



ALL STEER II[®] OPERATOR'S MANUAL

(U.S. PATENT NO. 5,417,299)

**FEATURING: LOW SPEED STEERING MODES
WITH
SPEED LIMITED MODE CONTROL**

OPTIONS INCLUDED: KEY SWITCH

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CAUTION

This vehicle is equipped with an Oshkosh ALL STEER® all-wheel steering system.

Compared to conventional front steer, the use of all-wheel steering significantly changes vehicle handling, particularly on a slippery road surface caused by rain, snow, or icy conditions.

Always train on all-wheel steer to get used to its characteristics.

Operating Instructions for ALL STEER® All-Wheel Steering System:

The Oshkosh ALL STEER® all-wheel steering system is intended to give your fire apparatus the maximum amount of maneuverability possible.

Maneuverability saves critical emergency response time when your fire apparatus confronts tight corners, narrow streets, parked cars, etc.

The all-wheel control system is a computer-based, electronic system. That technology makes possible the high maneuverability.

Signal errors can occur if the electronic components, wires, or connectors are damaged or contaminated by moisture. In that case, the system can malfunction. It is imperative that the fire department strictly adheres to the maintenance guidelines outlined in the ALL STEER® service manual.

To maximize the utility of the all-wheel steering system and to minimize the risk to you and to the public, Pierce recommends the following:

1. When driving in normal traffic, when extra maneuverability is of little benefit, drive routinely in front mode. Front mode is conventional steering.
2. Drive in *coordinated* all steer mode only when you need the additional maneuverability, or the time saved by the system is critical because you are responding to an emergency call.
3. *Fireground* and *crab* modes are, by their nature, limited to speeds less than 5 MPH and are intended for use at a fire scene.
4. Pay close attention to the maintenance requirements found in the service manual. Have components inspected and repaired as indicated.

All-wheel steering is a tool. Use it only when you need it.

Maximize your margin of safety.

 **CAUTION**

Do not drive this vehicle in traffic in any ALL STEER® mode until you have thoroughly read this manual and had behind-the-wheel training from a trained and certified ALL STEER® all-wheel steering system vehicle operator. Your operational training should take place on an empty parking lot and, as a minimum consist of the following operations:

Operator Training Check List:

- Learn each of the Oshkosh ALL STEER® all-wheel steering system controls.
- Practice 90 degree turns operating in front steer mode. Notice how the rear-end of the vehicle tracks inside of the front and possibly crosses over your traffic lane line toward the inside of a turn.
- Practice 90 degree turns operating in coordinated steer mode. Notice how much tighter the turn can be made. Pay special attention to the rear-end of the vehicle. It will swing-out away from the turn and likely cross over your traffic lane line toward the outside of the turn. The sharper you turn, the greater the rear-end will swing-out. More clearance is needed between your vehicle and any adjacent objects to avoid hitting them due to rear-end swing.
- Make lane change maneuvers at speeds up to 35 mph in both front steer and coordinated steer modes to learn the handling characteristic of the vehicle.
- Turn the steering wheel right and left through progressively larger angles at speeds ranging from 1 to 10 mph, to establish a feel for the point at which the rear wheels actually start to turn.
- Familiarize yourself with the low speed-coordinated and the low speed-crab steering modes. Experience how much sharper the vehicle turns in the low speed-coordinated mode. Experience how the vehicle moves diagonally, right or left, in low speed-crab mode.
- Practice backing the vehicle in each of the available steering modes.
- Return to the training area when rain or snow makes the pavement slippery, and practice several low speed, panic brake stops and sharp steering maneuvers in both front steer and coordinated steer modes. Learn the difference in how quickly the vehicle changes direction when recovering from a skid or when making a hard turn in the coordinated steer mode, compared to the way the vehicle handles while in the front steer mode.

FOREWORD

1. PURPOSE

This publication provides the information needed to properly operate the Oshkosh ALL STEER® all-wheel steering system.

Failure to follow the enclosed instructions and requirements could cause equipment failures or malfunctions that can result in death, serious bodily injury, or damage to property.

Additionally, failure to follow these instructions will void the warranty provided to the OEM/Installer by Oshkosh Truck Corporation.

If conditions arise that have not been described in this document, or you are uncertain about the operation or procedures and their possible affect on the vehicle, immediately contact the OEM/Installer or Oshkosh Truck Corporation.



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OSHKOSH ALL STEER® ALL-WHEEL STEERING SYSTEM OPERATION

1. INTRODUCTION

The Oshkosh ALL STEER® all-wheel steering system consists of the following:

- The vehicle's original front steering system
- Driving, steerable rear axle(s)
- Rear axle hydraulic steering pump, steering cylinder(s) and hydraulic filter
- Various valves and sensors
- ALL STEER® VIM (Vehicle Interface Module), translators, mode selector switches, and liquid crystal display

All of the ALL STEER® operator controls are located in the cab.

The Oshkosh ALL STEER® all-wheel steering system has several different steering modes for improved maneuverability. The driver selects the desired mode on the go based on the driving conditions at hand.

Use the front steer mode for normal highway driving. Use the coordinated steer mode for driving when more maneuverability is required at speeds up to 38 mph. Use the fire ground-coordinated and fire ground-crab modes when maximum maneuverability is required at very low speeds (up to 10 mph for FG Coord, up to 6 mph for FG Crab) when parking or positioning the vehicle. The fire ground-coordinated mode provides the sharpest turning possible and the fire ground-crab mode allows the vehicle to move sideways in a diagonal manner.

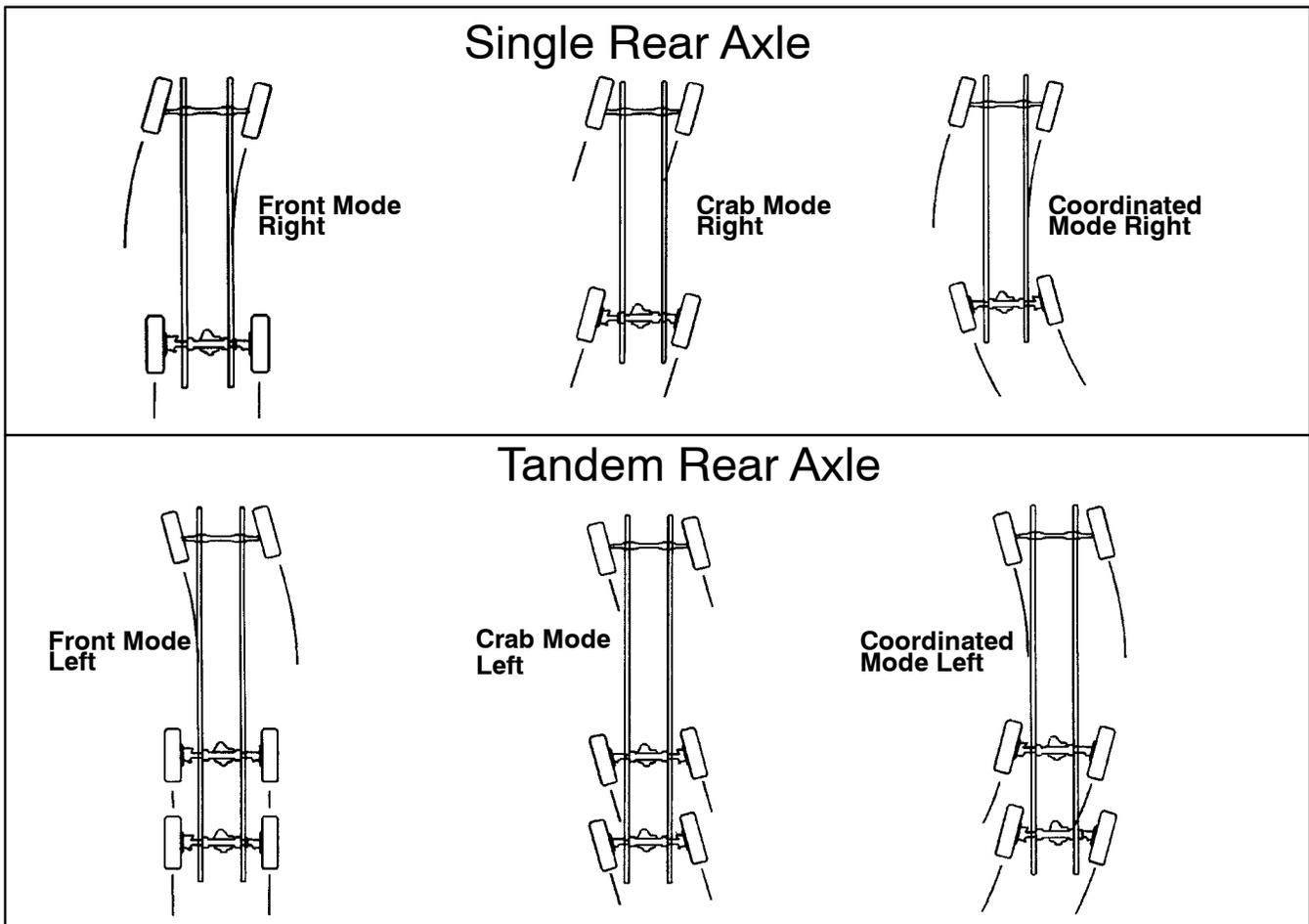


Figure 1. Steering Mode-Single Rear and Tandem Rear Axles

2. INSTRUMENT PANEL CONTROLS AND THEIR FUNCTION

Read section 3 in this manual for a detailed explanation of how the mode selector switches, liquid crystal display, and the ALL STEER® control system work together before operating the Oshkosh ALL STEER® all-wheel steering system installed on your vehicle.

2.1 Steering Controls. The ALL STEER® control system includes a three-position ALL STEER® mode switch for selecting between front, coordinated and fire ground steer modes, see Figure 2. With the ALL STEER® mode selector switch in the FIRE GROUND position, the fire ground two-position rocker switch allows selection between fire ground-coordinated or fire ground-crab steer modes, see Figure 2.

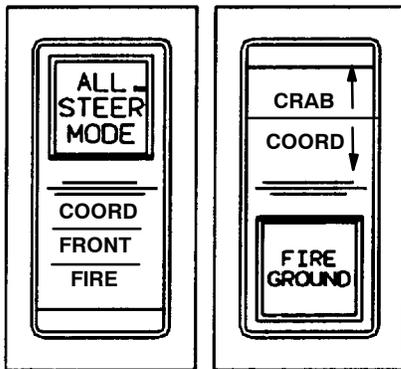


Figure 2. Mode Selector Switches

2.1.1 Front Steer Mode. When the ALL STEER® mode switch is placed in the FRONT STEER position the rear wheels are locked in the straight-ahead position regardless of the front wheel position. In front steer, only the front wheels steer when the steering wheel is turned.

2.1.2 Coordinated Steer Mode. When the ALL STEER® mode selector switch is placed in the COORD STEER position, and the front wheels turn past the programmed deadband (see sections 3.1, 3.4, and Figure 23), the rear wheels turn proportionally in the opposite direction of the front wheels to provide a tighter turning radius, see Figure 1. The coordinated steer mode has a maximum operating speed of 38 mph.

2.1.3 Fire Ground Steer Modes. When the ALL STEER® mode selector switch is placed in the FIRE GROUND position, the operator can select either COORD STEER or CRAB STEER for maximum maneuverability at speeds up to 10 mph for COORD STEER and 6 mph for CRAB STEER.

When operating in fire ground-coordinated steer, the rear wheels turn proportionally in the opposite direction to the front wheels to allow a tighter turn than the normal

coordinated steer mode. In the fire ground modes, the deadband is smaller than it is in the normal coordinated steer mode, allowing the vehicle to turn even sharper, see Figure 1.

When operating in fire ground-crab steer, the rear wheels turn proportionally in the same direction as the front wheels to allow the vehicle to move sideways in a diagonal manner, see Figure 1.

2.1.4 LCD display

The new ALL STEER® system will use a liquid crystal display in place of the wheel position gauge. This display will provide the operator and technician with more information than was available with the wheel position gauge.

2.1.5 Display Operation

2.1.6 Axle Status Screen

The axle status screen is the first screen that is displayed after the ALL STEER® system is powered up. This is the screen that will be used during operation of the ALL STEER® system.

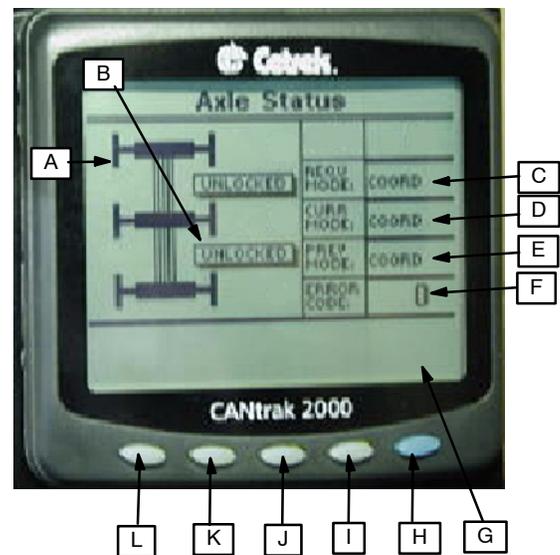


Figure 3. Default Screen, System Shown In COORD MODE

The axle status screen displays the following information, see Figure 3:

A. Chassis Outline

The front of the chassis is towards the top of the screen. The wheels of the Chassis Outline turn in accordance with the wheels of the truck. If this were a single rear axle truck, the axle closest to the bottom of the screen would be omitted.

B. Axle Lock Status

These windows display the state of the mechanical lock pins. When the pins are in the raised position, the windows read “UNLOCKED”, when the pins are seated in the tapered hole of the lock block the windows read “LOCKED”. The upper window is the lock status for Axle 2 of a tandem truck or the rear axle of a single axle truck. The lower window is for Axle 3 of a tandem axle truck. If this were a single rear axle truck the lower window would be omitted.

C. Requested Mode

This displays the mode that the operator has selected with either the three or the two position mode switch.

D. Current Mode

This displays the steering mode that the system is actually operating in.

E. Previous Mode

This displays the steering mode that the system will go back to, when the vehicle slows down from an overspeed condition.

F. Error Code

This displays the error code number.

G. Message Box

This displays special messages to the operator such as what conditions must be satisfied to change a requested mode to a current mode, error code details, and calibration instructions.

H. Enter/Exit Pushbutton

This is the only pushbutton on the display that is blue in color. This pushbutton is used for entering and exiting the screen adjusting mode.

I. Screen Adjusting Pushbutton

This pushbutton is used to move forward to the Input/Output screen. This pushbutton is also used to increase contrast in the screen-adjusting mode.

J. Screen Adjusting Pushbutton

This pushbutton is used to move back to the Input/Output screen or the Axle Status screen. This pushbutton is also used for decreasing contrast in the screen-adjusting mode.

K. Screen Adjusting Pushbutton

This pushbutton is used to update the display data. This pushbutton can only be used to update data when viewing the Axle Center screen. This pushbutton can also be used to increase the screen back lighting in the screen-adjusting mode.

L. Screen Adjusting Pushbutton

This pushbutton is used to decrease the screen backlighting in the screen-adjusting mode.

2.1.7 Input/Output Screen

The Input/Output screen is the second of the three screens available on the new display. This screen shows the state of the input and output circuits from the VIM (Vehicle Interface Module) and I/O (Input/Output) module. This screen will be useful to the technician for troubleshooting. This screen does not need to be used for normal ALL STEER® operation.

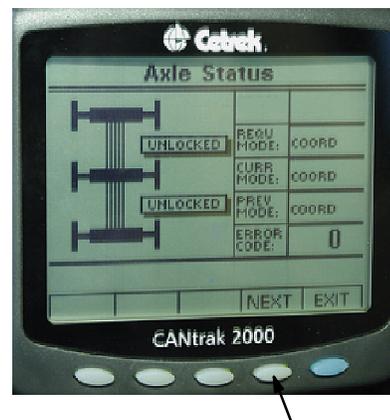


Figure 4. Arrow Shows Pushbutton Used To Access I/O Screen

To access the Input/Output screen, press the fourth pushbutton from the left indicated by the arrow in Figure 4. After pressing the pushbutton, 5 boxes emerge from the bottom of the screen. The fourth pushbutton from the left has a box above it that is labeled “NEXT”. Press the fourth pushbutton again. The Input/Output screen will be shown on the display.

2.1.8 VIM Inputs

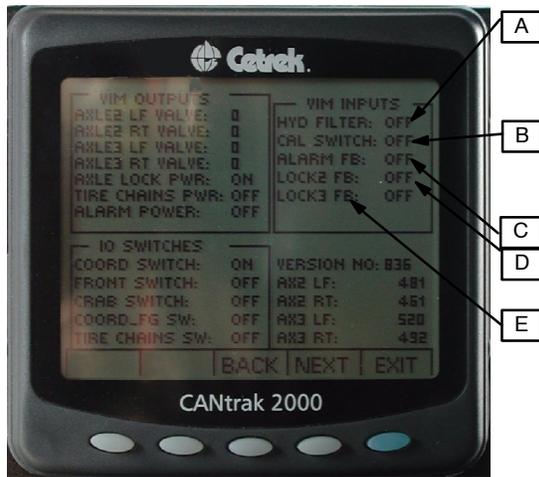


Figure 5. I/O Screen Showing VIM Inputs

The VIM Input section of the Input/Output screen displays the following information, see Figure 5:

A. Hydraulic Filter Input

This input is from the differential pressure switch on the high-pressure filter located between the ALL STEER® hydraulic pump and the ALL STEER® hydraulic manifold. This input is on when the hydraulic filter is clean and oil is flowing freely. This input is off when the filter is plugged and oil flow is restricted, or there is a break in continuity between the filter switch and the VIM.

B. Calibrate Switch Input

This input will normally read “OFF”. When the calibration switch is actuated the input will change to “ON”.

C. Alarm Feedback Input

This input will read “OFF” when the crab alarm is off. This input will read “ON” when the crab alarm is sounding.

The VIM Output section of the Input/Output screen displays the following information, see Figure 6:

D. Lock 2 Feedback Input

This input will read “OFF” when the lock pin on the forward rear axle of a tandem rear axle truck, or the rear axle of a single rear axle truck, is up, or outside the range of the lock proximity switch.

E. Lock 3 Feedback Input

This input will read “OFF” when the lock pin on the rear most axle of a tandem rear axle truck is up or outside the range of the lock proximity switch. This input will read “ON” when the lock pin is fully seated in the tapered hole or within the range of the lock proximity switch. This input will be omitted on single rear axle trucks.

Steering Valves

The four steering valve outputs display a “Ø” when the valve is off or not steering, and will display a number when the valve is steering. The low number will vary depending on the learned threshold for that valve but it is usually between 350 and 550 for a tandem aerial fire truck. The number will increase as the hydraulic effort required to make a turn increases. The number displayed at each valve will change rapidly and the number could be potentially difficult to read. This condition is normal. The number is only used as an indicator that the valve is on. When a number is displayed, this means voltage is being sent to the valve. The coil is energized, shifting the spool in the valve, causing the rear axle to turn.

When making a right turn in Coordinated Mode, the left steering valve(s) turn on, here is why: The left side of the vehicle is the drivers side of the vehicle, the right side is the passengers side. The operator makes a right turn. The operator has selected Coordinated Mode, and expects the truck to turn with a reduced turning radius. The front half of the front wheels of the truck turn to the right as always. The rear wheels must turn in the opposite direction of the front wheels to reduce the turning radius; therefore, the left steering valve(s) turn on, and the front of the rear wheels turn to the left.

A. Axle 2 Left Valve

This output is for the left valve on the forward rear axle of a tandem rear axle truck or the rear axle of a single rear axle truck. This output reads “Ø” when the valve is turned off and reads a number when the valve is on.

2.1.9 VIM Outputs

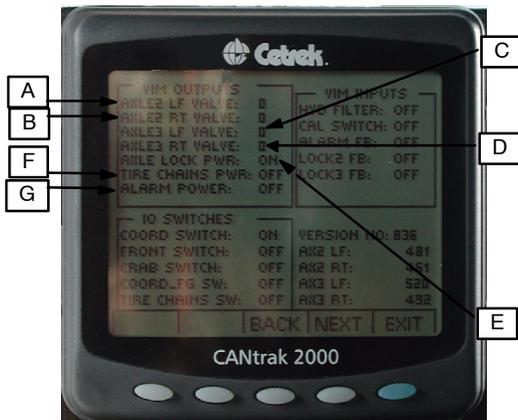


Figure 6. I/O Screen Showing VIM Outputs

B. Axle 2 Right Valve

This output is for the right valve on the forward rear axle of a tandem rear axle truck or the rear axle of a single rear axle truck. This output reads “0” when the valve is turned off and reads a number when the valve is on.

C. Axle 3 Left Valve

This output is for the left valve on the rear most axle of a tandem rear axle truck. This output reads “0” when the valve is turned off and reads a number when the valve is on. This output will be omitted on single rear axle trucks.

D. Axle 3 Right Valve

This output is for the right valve on the rear most axle of a tandem rear axle truck. This output reads “0” when the valve is turned off and reads a number when the valve is on. This output will be omitted on single rear axle trucks.

Other VIM Outputs

E. Axle Lock Power

This is the 12-volt output to the electric over air lock valve(s). This output reads “ON” when the locks are unlocked and “OFF” when they are locked.

F. Tire Chain Power

This is the 12-volt output that engages the automatic tire chains. This output is “ON” when the tire chains are engaged and “OFF” when the tire chains are disengaged.

G. Alarm Power

This is the 12-volt output to the crab alarm. This output is “ON” when the crab alarm is on and is “OFF” when the crab alarm is off.

2.1.10 I/O Switches

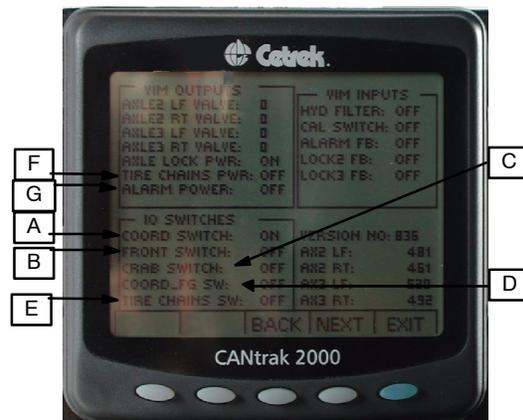


Figure 7. I/O Screen Showing I/O Switches

This section reads the switch states. These switches are connected to the Input/Output Module located inside the cab, see Figure 7.

A. Coord Switch

This input reads the Coordinated mode input on the three-position mode switch. This input reads “ON” when the Coordinated Mode has been selected and reads “OFF” when any other mode has been selected.

B. Front Switch

This input reads the Front mode input on the three-position mode switch. This input reads “ON” when the Front Mode has been selected. This input reads “OFF” when any other mode has been selected.

C. Crab Switch

This input reads the Crab Mode input on the two-position mode switch. This input reads "ON" when Fireground on the three-position switch and Crab on the two-position switch has been selected. This input reads "OFF" when any other mode has been selected.

D. Coordinated Fireground Switch

This input reads the Coordinated Fireground input on the two-position mode switch. This input reads "ON" when Fireground on the two-position mode switch and Coordinated on the three-position mode switch has been selected. This input reads "OFF" when any other mode has been selected.

E. Tire Chains Switch

This input reads the automatic tire chains switch input. This input reads "ON" when the tire chain switch is on and "OFF" when the tire chain switch is off.

2.1.11 Miscellaneous Information (See Figure 8)

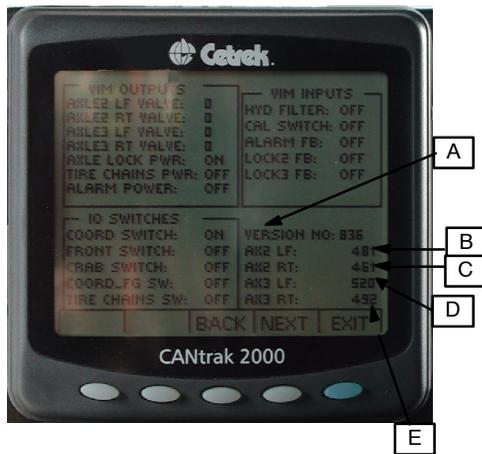


Figure 8. I/O Screen Showing Software Rev And Thresholds

A. Software Revision

This number is the software revision level of the ALL STEER® system. the first 3 digits are VIM software revision; the last 2 digits are display software revision.

Valve Thresholds

Valve Threshold numbers are set up during the calibration and learn cycle. These numbers represent the minimum electrical signal required to turn the rear

axle. These numbers vary from left to right and axle to axle but usually are between 350 and 550 for a tandem aerial ladder fire truck. These numbers do not change during normal operation. If the system is recalibrated or relearned it is likely these numbers will be different after these cycles have been completed. If these numbers do not change after the Calibration or Learn Cycle, access the axle center screen and press the white pushbutton below the box labeled "DATA" and scroll back to the I/O screen.

B. Axle 2 Left Threshold

This represents the threshold number of the left valve for the forward rear axle of a tandem or a single rear axle truck.

C. Axle 2 Right Threshold

This represents the threshold number of the right valve for the forward rear axle of a tandem or a single rear axle truck.

D. Axle 3 Left Threshold

This represents the threshold number of the left valve for the rear most axle of a tandem axle truck. This threshold will be omitted if this is a single rear axle truck.

E. Axle 3 Right Threshold

This represents the threshold number of the right valve for the rear most axle of a tandem axle truck. This threshold will be omitted if this is a single rear axle truck.

Encoder Value Screen

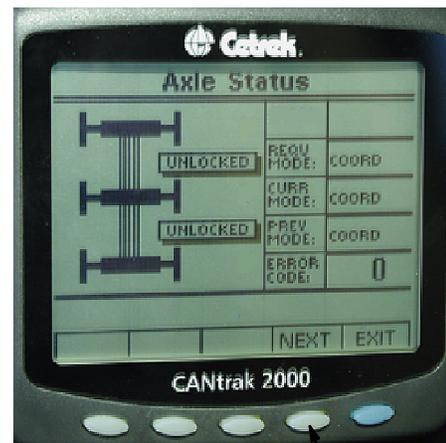


Figure 9. Arrow Shows Pushbutton Used To Access Encoder Value Screen

The encoder value screen is the third of the three screens available on the new display. This screen shows the calibrated center positions, full cramp positions, real time encoder values, and calibrated deadband values of each axle. This screen will be

useful to the technician for troubleshooting. This screen does not need to be used for normal ALL STEER® operation.

To access the encoder value screen, press the fourth pushbutton from the left indicated by the arrow in Figure 9. After pressing the pushbutton, 5 boxes emerge from the bottom of the screen. The fourth pushbutton from the right has a box above it that is labeled "NEXT". Press the fourth pushbutton from the left twice. The encoder value screen will be shown on the display.

2.1.12 Front Axle Values (see Figure 10)

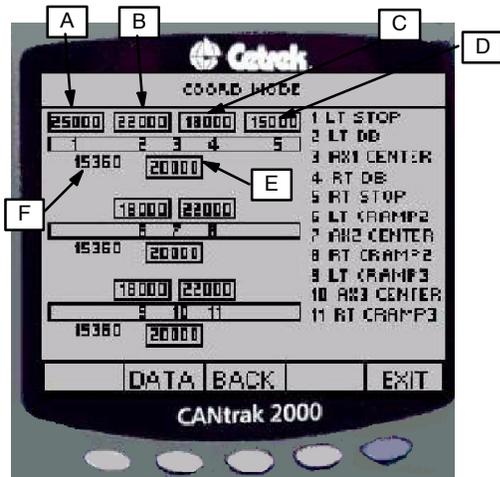


Figure 10. Encoder Value Screen Showing Front Axle Information

A. #1 Left Turn Stop

This number represents the calibrated left turn full cramp encoder value. The actual left turn encoder value could be greater than this value.

B. #2 Left Turn Deadband

This number represents the left turn deadband. When the encoder position number is greater than this value the rear axles will begin to turn.

C. #4 Right Turn Deadband

This number represents the right turn deadband. When the encoder position number is less than this value the rear axles will begin to turn.

D. #5 Right Turn Stop

This number represents the calibrated right turn full cramp encoder value. The actual right turn encoder value could be greater than this value.

E. #3 Front Axle Calibrated Center

This number represents the encoders calibrated center position.

F. Front Axle Encoder Position

This number represents the actual encoder position. This number will continually change as the steering wheel is turned.

2.1.13 Axle 2 Values (see Figure 11)

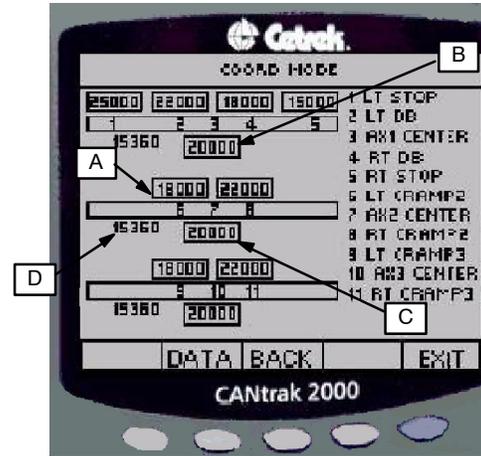


Figure 11. Encoder Value Screen Showing Axle 2 Information

Axle 2 is defined as the forward rear axle on a tandem rear axle truck, or the rear axle on a single rear axle truck. In this section a left turn of the rear wheels is when the front of the tires turn left. The left valve turns on when making a right turn in Coordinated mode.

A. #6 Left Turn Cramp Angle

This number represents the left turn full cramp encoder value.

B. #8 Right Turn Cramp Angle

This number represents the right turn full cramp encoder value.

C. #7 Axle 2 Calibrated Center

This number represents the encoders calibrated center position value.

D. Axle 2 Encoder Position

This number represents the actual encoder position. This number will continually change as the rear axle turns.

2.1.14 Axle 3 Values (see Figure 12)

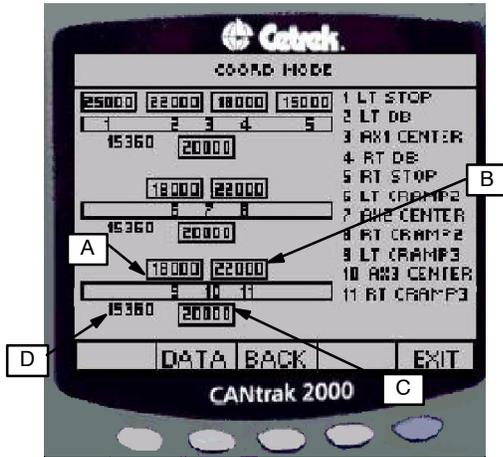


Figure 12. Encoder Value Screen Showing Axle 3 Information

Axle 3 is defined as the rear most axle on a tandem rear axle truck. In this section a left turn of the rear wheels is when the front of the tires turn left. The left valve turns on when making a right turn in Coordinated mode. Axle 3 values will be omitted if this is a single rear axle truck.

- A. #9 Left Turn Cramp Angle
This number represents the left turn full cramp encoder value.
- B. #11 Right Turn Cramp Angle
This number represents the right turn full cramp encoder value.
- C. #10 Axle 3 Calibrated Center
This number represents the encoders calibrated center position value.
- D. Axle 3 Encoder Position
This number represents the actual encoder position. This number will continually change as the rear axle turns.

2.1.15 Scrolling To Previous Screens (see Figure 13)



Figure 13. Encoder Value Screen. Arrow Points To The Pushbutton Used To Scroll Backwards

To scroll backward to the I/O screen press the white pushbutton below the box labeled “BACK”.

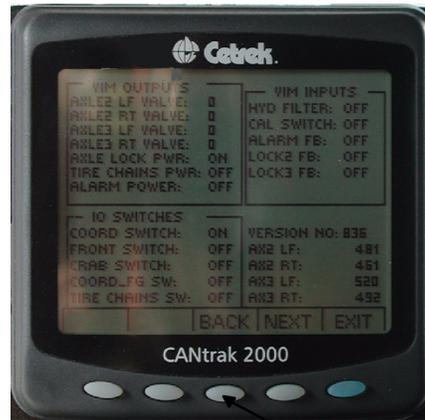


Figure 14. I/O Screen. Arrow Points To The Pushbutton Used To Scroll Backwards

To scroll backward to the Axle Status screen press the white pushbutton below the box labeled “BACK”.

2.1.16 Screen Adjustments (see Figure 15)

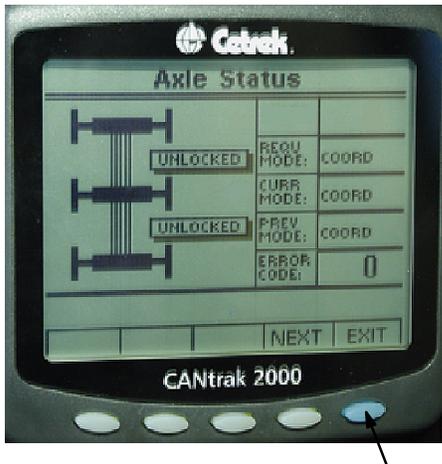


Figure 15. Axle Status Screen Indicating The Pushbutton Used To Access Screen Adjustments

Contrast and lighting may be adjusted to aid in reading the display. The screen will retain the adjusted settings until it is powered down. When the display is repowered it will revert to the default settings.

To access screen adjustments, press the blue pushbutton, see Figure 16. The following screen will be displayed:



Figure 16. Display With Contrast Adjust Feature

To increase contrast, press the white pushbutton below the plus sign in the contrast box. To decrease contrast, press the white pushbutton below the minus sign in the contrast box.

To adjust the lighting press either of the two pushbuttons below the lighting box. When either of these two

pushbuttons is pressed the following screen will be displayed, see Figure 17:



Figure 17. Lighting Adjustments

To increase lighting, press the white pushbutton below the plus sign in the lighting box. To decrease lighting, press the white pushbutton below the minus sign in the lighting box.

To exit the Screen Adjustment Features press the blue pushbutton below the "EXIT" box.

2.1.17 Key Switch. A key switch option has been provided to allow the system to be powered down, see Figure 18.



Figure 18. Key Switch

To activate ALL STEER®:

- (1) Insert the key into the key switch and turn the key clockwise to activate. The key may be removed to prevent unauthorized de-activation of ALL STEER®.

To deactivate ALL STEER®:

- (1) Place the ALL STEER mode switch in the FRONT STEER position.
- (2) Steer the vehicle into the straight ahead position to ensure that the rear wheels are locked in the straight ahead position.

- (3) Verify that LOCKED appears on the LCD display.
- (4) Insert the key into the lock switch and turn the key counter-clockwise to deactivate.
- (5) Remove the key.

NOTE

When ALL STEER is deactivated:

- The system is powered down.
- The rear axle(s) remain in whatever position it was (they were) in when the system was powered down.
- The controller is inactive and does not check for errors or axle misalignment.
- The vehicle drives as if it is not equipped with ALL STEER all wheel steering system.

2.1.18 ALL STEER® Calibration. The ALL STEER® calibration switch is used during calibration procedures and for error code retrieval, see Figure 19. In most applications, a push-button style calibration switch is used.



Figure 19. Calibration Switch

3. CONTROL SYSTEM OPERATION

The Oshkosh ALL STEER® all-wheel steering control system has automatic features that simplify the operation of your vehicle and reduce the risk of unintended over-steering. If you have the key switch option, turn the switch to the on position to activate ALL STEER®.

Although ALL STEER® aids in maneuverability, YOU are in control of the system. You must decide which mode you want to drive in. You must make appropriate judgements and decisions in light of traffic, road conditions, the amount of space available to turn, the presence of people, vehicles, or other objects, and where you wish to drive.

Drive using ALL STEER® modes only when added maneuverability is necessary.

When using ALL STEER®, make all steering angle corrections slowly to avoid over-steering, loss of control, and roll-over.

If your Oshkosh ALL STEER® all-wheel steering system does not operate as described in the following sections, straighten the rear wheels, deactivate the system, drive only in the front steer mode and contact your authorized Pierce dealer.

3.1 Deadband. The deadband is the number of degrees you must turn the front wheels, right or left, before the rear wheels also turn. The angle of rear axle wheel turn is always proportional to the number of degrees that you steer the front wheels beyond the programmed deadband for any given speed.

3.2 Switching Modes

The mode switches can be moved at any time; however, the mode changes will not become effective until the front axle crosses through center. This means that first the new mode must be selected and then the front axle must be steered through its center position to become effective.

Lets run through a simple mode change. The system has been started and is currently in front mode. Notice **REQU MODE** (Requested Mode), **CURR MODE** (Current Mode), **PREV MODE** (Previous Mode) all show **FRONT**, see Figure 20.

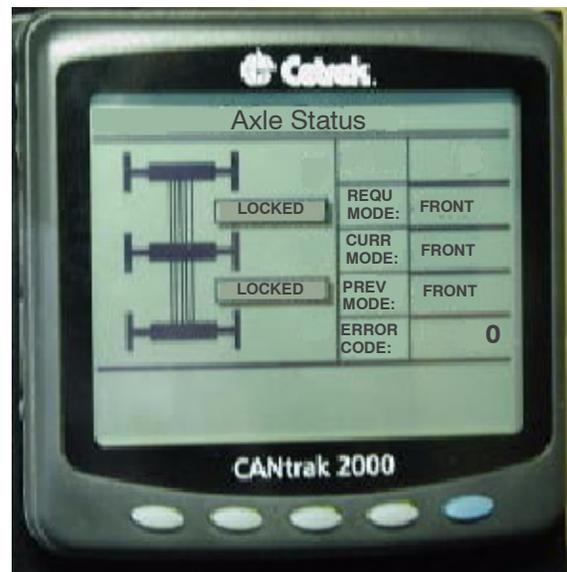


Figure 20. FRONT Mode

Actuate the three position mode switch to put the system into Coordinated Mode. See how the **CURR MODE** is still **FRONT**. The **REQU MODE** has changed to **COORD**. There is also a message at the bottom of

the screen to advise the operator, "waiting for front to cross center", see Figure 21.

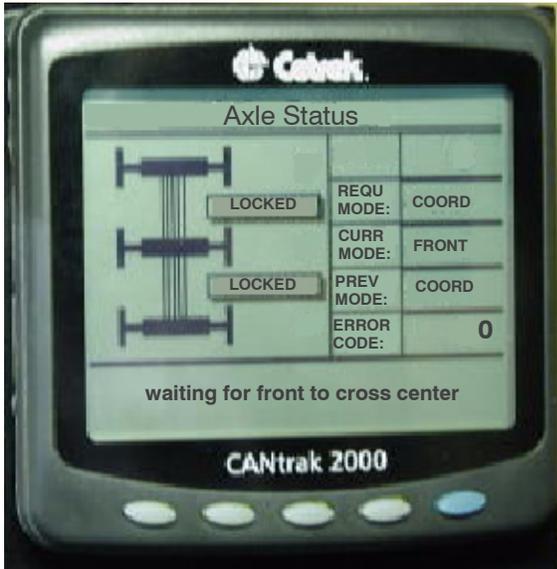


Figure 21. Mode Switch Has Been Actuated But Front Axle Has Not Crossed Center

The operator has now crossed center. REQU, CURR, and PREV modes have all changed to COORD, and the mechanical locks have unlocked, see Figure 22.

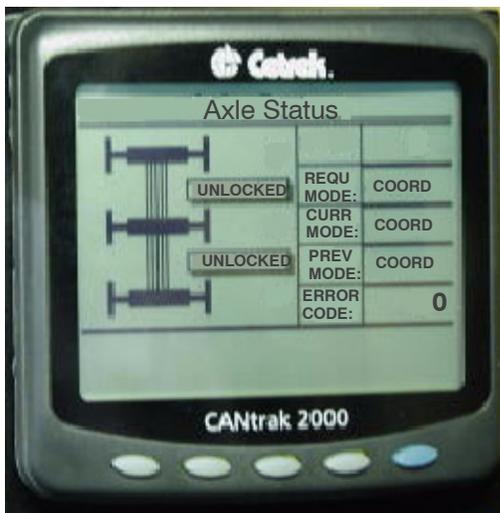


Figure 22. The Mode Change To COORD Is Complete

NOTE

Although the ALL STEER® controller changes steering modes and deadband as the vehicle speed varies, the driver always controls the vehicle's direction through the steering wheel.

3.3 Front Steer Mode Operation. In the front steer mode the vehicle drives as if it is not equipped with the Oshkosh ALL STEER® all-wheel steering system. In the front steer mode the rear wheels are mechanically locked in the straight-ahead position at all vehicle speeds, and in any front wheel position. You can switch to the front steer mode at any time.

To operate in the front steer mode, place the ALL STEER® mode switch in the FRONT STEER position, see Figure 2. This causes the FRONT to be the Requested Mode. After moving the selector switch, the front wheels must be returned to their straight-ahead position before the ALL STEER® controller completes the mode change, makes Front the current mode, and allows the rear axle lock to engage.

3.4 Coordinated Steer Mode. To operate in the coordinated steer mode, place the three position ALL STEER® mode switch in the COORD STEER position, see Figure 2.

You may select the coordinated steer mode with the vehicle moving or stopped, and make the change from either the front steer or the fire ground modes. After moving the selector switch, you must steer the front wheels to their straight-ahead position before the ALL STEER® controller completes the mode change.

Since the axle lock is unlocked, the rear axle steers when it receives a steering command from the ALL STEER® controller. The amount of rear steering allowed depends on the front axle wheel position, the speed of the vehicle, and the deadband. Figure 23 shows how the deadband varies with vehicle speed from 0 to 38 mph.

The deadband and speed relationship from 0 to 10 mph are programmed to minimize the amount of rear-end-swing when making a sharp 90 degree turn. From 0 to 2 mph the deadband is at its maximum and the rear axle will not steer. From 2 to 10 mph the deadband decreases to ±7 degrees. From 10 to 20 mph the deadband is fixed at ±7 degrees. Once vehicle speed reaches 20 mph, the deadband progressively increases as the speed increases to reduce the possibility of making too sharp a turn. When the vehicle speed reaches 38 mph the rear axle does not steer.

When vehicle speed exceeds 38 mph, the ALL STEER® controller automatically switches to the front steer mode. At this time, FRONT becomes the Current Mode. COORD is the Requested and Previous Mode. The

mechanical lock window(s) will read LOCKED. This indicates that the mechanical lock on the rear axle(s) has locked.

When the vehicle slows down to a speed less than 38 mph, the ALL STEER® controller automatically switches back to the coordinated steer mode. The rear axle unlocks and the rear axle is able to steer again. The deadband depicted in Figure 23 also applies as vehicle speed is reduced from 38 mph down to 0 mph.

3.5 Fire Ground-Coordinated and Fire Ground-Crab Steer Modes. The fire ground-coordinated and fire ground-crab steering modes are available for low speed situations requiring maximum maneuverability. The fire ground-coordinated mode provides the sharpest turning possible and the fire ground-crab mode allows the vehicle to move sideways in a diagonal manner. The ALL STEER® controller restricts the use of low speed steering modes to speeds ranging from 0 to 10 mph for Fireground, Coordinated, and 0 to 6 mph for Fireground Crab modes. The deadband is fixed at ± 3 degrees for the fire ground-coordinated mode, and ± 1 degree for the fire ground-crab mode.

To operate in one of the fire ground modes, perform the following:

- (1) **STOP THE VEHICLE.**
- (2) Place the three position ALL STEER® mode selector switch in the FIRE GROUND position, see Figure 2. As soon as you have selected fire ground mode, an audible alarm begins to cycle on-and-off signaling that the fire ground mode has been selected.

Never tamper with the audible alarm! If you attempt to remove the alarm from the circuit, the ALL STEER® controller will not be able to enter the fire ground mode, and an 11 error code will be displayed.

Fireground Coordinated or Fireground Crab will show as the requested and Previous Mode. "Waiting for front to cross center" will be displayed in the message box of the liquid crystal display.

- (3) Check the fire ground mode selector switch or display to determine whether the ALL STEER® system is in fire ground COORD STEER, or fire ground CRAB STEER, see Figure 2. Since there is no neutral position, one of these two settings is active when the ALL STEER® mode switch is in the FIRE GROUND position. If you need to change fire ground modes, move the fire ground mode switch, see Figure 2. The mode that is being requested is what is shown as Requested Mode on the display.

- (4) To switch into the Fire Ground-Coordinated Mode, move the the two-position mode switch to the Coordinated position. FG COORD should be listed as the requested mode. A message should be displayed at the bottom of the display that says, "Waiting for front to cross center". Cross center with the front wheels. The "Waiting for front to cross center" message should go away. FG COORD should be listed as the Requested, Current and Previous modes.

You are now ready to position the vehicle while operating at speeds up to 10 mph. If you operate in the Fire Ground Coordinated mode, you will be able to turn a tighter circle than is possible in the normal Coordinated Steer Mode.

If you are in a turn and the speed goes above 10 mph, you will be able to complete the turn without a steering mode change. However, as you steer back to the straight-ahead position, the ALL STEER® controller automatically switches to the Front steer mode. The Current mode will be listed as FRONT. FG COORD will be listed as the Requested and Previous modes. The following message will be displayed at the bottom of the display "wait for front to cross center and speed <10.

To reactivate Fire Ground Coordinated mode, slow down to less than 10 mph and cross center with the front wheels. FG COORD will now be displayed as the Requested, Current and Previous modes.

- (5) To switch into the Fire Ground Crab Mode, move the two-position mode switch to the Crab position. CRAB should be listed as the requested mode. A message should be displayed at the bottom of the display that says "Waiting for front to cross center". Cross center with the front wheels. The "Waiting for front to cross center" message should go away. CRAB should be listed as the Requested, Current and Previous modes..

You are now ready to position the vehicle while operating at speeds up to 6 mph. If you operate in the Fire Ground Crab mode, the vehicle will move in a diagonal sideways motion.

If you are in a turn and the speed goes above

6 mph, you will be able to complete the turn without a steering mode change. However, as you steer back to the straight-ahead position, the ALL STEER® controller automatically switches to the Front steer mode. The Current mode will be listed as FRONT. CRAB will be listed as the Requested and Previous modes. The following message will be displayed at the bottom of the display: “wait to cross center and speed <6.”

To reactivate Fire Ground Coordinated, slow down to less than 6 mph and cross center

with the front wheels. CRAB will now be displayed as the Requested, Current and Previous Modes.

Notice that the audible alarm continues to cycle on-and-off until the ALL STEER® mode change is complete.

- (6) To switch out of Fire Ground steer mode, return the three position ALL STEER® mode switch (see Figure 2) to either FRONT STEER or COORD STEER. You must also steer the front wheels to their straight-ahead position before the ALL STEER® controller completes the mode change.

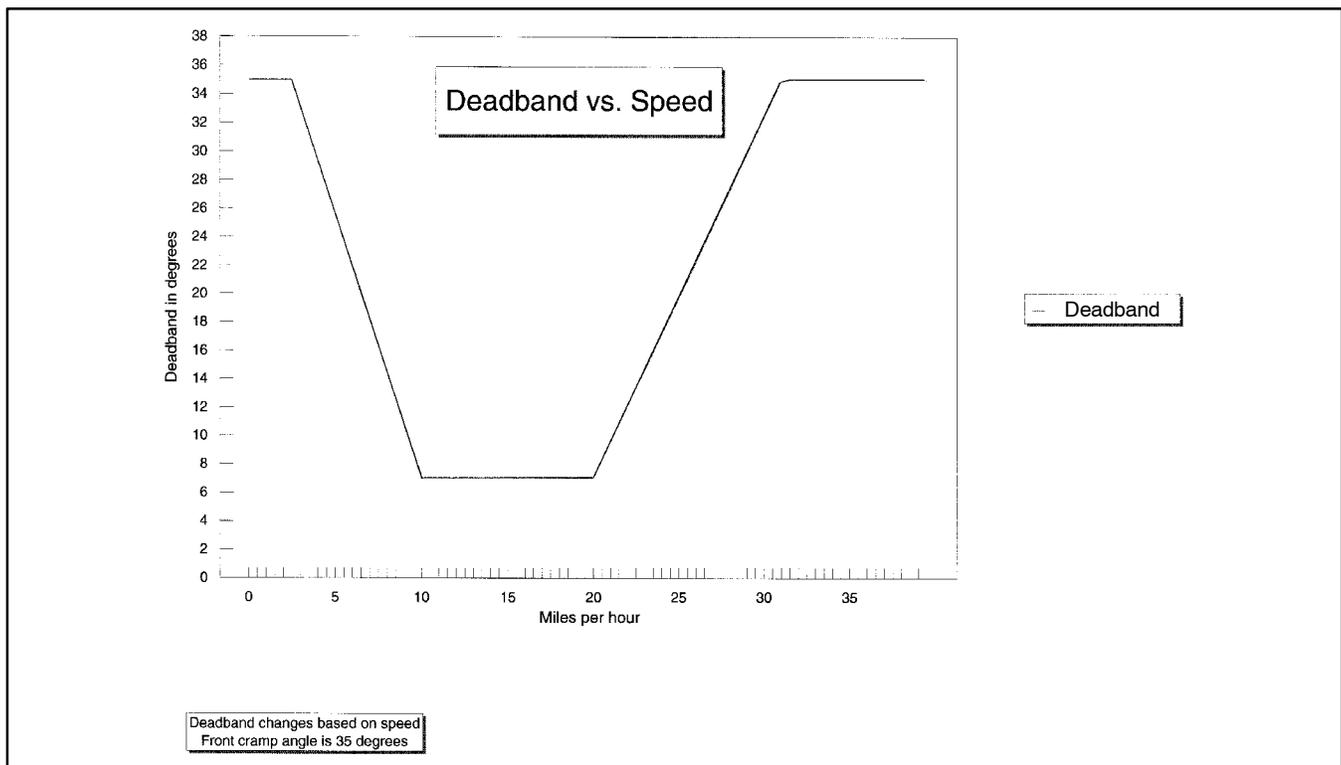


Figure 23.

4. SAFETY PRECAUTIONS

The ALL STEER® product safety labeling is important. Do not remove any of these labels. Replace any labels that become damaged or loose. Order replacement labels through your dealer or service center.

One ALL STEER® product label is mounted next to each driver entry door on your vehicle, see Figure 24. The purpose of these labels is to alert the driver that the vehicle is equipped with a unique all-wheel steering system.



Figure 24. ALL STEER® Product Label

4.1 Steering Mode Caution and Operator Caution Labels. The small Steering Mode caution label is located next to the ALL STEER® mode selector switch, see Figure 25. The Operator Caution label is located near the driver's seat, see Figure 26. **Follow the instructions on these labels and in this manual before operating this vehicle in any ALL STEER® mode.**

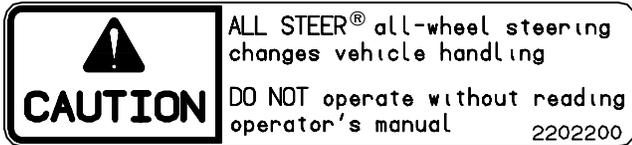


Figure 25. Steering Mode Caution Label

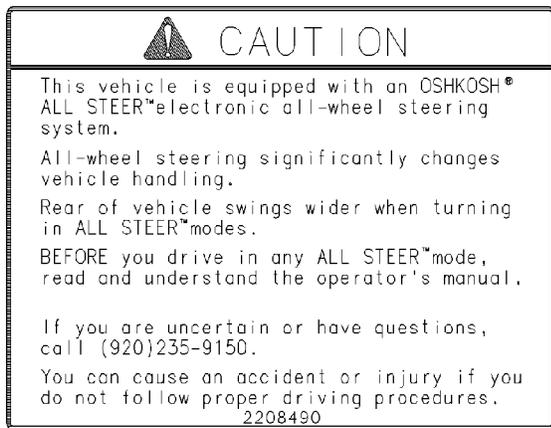


Figure 26. Operator Caution Label

4.2 Rear-Swing Caution Label. A Rear Swing caution label is mounted at the bottom of each outside, rear view mirror, see Figure 27. These labels are mounted on the mirrors to remind you of the rear-swing that occurs when cornering.



Figure 27. Rear Swing Caution Label

The rear corners of any vehicle designed with a long body overhang behind the rear axle swing-out when turning sharply, even when operating in the front steer mode. To reduce the risk of a side collision when turning at intersections in traffic, always shift to the inside of your lane. If you are turning right, start your turn from the right side of your lane. If you are turning left, start your turn from the left side of your lane. **Never start a turn unless you have adequate clearance to the outside of your turn when operating in both the coordinated steer and fire ground—coordinated**

steer modes. Rear-swing will be greatest in the low speed mode.

4.3 Rear Wheel Clearance Warning Label. The Rear Wheel Clearance warning label is located on the vehicle body next to the rear wheels, see Figure 28.

⚠ WARNING

Never place your body between the wheel and other objects when the engine is running or when someone is steering the vehicle, because the rear wheels can crush you. Refer to the ALL STEER® service manual for proper service instructions.



Figure 28. Wheel Warning Label

4.4 Starting the Vehicle. This manual explains the operation of only the Oshkosh ALL STEER® all-wheel steering system installed on your vehicle. Read your vehicle manufacturer's Operator's Manual for all other operating instructions before starting and driving your vehicle.

⚠ CAUTION

ALL STEER® will not function properly until vehicle system air pressure is above 85 psi because the rear axle lock will not release.

4.5 Towing Caution. Vehicle damage can occur if you tow with incorrect equipment. **Obtain factory authorized towing instructions from your vehicle supplier before towing in any ALL STEER® mode.** Follow the instructions provided by the vehicle manufacturer.

4.6 Front Towing. ALL STEER® equipped vehicles may not be towed from the front.

4.7 Rear Towing. Follow the instructions provided by the vehicle manufacturer.

5. SYSTEM ERROR

In the event an error code is displayed (see Table 1) while operating the Oshkosh ALL STEER® all-wheel steering system, the system responds based on the type of the error code.

If a critical error code occurs, the entire screen will flash “Warning-ALLSteer Disabled”. If a minor error code occurs, the entire screen will flash “Warning-ALLSteer Going Into Front Mode”. The operator is able to read the error code and return to a full suite of screens to aid in trouble-shooting by pushing the Enter/Exit (far right/blue) button on the LCD display.

If the ALL STEER® system develops an error during vehicle operation perform the following steps.

- (1) Shut the vehicle down.
- (2) Restart the vehicle and check the operation of the ALL STEER® system. If after shutting down and restarting the vehicle the ALL STEER® system rear wheels are still in the position they were when the error occurred, perform the Manual Centering procedure or consult the vehicle’s Service Manual for error code retrieval.

Table 1. ERROR CODE CHART.

ERROR CODE	CAUSE OF CODE	SYSTEM RESPONSE
0	No errors currently on system (clear screen)	
10	Bad CRC from EPROM	System locks axles in position, then shuts down.
11	Fireground alarm feedback missing	When error code is active, system will not enter Fireground or Crab mode.
12	No mode switches selected	System returns to Front mode once axle is within 7 degrees of center.
13	More than one mode switch selected	System recenters rear axle(s) automatically, then shuts down.
14	# Axles and translators mismatched	System locks axles in position, then shuts down.
15	Wheel base is not within range	System locks axles in position, then shuts down.
16	Truck ID invalid	System locks axles in position, then shuts down.
17	Encoder 1 out of range	System locks axles in position, then shuts down.
18	Encoder 2 out of range	System locks axles in position, then shuts down.
19	Encoder 3 out of range	System locks axles in position, then shuts down.
22	Axle 2 moved too much with pwm OFF	System locks bad axle, allows other axle to be re-centered by operator, then shuts down.
23	Axle 3 moved too much with pwm OFF	System locks bad axle, allows other axle to be re-centered by operator, then shuts down.
24	Axle 1 value outside cal'd range	System recenters rear axle(s) automatically, then shuts down.
25	Axle 2 value outside cal'd range	System locks bad axle, allows other axle to be re-centered by operator, then shuts down.
26	Axle 3 value outside cal'd range	System locks bad axle, allows other axle to be re-centered by operator, then shuts down.
27	Axle 1 encoder moved too fast	System recenters rear axle(s) automatically, then shuts down.
28	Axle 2 encoder moved too fast	System locks bad axle, allows other axle to be re-centered by operator, then shuts down.
29	Axle 3 encoder moved too fast	System locks bad axle, allows other axle to be re-centered by operator, then shuts down.

ERROR CODE	CAUSE OF CODE	SYSTEM RESPONSE
31	Speed message not received	System returns to Front mode once axle is within 7 degrees of center (Front & Coordinated mode), 3 degrees from center (Coordinated Fireground mode), or 1 degree from center (Crab mode).
32	Display message not received	Maintenance code - no system action.
33	I/O module message not received	System returns to Front mode once axle is within 7 degrees of center.
34	Axle 2 lock stuck	Maintenance code - no system action.
35	Axle 3 lock stuck	Maintenance code - no system action.
36	Both locks stuck	Maintenance code - no system action.
41	Axle 1 translator message not received	System recenters rear axle(s) automatically, then shuts down.
42	Axle 2 translator message not received	System locks bad axle, allows other axle to be re-centered by operator, then shuts down.
44	Encoder inop during axle 2 right output	System locks bad axle, allows other axle to be re-centered by operator, then shuts down.
45	Encoder inop during axle 2 left output	System locks bad axle, allows other axle to be re-centered by operator, then shuts down.
46	Encoder inop during axle 3 right output	System locks bad axle, allows other axle to be re-centered by operator, then shuts down.
47	Encoder inop during axle 3 left output	System locks bad axle, allows other axle to be re-centered by operator, then shuts down.
48	Axle 1 encoder disconnected	System recenters rear axle(s) automatically, then shuts down.
49	Axle 2 encoder disconnected	System locks bad axle, allows other axle to be re-centered by operator, then shuts down.
50	Axle 3 encoder disconnected	System locks bad axle, allows other axle to be re-centered by operator, then shuts down.
51	Axle 3 right exceeded 80% range	Code only possible during system calibration.
52	Axle 3 left exceeded 80% range	Code only possible during system calibration.
53	Axle 2 right exceeded 80% range	Code only possible during system calibration.
54	Axle 2 left exceeded 80% range	Code only possible during system calibration.
61	Error in calculating turn direction	System recenters rear axle(s) automatically, then shuts down.
62	Error in mode selection	System recenters rear axle(s) automatically, then shuts down.
63	Divide by zero in Coord mode	System recenters rear axle(s) automatically, then shuts down.
64	Hydraulic filter is clogged	Maintenance code - no system action.
65	Battery voltage is low	Maintenance code - no system action.
72	OUTPUT 1-Axle 2 left short to battery	Maintenance code - no system action.
73	Axle 2 left open load	Maintenance code - no system action.

ERROR CODE	CAUSE OF CODE	SYSTEM RESPONSE
76	OUTPUT 2-Axle 2 right short to battery	Maintenance code - no system action.
77	OUTPUT 2-Axle 2 right open load	Maintenance code - no system action.
80	OUTPUT 3-Axle 3 left short to battery	Maintenance code - no system action.
81	OUTPUT 3-Axle 3 left open load	Maintenance code - no system action.
84	OUTPUT 4-Axle 3 right short to battery	Maintenance code - no system action.
85	OUTPUT 4-Axle 3 right open load	Maintenance code - no system action.
88	OUTPUT 5-Lock valve short to battery	Maintenance code - no system action.
89	OUTPUT 5-Lock valve has open load	Maintenance code - no system action.
128	OUTPUT 15-Tire chain short to battery	Maintenance code - no system action.
129	OUTPUT 15-Tire chain has open load	Maintenance code - no system action.

6. MANUAL CENTERING

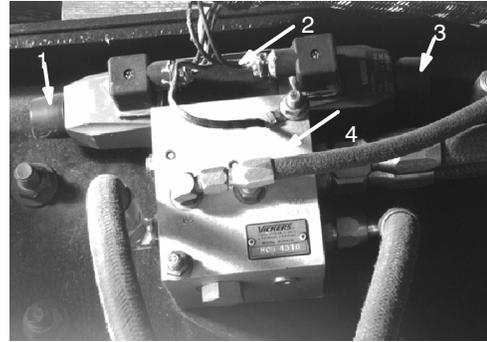
If the rear wheels are not in the straight-ahead position, perform the following steps to manually center the wheels before proceeding to an authorized service center.

- (1) Before leaving the vehicle:
 - (a) Move the vehicle to the side of the road and stop.
 - (b) Set the parking brake and place the transmission shift control in neutral. Leave the engine running to provide hydraulic pressure to the steering system.
 - (c) Place the three position ALL STEER® mode selector switch in the FRONT MODE position, see Figure 2.
 - (d) Turn the vehicle's 4-way emergency flashers on.
 - (e) Display reflective triangles or flares as required by local road regulations.

WARNING

Never place your body between the wheel and other objects when the engine is running or when someone is steering the vehicle, because the rear wheels can crush you. Refer to the ALL STEER® service manual for proper service instructions.

- (2) Locate the ALL STEER® hydraulic manifold assembly, see Figure 29; located near the rear axle(s). On tandem axle vehicles, each axle has a hydraulic manifold assembly. A hydraulic proportional valve with a black button on each end is mounted to this assembly. Use the black buttons to manually center the rear wheels. When you press one of the buttons at a time, the rear axle steers.



1. Button
2. Valve
3. Button
4. Valve body

Figure 29. Hydraulic Manifold Assembly

CAUTION

Damage to the lock will occur if you try to rotate the wheels past center with the lock engaged (Refer to step 3).

- (3) Press and hold one of the black buttons until the wheels are in their straight-ahead position. If the wheels move in the wrong direction, press the other button. When the wheels are centered, the mechanical lock automatically engages and the wheels lock in their straight-ahead position.
- (4) On tandem rear axle vehicles, two hydraulic manifold assemblies exist, one for each axle. There is a hydraulic proportional valve for each. To set the second of the two axles, follow steps 1-3 above.
- (5) Only operate the vehicle in the front steer mode and proceed to an authorized service center for further assistance.

7. ELECTRONIC ALIGNMENT

If for any reason the rear axle is out of alignment contact the nearest authorized Pierce Dealer.

8. ON-SPOT® AUTOMATIC TIRE CHAINS (OPTIONAL)

On-Spot® automatic tire chains may be installed on your ALL STEER® axle.

NOTE

The tire chains will only be operational when the AWS KEY SWITCH is in the ON position and the mode switch is in the FRONT mode.

Automatic tire chains may only be used in Front mode.

To raise or lower chains:

- (1) Place mode switch in the front mode.
- (2) If front wheels are turned, center front wheels.
- (3) When the lock windows display LOCKED the chains can be activated.

NOTE

If your vehicle is not equipped with On-Spot® tire chains, this option can be added to your vehicle, as tire chain circuits are already included in the ALL STEER® axle. A special wire harness and switch is required to provide an interface between the ALL STEER® and On-Spot® systems. The harness and switch are available from your local dealer.



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