

STEERING AND O.T.A.S. SYSTEM

SERVICE TOOLS

Description	Part Number	Page
DIAGNOSTIC HARNESS	529 036 188	16–17
FLUKE 115 MULTIMETER	529 035 868	16–17
STEERING CABLE TOOL	295 000 145	11

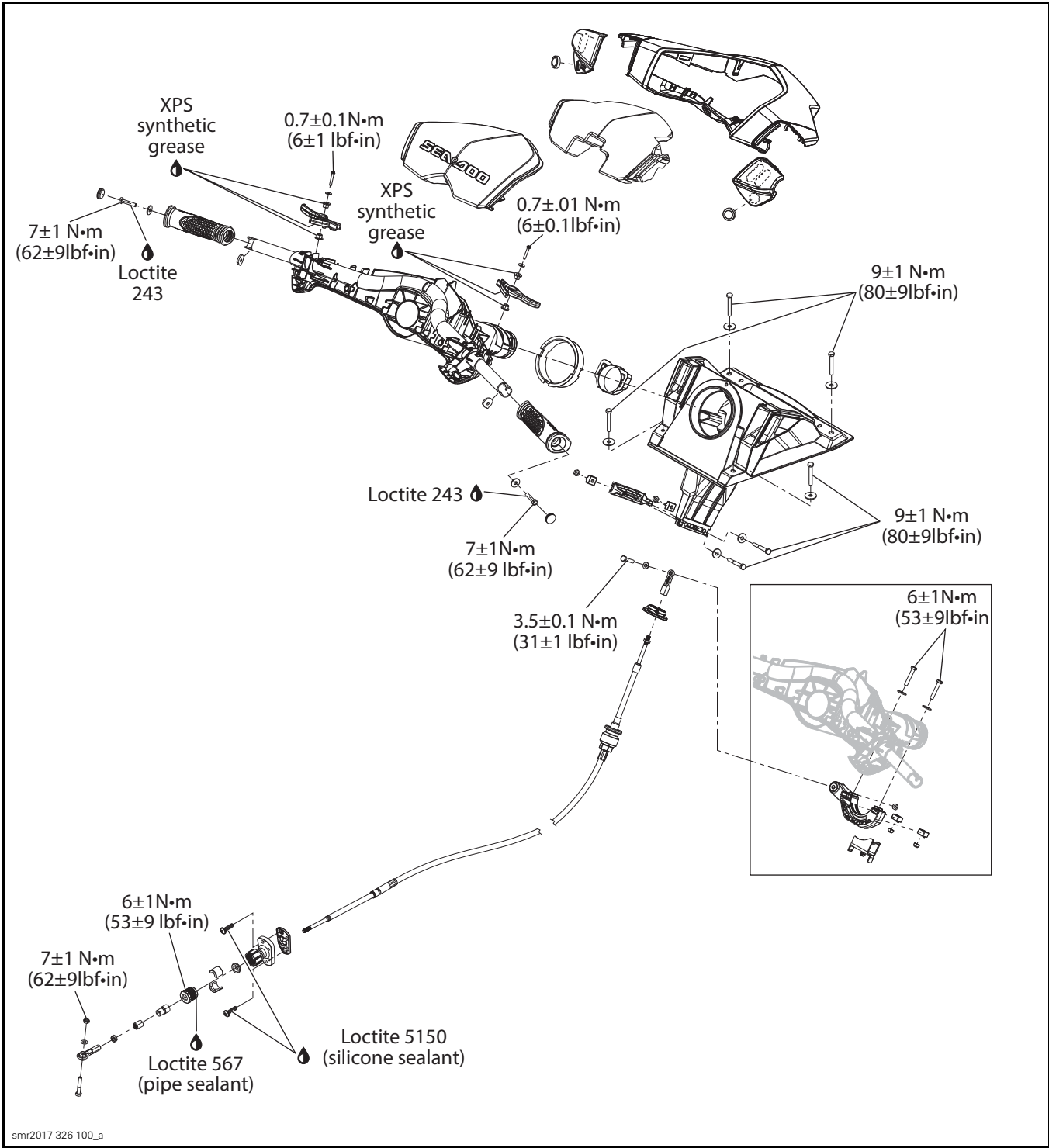
SERVICE TOOLS – OTHER SUPPLIER

Description	Part Number	Page
MODIFIED WRENCH 22 mm (7/8 in) x 100 mm (4 in)	none	3

SERVICE PRODUCTS

Description	Part Number	Page
LOCTITE 243 (BLUE)	293 800 060	6, 8
LOCTITE 567 (PIPE SEALANT)	293 800 013	12
XPS SYNTHETIC GREASE.....	293 550 010	10

STEERING COLUMN AND CABLE



GENERAL

SYSTEM DESCRIPTION (O.T.A.S.)

The O.T.A.S. (Off-Throttle Assisted Steering) provides additional maneuverability in off-throttle situations.

The system uses a pair of magnets attached to the steering column and a Hall effect switch attached to the steering column support.

When activated by a magnet, the O.T.A.S. switch sends a signal to the ECM.

The ECM activates a pre-programmed RPM setting when the driver initiates a full turn after releasing throttle lever. The engine RPM is controlled by the Intelligent Throttle Control (ITC).

The O.T.A.S. system is activated in the following conditions:

- The engine speed must be above 4000 RPM for at least 1.5 second (approximately).
- The throttle lever must be released completely.
- The steering must be fully turned within approximately 4 seconds after throttle release.

The O.T.A.S. will stay activated for a random period of time as long as the O.T.A.S. switch is closed.

O.T.A.S. will be deactivated if:

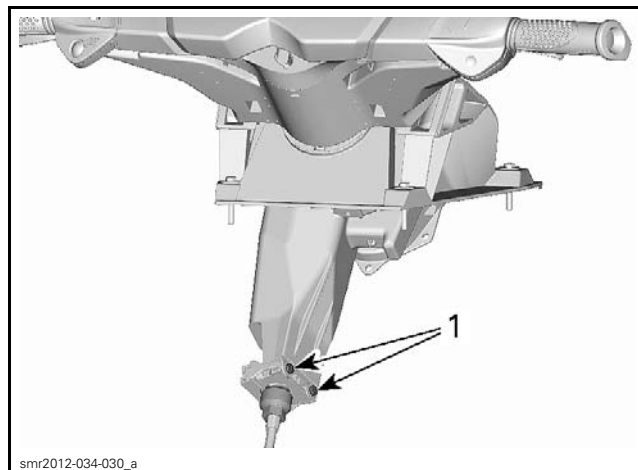
- The throttle is reapplied, or
- The steering is turned sufficiently to open the O.T.A.S. switch for more than one second.

ADJUSTMENT

STEERING ALIGNMENT

Work from engine compartment to reach adjustment nut.

1. Loosen steering cable clamp bolts. Do NOT remove bolts.



ACCESS FROM ENGINE COMPARTMENT

1. Loosen bolts

2. Turn adjustment nut 1 turn at a time in the direction shown in following table.

REQUIRED TOOL
MODIFIED WRENCH 22 mm (7/8 in) x 100 mm (4 in) (P/N none)


ACCESS FROM ENGINE COMPARTMENT	
WATERCRAFT BEHAVIOR	WHAT TO DO
Pulls on left side	Turn steering cable adjustment nut as shown 
Pulls on right side	Turn steering cable adjustment nut as shown 

3. Tighten steering cable clamp bolts to specification.

TIGHTENING TORQUE	
Steering cable clamp	6 N•m (53 lbf•in)

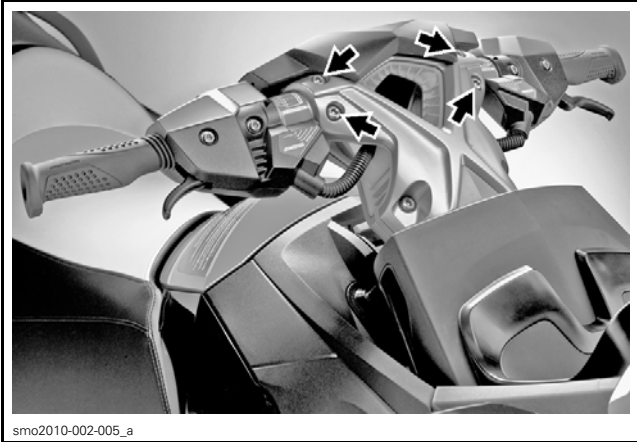
- 4. Test watercraft.
- 5. Readjust adjustment nut as necessary.

ADJUSTABLE ERGONOMIC STEERING (AES)

The handlebar may be adjusted to driver preference by extending and rotating the handlebar extension tubes.

To adjust, carry out the following steps:

- 1. Loosen the screws (2 each side) that secure the handlebar extension tubes.



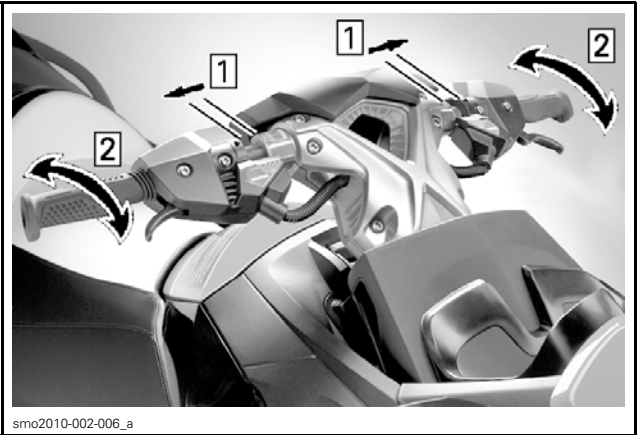
EXTENSION TUBE RETAINING SCREWS (4)

- 2. Pull out or push in the handlebar grips to adjust handlebar width.

NOTE: The handlebar width factory set position is fully closed. The handlebar width may be increased by 2.5 cm (1 in) each side.

- 3. Rotate the handlebar grips to the desired position of the controls.

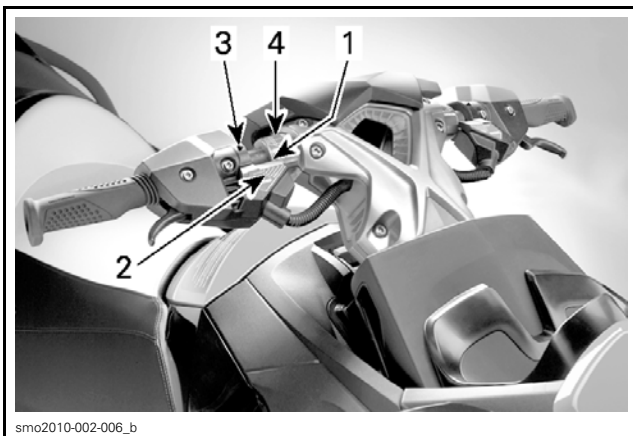
NOTE: Rotating the handlebar grips rotates the handlebar extension tubes and controls. The extension tubes may be rotated plus or minus 18° from the factory set position.



ERGONOMIC ADJUSTMENTS

- Step 1: Adjust handlebar width
- Step 2: Adjust angular position of controls

- 4. Using the index marks and scales on each side of the handlebar, ensure identical width and angular position of both handlebar extension tubes.



1. Width index
2. Width scale
3. Angular position index
4. Angular position scale

5. Torque handlebar retaining screws to specification.

TIGHTENING TORQUE	
Handlebar retaining screws	9 N•m (80 lbf•in)

INSPECTION

O.T.A.S. OPERATION

This test is to be performed with the watercraft in the water (test tank or on a trailer).

NOTICE If the test is performed on a trailer, ensure no debris or rocks can damage the jet pump.

Start engine.

Raise engine speed higher than 4000 RPM for more than 1 second.

Release throttle while steering is in the straight ahead position.

Within 1 to 3 seconds, turn handlebar all the way to one side.

The O.T.A.S. should come on by keeping or increasing engine speed to approximately 3000 RPM.

Then, engine speed will gradually decrease to idle speed within approximately 5 seconds.

Repeat test for the other side.

If the engine does not behave as described, carry out the *O.T.A.S. SWITCH TEST WITH BUDS2*

TROUBLESHOOTING

DIAGNOSTIC TIPS

Check fault codes as a first troubleshooting step. If O.T.A.S. works when handlebar is turned on one side only, check:

- Magnets condition
- If magnets and switch are securely installed.

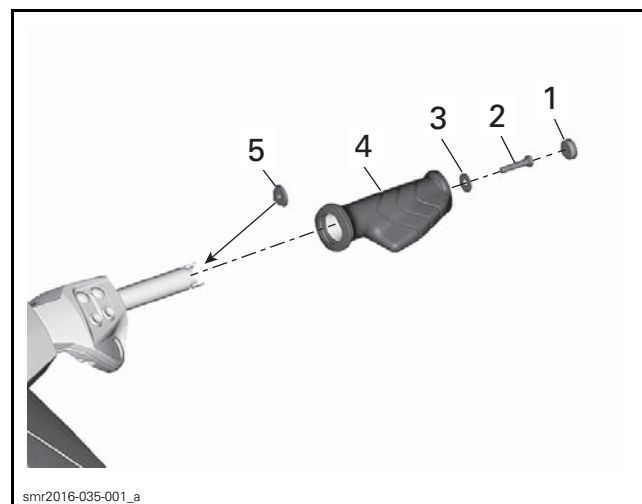
To confirm is O.T.A.S. is functional, carry out *O.T.A.S. OPERATION* in this subsection. If it is not possible, carry out *O.T.A.S. SWITCH TEST WITH BUDS2*

PROCEDURES

HANDLEBAR GRIP

Removing the Handlebar Grip

To remove handlebar grip, remove the cap, then the retaining screw.



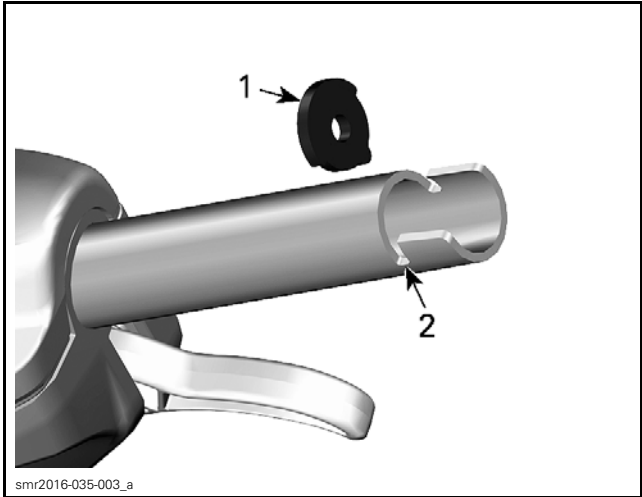
1. Handlebar grip cap
2. Handlebar grip screw
3. Flat washer
4. Handlebar grip
5. Handlebar grip insert

Pull out handlebar grip and remove grip insert from handlebar.

NOTE: Verify grip insert for damage.

Installing the Handlebar Grip

When installing the grip insert in the handlebar, ensure that it is properly inserted in the slot at the end of the handlebar tubing.



TYPICAL
1. Grip insert
2. Handlebar slot

Install handlebar grip on handlebar matching it to the notch in the handlebar.

Apply LOCTITE 243 (BLUE) (P/N 293 800 060) on screw threads (or use new self-locking screws).

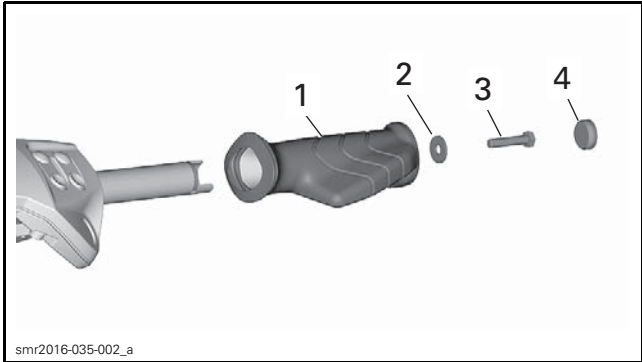
Install flat washer and handlebar grip screw.

NOTICE Ensure to install flat washer otherwise screw will damage the grip end.

Torque handlebar grip screw to specification.

TIGHTENING TORQUE	
Handlebar grip screw	7 N•m ± 1 N•m (62 lbf•in ± 9 lbf•in)

Install cap.



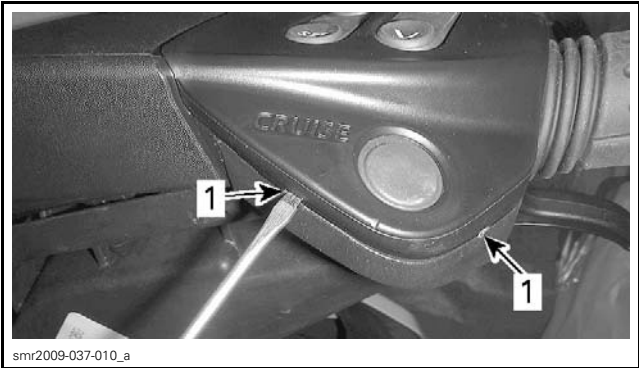
TYPICAL
1. Grip
2. Flat washer
3. Screw
4. Cap

HANDLEBAR SWITCH COVER (LH OR RH)

Removing the Handlebar Switch Cover(LH or RH)

Models without AES Steering

1. Insert the end of a small screwdriver in one of cover slots.

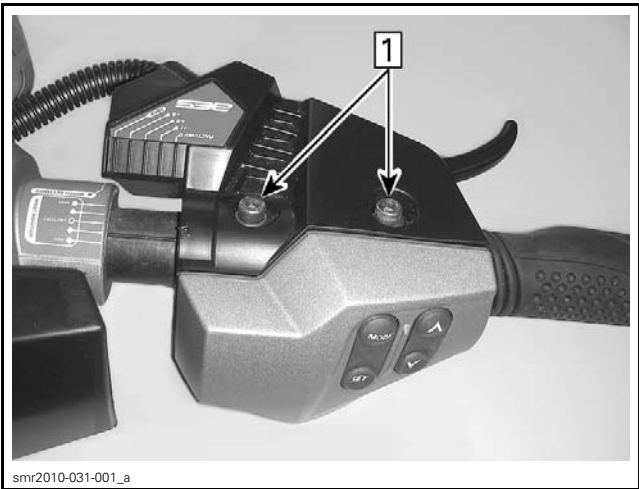


RH SIDE SHOWN
1. Cover slots

2. Twist screwdriver to open cover.
3. Remove the switch cover.

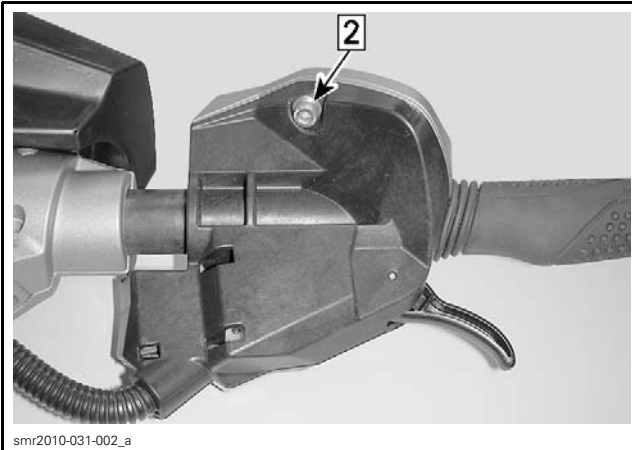
Models with AES Steering

1. Remove the 2 screws at front of the upper handlebar housing.



Step 1: Remove these two screws

2. Remove the screw at rear of the handlebar.

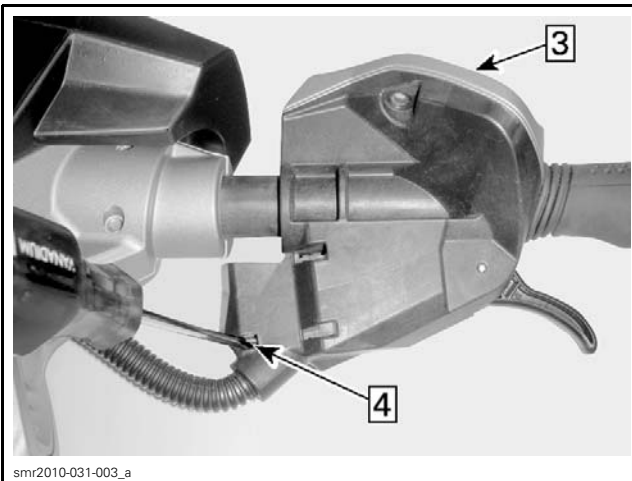


Step 2: Remove this screw

NOTICE Do not try to pull the cover off the housing at this time.

3. Hold the housing cover to prevent it from falling off the handlebar when unlocking the upper housing in the following step.
4. Using a small screwdriver, unlock the tab retaining the upper housing and pull the upper housing off.

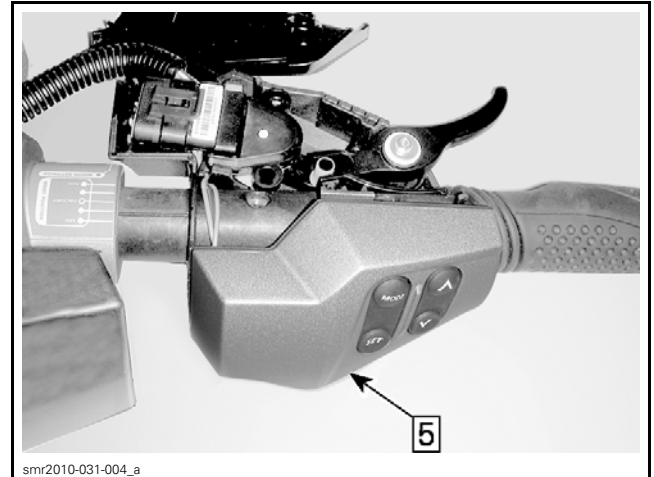
NOTICE As you remove the upper housing, hold the housing cover to prevent it from falling off the handlebar.



Step 3: Hold on to this housing cover

Step 4: Unlock this tab

5. Remove the housing cover from the handlebar.



Step 5: Remove housing cover

Installing the Handlebar Switch Cover(LH or RH)

Models without AES Steering

1. Install the round rubber button in the cover.
2. Insert the front tab and tilt the cover over the switches (applicable models).



TYPICAL — RH SIDE SHOWN

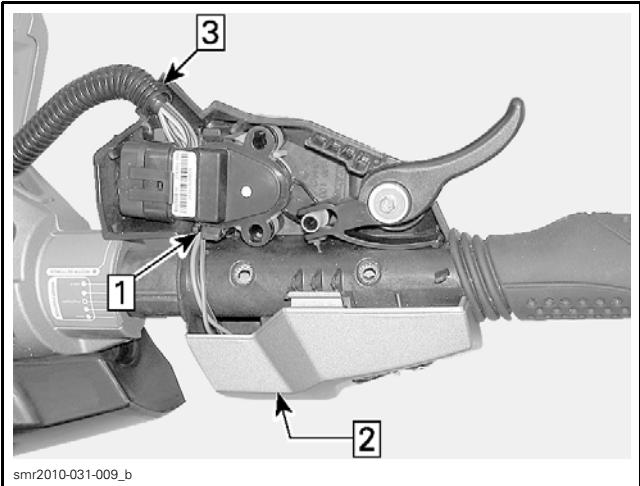
1. Front tab

3. Press on the cover to lock it.

Models without AES Steering

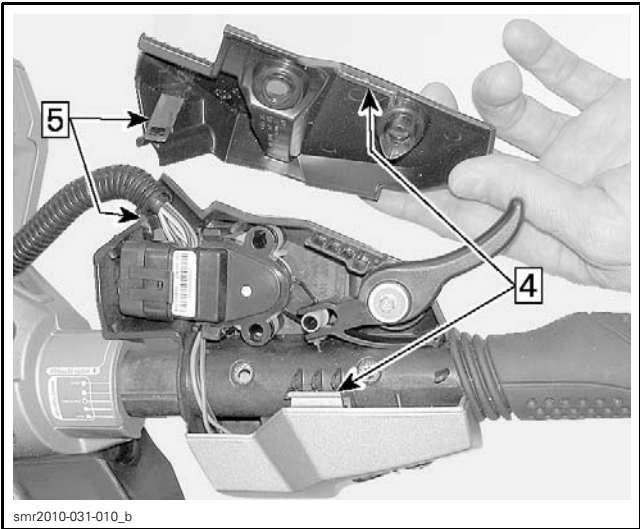
Installation is the reverse of the removal procedure however, pay attention to the following.

1. Route wires to avoid pinching them.
2. Position the housing cover onto the handlebar housing.
3. Ensure positioning of corrugated conduit



Step 1: Ensure wiring is properly routed
Step 2: Install housing cover
Step 3: Ensure proper corrugated conduit positioning

- 4. Position the upper housing on the handlebar housing.
- 5. Ensure proper engagement of the upper housing and cover tabs.



Step 4: Ensure engagement of housing cover retaining tabs
Step 5: Ensure engagement of upper housing locking tabs

- 6. Install the three retaining screws for the upper housing and torque them to specification.

TIGHTENING TORQUE	
Upper housing screws	2 N•m (18 lbf•in)

- 7. Ensure proper operation of throttle lever.

EXTENSION BLOCKS
(AES STEERING)

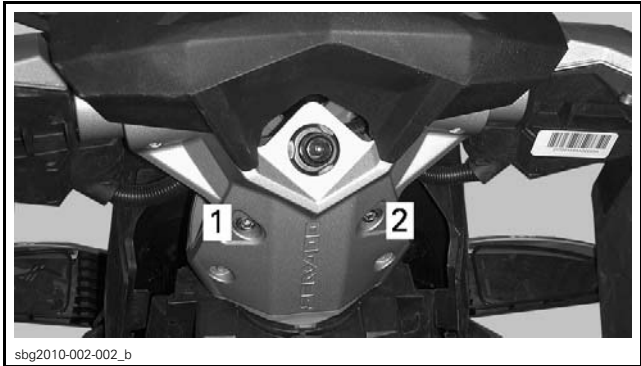
Removing the Extension Block

- 1. Remove all socket screws (8x) that retain the front and the rear extension blocks.

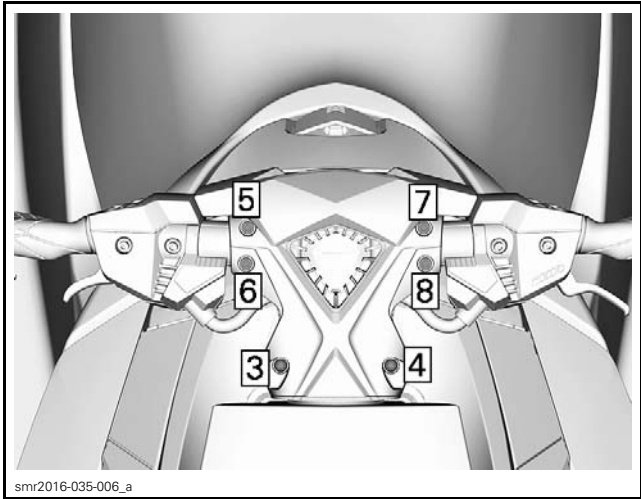
- 2. Separate both extension blocks.
- 3. Remove the engine cut-off switch (D.E.S.S. post) retaining nut. Refer to *IGNITION SYSTEM*.

Installing the Extension Block

Tighten screws to specification as per illustrated sequence.



REAR STEERING EXTENSION BLOCK
Torque to 33 N•m (24 lbf•ft)



FRONT STEERING EXTENSION BLOCK

TIGHTENING TORQUE		
Steps 3 and 4	Torx screw	33 N•m (24 lbf•ft) + LOCTITE 243 (BLUE) (P/N 293 800 060) or install new self-locking screws)
Step 5 to 8	Allen socket screws	22 N•m (16 lbf•ft)

Install engine cut-off switch (D.E.S.S. post) retaining nut. Refer to *IGNITION SYSTEM*.

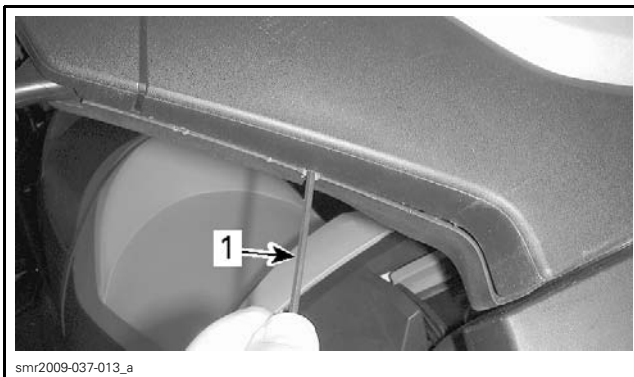
STEERING COVER

Removing the Steering Cover

Models without AES Steering

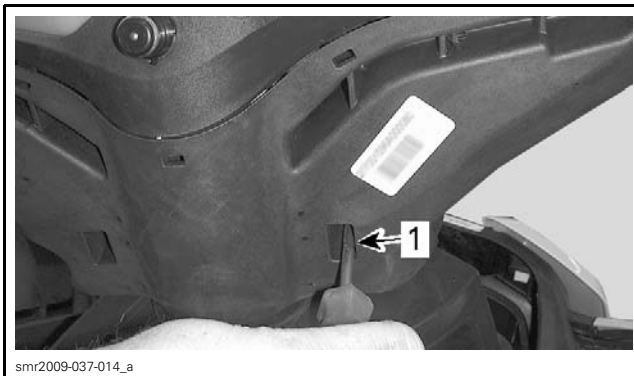
1. Remove the engine cut-off switch (D.E.S.S. post) retaining nut. Refer to *IGNITION SYSTEM*.
2. Remove both handlebar switch covers. See procedure in this subsection.
3. Unlock steering cover from steering.
 - 3.1 Insert a small tool, such as an Allen key, into a steering cover hole. Press the tool against the retaining tab to unlock it. Repeat for the other side.

NOTICE The tool must be inserted perfectly straight to avoid breaking the tab holder.



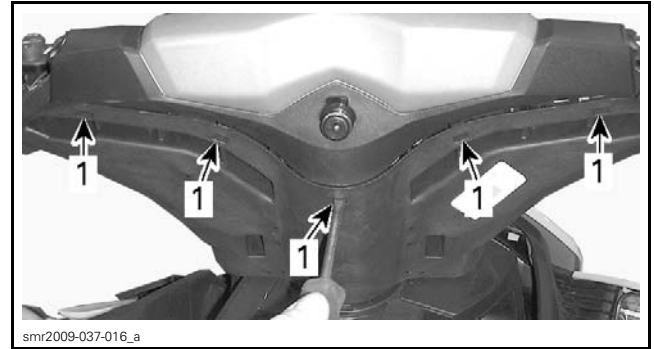
1. Allen key

- 3.2 In both cavities at the back of steering cover, release both inner retaining tabs using a long screwdriver.



1. Rear cavity

- 3.3 Release the five retaining tabs at the rear of steering cover.

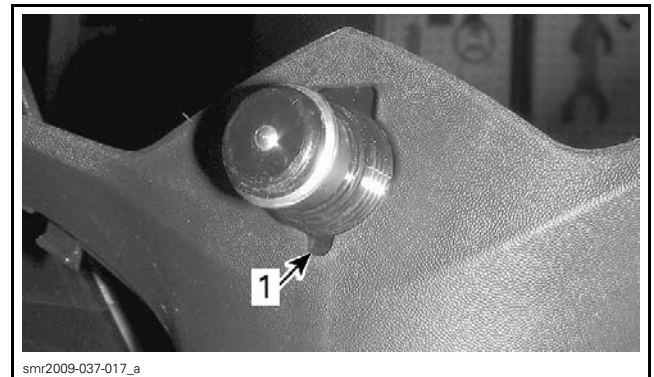


1. Retaining tabs

- 3.4 Remove the foam inside the steering cover.
- 3.5 Remove the engine cut-off switch from the steering cover.

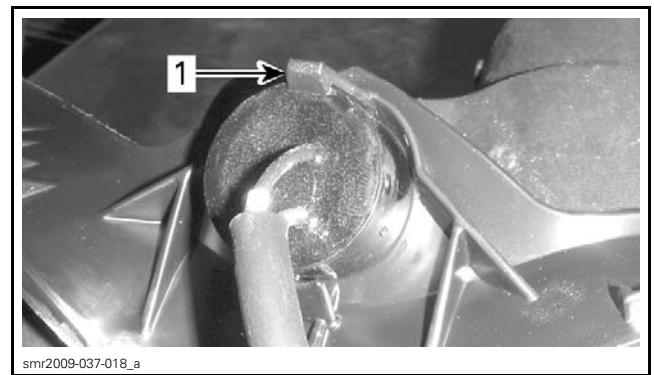
Installing the Steering Cover

1. Install the engine cut-off switch.
 - 1.1 Index the alignment pin of the engine cut-off switch with the notch of steering cover.



1. Steering cover notch

- 1.2 Press the engine cut-off switch until retaining tab is positioned correctly.

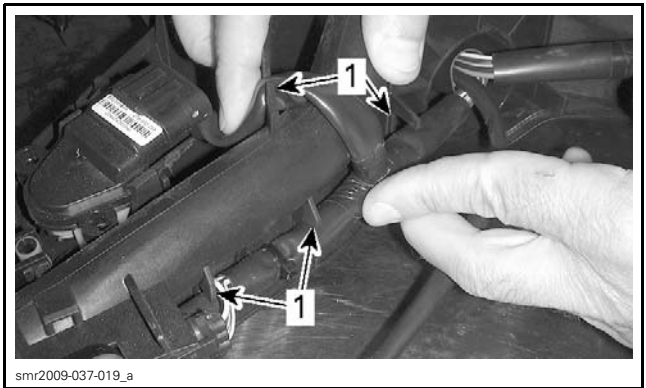


1. Retaining tab

2. Install the engine cut-off switch nut.

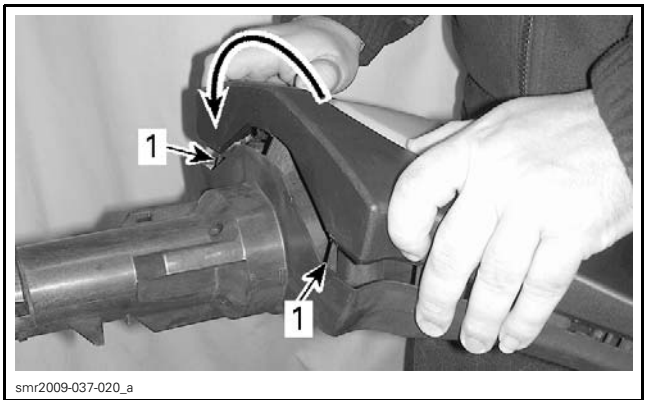
TIGHTENING TORQUE	
Engine cut-off switch nut	2 N•m (18 lbf•in)

- 3. Install the foam.
- 4. Place the engine cut-off switch harness in foam slot.
- 5. Install the steering cover.
 - 5.1 Check if all harnesses are route properly. All harness must be inserted in its slot.



1. Harness slots

- 5.2 Clip the top of the cover.
- 5.3 Stretch the bottom of the steering cover until the cover edge passes over the inner ribs.



STEERING REMOVED FOR CLARITY PURPOSE
1. Inner ribs

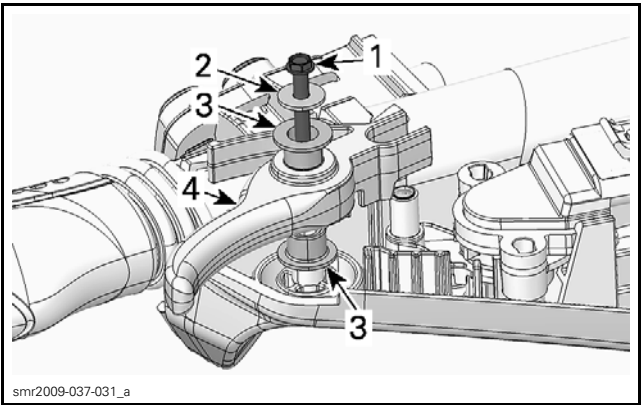
- 5.4 Push both side of the cover to lock it with the steering column.
- 5.5 Install switch covers.

THROTTLE AND iBR LEVERS

NOTE: The following procedure demonstrates the replacement of the throttle lever but the same procedure will be used for the iBR lever.

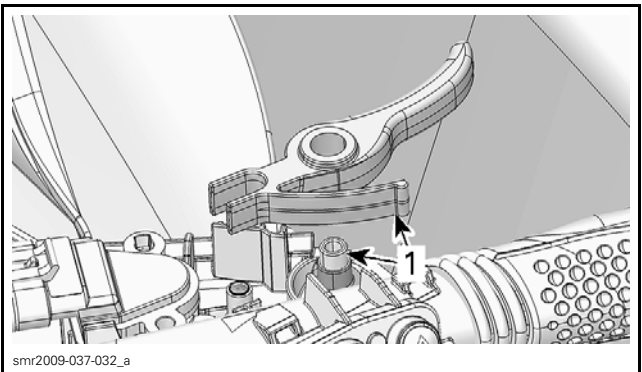
Replacing the Lever

- 1. Remove *HANDLEBAR SWITCH COVER*, see procedure in this subsection.
- 2. Remove the screw and washer securing throttle lever.
- 3. Remove throttle lever and its bushings.



1. Retaining screw
2. Washer
3. Bushings
4. Throttle lever

- 4. Clean throttle lever area from dust or any deposits.
- 5. Apply XPS SYNTHETIC GREASE (P/N 293 550 010) on bushings and on the outer surface of the return tab.



1. Apply grease here

- 6. Install the lever.
 - 6.1 Install both bushings in lever hole.
 - 6.2 Insert sensor lever end into throttle lever fork.
 - 6.3 Position the return tab against the handlebar.
 - 6.4 Secure the lever with washer and screw.
 - 6.5 Tighten the lever screw to specification.

TIGHTENING TORQUE	
Lever screw	0.7 N•m (6 lbf•in)

7. Reinstall all removed parts using appropriate procedures.

STEERING CABLE

Replacing the Steering Cable

Remove seat.

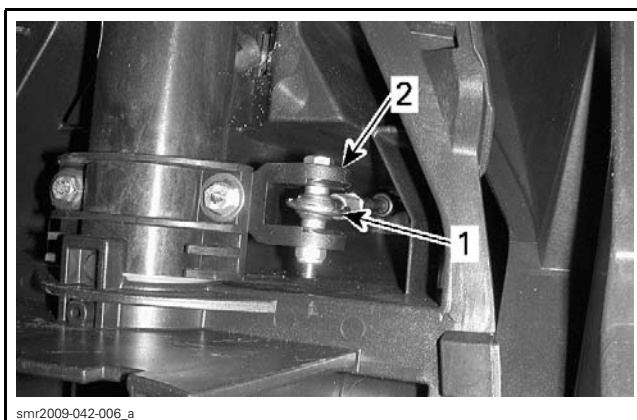
Open the front storage compartment cover.

Remove access cover.

Remove the gauge trim. Refer to *BODY* subsection.

1. Detach steering cable from steering column.

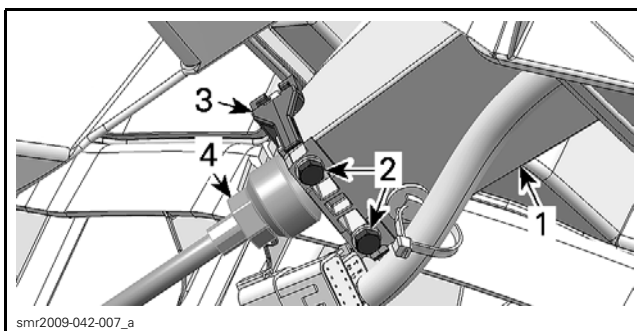
1.1 Remove the bolt securing the ball joint to the steering column arm.



1. Steering cable ball joint
2. Steering column arm

1.2 Remove the steering cable clamp bolts.

1.3 Unhook steering cable clamp.



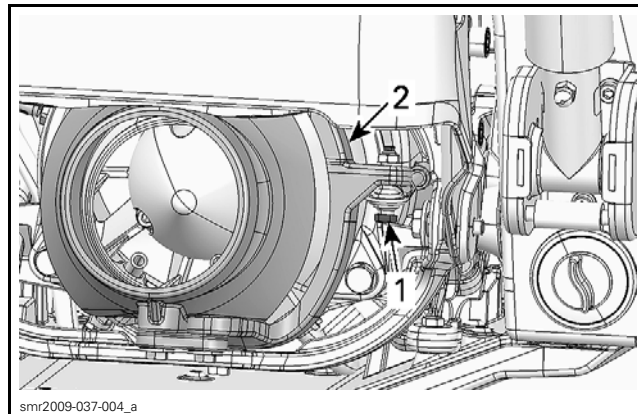
TYPICAL

1. Steering column
2. Steering column clamp bolts
3. Steering column clamp
4. Steering cable adjusting nut

1.4 Place steering in its lower position (models with tilt steering).

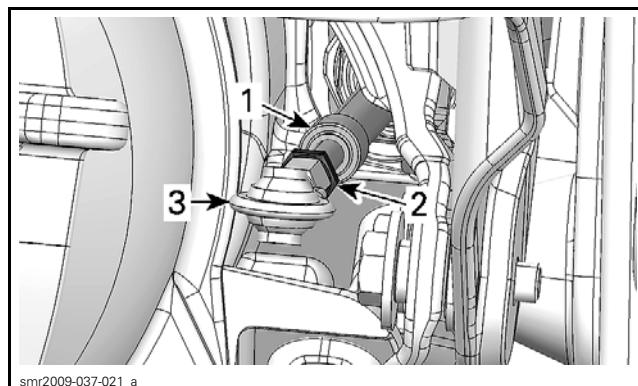
1.5 Free steering cable from the clamp.

1. At rear of the watercraft, disconnect ball joint from jet pump nozzle arm.



1. Steering cable bolt
2. Nozzle arm

2. Remove ball joint and jam nut from cable.

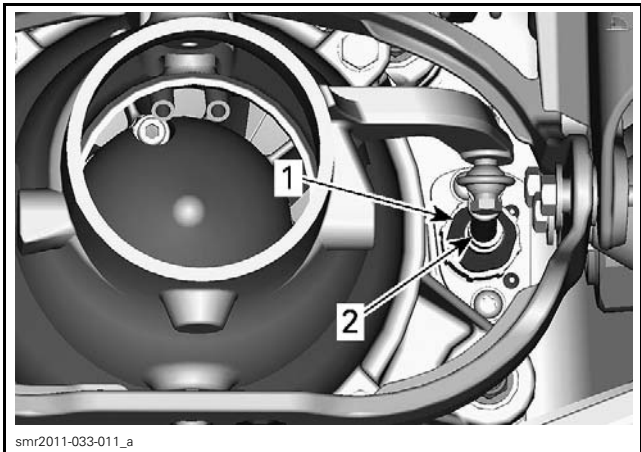


1. Steering cable
2. Jam nut
3. Ball joint

3. Using the required tool, loosen the steering cable nut.

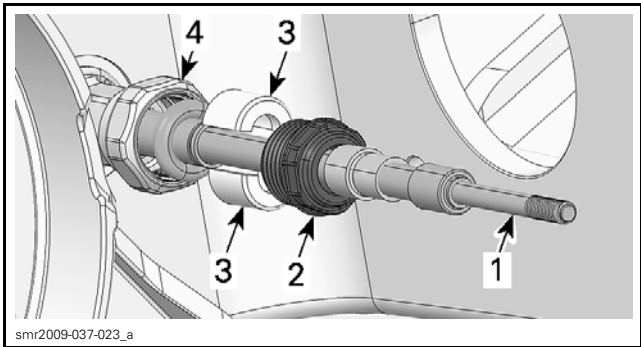
REQUIRED TOOL	
STEERING CABLE TOOL (P/N 295 000 145)	

Subsection XX (STEERING AND O.T.A.S. SYSTEM)



- 1. Steering cable nut
- 2. Steering cable

4. Remove steering cable nut, half rings and O-ring.



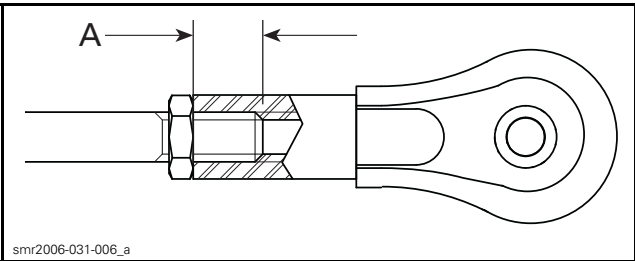
TYPICAL - PUMP AND iBR SYSTEM REMOVED FOR CLARITY PURPOSE ONLY

- 1. Steering cable
- 2. Steering cable nut
- 3. Half rings
- 4. O-ring

5. Remove the adjusting nut from the new steering cable.
6. From inside the hull, pull the aft end of the cable through the hull fitting.
7. Using a piece of hose, attach one end of the new cable to the opposite end of the old cable together.
8. Route the new cable in the hull by slowly pulling the old one, then separate cable ends.
9. From inside of the hull, pass the aft end of the cable through the hull fitting.
10. Secure the steering cable to the hull fitting.
- 10.1 Install O-ring and half rings.
- 10.2 Apply LOCTITE 567 (PIPE SEALANT) (P/N 293 800 013) on nut threads.
- 10.3 Secure steering cable with the steering cable nut.
- 10.4 Tighten nut to specification.

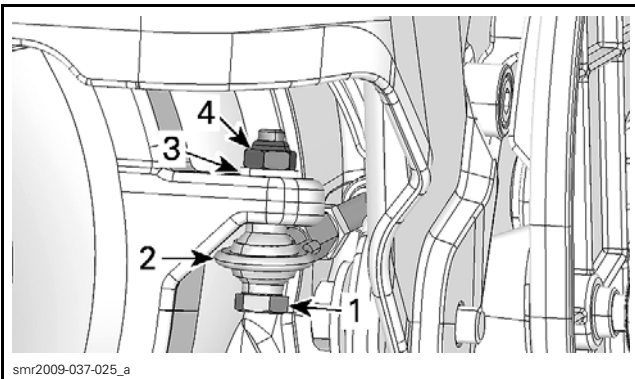
TIGHTENING TORQUE	
Steering cable nut	6 N•m (53 lbf•in)

11. Install the ball joint on the end of the steering cable.
- 11.1 The threaded portion of steering cable inserted into ball joint should be within 9 mm ± 1 mm (.354 in ± .039 in).



A. 9 mm ± 1 mm (.354 in ± .039 in)

- 11.2 Tighten jam nut to 2.5 N•m (22 lbf•in).
- 11.3 Position the steering cable ball joint to the nozzle as per following illustration.



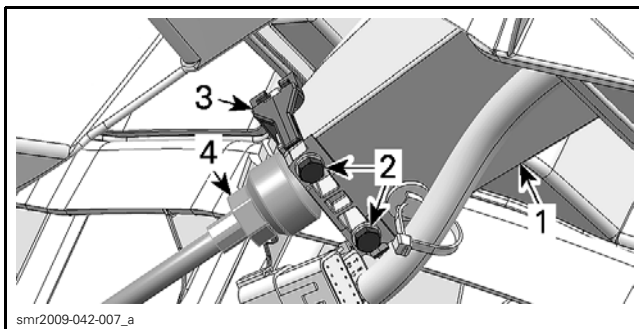
TYPICAL

- 1. Ball joint bolt
- 2. Ball joint under nozzle arm
- 3. Washer
- 4. Nut

11.4 Tighten ball joint nut to specification.

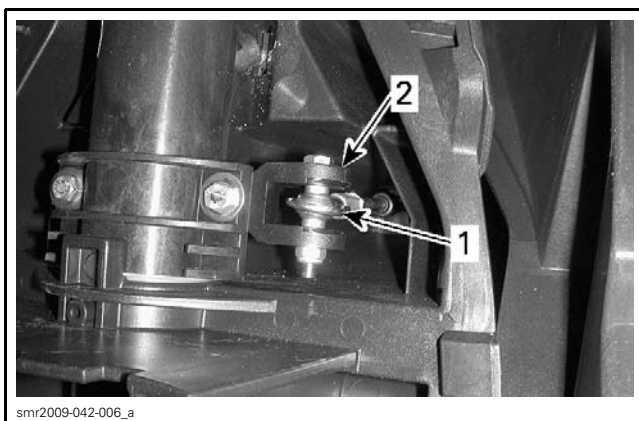
TIGHTENING TORQUE	
Ball joint jam nut	2.5 N•m (22 lbf•in)
Ball joint nut	7 N•m (62 lbf•in)

1. Carry out *STEERING ALIGNMENT*. See procedure in this subsection.
2. Insert the steering cable through the bottom end of the steering column.
3. Install steering cable clamp and its bolts. Do not tighten bolts yet.



1. Steering column
2. Steering column clamp bolts
3. Steering column clamp
4. Steering cable adjusting nut

4. Attach steering cable to steering column arm.



1. Steering cable ball joint
2. Steering column arm

5. Tighten retaining bolt to specification.

TIGHTENING TORQUE	
Steering cable retaining bolt	5 N•m (44 lbf•in)

6. Install other removed parts.

Adjusting the Steering Cable

Steering cable adjustment is required only if:

- A steering cable end ball joint has been replaced or loosened/tightened.
- Steering cable adjustment nut has been loosened/tightened.
- Steering cable has been replaced.
- Steering column or support has been replaced.

Models with iBR

Raise the iBR gate by activating the iBR override function. Refer to *iBR ,REVERSE AND VTS* subsection.

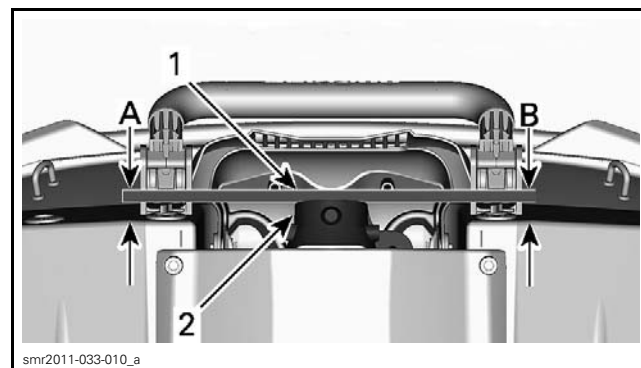
All Models

Refer to *STEERING CABLE* in this subsection and:

- Detach steering cable end from steering column.
- Unhook steering cable from retaining clamp of steering column support.

1. Position jet pump nozzle as follows:

- 1.1 Place a straight edge on the nozzle end.
- 1.2 Measure the distance from the transom each side of the straight edge.



TYPICAL VIEW FROM UNDERNEATH THE HULL

1. Straight edge
2. Nozzle
- A. LH side measure
- B. RH side measure

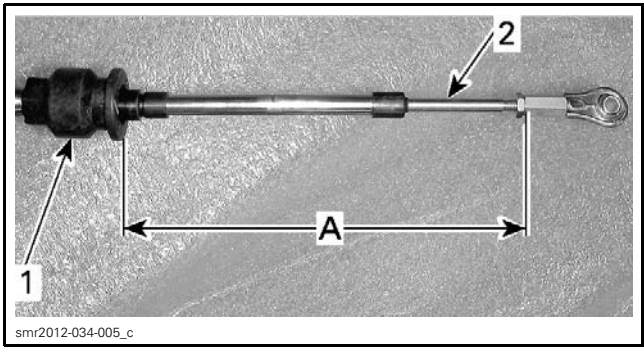
1.3 Turn nozzle so that measures A and B are equal.

2. Adjust steering cable as follows:

2.1 Turn adjustment nut to reach specification.

STEERING ADJUSTMENT SPECIFICATION
187.7 mm (7.39 in)
NOTE: This specification gives the proper nozzle adjustment to offset the jet pump thrust.

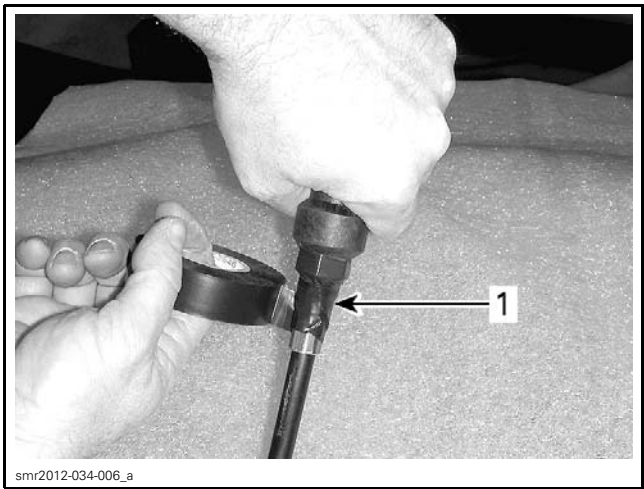
NOTE: Be careful not to move inner rod as it would alter nozzle position.



1. Adjustment nut
2. Do NOT move inner rod
A. 187.7 mm (7.39 in)

- 2.2 Recheck nozzle position. If it moved, reposition it and readjust cable nut.
- 2.3 Reinstall steering cable. Pay attention not to turn the adjustment nut as it would alter adjustment.

NOTE: Tape can be used over adjustment nut to prevent altering adjustment.



1. Tape adjustment nut to cable housing to prevent altering adjustment

- 2.4 Tighten steering cable clamp bolts to specification.

TIGHTENING TORQUE	
Steering cable clamp bolts	6 N•m (53 lbf•in)

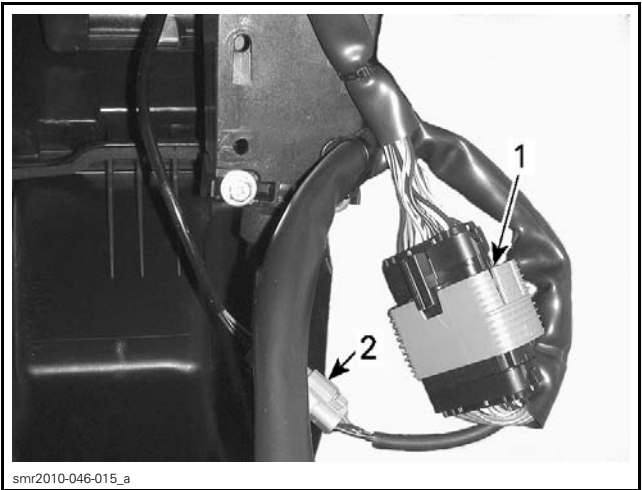
NOTE: When handlebar is in straight position and steering cable is installed, steering nozzle may not be parallel to transom. This is to offset jet pump thrust.

- 3. Test ride watercraft.
 - 3.1 If watercraft pull on one side, carry out *STEERING ALIGNMENT* in this subsection.

STEERING COLUMN

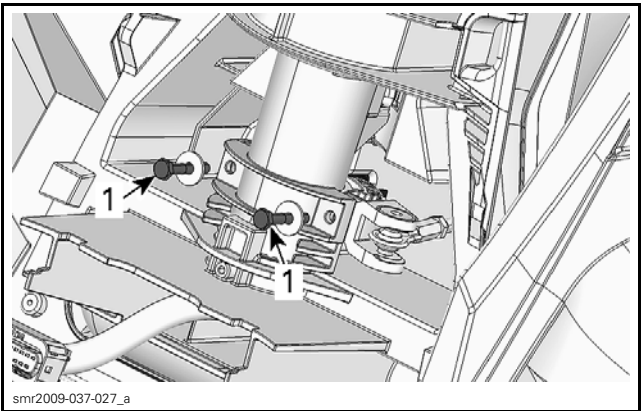
Removing the Steering Column

- 1. Open the front storage cover.
- 2. Remove the access cover.
- 3. Remove gauge trim, refer to *BODY* subsection.
- 4. Disconnect both connectors under the steering column.



1. Steering connector
2. O.T.A.S. connector

- 5. Remove both screws securing the steering column.



1. Steering column screws

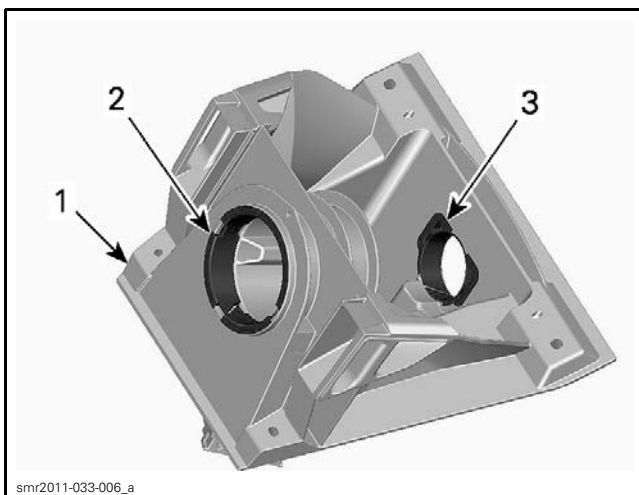
- 6. Pull steering column out of its support. Ensure to not damage wiring harness connectors and O.T.A.S. magnets.

Inspecting the Steering Column

Check steering column for:

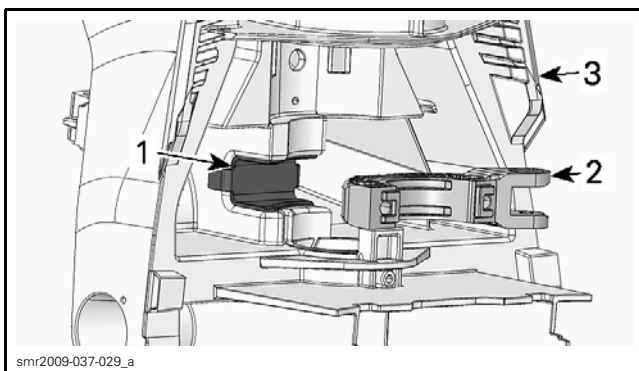
- Cracks
- Stress marks
- Signs of wear.

Check steering column support bushings.



- smr2011-033-006_a
1. Steering column support
 2. Upper bushing
 3. Lower bushing

Check wear sleeve behind the steering column arm.



- smr2009-037-029_a
1. Wear sleeve
 2. Steering column arm
 3. Steering column support

Replace any damaged or worn parts.

Installing the Steering Column

The installation is essentially the reverse of the removal procedure. However, pay attention to the following.

Carefully, drive steering column through steering column support. Ensure not to hit the O.T.A.S. magnet during steering column installation.

Tighten steering column screws to specifications.

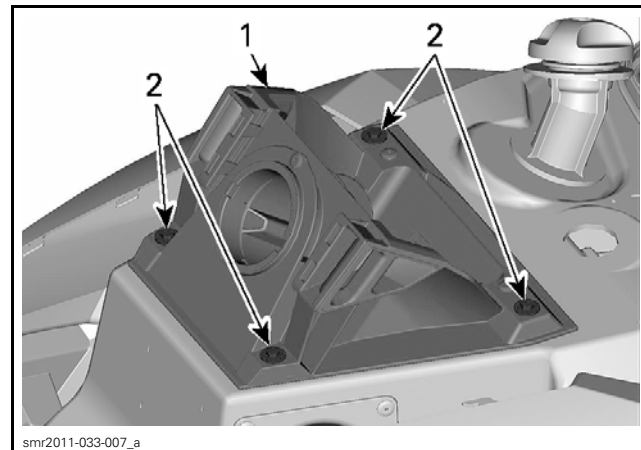
TIGHTENING TORQUE	
Steering column screws	6 N•m (53 lbf•in)

Reinstall all removed parts using appropriate procedure.

STEERING COLUMN SUPPORT

Removing the Steering Column Support

1. Remove steering column, see procedure in this subsection.
2. Remove console, refer to *BODY* subsection.
3. Remove steering column support retaining screws.



- smr2011-033-007_a
1. Steering column support
 2. Retaining screws

Installing the Steering Column Support

Installation is the reverse of the removal procedure.

O.T.A.S. SWITCH

Testing the O.T.A.S. Switch with BUDS2

Connect watercraft to BUDS2 Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.

Select the **Measurement** and **iBR** tabs.

Briefly press the START/STOP button to wake up the ECM.

Install the tether cord on the engine cut-off switch.

While monitoring the O.T.A.S. indicator in BUDS2, completely turn steering in one direction and keep it in this position.

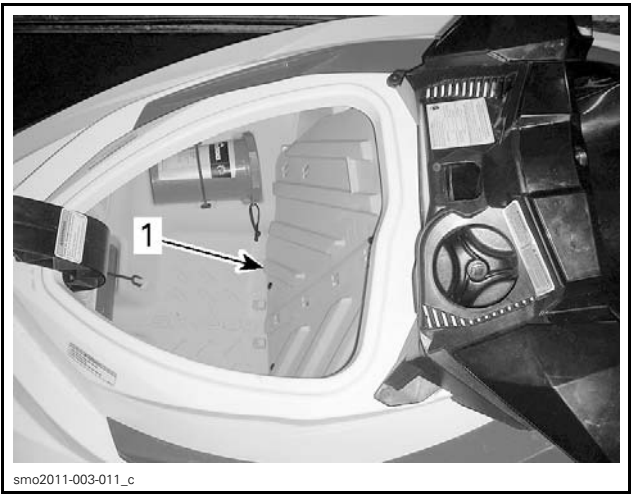
The O.T.A.S. indicator should turn on when handlebar reaches the stopper.

Repeat test for the other side.

If O.T.A.S. indicator does not turn on, carry out the *O.T.A.S. SWITCH INPUT VOLTAGE TEST*.

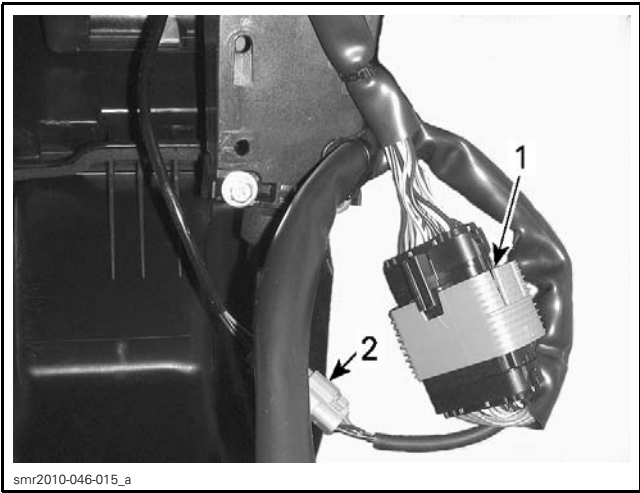
Testing the O.T.A.S. Switch Input Voltage

Access the O.T.A.S. connector as follows:
Open the front storage cover an remove the access panel.



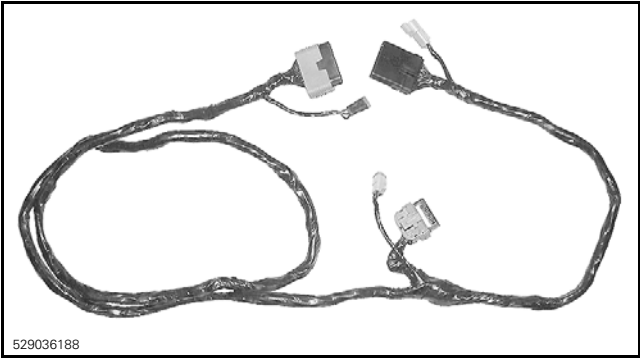
1. Access panel

Disconnect the O.T.A.S. connector (keep the 24-pin steering harness connected).



1. Steering connector
2. O.T.A.S. connector

Connect the DIAGNOSTIC HARNESS (P/N 529 036 188) in-line between the disconnected O.T.A.S. connectors.



Press the START/STOP button to activate the electrical system.

Using the FLUKE 115 MULTIMETER (P/N 529 035 868), measure voltage as follows.

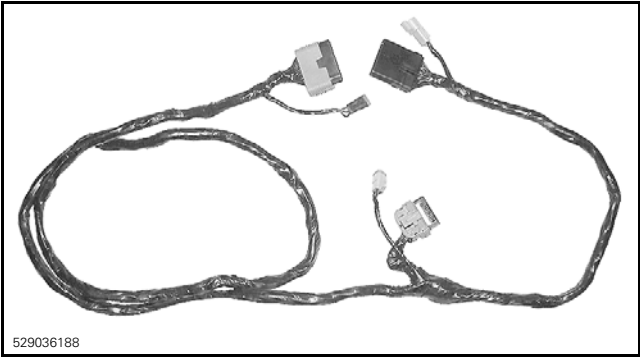
TEST PROBES		VOLTAGE (VDC)
PIN A (3-pin connector)	Battery negative post	Battery voltage

If voltage is not as specified, check wiring and connectors.

If voltage is as specified, carry out the *O.T.A.S. SWITCH GROUND TEST*.

Testing the O.T.A.S. Switch Ground

Install the DIAGNOSTIC HARNESS (P/N 529 036 188) as described in the *O.T.A.S. SWITCH INPUT VOLTAGE TEST*.



Press the START/STOP button to activate the electrical system.

Using the FLUKE 115 MULTIMETER (P/N 529 035 868), check ground circuit as follows.

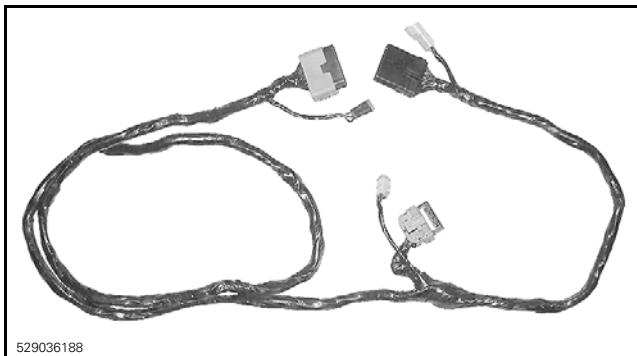
TEST PROBES		VOLTAGE (VDC)
PIN A (3-pin connector)	PIN B (3-pin connector)	Battery voltage

If voltage is not as specified, check wiring and connectors.

If voltage is as specified, carry out the *O.T.A.S. SWITCH SIGNAL TEST*.

Testing the O.T.A.S. Switch Signal

Install the DIAGNOSTIC HARNESS (P/N 529 036 188) as described in the *O.T.A.S. SWITCH INPUT VOLTAGE TEST*.



Press the START/STOP button to activate the electrical system.

Using the FLUKE 115 MULTIMETER (P/N 529 035 868), check switch signal as follows.

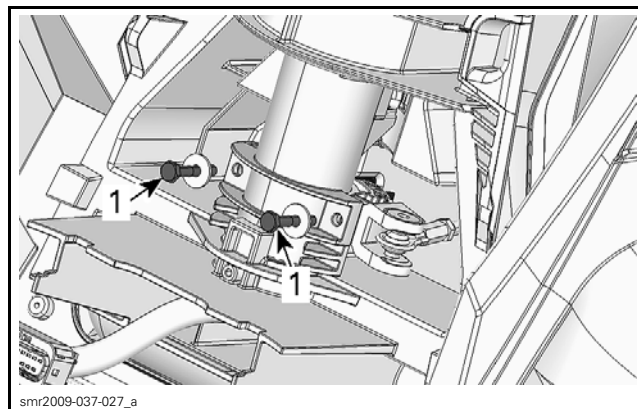
TEST PROBES		HANDLEBAR POSITION	VOLTAGE
PIN C (3-pin connector)	PIN B (3-pin connector)	Straight ahead	0.6 to 0.8 Vdc
		Turned completely to the right	2.0 to 2.5 Vdc
		Turned completely to the left	

If voltage is not as specified, replace the switch.

NOTE: To avoid useless switch replacement, make sure magnets are in good condition. Also, make sure magnets and switch are securely clipped.

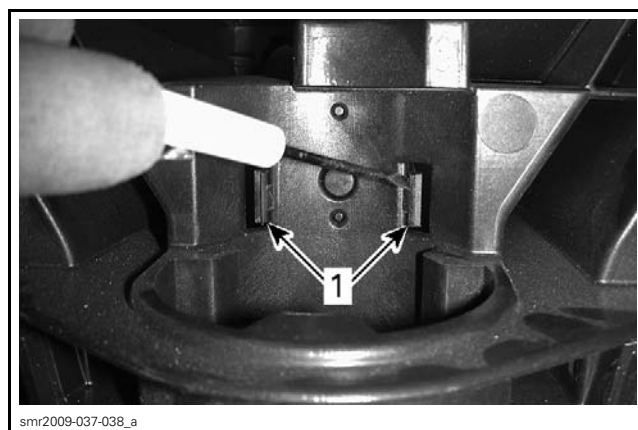
Replacing the O.T.A.S. Switch

Remove steering column from its support by removing both retaining screws.



1. Steering column screws

- Using a small screwdriver, unhook the switch from steering support.



1. Switch retaining tabs

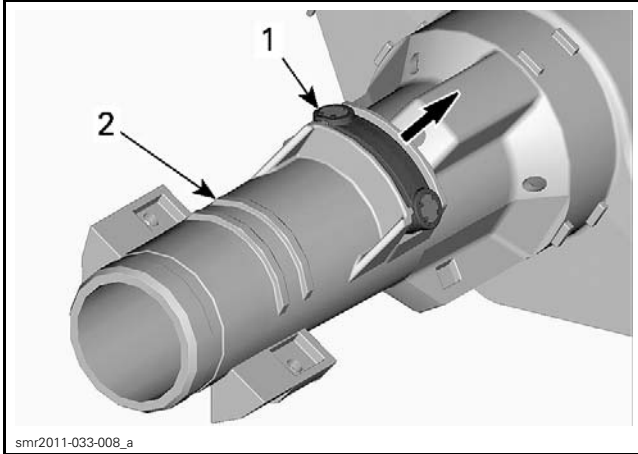
Reverse removal procedure to reinstall the O.T.A.S. switch.

O.T.A.S. MAGNETS

Replacing the Magnets

- Remove *STEERING COLUMN*, see procedure in this subsection.
- Pull magnets off the steering column.

Subsection XX (STEERING AND O.T.A.S. SYSTEM)



1. Magnets
2. Steering column

Reverse removal procedure to reinstall the magnets.