

**Description**  
**and**  
**Operating Instructions**

**BATTERY CONTROL SYSTEM**

**DCC 4000**

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**BATTERY CONTROL SYSTEM**

**DCC 4000**

**Dear customer,**

you have made a wise decision: you have acquired one of the finest battery control systems in the world. Its accuracy, reliability, and versatility are convincing. But above all, it informs you at any time about the important charge condition of your batteries. To let you have battery power when you need it.

Although at first sight it may appear complicated, it is simple and easy to use.

Admittedly, the DCC 4000 is not quite cheap, but it's very much cheaper to buy an expensive instrument once, than buying new batteries often.

**GENERAL FUNCTIONS**

- \* Indication of available capacity in % or Ah (ampere hours)  
or  
indication of "used-up" capacity in Ah
- \* Low-capacity warning (presettable warning level)
- \* Low-capacity warning indicated on the display
- \* Charge and discharge current meter
- \* Indication of current flow direction (charging /discharging) by +/- symbol and arrow in display
- \* Battery voltage meter
- \* Relay-switched outputs (optional)

## KEY FUNCTIONS

### MODE key

Pressing the MODE key steps through indication of

- Available capacity in ampere hours
- Available charge in percent
- Actual current flow: charging (+) or discharging (-)

### VOLT key

The DCC 4000 indicates the battery voltage while the VOLT key is pressed.

### SET ( ) keys

These are used together with the MODE key, see under PROGRAMMING.

### General

When the device is switched off, or a power failure occurs, the preset values and the actual count are retained.

In case of external interference the DCC 4000 will be reset to its default values.

## MOUNTING INSTRUCTIONS

### Installation notes

Install the device at a location that is not permanently subjected to direct sunlight.

The drawing printed on the back of these instructions is in a 1:1 scale and can be used a template for drilling mounting holes, and for making a cut-out.

The front panel can be taken off by removing the two recessed-head screws. This exposes the four mounting holes. Use counter-sunk screws for mounting. Thereafter fasten again the front panel with the two recessed-head screws.

When mounting the measuring shunt resistor make sure that sufficient heat dissipation is provided, especially if large currents will flow. **DO NOT** tape up the resistor!

### Electrical connection

#### Supply voltage

Before putting the device into operation verify that the supply voltage corresponds to the value indicated on the name plate. Only if both are identical do connect the supply lines to the terminal lugs provided.

Terminal lug no. 1     negative (-) supply line

Terminal lug no. 2     positive (+) supply line.

If possible the supply lines of the DCC 4000 should be connected as close to the battery as possible to ensure correct measurement of the battery voltage. The minimum wire size should be no. 20 Standard Wire Gage.

To prevent damage to the supply line by short circuit, insert a 1-amp fuse as close to the battery as possible.

## **Lighting**

The DCC 4000 comes with a backlit liquid crystal display (LCD). The backlight uses high-power light emitting diodes (LEDs). To light the LCD, connect

Terminal lug no. 3

with the positive wire for the general panel lighting (10 to 30 VDC).

## **Measuring shunt resistor**

The measuring shunt resistor can be inserted into the minus-lead or the plus-lead of the battery. As a protection against short circuit, it is recommended to choose the lead that is connected to the chassis, or to the ground potential, of the system.

Cut this lead and connect the ends to the high-current (large) terminals of the resistor.

Connect the sensing wires to the two small terminals each. Connect these wires to the measuring input connectors of the DCC 4000:

Terminal lug no. 8

Terminal lug no. 9

When battery current is drawn during normal operation, a negative current flow should be indicated; if not, reverse the connection of the two sensing wires.

## **Caution:**

DO NOT connect a high-current battery lead and a sensing wire to the same terminal screw, an erratic measurement may result.

The DCC 4000 provides a high-impedance measuring input, therefore, the size of the sensing wires is not critical, and the length may be as needed.

### **Relay switching outputs**

Terminal lug no. 4      relay no. 1 contact

Terminal lug no. 5      relay no. 1 contact

Terminal lug no. 6      relay no. 2 contact

Terminal lug no. 7      relay no. 2 contact

The relay contacts can be factory-set to normally open, or normally closed, as desired. See the corresponding instructions on the DCC 4000.

## PUTTING THE DCC 4000 INTO OPERATION

Upon first power-on, the factory-set default values are loaded. This takes a few seconds.

Default values:

Shunt:	type 2 (1 mOhm)
Battery capacity:	100 Ah nominal
Charging factor:	90%
Capacity warning level:	50%
Autofocus:	0 (off)
Counter reset:	0

The values can be displayed in the programming mode and changed to correspond to the existing battery, or battery bank, see PROGRAMMING.

Note: If power goes on and off several times while connecting the supply lines, random values may be loaded and the display will be erratic. In this case disconnect either supply line and reconnect after a few seconds.

Connect a load to the battery.

Step through the indications by pressing the MODE key three times:

Display indicates

1. step:	bottom right:	"A"	for amperes
2. step:	middle left:	"-"	minus sign
3. step:	bottom left:	"∇"	downward arrow.

If the display does not indicate these symbols, reverse the connections of the sensing wires.

## PROGRAMMING

To enter the programming mode:

Press MODE key and SET ( $\Delta$ ) key at the same time.

After each of the settings described below have been achieved, press the MODE key once. This confirms the set up value and steps the program forward to the next setting.

### 1. Shunt

Display indication: SHUNT

Press the SET keys to select the measuring shunt resistor in use.

Type 1      10 mOhms, e.g. 20 A/200 mV

Type 2      1 Ohm, e.g. 60 A/60 mV, 100 A/100 mV, 200 A/200 mV

Type 3      0.1 mOhm, e.g. 300 A/30 mV, 600 A/60 mV

### 2. Nominal capacity

Display indication: CAP ("capacity")

With the SET keys set the nominal capacity of the battery, or battery bank, in ampere hours (Ah) as marked on the batteries, or as stated by the battery vendor. In normal operation the display will indicate the available capacity in Ah, and %.

or

Set the capacity to 0 Ah. In normal operation the display now indicates the "used-up" capacity in Ah AND NOT the available capacity! For this operating mode the counter should be programmed not to count upward beyond zero, see step 5 below.



### 3. Charging factor

Display indication: CHAF ("charging factor")

Press the SET keys to set the appropriate value, e.g. 90% for regular lead batteries.

This is a compensating factor for the DCC 4000 to correctly calculate the "used-up" capacity, for batteries consume more energy than they deliver. The exact charging factor depends on the type of battery in use, and on the charging current.

The following table provides some typical charging factors as a guide line:

Battery type	Charging current	Charging factor
Lead batteries	low charging current	average 95 %
Lead batteries	high charging current	average 90 %
NC batteries	nominal charging current	average 80 %

### 4. Alarm level

Display indication: MEM ("memory")

If the nominal capacity of the battery has been entered in step 2, an alarm level in percent can be preset with the SET keys. If the remaining capacity falls below that level, the display alternates between CAP and MEM.

If in step 2 the capacity has been set to 0 Ah, however, the alarm level is preset in Ah. If the "used-up" capacity exceeds that level, the display alternates between CAP and MEM.

## 5. Counter zero stop

Display indication: ZS ("zero stop")

Appears only if in step 2 the Ah value has been set to 0. In this case the counter in normal operation indicates the "used-up" capacity in Ah. As the battery is recharged, the counter counts backwards towards 0. The ZS function stops the counter at zero to prevent it from going beyond that indication.

Program this function with the SET keys:

display indicates 1 = zerostop active  
display indicates 0 = zerostop inactive

## 6. Measuring range expansion

Display indication: AF ("autofocus")

Autofocus expands the measuring range by the factor 10 within four seconds, if the measured current goes below these values

with measuring shunt resistor type 1	0.64 A
with measuring shunt resistor type 2	6.4 A
with measuring shunt resistor type 3	64 A

The decimal point on the display then moves one place to the left.

Program this function with the SET keys:

display indicates 1 = autofocus active  
display indicates 0 = autofocus inactive

With autofocus active, the sampling rate changes from 4 measurements per second to 1 measurement per second. Also, a slight zero drift will occur.

## 7. Counter setting

Display indication: SC ("set counter")

Sets the counter to the nominal Ah value entered in step 2.

Set the counter with the SET keys:

display indicates 1 = set counter  
display indicates 0 = do not set counter

### **Normal operation**

Pressing the MODE key to confirm the settings achieved in step 7 exits the programming mode and activates the programmed functions and the alarm level.

The set up values are stored and can be verified at any time by pressing the MODE and SST ( $\Delta$ ) keys together, and stepping through the program with the MODE key. Modifications can be made as well.

### **Battery voltage meter**

Holding the VOLT key down turns the DCC 4000 into a battery voltage meter.

The voltage is measured across the supply line. In systems with separate batteries for different voltages, the battery voltage is measured across the sensing wires.

**Supply**

8 to 30 V DC

**Current draw**

4 mA

**Display lighting**

approx. 25 mA (separate terminal lug)

**Measuring range**

with measuring shunt resistor type 1:  
0.01 to 40.00 A / 0.01 to 99.99 Ah

with measuring shunt resistor type 2:  
0.1 to 400 A / 0.1 to 999.9 Ah

with measuring shunt resistor type 3:  
1 to 4000 A / 1 to 9999 AH

**Accuracy**

+ 0.5% / +1 digit

+1% /  $\pm 4$  digits with autofocus active

**Measuring method**

Current mean value method

4 measurements/second

1 measurement/second with autofocus active

**Temperature range**

-10 to +60 degrees Celsius

**Dimensions**

125 x 45 mm overall

105 x 40 x 80 mm panel mounting

**Connector**

6.3 mm AMP terminal lugs

## PROFESSIONAL APPLICATIONS

The DCC 4000 checks batteries, charging station, solar generator, electroplating plants. These are just a few examples for the large range of application for the Battery Control System DCC 4000.

1. Presetting it to 0 Ah lets the DCC 4000 not compute a percentage, but makes it a pure Ah-counter of absolute values, without restriction.

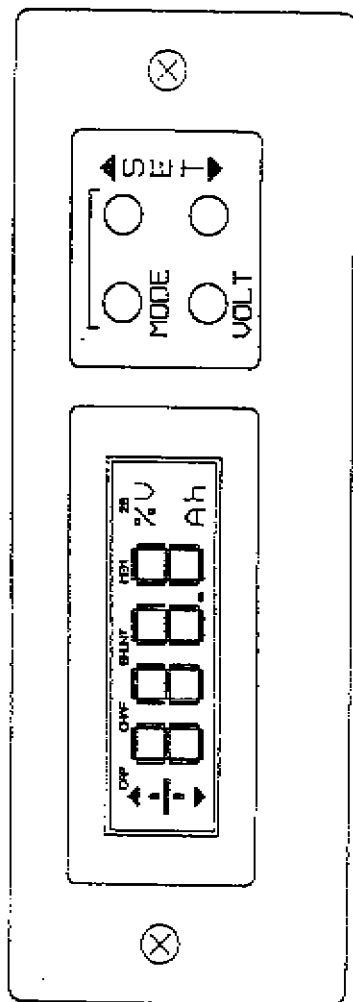
2. When using it as described in 1., the counter can be programmed to count past "0", or to stop at 0 Ah. This can be controlled by the ZS function, see PROGRAMMING, step 5.

3. Setting the charging factor to 100% enables counting of current measurements in both directions without rating. When the charging factor is preset to 0%, counting in a positive direction is automatically inhibited.

4. Optional relay switching outputs can be obtained at

- battery fully charged
- preselected warning level reached ("MEM")
- battery completely discharged (not effective if device is programmed to indicate "used-up" capacity instead of remaining capacity).

Any two of the three variants are available.



# Schematic Drawing

