

## Receiving Data from CCS-Adapter

The use of the ADAPTER is intended for the inspection of the charging process. It is not made to make precise measurements of battery voltage or other exact values. By showing the charging curve the intention is to help in decision making by investigation of the behavior of the battery voltage over time.

### Advantages:

- Monitoring of battery charging over longer periods of time, eliminating the need for human observation and manual measurements. Because data are directly measured at the controller site all signal modifications along the entire circuit path are taken into account.
- Verification of the decisions of the CCS-Controller for charge termination as a consequence of the measures
- Calculation of time and capacity from Start/Stop-Time information
- Evaluation and allocation of charging problems (Circuit/Connections/Battery)

## CCS-Controller TxD-Signal

The TxD Signal of the CCS-controllers is a non standard PPM-encrypted signal needing online synchronization for decoding.

The controller inside of the ADAPTER performs the required decoding. A common PC or any other non-continuous RealTimeSystem is not applicable for decoding the TxD-Signal.

After decoding the ADAPTER sends out a 10-bit Data stream in a simplified RS232C Format. Serial Transmission: 2400 Baud, 8 Bit, NoParity, 1 Stopbit.

### Restrictions:

- 1) PC can receive data from ADAPTER only.
- 2) Data Port is pulled from 5V to GND.  
(normal RS232 range is  $\pm 8.12V$ )

## Transmission Code

Data Stream: BBBBBD DDDDCRLF

- B.. 6 Characters Header
- D.. 4 Characters Measured Data
- CR. 1 Character Carriage Return
- LF. 1 Character Line Feed

## Data Conversion

Extract the last 4 Characters (HEX-coded) Extract Status Code Information (see table)  
Convert other HEX Numbers into decimal  
Calculate Battery Voltage from Formula

**Status Code Information**

<i>HEX-Codes</i>	<i>Interpretation</i>	<i>Bedeutung</i>
FFFF	Disconnection	Unterbrechung
FFFE	Battery fully charged	Akku voll
FFFD	Defective Battery	Akku defekt
FFFC	Start Charging	Laden Start
FFFB	Battery Disconnected	Akku abgesteckt
FFFA	Battery Connected	Akku angesteckt
FFF0...FFF9	reserved	
0000...FFEF	Battery Data	Messwerte

**Calculation of Battery Voltage**1. Method (simple):

$$\text{Battery Voltage} = \text{Measurement} * /15325$$

$$V_{\text{Bnom}} = \text{Nominal Battery Voltage (1*NiCd=1,2V, 4*NiCd=4,8V, 1*Pb = 2V, 6*Pb=12V)}$$

2. Method (more detailed):

$$\text{Battery Voltage} = (\text{Measurement} * \text{Divider} / \text{Factor}) - V_{f_{\text{Diode}}}$$

Divider = (R9+R10)/R10 (see CCS Data Sheet)

Factor = 12260 (adjustment for the actual application may be required)

$V_{f_{\text{Diode}}}$  = D1 forward Voltage (use 0,5V for PN, 0,2V for Schottky)

**Calculation of Times**

The Adapter does not transmit time information. Times and Time intervals and related parameters must be derived and calculated from the clock of the host system (PC).

Notes:

- Data transmit intervals are clocked (initiated and controlled) by the CCS-Controller (source) and not by the adapter (interface).
- Data transmit rate is not always constant. Intervals do vary with the controllers state.
- Time logging is necessary for the reconstruction of the time axis of the charging curve.
- Time logging is necessary for recalculation of charge duration and capacity.

Ref. Adapter Manual

**Comments:** Our aim is to help you best in the design of superior chargers with CCS-technology. This Application Note was carefully composed. However, according to the wide range of solutions not all aspects and possibilities can be covered by this publication. Furthermore errors cannot be completely excluded and we do not provide any responsibility for the given applications. Therefore we welcome your response comments and suggestions for further improving our CCS-Application Notes. **Thank you!**

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