Opme

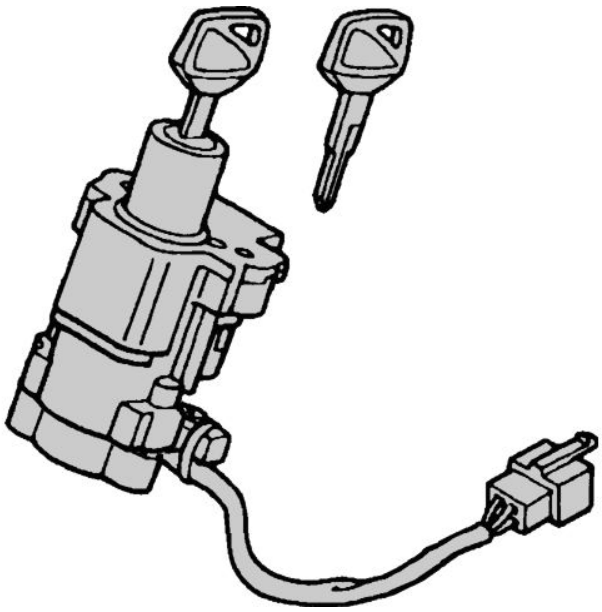
IMMOBILIZER

■ IMMOBILIZER Overview

Purpose

= An anti-theft system built-in the Ignition (or Injection) system to prevent engine starting without "authorized" key.

• The system also features a more robustly constructed combination switch that more effectively resists tampering.



• While this IMMOBILIZER system cannot protect the motorcycle against every possibility of theft, it does effectively prevent the motorcycle from being ridden away, thus preventing one of the most common forms of theft, and hopefully convincing potential thieves and "joy-riders" to look elsewhere.

General Remarks and precautions

1) Since the engine is disabled inside the ECU, it cannot be bypassed by either hot-wiring the ignition (or fuel injection) system or by exchanging the combination switch assembly.

2) Up to four keys can be registered with the immobilizer system, including the two keys supplied with each new machine.

3) Each time that the ECU is brought in "Registration Mode", all keys are erased from it's memory, except the one used during this process.

=> Consequence: To reproduce one or more new keys, it is recommended to bring in **all existing keys**, together with the motorcycle, as they will all have to be re-registered. The key number plate is also needed if the key cutting process needs it.

4) If all keys are lost, the **Ignition Control Module** must be replaced as it cannot be brought into "Registration Mode" anymore. To avoid this, it is recommended that a back-up key is always available. .

5) The immobilizer keys contain electronic "transponder" chips, activated by the immobilizer system. They may fail if damaged physically or magnetically.

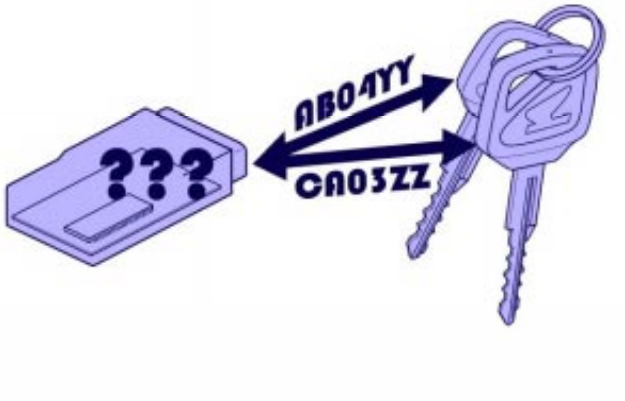
To be avoided:

- Do not drop the key or set heavy objects on them.
- Do not grind, drill or in any way alter the original shape of the key.
- Keep the key away from magnetic sources.

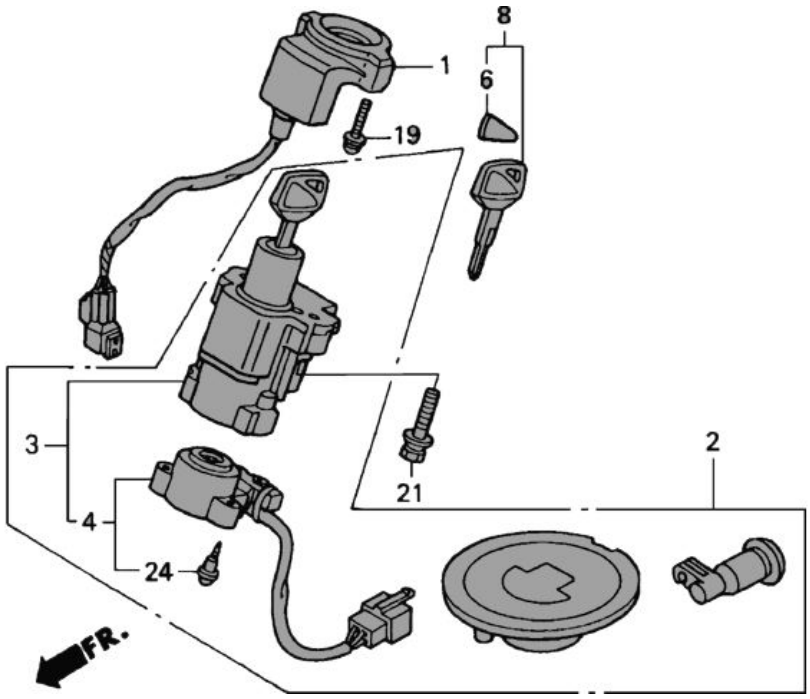
6) The system may not recognize the key's codes if any other (unregistered) immobilizer key is near the ignition switch. To make sure the system recognises the key codes, keep immobilizer keys sufficiently separated from each other.

7) Special procedures are required to:

- Replace steering lock / ignition switch
- Replace Ignition control module



■ IMMOBILIZER COMPONENTS

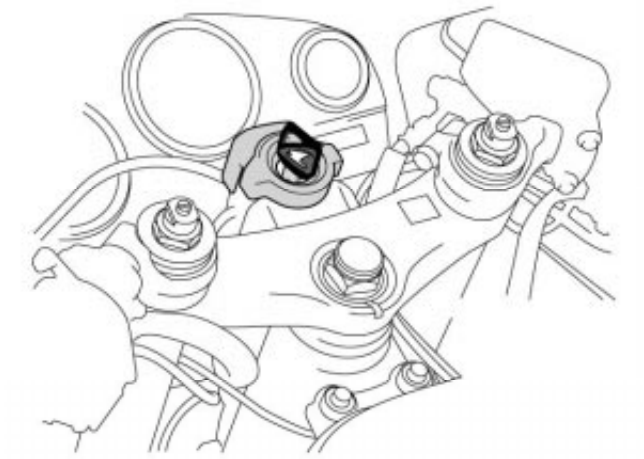


KEY

- Contains a special **coded chip (="*transponder*")**
- This chip contains the logic and individual codes to identify itself to the motor-cycle's ECU as an "OFFICIAL" key
- The key is "married" with the ECU during the first registration. After that, it cannot be registered anymore in another ECU.

IMMOBILIZER RECEIVER / ANTENNA

- A coil-antenna built into the ring surrounding the upper edge of the **key switch** detecting the presence of an encoded key.
- Powered by the ICM with 5V DC, it energizes the transponder by means of electromagnetic waves.
- It functions as an "antenna" in conjunction with the steering top bridge, receiving the weak key signals. (Which amplifies it's effect by reflecting the high frequency waves)
- The "antenna" interfaces the ICM and the transponder chip in the key.



TESTING: For all wire colour codes, CHECK the wiring diagram first!

- Power supply to the antenna: Approximately 5V should be measured between the Yellow/Red and Green/ Orange wires at the ICM and antenna couplers.
- Antenna ground: Check if the Green/ Orange wire is connected to the Immobilizer ground terminal at the ICM.
- Data flow to and from the antenna: It is difficult to check this. For this purpose an oscilloscope is needed and a "wave pick-up" to visualize the signals. However, due to the confidentiality of this system, we cannot disclose more details.

IMMOBILIZER INDICATOR (IMMO / M.IND)

- An LED indicator light, located on the instrument panel:

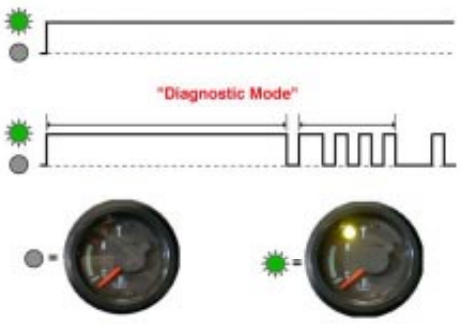
CBR600F: in the fuel gauge.

CBR1100XX: in the speedometer.

NT650V:

- It turns ON for approx. 2 seconds when the ignition switch is turned ON. It then turns OFF if a properly coded key is used. If not, it remains ON and the engine cannot start.
- Also indicates the failure mode by blinking while the system is in "self-diagnostic mode".

The LED can be tested by connecting it's signal wire at the ICM side to GROUND. Usually it is the White/Red wire. CHECK the wiring diagram first!



IGNITION / INJECTION CONTROL MODULE (ICM)

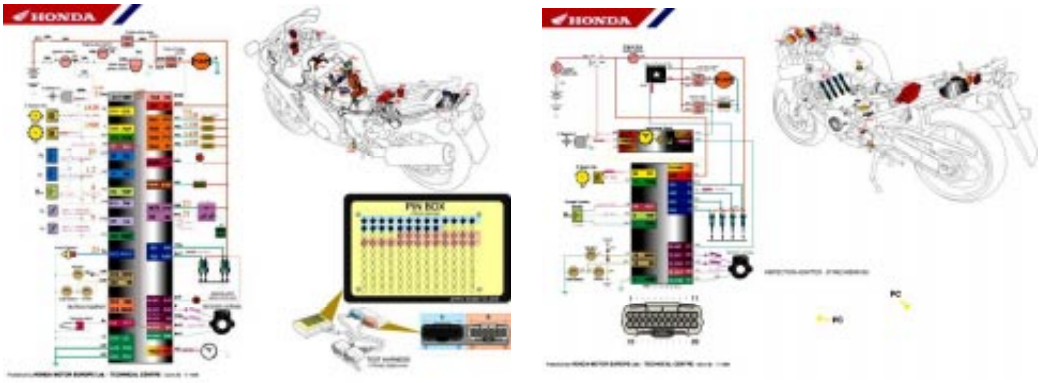
- An **Electronic Control Unit** (= ECU) containing a specialized microchip, designed to "cooperates" with the "transponder" chip in the key.
- On the CBR600Fx and the NT650Vx this "black-box" is the ignition ECU, while on the CBR1100XX it is the Engine Control Module (ECM) controlling both the ignition as the fuel injection systems.
- You may encounter some other names for this element:

ECU = Electronic Control Unit
(General name)
ECM = Electronic Control Module
(General term)

TESTING?

- As the control module has so many functions to be tested, we refer to the Service Manual of each specific model.
- For CBR600Fx and CBR1100XXx, additional guidance and overview of the ICM input and output signals is given on the specially developed colour "**Job-Aid charts**" included with the NM99 training manual and CD-ROM:

CBR1100XX **CBR600F**



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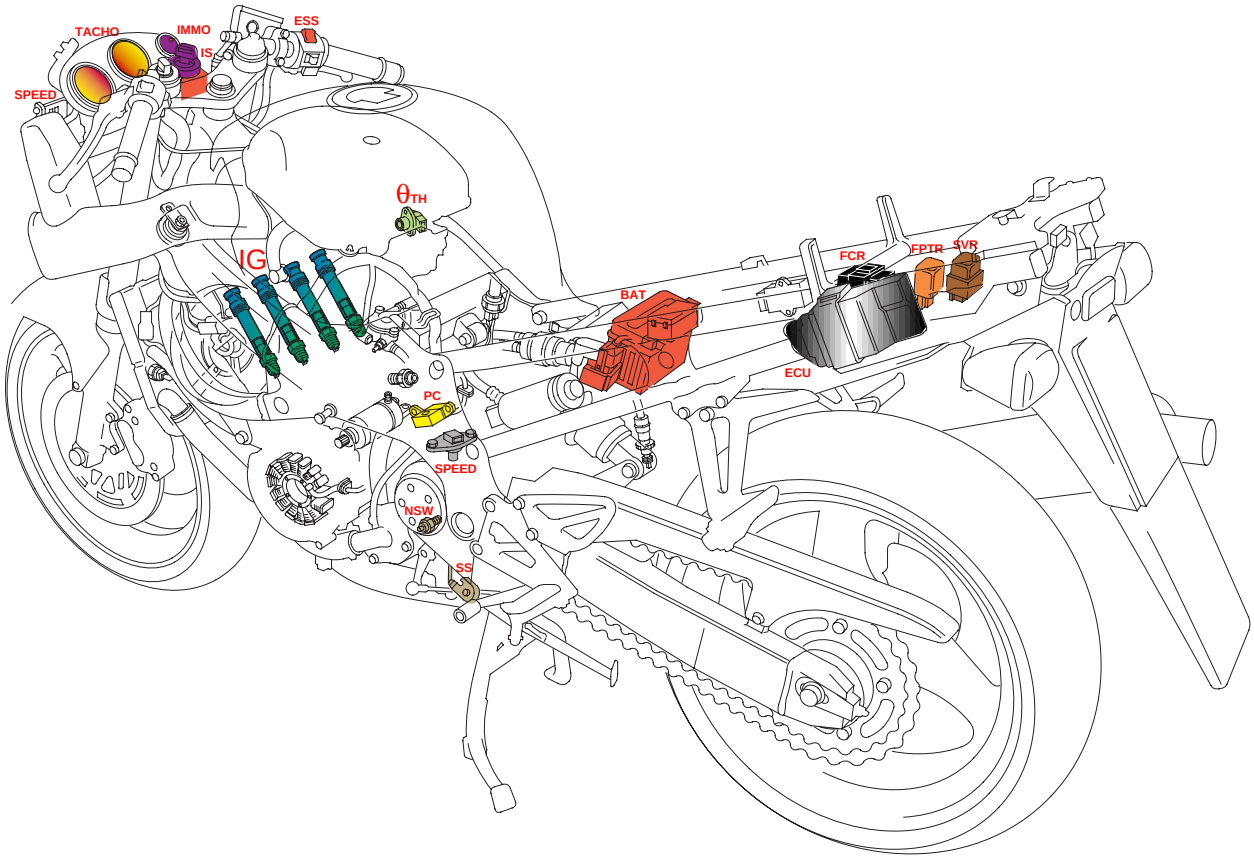
IMMO-1

■ LOCATION OF COMPONENTS

=> Check-out the special screen for CBR600:



- This system is built up of only four main components, easy to locate:

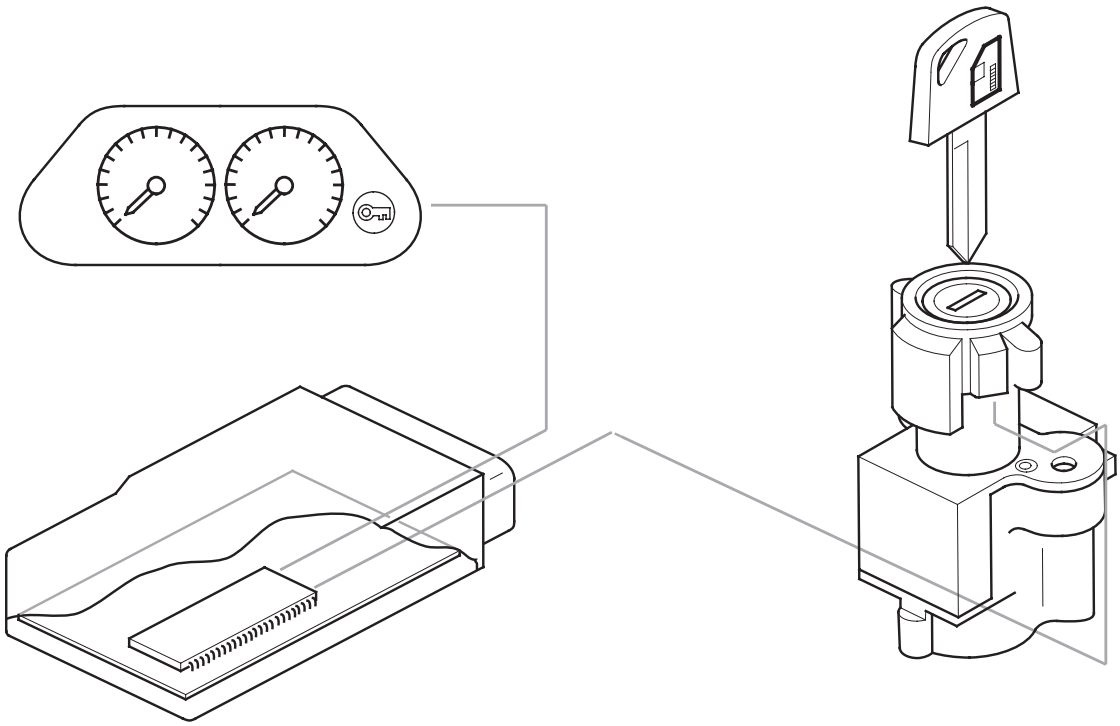
*** The KEY** Is used in the steering lock
*** The IMMOBILIZER RECEIVER / ANTENNA**
- CBR600F:
- CBR1100XX:

*** The IMMOBILIZER INDICATOR (IMMO / M.IND)**
- CBR600F: in the fuel gauge.
- CBR1100XX: in the speedometer.
- NT650V:

*** The IGNITION / INJECTION CONTROL MODULE (ICM)**
- CBR600F:

How does the IMMOBILIZER work?

KEY RECOGNITION PROCESS



* Check out the animation clip, showing the six steps:

1. The mainswitch is operated with a key and this powers the Electronic Control Unit.

2. The IMMOBILIZER indicator on the instrument panel turns ON and the antenna ("receiver") starts emitting electromagnetic waves, powering the "transponder" chip in the key.

3. The ECU sends a signal to the transponder via the "antenna", requesting it's ID code: ***"Who are you?"***

4. The transponder sends his ID code as a pulse-train of electromagnetic waves which are picked-up by the "antenna" and led to the ICM: ***"I am key N°2"***
5. In the ECU, this ID code is looked up among the 4 possible key-memories. If one of them corresponds to the ID received, the ECU asks the transponder for an extra authorization code, the "Password".
6. The transponder replies by sending it's password to the ECU: "**My Password: A1X3625**"…

=> The ECU checks if this Password corresponds with it’s own Password.
If it corresponds, the indicator LED turns OFF and engine starting is enabled. However, if it doesn’t match the ECU’s Password, even if the key is identical in every other way, the ignition remains switched off and the engine cannot be started.

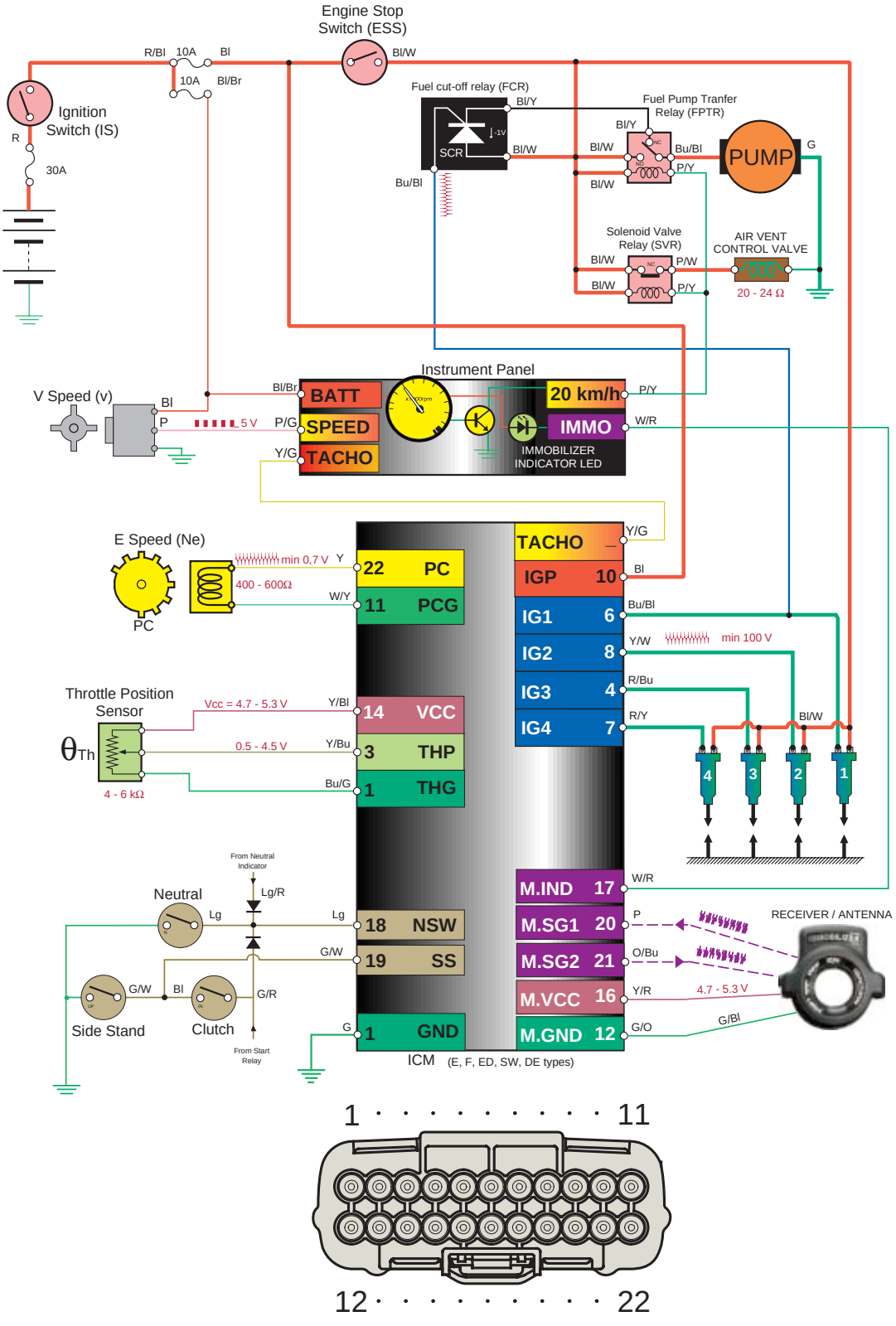
Remark:

The above recognition process takes only a few milliseconds. However, if the process is not successful from the first times, it will be repeated until 255 times.
In any case, the LED will stay on for about 2 seconds minimum, in order to be noticed by the rider.

■ INPUT & OUTPUT SIGNALS

IMMO-1

=> Check-out the special screen for CBR600:



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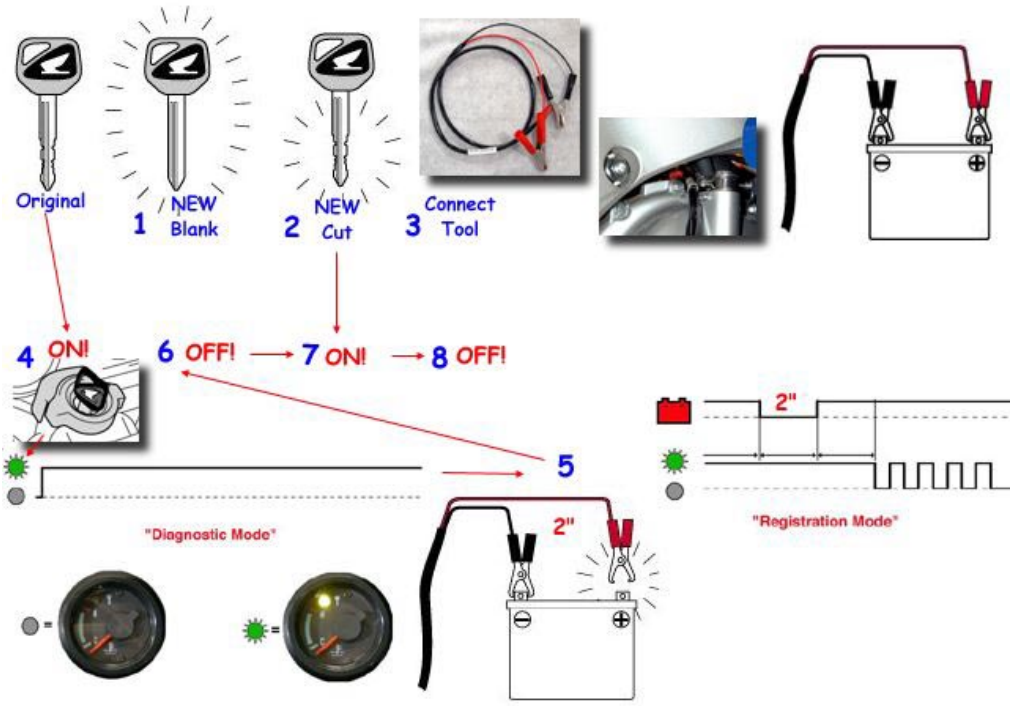
IMMO-2

■ KEY REGISTRATION PROCEDURE

• The following panel summarizes the complete process described hereafter:



• To reproduce keys, the following is required:

- **All** original keys (<u>All of them</u> must be re-registered every time)
- Eventually the **key number** (if key cutting process needs it)
- The **motorcycle** itself
- A special tool: **Inspection adapter: 07XMZ-MBW0100**
- Up to <u>four keys</u> can be registered with this immobilizer system including the two keys supplied with each new machine.
- If all keys are lost, the Ignition Control Module must be replaced.

ADDING A SPARE KEY

Procedure

*** Step1**: Cut a new key

Copy-cut the new key using the original key or according to the **key number**.

*** Step2**: Connect ADAPTER **07XMZ-MBW0100**

- The coupler of the ignition pulse generator is located above the crankcase, behind the cylinder block. The fuel tank can be raised to reach it easier.
- Connect the adapter to the battery

*** Step3**: Switch ON with OK key

=> "Lamp remains ON!"

- The ID code of the original key is recognised by the ICM.
- This makes the system enter the "**diagnostic mode**". (The indicator would start blinking when the system detected a problem)

*** Step4**: Disconnect battery connector 2 sec and re-connect.

=> "Now entering in "**registration mode**"

- The immobilizer indicator remains on for two seconds and starts blinking four times.
- Now the key in the ignition switch is registered. Its ID and password are registered in the ICM, while the registration of ALL other keys is cancelled.

*** Step5**: Switch OFF, Remove OK key, Battery = still connected!

*** Step6**: Switch ON with unregistered key => Lamp blinks …

- The ID code of the new key is registered in the ICM.
- The ICM generates a password which is written into the key's memory.

=> Also this key is now "OK!"

- Register also the 3rd and 4th keys, if necessary…

*** Step7**: Swith OFF, Remove ADAPTOR

*** Step8**: Verify all registered keys... Finished!

- Insert each key to the ignition switch and turn it ON.
- Check that the immobilizer indicator lights on and goes off in approx. two seconds.

What if ALL keys are lost?

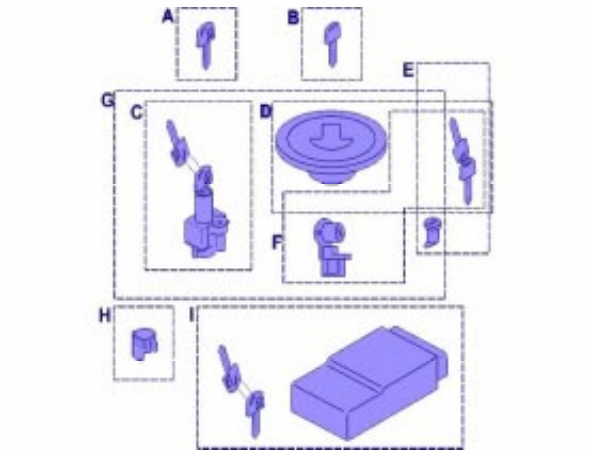
=> The ignition Control Unit must be replaced!
=> Refer to the chapter "Replacing the Control Unit".

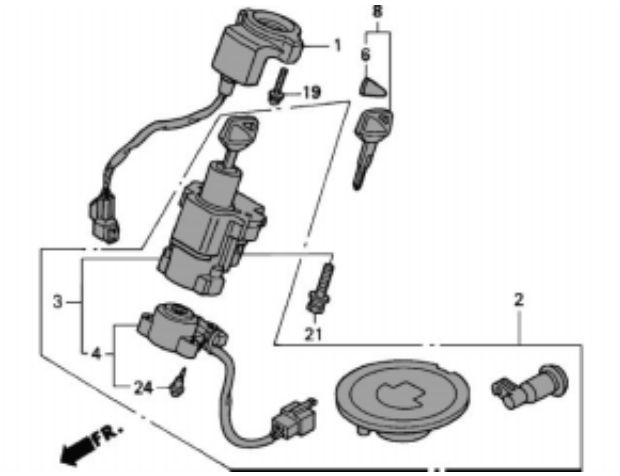
Why?

- The original ICM, in which an unique "password" code is written, only accept keys which have this same "password".
- A blank key, in which no ECU "password" is written yet, can not make the system enter the "registration mode".
- If the key number is also lost, the ignition switch must be replaced as well…

■ STEERING LOCK / IGNITION SWITCH REPLACEMENT PROCEDURE

IMMO-3



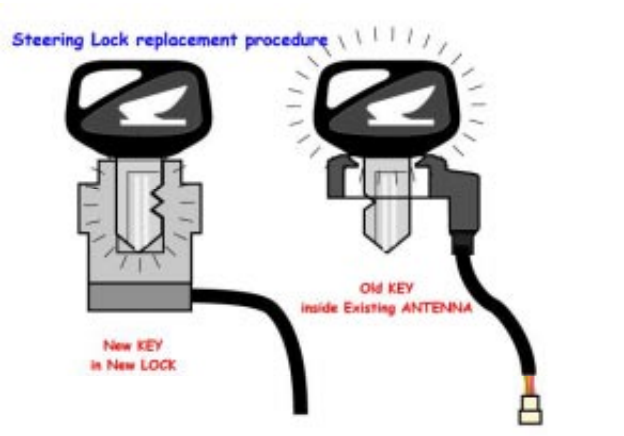


• Whenever the lock is damaged, it can be replaced independently from the immobilizer system.
• To activate the immobilizer system, both the new keys and one original key are required: The original key to activate the immobilizer system with it's ID code and password and the new key to turn ON the new main switch.

Procedure

*** Step1**: Obtain a **new ignition switch** with two new keys and **remove the broken lock** from top bridge

*** Step2**: Separare the NEW lock and the EXISTING antenna



*** Step3**: Put the OLD key in the EXISTING antenna

*** Step4**: Put the NEW key in the NEW lock

*** Step5**: Turn the mainswitch ON!

=> Indicator turns OFF : The OLD key is now OK. (= recognized).

*** Step6**: Apply battery voltage to the pulse generator lines of the ICM
using the Inspection adapter: **07XMZ-MBW0100**

*** Step7**: Register the 2 NEW keys "as usual"

The new keys supplied with the ignition switch as well as all existing keys (max 4) must be registered again with the existing ICM.

IMMO-1

■ CONTROL UNIT REPLACEMENT

- The ICM is delivered with 2 new keys. The immobilizer system starts functioning only after registering the 2nd key. The special harness adapter tool is NOT required for this task.

*** Step1**: Copy-cut the new keys according to the key number of the ignition switch.
(If the key number is not available, a key-set or at least ignition switch assembly must be replaced.)

*** Step2:** Replace the ICM

*** Step3:** Turn the ignition switch ON with the 1st new key.

- The immobilizer indicator comes on for two seconds, then it blinks four times repeatedly.
- The ICM reads the key ID, registers it and generates a password, which is registered in both the key and the ICM.

*** Step4:** Turn the ignition switch OFF and remove the 1st new key.

*** Step5:** Insert the 2nd new key in the ignition switch and turn it ON.

- The immobilizer indicator comes on for two seconds, then it blinks four times.
- The ICM reads the key ID and registers it, generates a password which is registered in both the key and the ICM.

*** Step5:** Turn the ignition switch off and re-test all registered keys.

■ IMMOBILIZER TROUBLESHOOTING

1) QUICK FAULT FINDING TIPS

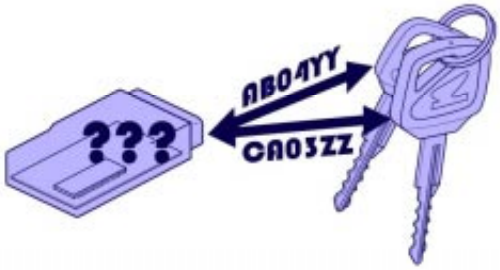
*** Verify the immobilizer's NORMAL behaviour:**

- If the immobilizer indicator LED lamp remains on for more than a few seconds after the ignition switch is turned ON, the system does not recognise the coding of the key.
=> The ignition system is "immobilized" and the engine cannot be started. The problem may be with the key (transponder), the receiver, the ICM, the indicator itself, or communication between them.

*** Troubleshooting Tip1: KEY INSPECTION**

1) **Key "interference":** Check if other keys are not too close to the antenna.

=> The system may communicate with more than two keys at a time and fail to recognise the proper key.



2) **Is there any physical damage** to the "transponder" chip?

High temperature (over 60°C) and immersion in water for some time can damage the transponder.

=> Test with another original key.
=> If the system recognises the other key, the transponder of the first key is faulty.

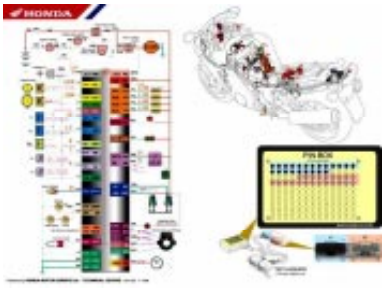
*** Troubleshooting Tip2: Communication problem**

Check for poor contact in the Antenna Connections (corrosion etc…)

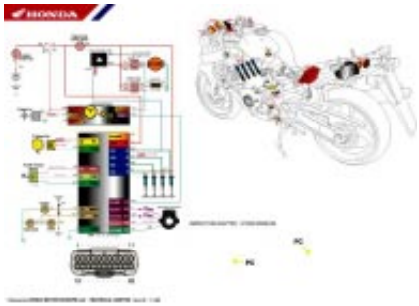
*** Troubleshooting Tip3: Troubleshooting "job-aids"**

For CBR600Fx and CBR1100XXx, you can find a clear drawing on the specially developed colour "**Job-Aid charts**" included with the NM99 training manual and CD-ROM:

CBR1100XX



CBR600F



2) PARTS REPLACEMENT GUIDE: What to do IF…?

*** One key has been lost**:
Cut and register a new key

*** Adding a spare key**:
Cut and register a new key

*** All keys have been lost**:
Replace the ICM (2 new keys included)

*** The Ignition switch is damaged**:
Replace the Ignition switch (2 new keys included) + register both new keys

*** Accessory lock is faulty**:
Replace Accessory lock and key

*** ICM is faulty**:
Replace the ICM (2 new keys included)

3) DETAILED TROUBLESHOOTING

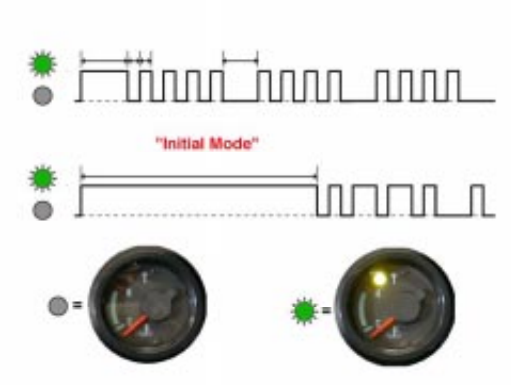
"DIAGNOSTIC" MODE

*** Operation modes and indicator behaviour**

- Turn the ignition switch ON.
- The system activates one of the four **operation modes** according to the conditions:

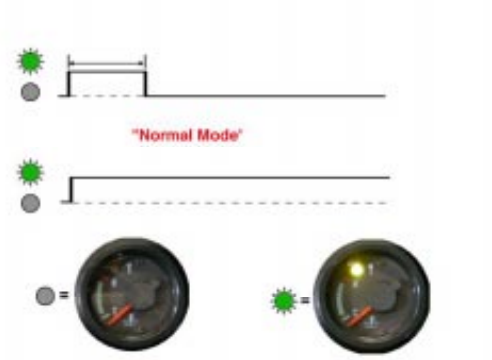
Question1: Are two or more codes already registered in the ICM?

=> If NOT: Initial registration mode -> When registering an NEW ICM.
=> If YES:



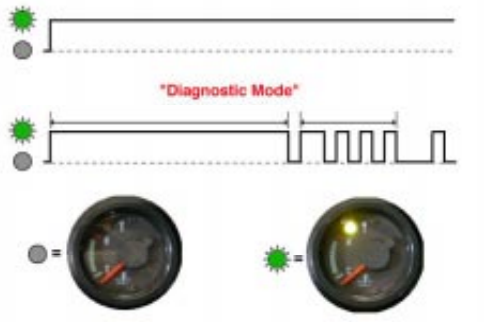
Question2: Is there a battery voltage input to the ignition pulse generator line?

=> If NOT: Normal operation mode
=> If YES:

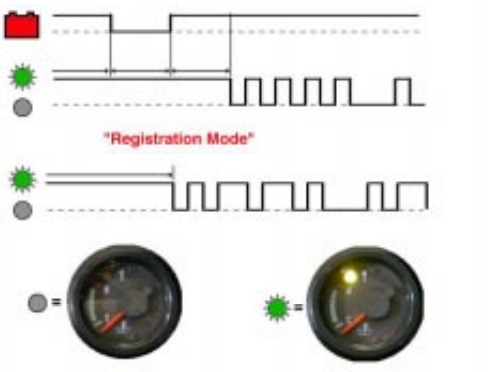


Question3: Is the key code recognised and validated? ?

=> If NG: Diagnostic mode



=> If OK: Registration mode



CALLING & INTERPRETING FAILURE CODES

To switch the system to the **diagnostic mode** :

1. Connect the **Inspection adapter: 07XMZ-MBW0100**

2. Turn the **ignition switch ON**.

=> The immobilizer indicator will come ON for about 10 or 12s and then start blinking 4 times LONG or SHORT pulses to indicate the failure code if the system has found a problem.
The indicator will remain ON when no defect is found.

DESCRIPTION OF POSSIBLE SYMPTOMS

- The following list describes the possible causes of problems and their symptoms.
- To simplify the recognition, we have represented the codes like "MORSE" signals:

- = Long pulse, . = Short pulse

=> For details on the "blinking patterns", please refer to the Shop Manual (Section 20)

*** "ID code" disagreement - . . .**

- The ID code the ICM receives from the key transponder does not match any ID codes registered in the ICM. Possibly the transponder is faulty, or the key is not a registered key even though the key cut matches.
=> See also Troubleshooting Tip1 above: **Key "interference":** Check if other keys are not too close to the antenna.

*** "Password" disagreement - . . -**

- The secret code in the key does not match the one in the ICM. The transponder is faulty.

*** Communication error . . - - (Code signals not sent or not received.)**

- The ICM cannot receive the transponder responses via the antenna. The communication between the ICM - Antenna - Transponder should be inspected.

=> See Troubleshooting Tip2 above: Communication problem

1. Confirm that the ICM is supplying 5V DC to the receiver. (YEL/RED, GRN/ORN)
2. Confirm that the ICM outputs 5V DC to the pink wire.

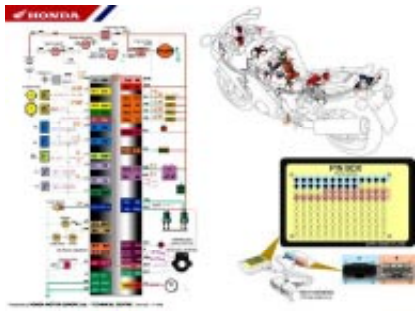
If 1. and 2. above are okay, the ICM is properly providing power and signals to the receiver.

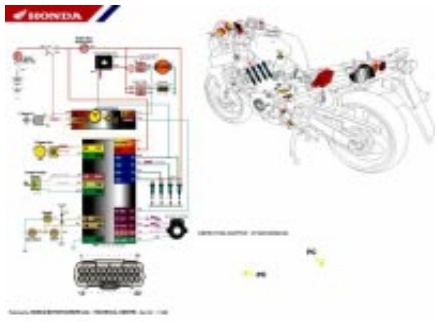
=> The cause of the problem is now narrowed to the receiver and the transponder. The receiver is faulty if the same symptom is reproduced with a second registered key.

=> See Troubleshooting Tip3 above: Troubleshooting "job-aids"

For CBR600Fx and CBR1100XXx, you can find a clear drawing on the specially developed colour "**Job-Aid charts**" included with the NM99 training manual and CD-ROM:

CBR1100XX **CBR600F**





*** ICM data error . . - .** (abnormal ICM data)

- The ID code and password of the registered keys are not found in the ICM. The data may have been erased accidentally, or corrupted.
=> Possibly caused by a faulty ICM.

Problems during key registration:

*** Registration overlap . - . -**

- The key is already registered in this ICM.

=> This can happen in 2 cases:

- When adding spare key, a key already registered in the ICM is being registered again.
- When registering a new ICM, the first key is inserted when the registration routine requires insertion of the second key.

*** Transponder writing error . - - .**

- The ICM attempts to write the password and secret code to the transponder. The ICM then tries to validate the data in the transponder and finds an abnormality.
=> The transponder is faulty.

*** ECU (ICM) writing error . - - -**

- The ICM attempts to write key ID code and password to memory. The ICM then tries to validate the data in the memory and find an abnormality.
=> Possibly caused by a faulty ICM.

*** Registration impossible . - . .**

- This key has already been registered with another ICM.

=> Use another key.