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Introduction

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

Taximeter’s features include:

- 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 (itemized extras can be programmed via XML)
- Minimum fare
- Tax
- Discounts
- Tips
- Yards/metres units
- Hire log (text and/or CSV format) with automatic send via email
- Integration with PayPal Here™, Square Point of Sale™ or SumUp™ payment processing
- Receipt printing (Planet Coops’ POS Print application and a compatible Bluetooth mobile printer are required)
- Generate a PDF receipt which can be emailed or printed through the Android Print Service (Android KitKat or later required). Links can be sent via SMS or viewed as a QR code when cloud storage is enabled.
- Roof light control (a compatible Bluetooth switch is required)
- 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 (an OBD-II compliant vehicle and an ELM327 compatible Bluetooth, Wi-Fi or USB OBD-II adapter are required. If you are planning to use a USB adapter check that your device is running Android™ 3.1+ and supports USB host mode.)
- OBD calibration function
- Support for wireless GPS receivers
- Data logging - log GPS position, meter state and fares to the cloud (incurs a small monthly charge to contribute to server costs). A basic online tracking facility is available should you choose this option.
- API for integration with 3rd party apps
- Backup and restore settings
- Supports Samsung Multi Window™, LG Dual Window™ & Android™ Multi-Window
- Screen saver, floating widget

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 colour for a given GPS quality. The horizontal white line indicates the average quality.
Table 1

<table>
<thead>
<tr>
<th>Quality</th>
<th>Bar Colour</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. If the Planet Coops’ POS Print application is installed, long pressing this hotspot at the end of a hire with the fare totalled (or in FOR HIRE mode immediately following the hire) will initiate a receipt print.

When the fare is totalled press the tip icon to add any tip. The tip will be recorded in the hire logs, receipt, 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 when *Enable OBD over USB* is checked or a Bluetooth device has been set, and a connection is not in
progress or already established. Touching this hotspot has the same effect as checking Menu > Settings > OBD settings > Enable OBD.

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

**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](image)

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 or pressing the menu button will bring out the User Menu, see Figure 4. The menu button, for devices without hardware buttons, is briefly displayed whenever the main display is touched. The button can be dragged to a custom screen location. On some devices, long pressing the back soft key will also open the 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 41 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.
Figure 6 – Custom Preset Settings

This dialog lists the settings for the Custom preset.

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

**Distance in yards**
If checked, the preset’s units of distance are yards. If unchecked, 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, see ‘Tariff 1 - 10’, 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, $2.90 = $2.90, etc.

Flag drop distance is automatically calculated when Apply is selected but, if required, you can specify a separate initial distance for the flag drop by checking the check box 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 checkbox). 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 Apply button to save the changes to the selected tariff or the Cancel/Close button to exit the wizard. When you click Apply, 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. Check 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 \( \frac{D}{T} \) 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. Check 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
Check this to have the meter charge for contiguous units of waiting time. When enabled, 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 2

<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 “290” is “2.90” 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, receipt, totals, and be 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
Check 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
Check this 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
Check 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 presets.

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

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

Enable OBD over USB
Check this to enable Taximeter’s USB interface for OBD, see OBD Interface.
**USB serial baud rate**
The majority of USB OBD adapters communicate using 38400 baud but some devices, e.g. ScanTool OBDLink, communicate at 115200 baud. If you fail to get any speed reading from your device, try changing this setting to 115200 baud, then unplug and reconnect it.

**Bluetooth device**
Specify the address of the paired Bluetooth device to use for OBD data.

**Wi-Fi address**
As an alternative to Bluetooth, specify the network address of a Wi-Fi OBD adapter on the Wi-Fi subnet (usually 192.168.0.10), see *OBD Interface*.

**Wi-Fi port**
Specify the network port of the Wi-Fi 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.

**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 setting is only set when the device is initialized).

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

**GPS Bluetooth device**
Specify the address of the paired Bluetooth GPS receiver to use as the source of GPS position data. Location updates will be shared with other applications if *Settings > Developer options > Allow mock locations* is enabled before starting Taximeter.

**Enable Wi-Fi GPS over UDP**
If checked, the meter will use NMEA 0183 data received on the specified UDP address and port for position updates. Enabling this option will disable built-in GPS reception. Location updates will be shared with other applications if *Settings > Developer options > Allow mock locations* is enabled before starting Taximeter.

**Wi-Fi GPS TCP address**
Taximeter can receive GPS position data over a TCP network socket. Specify the network address of the Wi-Fi GPS device. Specifying a value will disable built-in GPS reception. Location updates will be shared with other applications if *Settings > Developer options > Allow mock locations* is enabled before starting Taximeter.

**Wi-Fi GPS TCP port**
Specify the TCP network port of the Wi-Fi GPS device.
Wi-Fi GPS UDP address
Taximeter can receive GPS position data over a UDP network socket. Specify the optional multicast group address on which to listen for UDP data. Only a few multicast addresses appear to work on Android (we've had success with 224.0.0.1 and 224.0.0.251).

Wi-Fi GPS UDP port
Specify the UDP network port on which to listen for NMEA 0183 data.

Failover to built-in GPS
If checked, the meter will use the built-in GPS if the wireless GPS signal is lost while hired. The meter will switch back to using wireless GPS location updates if a wireless GPS fix is re-acquired.

Reset GPS
Select this option to clear cached GPS state (perform a cold start).

Download A-GPS data
Select this option to manually download Assisted GPS data (satellite orbital information) from the Internet. This should make the time to first fix quicker. Note that Taximeter will automatically perform this during start-up if there is an active data connection and at least 24 hours have passed since the last download.

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

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

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

Bitmap settings
Selecting this setting will open the Bitmap settings dialog see Figure 8.
**LED bitmap color**
Specify the LED bitmap color. Choose from red, green or blue.

**Use low intensity bitmaps**
If checked, 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**
If checked, 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**
Check 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**
Check 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**
Check this to disable the screen saver when the meter is hired (i.e. not in FOR HIRE mode).

**Full screen**
Check this option to enable full screen layout.

**Enable floating widget**
Check this option to display a floating widget when Taximeter is running in the background.

![Figure 9 - Floating Widget](image)

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

**Enable Taximeter API**
Check this option to enable the Taximeter API (Application Programming Interface). This will allow third party software to interact with Taximeter using the API.
**Roof light settings**

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

Using a Bluetooth Classic relay switch (not BLE), 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 or when exiting the app. Possible roof light wiring schematics are shown in Figure 10. Please consult or use a qualified automotive electrician to perform the installation.

![Roof Light Schematic](image)

**Figure 10 - Example Roof Light Schematics**

Table 3 below shows a selection of Bluetooth Classic switches that were available at the time of writing.

<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 V2 (Bluetooth)</td>
<td>On = e, Off = o</td>
<td>US $30</td>
<td>Requires a DC 12V – DC 5V 3A Converter @ ~ $5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Manufacturer claims CE compliance</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Bluetooth pairing code can be changed from default (1234) using USB adapter and BluetoothBee setting tool</td>
</tr>
<tr>
<td>Bluetooth Switch</td>
<td>Commands</td>
<td>Cost (at time of writing)</td>
<td>Comments</td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>---------------</td>
<td>---------------------------</td>
<td>---------------------------------------------------------------------------</td>
</tr>
<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 Tinysine app)</td>
</tr>
<tr>
<td>eletechsup 1 Channel Bluetooth Relay</td>
<td>On = A4</td>
<td>US $18</td>
<td>✓ The cheapest switch we tested</td>
</tr>
<tr>
<td></td>
<td>Off = A3</td>
<td></td>
<td>✗ Difficult to change the Bluetooth pairing code from its default (needed a USB to TTL UART converter and Blu-Tack to connect TX and RX pins, see picture)</td>
</tr>
</tbody>
</table>
### Bluetooth Switch

<table>
<thead>
<tr>
<th>Bluetooth Switch</th>
<th>Commands</th>
<th>Cost (at time of writing)</th>
<th>Comments</th>
</tr>
</thead>
</table>
| Numato Lab 2 Channel Bluetooth Relay Module            | On = \relay on 0\r  
Off = \relay off 0\r                                                   | US $50                    | × No plastic enclosure  
✓ Uses an FCC, ICS, CE (RoHS) compliant RN42 Bluetooth module  
✓ RN42 Bluetooth pairing code can be easily changed over a Bluetooth connection using a terminal emulator (Tera Term):  
$$  
SA,4  
SP,nnnn  
R,1  
<power cycle>  
$$ |
| Pointguard iToplight (Bluetooth Classic)               | On = P:0\r  
Off = P:1\r                                                        | POA contact Pointguard    | Choose from the following commands:  
On P:0\r  
Off P:1\r  
Slot 1 P:0\rD:1\r  
Slot 2 P:0\rD:2\r  
Slot 3 P:0\rD:3\r  
Slot 4 P:0\rD:5\r  
Slot 5 P:0\rD:6\r  
Booking# P:0\rD:4 nnnn\r |

Table 3 - Example Bluetooth Switches

How to setup Taximeter:

1. To prevent unauthorized access to the Bluetooth switch please ensure that you change the Bluetooth pairing code from its default value or enable password protection (Tinysine LazyBone V5 Bluetooth). You really don't want the general public being able to turn your roof light on and off!

2. Pair your Bluetooth switch with your phone/tablet. Power on the switch. On your phone/tablet, go to “Settings > Wireless & Networks > Bluetooth”, ensure Bluetooth is turned on and “Search for devices”. The switch should appear in the list of Bluetooth devices (the devices we tested appeared as “LazyBone”, “SPP-CA”, and “RNBT-A2BA”). Select the device and enter the pairing code (the LazyBone V5 pairing code is 1234) when prompted.

3. In the Taximeter app, go to “Menu > Settings > Interface settings > Roof light settings > Roof light Bluetooth device” and select the previously paired device from the list.
4. Set the “Light ON command” to the appropriate relay ON command for the switch.

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

6. Set “Password” to the switch password (Tinysine LazyBone V5 Bluetooth only).

7. Check “Enable roof light” and restart Taximeter.

Enable roof light
This setting is the master switch for roof light control. Check this setting to enable roof light control.

Roof light Bluetooth device
Specify the address of the paired Bluetooth relay switch.

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).
**Hire log settings**
Selecting this setting will open the *Hire log settings* dialog see Figure 11.

---

**Figure 11 – Hire Log Settings**

**Enable hire logging**
If checked, 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 root folder (/) of the internal storage. 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".

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>Note: Distances are in yards or metres depending on whether the Imperial Units field is true or false respectively.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Enable address lookup**

If checked, Taximeter will use Google’s Geocoding Service to attempt to decode hire start and end locations to addresses which will be appended to the text log. Note: This operation will only be performed if there is an active data connection and sufficient time before application shutdown for it to complete successfully.
Automatic email settings
Selecting this setting will open the Automatic email settings dialog Figure 12.

Enable automatic email send
When enabled, Taximeter will attempt to zip and email the hire and event logs to the Destination email 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
If checked, Taximeter will only send hire/event log emails when there is an active Wi-Fi connection.
**Destination email addresses**
The email addresses to which hire logs should be sent. Multiple email addresses can be specified if they are separated by commas.

**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**
If checked, Taximeter will clear the hire logs after each successful send.

**SMTP host**
The host name or IP address of the outgoing mail server.

**SMTP port**
The SSL/TLS port of the outgoing mail server, which is usually 465 or 587.

**SMTP protocol**
The protocol used to communicate with the outgoing mail server, either TLS or STARTTLS.

**Username**
The username of the email account being used to send the hire logs email.

**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](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 TLS 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*. 
Data log settings
Selecting this setting will open the Data log settings dialog see Figure 13.

Log key
Enter the log key issued to you by Planet Coops. This is unique to each operator and should be kept confidential.

Enable data logging
If checked, Taximeter will periodically upload Automatic Vehicle Location (AVL) data and taximeter data to Planet Coops’ data server. Taximeter data are captured upon state changes and AVL data at the AVL interval while Taximeter is running. The AVL data are stored in files with the name `avl_YYYYMMDD.csv` where YYYY is the year, MM the month, and DD the day the data was collected. Similarly, taximeter data are stored in files with the name `taximeter_YYYYMMDD.csv`. These are comma separated value (csv) files and are available for download from the History page of the tracking website, [https://datalog.planetcoops.com/tracking](https://datalog.planetcoops.com/tracking).

The format of the AVL file is:
The format of the taximeter file is:

<table>
<thead>
<tr>
<th>Date (local tz)</th>
<th>Time (local tz)</th>
<th>Operator</th>
<th>VIN</th>
<th>Badge#</th>
<th>Status</th>
<th>Preset</th>
<th>Tariff#</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time Hired (s)</td>
<td>Distance Hired (m)</td>
<td>Time Free (s)</td>
<td>Distance Free (m)</td>
<td>ISO Currency Code</td>
<td>Extras</td>
<td>Fare</td>
<td>Tax</td>
</tr>
<tr>
<td>Total Fare</td>
<td>Discount</td>
<td>Tip</td>
<td>Payment Type</td>
<td>Invoice ID</td>
<td>Transaction ID</td>
<td>Receipt#</td>
<td></td>
</tr>
</tbody>
</table>

Note: The fare information shown in blue is recorded at the end of a hire on the transition from STOPPED to FOR HIRE mode.

Please note that the server will automatically delete any data more than a week old and while we can’t provide a service level guarantee, our service provider claims 99.9% uptime.

When using this feature please ensure that you have set the Operator settings; operator name, vehicle identification number (VIN or plate#), and the driver’s badge number to appropriate values.

![Figure 14 - Online Tracking](https://datalog.planetcoops.com/tracking)

A basic online tracking facility using MapQuest™/Leaflet is available at [https://datalog.planetcoops.com/tracking](https://datalog.planetcoops.com/tracking).

There is a small monthly charge for this service to help with the ongoing costs of the data server and mapping provider.
**Lock configuration**
If checked, data log settings will be locked when the preset is locked.

**AVL interval**
Select the interval at which Automatic Vehicle Location (AVL) data should be captured whilst Taximeter is running.

**Upload interval**
Select the interval at which AVL and taximeter data should be uploaded to the data server. If this is less than the AVL interval, the AVL interval will be used instead.

**Event alerts**
Select this option to open the Event alert settings dialog, see Figure 15.

![Event alerts](image)

**Figure 15 - Event Alerts**

**Lock alerts configuration**
If checked, the alerts configuration will be locked when the preset is locked, see Lock/Unlock.
**Events**
Select this option to open a list of events. Check 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**
Check this to enable email alerts.

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

**SMTP host**
The host name or IP address of the outgoing mail server.

**SMTP port**
The SSL/TLS port of the outgoing mail server, which is usually 465 or 587.

**SMTP protocol**
The protocol used to communicate with the outgoing mail server, either TLS or STARTTLS.

**Username**
The username of the email account being used to send the alert email. 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 is 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 TLS 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, data logs and on the receipt.

**Vehicle identification number**
The unique vehicle identification number of the vehicle. This information will appear in data logs and on the receipt.

**Operator name**
The name of the operator/broker. This information will appear in data logs.

**Payment processor**
Specify the preferred payment processor, see *PayPal Here™, Square Point of Sale™ or SumUp™ Integration*. When multiple payment processing apps are installed this setting can be used to switch between them.

**Receipt settings**
Select this option to open the Receipt settings dialog, see Figure 16.

![Receipt settings](Image)

Figure 16 - Receipt Settings
Receipt font size
Specify the receipt font size either Large or Small (these correspond to POS Print fonts A and B respectively).

Receipt header
Specify the header text to be printed at the top of the receipt, see Figure 17. This field is XML sensitive so you can use formatting tags from the POS Print document language. Any characters that have a special meaning in XML 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>'</td>
<td>'</td>
</tr>
<tr>
<td>&quot;</td>
<td>&quot;</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 17. This field is XML sensitive so you can use formatting tags from the POS Print document language. Any characters that have a special meaning in XML 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 17.

Logo dither algorithm
Specify the dither algorithm used to dither the logo bitmap. Choose from Floyd Steinberg or Threshold.

Address decode timeout
Specify the time to allow for the reverse geocoding of the “from and to locations” to street addresses. The time it takes to print a receipt could be adversely affected by reverse geocoding 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.

Prompt for a PDF receipt
POS Print users should check this if they would like the option to create a PDF receipt instead of printing via POS Print. If checked, the user will be asked if they would like to create a PDF receipt whenever they select Print or long press the Total Fare Hotspot with the fare totalled.
**Cloud storage for PDF receipts**
Specify the cloud storage provider for PDF receipts. PDF receipts generated from the Receipt activity will be uploaded to the cloud storage provider specified (requires an active internet connection when the receipt is generated). Once uploaded, a link to the receipt can be shared via SMS or a QR code, see *Print* below for more information. This setting will only be available on devices with Google Play Services installed.

**Enable professional mode**
Check this 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**
If POS Print is installed, at the end of a hire with the fare totalled, a receipt with the layout shown in Figure 17 can be printed to a Bluetooth mobile printer. If POS Print is not installed, users on Android KitKat and later devices can generate a PDF receipt which can be emailed and/or printed using the Android Print Service, see Figure 18. 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.

If a cloud storage provider has been specified, see *Cloud storage for PDF receipts*, the menu options to send an SMS or create a QR code will be available within the Receipt activity. An active internet connection is required to upload the PDF receipt to cloud storage. The receipt will be uploaded to a “Taximeter Receipts” folder with the filename “Receipt_<serial#>_<receipt#>”. The receipt must have been successfully uploaded before a shareable link to the document can be sent via SMS or encoded in a QR code. If the feature is being used to keep a record of receipts then the Receipt activity can be closed after the “Uploading receipt” toast message appears, the upload will complete in the background.
**Figure 17 – POS Print Receipt Layout**
Figure 18 - PDF 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 and, if scrolled, details of the previous hire (when available) see Figure 19. If requested by support, press the *Send diagnostics* button to send your device’s system log to support for analysis, otherwise press *OK* to dismiss the dialog.

Figure 19 – 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.

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 and examine the *Event log* for 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 from “Settings > Apps > [View All apps] > Taximeter > Clear data” or by uninstalling and reinstalling the application. Note that resetting/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 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>Rooted device detected during preset/settings 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>MOCK_LOCATION</td>
<td>A mock location app was detected.</td>
</tr>
<tr>
<td>CLOCK_SKEW</td>
<td>Clock skew (time variance) detected.</td>
</tr>
<tr>
<td>ALERT_FAILED</td>
<td>Taximeter failed to send an alert event.</td>
</tr>
</tbody>
</table>
If POS Print is installed, it is possible to print the event log to a compatible printer using the Print menu option and by providing a range of event ids to print.

Select the Share with menu item 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 Share with menu item 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 discounts, total tips, total hire distance and total hire time. Press the Reset Totals button to reset the user totals. If POS Print is installed, it is possible to print the totals to a compatible printer using the Print menu option.

Select the Share with menu item 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 Taximeter subfolder of the storage card. 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 menu option 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 item in the action 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 Menu > Clear calibration to clear the currently applied calibration. Use Menu > Clear all calibrations 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.

Exit
If the meter is in FOR HIRE mode, selecting this menu option will prompt you to terminate the Taximeter application.
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 Bluetooth, Wi-Fi or USB adapter. If you are using a USB adapter make sure the adapter uses a FTDI (FT232Rx) USB to serial chip, and that you have an Android™ device running Android™ 3.1+ that supports USB Host mode. Taximeter was tested using a $19 Bluetooth adapter freely available on eBay (at the time of writing) see Figure 20.

![Figure 20 - ELM327 Compatible Bluetooth Adapter](image)

To enable Bluetooth 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. Pair your adapter with your phone/tablet. On your phone/tablet, go to “Settings > Wireless & Networks > Bluetooth” and “Search for devices”. The adapter should then appear in the list of Bluetooth devices (the adapter we tested appeared as “CBT”). Select the device and enter the pairing code, usually “1234” or “0000”.
4. In Taximeter, go to “Menu > Settings > OBD settings > Bluetooth device” and select the previously paired adapter from the list. Then click “Enable OBD” to connect to the device. Once successfully connected, speed broadcasts will be enabled and
used in distance calculations, a blue Taximeter icon will be visible in the notification bar and the GPS Accuracy bar will be replaced by a blue Speed (SPD) bar (scale 0 – 160 kph), see Figure 21.

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 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. 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).

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 (some adapters come with an on/off switch)!

Figure 21 - Main Display with OBD Enabled

To enable USB 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. Connect your adapter to your phone/tablet. Once connected, you will be prompted to “select an application for the USB device”, choose Taximeter.

4. In Taximeter, go to “Menu > Settings > OBD settings” make sure “Enable OBD over USB is checked” and click “Enable OBD” to connect to the device. Once successfully connected, speed broadcasts will be enabled and used in distance calculations, a blue Taximeter icon will be visible in the notification bar and the GPS Accuracy bar will be replaced by a blue Speed (SPD) bar (scale 0 – 160 kph), see Figure 21.

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!
Presets
Details of the presets included in the latest preset data file and whether they support calendar control/geofencing/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.

Geofencing
Presets which support geofencing 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 geofenced preset. Geofenced 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 geofenced 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. Simplified 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 geofenced/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 geofencing/calendar control so a preset which supports tariff auto-switch will, by definition, also support geofencing/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, discount and extra 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" validFrom="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="1" 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>
```
Itemized Extras
A preset can be restricted to a list of specific extras which will be itemized on the receipt. Extras can be a flat amount, a percentage of the fare or a driver defined amount with an upper limit, see the Planet Coops (United Kingdom) preset for an example.

![Itemized Extras](image)

Figure 22 - Itemized Extras

Taximeter API
Taximeter has an application programming interface (API) which third party applications can use to interact with Taximeter. The latest API definition and sample project can be found on the Planet Coops website.
PayPal Here™, Square Point of Sale™ or SumUp™ Integration

Taximeter can transfer fare information to the PayPal Here™, Square Point of Sale™ or 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: If multiple payment processing apps are installed the order of precedence is PayPal Here, Square POS and then SumUp. This can be overridden by selecting the preferred payment processor under Operator settings, see Payment processor.

FAQ

Why does Taximeter tell me that the “License check failed”? 
To prevent piracy, Taximeter uses Google Play Licensing to query the market to obtain the licensing status for the current user. The result of a licensing query is cached so network access is rarely required. If you see the message shown in Figure 23 as a licensed user, then you will need to restart Taximeter once you have reliable Wi-Fi/mobile access to the internet.

If problems still continue then clear the cache and data of the Google Play Store app:

1. Visit Settings > Apps on your device
2. View All apps
3. Select the Google Play Store app, then tap Force stop and then under Storage, Clear data and Clear cache.

If problems still persist:

1. Is the system date and time correct?
2. Make sure that the account on the device is the same account used to purchase Taximeter (check via Settings > Accounts > Google). Try signing into https://payments.google.com/payments/home#oneTimePurchase to verify that the app is not “Refunded” or “Cancelled”.


Why does Taximeter ask me to enable or disable GPS satellites?

Taximeter makes use of your handset's GPS receiver. On start-up, if GPS satellites are not already enabled, Taximeter will direct you to the "Use GPS satellites" location setting to enable them. Check the setting and then press the back key. If it directed you on start-up, then on shutdown it will ask if you would like to be directed again so they can be disabled. Unfortunately the Android™ operating system does not allow Taximeter to alter this setting on your behalf.

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. When “Use GPS satellites” setting is first enabled, the GPS icon in the status bar at the top of the screen will flash until it establishes a fix. This 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.

There is a known issue for Motorola Atrix™, Electrify™ and Photon™ phones running Android™ 2.3.x Gingerbread software versions.

These suffer from a GPS accuracy bug, where accuracy is always reported as 0m even though the GPS has a lock. As a consequence, Taximeter will never get past the "Waiting for a valid GPS fix..." message. At the moment the only solution is to root the phone and replace the /system/lib/libnmea.so library with an older version (1.8.3), see http://forum.xda-developers.com/showpost.php?p=21586204&postcount=5. Motorola are aware of the issue and we are hoping any subsequent software update for the phones fixes the problem.

If you have a rooted phone and are having problems with GPS locks or slow locks, it is worth checking that you have the correct GPS settings in /system/etc/gps.conf for your region, see
Why is the GPS quality bar almost always red?
See the answer to Why is Taximeter “Waiting for a valid GPS fix...”?. In our experience if the phone has a clear view of the sky and you continually receive “red” low quality fixes, rebooting the phone and re-enabling GPS satellites can bring them back to “green” high quality fixes. Users with Motorola Droid X™ phones have reported that upgrading to SBF 4.5.602 has improved GPS accuracy.

I purchased Taximeter from Google Play and have been trying to download it but keep getting an error. Can you help?
See http://support.google.com/googleplay/bin/answer.py?hl=en&answer=1067233

Most download errors are resolved using this step:

Make sure you've cleared the cache and data of both the Google Play Store app and the Download manager. Here's how:

1. Visit Settings > Apps on your device
2. View All apps
3. Select the Google Play Store app, and then under Storage tap Clear data and Clear cache.
4. Then, select Download Manager and under Storage tap Clear data and Clear cache.

Google Play support can be reached via http://support.google.com/googleplay/bin/request.py?contact_type=contact_policy&policy=apps.

I've lost the Taximeter main display, how do I get back to it?
If the Taximeter application is still running the Taximeter icon 🏅 will be visible in the status bar at the top of the screen. To get back to the taximeter display, reveal the Notifications window by pulling down the status bar (or selecting Notifications from the Home options menu). In the Notifications window, select the Taximeter item from the list of “Ongoing” notifications, see Figure 24. Alternatively select the Taximeter launcher icon from the Android™ Launcher 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](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.

**More FAQs online**
See our website for more FAQs, [http://www.planetcoops.com/faqs](http://www.planetcoops.com/faqs).

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