

SERVICE MANUAL

SERVICE MANUAL SECTION

STEERING COLUMN ASSEMBLY, TILT/TELESCOPING - ProStar

Model: ProStar

S05018

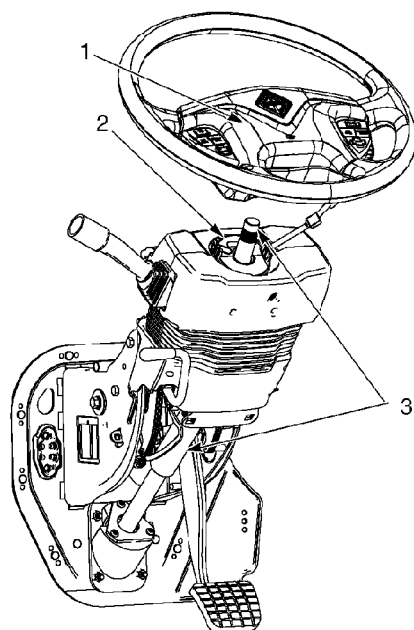
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1. DESCRIPTION

This manual covers the removal and installation instructions for the ProStar™ steering wheel, clock spring, and tilt/telescoping steering column.



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Figure 1 Steering Column Components

1. STEERING WHEEL
2. CLOCK SPRING
3. STEERING COLUMN

1.1. STEERING WHEEL

Many commonly used controls are located on the steering wheel for easy driver access. These controls are back lit for easy visibility. An electric horn pad is located in the center of the steering wheel. Standard switches include cruise control, headlight flash (USA), marker light interrupt, and air horn. Optional switches include engine brake, radio, and automatic manual transmission.


1.2. CLOCK SPRING


Located under the steering wheel, the clock spring provides transmission of electrical signals and power between the fixed structure of the steering column and the rotating switches that are mounted on the steering wheel. Functions such as horn, light interrupt, cruise control, engine brake, radio, and transmission gear selectors are integrated into the steering wheel control system by using a clock spring.


1.3. STEERING COLUMN

The tilt/telescoping steering column assembly can be moved toward or away from the driver. The adjustment lever is located on the left side of the steering column. To unlock and adjust the tilt/telescoping steering column position, push the lever down, move the column to the desired position, and then pull the lever up to lock the tilt/telescoping steering column in position. The tilt/telescoping steering column features a stowaway position for easy entry and exit.

2. REMOVE AND INSTALL PROCEDURES

 **WARNING** – To prevent vehicle damage, personal injury, or possible death, park the vehicle on a flat, level surface. Make sure the engine ignition is in the off position and the transmission is in neutral or in the park position if the vehicle is equipped with an automatic transmission. Set the parking brake, chock the wheels, and disconnect the batteries at the negative terminal before doing any service procedures on the engine or vehicle.

 **WARNING** – All steering mechanisms are critical to personal safety. It is imperative that the instructions in this section are followed exactly. Failure to observe the procedures and instructions set out herein may result in loss of steering control.

 **WARNING** – This adjustable steering column assembly has components under spring tension. The tilt adjustment should be in the full up position to minimize spring tension before removal from the vehicle. Wear eye protection and use caution to prevent injury.

 **WARNING** – Always disconnect power source before working on electrical equipment.

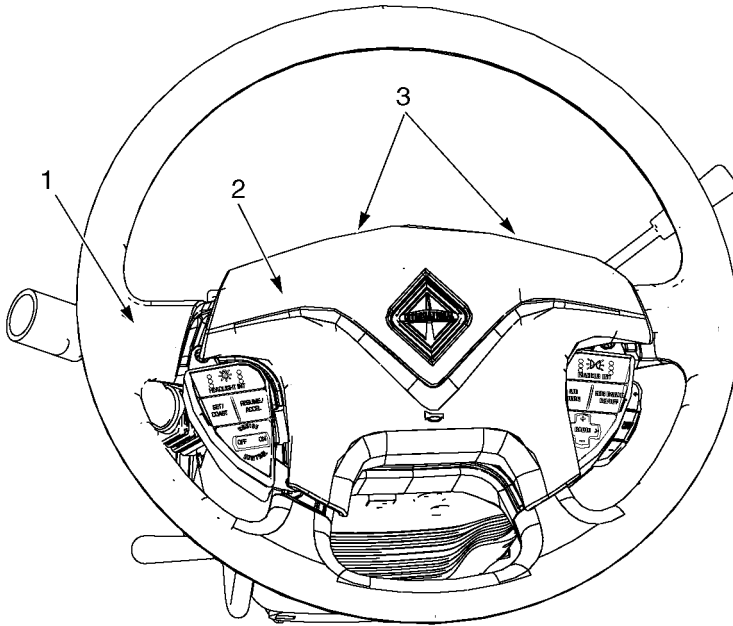
IMPORTANT – Before performing any work on the steering components, be sure to perform these basic procedures:

1. Park the chassis on a flat, level surface.
2. Place transmission in neutral (or park, if automatic transmission).
3. Set the parking brake.
4. Turn off ignition.
5. Install wheel chocks.
6. Disconnect the battery.

IMPORTANT – The vehicle must be parked with the wheels in the straight-ahead position, and the wheels must remain straight while performing the procedures in this service manual.

2.1. STEERING WHEEL

Steering Wheel – Removal

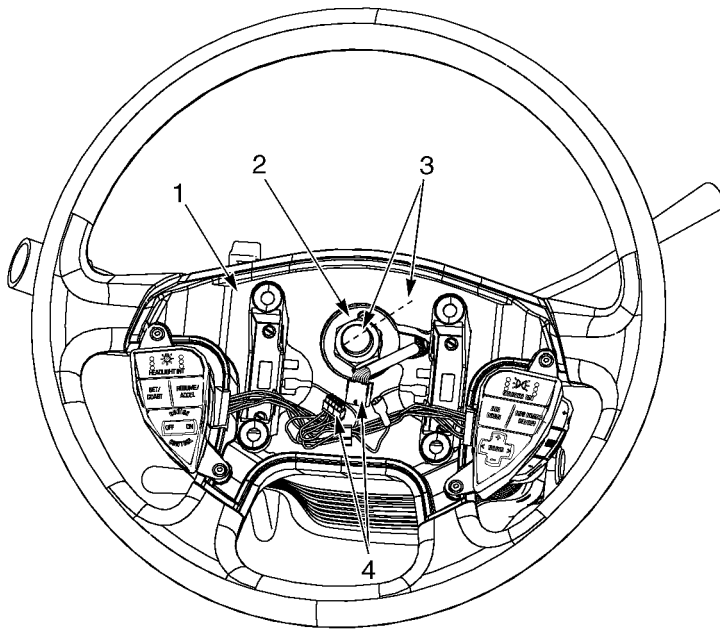


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Figure 2 Horn Pad

1. STEERING WHEEL
2. HORN PAD
3. TOP LEADING EDGE

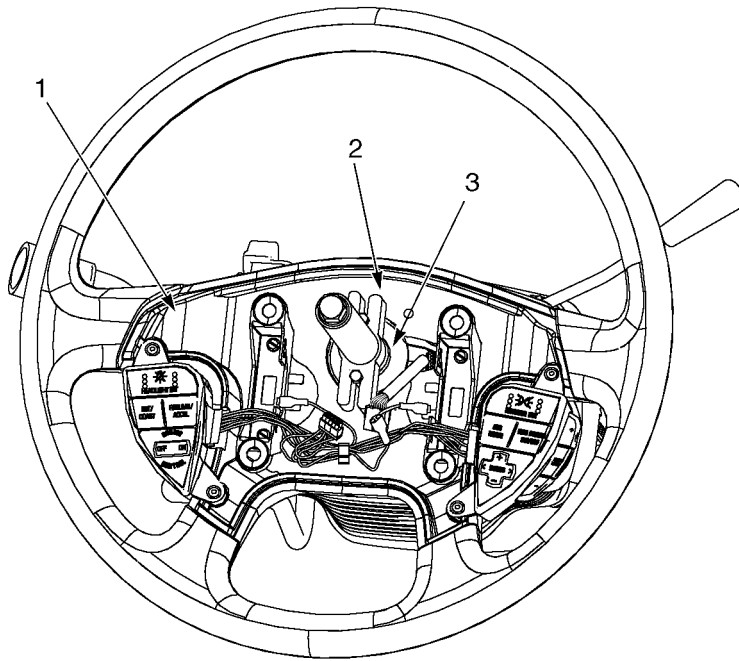
1. Remove the horn pad by placing both hands on top of the horn pad and using your fingertips underneath the top leading edge of the horn pad to gently pull upward toward you.
2. Disconnect wire connector from the back of the horn pad.



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Figure 3 Steering Wheel Retaining Nut

1. STEERING WHEEL
 2. RETAINING NUT
 3. REFERENCE MARK
 4. STEERING WHEEL HARNESS CONNECTOR
3. Place a reference mark on the steering column shaft and steering wheel to aid in the alignment of the steering wheel during installation procedures.
 4. Disconnect the steering wheel harness connector.
 5. Remove the retaining nut from the steering wheel and steering column.



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Figure 4 Steering Wheel Puller

1. STEERING WHEEL
 2. STEERING WHEEL PULLER
 3. STEERING COLUMN
6. Attach the appropriate steering wheel puller to the steering wheel. If there is no center-hole or divet in the steering shaft, technicians are advised to use a harmonic balancer puller and use care to ensure that the puller is not cocked. If trouble is encountered removing the wheel, please search iKNOW for ProStar Steering Wheel. Apply enough pressure with the puller to loosen the steering wheel from the steering column.



Figure 5 Harmonic Puller

7. Remove the steering wheel from the steering column.

Steering Wheel – Installation

CAUTION – Make sure the clip on the top of the clock spring properly aligns with the slot in the steering wheel and that the clock spring wiring is fed through the appropriate hole in the steering wheel. The clock spring could be damaged if these components are not aligned properly during installation.

NOTE – If a new steering wheel is being installed, place the new steering wheel next to the removed steering wheel and copy the reference mark that was made during the removal procedures onto the new steering wheel.

1. Position the steering wheel on the steering column shaft, making certain to align the marks that were made during the removal procedures (Figure 3, Item 3).
2. Install the retaining nut on the steering wheel and steering column (Figure 3, Items 1 and 2). Torque nut to 60 to 65 lbf-ft (81 to 88 N•m).
3. Connect the steering wheel harness connector (Figure 3, Item 4).
4. Connect the wire connector on the back of the horn pad (Figure 2, Item 2).

CAUTION – Do not attempt to snap all four horn pad retaining posts in at the same time by hitting the steering wheel in the center, otherwise damage may result.

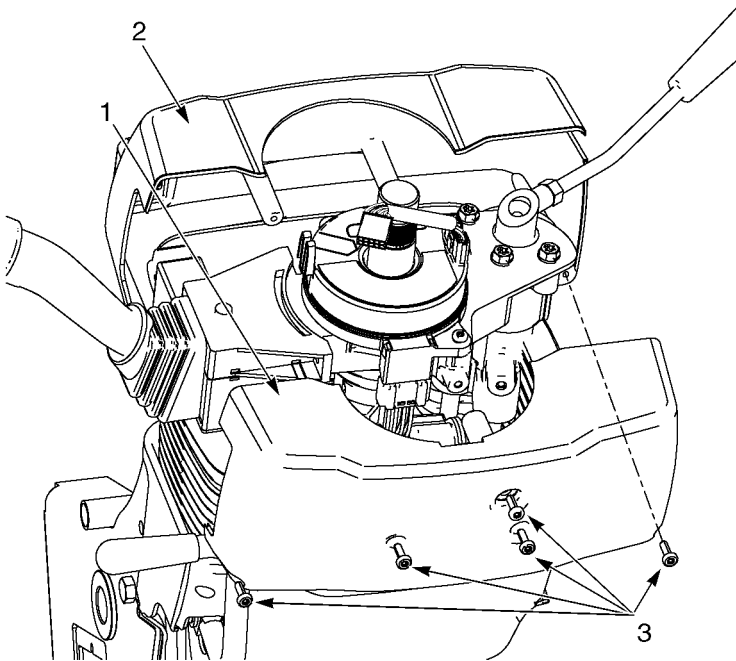
5. Lay the horn pad on top of the steering wheel and align the four horn pad retaining posts directly on top of their respective mating holes. Using the palm of your hand, gently tap each of the four corners of the horn pad starting with the lower right, then lower left, then upper right, and finishing with the upper left (Figure 2, Items 1 and 2).

2.2. CLOCK SPRING

Clock Spring – Removal

1. Remove the horn pad by placing both hands on top of the horn pad and using your fingertips underneath the top leading edge of the horn pad to gently pull upward toward you (Figure 2, Items 1 and 2).
2. Disconnect the wire connector from the back of the horn pad (Figure 2, Item 2).
3. Place a reference mark on the steering column shaft and steering wheel to aid in the alignment of the steering wheel during installation procedures (Figure 3, Item 3).
4. Disconnect the steering wheel harness connector (Figure 3, Item 4).
5. Remove the retaining nut from the steering wheel and steering column (Figure 3, Items 1 and 2).
6. Attach the appropriate steering wheel puller to the steering wheel. Apply enough pressure with the puller to loosen the steering wheel from the steering column (Figure 4, Items 1, 2, and 3).

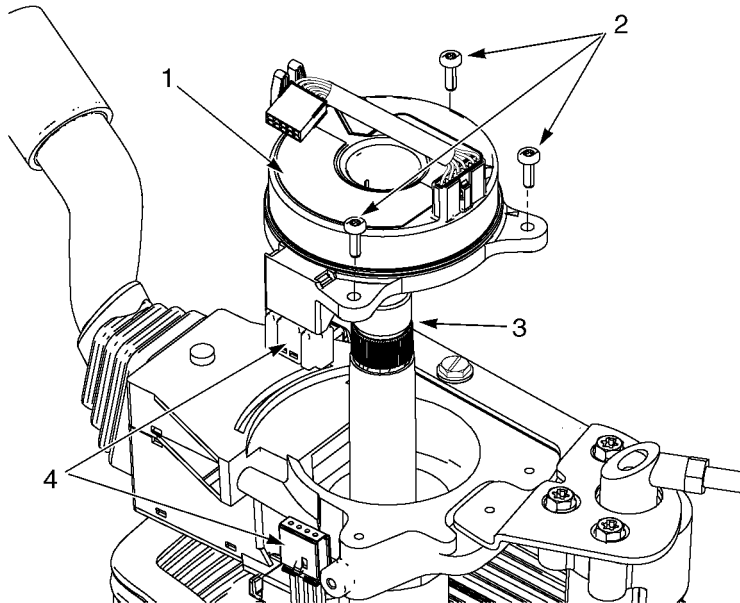
7. Remove the steering wheel from the steering column (Figure 4, Items 1 and 3).



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Figure 6 Top Steering Column Cover

1. TOP STEERING COLUMN OUTER COVER
 2. TOP STEERING COLUMN INNER COVER
 3. SCREWS
8. Remove five screws from the top steering column outer cover.
9. Remove the top steering column outer cover and the top steering column inner cover.



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Figure 7 Clock Spring

- 1. CLOCK SPRING
- 2. MACHINE SCREWS
- 3. STEERING COLUMN
- 4. WIRE CONNECTOR

- 10. Disconnect the wire connector from the clock spring.
- 11. Verify that the wheels are straight, then tape the top cover of the clock spring to the bottom housing of the clock spring.
- 12. Remove three machine screws from the clock spring.
- 13. Remove the clock spring from the steering column.

Clock Spring – Installation

CAUTION – Read and follow directions for the clock spring installation very carefully. This device will break if not properly installed.

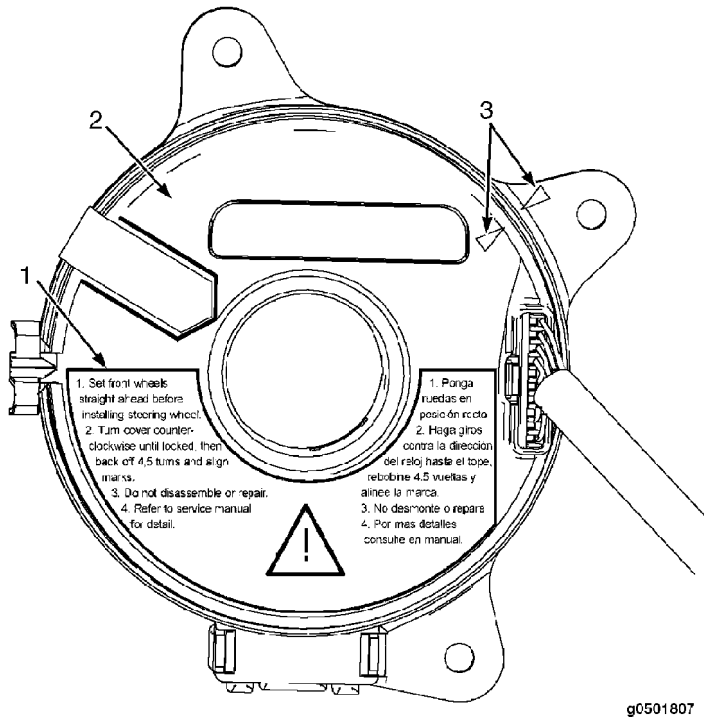


Figure 8 Clock Spring Alignment

1. INSTRUCTION DECAL
2. CLOCK SPRING
3. ALIGNMENT ARROWS

NOTE –

- If the clock spring binds or the tape that was installed during the removal procedures is broken, perform step 1.
- If the clock spring is secured with tape, skip step 1.

1. To ensure that the spring is centered, do the following:

- A. Turn the clock spring cover counterclockwise until it is locked.
- B. Turn the clock spring cover clockwise 4.5 turns.
- C. Align the arrows on the clock spring cover and mounting body (Figure 8, Item 3)
- D. Tape the top cover of the clock spring to the bottom housing of the clock spring.

2. Install the clock spring onto the steering column and secure the clock spring with three machine screws (Figure 7, Items 1, 2, and 3). Torque machine screws to 10 to 25 lbf-in (1.1 to 2.8 N•m).

3. Connect the wire connector to the clock spring (Figure 7, Items 1 and 4).

NOTE – There are four standard screws and one machine screw used for mounting the top steering column outer cover. Be sure to install the machine screw into the top mounting hole, as this position secures the top steering column outer cover to the steering column.

4. Install the top steering column outer cover and top steering column inner cover (Figure 6, Items 1 and 2). The top steering column covers must capture the top bellow and plastic ring of the steering column bellow.
5. Secure the top steering column outer cover to the top steering column inner cover with five screws (Figure 6, Items 1, 2, and 3). Torque screws to 10 to 25 lbf-in (1.1 to 2.8 N•m).

CAUTION – Make sure the clip on the top of the clock spring properly aligns with the slot in steering wheel and that the clock spring wiring is fed through the appropriate hole in the steering wheel. The clock spring could be damaged if these components are not aligned properly during installation.

NOTE – If a new steering wheel is being installed, place the new steering wheel next to the removed steering wheel and copy the reference mark that was made during the removal procedures onto the new steering wheel.

6. Position the steering wheel on the steering column, making sure to align the marks that were made during the removal procedures (Figure 3, Item 3).
7. Install the retaining nut on the steering wheel and steering column (Figure 3, Items 1 and 2). Torque nut to 60 to 65 lbf-ft (81 to 88 N•m).
8. Connect the steering wheel harness connector (Figure 3, Item 4).
9. Connect the wire connector on the back of the horn pad (Figure 2, Item 2).

CAUTION – Do not attempt to snap all four horn pad retaining posts in at the same time by hitting the steering wheel in the center, otherwise damage may result.

10. Lay the horn pad on top of the steering wheel and align the four horn pad retaining posts directly on top of their respective mating holes. Using the palm of your hand, gently tap each of the four corners of the horn pad starting with the lower right, then lower left, then upper right, and finishing with the upper left (Figure 2, Items 1 and 2).

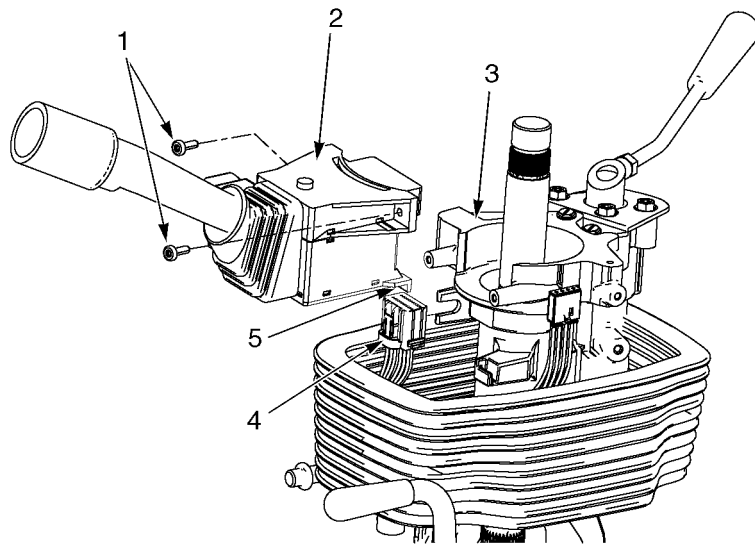
2.3. STEERING COLUMN



WARNING – The tilt/telescope steering column is replaced as a unit. Do not attempt to disassemble or modify this unit. The tilt/telescope steering column unit is under spring tension and serious injury may result if disassembly is attempted.

Steering Column – Removal

1. Remove the horn pad by placing both hands on top of the horn pad and using your fingertips underneath the top leading edge of the horn pad to gently pull upward toward you (Figure 2, Items 1 and 2).
2. Disconnect wire connector from the back of the horn pad (Figure 2, Item 2).
3. Place a reference mark on the steering column shaft and steering wheel to aid in the alignment of the steering wheel during installation procedures (Figure 3, Item 3).
4. Disconnect the steering wheel harness connector (Figure 3, Item 4).
5. Remove the retaining nut from the steering wheel and steering column (Figure 3, Items 1 and 2).
6. Attach the appropriate steering wheel puller to the steering wheel. Apply enough pressure with the puller to loosen the steering wheel from the steering column (Figure 4, Items 1 and 2).
7. Remove the steering wheel from the steering column (Figure 4, Items 1 and 3).
8. Remove five screws from the top steering column outer cover (Figure 6, Items 1 and 3).
9. Remove the top steering column outer cover and the top steering column inner cover (Figure 6, Items 1 and 2).
10. Disconnect the wire connector from the clock spring (Figure 7, Items 1 and 4).
11. Verify that the wheels are straight, then tape the top cover of the clock spring to the bottom housing of the clock spring.
12. Remove three machine screws from the clock spring (Figure 7, Items 1 and 2).
13. Remove the clock spring from the steering column (Figure 7, Items 1 and 3).

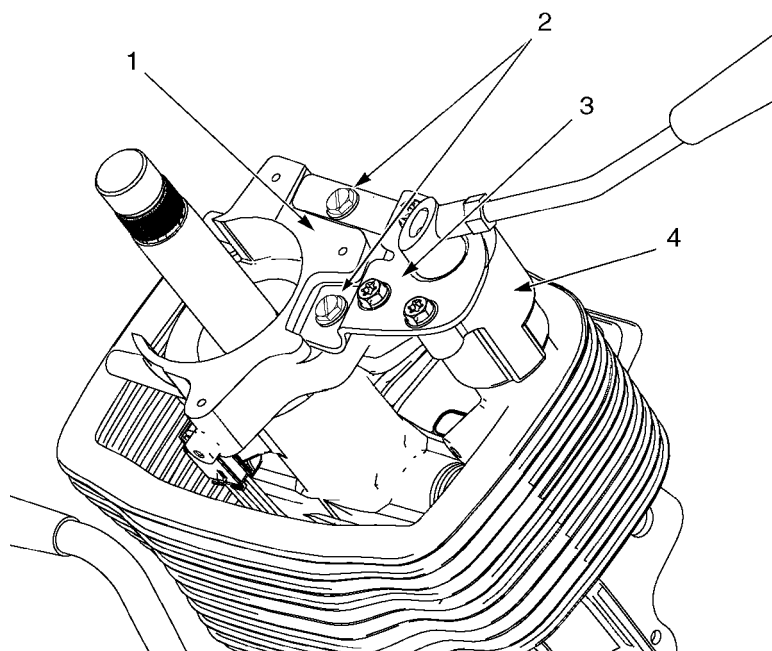


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Figure 9 Turn Signal Operating Switch

1. MACHINE SCREWS
2. TURN SIGNAL SWITCH HOUSING
3. STEERING COLUMN
4. WIRE CONNECTOR
5. ALIGNMENT TAB

14. Remove two machine screws and the turn signal switch housing.
15. Disconnect the wire connector from the turn signal switch housing.



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Figure 10 Trailer Brake Lever

1. STEERING COLUMN
2. MOUNT SCREWS
3. TRAILER HAND BRAKE VALVE MOUNT PLATE
4. TRAILER HAND BRAKE VALVE

16. Remove two mount screws from the trailer hand brake valve mount plate and the steering column.

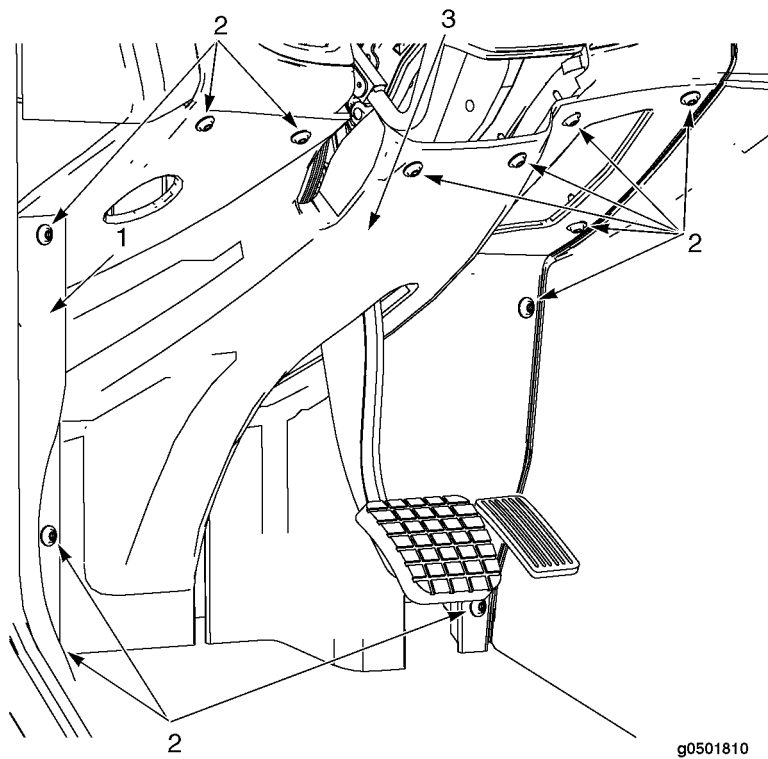
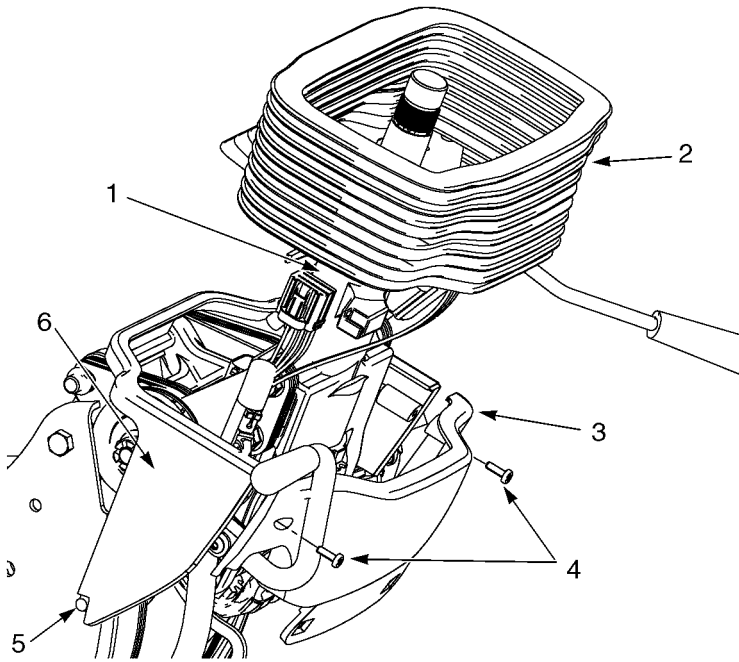


Figure 11 Kick Panels

1. LEFT SIDE KICK PANEL
2. SCREWS
3. LEFT LOWER KICK PANEL

17. Remove four screws and the left side kick panel.

18. Remove 10 screws and the left lower kick panel.



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Figure 12 Lower Steering Column Cover

1. STEERING COLUMN
2. STEERING COLUMN BELLOW
3. BOTTOM STEERING COLUMN OUTER COVER
4. SCREWS
5. SNAP RIVET
6. BOTTOM STEERING COLUMN INNER COVER

19. Remove two screws and the bottom steering column outer cover.
20. Remove the snap rivet from each side of bottom steering column inner cover.
21. Slide the steering column bellow up and off of the steering column.

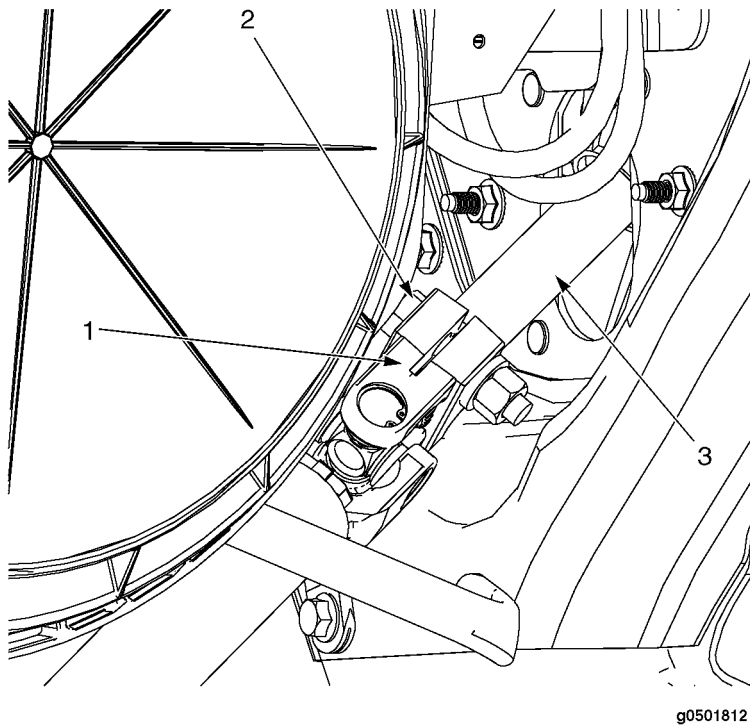


Figure 13 Intermediate Shaft

1. INTERMEDIATE SHAFT UNIVERSAL JOINT
2. PINCH BOLT
3. STEERING COLUMN

NOTE – Applying a light coat of penetrating oil to the intermediate shaft universal joint and the steering column splines will break up the rust and aid in removal of the intermediate shaft.

22. Remove the pinch bolt from the intermediate shaft universal joint.
23. Disconnect the intermediate steering shaft from the steering column.

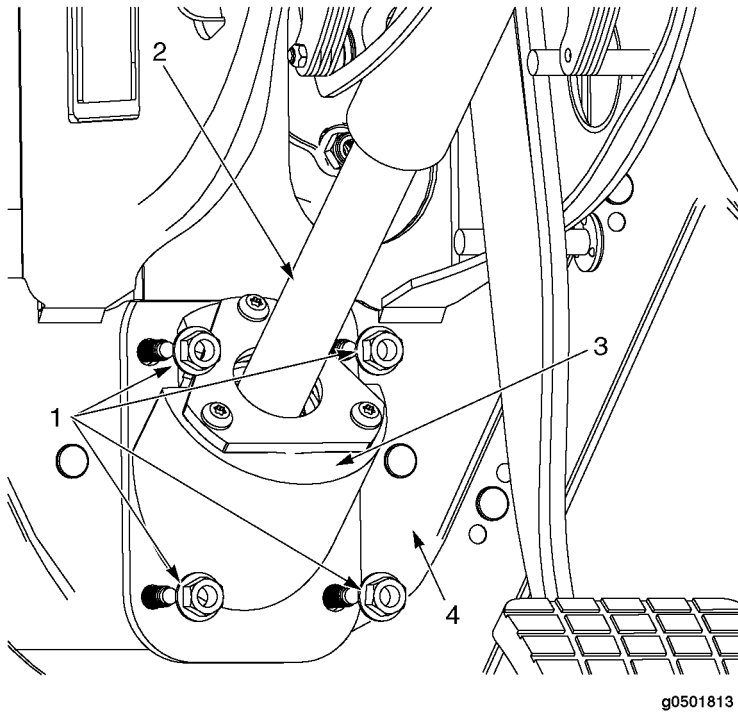


Figure 14 Lower Steering Column Mount Cup

1. MOUNT NUTS
2. STEERING COLUMN
3. LOWER STEERING COLUMN MOUNT CUP
4. DASH PANEL

24. Remove four mount nuts from the lower steering column mount cup at the dash panel.

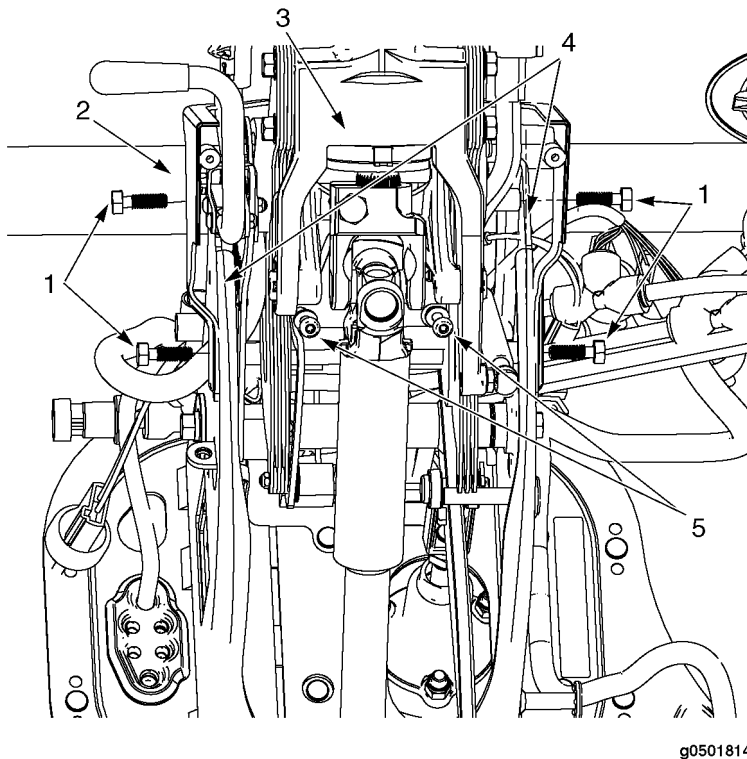
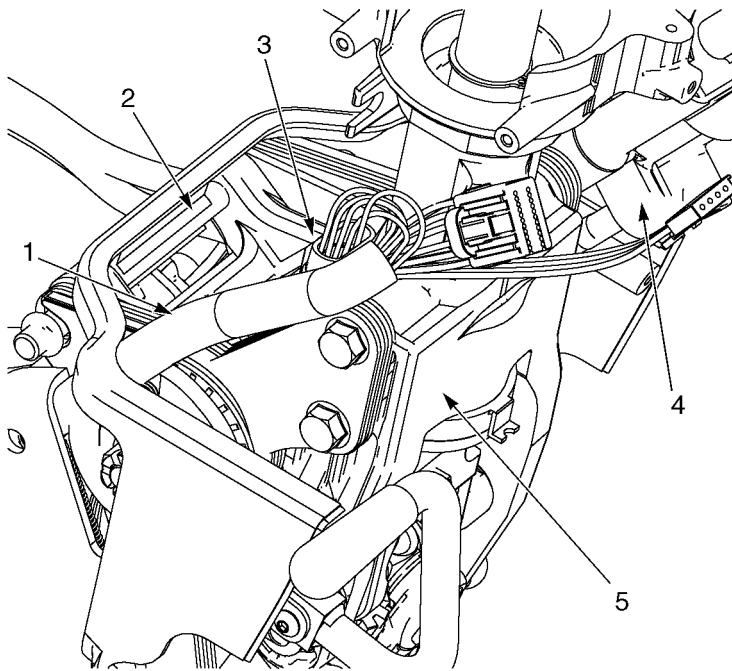


Figure 15 Side Support Bracket Bolts

1. SIDE MOUNT BOLTS
2. CROSS-CAB BEAM
3. STEERING COLUMN
4. SIDE SUPPORT BRACKETS
5. CENTER MOUNT BOLTS AND WASHERS

25. Remove two side mount bolts from each side support bracket and the steering column.
26. Remove two center mount bolts and washers from the steering column and cross-cab beam.



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Figure 16 Steering Column

1. WIRING HARNESS
2. BOTTOM STEERING COLUMN INNER COVER
3. STEERING ANGLE SENSOR ELECTRICAL CONNECTOR
4. TRAILER HAND BRAKE VALVE
5. STEERING COLUMN

27. Disconnect the bottom steering column inner cover from the steering column.
28. If the vehicle is equipped with a steering angle sensor, disconnect the steering angle sensor electrical connector from the back side of the steering column.
29. Disconnect wiring clips and reposition wiring harness away from steering column.
30. Position the trailer hand brake valve, with the air lines connected, away from the steering column.
31. Remove the steering column.

Steering Column – Installation

1. Position the steering column.

NOTE – Be sure to route the electrical harness and the air harness between the steering column shaft and the steering column inner cover.

2. Connect the bottom steering column inner cover to the steering column (Figure 16, Items 2 and 5).
3. Install two side mount bolts on each side support bracket and the steering column (Figure 15, Items 1, 3, and 4). Torque bolts to 14 to 17 lbf-ft (19 to 23 N•m).
4. Install four mount nuts on the lower steering column mount cup at the dash panel (Figure 14, Items 1, 3, and 4). Torque nuts to 17 to 20 lbf-ft (26 to 27 N•m).
5. Secure the steering column to the cross-cab beam with two center mount bolts and washers (Figure 15, Items 2, 3, and 5). Torque bolts to 20 to 25 lbf-ft (27 to 34 N•m).
6. Route wiring harness back onto steering column and secure wire clips.
7. If the vehicle is equipped with a steering angle sensor, connect the steering angle sensor electrical connector on the back side of the steering column (Figure 16, Items 3 and 5).
8. Secure the bottom steering column inner cover to the steering column with one snap rivet on each side (Figure 12, Items 5 and 6).
9. Connect the intermediate shaft universal joint to the steering column (Figure 13, Items 1 and 3).
10. Install the pinch bolt on the intermediate shaft universal joint (Figure 13, Items 1 and 2). Torque bolt to 50 to 60 lbf-ft (68 to 81 N•m).

NOTE – Prior to installing the steering column bellow on the steering column, ensure that the first bellow and last bellow contain the plastic rings for mounting the steering column bellow. The electrical harness and air harness must be routed through the bellow during installation.

11. Slide the steering column bellow onto the steering column (Figure 12, Items 1 and 2).

NOTE – Ensure that the last bellow and plastic ring of the steering column bellow are captured into the bottom steering column outer cover and bottom steering column inner cover properly during installation.

12. Install the bottom steering column outer cover and secure with two screws (Figure 12, Items 3 and 4). Torque bolts to 10 to 25 lbf-in (1.1 to 2.8 N•m).
13. Install the left, lower kick panel and secure with 10 screws (Figure 11, Items 2 and 3).
14. Install the left, side kick panel and secure with four screws (Figure 11, Items 1 and 2).
15. Install the trailer hand brake valve mount plate on the steering column and secure with two mount screws (Figure 10, Items 1, 2, and 3). Torque screws to 35 to 45 lbf-in (4 to 5 N•m).
16. Connect the wire connector to the turn signal switch housing (Figure 9, Items 2 and 4).

17. Align the turn signal switch housing alignment tab on the steering column (Figure 9, Items 3 and 5).
18. Secure the turn signal switch housing on the steering column with two machine screws (Figure 9, Items 1, 2, and 3). Torque machine screws to 10 to 25 lbf-in (1.1 to 2.8 N•m).

CAUTION – Read and follow directions for the clock spring installation very carefully. This device will break if not properly installed.

NOTE –

- If the clock spring binds or the tape that was installed during the removal procedures is broken, perform step 1.
- If the clock spring is secured with tape, skip step 1.

19. To ensure that the spring is centered, do the following:

- A. Turn the clock spring cover counterclockwise until it is locked.
- B. Turn the clock spring cover clockwise 4.5 turns.
- C. Align the arrows on the clock spring cover and mounting body (Figure 8, item 3)
- D. Tape the top cover of the clock spring to the bottom housing of the clock spring.

20. Install the clock spring onto the steering column and secure the clock spring with three machine screws (Figure 7, Items 1, 2, and 3). Torque machine screws to 10 to 25 lbf-in (1.1 to 2.8 N•m).

21. Connect the wire connector to the clock spring (Figure 7, Items 1 and 4).

NOTE – There are four standard screws and one machine screw used for mounting the top steering column outer cover. Be sure to install the machine screw into the top mounting hole, as this position secures the top steering column outer cover to the steering column.

22. Install the top steering column outer cover and top steering column inner cover (Figure 6, Items 1 and 2).
The top steering column covers must capture the top bellow and plastic ring of the steering column bellow.
23. Secure the top steering column outer cover to the top steering column inner cover with five screws (Figure 6, Items 1, 2, and 3). Torque screws to 10 to 25 lbf-in (1.1 to 2.8 N•m).

CAUTION – Make sure the clip on the top of the clock spring properly aligns with the slot in the steering wheel and that the clock spring wiring is fed through the appropriate hole in the steering wheel. The clock spring could be damaged if these components are not aligned properly during installation.

NOTE – If a new steering wheel is being installed, place the new steering wheel next to the removed steering wheel and copy the reference mark that was made during the removal procedures onto the new steering wheel.

24. Position the steering wheel on the steering column shaft, making sure to align the marks that were made during the removal procedures (Figure 3, Item 3).
25. Install the retaining nut on the steering wheel and steering column (Figure 3, Items 1 and 2). Torque nut to 60 to 65 lbf-ft (81 to 88 N•m).
26. Connect the steering wheel harness connector (Figure 3, Item 4).
27. Connect the wire connector on the back of the horn pad (Figure 2, Item 2).

CAUTION – Do not attempt to snap all four horn pad retaining posts in at the same time by hitting the steering wheel in the center, otherwise damage may result.

28. Lay the horn pad on top of the steering wheel and align the four horn pad retaining posts directly on top of their respective mating holes. Using the palm of your hand, gently tap each of the four corners of the horn pad starting with the lower right, then lower left, then upper right, and finishing with the upper left (Figure 2, Items 1 and 2).

3. CHECKS AND ADJUSTMENTS

3.1. STEERING WHEEL

Steering Wheel – Check

1. Activate the horn to verify the electrical connection to the horn is complete.
2. Turn on the turn signals, one at a time, and then operate the flashers.
3. If the horn and/or turn signals are not functioning properly, verify that the power source is connected and that all electrical connections are properly seated.
4. Verify the vehicle wheels turn when the steering wheel is turned and that the steering wheel features, such as tilt and telescoping, are also functioning properly.

Steering Wheel – Adjust

Proper steering wheel-to-steering gear alignment is designed into the steering assembly. Following are a few alignment points to check at assembly or when steering wheel alignment is a problem:

1. Test drive the vehicle on a straight and level (no crown) section of road for at least one-quarter mile. Determine if, or how far off center, the steering wheel is when the vehicle is going straight.
2. If the steering wheel alignment is off, return the vehicle to the work area for further adjustment. Stop the vehicle with front road wheels (not steering wheel) straight ahead as indicated by driving test.
3. Proper steering wheel-to-steering gear alignment can be accomplished by removing the steering wheel (refer to Steering Wheel – Removal procedure), and reindexing the steering wheel onto the splines of the steering column shaft.
4. Install the steering wheel (refer to Steering Wheel – Installation procedure).
5. Test drive vehicle to ensure that proper alignment has been accomplished and that steering is correct.

TORQUE

Table 1 Torque Chart

Figure No. (Item No.)	Location	Lbf-ft/Lbf-in	N•m
Figure 3 (Item 2)	Steering Wheel Retaining Nut	60 to 65 lbf-ft	81 to 88
Figure 6 (Item 3)	Top Steering Column Cover Mount Screws	10 to 25 lbf-in	1.1 to 2.8
Figure 7 (Item 2)	Clock Spring Mount Screws	10 to 25 lbf-in	1.1 to 2.8
Figure 9 (Item 1)	Turn Signal Switch Housing Mount Screws	10 to 25 lbf-in	1.1 to 2.8
Figure 10 (Item 2)	Trailer Hand Brake Valve Mount Plate Screws	35 to 45 lbf-in	4 to 5
Figure 12 (Item 4)	Bottom Steering Column Cover Mount Screws	10 to 25 lbf-in	1.1 to 2.8
Figure 13 (Item 2)	Intermediate Shaft Universal Joint Pinch Bolt	50 to 60 lbf-ft	68 to 81
Figure 14 (Item 1)	Lower Steering Column Mount Cup Nuts	17 to 20 lbf-ft	23 to 27
Figure 15 (Item 1)	Steering Column to Side Support Bracket Bolts	14 to 17 lbf-ft	19 to 23
Figure 15 (Item 5)	Steering Column to Cross-Cab Beam Bolts	20 to 25 lbf-ft	27 to 34