

Removal of the exhaust noise-control valve

All BMW R-series models, model-years 2010 to 2013

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Introduction and rationale

BMW R-series motorcycles manufactured between 2010 and 2013 possess an exhaust noise-control valve whose stated purpose is to reduce the exhaust noise level at lower engine speeds and loads (i.e. in urban 'drive-by' situations) whilst opening at higher engine speeds and loads in order to facilitate higher engine power output. The valve does not, as is commonly thought, perform an exhaust-gas resonance function to improve midrange power (for example, in the same way as the Yamaha EXUP and Honda H-VIX systems).

The butterfly valve is located within a removable cast-steel housing located downstream of the exhaust catalytic convertor. The housing is clearly visible from the left-hand side of the motorcycle (see image above). The valve is actuated by a pulley, which is in turn operated by two steel cables under tension. These cables connect the exhaust pulley to the electrically-operated exhaust pulley servo actuator, with the actuator connected to the motorcycle's wiring harness via a single four-pin electronic multi-plug. The actuator varies the butterfly valve position according to inputs from the engine ECU.

By some accounts, the system is not as reliable and trouble-free as advertised. The most commonly-known issue involves corrosion and seizure of the butterfly valve spindle (particularly in world markets where salt is used to de-ice roadway surfaces). This can cause the valve to stick in a random position, whereupon a valve-related fault code is logged by the engine management system. In this situation, power losses and fuel-consumption issues are also a possibility.

This document illustrates the procedure whereby the exhaust noise-control valve is removed outright from the motorcycle. This brings the benefits of less weight and complication, as well as eliminating the possibility of butterfly-valve malfunction and associated consequences.

Aside from a slightly increased level of exhaust noise, no negative effects are brought about by performing this conversion. The procedures illustrated in this document are completely reversible should the owner wish to re-install the valve.

This procedure was written with extensive reference to a 2010 R1200GS Adventure. However, it is also applicable to all other BMW Motorrad R-series models utilizing the valve, as the removal procedure is identical for all such models.

If you are unfamiliar with the procedures required to remove any peripheral components from the motorcycle before proceeding, consult the appropriate section(s) of the relevant BMW, Haynes or Clymer workshop manual as required.

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Should any technical errors or discrepancies be found in this document, please forward relevant details to the author at technicwrite@gmail.com for inclusion in updated editions.

Equipment List

- T25 Torx wrench.
- T30 Torx wrench.
- T45 Torx wrench.
- Electrical side-cutters.

If installing non-standard exhaust headers:

- 1/2" ratchet bar.
- 1/2" 300mm socket extension.
- 1/2" 13mm hex socket.
- 22mm ringset wrench.

Consumables List

If retaining the standard silencer:

- Copper grease
- 1x stainless steel tube: length 67mm, outer diameter 63.5mm, inner diameter 57mm.

If installing an aftermarket silencer:

- 1x aluminium spacer: length 23mm, outer diameter: 63.5mm, inner diameter corresponding to outer diameter of exhaust silencer pipe.
- High-quality temperature-resistant silicone sealant.
- Small bottle of white spirit vinegar.
- Clean rags.

If removing the NCV actuation servo:

- High-quality black insulation tape.
- 2x T30R cable ties.

If installing non-standard exhaust headers:

- High-temperature-resistant thread-locking compound.

Procedure

There are a variety of possible methods to remove the noise-control valve and its associated hardware, all of which are illustrated below:

1. If the standard exhaust headers and standard silencer are to be retained, the noise-control valve (hereafter NCV) can be replaced by a straight section of steel tube. Follow the instructions in sections 1, 2 and 3 below (section 5 is optional).
2. If the standard exhaust headers are to be retained but the standard silencer replaced by an aftermarket silencer, the NCV can be replaced by an aluminium spacer or silicone sealant buffer. Follow the instructions in sections 1, 2 and 4 below (sections 5 and 7 are optional).
3. If the standard exhaust headers and standard silencer are both to be replaced by aftermarket equivalents, the NCV does not need to be accommodated. Follow the instructions in sections 1, 2 and 6 below (sections 5 and 7 are optional).
4. If retaining the NCV actuation servo in order to prevent the engine ECU from registering associated fault codes, follow the instructions in section 5 below.

<p>Note: Omitting re-installation of the NCV actuation servo will not result in negative consequences. Engine power will remain unaffected, the ECU will not initiate 'Limp-home' mode and the Master Caution light will not illuminate. However, an NCV valve-related fault code will be logged by the engine ECU and remain for as long as the valve stays disconnected.</p>

Section 1: Initial Exhaust Disassembly

1. Using a T45 Torx wrench, loosen but do not remove the screw securing the exhaust silencer inlet pipe to the NCV valve.
2. Using a T45 Torx wrench, remove the screw securing the exhaust silencer to the rear frame.
3. Remove the exhaust silencer from the NCV valve and rear frame. If the silencer is difficult to remove, apply aerosol penetrating lubricant to the join between the silencer pipe and valve.

Section 2: NCV valve removal

The NCV actuation servo will need to be temporarily relocated as follows:

1. Ensure that the motorcycle's ignition is switched off.
2. Place a clean shop rag over the left-hand rider's footpeg.
3. Disconnect the four-pin servo electronic multi-plug located forward of the actuation servo (Red arrow, Figure 1).
4. Using a T30 Torx wrench, remove the screw securing the servo to the rear frame (Green arrow, Figure 1).

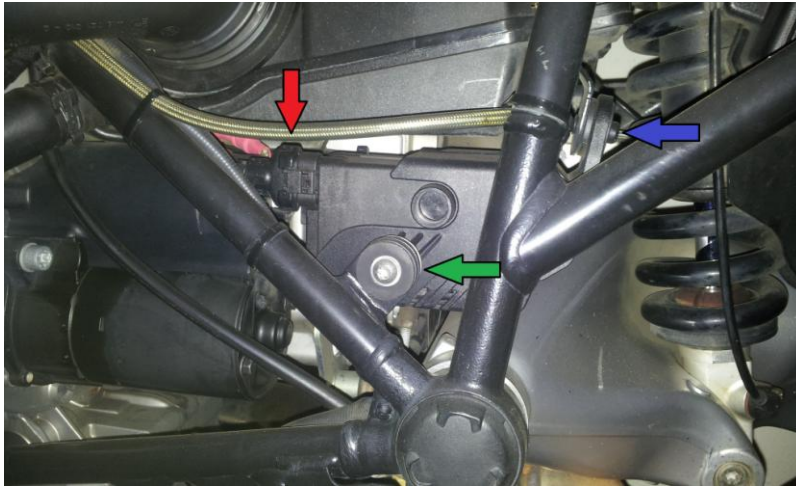


Figure 1

5. Slide the servo rearwards off its locating peg (Blue arrow, Figure 1) and out of the rear frame, taking care not to snag the two actuation cables. Rest the servo on the left-hand rider's footpeg.
6. Position the servo so that its rear side is visible. Using a T25 Torx wrench, remove the two screws securing the servo pulley cover to the rear of the NCV actuation servo (Blue arrows, Figure 2). Slide the pulley cover off the NCV actuation servo.

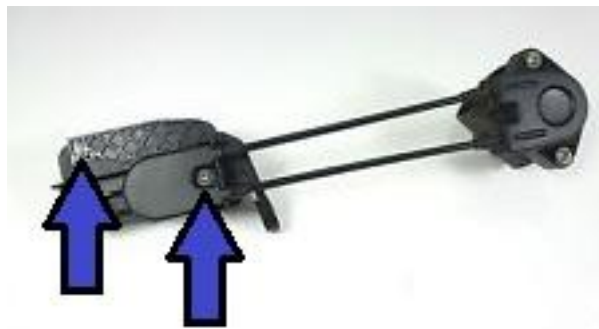


Figure 2

7. At this point, the actuator's cable control pulley will be exposed. Remove the ends of the control cable from the actuator control pulley. It is not necessary to remove the control cables from the NCV valve.
8. Using a T45 Torx wrench, loosen (but do not remove) the screw securing the exhaust header outlet pipe to the NCV valve.
9. Remove the NCV valve from the exhaust header pipe. If the valve is difficult to remove, apply aerosol penetrating lubricant to the join between the header pipe and valve.

Section 3: If retaining the standard exhaust headers and standard silencer

1. Get an automotive exhaust fabrication shop or steel-tube supplier to fabricate a blanking tube to the following specifications and dimensions:
 - a. Material: stainless steel. (Mild steel can be used, but is not recommended.)
 - b. Tube length: 67mm.
 - c. Tube outer diameter: 63.5mm.
 - d. Tube inner diameter: approximately 57mm.
2. Lightly lubricate both outer ends of the blanking tube with copper grease.

3. Insert the blanking tube into the exhaust header outlet pipe. Using a T45 Torx wrench, fasten the screw securing the header pipe outlet to the blanking tube.
4. Mate the exhaust silencer inlet pipe to the blanking tube, ensuring that the exhaust silencer hanger is correctly positioned in relation to it's attachment point on the rear frame. Insert the blanking tube into the exhaust silencer inlet pipe.
5. Install the screw securing the exhaust silencer to the rear frame. Do not fully fasten the screw at this time.
6. Ensure that the blanking tube is fully seated into both the exhaust header outlet pipe and exhaust silencer inlet pipe. Using a T45 Torx wrench, fasten the screw securing the exhaust silencer to the blanking tube.
7. Using a T45 Torx wrench, fasten the screw securing the exhaust silencer to the rear frame.

Section 4: If retaining the standard exhaust headers and using an aftermarket silencer

There are two alternatives which enable the installation of a 'lesser-diameter' exhaust silencer tube to a 'greater-diameter' exhaust header outlet:

ALTERNATIVE 1:

1. Get an engineering works equipped with a suitable metalworking lathe to fabricate a spacer tube to the following specifications and dimensions:
 - a. The spacer tube can be fabricated in almost any grade of aluminium, although 6082 is preferable.
 - b. Tube length: 23mm.
 - c. Tube outer diameter: 63.5mm.
 - d. The tube inner diameter should ideally be 0.5 to 0.75mm more than the outer diameter of the aftermarket silencer inlet tube (the diameter of a typical aftermarket exhaust silencer tube will be between 57mm and 58mm).
2. Slot the spacer tube by using a hacksaw equipped with an alloy-steel blade to make a longitudinal cut through the entire wall thickness of the spacer tube.
3. Lubricate the inside of the exhaust header pipe outlet, the spacing tube and the spacing tube slot with high-quality temperature-resistant silicone sealant.

<p>Note: Use only silicone sealant rated as temperature-resistant to at least 250° Celcius (300°+ preferable). Silicone sealants rated for lower temperatures will be quickly destroyed by exhaust heat.</p>

4. Insert the spacer tube fully into the header pipe outlet.
5. Mate the exhaust silencer inlet pipe to the spacing tube, ensuring that the exhaust silencer hanger is correctly positioned in relation to it's attachment point on the rear frame. Insert the exhaust silencer inlet pipe into the spacer tube by 23mm.
6. Using a T45 Torx wrench, fasten the screw securing the exhaust silencer to the rear frame.

<p>Note: Allow at least 24 hours for the silicone sealant to cure before starting the engine. If this is not done, there is a risk of unevaporated solvent boiling and forming gas voids in the sealant. This may compromise the join between the header pipe and silencer pipe.</p>

ALTERNATIVE 2:

1. Remove the steel clamp which formerly secured the header pipe outlet to the NCV valve. It will not be used.

2. Thoroughly clean the inside of the header pipe outlet and exhaust silencer inlet pipe with lacquer thinners.
3. Smear an even layer of high-temperature silicone sealant on the inside mating surface of the header pipe outlet and exhaust silencer inlet pipes.

Note: Use only silicone sealant rated as temperature-resistant to at least 250° Celcius (300°+ preferable). Silicone sealants rated for lower temperatures will be quickly destroyed by exhaust heat.

4. Assemble the exhaust silencer inlet pipe to the inside mating surface of the header pipe outlet. Ensure that the end of the exhaust silencer inlet pipe 'bottoms out' against the inside of the header pipe outlet.
5. Install the screw securing the exhaust silencer to the rear frame, but do not fully fasten the screw at this time.
6. Screw the tapered applicator nozzle packaged with the tube of silicone sealant onto the sealant tube nozzle.
7. Squeeze sealant into the cavity between the header pipe outlet and exhaust silencer inlet pipe until sealant is ejected from the cavity. Repeat this process around the entire circumference of the cavity until no air spaces remain.
8. Using a clean rag soaked in white spirit vinegar, clean any excess sealant from around the mating join between the inside mating surface of the header pipe outlet and exhaust silencer inlet pipe.
9. Using a T45 Torx wrench, fasten the screw securing the exhaust silencer to the rear frame.

Note: Allow at least 24 hours for the silicone sealant to cure before starting the engine. If this is not done, there is a risk of unevaporated solvent boiling and forming air voids in the sealant. This may compromise the join between the header pipe and silencer pipe.

Caution: Should the exhaust outlet be positioned higher than standard, ensure that the left rear turn-signal indicator is protected from hot exhaust gasses. If this is not done, the indicator may be severely damaged.

A method of achieving this goal can be found in section 7.

Section 5: NCV actuation servo re-installation

Tip: If desired, the NCV actuation servo can be disconnected and removed. Engine power will remain unaffected, the ECU will not initiate 'Limp-home' mode and the Master Caution light will not illuminate. However, an NCV valve-related fault code will be logged by the engine ECU and remain for as long as the valve stays disconnected.

To delete the actuation servo, refer to section 5A.

1. Slide the servo pulley cover onto the NCV actuation servo. Using a T25 Torx wrench, fasten the two screws securing the servo pulley cover to the servo (Blue arrows, Figure 2).

2. Ensuring correct orientation of the servo, slide the servo forward into position on the rear sub-frame, onto it's locating peg (Blue arrow, Figure 1).
3. Using a T30 Torx wrench, fasten the screw securing the servo to the rear frame.
4. Re-connect the four-pin servo electronic multi-plug to the connection located on the forward side of the servo.
5. Switch on the motorcycle's ignition. If all components have been re-installed and the motorcycle is in running order, start the engine. Wait for approximately ten seconds. The Master Caution light on the digital display should go out as normal, and no fault codes should be visible on the display itself.

Note: The only reason for retaining the NCV actuation servo in the absence of the NCV valve is to eliminate the possibility of unwanted ECU fault codes.

Dynojet Research manufacture a 'servo eliminator' plug which substitutes for an NCV actuation servo at a small fraction of the mass and size. However, this plug is only available for certain Yamaha motorcycles.

Should a way be found to engineer a similar electronic means of bypassing the NCV servo control circuit on BMW R-series motorcycles, please contact the author at technicwrite@gmail.com.

Section 5A: NCV actuation servo deletion

If you do not wish to re-install the NCV actuation servo:

1. Ensure that the four-pin NCV actuation servo electrical plug connected to the motorcycle's wiring harness is clean and free of moisture and foreign matter. If necessary, electrical contact cleaner may be used to clean the plug.
2. Using high-quality electrical insulation tape, wrap the plug well from top to bottom, ensuring a water-tight seal over the plug contacts.
3. Secure the waterproofed plug to the motorcycle's rear sub-frame, hiding it behind the frame tube using two cable ties. Trim any excess length from the cable ties using electrical side-cutters.

Section 6: If replacing the standard exhaust headers and silencer with aftermarket components

1. Follow the section titled 'Initial Exhaust Disassembly'.
2. Follow the section titled 'NCV valve removal'.
3. Place the motorcycle on it's centre stand. If the motorcycle is not equipped with a centre stand, place it securely on a suitable paddock stand.
4. Locate the four-pin electronic connectors which connect the Lambda sensor plugs to the wiring harness (these connectors are located next to the secondary spark-plug coils). Remove the secondary ignition coil covers in order to displace the connectors. Disconnect both connectors from the wiring harness.
5. Using a 13mm hex socket, remove the two dome nuts securing each of the two exhaust-header flanges (four nuts in total).
6. Generously lubricate the exhaust header hanger at the rear of the gearbox with silicone-based spray. Allow five minutes for the spray to penetrate.
7. Gently slide the header pipe assembly forward until the flanges clear the flange securing studs. Angle the front of the header pipes downward, and slide the header pipe assembly backwards until the hanger above the catalytic convertor clears the hanger pin mounted to the rear of the gearbox.

8. Ensure that the exhaust flange gaskets (one gasket per exhaust port) remain in place. These gaskets will be re-used.
9. Using a 22mm ringset wrench, carefully remove the Lambda sensors from the original header pipe assembly.
10. Fit the Lambda sensors to the aftermarket header pipe, using a small amount of temperature-resistant thread-locking compound on the sensor threads.
11. Mount the exhaust header hanger of the aftermarket header to the aftermarket header pipe (if applicable).
12. With the front of the aftermarket header pipe angled downward, bring the rear header pipe hanger into the vicinity of the hanger pin mounted to the rear of the gearbox.
13. Slide the header exhaust hanger forward over the hanger pin to secure the rear of the header pipe.
14. Slide the header pipe assembly as far forward on the rear hanger pin as possible. Lift the front of the header pipe assembly, passing the header flanges alongside the flange securing studs until they make contact with the cylinder head flanges.

Caution: The exhaust flange gaskets are fragile and easily damaged. Ensure that they are properly seated in the cylinder head exhaust ports and that they cannot be mis-aligned when performing the next step.

15. Slide the header pipe assembly backward until the header flanges are in secure contact with the cylinder head flanges.
16. Draw the exhaust flange collars over the flange securing studs. Secure the flange collars by threading all four 13mm dome nuts onto the studs. Hand-tighten all dome nuts at this time.
17. Re-check all parts of the header assembly, making sure all parts are properly located and secured.
18. Remove the 13mm dome nuts one by one. Clean each dome nut and it's exhaust stud using solvent. Apply heat-resistant thread-locking compound to the stud threads before re-installing and hand-tightening each dome nut.
19. Torque all exhaust flange dome nuts evenly and to the correct value.
20. Connect the four-pin Lambda sensor electronic connectors to the wiring harness. Secure each connector next to it's relevant secondary ignition coil cover.
21. Replace the secondary ignition coil covers.
22. Mate the exhaust silencer inlet pipe to the header pipe outlet, ensuring that the exhaust silencer hanger is correctly positioned in relation to it's attachment point on the rear sub-frame.
23. Fasten the screw securing the exhaust silencer to the rear sub-frame.
24. Fasten the screw securing the exhaust silencer inlet pipe to the header pipe outlet.

Caution: Should the exhaust outlet be positioned higher than standard, ensure that the left rear turn-signal indicator is protected from hot exhaust gasses. If this is not done, the indicator may be severely damaged.

A method of achieving this goal can be found in section 7.

Section 7: Clearing offset rear direction indicators from the exhaust stream

Aftermarket exhaust silencer outlets which are positioned higher than standard may direct exhaust gases in such a way as to melt or damage the left rear direction indicator.

In the case of downward-offset twin-LED direction indicators (as fitted to R1200GS Adventure models), the easiest and quickest way to solve this problem is to move the left-hand indicator to the right-hand side and *vice versa* using the procedure below. This will raise both indicators by 50mm, as illustrated in Figure 3 below.



Figure 3

1. Using the ignition key, remove the front and rear seats from the motorcycle.
2. Using a T30 Torx wrench, remove the rear luggage rack/grab handles.

Tip:

If the standard GS-pattern plastic top-box rack and steel top-box support frame (as fitted to non-Adventure R1200GS models) are present, it is not necessary to remove the four screws and nuts which secure the top-box rack to the rear plastic luggage rack.

Simply remove the two 6mm screws securing the steel top-box support frame to the motorcycle's rear sub-frame. The entire top-box rack / plastic luggage rack assembly can then be removed as a unit.

3. Using a T25 Torx wrench, remove the screw securing the seat lock to the rear sub-frame (this screw is located just inboard of the seat-removal key slot).
4. Using a T30 Torx wrench, remove the four screws securing the rear seat support panel to the rear sub-frame. Lift and remove the rear seat support panel.
5. Trace the wiring runs from each indicator to it's associated two-pin connector. Make a note of which connector services which indicator.
6. Carefully cut the two cable ties forward of the rear brake light which secure the indicator wires.
7. Disconnect both indicators from their associated two-pin connectors.
8. Using a T30 Torx wrench, remove the screws securing the indicators to the rear sub-frame.
9. Remove both indicators from the motorcycle. Note that each indicator is marked 'L' or 'R'.
10. Obtain:
 - a. Two 40mm A2-70 stainless steel screws of M6x1.0.

- b. Two stainless steel penny washers of 6mm IØ, 20mm OØ.
 - c. Eight black rubber household tap washers of 6mm IØ, 25mm OØ, 4mm thickness.
11. Remove the cut cable ties from their securing bases. Replace them with new cable ties.
 12. Insert what was previously the left-hand indicator's two-pin connector and wiring through the right-hand indicator wiring hole. Thread the wiring through the correct channels and connect the two-pin connector to the right-hand indicator's electrical supply.
 13. Repeat the step above for the new left-hand indicator.
 14. Switch on the motorcycle's ignition. Ensure that all direction indicators are working as normal. If either or both indicators are not functional, locate and fix the problem before proceeding.
 15. Insert one of the new 6mm screws through the indicator's mounting hole. Mount a penny washer over the screw shaft, followed by four of the rubber tap washers.
 16. Thread the new mounting screw into the mounting hole. Fasten the screw, ensuring that the indicator is facing directly to the rear.
 17. Repeat the two steps above for the opposite side indicator.
 18. Arrange the wiring for the two indicators into the proper runs. Secure all wiring using the new cable ties. Cut off any excess tie material.
 19. Reinstall the rear seat support panel and fasten the four T30 Torx screws.
 20. Reinstall the rear grab handles and fasten the three T30 Torx screws.
 21. Using a T25 Torx wrench, install and fasten the screw securing the seat lock to the rear sub-frame.
 22. Reinstall the front and rear seats.