (39)



6. Install tracking mirrors on rear wheels and adjust mirrors so cross hair reflects and is visible on wheel tracking screen. (40)

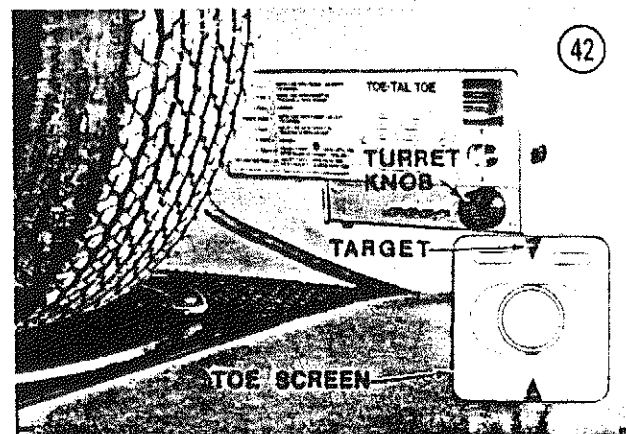
7. Repeat steps 3, 4, 5 and 6 for right toe head.

8. Place yourself under vehicle and between front wheels so toe screens can be observed.



TOE PROCEDURE (LEFT)

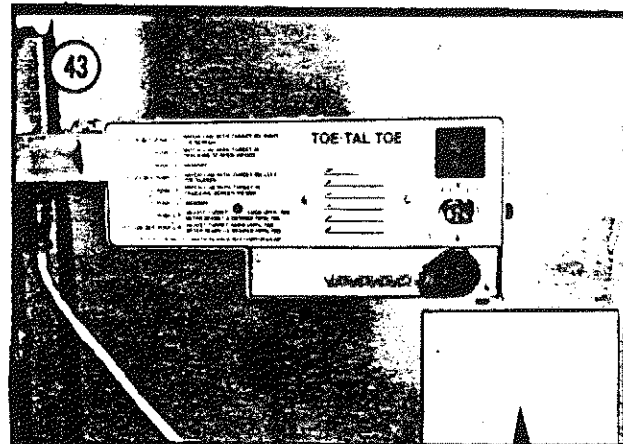
9. Starting on left side, push button No. 1 on toe head and focus projected line onto opposite toe screen. (41)



10. Turn turret knob until projected line and target line up on toe screen on right side. (42)

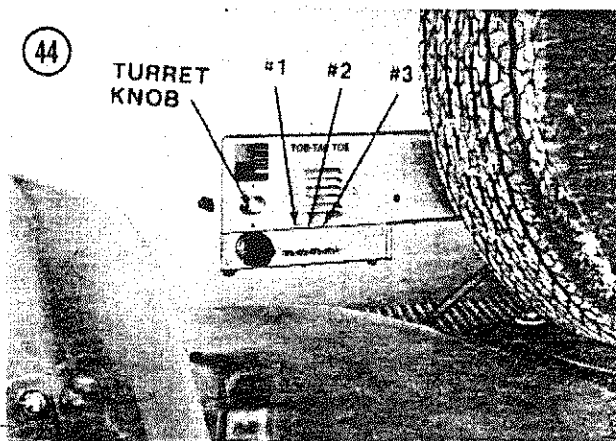
NOTE: Target is a triangle. Projected line must be at tip of triangle.

11. Push button No. 2 on left toe head.
12. Observing left tracking screen viewer, turn left turret knob until cross hair and target line up.
13. Push button No. 3 on left toe head. (43)



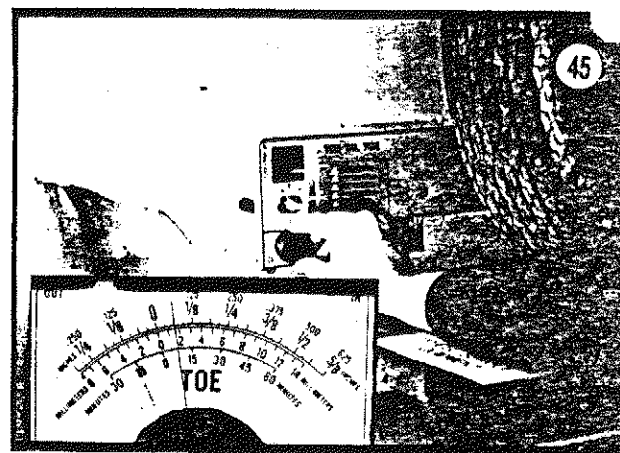
TOE PROCEDURE (RIGHT)

14. Push button No. 1 on right toe head.
15. Turn turret knob until projected line lines up with target on toe screen on left side.
16. Push button No. 2 on right toe head.
17. Observing right tracking screen viewer, turn right turret knob until cross hair and target line-up.
18. Push button No. 3 on right toe head. (44)

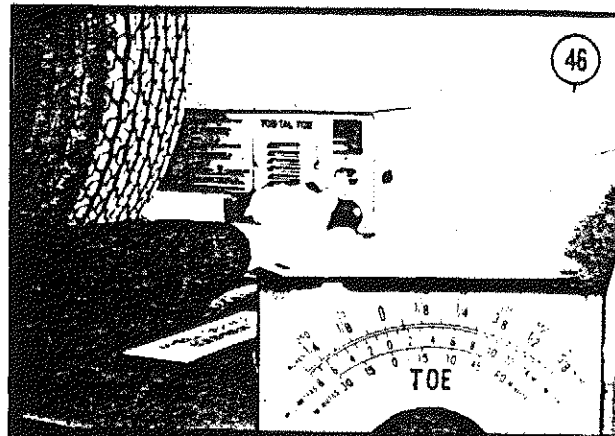


19. Push the L/R button on the right toe head. On right toe head turn turret knob until toe meter reads $\frac{1}{2}$ the desired total toe. Refer to vehicle manufacturers specification. (45)

NOTE: Refer to vehicle manufacturers specification charts for preferred toe setting.



20. On left toe head push L/R button so toe meter reads left wheel toe.
21. On left toe head turn turret knob until toe meter reads $\frac{1}{2}$ the desired total toe. (46)



NOTE: For rear wheels, wheel units should be installed facing the front of the rack. If toe head faces front of rack, we must remember that the toe meter reading is reversed. That is, TOE IN is actually TOE OUT. Perform "eliminating wheel run out" procedure to rear wheels.

51

CAMBER

Perform normal camber check procedure.

TOE

1. Turn "Wheel Diameter Selector" to wheel diameter. 52
2. Place "Toe Functions Switch" to CALIBRATE.

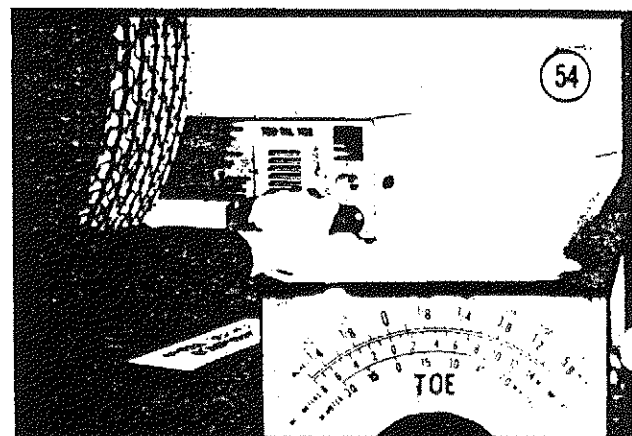
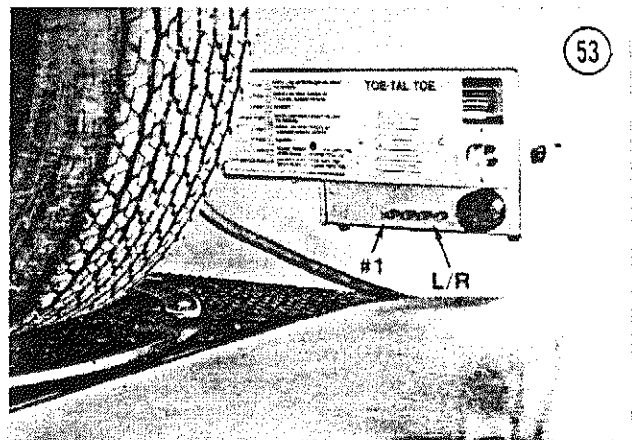
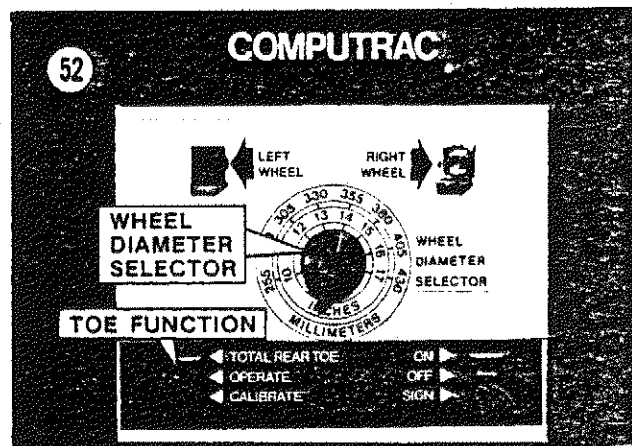
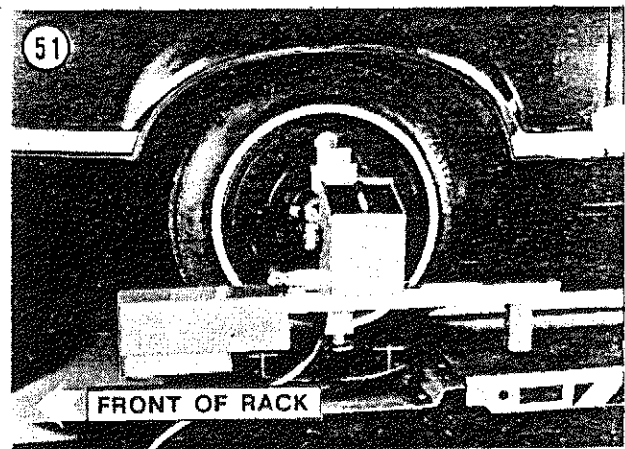
3. Level both wheel units.

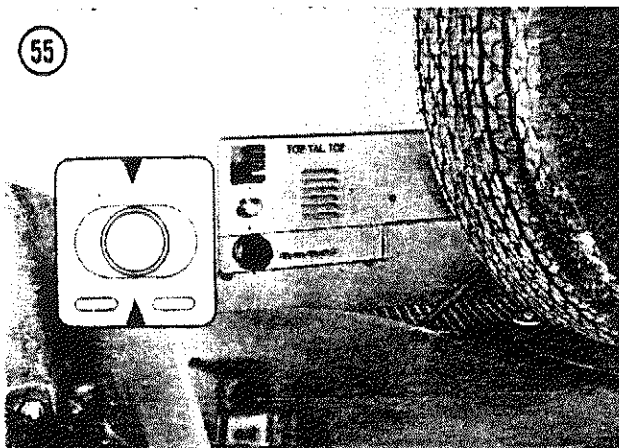
4. Press L/R button. 53

5. Press button No. 1.

NOTE: If heads are to the front of rack, meter reading will be opposite. That is, TOE IN will actually be TOE OUT.

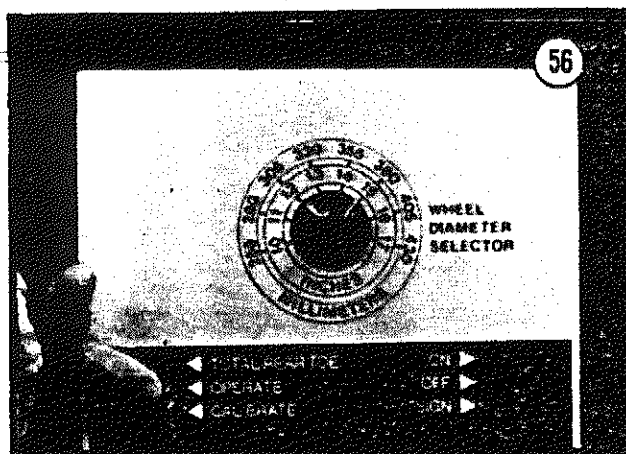
6. Turn turret knob until toe meter reads desired toe. ($\frac{1}{2}$ of total rear toe). 54





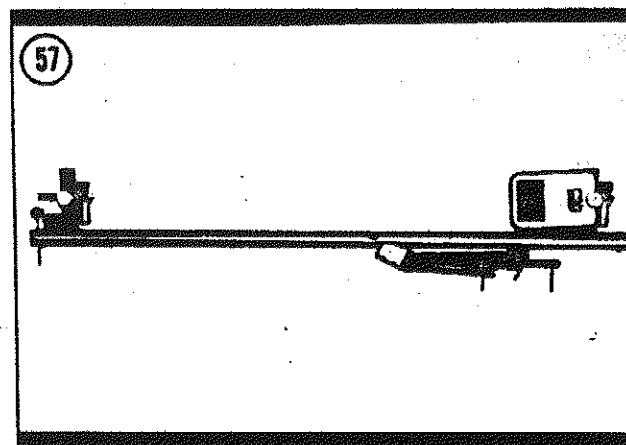
7. Adjust wheel toe until projected line aligns with target on toe screen of opposite wheel.

8. Repeat steps 6 and 7 for opposite wheel.



TOTAL REAR TOE

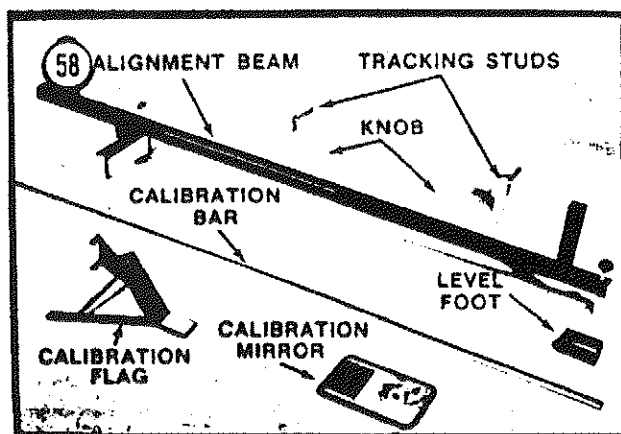
To read Total Rear Toe, follow Toe and Track steps 1 through 12 for left head, page 14, and steps 14 through 17 for right head, page 16. Holding Total Rear Toe Switch in position, read Total Rear Toe on Toe Meter.



CALIBRATION

The calibration fixture is a self contained calibration bar with stand and attachments used to calibrate the wheel units and the tracking mirrors. The calibration fixture allows the operator to periodically check and calibrate the equipment for correct camber, caster and toe.

When not in use, the calibration fixture should be assembled as in figure 57 and stored by hanging on the wall in a vertical position.

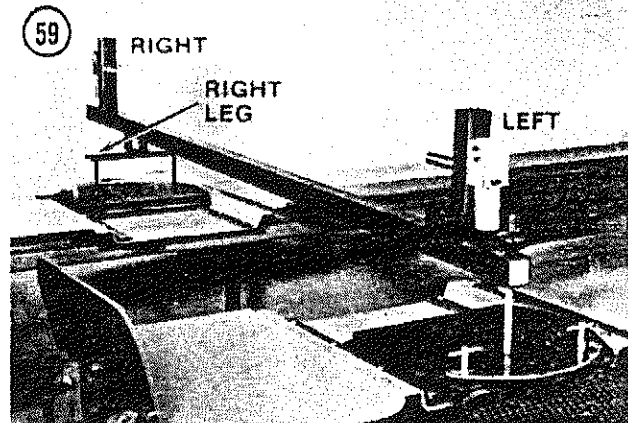


Refer to figure 58 for identification of calibration fixture components.

CALIBRATION FIXTURE SET-UP

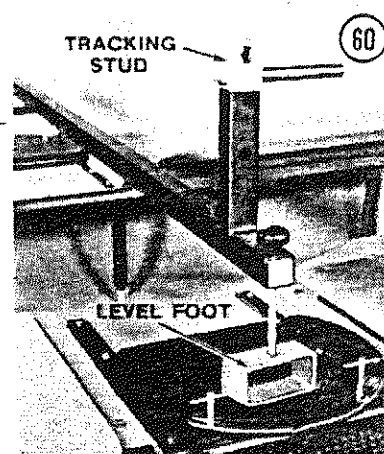
1. Rotate right leg so it is 90° to alignment beam. Place alignment beam onto turning radius plates of rack, left end of beam on left turning radius plate, right end of beam on right turning radius plate.

59



2. Remove left tracking stud knob, tracking stud and level foot. Install level foot under left end and install tracking stud so stud faces to the rear of the rack.

60



3. Remove right tracking stud knob and tracking stud and install tracking stud so stud faces to the rear of the rack.

4. Remove calibration bar from storage clips. Install through tracking stud blocks, and align scribe marks on bar with scribe marks on stud blocks. Position bar end using level/locator so that bar end contacts inner level/locator stop with level/locator in contact with stud block. Tighten knobs on both ends of bar.

(On older units remove calibration bar from center of alignment beam and install into tracking stud blocks from the center. Adjust bar so it is equal on both ends, and rotate the bar so the "TOP" mark on the bar is to the top. Install and tighten tracking stud knobs securely.)

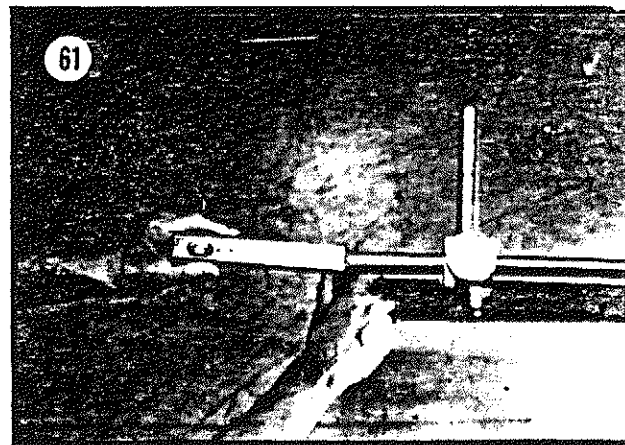
TOE CALIBRATION CHECK PROCEDURE

NOTE: This procedure is used to check wheel unit to see if calibration is necessary. Make sure units have at least fifteen minutes of warm up time prior to calibration check.

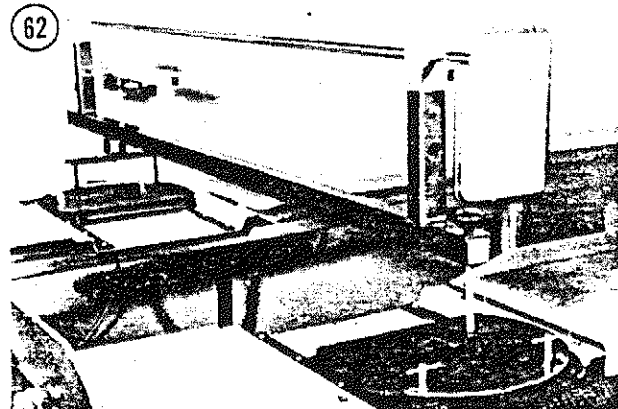
1. Turn telatronic unit on.
2. Mount right wheel unit onto right tracking stud.
3. Mount calibration mirror onto left tracking stud.

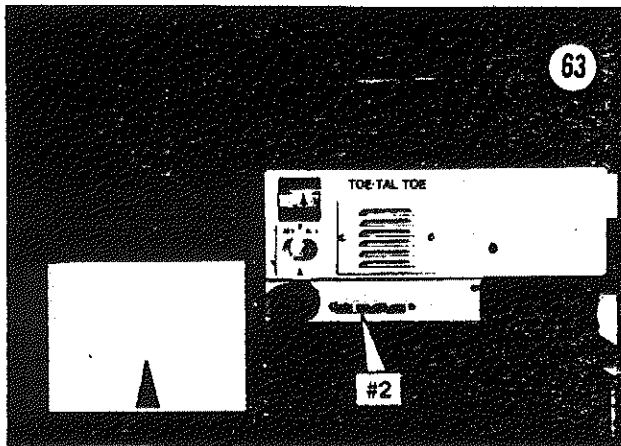
62

4. Push right toe button or right L/R button.



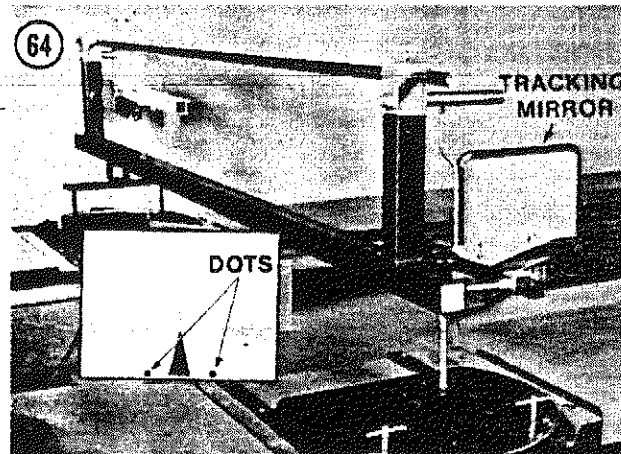
62





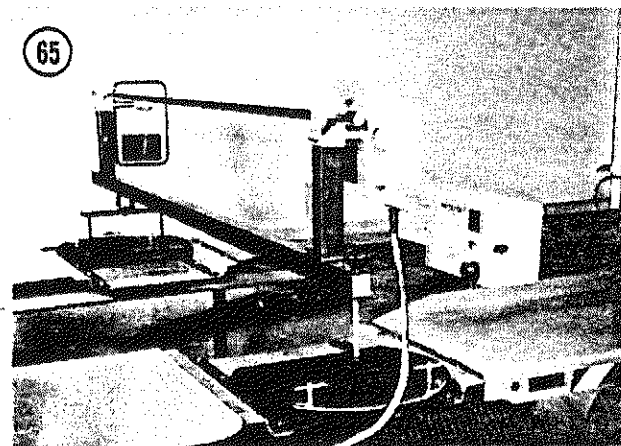
5. Push button two.
6. Adjust mirror so that projected line reflects into tracking screen.
7. While observing tracking screen viewer, rotate turret knob to align vertical line with tip of target.

63



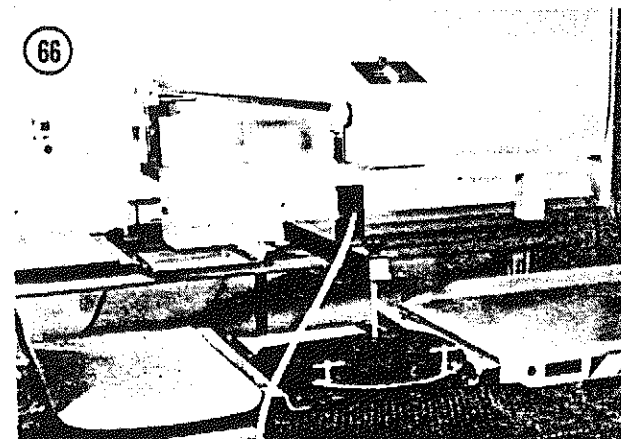
8. Remove calibration mirror.
9. Remove hook and locking screw from top of tracking mirror, and reinstall hook and locking screw into bottom of mirror. Install left tracking mirror at extreme end of left side of calibration bar. See 145.
10. Observe tracking screen viewer. Vertical line should fall within width of target dots.

64



11. Install calibration mirror onto right tracking stud.
12. Install left wheel unit onto left tracking stud. Perform procedures 5 through 10 using right tracking mirror.

65

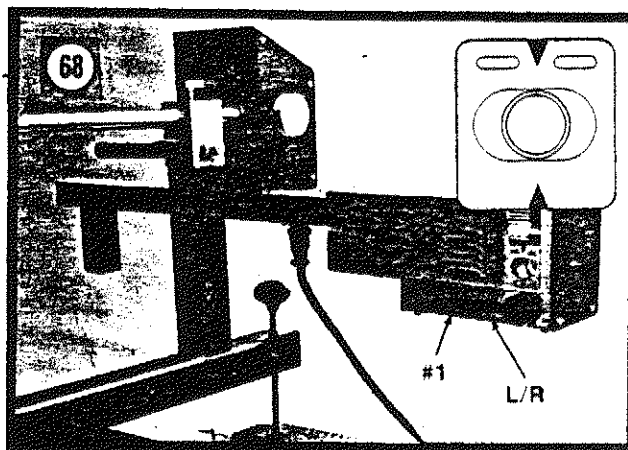
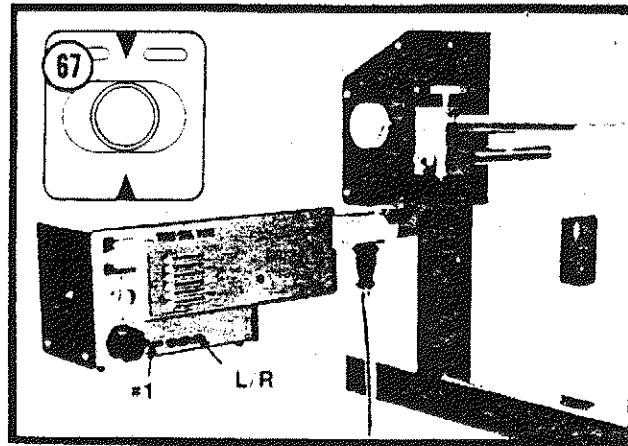


13. Remove tracking mirror and install left wheel unit onto calibration bar on left end and right wheel unit onto calibration bar on right end. Make sure both units are level.

66

14. Place toe function switch to the calibrate position.

15. On right wheel unit press button No. 1 and press L/R button.
16. Toe meter should read zero + or - 1/64 of an inch. Vertical lines should align within the width of the target arrows on the left toe screen. (67)
17. On left toe head push button No. 1, and L/R button. Toe meter should read zero, + or - 1/64", and vertical line on right toe screen should align within width of target arrow. (68)
18. Place tracking mirror hook back to normal position.



CALIBRATION — CASTER CAMBER RIGHT UNIT

1. Place master on/off switch to on.

NOTE: Make sure units have at least fifteen minutes of warm up time prior to calibration. All meters should read "O" when unit is off. If not, adjust mechanical "O".

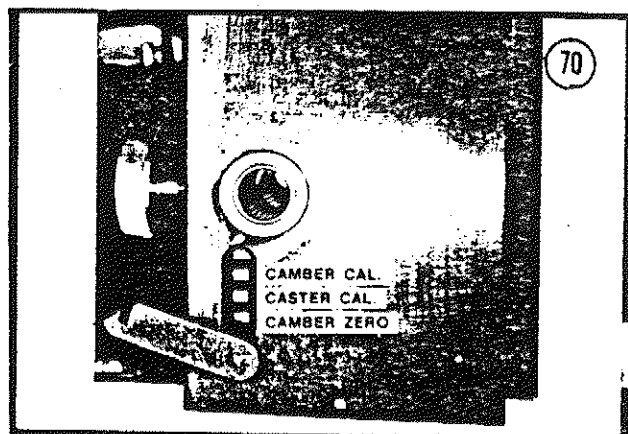
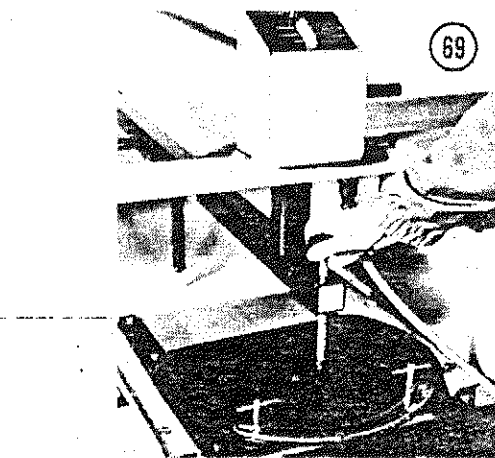
2. Make sure wheel units are plugged into meter unit. On a single unit, when caster/camber or toe buttons are pressed the right light should go on with right unit.
3. Slide level/locator onto calibration bar end (see figure 61). Level calibration bar using adjustment knob until level/locator bubble is centered.
4. On older units install right wheel unit onto left end of calibration bar and lock into place. Move calibration bar adjustment knob end up and down until camber check vial is level. (69)

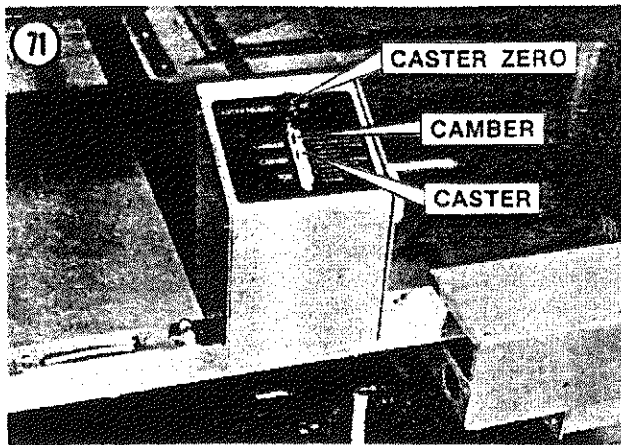
5. At wheel unit, push camber button. Camber meter should read zero.

If it does not;

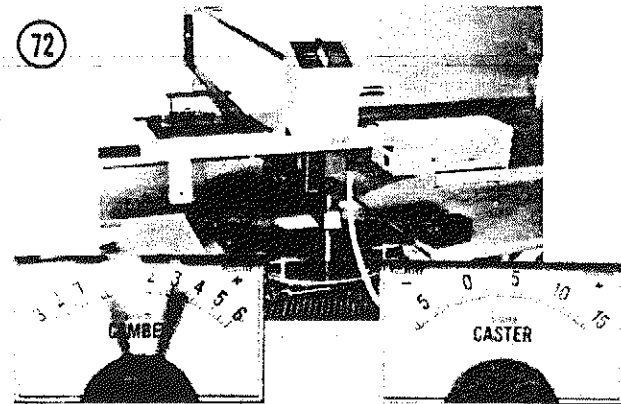
open cover plate and adjust camber zero potentiometer until meter reads zero. (70)

NOTE: It may be necessary to loosen calibration bar and slide bar to gain access to potentiometer adjustment.

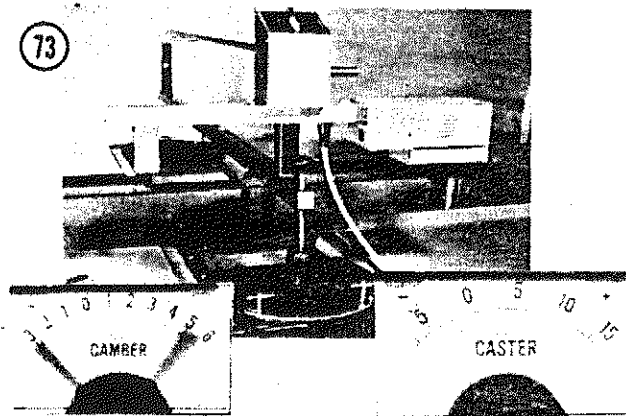




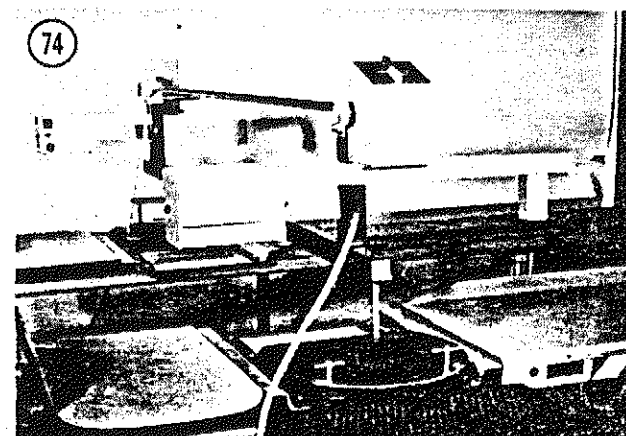
6. At wheel unit, push caster button. (71)
7. Adjust caster zero knob until caster meter reads zero.
8. Push camber button.



9. Remove level foot from left end. Camber meter should read $+2^\circ$. If camber meter does not read $+2^\circ$, adjust camber calibrate potentiometer located on rear of wheel unit, until meter reads $+2^\circ$. (72)
10. Push caster button. Caster meter should read $+5\frac{3}{4}^\circ$. If caster meter does not read $+5\frac{3}{4}^\circ$, adjust caster calibrate potentiometer located on rear of wheel unit, until caster meter reads $+5\frac{3}{4}^\circ$. (72)



11. Install level foot in a vertical position.
12. Push camber button. Camber meter should read $-1\frac{1}{8}^\circ$ to $-2\frac{1}{8}^\circ$. If it does not, re-check camber zero.
13. Push caster button, meter should read $-5\frac{1}{2}^\circ$ to -6° . If not, recheck camber calibrate. (73)
14. Remove right wheel unit.



CALIBRATION — CASTER/CAMBER LEFT WHEEL UNIT

15. Place level foot in horizontal position using level/locator. Install left wheel unit onto left end of calibration bar and lock into place. (74)
16. Perform steps four through thirteen.
17. Place level foot in level position.
18. Equalize calibration bar between tracking stud blocks and retighten knobs.

TOE CALIBRATION

1. Relevel both wheel units using level vial and lock securely.

NOTE: Units must remain level throughout calibration procedure.

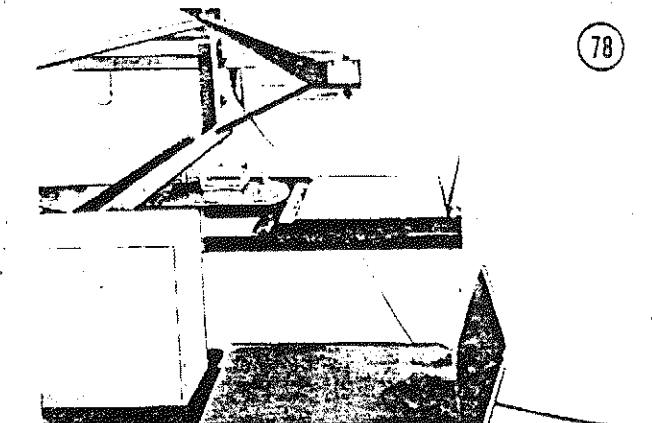
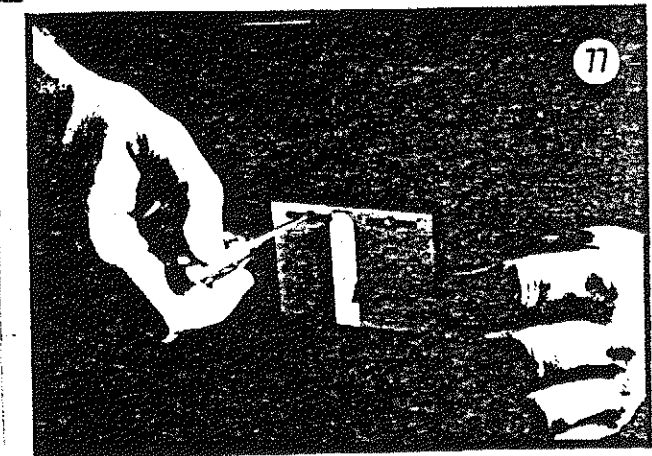
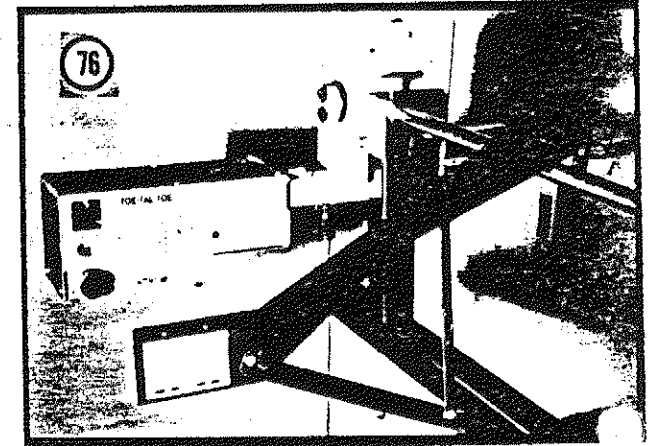
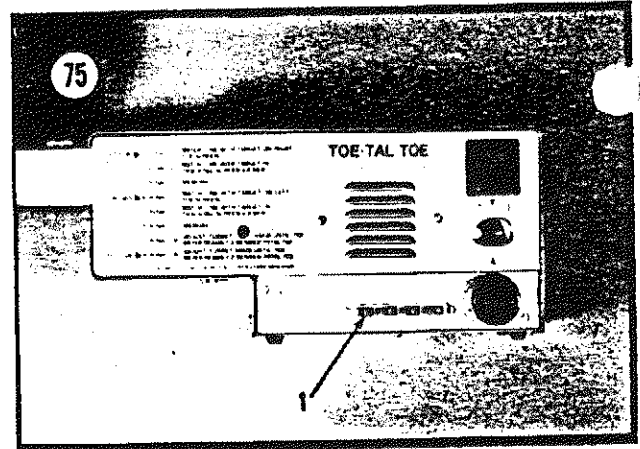
2. Push toe button on left wheel unit.
3. Push button No. 1 on both toe heads.
4. Adjust turret control so projected line aligns with vertical line on opposite toe screen on both units. Focus to obtain a sharp image. **(75)**
5. Install calibration flag onto calibration bar approximately 18" from wheel unit being calibrated. **(76)**

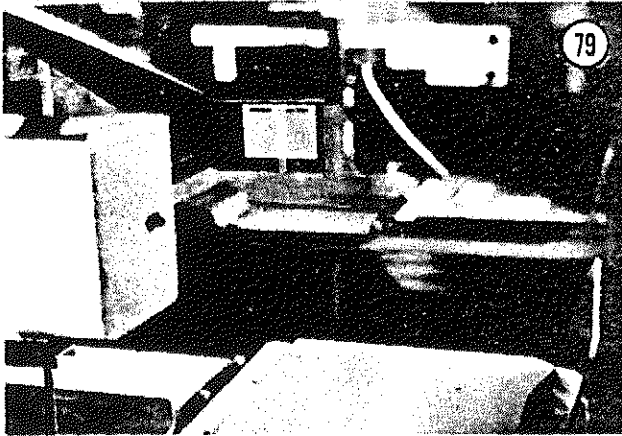
NOTE: Make sure flag is fully opened and locked into position.

6. Focus projected line onto flag, loosen adjustment screws on flag screen. Adjust the tip of calibration arrow on the flag to coincide with vertical projected line. **(77)**

7. Move calibration flag to the extreme opposite end of calibration fixture and refocus beam. Projected vertical line should align with tip of calibration arrow on the flag. If projected line and arrow do not line up. **(78)**

- a. Turn turret knob, move projected line slightly past arrow tip.

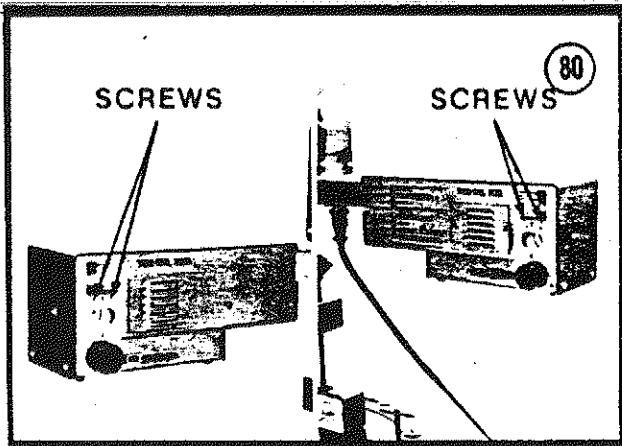




- b. Move calibration flag to approximately 18" from wheel unit being calibrated. Refocus hair line onto flag. (79)
- c. Loosen adjustment screws on calibration flag screen and move screen until target arrow tip and projected line align.
- d. Repeat a, b, and c until projected line coincides with tip of arrow.

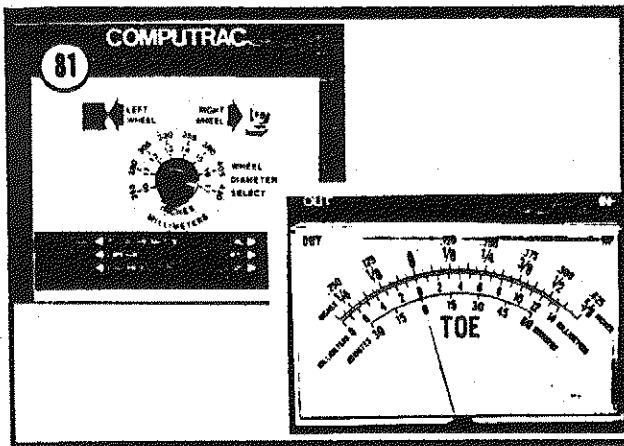
8. Perform calibration procedure for right toe head.

9. Recheck level of both wheel units.



10. Remove calibration flag and focus both projected line onto opposite toe head toe screens. and observe positions of vertical lines. (80)

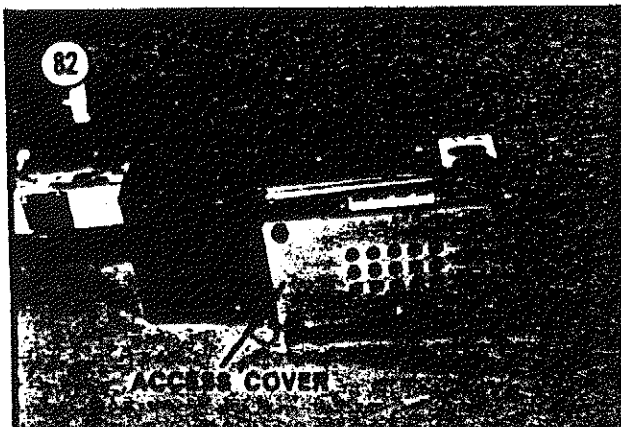
11. Loosen screws on toe screen and adjust screen arrow tip to coincide with projected line, retighten screws.



12. Place Toe Function Switch on meter panel to CALIBRATE, turn (Wheel Diameter Selector) to 17. (81)

13. Push L/R button on left unit.

14. Observe toe meter, should read zero \pm or \pm 1/64" (\pm or \pm 1/2 millimeter).

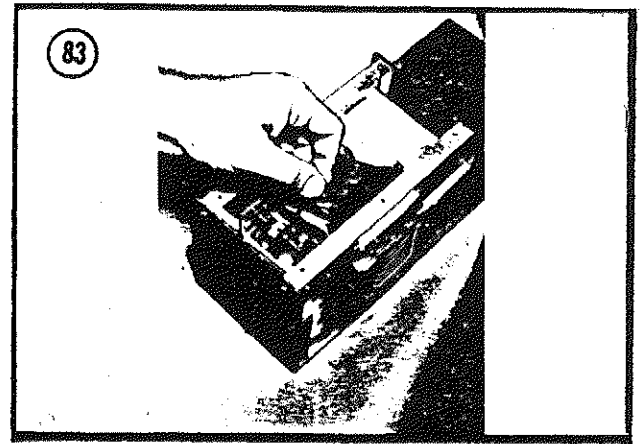


If meter does not read zero:

- a. Remove lower access cover from toe head.

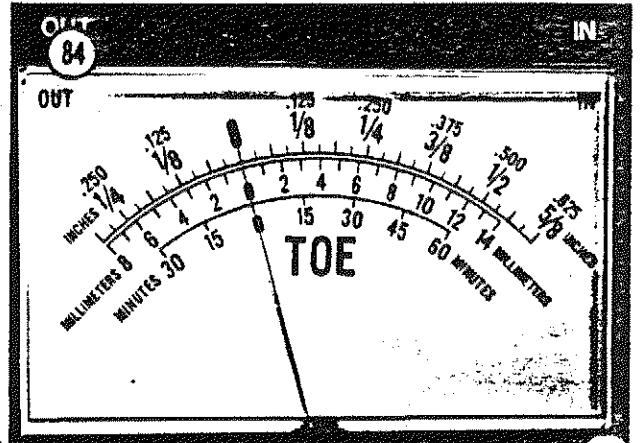
(82)

- b. Loosen turret knob to potentiometer coupling using allen wrench. **(83)**



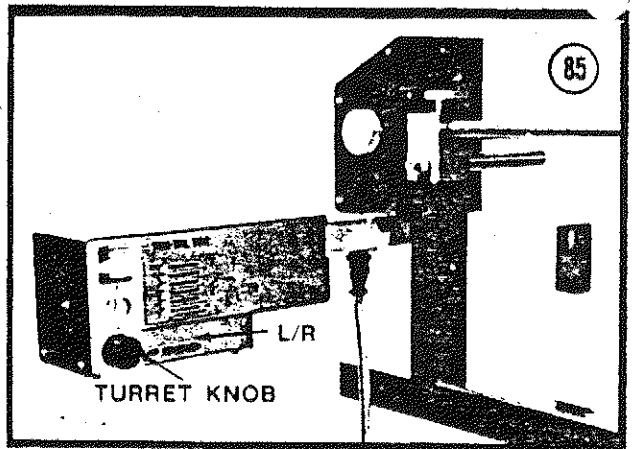
- c. With turret knob stationary rotate potentiometer shaft until toe meter reads zero while projected vertical line is aligned with opposite target, retighten coupling. **(84)**

15. Push L/R button on right unit and repeat step 14 if necessary.

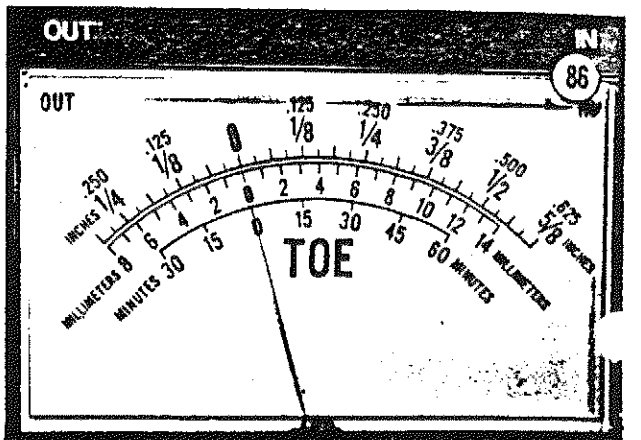


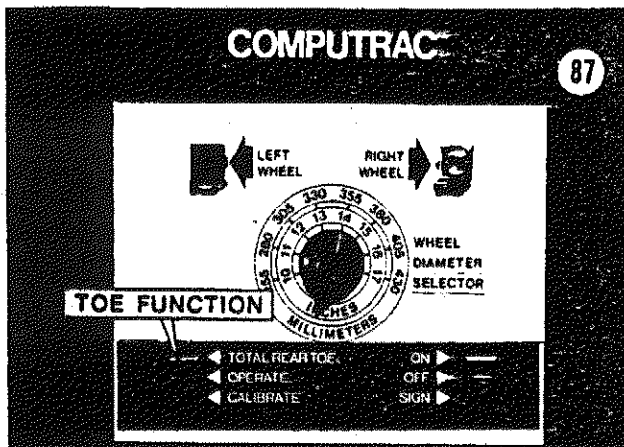
FINAL TOE CALIBRATION CHECK

1. Push right L/R button. **(85)**
2. On right toe head, adjust turret knob until toe meter reads zero.
3. Push left L/R button.

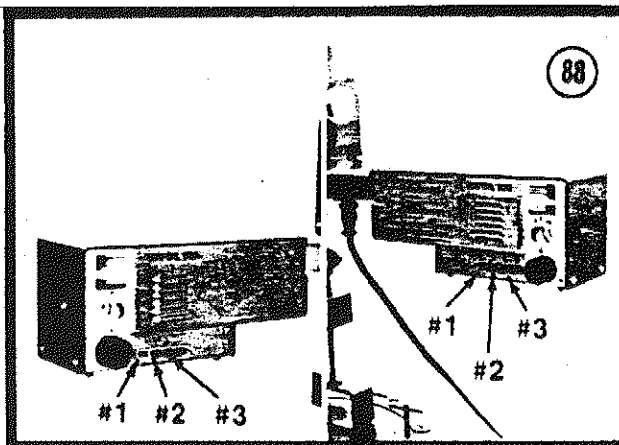


4. On left toe head, adjust turret knob until toe meter reads zero. **(86)**

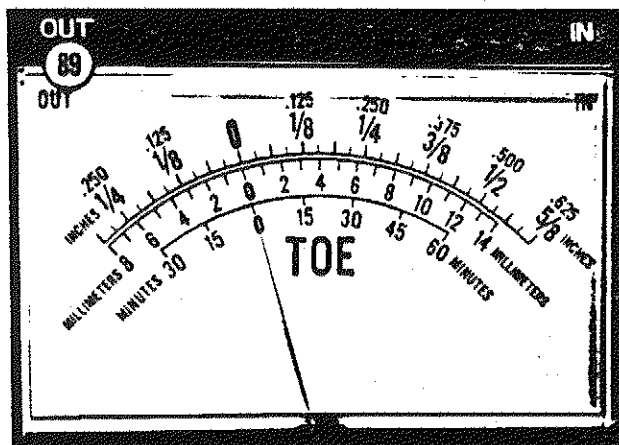




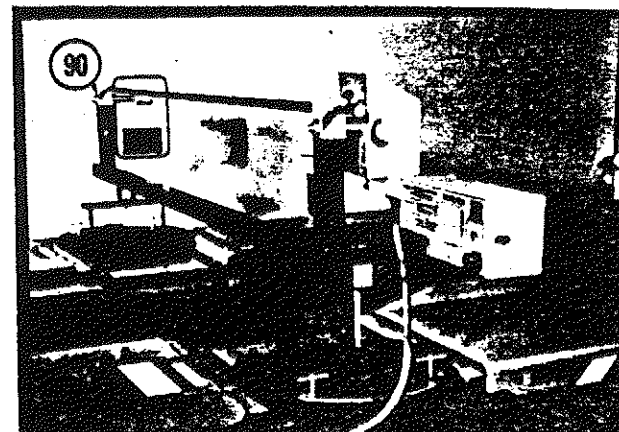
5. Place toe function switch on meter unit to OPERATE. (87)



6. On right toe head, push button numbers 1, 2, and 3 with a five second pause between buttons. (88)
7. On left toe head, push button numbers 1, 2 and 3 with a five second pause between buttons. (88)



8. Toe meter should read zero + or -1/64". If meter does not read within specification, call service technician. (89)
9. Press right L/R button on opposite head and observe meter.
10. Toe meter should read zero + or -1/64". If meter does not read within specifications, call service technician.



TRACKING

1. Remove right wheel unit and place on storage bracket or bench.
2. Remove left wheel unit from end of calibration bar and install onto left tracking stud.
3. Push button No. 2 on toe head.
4. Install calibration mirror onto right tracking stud, and align mirror so cross hairs appear on screen of left wheel unit. Tighten mirror.

5. Observe tracking screen viewer, vertical lines should coincide. If not: (91)

- a. Install allen wrench into each side of toe head and hold. (92)

NOTE: Inward screw requires a 9/64 allen wrench, while outward screw requires a 5/64 allen wrench.

- b. While loosening one side and tightening opposite side, move vertical line until they are aligned.

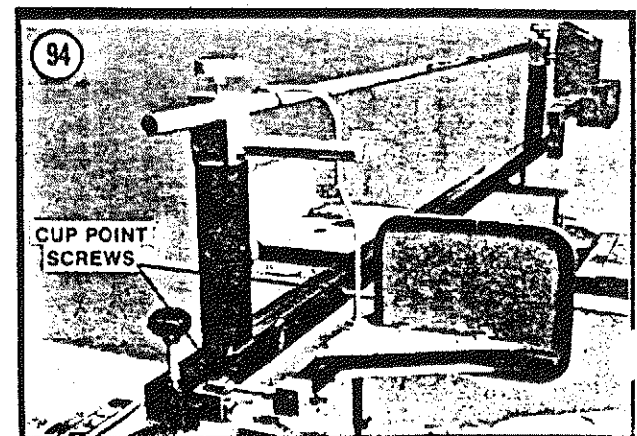
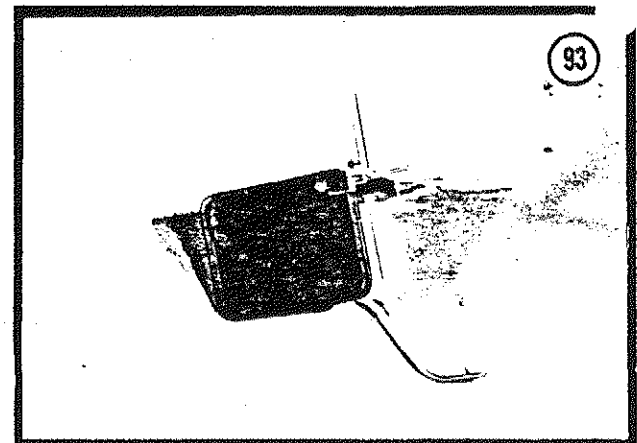
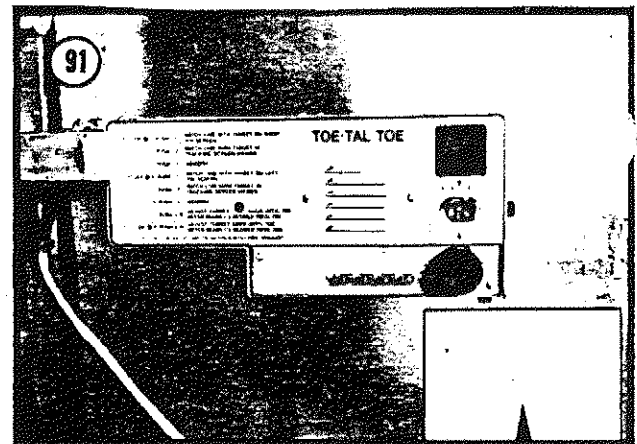
6. Remove calibration mirror.

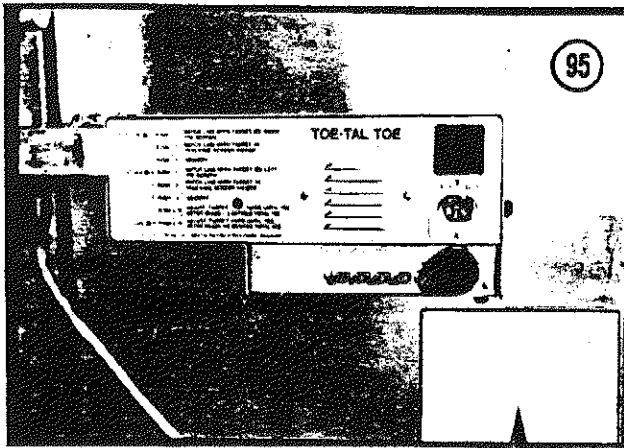
7. Remove top hook and locking screw from right tracking mirror, and reinstall hook and locking screw into bottom of mirror. (93)

The method of installing the tracking mirrors onto the calibration bar has been changed.

8. Install tracking mirror onto calibration bar and extend the two lower pointers until each one rests in the center of the cup point screws located on the alignment beam. (94)

Note: The cup point screws are positioned in the alignment beam at the factory and MUST NEVER BE READJUSTED.

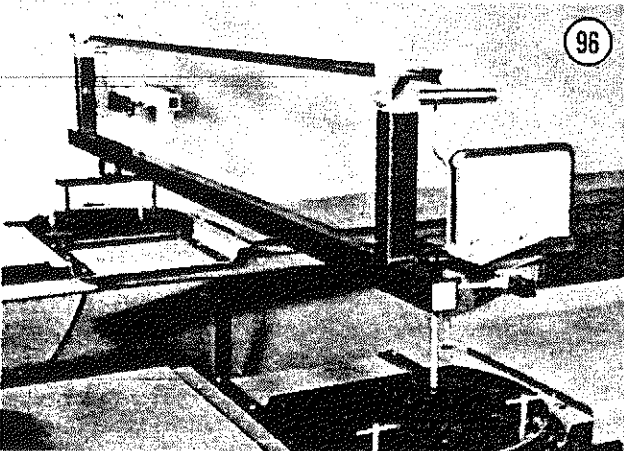




9. Tilt left wheel unit until horizontal cross hair reflects in the tracking screen. Observe vertical cross hair location. **(95)**

10. If lines do not line up: Loosen two $\frac{7}{8}$ " nuts on vertical hook tube and loosen $\frac{7}{16}$ " nut on triangular support bracket. Adjust mirror until vertical line aligns on the tracking screen.

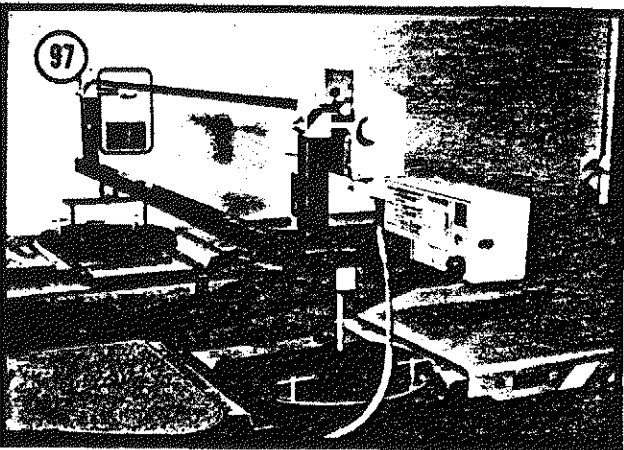
11. Check vertical line alignment through tracking screen viewer, tighten $\frac{7}{16}$ " nut first; then tighten the two $\frac{7}{8}$ " nuts.



12. Remove left wheel unit and place on storage bracket or bench.

13. Install right wheel unit onto right tracking stud.

14. Perform steps three through eleven. **(96)**



CHECKING CALIBRATION FIXTURE

NOTE: This procedure is used if it is suspected that calibration fixture has been dropped or damaged.

1. Assemble calibration fixture. Refer to "CALIBRATION" set-up.

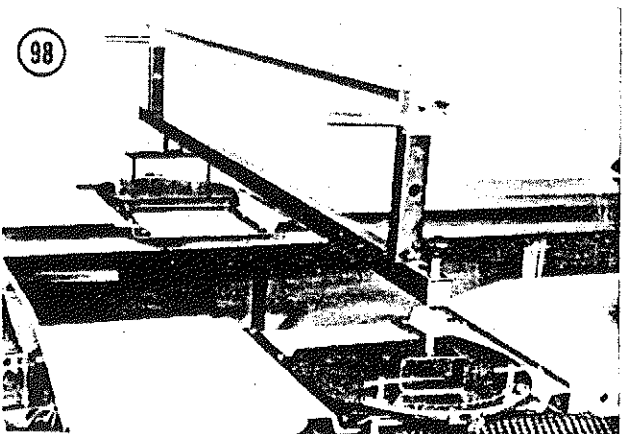
2. Install left wheel unit onto left tracking stud.

3. Install calibration mirror onto right tracking stud. **(97)**

4. While observing tracking screen viewer, rotate turret knob until projected cross hair aligns with target.

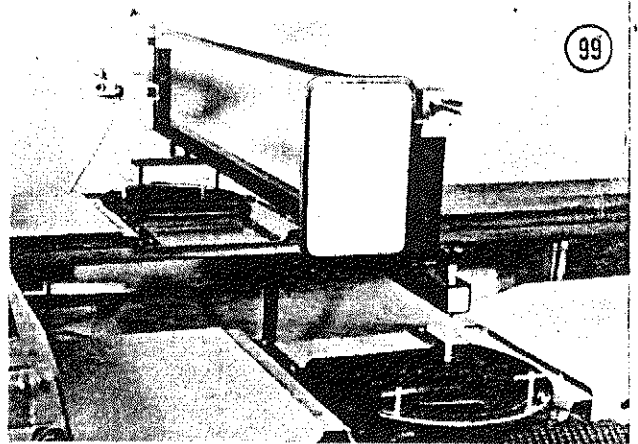
5. Remove wheel unit and calibration mirror.

6. Loosen lock knobs on tracking stud assembly, push calibration bar from track stud assembly. Rotate tracking stud 180° and reinstall calibration bar. Do the same to both tracking stud assemblies. Make sure the word "TOP" on the calibration bar is up. **(98)**



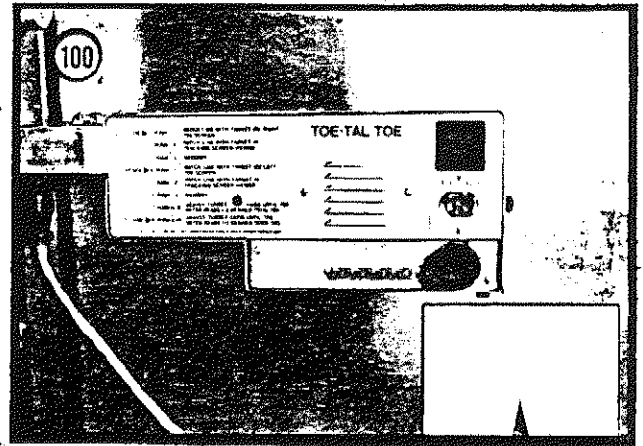
7. Place left wheel unit onto right tracking stud.

99




8. Place calibration mirror onto tracking stud. Projected cross hair must be within width of target.

100

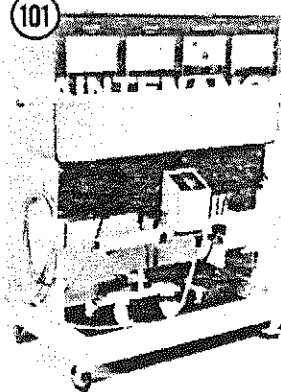


MAINTENANCE

TOE HEAD BULB REPLACEMENT

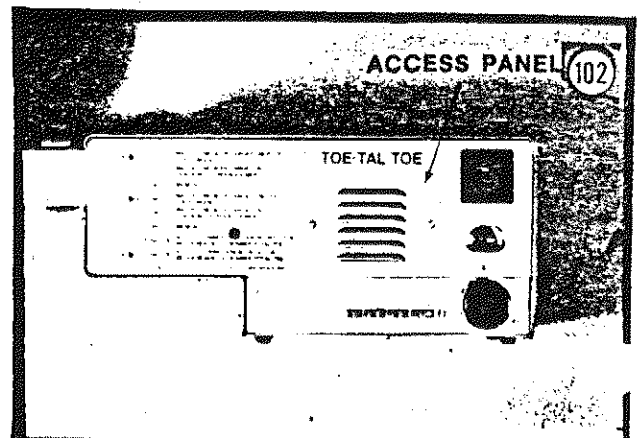
 **WARNING:** Make sure wheel unit is unplugged before performing disassembly.

101



1. Remove 2 screws from toe head lamp access panel and remove panel.

102



2. Remove 2 screws from lamp socket plate and pull socket and lamp from the head. (103)
3. Lamp pulls from socket.
4. Install replacement lamp using care not to touch bulb with fingers.



WARNING:

Do Not remove bulb until toe head is cool. Do Not touch replacement bulb with bare fingers. The bulb is quartz halogen and finger prints on the bulb will cause it to burn out.

5. Reinstall socket plate and access panel.

NOTE: Lamp socket can be moved to get maximum beam intensity.

METER BULB AND SIGN BULB REPLACEMENT

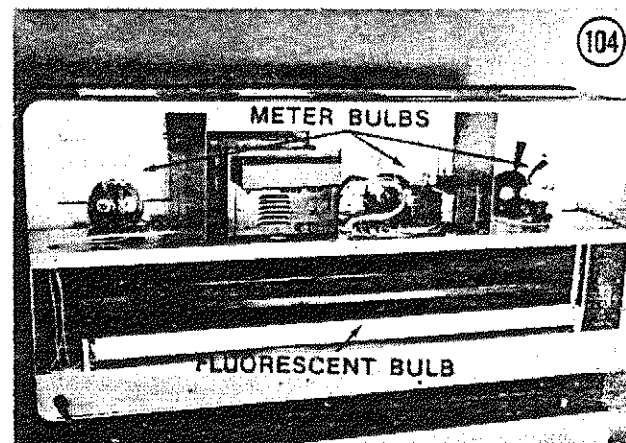
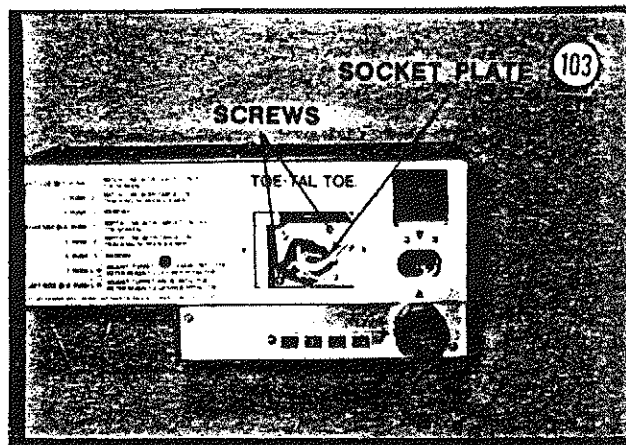


WARNING: Make sure power is removed from meter unit before performing disassembly.

1. Remove 9 screws from rear of meter unit and remove rear panel.
2. Meter unit bulbs are replaced by unscrewing bulb from its socket. (104)

NOTE: A clear 75 watt incandescent bulb must be used or meters will not illuminate properly.

3. The sign bulb is a standard 36 inch cool white fluorescent bulb. The bulb is turned and pulled out. (104)
4. Reinstall rear panel.



CLEANING and LUBRICATION

TOE and TRACKING LENSES

Clean with a narrow camels hair brush. Do not wipe with a rag.

TRACKING MIRRORS

Use glass cleaner on a clean rag.

METER FACES

Clean with warm soapy water and rag. Do Not use cleaning fluids, solvents or brake fluid on meter faces.

CABLES

Clean cables with warm soap and water and rag. Do Not allow water to enter connector end.

RIM CLAMP and SPINDLE

Lubricate with light oil to prevent corrosion. Lubricate adjustment threads and runout compensation knob threads.

CALIBRATION FIXTURE

Lubricate calibration bar and tracking studs with light oil when fixture is stored to protect from corrosion.



APPLIED POWER
INC.

Wheel Alignment Equipment

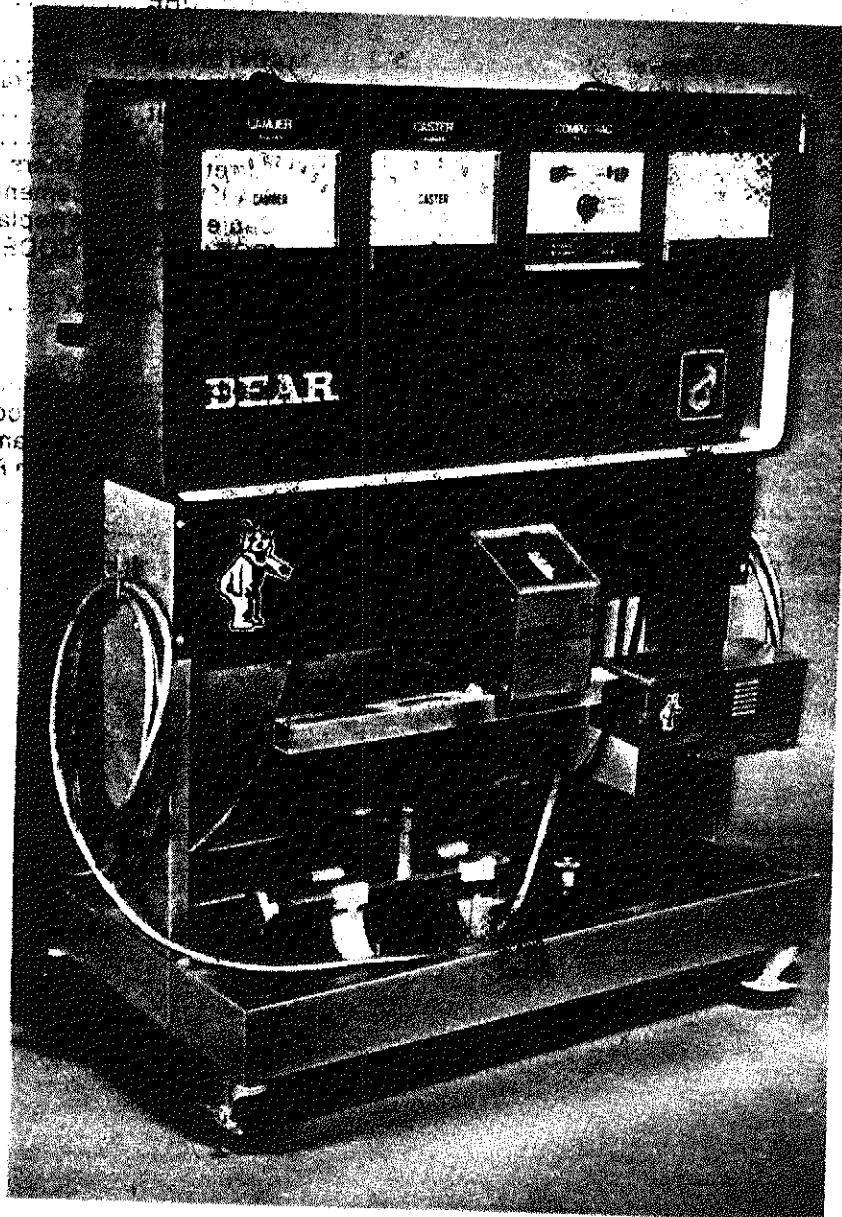
Automotive Product Service Division

NO. 820-20178

DATE April, 1976

MODEL 665, 675, 680, 685

Service Manual





WARNING:

FOR YOUR SAFETY, OBSERVE THESE PRECAUTIONS TO PREVENT PERSONAL INJURY.

WHEN PLUGGING METER CONSOLE INTO ELECTRICAL OUTLET, AVOID WET FLOORS TO PREVENT ELECTRICAL SHOCK. DO NOT OPERATE WITHOUT GROUND PRONG.

AS SOON AS VEHICLE IS MOVED ONTO THE RACK, PLACE VEHICLE IN PARK AND BLOCK REAR WHEELS. IF MANUAL TRANSMISSION, PLACE IN GEAR AND BLOCK REAR WHEELS.)

WHEN JACKING VEHICLE, SUPPORT VEHICLE WITH CAR STANDS OR EQUIVALENT BLOCKING.

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TABLE OF CONTENTS

	Page		Page
INTRODUCTION	1	TROUBLESHOOTING	9
SERVICE PRECAUTIONS	1	Troubleshooting Chart	9
SYSTEM COMPONENTS, IDENTIFICATION and FEATURES	2	Toe Electrical Troubleshooting Procedure ...	10
METER UNIT	2	CIRCUIT BOARD TROUBLESHOOTING	
Computation Control Drawer	2	PROCEDURE	11
Wheel Diameter Selector	2	MAINTENANCE	11
Left and Right Wheel	2	Computation Control Drawer	11
Master ON-OFF Switch	2	Wheel Unit	11
Toe Function Switch	2	Toe	12
WHEEL UNIT	3	Turret Position Washers	12
Toe Head	3	S.A.I. Valve Replacement	12
WHEEL CLEARANCE	3	Cable Connector Replacement	12
TRACKING MIRROR	3	IPCEA COLOR CODE	13
SPECIFICATIONS	4	WHEEL DIAGRAM	15
CIRCUIT THEORY OF OPERATION	5	CALIBRATION	16
Wheel Units (left and right)	5	Calibration Fixture Set-Up	16
Memory Circuit Boards (left and right)	5	Calibration Check Procedure	16
Computation Circuit Board	6	Calibration Caster Camber	17
Relay and Logic Circuit Board	6	Checking Calibration Fixture	19
Power Supply	7	INDEX	19
OPERATION CHECK OUT	8		
Operation Check-Out Chart	8		

INTRODUCTION

The purpose of this manual is to make available to you the technician, as much information as possible to aid in the repair of the Telatronic® system and its parts identification. The manual includes Description, Theory of Operation, Operation Check-Out, Troubleshooting, Maintenance and Exploded Parts Views. Also, in the manual is an electrical schematic.

The following procedure should be used to service the Telatronic:

OPERATION CHECK-OUT

1. All functions must be checked and symptoms noted and compared with customer's complaints. Follow the steps in the calibration check procedure or operation check-out.
2. Review all Service Notices relating to the equipment and take required action.

SERVICE PRECAUTIONS

CAUTION: If a vehicle is on the rack, make sure rear wheels are blocked and car is in neutral.

CAUTION: Make sure wheel unit is unplugged before performing disassembly.

CAUTION: Toe Head bulb operates at extremely high temperatures. Allow to cool sufficiently before servicing Toe Head.

CAUTION: Do Not touch Toe Head bulb with bare fingers. The bulb is quartz halogen and finger prints on the bulb can cause it to burn out in a matter of minutes.

CAUTION: Make sure power is removed from meter unit before performing disassembly.

CAUTION: Use only a 75 watt maximum clear

TROUBLESHOOTING

Refer to the troubleshooting chart for specific problems. Use the following procedure until problems are isolated:

1. Check power supply outputs. If incorrect, check voltage inputs. Refer to wiring diagram.
2. Exchange suspected p.c. boards with known good units.
3. Make point-to-point ohmmeter continuity checks using information on wiring diagrams. This check will quickly show defective connectors, switches, board contacts, and bad wire connections.

CALIBRATION

1. The equipment should be operational and all repairs and modifications made before proceeding with calibration.
2. Follow steps given in Calibration Procedure section.

incandescent bulb to light the meters or meters will not illuminate properly.

CAUTION: Clean meter faces with a warm soapy damp cloth. Do Not use cleaning fluids, solvents or brake fluid on meter faces.

CAUTION: Clean cables with a warm soapy damp cloth. Do Not allow water to enter connector end.

CAUTION: If switch contacts require cleaning, use a cleaner that clearly states on the container that it will not harm plastics.

CAUTION: Always turn Telatronic Off when plugging or unplugging printed circuit boards.

FAILURE TO FOLLOW THESE PRECAUTIONS CAN RESULT IN DAMAGE TO EQUIPMENT.

SYSTEM COMPONENTS — IDENTIFICATION & FEATURES

The Telatronic is an electronic meter read out, wheel alignment system which aligns the front wheels to the rear wheels for total wheel alignment.

The system can be purchased as a complete service center with a set of meters for each wheel or as a mobile cart with one set of meters and an indicator light for the wheel being displayed. A wall mount and boom or track mount cabinet is also available.

The Dual unit includes an additional meter unit which contains a Camber, Caster and Toe meter. These added meters are slave meters to allow a greater visual readout than the single console provides.

The Dual unit contains meters only. The electronics for the complete system are in the Computrac drawer. For the dual unit the Computation Circuit board and the Relay and Logic circuit board are different than the same circuit boards in the single console unit. The Power Supply circuit boards and Memory circuit boards (Left and Right) are the same for both single and dual consoles. The push button units provide simplicity of use and ease of operation for speedy wheel alignment service.

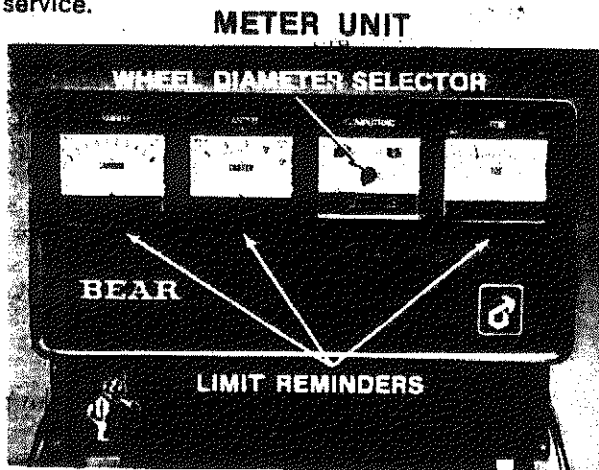


Figure 1. Meter Unit Identification

The meter unit contains the display meters and the electronic circuit boards for the alignment system, figure 1. The meters are illuminated when their function is selected. Each meter has two color coded Limit Reminders to display vehicle specification limits on the meter. Refer to figure 1 for meter unit identification.

Computrac Control Drawer

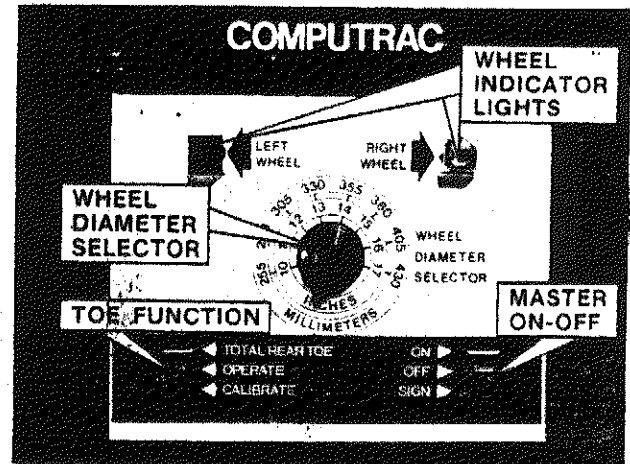


Figure 2. Computrac Identification

The Computrac Control Drawer contains the circuit boards for the complete system. The drawer slides out making the circuit boards easily accessible. See figure 12 for circuit board location identification.

Wheel Diameter Selector

The Wheel Diameter Selector is located on the control drawer. The selector is calibrated in inches for domestic vehicles and millimeters for import vehicles. The wheel size of the vehicle to be aligned is selected with the selector knob.

Left and Right Wheel Indicator

The Left and Right Wheel Indicator is used only on the single console model to indicate which wheel unit is in operation. They are color coded Amber for left and Green for right.

Master ON-OFF Switch

The Master ON-OFF switch is located on the Computrac Drawer. Power supplied is 115V., A.C., 60 Hz.

Toe Function Switch

The Toe Function Switch is located on the Computrac Drawer and controls the function of the Toe Head. The Toe Function Switch has three positions, Total Rear Toe, Operate and Calibrate. "Operate" position is used for normal front toe reading. "Total rear toe" position is used to read rear toe. "Calibrate" position is used when calibrating the Toe Head.

WHEEL UNIT

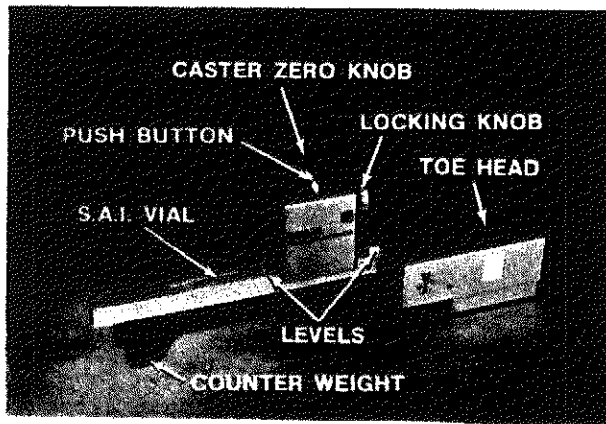


Figure 3. Wheel Unit Identification

The Wheel Unit contains the push buttons for the alignment functions, Toe Head, steering axis inclination vial, levels and counter weight.

The locking knob on the Wheel Unit locks the unit onto the wheel clamp spindles. The counter weight is used to balance the wheel unit using the levels as a guide during wheel alignment.

The caster zero knob is used to zero the caster meter during wheel alignment.

The camber, caster and toe push buttons select the meter and function to be performed during wheel alignment.

Located within the wheel unit beam is the steering axis inclination (S.A.I.) vial for measuring the S.A.I. angle.

Refer to figure 3 for part identification..

Toe Head

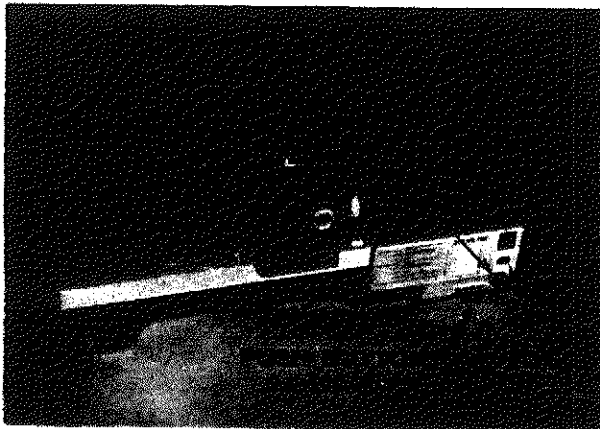


Figure 4. Toe Head Identification

The Toe Head contains the beam projection lamps and adjustable lens, the projection screens for front and rear tracking toe and the push button function controls and turret knob. The controls are positioned so all toe functions can be accomplished from under front of vehicle and be-

tween the front wheels. Refer to figure 4 for Toe Head identification.

The first three push buttons on the Toe Head control the input to the toe meter and memory circuit. The L/R switches the meter function from left to right wheel unit and vice versa.

The turret knob is used to place desired toe into the system and to align projected beams during wheel alignment. The beam focus knob focuses the projected beam on the receiving screens. Refer to figure 4 for part identification.

WHEEL CLAMP



Figure 5. Wheel Clamp Identification

The Wheel Clamp is fully adjustable to desired rim size and the spindle is self centering. The rim jaws are reversible for non-marring on sport rims. Three runout compensation knobs are used to remove wheel runout during alignment.

TRACKING MIRROR

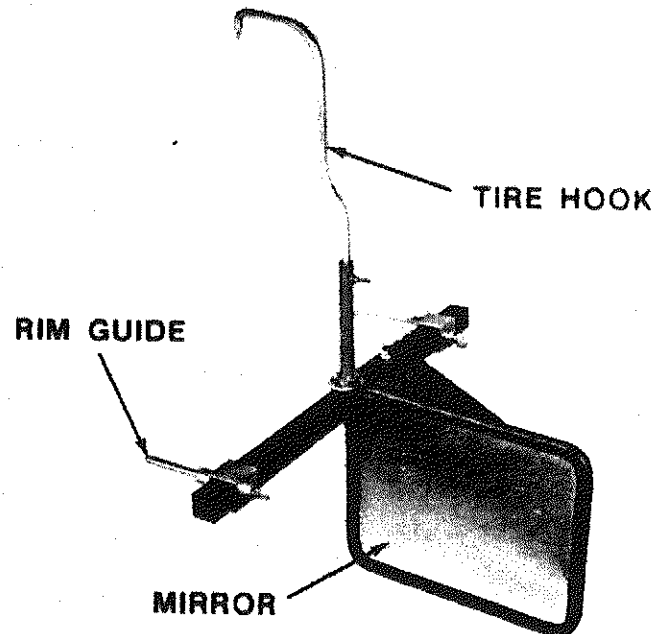


Figure 6. Tracking Mirror Identification

The Tracking Mirror is adjustable to wheel size by adjusting the tire hook and the rim guides. The mirror is breakable so use care when storing and using.

SPECIFICATIONS

ELECTRICAL

115 VAC 60 Hz. Single Phase

15 Ampere Service

Voltage to Wheel unit 12.5 V.D.C.

Right/Left Indicator Bulb No. 120PSB, type 32072-0

Meter Bulb 75 Watt Max. Clear

Wheel Unit Bulb 12V 60/55 Watt Quartz Halogen
(Phillips 12342PH4 or equiv.)

Flourescent Display Bulb 36 inch Cool White

Wheel Unit to Meter Unit Cable 22 Feet

AC Electrical Cord 12 Feet

Fuses:

Toe Lamps 10 Amp. Slo-Blow

Input Line 5 Amp. (Dual Console Models)
3 Amp. (Single Console Models)

ALIGNMENT CAPABILITIES

Camber Range (Red pointer) -3° to $+6^{\circ}$

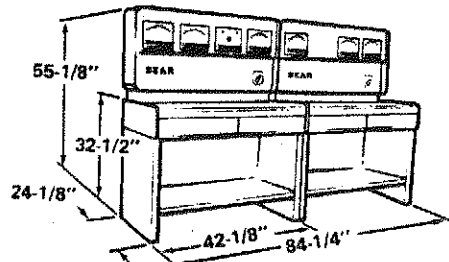
Caster Range (Blue pointer) $-7\frac{1}{2}$ to $+15^{\circ}$

Toe Range (Yellow pointer) $\frac{5}{16}$ " out to $\frac{5}{8}$ " in
8mm out to 14mm in
30' ($\frac{1}{2}^{\circ}$) out to 60' (1°) in

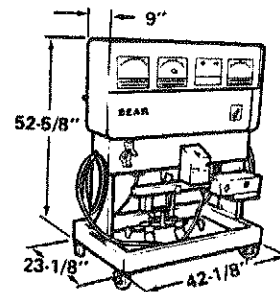
Rim Diameter 10 inch to 17 inch

Steering Axis Inclination -18° to $+18^{\circ}$

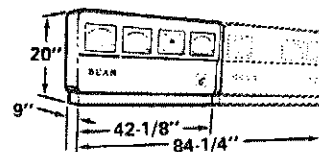
METER UNIT
(Service Center)



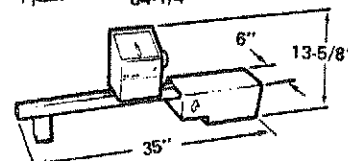
(Mobile Cart)



(Boom, Track or Wall)



WHEEL UNIT



CIRCUIT THEORY OF OPERATION

The Telatronic System is made up of two wheel units and a meter module. The meter module contains five (5) main electronic assemblies. They are:

1. The Left Memory Board (Figure 8)
2. The Right Memory Board (Figure 8)
3. The Computation Board (Figure 9)
4. The Relay and Logic Board (Figure 10)
5. The Power Supply Board (Figure 11)

WHEEL UNITS (LEFT & RIGHT)

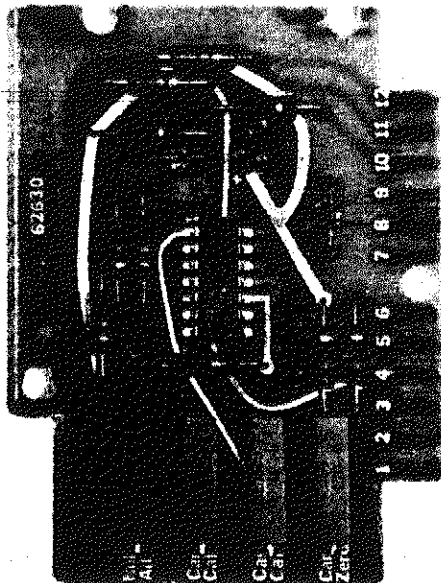


Figure 7. Wheel Unit Circuit Board

There are three function (Camber, Caster, Toe) selector buttons on the wheel unit. The switches signal the meter module as to the function and the side of the vehicle to be measured. The signaling is performed by momentarily grounding the appropriate control line.

The pendulum assembly receives a 500 Hertz excitation from the meter module. The outputs of the pendulum assembly are two differential A.C. signals that are rectified and filtered on the wheel unit board. (Figure 7) Here these filtered signals are summed by an operational amplifier. The operational amplifier output is a D.C. value proportional to the camber sensed by the pendulum assembly. This signal is then sent to the meter module.

The Zero Caster Control Pot sets a reference for the Caster Meter when in the Caster mode. The Zero Caster signal is buffered to eliminate loading of the zero Caster Control Pot.

The toe function can be activated by either the toe function switch or the R/L switch on the Toe Head.

The toe procedure is started by depressing toe button #1. This turns on the toe filament of the Toe Lamp and grounds the T_1 control line. With the toe filament "ON", the Toe Head projects an image across the front of the car to be aligned with a reference on the other side of the car, by turning the knob of the turret position pot.

Then toe button #2 is depressed which turns the toe filament "OFF" and grounds the T_2 control line. When the toe filament is "OFF", the tracking filament is "ON". The tracking filament projects an image down the side of the vehicle to a mirror on the rear wheel and then back to a viewing screen in the Toe Head. The viewing screen can be seen in a mirror. The projected image is aligned with the reference on the viewing screen by turning the knob connected to the turret position pot.

The signals from the turret position pot are fed into the meter module for processing.

Then toe button #3 is depressed which grounds the T_3 control line. The procedure is repeated on the other side of the car. When both #3 buttons have been depressed, the toe meter is referenced to an electrically derived line that is parallel to the thrust line of the car. The turret pots are adjusted so that each wheel has the corrected amount of toe indicated on the meter. Once this is accomplished the toe rods are adjusted to bring the projected tracking image back into alignment with the reference on the tracking view screen.

MEMORY CIRCUIT BOARDS (LEFT & RIGHT)

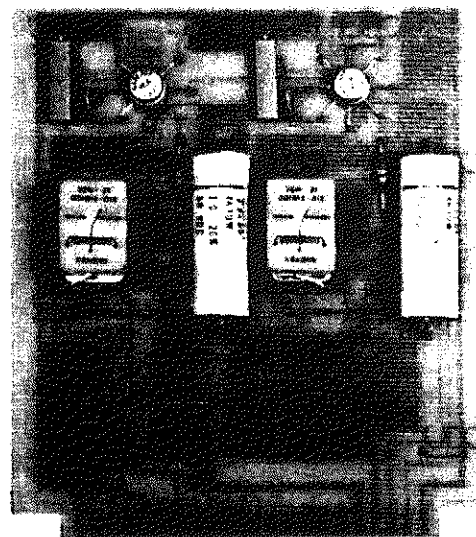


Figure 8. Memory Circuit Board

Each of the memory boards can store two voltage values. These values are stored in capacitors. The capacitor voltage is sensed by a buffer ampli-

fier with an extremely high input impedance.

The outputs of the two amplifiers are the outputs on the memory board. One output is called T_1 value which is proportional to the position of the turret pot at the time just before the #2 button was depressed. The other output is the T_2 value and relates to the position of turret pot just before the #3 button was depressed. In other words the stored value is determined by the turret pot just before the appropriate control line is released from ground.

However, there is only one input to each memory board and it comes from the Computation Board.

COMPUTATION CIRCUIT BOARD

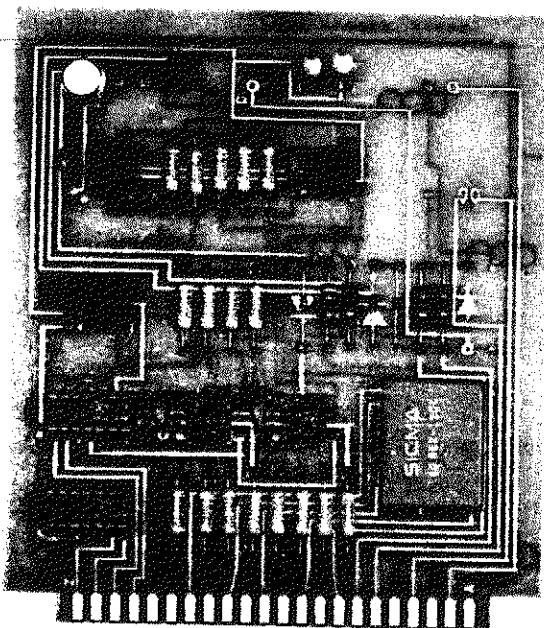


Figure 9. Computation Circuit Board (Single Console)

The outputs of the right and left turret position pots feed into buffer amplifiers on the Computation Board. The outputs of the buffer amplifiers go to the Wheel Size Switch to scale the signal. The outputs from the switch go back to the Computation Board to another set of buffer amplifiers. The scaled and buffered toe signals are then supplied to the respective memory board and also to the Relay and Logic Board.

The Computation Board Receives the T_1 and T_2 values from the two memory boards. When the #3 buttons on both Toe Heads are depressed, grounding the T_1 control lines, this board then references the toe meter to a value equal to:

$$\frac{(L.T._2 - L.T._1 + R.T._2 - R.T._1)}{2}$$

This value is computed using operational amplifier arithmetic circuitry. It represents electrically a line parallel to the thrust line of the vehicle.

Before the last #3 button is depressed, the toe meter can be made to indicate Total Rear Toe by pressing the toe function switch on the Meter Module to the appropriate position. This is an output from the Computation based on the value:

$$(L.T._2 - L.T._1) + (R.T._2 - R.T._1)$$

The toe function switch can also be placed in a calibrate position. This then allows the meter to indicate the position of the turret position pot. This function is used for calibration and troubleshooting.

However, the position of the Toe function switch is of no consequence once both #3 buttons on the Toe Head have been depressed. The machine automatically goes into the normal operational mode. The meter then indicates the wheel position in relation to the vehicles' thrust line.

RELAY & LOGIC CIRCUIT BOARD

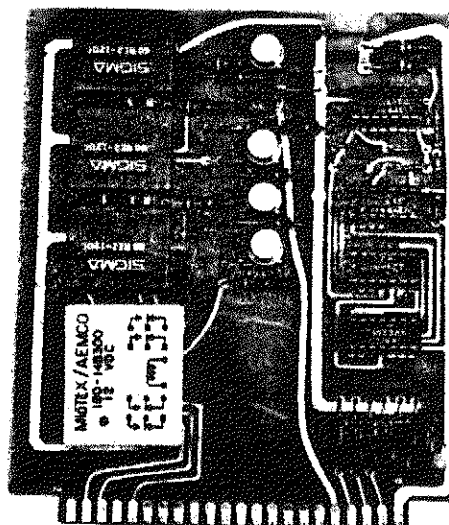


Figure 10. Relay & Logic Circuit Board (Single Console)

The function of Relay and Logic Board is to route the Camber, Caster and Toe signals from the right and left wheel units, to the appropriate meter according to control line signals from the Function switches on the Wheel Units. When a function switch is closed, the former function is dropped out and the new function is latched in. As a result of this latch operation the Function switches become momentary action switches and the Meter Module can be controlled entirely from either Wheel Unit.

The Relay and Logic circuit board also controls the meter back lighting lamps according to the function use. It also controls the right and left indicators.

POWER SUPPLY

The power supply board outputs are; regulated d.c. voltages of +12 volts, + 6 volts, -6 volts and -12 volts and 2 volts 500 Hertz to drive the pendulum assembly exciter coil.

A power transformer supplies the power supply board with 30 volts center tapped. The transformer also supplies 12.5 volts for the toe lamps in the Wheel Units. This 12.5 voltage is fused at 10 amps. to prevent transformer failure if a short occurs in the cable to the Wheel Units.

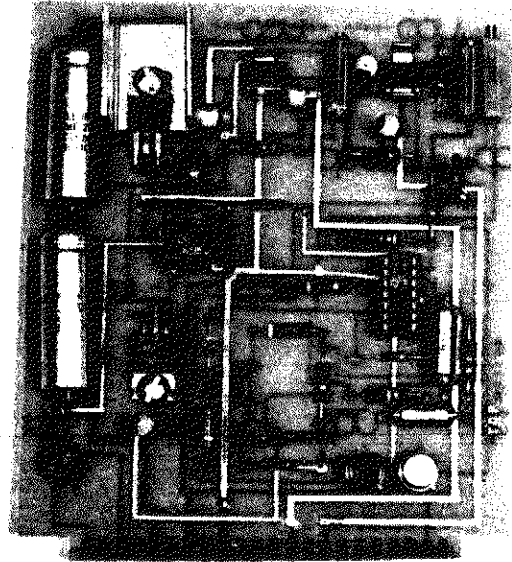


Figure 11. Power Supply Circuit Board

OPERATION CHECK OUT

The operation check out is a condensed chart of the operation procedure in the operation manual. It may be used when the Telatronic is set up for alignment with a vehicle. This procedure should be used to check out the operation of the Telatronic if the calibration fixture is in doubt or if you

feel the problem is improper operator procedure. The only procedure necessary prior to using the chart is "Eliminating Wheel Runout".

If the equipment is suspected of being out of calibration or defective, refer to the Troubleshooting and Calibration sections of this manual.

CHECK OUT CHART

CHECK OUT CHART													
CHECK	METER UNIT			WHEEL UNIT			TOE HEAD			REMARKS	RESULTS		
	Wheel Dia. Selector	Main Power Switch	Toe Function Switch	Camber Button	Caster Button	Toe Button	Toe #1	Toe #2	Toe #3	L/R Button			
CAMBER LH	X			X							Wheel Unit Level	Camber Meter Reads Left Camber	
CAMBER RH	X			X							Wheel Unit Level	Camber Meter Reads Right Camber	
CASTER LH	X				X						Wheel Unit Locked/wheel in 10° —zero meter out 10°	Caster Meter Reads LH Caster	
CASTER RH	X				X						Wheel Unit Locked/wheel in 10° —zero meter out 10°	Caster Meter Reads RH Caster	
TOE SET-UP	X	X	X					X			Wheel Unit Level & Straight Ahead. Tracking mirrors installed	Turn turret knob to align crosshairs & target	
TOE Test 1 & TRACK	X	X	X				X		X		Turn turret knob & align crosshairs & target	Note: L/R for side checking	
	X	X	X					X			Turn turret knob & align crosshairs & target	—	
	X	X	X						X		Note: Perform for both Toe Heads	Toe Meter Reads Toe	

TROUBLESHOOTING

The troubleshooting section of this manual should be used to isolate problems in the Telatronic System. As a quick method of isolating defective circuit boards, exchange suspected circuit boards with known good ones.

The numbers in the Troubleshooting chart indicate the sequence of the probable cause to be checked.

Also Wheel Units and Control Cables can be switched from side to side to help isolate defective components.

The system circuit boards are repairable by the factory only and therefore circuit board information has not been included in this manual.

TROUBLESHOOTING CHART

PROBLEM	PROBABLE CAUSE											
	Fuse	Lamp Burnt Out	Wheel Unit Cable	Function Switch (Wheel Unit)	Logic & Relay Circuit Board	Check Power Cord	Master ON-OFF Switch	Power Transformer	Power Supply Circuit Board	Toe Potentiometer	Computation Circuit Board	Check Wiring
Left and Right Toe Lamps Out	1	2										
Toe Lamp Not Lit on all Positions		1										
Meter and/or Side Will not Change			1	2	4		3					
No Lights	2					1	3					
All Lights Out — Sign Light On	1						2					
Left Side Light & Sign Light On (all others off)								1				
Toe Meter Lights in Calibrate No meter indication			1							2	3	4
Toe Meter Indicates Only in Total Rear Toe						1						
Toe Meter Indicates in Calibrate and Total Rear Toe — not in button 3											1	
Caster & Camber Light On — no indication								2	1			

TOE ELECTRICAL TROUBLESHOOTING PROCEDURE

The Toe Electrical Troubleshooting Procedure is an electrical troubleshooting check procedure of the computation and memory circuits used for toe calculation in the Telatronic. This procedure will find the defective circuit board in the computrac drawer electrically, by actually performing predetermined toe computations in the system. If the meter readings are incorrect, this procedure will assist in locating the defective circuit board.

1. Telatronic need not be set-up on vehicle or calibration bar.

2. Place "Power Switch" to ON, "Wheel Size Selector" to 17, and "Toe Function Switch" to Calibrate.

3. Refer to Toe Check Chart and perform the steps as indicated.

4. If after Step 3 and 7 meter does not read zero, follow Circuit Board Troubleshooting procedure.

5. If after Step 8 meter does not read zero, follow Circuit Board procedure.

TOE CHECK CHART

PROCEDURE						
Step	LEFT TOE HEAD			RIGHT TOE HEAD		
1	Push L/R button	Push #1 button	Adjust Turret knob until left head meter reads zero	Push L/R button	Push #1 button	Adjust Turret knob until right head meter reads zero
2	Push L/R button	Push #2 button	Adjust Turret knob until left head meter reads $\frac{1}{4}$ " OUT	Push L/R button	Push #2 button	Adjust Turret knob until right head meter reads $\frac{1}{4}$ " IN
3	Place Toe Function Switch on Computrac Drawer to "TOTAL REAR TOE" Position. Toe Meter should read zero. If meter DOES NOT read zero, trouble could exist in Computation or Memory Circuit Boards. Refer to "CIRCUIT BOARD TROUBLESHOOTING PROCEDURE".					
4	Push L/R button	Push #3 button	Meter should read $\frac{1}{4}$ " OUT. If meter does not read $\frac{1}{4}$ " OUT, refer to "Circuit Board Troubleshooting Procedure".	Push L/R button	Push #3 button	Meter should read $\frac{1}{4}$ " IN. If meter does not read $\frac{1}{4}$ " IN, refer to "Circuit Board Troubleshooting Procedure".
5	Push L/R button	Push #1 button	Adjust Turret knob until left head meter reads $\frac{1}{4}$ " OUT	Push L/R button	Push #1 button	Adjust Turret knob until right head meter reads $\frac{1}{4}$ " IN
6	Push L/R button	Push #2 button	Adjust Turret knob until left head meter reads zero	Push L/R button	Push #2 button	Adjust Turret knob until right head meter reads zero
7	Place Toe Function Switch on Computrac Drawer to "TOTAL REAR TOE" Position. Toe Meter should read zero. If meter DOES NOT read zero, trouble could exist in Computation or Memory Circuit Boards. Refer to "CIRCUIT BOARD TROUBLESHOOTING PROCEDURE".					
8	Push L/R button	Push #3 button	Meter should read zero. If meter does read zero, refer to Circuit Board Troubleshooting Procedure".	Push L/R button	Push #3 button	Meter should read zero. If meter does not read zero, refer to "Circuit Board Troubleshooting Procedure".

CIRCUIT BOARD TROUBLESHOOTING PROCEDURE

If meter has not read $\frac{1}{4}$ " on step 4 or zero on step 8 the following circuit boards are defective.

Right Memory Circuit Board
Left Memory Circuit Board
Computation Circuit Board

NOTE: All three circuit boards may be replaced if time is a critical factor. However, this procedure will find the defective circuit board.

1. Check the DC voltage at pin 16 on the (left or right) Memory Circuit Board, while rotating turret on (left or right) Toe Head. If voltage does not vary, replace Computation Board.
2. Push button No. 1 on (left or right) Toe Head. Check the DC voltage at pin 2 on the (left or right) Memory Circuit Board, while rotating turret on (left or right) Toe Head. If voltage does not vary, replace (Left or right) Memory Board.

3. Push button No. 2 on (left or right) Toe Head. Check the DC voltage at pin 2 and 3 on the (left or right) Memory Circuit Board, while rotating turret on (left or right) Toe Head. Voltage should remain unchanged. If voltage varies replace (left or right) Memory Board.
4. Check voltage on pin 20 on the (left or right) Memory Circuit Board, while rotating turret on (left or right) Toe Head. Voltage should vary with turret knob. If voltage does not vary, replace (left or right) Memory Board.
5. If both Memory Circuit Boards check good, replace Computation Circuit Board.

NOTE: Right Memory Circuit Board may be placed in the left Memory Circuit Board connector for check out to aid in pin accessibility, but remember that the right controls must then be used.

MAINTENANCE

The disassembly and reassembly of most of the Telatronic components is relatively simple. The exploded views in the SERVICE PARTS LIST will aid you in the disassembly and reassembly of the components. Components requiring special procedures are outlined in this section.

COMPUTRAC CONTROL DRAWER

Refer to figure 12 for identification of circuit boards and location in the Computrac drawer.

WHEEL UNIT

The Wheel Unit contains the wheel unit circuit board, function switch, zero potentiometer and the pendulum assembly.

The circuit board may be removed by removing one screw and loosening two screws. Then pull tab on connector and remove circuit board from connector.

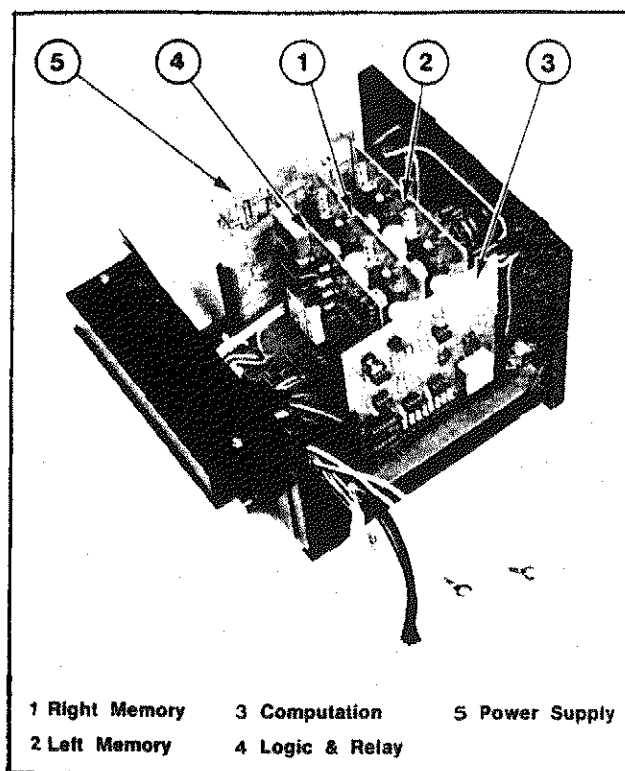


Figure 12. Circuit Board Location

TOE HEAD

Refer to figure 4 for Toe Head identification. The condenser lens tube assemblies and tracking projectoe lens barrel assembly are held into place by allen head set screws. These screws must be removed to replace either lens tube assembly.

TURRET TEFLON WASHERS

Located between the turret assembly and the toe head are 2 teflon washers which allow the turret assembly to turn with the turret knob. Use the following procedure if these washers should need replacement.

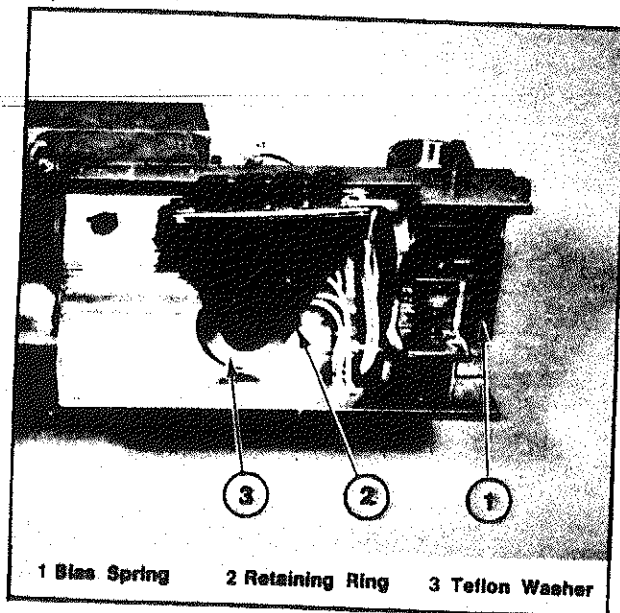


Figure 13. Turret Teflon Washers

1. Remove sheet metal from Toe Head.
2. Remove bias spring, figure 13.
3. Remove quartz lamp assembly.
4. Remove retaining ring from turret and left off turret.
5. Replace washers. Lubricate turret and washers with teflon-based grease.
6. Assemble washers onto turret and replace turret onto chassis.
7. Replace retaining ring, quartz lamp assembly, bias spring and sheet metal.

S.A.I. VIAL REPLACEMENT

1. Remove S.A.I. Vial adjustment screw, located under wheel unit beam, under S.A.I. assembly.
2. Remove two screws from S.A.I. cover and remove cover, and lift out S.A.I. vial.
3. Install replacement S.A.I. vial as shown in figure 14.

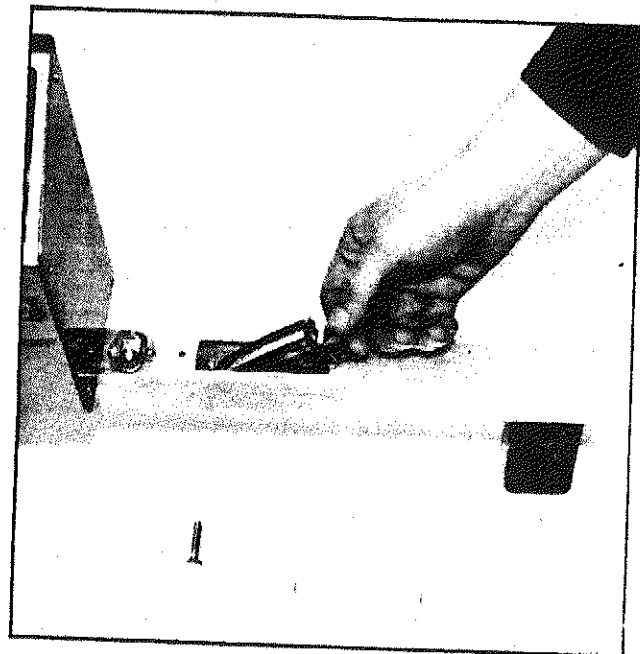


Figure 14. S.A.I. Vial Replacement

NOTE: S.A.I. vial only installs one way. Vial end without springs must install into cavity end toward wheel unit first. There is a left S.A.I. vial for the left wheel unit and right S.A.I. vial for the right wheel unit.

4. Install adjustment screw into bottom of wheel unit beam and adjust vial so S.A.I. cover and two screws can be installed.

CABLE CONNECTOR REPLACEMENT

1. Remove the damaged connector from the cable by cutting the cable directly in back of damaged connector.
2. Install connector housing onto cable.

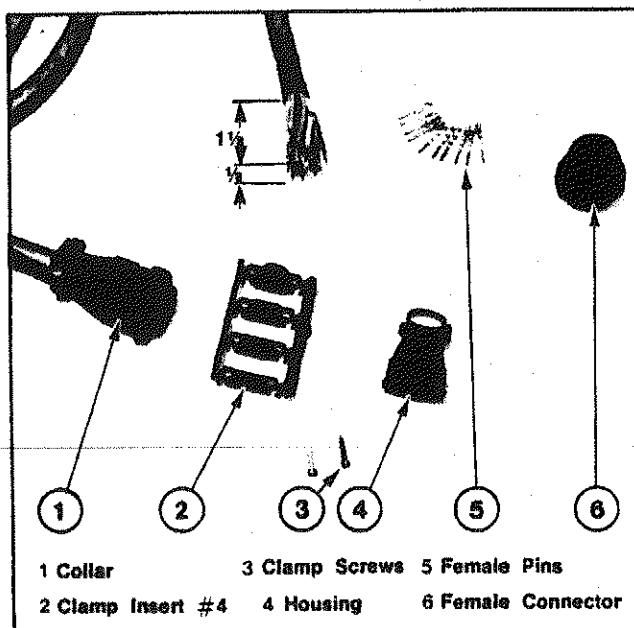


Figure 15. Connector Parts

3. Strip the outer cable covering 1 1/2 inch back from the end of the cable.
4. Strip each wire 1/2 inch from end of wire.
5. Using a suitable crimping tool crimp pins to wires.
6. Insert pins into connector observing wire color code and hole numbers.

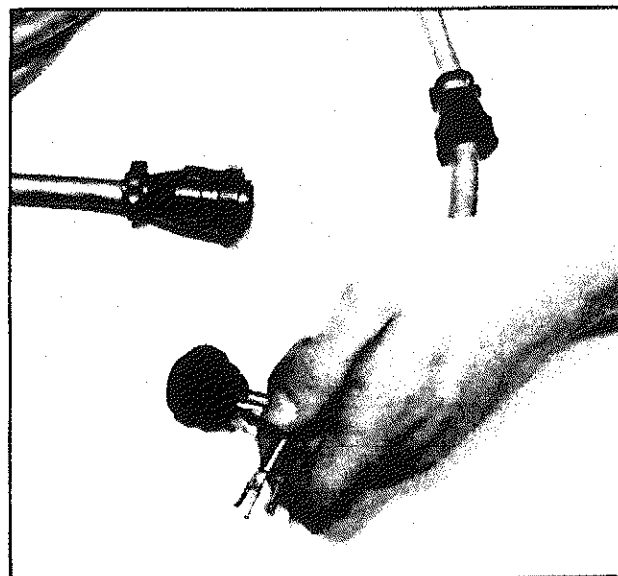


Figure 16. Inserting Pins into Connector

NOTE: Make sure pins are inserted all the way into the connector. Pins will snap into place when properly seated.

7. Screw housing onto connector and secure housing to cable by using number 4 clamp insert and two screws.

NOTE: If screw clamp collar is broken, it may be replaced separately.

IPCEA COLOR CODE

Pin No.	Wire Color	Pin No.	Wire Color
1	Black	8	Red/Black
2	White	9	Green/Black
3	Red	10	Orange/Black
4	Green	11	Blue/Black
5	Orange	12	Black/White
6	Blue	13	Red/White
7	White/Black	14	Green/White
		15	Blue/White

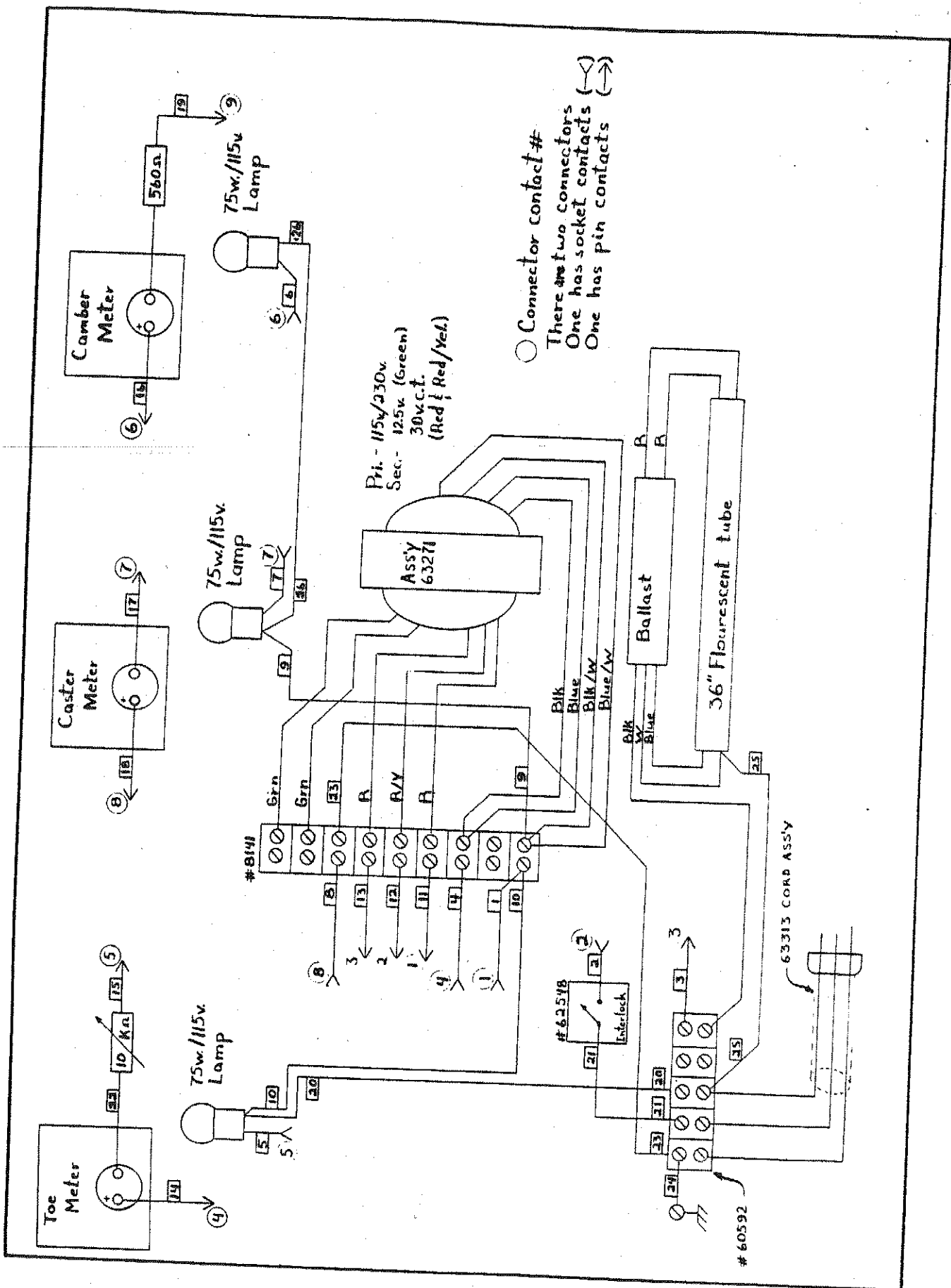


Figure 17. Meter Module Wiring.

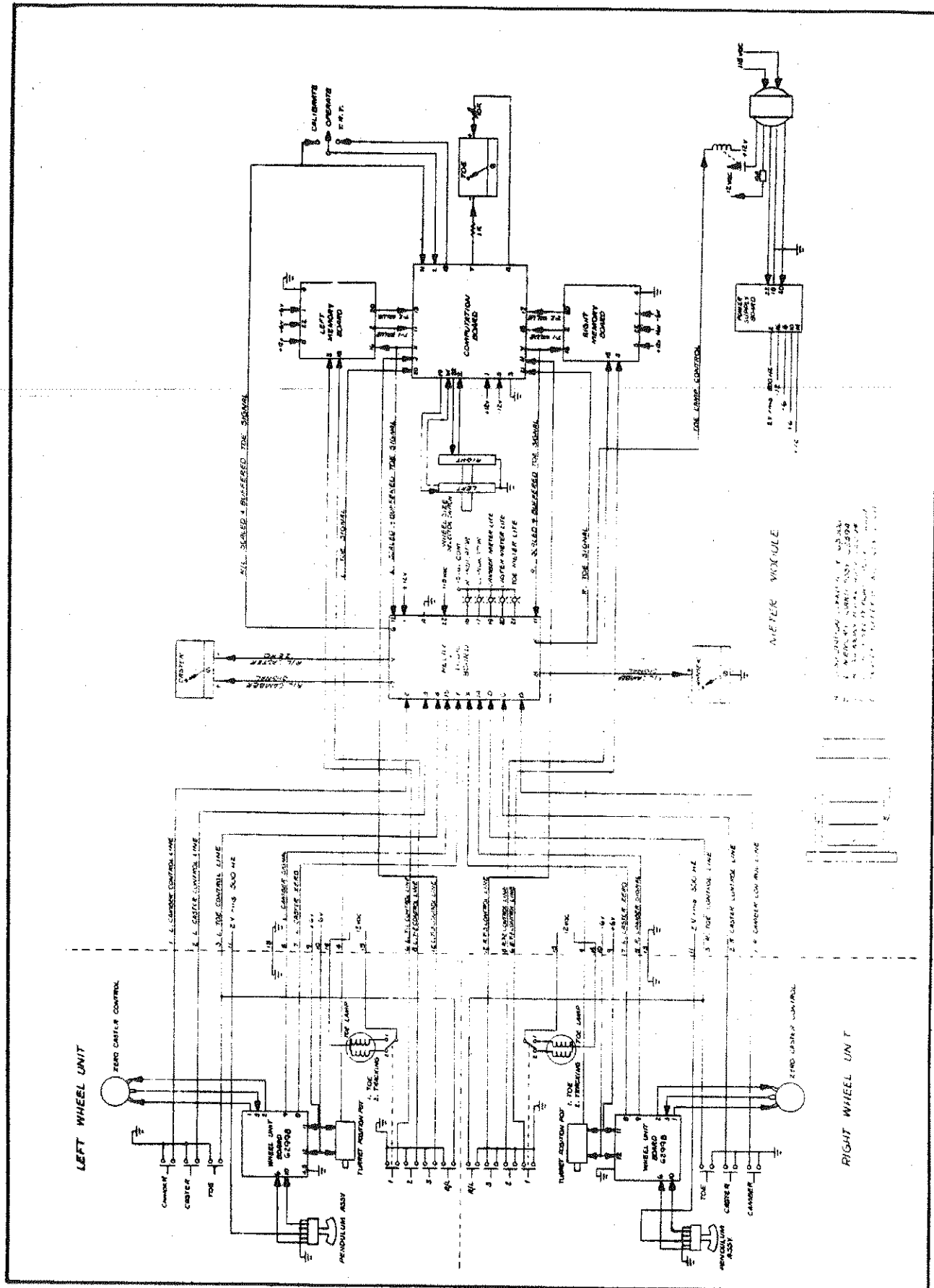


Figure 18. Wiring Diagram.

CALIBRATION

The calibration procedure is a detailed step by step procedure to calibrate the wheel units, tracking mirrors and meter module together to produce one accurate measuring system.

The Telatronic may need calibration due to rough handling of the equipment or if the wheel unit or tracking mirror should be dropped and knocked out of calibration or the electronic circuits have aged and require calibration. Whatever the reason, make sure the Telatronic is operating properly and that the trouble is not operator procedure error before calibrating the equipment.

The Calibration Check Procedure is a short check used to determine if calibration is actually necessary. Perform this check prior to performing the calibration procedure.

Refer to figure 19 for identification of calibration fixture components.

Check with the equipment operator and make sure the Calibration fixture has not been dropped or

damaged. The "Checking Calibration Fixture" procedure should be used if the calibration fixture is suspected of being damaged or misaligned.

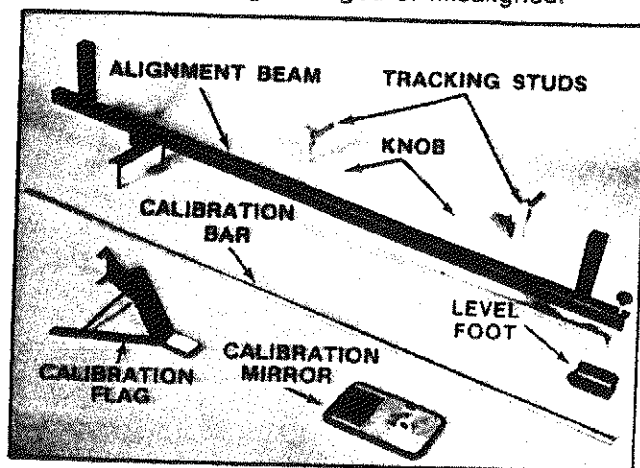


Figure 19. Calibration Fixture Identification.

CALIBRATION FIXTURE SET-UP

1. Rotate right leg and lock in place with thumb screw. Place alignment beam onto turning radius plates of rack, left end of beam on left turning radius plate, right end of beam on right turning radius plate.
2. Remove left tracking stud knob, tracking stud and level foot. Install level foot under left end and install tracking stud so stud faces to the rear of the rack.
3. Remove right tracking stud knob and tracking stud and install tracking stud so stud faces to the rear of the rack.
4. Remove calibration bar from center of alignment beam and install into tracking stud blocks from the center. Adjust bar so it is equal on both ends, and rotate the bar so the word "TOP" on the bar is to the top. Install and tighten tracking stud knobs securely.

CALIBRATION CHECK PROCEDURE

NOTE: This procedure is used to check wheel unit to see if calibration is necessary. Make sure units have at least fifteen minutes warm up time prior to calibration check.

TOE CHECK

1. Mount right wheel unit onto right tracking stud.
2. Mount calibration mirror onto left tracking stud.
3. Push button two.
4. Adjust mirror so that hair line reflects onto tracking screen.
5. While observing tracking screen viewer, rotate turret knob to align vertical line with tip of target.
6. Remove calibration mirror.
7. Install left tracking mirror at extreme end of left side of calibration bar.
8. Observe tracking screen viewer. Vertical line should fall within width of target arrow.
9. Install calibration mirror onto right tracking stud.
10. Install left wheel unit onto left tracking stud. Perform procedures 3 through 8 using right tracking mirror.
11. Remove tracking mirror and install left wheel unit onto calibration bar on left end and right wheel unit onto calibration bar on right end. Make sure both units are level.
12. On right wheel unit press button No. 1 and press L/R button.
13. Toe master should read zero + or - $1/64$ of an inch. Vertical lines should align within the width of the target arrows on the left toe screen.
14. On left toe head push button No. 1, and L/R button. Toe meter should read zero + or - $1/64$ " and vertical line on right toe screen should align within width of target arrow.

CALIBRATION — CASTER CAMBER

RIGHT WHEEL UNIT

NOTE: Make sure units have at least fifteen minutes warm up time prior to calibration.

1. Place master on/off switch to on.
2. Make sure wheel units are plugged into meter unit. On a single unit, when caster/camber or toe buttons are pressed the right light should go on with right unit.
3. Install right wheel unit onto left end of calibration bar and lock into place.
4. Move calibration bar adjustment knob until camber check vial is level.
5. At wheel unit, push camber button. Camber meter should read zero.
If it does not;
adjust camber zero potentiometer until meter read zero.
6. At wheel unit, push caster button.
7. Adjust caster zero knob until caster meter reads zero.
8. Push camber button.
9. Remove level foot from left end. Camber meter should read $+2^\circ$. If camber meter does not read $+2^\circ$, adjust camber calibrate potentiometer located on rear of wheel unit, until meter reads $+2^\circ$.
10. Push caster button. Caster meter should read $+5\frac{3}{4}^\circ$. If caster meter does not read $+5\frac{3}{4}^\circ$, adjust caster calibrate potentiometer located on rear of wheel unit, until caster meter reads $+5\frac{3}{4}^\circ$.
11. Install level foot in a vertical position.
12. Push camber button. Camber meter should read $-1\frac{1}{8}^\circ$ to $-2\frac{1}{8}^\circ$. If it does not, re-check camber zero.
13. Push caster button, meter should read $-5\frac{1}{2}^\circ$ to -6° . If not, re-check camber calibrate.
14. Install right wheel unit onto right end of calibration bar and lock into place.

LEFT WHEEL UNIT

15. Install left wheel unit onto left end of calibration bar and lock into place. Place level foot in horizontal position.
16. Repeat steps four through thirteen.
17. Place level foot in level position.

TOE CALIBRATION

NOTE: During calibration it is good practice when adjusting turret knob. Approach the final adjustment in a clockwise direction.

1. Re-level both wheel units using level vial and lock securely.

NOTE: Units must remain level through out calibration procedure.

2. Push toe button on left wheel unit.
3. Push button No. 1 on both toe heads.
4. Adjust turret control so projected hair line aligns with vertical line on opposite toe screen on both units. Focus to obtain a sharp image.
5. Install calibration flag onto calibration bar approximately 18" from wheel unit being calibrated.

NOTE: Make sure flag is fully opened and locked into position.

6. Focus hair line onto flag, loosen adjustment screws on flag screen. Adjust the tip of calibration arrow on the flag to coincide with vertical projected hair line.
7. Move calibration flag to the extreme opposite end of calibration fixture and refocus beam. Projected vertical hair line should align with tip of calibration arrow on the flag. If projected line and arrow do not line up.
 - a. Turn turret knob, move projected line slightly past arrow tip.
 - b. Move calibration flag to approximately 18" from wheel unit being calibrated. Refocus hair line onto flag.
 - c. Loosen adjustment screws on calibration flag screen and move screen until arrow tip and projected line align.
 - d. Repeat a, b, and c until projected line coincides with tip of arrow.
8. Perform calibration procedure for right toe head.
9. Re-check level of both wheel units.
10. Focus both projected hair lines onto opp

toe head toe screens, and observe positions of vertical lines.

11. Loosen screws on toe screen and adjust screen vertical line to coincide with projected hair line, retighten screws.
12. Place Toe Function Switch on meter panel to CALIBRATE, turn (Wheel Diameter Selector) to 17.
13. Push L/R button on left unit.
14. Observe toe meter; it should read zero + or $-1/64$ " (+ or $-1/2$ millimeter). If meter does not read zero:
 - a. Remove lower access cover from toe unit.
 - b. Loosen turret knob to potentiometer coupling using allen wrench.
 - c. With turret knob stationary rotate potentiometer shaft until toe meter reads zero while vertical line is aligned with opposite target, retighten coupling.
15. Push L/R button on right unit and perform step 14.

FINAL TOE CALIBRATION CHECK

1. Push right L/R button.
2. On right toe unit, adjust turret knob until toe meter reads zero.
3. Push left L/R button.
4. On left toe unit, adjust turret knob until toe meter reads zero.
5. Place toe switch on meter unit to OPERATE.
6. On right toe unit, push button numbers 1, 2, and 3 with a five second pause between buttons.
7. On left toe unit, push button numbers 1, 2, and 3 with a five second pause between buttons.
8. Toe meter should read zero + or $-1/64$ ".
9. Press right L/R button on opposite unit and observe meter.
10. Toe meter should read zero + or $-1/64$ ".