CCD-1500
Wheel Alignment Machine

Operating Instructions

Table of Contents

Introduction

⚠ Safety Precautions

- *MAKE SURE THE VEHICLE CANNOT ROLL.* If necessary, block the wheels to keep the vehicle from rolling off the rack.

- When raising the vehicle, use a proper jacking system provided with the rack.

About This Manual...

Figure 1-1 highlights the features on each page which will allow the reader to find and understand information quickly and easily.

❶ Chapter Heading - Allows the reader to locate main section headings while "thumbing through" the manual.

❷ Topic Headings - Identifies major topics within the chapter.

❸ Topic Subheadings - Calls attention to important concepts.

❹ Illustrations - Explain important ideas or procedures.

❺ Important Reader Messages:

⚠ *CAUTION!* When this symbol appears, the potential exists for serious injury and/or damage to the CCD-1500. READ AND FOLLOW THE INSTRUCTIONS IN THIS TYPE OF NOTE CAREFULLY!

IMPORTANT NOTE: Information in this type of note is extremely important and may affect CCD-1500 operation and quality of test results. READ THESE NOTES CAREFULLY!

NOTE: Notes contain helpful hints and tips to make operating the CCD-1500 easier.
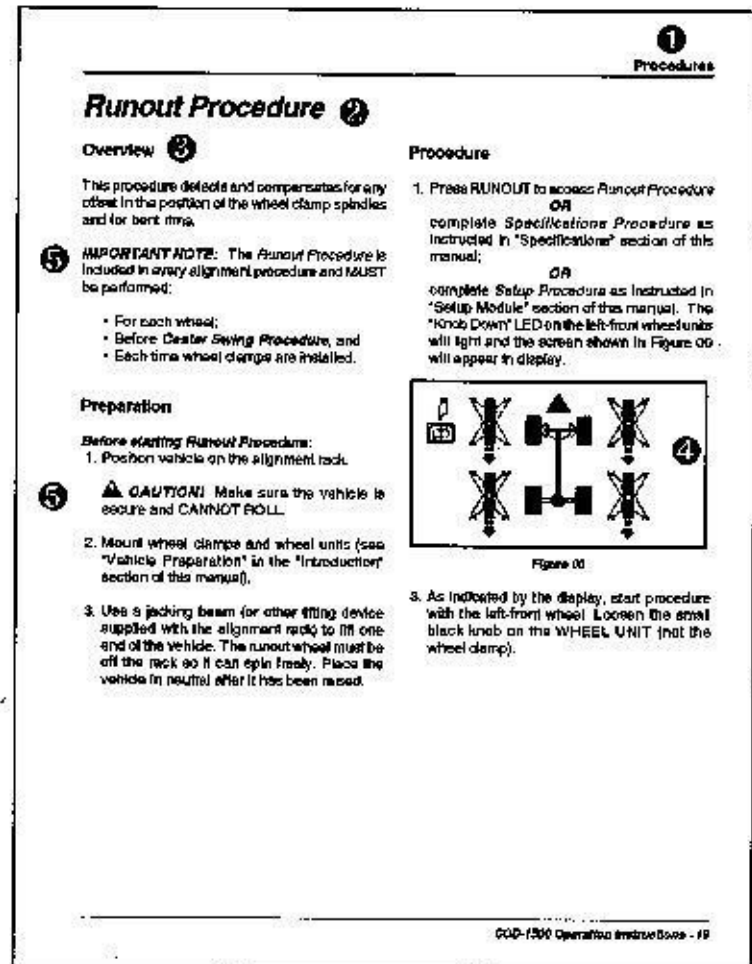
Figure 1-1

Alignment Overview

IMPORTANT! The following hardware items are essential for proper alignment. Read and understand the following descriptions and carefully follow the installation instructions appearing at the end of this chapter.

Wheel Units

See Figure 1-2. Wheel Units contain sensors which measure wheel position. Front wheel units (A) are mounted on front wheels; rear wheel units (B) are mounted on rear wheels. During alignment, wheel units are mounted to wheel clamps attached to the vehicle's wheels (see next section). Use wheel units as a set. Do NOT use wheel units from another alignment machine.
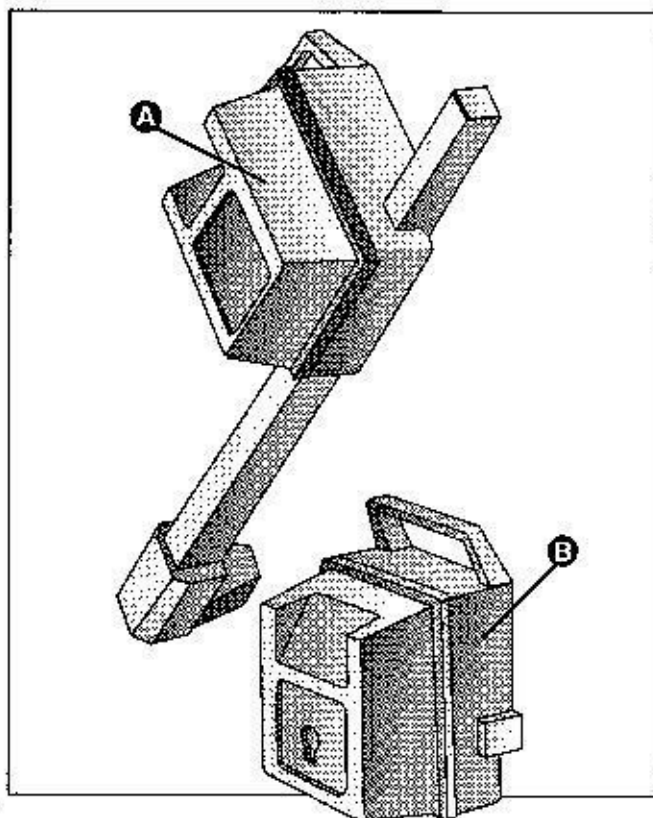
Figure 1-2

Wheel Clamps

Wheel clamps are four-armed clamps that attach to a vehicle's wheels (see Figure 1-3). The clamps provide spindles for hanging the wheel units. A wheel clamp spindle centers itself as the clamp is tightened on a rim.
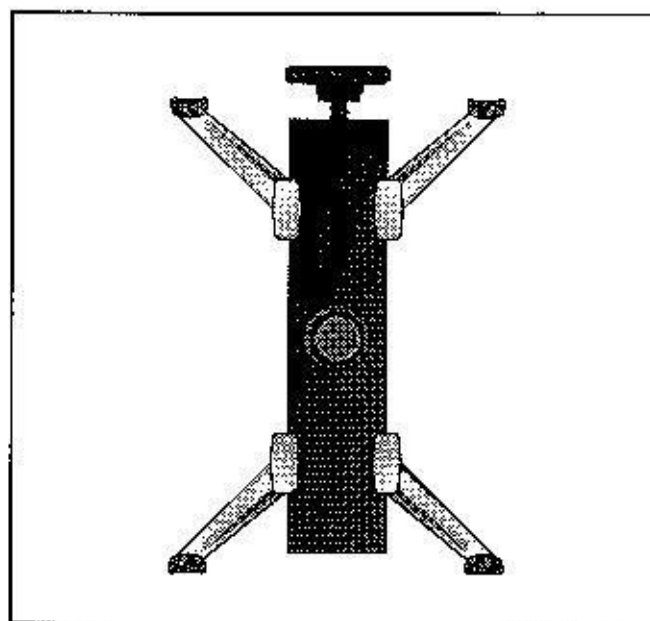
Figure 1-3

Controls

CCD-1500 (Refer to Figure 1-4)
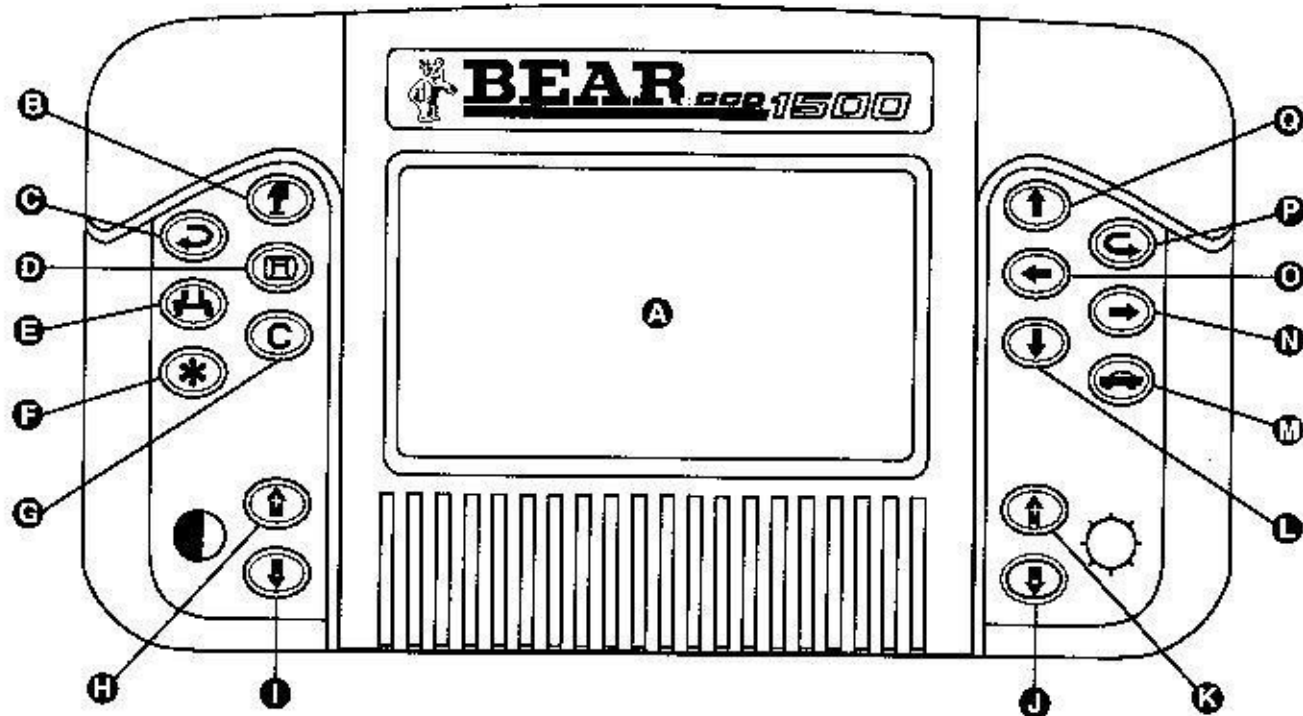
Figure 1-4

The CCD-1500 includes a liquid crystal display (LCD) screen (A) to display alignment menus and information. The sixteen function buttons control the alignment program as follows:

B. **Enter** - Press to confirm selected (highlighted) values.

C. **Backup** - Press to return to previous display screen.

D. **Set-Up** - Press to change units of measure and other values used throughout alignment program.

E. **Caster Swing** - Press to access Caster Swing function from anywhere in alignment program.

F. **Options** - Press to access alignment options.

G. **Clear** - Press to delete selected (highlighted) values.

H. **Increase Contrast** - Press to increase display contrast.

I. **Decrease Contrast** - Press to decrease display contrast.

J. **Decrease Brightness** - Press to decrease display brightness.

K. **Increase Brightness** - Press to increase display brightness.

L. **Down Arrow** - Press to select field below current field.

M. **Specifications** - Press to access vehicle make and model information.

N. **Right Arrow** - Press to select field to right of current field.

O. **Left Arrow** - Press to select field to left of current field.

P. **Continue** - Press to advance to next display screen.

Q. **Up Arrow** - Press to select field above current field.

Wheel Unit Controls

Wheel Unit Keypad

The alignment program may be controlled from any of the wheel units through the wheel unit keypads (see Figure 1-5).
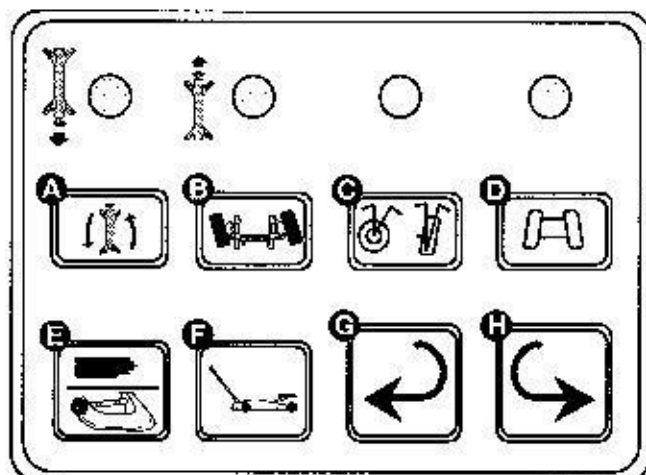
Figure 1-5

The keys function as follows:

A. **Runout** - Press to start the *Runout* procedure. Once in Runout mode, the runout key is used to take measurements in the "KNOB DOWN" and "KNOB UP" positions at a given wheel unit.

B. **Caster Swing** - Press to start the *Caster Swing* procedure

C. **Camber/Caster** - Press to select adjustment meters.

D. **Toe/Track** - Press to select adjustment meters.

E. **Drawing/Text** - (Not available on the CCD 1500) Steps through diagnostic drawings and associated text screens when specifications are loaded.

F. **Jack & Hold** - Press to select display readings when the wheels are jacked up.

G. **Backup** - Press to return to previous step in the procedure currently running.

H. **Continue** - Press to continue to the next step in the current procedure.

Wheel Unit LEDs

Each wheel unit has two light-emitting diodes (LEDs) which display wheel status during *Runout* procedure (see Figure 1-6).
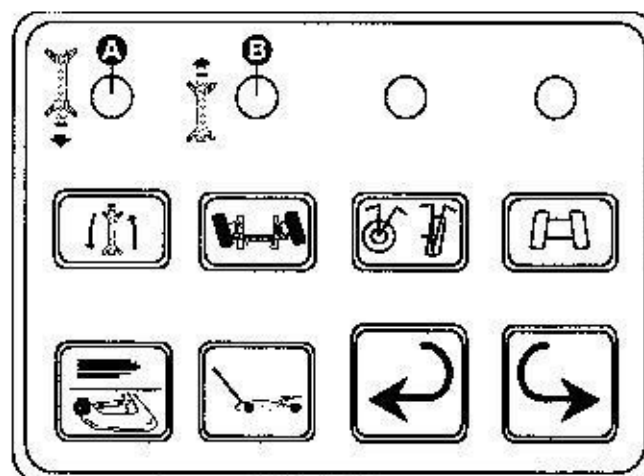
Figure 1-6

When lighted, the "KNOB DOWN" LED (A) indicates a wheel is ready for runout readings in the "KNOB DOWN" position. **NOTE:** "KNOB DOWN" LED is lighted on one or all wheel units (depending on runout mode selected) at the start of the *Runout* procedure.

When lighted, the "KNOB UP" LED (B) indicates a wheel is ready for runout readings in the "KNOB UP" position. This LED signals the operator to rotate the wheel 180° after runout has been taken in the "KNOB DOWN" position.

NOTE: See the "Runout" section of this manual for more details on wheel unit LEDs.

Set-Up Procedure

Program/Specification Cartridge

The Program/Specification Cartridge (see Figure 1-7) contains the CCD-1500 alignment program and current vehicle specifications. Insert the cartridge in the opening at the bottom of the CCD-1500 BEFORE making any cable connections.

⚠ WARNING! Do not plug the Program/Specification Cartridge into the CCD-1500 with the power on. Failure to observe this warning may result in damage to the cartridge or the CCD-1500.
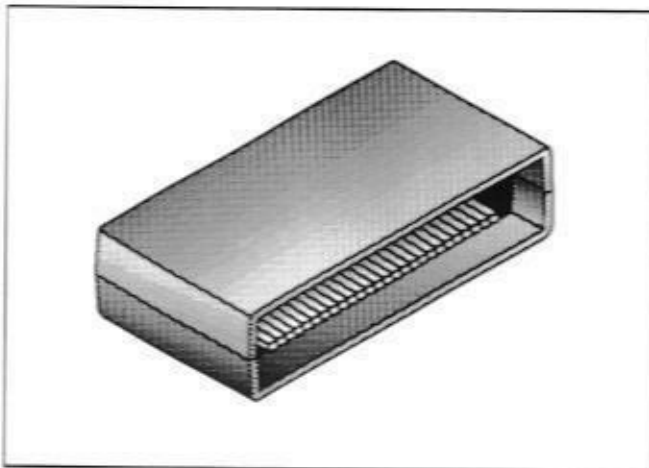
Figure 1-7

IMPORTANT NOTE: CCD-1500 will not function unless Program/Specification Cartridge is inserted.

Cable Connections (Refer to Figure 1-8)
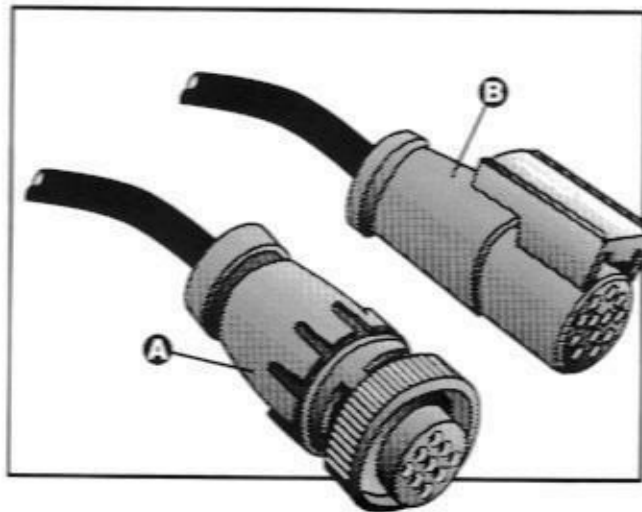
Figure 1-8

The CCD-1500 is available with either the Standard Cable Kit or an In-Rack Wiring Kit. The cables included with each kit will differ in length and in connector types. The connectors shown in Figure 1-8 are identified and used as follows:

- **Twist-Lock Connector** (A) - Secured to Power Supply Interface Module by pushing connector into receptacle on module, then turning 1/4 turn.

- **Push-Lock Connector** (B) - Secured to Wheel Units by pushing into receptacle on front of wheel unit until connector audibly "clicks" in place.

- **DB-9 Connector** (Not Shown) - Secured to back of CCD-1500 with integrated bracket and screws.

Standard Cable Kit Connections:
The Standard Cable Kit includes five cables:

- (4) with twist-lock connector on one end and push-lock connector on the other end. These cables are used to connect the Wheel Units to the Power Supply Interface Module.

1. Connect other end of cables to any of the five wheel unit connector sockets (A) on the back of the Power Supply Interface Module.

2. See Figure 1-9. Connect supplied cables to connector sockets on front of wheel units (B).
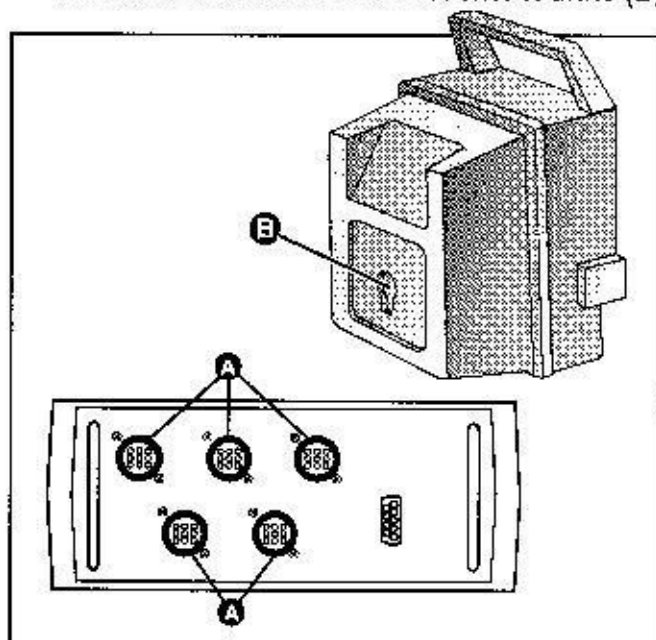
Figure 1-9

3. Connect DB-9 connector to back of CCD-1500 and secure with integrated screws. Connect other end of cable to the remaining connector socket on the back of the Power Supply Interface Module.

In-Rack Cable Kit Connections:
The In-Rack Kit includes a total of six cables:

- (2) short cables with push-lock connectors on both ends. These cables are used to connect wheel units to rack-mounted interface modules (see Figure 1-10) in normal- to short-wheel base applications.
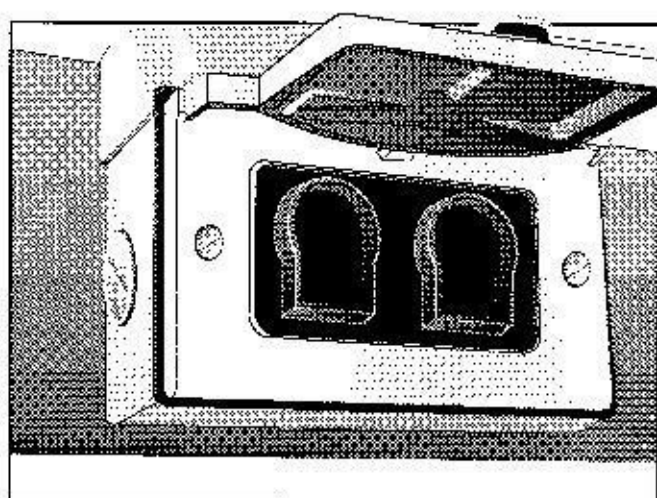
Figure 1-10

- (2) long cables with push-lock connectors on both ends. These cables are used to connect rear wheel units to rack-mounted interface modules in long-wheel base applications.

- (1) long cable with twist-lock connector on one end and push-lock connector on the other end. This cable is used to connect the Power Supply Interface Module to any rack-mounted interface module with an open receptacle.

- (1) adapter cable to plug the CCD-1500 into any open socket of an in-rack junction box.

Vehicle Preparation

Carefully read and understand the following instructions:

1. Connect wheel units to in-rack connectors:

   a. For vehicles with short wheel base, use the four short in-rack cables. Connect one end of the cable to the connector socket on the front of the wheel unit (see Figure 9). Connect the other end of the cable to the nearest rack-mounted interface module connector socket.

   b. For vehicles with long wheel base, use two short in-rack cables and two long cables, then follow the instructions in Step 1a.

2. Connect final long cable to any connector socket on back of Power Supply Interface Module. Connect the other end of the cable to any open rack-mounted interface module connector socket.

3. Find the long cable with a DB-9 connector on one end. Connect the DB-9 connector to the back of the CCD-1500 and secure. Connect the other end of this cable to the remaining connector socket on the back of the Power Supply Interface Module.

Secure vehicle on rack:
1. Lock turning plates into position with pointers at the 0° mark.

2. Drive the vehicle onto the rack. Position the front wheels in line with the zero mark of the turning plates.

3. If rear toe/camber is to be adjusted, rear wheels must be on slip plates.

4. Chock the wheels or take other steps to make sure the vehicle cannot roll.

⚠ **WARNING!** Make sure the vehicle is securely positioned on the rack and the vehicle CANNOT ROLL. Failure to properly secure vehicle may result in property damage, personal injury or death.

Select Wheel Clamp Hooks:

IMPORTANT NOTE: A stud at the end of each wheel clamp arm holds hooks which attach themselves to the wheel when the clamp is installed. Select the proper type of hook to be used according to the type of wheel on the vehicle.

These studs have two different types of hooks (see Figure 1-11):

• **Wheel Hooks** (A) - rest against the inside edge of the wheel. These hooks fit most style wheels.

• **Rim Finger Hooks** (B) - grasp the outer rim of a wheel, along the edge of the tire bead. These hooks fit wheel styles which prevent the use of the wheel hooks.
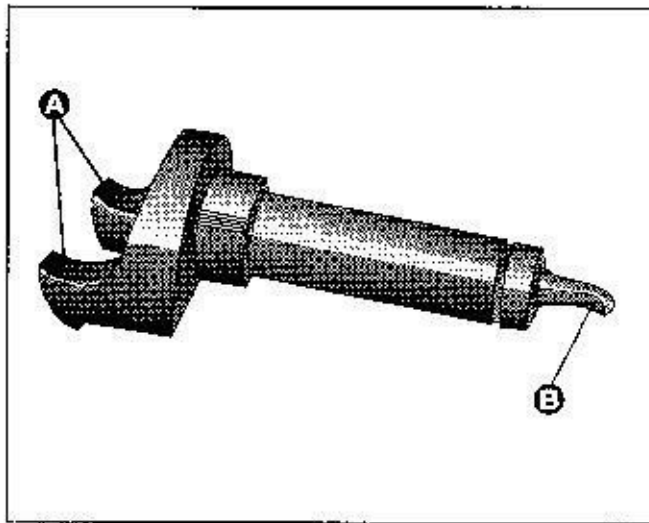
Figure 1-11

Wheel Clamp Hook Installation:

To change hooks, turn the studs around in the arms as follows:

1. Remove the hairpin clip that retains the stud.

2. Remove the stud from the arm and turn it around.

3. Put the stud back in the arm and reinstall the hairpin clip.

Install the Wheel Clamps:

1. To attach clamp to wheel, position the large black knob toward the top of wheel (see Figure 1-12). Set the lower hooks against wheel rim (or hook them around the bottom edge of the rim, depending on which hooks are used).
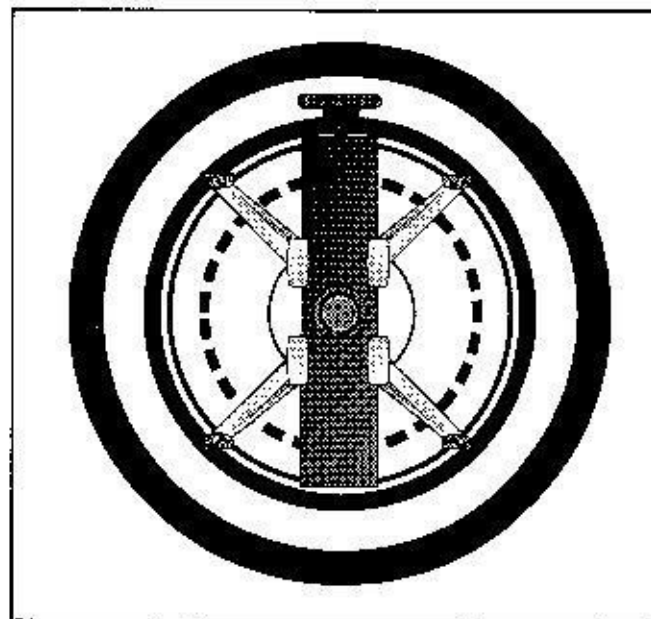
Figure 1-12

Error Messages

Blocked Beam

NOTE: On some vehicles, the body sheet metal prevents the wheel clamps from being mounted at 12 o'clock and 6 o'clock. If so, mount the clamps in the 3 o'clock and 9 o'clock position.

2. Turn the black knob to bring top hooks into place. Avoid wheel weights, burrs, or dents. Make sure the hooks seat properly.

3. Turn the knob tightly to secure the clamp to the wheel so it will not move.

4. Pull on the clamps to check for tightness. The wheel clamp spindle centers itself as the clamp is tightened to the rim.

IMPORTANT NOTE: Wheel runout compensation is done electronically by the CCD-1500. Do NOT adjust wheel clamps to compensate for wheel runout.

**Install Wheel Units:**
Each wheel unit is designed for a specific wheel position. Wheel units are NOT interchangeable from wheel to wheel.

1. Position the wheel units so there is a line-of-sight between the left- and right-front sensors, and a line-of-sight from the front sensors to the rear sensor on each side of the vehicle.

2. Slide the wheel units onto the wheel clamp spindles.

3. Use the leveling vial on each wheel unit to level the unit. Tighten the black knob on the wheel unit to secure the unit on the spindle.

4. If the line-of-sight is obstructed on front wheel units, units may be tipped down slightly to avoid the obstruction.

If the beam between wheel units is blocked, a warning tone will sound and a screen will appear in the display showing which beam is blocked (see Figure 1-13). Remove obstruction (if any) or turn wheels back into the wheel unit optical range.
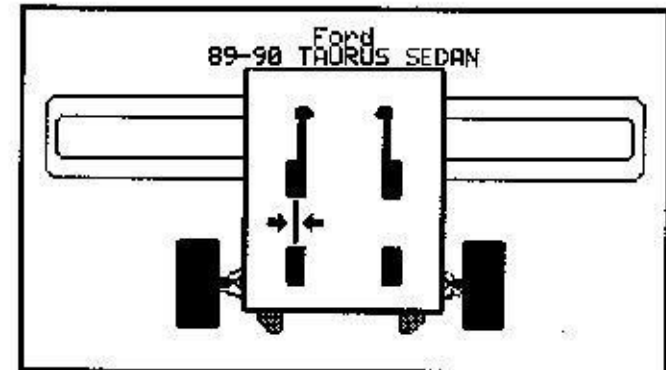
Figure 1-13

Disconnected Wheel Unit

If a wheel unit is unplugged during an alignment procedure, a warning tone will sound an the screen shown in Figure 1-14 will appear. The alignment system will not operate at all until all wheel units are plugged in.

Figure 1-14

Program Flowchart
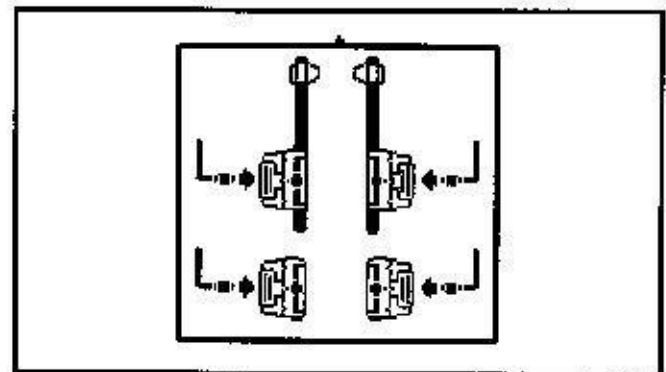
Figure 2-1

Overview

The CCD-1500 alignment program proceeds as shown in Figure 2-1. Perform set-up and alignment procedures according to the following instructions.

Before beginning alignment procedure:

- Be sure all cables are connected properly as described in the "Introduction" section of this manual.

- Toggle Power Switch on the front of the Power Supply Module to the ON position. (Lighted LED indicates module is receiving power from wall outlet.)

Setup Module

Units of Measure

The *Setup Module* allows the operator to change toe units, camber units, speaker volume, Alignment Mode and Runout Mode.

To enter the setup module, press SETUP. The first setup screen will appear on the display (see figure 2-2). Use UP and DOWN to move to the item you wish to change.

Select Toe Units

1. Press SETUP. The first Setup screen will appear in display (see Figure 2-2).

Figure 2-2

2. Cursor indicates *Toe* units are selected. Use RIGHT ARROW and LEFT ARROW to highlight one of the following units of measure:
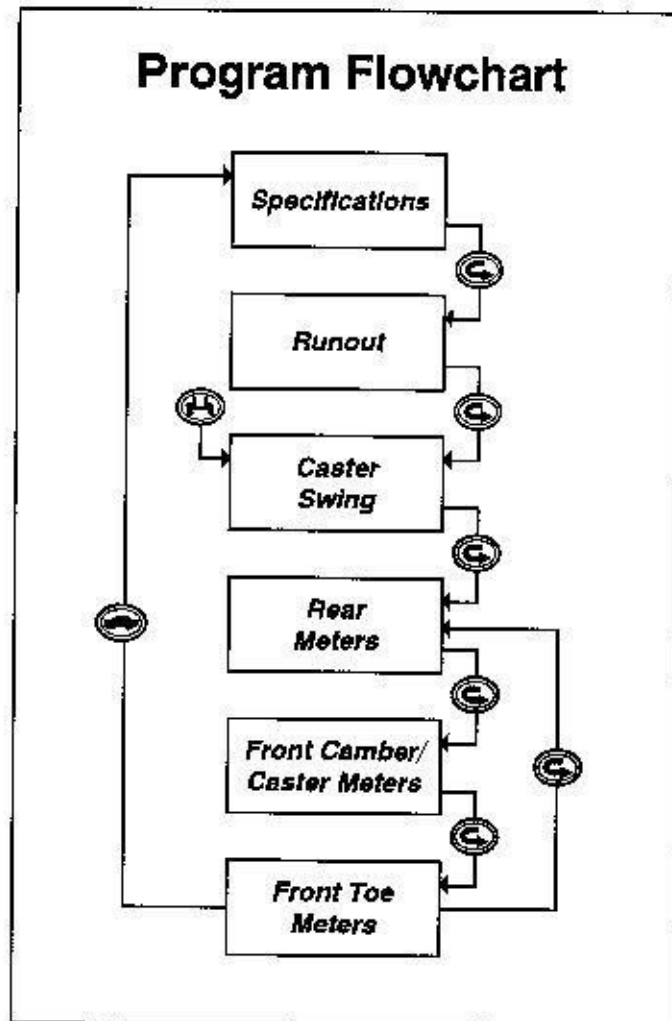   * Degrees (measured to hundredths with decimal-point separator);
   * Degrees (measured to hundredths with comma separator);
   * Degrees/Minutes;
   * Fractional Inches;
   * Metric (measured in millimeters with decimal-point separator);
   * Metric (measured in millimeters with comma separator).

NOTE: Toe will be measured at the rim (European Style) when millimeters are selected. When inches are selected toe is measured at the wheel.

When desired choice is highlighted, press DOWN ARROW to proceed to *Camber* units.

OR

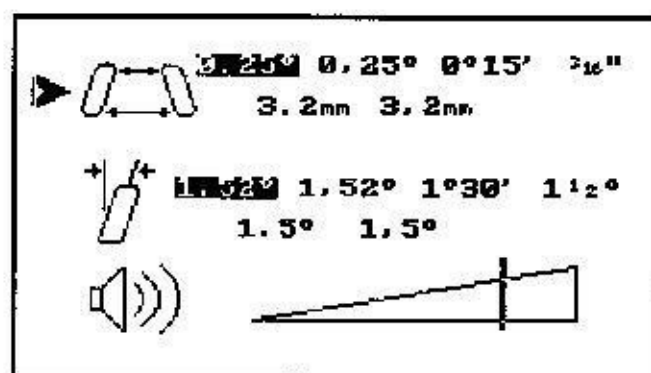Press BACKUP or CONTINUE to exit the setup module.

Setup (continued)

3. Cursor indicates *Camber* units are selected. Use RIGHT ARROW and LEFT ARROW to highlight one of the following units of measure:
   * Degrees (measured to hundredths with decimal-point separator);
   * Degrees (measured to hundredths with comma separator);
   * Degrees/Minutes;
   * Fractional Degrees;
   * Degrees (measured to tenths with decimal-point separator);
   * Degrees (measured to tenths with comma separator);

When desired choice is highlighted, press DOWN ARROW to proceed to *Speaker Volume* adjustment.

4. Cursor indicates *Speaker Volume* adjustment is selected. Use RIGHT ARROW to increase volume; use LEFT ARROW to decrease volume. As volume is adjusted, the indicator on the display will change and speaker will emit a tone reflecting volume changes.

When desired volume level is reached, press DOWN ARROW to proceed to Alignment and Runout Modes

OR

press CONTINUE to proceed to *Runout Procedure.*

Alignment Mode

IMPORTANT NOTES:

* For most accurate alignment readings, it is STRONGLY RECOMMENDED that ALL alignment procedures be done in 4-Wheel Alignment Mode.

* The operator cannot change either the Alignment or Runout Modes after beginning an alignment procedure. If the operator enters the "Alignment Mode" screen after beginning an alignment and presses the RIGHT or LEFT ARROW keys, a lock symbol appears (see Figure 2-3) indicating that the modes are locked.
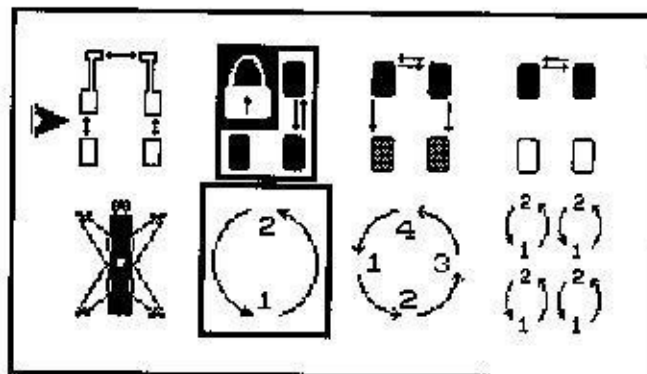

Figure 2-3

Runout Mode

To change the Default Alignment Mode:

1. Follow Steps 1 through 4 in "Setup Module" instructions

OR

press SETUP, then press DOWN ARROW three times. The screen shown in Figure 2-4 will appear in display.
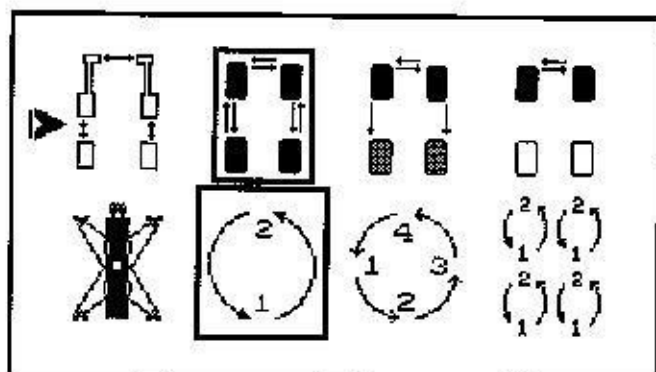
Figure 2-4

2. Press RIGHT ARROW or LEFT ARROW to select one of the following modes:
   - 4-Wheel Alignment;
   - 4-Wheel Alignment (with rear reference only);
   - 2-Wheel Alignment.

Press DOWN ARROW to proceed to Runout Mode

OR

When the desired mode is selected, press CONTINUE to return to the "Specifications" screen or to the alignment procedure that was running when the SETUP button was pushed.

To change Default Runout Mode:

1. Select an Alignment Mode and then press the DOWN ARROW

OR

press SETUP, then press DOWN ARROW four times. The screen shown in Figure 2-5 will appear in display.

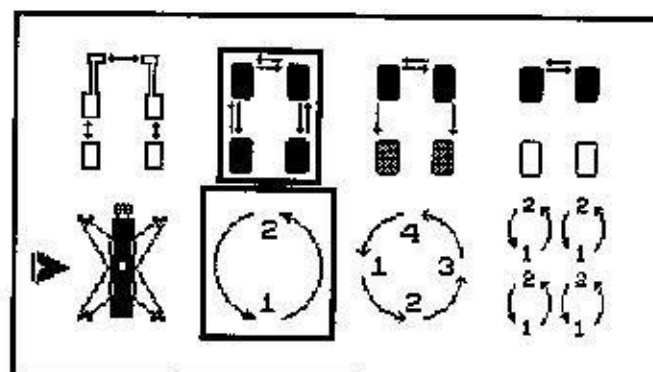*Figure 2-5*

2. Press RIGHT ARROW or LEFT ARROW to select one of the following modes:
   - Normal (2-Point);
   - 4-Point (Camber-Only);
   - Simultaneous (four-wheel adjustment).

When the desired mode is selected, press CONTINUE to return to the "Specifications" screen or to the alignment procedure that was running when the SETUP button was pushed.

Specifications

Figure 2-6

Figure 2-7

The CCD-1500 alignment program always starts at the *Specifications Menu* (see Figure 2-6). The menu offers three options:

- **Car Specifications** - allows the operator to select car specifications by entering make, year and model.

- **Truck Specifications** - allows the operator to select truck specifications by entering make, year and model.

- **User Specifications** - allows the operator to select user-entered specifications.

Car/Truck Specifications

To select car/truck specifications:

1. From *Specification Menu*, press UP ARROW or DOWN ARROW until cursor is pointing to the car or truck icon (see Figure 2-6).

2. Press ENTER to enter selection. The *Makes Menu* will appear in display (see Figure 2-7).

3. Vehicle makes are listed in alphabetical order. Press UP ARROW or DOWN ARROW until cursor highlights the correct vehicle manufacturer. (**NOTE:** Arrows in upper corners of display indicate more screens precede or follow the current display screen. Press LEFT ARROW or RIGHT ARROW to access these additional screens.)

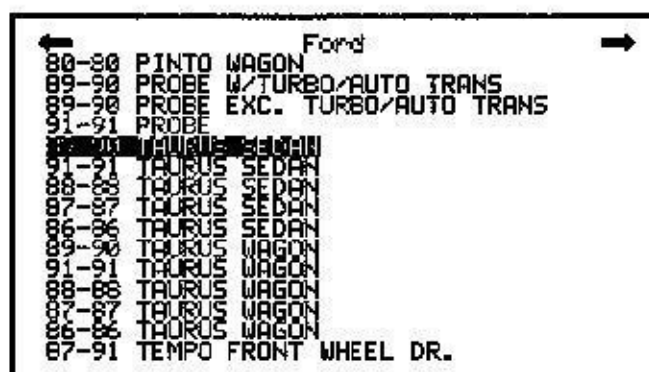4. Press ENTER to enter selection. The *Models Menu* will appear in display (see Figure 2-8).

Figure 2-8

5 Vehicle models are listed in alphabetical order with the most recent year ranges appearing first. Press UP ARROW or DOWN ARROW until cursor highlights the correct year and model information. (*NOTE:* Arrows in upper corners of display indicate more screens precede or follow the current display screen. Press LEFT ARROW or RIGHT ARROW to access these additional screens.)

6 Press ENTER to enter selection. The screen will briefly display make, year and model nformation before *Runout Procedure* begins.

OR

Press OPTION key to view specifications for the currently highlighed vehicle.

7. Some of the specifications are based on certain ride height measurments and/or load weight position. If load weight is a factor, the proper load weight will be displayed on the screen (see figure 2-9).
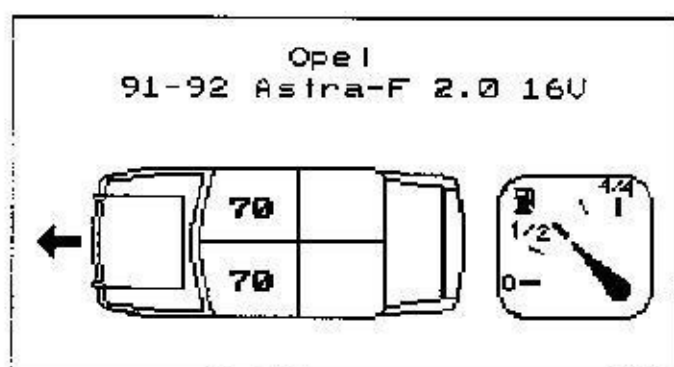
Figure 2-9

Press CONTINUE. If the specification is based on a certain ride height measurment one of two types of ride height screens will appear. The first type of screen prompts the operator to set the vehicle to the indicated ride height or heights (see Figure 2-10).

The second type of screen requests the operator to enter one or more ride-height measurments (see Figure 2-11).

Figure 2-10

Figure 2-11

To move between the data input fields use the LEFT ARROW and RIGHT ARROW keys. Press and hold the UP ARROW or DOWN ARROW keys to increment or deincrement the highlighted measurment values. When the values are correct press CONTINUE.

The specifications are loaded into the computer and the program continues to the *Runout Procedure.*

User Specifications:

1. Start at *Specification Menu* (if necessary, press SPECIFICATIONS to return to *Specification Menu*). The most recent specification used will be displayed (see Figure 2-12).
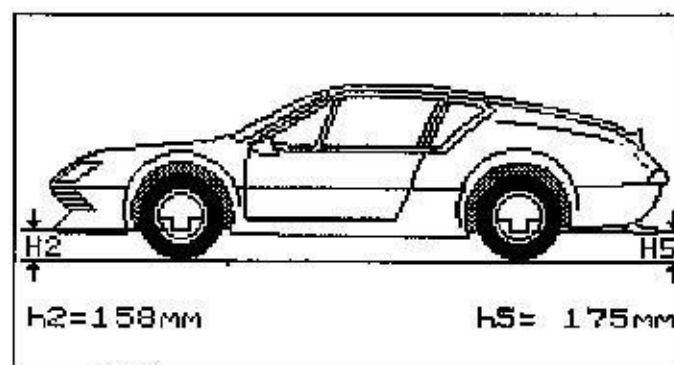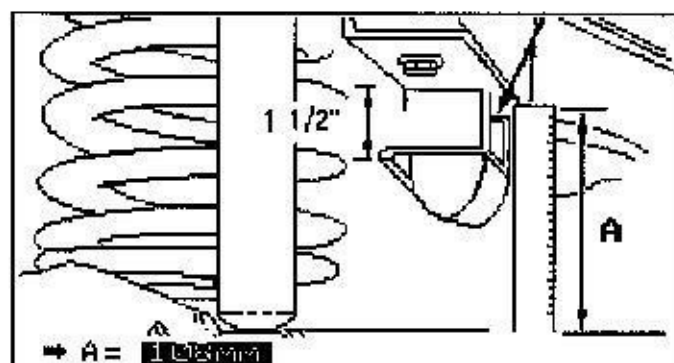

Figure 2-12

2. Press DOWN ARROW until arrow cursor is pointing to book icon, then press ENTER. A list of stored User Specifications will be appear in display (see Figure 2-13).
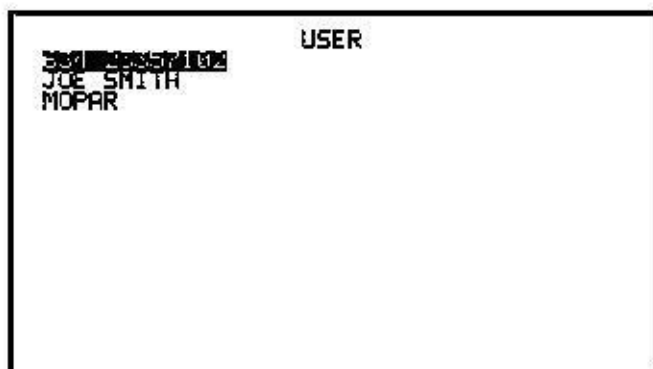
Figure 2-13

3. Press UP ARROW or DOWN ARROW to highlight desired User Specification, then press ENTER. The selected User Specification will be loaded into the alignment program and the CCD-1500 will proceed to the *Runout Procedure*.

4. To delete a user specification, use the ARROW keys to highlight the spec to be deleted and then press CLEAR. The highlighted specification will be deleted from the list.

Viewing Specifications

This option allows the operator to view manufacturers' specifications. The operator can use the User Specification feature to edit existing specifications for use in alignment procedures.

1. From the *Models Menu* or the *User Specification Menu*, press OPTION. The screen shown in Figure 2-14 will appear in display.

Figure 2-14

Runout Procedure

Overview

The screen contains the following information fields:
A. Arrow Cursor moves around screen to indicate the selected field;
B. Selected Make;
C. Selected Year and Model;
D. Manufacturer's *minimum* acceptable value;
E. Manufacturer's *preferred* value;
F. Manufacturer's *maximum* acceptable value;
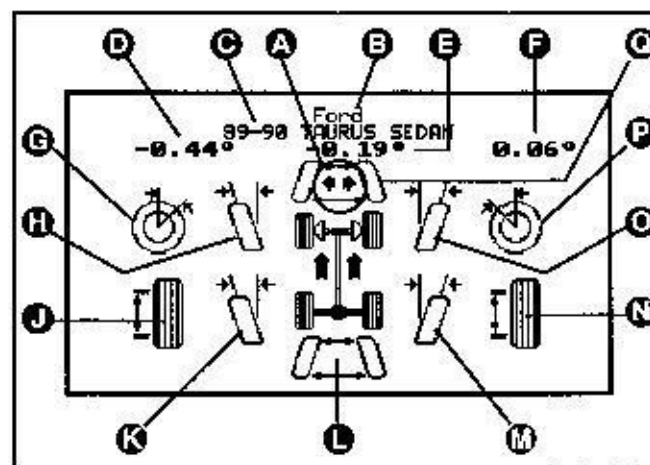G. Left-front caster value;
H. Left-front camber value;
J. Rim diameter;
K. Left-rear camber value;
L. Rear toe value;
M. Right-rear camber value;
N. Rim diameter;
O. Right-front camber value;
P. Right-front caster value;
Q. Front toe value.

2. Use arrow keys to move from field to field; an arrow cursor indicates selected field.

This procedure detects and compensates for any offset in the position of the wheel clamp spindles and for bent rims.

IMPORTANT NOTE: The *Runout Procedure* is included in every alignment procedure and MUST be performed:

- For each wheel;
- Each time wheel clamps are installed.

Preparation - Standard 4-Wheel Alignment

Before starting Runout Procedure:
1. Position vehicle on the alignment rack.

   ⚠ *CAUTION!* Make sure the vehicle is secure and CANNOT ROLL.

2. Mount wheel clamps and wheel units (see "Vehicle Preparation" in the "Introduction" section of this manual).

3. Use a jacking beam (or other lifting device supplied with the alignment rack) to lift one end of the vehicle. The runout wheel must be off the rack so it can spin freely. Place the vehicle in neutral after it has been raised.

Procedure

1. Press RUNOUT key on any wheel unit or complete *Specifications Procedure* as instructed in "Specifications" section of this manual;

OR

2. Complete *Setup Procedure* as instructed in "Setup Module" section of this manual. The "Knob Down" LED on the left-front wheel units will light and the screen shown in Figure 2-15 will appear in display.
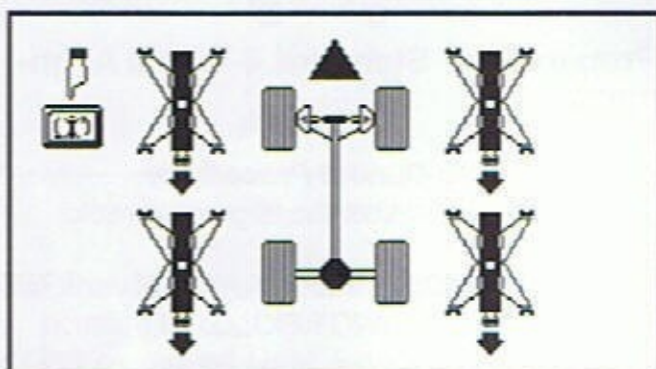

Figure 2-15

3. As indicated by the display, start procedure with the left-front wheel. Loosen the small black knob on the WHEEL UNIT (not the wheel clamp).

4. Spin the runout wheel 180° so the wheel clamp knob is pointing down.

NOTES:
- If optional spindle spacers is installed, loosen the knob on the spacer instead of the wheel unit.
- On some vehicles it may have been necessary to mount the wheel clamps in the 3 o'clock and 9 o'clock position because of body sheet metal covering the wheel opening. As long as the wheels are rotated 180° during *Runout*, readings will be accurate.

- On some vehicles, the wheel opposite of runout wheel may tend to spin. If necessary, block the opposite wheel to prevent it from spinning.
- On some four-wheel drive vehicles, both the left and right side wheels rotate simultaneously. To perform Runout on these vehicles:

A. Unlock the wheel unit on the opposite side from where you will start. If you start with the passenger side, unlock the wheel unit on the driver's side.

B. Perform Runout on the passenger side wheel. Then unlock the wheel unit on the passenger side.

C. Lock and level the wheel unit on the *driver's* side, and perform Runout on the driver's side. When both sides have Runout completed, level and lock both wheel units.

5. While the clamp is turned down, level the wheel unit, then tighten knob with moderate pressure to secure unit.

6. Press RUNOUT on the WHEEL UNIT. Wait while runout readings are taken. The screen shown in Figure 2-16 will appear in display. The hand symbol indicates that the operator should wait before entering the next command.
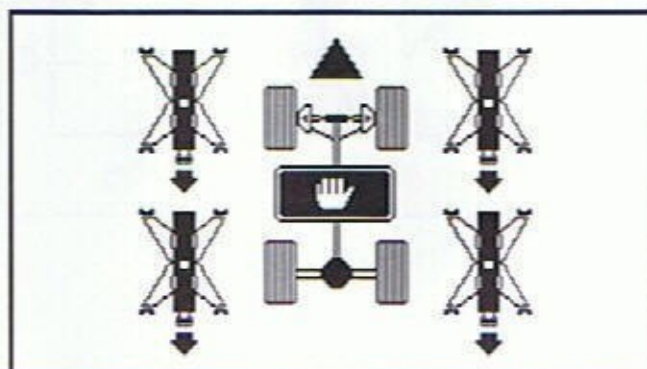

Figure 2-16

7. When reading is complete:

   A. A tone will sound;
   B. The "Knob Down" LED on the wheel unit will go out;
   C. The "Knob Up" LED on the wheel unit will light;
   D. The screen shown in Figure 2-17 will appear in display.

   IMPORTANT NOTE: Do NOT move wheel or wheel unit while runout readings are taken.
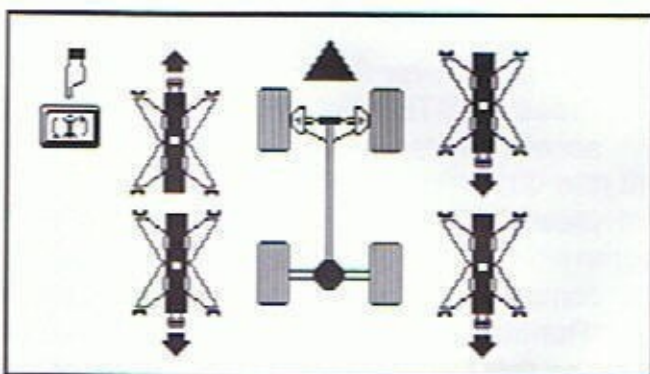
Figure 2-17

8. Again loosen the small black knob on the WHEEL UNIT, then turn the wheel 180° until the knob is pointing up.

9. Press RUNOUT on WHEEL UNIT. Wait while runout readings are taken. When reading is complete:

   A. A tone will sound;
   B. The "Knob Down" and "Knob Up" LEDs on the wheel unit will light to indicate runout is complete for that wheel;
   C. The screen shown in Figure 2-18 will appear in display.

Figure 2-18

10. Perform steps 1 - 9 for remaining wheel units.

Prepare Vehicle After Runout

When Runout is complete for all wheels, a checklist for setting the vehicle on the rack will appear in the display (see Figure 2-19).

Figure 2-19

1. Turn steering wheel to straighten wheels (point front wheels straight ahead).

2. Apply brake pedal depressor:

Caster Swing

Overview

IMPORTANT NOTE: The Pedal Depressor MUST be installed to ensure accurate readings. If the vehicle has power brakes, follow these steps:
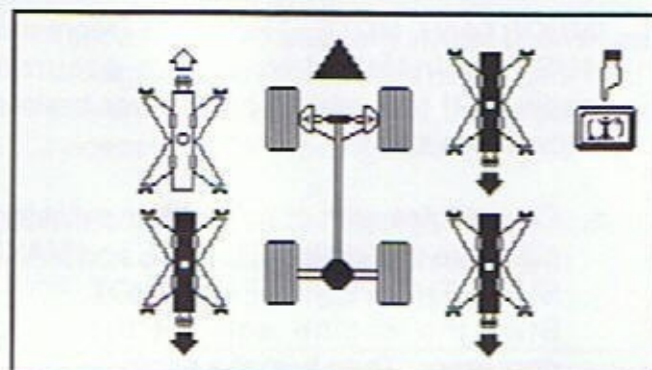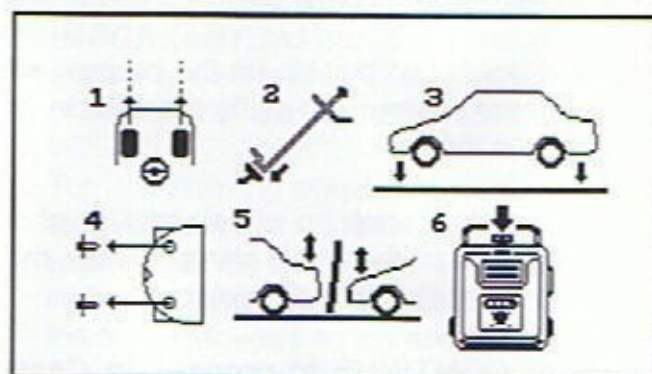
a. On vehicles with standard transmission, place the vehicle in NEUTRAL and MAKE SURE THE VEHICLE CANNOT ROLL. Start the engine and set the pedal depressor. Then turn the engine "OFF."

b. On vehicles with automatic transmission, place the vehicle in PARK and MAKE SURE THE VEHICLE CANNOT ROLL. Start the engine and set the pedal depressor. Then turn the engine "OFF."

3. Lower the vehicle onto the rack.

4. Remove turning radius plate pins. If present, remove slip plate pins.

5. Push down and pull up on the bumper with moderate pressure to settle the vehicle into place on the rack.

6. Loosen black knob on wheel units, level the wheel units on the wheel clamp spindle, then tighten the knob to lock in place.

7. Press CONTINUE to proceed to *Caster Swing Procedure.*

This procedure measures Caster, Included Angle and SAI (Steering Axis Inclination). The procedure MUST be repeated each time an adjustment is made and alignment values are updated.

IMPORTANT NOTES:

- Before beginning *Caster Swing Procedure* vehicle MUST be settled on rack as outline in Steps 1-7 of preceding section.
- The Brake Pedal Depressor **MUST** be installed!

To perform Caster Swing Procedure:

1. Press CASTER SWING on CCD-1500 to access *Caster Swing Procedure*
   ### OR
   press CASTER SWING on any wheel unit:
   ### OR
   complete *Runout Procedure* as instructed in "Runout Procedure" section of this manual. The first Caster Swing screen will appear in the display.

2. The meter in Figure 2-20 represents the position of the wheels. A picture at the bottom of the meter will appear briefly to indicate which direction the wheels should be turned.
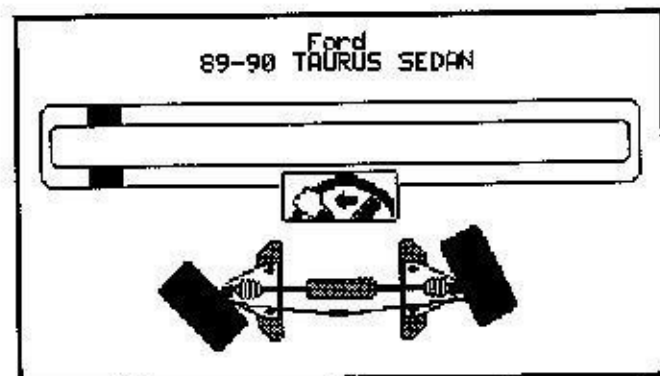

Figure 2-20

Turn the steering wheel to the LEFT. A solid arrow will appear in the center of the meter and move in the same direction as the wheels when the wheels are turned (see Figure 2-21).
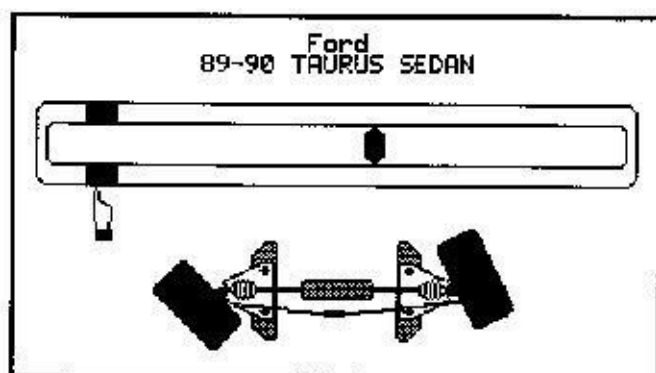

Figure 2-21

Turn wheels until the arrow lines up with the range indicator bar at the left of the meter. When arrow moves into the acceptable range:

A. The arrow will change to a light color;
B. An "ascending" tone will sound;
C. The "WAIT" screen shown in Figure 2-22 will appear in the display.
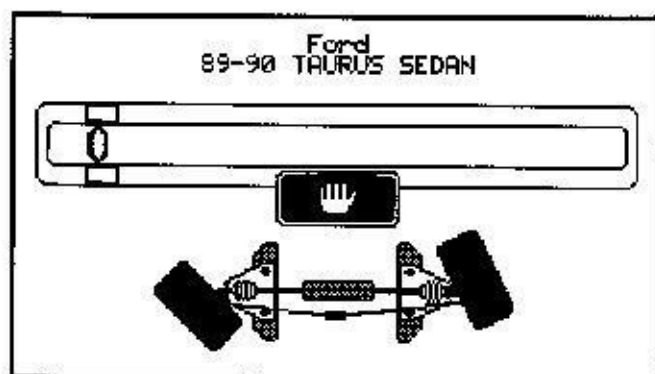
Figure 2-22

NOTE: A "descending" tone indicates wheel position has moved out of acceptable range.

To correct, turn steering wheel until wheels are again within acceptable range and "WAIT" screen re-appears. Repeat this procedure if necessary until readings are complete.

3. Wait for the CCD-1500 to take readings. When complete, the screen shown in Figure 2-23 will appear in the display.

Figure 2-23

IMPORTANT NOTE: DO NOT move the wheels while the "WAIT" screen is displayed or inaccurate readings may result.

4. Turn the steering wheel to the RIGHT. A solid arrow will appear at the left of the meter. Turn wheels until the arrow lines up with the range indicator bar at the right of the meter. When the arrow moves into the acceptable range:

A. The arrow will change to a light color;
B. An "ascending" tone will sound indicating acceptable range has been reached;
C. The "WAIT" screen will appear in the display indicating the CCD-1500 is taking readings.

Meter Screens

Overview

5. Wait for the CCD-1500 to take readings. When complete, the screen shown in Figure 2-24 will appear in the display.

Figure 2-24

6. Turn the steering wheel to the LEFT. A solid arrow will appear at the right of the meter. Turn wheels until the arrow lines up with the range indicator bar in the middle of the meter. When the arrow moves into the acceptable range:

A. The arrow will change to a light color;
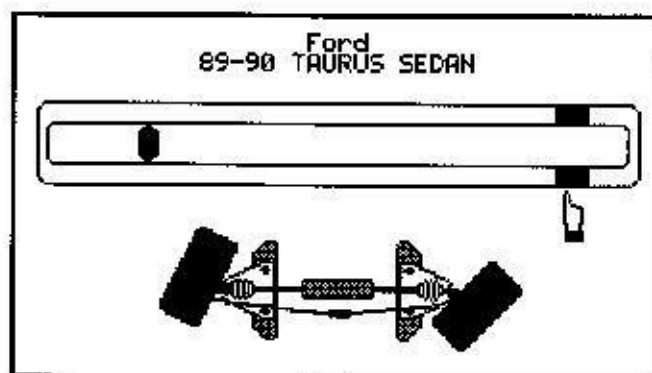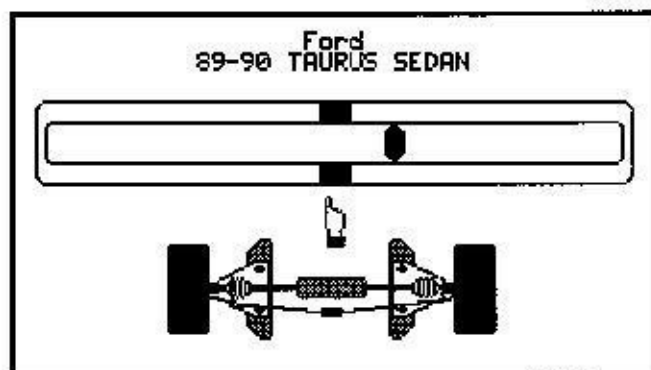B. An "ascending" tone will sound indicating acceptable range has been reached;
C. The "WAIT" screen will appear in the display indicating the CCD-1500 is taking readings. When complete, the first **Meter Screen** will appear.

Use these "live" meter screens to see the effects of adjustments to the vehicle as they are being made.

The dot (A) which appears over the readings on the screen indicates which specifications will be displayed (see Figure 2-25).
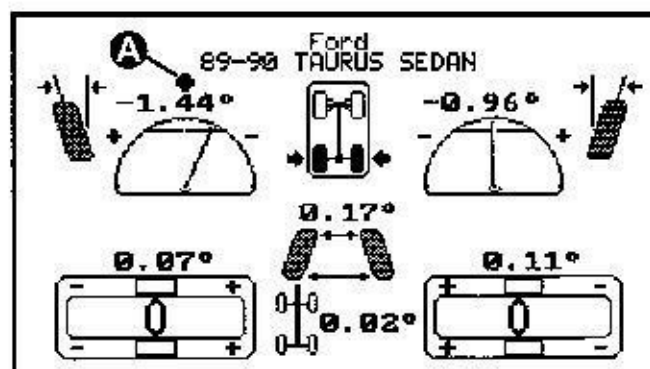
Figure 2-25

Press the ARROW keys to move the dot around the screen to choose the specifications to display. Press ENTER to display the manufacturer's specifications (see Figure 2-26). The minimum, preferred, and maximum specifications appear from right to left inside the bar at the top of the screen. The screen will automatically clear after approximately five (5) seconds. To clear the screen faster, press the CLEAR key.
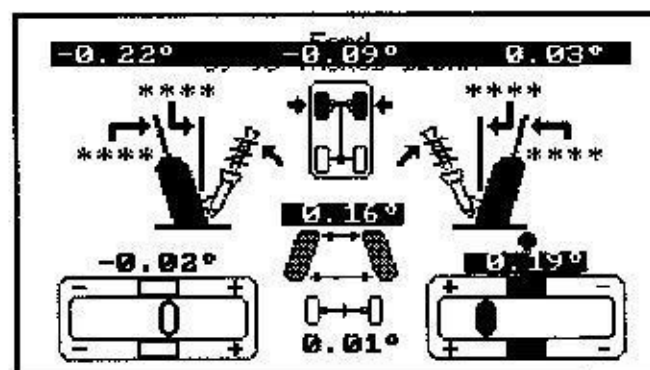

Figure 2-26

Rear Camber and Toe Meters

Figure 2-27

Figure 2-27 contains the following information fields:

A. **Selected Manufacturer** - indicates that a specification is stored in memory.

B. **Selected Make and Model** - indicates that a specification is stored in memory.

C. **Graphic** - Indicates which axle the meters are measuring.

D. **Right & Left Camber Meters** - The number above the meter indicates the live reading. If the number appears in reverse video and the area at the top of the meter is filled in black, the readings are out of spec (see Figure 2-28).

Figure 2-28

If the number appears in normal video and the area at the top of the meter is white, the readings are within spec.

E. **Toe Meters** - These meters operate in the same way as the Caster Swing Meters. If the range bars and pointers appear black, the readings are out of spec. If the numbers appear in reverse video, the readings are out of spec.

F. **Toe Symbol** - The number above the symbol is the total toe (sum of the left and right toe angles). If the number appears in reverse video, the reading is out of spec.

G. **Rear Thrust Line** - The wheels on the symbol turn to indicate the thrust line. If the thrust angle is less than .05°, the wheels will appear to point straight ahead on the symbol.

Perform whatever adjustments are necessary on the vehicle and then press CONTINUE to display the *Front Caster and Camber* meters.
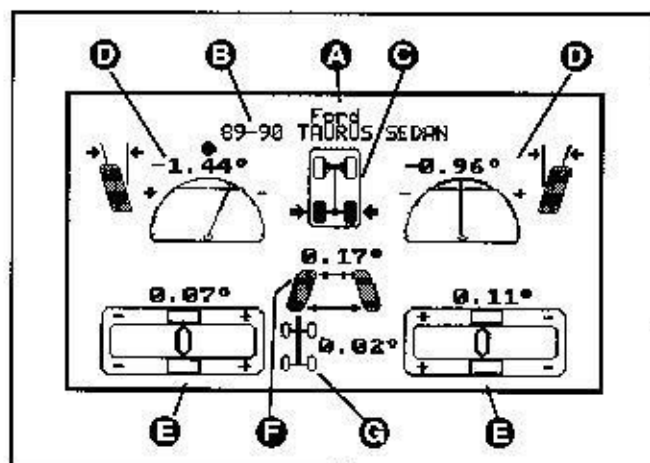
Front Caster and Camber Meters

Figure 2-29

Figure 2-29 contains the following information fields:

A. **Selected Manufacturer** - indicates that a specification is stored in memory.

B. **Selected Make and Model** - indicates that a specification is stored in memory.

C. **Graphic** - Indicates which axle the meters are measuring.

D. **Right & Left Camber Meters** - The number above the meter indicates the live reading. If the number appears in reverse video and the area at the top of t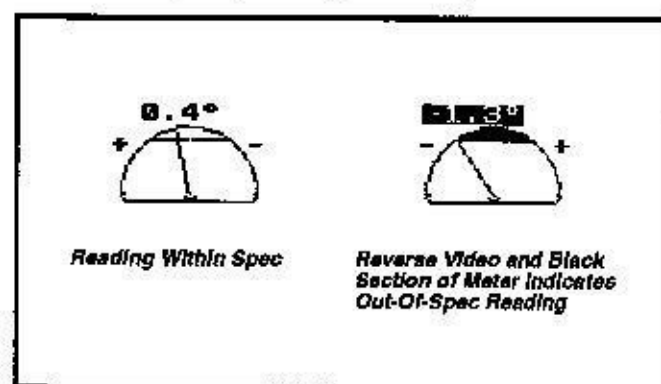he meter is filled in black, the readings are out of spec. If the number appears in normal video and the area at the top of the meter is white, the readings are within spec.

E. **Camber Difference or Cross Camber Symbol** - Reverse-video reading indicates an out-of-spec condition.

F. **Right & Left Caster Meters** - These meters provide live readings. If the pointers appear black and the number values appear in reverse video, the readings are out of spec.

G. **Caster Difference or Caster Swing** - Reverse-video reading indicates an out-of-spec condition.
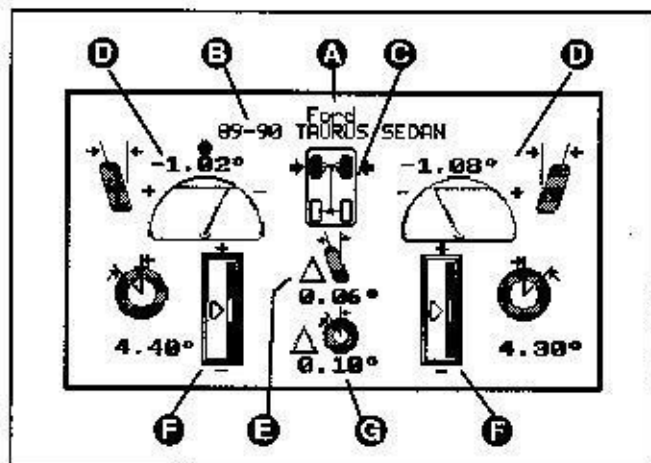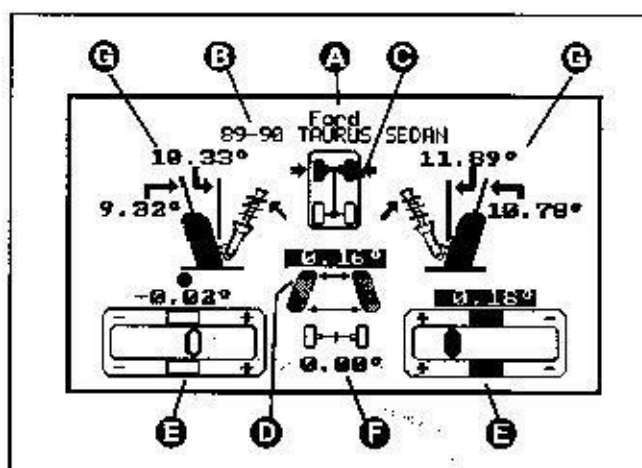
Front Toe/SAI Meters

Figure 2-30

This screen contains the following information fields:

A. **Selected Manufacturer** - indicates that a specification is stored in memory.

B. **Selected Make and Model** - indicates that a specification is stored in memory.

C. **Graphic** - Indicates which axle the meters are measuring.

Options

Overview

D. **Total Front Toe** - The number above the symbol is the total toe (sum of the left and right toe angles). If the number appears in reverse video, the reading is out-of-spec.

E. **Right and Left Toe Meters** - The number above the meter indicates the live reading. If the number appears in reverse video and the area at the top of the meter is filled in black, the readings are out of spec. If the number appears in normal video and the area at the top of the meter is white, the readings are within spec.

F. **Setback** - If the wheels are in line within .05°, the line between the wheels on the screen will appear straight. The number value is for reference only, and indicates the straightness of the front suspension.

G. **SAI Graphic** - The upper value is the SAI reading. The lower outside reading is the Included Angle reading. These readings are not live - they are calculated during Caster Swing Procedure.

Press CONTINUE to return to the first meter screen, or press the SPECIFICATIONS key to select specifications for the next vehicle.

IMPORTANT NOTE: Install a steering wheel holder before setting front toe!

To access any available option, press the OPTION key from any meter screen. The option menu will appear (see Figure 2-31).

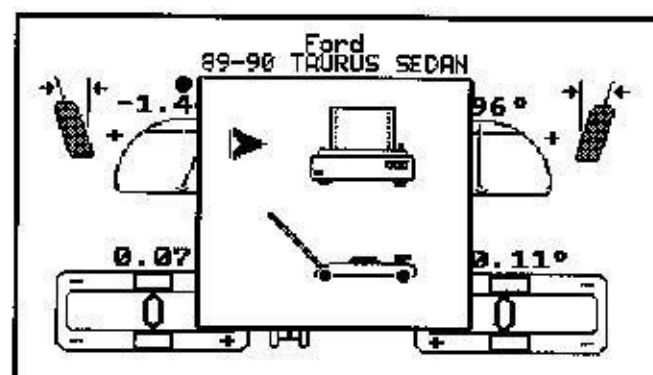*Figure 2-31*

Use the ARROW keys to move the cursor up and down the list. To select an option, press the ENTER key.

Printer Kit Option (Model No. 65-238)

This feature allows the operator to print an Alignment Report for the vehicle. The Alignment Report consists of data on the customer vehicle and maximum and minimum specifications recommended by the manufacturer. Contact your Bear Representative for further details.

To Use Printer

1. Access printer by pressing the OPTION key from any meter screen. The option menu will appear (see Figure 2-31). Use the ARROW keys to move the cursor to point to the printer icon. Then press ENTER.

2. The screen will display a list of languages (see Figure 2-32). Use the up and down ARROW keys to highlight the language desired.

Figure 2-32

3. Press ENTER or CONTINUE to print data.

   NOTE: There will be a pause while the system collects data. Front and rear alignment data will be printed. Data printed in bold type indicacates an out-of-spec condition. The appearance of **** in the report indicates the data is not available.

4. Press CLEAR to restore meter screen without printing.

Jack & Hold

This feature allows the operator to view "live" camber and caster readings on the display while making caster and camber adjustments on the raised vehicle. **NOTE:** Toe cannot be read while using this option.

To use Jack & Hold:

1. With vehicle secured on the rack, press OPTION. Use the ARROW keys to select Jack & Hold (move the cursor to point to the jack icon). Then press ENTER.

   OR

   press the Jack & Hold key on a wheel unit. The CCD-1500 will store the current readings as offset points.

2. Follow the screen prompts and raise the wheels to be adjusted. Then press CONTINUE.

   ⚠ CAUTION! Make sure the vehicle is securely jacked so it will not move.

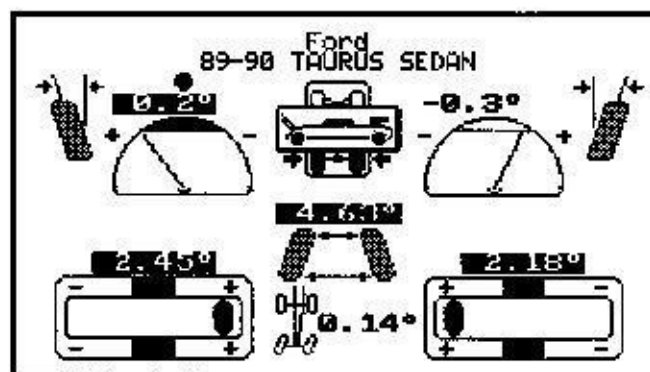3. The Jack & Hold meter screen will appear (see Figure 2-33).

Figure 2-33

The current values are reset to the offset values stored in Step 1. The current meter screen will appear in the display with a picture of a floor jack to indicate Jack & Hold option is active.

4. Make necessary adjustments. As any adjustments are made, "live" alignment readings are displayed. Readings reflect adjustment changes as if the vehicle were sitting on the rack.

   Important Note: Do **NOT** adjust or re-level wheel units during Jack & Hold procdure!

5. When finished making adjustments, lower the vehicle, then press CLEAR or Jack & Hold key at a wheel unit to cancel Jack & Hold.

6. Perform *Caster Swing Procedure* to update current readings.

Creating User Specifications

1. From the *Select Model* screen, press OPTION. The screen shown in Figure 2-34 will appear in display.
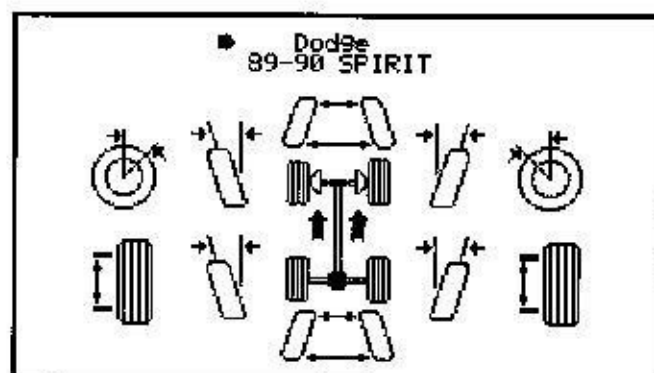

Figure 2-34

2. Press ENTER. The current make appears on the screen as a default. An editing window will appear in the display (see Figure 2-35).
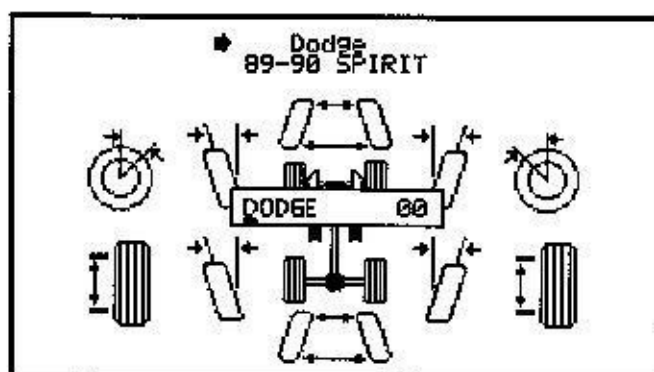

Figure 2-35

NOTE: To cancel the Enter Specifications function, press the CLEAR button. The edit window will disappear.
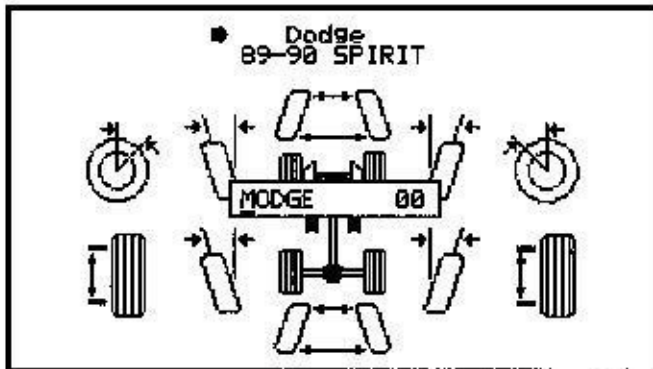
3. Refer to Figure 2-36.

Figure 2-36

To edit the display:
A. Press UP ARROW to change the first character in ascending order of the alphabet; press DOWN ARROW to change the first character in descending order of the alphabet.
B. Press RIGHT ARROW to move to the next character in the sequence, then repeat Step 3-A, above, to select new character.
C. Continue with Steps 3-A and 3-B, above, until all characters have been changed, then press ENTER. The edited text will be displayed (see Figure 2-37) and the heading will change to "User."
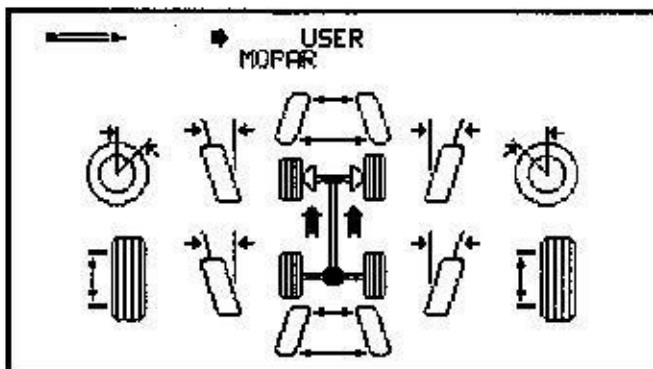
Figure 2-37

NOTE: Numeric and blank characters appear before "A" in the alphabet.

The pencil icon will appear in the upper left hand corner of the screen, indicating that the values in the data fields can now be edited.

4. Use arrow keys to select alignment data field (selected field is indicated with an arrow cursor). When desired field is selected, press ENTER. Minimum, preferred and maximum recommended values will be displayed (see Figure 2-38).
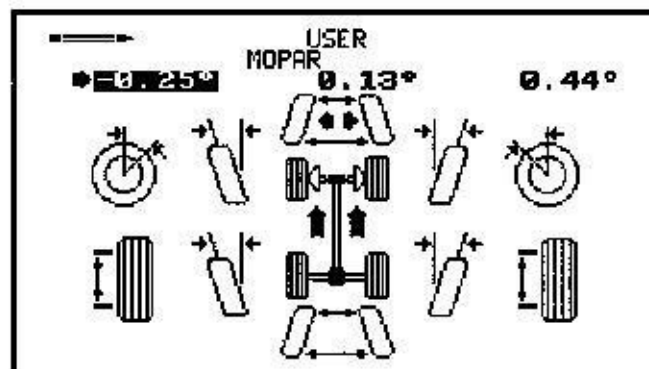
Figure 2-38

5. Press RIGHT ARROW or LEFT ARROW to move between minimum, preferred and maximum value fields. Press UP ARROW to increase selected value; press DOWN ARROW to decrease selected value.

6. Repeat Steps 4 and 5 until all desired fields have been edited.

7. To exit User Specification Mode, press CONTINUE to proceed to *User Specification* menu. The new specification is automatically stored.

OR

press BACKUP to return to *Specification Menu.* Edited User Specification will be stored in memory.

Optional Runout Modes

4-Point Camber-Only Mode

Overview

Some racks create beam block problems for wheel units, making standard runout procedures impossible.

4-Point Camber-Only Runout overcomes this problem by using the camber vials inside the wheel units to measure runout.

The major difference in the runout procedure is that the readings are taken at four positions on each wheel.

Important Note: Always turn the wheel being tested *counterclockwise!*

Procedure

1. Follow the instructions under "To Change the Default Runout Mode" in the "Setup" section. The screen shown in Figure 2-39 will appear when 4-Wheel Runout is properly selected.

Figure 2-39

2. Prepare the vehicle. Refer to the "Preparation" section under "Runout Procedure."

3. Press CONTINUE to return to exit from the "Setup" routine. Press CONTINUE again to enter the Runout procedure or press RUNOUT on any wheel unit.

4. The screen shown in Figure 2-40 appears.
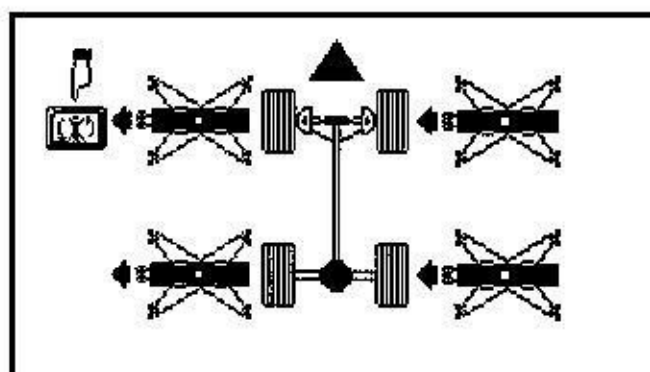
Figure 2-40

A. Level and lock the first wheel clamp so that the lock knob is at the 9 o'clock position. The third LED from the left on the first wheel unit will light.

B. Press RUNOUT on the wheel unit. Wait while readings are taken. After the tone sounds, unlock the wheel unit, follow the screen prompt and turn the wheel so that the clamp lock knob is pointing down (6 o'clock position). Repeat the procedure, turning the wheel clamp so that the lock knob is at the 3 o'clock and finally the 12 o'clock position. When Runout is completed for each wheel, all four LEDs on the wheel unit will be lit.

C. Repeat Steps A and B for the three remaining wheels.

D. Follow the steps in the "Prepare the Vehicle After Runout" section under "Runout" to complete the procedure.

Simultaneous Runout Procedure

Overview

Select this procedure when the vehicle cannot be jacked up so that the wheels can spin freely.

Procedure

1. Follow the instructions under "To Change the Default Runout Mode" in the "Setup" section. The screen shown in Figure 2-41 will appear when 4-Wheel Runout is properly selected.
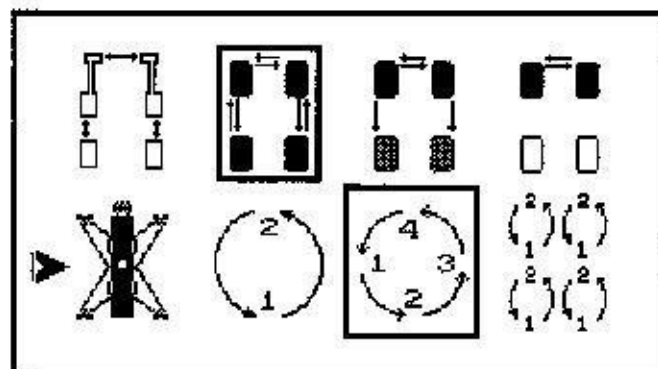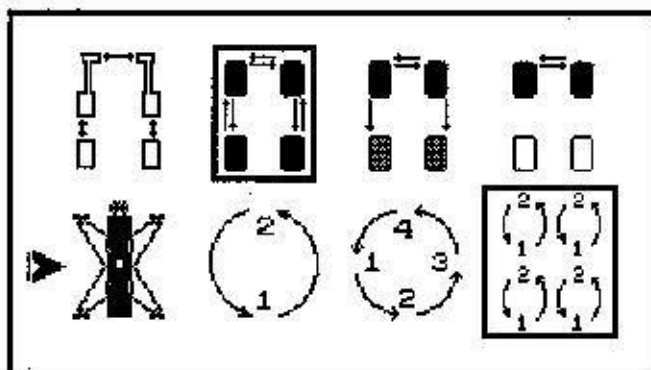

Figure 2-41

2. Prepare the vehicle. Refer to the "Preparation" section under "Runout Procedure."

   IMPORTANT NOTE: Make sure that all four wheel clamps are installed with the lock knob down.

3. Press CONTINUE to return to exit from the "Setup" routine. Press CONTINUE again to enter the Runout procedure or press RUNOUT on any wheel unit.

4. The screen shown in Figure 2-42 appears.
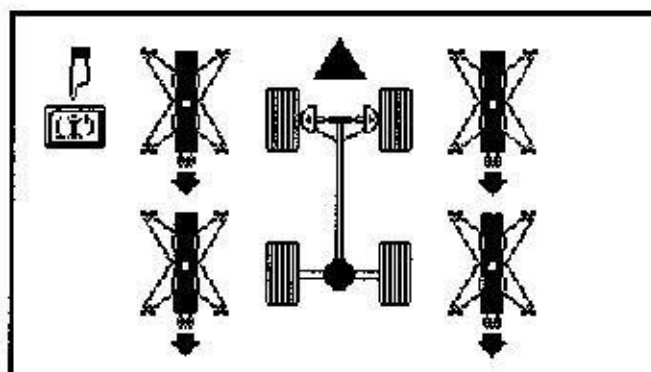
Figure 2-42

A. The "Knob Down" indicator LED will light on all four wheel units.

B. Press RUNOUT on any wheel unit. The CCD 1500 prompts the operator to press the RUNOUT key on the left front as a default, but any runout key will work.

C. Wait while the readings are taken. After the tone sounds, position all four wheels so that all four wheel clamp lock knobs are up. The screen shown in Figure 2-43 will appear. Level and lock all four wheel units and then press RUNOUT again.
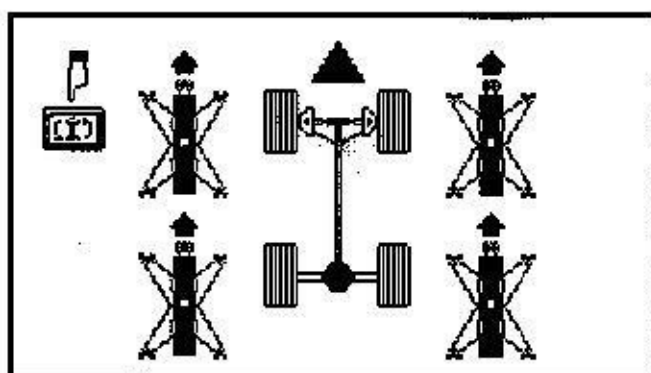
Figure 2-43

Maintenance

Error Messages

Figure 3-1 shows an example of an error message.
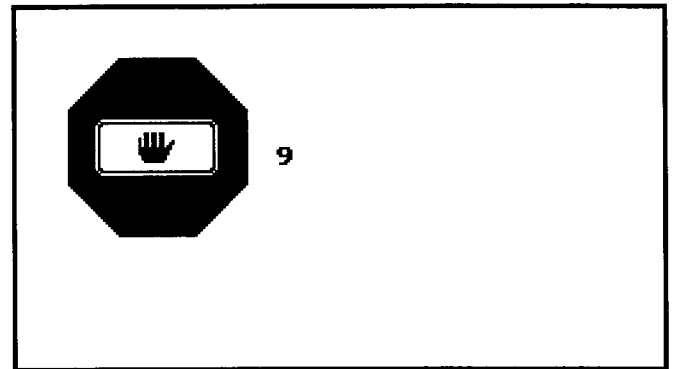
Figure 3-1

Error messages #9 and #10 can be reset by the operator. If any of the other messages listed below appear, make a note of the error message code and call BEAR for service assistance.

0 - Illegal Opcode error.
1 - Divider error exception.
2 - Unused interrupt error.
3 - CCD1500 RAM error.
4 - LCD RAM error.
5 - CCD1500 EEPROM error.
6 - Wheel Unit EEPROM error.
7 - Wheel Unit cal data checksum error
8 - CCD1500 EEPROM checksum error.
9 - Wheel Unit calibration data time/date mismatch error. The time/date stamps which are stored in each wheel unit at calibration do not match. Use all four origional wheel units as a set. Do **NOT** use other wheel units.
10 - User Specs full. The number of User Specifications which can be stored in the CCD1500 memory has reached its maximum limit. Delete an old User Specification to make room for a new one.

Preventive Maintenance

Cleaning

The following information applies to cleaning the CCD-1500 case and display window.

1. Prepare a mild solution of soap and water or recommended amounts of any of the following cleaning agents:

   - Windex
   - Joy
   - Top Job
   - Mr. Clean
   - Fantastik
   - Formula 409

   IMPORTANT NOTE: Do NOT use cleanser or any abrasive cleaner. Permanent surface damage may result.

2. Use a soft cloth or sponge dipped in the cleaning solution. Gently wipe surface to remove dirt and grime.

3. Dry surface with a clean, dry cloth or sponge.

   NOTE: Moisture must be removed immediately after cleaning or water spotting may result.

Wheel Alignment Rack/Runways

1. Runways must remain level side to side and front to rear when resting on safety legs at working height.

- Side to side tolerance front $= \pm 1/16"$. Measure from center of Turning Radius Plate on left side to center of Turning Radius Plate on right side.
- Side to side tolerance rear $= \pm 1/16"$. Measure from center of rear slip plate on left side to center of slip plate on right side.

- Front to rear tolerance $= \pm 1/4"$. Measure from center of left front Turning Radius Plate to center of left rear slip plate. Then repeat front to rear measurement on right side.

2. Check rack for available lubrication areas. Lubricate once every six (6) months.

Full Floating Front Turning Radius Plates

1. Plates must be disassembled once every six (6) months and bearing race cleaned.

   NOTE: After bearing race is cleaned only a dry spray lubricant such as silicone or graphite should be used on the bearings. Grease or oil should never be used as it will hold dirt/grit and act as an abrasive.

   Full Floating Turning Radius Plates in good working condition will swivel when light hand pressure is applied.

2. Use air hose to blow dirt/grit and water from bearings each day.

3. Always place pins in Turning Radius Plates before front wheels of vehicle drive on or off plates.

Rear Slip Plates

1. Use same maintenance procedure as front Turning Radius Plates.

Sliding Jacking Beam

1. Clean oil and grease from jack pads/flip pads and slide bars each working day.

2. Clean and lubricate outer surface of the roller rails (located on bottom area of Jacking Beam) once a month.

3. Clean rack runway tracks where roller rails make contact once a month.

Wheel Units

1. Clear Toe/Track Lens on Wheel Units—Clean once a week with window cleaner and soft cloth.

2. Wheel Unit Keypad—Clean once a week with spray type household cleaner and soft cloth. Do not use a harsh cleaning agent.

3. All Electrical cables—Clean once a week with industrial hand cleaner and shop towel. Also, inspect cables and connectors for damage.

Wheel Clamps

1. Screw Thread—Clean and lubricate with light oil once a month.
2. Spindle—Clean and lubricate with light oil once a month.
3. Center Sliding Bar—Clean and lubricate with light oil once a month.
4. Hook Adapter (Claw foot)—Check Hook Adapter screw daily (four on each Wheel Clamp) for tightness. If loose, tighten screw with large flat blade screwdriver.

Brake Pedal Depressor

1. Must be inspected for proper working condition before each use.

Steering Wheel Holder

1. Must be inspected for proper working condition before each use.

Printer Maintenance

NOTE: These instructions apply to the Okidata Microline 380 printer in the Printer Kit Option (Mode No. 65-238)

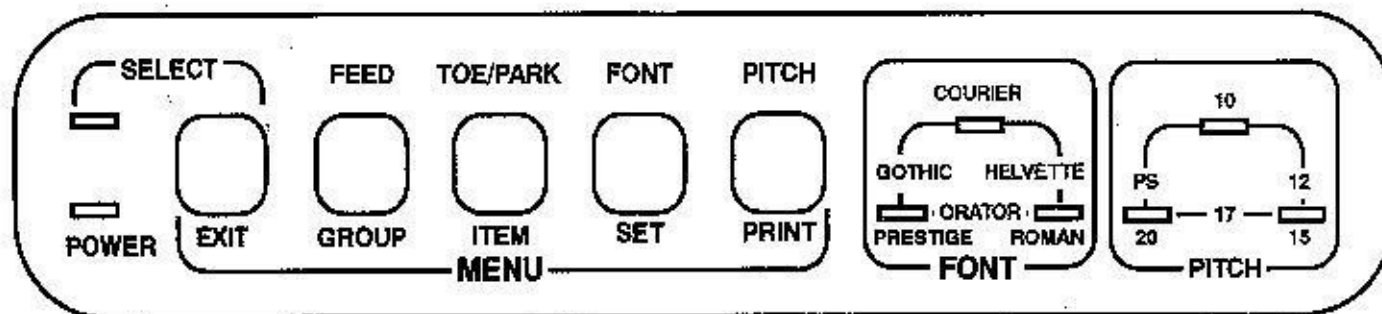## Front Panel Controls *(Refer to Figure 3-2)*

Figure 3-2

There are five buttons on the control panel. The functions represented by the labels at the top of each button are engaged when the printer is in Print Mode." The functions represented by the labels at the bottoms of each button are engaged when the printer is in "Menu Select Mode." In "Menu Select Mode" the operator can change the printer's default settings.
Print Mode

When the printer is turned "ON" it defaults to "Print Mode," ready to receive data or commands from the CCD1500.

Lights

"POWER" light: This light indicates that the printer is turned on.

"SELECT" light: When this light is "ON," the printer is selected and ready to receive data from the computer. When the light is "OFF," the printer is deselected and can't receive data. When the light is flashing, the printer is out of paper or an error (such as a paper jam) has occurred.

"FONT" lights: These lights indicate which font is engaged. When all font lights are "OFF," the printer is in the "Utility Print Mode."

"PITCH" lights: These lights indicate which pitch is engaged.

Control Buttons

SELECT button: Push this button to select or deselect the printer ("SELECT" light is "ON" or "OFF").

To reset the printer to factory default settings, hold down the "SELECT" button and the "FEED" button while turning on the printer. (See Appendix B in the printer manual for more information on the menu factory settings.)

Hold down the "SELECT" button and the "TOF/PARK" button while turning on the printer, to place the printer in the hex dump mode. Refer to the printer manual for more information.

"FEED" button: Push and release this button to advance the paper one line. Push the button and hold it for approximately one second, to advance the paper to the first print line of the next page.

Hold down this button while turning on the printer, to engage the "Self Test Mode." Refer to the printer manual for more information.

"TOF/PARK" button: When the printer is selected, push this button to park continuous-form paper. The paper will retract from the front of the printer so the operator can use single sheets without completely removing the continuous forms. Refer to the printer manual for more information.

When the printer is deselected, push this button to set the position of the first print line on the page ("top of form").

Hold down the "TOF/PARK" button while turning on the printer, to engage the Rolling ASCII test.

"FONT" button: Push this button (printer selected or deselected) to select the font to use. Refer to the printer manual for more information.

The "FONT" lights to the right of the "FONT" button indicate which font is engaged. If only one light is glowing, then the font associated with it is engaged (Courier, Roman, or Prestige). If two lights are glowing, then the font between them is engaged (Helvette, Orator, or Gothic).

NOTE: When the printer is placed in the Utility print mode, all of the "FONT" lights stop glowing.

Push the "FONT" button while turning on the printer to enter the "Menu Select Mode."

"PITCH" button: Push this button (printer selected or deselected) to select the pitch (character width). Refer to the printer manual.

The "PITCH" lights to the right of the "PITCH" button indicate which pitch is engaged. If only one light is glowing, then the pitch associated with that light is engaged (10, 15, or 20 cpi).
If two lights are glowing, then the pitch between them is engaged (12, 17, or PS).

Menu Select Mode

Use this mode to create custom defaults for the printer.

When the printer is in the Menu Select Mode, the function of the control panel buttons corresponds to the label below them: "EXIT," "GROUP," "ITEM," "SET," and "PRINT."

For a listing of all the menu selections, refer to the printer manual.

NOTE: The operator can override features set on the menu using either the front panel or commands sent from the computer. However, when the printer is turned "OFF," features set by those methods will be cancelled. Features set on the menu will stay in effect, even when the printer is unplugged.

Enter the "Menu Select Mode" either directly from the "Print Mode" or from the power off state.

To enter the "Menu Select Mode" from the "Print Mode:"

1. Make sure the printer has ribbon and paper.

2. Press the "FONT" and "PITCH" buttons simultaneously. The "SELECT" light will go off and "Menu Mode" will print. Make menu changes by using the control panel.

3. To return to the "Print Mode," press the "EXIT" button. The "SELECT" indicator will light.

Menu Select Mode (continued)

To enter the Menu Select Mode from the "Power Off" state:

1. Make sure the printer has ribbon and paper, and that it is turned "OFF."

2. Hold down the "FONT" button while turning the printer "ON." The "POWER" light will come on ("SELECT" light remains "OFF") and "Menu Mode" will print. Make menu changes by using the control panel.

3. To switch to the "Print Mode," press the "EXIT" button. The "SELECT" indicator will light.

Control Buttons

"GROUP" button: Push this button to move to the next Group in the menu.

"ITEM" button: Push this button to move to the next Item within the Group.

"SET" button: Push this button to move to the next setting within the Item. Once a setting is changed, it will be stored in the printer's permanent memory, even if the printer is turned "OFF," until the operator presses "SET" with that Group and Item selected.

"PRINT" button: Press this button at any time while in "Menu Select Mode" to print a listing of all the current menu settings. Print out the menu whenever It is changed for reference.

"EXIT" button: Push this button to exit the "Menu Select Mode" and return the printer to the "Print Mode."

For detailed information on changing printer settings, refer to the printer manual.

Loading Paper

The printer can feed sprocket (computer) paper or single sheets and accepts up to four-part forms.

Before loading paper, set the blue print head gap lever (at the left of the print head) to position 1 for 1- or 2-part paper, position 2 for 3- or 4-part paper or position 3 for extra thick paper.

1. Pull the printer drawer out. Load the paper drawer.

2. Slide the paper separator guides to their widest position.

3. Lift off the access cover.

4. Open the paper lever and the bail lever.

5. Insert the paper in the slot in the paper separator.

6. Continue sliding the paper until it reaches the platen.

7. Using the platen knob, engage the sprocket holes with the pins. If the pins need adjusting, pull the tabs forward and slide the pins left or right to accommodate the width of the paper. Lock the tabs when the pins are at the proper distance.

   (*NOTE:* Do not stretch the paper. If the sprocket holes stretch or tear during printing, readjust the pins.)

8. Close the bail, but leave the paper lever open for sprocket paper feeding.

9. Replace the access cover, making sure the paper exits through the opening.

Ribbon Removal

1. Open the printer cover.

2. Lift off the access cover.

3. Push the print head to the center of the carriage so it is away from the bail rollers. Make sure the bail is closed (lever back - see Figure 3-3).
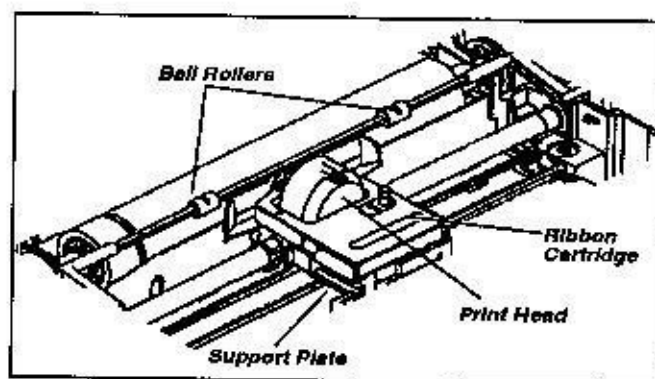

Figure 3-3

4. To remove the cartridge, slide the print head away from the rollers, grasp the cartridge on both sides and lift the cartridge off.

Ribbon Replacement

1. With the knob facing up, tilt the ribbon cartridge onto the printhead plate so it slides into the area of the plate is closest to the front of the printer (see Figure 3-4).
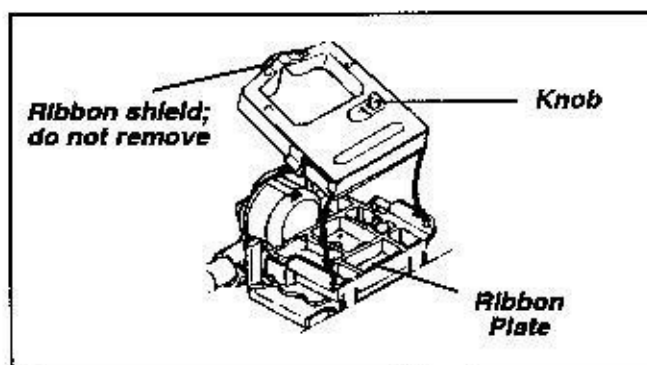

Ribbon shield; do not remove

Knob

Ribbon Plate

Figure 3-4

NOTE: If the ribbon won't load easily, turn the blue knob slightly until the x-shaped notch on the bottom of the ribbon cartridge aligns with the x-shaped insert on the ribbon plate.

2. Lower the ribbon shield over the printhead, aligning the tabs with the inserts on the printhead plate (see Figure 3-5).
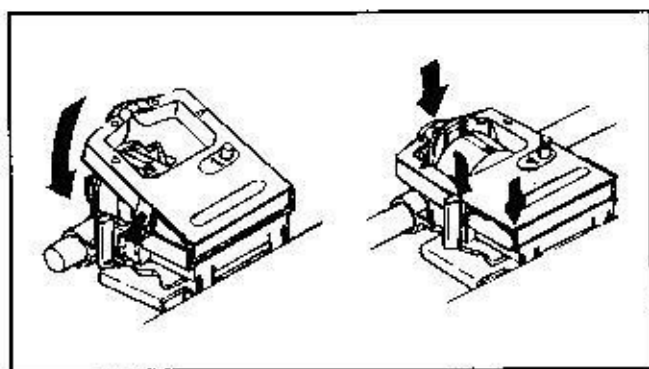

Figure 3-5

NOTE: Do not remove the clear plastic ribbon shield from the ribbon cartridge.

3. Press on the cartridge until it snaps into place.

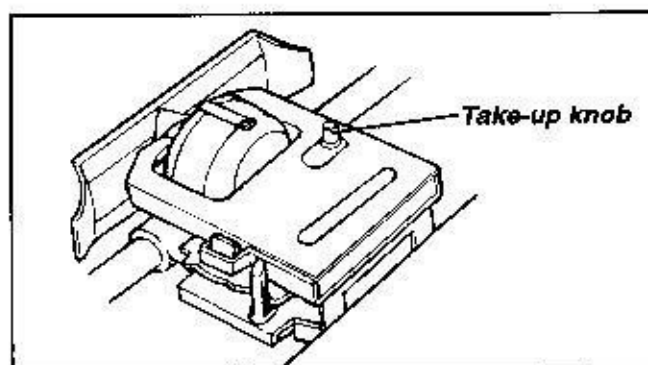4. Turn the knob in the direction of the arrow to take up slack in the ribbon (see Figure 3-6

Take-up knob

Figure 3-6

CAUTION! Do NOT touch the printhead directly after printing. Allow five minutes for it to cool.