Using Team Plus TELELOGGER Bluetooth and RaceChrono

From Version 3.7 of the Team Plus TELELOGGER firmware, Bluetooth Low Energy (sometimes called BLE, or BTLE or Bluetooth 4.0) has been added to the TELELOGGER 1+B. For this guide, we will call it BLE.

As at version 3.7 of Team Plus TELELOGGER software, there is configuration options for BLE that determine the format and identity information that the TELELOGGER will use. Many phone or computer applications can connect through BLE, and most have their own specific format and identity requirements. In version 3.7 we have added support for 2 BLE configurations: Team Plus BLE format and RaceChrono-DIY BLE format . We will add more options over time when there is demand for it on the user forum.
TELELOGGER will always have one of the BLE configurations active and available. By default this will be the Team Plus BLE format.

RaceChrono is a smart phone based lap timer app that is popular and has good open interface information available for external sensors like the Team Plus TELELOGGER 1+B.   For information about RaceChrono, see their website at: https://racechrono.com/

The BLE format configuration is set through the TELELOGGER Config Tool, which is available from the support pages at: https://teamplus.cloud/support

RaceChrono-DIY is a documented format and Application Programming Interfaces (APIs) that RaceChrono team developed that allows external sensor device developers to send their data to RaceChrono. It started as a way for build your own electronics enthusiasts to get their data into the app, but is now used by several sensor manufacturers as a preferred method of getting their device connected.   Team Plus TELELOGGER BLE connection to RaceChrono uses this RaceChrono-DIY method and this guide will help you get it setup.

This document can help you configure your TELELOGGER for use with RaceChrono through the BLE service as at September 1st 2020.   We will attempt to keep up to date with changes in RaceChrono that impact this interface. Please report and problems on our support pages.   Configuration is in 2 parts:
   - TELELOGGER BLE Configuration to deliver RaceChrono-DIY BLE data.
   - RaceChrono configuration to specify the data to read from TELELOGGER on BLE.

Let's go through the process of configuring the TELELOGGER for RaceChrono-DIY

Step 1: Team Plus TELELOGGER Config Tool
-   Connect your TELELOGGER to the PC via a USB cable. You should hear the PC chime as it recognises a new device.
-   On a PC, run the TELELOGGER Config Tool.   If you don't have this tool, you can download it from our support pages at: https://teamplus.cloud/support
-   On the Config Tool, select the latest firmware/software version (3.7 or later for serial inputs)
-   Select the TELELOGGER device version (in this case the Team Plus TELELOGGER 1+B)
-   Ensure all your configuration setting match the networking model you are using (4G SIM or Wi-Fi with passwords etc)
-   Set the Bluetooth Mode to be "RaceChono-DIY format BLE"

-   You can optionally change the OBD CAN PID option to add the extended PID for RaceChrono (see PID lists later in Guide)
-   The available Serial COM ports will show as buttons, and one of those will be the TELELOGGER. Press that COM button to start reconfiguration, which will recompile the software for the telelogger and then upload it to the device.
-   The status window will tell you when configuration is complete, and you can exit the config tool and disconnect TELELOGGER from PC.
-   Plug the Telelogger into the car as normal via the OBD port or powered by USB if you don't have a compatible OBD port and ensure all cables are well secured to prevent any disruption to driving the car.
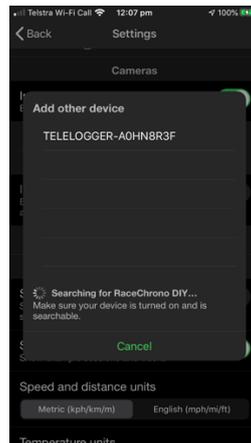-   The TELELOGGER should now be ready to transmit to RaceChrono
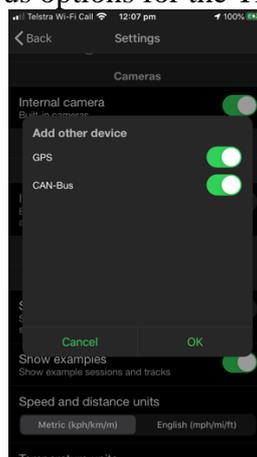
Step 2: RaceChrono BLE Device Configuration

These steps will try to represent the actions needed in RaceChrono to connect the TELELOGGER. However, RaceChrono may update these steps or screens at any time. We suggest looking at the connecting device instructions on the RaceChrono website for up to date information.

The RaceChono-DIY format is a known device type in RaceChono, so the basic connection to the TELELOGGER is straightforward.

- Open RaceChrono Phone app on IOS or Android, and open the Configuration Screen (a gear symbol at top right)
- Do not try to add TELELOGGER as a GPS or a OBD Reader. This will not work.
- Scroll down to "OTHER DEVICES" section of configuration page.
- Press "+ Add other Device"
- Choose "RaceChono DIY" option
- Select "Bluetooth LE" connection option
- RaceChrono will list all the compatible devices available on BLE, and your TELELOGGER should show up on the list as TELELOGGER-(deviceID). Select the device.

- Select both GPS and CAN-Bus options for the TELELOGGER and confirm.

- The device is now added to RaceChrono. Ensure there are no other conflicting devices active in RaceChrono configs.
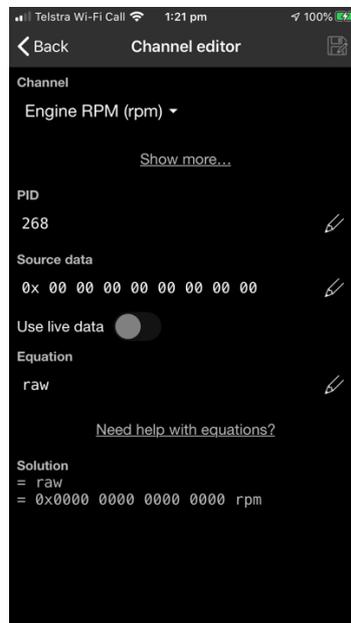
Step 3: RaceChrono CAN-Bus PID Configuration
After Step 2 above, RaceChrono will immediately recognise all the GPS channels of the TELELOGGER, but needs to be configured for the specific CAN-bus channels it will use.

RaceChrono recognises Team Plus TELELOGGERS as a CAN-bus reader, rather than an OBD reader, which is good, as it allows a lot of freedom to show data in any device format.

The CAN-BUS PIDs (which is the name used for the channels of data) are configured in the "Vehicle Profiles" configuration of RaceChrono. Follow these steps to add a CAN-Bus Channel that you wish to add to RaceChrono.
- In the RaceChrono Vehicle Profiles configuration, create or open a vehicle profile
- Scroll down to CAN-Bus settings
- Activate the "Test connection" Option, which will make a connection to the TELELOGGER you configured at step 2.
- Press the "+ Add channel" button
- Start by adding an engine RPM channel which the TELELOGGER gets from OBD by entering the following:
  - Channel: choose "Engine RPM" from pulldown list of channels
  - PID: 0x010c. – This will immediately change to be 268 which is the non hex version.
  - Data Source: 0x 00 00 00 00 (default)
  - Use Live Data (on). - this will only allow you to turn on if the channel is found and TELELOGGER is online.
  - Equation: raw
  - Press the save icon.

- You now have one CAN-Bus channel available to RaceChrono.   You can repeat this process to add any of the available TELELOGGER PID's.   TELELOGGER does not access all the PID's available in the CAN Bus or OBD. OBD reads are very slow, and each channel added reduces the speed of data (hertz rate) of TELELOGGER.   So Team Plus has chosen to focus on a specific set of OBD data related to driver inputs

and vehicle dynamics. Some vehicle engine data is optionally available in the Config Tool, but this will slow down the TELELOGGER data.

Once you have added all the PID's you wish to monitor, your TELELOGGER data will be available to RaceChrono.
Remember, your data will also be logged into the SD card of the TELELOGGER, and if you are connected to the TELEHUB, it will also be sent there for later review.

TELEHUB has a focus on helping drivers understand and improve driver inputs, with the unique C3F driver scoring and advice solution.

AVAILABLE TELELOGGER PID

The following are the CAN-BUS PID's available from TELELOGGER to RaceChrono and the formula to enter for each one.

	Channel Name	**PID (hex)**	**formula**
Standard OBD PIDs	Vehicle Wheel Speed (kph)	0x010D	bytesToUInt(raw,0,4)/3.6
	RPM	0x010C	bytesToUInt(raw,0,4)
	Accelerator Position	0x0111	bytesToUInt(raw,0,4)
	Accelerator Position B	0x0149	bytesToUInt(raw,0,4)
Extended OBD PIDs (optional)	Air/Fuel ratio	0x0144	Petrol: bytesToUInt(raw,0,4) * 0.1464 Diesel: bytesToUInt(raw,0,4) * 0.145 LPG: bytesToUInt(raw,0,4) * 0.1567
	Timing Advance	0x010E	min(40,bytesToUInt(raw,0,4))
	Intake Temperature	0x010F	bytesToInt(raw,0,4)
	Air Temperature	0x0146	bytesToInt(raw,0,4)
	Coolant Temperature	0x0105	bytesToInt(raw,0,4)
	Engine Oil Temperature	0x015C	bytesToInt(raw,0,4)
Telelogger Data PIDs	Battery Voltage (v)	0xC324	bytesToint(raw,0,4)
	TELELOGGER Temperature C	0xC382	bytesToint(raw,0,4)
	Longitudinal G force	0xC371	bytesToint(raw,0,4)/9.804
	Lateral G force	0xC370	bytesToint(raw,0,4)/ 9.804
	Vertical G force	0xC372	bytesToint(raw,0,4)/ 9.804
	Yaw Angle	0xC37A	bytesToint(raw,0,4)/100
	Pitch Angle	0xC379	bytesToint(raw,0,4)/100
	Roll Angle	0xC37B	bytesToint(raw,0,4)/100
External Input PIDs (depends on Config Tool Settings)	Input A (not specified)	0xC390	bytesToint(raw,0,4)/100
	Input B (not specified)	0xC391	bytesToint(raw,0,4)/100
	Boost Pressure	0xC3D0	AEM Gauges: bytesToint(raw,0,4)/100/.1450
	Brakes	0xC3D1	bytesToint(raw,0,4)/100
	Oil Pressure	0xC3D2	bytesToint(raw,0,4)/100
	Other Pressure	0xC3D3	bytesToint(raw,0,4)/100
	Oil Temp	0xC3D4	bytesToint(raw,0,4)/100
	Other Temp	0xC3D5	bytesToint(raw,0,4)/100
	Fuel Pressure	0x010A	bytesToint(raw,0,4)/100

For more information on External Sensors connected to TELELOGGER, see the TELELOGGER External Inputs connection guide on our support pages: https://teamplus.cloud/support

Note:

RaceChrono calculates a lateral acceleration channel from bearing change and a longitudinal acceleration channel from speed change. This means you will see these GPS channels in RaceChrono, but I suggest using the proper G force channels from the CAN-Bus PID's instead.

RaceChrono does not do averaging/smoothing for the speed data when calculating the accelerations, so their calculated acceleration data may be quite noisy.

GETTING SUPPORT

Team Plus TELEHUB has support options listed on the page:
https://teamplus.cloud/support
This includes:

- A Community Forum for discussion, best ideas sharing, and logging of faults or ideas for improvement
- A list of reference guides (including this one)
- The TELELOGGER CONFIG TOOL installer download to get latest firmware or adjust network settings
- An email help request link for situations where none of the above helps.