

SIMPROP



ELECTRONIC

Simprop electronic
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NC-Manager II plus

Best.-Nr: 011 098 1

Operating Instructions

Harsewinkel, May1995

We reserve the right to make any
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1. The NC-Manager plus

Simprop electronic has developed this new range of quick chargers to further help with the operation of your electric-powered model. During the development of this charger a large amount of practical experience to satisfy your charging needs of today and in the future has been incorporated. The charger's design incorporates the most modern Microprocessor Technology, and its manufacture is based on Surface Mount Device (SMD) Technology, which gives an unsurpassed level of quality and reliability in operation.

With the NC-Manager plus you are always prepared to charge and maintain your batteries to suit your operational demands.

Due to the microprocessor monitoring of the charging process and the display of the parameters, you are kept constantly informed of the condition of your batteries at any time in the charging process.

Use of the NC-Manager plus

- Rapid charging of NC batteries from a 12 V lead-acid car battery
- Equalising the NC-battery
- Charging of lead-acid batteries
- Capacity measurement
- Multi-charging of batteries
- Improved performance espec. for Job programming
- Care and maintenance of batteries

Features and characteristics

- Constant current charging up to 7 amperes
- High output voltage to charge up to 30 cells
- Automatic cut-off using two "Delta Peak" methods with adjustable sensitivity or only with "Time-out" feature.
- Liquid Crystal Display (LCD) in two lines with five selectable display modes for the display of charging process and a report of charging status after completion of charging.
- Self-explanatory and "user-friendly" operations with dust proof keypad.
- Storing of 5 freely programmed charging programmes and further useful settings, e.g. basic parameters setting, job order etc.
- Electronic protection of opposite polarity connection of 12 V battery.
- All connections protected against opposite polarity and high-voltage.
- Monitoring of car battery voltage with acoustic warning.
- Charging of lead-acid batteries with automatic monitoring (gel and wet batteries with charging currents up to max. 5 amperes
- Extended operation functions for easy control

- Rapid charge of 2 additional batteries with adjustable current up to 2 Amp. for each battery.
- A higher charge capacity with shorter charge time is possible with the "Hyper-Charge" feature.
- Display of capacity measurement up to a discharge current of 2 Amp.
- Storing of the last chosen adjustment for the additional outputs.
- Programming of "jobs" (automatic run of freely programmed charging and discharging processes)

2. General Instructions for charging and using batteries.

2.1. General characteristics

The NC-Manager plus is designed for slow-charging, rapid-charging and discharging of nicad and lead-acid batteries. The charging and discharging parameters are electronically monitored, meaning that after setting of correct charging parameters, the charging of the batteries will always be optimally maintained. The batteries are protected by the electronics against over-charging.

A 12 V car battery is used as power source. To avoid discharging the car-battery too much, an acoustic alarm is fitted..

Before use :

Please read and observe these operating instructions thoroughly, so that you are familiar with the charger, and that you can attempting to make the correct adjustments to the NC-Manager before charging and discharging your valuable batteries.

ATTENTION !!!

Only charge with the car engine switched off !

Check, when connecting the charger to the car, that the battery has enough charge in it!

Only connect the NC-Manager using original cables and crocodile clips to the car-battery!

Follow the correct order of connection!

Avoid short-circuits across any of the inputs and outputs!

Never lay the battery pack on an inflammable or conductive surface such as car bodywork or motor!

Keep away from flammable material such as petrol or oil!

During operation, all settings will be displayed on the NC-Manager's LCD. The display will differ between the two modes, menu or operation.

After connecting the input voltage, the user level is active. In the display, all the settings and the function of the different outputs will be shown.

The following abbreviations appear in the LCD:

Output 1

NC1:	Rapid-charge of nicad batteries
HC1:	Hyper-charge of nicad batteries
FO1:	Forming or equalising of nicad batteries
PB1:	Lead-acid batteries charging
EL1:	Discharging of nicad batteries with capacity test
NCJ:	Job run activated - rapid charging operates
HCJ:	Job run activated - hyper charge operates
FOJ:	Job run activated - equalising operates
PBJ:	Job run activated - charging of lead-acid batteries operates
ELJ:	Job run activated - discharge / capacity test operates

In the second line of the display, the information for the outputs 2 and 3 are shown. These outputs will only be used for charging nicads and therefore NC2 and NC3 respectively will be displayed.

2.2 Charging of lead-acid batteries

According to the latest European regulations, charging of lead-acid batteries may only be done to minimize the overcharging and gassing of the battery are taken. Furthermore, it is strongly advised, that batteries not be charged within a confined space. The above is true for chargers and not just for the Simprop product.

Lead-acid batteries should be charged with a constant current, appropriate to the rated capacity of the battery. The charging time must be carefully observed, because too long a charge time will cause the battery to start venting or gassing! Whilst calculating the charge time, it is necessary to take into account the residual charge left in the battery. For example: a residual charge in the battery of 30 % means that the total charge time from flat should be reduced by also 30 %. If the battery is overcharged, then the electrolyte (acid) will start to evaporate. In the case of old style batteries, the electrolyte level can be returned with the appropriate topping-up with distilled water. However, the modern maintenance-free type of battery does not allow this, and therefore gassing must be avoided at all costs. This is not only to avoid reducing the batteries life and capacity, but also the gas is dangerous to humans.

For more detailed information please refer to the manufacturer of your battery.

2.3 Charging of Nicad Batteries

General information and advice in handling nicad batteries

Nicad batteries contain a corrosive electrolyte and poisonous heavy metal, in addition they can deliver a very high current.. Therefore the handling this type of battery requires a meticulous approach. Please take note of the advice given by the nicad manufacturer!

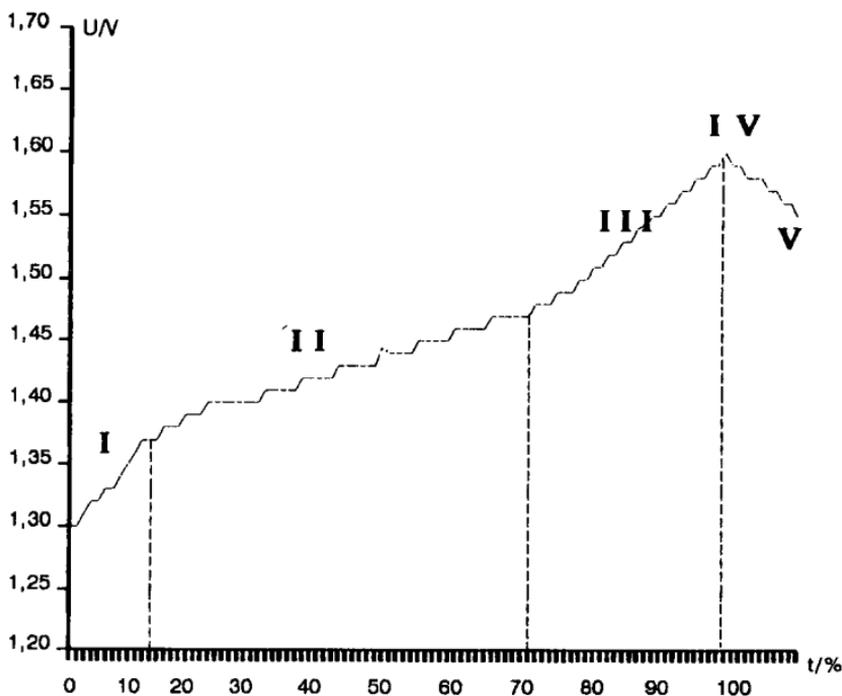
The following general rules should be noted and carefully observed to avoid damage to persons or objects!

- Store the batteries in a cool and dry environment!
- Avoid short circuits at all costs!
- Keep away from metallic or conductive objects, only use isolated tools when working with them
- Never throw cells in a fire, try to open them, or expose them to forces which may cause them to rupture or burst, they contain a strong corrosive!
- Only solder cables or terminals to the welded solder tag, never solder directly to the terminals or body of the cell!
- Keep batteries away from children and animals!
- Only make cable connections with the appropriately sized (large cross-sectional area) cable!
- Only connect cells together into a pack from the same manufacturer, which have the same rated capacity and type and the same residual charge!
- Keep cells, connectors and cables away from flammable materials!
- Never connect nicads in parallel, always in series!
- Return defective cells to the manufacturer or from where you purchased. They must be disposed of in the special rubbish and do not in your normal household rubbish!

Rapid charging of nicad cells:

- **Only** use cells which can be rapid charged, take note of any special markings or instructions given by the cell manufacturer!
- Only charge cells which are at a normal room temperature (ca. 20 degree Celsius and do not charge cells which have just been used, they will be too hot, allow them to cool!
- Don't overcharge the cells, you risk the danger of explosion!
- Bring cells, which are in a pack, separately to the same residual charge!
- Avoid reverse polarity!

Rapid rechargeable nicad cells have the following characteristics with rapid charging:



The voltage of a flat cell increase directly after start of charging (I). It enters a middle-level and goes into a relatively flat voltage climb as seen in (II), this condition remains until approximately 60 % of the full-charge is reached. After 80 % of the charge is completed, the voltage climbs further as illustrated in (III) and then as 100 % capacity is reached, the charge voltage falls away due to increased internal resistance (IV). This phenomena is known as Delta-Peak effect and is used to signify that the cell is 100 % charged and more importantly the charging can be switched off at the optimum level..

The Delta-Peak method has a number of advantages in comparison to other known charging methods:

- The cell will be charged to its optimum
- Overcharging and subsequent damage can be avoided
- Easy to operate

Besides the Delta-Peak monitoring, the time-out function should be used to limit the total charge time. This is done to minimise overcharging, should the Delta-Peak switching-off not occur.

Reasons that this may occur are as follows:

- Battery was absolutely flat or the cells were not of an equal charge status
- Poor electrical contact between the car battery and charger or between the charger and nicad pack, possibly due to oxidation of the terminals
- Defective cell
- Too low a charge current

Two problems after occur with nicad cells:

▷ **Memory effect**

Effect: The cell loses capacity

Reason: Cells are often only discharged partially, the cells' internal reaction creates a reduced capacity

Cure: Fully discharge the cell(s) before recharging

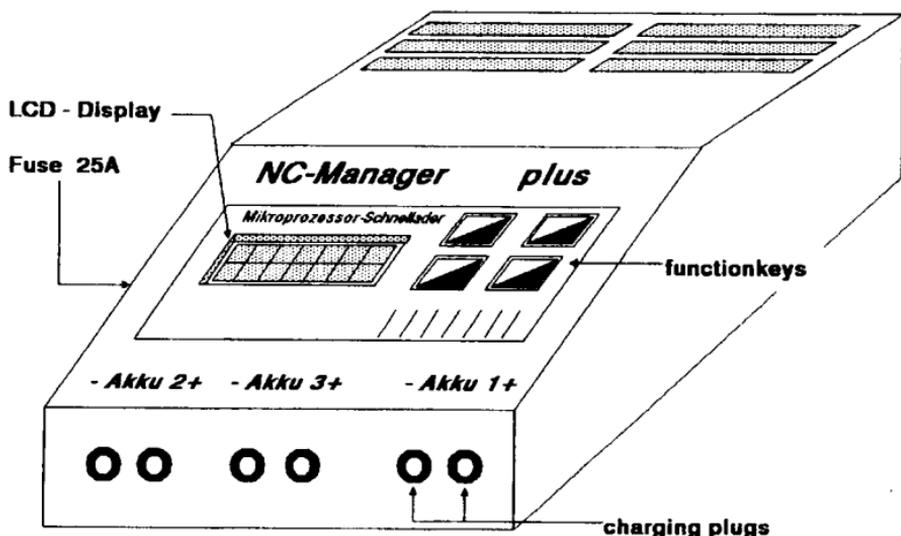
▷ **Unequal charge of condition of a single cell in a pack**

Effect: Loss of capacity single cells heat-up dramatically during charge or discharge

Reason: Natural differences in the structure of the cells or different treatment (charge/discharge of a single cell separately from the rest in the pack) will allow differences in the cells

Cure ; Discharge and slowly charge the affected cells, possibly repeating if the problem is not cured immediately

3. External Connections and User Controls



All adjustments of the NC Manager plus will be made through four keys of the dust proof key pad. By means of the self-explanatory menu after a short amount of time you will be able to effect all settings without operating instructions.

Same function in all menus:

The SET key will switch between the menu and operating level

The ENTER key will confirm and activate the chosen menu as well as the chosen parameter setting and the start resp. stop of the charging process effected

.'>>' and '<<.' key

These cursor keys can page through the different menus or can be used to change parameter settings

4. Start-Up and Adjustment

4.1. Start-Up



After connecting to car battery, the NC-Manager will revert to the last chosen charge parameters and activate the operating level.

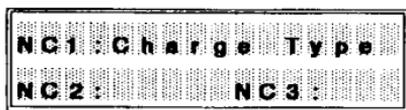
If no changes to the charging parameters are necessary, the NC-Manager can be used straight away.

To be able to change one or more charging parameters, it is necessary to select the desired output by use of the cursor "<<" or ">>" keys.

The chosen output will be displayed in the LCD. Confirm your selection by pressing once the "Set" key, the system will revert to the menu.

4.2. Menu Level of NC-Manager for Output 1

After a single press of the SET key you will find yourself at the menu entry of different functions parameters can be made. The display shows the following:



The cursor "<<" or ">>" can be used to choose an output

- Charge type
- Charging Current (discharging current for nicad battery discharge)
- Switching-Off method (rated voltage for lead-acid battery charge, residual charge for nicad battery discharge)
- Time-Out Setting
- Display Mode
- Job run
- Program / Memo

The choice of a menu is normally made with the ENTER key.

If any batteries are being charged at this point, pressing the ENTER key will break the charging process. Pressing the ENTER key once more, will reactivate the charging process.

4.2.1 Charge Type (Type of Operation)

With this menu, the different types of operation of the NC-Manager can be chosen.

```
NC1: Charge Type
NC2:          NC3:
```

Enter



• Rapid Charging

```
NC1: Rap. Charge
NC2:          NC3:
```

<< / >>



• Hyper-Charge

```
NC1: Hypercharge
NC2:          NC3:
```

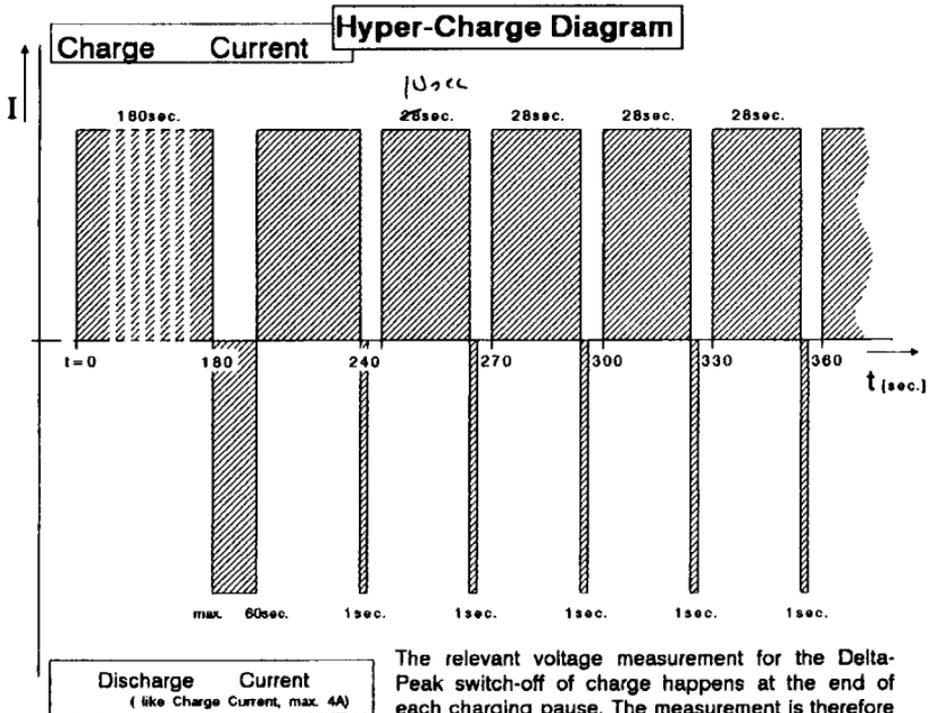
<< / >>



After choosing this menu with ENTER, the submenu will appear, it is possible to then choose by "<" or ">" between 5 types of operation. The current type of operation is marked with "*".

In this menu all the Nicad packs will be charged with the Constant-Current method. The maximum charging current is 7 Amps; this current may be selected in the menu "Charge Current". The switching-off will take place through Delta-Peak or Time-Out.

This menu function will charge the Nicad pack with a constant-pulse-current. The average of this current can be adjusted in the menu "Charge Current". It will be electronically regulated. This charging method will allow a higher charge capacity with a reduced charge time. The switch-off is made using Delta-Peak or Time-Out function.



The relevant voltage measurement for the Delta-Peak switch-off of charge happens at the end of each charging pause. The measurement is therefore free from external influences e.g. the charging current.

• NC-Equalising ("Normal"-Charging)

```

NC1 : F o r m
NC2 :          NC3 :
    
```

<< / >>

This type of operation is a trickle charge and the charging capacity of the cells after a long period of unuse or with new Nicads. Nicads should be regularly cycled, particularly after being rapid-charged several times. This is to avoid the so-called "Memory Effect" occurring which can reduce the battery capacity significantly.

Switching-off of the charge can only be made using the Time-Out function (see menu "Time-Out").

The maximum cycling current is 0.5A and can be set in 0.1A steps in the menu "Charging Current".

PB Battery Charging

NC1: Auto Charge
 NC2: NC3:

* << "/>> *

In this function it is possible to charge lead-acid (PB) batteries. The max. charge current is set in menu "Charge Current". When charging PB batteries the Delta Peak function cannot be applied for the charging control so that the Switching-Off has to be activated by the Time-Out function. In addition the charge condition of the battery will be checked by the voltage of the individual cells.

A cell voltage of 2.35 V for PB batteries resp. 2.5 V for maintenance-free gel batteries will reduce the charge current, so that a gassing of the battery is avoided.



Important!

Before charging PB batteries the nominal voltage of the battery and the battery type as well as the correct of Time-Out function should be set. Pls. also refer to the manufacturer's instructions. The max. charge current is 5 Amp and is set in menu "Charge Current".

NC1: NC Disch.
 NC2: NC3:

NC-Dicharge

This function allows batteries to be discharged and the storage capacity to be measured. The maximum discharge current is 2 amp. and is set in menu "Discharge Current", it may be adjusted in 0,1 amp. steps. The discharge process will end, when the cell voltage drops below a prescribed voltage. This voltage can be set from 0,8 - 1,2 V per cell in 0,1 V steps in the menu "Cell Voltage"

* << "/>> *



IMPORTANT:

Before discharging, the charger measures the voltage and works out automatically the discharge voltage. The charger assumes here that the cells are fully charged and have a voltage of 1,3 ... 1,4 V. A correction of the number of cells automatically determined is possible (refer to 7.4).

After choosing the required function with the cursor "<<" or ">>" confirm and activate your selection with "Enter", the charger display will return to the menu level.

4.2.2 Charging Current / Discharge Current

```

NC1 : Charge Curr.
NC2 :          NC3 :
    
```

ENTER

```

NC1 : 0.6A max. 42V
NC2 :          NC3 :
    
```

Confirmation with "Enter" will then lead to the submenu for setting the charge and discharge currents.

In function NC Discharge menu "Discharge Current" appears

The displayed value will show the instantaneous charge/discharge voltage of the battery. With the cursor key "<" or ">" the current can be set according to the chosen function.

Furthermore the associated max. charge and discharge voltage will be displayed. The respective number of cells can be seen in the tables 1 - 4 below.

Pressing "Enter" will choose and activate the current. At the same time the display will return to the menu level.

Charge Current	Charge Voltage	No. of cells
0,6A	2 - 48V	4-30
:	:	:
2,0A	2 - 48V	4-30
2,5A	2 - 48V	4-30
3,0A	2 - 48V	4-30
3,5A	2 - 44V	4-27
4,0A	2 - 40V	4-25
4,5A	2 - 36V	4-22
5,0A	2 - 32V	4-20
5,5A	2 - 29V	4-18
6,0A	2 - 27V	4-16
6,5A	2 - 25V	4-15
7,0A	2 - 23V	4-14

Note:

The maximum output voltage which is determined by the max. charger's leakage power for the final stage of the voltage converter is a preset limit value. The NC-Manager plus permanently monitors the output power (max. abt. 160 Watt) and thus avoids the overcharging.

Table 1 shows the max. output voltage of output 1 referring to all charging currents which may be selected; e.g. 36 V for charging current 4.5 amps. The relating number of cells (for a.m. example 22) shows the max. number of cells where normally the charging current can be kept for the total charging period (provided that the charging residual voltage doesn't exceed 1.6V per cell).

Example:

Charging current of function NC1: 6.0A

Quantity of connected cells: 24 nicad cells

As the voltage at the battery immediately will rise up to abt. 34 V the NC-Manager plus starts with a charging current of abt. 4.5 amps. In the course of the charging process the current is reduced to 4.0 amps as the battery voltage exceeds 36 V; the battery is charged with this voltage.

The preset values at no time will cause an overcharging of the charger.

Recommended current for rapid charging of nicad cells:

$$2 \dots 2,5 \times C$$

Example	1300 mAh	-> 2,6 A.....3,25A	chosen: 3A
	1800 mAh	-> 3,6 A.....4,4A	chosen: 4,5A



The correct choice of the Charge/Discharge current will guarantee that:

- a battery receives a full charge without overcharging
- safer and consistent operation of the Delta-Peak switch-off

Attention! Please note the battery manufacturer's instructions.

Table 2 Discharging current 'NC-Discharge'EL 1

Discharg.curr.	Battery voltage	No.of cells	
0,2A	3,2 - 40V	4 - 30	3 A
0,3A	3,2 - 40V	4 - 30	
0,4A	3,2 - 40V	4 - 30	
0,5A	3,2 - 32V	4 - 24	7 - 2,6 A
0,6A	3,2 - 26V	4 - 20	8 - 2,4 A
0,7A	3,2 - 22V	4 - 16	10 > 1,6 A
0,8A	3,2 - 20V	4 - 14	
0,9A	3,2 - 18V	4 - 13	14 - 2,4 A
1,0A	3,2 - 16V	4 - 12	16 - 2,2 A
1,1A	3,2 - 14V	4 - 10	18 - 1,6 A
1,2A	3,2 - 13V	4 - 9	20 - 1,4 A
1,3A	3,2 - 12V	4 - 8	22 - 1,2 A
1,4A	3,2 - 11V	4 - 8	
1,5A	3,2 - 10V	4 - 7	24 - 1,2 A
1,6A	3,2 - 10V	4 - 7	26 - 1 A
1,7A	3,2 - 9V	4 - 6	28 -
1,8A	3,2 - 9V	4 - 6	30 -
1,9A	3,2 - 8V	4 - 6	
2,0A	3,2 - 8V	4 - 6	

Note:

Analogous to the capacity control of the charging process the NC.Manager plus also in function "Discharging" (EL1) controls the capacity caused by discharging current and battery voltage.

If the chosen discharge current is too high for the number of cells, the discharge current is automatically reduced at the beginning of the discharge process to a reasonable value (for battery voltage determined the max. current). The charging current automatically chosen is maintained up to the end of the discharge process.

Discharging current recommended for Nicad batteries:

0,1 1 x C

Pls. bear in mind that the capacity of Nicad batteries etc. depends on the discharge current; so pls correspond to the individual requirements when determining the discharge current. Pls. also note the battery manufacturer's instructions.

Table 3: Trickle Charge Current "Equalising" FO1

Trickle charge curr.	Battery voltage	number of cells
0,2A	2 - 48V	4 - 30
0,3A	2 - 48V	4 - 30
0,4A	2 - 48V	4 - 30
0,5A	2 - 48V	4 - 30

For new batteries or batteries that haven't been used for a long time the capacity will be equalised; the trickle charge current indicated in table 3 refers hereto.

For equalising the capacity the time switch-off only is activated; thus pls. take care of adequate setting of the charge time.

Table 4: Charging current "PB-Charging" PB1

Charging current	Rated Voltage	No. of cells
0,2A	2 V - 30V	1, 3, 6, 12
0,4A	2V - 30V	1, 3, 6, 12
:	:	:
1,8A	2V - 30V	1, 3, 6, 12
2,0A	2V - 30V	1, 3, 6, 12
2,5A	2V - 30V	1, 3, 6, 12
:	:	:
4,5A	2V - 30V	1, 3, 6, 12
5,0A	2V - 30V	1, 3, 6, 12

For charging lead-acid batteries (gel or wet type) the following charging current is recommended:

0,1 x C

4.2.3. "Switch-off method"

```

NC1: Cut-off Type
NC2:                NC3:
  
```

Enter

- **With Delta-Peak**

```

NC1: by Δ-Peak
NC2:                NC3:
  
```

Enter

```

NC1: 30mV/cell
NC2:                NC3:
  
```

When using the functions "rapid charge" and "hyper charge" (NC-Manager plus only), this menu will be used to set the switch-off method.

Pressing "Enter" will call up the submenu, illustrating the different switch-off methods possible. The method being used at any instant will be marked with a "*".

With the cursor "<" or ">" it is possible to choose between 3 switch-off methods.

The switch-off of the charge automatically measured by the charger, when rapid-charging. The switch-off of the charging process is made with the Delta peak method, referred to in 2.3.

Pressing "Enter" will call-up a further sub-menu set the sensitivity of sensing the Delta-Peak.

By using the cursor "<<" or ">>", one can select one of two differing values of voltage, sensitivity for the nicad.

Possible values:

ca. 15 mV/cell

ca. 30 mV/cell

Please note that with battery packs with less than 7 cells, the 30mV/cell sensitivity will be automatically measured by the charger, when rapid-charging. This is because a 15 mV/cell sensitivity will switch-off the charging process sooner (because of the smaller voltage difference) as 30 mV/cell and may cause problems with a low cell number in the pack, which would create a relatively small voltage difference for the charger to correctly sense it.

For quick charging of packs with more than 7 cells one can select a sensitivity of 15 mV/cell.

Press "Enter" to confirm and return to main menu.

• **With Delta 2-Peak**

```

NC1 : by Δ 2 - P e a k
NC2 :          NC3 :
    
```

With the Delta 2 method, the auto switch-off is during the first 7 minutes of the charge not in use. This is to avoid a wrong switch-off, if the nicad suffers a volt-drop at the beginning of the charge process. This can happen with old or deeply discharged cells. After 7 minutes, this charge method works in exactly the same way as the "normal" Delta-Peak method. Setting of sensitivity is made in the same way as "Delta-Peak" method.

Advice

With this method, the voltage drop of an almost fully charged battery will not exist during the first 7 minutes of charge, therefore this method must not be used to charge almost full batteries.

• **With Time-Out**

```

NC1 : by T i m e o u t
NC2 :          NC3 :
    
```

Pressing "Enter" will activate the time-out process and return to the main menu. If the charging process is started, then the time-out switch-off will be effected according to the set time. The Delta-Peak monitoring is inactive.

Attention:

Always activate either Delta-Peak or Delta 2-Peak methods, when charging nicads, this is to avoid the possibility of overcharging one or more cells, because of different charge levels existent before charging. The setting of time-out is used as an additional safety feature to avoid this overcharging, if the charger fails to sense the Delta-Peak point of the battery. The time should be set so that the time-out is activated 5-10 minutes after the Delta-Peak switch-off. This time will be found out with experience and is dependent upon the number and capacity of the cells being charged.

4.2.4. Rated voltage

```

PB1: Rated Volt.
NC2:          NC3:
    
```

Enter



```

PB1: 12.0 V
NC2:          NC3:
    
```

The rated voltage of a lead-acid battery as well as the battery type (gel/wet battery) will be set in this menu. Pressing "Enter" will call-up the sub-menu to change the rated voltage.

The display will show the set voltage according to the battery type. The cursor "<" or ">" can be used to adjust the voltage and the battery type.

The following combinations are possible:

Gel Battery: 2 V, 6 V, 12 V, 24 V rated voltage

Wet Battery: 2 V, 6 V, 12 V, 24 V rated voltage

Pressing "Enter" will set and activate the voltage at the same time returning to the main menu.

4.2.5. Residual voltage

```

EL1: Resid. Volt.
NC2:          NC3:
    
```

Enter



```

EL1: 0.8 V/cell
NC2:          NC3:
    
```

The residual voltage for the discharge feature will be set here.

Pressing "Enter" will call-up the sub menu to set this voltage. Use of the cursor < or > can adjust this voltage between 0,8-1,2V per cell.

During discharge the programm calculates the no-lead voltage of the battery. (See also 7.4)

Pressing "Enter" will set and activate this voltage. At the same time returning to the main menu.

4.2.6. Time-Out Time

```

NC1: Time out time
NC2:                NC3:
    
```

ENTER

```

NC1: 40Min.
NC2:                NC3:
    
```

Here the time period for the time-out function can be set., i.e. after this period the charge process is cut off.

Confirming with "Enter" will call up the display to adjust the time in minute steps with the cursor < or >.

NC 1 and HC 1: 1 - 180 Min.

FO 1 and PB 1: 5 - 900 Min.

For menu EL 1 the adjustment of Time-out time is impossible; it is set to 900 min.

Note:

By pressing shortly << or >> the Time-out function is set in steps of 1 resp. 5 min.. Pressing more than 1 sec. , however, will activate a quick scrolling of the values. So an immediate and effective change of the Time-out function is possible.

"Enter" will confirm and activate the set time as well as returning to the main menu.

4.2.7 Display-Mode

During the charge and discharge process the different values such as current, voltage charged/discharged capacity and running time can be displayed at will.

```

NC1: Display Mode
NC2:                NC3:
    
```

This menu will display any one of the above mentioned units at any time during the charge/discharge process.

Confirming with "Enter" will call up the submenu to display the units chosen. The function which in operation is indicated with "**".

```
NC1: All Units *
NC2:          NC3:
```

The cursor < or can be used to choose the following units to be displayed:

All units	All units will be shown consecutively
Current	The measured charge or discharge current
Voltage	The battery voltage
Charge time	The running time of the charge process
Capacity	The charged or discharged battery capacity

"Enter" will confirm, activate and return to the main menu level.

4.2.8 Program / Memo

The NC-Manager offers 5 program memories,.

If requested the settings in the following menus can be stored and called up:

- Charge Type
- Charge Voltage (discharge current for discharge of NC batteries)
- Switch-off method (rated voltage for PB charge, residual voltage for NC discharge)
- Time-out time (for NC discharge not applicable)
- Display-Mode
- Job sequence

```
NC1: Program / Memo
NC2:          NC3:
```

Enter

```
Store Program
NC2:          NC3:
```

To activate this menu, press "Enter".

In the menu one can use the cursor < or > to choose between the "store" or "charge" points.

After confirming with "Enter", a further menu will appear, where one can record the name of the program (e.g. model name etc) if desired.

The name will identify the program.

4.2.9 Job Sequence

```

NC 1 : J o b   S e q u e n c e
NC 2 :          NC 3 :
    
```

ENTER

```

3 : F O -> 4 : E L -> 1 : N C
NC 2 :          NC 3 :
    
```

The NC-Manager plus offers the possibility to program the so-called "Jobs", i.e. to process two or three freely selectable charge/discharge programs one after another. The choice of the programs and its order within the Job is effected under menu "Job Sequence".

Press "ENTER" in order to choice "Job Sequence".

The current Job Sequence appears in the order of the processing (number of storage position followed by the index for the operation mode selected in this storage position). The display shown indicates as follows:

1. Program within the Job is the program of storage position 3 containing operation "NC Equalising".
2. Program within the Job is the program of storage position 4 which means operation "NC Discharging".
3. Program of the Job relates to storage position 1 so that "NC Rapid Charge" is called.

The cursor indicates which place of the Job Sequence can be changed by "<<" or ">>". All five storage positions available for the NC-Manager plus can be integrated into the Job Sequence.

When selecting the first storage position of the Job Sequence by "<<" or ">>" please confirm with "ENTER"; the cursor now will indicate the second item of the Job Sequence. After selecting by "<<" or ">>" and confirming with "ENTER" the cursor now will go to the third item of the Job Sequence. Storage position 0 can be added to positions 1 to 5 which doesn't contain data and thus will not be processed.

After confirming the third item of the Job Sequence by "ENTER" automatically the menu for activating the Job function is reached.

Attention!

This charger does not control the Job Sequence selected by the user.

That is why the user is responsible for a reasonable order of programs and e.g. a programming of two or three successive rapid chargings is not advisable.

It is recommended for example to charge a discharge accu with the rated voltage by an equalising program, then to discharge it for capacity control and finally to start with rapid charging.

ENTER



```
Job activated
NC2:          NC3:
```

'ENTER' will confirm the final item of the Job Sequence and directly call up the submenu for activating/deactivating the Job.

The cursor "<<" or ">>" may choice between 'Job activated' or 'Job inactivated'; the function which is in operation is indicated as usually by ***.

'ENTER' will activate the selected setting.

Activating the Job will call up immediately all data of the first item within the Job Sequence. All functions of output 1 now refer to the processing of the Job, i.e. after connecting an accu with output 1 and starting the charger the program of the first storage position within the Job Sequence will run.

Activating the job run is indicated in the operating level by adding a 'J' instead of '1' according to the correspondent operation mode: NCJ, HCJ FOJ, ELJ od PBJ.

After the first program of the Job Sequence was processed automatically the dates stored in the second storage position of the Job Sequence will be called and activated.

The same applies to the change from the second to the third program (if available).

When the final program of the Job was processed the Job has finished and will be deactivated automatically by the charger; the same applies in case of error detection.

An acoustic alarm isn't heard (Battery full, Test End, etc. if permitted) before the Job processing completely was finished.

If the Job is effected with programs of two resp. three different storage positions so the dates resulting from charge/discharge processing

- reason for cut-off
- charging/discharging current before cut-off
- max./min. battery voltage
- period of charging/discharging process
- charged/discharged capacity

can be read as usually. For this the dates of the corresponding storage position (as described under 4.2.8) should be called.

The NC-Manager plus therefore is excellently suited for an effective servicing, maintenance and control of your accus independent of the application.

5. Set-up

This menu is used to set the basic parameters of the charger, such as:

Car Battery Check:	Display of the car battery voltage
Automatic Start:	Switch on or off
Language:	German/English/French
Car Battery Alarm:	can be chosen Switch on or off
Keypad Tone:	Switch on or off
Battery Full Alarm	Switch off/30 sec.-alarm/permanent alarm

The charger is delivered with the German language parameters as standard. After connecting to the 12V battery, press the "Set" key twice to call-up the menu. The cursor < or > can be used at any time to select any of the six parameters that are wished to be changed.. This selection and charge may also be done when the charge/discharge process is in operation without disturbing this charging/discharging process.

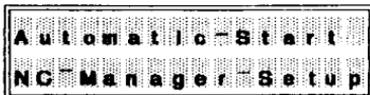
- **Car Battery Check**



Pressing "Enter" will display the car battery voltage

Pressing "Enter" or "Set" will leave this menu; "Set" will return to the main menu.

- **Automatic Start**



Pressing "Enter" will call this menu, the cursor can be used to switch on or switch off this feature. The chosen parameter is marked with a "▲".

Should it be required after connecting the charger to the battery, to immediately start a **charge/discharge** process with manual control, then "Switch-off" must be selected with the "Enter" key.

Pressing "Set" will return to the main menu without changing the setting.

• Language:

```
Language
NC-Manager-Setup
```

Selecting this menu is made with the "Enter" key, the cursor < or > will select the display language that is required.

It will be seen that the example displays in this section have the German language parameter names, which will of course be changed to the English or French equivalent in this menu by pressing the "Enter" key once more. Pressing "Set", however, will return to the menu without changes.

• Car Battery Alarm

```
Car-Batt.-Alarm
NC-Manager-Setup
```

This menu will allow the car battery alarm to be switched on or off. Entry to the menu is made with the "Enter" key and the cursor will select "Switch-on" or "Switch-off". The selection will be marked with a "*".

The alarm will signal when the car battery voltage drops below 11.5 V. If it is desired not to have an alarm signal then "Switch-off" must be selected.

The selection is made and activated with "Enter", "Set" key doesn't effect any changes.

• Keyboard Tone:

```
Keyboard Tone
NC-Manager-Setup
```

This menu is selected with "Enter" and a choice made with the cursor < or > between **switching-on** or **switching off** the beep tone to be activated each time a key is pressed.

Pressing the "Set" key will return to the main menu by keeping the previous setting.

Pressing "SET" will keep the previous setting and return to the main menu.

The basic set-up for all programs will be memorised each time the charger is connected to the battery.

■ **Battery-Full-Alarm**



After confirming with "Enter" you can select with keys < or > between

- switch-off alarm
- 30 sec. alarm
- permanent alarm

The current setting is marked with ***.

"Enter" will confirm and "Set" will return to the main menu without changes.

6. Adjustments for outputs Accu 2 and Accu 3

The outputs accu 2 and 3 can be used for rapid charging of additional Nicad packs (Tx and Fx) simultaneously when charging from the output accu 1 (flight battery).

The charging process for 4 - 6 Nicad cells can be made using the constant current charging method with a maximum charge current of 2A, which can be adjusted in 0.2 A steps. From the menu, using the "Set" key, either accu 2 or accu 3 output can be selected.

The appropriate menus will be displayed in the second line of the display.

The cursor < or > can be used to select between the following options:

- **Charge Current**
- **Switch-Off Method**
- **Time-Out Time**
- **Display-Mode**
- **Memory**

The adjustment method for these options are the same as described previously for accu 1.

In "Memory" it is possible to store and call-up a charge program for accu 2 and accu 3 outputs. The "Enter" key must be pressed in between "Memory" and "Charge" display to select this option. Confirmation is made with "Enter".

It is not possible to store a program name for accu 2 and accu 3.

7. Practical Example of the NC-Manager in use

After the "Set-Up" described in section 4, it is necessary to switch to the operating level with the "Set" key. The display will show the chosen function, the charge/discharge process now can begin.

7.1 Rapid Charging of a Nicad

The first line of the display shows NC1: The battery is connected to the output 1 of NC Manager plus.

There are three different possibilities for starting the charging process:

- If "Automatic Start" is switched on, then the charging/discharging process will start immediately the Nicad is connected
- If "Automatic Start" is switched off and the battery is neither connected reverse polarity nor completely discharged (minimum voltage of a total of 1.5V to function) nor is protected against reverse polarity by diodes then the display will show "Battery ready". "Enter" will start the charge/discharge process. For reverse polarity the display will show "Reverse Pol" and the start of charging is not allowed.
- If the display "Battery ready" doesn't appear after connecting the battery then the battery is either completely discharged or is protected by diodes against reverse polarity. In this case the NC Manager plus is unable to recognize the battery output and the charger doesn't start. In order, however, to activate the charging process "Enter" key is to be pressed for minimum 4 seconds.

The charging process will be controlled by the microprocessor according to the setting.

During the charging process the following parameters, dependent upon what has been set in "Display-Mode" will be displayed:

- **Actual Charge**
- **Current Actual**
- **Charge Time in min./sec.**
- **Actual Charged Capacity in MAh**
- **Charge Condition**

The charging process at any time may be cut off by the "Enter" key. This also is effected when leaving the operating menu after selecting menu charge type, charge current, switch-off method, display mode, job order or program/memo. The charging process, however, will be continued when going to the set-up menu (e.g. In order to control the car battery voltage).

The NC Manager plus will cut off the charging process when the following reasons are identified:

- end of the charging process due to the selected switch-off method
- cut-off of connection to the battery
- short circuit between the charging sockets
- defect of the charger or wrong program order

After the end of the charging process the charging current is cut off, the end of the charging process is shown by the display and beep tone (provided the main menu allows the alarm for battery full) as follows:

LCD display	Reasons for switch-off	Beep tone / connect. Switching equ
Battery full	Delta-Peak or time switch-off	activated
Time-out	Exceeding the max. charging time set	activated
Cable break	Break of cable connection to battery	not activated
Short circuit	Short circuit of output 1	not activated
Break	End of charging by pressing the wrong key	not activated
Break > 50V	Exceeding the rated output	not activated

Alternatively to the reasons for switch-off the following values are indicated until the battery is disconnected:

- Charging current immediately before charging process is complete
- Max charging voltage
- Complete charging time
- Charged capacity in mAh

After switching off the charge in process the data displayed will be stored, it is possible to retrieve this data the next time a charge is begun. If the battery is disconnected for any reason the "Enter" key should be pressed.

The following will be displayed:

- Iend = ...A (current at time of disconnection)

Pressing "Enter" again will display the following data:

- Umax = ... V (max battery voltage)
- t = ... min. (charging period)
- C = ... Ah (charged capacity)
- xxxxx (reason for switch-off)

Pressing "Enter" again will return to the operating level.

7.2 Hyper- Charge

HC1 is shown when this operation is activated. When connecting a battery a charging is possible in accordance with all conditions stated under 7.1. The charge of batteries with a battery voltage of < 1.5V or protected against reverse polarity cannot be effected within this operation, and should be done with "NC Rapid Charge" or "NC Equalising".

"Hyper-Charge" corresponds to mode "NC-Rapid Charging" with regard to operation and switch-off characteristics.

The charging process is continuously interrupted by short discharge and interval cycles (see 4.2.1) so that the display for the charging current shows the relating polarity sign.

'+' indicates that current flows from NC-Manager plus to the battery (charging)

'-' indicates that current flows from battery to NC-Manager plus (discharge)

Except for the display function and the very different internal processes operation mode of 7.1 doesn't differ from that described in 7.2..

7.3 NC Battery Equalising

The display indicates FO1 when the charger is ready for equalising The equalising process refers to the same conditions as when starting the rapid charging (see 7.1).

The equalising process is controlled by processors in accordance with the selected functions (Time-out time, Display-mode etc.)

When equalising the capacity there is no Delta-Peak switch-off. That is why after the Time-out time which was selected by the user is complete the "Battery-Full" display along with the corresponding beeptone will appear. If the operation is cut off earlier the signal will be as described in the table of 7.1.

As for all other functions data will be stored also in this operation after charge is complete; it is possible to retrieve this data by pressing "Enter" the next time a charge is begun (no battery to output 1).

7.4 Nicad -Discharging (Check of Capacity)

The choice of operation mode "NC Disch." is displayed in the first line of the LCD-display with EL1:

If a battery has been connected with correct polarity the NC-Manager plus immediately will evaluate the number of cells by means of the voltage. As the voltage is very dependent on the instantaneous accu condition a manual correction of the cell quantity automatically found out may be sometimes required. This should be done by pressing the key "<<" or ">>" within the first 10 seconds after connecting the battery. If no key is pressed and the automatic start is activated the discharging process begins after 10 seconds.

The NC-Manager plus also in this operation mode recognizes reverse polarity and will display "Reverse Polarity".

The discharging process operates automatically with the selected discharge current. If the selected discharge current is too high for the connected number of cells it will be automatically reduced.. In order to make possible a repeated discharge under same conditions also the charge current in any case is kept constant for the complete period.

Dependent of the settings in "Display-Mode" the following values will be displayed:

- actual discharge current
- actual battery voltage
- actual discharge period
- the capacity achieved
- discharge status

If the accu voltage is lower than the selected end voltage for each cell multiplied by the number of cells found out (or corrected if necessary) so the discharging process will be cut off. The warning is as follows:

<u>LCD Display</u>	<u>Reasons for switch-off</u>	<u>Warning</u>
Test-end	Minimum discharge voltage has been reached	activated
Time-out	Maximum discharge time has been reached	activated
Cable break	Break in cable connection to battery	no warning
Short circuit	Short circuit across the output	no warning
Break	Key press or problem	no warning

Together with the reason for switch-off the following displays are shown dependent on the settings in "Display-Mode" until disconnecting the battery:

- The discharge current
- The minimum battery voltage
- The total discharge time
- The capacity discharged

The data found out will be stored; it is possible to retrieve this data at any time by pressing "Enter".

7.5 Lead-acid (PB) Charging

The NC-Manager is ready to charge lead-acid batteries (wet/gel) if PB1: will appear on the first line of the LCD-display.

When connecting a battery with correct polarity "Batt. ready" is displayed (automatic start is switched off). In case of reverse polarity also in this mode "Reverse polarity" is displayed.

A charging process cannot be started if

- the battery is connected with reverse polarity
- the voltage of a battery is < 1.5V
- the battery is protected against reverse polarity by a diode

After starting the charging process will be done in accordance with the settings; the data found out will be displayed in "Display-Mode" as follows:

- actual charge current
- actual battery voltage
- actual charge time
- charged capacity
- charge status

Especially the battery voltage is controlled by the NC-Manager plus so that the maximum charge voltage for each cell is continuously supervised. When charging the maximum battery voltage must not be exceeded in order to avoid a gassing of the electrolyte. The voltage allowed is as follows:

for lead-acid batteries	2.35 V per cell
for maintenance free gel batteries	2.50 V per cell

If the voltage is exceeded the NC-Manager plus will reduce the charge current resulting that the battery voltage will drop. If a further reduction of the charge current is impossible ($I = 0.2A$) "Battery full" is reached resulting in switching off the process.

All possible reasons for switch-off and the relating signals are shown in the following table:

<u>LCD-Display</u>	<u>Reasons for switch-off</u>	<u>Beeptone</u>
Battery full	Time switch-off or max. battery voltage has been reached	activated
Cable-Break	Break in cable connection to battery	no signal
Short circuit	Short circuit across output 1	no signal
Break	End of charge by pressing the key or problem	no signal
Break > 50V	Exceeding the rated output	no signal

After end of the charging process all data will be stored which correspond to those stored in "NC Rapid Charging" (see 7.1)

7.6 Job run

The order of the respective job programs is the same as already described under 7.1 til 7.5, except that the acoustic signal only is to be heard at the end of the job run, i.e. only at the end of the third (resp. second) job program the acoustic signal "Battery full" resp. "Test-End" is indicated by a beeptone.

Furthermore it should be noted that some conditions will not only cut off the actual program but the complete job run.

The storing of the charge/discharge data for the job programs is effected by the same way as for the respective charging/discharging processes. If for all job programs different storage positions are used so all data of all programs will be stored until the job run has finished and even beyond it.

8. Safety features

8.1 Battery alarm

The NC-Manager plus monitors continuously, if the car battery voltage drops below a limit of 11.5V, an optical and acoustic warning will be made by the charger. It will be a different type of signal to that made when the battery is full and will be instantly recognisable. The display will show "U.Batt < 11.5V!" Please remember a discharged car battery can mean a long walk home! So please stop charging or discharging at once, disconnect the charger and try and start the car engine.



If the voltage of the car battery drops below 10.5 V, then all charging and discharging will stop automatically. Below 10.5 volts input the charger cannot work reliably.

It is possible to switch-off this alarm in the menu "Car Battery Alarm" or by disconnecting the charger from the car battery.

8.2 Temperature

The NC-Manager plus has an internal temperature monitor, which can be used to minimise any damage, which may be caused by overheating. If the charger temperature climbs above 60 deg. Celsius, the output power will be reduced to a level, which will stop overheating recurring. Simultaneously an acoustic and optical alarm will be made similar to the battery alarm, the display will show a warning "Temp > 60 def. Celsius!"

8.3 Fuse

The internal safety devices in the electronics are supplemented with an external fuse of 25 amp. rating. It is the same as the traditional car-type of fuses, which can be obtained from your local garage. If replaced, always use a fuse of the identical type, a 25 amp. type with a white body.

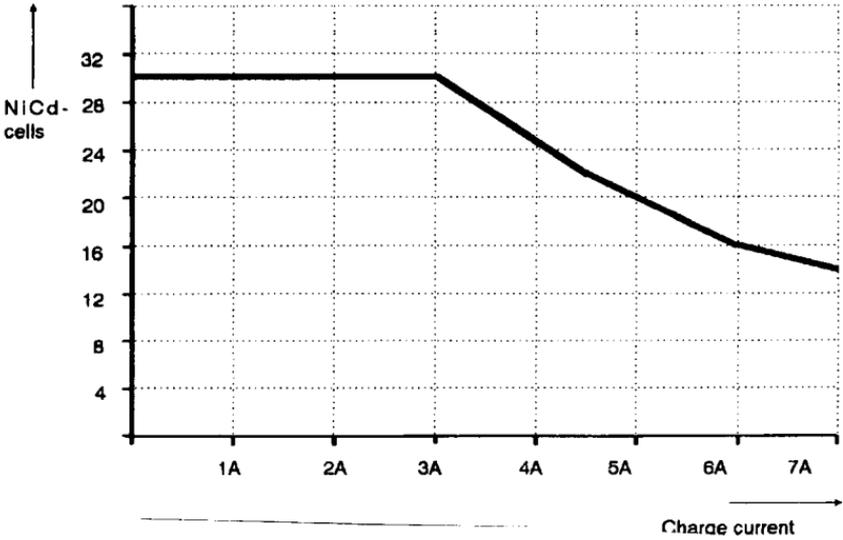
9. Technical data

NC-Manager plus

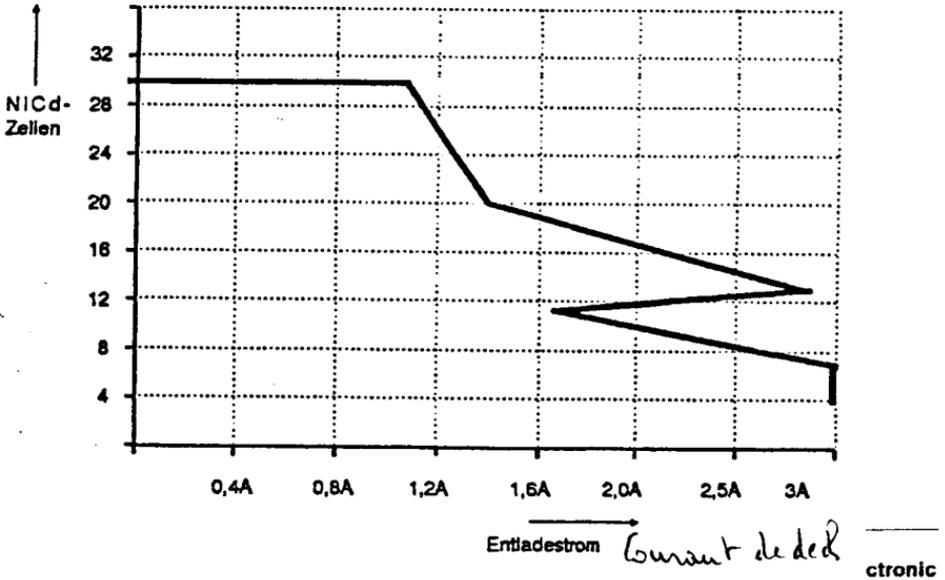
Size (L x B x H):	195 x 163 x 60
Weight:	ca. 1450 grammes
Display:	LCD, two lines with 16 characters each
Overheating protection:	at abt. 80 deg. Celsius
Battery alarm:	at < 11.5V, at < 10.5 V complete switching -off
Warning:	piezo-buzzer. <i>connect switching equip 12V, 0.5A</i>
Operation:	menu type programming via 4 keys
Microprocessor	
Timing pulse rate:	16 MHz
Program memories:	EPROM 64kByte
Data store	EPROM 1kBit
Programming language	C
Converter	
Power:	maximum 160 Watt
Timing pulse rate:	31.25 Hz
Efficiency:	abt. 80 - 95 %
Input 12 V	
Input	12-14V, max.25A, electr.protected against reverse polarity
Capacity of car battery:	minimum 36 Ah
Connecting cable	2 x 4 quadrat mm Cu wire
Fuse	car -type fuse, 25 amp type with a white body
Accu 1-output	
Mode NC1/HC1:	4-30 Nicad cells, 0.6-7.0A, Delta-Peak, Delta2-Peak or Time-Out
Mode EL1:	4-30 Nicad cells, 0.2-3.0A, max. ^{40W} 15 Watt, cut-off at 0.8-1.2V/cell
Mode FO1:	4-30 Nicad cells, 0.2-0.5A, Time-out 5-900 min., capacity test
Mode PB1:	1, 3, 6, 12 PBcells, 0.2-5.0A, Time-out, control of max.batt.voltage
Memories:	5 with freely selectable program name of 6 positions
Protection:	reverse polarity protection
Accu 2 and 3-output	
Mode NC2/3:	4-8 Nicad cells each, 0.2-2.0A, Delta-Peak or Time-out
Memory:	1 each
Protection:	reverse polarity, overheating at 50V

10. Summary - Currents and maximum number of cells

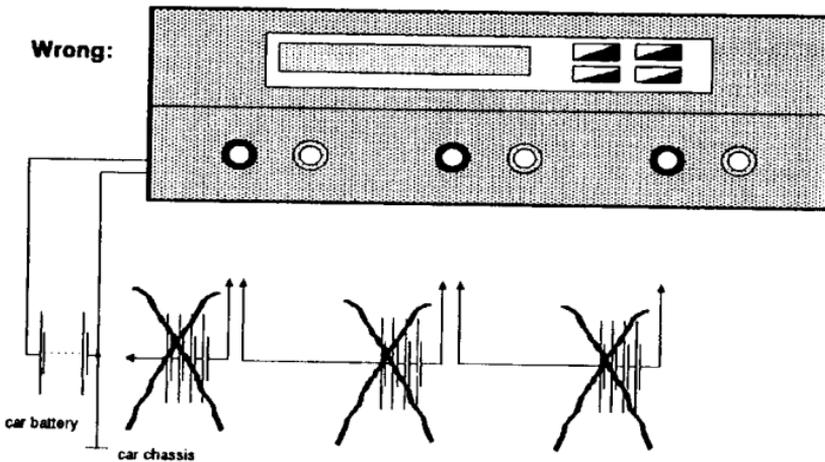
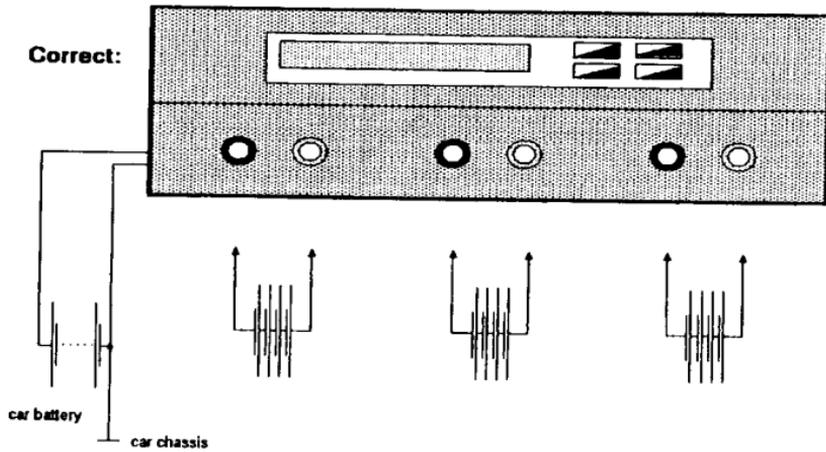
10.1 NC-Rapid Charging



charge



11. Connecting of Accus



Attention!

Only one accu for one connection!

Never join connection and accus among one another!

Don't operate the transmitter and receiver near by the charger!

12. Measuring units

Time in seconds/hours:	$t [s], [h]$	$1h = 3600s$
Voltage:	$U [V]$	
Current in (milli) amperes:	$I [A], [mA]$	$1A = 1000mA$
Capacity in (milli) amp. hours:	$C [Ah], [mAh]$	$1Ah = 1000mAh$

The rated capacity C of accu is indicated in Ah (ampere hours) or mAh (milliampere hours for lower capacity) resulting from the product of the discharge current and discharge time:

$$C = I \times t$$

Thus the label *1700 mAh* on a Nicad battery means the battery can be discharged e. g. with:

- 1h at 1,7A $(1,7A (=1700mA) \times 1h = 1700mAh)$
- 10h at 170mA $(170mA \times 10h = 1700mAh)$
- 10min. at 10,2A $(10,2A \times 10min (= 0,1667h) = 1,7Ah (=1700mAh))$

The a.m. formula is also applicable for the charge of accu; in this case, however, the charge voltage and the charge time are to be substituted.

The recommended charge current often is indicated as a multiple of the capacity; e. g. a charge current of $0.1 \times C$ for a 1700mAh acuu means: $0.1 \times 1700mAh (=) 170mA$ charge current.

13. Warranty Terms

SIMPROP articles are warranted to the original purchaser-consumer, to be free from defects in material and workmanship for a period of 6 months from the date of purchase.

During this time Simprop will repair or replace any defective parts without charge. All further claims and the legal assertion of those claims are excluded. This warranty does not apply to damage or defect resulting from misuse, abnormal service, crash damage, non-observance of the operation manual or application of wrong auxiliary means.

This warranty does not apply to damage or defect caused or aggravated by any repair or attempted repair performed by any person or firm other than Simprop or an authorized representative or service agent.

This warranty does not cover incidental or consequential or workmanship or other equipment failure as a correct use and application is beyond our control. Claiming to our warranty does not extend the warranty period.

To obtain our warranty service, mail or ship the item along with the completed warranty certificate, securely packaged and postage or shipping prepaid to the address please turn over. All items returned to us without warranty certificate will be repaired at your cost.

Page 4 further to

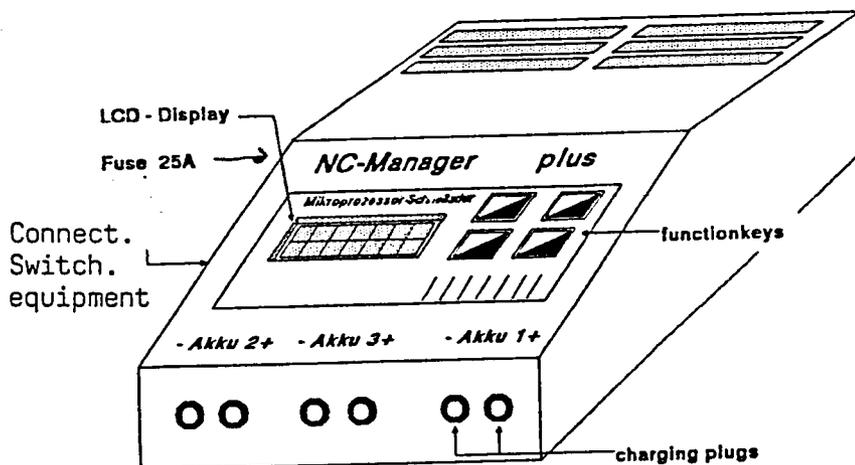
Features and characteristics

- * Connection switching equipment - Additionally to the acoustic warning an external buzzer, light signal, relay can be connected here when end of charging has been reached (see page 9)
- * If you follow our operating instructions the NC- Manager II plus will correspond to the EMC requirements (CE symbol).

2.1 General Characteristics

If the voltage of the car battery drops below a limit value an acoustic alarm is activated.

3. External Connections and User Controls



Page 9 amendment

The connection for switching equipment makes it possible to connect an external buzzer, light signal, relay etc. to show the end of the charging or time-out. This switching element will be activated - independant from alarm time preset - always for 30 sec. after end of charge or time-out. All equipments can be connected operating with 12V DC and consuming not more than 500 mA. The output is circuit proof and will switch off in case of overload.

For connector pin a 6-pole pin DIN 45 322 is required for the holding as follows:

Pin 6 (mid pin): MINUS

Metal ring outside: Plus

Pls only use the original cable ref. no. 011 107 4 for the connection of the switching equipment.

Page 13

NC-Discharge (Changement of the value):

The maximum discharge current is 3 amp. and is set

Page 16

Change of table 2 Discharging current 'NC-Discharge' EL1

<u>No. of cells</u>	<u>max.. discharge current</u>
4	3A
5	3A
6	3A
7	2.6A
8	2.4A
10	1.6A
12	1.6A
14	2.4A
16	2.2A ✓
18	1.6A
20	1.4A
22	1.2A
24	1.2A
26	1A
28	1A
30	1A