

Piaggio, Gilera & Vespa

Immobiliser systems

The following pages are an explanation of the original fitment immobiliser systems fitted to vehicles beginning in the 1990's with the original (pre Leader) Vespa ET4.

Most space is devoted to the system fitted to Leader engined vehicles because this is by far the most common. Much of the operation of other systems is the same as the Leader system.

Systems covered:

Leader
Pre Leader
Quasar
Master

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1st edition

Piaggio and other after market alarms and immobilisers are not covered here.

Copies of this and other Piaggio technical information can be obtained from the Piaggio UK dealer portal web site or from Piaggio Ltd.

Immobiliser Systems

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Leader Immobiliser

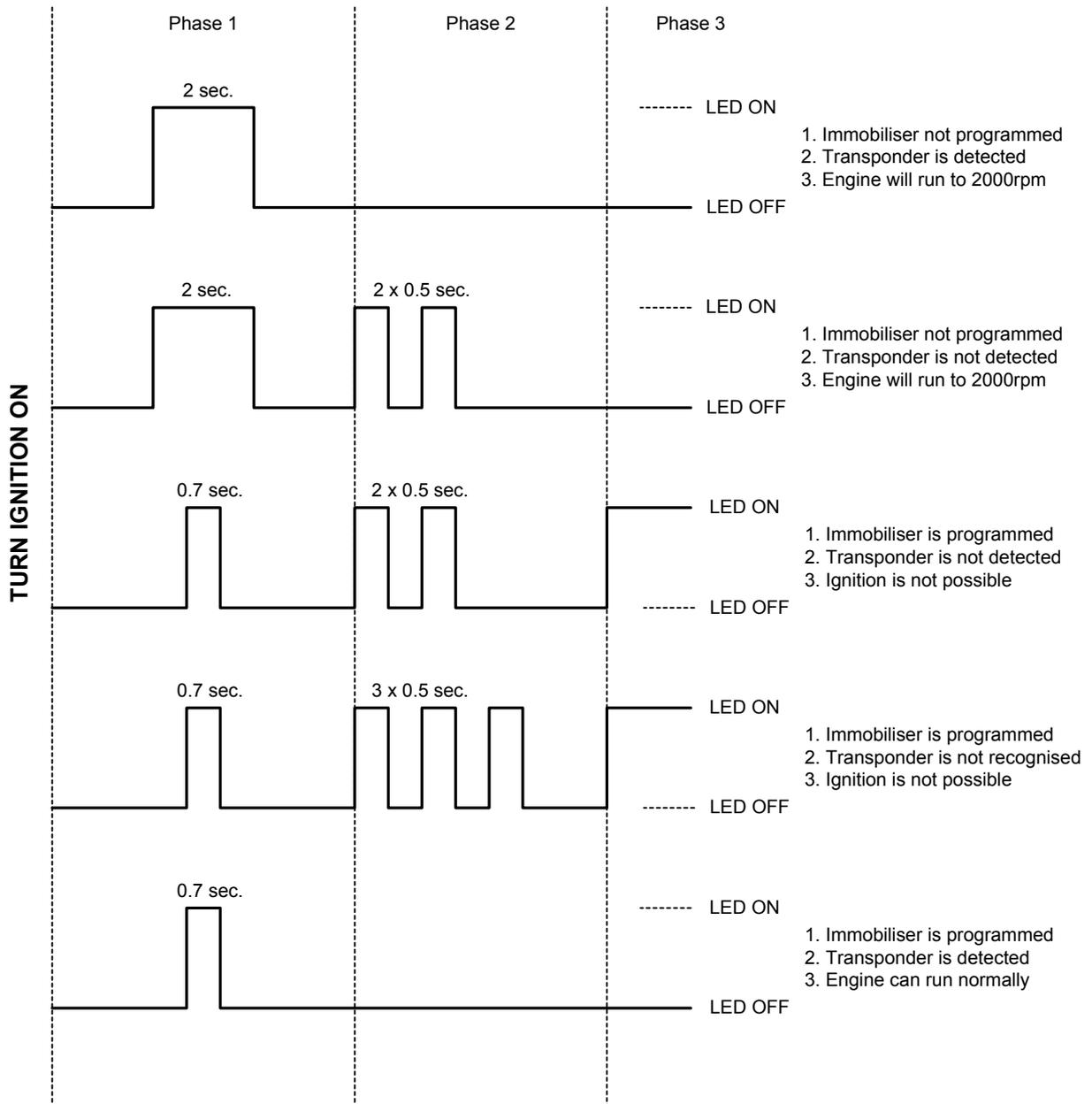
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EXPLANATION

1. The immobiliser system fitted to all Piaggio, Gilera & Vespa "Leader" engined vehicles operates in exactly the same way.
2. Although the principle is the same the wiring differs on different models.
Refer to the wiring diagram and Service Station Manual for your specific model.
3. CDI and immobiliser are combined in one unit.
4. The CDI / immobiliser units may look the same but:
They have different characteristics on different models.
Ensure you fit the correct unit. Always order by part number .
5. The flashing LED on the instrument panel is the key to understanding how the immobiliser is behaving. The list below shows what the LED can tell you.
Note that the LED should flash steadily all the time the ignition is off and the battery is connected.
If not, go to PAGE 7 for fault finding information.
6. If you have no spark you must first prove that it is not due to the immobiliser.
7. Keys should not be on a metal key ring or with other keys. Sometimes this can upset the system.

Possible LED Flashing Fault Codes

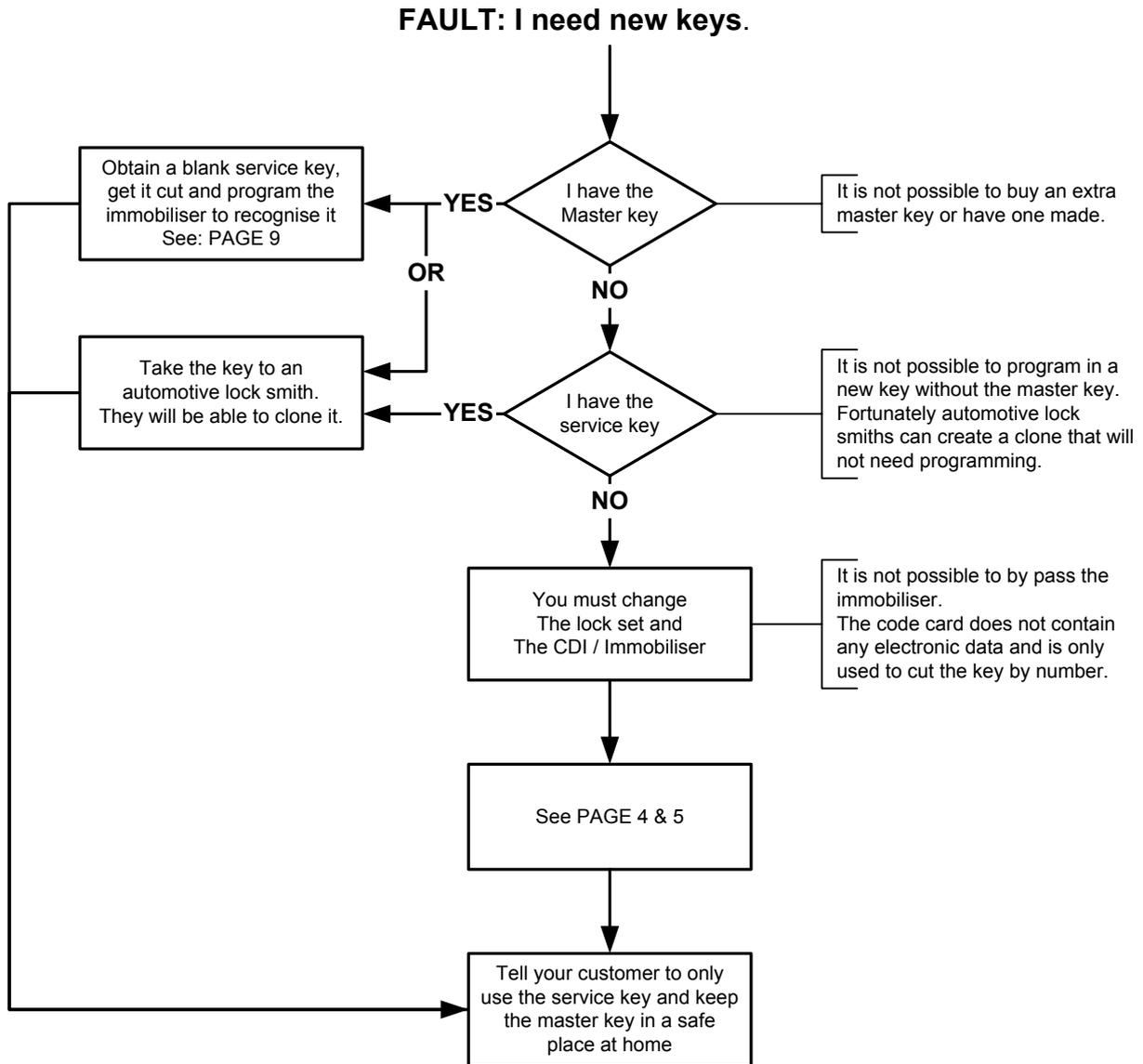


Leader Immobiliser

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NEW KEYS

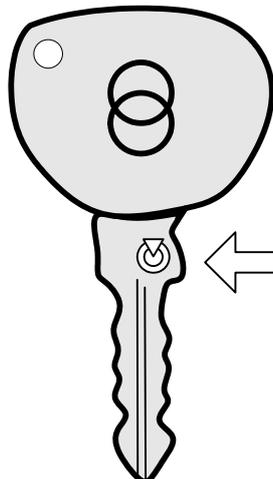


Gilera Runner service keys

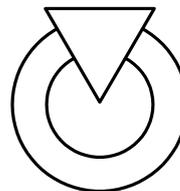
The red service key for Runner two strokes and Runner four strokes now look the same.

The four stroke key has a transponder chip in it and the two stroke key does not.

You can recognise the keys which contain a transponder by a symbol that is engraved on the key



This key contains a transponder



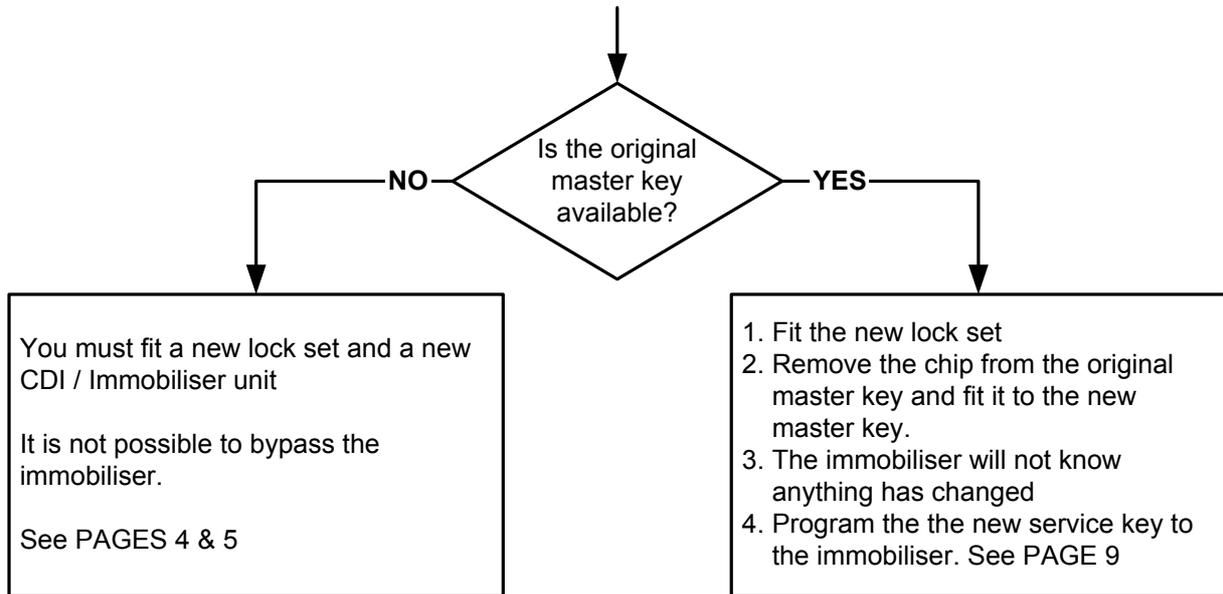
Leader Immobiliser

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NEW LOCKS

FAULT: I need to fit new locks.



The lock set is supplied with one (brown) master key and one service key.

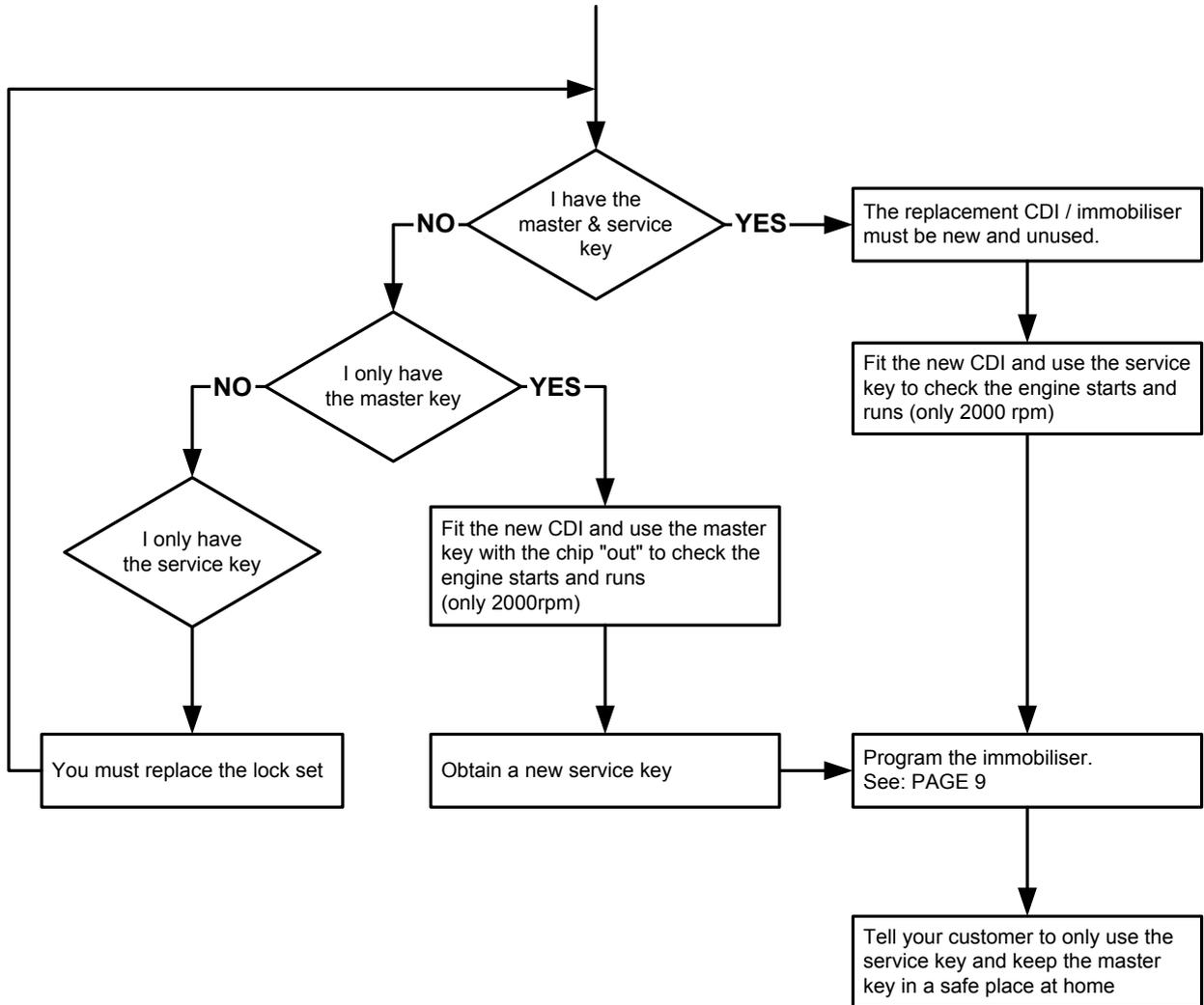
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NEW CDI

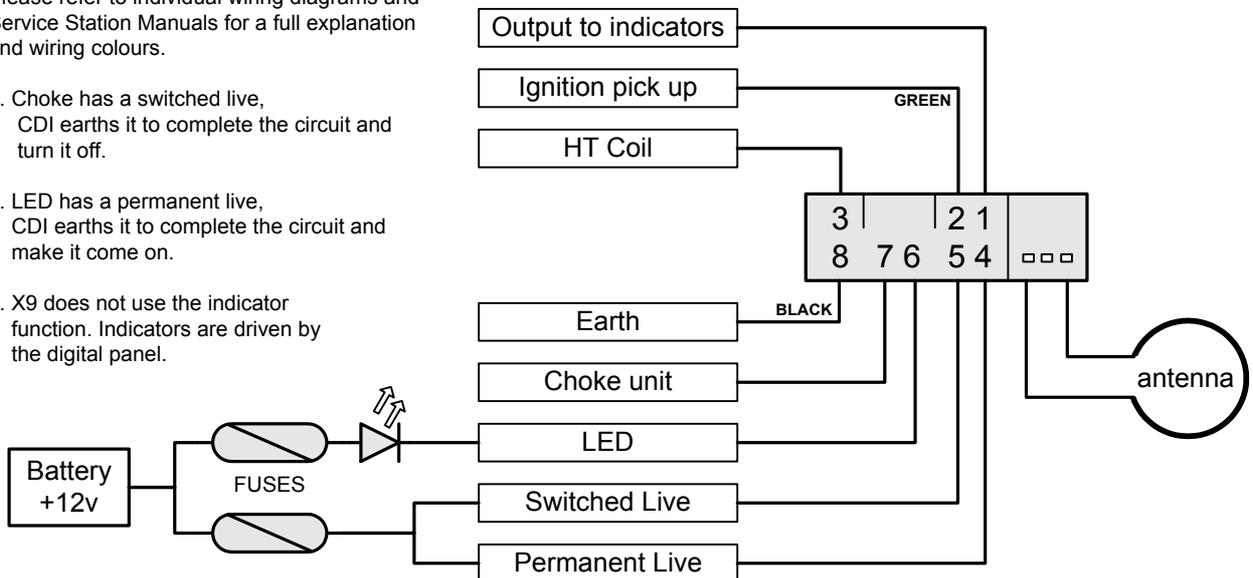
FAULT: I need to fit a new CDI / Immobiliser.



CDI / Immobiliser Connections

Please refer to individual wiring diagrams and Service Station Manuals for a full explanation and wiring colours.

1. Choke has a switched live, CDI earths it to complete the circuit and turn it off.
2. LED has a permanent live, CDI earths it to complete the circuit and make it come on.
3. X9 does not use the indicator function. Indicators are driven by the digital panel.



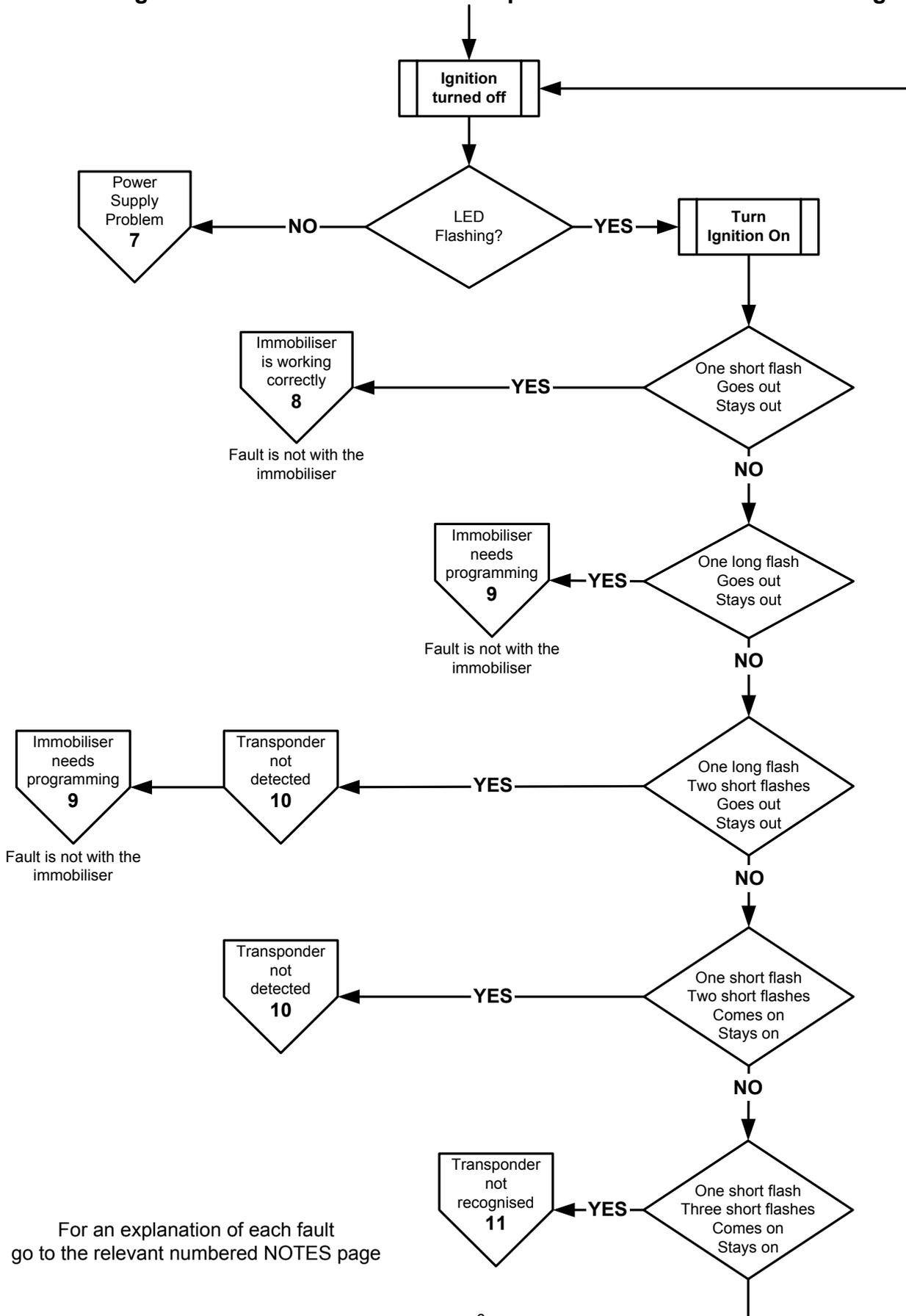
Leader Immobiliser

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Fault Finding

FAULT: Engines turns over but there is no spark when tested with a strobe light



For an explanation of each fault go to the relevant numbered NOTES page

Leader Immobiliser

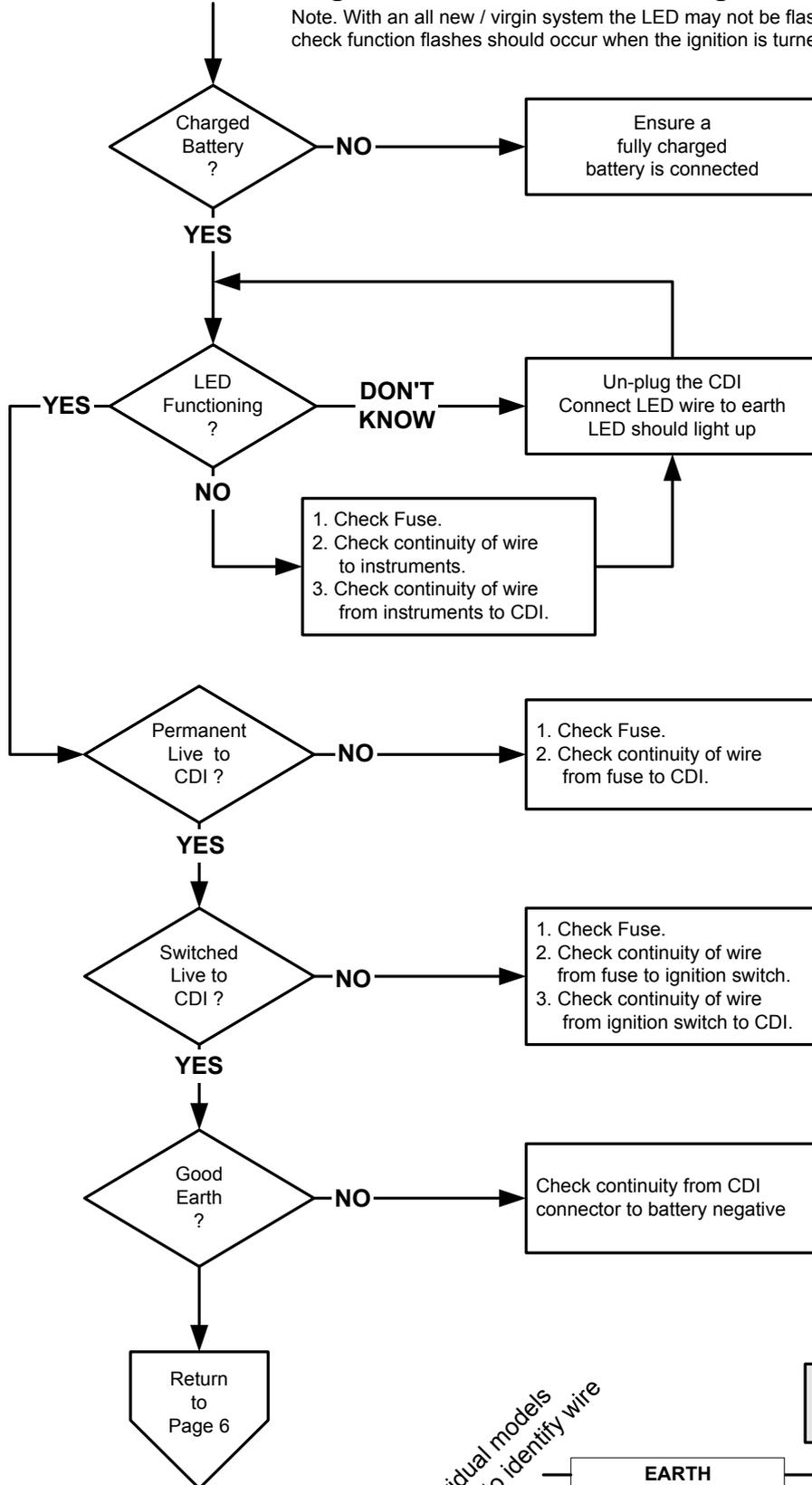
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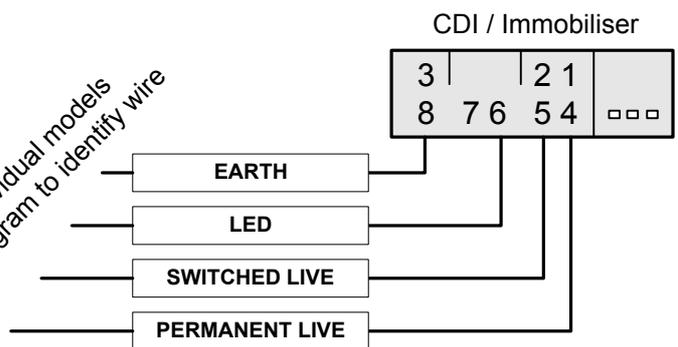
NO LED

FAULT: With Ignition turned off the LED light is not flashing

Note. With an all new / virgin system the LED may not be flashing but the check function flashes should occur when the ignition is turned on.



Refer to individual models wiring diagram to identify wire colours



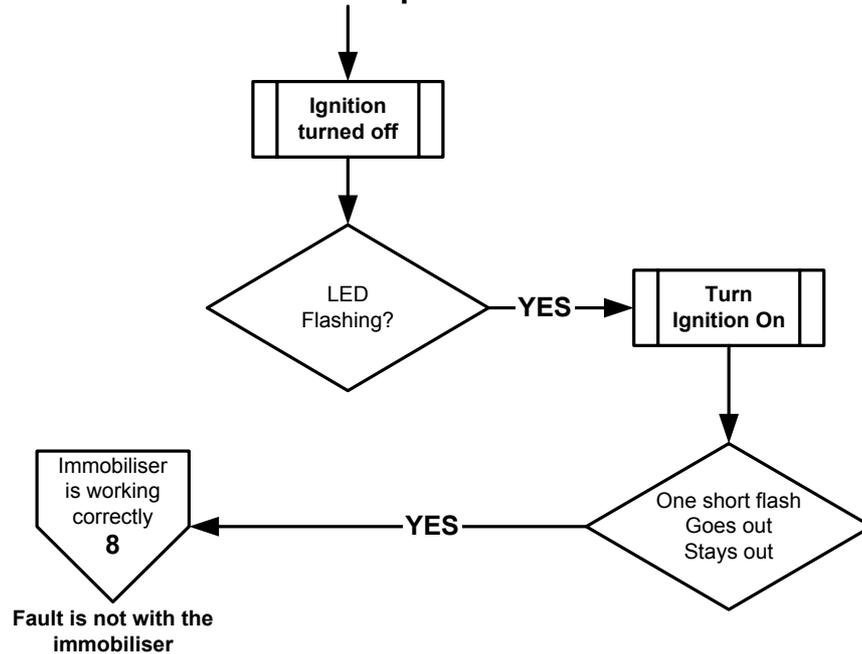
Leader Immobiliser

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Immobiliser OK

FAULT: Engines turns over but there is no spark when tested with a strobe light



We know that the immobiliser is working correctly so the immobiliser system can now be ignored and normal fault finding can be continued.

1. Test the ignition pick up.
Un-plug the CDI. Green wire to earth = 105 - 124 ohms.
2. Test the HT coil (unplugged).
Primary: Purple to Earth = 0.4 - 0.5 ohm.
Secondary: HT to Earth = 3000 ohms (3k ohm).
A 5000 ohms (5K ohm) resistor plug cap should be fitted.
3. Test earth continuity.
Un-plug the CDI. Check continuity between black wire and battery negative.

If no fault has been found you should suspect the CDI unit.

- * Fit a new CDI (not from another bike)
- * Use the service key (not the brown master key)
- * Check that the spark is restored. engine should start but it will not rev beyond 2000 rpm.

If the fault is cured you must program the CDI unit.

GO TO PAGE 9 for programming information.

Leader Immobiliser

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PROGRAMMING

FAULT: I need to program the immobiliser unit

Notes.

1. It is not possible to re-program an immobiliser unit to a new master key.
Once it has been programmed it is irrevocably linked to that master key.
2. It is not normally possible for an immobiliser to lose its program and then need re-programming.
If it was programmed and working but now it is saying that it is not programmed, First, check the HT lead and plug cap, It is possible that extreme electrical interference from a faulty HT circuit could upset the immobiliser.
Plug cap must be at least 5000 ohms. Change the cap and lead if suspect.
A resistor plug must be used on all Leader engines.
Then try re-programming the immobiliser.
If it will not re-program then it is faulty.

Programming a new immobiliser.

1. Do not attempt to program a new immobiliser until you know that the fault is cured.
Attach the new immobiliser, use the service key (not the brown master key)
LED will give one long flash then go out and stay out. System is working correctly, Immobiliser is not programmed
The engine should start but will not rev above 2000 rpm until the immobiliser is programmed.
2. To program a new immobiliser
 - * Insert the brown master key and turn on for two seconds
 - * Insert the service key and turn on for two seconds
 - * (extra service keys are included here)
 - Insert the extra service key and turn on for two seconds
 - * Insert the brown master key and turn on for two seconds

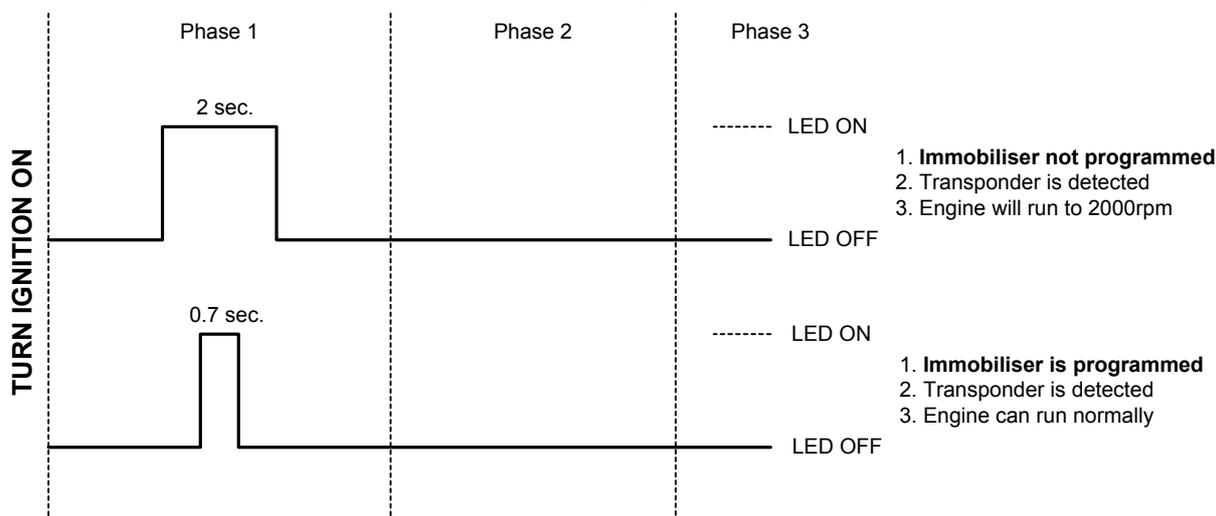
* The timing of the two seconds can be critical so use a watch to time it, you may need to do the sequence several times before it is accepted.

* Changing from one key to the next should be done within ten seconds.

* An extra service key is not just added, you must go through re-programming all the keys as above.
You are not re-programming the master key, the master key is giving permission for the service keys to be added.

* You do not need to start the engine just to check if the programming has been successful, Just turn on the ignition and watch the LED.
One short flash (half second) means the programming was successful.
One long flash (two seconds) means the system is still not programmed.

Possible LED Flashing Codes



Leader Immobiliser

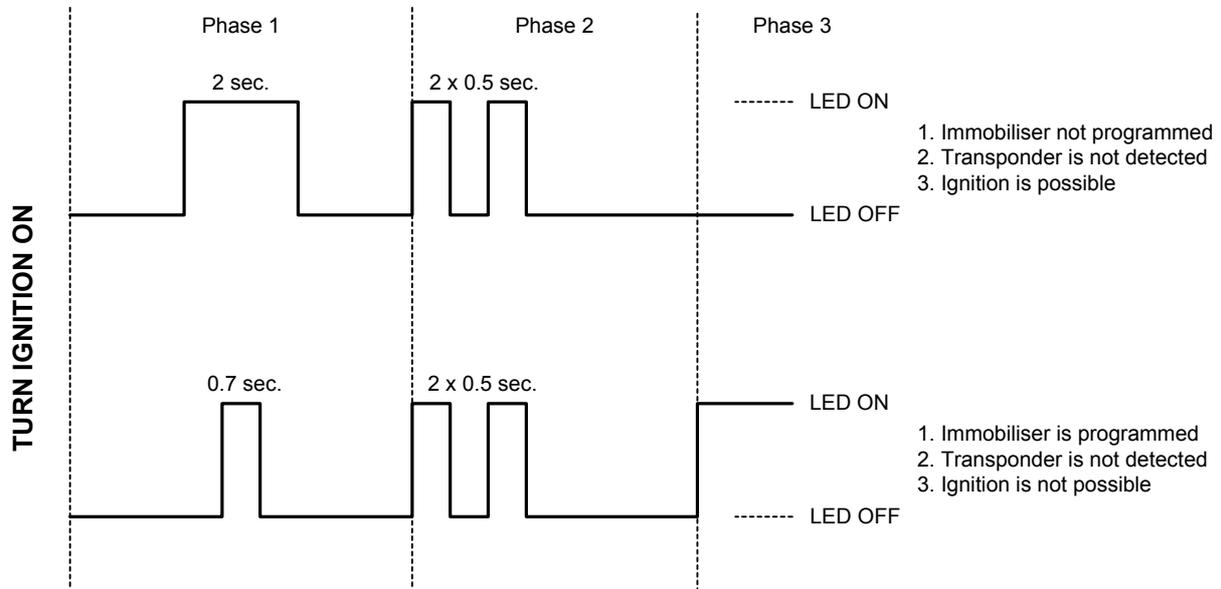
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NOT DETECTED

FAULT: Transponder not detected.

Possible LED Flashing Codes



The immobiliser knows the ignition has been turned on but it has not been able to detect the transponder chip in the key.

Possible reason for transponder chip not being detected.

1. The transponder chip is damaged or missing from the key.
 - * Try another key.
2. The aerial is damaged, un-plugged or not correctly positioned
 - * Un-plug the aerial from the CDI and check the aerial for continuity.
Aerial resistance = 7 to 9 ohms. If resistance is wrong replace the aerial.
 - * Check that the black plastic aerial housing is securely clipped into position around the ignition switch.
 - * Inspect the pins in the plug and socket for signs of damage or corrosion.

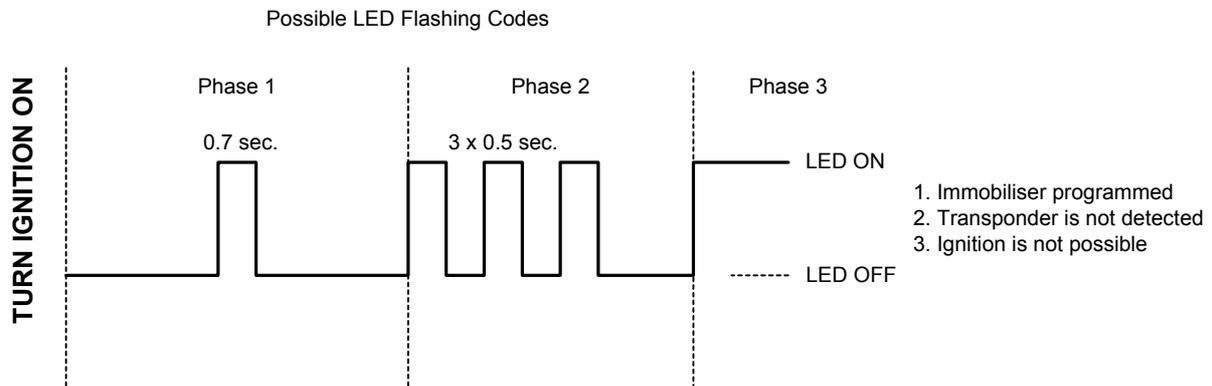
Leader Immobiliser

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NOT RECOGNISED

FAULT: Transponder is not recognised.



The immobiliser has seen the transponder chip so you know that the chip in the key is intact and the aerial is working correctly.

Possible reasons for the transponder not being recognised.

1. The wrong key is being used.
It is possible for two keys to have the same cut profile on different vehicles (there are limited number of profiles).
If the keys were mixed up you could turn on the ignition but the immobiliser would not recognise the chip.
2. The key you are using has not been programmed into the immobiliser.
See PAGE 9 for details of programming .

Non Leader Immobiliser

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EXPLANATION

The original Vespa ET4 (ZAPM04) was powered by an air-cooled four stroke engine that looked similar but was very different to the Leader engine.

On the next page there is an explanation of the wiring for this engine.

Immobiliser operation once the system is programmed and working correctly:

CDI is irrevocably linked to the immobiliser

Immobiliser is irrevocably linked to the red master key.

It is possible to fit a new CDI alone.

It is not possible to fit a new immobiliser alone, you must also change the CDI.

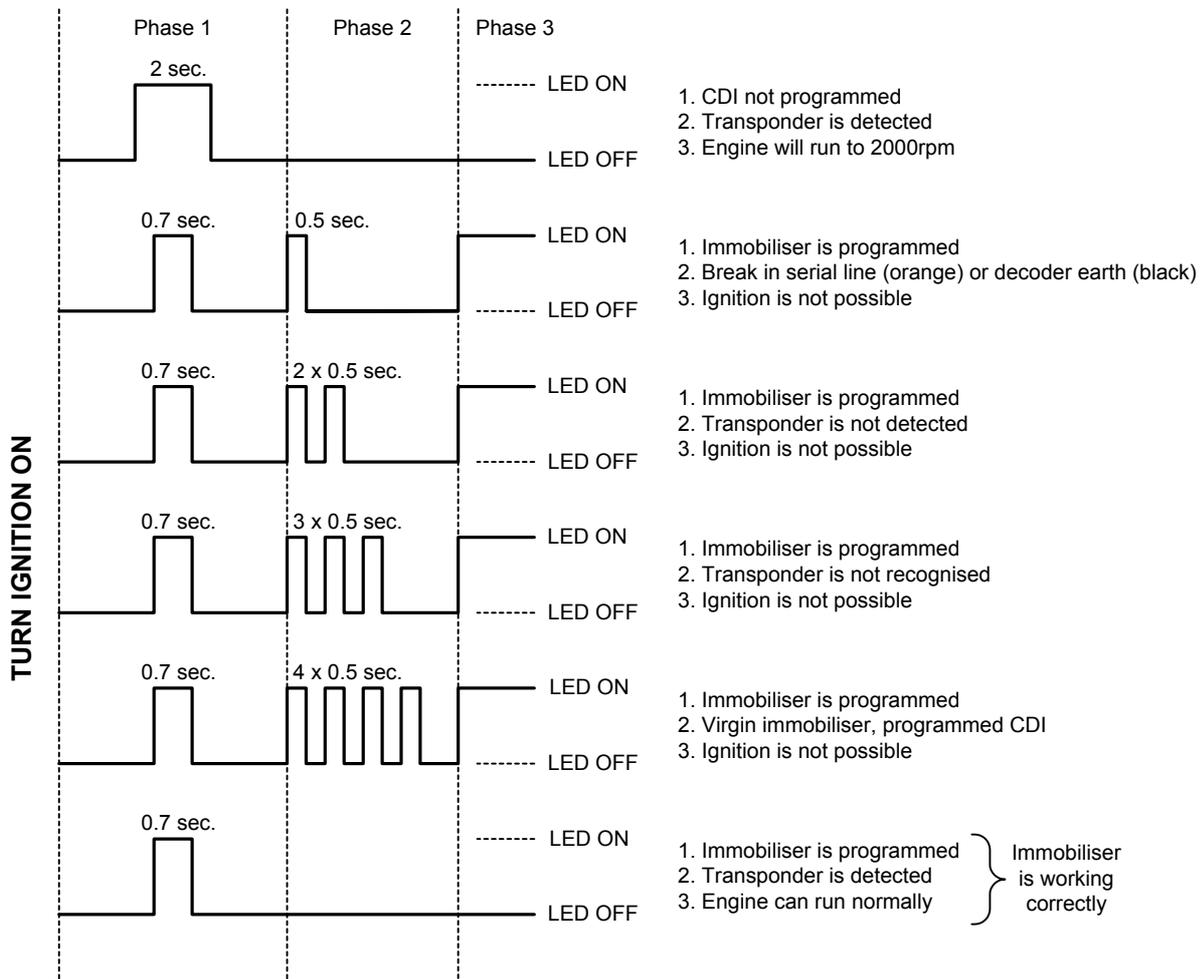
It is not possible to change the red key alone.

Fault finding:

- * Fault finding is done either with the diagnostic tester or a 12 volt LED.
- * The tester is explained in the service station manual. Using an LED is explained here.
- * The vehicle is not fitted with an LED in the instrument panel.
- * You must connect a 12 volt LED to the test socket.
- * The test socket is a grey two pin plug with nothing plugged into it located in a large rubber sheath on the right side of the engine bay.
- * Remove the helmet storage to access the socket.

Note. Keys should not be on a metal key ring or with other keys.
Sometimes this can upset the system.

Possible LED Flashing Fault Codes

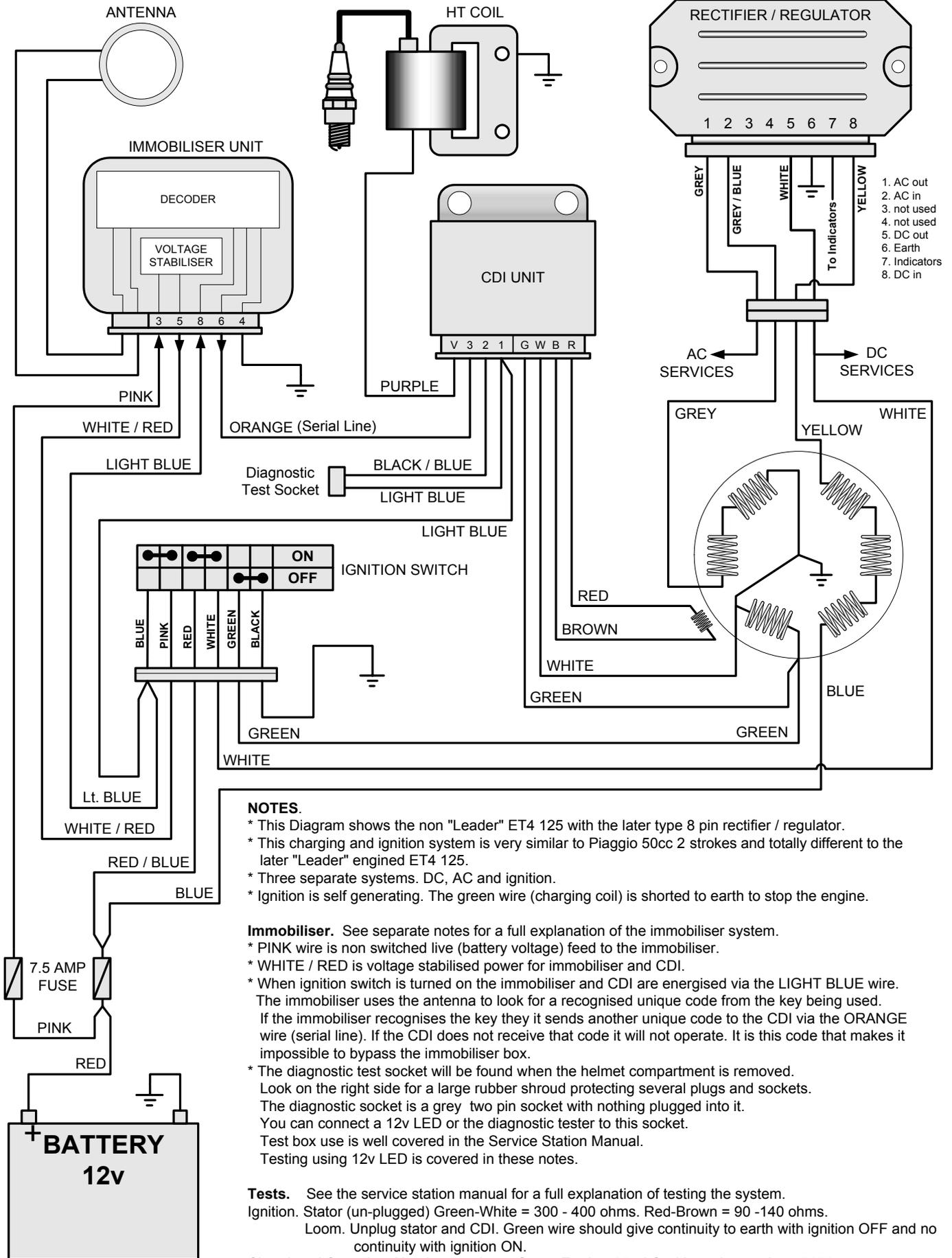


Vespa ET4 125 charge / ignition (non Leader)

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ZAPM 04 Later version



NOTES.

- * This Diagram shows the non "Leader" ET4 125 with the later type 8 pin rectifier / regulator.
- * This charging and ignition system is very similar to Piaggio 50cc 2 strokes and totally different to the later "Leader" engined ET4 125.
- * Three separate systems. DC, AC and ignition.
- * Ignition is self generating. The green wire (charging coil) is shorted to earth to stop the engine.

Immobiliser. See separate notes for a full explanation of the immobiliser system.

- * PINK wire is non switched live (battery voltage) feed to the immobiliser.
- * WHITE / RED is voltage stabilised power for immobiliser and CDI.
- * When ignition switch is turned on the immobiliser and CDI are energised via the LIGHT BLUE wire. The immobiliser uses the antenna to look for a recognised unique code from the key being used. If the immobiliser recognises the key they it sends another unique code to the CDI via the ORANGE wire (serial line). If the CDI does not receive that code it will not operate. It is this code that makes it impossible to bypass the immobiliser box.
- * The diagnostic test socket will be found when the helmet compartment is removed. Look on the right side for a large rubber shroud protecting several plugs and sockets. The diagnostic socket is a grey two pin socket with nothing plugged into it. You can connect a 12v LED or the diagnostic tester to this socket. Test box use is well covered in the Service Station Manual. Testing using 12v LED is covered in these notes.

Tests. See the service station manual for a full explanation of testing the system.

- Ignition. Stator (un-plugged) Green-White = 300 - 400 ohms. Red-Brown = 90 -140 ohms. Loom. Unplug stator and CDI. Green wire should give continuity to earth with ignition OFF and no continuity with ignition ON.
- Charging. AC section. Un-plug regulator. Grey - Earth = 25v AC with engine at about 3000 rpm. DC section. Ammeter between Battery + and red wire = at least 1.8 amps, fully charged battery Disconnect battery. yellow - red = at least 15v AC @ 3000 rpm.

Quasar Immobiliser

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EXPLANATION

The 250 cc Quasar engine is available with a CV carburettor or semi closed loop fuel injection. The Quasar engine with a carburettor has exactly the same immobiliser function as a Leader engine.

The Injected engine is detailed below.

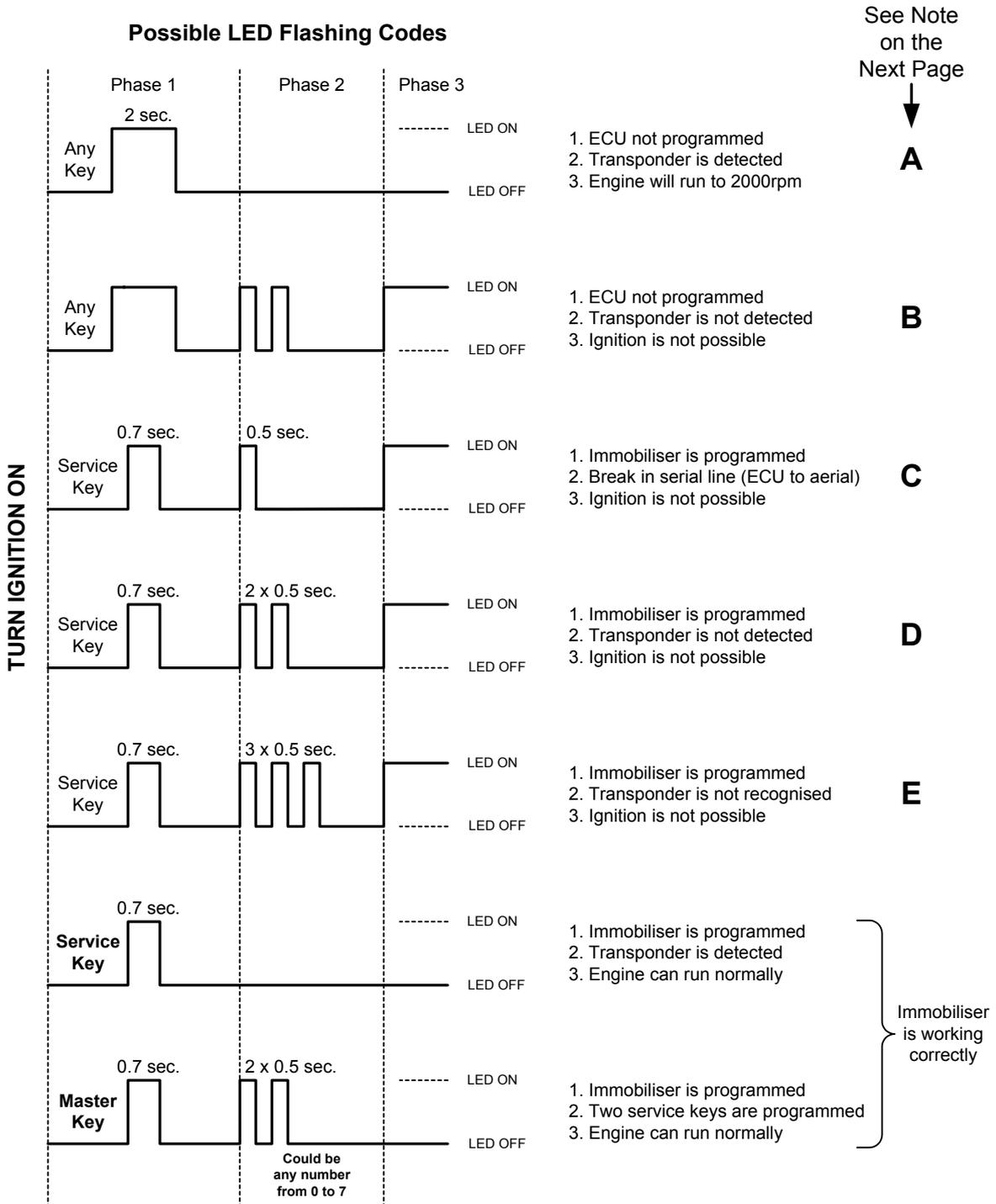
This is only a quick reference guide for basic fault finding of the immobiliser system.

For a full explanation please see the Service Station manual.

The Quasar has an ECU with a separate immobiliser which is built into the aerial, so the ECU must obtain authority from the aerial (active antenna).

Keys should not be on a metal key ring or with other keys. Sometimes this can upset the system.

Possible LED Flashing Codes



Quasar Immobiliser

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NOTES

LED flashing code notes.

A. ECU is not programmed.

The LED gives a single two second flash. The Engine management light will be on.
 You should get this code when you have fitted a new ECU.
 The immobiliser system is working correctly and only needs programming.

B. ECU is not programmed. Transponder is not detected.

The LED gives a single two second flash, then two short flashes, then comes back on..
 The ECU is not programmed (as above) but also the chip in the key has not been detected.
 You must resolve the transponder problem before trying to program the ECU.
 The master key will give this fault if the chip is hinged out.
 If you have another key try that, if it is still not detected it is probably the aerial.
 Verify that the aerial is correctly located and secure in it's mounting around the ignition lock.

C. Break in the Serial line.

A single short flash, pause, then a second short flash, LED then comes back on.
 There is a break in the wire between the ECU and the aerial (active antenna).
 The Orange / White wire on pin 7. is the link.

D. Transponder is not detected.

A single short flash, then two short flashes, then comes back on.
 The chip in the key has not been seen.
 Either there is a fault with the key or the aerial.
 If you have another key try that, if it is still not detected it is probably the aerial.
 Verify that the aerial is correctly located and secure in it's mounting around the ignition lock.

E. Transponder is not recognised.

A single short flash, then three short flashes, then comes back on.
 The chip in the key is seen be is not recognised.
 The key is not programmed into the immobiliser memory.
 You are using the wrong key or it needs to be programmed into the immobiliser memory.

Diagnostic Tester

If you use the hand held diagnostic tester you can check the immobiliser.
 Select the "Errors" menu to see detailed fault information.

DISPLAY		NOTES
Uncoded ECU	Yes / No	Yes = Virgin ECU LED - one 2 sec flash in phase one (page 14 A)
Imm start inhib	Yes / No	Yes = Ignition is not possible (no spark). LED remaining on in phase three (page 14 B,C,D,E)
Universal code	Yes / No	For production assembly line use only. Yes = Virgin ECU
Key failure	Yes / No	Yes = Key transponder is not seen. LED - two flashes in phase two (page 14 D)
Wrong Key code	Yes / No	Yes = Key transponder is seen but not recognised LED - three flashes in phase two (page 14 E)
Commun timeout	Yes / No	Yes = No signal from active antenna to ECU LED - one flash in phase two (page 14 C)
Stored key num	<value>	Number of keys coded to the ECU (0 up to 7)

Programming.

Notes.

1. It is not possible to re-program an immobiliser unit to a new master key.
Once it has been programmed it is irrevocably linked to that master key.
2. It is not normally possible for an immobiliser to lose its program and then need re-programming.
If it was programmed and working but now it is saying that it is not programmed, First, check the HT lead and plug cap. It is possible that extreme electrical interference from a faulty HT circuit could upset the immobiliser.
Plug cap must be at least 5000 ohms. Change the cap and lead if suspect.
A resistor spark plug must be used.
Then try re-programming the immobiliser.
If it will not re-program then it is faulty.

Programming a new immobiliser.

1. Do not attempt to program a new immobiliser until you know that the fault is cured.
Connect the new immobiliser, use the service key (not the brown master key)
LED will give one long flash then go out and stay out. System is working correctly,
Immobiliser is not programmed
The engine should start but will not rev above 2000 rpm until the immobiliser is programmed.
 2. To program a new immobiliser
 - * Insert the brown master key and turn on for two seconds
 - * Insert the service key and turn on for two seconds
 - * (any extra service keys are included here)
 - Insert the extra service key and turn on for two seconds
 - * Insert the brown master key and turn on for two seconds
- * The timing of the two seconds can be critical so use a watch to time it, you may need to do the sequence several times before it is accepted.
- * Changing from one key to the next should be done within ten seconds.
- * An extra service key is not just added, you must go through re-programming all the keys as above.
You are not re-programming the master key, the master key is giving permission for the service keys to be added.
- * It is not the keys that are programmed.
The immobiliser is being programmed to recognise the keys.
- * You do not need to start the engine just to check if the programming has been successful, Just turn on the ignition and watch the LED.
One short flash (half second) means the programming was successful.
One long flash (two seconds) means the system is still not programmed.

Master Immobiliser

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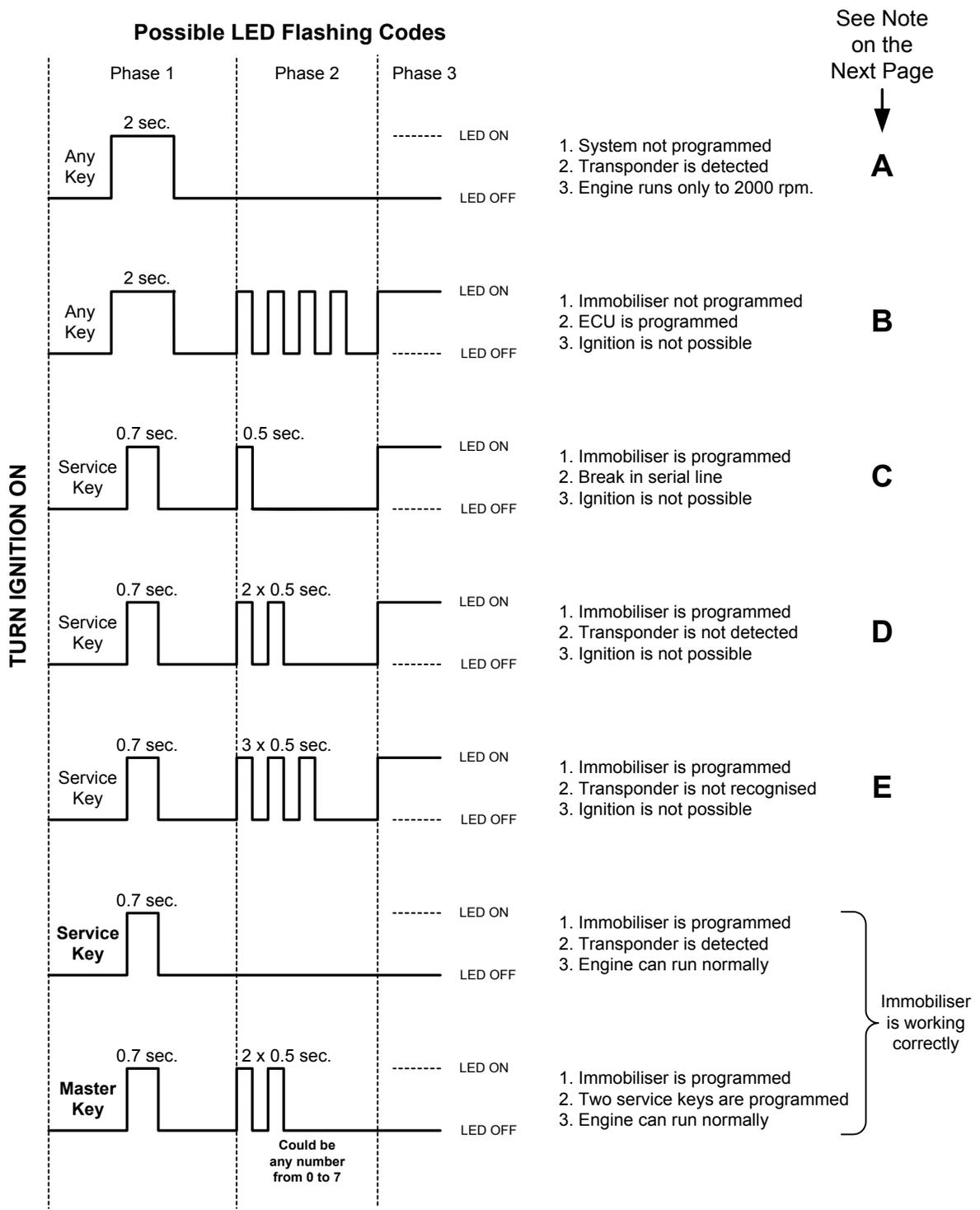
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EXPLANATION

The 500 cc Master engine has separate immobiliser and ECU.
Once the system is programmed the ECU and immobiliser are irrevocably linked to the brown master key.

Keys should not be on a metal key ring or with other keys. Sometimes this can upset the system.

For a full explanation of fault finding please see the Service Station manual.



Master Immobiliser

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NOTES

LED flashing code notes.

A. System is not programmed.

The LED gives a single two second flash. The Engine management light will be on.
You should get this code when you have fitted a new immobiliser and ECU.
The immobiliser system is working correctly and only needs programming.

B. Immobiliser is not programmed, ECU is programmed.

The LED gives one long flash, then four short flashes, LED then comes back on.
Programming the immobiliser is only possible if the original master key is used.
If the original master key (chip) is not available then you must change the ECU as well.

C. Break in the Serial line.

A single short flash, pause, then a second short flash, LED then comes back on.
Either there is a break in the orange / white wire between the immobiliser and ECU (serial line) or if the vehicle has a "fall over cut out" fitted it could be that.
If the cut out is active it shorts the serial line to earth.
The fall over sensor is located behind the fuel tank (Nexus) in a rubber mounting.

The fall over sensor
must be mounted
THIS WAY UP



D. Transponder is not detected.

A single short flash, then two short flashes, then comes back on.
The chip in the key has not been seen.
Either there is a fault with the key or the aerial.
If you have another key try that, if it is still not detected it is probably the aerial or it's wires.
Un-plug the aerial from the immobiliser and check for continuity.
Check that the aerial is correctly located and secure in it's mounting.

E. Transponder is not recognised.

A single short flash, then three short flashes, then comes back on.
The chip is seen be is not recognised. The key is not programmed into the immobiliser.
You are using the wrong key or it needs to be programmed into the immobiliser memory.

Master Immobiliser

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PROGRAMMING

Programming.

Notes.

1. It is not possible to re-program an immobiliser unit to a new master key.
Once it has been programmed it is irrevocably linked to that master key.
2. It is not normally possible for an immobiliser to lose its program and then need re-programming.
If it was programmed and working but now it is saying that it is not programmed, First, check the HT lead and plug cap, It is possible that extreme electrical interference from a faulty HT circuit could upset the immobiliser.
Plug cap must be at least 5000 ohms. Change the cap and lead if suspect.
Also a resistor spark plug must be used.
Then try re-programming the immobiliser.
If it will not re-program then it is faulty.

Programming a new immobiliser.

1. Do not attempt to program a new immobiliser until you know that the fault is cured.
Connect the new immobiliser, use the service key (not the brown master key)
LED will give one long flash then go out and stay out. System is working correctly, Immobiliser is not programmed
The engine should start but will not rev above 2000 rpm until the immobiliser is programmed.
 2. To program a new immobiliser
 - * Insert the brown master key and turn on for two seconds
 - * Insert the service key and turn on for two seconds
 - * (any extra service keys are included here)
 - Insert the extra service key and turn on for two seconds
 - * Insert the brown master key and turn on for two seconds
- * The timing of the two seconds can be critical so use a watch to time it, you may need to do the sequence several times before it is accepted.
- * Changing from one key to the next should be done within ten seconds.
- * An extra service key is not just added, you must go through re-programming all the keys as above.
You are not re-programming the master key, the master key is giving permission for the service keys to be added.
- * It is not the keys that are programmed.
The immobiliser is being programmed to recognise the keys.
- * You do not need to start the engine just to check if the programming has been successful, Just turn on the ignition and watch the LED.
One short flash (half second) means the programming was successful.
One long flash (two seconds) means the system is still not programmed.