Battery CAN-Bus-Messages

The battery sends CAN messages as soon as there is a certain charge current. CAN-Frame-IDs in the range of 0x400 seem to come from the battery (0x400, 0x401, 0x402, 0x403).

CanOpen

https://en.wikipedia.org/wiki/CANopen

Levo does **NOT** use CanOpen !!!

Trace-Excerpts

Data is basically „Little Endian“, which means. `a1 fe ff ff` is 0xFFFFFEA1. Current and voltage values in most cases are multiplied by „1000“.

71 percent battery voltage:

```
00000401       8      |b0 9a|00 00|a1 fe|ff ff       39.6V
00000400       8       00 00 8c 80 00 00 00 00
00000401       8       b0 9a 00 00 a1 fe ff ff
00000400       8       00 00 8c 80 00 00 00 00
00000401       8       b0 9a 00 00 a1 fe ff ff
00000400       8       00 00 8c 80 00 00 00 00
00000401       8       b0 9a 00 00 fa fd ff ff
00000400       8       00 00 8c 80 00 00 00 00
00000401       8       b2 9a 00 00 fa fd ff ff
00000400       8       00 00 8c 80 00 00 00 00
00000402       8       46 00 00 00 28 d9 04 00        317 Wh corresp. 63% → *1.12=70,56% (s.u.)
00000401       8       b2 9a 00 00 fa fd ff ff
00000400       8       00 00 8c 80 00 00 00 00
00000401       8       b0 9a 00 00 fa fd ff ff
```

23 percent battery voltage (measured 35.5V):

```
00000400       8       00 00 8c 80 00 00 00 00
00000401       8      |d3 8a|00 00|03 fe|ff ff     35.5V
00000400       8       00 00 8c 80 00 00 00 00
00000401       8       d3 8a 00 00 03 fe ff ff
00000400       8       00 00 8c 80 00 00 00 00
00000401       8       d3 8a 00 00 f8 fd ff ff
00000400       8       00 00 8c 80 00 00 00 00
00000401       8       d5 8a 00 00 f8 fd ff ff
00000400       8       00 00 8c 80 00 00 00 00
00000402       8       16 00 00 00 24 8c 01 00        22%   101 Wh ???=20% → *1,12=22,44%
00000401       8       d5 8a 00 00 f8 fd ff ff
00000400       8       00 00 8c 80 00 00 00 00
```

```
00000401      8      d3 8a 00 00 f8 fd ff ff

00000400      8      00 00 8c 80 00 00 00 00

00000401      8      d3 8a 00 00 f8 fd ff ff

00000400      8      00 00 8c 80 00 00 00 00
```

Interpretation

ID 401: Batt

```
23%
00000401      8      |d3 8a|00 00|03 fe|ff ff    35.5V  -0,509A
…
00000401      8      09 8d 00 00|58 f0|ff ff    36.1V  -4.008A

71%
00000401      8      b0 9a 00 00|a1 fe|ff ff    39.6V  -0.351A
…
00000401      8      2a 9d 00 00|62 f0|ff ff    40.2V  -0,3998A
```

```
23-35%:
19:01:53:823      00000401      8      10 8b 00 00 5a fe ff ff
19:02:30:184      00000401      8      a6 8d 00 00 5b f0 ff ff  36.2V (35.43) -4.005A
19:03:30:143      00000401      8      52 8e 00 00 5c f0 ff ff  36.4V (36.25)
19:05:30:773      00000401      8      22 8f 00 00 5a f0 ff ff  36.6V (36.51)
19:09:30:048      00000401      8      31 90 00 00 55 f0 ff ff  36.9V (36.71)
19:12:30:477      00000401      8      c6 90 00 00 52 f0 ff ff  37.1V (36.90)
19:14:30:716      00000401      8      1d 91 00 00 52 f0 ff ff  37.1V (37.00)
19:19:30:854      00000401      8      db 91 00 00 4f f0 ff ff  37.3V (37.20)
19:22:30:955      00000401      8      4a 92 00 00 4d f0 ff ff  37.4V (37.30)
```

First data word low/hi: battery voltage, here 35,5V (23%) and 39,6V (71%) , divided by 1.000.

Second data word: always 0

Third and fourth data word: charge current as negative value (2er-complement) divided by 1.000.

ID 400: Batt

Second data word: unclear, probable minimal voltage ??? 0x808c = 32,9 V

```
00000400      8      00 00 8c 80 00 00 00 00

…

00000400      8      00 00 8c 80 00 00 00 00
```

Drive/charge status (?):

```
00000400      8      01 00 0c 00 00 00 00 00     Batt Status ??? 1=drive, 0=charge ?
```

ID 402: Batt

First word/Byte: charge status in percent ?

3rd and 4th word: electric energy DWORD ???

23% (22%):

```
00000402      8      16 00 00 00 24 8c 01 00  22%  101 Wh ???
…
00000402      8      16 00 00 00 64 8e 01 00  22%
```

71% (70%):

```
00000402      8      46 00 00 00 28 d9 04 00
…
00000402      8      46 00 00 00 68 db 04 00    318Wh ???
…
00000402      8      46 00 00 00 b0 db 04 00
```

23-35%:

```
00000402      8      17 00 00 00 40 97 01 00    23%  104 Wh ??? (20,8%)
…
00000402      8      22 00 00 00 74 59 02 00    35%  153 Wh ??? (30,6%) BlEvo:174Wh @504Wh batt
```

Calculation of correct energy amount, see assumption below

ID 403: Batt

PDO, Node-ID: 1, RTR 1

```
00000403      8      64 00 00 00 d0 dd 06 00          450Wh ??? Max. capacity ??
                                                      64 = Batt health ???
```

Assumption concerning energy amount /capacity

The 403-message mentions a capacity of 450Wh, instead of 504Wh. Capacity value of the 402-message thus must be multiplied with a factor of 1.12 (=504Wh/450Wh)

BLEvo i.e. shows 174Wh at 153Wh sent by CAN → multiplied with 1.12 → 171 Wh.

ID 404: TCU requests batt data???

z.B. „Message 20“, see Traces for ID 405

```
00000404      2      20 00     ??? „message 20“
```

ID 405: Battery serial number and other data (sent in chunks)

```
00000404      2      4a 00
00000405      8      4a 00 00 00 02 00 00 00
00000404      2      44 00
00000405      6      44 00 00 00 d4 30
00000404      2      01 00
00000405      8      01 00 00 00 01 03 03 00
00000404      2      a3 01
00000405      5      a3 01 00 00 01
00000404      2      20 00     ??? „message 20“
00000405      8      20 00 00 00 39 33 39 37    Paket 20 batt serial number "9397"
00000404      2      21 00       ??? „Paket 21“
00000405      8      21 00 00 00 4a 54 41 31   Akku? "JTA1"
00000404      2      22 00
00000405      8      22 00 00 00 30 30 31 37   Akku? "0017"
00000404      2      23 00                     ??? „Paket 23“
```

```
00000405      8      23 00 00 00 57 30 30 30   Akku? "W000"
00000404      2      24 00
00000405      8      24 00 00 00 30 30 30 30  Akku? "0000"
00000404      2      25 00
00000405      8      25 00 00 00 30 30 30 30  Akku? "0000"
00000404      2      26 00
00000405      8      26 00 00 00 30 30 30 30  Akku? "0000"
00000404      2      27 00
00000405      6      27 00 00 00 30 30        Akku?  "00"
00000404      2      4c 00
00000405      8      4c 00 00 00 01 24 00 00
00000404      2      46 00
00000405      5      46 00 00 00 00
00000404      2      4d 00
00000405      8      4d 00 00 00 00 00 00 00
00000404      2      50 00
00000405      8      50 00 00 00 ad 00 ab 00
00000404      2      02 00
00000405      8      02 00 00 00 53 42 43 54       „SBCT“
```