Installation Instructions for
IPP
Suspension Sensor Arms

Please read these installation instructions in their entirety before commencing work on the vehicle. There are several procedures which must be carried out in the order specified to ensure a successful installation and minimize damage to components or injury to personnel.

Package Contents:

Figure 1: Package Contents

4 - IPP Suspension Sensor Arms
4 - M6x20 flange screws
4 - M6 flange nuts

WARNING:

Never work under a vehicle that is supported by a Hydraulic Jack. Ensure vehicle is properly supported using jack stands or other suitable device. Failure to do so may cause injury or death.

CAUTION:

If your vehicle has been previously lowered by adjusting adaptation channel values on the Level Control Module (LCM) (known as the “402” mod), you must first return the vehicle to factory ride height settings, otherwise you may be presented with a situation where the LCM will not allow you to perform the adaptation. The increased suspension travel provided by the IPP Suspension Sensor Arms may cause a “control limit reached” error code. Basically, the vehicle cannot go low enough for the suspension sensors to read Level 1.

NOTE:

This procedure does not require the vehicle to be raised off the ground, however, access is greatly improved by raising each corner of the vehicle and removing the applicable wheel where the IPP Suspension Sensor Arm is to be installed.

The installation procedures in this document were done with the vehicle on ramps. If you chose to not lift the vehicle, installation of the rear sensor arms can be made easier by backing the vehicle onto suitable ramps. For the front sensors, setting the suspension to level 4 and turning the steering to the left or right (depending on which side is being worked on) will provide adequate clearance for installation.

Front IPP Suspension Sensor Arms Installation

NOTE:

Ensure wheels are chocked and parking brake is fully engaged.

NOTE:

The following steps are applicable to the left and right front suspension sensor assemblies. Only the right side is shown.

1. Start engine and press the air suspension UP button to raise the vehicle to level 4.
2. Turn steering wheel fully to the right.
3. Turn engine off and remove key from ignition to engage steering wheel lock.
4. Locate right front suspension sensor.

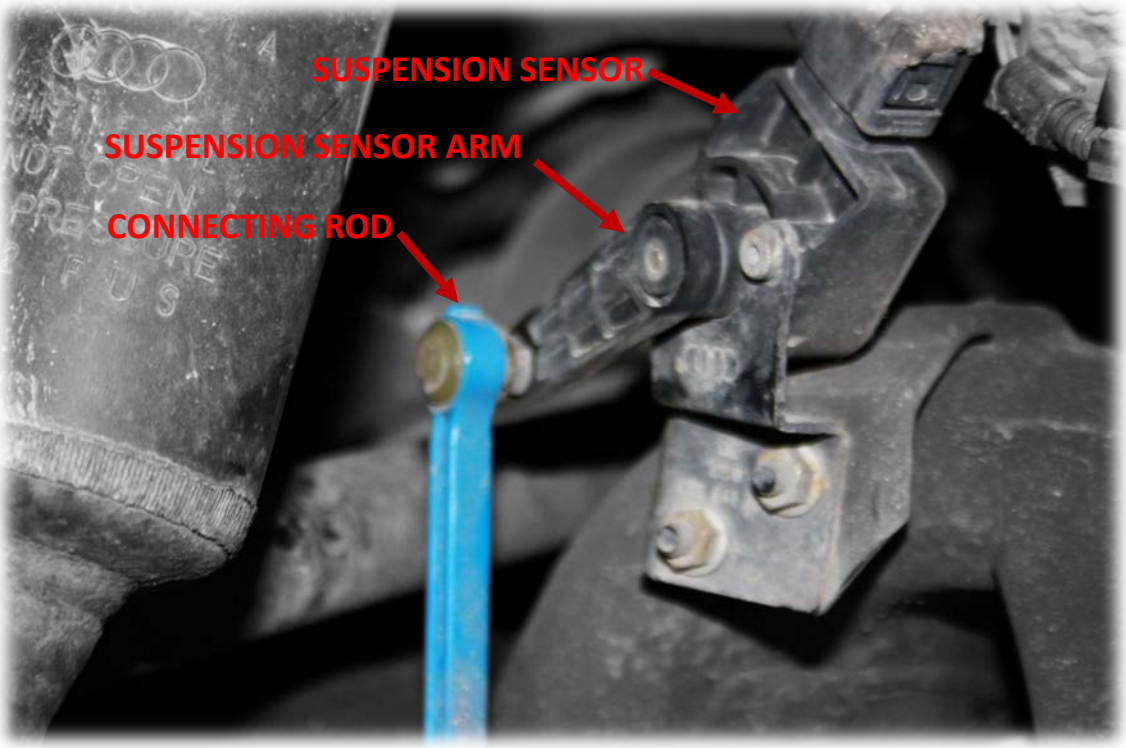


Figure 2: Right Front Suspension Sensor, looking inboard.

5. Remove lock nut that secures connecting rod to front suspension sensor arm. It may be necessary to hold one side of the connecting rod joint to prevent it from spinning while removing lock nut. Retain lock nut.
6. Clean suspension arm thoroughly.
7. Lubricate IPP Suspension Sensor Arm cavity with lithium grease. Lubrication will facilitate installation of the IPP Suspension Sensor Arm over the original ABS plastic suspension sensor arm.

8. Position IPP Suspension Sensor Arm over front suspension sensor arm.

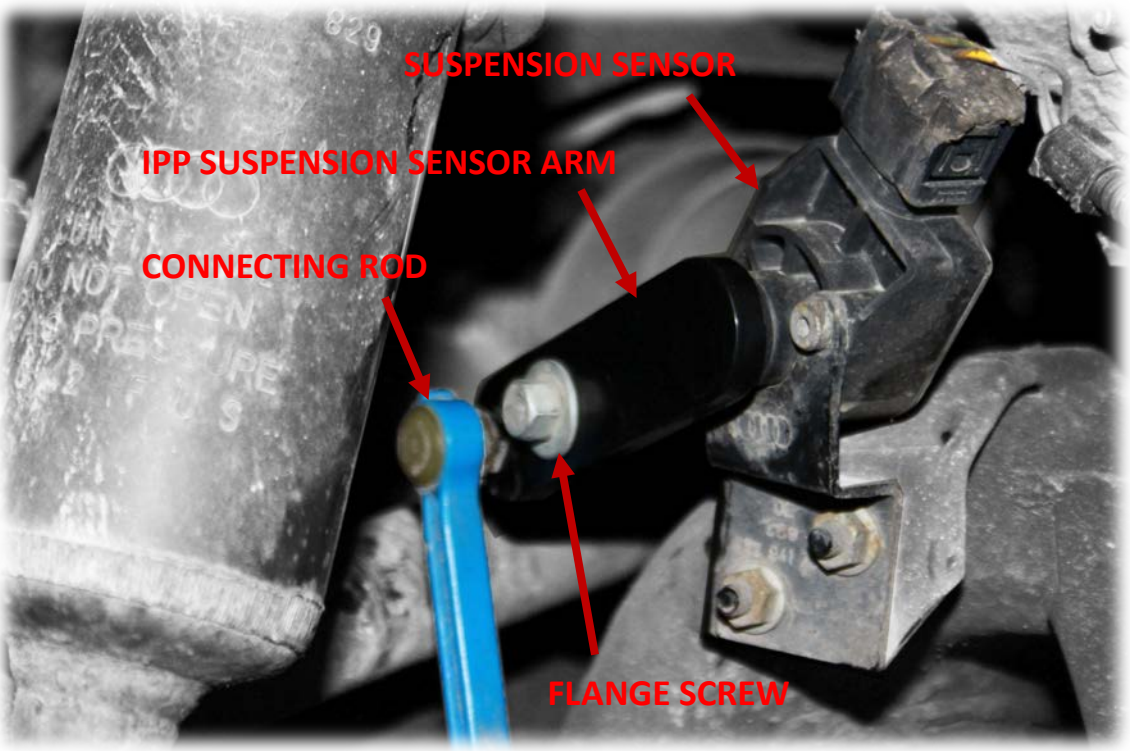


Figure 3: IPP Suspension Sensor Arm Installed on Right Front Sensor.

9. Install flange screw and flange nut (not shown) to secure IPP Suspension Sensor Arm to front suspension sensor arm.
10. Install retained lock nut (from step 5) to secure connecting rod to IPP Suspension Sensor Arm. It may be necessary to hold one side of the connecting rod joint to prevent it from spinning while tightening lock nut.
11. Insert key in ignition but do not turn the ignition ON.
12. Turn steering wheel fully to the left and remove key from ignition to engage steering wheel lock.
13. Repeat steps 4 through 10 to install IPP Suspension Sensor Arm on left front suspension sensor arm.

Rear IPP Suspension Sensor Arms Installation

NOTE:

For ease of installation, the vehicle can be backed onto suitable ramps. Alternately, the vehicle can be lifted off the ground and the wheel removed.

NOTE:

Ensure wheels are chocked and parking brake is fully engaged.

NOTE:

The following steps are applicable to the left and right rear suspension sensor assemblies. Only the right side is shown.

1. Locate right rear suspension sensor.

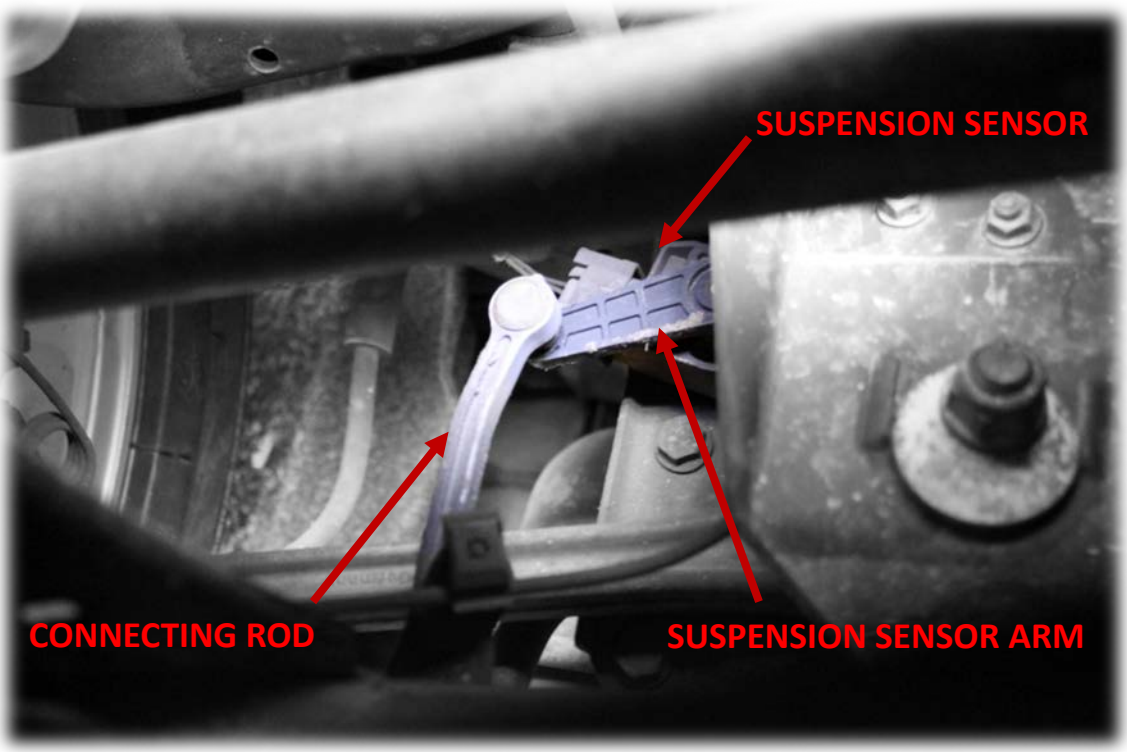


Figure 4: Right Rear Suspension Sensor, looking aft.

2. Remove lock nut that secures connecting rod to rear suspension sensor arm. Retain lock nut. It may be necessary to hold one side of the connecting rod joint to prevent it from spinning while loosening lock nut.
3. Clean suspension arm thoroughly.
4. Lubricate IPP Suspension Sensor Arm cavity with lithium grease. Lubrication will facilitate installation of the IPP Suspension Sensor Arm over the original ABS plastic suspension sensor arm.

5. Position IPP Suspension Sensor Arm over rear suspension sensor arm.

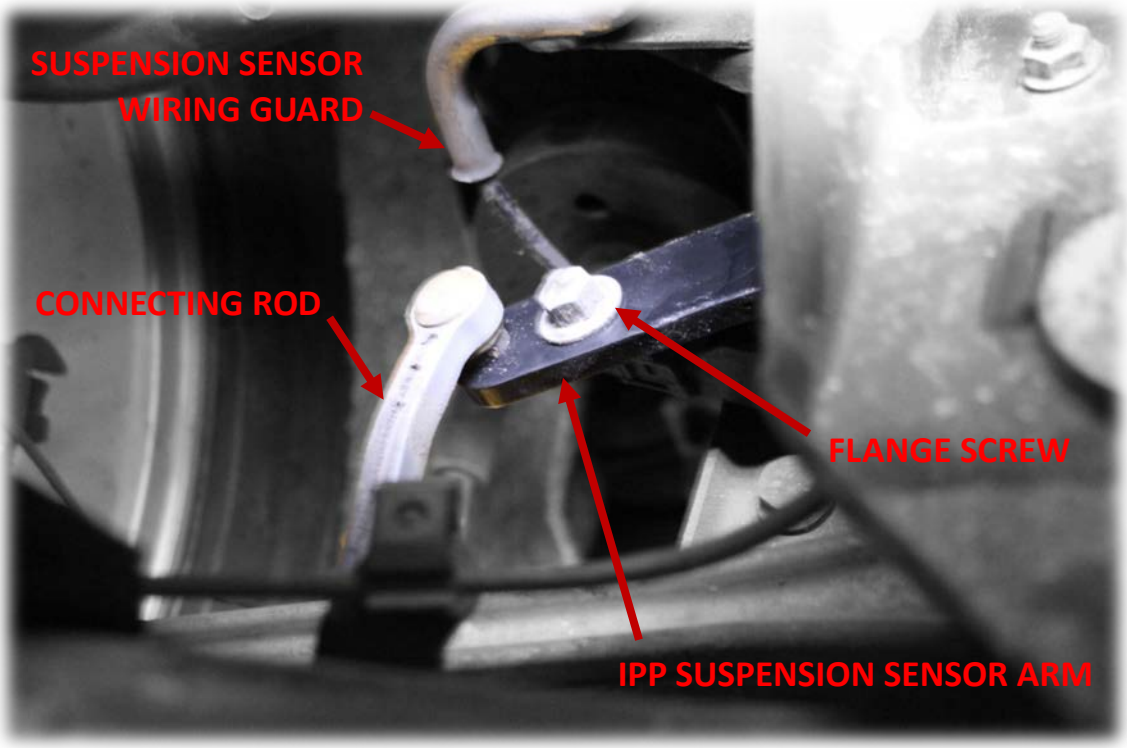


Figure 5: IPP Suspension Sensor Arm Installed on Right Rear Sensor.

6. Install flange screw and flange nut (not shown) to secure IPP Suspension Sensor Arm to rear suspension sensor arm.

NOTE:

Ensure there is a minimum of 1.5 mm (1/16 inch) clearance between the suspension sensor wiring harness guard and the IPP Suspension Sensor Arm when rotating suspension sensor through its operating range.

7. Prior to installing connecting rod on IPP Suspension Sensor Arm, manually rotate suspension sensor arm in both directions to ensure that end of IPP Suspension Sensor Arm does not make contact with suspension sensor wiring harness guard. If there is interference, the aluminum wiring harness guard can be tweaked a few millimeters for clearance.
8. Install retained lock nut (from step 2) to secure connecting rod to IPP Suspension Sensor Arm. It may be necessary to hold one side of the connecting rod joint to prevent it from spinning while tightening lock nut.
9. Repeat steps 1 through 8 to install IPP Suspension Sensor Arm on left rear suspension sensor arm.

Suspension Adaptation General Information

CAUTION:

If your vehicle has been previously lowered by adjusting adaptation channel values on the Level Control Module (LCM) (known as the “402” mod), you must first return the vehicle to factory ride height settings, otherwise you may be presented with a situation where the LCM will not allow you to perform the adaptation. The increased suspension travel provided by the IPP Suspension Sensor Arms may cause a “control limit reached” error code. Basically, the vehicle cannot go low enough for the suspension sensors to read Level 1.

Suspension Level Control Module (LCM) adaptation is done using VCDS (previously known as VAG-COM), and is otherwise known as the 402 modification/adaptation. The number “402” refers to the factory specification, in millimeters, for the ride height, which is the distance between the center of each wheel hub to the edge of the corresponding fender flare, as shown in the picture below.

Figure 6: Measuring suspension heights prior to performing adaptation.

When a technician performs a suspension LCM 402 adaptation, he/she is trying to bring back into factory specifications the wheel hub center to fender flare edge measurement at each corner of the vehicle. When performing an adaptation on an untouched suspension system, the technician calculates the desired ride height by adding/ subtracting the difference between the measured number and the number 402.

Example:
If the measured ride height from the center of the wheel hub to the bottom of the fender flare edge is 390 mm, and the technician wishes to bring that it back into the factory specification of 402 mm, he/she would enter the number 390 in the VCDS adaptation screen. The suspension LCM now “knows’ that the vehicle is 12 mm lower than it should be, and therefore raises the suspension until the desired height of 402 mm is achieved.

The common 402 modification:
If the measured ride height from the center of the wheel hub to the bottom of the fender flare edge is 402 mm (factory specification), and the technician wishes lower that height to 390 mm (thereby lowering the vehicle 12 mm), he/she needs to “fool” the suspension LCM into thinking that the vehicle ride height is currently higher than it really is. The technician would add the difference (12 mm) to the original 402 number. In the VCDS adaptation screen, the technician would enter the number 414, fooling the suspension LCM into thinking that the ride height is 12mm higher than it really is. The suspension LCM will adjust the ride height accordingly by lowering it 12 mm.

Suspension Adaptation to factory ride height with IPP Suspension Level Sensor Arms

When performing a suspension LCM adaptation on a vehicle with IPP Suspension Level Arms, a few things must be kept in mind to ensure a successful adaptation procedure.

1. The IPP Suspension Sensor Arms increase the amount of total ride height adjustability from the OE spec of 66 mm to approximately 99 mm, or 1.5 times (50% increase). This ratio is crucial when making adjustments to the ride height and calculating numbers for adaptation purposes.
2. Below is a chart comparing Original Equipment (OE) ride height adjustability with IPP Suspension Sensor Arm ride height adjustability and ground clearances:

Suspension Ride Height Levels	**OE**	**IPP Arms**
Level 4, offroad, orange LED	+41 mm	+62 mm
Level 3, raised	+25 mm	+37 mm
Level 2, nominal setting	0	0
Level 1, lowest	-25 mm	-37 mm

Ground Clearance	**OE**	**IPP Arms**
Level 4, offroad, orange LED	208 mm	229 mm
Level 3, raised	192 mm	204 mm
Level 2, nominal setting	167 mm	167 mm
Level 1, lowest	142 mm	130 mm

3. With these IPP arms, and level 2 set at factory ride height (402mm), the level 4 setting is about 62 mm higher than level 2, compared to 41mm for the factory settings. At this setting, the front struts are very close (about 1") to being fully extended. Though this can be considered extreme, keep in mind that level 4 is only active up to 30 Km/h (20 MPH). The benefit is a noticeable increase in ground clearance when you need it.

4. With the above in mind, if the measured ride height from the center of the wheel hub to the fender flare edge is 402 mm, and you wish to lower that height to 390mm, then you take the difference (12 mm), divide it by 1.5 (8 mm), then add that number to the original 402 number. In the VCDS adaptation screen, you would enter 410, fooling the suspension LCM into thinking that the suspension is 12mm higher (8mm x 1.5) than it really is. The resulting ride height would be lowered 12mm. The reason for dividing the desired change by 1.5 is that, with the IPP Suspension Sensor Arms, each change in ride height (level change) has been increased by about 50%. Because of this, each change entered in VCDS during adaptation (402 mod) will result in a 50% increase or 1.5 times the desired change.

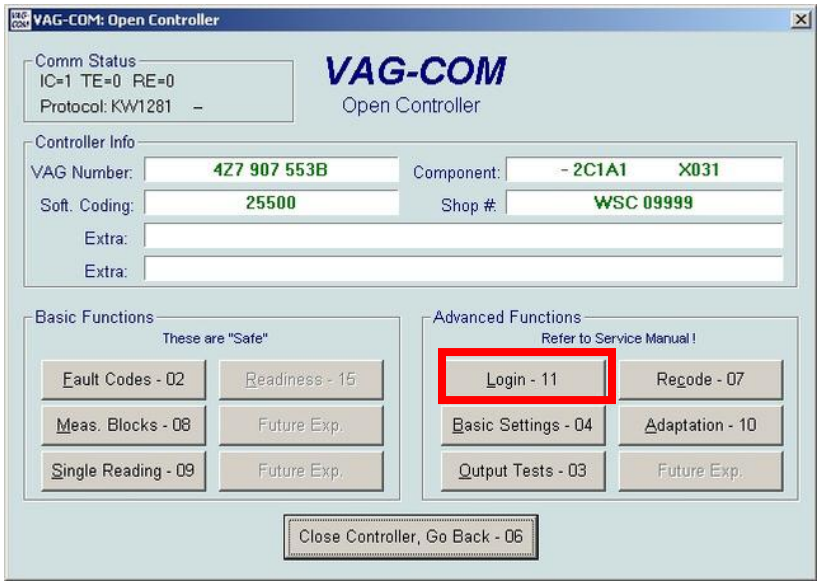
5. We strongly advise against deviations of 10 mm or more from the suggested adaptation values for factory 402 mm ride height setting. As noted above, the IPP Suspension Sensor Arms increase the overall ride height adjustability by a factor of 1.5, therefore, not only will levels 3 and 4 change (higher ground clearance), but so will level 1, with an approximate 12 mm decrease in ground clearance when compared to Original Equipment (OE) settings.

Adaptation Procedure

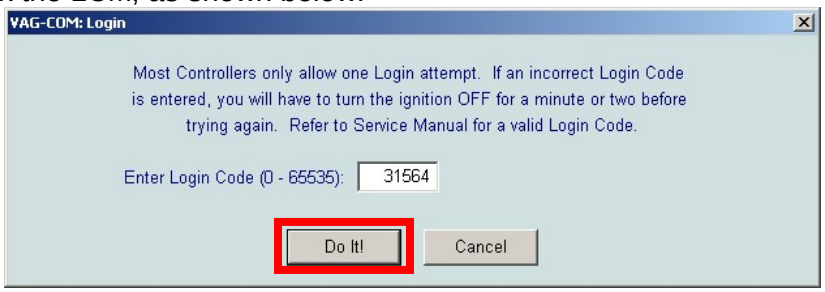
NOTE:

The two vehicles on which these IPP Suspension Sensor Arms were tested for one year both required the same initial adaptation changes. The numbers used in this example reflect measurements seen during initial suspension LCM adaptation on these two vehicles.

1. Park the vehicle on a solid, level surface and turn off the ignition. Set the parking brake.
2. With the engine off and the ignition in the "ON" position, connect to the OBD2 port the applicable VCDS or other suitable cable.
3. Start the VCDS application and enter Module 34 (Level Control Module, LCM). A screen similar to this will appear:



4. Select the “Login - 11” button from the VCDS “Open Controller” screen. This will enable a code to be entered to unlock the LCM, as shown below:



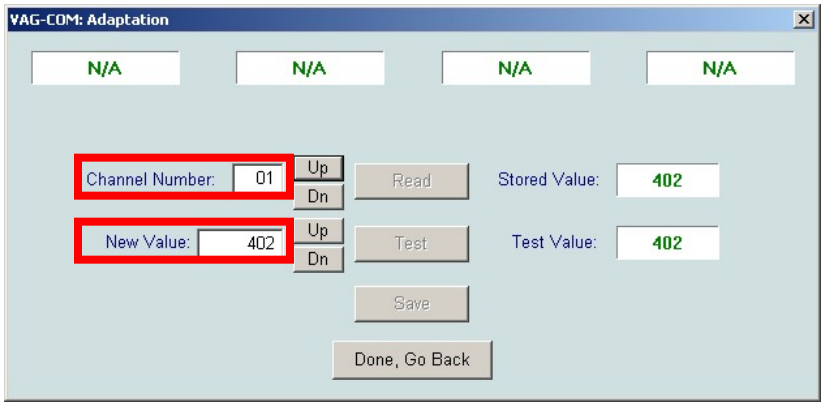
5. When prompted, enter 31564 and click "Do It".
6. VCDS will then return to the previous “Open Controller” screen and the LCM is now unlocked for adaptation.

NOTE:

From this point onward, the entire adaptation must be completed in its entirety, otherwise, the suspension LCM will detect an error and the ride height will be locked to Level 2 until the adaptation process can be completed. If an error is encountered at any point during the adaptation process (for instance, if the wrong number is entered), the process should be aborted and restarted.

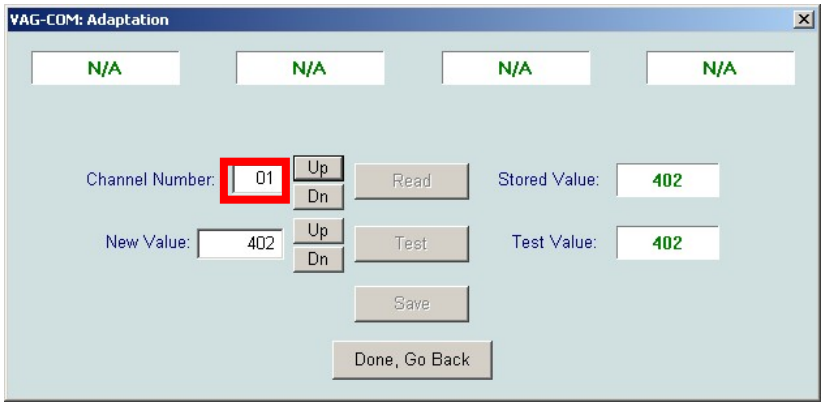
7. Select the “Adaptation - 10” button.

8. Once in the adaptation screen, there are two input fields, “Channel Number” and “New Value”. The Channel Number corresponds to the 4 wheel corners, as follows:
    a. Channel 01 = Left Front
    b. Channel 02 = Right Front
    c. Channel 03 = Left Rear
    d. Channel 04 = Right Rear



9. Adaptation must be completed in the same order as the channel numbers, starting with the left front (Channel 1), then right front (Channel 2), then left rear (Channel 3), and last, right rear (Channel 4).
10. The “New Value” field will be used to enter the suspension ride height readings from each corner.

11. Click the “Up” button to display “01” in the “Channel Number” field. If required, click the “Read” button. The vehicle will automatically adjust its ride height to Level 2 for adaptation. Once this height adjustment is complete, VCDS will list four green N/A's in the top four fields and the number 402 will be shown in the “Stored Value” field.



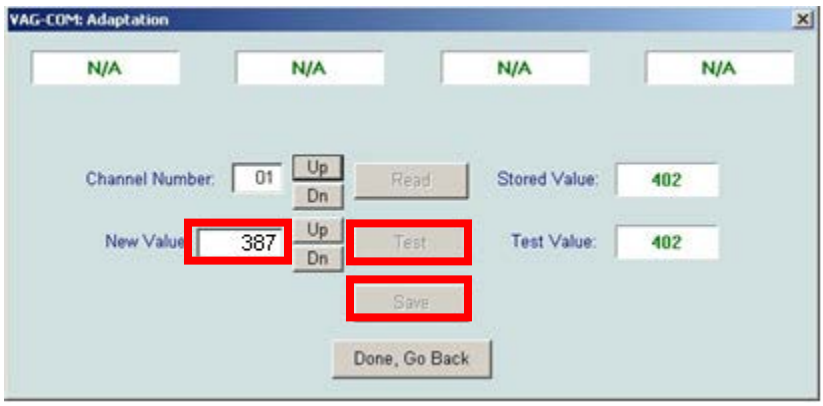
12. At this point, exit the vehicle and obtain the ride heights by measuring the distance from the wheel hub center line to fender flare edge measurement at each vehicle corner. Record these numbers for the adaptation process. For the test vehicles, the readings were as follows:
    a. Left Front: 380 mm.
    b. Right Front: 380 mm
    c. Left Rear: 385 mm
    d. Right Rear: 385 mm

13. It is now time to enter the new values in the VCDS adaptation screen, keeping in mind the following formula to set the ride height back to factory ride height specs:

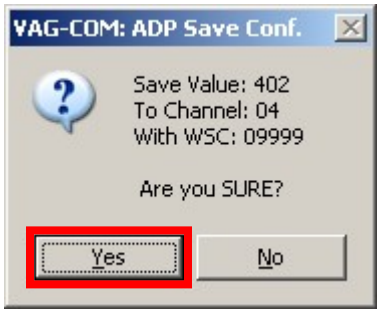
    New Value = 402 - $\frac{\text{Desired Change}}{1.5}$

    Where Desired Change = The difference between the current measured height of 380 mm and final ride height of 402, in this case 22 mm.

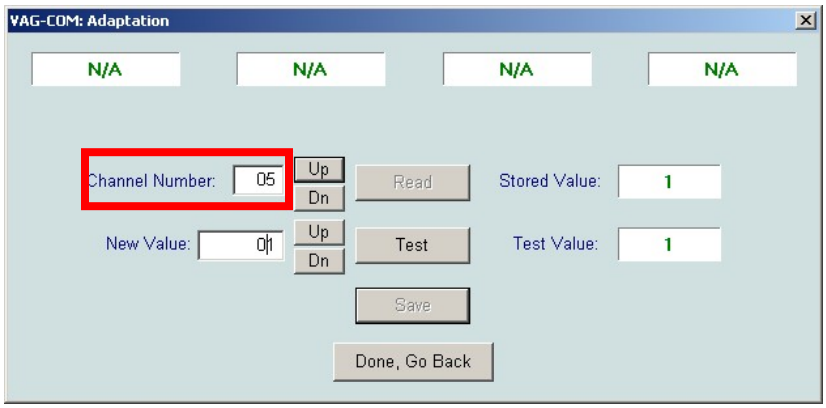
14. Using the formula above, and with an actual front ride height of 380 on our test vehicle, to obtain a final ride height of 402 mm, we need to raise the vehicle 22 mm. To do so, we input 387 as the adaptation value:



15. Upon entering “387” in the “New Value” field, click the “Test” button. Once the newly entered value is shown in the “Test Value” field, click the “Save” button.



16. When prompted with "Are you SURE", click “Yes” to proceed. The value for channel “01” has been stored.
17. Click the “Up” button to increase the value in the “Channel Number” field from "01" to "02".
18. Repeat the previous four steps to successfully set new values for the remaining channels, always keeping in mind the formula.
19. On our test vehicle, after installation of the IPP Suspension Sensor Arms, the rear ride height was 385 mm, slightly higher than the front. In this case, the desired change is 17 mm (402-385), therefore, using the formula in step 13, the value we will need to input during adaptation of channels “03” and “04” is 390.
20. After the four channels have been set, the adaptation must be saved. Click the “Up” button once more to increase the value in the “Channel Number” field to "05". This channel will save the work done previously.



21. Enter “01” in the “New Value” field, test and Save. You'll may receive an error message. Not to worry, this is normal. Click the "Done, Go Back" button to exit out of the adaptation screen, then click “Close Controller, Go Back - 06” on the “Open Controller” VCDS screen.
22. Start the vehicle and move up and down through the four suspension levels to ensure all are functioning as intended. Check that the vehicle is level when set to level 2.

For more information or technical assistance, please email biturboaudis4@gmail.com.

Enjoy the increased suspension adjustability!

IPP INNOVATIVE PERFORMANCE PRODUCTS