TIGERTOOL V3.0 INSTRUCTIONS

INTRODUCTION

TigerTool V3.0 runs under the Windows operating systems and with versions from XP to 10. It includes features to allow the user to do the following:-

- Reset the service interval and clear the 'service due' wrench symbol from the instruments
- Configure ABS / TPMS menu items & default units for the instruments
- Read & clear diagnostic trouble codes (DTCs) and the Malfunction Indicator Light (MIL)
- Read & clear ABS DTCs
- Bleed ABS brake modulator
- Check throttle body balance
- Read, enable/disable & program TPMS sensors
- Erase Immobiliser/TPMS DTCs and monitor live TPMS data
- Read VIN, ECU serial & engine map reference codes

DISCLAIMER

TigerTool V3.0 is provided as-is and without warranty of any sort.

The software is provided free of charge for non-commercial use. It allows the user limited access to the ECU on ***Triumph Tiger 800, 900, Sport & Explorer/1200 models*** *and can be used to perform various functions as part of a regular maintenance and/or servicing schedule. Note: TigerTool may work, but is not fully tested on other Triumph models. Details on how to try TigerTool with other models are shown at the end of this document.*

Using this software, and the consequences therein, remains the sole responsibility of the user. Neither the author nor anyone associated with the officially supported forums will be held liable for any subsequent costs, losses or damages as a result of downloading, installing or using this software.

The software ***MUST NOT*** *be copied to other web-sites, internet forums, social media sites etc. without the express written authority of the original author. Software support and new releases will only be provided by the author via the forums at www.tiger800.co.uk and www.tiger-explorer.com.*

All reasonable steps have been taken to ensure the accuracy of the instructions and suitability of the software, but be aware that editing or modifying your bike's ECU may cause undesirable effects and/or invalidate your warranty. The software has been scanned at VirusTotal prior to release.

OBD INTERFACE

Accessing ECU data can be achieved using the ISO9141-2 and ISO15765-4 (aka CAN bus) protocols. This software is intended to work with most USB & Bluetooth ELM327-based OBD2 interfaces, including clones. There are a number of ELM327-based interfaces around that don't work with TigerTool because they contain very poor quality components and/or firmware and don't support some the of the basic ELM327 commands that are needed, in particular '***AT D***'.

Some of the USB interfaces have the FTDI USB-to-serial chipsets which seem to work well under any version of Windows, as FTDI are usually on-the-ball with releasing drivers. Unfortunately FTDI released driver updates a few years back that bricked many of the clone chips that were being used in cheap OBD2 interfaces so it can be a case of buyer beware.
There are also many interfaces that use different serial chipsets, e.g. the PL2303 interface from Prolific Tech, and most of these have been tested. The key is to ensure that you have the latest drivers for the device that you're using to support the version of Windows that your PC is running.

NOTE:

- ***This software WILL NOT work with the VAG/KKL leads such as those from Lonelec that are used with TuneECU.***
- ***This version supports ELM327 OBD2 interfaces that are V1.n or V2.n.***

INSTALLATION

TigerTool is a standalone application that needs no installation process and no additional files to run. You can manually add a shortcut to your desktop to make access easier if you like.

This latest TigerTool software has been thoroughly tested on various models of Tiger 800, 900, Sport & Explorer/1200 using Windows versions from XP to 10Pro. The screenshots used in the following instructions were all taken from Windows 10Pro but should look similar under other Windows versions.

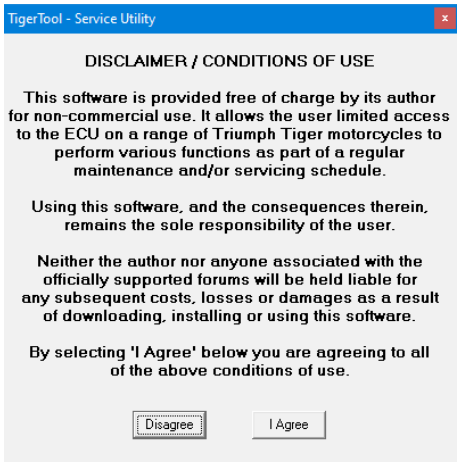
CONNECTION

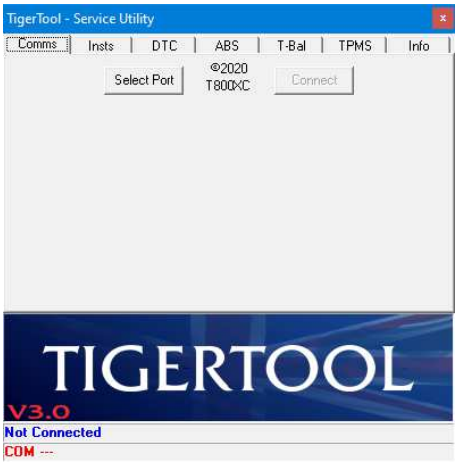
Before running TigerTool you'll need to connect & install your ELM327 OBD2 interface as per the manufacturer's instructions. The ELM327 interface should appear in Device Manager as a serial port with an assigned port number. If you have problems installing then please post details in the supported forums for possible help.

Most ELM327 interfaces will not run unless they're connected to the OBD socket on the bike. The socket has a large black moulded shroud and is located under the pillion or rider seat depending on the Tiger model. The socket can be carefully lifted from its mounting lug and connected to the ELM327 interface. When you connect, most interfaces run through a sequence of tests causing various LED to flash.

Make sure that the bike's engine kill switch is in the 'run' position then turn on the ignition switch. There's no need to start the engine (unless you're checking the throttle body balance – see later).

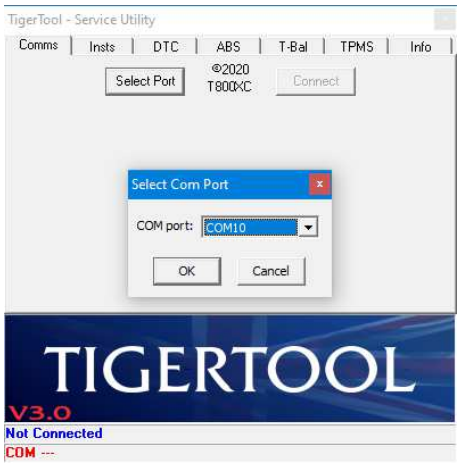
On your PC, locate & run the TigerTool application from where you saved it. When you run TigerTool, you will see the 'disclaimer & conditions of use' screen first. To continue you must agree to the conditions and click on 'I Agree'. If you click on 'Disagree', TigerTool will close. If you agree, the next (main comms tab) screen will appear:-

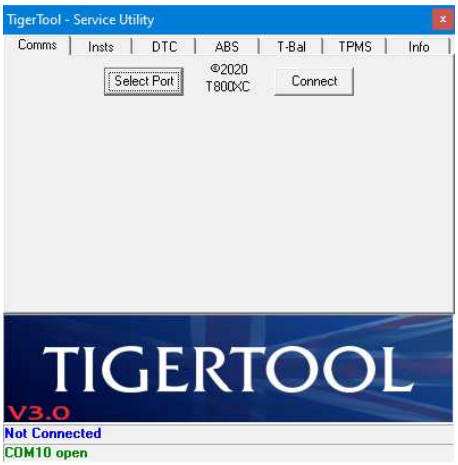




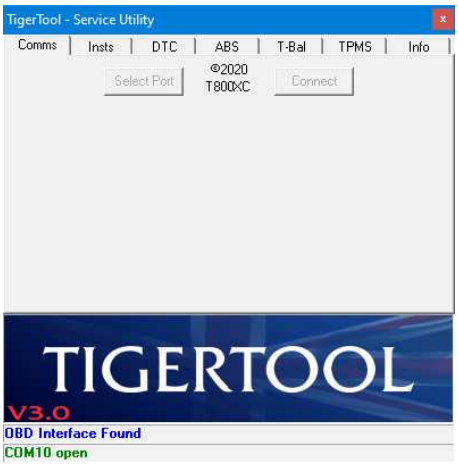
Click on the 'Select Port' button then use the arrow in the list box to select the serial port for your ELM327 interface. Depending on your PC configuration you may have several serial ports so it's worth looking at Windows Device Manager to check which one is assigned to your ELM327 interface. In the case of Bluetooth interfaces, there may be two assigned serial ports (depending on the drivers) so you may have to try both to see which one provides access.

The following images show a typical port selection and the updated 'Connect' button & port status message at the bottom of the screen once the port is opened:-

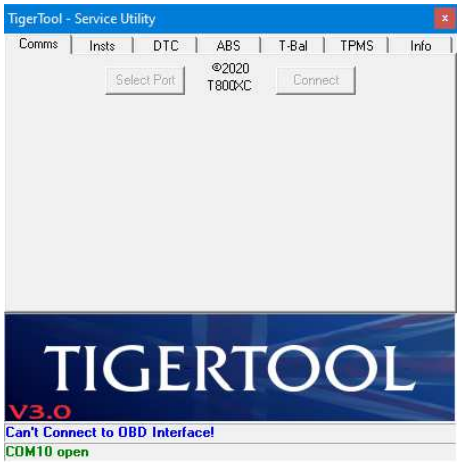




Now click the 'Connect' button to start communicating with the ELM327 interface and ECU - this may take several seconds and should indicate progress according to the following images:-

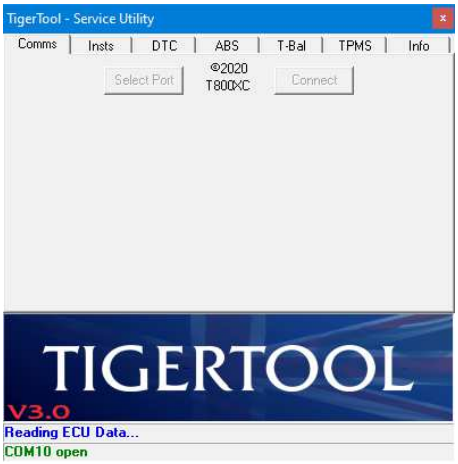


If the interface can't be found, the following image will be displayed and the operation will be aborted:-



The most likely causes of this error are either the wrong serial port being selected or no power to the ELM327 interface. Try to unplug then reconnect the interface from the bike (and observe the active LEDs) and/or try a different serial port. Also make sure that the ignition & engine kill switches are on.

Once connection has been established with the interface you should see the following sequence of images while the interface is initialised and communication is attempted with the ECU:-



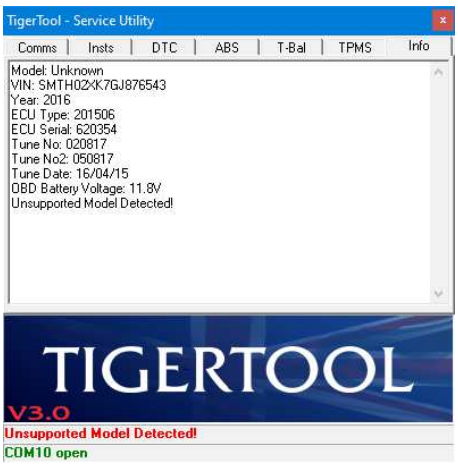
If the ECU type-check matches and data was read successfully, the 'ECU Information' pop-up box should appear, as shown above, to display the VIN number, ECU serial number, engine map/tune number, the date the tune was installed, and the approximate battery voltage.

Note: *The reported battery voltage is only an estimate and is based on a reading from within the ELM327 interface rather than directly from the ECU. Some interfaces are more accurate at measuring this than others.*

At this point, if the interface can't connect with the ECU, the following image will be displayed and the operation will be aborted:-

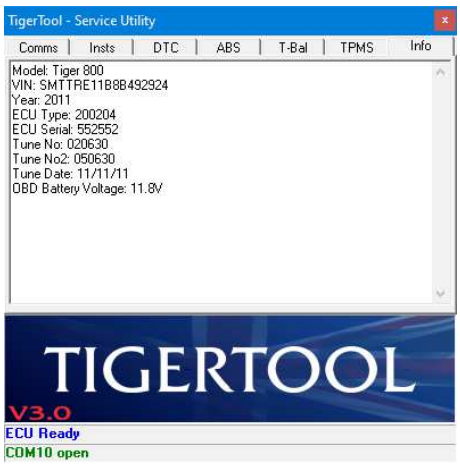
The most likely cause of this error is the bike's ignition or engine kill switch being in the off position. Ensure that the both switches are on and try again.

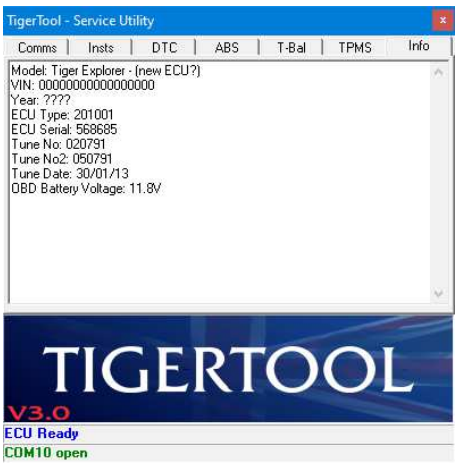
If the wrong ECU type was detected, which may happen if you attempt to use TigerTool on a bike other than those listed at the start of this document, the following images will be displayed and the operation will be aborted:-



The image on the right shows some additional detail read from the ECU. There's nothing further you can do about this for now as the software is intended only for use with the bikes listed. As mentioned at the top of this document, it's possible to try connecting this version of TigerTool to other unsupported models. Details on how to do this are shown at the end of this document.

If connection was made successfully then at this point you're ready to continue and use all of the TigerTool features. The last 'Info' tab will show some more details about the ECU etc. The following images show typical examples:-



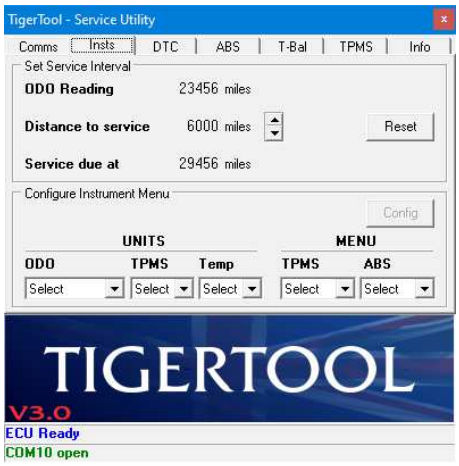


The model info is selected from a list based on the VIN. In the case of Explorers that have had their ECU replaced under recall (Triumph SB505), the VIN may read all zeros making it impossible to decode, so the Model will appear as shown in the second image.

SERVICE INTERVAL RESET & INSTRUMENTS CONFIGURATION

By selecting the 'Insts' tab, you can change the service interval reminder on your Tiger and clear the spanner / wrench symbol from the dash / instrument panel. You can also configure the units for the odometer, ambient temperature and TPMS, and enable / disable the TPMS & ABS menu items.

The following image shows the Instruments tab:-



In TigerTool V3.0 the odometer reading and units (miles / km) are automatically read when the initial connection is made to the ECU. The current odometer reading is displayed together with the preset service interval and the 'service due' value. All odometer values are stored in the instruments in kilometres. Due to different conversion factors and rounding used across the Triumph model range, if miles are selected as the distance units there may be a 1mile discrepancy between the 'ODO Reading' shown in TigerTool and that displayed on the bike.

Resetting the Service Interval

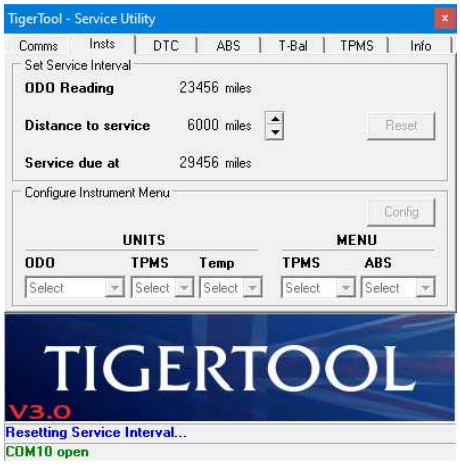
Use the up/down arrows to scroll through and select the service interval that you want to use. Note that the service interval can only be set in multiples of 100 (miles or km).

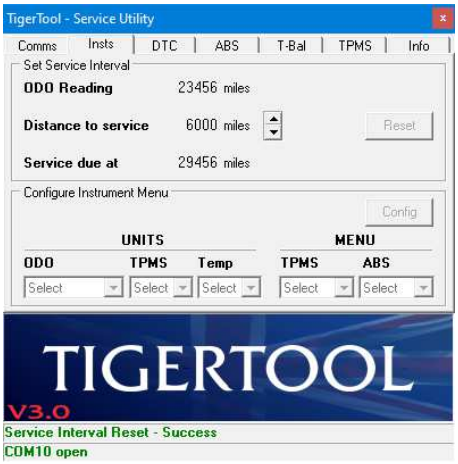
For the Tiger 800, 900 & Sport models, the maximum service interval limits are 6000 miles or 10000km, and for the Explorer/1200 the limits are 10000 miles or 16000km. The settable limits are controlled by the TigerTool software to match the Tiger model so it shouldn't be possible to set a service interval that the bike doesn't support.

When you've selected the new service interval, and you're ready to complete the reset procedure, click on the 'Reset' button and the following image will be displayed:-

If you select 'No' the pop-up window will close and nothing more will happen. You can select 'Reset' again at this point if you change your mind, or you can choose one of the other tab items.

If you select 'Yes' to reset the service interval, the messages shown in the following images should appear:-



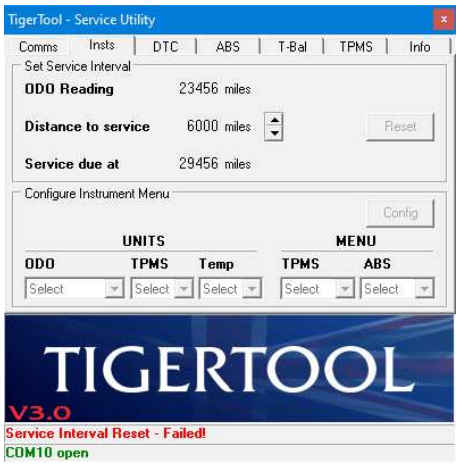


If successful, that's it, you're done and you can go into the instrument's menu on the bike to check that your service interval has been updated to the new value.

Note: When you reset the SIA (Service Interval Announcement), a new countdown begins based on the bike's current odometer reading. The spanner / wrench reminder symbol will reappear when the bike reaches 500 miles (800km) of the 'Service due at' distance that you set.

On newer models with a calendar function, the service due date ***IS NOT*** reset by TigerTool. In these circumstances the wrench symbol may still be shown on the display and you will have to reset the due date manually from the instrument's menu. See the relevant owner's manual for details on how to do this.

If the service interval reset fails, you should see the error message as shown in the following image:-



As with other diagnostic features, the most likely cause of this error is the bike's ignition or engine kill switch being in the off position. Ensure that the both switches are on and try again.

Occasionally the ECU may take too long to respond to the reset request and this message can appear even though the SIA has been reset. You can check this by scrolling through the menu on the bike's instruments to see if it's been reset.

At this point all other TigerTool functions may have been disabled and further access to the ECU prevented, so you'll need to re-connect to the ECU from the first 'Comms' tab to re-establish communication and to try again.

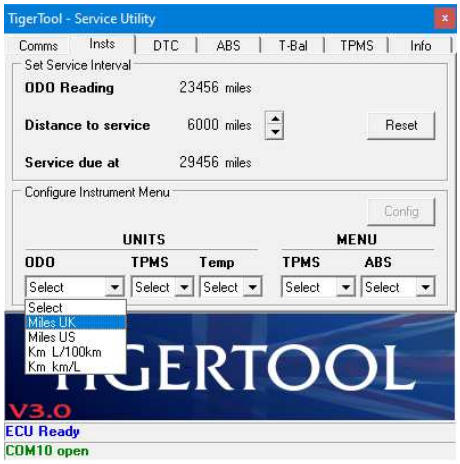
Configuring Instrument Units & Menu

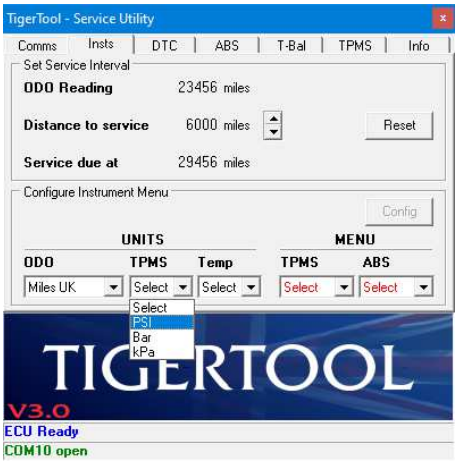
TigerTool V3.0 allows several settings in the bike's instrument menu to be configured. These are grouped as Units & Menu items.

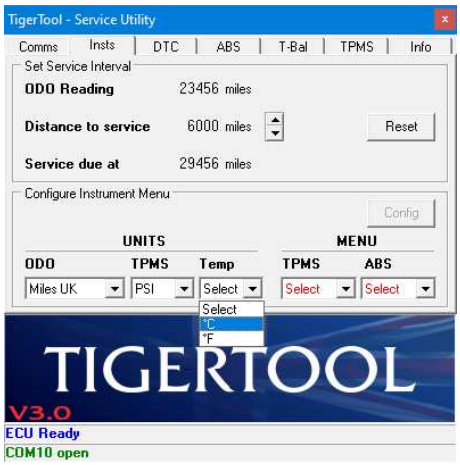
The Units section allows selection of Odometer, TPMS & Temperature units.

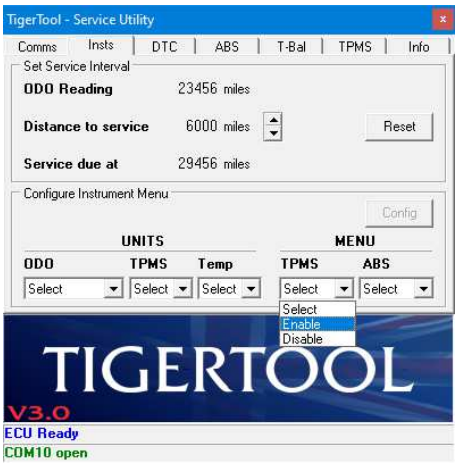
The Menu section allows the TPMS or ABS menu items to be enabled or disabled.

The following images show the options that are available for each section:-







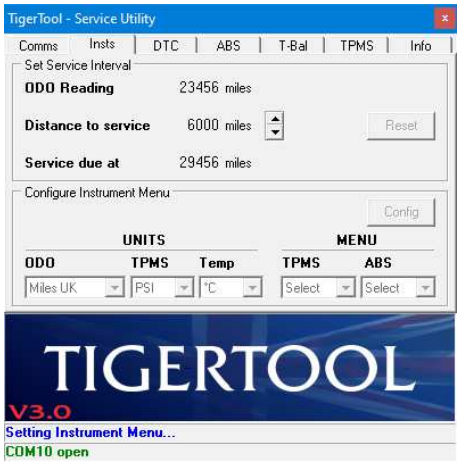


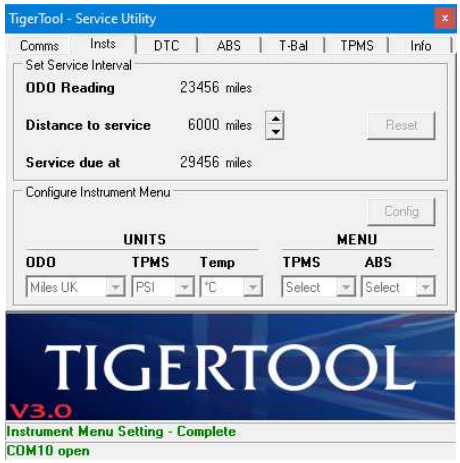
The 'Config' button remains disabled until a valid selection is made under the Units or Menu options. During selection, unavailable options have their text colour changed to red once another selection is made.

In the Units section, all three values must be selected, but in the Menu section, either the TPMS or ABS enable/disable items must be selected before the 'Config' button is enabled.

Note: Not all bike models will have all Units or Menu items available, but they still need to be selected and configured. e.g. Early Tiger 800s didn't have the option to select kPa for the TPMS unit display, or didn't have an ambient temperature indicator. In such cases the bike will ignore the setting and use a default value. Similarly, not all bikes allow the ABS menu item to be disabled so this command may get ignored if issued.

When you've selected the menu options and you're ready to make the changes, click on the 'Config' button and the messages in the following images will be displayed:-

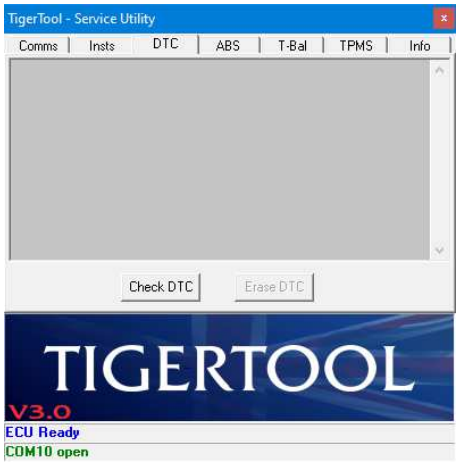




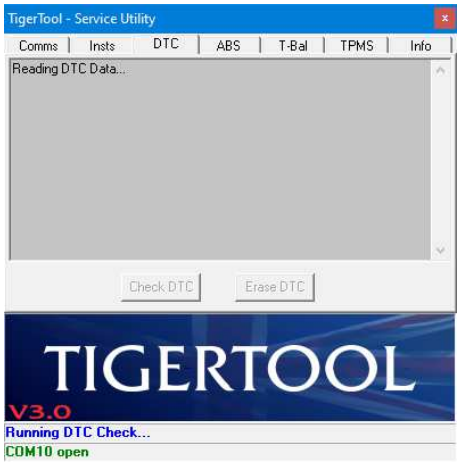
Once completed, the odometer details are re-read from the bike in case the distance units have been changed between miles & km.

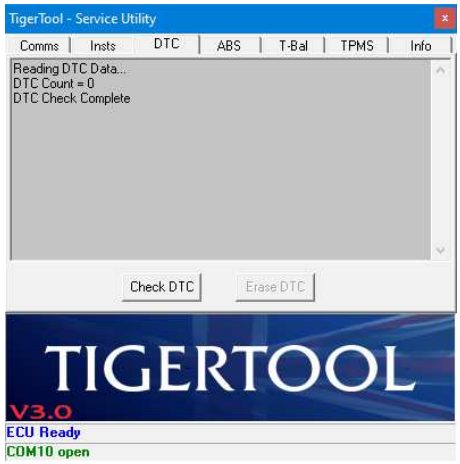
DIAGNOSTIC TROUBLE CODES - DTC

By selecting the 'DTC' tab, you can check for and clear any confirmed error codes from the ECU. The following image shows the main DTC tab page:-



To read the list of confirmed DTCs from the ECU, click on the 'Check DTC' button and the following images should appear if no DTCs are found:-





If any confirmed DTCs are found the 'Erase DTC' button will be enabled and the codes will be listed. You can scroll down through the list if there are too many to show in one pane. The following example image shows a typical DTC result list:-

If you click on the 'Erase DTC' button, the following message will appear for you to confirm the next action:-

CAUTION
Always check the nature of any DTCs and investigate the reason for their presence. Never just assume that it's safe to simply erase the DTCs as there may be a serious problem that needs to be rectified!

Before resetting the DTCs and clearing the MIL, be aware that the following ***may*** also occur as a result:-

- Reset the number of DTCs (count)
- Erase any stored DTCs
- Erase any freeze-frame diagnostic data
- Erase the DTC that initiated the freeze-frame
- Erase all oxygen sensor data

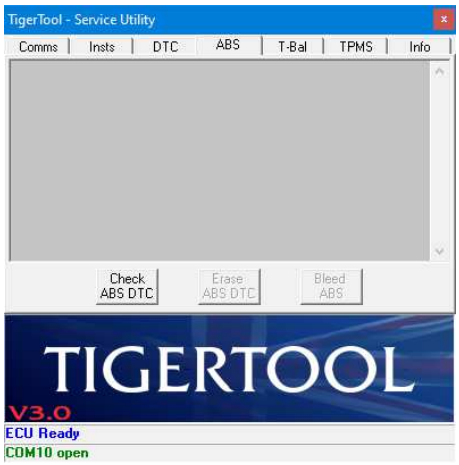
The engine may run slightly differently for a time after a DTC reset while it recalibrates. These conditions are not unique to TigerTool and ***may*** occur when any diagnostic scan tool issues a DTC reset on any vehicle.

If you click on the 'No' button, the pop-up message will disappear and nothing further will happen. If you click on the 'Yes' button, the messages shown in the following images should appear:-

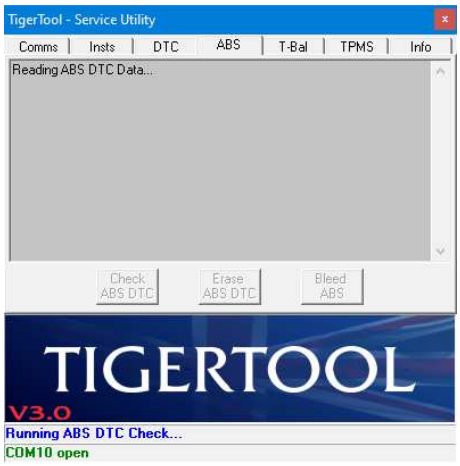
Once the DTCs have been successfully erased, you can confirm this by re-clicking the 'Check DTC' button. It may be necessary to switch off the ignition, wait 1 minute then switch on again to allow the ECU and other systems to fully reset before re-checking for DTCs.

ABS DIAGNOSTIC TROUBLE CODES

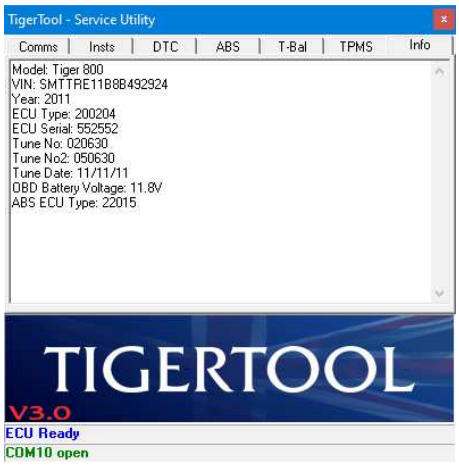
By selecting the 'ABS' tab, you can check for and clear any error codes stored in the ABS modulator's ECU. You can also run the ABS Bleed process to purge old brake fluid from the modulator during a brake service. The following image shows the main ABS tab page:-



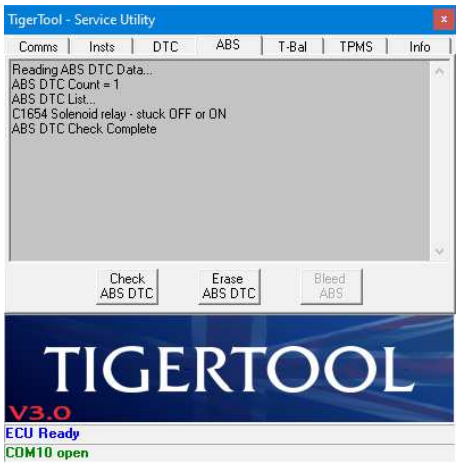
To read the list of confirmed ABS DTCs, click on the 'Check ABS DTC' button and the following images should appear if no DTCs are found. The image on the right shows the 'Bleed ABS' button has been enabled because no ABS DTCs were found.



The following image shows the contents of the 'Info' tab where the ABS ECU Type has been added:-



If any ABS DTCs are found they will be listed as shown in the following image. The 'Erase ABS DTC' button will be enabled to allow you to clear the ABS DTCs. The 'Bleed ABS' button remains disabled because the bleed process should not be run if there are any ABS DTCs present.

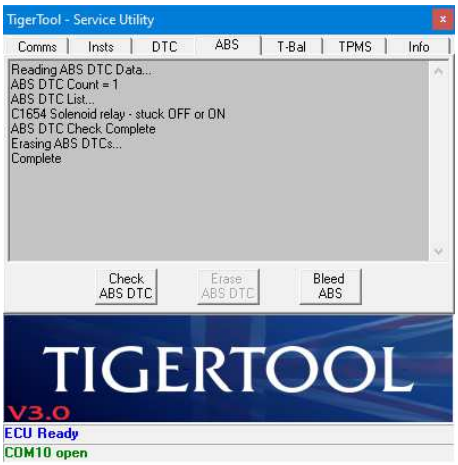


If you click on the 'Erase ABS DTC' button, the following message will appear for you to confirm the next action:-

CAUTION

Always check the nature of any ABS DTCs and investigate the reason for their presence. Never just assume that it's safe to simply erase the ABS DTCs as there may be a serious problem that needs to be rectified!

If you click on the 'No' button, the pop-up message will disappear and nothing further will happen. If you click on the 'Yes' button, the messages shown in the following images should appear:-



After erasing ABS DTCs it may also be necessary to re-check & erase non-ABS DTCs as some are inter-linked. You may also need to switch off the ignition, wait 1 minute then switch on again to allow the ECU and other systems to fully reset before re-checking for ABS DTCs.

If the bike isn't fitted with ABS, or the ABS ECU takes too long to respond, either of the following images may appear when checking for ABS DTCs:-

At this point the software has been disconnected from the ECU and all other TigerTool functions may have been disabled, so you'll need to re-connect to the ECU from the first 'Comms' tab to re-establish communication and to try again.

ABS Bleed Process

The 'ABS' tab includes a button to allow old brake fluid to be purged from the ABS modulator, i.e. 'Bleed ABS'.

As noted in the section above, the bleed process should only be run when there are no ABS DTCs. The 'ABS Bleed' button remains disabled until an ABS DTC check has been carried out and no codes were found. Additionally, when the bleed process starts, it re-checks for any DTCs and prevents the process from completing.

CAUTION
Before bleeding the ABS modulator, refer to the service manual for your bike model to familiarise yourself with the bleed process! *In general, manual bleeding of the front & rear brake systems should be performed before bleeding the ABS modulator.*

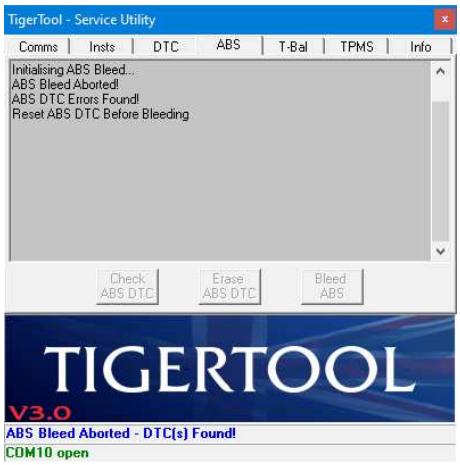
On the most recent ABS systems such as that fitted to the latest Tiger 1200 range, the bleed process consists of three stages - Flush Stage, Bleed Stage 1 & Bleed Stage 2 - and takes around 140s to complete. On other models this can be between 90 & 140s. On older ABS systems the bleed process takes just 7s and may have to be executed several times.

When the bleed process has started the text on the ‘Bleed ABS’ button changes to ‘STOP Bleed’ to allow the button to be used to interrupt the bleed process, should that be necessary. This is mainly for use on newer ABS systems that take upto 140s to complete.

The following images show the normal sequence of events when the 'Bleed ABS' button is pressed:-

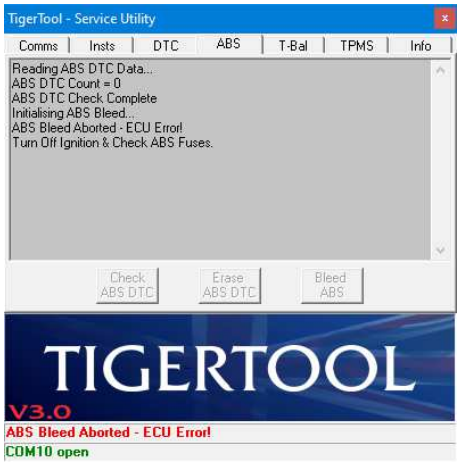
If the 'STOP Bleed' button is pressed during a bleed process the messages shown in the following images should appear:-

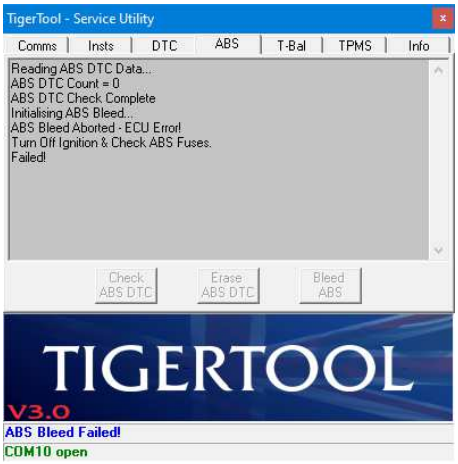
If ABS DTCs are found while starting the bleed process, the messages shown in the following images should appear:-



Refer to the previous section to investigate & clear the ABS DTCs.

If there's a problem during the ABS bleed initialisation, the following images may appear:-





This error can be caused by a faulty supply to the ABS modulator. It usually indicates that the ABS ECU is responding but there's no power to drive the solenoids & pump sections. The ABS fuses and wiring should be checked.

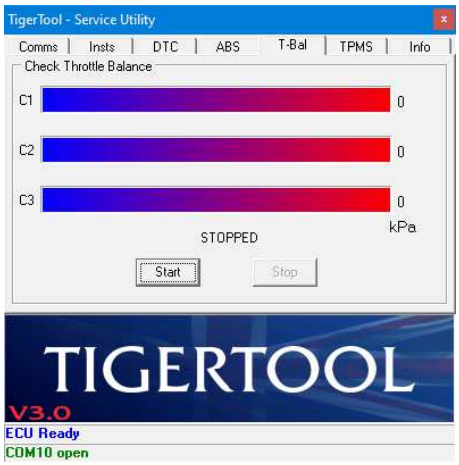
At this point all other TigerTool functions will have been disabled and further access prevented. You'll need to re-connect to the ECU from the first 'Comms' tab to re-establish communication and to try again.

THROTTLE BODY BALANCING

By selecting the T-Bal tab, you can access the controls to check the throttle body balancing. These instructions only cover the use of TigerTool to check the throttle body balancing. You will need to refer to the relevant service manual for your bike for details on how to access, check & adjust the throttle balance.

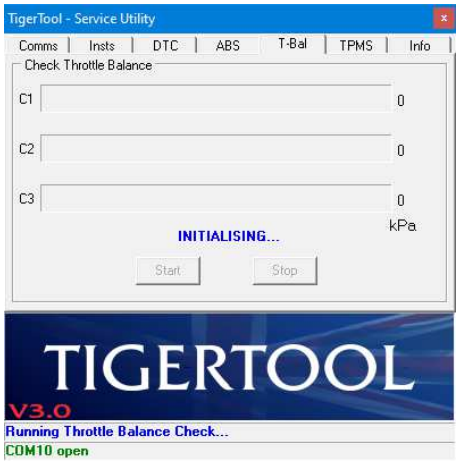
The throttles can't be balanced using traditional vacuum gauges and can only be checked using diagnostic software which uses the bike's ECU & built-in sensors. During the checks, the ECU decides whether the throttles are balanced and TigerTool simply reports this status.

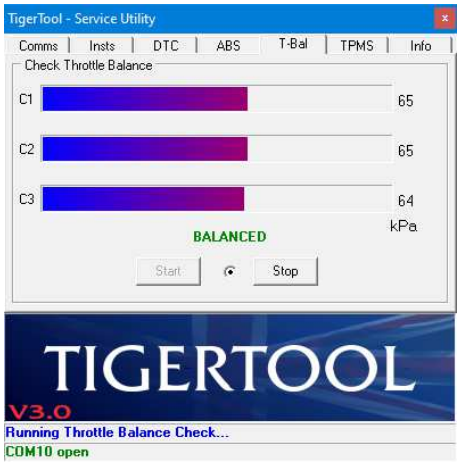
The following image shows the main T-Bal tab page as it appears when you first connect to the ECU:-

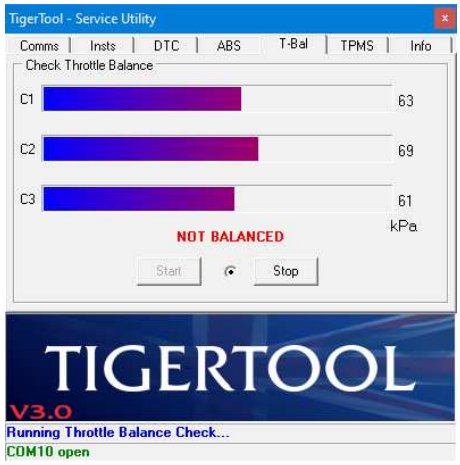


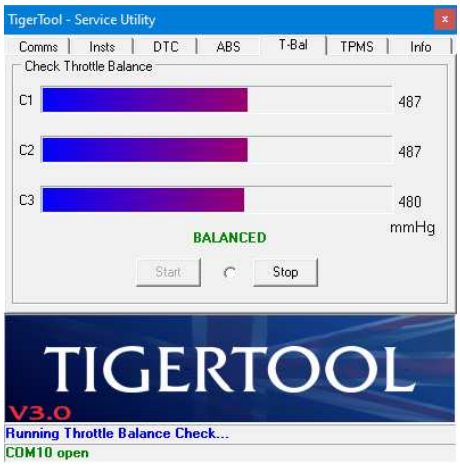
Before attempting to check the throttle balancing, start & run the engine and allow the bike to idle.

When you click on the 'Start' button, the software will initialise then request and display the values for each throttle from the ECU. It will also check if the engine is running. You may see messages similar to those in the following images when these functions are processed:-





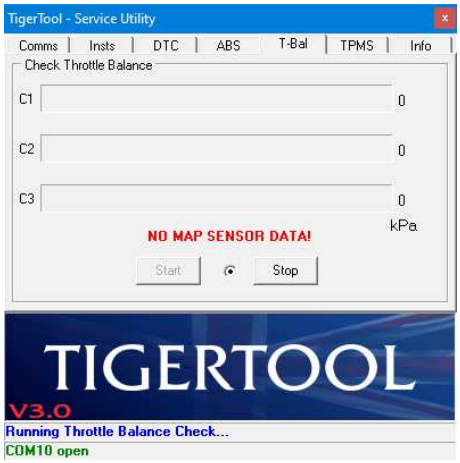




The flashing dot between the 'Start' & 'Stop' buttons is there to indicate that live readings are being taken.

If you want to toggle the displayed units, simply click on the units text ('***kPa***' or '***mmHg***') below the bottom reading and the units will toggle between the two for each click.

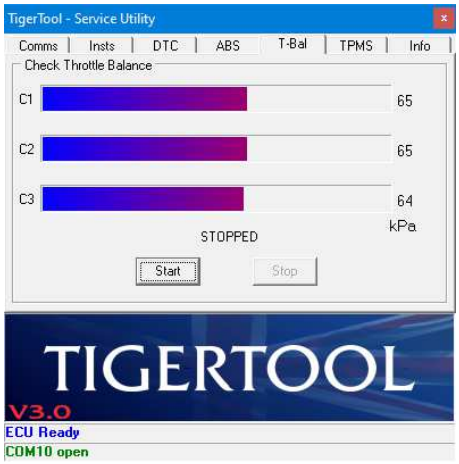
If the MAP sensor is not providing any readings, you will see the following image:-



This can be caused if the engine is not running, or your MAP sensor is disconnected.

The software will continue to request the values from the ECU and if you start the engine or re-connect the MAP sensor the readings should appear after a couple of seconds.

When you've finished checking or adjusting the throttles, click on the 'Stop' button and the process will quit. The last recorded values will remain on display and the 'ECU Ready' message should appear on the status line near the bottom of the window, as shown in the following image:-

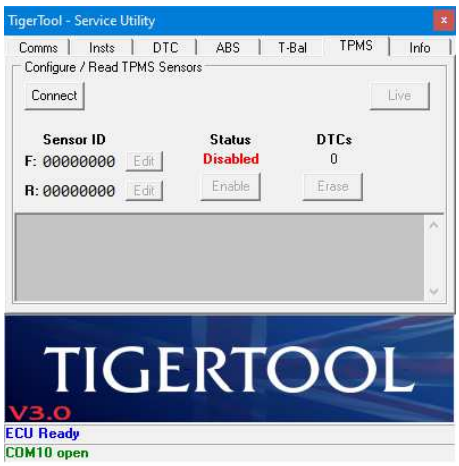


TPMS – TYRE PRESSURE MONITORING SYSTEM

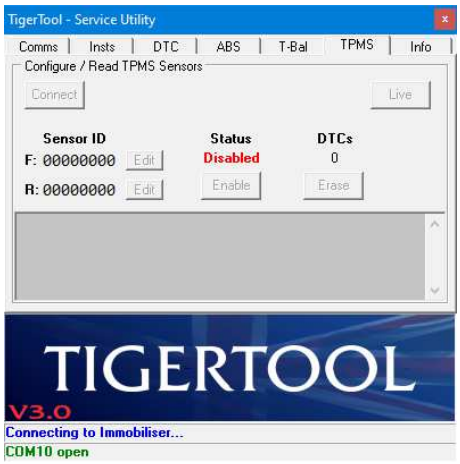
New to TigerTool V3.0 is the ability to read & program TPMS sensors, enable / disable the system, read & clear immobiliser DTCs and monitor live TPMS data.

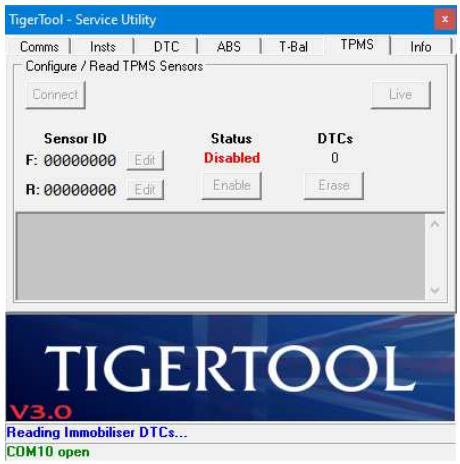
Note:- *The TPMS feature will currently only work on bikes that have an immobiliser that also acts as the TPMS controller. Due to access restrictions it cannot be used on newer bikes that have a Chassis ECU. Work is ongoing to provide support for these bikes.*

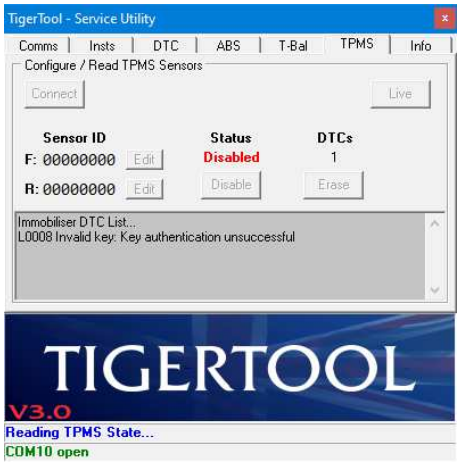
The following image shows the main TPMS tab page as it appears when you first connect to the ECU:-

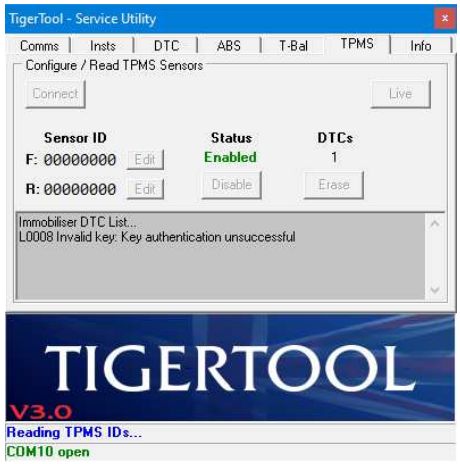


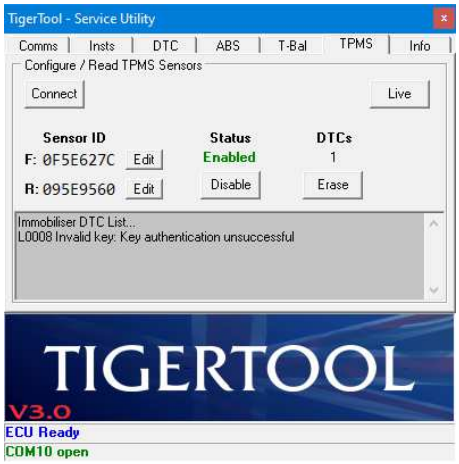
If you click on the 'Connect' button TigerTool will try to establish a connection with the immobiliser, read any stored DTCs, read the enabled/disabled status and finally read any stored sensor IDs, as shown in the following sequence of images:-





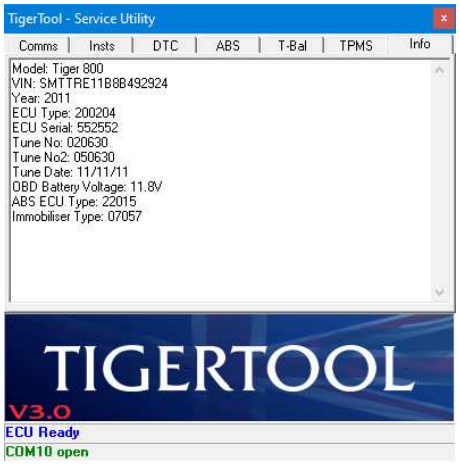




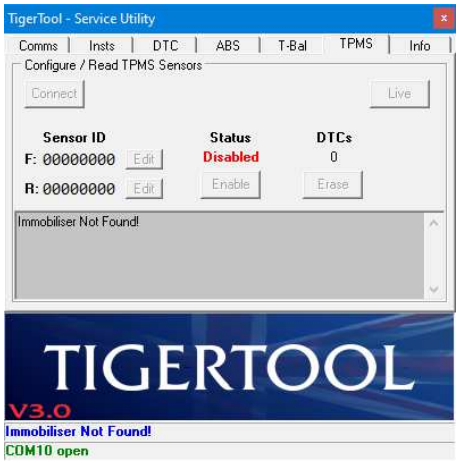


If any DTCs are found the 'Erase' button will be enabled. Similarly, if the TPMS is enabled the text on the status button will change to 'Disable' and the 'Live' button will be enabled to allow live monitoring of TPMS data (see later). Finally, if any sensor IDs are found they will be listed for the Front & Rear tyres.

The following image shows the contents of the 'Info' tab where the Immobiliser Type has been added:-

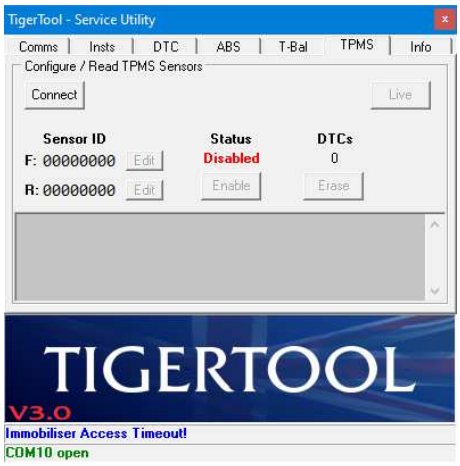


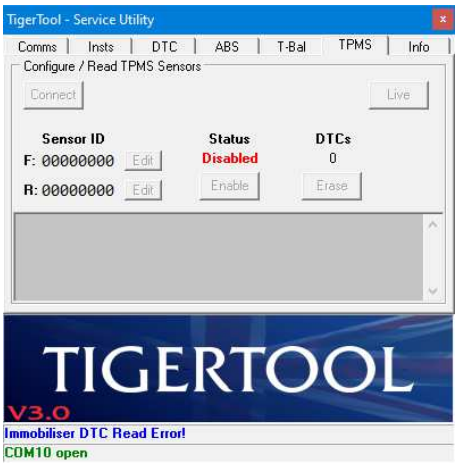
If the immobiliser is not found, as would be the case if the bike is equipped with a Chassis ECU, the following image should appear:-

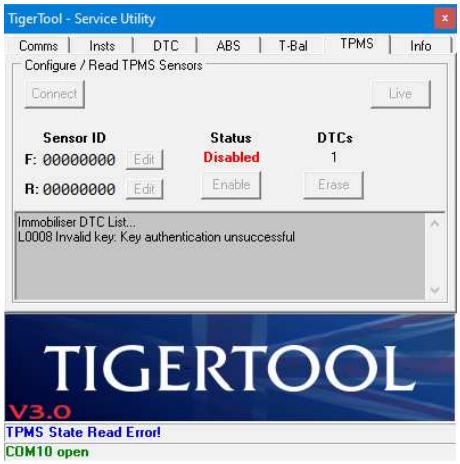


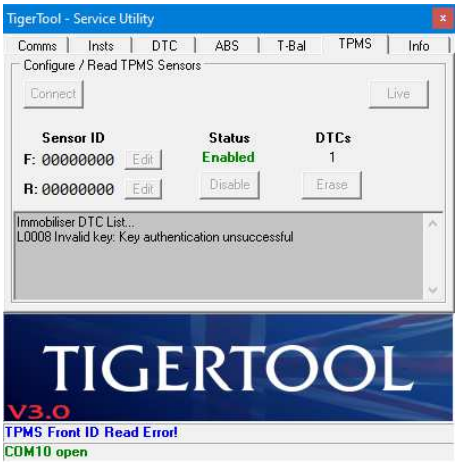
You can try connecting again in case it was a communications error, but if it continues to fail then it would suggest that the bike doesn't have an immobiliser module.

During connection to the immobiliser and reading of the data various error messages may be displayed. In most cases these are caused by communication timeouts so simply trying again may be successful. A summary of these is shown in the following images:-



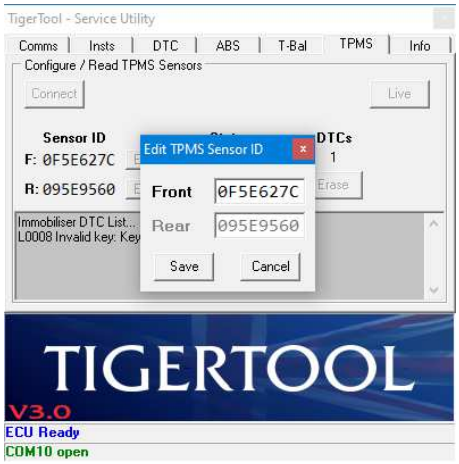






Editing TPMS Sensor IDs

The front & rear sensor IDs must be edited individually. Click on the 'Edit' button next to the tyre sensor that you want to edit and the edit pop-up window should appear as shown in the following image:-



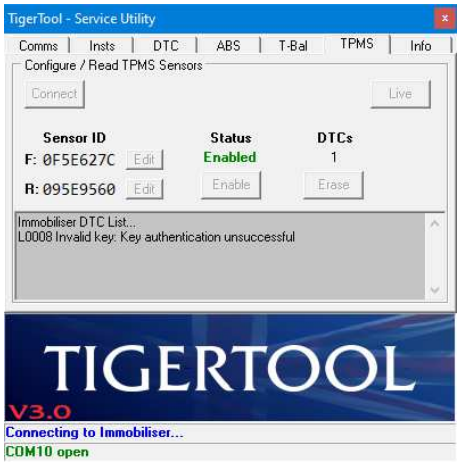
The current sensor ID for the selected tyre can now be edited. The 'Save' button will only be enabled when the full 8 digit ID has been entered. The IDs are in hexadecimal format so only characters 0-9 & A-F can be entered. The ID for the other tyre will be displayed but greyed-out to prevent editing.

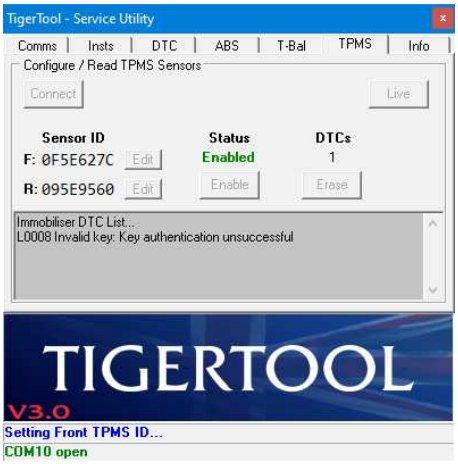
You can abort the editing by clicking on the 'Cancel' button and the edit window will close. To update the ID stored in the immobiliser click on the 'Save' button.

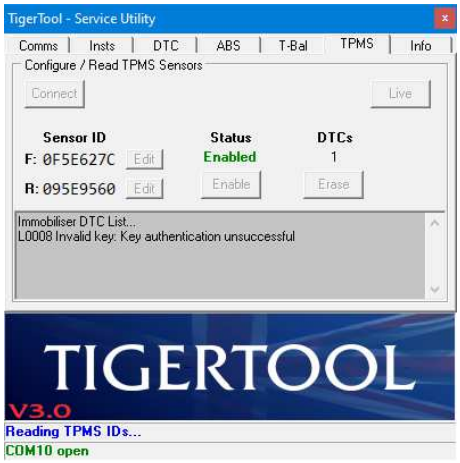
If you save without changing the ID a message will temporarily appear in the status area at the bottom of the main TigerTool window to say 'TPMS ID not changed'.

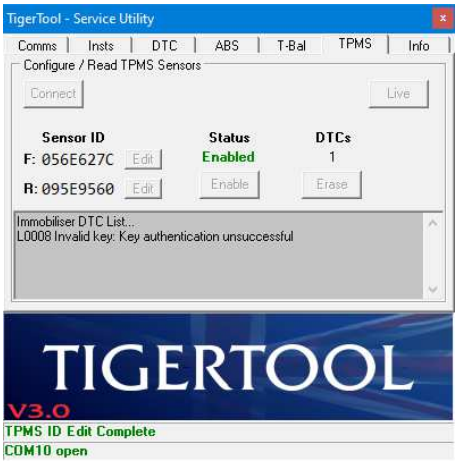
If the sensor ID has been changed the following pop-up message window will appear (the text will change to suit which tyre's sensor is being changed) for you to confirm:-

If you select 'Yes' to change the ID the following sequence of images should appear:-





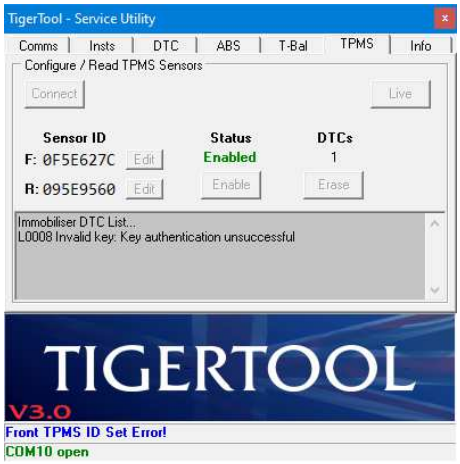




Once the new ID has been programmed into the immobiliser it is read back out again for confirmation. If successful the 'TPMS ID Edit Complete' message should be seen as shown in the 4th image above.

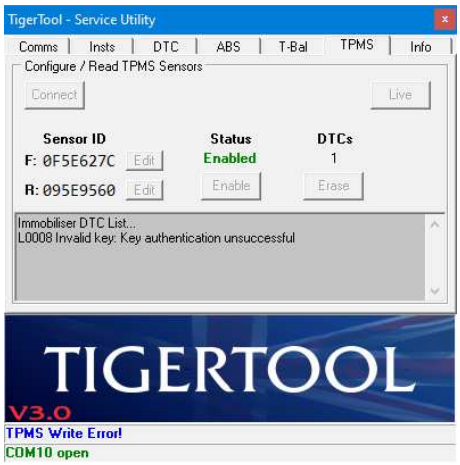
The example images above are for the front TPMS sensor but equivalent images will be displayed for rear sensor editing.

In the event of an error during the ID programming, one or more of the following images may appear:-



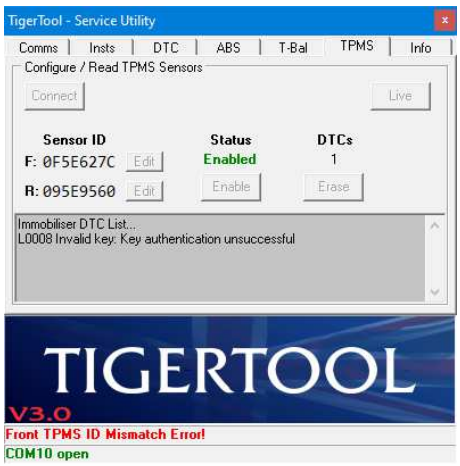
This error is caused by the immobiliser not responding to the sensor ID programming command.

If you see this message try editing and saving the ID again.



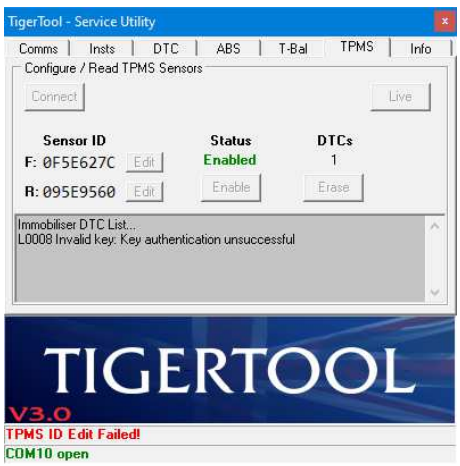
This error is caused by a timeout while waiting for confirmation that the new sensor ID has been stored in the immobiliser. The sensor ID was accepted but not confirmed.

If you see this message you'll need to re-edit & save the ID again.



After the new sensor ID has been saved it is read back from the immobiliser to check that it matches the number that was edited. This error is caused by a mismatch between the two numbers.

If you see this message you'll need to re-edit & save the ID again.

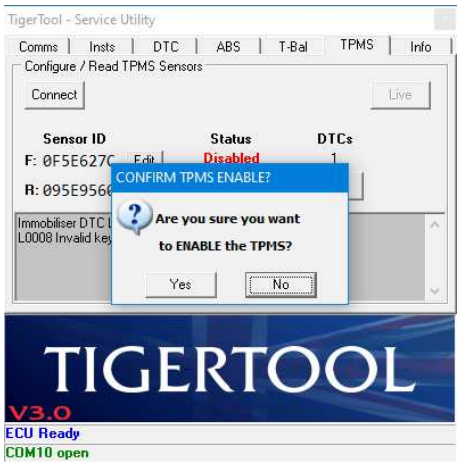


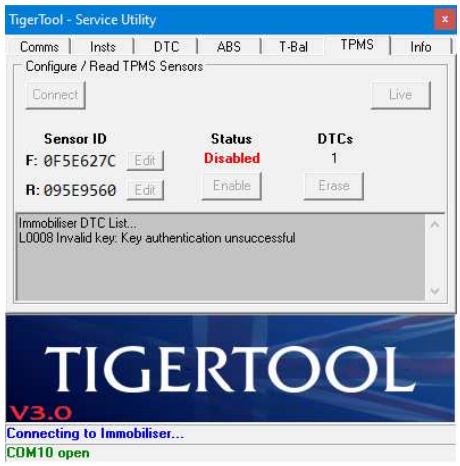
This is a general failure notice if any of the above errors occurred.

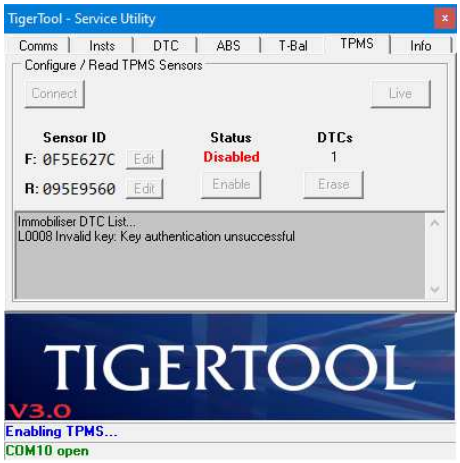
Enabling / Disabling TPMS

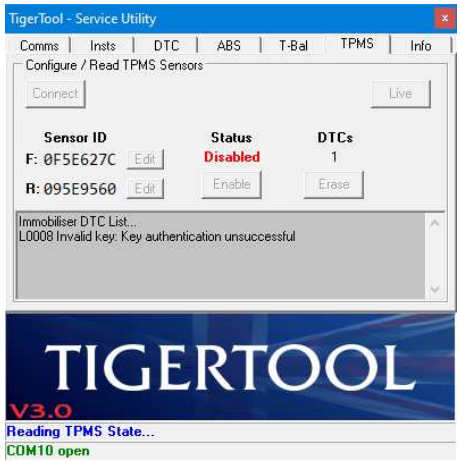
In order to use the TPMS it must first be enabled in the immobiliser. (See comments above about support for bikes with a Chassis ECU). Once the TPMS is enabled it will transmit sensor data over the CAN bus to the instruments.

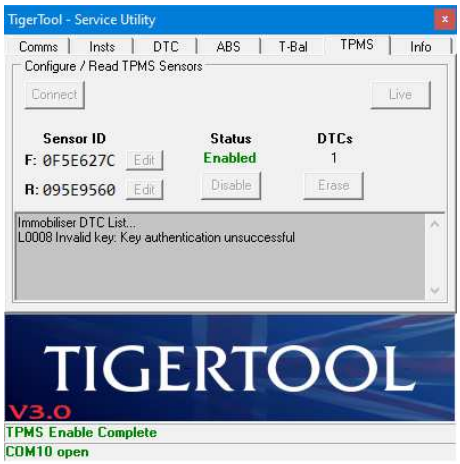
If the system is currently disabled the text on the Status button will show 'Enable'. If you click on this button to enable the TPMS the following images show the sequence of messages during the enable process:-

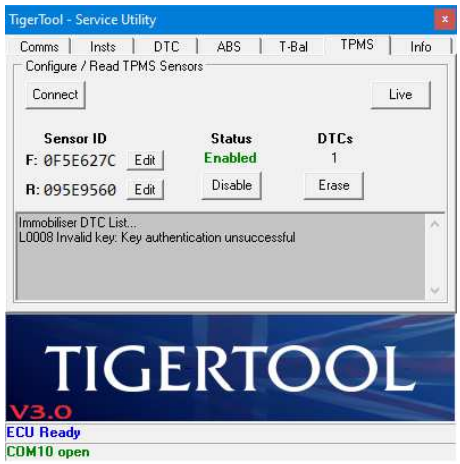








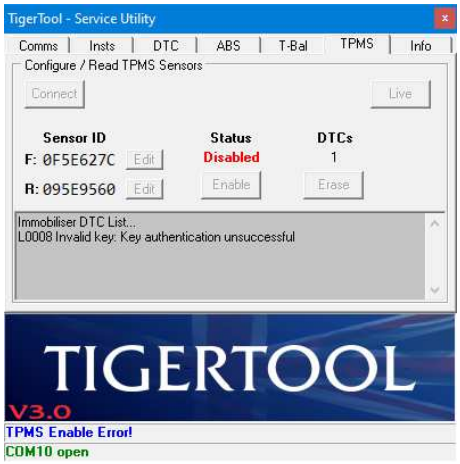




In the 4th image above, now that the TPMS is enabled, the text on the Status button has been changed to 'Disable' and the 'Live' monitor button has been enabled.

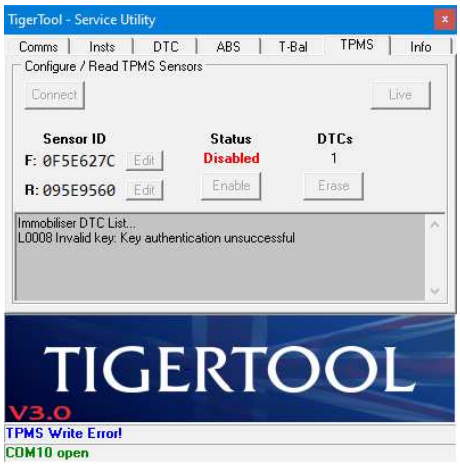
The example images above are for enabling TPMS but equivalent images will be displayed for disabling.

In the event of an error during TPMS Enable / Disable, one or more of the following images may appear:-



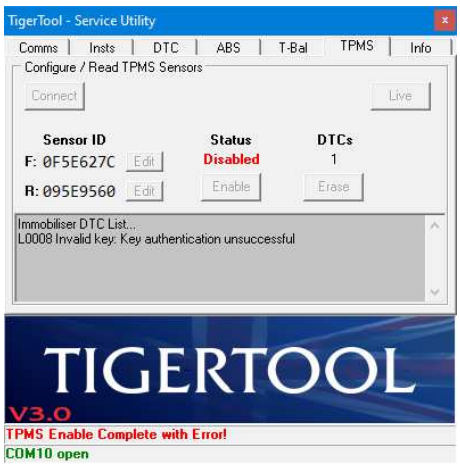
This error is caused by the immobiliser not responding to the TPMS Enable command.

If you see this message try enabling again.



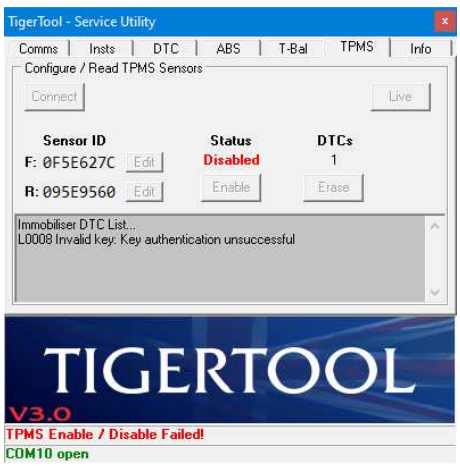
This error is caused by a timeout while waiting for confirmation that the TPMS Enabled status has been set in the immobiliser. The command was accepted but not confirmed.

If you see this message try enabling again.



This error is caused by the TPMS Enable command completing but the status read-back suggesting that TPMS is not enabled.

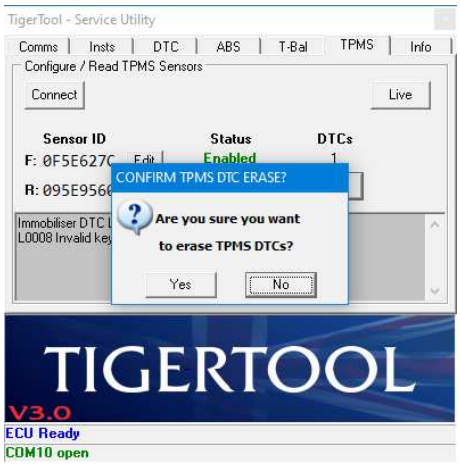
If you see this message try enabling again.



This is a general failure notice if any of the above errors occurred.

Erasing Immobiliser (TPMS) DTCs

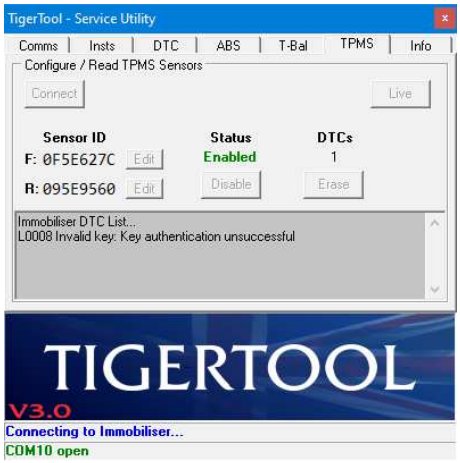
The immobiliser stores error codes (DTCs) for the TPMS as well as its own functions. To erase these codes, if you click on the 'Erase' button the following message will appear for you to confirm the next action:-

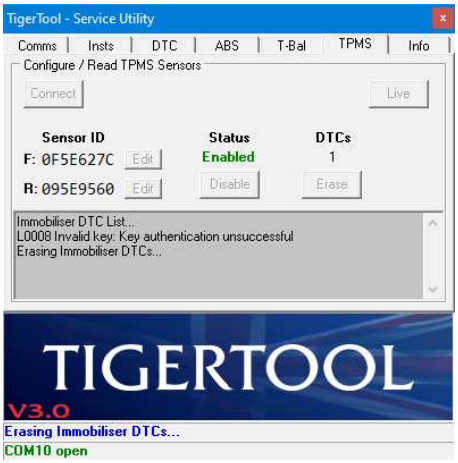


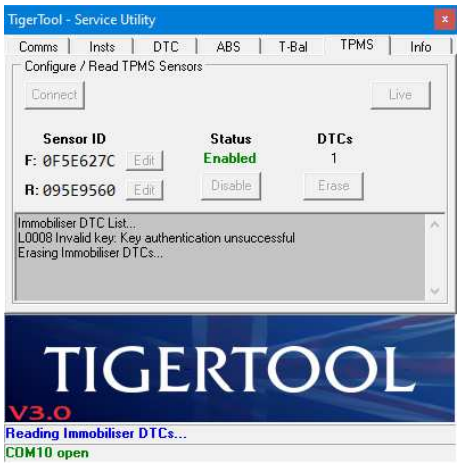
CAUTION

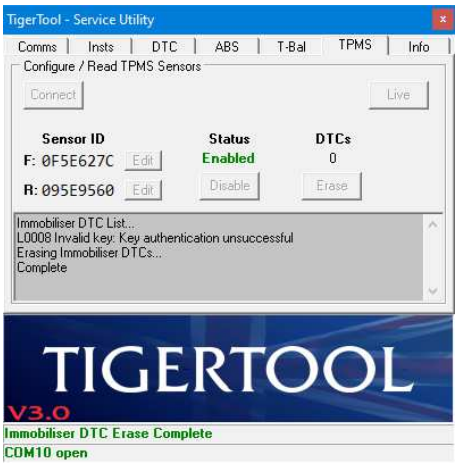
Always check the nature of any Immobiliser/TPMS DTCs and investigate the reason for their presence. Never just assume that it's safe to simply erase the DTCs as there may be a serious problem that needs to be rectified!

If you click on the 'No' button, the pop-up message will disappear and nothing further will happen. If you click on the 'Yes' button, the messages shown in the following images should appear:-

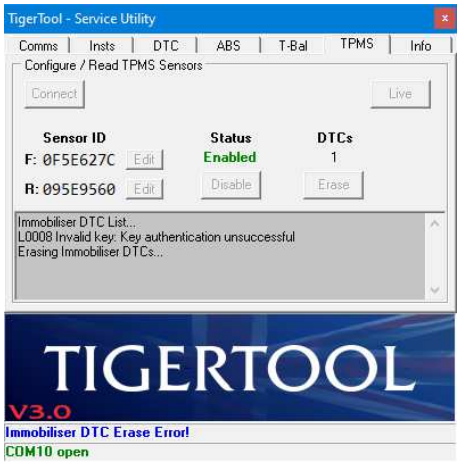




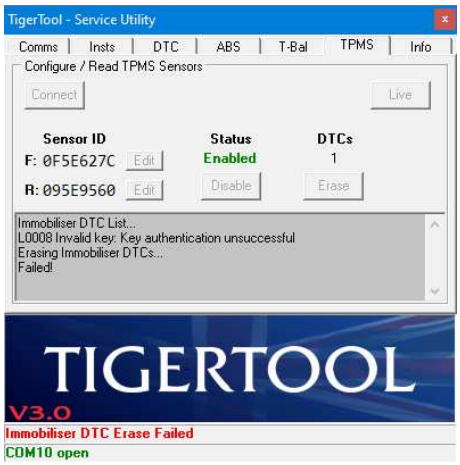




In the event of an error when erasing Immobiliser/TPMS DTCs, one or more of the following images may appear:-

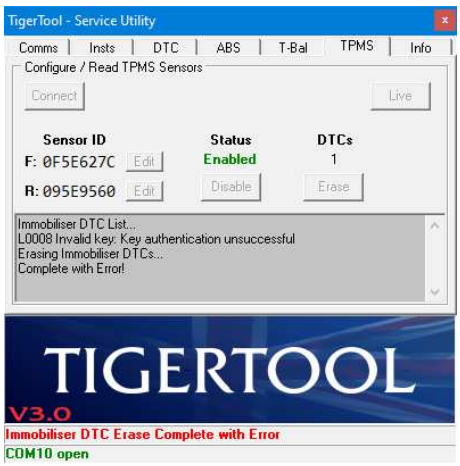


This error is caused by a timeout while waiting for confirmation that the DTC erase command has been executed.



This error usually follows the one above and indicates that the DTC erase process failed.

If you see this message try erasing again.

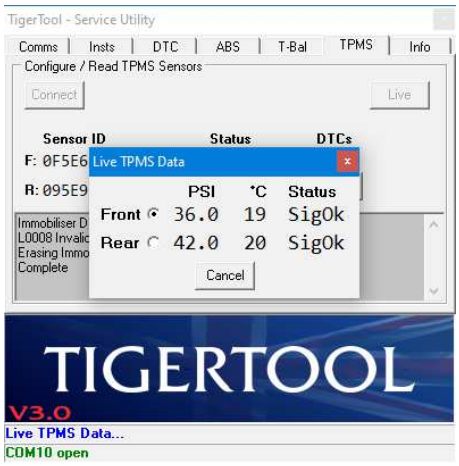


This error is caused by the DTC erase command completing but the immobiliser DTC read-back failing.

If you see this message try erasing or connecting again.

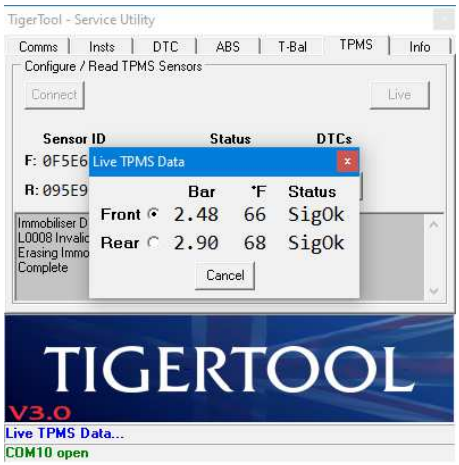
Monitoring Live TPMS Data

Once TPMS is enabled it's possible to monitor the live pressure & temperature data from the immobiliser. By clicking on the 'Live' button the following TPMS data window will appear:-



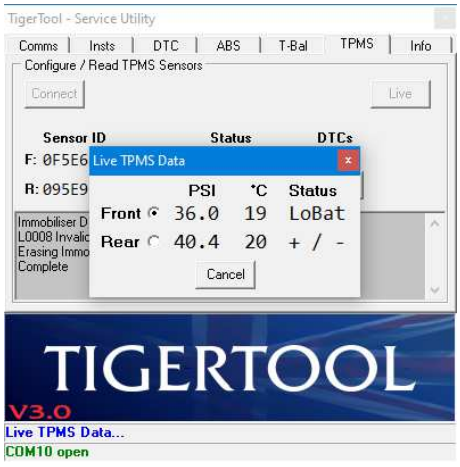
The pressure, temperature and status data for the front & rear pressure sensors will be displayed. The flashing dots near the 'Front' & 'Rear' labels are there to indicate that live readings are being taken.

The units displayed in the live data window can be changed by clicking on the text labels above the displayed pressure and temperature. The pressure options are PSI, Bar or kPa, and the temperature options are °C or °F. The following image shows some of the option changes:-



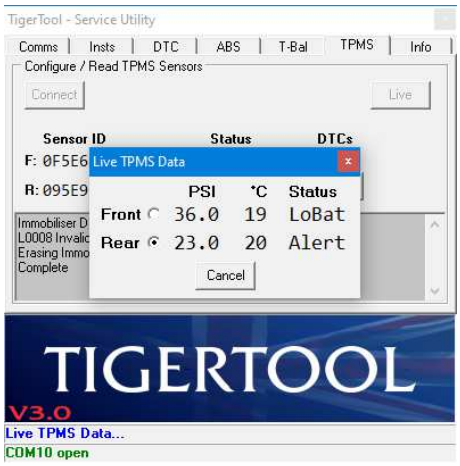
The status labels will indicate if there is a problem with either tyre sensor data. In the images above the normal signal status is shown.

The following three images show the possible status conditions that may be displayed:-

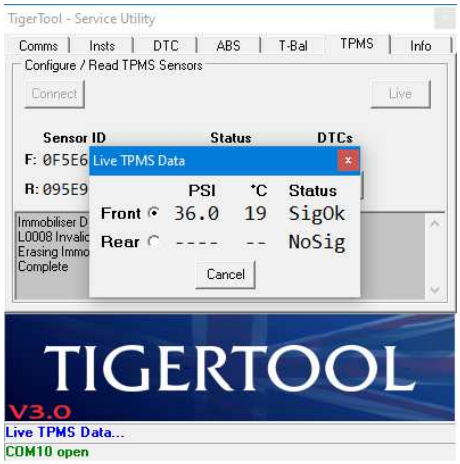


In this image the front tyre sensor is reporting a low battery voltage and the rear tyre sensor is indicating there's a change in pressure (up or down).

The battery warning message should also be displayed on the bike's instruments when the sensor first wakes when riding.



In this image the rear tyre sensor is reporting a low tyre pressure alert. The TPMS warning light should also be displayed on the bike's instruments.



In this final image the rear tyre sensor is not transmitting any data. This message may be seen if the TPMS sensor has gone to sleep.

Note:- *If the bike has been stationary for longer than 7 minutes the TPMS sensors will go to sleep until the wheel rotates again to wake them up.*

Other causes of this status message are the battery having gone flat or the wrong sensor ID is programmed into the immobiliser.

UNSUPPORTED MODEL USAGE

It's possible to test some / all of TigerTool V3.0's features with other Triumph models through the use of command-line switches, although not all of the features will be supported by all models.
The command-line switches should only be used when testing TigerTool V3.0 on unsupported models.

The switches are:-

-tryecu1	This forces TigerTool to attempt comms based on the protocols used by similar ECUs to those typically fitted to the Mk1 Tiger 800. These ECUs use a combination of ISO9141-2 & ISO15765-4 (aka CAN bus) protocols.
-tryecu2	This switch forces TigerTool to attempt comms based on the protocols used by later ECUs that primarily use ISO15765-4 (aka CAN bus) protocols.
-twin	This switch forces TigerTool to only read MAP sensor data (during throttle balance checks) for cylinders 1 & 2 and is intended for use with 2-cylinder Triumph models.

To run TigerTool V3.0 with command-line switches, create a shortcut to the ***TigerTool.exe*** file on your Desktop (or a location to suit your preferences). Right-click on the shortcut and set the 'Target' line of the shortcut properties as shown in the following example:-

C:\TigerTool\TigerTool.exe -tryecu2
If your TigerTool directory is different to the example shown above then edit accordingly.

It's possible to append the '-twin' to either of the '-tryecu' switches by adding a space between them in the shortcut properties. If the 'twin' switch is used, it ***must*** be set ***after*** the 'tryecu' switch.