



Control Manual SE5000-8.1 Smart Tachograph



Important

The Stoneridge tachograph SE5000-8.1 has full type approval for use in the European union according with Commission Regulation (EU) 2016/799 of 18 March 2016 amended by Commission implementing regulation (EU) 2021/1228 of 16 July 2021 – M3 and other related legislatives.

The Approval Certificate number will be indicated on all Stoneridge tachograph.

The tachograph fulfils the requirements of UNECE regulation number 10, revision 05, in respect of electromagnetic compatibility.

Tachograph Version

Smart Tachograph SE5000-8.1.

Type approval number: e5 0002

This manual is designed for revision A

Internet Information

Further information about Stoneridge SE5000-8.1 Smart Tachograph and about Stoneridge can be found at:

www.stoneridgeelectronics.com

Copyright

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Changes

Stoneridge Electronics reserves the right to introduce changes in design, equipment, and technical features at any time. You cannot, therefore, base any claims on the data, illustrations or descriptions in this Manual.

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Introduction

This manual concerns the control mode of operation. However, knowledge of the operational mode of the unit is also required in case of driving a tachograph fitted vehicle.

A Stoneridge tachograph can be operated in one of four modes of operation:

- Operational (driver card or no card inserted)
- Control (control card inserted)
- Calibration (workshop card inserted)
- Company (company card inserted)

Company Lock-in/Lock-out details can be used to identify the true owners of blocks of stored tachograph data. Enforcement officers should encourage companies to Lock-in tachograph data as it not only identifies their company as the owner of the data, but also prevents third party company card owners from viewing or downloading their data.

Also, when transferring ownership of a tachograph to another company, the current tachograph owner must Lock-out the data before transfer of the tachograph. Thus any future data stored after the Lock-out would be clearly identified as not applying to them.

Due to data protection laws, care must be taken to ensure that the tachograph data is not downloaded and passed on to third parties without the permission of the tachograph owner.

The control card can be inserted in either of the trays. If control cards are inserted in both trays the card in tray 1 will be used for the control operation and the card in tray 2 will be ignored.

The Control Card

- Must be obtained via an application to the relevant authorities.
- Is valid for 2 years only.
- Will only be issued to enforcement officers or enforcement authorities.
- Are personal to the enforcement officer and authority and is not transferable.
- Allows read-only access to data stored in the driver card or in the tachographs internal memory respectively.
- Can store a minimum of 230 records of displaying and/or printing and/or VU downloading and/or card downloading. The maximum number of records is dependent on the card type. When the upper limit is reached the oldest data will be overwritten.

Note!

Extra care must be taken to ensure that only the authorised owner of a control card has access to it at all times.

Don't open the Case

The tachograph has been installed by authorised personnel.

A tachograph case must never be opened. No tampering with or modifications to the tachograph are permitted. A tamper label is placed inside the printer housing. The tamper label must not be torn apart.

Here you can see where the tampering label is placed and how it looks when it is untouched.

- The label itself will be red
- On the left-hand side of the label there will be a security ink section
- On the right-hand side Stoneridge Electronics AB and a data matrix code (contains the serial number of the Tachograph) is printed



A tampered label might look like this, and a few examples to check for.

- Void appears as text on the label
- Not correctly attached on the tachograph
- The red label is damaged
- The security ink on the left is broken



Introduction

Note!

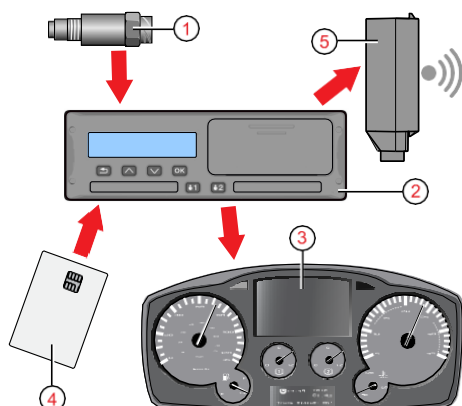
The tampered label in the image above is missing the security ink on the right side of the label.

Note!

Unauthorized persons that modify this equipment are committing a punishable offence, depending on the legislation in the country concerned.

Overview

The Tachograph installation.



1. Encrypted motion sensor
2. Smart tachograph, with integrated display and printer
3. Display in vehicle's instrument cluster
4. Card
5. DSRC (Dedicated short-range communications)

Motion Sensor (1)

Used to provide the tachograph with speed signal pulses from the vehicle gearbox. To ensure the integrity of the speed sensor signal, the speed signal is transferred between the sensor and the tachograph in an encrypted form. Encrypting the speed signal ensures that any tampering with the signal will be detected and recorded.

Smart Tachograph (2)

The tachograph records and stores various data:

- Workshop or driver card data.
- Warnings and malfunctions relating to tachograph, driver, company and workshop.
- Vehicle information, odometer data and detailed speed.
- Tampering the tachograph. For more information on the tachograph, see the Driver & Company Manual.

Display in Instrument Cluster (3)

The display in the instrument cluster can be used to display information passed from the tachograph, such as speed (speedometer) and distance travelled (trip and odometer).

Control and Driver Card (4)

The following cards dedicated for specific usage can be used in the tachograph:

- Driver card - records the drivers activities.
- Control card - authority control and inspection.
- Workshop card - calibration mode.
- Company card - hauliers and vehicle owners, down loading and storage of data.

Note!

All cards are personal and may not be used by anyone else but the rightful card holder.

DSRC (5)

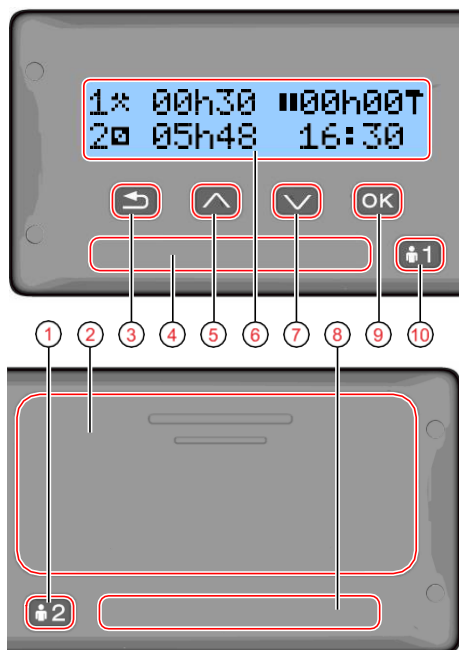
The DSRC, is a unit that is separate from the vehicle unit, and it is used to perform targeted roadside checks via a wireless communication link.

User Interface

The tachograph detailed within this manual comprises two card tray mechanisms, a printer, an LCD display, a calibration/download interface (6-pin connector located behind paper cassette) and user controls, located in an ISO standard radio enclosure. This type of enclosure enables mounting in a variety of locations, ensuring that insertion and removal of the driver cards and operation of the controls can be easily achieved by an operator.

The tachograph complies with EU Regulations and displays and records speed and distance in metric units (kilometres per hour and kilometres respectively).

The tachograph also incorporates an internal clock, which is used to indicate the current time on the tachograph display. The tachograph is available for use in both 12 and 24 V vehicle systems.



1. Co-driver button
2. Printer, 6-pin calibration/download connector, behind the paper cassette
3. Back button
4. Driver card tray
5. Up button
6. Display
7. Down button
8. Co-driver card tray
9. OK button
10. Driver button

Downloading Data

General

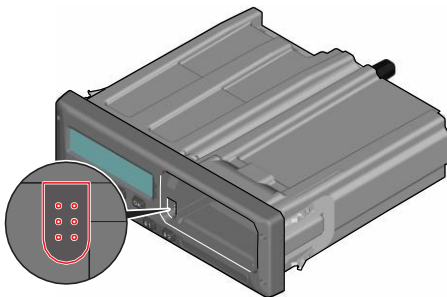
An enforcement officer can download data from a smart tachograph system. Downloading means the copying, together with a security digital signature, of a partial or a complete set of data that is stored in the memory of a tachograph or on a driver card.

The download must be done to aid investigations into “Drivers Hours” legislation checks and to aid determination of the validity of the smart tachograph systems. When carrying out “Drivers Hours” investigations, care must be taken to identify the true owners of blocks of stored tachograph data.

Dedicated download equipment or a valid control card is essential for the downloading of the data stored in the tachograph or on the driver card.

Download Equipment

Behind the paper cassette is a 6-pin connector located. This is where the required downloading equipment is connected.



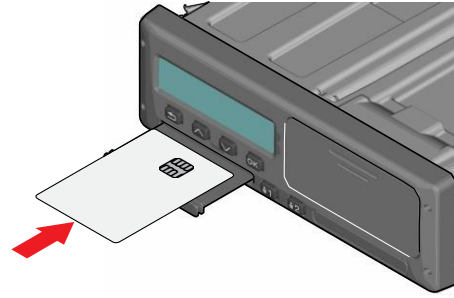
Control Card

A valid control card is required to download or to view driving data stored on either an inserted driver card or in the tachograph's data memory. The control card provides read-access to the entire tachograph data memory contents whether or not the data has been company locked using a valid company card.

Inserting a Control Card

Insert the control card in either of the trays (No. 1 in our example).

1. Press and hold button **1** on the tachograph until the tray is opened.
2. Insert the card with the chip facing forward and upwards.
3. Close the tray by pushing it carefully forward.



The control card must be inserted to identify the controller/user.

4. Close the tray by pushing it in carefully. The tachograph now processes the control card data. If the control card authentication fails, see **Display Messages** on page **22**.

The card tray is locked when the vehicle is in motion, while the tachograph is busy processing the control card and if the power supply to the tachograph is interrupted.

Eject a Control Card

1. Press button **1** or **2** on the tachograph and hold it until the tray opens.
2. Press the card up slightly from underneath through the opening on the tray, or push the edge of the tray down until the card pops out.
3. Close the tray by pushing it carefully forward.

Note!

Withdrawal of the Control Card is not possible in all menus.

Storing Data

When a control card is inserted into a tachograph in order to perform a control activity, a record of the control activity is stored on the control card and in the tachograph as described below. The type of controls that can be performed are displaying, downloading or printing data from the tachograph and/or the card.

Storing Data on the Control Card

On the control card a single record will be stored. This record contains the following:

- The card number.
- The issuing Member state, issuing authority name and the issue date.
- The beginning of card validity date, and card expiration date.
- The control body name and address.
- The surname and forename of the card holder.
- The preferred language.

Downloading Data

Each time a control card is used to carry out a control activity the following data is stored on the control card:

- The date and time of the control activity.
- The type of control activity performed.
- The period downloaded, if applicable.
- The VRN (Vehicle Registration Number) and Member State registering authority of the controlled vehicle.
- The card number and card issuing Member State, of the controlled driver card.

Storing Control Activities in the Tachograph

Each time a control card is used to carry out a control activity a record of the activity is stored in the tachograph. The data in each record is:

- Date and time of the control.
- The control card number and card issuing Member State, and card generation.
- The type of control.

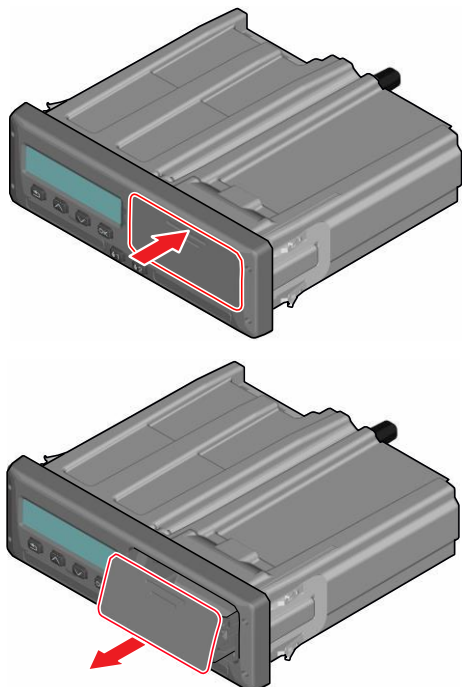
Note!

In case of downloading, the date of the oldest and most recent days downloaded must also be recorded.

Downloading Data

To download data do the following:

1. Remove the paper cassette.



2. Attach the download equipment to the tachograph through the 6-way front download connector.
 3. Start downloading data according to the instruction on the download equipment.
- When the download is completed, the following message will be displayed.

`Download complete`

If the download process has failed and is incomplete the following message will be displayed:

`Download failed`

If the download fails:

4. Remove the control card.
5. Check the connections.
6. Check the download equipment.
7. Re-insert the control card and redo the process until downloading is made.

If the data download cannot be completed and the following message is displayed:

`Download fault`

The tachograph is found to be the cause or if it is unsure whether the card or the tachograph is faulty, the vehicle must be taken to a Tachograph Workshop for investigation.

System Inspection

General

The control function involves a number of different functions associated with the smart tachograph system. A tachograph inspection is done to ensure that it still meets the EU legislation requirements.

For example, downloading and checking the data stored on either the driver card or in the tachograph internal memory, and an inspection of the tachograph system.

Note!

If any unit fails the inspection the vehicle must be taken to a Workshop for further investigation.

Visual Check

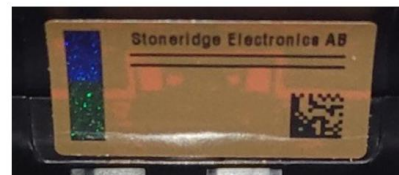
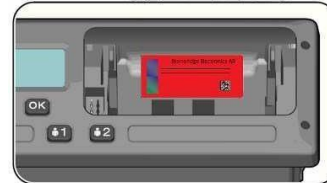
1. Ensure that there is no damage to or drill-holes in the entire exterior casing including underneath rubber acorn, which would imply a tampering attempt.
2. Check for evidence of tampering with the seals and labels.
3. Check for additional seals and labels that do not belong to the tachograph, as they might cover drill-holes.
4. Check that the heat seals is present.
5. Check that the predetermined breakpoints are unbroken (to support Opening Failing Card Trays).



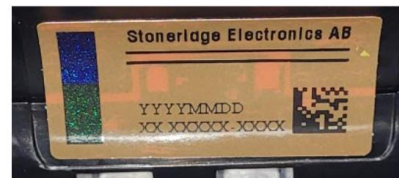
A. Predetermined breakpoint.

6. Check that all tachograph system seals are intact.
7. Confirm the presence of the installation plaque.
8. Check that the tamper label is valid and intact:
 - The label itself will be red.
 - On the left-hand side of the label there will be a security ink section.

- On the right-hand side Stoneridge Electronics AB and a data matrix code (containing the serial number of the VU) will be printed.



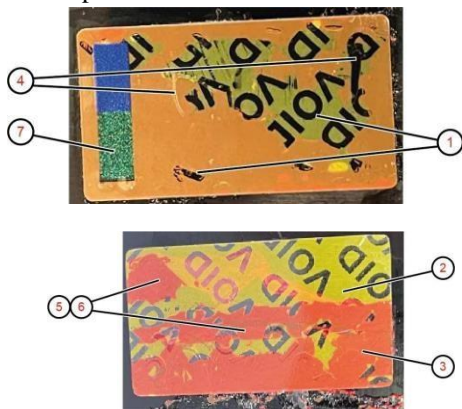
Stoneridge default print



MAN customer print

System Inspection

A tampered label might look like this, and a few examples of what to check for:



1. “VOID” text is visible under the label
2. Label color has turned from red to yellow
3. Label color is not red-brown and has turned to tomato-red
4. Label has some cut ins or pieces missing.
5. Stoneridge print is missing, or placement is wrong
6. Security ink on the left is broken.
7. Color shift will not appear on security ink or sparkling effect missing, see following chapter.
8. Surrounding material has visible traces of cuts, deformations or color variations.
9. Not correctly attached to tachograph.

Inspection Procedure

Follow this procedure to confirm that the function of the recording equipment is correct (*some listed points may need the unit to be removed from the fixture*):

1. Check that the operation of the recording equipment including data storage on cards is satisfactory.
2. Determine that the tachograph operates within maximum tolerances for both speed and distance

3. Compare that the actual circumference and tyre size corresponds with the information on the installation plaque.
4. Check the internally stored calibration factors according to the installation plaque with a technical printout.
5. Check the internally stored vehicle parameters, VIN (Vehicle Identification Number) and VRN (Vehicle Registration Number) and compare to the actual vehicle data with a technical printout.
6. Check the correctness of UTC time
7. Check if the Serial Number is the same on the seal label, technical printout and on the laser mark on the casing (*to see the laser mark, the unit need to be removed from the fixture*)

Methods to see Color Shift

Tamper label have two different security inks, which will have color shifts depending on viewing angle:



Upper ink: Blue/violet.
Lower ink: Green/blue.

Color shift is best visible when viewed from the bottom left corner. Use a flashlight with direct beam.

Note!

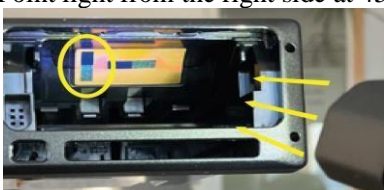
Middle horizontal ink to be ignored! This is not part of the security label.

1. Point light perpendicular to the label.



Upper ink: Blue
Lower ink: Green

2. Point light from the right side at 45°-50°.



Upper ink: Violet
Lower ink: Blue

Installation Plaque

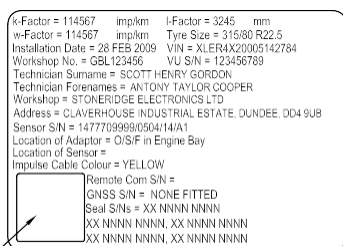
The final part of the smart tachograph system installation procedure is the completion and fitment of an installation plaque.

The installation plaque must be clearly visible and easily accessible. The installation plaque is normally placed on the recording equipment, the vehicle's "B" pillar or the doorframe on the driver's side of the vehicle.

The installation plaque state the following:

- Name, address, or trade name of the approved fitter or workshop.
- Constant of the tachograph, K factor (imp/km).
- Characteristic coefficient of the vehicle, W factor (imp/km).
- Effective circumference of the wheel tyres, L factor (mm).
- Tyre size.
- Vehicle Identification Number (VIN).
- Date of calibration.
- Information that the GNSS facility is internal.
- Serial number of the DSRC unit.
- Load type of the vehicle (Goods or Passenger)
- Serial numbers of the seals in place (up to 5).
- If motion sensor is not connected to the gearbox the other location needs to be specified

Additional data shall be included if a MIN1-adaptor is used.



HOLO GUARD LABEL

Pictograms

Symbols

This is a list of the most frequently shown symbols on the display and on the printouts.

| Symbol | Description |
|-----------------|---|
| | Function not available |
| | Driver or slot |
| | Co-driver or slot |
| | Card |
| | Eject |
| | Work |
| | Driving / driver (Operational mode) |
| | Rest / break |
| | Available |
| | Ferry / train crossing |
| OUT | Out of scope, -i.e. no activities time durations are calculated |
| | Local time / location |
| | Start of daily work period |
| | End of daily work period |
| | Break |
| | From or to |
| | Printer, printout |
| | Paper |
| | Display |
| | Processing, please wait |
| | Time, clock |
| UTC | UTC time |
| 24h | Daily |
| | Weekly |
| | Two weeks |
| Σ | Total / summary |
| > | Speed |
| >> | Over speeding |
| X | Faults |
| ! | Events |
| ? | Pre-warning/question/unknown activity / undefined load type |
| | Workshop / calibration mode |
| | Company / company mode |
| | Controller / control mode |
| | Manufacturer / not activated |
| | Security / authenticated positions / seals |
| | External storage / download |
| | Buttons |
| | Finished |
| | Tachograph (VU), vehicle |
| | Tyre size |
| | Sensor |

| Symbol | Description |
|----------|--------------------------------------|
| | Power supply |
| | Print |
| | Print, submenu |
| | Company lock |
| | Places |
| | Places, sub menu |
| | Settings |
| | GNSS positioning facility |
| | ITS interface |
| | Remote communication facility (DSRC) |
| | Load operation |
| | Unload operation |
| | Simultaneous load / unload operation |
| | Load type: Passengers |
| | Load type: Goods |
| | Digital map / border crossing |
| | Manual entry of driving activities |
| X | RHMI |

Symbol Combinations

The following combination of symbols are the most common.

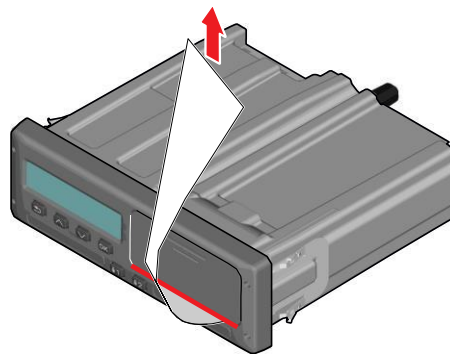
| Symbols | Description |
|--------------|---|
| | Location start of daily work period |
| | Location end of daily work period |
| | From time (UTC) |
| | To time (UTC) |
| | Local time |
| | Crew driving |
| | Driving time for one week |
| | Driving time for two weeks |
| OUT → | Out of scope - begin |
| → OUT | Out of scope - end |
| | Ferry/train mode - begin |
| | Ferry/train mode - end |
| | Cumulative driving time of current day |
| | Printer low temperature |
| | Printer high temperature |
| | No card |
| | Driver card |
| | Workshop card |
| | Company card |
| | Control card |
| | Control place |
| | From vehicle |
| | Position after 3 hours accumulated driving time |
| | Position where the vehicle has crossed the border between two countries |
| | Position where a load operation has occurred |

Pictograms

| Symbols | Description |
|---------------|---|
| □□ | Position where an unload operation has occurred |
| □□ | Position where a simultaneous load/unload operations has occurred |
| 24h □□ | Daily (24h) activities from card |
| 24h □□ | Daily (24h) activities from tachograph |
| !□□□ | Events and Faults from card |
| !□□□ | Events and Fault from tachograph |
| □□□ | Technical data |
| □□□ | Over speeding |
| □□□□ | Historic of inserted cards |
| ! | Insertion of a non-valid card |
| !□□ | Card conflict |
| !□□ | Time overlap |
| !□□ | Driving without an appropriate card |
| !□□ | Card insertion while driving |
| !□□ | Last card session not correctly closed |
| □□ | Over speeding |
| ! | Power supply interruption |
| ! | Motion data error |
| !□□ | Vehicle motion conflict |
| ! | Security breach |
| ! | Time conflict / time adjustment |
| □□ | Over speeding control |
| ! | Absence of GNSS position |
| ! | Communication error with DSRC unit |
| !□? | GNSS Anomaly |
| □□1 | Card fault (driver slot) |
| □□2 | Card fault (co-driver slot) |
| □□ | Display fault |
| □□ | Downloading fault |
| □□ | Printer fault |
| □□ | Sensor fault |
| □□ | VU internal fault |
| □□ | GNSS fault |
| □□ | DSRC fault |

Printouts

You can view the information stored in the tachograph and on the driver cards by printing it on paper or by showing it on the display. There are a number of different presentations available, which you can read more about in **Printout Examples below**



Printout Data

1. Press **OK** to show the menu and select:
PRINT
2. Press **OK** and select the type of printout to make.
Then press **OK**.

Some types of printouts require specification of the driver card and a date. If so the following is displayed:

select card 1 or 2

3. Select **1** to make a printout for the current driver's card or **2** to make a printout for a co-driver's card.
Some printouts require selection of the file system generation (generation 2 cards has two file systems, gen 1 and gen 2). If so the following is displayed:

Card gen 1 or 2

4. If applicable, select card file system generation 1 or 2
5. Select the desired date by using the arrow buttons and press **OK**.
6. Now you select whether to view the data on the display only or to make a printout on paper.

- To view the data on the display only, select:
display
- Press **OK** and scroll through the data using the arrow buttons and then press **OK** to return.
- To make a printout on paper, select
printer
- Press **OK**. The display will show:
Printer busy
- If you would like to cancel the process, press and hold the **Back** button. Wait until the message is cleared and then pull the printout upwards to tear it off.

Note!

To avoid paper jam make sure the slot on the paper cassette is not blocked.

Printout Examples

On the following pages there are a number of printout examples that can be selected from the PRINT menu:

- Daily printout (card) 24h card (including local time).
- Daily printout (VU) 24h vehicle (including local time).
- Event and faults (card) event card.
- Event and faults (VU) event vu.
- Technical data technical data.
- Overspeeding overspeeding.
- Historic cards historic cards.

Generation 1

User selected to print Gen 1 data from the card

```

□□□ GEN1 □□□
□ 22/10/2022 08:04 (UTC)
-----□-----

```

Generation 2

User selected to print Gen 2 data from the card

```

□□□ GEN2 □□□
□ 22/10/2022 08:04 (UTC)
-----□-----

```

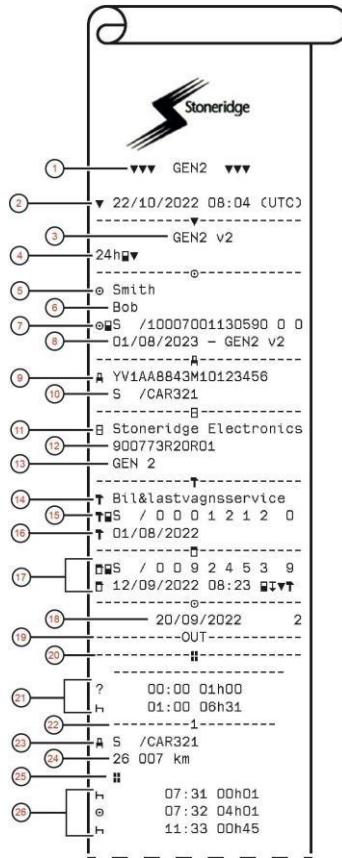
- If card is Gen2 v1, it does not include any Gen2 v2 data.
- If card is Gen2 v2, it includes Gen2 v1 and Gen2 v2 data.

Daily Printout (card) (1/2)

This printout lists all activities stored on the driver card (or codriver card) for the selected date (legal requirement). UTC time is used.

The display shows the following (on the second line):

24h card



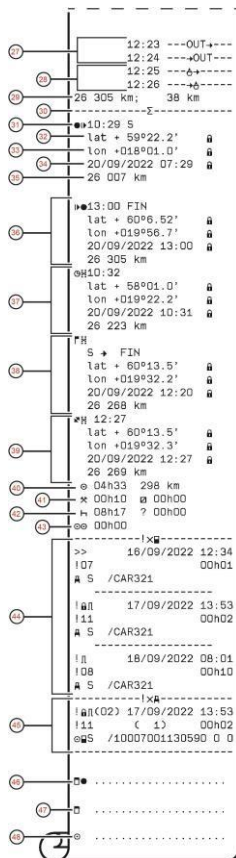
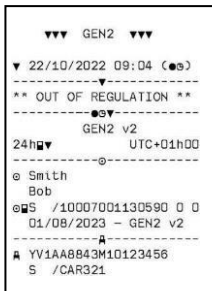
1. Type of data printed, GEN1 or GEN2
2. Printout date and time
3. Printout from a GEN2 v2 VU
4. Type of printout (24h, card)
5. Card holder's surname
6. Card holder's first name
7. Type of card, Issuing country, and Card number
8. Card expiry date, Generation and version
9. Vehicle identification number (VIN)
10. Country of registration, and Vehicle registration number (VRN)
11. Tachograph manufacturer
12. Tachograph part number
13. Tachograph generation
14. Workshop responsible for last calibration
15. Workshop card, Issuing country, Card number
16. Date of last calibration
17. Control card, Issuing country, Card number, Last inspection the driver experienced, type of VU action by enforcer
18. Date printed and Card daily presence counter
19. Printed if Out of Scope was active at insertion of card
20. Load type of vehicle if card was as left inserted over night
21. Manually entered activities (Unknown, and Rest)
22. Slot in which card was inserted
23. Country of registration and VRN
24. Vehicle odometer at card insertion
25. Load type of the vehicle (Goods or Passenger)
26. Activity type, Start time, and duration of the activity

Daily Printout (card) (2/2)

To make it easier to check the activities on the printout you can select local time instead of UTC. The printout contains in all other respect the same information.

Note!

The text OUT OF REGULATION indicates that this printout doesn't comply with any regulation.



27. Out of Scope Started, Out of Scope Ended
28. Ferry/Train Started, Ferry/Train Ended
29. Vehicle odometer at withdrawal and distance travelled since last insertion
30. Summary block indicator
31. Time and Country (and region if applicable) at start of daily working period
32. Latitude at start of daily working period, Authentication status
33. Longitude at start of daily working period, Authentication status
34. Date and time of latest position, Authentication status
35. Odometer at start of daily working period
36. End of daily working period record
37. 3 hours of accumulated driving record
38. Border crossing record with Country left, Country entered
39. Load operation record (Load, Unload, Simultaneous Load/Unload)
40. Total driving duration and distance
41. Total duration of the activities, **Work**, and **Available**
42. Total duration of the activities, **Rest**, and **Unknown**
43. Total duration of crew activities
44. Events and faults from the card
45. Events and faults from the VU
46. Control place
47. Controllers signature
48. Driver's signature

Daily Printout (VU) (1/3)

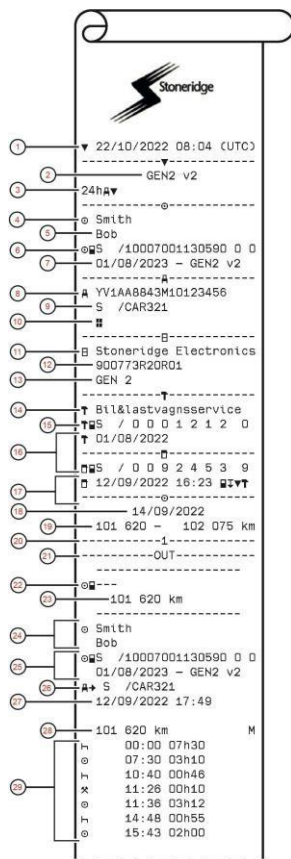
This printout lists all activities stored in the tachograph (VU) for the selected date (legal requirement). UTC time is used.

The printout is dependent of the following:

- If no card is inserted, select either the current day or any of the eight previous calendar days.
- When a card is inserted, select any day stored in the tachograph, out of a maximum of typically the most recent 28 days. If no data is available for the selected date, the printout will not be initiated.

The display shows the following (on the second line):

24h vehicle



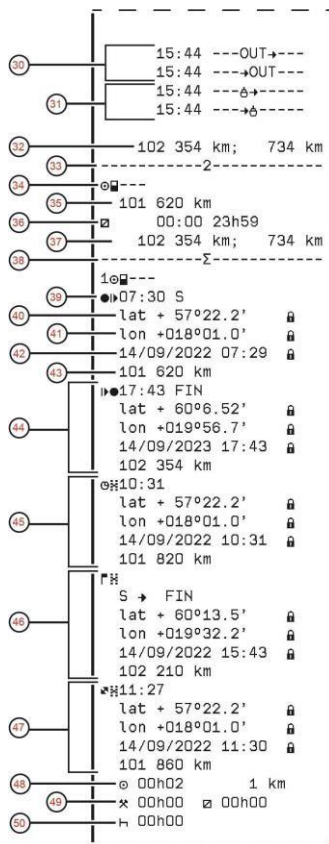
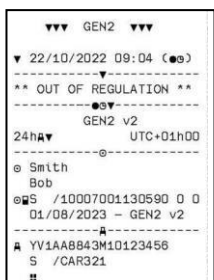
1. Printout date and time
2. Printout from a GEN2 v2 VU
3. Type of printout (24h, VU)
4. Card holder's surname
5. Card holder's first name
6. Type of card, Issuing country, and Card number
7. Card expiry date, Generation and version
8. Vehicle identification number (VIN)
9. Country of registration, and Vehicle registration number (VRN)
10. Load type of the vehicle (Goods or Passenger)
11. Tachograph manufacturer
12. Tachograph part number
13. Tachograph generation
14. Workshop responsible for last calibration
15. Workshop card, Issuing country, Card number
16. Date of last calibration
17. Control card, Issuing country, Card number, Last inspection the vehicle experienced, type of VU action by enforcer
18. Date printed
19. Vehicle odometer at 00:00, and at 24:00
20. Slot relevant for below activities
21. Printed if Out of Scope was active at beginning of day
22. Indicator that below information is when there was no card present
23. Odometer at the beginning of the following activities
24. Driver's surname and first name
25. Type of card, Issuing country, Card number, Card expiry date, Generation and version
26. Country of registration, and Vehicle registration number of the vehicle where the card was last inserted
27. Date and time of card withdrawal from previous vehicle
28. Vehicle odometer at card insertion, and indicator (M) if driver performed manual entries
29. Activity type, Start time, and duration of the activity

Daily Printout (VU) (2/3)

To make it easier to check the activities on the printout you can select local time instead of UTC. The printout contains in all other respect the same information.

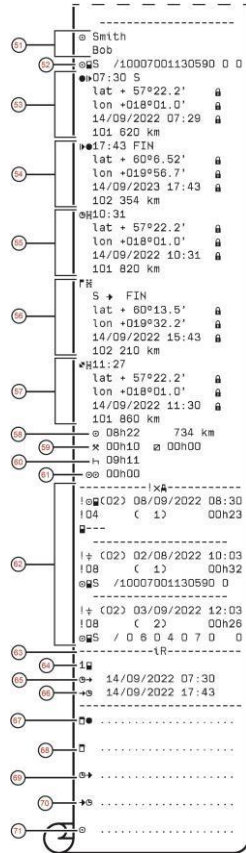
Note!

The text OUT OF REGULATION indicates that this printout doesn't comply with any regulation.



30. Out of Scope Started, Out of Scope Ended
31. Ferry/Train Started, Ferry/Train Ended
32. Vehicle odometer at withdrawal and distance travelled since last insertion
33. Slot relevant for below activities
34. Indicator that below information is when there was no card present
35. Odometer at the beginning of the following activities
36. Activity type, Start time, and duration of the activity
37. Vehicle odometer at withdrawal and distance travelled during the no card period
38. Summary block indicator
39. Time and Country (and region if applicable) at start of daily working period
40. Latitude at start of daily working period, Authentication status
41. Longitude at start of daily working period, Authentication status
42. Date and time of latest position, Authentication status
43. Odometer at start of daily working period
44. End of daily working period record
45. 3 hours of accumulated driving record
46. Border crossing record with Country left, Country entered
47. Load operation record (Load, Unload, Simultaneous Load/Unload)
48. Total driving duration and distance travelled
49. Total duration of the activities, **Work**, and **Available**
50. Total duration of the activity, **Rest**

Daily Printout (VU) (3/3)



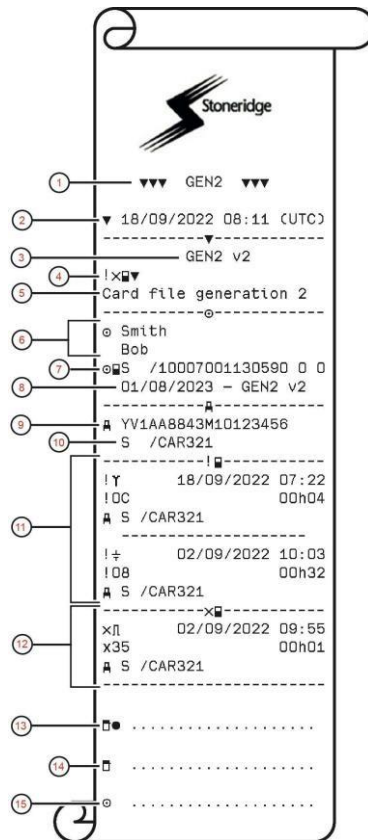
51. Driver's surname and first name
52. Type of card, Issuing country, Card number
53. Start of daily working period record
54. End of daily working period record
55. 3 hours of accumulated driving record
56. Border crossing record with Country left, Country entered
57. Load operation record (Load, Unload, Simultaneous Load/Unload)
58. Total driving duration and distance
59. Total duration of the activities, Work, and Available
60. Total duration of the activities, Rest
61. Total duration of crew activities
62. Last five events and/or faults from the VU
63. Remote HMI session block
64. Indicator for which slot the session was active
65. Start time of the Remote HMI session
66. End time of the Remote HMI session, omitted if still ongoing
67. Control place
68. Controllers signature
69. From time
70. To time
71. Driver's signature

Events and Faults (card)

This printout lists all warnings and faults stored on the card (legal requirement). UTC time is used.

The display shows the following (on the second line):

event card



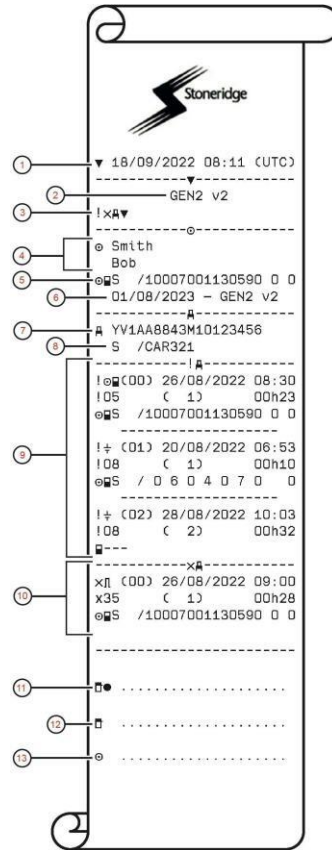
1. Type of data printed, GEN1 or GEN2
2. Printout date and time
3. Printout from a GEN2 v2 VU
4. Type of printout (Events and Faults, card)
5. Card file system (generation 1 or 2)
6. Card holder's surname, and first name
7. Type of card, Issuing country, and Card number
8. Card expiry date, Generation and version
9. Vehicle identification number (VIN)
10. Country of registration, and Vehicle registration number (VRN)
11. List of all events stored on the card
12. List of all faults stored on the card
13. Control place
14. Controllers signature
15. Driver's signature

Events and Faults (VU)

This printout lists all warnings and faults stored in the tachograph or vehicle unit (legal requirement). UTC time is used.

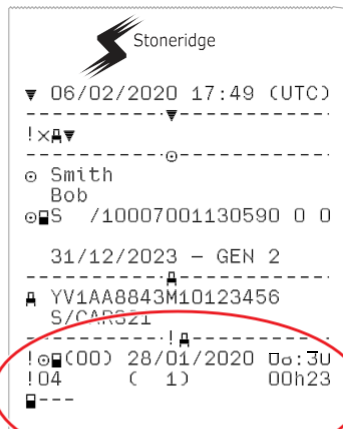
The display shows the following (on the second line):

event vehicle

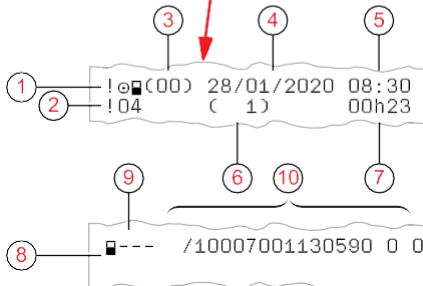


1. Printout date and time
2. Printout from a GEN2 v2 VU
3. Type of printout (Events and Faults, VU)
4. Card holder's surname, and first name
5. Type of card, Issuing country, and Card number
6. Card expiry date, Generation and version
7. Vehicle identification number (VIN)
8. Country of registration, and Vehicle registration number (VRN)
9. List of all events stored in the VU
10. List of all faults stored in the VU
11. Control place
12. Controllers signature
13. Driver's signature

Details of Events and Faults (VU)



1. Type of event or fault.
2. Event or fault code.
3. Event or fault record purpose (All purposes are not saved for each event):
 - 00 - one of the 10 most recent (or last) events or faults.
 - 01 - the longest event for one of the last 10 days of occurrence.
 - 02 - one of the 5 longest events over the last 365 days.
 - 03 - the last event for one of the last 10 days of occurrence.
 - 04 - the most serious event for one of the last 10 days of occurrence.
 - 05 - one of the 5 most serious events over the last 365 days.
 - 06 - the first event or fault having occurred after the last calibration.
 - 07 - an active/on-going event or fault.
4. Date of event or fault.
5. Start time of event or fault.
6. Number of events of the same type during the day.
7. Duration of event or fault.
8. Card inserted in slot 1 at the beginning of event or fault (Driver card).
9. Card issue country.
10. Card number (shown with every second number replaced with a space if not in calibration or company mode or if no card is inserted)

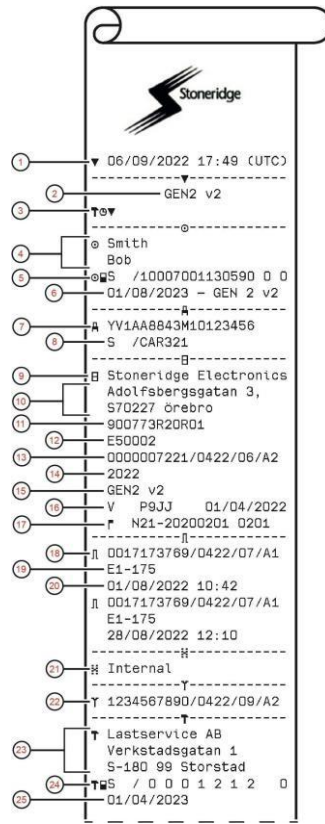


Technical Data (1/2)

This printout list data as speed settings, tyre size, calibration data and time of adjustments.

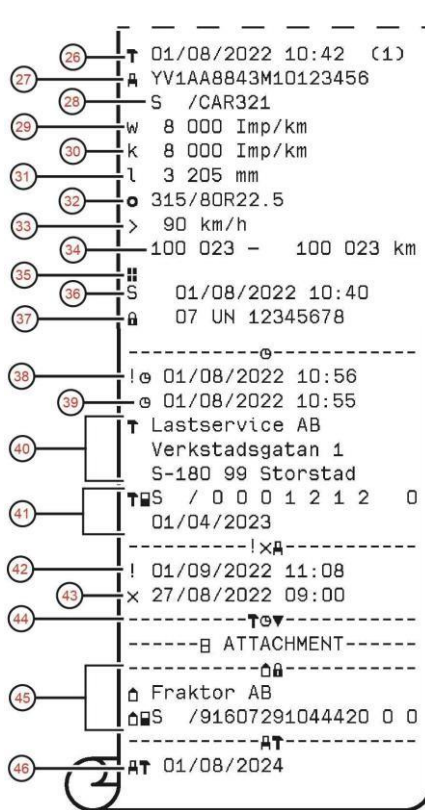
The display shows the following (on the second line):

`technical data`



1. Printout date and time
2. Printout from a GEN2 v2 VU
3. Type of printout (Technical data)
4. Card holder's surname, and first name
5. Type of card, Issuing country, and Card number
6. Card expiry date, Generation and version
7. Vehicle identification number (VIN)
8. Country of registration, and Vehicle registration number (VRN)
9. VU manufacturer
10. Address of VU manufacturer
11. VU part and variant number
12. VU type approval number
13. VU extended serial number
14. Year of manufacturing
15. VU generation and version
16. VU software version and installation date
17. Digital map version, and Stoneridge map version
18. Sensor extended serial number
19. Sensor type approval number
20. Sensor pairing date and time
21. Information that the GNSS receiver is internal in the VU
22. DSRC extended serial number
23. Name and address of the workshop that performed the calibration of the VU
24. Type of card, Issuing country, and Card number
25. Card expiry date, Generation and version

Technical Data (2/2)



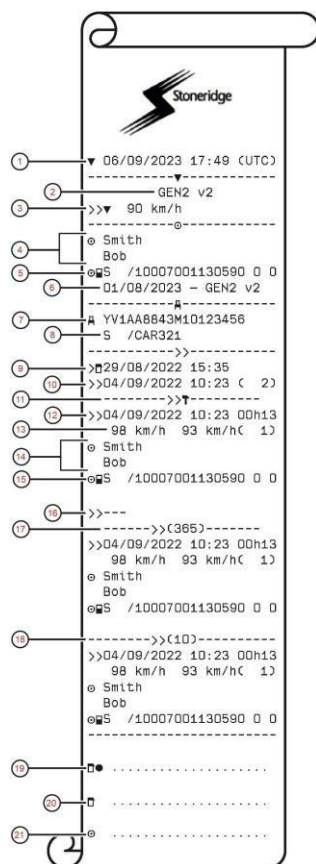
26. Date and time of calibration, and calibration purpose. Calibration purposes:
 1. Activation (parameters when VU was activated)
 2. First calibration of the VU after activation
 3. First calibration in a new vehicle
 4. Periodic inspection
 5. Entry of vehicle registration number by company
 6. Time adjustment without calibration
27. Vehicle identification number
28. Country of registration, and Vehicle registration number (VRN)
29. W-factor, the characteristic coefficient of the vehicle
30. K-factor, the constant of the VU
31. L-factor, the effective circumference of the tyres
32. Vehicle tyre size
33. Authorized speed of the vehicle
34. Old odometer value - new odometer value
35. Load type of the vehicle (Goods or Passenger)
36. Country where the calibration has been performed, time and date for the GNSS position data
37. Seal data (up to five seals) - Equipment sealed, manufacturer code, serial number
38. Old date and time (before time adjustment)
39. New date and time (after time adjustment)
40. Workshop that updated the UTC
41. Type of card, Issuing country, Card number and Card expiry date
42. Most recent event date and time
43. Most recent fault date and time
44. End of legally required printout data
45. Company lock (Company name and card data)
46. Next calibration date of the VU

Overspeeding

This printout lists overspeeding events together with duration and the name of the driver.

The display shows the following (on the second line):

overspeeding



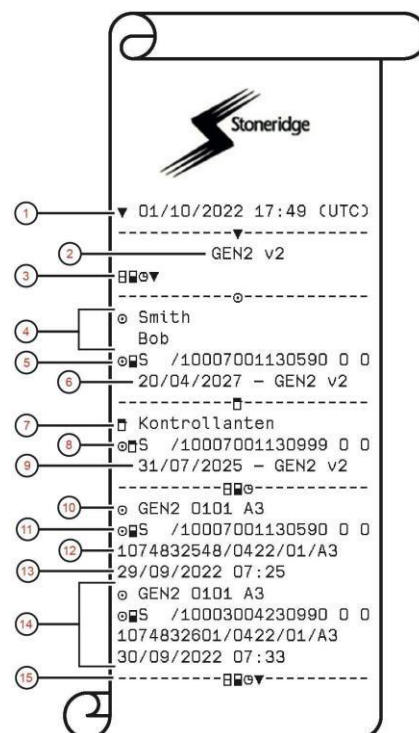
1. Printout date and time
2. Printout from a GEN2 v2 VU
3. Type of printout (Over speeding), and authorized speed
4. Card holder's surname, and first name
5. Type of card, Issuing country, and Card number
6. Card expiry date, Generation and version
7. Vehicle identification number (VIN)
8. Country of registration, and Vehicle registration number (VRN)
9. Date and time of last over speeding control
10. First over speeding and number of over speeding events since
11. First over speeding after last calibration
12. Date, time and duration
13. Max and average speed, and number of similar events this day
14. Driver's surname, and first name
15. Type of card, Issuing country, and Card number
16. If no over speeding events exists this line would be printed
17. The 5 most serious over speeding events in the last 365 days
18. The most serious for each of the last 10 days of occurrence
19. Control place
20. Controllers signature
21. Driver's signature

Historic Cards

This printout lists the history of cards used in the Tachograph. Only available with inserted Workshop card or Control card.

The display shows the following (on the second line):

historic cards







1. Printout date and time
2. Printout from a GEN2 v2 VU
3. Type of printout (Historic card)
4. Card holder's surname, and first name
5. Type of card, Issuing country, and Card number
6. Card expiry date, Generation and version
7. Control card information
8. Type of card, Issuing country, and Card number
9. Card expiry date, Generation and version
10. Type of card, generation, version, manufacturer code
11. Card information
12. Card serial number
13. Date of last card insertion
14. Data for most another of the most recent card inserted
15. End of legally required printout data

Display Messages



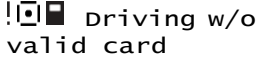
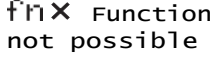
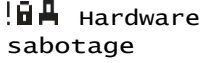
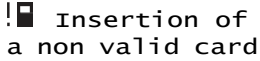

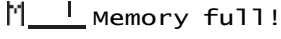
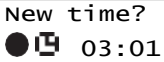
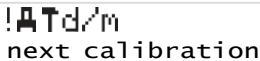
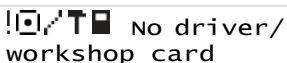
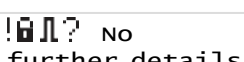
There are four type of messages that can be seen on the display.














- **Messages** - contains information on processes or reminders to the driver. Messages are not stored and can not be printed. Press the **Back** button to clear the message.
- **Pre-warnings** - appear as early reminders to the warnings. Pre-warnings, except DDS and WTD related, are stored and can be printed. Press the **OK** button twice to clear the Pre-warning.
- **Warnings**- appear in the event of e.g. overspeeding or violations of the law or tachograph recording issues. Warnings are stored and can be printed. Press the **OK** button twice to clear the Warning.
- **Faults** - are more critical than warnings and are displayed if there is a fault detected in the tachograph, in the sensor or driver card. In addition faults are presented if tampering with the equipment is detected. Faults are stored and can be printed. Press the **OK** button to acknowledge the Fault.

| Display | Description | Action |
|--|--|---|
|  | Message Entry not possible while driving. Related to the operator. | Stop the vehicle and try the entry again. If the symbol still is present when vehicle stopped, disconnect and reconnect the tachograph and retry. If the symbol still is present after reconnect, tachograph must be decommissioned. |
|  Absence of GNSS pos info | The VU is unable to detect any valid GNSS satellite signal for a long time | Make sure the GNSS antenna is not covered with or close to large metallic parts. Position the VU to the bottom right hand side of the top shelf. Move any GSM/WiFi repeater/antennas, and third-party ECUs which power supplies may leak EMC interferences Use Optimo ² to verify signal quality via HDOP value. |
|  Already in control mode | Message Two control cards inserted. The second card will be ejected without being processed (authenticated). Related to the operator. | Insert only one Control card. |
|  Card auth. failure | Fault The tachograph security check for the card in slot 1 failed. Similar message for slot 2. Related to the tachograph. | Check that the inserted card is valid and correctly inserted. Eject the card and check it visually. Clean the card and the card slot with a soft damp cloth and try again. Check if the card works in another tachograph. Try to insert another card. |

| Display | Description | Action |
|---|--|---|
|  Card fault | Fault The card in slot 1 is defective. Similar message for slot 2. Related to the card. | Check that the inserted card is valid and correctly inserted. Eject the card and check it visually. Clean the card and the card slot with a soft damp cloth and try again. Check if the card works in another tachograph. Try to insert another card. |
|  Card conflict | Warning An invalid card combination has been detected. Related to the card. | Withdraw the offending card. |
|  Card eject without saving | Message Data could not be stored on the card withdrawn from slot 2 due to an error. Similar message for slot 1. Related to the card. | Clean the card and the card slot with a soft damp cloth and try again. In case of a faulty card, contact the responsible authority in the country in which you are located. |
|  Card expired | Message The card in slot 1 has expired. Similar message for slot 2. Related to the operator. | Remove the card and replaced it with a valid one. |
|  Card expiry | Message The card in slot 1 will expire (Day/Month) . Similar message for slot 2. Related to the operator. | Contact the responsible authority to get a new card. |
|  Card ins. while driving | Warning A tachograph card is inserted in any slot while driving. Related to the operator. | No further action required. |
|  Card integrity error | Fault Corrupt data detected when reading data from the card in slot 2 to the tachograph. Similar message for slot 1. Related to the card. | In case of a faulty card, contact the responsible authority in the country in which you are located. |
|  Data integrity error | Fault Corrupted files have been detected in the tachograph. These files will not have a valid signature when downloaded. Related to the tachograph. | Check for evidence of tampering with the tachograph. If there is evidence of tampering the tachograph must be decommissioned and replaced. |
|  d/m download card | Message Indicates the time to next download of the card (Day/Month) in slot 1. Similar message for slot 2 | Prepare for download. |
|  d/m download vehicle | Message Indicates the time to next download from the tachograph (Day/Month). | Prepare for download. |
|  Download complete | Message The tachograph download process has been completed successfully. | No further action required. |













Display Messages

| Display | Description | Action |
|---|---|--|
|  Download failed | Warning The tachograph download process has failed and is incomplete. [Workshop card] | <p>Retry the download.</p> <p>Check the connections and the download equipment.</p> <p>Re-insert the card and retry the download.</p> <p>Replace or repair the download equipment if required.</p> <p>If the tachograph is faulty beyond repair it must be decommissioned and replaced.</p> <p>Remove power from the tachograph for 30 seconds and try with another tool/download-cable.</p> |
|  Driving can't open slot | Message An attempt was made to open the slot while the vehicle was in motion. Related to the operator. | Stop the vehicle. The card tray can be opened only when the vehicle is stationary. |
|  Driving w/o valid card | Warning Driving without an appropriate card, or with an inappropriate card combination. Related to the operator. | Stop and remove inappropriate card. |
|  Function not possible | Message The desired function cannot be carried out. Related to the tachograph. | No further action required. |
|  Hardware sabotage | Fault Authenticated card has been removed by force. Related to the operator. | The tachograph must be decommissioned and replaced. |
|  Insertion of a non valid card | Warning A non-valid card has been inserted to a slot. Related to the operator. | Check that the card has not been inserted upside down or is expired. |
|  Last sess. not closed ok | Warning The driver card in tray 1 was ejected incorrectly during the last session. The previous card withdrawal in tray 1 was not completed correctly by the tachograph. Similar message for slot 2. Related to the card. | <p>Eject the card and check it visually.</p> <p>Clean the card with a soft damp cloth and try again.</p> <p>In case of faulty card, contact relevant authority to get it replaced.</p> |
|  Memory full! | Message Manual entries memory full. Related to the operator. | Modify the manual entries so that the total number of entries is less. |
|  New time? ● 03:01 | Message Daylight saving time changes. | <p>Answer YES to start or end daylight saving time.</p> <p>Answer NO or press the Back button to cancel.</p> |
|  Next calibration | Warning Next mandatory calibration has to be carried out (d/m = Day /Month) | Plan for the calibration. |
|  No driver/workshop card | Message A function has been selected that requires an inserted driver or workshop card. Related to the operator. | Insert a driver or workshop card. |
|  NO further details | Fault An unknown type of sensor error occurred. Related to the motion sensor. | Replace the motion sensor. |

| Display | Description | Action |
|---|--|---|
|  Power supply interruption | Warning The power supply to the tachograph has been interrupted for more than 200 milliseconds. Cranking voltage should not cause this event. The event is not generated in calibration mode. Related to the vehicle. | Check the vehicle and tachograph power supply levels. Check the power supply cables. Check the vehicle's battery and replace if necessary. |
|  Printer high temperature | Message The printing could not start, or the ongoing printing has been interrupted, because the temperature of the printer is too high. Related to the printer. | Wait until the printer temperature is in allowable range and try to print again. |
|  Printer low power | Message The ongoing printing has been interrupted because the tachograph input voltage is too low. Related to the vehicle. | Check that the ignition is on. Check the vehicle battery voltage, connections, etc. |
|  Printer low temperature | Message The printing could not start because the temperature of the printer is too low. Related to the printer. | Wait until the printer temperature is in allowable range and try to print again. |
|  Printer out of paper | Message The ongoing printing has been interrupted because the printer is out of paper. | Replace paper. If fault remains active for no apparent reason the tachograph must be decommissioned and replaced. |
| Cancelling printing  | Message The ongoing printing is being cancelled. | No further action required. |
|  Remote Detection fault | Fault Cannot communicate with the Remote Detection facility (DSRC) | |
|  Security violation | Tampering with hardware has been detected | Visit a smart tachograph workshop to have the equipment checked. |
|  Sensor auth. failure | Fault The tachograph does not detect the sensor. Related to the motion sensor. | |
|  Sensor auth. failure | | Check motion sensor operation and all wiring. Check for evidence of tampering. Pair the motion sensor and tachograph again. Perform a new calibration of the tachograph system. Replace the sensor if found faulty. |
|  Sensor cable fault | Warning No pulses received from motion sensor, but encrypted data is received. Related to the motion sensor. | Check the motion sensor operation and wiring. Replace the motion sensor if necessary. |
|  Sensor cable fault | Warning Pulses received from motion sensor, but encrypted data missing or mismatch. Related to the motion sensor. | Check the motion sensor operation and wiring. Replace the motion sensor if necessary. |
|  Sensor comms error | Fault Motion sensor communication error. Related to the motion sensor. | Check the motion sensor operation and wiring. Replace the motion sensor if necessary. |

Display Messages

| Display | Description | Action |
|---|--|---|
|  sensor data error | Warning Signal failure between motion sensor and tachograph. Related to the motion sensor. | Check the motion sensor operation and wiring. Replace the motion sensor if necessary. Check for evidence of tampering. If the error remains active for no apparent reason, decommission and replace the tachograph. |
|  sensor data integrity error | Fault Internal motion sensor error, stored data integrity failure. Related to the motion sensor | Replace the motion sensor if necessary. |
|  sensor no acknowledge | Fault Motion sensor communication error. Related to the motion sensor. | Check the motion sensor operation and wiring. Replace the motion sensor if necessary. |
|  sensor no answer | Fault Motion sensor communication error. Related to the motion sensor. | Check the motion sensor operation and wiring. Replace the motion sensor if necessary. |
|  sensor no power signal | Fault Motion sensor has no power. Related to the motion sensor. | Check the vehicle battery voltage, wiring, cable between tachograph and sensor, etc. Replace the motion sensor if necessary. |
|  sensor power high | Fault Motion sensor power too high. Related to the motion sensor. | Check the vehicle battery voltage, wiring, cable between tachograph and sensor, etc. Replace the motion sensor if necessary. |
|  sensor power low | Fault Motion sensor power too low. Related to the motion sensor. | Check the vehicle battery voltage, wiring, cable between tachograph and sensor, etc. Replace the motion sensor if necessary. |
|  service pre-warning | Message Next calibration, pre-warning. | Perform a calibration. |
|  time conflict GNSS versus VU | Message The internal clock and the GNSS clock differs more than 1 minute | Make sure the GNSS antenna is not covered or that the GNSS signal is distorted. |
|  Time for service | Message The tachograph is out of calibration. | Perform a calibration. |
|  Timeout no key pressed | Message The tachograph is waiting for input. Timeout 1 min or 20 min. | Press the appropriate buttons and complete the process. Timeout can be changed in Settings menu. |
|  Unable to open slot | Message The card tray concerned cannot be opened. Related to the tachograph. | Check that the ignition is on. Power cycle the unit and check that the card is successfully ejected. Clean the card and the card slot with a soft damp cloth and try again. If the tray is still faulty - Visit a smart tachograph workshop to have the equipment checked. |

| Display | Description | Action |
|--|--|--|
| !  unauth. change of sensor | Fault The sensor has been changed since last pairing. Related to the motion sensor. | Check the motion sensor operation and all wiring. - replace sensor if faulty Check for evidence of tampering. Pair the motion sensor and the tachograph again. Perform a new calibration of the tachograph system. Replace the sensor if found faulty. |
| !  vehicle Motion Conflict | Message GNSS motion sensor and primary motions sensor data contradicts. Related to the motion sensor. | Check DTCs to verify which of the triggers that create the event. Check GNSS equipment, is anything interfering with the GNSS signal? Check for evidence of tampering. Use reference cables. |
| !  12/10 VU expiry | Warning The tachograph (VU) will expire as per legal at the displayed date. | |
| ✗  VU internal fault | Fault The tachograph has detected an internal fault. Related to the tachograph. | |
| !  GNSS Anomaly | Fault GNSS receiver has detected an attack, or failed in authenticating messages. | Check for evidence of tampering with the unit, or devices interfering with the reception around the tachograph. Restart the tachograph, verify if the GNSS receiver still reports anomalies. |
| !  Pairing Failed | Message The ITS pairing with a device has failed. | |
| !  Pairing Complete | Message The ITS pairing with a device has completed successfully. | |
| !  RHMI Pairing Failed | Message The RHMI pairing with a device has failed. | |
| !  RHMI Pairing Complete | Message The RHMI pairing with a device has completed successfully. | |
| RHMI TOKEN 12345678 | Message The RHMI pairing requires confirmation from a device. | |
| RHMI Manual entries ongoing... | Message Manual entries via RHMI are currently taking place. | |
| RHMI Manual entries aborted! | Message Manual entries via RHMI have been aborted. | |
|  VU Update available | Message The VU has detected that there is a software update available. | |
|  Updating VU  | Message The VU is currently being updated. | |

Display Messages

| Display | Description | Action |
|----------------------|---|--------|
| ☐☐☐ Update completed | Message The update of the VU was successfully completed. | |
| ☐☐☐ Update failed | Message The updated of the VU failed. | |

Event, Fault and Diagnostic Trouble Codes

A list of all DTCs that are stored in the Stoneridge smart tachograph is presented below. A check should be made to determine whether the DTC is still active or not. The cause of the DTC should be determined and appropriate action taken as described in the table that follows. The Code will be seen on the Event & Fault printout as well as on the Daily printout. The DTC will be seen on a test instrument, such as Optimo².

General events

| Code | DTC | Type of event or fault | Description | Suggested action to be taken |
|------|--------|---|---|--|
| !02 | | Card conflict | An invalid card combination has been detected. For example a company and a workshop card. | Withdraw the offending card. |
| !03 | | Time overlap | The last withdrawal time of the inserted driver card, as read from the inserted card, is later than the UTC time of the tachograph. | Check the UTC time of the tachograph. Wait for the overlap period to elapse. If UTC time differs more than 5 minutes, a calibration has to be performed. |
| !04 | 001260 | Driving without an appropriate card | Driving without a valid card or with an invalid card combination. | Stop and insert a valid card and/or remove inappropriate card. |
| !05 | | Card inserted while driving | A tachograph card is inserted in any slot while driving. | No further action required. |
| !06 | | Last card session not correctly closed | The card (inserted in slot 1 or 2) has been withdrawn before all relevant data have been stored on the card. It is caused at withdrawal but detected at the next insertion. | No further action required. |
| !07 | | Overspeeding | The speed of the vehicle has exceeded the highest speed allowed for the vehicle. This has been active during at least 60 seconds. | Get information on the maximum speed allowed for the vehicle. |
| !08 | 000004 | Power supply interruption (VU) | The power supply to the tachograph has been interrupted for more than 200 milliseconds. The event is not generated in calibration mode. | Check the vehicle and tachograph power supply levels. Check the power supply cables. |
| | 002004 | Power supply interruption (MS) | Power supply to motion sensor has been interrupted for more than 200 ms. | Check the vehicle and motion sensor power supply levels. Check the motion sensor operation and all the wiring, replace the sensor if faulty. |
| !09 | 002180 | Motion data error (No CNTR) | Motion sensor data incorrect. Tachograph receives speed value from motion sensor without receiving any pulses. | Check motion sensor operation and all wiring. Check for evidence of tampering. |
| | 002280 | Motion data error (CNTR) | Motion sensor data incorrect. Tachograph receives speed counter value from motion sensor that differs from value calculated by the tachograph. | Pair the motion sensor and tachograph again. Perform a new calibration of the tachograph system. |
| | 002452 | Motion data error (Event) | Motion data incorrect. Tachograph signature mismatch. | Replace the sensor if found faulty. |
| !0B | 002B80 | Time conflict (GNSS versus VU internal clock) | Internal and GNSS clock differs more than 1 minute at 12 hours after time settings. | Check internal clock setting. Check GNSS received clock. |

Event, Fault and Diagnostic Trouble Codes

| Code | DTC | Type of event or fault | Description | Suggested action to be taken |
|------|--------|--|---|---|
| !0C | 002D80 | Communication error with the remote communication facility | VU cannot communicate properly with the DSRC-VU facility. | Check the remote DSRC-VU unit. Check cabling to DSRC-VU facility. Check the VU-DSRC CAN Parameters in the VU. |
| !0D | 002C80 | Absence of position information from GNSS receiver | No valid GNSS signal received during three hours of accumulated driving. | Check that GNSS signal can be received Check if external objects obstruct the GNSS signal. |
| !0F | 002E80 | GNSS Anomaly | The GNSS receiver has detected an attack, or failed in authenticating messages. | Check for evidence of tampering with the unit, or devices interfering with the reception around the tachograph. Restart the tachograph, verify if the GNSS receiver still reports anomalies. Replace any equipment if found faulty or manipulated |

VU Security breach attempts

| Code | DTC | Type of event or fault | Description | Suggested action to be taken |
|------|--------|--------------------------------------|--|---|
| !11 | 002452 | Motion sensor authentication failure | An unsuccessful authentication attempt of the motion sensor has been detected. | Check motion sensor operation and all wiring. Check for evidence of tampering. Pair the motion sensor and tachograph again. Perform a new calibration of the tachograph system. Replace the sensor if found faulty. |

Event, Fault and Diagnostic Trouble Codes

| Code | DTC | Type of event or fault | Description | Suggested action to be taken |
|------|--------|--|--|--|
| !12 | | Tachograph card authentication failure | The inserted card cannot be authenticated by the tachograph. | <p>Check that the inserted card is valid and correctly inserted.</p> <p>Check that the card works in another tachograph.</p> <p>Try to insert another card.</p> |
| !13 | 002452 | Unauthorised change of motion sensor | The sensor has been changed since last pairing. | <p>Check motion sensor operation and all wiring.</p> <p>Check for evidence of tampering.</p> <p>Pair the motion sensor and tachograph again.</p> <p>Perform a new calibration of the tachograph system.</p> <p>Replace the sensor if found faulty.</p> |
| !14 | | Card data input integrity | The cryptographic communication with the card inserted (in slot 1 or 2) is unsuccessful. | <p>To check the card, insert it in another tachograph.</p> <p>Try to insert another card.</p> |
| !15 | | Stored data integrity error | The stored data in the 365 day memory is erroneous. | <p>Check for evidence of tampering with the tachograph.</p> <p>If there is evidence of tampering the tachograph must be decommissioned and replaced.</p> |
| !18 | | Hardware sabotage | Card has been removed by force | <p>Check for evidence of tampering with card reader.</p> <p>Decommission and replace the tachograph.</p> |
| !18 | | Security violation | Tampering with hardware has been detected. | <p>Check for evidence of tampering with the unit.</p> <p>Decommission and replace the tachograph.</p> |
| !1C | 000140 | Inconsistency between motion data and stored driver activity data. | The validation of stored driver activity vs motion data has detected an inconsistency. | <p>Verify speed and activity recording .</p> <p>Check for evidence of tampering with the VU, sensor, or sensor cable.</p> <p>Pair the motion sensor and tachograph again.</p> <p>Perform a new calibration of the tachograph system.</p> <p>Replace any equipment if found faulty or manipulated .</p> |

Motion sensor related events

| Code | DTC | Type of event or fault | Description | Suggested action to be taken |
|------|--------|-------------------------------------|---|---|
| !0A | 002780 | Vehicle motion conflict | Speeds from motion sensor and GNSS contradict | Check that GNSS can receive satellite signals |
| !0A | 002880 | Vehicle motion conflict (trigger 2) | GNSS distance vs travelled distance based on odometer valued has detected an inconsistency. | Verify, GNSS, speed and distance recording. Perform a new calibration of the tachograph system. Replace any equipment if found faulty or manipulated. |
| !0A | 002980 | Vehicle motion conflict (trigger 3) | The 3rd motion sensor has detected movement over a period of time while no speed has been recorded. | Verify sensor, speed and tachograph functionality. Perform a new calibration of the tachograph system. Replace any equipment if found faulty or manipulated |
| !20 | 002508 | No further details | Motion sensor internal error, but no further fault cause. | Replace the motion sensor. |
| !21 | 002508 | Authentication failure | Motion sensor internal error, authentication failure. | Replace the motion sensor. |
| !22 | 002508 | Stored data integrity error | Motion sensor internal error, stored data integrity failure | Replace the motion sensor |

Recording equipment faults

| Code | DTC | Type of event or fault | Description | Suggested action to be taken |
|------|----------------------------|---|--|--|
| X31 | 000139 002007 000C31 | VU internal fault | Internal fault in the tachograph | If DTC remains active, it is a non-recursive error. Decommission and replace. |
| | 002280 | Sensor fault Error response or acknowledge | Motion sensor communication error. Content of acknowledge or response is not correct. | Check motion sensor operation and all wiring. Check for evidence of tampering. Pair the motion sensor and tachograph again. |
| | 002003 | Sensor fault (MS Power to Low) | Motion sensor power supply too low. DTC is activated 4 sec after low power is detected. | Perform a new calibration of the tachograph system. Replace the sensor if found faulty. |
| X35 | 002380 | Sensor fault (No acknowledge) | Motion sensor communication error. No acknowledge received when expected. | Check motion sensor operation and all wiring. Replace the sensor if found faulty. |
| | 002380 | Sensor fault (No response) | Motion sensor communication error. No response received when expected. | Check motion sensor operation and all wiring. Replace the sensor if found faulty. |
| X36 | | Internal GNSS fault | Tachograph internal GNSS receiver has ceased to provide position data. | The fault should clear itself when the tachograph receives data again. If still active, power cycle the tachograph, take the vehicle for a test drive. If it remains active, the tachograph may need to be replaced. |

| Code | DTC | Type of event or fault | Description | Suggested action to be taken |
|------|-----|------------------------|---|--|
| X3A | | Internal sensor fault | Tachograph internal sensor (3rd source of motion) has ceased to provide data. | The fault should clear itself when the tachograph receives data again. If still active, power cycle the tachograph, take the vehicle for a test drive. If it remains active, the tachograph may need to be replaced. |

Card faults

| Code | DTC | Type of event or fault | Description | Suggested action to be taken |
|------|--------|-------------------------------|--|---|
| !01 | | Insertion of a non-valid card | A non-valid card has been inserted in the VU | Make sure that only valid tachograph cards are used. |
| X40 | | Card fault | | Withdraw the card and check it. |
| | 000200 | Card fault - Slot 1 | Error detected on inserted card in slot 1. | Insert the card into another tachograph and verify functionality. |
| | 000300 | Card fault - Slot 2 | Error detected on inserted card in slot 2. | Insert another card and verify functionality. |

Manufacturer specific events and faults (pop-ups)

| Code | DTC | Type of event or fault | Description | Suggested action to be taken |
|------|--------|--------------------------------|--|--|
| | 000660 | Printing stopped, out of paper | Printer is out of paper. | Insert a new paper roll. |
| | 0001C0 | Overspeeding pre warning | The speed of the vehicle has exceeded the highest speed allowed for the vehicle. This has been active during less than 60 seconds and the overspeeding event is not yet activated. | Driver related message. |
| | 000D40 | Calibration error | Calibration error, time for periodic inspection. Two years has passed since last calibration. | Perform a calibration. |
| | 000B78 | CAN bus off, TCO CAN | CAN bus off, A connector, also named TCO-CAN or A-CAN. | Check cables, especially A connector at the back of the tachograph. Verify CAN settings in the VU. Verify CAN termination (60 Ohms overall). |
| | 00FD0B | CAN bus off, FMS CAN | CAN bus off, C connector, also named FMS-CAN or C-CAN. | Check cables, especially C connector at the back of the tachograph. Verify CAN settings in the VU. Verify CAN termination (60 Ohms overall). |
| | 000007 | VU power supply high | Tachograph power supply voltage is higher than maximum value. | Check vehicle power supply levels. Check power supply input to tachograph. Check all connections and tachograph operation. |
| | 000003 | VU power supply low | The power supply to the tachograph has been lower than minimum value for more than 4 seconds. Cranking voltage should not cause this event | Check vehicle power supply levels. Check power supply input to tachograph. Check all connections and tachograph operation. |

Event, Fault and Diagnostic Trouble Codes

| Code | DTC | Type of event or fault | Description | Suggested action to be taken |
|------|--------|--------------------------------------|--|--|
| | 000900 | No ignition but speed pulses present | Ignition off, but speed pulses are present. | <p>Investigate if the vehicle has been under environmental disturbances like vibrations etc.</p> <p>Check motion sensor operation and all wiring – replace sensor if faulty.</p> <p>Check speed pulses are not being injected through front connector.</p> |
| | 003000 | Output B7 fault | Diagnostic feedback from output B7 not equal to requested level. | <p>Check cables on B connector at the back of the tachograph. Especially pin B7 for any short circuits.</p> <p>If DTC remains active, check if caused by the vehicle ECU wired to B7 also monitoring the signal. Try moving wire to pin B6.</p> |

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