

EUROPEAN SECURITY
Volkswagen Passat smart key
evaluation
November 2006

SAMPLE



The Authors

M. Rhodes
G. Acott

Report ref:
SBD/SEC/1990

SBD.

Overview

SBD is an independent company providing specialist consultancy in the design and development of automotive components and systems. The company founded in 1995 has extensive knowledge of the strategic development of vehicle systems.

Working closely with manufacturers and suppliers, SBD provides consultancy at various levels including:

- Technical Research**
- Strategic Planning**
- Program Management**
- Product Development.**

SBD also provides the industry with detailed market and technical reports on various technologies, market trends and competitor analysis.

The company has helped to develop many successful systems seen in the market today and is continuing to help manufacturers implement the next generation of systems with an emphasis on *Vehicle Security* and *Vehicle Telematics*.

For more information, visit www.sbd.co.uk

This report is intended for the addressee only, and may contain confidential or privileged information that is not available to the general public. You are being sent this information because you are known and trusted by SBD. We therefore expect the information to be handled in a responsible and sensitive manner.

The views expressed in this report are those of SBD only, and we do not take responsibility for any misinterpretation based on the information contained in this report. Vehicle testing reports can only be considered to represent the specific vehicle being tested at that time, and are not necessarily representative of the complete range of vehicles and models available.

Contents

1. Executive Summary	5
1.1 Conclusion.....	5
1.2 Summary of performance.....	5
2. Introduction	7
3. Performance evaluation summary	8
3.1 Smart Entry Performance.....	8
3.2 Smart Start Performance.....	9
3.3 Summary of UK insurance prediction.....	12
4. Locking system operation	13
4.1 Overview	13
4.2 Smart entry mode.....	14
4.3 Keyless entry mode.....	17
4.4 Mechanical key mode.....	18
4.5 Selective unlock	20
4.6 Other locking features	20
4.6.1. <i>Locking status LED</i>	20
4.6.2. <i>Internal central locking switch</i>	21
4.6.3. <i>Trunk Release Button</i>	21
4.7 Observations and anomalies.....	22
4.7.1. <i>Locking the remote control in the vehicle</i>	22
4.7.2. <i>Water Sensitivity</i>	22
4.7.3. <i>Power save</i>	23
4.7.4. <i>Faulty Capacitive handles</i>	23
5. Smart start operation	24
5.1 Overview	24
5.2 Smart start.....	24
5.2.1. <i>Smart start procedure</i>	25
5.2.2. <i>Smart Engine off procedure</i>	26
5.3 Display messages	26
5.4 Emergency key.....	27
5.5 Trunk coverage	28
6. Performance against Thatcham criteria	29
6.1 External smart entry operating range	29
6.2 Immobiliser un-setting	31
6.3 Drive away without remote control	35
7. Smart key system functionality	37

List of figures

Figure 1. Summary of performance	5
Figure 2. Test vehicle	7
Figure 3. Performance prediction against Thatcham Smart Key criteria	12
Figure 4. Remote control	13
Figure 5. Location of smart system components	14
Figure 6. Smart entry unlocking	15
Figure 7. Smart entry locking	15
Figure 8. External trunk opening	16
Figure 9. Keyless operation buttons	17
Figure 10. Mechanical emergency key location	18
Figure 11. Key cylinder (Driver's door)	19
Figure 12. Emergency locking process	19
Figure 13. Status LED	20
Figure 14. Internal locking switch	21
Figure 15. Internal trunk release switch	21
Figure 16. Water sensitivity of handles	22
Figure 17. Start button positions	25
Figure 18. Meter display messages:	26
Figure 19. Emergency start procedure	27
Figure 20. Remote used for emergency start	27
Figure 3. Thatcham maximum allowed exterior range	29
Figure 4. External smart entry operation range	30
Figure 23. Thatcham guideline on exterior leakage	31
Figure 24. Rear glass to bumper dimension	32
Figure 25. Exterior leakage – Side door measurement	33
Figure 26. Exterior leakage – Trunk measurement	34
Figure 27. Interior smart operating range	35
Figure 5. Explanation of <i>flowchart</i> colour scheme	37
Figure 6. <i>Lock</i> ~ smart entry	37
Figure 7. <i>Lock</i> ~ keyless entry	38
Figure 8. <i>Lock</i> ~ mechanical key	38
Figure 32. <i>Unlock</i> (from locked) ~ smart entry	39
Figure 33. <i>Unlock</i> (from locked) ~ keyless entry	39
Figure 34. <i>Unlock</i> (from locked) ~ mechanical key	40
Figure 35. <i>Unlock</i> (from double-locked) ~ smart entry	40
Figure 36. <i>Unlock</i> (from double-locked) ~ keyless entry	41
Figure 37. <i>Unlock</i> (from double-locked) ~ mechanical key	41
Figure 38. <i>Lock</i> (from double-locked) ~ smart entry	42
Figure 39. <i>Double-lock</i> (from locked) ~ smart entry	42
Figure 40. <i>Unlock</i> (from double-locked) ~ smart entry from trunk	43
Figure 41. <i>Engine starting</i> operation	44
Figure 42. <i>Engine stopping</i> and steering lock <i>engagement</i>	45

1. Executive Summary

フォルクスワーゲン (VW) のパサットは、xx 製のスマートキー・システムが装備された最初の VW 車である。(アウディ/フォルクスワーゲングループの他のシステムは xxxxx 製) このシステムは、VW 内では「KESSEY」と呼ばれており、欧州市場向けの右ハンドル、左ハンドル車共に、ほとんどのモデルにオプション装備できる。VW のパサットは「D」クラスで、アウディ A6、ボルボ S4、BMW 3 シリーズなどと競合するが、これらの競合モデルにはすべてスマートキー・システムが用意されている。

The VW Passat is the first model from VW to be equipped with a smart key system supplied by xxxxxx (other systems within the Audi/VW group are supplied by xxxxx). VW refer to the system as “KESSEY” and is available as an option on most models in both RHD and LHD European markets. The VW Passat is a “D” segment model and competes with models including the Audi A6, Volvo S40 and BMW 3-series, which all offer smart key systems.

1.1 Conclusion

これはよく考えられたシステムで、なかなかすばらしい機能を備えている。表示画面には、システムの状況を示すわかりやすいメッセージが表示され、ユーザーによる操作が必要なおくには、ユーザーに合図が送られるようになっている。スタートスイッチは xxxxxxxx の押しボタンで、xxx、この種の xxxx 機能を備えたタイプとしては、SBD は始めてこのようなシステムを試験した。どのようにエンジンを始動させるのかユーザーにとってわかりやすく、又メッセージ表示で何をすべきか明確な指示が与えられる。しかし、スイッチは xxxxx で、操作に xxxxxxxx、システム全体の質が xxxxxxxx ような印象を与える。

The system is well thought out and offers the user a good range of features. A display screen gives clear messages about the system status and prompts the user when an input is required to operate the vehicle.

The xxxxxxxx push button start switch is xxxxxxxx and is the first system SBD has tested which incorporates this type of xxxxx mechanism. It is easy for the user to understand how to start the engine and the message display gives clear direction as to what needs to be done. The switch is however xxxxxxxx xxxxxxxx in its performance and gives a xxxxxx quality feel for the system overall.

xx (システムの供給元) から出されている技術的な宣伝資料によれば、システムの反応時間が、市場の他のシステムよりも優れているとのことであるが、スマートエントリーに関しては、システム反応時間は、xxxxxxx、xxx、xx というのが、SBD の判定である。

Technical promotional material from xxxxxxx (the system supplier) suggests that the system response time is superior to other systems on the market. SBD found the system response time for smart entry xx xx xx, xx xxxxx, xxxxxxxx xxx xxxxxxxx xx xxxxxxxxxxxx xxxxx xxxxx xxxxxx xxxxxxxx xxxxxxxx xx xxx xxxxxxxx.

VW パサットのスマートキー・システムは、スマートエントリー、スマートスタートの両方とも、xxx xxxxxxxxxxxxxxxxxxxxxx。SBD が試験した結果、システムは、Thatcham の防犯要件を xxxxxxxx。

The VW Passat smart key system operates in xxxxx xxxxxxx zones for both smart entry and smart start. The system xxxxx xxx Thatcham’s security requirements as tested by SBD.

1.2 Summary of performance

下表 1 には、性能に関する、SBD の調査結果がまとめられている。スマートエントリー、スマートスタート共に、便宜性、機能性、防犯性の 3 面で評価した。評価は、顧客の期待するレベル、競合他社のシステム、また車両防犯性などに関する SBD の経験に基づいて行った。防犯面では、Thatcham のスマートキー基準、および SBD が防犯面で問題点となりうると思われる、その他の面について評価を行った。

Figure 1 below summarises the performance findings from SBD’s investigation. Both *Smart entry* and *Smart start* were judged in three main areas of Convenience, Features & Security. The evaluation is based on SBD’s experience of customer expectation, competitor systems, and vehicle security. In the area of security the vehicle was assessed against Thatcham’s smart key criteria and against additional items judged by SBD as potential security issues.

図 1 : 性能のまとめ

Figure 1. Summary of performance

Criteria	Smart entry	Smart start
Convenience	★★★★ Excellent	★★★ Good
Features	★★★ Good	★★ Average
Security	★★★ Good	★ Poor

Source: SBD 2006

2. Introduction

Volkswagen refer to their Smart key system for the Passat as KESSY, it provides both *smart entry* (locking and unlocking) and *smart start* (engine starting and stopping) functions. The KESSY system is available as an option a wide range of models throughout Europe The option cost (dependant on grade) is typically £305~£360 in the UK and €415~€465 in Germany.

The Passat is the first car to use the xxxxx smart key system which utilizes dedicated capacitive touch sensors for lock and unlock. It was introduced to the market in the second quarter of 2005.

Technical literature from xxxxx states "Exterior handles detect the approach of the ID transmitter and wake the system."

This report covers a detailed investigation into the functionality, performance and features of the xxxxx smart key system as fitted to the VW Passat test vehicle shown below in Figure 2.

Figure 2. Test vehicle



- Model ~ Passat
- Grade ~ Highline
- Specification ~ LHD Germany (4 door)
- Engine ~ 2000cc TDI
- VIN ~ XXXXXXXXXXXXXXXXXXXX

Source: SBD 2006

The only available test vehicle was from Germany which was the *luxury* model and came equipped with double-locking, perimeter alarm, selective unlock and drive away locking. Despite the originating from the German market the vehicle was tested (by SBD) to the UK Thatcham criteria for smart key systems. From the results of tests it is almost certain that the German test vehicle is representative of a UK specification with respect to the smart key system.

6. Performance against Thatcham criteria

In November 2004 the Motor Insurance Repair Research Centre (Thatcham) published their criteria for *smart entry and smart start systems evaluation*. Thatcham declare the purpose of this document as;

“To enable motor manufacturers developing smart entry/smart start systems to gain acceptance by the British Insurance Industry’s Criteria”

Since this time, whilst there has been no official update of the criteria, however, Thatcham have unofficially updated the test procedure in line with practical requests from vehicle manufacturers.

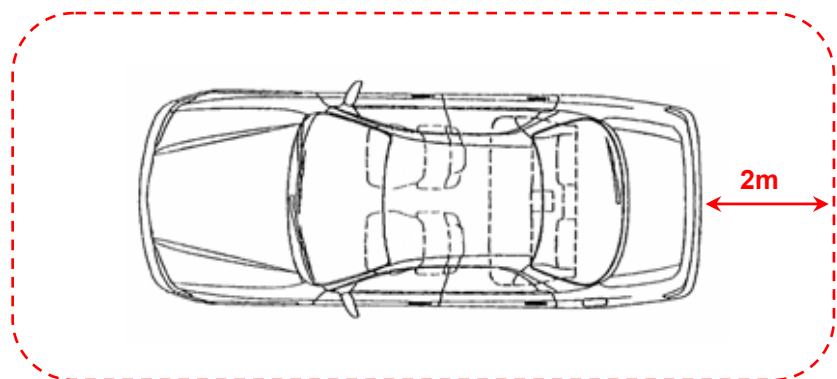
The significant updated areas relate to the allowable leakage outside of the vehicle under which the system will recognise the smart key and allow the engine to start which has been increased from 100mm to 200mm.

Thatcham are currently reviewing their criteria and expect to release an update later this year (2006). The Volkswagen Passat under evaluation in this report was judged by SBD against the new unofficial test criteria known to be in force by Thatcham. The results and key points are highlighted in this section of the report for reference.

6.1 External smart entry operating range

If a user was to inadvertently leave the *remote control* in a position within the smart external operation range, then the vehicle will be effectively unlocked. The larger the range, the more likely the situations where this may occur, (such situations include a car parking area immediately adjacent to an owners house). Thatcham set a limit of 2m maximum on the smart entry operating range, measured perpendicular to the vehicle perimeter.

Figure 21. Thatcham maximum allowed exterior range



Source: SBD. 2006

❑ **External smart entry operating range result**

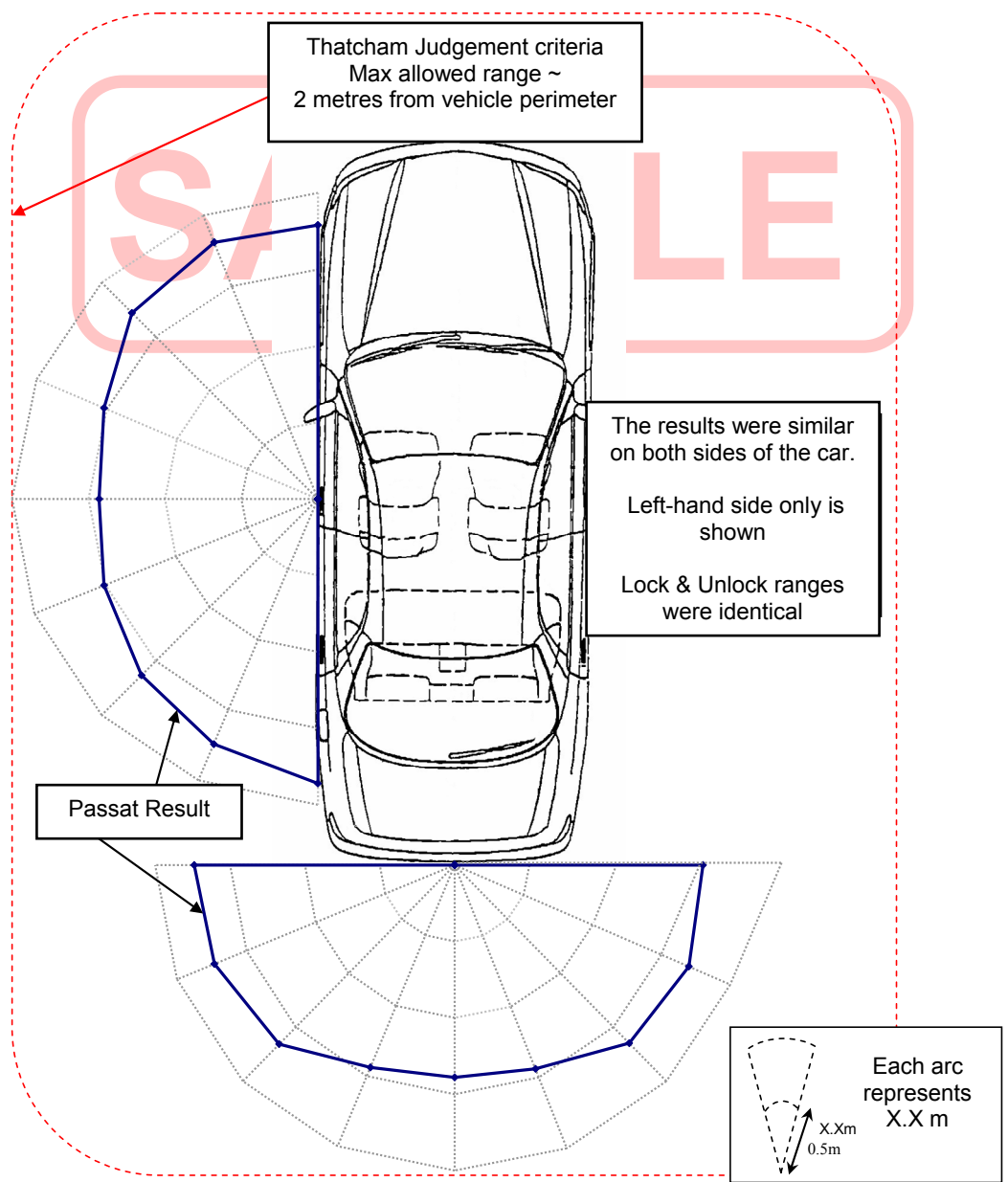
SBD assessed the Volkswagen Passat to establish the external smart entry operation range. The detailed results are illustrated in Figure 22 below, and show that the system as tested meets Thatcham's requirements for smart operating range.

Maximum perpendicular lock range = X.XXm

Maximum perpendicular unlock range = X.XXm

All results meet the Thatcham requirement of less than 2 metres.

Figure 22. External smart entry operation range



Source: SBD 2006

7. Smart key system functionality

The system functionality is explained in flowcharts and tables. Figure 27 (below) gives an explanation of the basic colour scheme used throughout the flowcharts.

Figure 28. Explanation of *flowchart* colour scheme

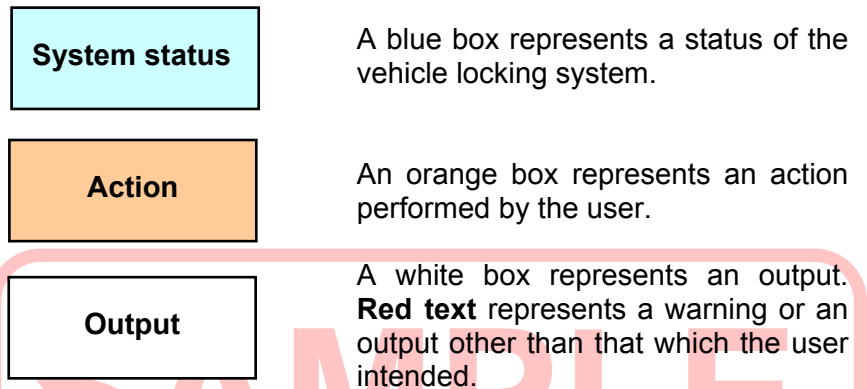
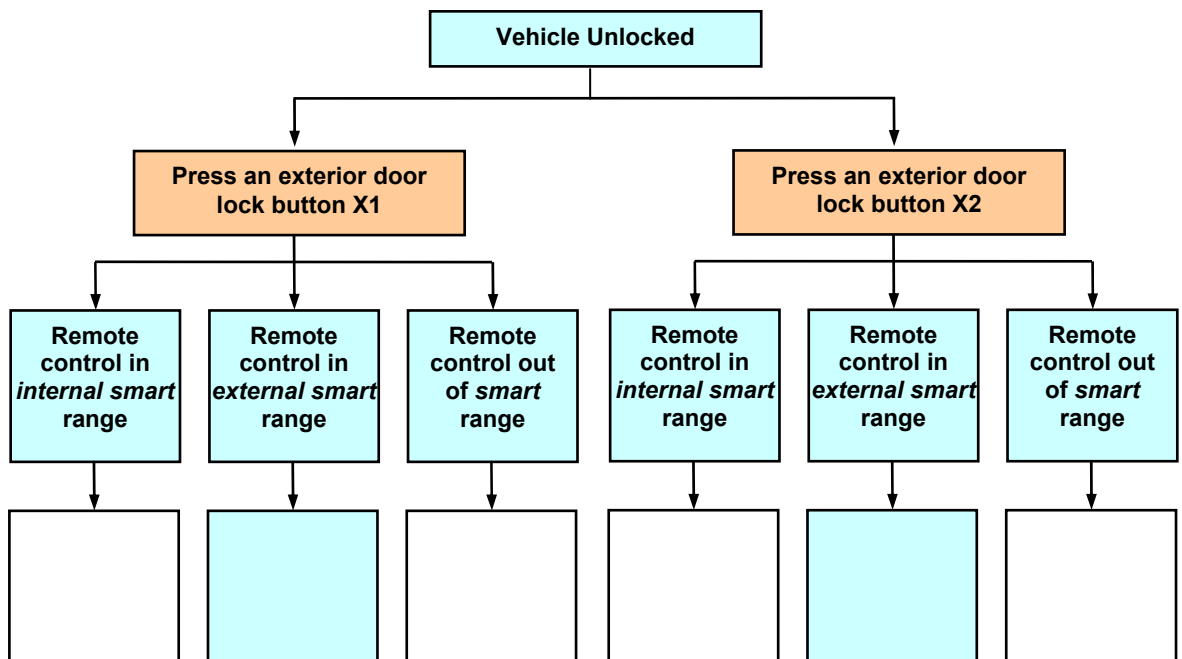
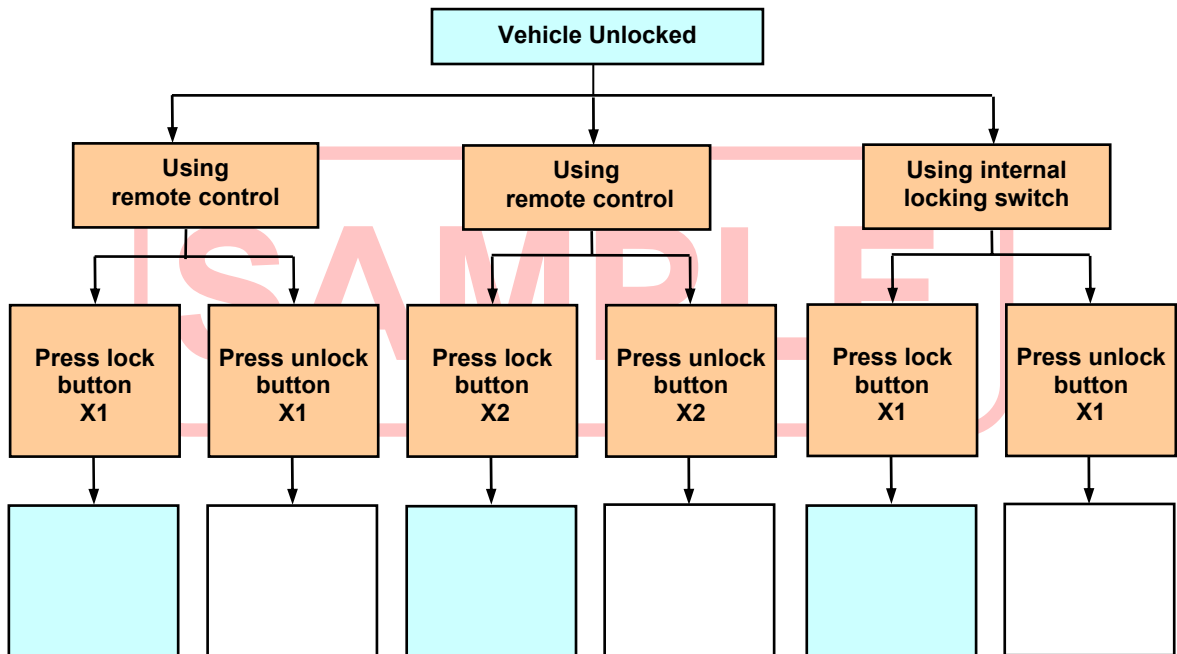


Figure 29. *Lock* ~ smart entry



Source: SBD 2006

Figure 30. *Lock* ~ keyless entry

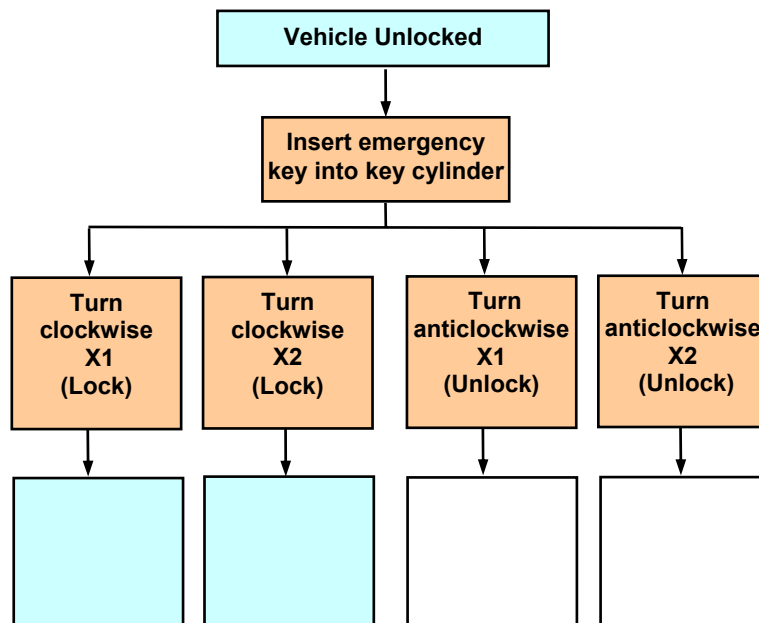


Notes

① Lock motor actuators are driven to stall

Source: SBD 2006

Figure 31. *Lock* ~ mechanical key



Notes

① Lock motor actuators are driven to stall

Source: SBD 2006