

Pass-By Noise Testing



Certification of vehicle noise emissions for passenger vehicles, motorcycles and light trucks is achieved by measuring external sound levels according to procedures defined by international standards such as ISO 362.

ISO 362 defines the pass-by test procedures for measuring noise emitted by accelerating road vehicles, and the ECE R41 (motorcycle) and R51 (automobile) standards regulate the limits of the vehicle exterior noise.

Racelogic is providing Pass-By (or Drive-By) Noise testing equipment to log channels such as engine RPM, vehicle velocity and maximum vehicle exterior noise to the accuracy requirements of this standard. The system can be installed in the vehicle for R51, allowing the driver to operate the measurement equipment without the need for additional operatives.

Additionally, the VBOX Test Suite software has been enhanced to include Pass-By Noise plugins allowing development programs to be completed to the ECE R41/ R51 standards, prior to homologation testing.



Test Procedure

The test procedure involves an open-throttle acceleration test and a constant speed test (only for vehicles with a power-to-mass ratio higher than 25). The tests must be repeated several times to prove a consistent average value, with at least four measurements on each side of the vehicle and for each gear.

Although the test pass criteria are different between R41 and R51 testing, the test track layouts are the same as shown in Figure 1.

Acceleration Test

This test require the driver to apply full throttle between the lines AA' and BB'. The selection of gear ratio depends on the vehicles acceleration potential as specified in the standard. The test must be repeated several times to prove a consistent average value.

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Constant Speed Test

The constant speed test shall be carried out with the same gear(s) as specified in the acceleration test and a constant speed of 50 km/h \pm 1 km/h between AA' and BB'. The tests must be repeated several times to prove a consistent average value.

Test Setup

Microphones placed within the test area output to a VBOX Mini Input Module using the DC voltage output of the microphones. The Mini Input Module continuously transmits the converted sound readings to the VBOX 3i GPS data logger mounted on the test vehicle at 100 Hz using 2.4 GHz Telemetry Radios.

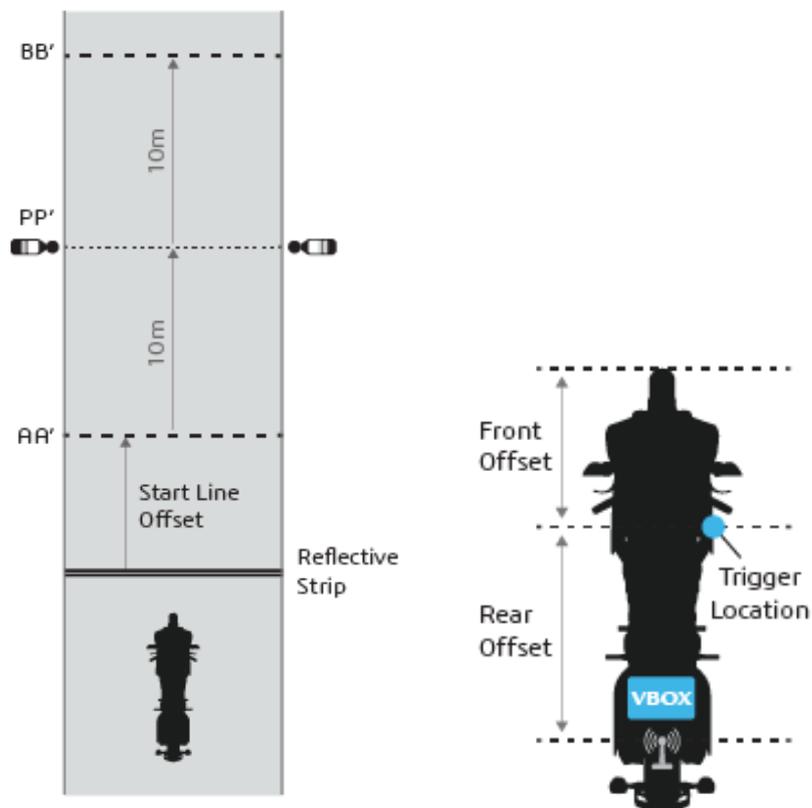


Figure 1 - Test Track Layout showing microphone locations (Left) and Laser Trigger installation on test vehicle (Right)

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If using a laser light, it should be attached to the side of the vehicle under test and a reflective strip is placed a distance before the start test line AA' to define the start and end lines of the test as shown in Figure 1.

These offset distances are input into the VBOX Test Suite Pass-by Noise plugins for the analysis to occur. You can use the system in both directions, just install another reflective strip on the other end of the test track so when you drive in the opposite direction it will also trigger. The reflective strip needs to be the same distance away from the start line as your current strip. The vehicle must come to a stop after each pass so the function can be reset.

Instead of using a laser light barrier to trigger the start of the test, a VBOX 3i RTK (VB3iSLR) can be used to set the start and finish lines when used with an RTK Base Station or NTRIP solution. This means that the test vehicle doesn't have to come to a stop between test runs. Find more information about this [here](#).

If an extension cable for the SLMs is not possible on your test track, then another Mini Input Module and Road Side Telemetry radio positioned on the opposite side of the track can be used to stream the sound pressure level from the Sound Level Meter to the VBOX. Further information can be found in the R41 and R51 hardware setups as shown below.

Furthermore, if you would like to log weather station data details can be found [here](#).

Hardware and Software Configuration

In terms of hardware layout, the only difference between the layouts for each regulation is that the PC or Tablet can be easily installed inside the vehicle for R51 Testing instead of the road side for R41 Testing.



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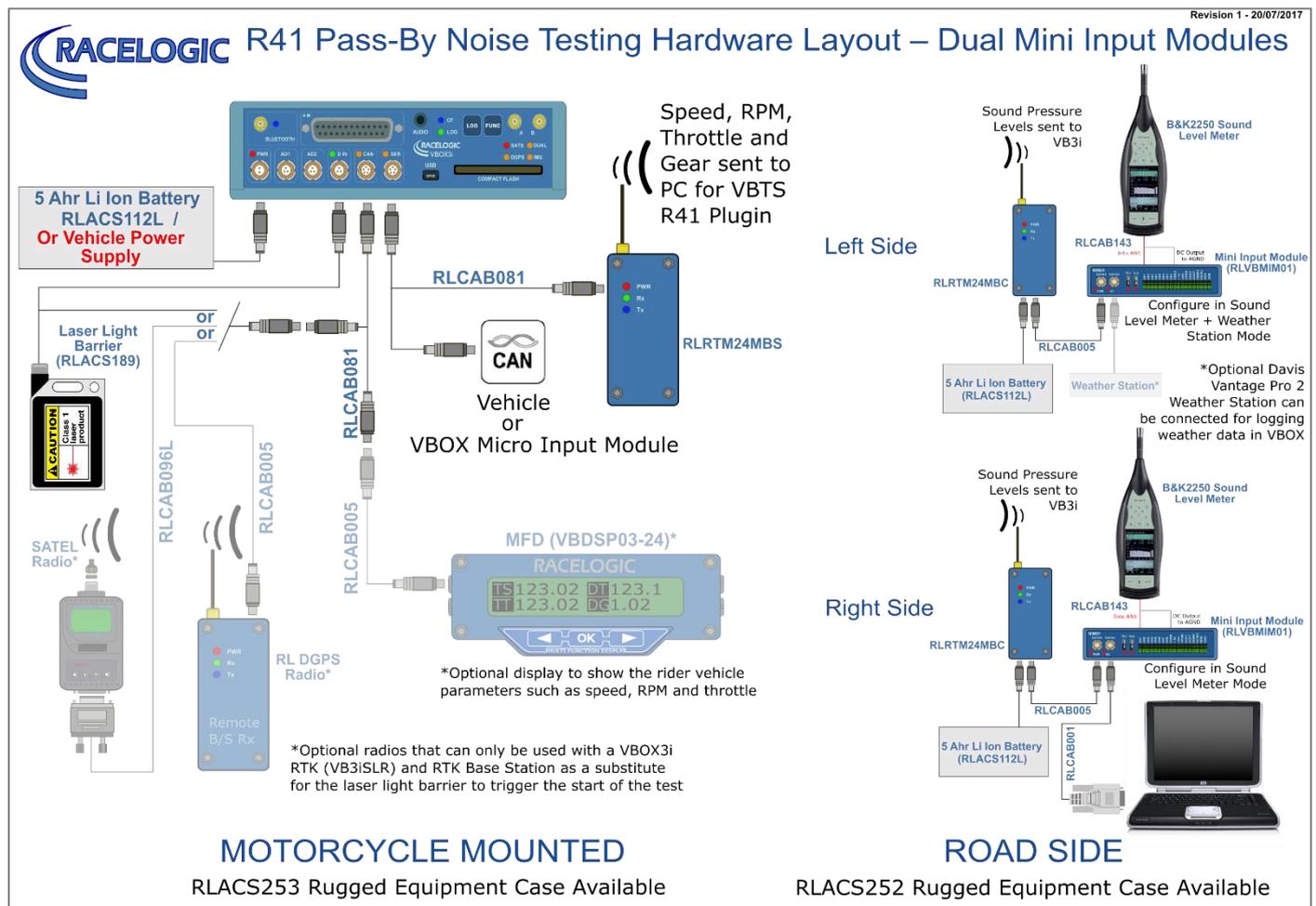
R41 Dual Mini Input Modules

Equipment

- 1 x RLVB3i; 100 Hz GPS Data Logger
- 1 x RLACS189; Laser Light Barrier Kit*
- 3 x RLACS112L; 5 Ahr Li Ion battery pack
- 1 x RLRTM24MBS; Vehicle Telemetry Radio
- 2 x RLRTM24MBC; Road side Telemetry Radio
- 2 x RLVBMIM01; Mini Input Module
- 2 x RLCAB143; B&K 2250 SLM DC output Cable to Mini Input Module
- 1 x PC or Tablet
- 1 x RLVBDSP03-24; Multi-Function Display is an optional item for R41 Testing
- 2 x RLCAB081; Optional cables if using both an MFD and CAN Input from test vehicle
- 2 x RLACS252; Rugged roadside equipment case
- 1 x RLACS253; Rugged motorcycle equipment case

*Optional DGPS radio can be used as a substitute for the Laser Light Barrier (RLACS189), however a VB3iSLR and RTK Base Station are required.

Hardware Layout



Pass-By Noise Testing



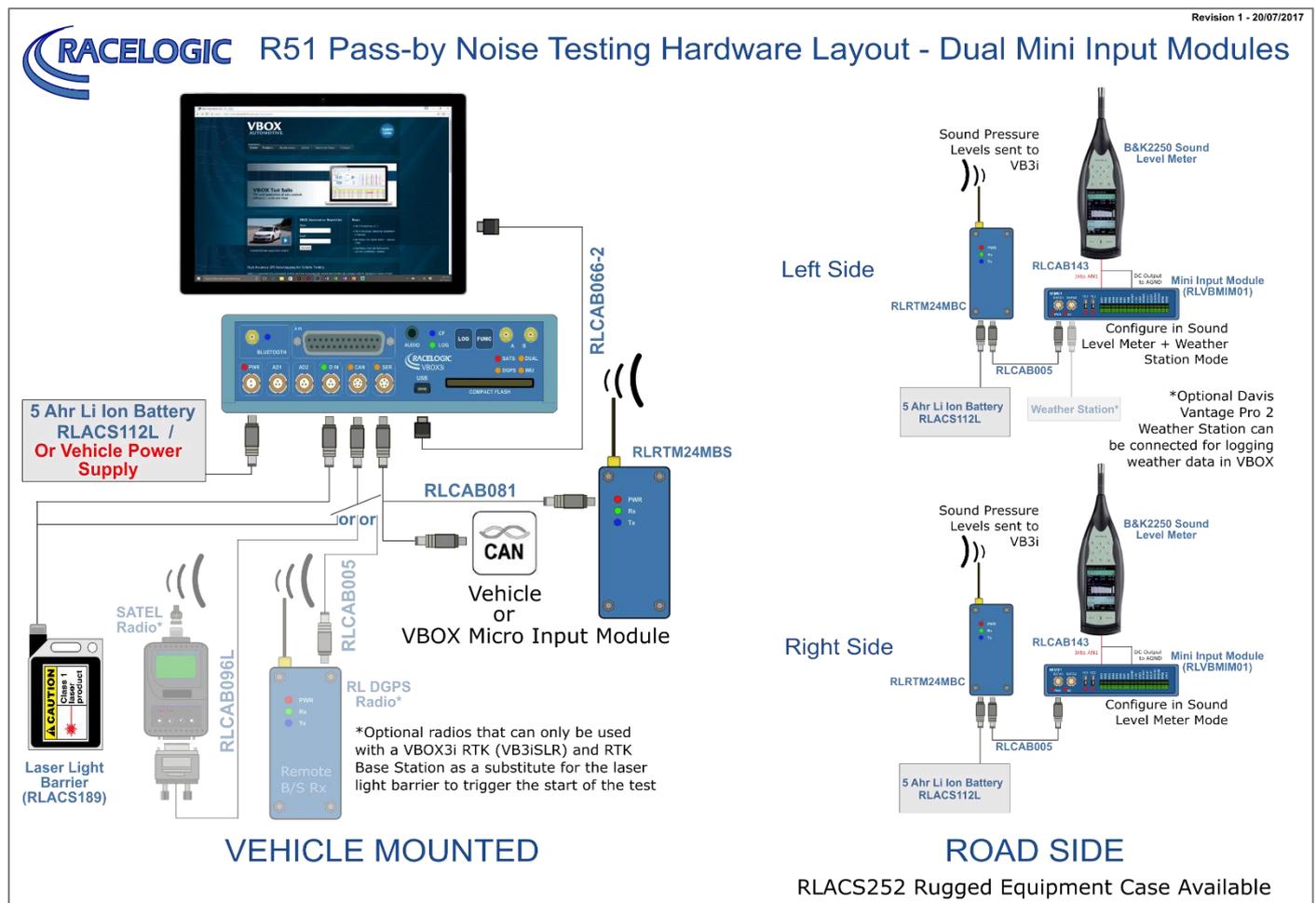
R51 Dual Mini Input Modules

Equipment

- 1 x RLVB3i; 100 Hz GPS Data Logger
- 1 x RLACS189; Laser Light Barrier Kit*
- 2 x RLACS112L; 5 Ahr Li Ion battery pack
- 1 x RLRTM24MBS; Vehicle Telemetry Radio
- 2 x RLRTM24MBC; Road side Telemetry Radio
- 2 x RLVBMIM01; Mini Input Module
- 2 x RLCAB143; B&K 2250 SLM DC output Cable to Mini Input Module
- 1 x PC or Tablet
- 1 x RLCAB081; Optional cables if using both an MFD and CAN Input from test vehicle
- 2 x RLACS252; Rugged roadside equipment case

*Optional DGPS radio can be used as a substitute for the Laser Light Barrier (RLACS189), however a VB3iSLR and RTK Base Station are required.

Hardware Layout



Pass-By Noise Testing



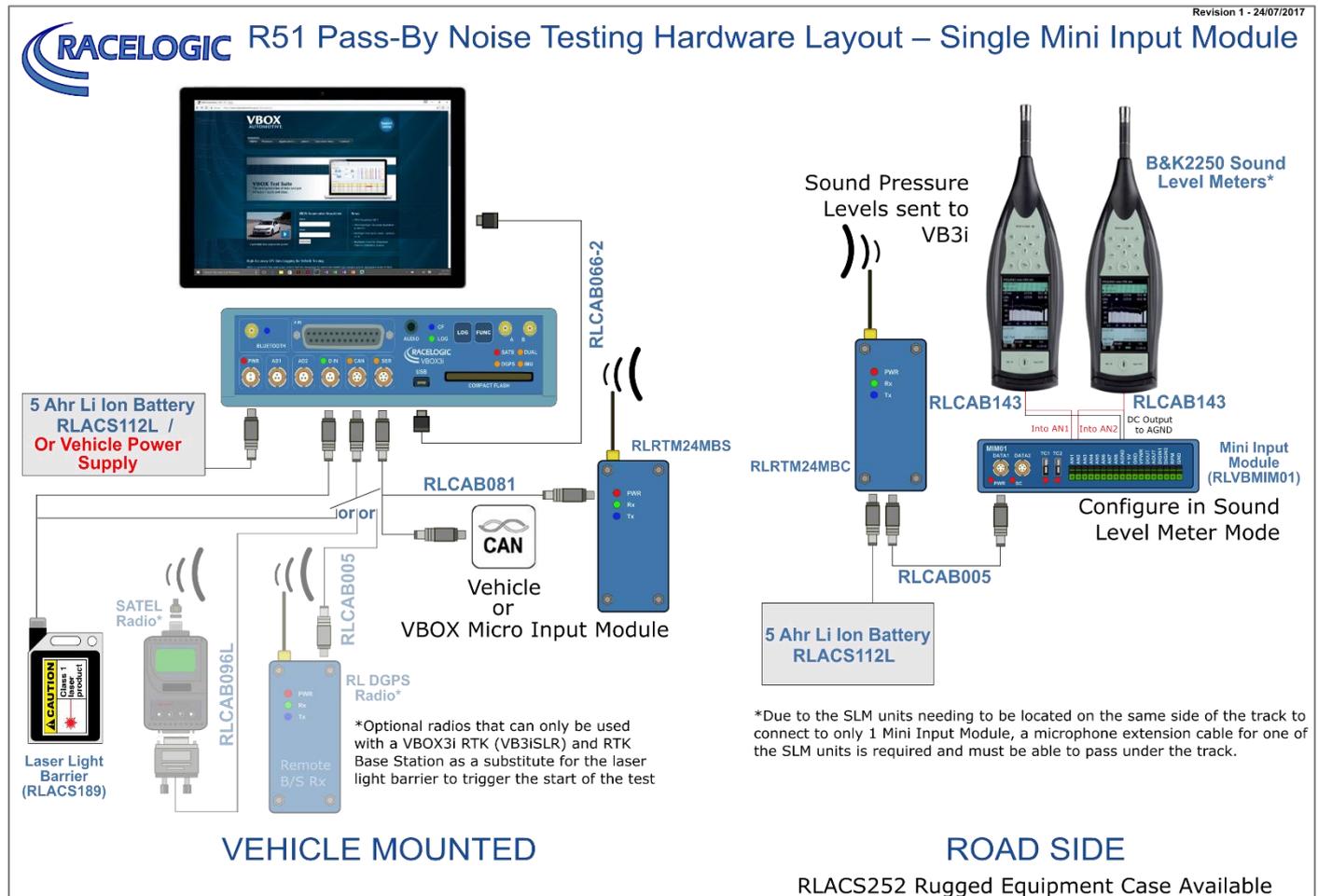
R51 Single Mini Input Modules

Equipment

- 1 x RLVB3i; 100 Hz GPS Data Logger
- 1 x RLACS189; Laser Light Barrier Kit*
- 2 x RLACS112L; 5 Ahr Li Ion battery pack
- 1 x RLRTM24MBS; Vehicle Telemetry Radio
- 1 x RLRTM24MBC; Road side Telemetry Radio
- 1 x RLVBMIM01; Mini Input Module
- 2 x RLCAB143; B&K 2250 SLM DC output Cable to Mini Input Module
- 1 x PC or Tablet
- 1 x RLCAB081; Optional cables if using both an MFD and CAN Input from test vehicle
- 1 x RLACS252; Rugged roadside equipment case

*Optional DGPS radio can be used as a substitute for the Laser Light Barrier (RLACS189), however a VB3iSLR and RTK Base Station are required.

Hardware Layout



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Sound Level Meter Setup

Configure the SLMs such that LAF sound pressure level is set to the DC output. Using a B&K 2250 Sound level meter, the procedure is as follows.

1. Go into the **Menu** (bottom left of screen).
2. Go to **Setup**.
3. Click on **Output Socket Signal**.
4. Set the Source to **LAF**.

Firmware Upgrade

Load the latest firmware into the Mini Input Module and VBOX 3i from the [VBOX Automotive website](#).

The instructions on how to do this are here.

[https://racelogic.support/01VBOX_Automotive/04Modules_and_accessories/Mini_Input_Module/MIM - User manual/08 -
_MIM_Firmware_Upgrade](https://racelogic.support/01VBOX_Automotive/04Modules_and_accessories/Mini_Input_Module/MIM_-_User_manual/08_-_MIM_Firmware_Upgrade)

[https://racelogic.support/01VBOX_Automotive/01VBOX_data_loggers/VBOX_3i_Range/VBOX_3i_User_Manual_\(All_Variants\)/
18 - VB3i Firmware Upgrade](https://racelogic.support/01VBOX_Automotive/01VBOX_data_loggers/VBOX_3i_Range/VBOX_3i_User_Manual_(All_Variants)/18_-_VB3i_Firmware_Upgrade)

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Mini Input Module (MIM01) Setup

1. Install the latest version of VBOX Setup which can be downloaded [here](#).
2. Go to '**Settings**' and if you are using 'Sound Level Meter(s) only', toggle the Operation mode as shown below and click on '**Write to unit**' as shown in Figure 4.

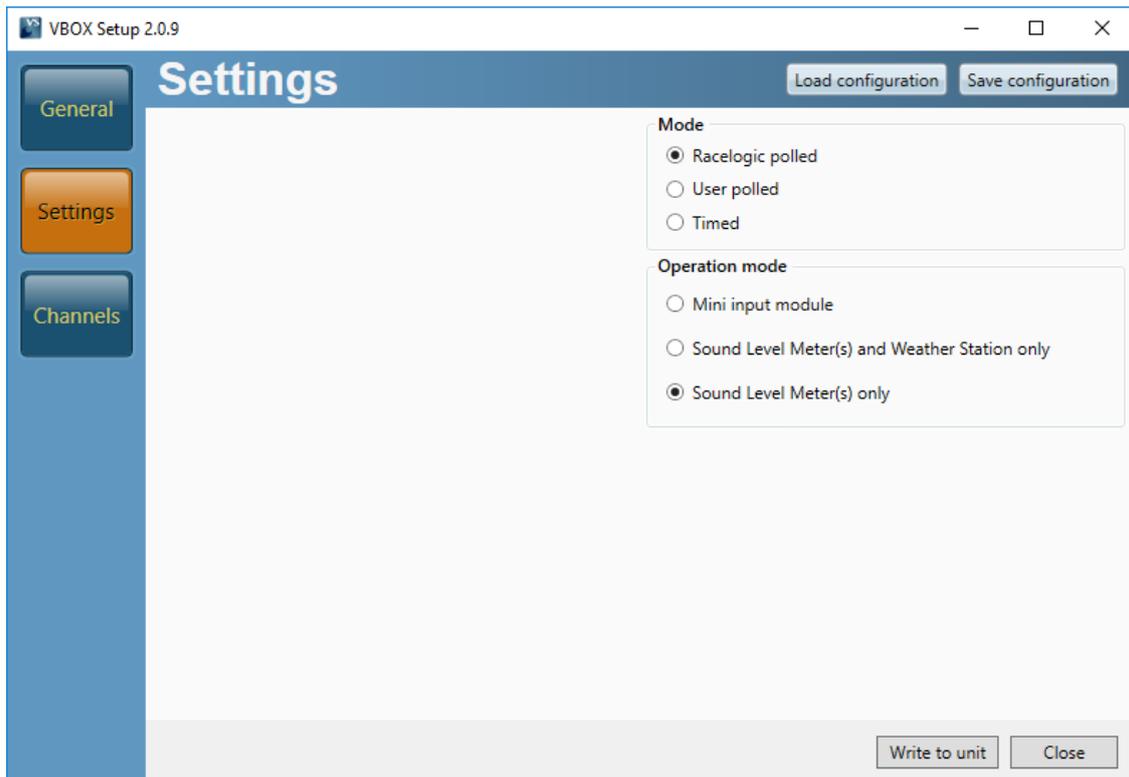


Figure 2- MIM01 configuration settings required for Pass-by Noise

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VBOX 3i Setup

1. When the laptop has made a connection to the VBOX 3i using VBOX Setup. Click on '**Channels**' and then '**Internal Pass-By Noise**' and the first tab as shown in Figure 5.

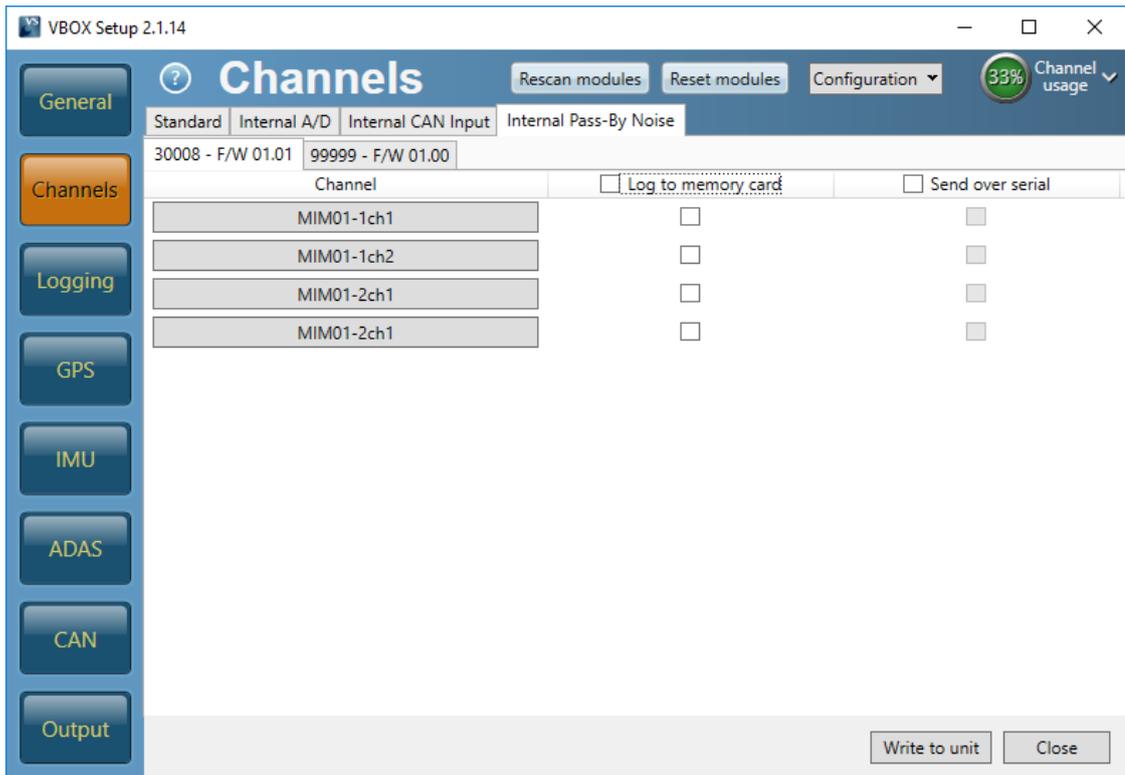


Figure 3 - VBOX Setup for VB3i for Pass-by Noise

2. If using only Sound Level Meters, then click on '**MIM01-2ch1**', the channel name and units can be changed. Also set the scaling to '**50**' in the '**B&K 2250 SLM**' and click '**OK**'. Repeat again for '**MIM01-2ch2**'. Figure 6 shows an example of a typical setup.

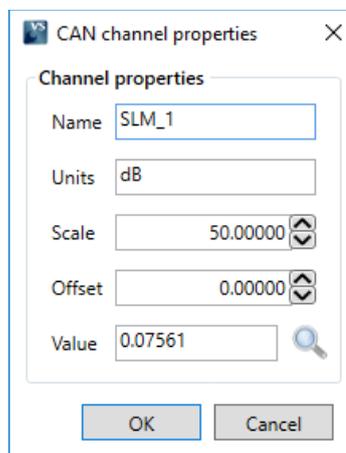


Figure 4 - Channel Properties Setup

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3. Check 'Log to memory card' and 'Send over serial' boxes as shown in Figure 7.

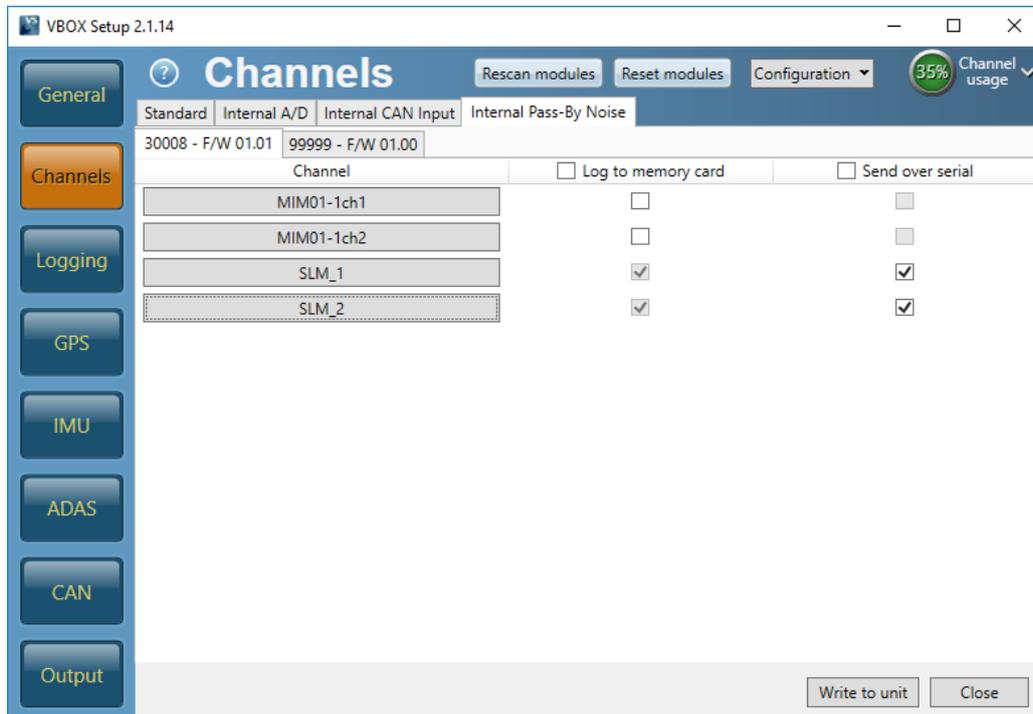


Figure 5 - SLM channel setup in the VB3i using VBOX setup

4. Click the 'Write to unit' button.
5. Close Setup. Both RX/TX LEDs should be both flashing on the radios, this demonstrates that the Road Side equipment and the VBOX 3i are communicating correctly with each other.

Detailed instructions on how to use the Pass-By Noise Software Plug-ins are available within in the VBOX Test Suite [R41](#) and [R51](#) user manual pages.