860C additional manual

TSDZ2 open source firmware v20.1C for APT- 860C display
modified version of 20 beta 1 (C)

Before using the software, please read the following instructions and the display wiki carefully:
Features and configurations on display · OpenSourceEBike/TSDZ2 wiki Wiki · GitHub
This manual is a supplement only.

- Set assist mode

There are 5 assistance modes available, the choice is in the main screen.

POWER ASSIST	assistance proportional to the power on the pedals
TORQUE ASSIST	assistance proportional to the torque on the pedals
CADENCE ASSIST	assistance subordinated to the movement of the pedals
EMTB ASSIST	assistance with progressive percentage of the torque on the pedals
HYBRID ASSIST	combined torque + power assistance

At level 0, ON/OFF button to view the current mode, UP/DOWN button to change, ON/OFF button to confirm. Assistance values for all modes from 1 to 254, for eMTB from 1 to 20.
“Hybrid assist” is a combination of the “Torque assist” and “Power assist” modes.
The result is excellent low-cadence assistance typical of Torque mode, and the extension of high-cadence Power mode.
The assistance parameters are the same used in the two modes, combined with the same level.

- Menu items changed or added

SOC

Text
Reset at voltage
Battery total Wh
Used Wh
Manual reset (no/yes)

Use when putting on an incompletely charged battery or at the first power on after the flashing. In this case, “Used Wh” is calculated with reference to voltage.
When the battery is fully charged, the reset to 100% is automatic.

Motor

Motor voltage
Motor acceleration

Acceleration of the motor.
As a first setting, use low values, then gradually increase if necessary.
Consider the values in the table as maximum values.
Set carefully, aware that setting a higher value than necessary can cause greater stress on the transmission.

Recommended values:

36 Volt motor, 36 volt battery = 35
36 Volt motor, 48 volt battery = 5
36 Volt motor, 52 volt battery = 0
48 Volt motor, 36 volt battery = 45
48 Volt motor, 48 volt battery = 35
48 Volt motor, 52 volt battery = 30

Min current ADC step

Torque sensor

Torque ADC threshold

In addition to the initial assistance with just the push on the pedals, without rotation for an immediate start, now this function is also activated with the bike in motion, when you resume pedaling after a break.
Attention, by enabling the BOOST function at the same time, the effect increases!
This can cause greater transmission stress.

Assist w/o pedal rotation

Coast brake

Coast brake ADC

Calibration

Enabled / Disabled. Enable only after having entered the actual values of “Pedal torque ADC offset” and “Pedal torque ADC max”, obtained from the calibration.
Enabling without having entered the correct values can lead to unpredictable operations.
Calibration procedure: see "ADC torque sensor" in the "Technical" menu, enter the ADC value of the torque sensor without any push on the pedals in "Pedal torque ADC offset".
Enter the ADC value of the torque sensor with the maximum thrust applied to the pedal (cyclist standing on the right pedal in horizontal position) in "Pedal torque ADC max".
Torque sensor calibration is required if the working range is limited.
“Pedal torque ADC max” - “Pedal torque ADC offset” < 140.
Caution. The ADC values of the torque sensor over time may change, check periodically.

Torque adc step

Conversion factor of the torque applied to the pedal.
It is used to calculate the correct ratio between the assistance factor and the human power (only in “Power assist”), the actual value obtained from the calibration can be entered.
This parameter is not used for the calculation of the human power shown on the display.

Torque adc offset

ADC value of the torque sensor without any push on the pedals.
It is obtained from the calibration procedure to be carried out on the display.
When you need to increase the sensitivity at the start, for example with a arm-dbike, subtract a number from 1 to 10 from the value obtained. Caution. Decreasing the offset value too much can cause an unwanted start and / or a delayed motor stop.

Torque adc max

ADC value of the torque sensor with the maximum thrust applied to the pedal (cyclist standing, on the right pedal in horizontal position).
It is obtained from the calibration procedure to be carried out on the display.
This parameter is used to amplify the range of use of the torque sensor when it is too limited.
Check that the assistance is well distributed over all levels and in all modes, if necessary correct the value obtained in plus or minus. Lower value = higher amplification.

Weight on pedal

Weight to be applied to the pedal for the calibration of the ADC value of the torque sensor used in the calculation of the human power to be shown on the display.
Use a weight of 20 to 30Kg.

Torque adc on weight

ADC value of the torque sensor for the calculation of human power to be shown on the display. It is not used for the calculation of the assistance factor.
It is obtained from the calibration with a weight from 20 to 30Kg, to be carried out on the display.

Calibration procedure: see "ADC torque sensor" in the "Technical" menu, enter the value read, with the weight applied to the pedals in a horizontal position, in "Torque adc on weight".

Default weight (no/yes)

After having entered the calibration values in "Torque ADC offset" and "Torque ADC max", with this function it is possible to calculate an estimated value of "Torque adc on weight" for a weight of 25Kg. The value is less accurate than that obtained with real calibration, but it is adequate for the purpose.

Assist level

Number of assist levels

Power assist

"Power assist" is an assistance mode proportional to the power on the pedals.
Levels available from 1 to 9. Set assistance levels according to your needs. Value% / 2, maximum 254.
For example, applying 100 Watt to the pedals, with 150 assist, the motor delivers 300 Watt.
These assistance parameters are also used in the hybrid mode.

Torque assist

"Torque assist" is an assistance mode proportional to the torque on the pedals.
Levels available from 1 to 9. The power delivered by the motor is proportional to the applied torque and the set assistance values.
Set assistance levels according to your needs. Relative values, maximum 254.
These assistance parameters are also used in the hybrid mode.

Cadence assist

"Cadence assist" is an assistance mode subject to pedal movement.
Levels available from 1 to 9.
The power supplied by the motor depends partly on the assistance values set and partly on the cadence of the pedals. Relative values, maximum 254.
It is recommended to use this assistance mode with the brake sensors installed and enabled.

eMTB assist

"eMTB assist" is an assistance mode with progressive percentage of the torque on the pedals. Levels available from 1 to 9. The power delivered by the engine is progressively proportional to the applied torque. There are 20 predefined sensitivities.
Higher values correspond to more responsive assistance, quicker to reach maximum engine power.

Walk assist

Feature (enable/disable)

Level (da 1 a 9)

Cruise feature

Enable/disable the cruise function. It can only be enabled with Walk assist enabled.
By pressing the DOWN button for a long time at speeds above 9 km/h and with the function enabled, the current speed is stored and maintained for as long as the button is pressed.
Speed may not be achieved due to limited engine power.
The speed limit has priority.
It is recommended to use cruise mode with brake sensors installed.
Find out about the legal restrictions in your country.

Startup boost

Feature (enable/disable)

Startup boost torque factor

It is used to increase the starting assistance and at low cadence.
“Startup boost” must be enabled. Available only in "Power assist" mode.
It works both with standing start and with resuming pedaling in motion.
The value of this parameter is the percentage increase in torque applied to the pedals with cadence = 0. This value gradually decreases as the cadence increases, depending on the next parameter.
Set carefully, aware that setting too high a value can cause greater stress to the transmission. Value in %, recommended 250, maximum 500.

Startup boost cadence step

It is used to calculate the decrease in the boost torque factor as the cadence increases, until extinction.
Recommended value 25. Limits from 10 to 50, higher value = shorter effect.

Street mode

Enable mode
Enable at startup
Speed limit
Motor power limit
Throttle enable
Cruise enable

Enable/disable the cruise function in "Street mode".

Hotkey enable

Various

Lights configuration

Lights configuration. Inquire about compliance with current regulations.
Choose your preferred mode from the 9 available.
With light control ON:
0 - on
1 - flashing
2 - on and fast flashing when braking
3 - flashing and on when braking
4 - flashing and fast flashing when braking
5 - on and on during braking also with light control OFF
6 - on and fast flashing when braking even with the light control OFF
7 - flashing and switched on when braking even with the light control OFF
8 - flashing and fast flashing when braking even with the light control OFF
The braking modes are only available with the brake sensors installed.

Assist with error

Enabled / Disabled. The presence of an error disables assistance in all modes.
It is however possible to force assistance even with an error if this is caused by a problem with a sensor. Torque, cadence or speed sensor.
You will have to choose the assistance mode that does not involve the use of the faulty sensor.
Use only in case of need, with this function enabled there are limitations in assistance.
See error codes below.

Virtual throttle step
Odometer

Display

…

Config shortcut key (no/yes)

By enabling this function (yes), with assistance level greater than zero, it is possible to directly access the configuration menu with a long press of the M button.
Only with level = 0, long pressing of the M button activates the customization of the numerical fields and graphs in the 3 main screens.
It is always possible to access the configuration menu with the UP + DOWN + ON/OFF buttons.

Technical

ADC battery current
ADC throttle sensor
Throttle sensor
ADC torque sensor

ADC torque delta

ADC value of the torque sensor without offset.
It is possible to observe and analyze the variations resulting from the calibration.

ADC torque boost

ADC value of the torque sensor without offset and with the increase of the "Startup boost" function if enabled. Only in "Power assist" mode.

ADC torque step calc

Conversion factor of the torque applied to the pedal obtained from the weight calibration.
Used for the calculation of the human power shown on the display.
This value can be entered in the "ADC torque step" parameter for a correct ratio in the assistance calculation (only in "Power assist").

Pedal cadence
PWM duty-cycle
Motor speed
Motor FOC
Hall sensors

- Error codes

Error codes and description:

E02 - ERROR_TORQUE_SENSOR
A mechanical problem may have occurred with the torque sensor or the calibration at startup has not been performed correctly. A torque was probably applied to the pedals during power on.
Switch off and on again so that the system can recalibrate, without forcing the pedals.
If the "Torque sensor calibration" function is enabled, check on the display if the value of "Pedal torque ADC offset" with free pedals and "Pedal torque ADC max" with maximum effort, correspond to those entered.

E03 - ERROR_CADENCE_SENSOR
While pedaling, no pulses are generated by the cadence sensor, possibly faulty.

E04 - ERROR_MOTOR_BLOCKED
Motor or wheel blocked, excessive current absorption without motor rotation.
Check the cause. After 6 seconds the error disappears and the bike can be reused.

E08 - ERROR_SPEED_SENSOR
Faulty speed sensor or magnet too far away.