

CarScope i-Tester Relative compression sync tests on real cars

1. Used sync accessories

Inductive pick-up clamp

- Connected to In2 or In15 to get current signal from the injector;
- Connected to In2 or In15 to get current signal from the primary ignition;
- Connected to In15 to get signal from classic secondary ignition system.



Note: Inductive pick-up clamp has  marked which should match the current direction! Incorrect connection will cause a lack of synchronization signal!

If you don't know the current direction, you may have to experiment with the inductive pick-up clamp orientation until you get a sync signal!

10/20A high sensitive, high frequency current clamps

- Connected to In2 to get current signal from the injector;
- Connected to In2 to get current signal from the primary ignition.



Note: Current clamps have  and "+" marked which should match the current direction! Incorrect connection will cause a lack of synchronization signal!

If you don't know the current direction, you may have to experiment with the current clamps orientation until you get a sync signal!

Universal probe

- Connected to In15 to get voltage signal from the injector;
- Connected to In15 to get voltage signal from the primary ignition (with 10:1 attenuator).

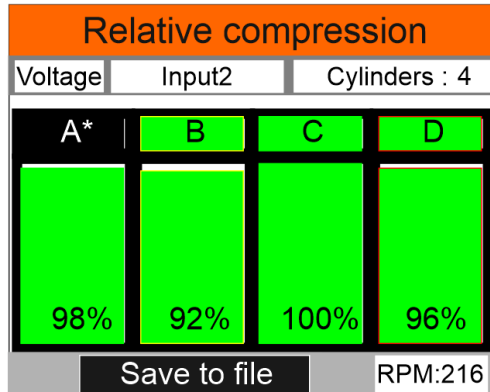


2. Basic synchronization guidelines

Cylinder identified as a synchronization cylinder is always A and it's marked with "*". By knowing the injection sequence/firing order of the engine and the cylinder number used for synchronization, you can identify the cylinder numbers and their percentages.

Important note: Before performing the relative compression test, you must disable the fuel system to prevent the engine from starting. This can be done by removing the fuel pump fuse, relay or disconnecting the fuel pump itself.

Example:



If cylinder 3 is used for synchronization, according to the injection sequence/firing order (1-3-4-2), cylinders on the above screen are:

A*-3: 98%
 B - 4: 92%
 C - 2: 100%
 D - 1: 96%

Note: You may receive errors/warnings during the test! See their description in the user manual!

I-Tester user manual:

<https://autoditex.com/cms/user/files/i-testermanualena4rev20.pdf>

Note: Only the "DC Voltage" relative compression measurement method has been demonstrated in this file! "DC Current" method is identical and it is not covered in this guide!

ATTENTION: Using the main signal cable with 20:1 attenuator to sync from the primary ignition coil is NOT recommended!

WARNING: HIGH VOLTAGES UP TO 400V!!! RISK OF ELECTRIC SHOCK!!!

ATTENTION: YOU MUST USE THE 20:1 ATTENUATOR!!!

ATTENTION: IMPROPER USE COULD DAMAGE CARSCOPE I-TESTER!!!

3. Relative compression synchronization tests on real cars

Car 1: Toyota Auris 1.4 VVTI (engine code: 4ZZ-FE) petrol 2009

| Test method | Sync input | Sync probes | Sync from | Notes |
|-------------|------------|---|----------------------------|---|
| DC Voltage | In15, In2 | Inductive pick-up | Primary ignition (current) | Clamp only 1 of the coil's wires! Clamps must match the current direction! Using In15 or In2 depends on the signal strength from the inductive pick-up! |
| | In2 | 10/20A High sensitive, high frequency current clamp | Primary ignition (current) | Clamp only 1 of the coil's wires! Clamps must match the current direction! |
| | In15 | Main signal cable and a voltage attenuator 20:1 | Primary ignition (voltage) | WARNING: HIGH VOLTAGE!!! ATTENTION: YOU MUST USE THE 20:1 ATTENUATOR!!! |
| | In15 | Main signal cable | Injector (voltage) | Back probe both injector pins until you get a sync! |
| | In2 | 10/20A High sensitive, high frequency current clamp | Injector (current) | Clamp only 1 of the injector's wires! Clamps must match the current direction! |
| | In2 | Inductive pick-up | Injector (current) | Clamp only 1 of the injector's wires! Clamps must match the current direction! |

Test 1: Using an inductive pick-up connected to In2 or In15 to sync from primary ignition:



[Large photo](#)

Sync input In2 or In15 depends on the primary ignition coil current and you may have to experiment changing inputs until you get synchronization!



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Test 2: Using a 10/20A high sensitive, high frequency current clamp connected to In2 to sync from primary ignition:

You must clamp only one of the injector wires!



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If you don't get a sync signal, rotate the current clamps or clamp the other coil wire!

Test 3: Using the main signal cable connected to In15 to sync from primary ignition:



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Note: In this case the ignition coil has the ignition controller integrated inside it. In that case the ECU controls the circuit with low voltage and thus you don't need the 20:1 attenuator. Please see the technical documentation for the current car or use an oscilloscope first to identify the system!

ATTENTION: Connecting an ignition coil with a 400V control voltage directly to i-Tester without using 20:1 attenuator, will damage the device!!!



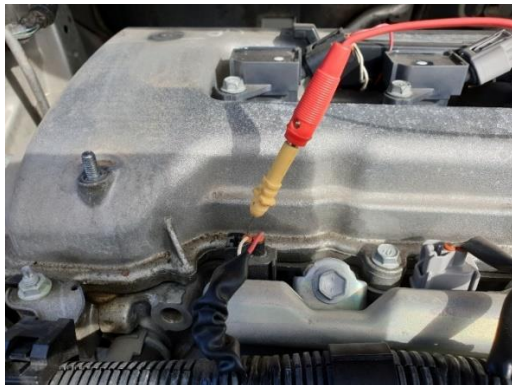
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Test 4: Using the main signal cable connected to In15 to sync from injector:

Video from the test: <https://youtu.be/fmPkbsBOoEU>



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Test 5: Using a 10/20A high sensitive, high frequency current clamp connected to In2 to sync from injector:



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Test 6: Using an inductive pick-up connected to In2 to sync from injector:

Video from the test: <https://youtu.be/42vxhwg8Po>



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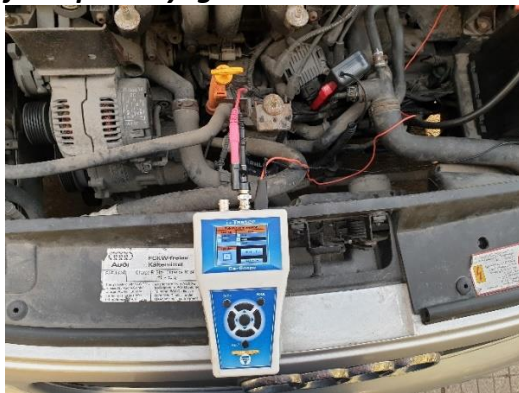
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Car 2: Audi A3 1.6 (engine code: AKL) petrol 1997

| Test method | Sync input | Sync probes | Sync from | Notes |
|-------------|------------|---|-----------------------------------|---|
| DC Voltage | In15 | Inductive pick-up | Classic secondary ignition system | Clamps must match the current direction! |
| | In15, In2 | Inductive pick-up | Primary ignition (current) | Clamp only 1 of the coil's wires! Clamps must match the current direction! Using In15 or In2 depends on the signal strength from the inductive pick-up! |
| | In2 | 10/20A High sensitive, high frequency current clamp | Primary ignition (current) | Clamp only 1 of the coil's wires! Clamps must match the current direction! |
| | In15 | Main signal cable and a voltage attenuator 20:1 | Primary ignition (voltage) | WARNING: HIGH VOLTAGE!!! ATTENTION: YOU MUST USE THE 20:1 ATTENUATOR!!! |
| | In15 | Main signal cable | Injector (voltage) | Back probe both injector pins until you get a sync! |
| | In2 | 10/20A High sensitive, high frequency current clamp | Injector (current) | Clamp only 1 of the injector's wires! Clamps must match the current direction! |
| | In2 | Inductive pick-up | Injector (current) | Clamp only 1 of the injector's wires! Clamps must match the current direction! |

Test 1: Using an inductive pick-up connected to In15 to sync from classic secondary ignition:[Large photo](#)**Test 2: Using an inductive pick-up connected to In15 or In2 to sync from primary ignition:**[Large photo](#)[Large photo](#)

Sync input In2 or In15 depends on the primary ignition coil current and you may have to experiment changing inputs until you get synchronization!

Test 3: Using a 10/20A high sensitive, high frequency current clamp connected to In2 to sync from primary ignition:[Large photo](#)[Large photo](#)

Test 4: Using the main signal cable connected to In15 to sync from primary ignition:[Large photo](#)[Large photo](#)

Note: Some ignition coils have the ignition controller integrated inside them. In the current case the ECU controls the circuit with low voltage and thus we can use it directly or with 10:1 attenuator.

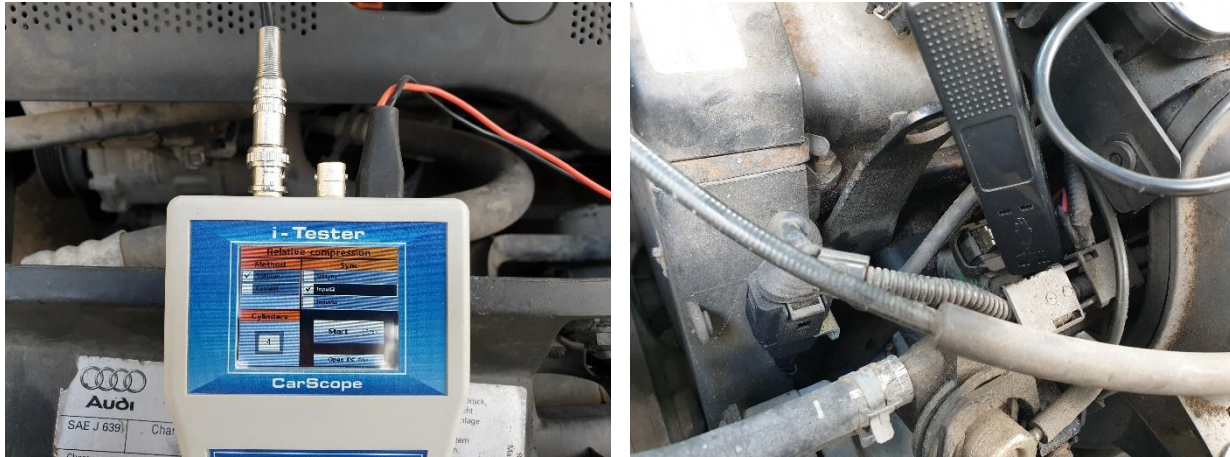
See the technical documentation for the current car or use an oscilloscope first to identify the system!

Connecting an ignition coil with a 400V control voltage directly to i-Tester without using 20:1 attenuator, will damage the device!!!

Test 5: Using the main signal cable connected to In15 to sync from injector:[Large photo](#)**Test 6: Using a 10/20A high sensitive, high frequency current clamp connected to In2 to sync from injector:**[Large photo](#)

Test 7: Using an inductive pick-up connected to In2 to sync from injector:

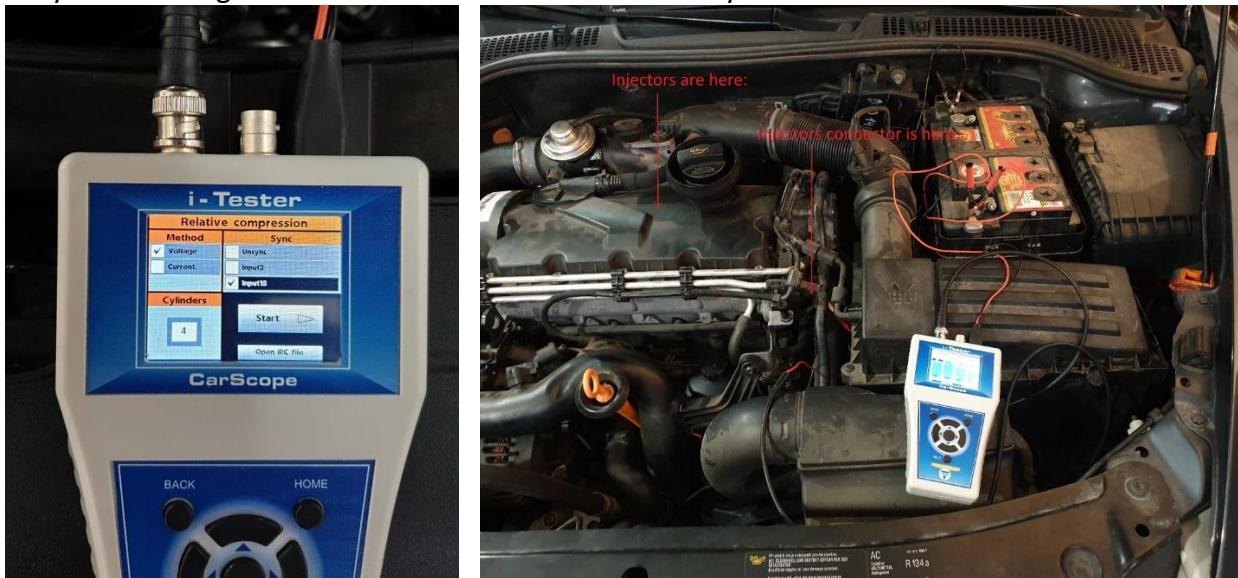
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Car 3: Skoda Octavia 1.9 TDI (engine code: BJB) Pumpe Düse diesel 2006

| Test method | Sync input | Sync probes | Sync from | Notes |
|-------------|------------|---|--------------------|---|
| DC Voltage | In15 | Inductive pick-up | Injector (current) | Clamp only 1 of the injector's wires! Clamps must match the current direction! Not performed in this test! See description below! |
| | In2 | 10/20A High sensitive, high frequency current clamp | Injector (current) | Clamp only 1 of the injector's wires! Clamps must match the current direction! Not performed in this test! See description below! |
| | In15 | Main signal cable | Injector (voltage) | Back probe both injector pins until you get a sync! |

Note: Using the Inductive pick-up and the 10/20A High sensitive, high frequency current clamps on this car is almost impossible due to the very tight space around the injector's connector! Only the main signal cable is used to demonstrate the sync connection on this car!



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You may have to see the technical manual of the car to identify each injector at the injector's connector!



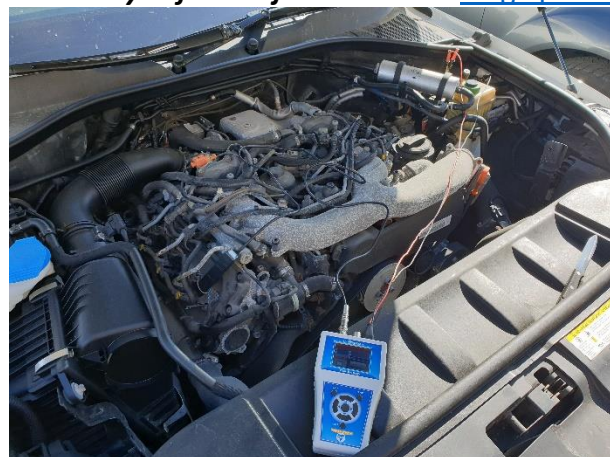
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Car 4: Audi Q7 3.0TDI V6 (engine code: CRCA) Common Rail diesel 2011

| Test method | Sync input | Sync probes | Sync from | Notes |
|-------------|------------|---|--------------------------|--|
| DC Voltage | In15 | Inductive pick-up | Injector (current) | Clamp only 1 of the injector's wires! Clamps must match the current direction! |
| | In2 | 10/20A High sensitive, high frequency current clamp | Injector (current) | Clamp only 1 of the injector's wires! Clamps must match the current direction! |
| | In15 | Main signal cable with 10:1 attenuator | Piezo injector (voltage) | ATTENTION: PIEZO INJECTORS HAVE CONTROL VOLTAGES UP TO 140V!!! Using the 10:1 attenuator is mandatory!!! Back probe both injector pins until you get a sync! |

Test 1: Using an inductive pick-up connected to In15 to sync from injector:

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Note: You must clamp only one of the 2 injector wires!!!

If you don't get a sync signal, rotate the inductive pick-up clamps or clamp the other injector wire!

Test 2: Using a 10/20A High sensitive, high frequency current clamp connected to In2 to sync from injector:



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Test 3: Using the Main signal cable connected to In15 to sync from injector:

You may have to see the technical manual of the car or use an oscilloscope to identify injector type – solenoid or piezo! In this particular case, injectors are piezo type.



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Car 5: VW Jetta 1.6 petrol 1989

| Test method | Sync input | Sync probes | Sync from | Notes |
|-------------|------------|---|-----------------------------------|--|
| DC Voltage | In15 | Inductive pick-up | Classic secondary ignition system | Clamps must match the current direction! |
| | In15, In2 | Inductive pick-up | Primary ignition (current) | Clamp only 1 of the coil's wires! Clamps must match the current direction! Using In15 or In2 depends on the primary ignition coil current! |
| | In2 | 10/20A High sensitive, high frequency current clamp | Primary ignition (current) | Clamp only 1 of the coil's wires! Clamps must match the current direction! |
| | In15 | Main signal cable and a voltage attenuator 20:1 | Primary ignition (voltage) | WARNING: HIGH VOLTAGE!!! ATTENTION: YOU MUST USE THE 20:1 ATTENUATOR!!! |

Test 1: Using an inductive pick-up connected to In15 to sync from classic secondary ignition:

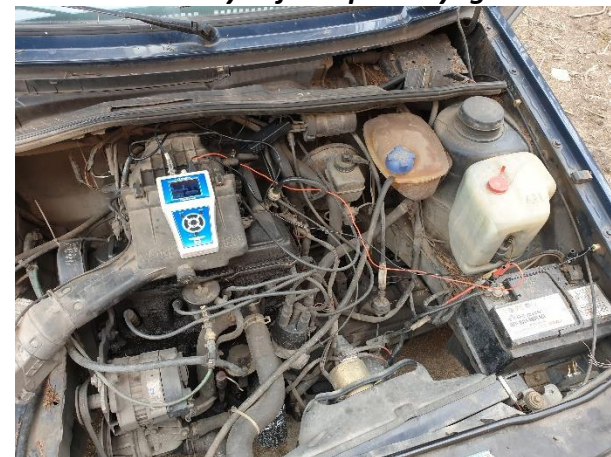


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Test 2: Using the inductive pick-up connected to In15 or In2 to sync from primary ignition:



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Test 3: Using the 10/20A High sensitive, high frequency current clamp connected to In2 to sync from primary ignition:



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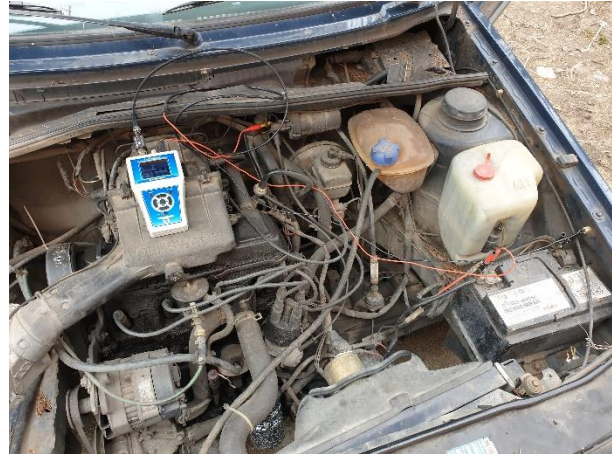


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Test 4: Using the main signal cable with 20:1 attenuator connected to In15 to sync from primary ignition:

Note: Getting a primary ignition voltage signal with the main cable could be dangerous because of the high voltages up to 400V!!!

Connecting an ignition coil with a 400V control voltage directly to i-Tester without using the 20:1 attenuator, will damage the device!!!



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