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Introduction

Welcome to Taximeter, a simulation of a modern taximeter for the iOS™ platform.

Taximeter features:

- Realistic “LED effect” appearance and operation
- More than 200 predefined presets in over 40 countries
- Latest presets can be downloaded from the internet
- Customizable preset with up to 10 tariffs
- Custom preset wizard for easy setup
- Lockable preset
- Calendar controlled (with tariff auto-switch) or manual tariffs
- Location controlled tariffs (geofencing)
- Ahead-of-time programming of future tariffs
- Extras
  - Minimum fare
  - Tax
  - Discounts
  - Tips
  - Yards/metres units
  - Hire log (text and/or CSV format) with automatic send
  - Event log with alerts
  - Resettable totals
  - Talking taximeter for the sight impaired
- Use On-Board Diagnostics (OBD) speed data to calculate distance instead of GPS (OBD-II compliant vehicle and an ELM327 compatible Wi-Fi adapter are required)
- OBD calibration function
- Integration with PayPal Here™, Square Point of Sale™ or SumUp™ payment processing
- Generate a PDF receipt which can be emailed or printed through AirPrint
- Roof light control (a compatible Bluetooth switch is required)
- Backup and restore settings
- Supports iOS Slide Over and Split View
- Screen saver

Taximeter is a simulation of a taximeter and is as accurate as the GPS/OBD updates it receives. The supplied presets were compiled from information available on the World Wide Web and no guarantee is made as to their accuracy.
Overview

Figure 1 below shows the layout of the main Taximeter display.

Active Preset
Shows the name of the active preset.

Hire Totals
Depending on the setting of Display hire total fields displays either distance in metres/yards (Dm/Dy) and time in seconds (Ts), or chargeable distance in metres/yards (Cm/Cy) and chargeable time in seconds (Cs) for the current hire.

Waiting Time Indicator
When visible indicates that the previous chargeable unit was for waiting time.
GPS Quality
The quality of the GPS fix is displayed on a scale of 1 to 100. Table 1 below shows the bar color for a given GPS quality. The horizontal white line indicates the average quality.

Table 1

<table>
<thead>
<tr>
<th>Quality</th>
<th>Bar Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 – 80</td>
<td>Red</td>
</tr>
<tr>
<td>80 – 90</td>
<td>Amber</td>
</tr>
<tr>
<td>90 – 100</td>
<td>Green</td>
</tr>
</tbody>
</table>

Hotspots
There are eight touch sensitive areas (hotspots):

Tariff Hotspot
Touching this hotspot will cycle through the available tariff codes for the selected preset. In FOR HIRE mode the selected tariff will be applied immediately. In HIRED and STOPPED modes, the selected tariff code will flash for 5 seconds before the tariff is applied to the current hire.

Extras + Hotspot
Touching this hotspot will increase the Extras amount by the Extras increment. As long as the hotspot is kept pressed, the amount will continue to increase (in gradually increasing steps). Note this hotspot is inoperative when TOTAL FARE is displayed.

Extras - Hotspot
Touching this hotspot will decrease the Extras amount by the Extras increment. As long as the hotspot is kept pressed, the amount will continue to decrease (in gradually increasing steps). Note this hotspot is inoperative when TOTAL FARE is displayed.

An Edit button will briefly appear when either Extras hotspot is touched. Pressing the Edit button will open a dialog where the extras amount can be directly entered.

Mode Hotspots
Allow the selection of FOR HIRE, HIRED or STOPPED operating modes, see Operating Modes.

Total Fare Hotspot
Touching this hotspot in STOPPED mode will toggle between combining the fare and extras together to display TOTAL FARE and separating the fare and extras to display FARE. This hotspot is inoperative in other modes.

When the fare is totalled press the tip icon to add any tip. The tip will be recorded in the hire logs, totals, and passed to PayPal Here™, Square Point of Sale™ or SumUp™ for payment.
OBD Connection Hotspot

*Touch this hotspot to initiate an OBD connection. This hotspot is only present in Professional Mode (see Receipt number)*

Specify the current receipt number. This value will be incremented with each hire and displayed on the receipt.

Enable professional mode) or when *Display connection hotspot* is enabled and a connection is not in progress or already established. Touching this hotspot has the same effect as enabling Menu > Settings > OBD settings > Enable OBD.

**Operating Modes**

Figure 2 shows Taximeter’s three operating modes and the transitions that can occur between them.

![Operating Modes Diagram]

*Figure 2 – Operating Modes*
FOR HIRE Mode
The taximeter displays the currently selected tariff code and any extras. If the preset supports geofencing and/or calendar control, the taximeter will automatically select the tariff for the current GPS location and/or date and time respectively. When this mode is selected, the default tariff code and extras are displayed, the fare is zeroed, and the taximeter distance and time meters are zeroed & stopped.

HIRED Mode
In this mode the taximeter time and distance meters are started and the fare is calculated based on the selected tariff. If the preset supports geofencing and/or calendar control with tariff auto-switch and a tariff code has not been manually selected, the taximeter will automatically switch the tariff based on the current GPS location and/or date and time. The taximeter will not enter HIRED mode from FOR HIRE mode if a valid GPS/OBD update has not been received.

STOPPED Mode
In this mode the taximeter time meter is stopped. The taximeter will continue to calculate the fare based on distance only.

Figure 3 – Totalling the Fare
Figure 3 shows the transition from FARE to TOTAL FARE that can be made in STOPPED mode by touching the Total Fare Hotspot.
User Menu

Swiping to the right on the main display will reveal the User Menu, see Figure 4.

![User Menu](image)

Figure 4 – User Menu

**Download presets**

This menu option is enabled when there is an active data connection (Wi-Fi/mobile). Selecting this menu option will download the latest preset data (currently 38 KB in size) from the location specified in the *Download URL* setting.
Settings
Selecting this option will open the Settings menu, see Figure 5.

Figure 5 – Settings

Country filter
Select a country from the list to limit the Taximeter preset list to presets from that particular country. Select “All” to see every preset in the Taximeter preset list.

Taximeter preset
Select the taximeter preset you would like to apply to the current hire. This list is constrained by the Country filter setting. Select “Custom” if you would like to apply your own customized preset.

Custom preset settings
Selecting this setting will open the Custom preset settings dialog see Figure 6.
This dialog lists the settings for the Custom preset.

**Name**
Specify a name for the custom preset.

**Distance in yards**
When this option switch is on, the preset's units of distance are yards. When off, the preset’s units of distance are metres.

**Total tariffs**
Specify the number of active tariffs from 1 to 10.

**Default tariff**
Specify the tariff to use when entering FOR HIRE mode.

**Currency symbol**
Specify up to three characters to be used as the currency symbol (allowing ISO 4217 three letter currency codes to be used), e.g. $, €, £. This is displayed in the main display next to the fare.

**Currency code**
Specify the three letter ISO 4217 currency code, e.g. USD, EUR, GBP. This is used to collate fares of the same currency when reporting totals.

**Custom preset wizard**
Selecting this option will open the Custom preset wizard, see Figure 7. The wizard provides an easy way to define each custom tariff in terms of the flag drop, meter increment, amount
per mile/km, and waiting time per hour/minute. Note that these figures are in the base currency unit so 0.50 = 50c, 2.80 = $2.80, etc.

Flag drop distance is automatically calculated when Save is selected but, if required, you can specify a separate initial distance for the flag drop by turning on the switch next to the Flag drop distance field and entering the value in yards or metres (the unit of measure is governed by the Distance in yards option switch). Flag drop time is automatically adjusted in proportion with the flag drop distance. A value of 0.00 turns off the distance and time pulse counters and is used to configure a fixed rate tariff where only the flag drop is charged.

Click the Save button to save the changes to the selected tariff or the Cancel button to exit the wizard. When you click Save, the wizard will calculate and update the underlying tariff settings namely Initial charge, Initial distance, Initial time, Unit charge, Distance per unit, and Time per unit.

Figure 7 - Custom Preset Wizard

**Charge distance and time concurrently**
Conventional “pulse” taximeters charge for either distance travelled or waiting time but not both. Enable this option to have the meter charge for both distance travelled and time.

**Use speed determined waiting time**
A conventional “pulse” taximeter will allow at most D yards/metres or T seconds for each “tick” of the meter. If the taxi travels more than D yards/metres within T seconds the meter will charge for distance otherwise the meter will charge for time. The transition speed is $D$ divided by $T$ yards/metres per second. As an alternative mechanism, the meter can use GPS or OBD speed to decide when to count time. When the speed is at or below a predetermined speed the meter counts time. Enable this option to use this alternative GPS/OBD speed based mechanism.

**Waiting time at or below speed**
Specify the speed at or below which the meter counts time when using speed determined waiting time, see *Use speed determined waiting time* above.
**Contiguous waiting time**
Enable this to have the meter charge for complete units of waiting time (fragments of a waiting time unit will not be accumulated).

Note: The algorithm allows a creep distance equivalent to travelling at the "waiting time at or below speed" or 2.5 kph whichever is greater for the duration of a waiting time unit, e.g. if the waiting time unit is 60 seconds, at 2.5 kph the meter will allow up to 41.67 metres (2500/3600 * 60) of creep distance. In this example, the vehicle can travel up to 41.67 metres (45.57 yards) in distance and will still be considered to be waiting.

**Minimum fare calculation**
Specify the algorithm used to determine the minimum fare. Table 2 describes the available algorithms.

<table>
<thead>
<tr>
<th>Algorithm</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start</td>
<td>Use the minimum fare from the tariff in effect at the start of the hire.</td>
</tr>
<tr>
<td>End</td>
<td>Use the minimum fare from the tariff in effect at the end of the hire.</td>
</tr>
<tr>
<td>Maximum</td>
<td>Use the highest minimum fare from all tariffs used during the hire.</td>
</tr>
</tbody>
</table>

**Tariffs**

**Tariff 1 - 10**
Selecting one of these will open the corresponding Tariff settings dialog, see Figure 6.

**Description**
Specify a tariff description. The selected tariff’s description will be displayed in square brackets to the right of the preset name at the top of the main display.

**Extras**
Specify any default extras for the tariff. These are in hundredths of the base currency unit so “50” will be displayed as “0.50”, “150” will be displayed as “1.50” in the EXTRAS area of the main display.

**Extras increment**
Specify the amount, in hundredths of the base currency unit, for the EXTRAS to increment or decrement with each touch of the Extras + Hotspot or Extras - Hotspot respectively.

**Maximum extras**
Specify the maximum extras for the tariff, in hundredths of the base currency unit.

**Minimum fare**
Specify the minimum fare, in hundredths of the base currency unit. When the fare is totalled at the end of the hire, by touching the Total Fare Hotspot, the displayed fare will be at least this value plus any extras.
Initial charge
Specify the charge for the first taximeter unit in hundredths of the base currency unit so “280” is “2.80” when added to the fare. The taximeter will charge in advance for each unit or part thereof. The Initial charge is therefore the minimum charge for the period of hire and is often referred to as the “drop”, “flag drop”, or “flag fall”.

Initial distance
Specify the distance in yards/metres for the first taximeter unit.

Initial time
Specify the time in seconds for the first taximeter unit. If this is set to “0”, the time meter will remain off, i.e. time will not play a part in the calculation of the first unit. In some tariffs the initial charge will buy you a certain number of metres/yards and it is only after travelling this distance that the time meter starts.

Unit charge
Specify the charge in hundredths of the base currency unit (“10” is “0.10” when added to the fare) for the second and subsequent taximeter units. The taximeter will charge in advance for each unit or part thereof. The unit charge is also known as the “meter increment” or “meter tick”.

Distance per unit
Specify the distance in yards/metres for the second and subsequent taximeter units.

Time per unit
Specify the time in seconds for the second and subsequent taximeter units. If set to “0”, the time meter will remain off.

Discounts
At the end of a hire with the fare totalled a discount may be applied by pressing the discount icon. Any discount will be recorded in the hire logs, totals, and passed to PayPal Here™, Square Point of Sale™ or SumUp™ for a reduced payment. To enable this option, one or more predefined or user defined discounts must be configured.

Allow user defined discount
Enable this setting to allow the user to specify their own discount as a percentage of the total fare or flat amount.

Discounts 1 - 4

Description
Specify a short description for the discount, e.g. Senior Citizen, Student, Military Personnel. This description will be displayed on the discount button together with the discount rate.

Type
Choose the type of discount either a percentage of the total fare or a flat amount.

Rate
Specify the discount rate as either a percentage or flat amount in hundredths of the base currency (cents/pence).
**Tax**

At the end of a hire with the fare totalled a sales tax may be applied. To enable this option, a tax with a non-zero tax rate must be configured.

**Tax type**

Choose the type of tax either a percentage of the fare, a percentage of the fare and extras, or a flat amount.

**Tax rate**

Specify the tax rate as either a percentage or flat amount in hundredths of the base currency (cents/pence). Enter 0 (zero) as the tax rate to disable tax.

**Tax rate 2**

Specify a second tax rate as either a percentage or flat amount in hundredths of the base currency (cents/pence). Enter 0 (zero) if not applicable.

**Rates inclusive of tax**

Enable this option if the custom preset tariffs are inclusive of tax. Taximeter will work out the tax and record pre-tax amounts in the hire log and totals.

**Extras override**

Override the default extras for the selected preset’s tariffs. Specify a value in hundredths of the base currency unit so “50” will be displayed as “0.50”, “150” will be displayed as “1.50” in the EXTRAS area of the main display. A value of 0 or no value turns off the override. This is a useful feature when a temporary extra, such as a fuel surcharge, is in use and removes the onerous task of resetting the extras for each hire.

**Keep last tariff**

Enable this option to prevent the tariff being reset to the default tariff whenever the meter enters FOR HIRE mode. This only applies to non geofenced/calendar controlled tariffs.

**OBD settings**

Selecting this option will open the **OBD settings** dialog.

**Enable OBD**

When enabled, Taximeter will attempt to connect to the specified OBD device and use OBD (On-Board Diagnostics) speed data for distance calculations. When disabled, Taximeter will disconnect from any currently connected OBD device.

**Wi-Fi address**

Specify the address of the OBD adapter on the Wi-Fi subnet (usually 192.168.0.10), see OBD Interface.

**Wi-Fi port**

Specify the port of the OBD adapter on the Wi-Fi subnet (usually 35000), see OBD Interface.

**Update period in milliseconds**

The amount of time Taximeter’s OBD service waits between querying vehicle data in milliseconds. Choose from 0ms, 250ms (quarter of a second), 500ms (half a second), 1000ms (one second) or 2000ms (two seconds). If professional mode is enabled, this setting is ignored and 0ms is assumed.
**Display connection hotspot**  
Enable this option to display the OBD Connection Hotspot on the main display.

**Disable ELM32x adaptive timing**  
If you experience communication problems or speed freezes with your OBD device, then enable this option and reconnect to the device (this option is enabled by default).

**Protocol**  
Specify the OBD-II communication protocol the adapter should use to connect to the vehicle’s ECU.

**Custom init**  
Specify additional ELM327 AT commands to run before connecting to the ECU. This setting helps some non-standard vehicles connect to the ECU, e.g. Toyota Celica ZZT230:  
ATSH8213F1\nATIB96\nATIIA13\nATSPA4\nATSW00.

**Retry continuously**  
When enabled, Taximeter will continuously attempt (once every 10 seconds) to connect to the configured OBD adapter in the background. When configuring an adapter for the first time, keep this unchecked (the default) so that you can see any configuration or connection errors should they occur.

**GPS settings**  
Selecting this option will open the GPS settings dialog.

**Auto stop/start**  
If enabled, the taximeter will automatically stop the time meter with a transition from HIRED to STOPPED mode if the GPS fix is lost and the previous two units were not for flag fall or waiting time. If, in the meantime, there has been no manual mode intervention and the fare has not been totalled, then the taximeter will automatically start the time meter with a transition from STOPPED to HIRED mode when the GPS fix is re-acquired. When the signal is re-acquired the distance meter can then charge for the straight line distance between the point where the signal was lost and the point where it was re-acquired. Turning off the time meter ensures there can be no waiting time charges while the GPS signal is lost.

If at the point the GPS signal is lost, the previous two units were for flag fall or waiting time then the assumption is that the vehicle is moving in traffic, in which case the time meter is left running. Should a waiting time charge be made whilst the GPS signal is lost, the location at which the signal was lost is discarded, and so it will no longer be possible to charge the straight line distance when the signal is re-acquired.

This setting is ignored when Charge distance and time concurrently is enabled.

**Allow forced hires**  
Enable this option to allow the meter to be placed into HIRED mode without a valid GPS fix. Once enabled, the meter can be forced into HIRED mode by long pressing the HIRED hotspot. This feature is useful when hires start from locations where GPS reception is poor, e.g. multi-storey or underground car parks. The meter will charge on a waiting time only basis until valid GPS or OBD speed data is acquired.
**Initial GPS accuracy**
Select the initial GPS accuracy required to remove the “Waiting for a valid GPS fix...” message. With the U.S. government’s removal of Selective Availability (SA), all GPS devices should be capable of achieving an accuracy of 20 metres or better. It is recommended that you do not adjust the default value of 20m but instead look for alternative ways to improve the accuracy of your device, e.g. firmware upgrades/downgrades.

**Audible GPS alert**
If enabled, taximeter will play an alert sound when the GPS fix is lost or acquired.

**Interface settings**
Selecting this option will open the *Interface settings* dialog.

**Show power warning**
When enabled and external power is not detected, a warning message will be displayed on start-up recommending that an external power source be used. Disable this option to suppress the power warning.

**Enable sounds**
When enabled the taximeter will beep with a positive or negative tone when a hotspot is touched. The volume plus and minus buttons govern this sound. Disable this option to turn off sounds.

**Bitmap settings**
Selecting this setting will open the *Bitmap settings* dialog see Figure 8.

---

**Figure 8 - Bitmap Settings**
**LED bitmap color**
Specify the LED bitmap color. Choose from red, green or blue.

**Use low intensity bitmaps**
When enabled, Taximeter will reduce the background intensity of the LED bitmaps. These low intensity bitmaps are recommended when it is dark. Note that the *Auto switch bitmap intensity* option, see below, overrides this.

**Auto switch bitmap intensity**
When enabled, Taximeter will automatically switch between high intensity and low intensity bitmaps at sunrise and sunset. This option overrides the *Use low intensity bitmaps* option.

**Display hire total fields**
Choose from “Off”, “Chargeable Totals”, or “Running Totals”. If “Running Totals” is selected, the taximeter main display will display the hire total distance (denoted Dy for yards and Dm for metres) and hire total time (time spent with the time meter running denoted Ds) fields. Note that these are trip totals; they are not the actual distance or time charged by the meter. If “Chargeable Totals” is selected, taximeter will display the chargeable distance (denoted Cy for yards and Cm for metres) and chargeable time totals (denoted Cs).

When OBD (On-Board Diagnostics) is enabled and in use for distance calculations, speed in kph or mph will also be displayed.

**Format totals as hours, miles or kilometres**
Enable this option to format the hire total fields as hours:minutes:seconds and miles/kilometres instead of seconds and yards/metres.

**Use alternate meter labels**
Enable this option to replace TARIFF with RATE, FOR HIRE with VACANT and STOPPED with TIME OFF on the main display. This option is only valid for English locales.

**Screen saver timeout**
Specify an interval after which a screen saver, displaying just the fare, will activate. Once the screen saver has activated, touch the screen to return to the main display.

**Disable screen saver when hired**
Enable this option to disable the screen saver when the meter is hired (i.e. not in FOR HIRE mode).

**Speech step**
Specify the minimum interval in cents/pennies between fare announcements when using the “talking taximeter” function see *Speech on/off*.

**Roof light settings**
Selecting this setting will open the *Roof light settings* dialog.

Using a Bluetooth relay switch, Taximeter is able to automatically control a roof light or sign. Taximeter will turn the light on when entering FOR HIRE mode and turn the light off when entering HIRED mode. A possible roof light wiring schematic is shown in Figure 9. Please consult or use a qualified automotive electrician to perform the installation.
Figure 9 - Example Roof Light Schematic

Table 3 below shows the Tinysine LazyBone V5 Bluetooth switch we tested. There are several versions of the LazyBone switch and it’s important you select the “V5 Bluetooth” version. This version is compatible with iOS, has a password protection option and supports 12V DC power. On iOS, Bluetooth devices (peripherals) are assigned an identifier (UUID) which changes whenever the iOS device is restarted. As a consequence, the only way Taximeter can recognise a device is from its name. It is therefore a good idea to change the name of the switch from its default, “LazyBone”, to something more unique using the “LazyBone BLE” app which can be downloaded from the app store.

<table>
<thead>
<tr>
<th>Bluetooth Switch</th>
<th>Commands</th>
<th>Cost (at time of writing)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tinysine LazyBone V5 (Bluetooth)</td>
<td>On = e</td>
<td>US $30</td>
<td>✓ Manufacturer claims CE compliance</td>
</tr>
<tr>
<td></td>
<td>Off = o</td>
<td></td>
<td>✓ Password protection option (the password can be easily changed using the “LazyBone BLE” app)</td>
</tr>
<tr>
<td>Pointguard iToplight (BLE)</td>
<td>On = P:0\r</td>
<td>POA contact Pointguard</td>
<td>Choose from the following commands:</td>
</tr>
<tr>
<td></td>
<td>Off = P:1\r</td>
<td></td>
<td>On</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Off</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Slot 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Slot 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Slot 3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Slot 4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Slot 5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Booking#</td>
</tr>
</tbody>
</table>

Table 3 - Example Bluetooth Switches
How to setup Taximeter:

1. In the Taximeter app, go to “Menu > Settings > Interface settings > Roof light settings > Roof light Bluetooth device” and select the switch from the list.

2. Set the “Light ON command” to the appropriate relay ON command for the switch.

3. Set the “Light OFF command” to the appropriate relay OFF command for the switch.

4. Set “Password” to the switch password (Tinysine LazyBone V5 Bluetooth only). We recommend that you enable password protection and change the password from its default, 123456, using the “LazyBone BLE” app which can be downloaded from app store.

Roof light Bluetooth device
Select the name of the Bluetooth relay switch from the list (which could take several seconds to populate).

Light ON command
Specify the command used to turn on the switch.

Light OFF command
Specify the command used to turn off the switch.

Password
Specify the switch password (Tinysine LazyBone V5 Bluetooth password protection). Leave this blank if you are not using the password protection option.

Light off in the background
Enable this option if you want the switch turned off when the app enters the background.

Hire log settings
Selecting this setting will open the Hire log settings dialog see Figure 10.
Enable hire logging

When enabled, Taximeter maintains a collection of log files containing previous hire data, called a rotating log set. The hire log files can be found in the documents folder of the application’s sandbox and can be copied using iTunes™ File Sharing. Taximeter appends hire data to the file named taximeter_hire_log_0.txt for text-formatted logs and taximeter_hire_log_0.csv for CSV formatted logs. When this file reaches a configurable size (Log size limit) the log set is rotated. During rotation, each log file taximeter_hire_log_N.txt (where N is the generation number), is renamed taximeter_hire_log_N+1.txt and a new taximeter_hire_log_N.txt is created. If the total number of files in the set exceeds the configurable Log count, the oldest log, having the highest generation number, is deleted. In this way, the log set never occupies more than (Log size limit x Log count) bytes of storage. The values of Log size limit and Log count should be chosen to capture sufficient hire data given the available storage space.

To summarize, taximeter_hire_log_0.txt is always the latest log file and the larger the (generation) number, the older the file. The oldest log file will be deleted during rotation once the Log count has been reached.

Log format

Choose from Text, CSV, or Text & CSV log record formats.

The Text format stores each hire record across multiple lines in the log file with each data field on a separate line. The Text log file has the extension “.txt”.

Figure 10 – Hire Log Settings
The CSV (Comma-Separated Values) format stores each hire record as a separate line in the log file with each data field separated by a comma character. The CSV log file has the extension ".csv". This log format makes it easier to import the data into a database or spreadsheet application. The fields from left to right in the CSV log record are:

<table>
<thead>
<tr>
<th>Hire start date / time (local tz)</th>
<th>Hire end date / time (local tz)</th>
<th>Hire start latitude, longitude</th>
<th>Hire end latitude, longitude</th>
<th>Badge#</th>
<th>Preset</th>
<th>Tariff#</th>
<th>Currency symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISO currency code</td>
<td>Extras</td>
<td>Fare</td>
<td>Tax</td>
<td>Total Fare</td>
<td>Discount</td>
<td>Tip</td>
<td>Payment type</td>
</tr>
<tr>
<td>Invoice ID</td>
<td>Transaction ID</td>
<td>Imperial units (true / false)</td>
<td>Running distance (yd/m)</td>
<td>Running time (s)</td>
<td>Hire distance (yd/m)</td>
<td>Hire time (s)</td>
<td>Chargeable distance (yd/m)</td>
</tr>
<tr>
<td>Chargeable time (s)</td>
<td>Receipt#</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Distances are in yards or metres depending on whether the *Imperial units* field is true or false respectively.

**Enable address lookup**

When enabled, Taximeter will use Apple’s Geocoding Service to attempt to decode hire start and end locations to addresses that will be appended to the text log. Note: This operation will only be performed if there is an active data connection.
Automatic email settings
Selecting this setting will open the Automatic email settings dialog, see Figure 11.

Enable automatic email send
When enabled, Taximeter will attempt to zip and email the hire and event logs to the Destination addresses at most every Log send interval hours using the email account specified in Username and Password. The send is triggered when Taximeter starts, and when Taximeter enters FOR HIRE Mode from STOPPED Mode providing that at least Log send interval hours have passed since the last successful send, that internet access is available and that the hire logs are not empty. The send is performed in the background and a message will appear briefly when the logs have been sent. The logs can be manually sent at any time, using the Send hire logs menu option.

Send over Wi-Fi only
When enabled, Taximeter will only send hire/event log emails when there is an active Wi-Fi connection.

Destination addresses
The email addresses to which hire logs should be sent. Multiple email addresses can be specified if they are comma separated.

Log send interval
The minimum interval since the last successful send before any subsequent attempt is made to send the hire logs.
Reset logs after send
When enabled, Taximeter will clear the hire logs after each successful send.

SMTP host
The host name or IP address of the outgoing mail server. For icloud.com accounts set this to smtp.mail.me.com.

SMTP port
The SSL/TLS port of the outgoing mail server, which is usually 465 or 587. For icloud.com accounts set this to 587.

SMTP protocol
The protocol used to communicate with the outgoing mail server, either TLS or STARTTLS. For icloud.com accounts set this to STARTTLS.

Username
The username of the email account being used to send the hire logs email. For icloud.com accounts set this to the full iCloud email address (for example, johnnoakes@icloud.com, not johnnoakes).

Password
The password of the email account being used to send the hire logs email.

Test email settings
Select this option to send a test email using the settings.

If you are using a Gmail account and receive the following error while testing your email settings:

Unable to send a test email: Bad email username or password

and you are confident that you are using the correct <user>@gmail.com username and password, then head over to Account Security Settings (https://www.google.com/settings/security/lesssecureapps) for the Gmail account in question and enable "Access for less secure apps". This allows you to use the Google SMTP mail server for clients other than the official ones and would appear to resolve this issue. Note that Taximeter securely connects to the Gmail SMTP server on port 465 using a SSL encrypted link. You might have to wait up to an hour for the setting to take effect as it's rolled out across Google's infrastructure.

Log size limit
The maximum number of bytes to append to a log file before rotating the log set, see Enable hire logging.

Log count
The maximum number of files in the log set. Once this has been exceeded the oldest log file will be deleted, see Enable hire logging.

Event alerts
Select this option to open the Event alert settings dialog, see Figure 12.
Lock alerts configuration
If enabled, the alerts configuration will be locked when the preset is locked, see Lock/Unlock.

Events
Select this option to open a list of events. Enable the events you would like to receive alerts for, then press the Back key to return.

Email
Select this option to configure the email settings to be used for the alert.

Enable email alerts
Toggle this switch on to enable email alerts.

Destination addresses
Specifies the email address to which alerts should be sent. Multiple email addresses can be specified if they are comma separated.

SMTP host
The host name or IP address of the outgoing mail server. For icloud.com accounts set this to smtp.mail.me.com.

SMTP port
The SSL/TLS port of the outgoing mail server, which is usually 465 or 587. For icloud.com accounts set this to 587.
SMTP Protocol
The protocol used to communicate with the outgoing mail server, either TLS or STARTTLS. For icloud.com accounts set this to STARTTLS.

Username
The username of the email account being used to send the alert email. For icloud.com accounts set this to the full iCloud email address (for example, johnnoakes@icloud.com, not johnnoakes). This should be an email account set up for the sole purpose of sending alerts so that any consequence of the account being compromised is kept to a minimum.

Password
The password of the email account being used to send the alert email. Note that if the account password were ever changed, all devices using that account would need to be reconfigured with the new password.

Test email settings
Select this option to send a test email using the settings.

If you are using a Gmail account and receive the following error while testing your email settings:

Unable to send a test email: Bad email username or password

and you are confident that you are using the correct <user>@gmail.com username and password, then head over to Account Security Settings (https://www.google.com/settings/security/lesssecureapps) for the Gmail account in question and enable "Access for less secure apps". This allows you to use the Google SMTP mail server for clients other than the official ones and would appear to resolve this issue. Note that Taximeter securely connects to the Gmail SMTP server on port 465 using a SSL encrypted link. You might have to wait up to an hour for the setting to take effect as it’s rolled out across Google's infrastructure.

Operator settings
Select this option to open the Operator settings dialog.

Driver’s badge number
The driver’s badge or other identification number. This information will appear in hire logs.

Vehicle identification number
The unique vehicle identification number of the vehicle. This information will appear in CSV hire logs.

Operator name
The name of the operator/broker. This information will appear in CSV hire logs.

Receipt settings
Select this option to open the Receipt settings dialog.

Receipt header
Specify the header text to be printed at the top of the receipt, see Figure 13. This field is HTML sensitive so you can use the formatting tags available in HTML. Any characters that
have a special meaning in HTML that are to be printed should be substituted with the corresponding character entity reference, i.e.

Table 4

<table>
<thead>
<tr>
<th>Special Character</th>
<th>Entity Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;</td>
<td>&quot;</td>
</tr>
<tr>
<td>'</td>
<td>'</td>
</tr>
<tr>
<td>&lt;</td>
<td>&lt;</td>
</tr>
<tr>
<td>&gt;</td>
<td>&gt;</td>
</tr>
<tr>
<td>&amp;</td>
<td>&amp;</td>
</tr>
</tbody>
</table>

**Receipt footer**
Specify the footer text to be printed at the bottom of the receipt, see Figure 13. This field is HTML sensitive so you can use the formatting tags available in HTML. Any characters that have a special meaning in HTML that are to be printed should be escaped using the corresponding character entity reference, see Table 4.

**Logo bitmap**
Specify the logo, if any, to be printed at the top of the receipt, see Figure 13.

**Address decode timeout**
Specify the time to allow for the reverse gecoding of the “from and to locations” to street addresses. The time it takes to generate a receipt could be adversely affected by reverse gecoding over a poor quality network connection so it is a trade off between a shorter printing duration and potentially omitting the street addresses from the receipt or a longer printing duration and including the street addresses.

**Receipt number**
Specify the current receipt number. This value will be incremented with each hire and displayed on the receipt.

**Enable professional mode**
Toggle this switch on to enable professional mode. This setting cannot be changed when the preset is locked and does not affect any active hire. Professional mode removes Taximeter’s reliance on GPS for distance calculations, i.e. GPS is not used as a backup for OBD data and a valid GPS fix is not required before being able to place Taximeter into HIRED mode. If the OBD connection should fail or speed updates stop while the meter is hired, the meter will continue to charge based on time until OBD communication is restored.

**Download URL**
The location where the latest preset data can be downloaded (used by the Download presets menu option).

**Send hire logs**
This menu option will be visible if both Hire logging and Automatic email send have been enabled. It will be disabled if internet access is not currently available. Select this menu option to manually trigger a hire log send, see Enable automatic email send.
Print
At the end of a hire with the fare totalled, a receipt with the layout shown in Figure 13 can be generated and printed with AirPrint or emailed. Selecting this option more than once will produce a duplicate receipt. A receipt can also be generated by long pressing the Total Fare Hotspot with the fare totalled.

Please note that the distance and time shown on the receipt are chargeable values for completed units only and not trip totals.

Figure 13 - Receipt Layout
About
Selecting this menu option will display an information dialog with program version information, serial number, preset version information, web/email contact information, open source credits and, if scrolled, details of the previous hire (when available) see Figure 14. If requested by support, press the Diag button to send your device’s system log to support for analysis, otherwise press OK to dismiss the dialog.

![About Taximeter](image)

Figure 14 – Last Hire

Speech on/off
Select this menu option to turn on/off the “talking taximeter” function. When turned on, Taximeter will use the built-in text-to-speech engine to vocalize the fare during the hire. The frequency of fare announcements can be controlled using the Speech step setting.

Lock/Unlock
Select this menu option to lock and unlock the selected preset. Once locked, preset selection settings will be disabled and Taximeter will only use the rates in use at lock time. After locking Taximeter, note the serial number and preset version from the About dialog. Before unlocking, check the serial number and preset version match those recorded at lock time. Before unlocking, check the serial number and preset version match those recorded at lock time and examine the Event log any unexpected UNLOCK / LOCK events.

It should be assumed that the locked preset has been tampered with if any of the following are encountered:

- Taximeter is already unlocked.
- The serial number and/or preset version do not match those recorded at lock time.
- It is not possible to unlock Taximeter using the lock password.
- There are unexpected UNLOCK / LOCK events in the event log.

During the unlock process, Taximeter will validate a digital signature taken at lock time and will alert you if this signature check fails. A signature check failure indicates that the locked preset has been altered.
If the password is forgotten, then Taximeter can be reset to defaults by uninstalling and reinstalling the application. Note that reinstalling the app will generate a new serial number which is why it is important to record the serial number when locking and to verify it before unlocking.

**Event log**

Select this menu option to open the event log. The event log is a chronological list of the last 1000 system events. A description of each system event code is shown in Table 5.

<table>
<thead>
<tr>
<th>Event Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>INSTALLED</td>
<td>Taximeter application installed (serial number recorded).</td>
</tr>
<tr>
<td>LOCK_ROOTED_DEVICE</td>
<td>Jailbroken device detected during preset/setting lock.</td>
</tr>
<tr>
<td>LOCK_SUCCESS</td>
<td>Preset locked successfully (XML preset data recorded).</td>
</tr>
<tr>
<td>UNLOCK_SUCCESS</td>
<td>Preset unlocked successfully.</td>
</tr>
<tr>
<td>UNLOCK_FAIL</td>
<td>Preset unlock failed (invalid password).</td>
</tr>
<tr>
<td>TAMPER_DATA</td>
<td>Preset data has been tampered with.</td>
</tr>
<tr>
<td>TAMPER_SIGNATURE</td>
<td>Preset signature verification failed during unlock.</td>
</tr>
<tr>
<td>TAMPER_SERIAL</td>
<td>Serial tamper detected. The serial number of the device does not match the serial number of the locked preset.</td>
</tr>
<tr>
<td>GPS_LOST</td>
<td>GPS fix lost during hire (HIRED/STOPPED modes).</td>
</tr>
<tr>
<td>GPS_ACQUIRED</td>
<td>GPS fix re-acquired during hire (HIRED/STOPPED modes).</td>
</tr>
<tr>
<td>GPS_ANOMALY</td>
<td>Multiple GPS anomalies were detected during hire. This could be an indicator of defective GPS hardware.</td>
</tr>
<tr>
<td>OBD_LOST</td>
<td>OBD communication lost during hire (HIRED/STOPPED modes).</td>
</tr>
<tr>
<td>OBD_ACQUIRED</td>
<td>OBD communication re-acquired during hire (HIRED/STOPPED modes).</td>
</tr>
<tr>
<td>OBD_SPEED_TAMPER</td>
<td>OBD speed tamper detected.</td>
</tr>
<tr>
<td>OBD_CALIBRATION_SET</td>
<td>An OBD calibration was applied.</td>
</tr>
<tr>
<td>OBD_CALIBRATION_CLEARED</td>
<td>The current OBD calibration was cleared.</td>
</tr>
<tr>
<td>OBD_CALIBRATION_ALL_CLEARED</td>
<td>All OBD calibrations were cleared.</td>
</tr>
<tr>
<td>BACKUP</td>
<td>Backup successfully completed.</td>
</tr>
<tr>
<td>RESTORE</td>
<td>Restore successfully completed.</td>
</tr>
<tr>
<td>ALERT_FAILED</td>
<td>Taximeter failed to send an alert event.</td>
</tr>
</tbody>
</table>

Select the *Action* button to share the event log with other apps.
Hire log
Select this menu option to open the pageable hire log viewer. This menu option will only be visible when hire logging to text formatted logs is enabled. The hire log viewer shows the last 256 KB of hire log data. The viewer initially displays the last page of the log. Change the page by swiping horizontally across the screen.

Select the Action button 🗺️ to share hire logs with other apps.

Totals
Select this menu option to open the totals page. This page displays a list of user resettable and system totals which include total hires, total extras, total fares, total taxes, total totals, total hire distance and total hire time. Press the Reset Totals button to reset the user totals.

Select the Action button 🗺️ to share totals with other apps.

Backup
Select this menu option to save Taximeter’s settings to a backup file. The generated backup file, taximeter.backup, can be found in the documents folder of the application sandbox and can be accessed using iTunes™ File Sharing. This file is portable; it can be used to restore settings on a different device. Note that for security reasons:

1. Passwords, keys, and serial numbers are not backed up.
2. Locked settings cannot be reinstated or overwritten using backup & restore.

Restore
Select this menu option to overwrite Taximeter’s settings with those from a previously saved backup file, see Backup.

Calibrate
Select this menu option to open the OBD Calibration page. This option will be visible when connected to a vehicle via the OBD interface and will only be enabled when the preset and settings are unlocked.

To perform a calibration:

- Pick a quiet major road/highway with a speed limit above 60 kph (37 mph) and a length of at least 4-5 km (2.5-3.1 mi).

- Once the vehicle speed is above 60 kph (37 mph) and with a GPS accuracy of 10m or less, the Start button will be enabled.

- Get a passenger to press the start button and continue driving in one direction using the most direct route for 4 km (2.5 mi). Follow the curvature of the road and avoid changing lanes. If during calibration the average speed drops below 50 kph (31 mph), the calibration will fail (hence the need for a quiet road which we know are hard to find these days!).
• Other conditions can cause a failure, e.g. loss of OBD connection, low OBD update frequency and you will be advised of any errors should they occur.

• If at the end of the run there is no available data network, the run will fail, but the results can be processed later using the Post Process tool bar button when a network connection (Wi-Fi or mobile) becomes available.

• When the calibration has successfully completed, use the View Route button to confirm that the correct route was used. The Google Distance Matrix service will select the most direct route between the start and end of the calibration run.

• Use the refresh button in the tool bar to reset the calibration run.

The calibration aims to achieve +/- 0.5% accuracy using the distance from the Google Maps Distance Matrix API as a reference.

Successful calibrations will be stored against the vehicle’s VIN (where this is available via OBD) and will be backed up by the Backup function. Calibrations will only be restored where a calibration does not already exist. Use ➕> Clear Current to clear the currently applied calibration. Use ➕> Clear All to clear calibrations for all vehicles.

Successful calibrations are noted in the Event log with the event OBD_CALIBRATION_SET. When calibrations are cleared they are recorded with the events OBD_CALIBRATION_CLEARED and OBD_CALIBRATION_ALL_CLEARED.

Upgrade
Select this menu option to purchase or restore the “Unrestricted Fare” upgrade. This in-app purchase will remove the 10.00 maximum fare limitation.
OBD Interface

As an alternative to GPS, Taximeter can use speed data from the vehicle’s ECU to determine distance travelled. When professional mode is not enabled, GPS will be used as a backup to OBD (in the event the OBD connection should fail or speed updates stop), so a valid GPS fix is required before being able to enter HIRED mode. Also note that the hire logging feature uses GPS to record hire start and end locations.

To use this feature you will need:

1. An OBD-II compliant vehicle (most petrol vehicles after 1996 and most diesel vehicles after 2004 will be).
2. An ELM327 compatible Wi-Fi adapter. Taximeter was tested using a $17 Wi-Fi adapter freely available on eBay (at the time of writing) see Figure 15.

![Figure 15 - ELM327 Compatible Wi-Fi Adapter](image)

To enable Wi-Fi OBD:

1. Locate your vehicle’s diagnostic socket. It’s a 16 pin D female connector. The OBD-II standard dictates that the socket must be within 3 feet of the driver and accessible without any tools.
2. Plug your adapter into the socket.
3. On your iOS device, in Settings, chose Wi-Fi, and select the adapter’s Wi-Fi network ID. This may appear as CLKDevices, WIFI ELM327, WiFiOBD, OBDDevice, V-Link, or something similar. If you need a password to connect it is usually 12345678.
4. Once connected to the Wi-Fi network, click the small blue information icon (an ‘i’ in a blue circle) and set the IP Address to 192.168.0.123 and the Subnet Mask to 255.255.255.0.
5. In Taximeter, go to “Menu > Settings > OBD settings” and check the Wi-Fi address is 192.168.0.10 and the Wi-Fi port is 35000. Then click “Enable OBD” to connect to the device. Once successfully connected, speed broadcasts will be enabled and used in
distance calculations and the GPS Accuracy bar will be replaced by a blue Speed (SPD) bar (scale 0 – 160 kph), see Figure 16.

Important Notes: The ignition will need to be in position 2 for Taximeter to be able to read vehicle speed data. If you don’t want a flat battery, remember to unplug your adapter when you’ve finished using it.

Figure 16 - Main Display with OBD Enabled
Preset details of the presets included in the latest preset data file and whether they support calendar control/geo-fencing/tariff auto-switch can be found on the Planet Coops website, http://www.planetcoops.com/apps/taximeter/presets.pdf. Please contact us at support@planetcoops.com if you would like us to update an existing preset or include an additional preset in the data file.

**Calendar Control**

Presets which support calendar control will select the tariff code for the current date and time when they are placed into FOR HIRE mode. The calendar can include holidays and up to 6 special days.

**Geo-fencing**

Presets which support geo-fencing will select the tariff code for the current GPS location when they are placed into FOR HIRE mode. See the Planet Coops (United Kingdom) preset for an example of a geo-fenced preset. Geo-fenced tariffs define the geographic area in which they are valid using polygons where each vertex is a latitude/longitude point in the world. If the polygon is declared inverse, the geo-fenced area will exclude the polygon. We have an online Geofence Polygon Tool, see https://taximeter.planetcoops.com/geofence/, which you can use to create the polygon XML. Simpler US ZIP code boundary polygons can be generated by substituting the required 5 digit ZIP code in the following URL, https://taximeter.planetcoops.com/geofence/polygon.php?zipcode=13214.

**Manual Switch**

It is possible to make a preset entirely geo-fenced/calendar controlled by disabling manual switching of the tariff. A boolean preset attribute, manualSwitchTariff, can be set to false to prevent users manually changing the tariff, see the London preset for an example.

**Tariff Auto-switch**

Tariff auto-switch is an extension of geo-fencing/calendar control so a preset which supports tariff auto-switch will, by definition, also support geo-fencing/calendar control. Presets with tariff auto-switch support (autoSwitchTariff="true") will automatically switch to the appropriate tariff for the current GPS location and/or date and time during an active hire period (HIRED/STOPPED modes) unless a tariff code has been manually selected. The switch will occur when the next taximeter unit is charged.

**Ahead-of-Time Programming**

To facilitate ahead-of-time programming of future tariffs, the tariff and discount elements support two optional XSD dateTime attributes, validFrom and validTo, representing the date and time the element is valid from and to respectively. A tariff without a validFrom date is considered as being valid from "1970-01-01T00:00:00+00:00".

Here's an example with two future tariffs effective from May 30th, 2018 and May 30th, 2022:

```xml
<preset name="Acme Cabs Inc" country="United States" defaultTariff="1" useImperialUnits="true"
supportsCalendar="false" currency="$">
  <tariff id="1" extras="0"
    validTo="2018-05-30T00:00:00-06:00">
    <unit min="-1" max="0" distanceUnit="135.38" timeUnit="30.0" unitCharge="330"/>
    <unit min="0" max="-1" distanceUnit="135.38" timeUnit="30.0" unitCharge="20"/>
  </tariff>
  <tariff id="2" extras="0"
    validTo="2022-05-30T00:00:00-06:00">
    <unit min="-1" max="0" distanceUnit="135.38" timeUnit="30.0" unitCharge="330"/>
    <unit min="0" max="-1" distanceUnit="135.38" timeUnit="30.0" unitCharge="20"/>
  </tariff>
</preset>
```
PayPal Here™, Square Point of Sale™ or SumUp™ Integration

Taximeter can transfer fare information to the PayPal Here™, Square Point of Sale™ or the SumUp™ application if it is installed. When the fare is totalled a PayPal™ icon ®, Square Point of Sale™ ® icon or SumUp™ ® icon will appear in the main display. Press the icon and the fare will be transferred for payment processing.

Note: An app force close will be required after changing the installed payment processor in order to load the appropriate icon. If multiple payment processing apps are installed the order of precedence is PayPal Here, Square POS and then SumUp.

FAQ

Why is Taximeter “Waiting for a valid GPS fix...”?
Make sure your handset has a clear view of the sky. Inside a vehicle, it helps if the handset is placed in a windscreen mount. It can take up to 15 minutes for a cold start and a few seconds for a warm start. A cold start refers to a situation in which the GPS must acquire all data in order to start navigation. A warm start means the GPS has most of the data it needs already in memory. Once the accuracy of this fix has reached the initial GPS accuracy (see Initial GPS accuracy) the message will clear. Taximeter can then be placed into HIRED mode.

I’ve lost the Taximeter main display, how do I get back to it?
If the Taximeter application is still running, a Taximeter notification will be visible in the Notification Centre. To get back to the taximeter display, reveal the Notification Center by pulling down the status bar. In the Notification Center, select the Taximeter notification from the list of notifications, see Figure 17. Alternatively select the Taximeter icon from the Home Screen as if you were launching Taximeter for the first time.
I am unable to get my OBD2 adapter to connect with the app it is blinking on SPD and says "Waiting for OBD...", do you have any help on this issue?

When we examined the diagnostic logs we found the following entries:

```
10-29 17:06:52.837 E/ObdCommand(28156): 01 0D
10-29 17:06:52.837 E/ObdCommand(28156): SEARCHING...
UNABLETOCONNECT
```

This indicates that the adapter was unable to connect to the vehicle's ECU. Usually this is the result of not having had the ignition turned to position 2 but in this case the ignition was in position 2 with the engine running so what went wrong?

It transpires that the majority of cheap Chinese OBD2 adapters you will find on eBay are missing the components needed to support the pre-2008 OBD2 protocols SAE J1850 VPW, and SAE J1850 PWM. In this case the vehicle was a 2006 Dodge Caravan which uses the SAE J1850 VPW protocol.

All cars sold in the US from 2008 onwards must support the ISO 15765-4 CAN protocol so these adapters generally work with these vehicles but before then, GM/Chrysler/Dodge and Ford tended to make use of the J1850 VPW and J1850 PWM protocols respectively. You can read about the missing components here: http://torque-bhp.com/forums/?wpforumaction=viewtopic&t=5155.0

If you are considering purchasing a cheap Chinese adapter and your car is pre-2008, check with the supplier that it is compatible with your make, model, and year of vehicle.

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