

# IC8A Battery Charger/Analyser Operator Manual



## IC8A BATTERY CHARGER & CAPACITY TESTER OPERATORS MANUAL



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# IC8A Battery Charger/Analyser Operator Manual



## 1 Manual Revision History

Rev	Date	Description
1	08-12-2010	Adapted from MB73P+ Manual
2	21-12-2011	Corrected calibration amps values.
3	08-02-2012	Corrected reference to internal lithium backup battery.
4	21-07-2015	Formatting changes.
5	20-11-2019	Updated drawings and incorporated new functions from MB.

## 2 Equipment Description

### 2.1 *General*

The Battery Charger Analyser is an electronically controlled combined universal battery charging unit with built in battery analysing (capacity testing) capabilities. It is housed in a metal enclosure designed for bench mounting. As it is supplied it is configured for use from a 240V 50/60Hz supply, it can be alternatively supplied for use with 115V 50/60Hz supply.

Equipment control is via an interactive 253 x 32 dot matrix display and data entry is via a 16-key keypad. Operating modes and functions are selected by the use of a simple menu system. Access to charging and testing operations is performed by either entry of eight digit battery library names, repeat of last charge or capacity test or new manual parameters. During operation the display will show the instantaneous values of battery voltage, current and time elapsed through the selected program.

Process modes can be created where complete unattended charging, capacity testing and final charging can be performed. Up to 6 different charge or capacity test steps can be created and up to 4 process programs can be stored in the unit. Each process step has an optional delayed start for resting the battery and also each step can sound the alarm with or without a pause in operation. The process is simply continued by pressing a key on the keypad.

Battery data is stored internally in the units non-volatile memory. The operator can add and modify this list by entering the details of the battery to be included on the display and keyboard. Alphanumeric digits, up to a maximum of 8 digits, identify Battery library entries

Batteries are connected to the front of the unit by means of two standard 4.0mm sockets. A set of 500mm leads are supplied with 4.0mm insulated plus and a pair of 4.0mm socketed crocodile clamps.

The IC8A can Charge 12V at 12.0A or 24V at 6.0A and can Capacity Test 12V at 12.0A or 24V at 6.0A. The unit contains a fan to extract the heat energy generated internally when running in capacity test mode.

## 2.1.1 Charging Modes

### CONSTANT VOLTAGE CHARGE

Where the battery is charged at a reducing current when the constant voltage threshold is met. Parameters for this mode are maximum charge time, optional minimum current to stop charge and a current threshold, which can detect a potentially faulty battery.

### CONSTANT CURRENT CHARGE WITH TOP UP CHARGE

Where battery is charged at a constant current until a terminal voltage is met, at this point it can be charged for an additional time at a user set current. The overcharge voltage is set in this mode to prevent overcharging of the battery.

### MULTIPLE STEP CONSTANT CURRENT CHARGE

Up to 4 constant current steps can be implemented for the charge cycle. this mode also has an overcharge voltage setting to prevent overcharging of the battery. Charge current can be set to zero for "rest" periods between charge steps.

## 2.1.2 Capacity Testing Modes

### CAPACITY TEST TO 100 PERCENT

This mode will discharge the battery connected at the current specified for the test duration specified thus reporting the battery capacity is 100% or more. The capacity test will be stopped if the target voltage is reached before the full test time has elapsed. During the capacity test and when it is terminated the display will show the amount the capacity test is complete as a percentage.

### CAPACITY TEST TO TARGET VOLTAGE

This mode will discharge the battery down to the terminal voltage specified thus reporting the actual percentage capacity. The capacity test will be stopped if the target threshold voltage is reached before the full test time has elapsed. During the capacity test and when it is terminated the display will show the amount the capacity test is complete as a percentage.

### FULL DISCHARGE

This mode will do a basic discharge of the battery at the current specified for the time specified.

The unit can be set so that a predefined charge or capacity test can be scheduled to start at up to 99h 99m in the future. And if during this time the power is lost to the unit, such as a power outage, the unit will continue to count down when the power is restored. Note: If the power outage resumes after the elapsed time has been passed the predefined charge or capacity test will not be executed.

The unit contains the software that will allow it to be calibrated by the end user doing away with the need to send the unit to a service centre for periodic calibration. The re-calibration process only takes a few minutes and this is done without the need to access the internals of the unit.

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## 2.2 Component Parts

Upon receipt of your new battery charger analyser unpack and check that all items are present in the containing box.

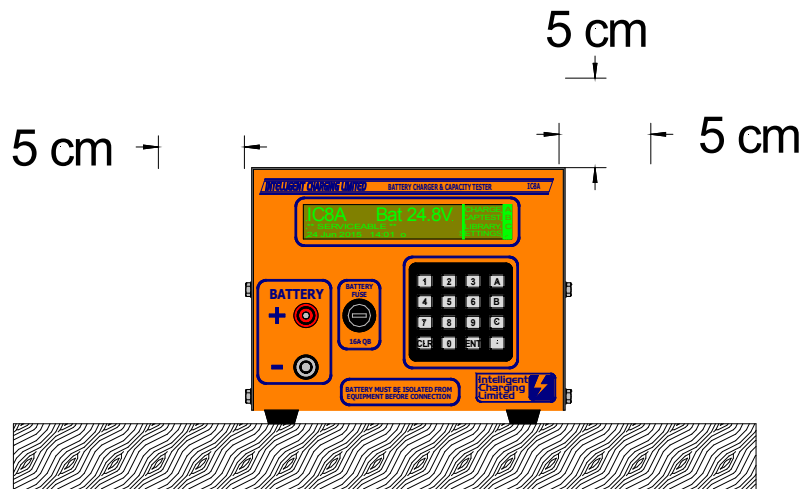
### STANDARD ITEMS

- One IC8A Battery Charger Analyser
- One IEC power cord
- One Set (+ve & -ve) standard battery leads.
- One pair crocodile clamps.
- One paper Copy Operators Manual
- Certificate Of Conformity
- Calibration Certificate

## 2.3 Installation

The Battery Charger Analyser should be mounted on a level surface such as a workbench or sturdy shelf above the batteries with a loading weight of at least 5Kg.

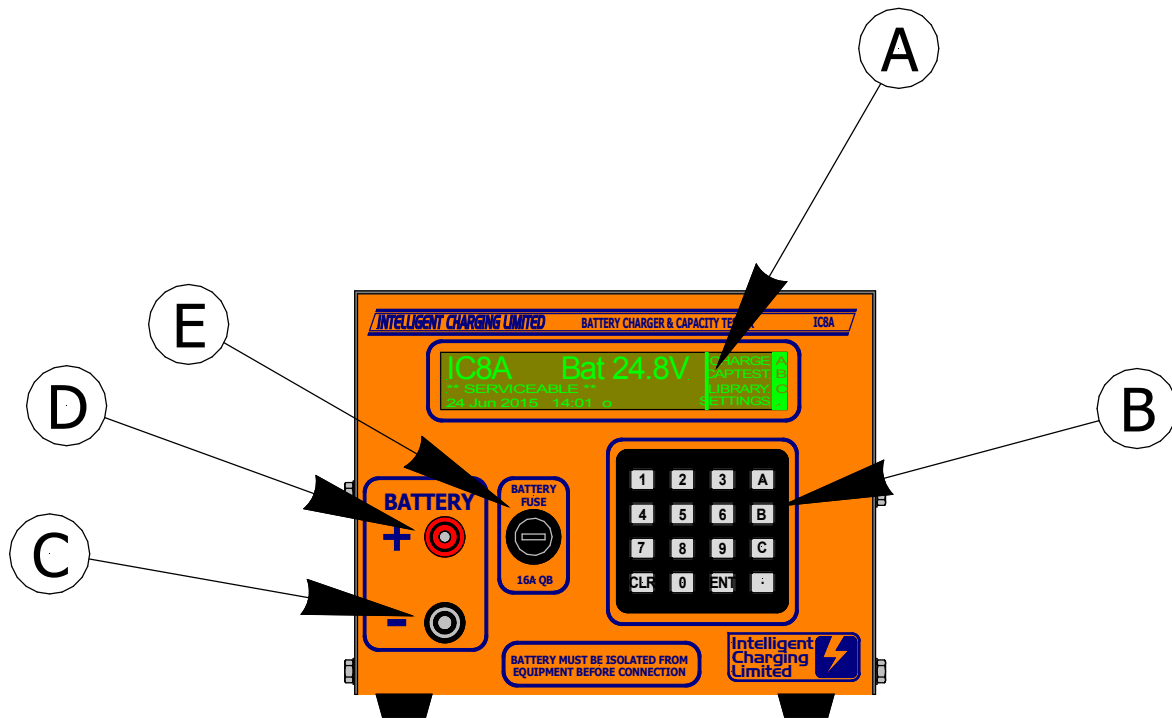
The unit should be sited so that at least 5cm of airspace is available all round the sides and top of the unit to allow free movement of air required for cooling.



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## 2.4 Front Controls And Indicators



### (A) – DISPLAY

All battery charger indications are made on this 256 x 32 dot matrix vacuum fluorescent display.

### (B) – KEYPAD

All battery charge and capacity test functions are activated via this 16 key keypad.

### (D) - NEGATIVE BATTERY TERMINAL

Connection of the negative battery lead is made to this terminal.

### (E) - POSITIVE BATTERY TERMINAL

Connection of the positive battery lead is made to this terminal.

### (F) – BATTERY PROTECTION FUSE

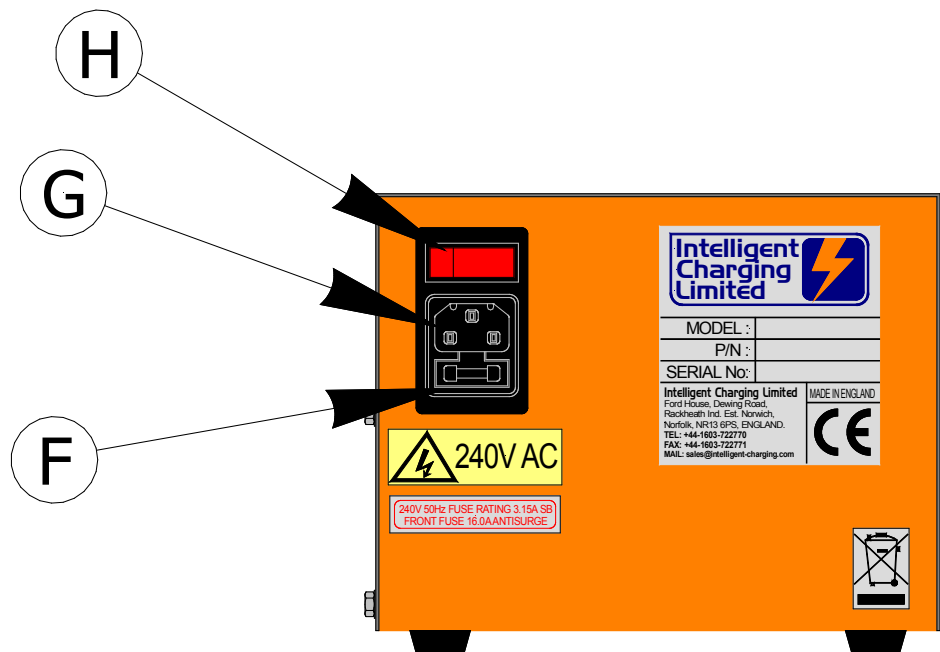
Fitted here is a 16.0A QB 1 1/4" fuse which is fitted to break if excessive or reverse currents are detected. If the fuse breaks during a charge or capacity test immediately press STOP and remove power from the unit and disconnect the battery. Failure of the fuse is an indication of a fault and the unit will need to be checked before using.



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## 2.5 Rear Controls And Indicators



### (F) – PROTECTION FUSE

Mains protection fuse. 20.0mm 3.15A Slow Blow.

### (G) – IEC POWER INLET

The IEC main input plug is inserted here.

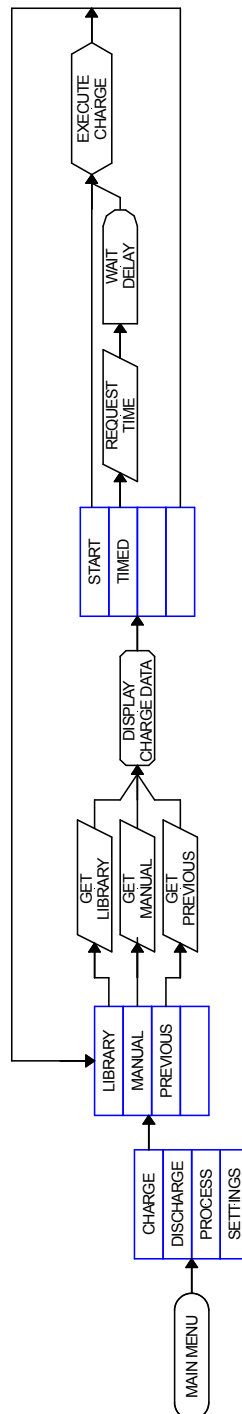
### (D) - POWER SWITCH

Operation of this switch applies or removes mains power from the battery charger.

## 3 Equipment Menu Operation

The Battery Charger Analyser is operated by the use of a simple menu structure which is accessed by simply pressing the 'A', 'B', 'C' or '.' keys. To get back to the main menu the 'CLR' key is pressed repeatedly. The following flowchart illustrate the menu structure.

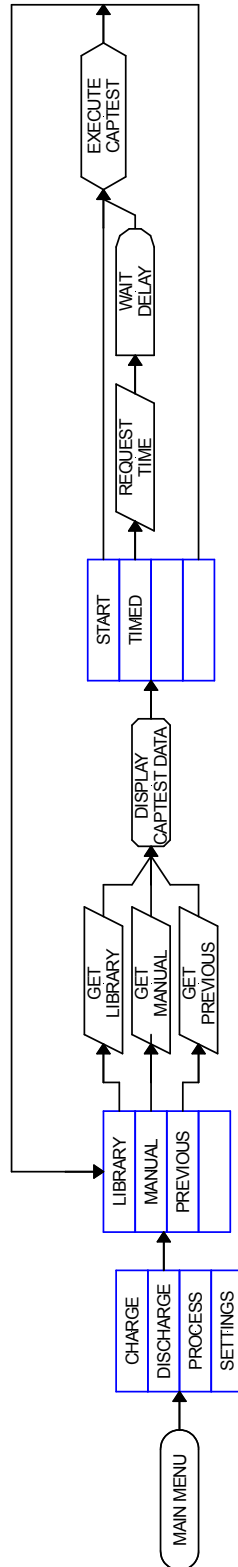
### 3.1 Charging Menu



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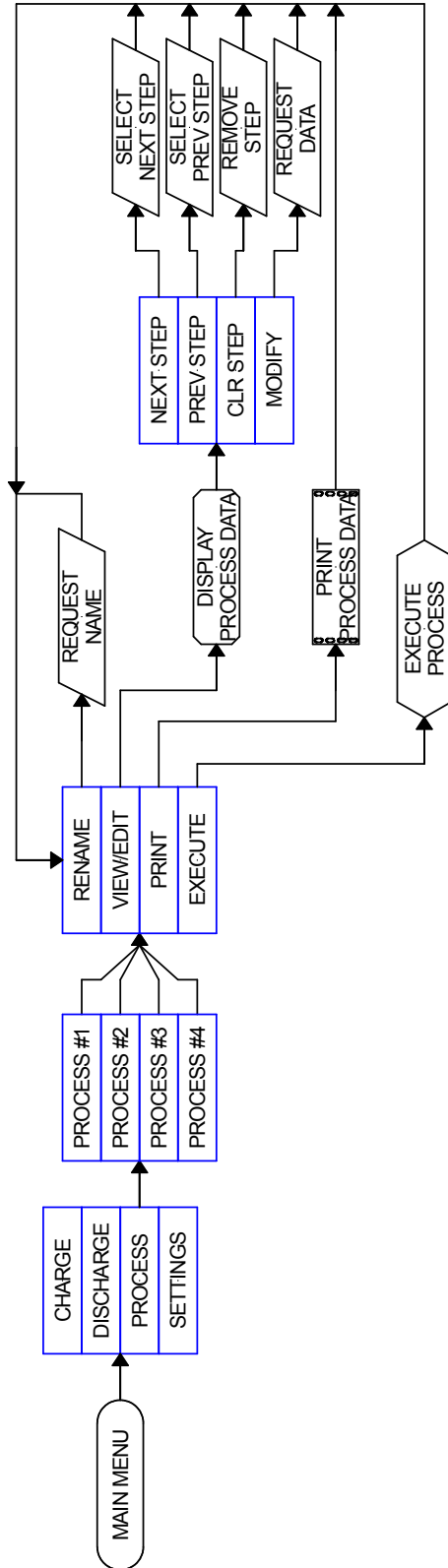
## 3.2 Capacity Testing Menu



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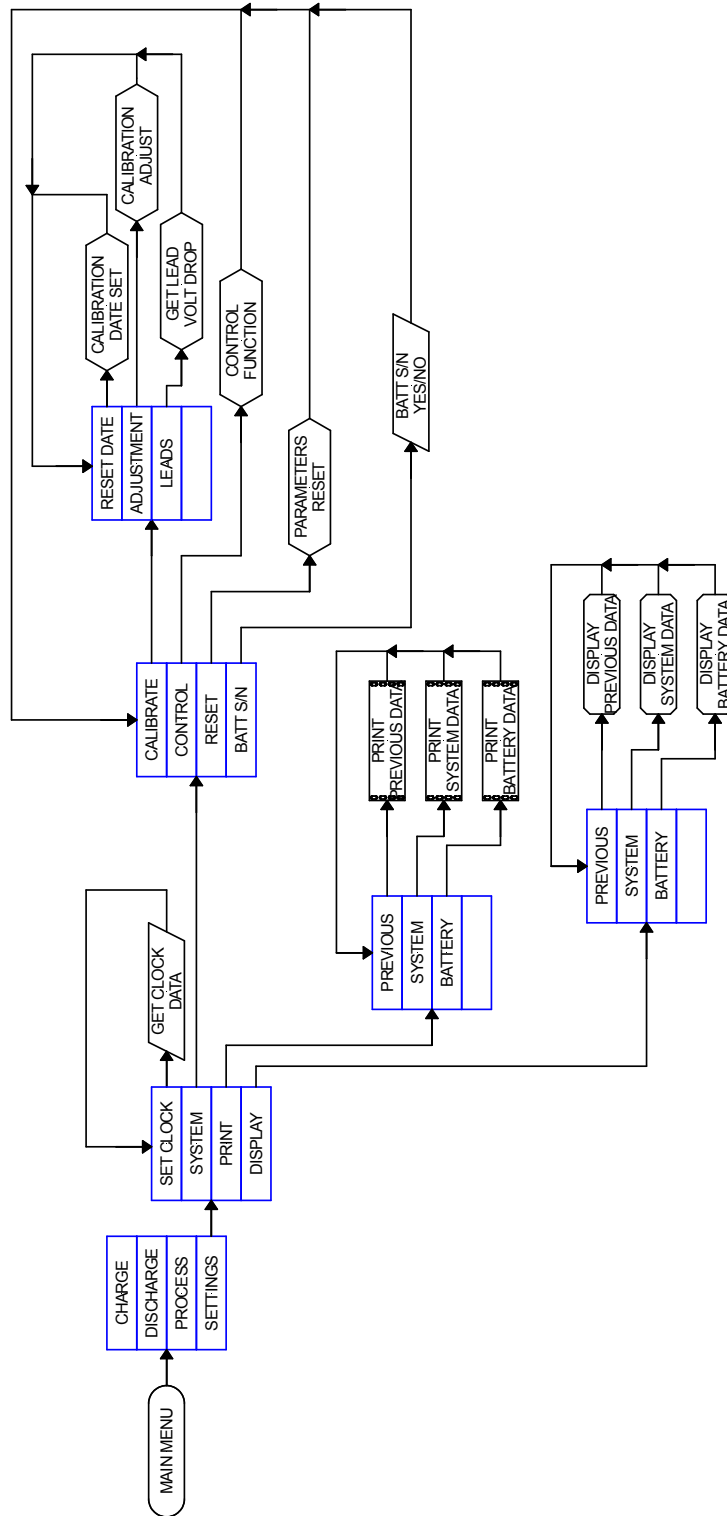
## 3.3 Process Operation Menu



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## 3.4 Settings Menu



## **4 Connecting A Battery**

For all methods of use of the battery charger the battery to be tested or charged must only be connected when the charger is either:

Not powered up,

or

Powered up and not executing a charge or capacity test function. Doing so would damage the equipment, and possible draw an electrical arc that, may cause an explosion from the venting gases being emitted from the battery.

Care must also be executed in ensuring that the bared ends of the battery leads do not come in contact with the metalwork of the charger as this may also cause electrical arcing and or explosion risk.

**THE BATTERY SHOULD NEVER BE CONNECTED OR DISCONNECTED FROM THE UNIT WHEN A CHARGE OR TEST IS IN PROGRESS AS ARCING CAN OCCUR CAUSING AN EXPLOSION FROM GASSES VENTING FROM BATTERIES BEING PROCESSED**

**THE BATTERY SHOULD ALWAYS BE ISOLATED FROM ANY EQUIPMENT BEFORE BEING CONNECTED**

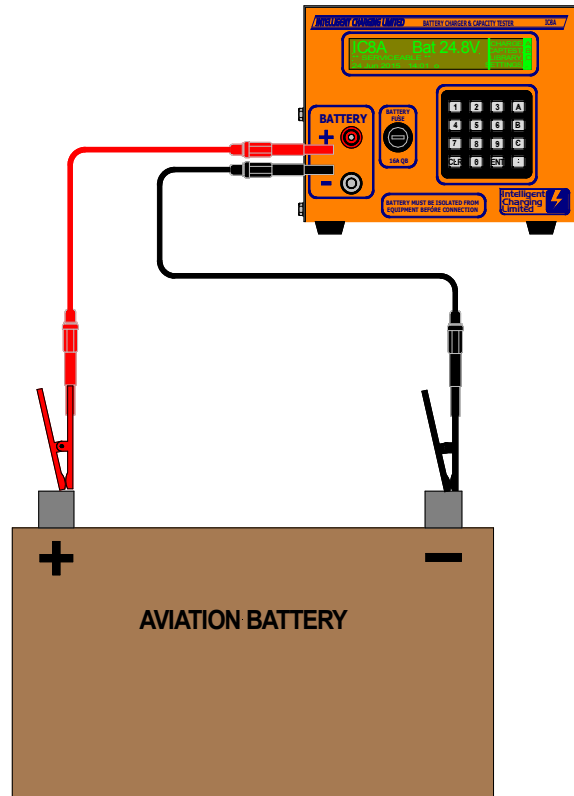
Stray ground loops between the attached equipment and the Battery Charger Analyser could cause catastrophic damage to the unit and the attached equipment.

Provided with the unit is one set of leads terminated with 8mm Ring Crimp Connectors. The 8mm ring crimps should be fitted with suitable battery connectors to suit the battery being charged.

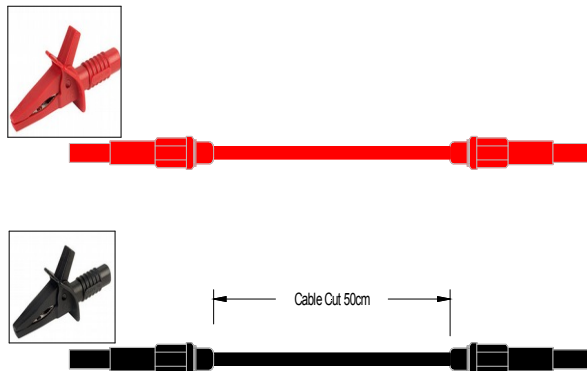
Always connect the battery leads as shown in the following figure to the unit before attempting to connect the battery to be charged/tested. Once the charger leads are connected to the unit then the battery can be connected.

### **BATTERY LEAD CONNECTION**

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## STANDARD LEAD SET



Specialist lead sets are available by request to suit many battery types.  
Please contact Intelligent Charging Limited for prices and availability.

## 5 Battery Charge Operation

### 5.1 Constant Voltage Charge

This charge mode is designed primarily for Lead Acid batteries, but can be used for any type of battery, which requires top-up charging through a constant potential of the battery voltage. The battery will be charged at the amount of amps specified until the target voltage has been achieved. At this point the charging amps will gradually reduce to zero as the battery voltage is maintained. This will continue until the charge time has been completed. The parameters for the charge are as follows: -

**Target Volts :** This is the constant potential voltage of the battery.

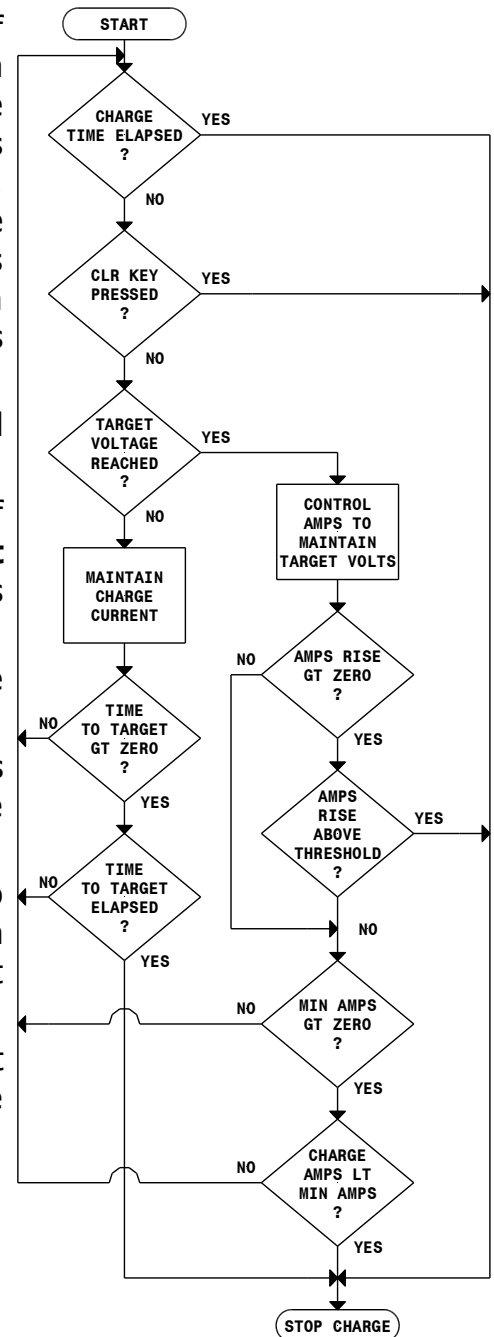
**Charge Amps :** This is the maximum amount of amps to deliver to the battery. Once the **Target Volts** has been reached the amount of amps delivered to the battery will decrease.

**Charge Time :** This is the maximum charge duration.

**Minimum Amps :** When the amount of amps delivered to the battery falls below this value the charge will stop. Set to zero if not required.

**Amps Rise :** If the current should increase to above this setting once the **Target Volts** has been reached the charge will stop. Set to zero if not required.

**Target Fail Time :** If the **Target Volts** has not been reached within this value of time then the charge will stop. Set to zero if not required.





## 5.2 Constant Current Charge

This charge mode is designed primarily for NiCd type batteries, but can be used for any battery type, which requires a constant current charge. The charge current is maintained at a constant current until the target voltage has been reached. The parameters for the charge are as follows: -

**Target Volts :** This is the voltage at which point the charge will stop, or switch to **Extra Time**.

**Charge Amps :** This is the constant current amps to deliver to the battery up until the **Target Volts** has been reached.

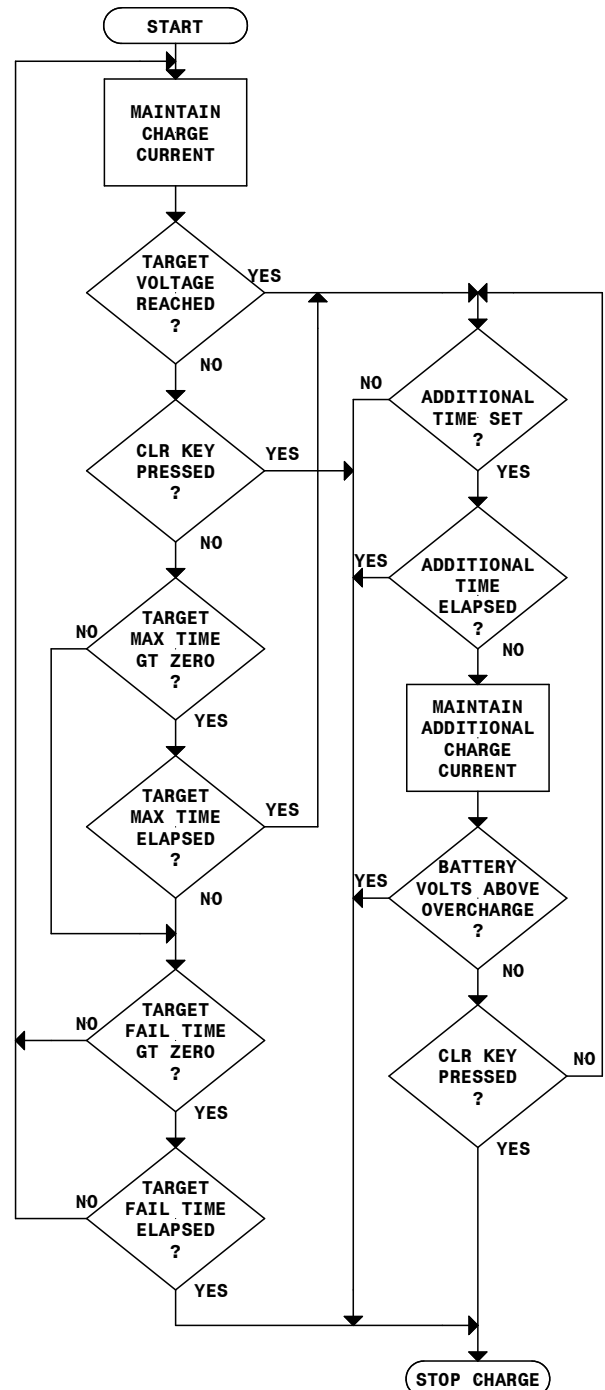
**Maximum Time:** This is the maximum time that the main charge can be applied, if zero is entered the extra target fail time will be requested.

**Target Fail :** If the **Target Volts** has not been reached within this value of time then the charge will stop. Set to zero if not required.

**Extra Time :** If set to a value greater than zero the charge will continue for this **Extra Time** once the **Target Voltage** has been achieved.

**Extra Amps :** If the **Extra Time** has been set to a value greater than zero this defines the constant current amps to deliver to the battery during the **Extra Time**.

**Overcharge Volts :** During the **Extra Time** the charge will stop if the battery voltage reaches this value.



## 5.3 Multi-Step Constant Current Charge

This charge mode is designed for NiCd batteries but can be used for any type of battery, which requires multi-step constant current charge. The unit will charge at the set amps for the time set for each step. During the charge the battery voltage will be monitored and the charge will stop if the overcharge voltage is exceeded. During the charge pressing the 'ENT' key can manually advance each step. The parameters for the charge are as follows: -

**Step #1 Charge Amps :** This is the constant current amps for step 1.

**Step #1 Charge Time :** This is the amount of time the charge is maintained for step 1.

**Step #2 Charge Amps :** This is the constant current amps for step 2.

**Step #2 Charge Time :** This is the amount of time the charge is maintained for step 2.

**Step #3 Charge Amps :** This is the constant current amps for step 3.

**Step #3 Charge Time :** This is the amount of time the charge is maintained for step 3.

**Step #4 Charge Amps :** This is the constant current amps for step 4.

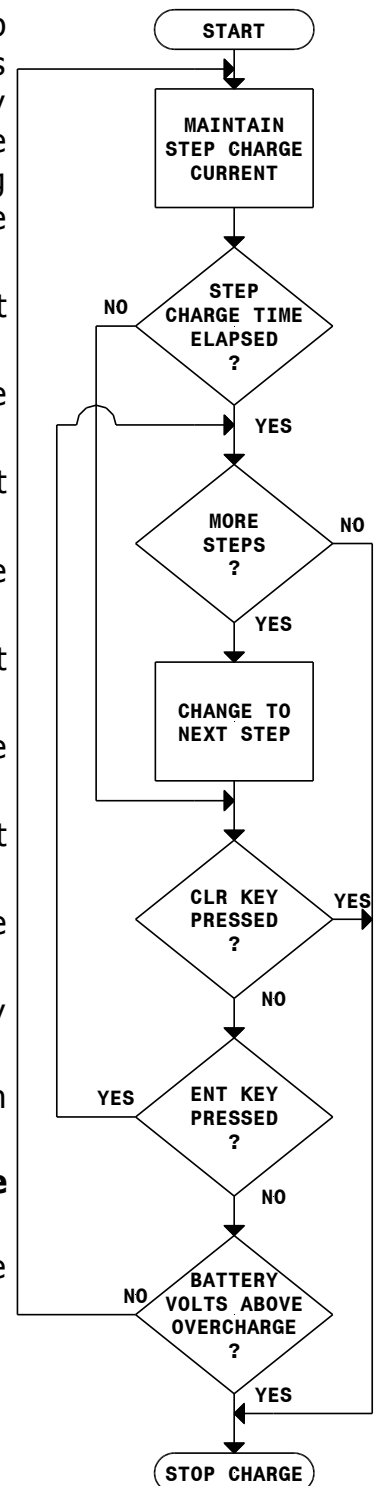
**Step #4 Charge Time :** This is the amount of time the charge is maintained for step 4.

**Overcharge Volts :** During the charge if the battery voltage exceeds this value then the charge will stop.

**Note :** Steps can have zero **Charge Amps** if a pause in charging is required between steps.

Steps that are not needed are simply set to zero **Charge Time** and zero **Charge Amps**.

At any time during the charge a step can be advanced before the time has elapsed by pressing the 'ENT' key.



### 5.3.1 CHARGE FROM A LIBRARY ENTRY

- Connect the battery to be charged and apply power to the unit.
- From the **MAIN** screen select **CHARGE** followed by **LIBRARY**.
- Using the **←→↑↓** arrows move the high light to point to the battery.
- Select **EXECUTE**.
- If a blank entry is selected the unit will warn that no data is exists.
- The unit will display the charge data for checking.
- To begin the charge select **START** or **TIMED**.
- If printer fitted and battery serial number set to on, the battery serial number will be requested at this point.

### 5.3.2 CHARGE FROM MANUAL DATA

- Connect the battery to be charged and apply power to the unit.
- From the **MAIN** screen select **CHARGE** followed by **MANUAL**.
- Enter the charge data as requested.
- The unit will display the charge data for checking.
- To begin the charge select **START** or **TIMED**.
- If printer fitted and battery serial number set to on, the battery serial number will be requested at this point.

### 5.3.3 CHARGE FROM PREVIOUS DATA

- Connect the battery to be charged and apply power to the unit.
- From the **MAIN** screen select **CHARGE** followed by **PREVIOUS**.
- The unit will display the charge data for checking.
- To begin the charge select **START** or **TIMED**.
- If printer fitted and battery serial number set to on, the battery serial number will be requested at this point.

## 6 Battery Capacity Test or Discharge Operation

### 6.1 Capacity Test To 100%

This mode will discharge the battery at the predefined current until the set time has elapsed. If the battery target voltage has not been reached the unit will stop and report a capacity test of 100%. This reported capacity is the minimum capacity of the battery. If the battery target voltage is reached before the set time the unit will stop and report the capacity calculated as follows: -

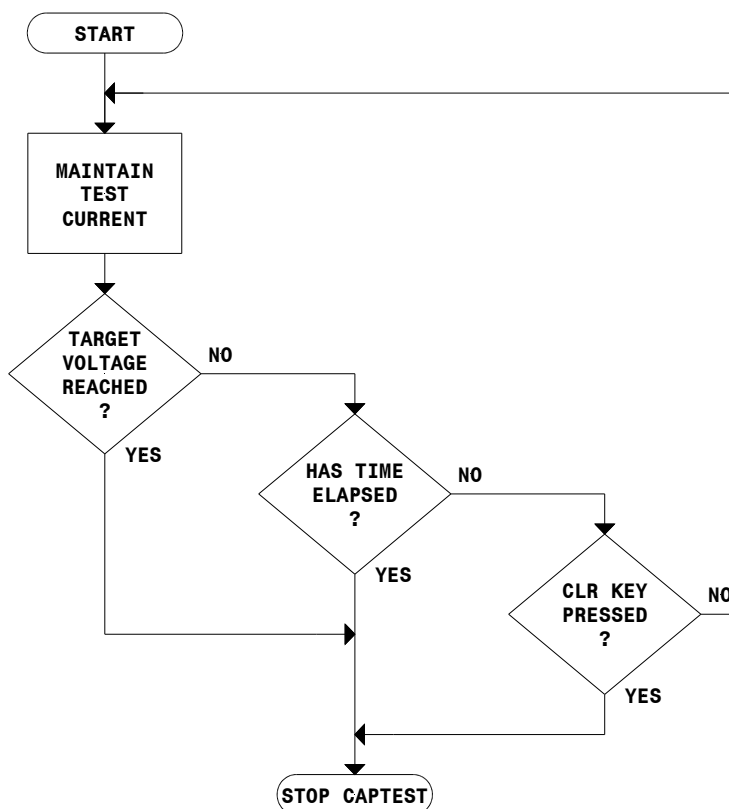
$$\%BATTERY\ CAPACITY = \frac{ACTUAL\ CAPTEST\ TIME}{CAPTEST\ TIME} \times 100$$

The parameters required for this mode are as follows: -

**Target Volts :** This is the point at which the discharge will stop.

**Discharge Amps :** This is the constant current amps to discharge the battery. This is usually the A/H rating of the battery.

**Test Time :** This is the maximum time at which the discharge test is to be performed. This is usually 1 Hour.



## 6.2 Capacity Test To Target Voltage

This mode will discharge the battery at the predefined current until the target voltage is reached. At this point the unit will stop and report the battery capacity as follows: -

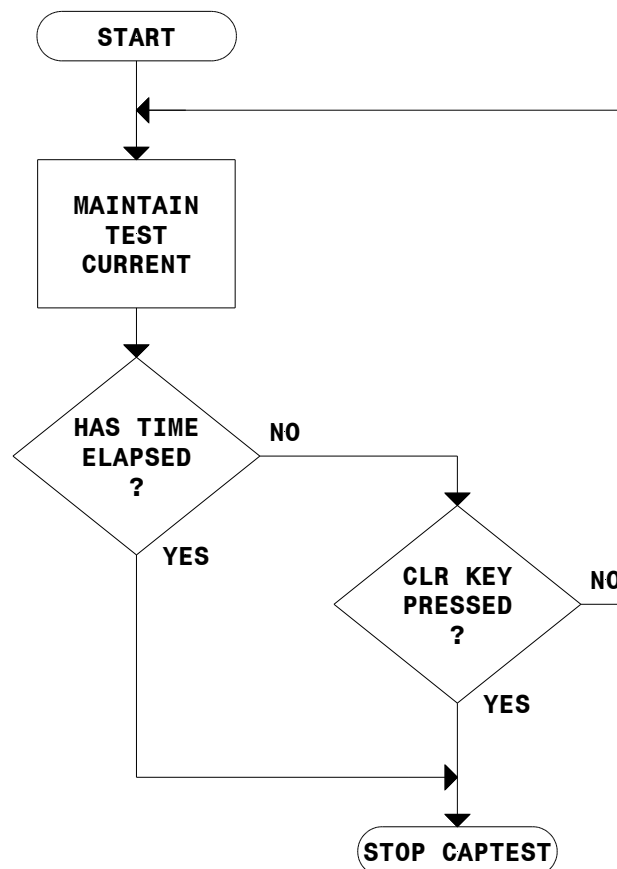
$$\%BATTERY\ CAPACITY = \frac{ACTUAL\ CAPTEST\ TIME}{CAPTEST\ TIME} \times 100$$

This mode can be used to discharge the battery and report the actual battery capacity. The parameters required for this mode are as follows: -

**Target Volts :** This is the point at which the discharge will stop.

**Discharge Amps :** This is the constant current amps to discharge the battery. This is usually the A/H rating of the battery.

**Test Time :** This is required to calculate the actual capacity of the battery at the end of the test. This is usually 1 Hour.



## 6.3 Full Battery Discharge

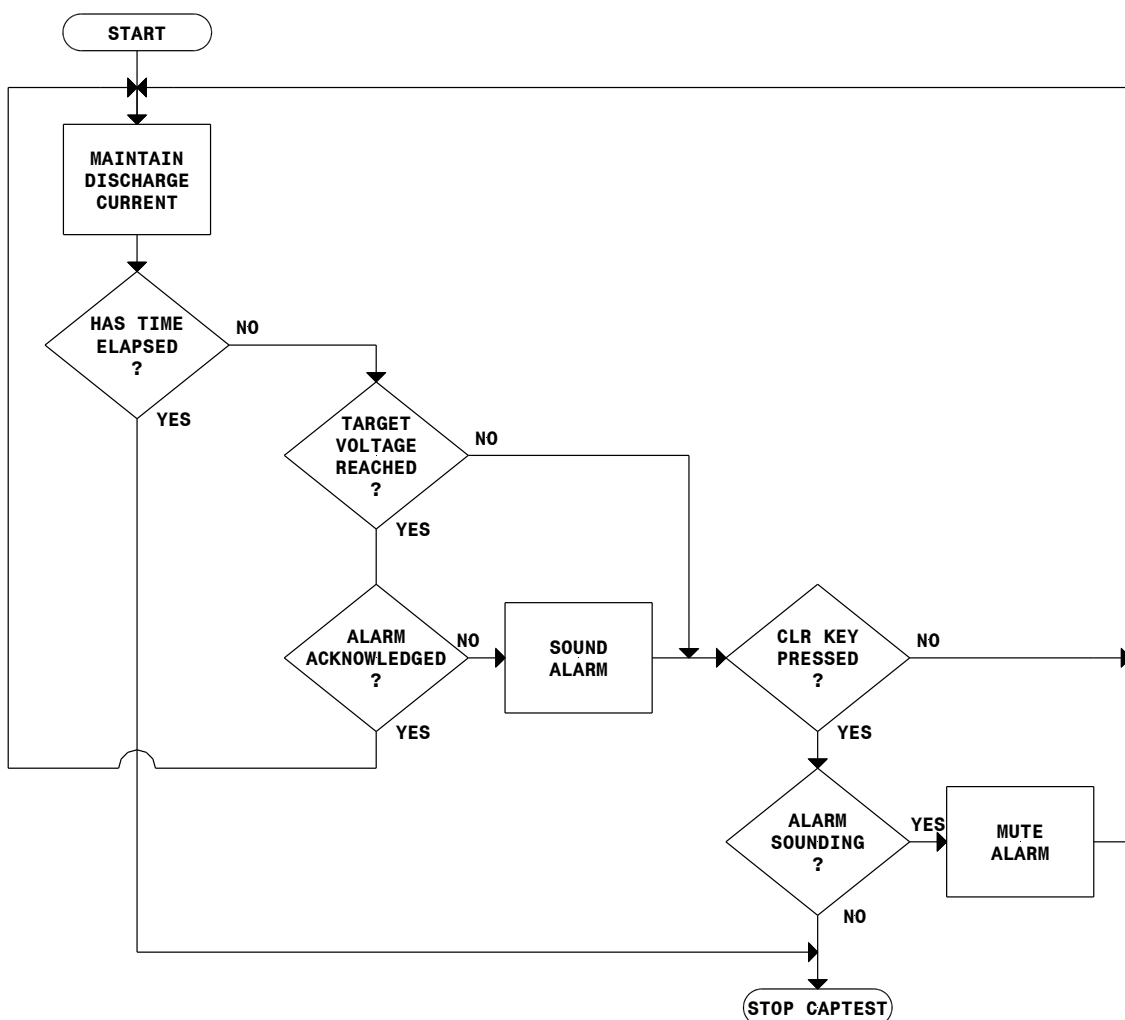
In this mode the battery is simply discharged at the **Discharge Amps** until the **Discharge Time** has been reached or stopped by pressing the **CLR** key. The **Alarm Volts** is used as an alert where manual application of balancing resistors is required where a cell monitor function has not been deployed. Once the alarm is sounding the unit will continue to discharge the battery and can be cleared by pressing the '**CLR**' key once.

The parameters required for this mode are as follows: -

**Alarm Volts** : This is the point at which the alarm will sound.

**Discharge Amps** : This is the constant current amps to discharge the battery.

**Test Time** : The length of time the discharge is to operate.



## 6.4 Performing A Capacity Test

### 6.4.1 Capacity Test or Discharge From A Library Entry

- Connect the battery to be discharged and apply power to the unit.
- From the **MAIN** screen select **DISCHARGE** followed by **LIBRARY**.
- Using the **←→↑↓** arrows move the high light to point to the battery.
- Select **EXECUTE**.
- If a blank entry is selected the unit will warn that no data exists.
- The unit will display the charge data for checking.
- To begin the charge select **START** or **TIMED**.
- If printer fitted and battery serial number set to on, the battery serial number will be requested at this point.

### 6.4.2 Capacity Test or Discharge From Manual Data

- Connect the battery to be discharged and apply power to the unit.
- From the **MAIN** screen select **DISCHARGE** followed by **MANUAL**.
- Enter the discharge data as requested.
- The unit will display the charge data for checking.
- To begin the charge select **START** or **TIMED**.
- If printer fitted and battery serial number set to on, the battery serial number will be requested at this point.

### 6.4.3 Capacity Test or Discharge From Previous Data

- Connect the battery to be discharged and apply power to the unit.
- From the **MAIN** screen select **DISCHARGE** followed by **PREVIOUS**.
- The unit will display the charge data for checking.
- To begin the charge select **START** or **TIMED**.
- If printer fitted and battery serial number set to on, the battery serial number will be requested at this point.

## 7 Creating Or Modifying Library Entries

The Battery Charger Analyser has a set of built in user-defined battery charge and capacity test parameters. The following procedure has to be observed to either enter new items or modify existing entries or erase an entry completely.

- From the **MAIN** screen select **CHARGE** or **DISCHARGE**
- Select **LIBRARY**.
  - Using the **←→↑↓** arrows move the high light to point to the battery.
  - Select **DELETE** if you wish to remove this item from the library.
  - Select **PRINT** if you want to make a hard copy of the item selected.
  - Select **MODIFY** to make changes to the selected item.
  - If the selected item is marked as **NO DATA** the name for this item will be requested.

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- If the name entered is the same as an existing library entry the parameters for the existing entry will be used to be modified.
- The charge parameters will then be requested.
- Followed by the capacity test parameters.
- Once the parameters have been entered the library entry will be shown in the library list.
- Note the new entry will be inserted after the last valid library entry.
- Press '**CLR**' repeatedly to return to the main screen.

### 7.1 Data Entry Procedure

When creating or modifying a library entry, or entering manual battery data for a one off charge or discharge the unit will prompt for necessary values for each charge or discharge mode selected.

When entering data the '**CLR**' will backspace any wrongly entered values. If the data field is empty (i.e. cursor in first location) the whole data entry process will be aborted and the charger will take you back to to the **MAIN** page.

### 7.2 Entering Charge Data

From the **MAIN** screen by selecting **CHARGE -> MANUAL**

From the **MAIN** screen by selecting **CHARGE -> LIBRARY -> ←→↑↓ -> MODIFY**

From the **MAIN** screen by selecting **PROCESS -> PROCESS # -> VIEW/EDIT -> MODIFY -> CHARGE BATTERY.**

The screen will request **CHARGE TYPE.**

Select >> **NEXT** >> or << **PREV** << to change to either : -

- CONSTANT VOLTAGE CHARGE**
- CONSTANT CURRENT CHARGE**
- MULTI-STEP CHARGE**

The following tables explains what the values entered mean.

CONSTANT VOLTAGE CHARGE		
Value Required	Units	Description
Nominal Volts	Volts.	The battery nominal voltage is used to determine what



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		power supply setting to use and also the help validate the data entered.
Target Voltage	Volts.	The is the constant voltage set point.
Charge Amps	Amps.	The is the maximum charge amps to put into the battery before the CV point is met at which point it will reduce.
Charge Time	Hours and Minutes.	The maximum charge time.
Min	Amps.	When the charge current falls below this value the charge will stop. If not used set to zero.
Rise	Amps	When the charge has reached the CV crossover point the current would normally continuously fall. If it was to rise again it is an indication of potential plate failure. This value can be set to stop the charge if the current should increase above the value entered. Set to zero if not required.
Target Fail	Hours and Minutes.	It can be determined by the battery A/H and the maximum charge amps that the battery would reach it's CV point at a known time. If the battery takes significantly longer that calculated time then it can be indication of internal plate failure and potential overheating. This value of time will stop the charge if the time elapses before the Target Voltage is achieved. If not required set to zero.

<b>CONSTANT CURRENT CHARGE</b>		
Value Required	Units	Description
Nominal Volts	Volts.	The battery nominal voltage is used to determine what power supply setting to use and also the help validate the data entered.
Target Volts	Volts.	This the voltage at which point the charge will stop or switch to the TopUp charge if one has been set.
Charge Amps	Amps.	This is the constant current charge current.
Max Charge Time	Hours and Minutes	If this value is set to a non zero value the charge will stop or switch to the TopUp charge if one has been set, at the preset time if the target voltage has not been met.
Target Fail Time	Hours and Minutes.	If a Max Charge Time has not been set the charge will stop if this time is met before the target voltage has been achieved. It will not switch to TopUp charge.
TopUp Amps	Amps.	If a TopUp charge is required this is the constant

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		current TopUp current. If no TopUp is required set to zero.
TopUp Time	Time.	If a TopUp charge is required this is the length of the TopUp.
Overcharge Volts.	Volts.	During the TopUp charge the voltage can be detected and stopped if the Overcharge Voltage is exceeded.

## MULTI-STEP CHARGE

Value Required	Units	Description
Nominal Volts	Volts.	The battery nominal voltage is used to determine what power supply setting to use and also the help validate the data entered.
Charge Amps #1	Amps.	Constant current step #1 current.
Charge Time #1	Hours and Minutes.	Constant current step #1 charge duration.
Charge Amps #2	Amps.	Constant current step #2 current.
Charge Time #2	Hours and Minutes.	Constant current step #2 charge duration.
Charge Amps #3	Amps.	Constant current step #3 current.
Charge Time #3	Hours and Minutes.	Constant current step #32 charge duration.
Charge Amps #4	Amps.	Constant current step #4 current.
Charge Time #4	Hours and Minutes.	Constant current step #4 charge duration.
Overcharge Volts	Volts.	Over charge voltage point to stop charge.

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## 7.3 Entering Discharge Data

From the **MAIN** screen by selecting **CHARGE** -> **MANUAL**

From the **MAIN** screen by selecting **CHARGE** -> **LIBRARY** -> **↔↑↓** -> **MODIFY**

From the **MAIN** screen by selecting **PROCESS** -> **PROCESS #** -> **VIEW/EDIT** -> **MODIFY** -> **CHARGE BATTERY**.

The screen will request **CHARGE TYPE**.

Select >> **NEXT** >> or << **PREV** << to change to either : -

### **CAPACITY TEST TO TIME**

### **CAPACITY TEST TO TARGET**

### **FULL DISCHARGE**

The following tables explains what the values entered mean.

<b>CAPACITY TEST TO TIME</b>		
Value Required	Units	Description
Nominal Volts	Volts.	The battery nominal voltage is used to determine what power rating is required for discharge and also the help validate the data entered.
Target Volts	Volts.	The target volts is the discharged voltage that the charge should stop the discharge and report the battery capacity.
Discharge Amps	Amps.	This is the constant current discharge amps that the battery has to be discharged at.
Discharge Time	Hours and Minutes.	This is the discharge time (usually 1 hour). When this time is reached the charge will stop and report the battery capacity of 100%.

<b>CAPACITY TEST TO TARGET</b>		
Value Required	Units	Description
Nominal Volts	Volts.	The battery nominal voltage is used to determine what power rating is required for discharge and also the help validate the data entered.
Target Volts	Volts.	The target volts is the discharged voltage that the charge should stop the discharge and report the

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		battery capacity. Note the capacity reported is a function of time elapsed and the Discharge time, and can be greater than 100%.
Discharge Amps	Amps.	This is the constant current discharge amps that the battery has to be discharged at.
Discharge Time	Hours and Minutes.	This is the discharge time (usually 1 hour). The charge does not stop when this time has elapsed but continues. This time is used to correctly calculate the battery capacity..

<b>FULL DISCHARGE</b>		
Value Required	Units	Description
Nominal Volts	Volts.	The battery nominal voltage is used to determine what power rating is required for discharge and also the help validate the data entered.
Alarm Volts.	Volts.	When the battery voltage falls below this set point the alarm will sound alerting the operator.
Discharge Amps	Amps	The discharge current to maintain. Note when the battery voltage falls to below one volt the discharge current will begin to fall due to the internal resistance and blocking diodes used in the discharge circuit.
Discharge Time	Hours and Minutes.	The discharge will continue for this set amount of time.

## 8 Process Mode

### 8.1 Overview Of Operation

Until now each charge or discharge action could only be done manually through a single set up and execution. The unit has now a process mode whereby multiple charge and discharge operations can be performed automatically.

The unit caters for up to four independent process trees containing up to six steps in each. Once a process tree is created it can be named and is stored in the units non-volatile memory so it can be recalled for subsequent re-use.

Each step in a process, apart from the usual charge and discharge parameters has three additional parameters.

At the beginning of each step a **Start Delay** can be specified to delay the process step, this may be after a high discharge or cell balance the battery can be "rested" before the charge can begin.

Also at the end of each step there are three options.

- **ALARM DISABLED**

At the end of the current step the next step will continue automatically.

- **ALARM & PAUSE**

At the end of the current step the alarm will sound and the next step will be paused until the '**ENT**' key is pressed. The alarm can be muted by pressing the '**CLR**' key once.

- **ALARM & CONTINUE**

At the end of the current step the alarm will sound and continue to sound until it is muted by pressing '**CLR**' once.

At the end of each step results will be printed if the **Prnt Yes** option is selected, this means that selective steps can be printed where the information is required, such as a Capacity Test where the capacity percentage needs to be known. Mundane steps such as cell balancing which may not need to be printed will not be if the print option is set to **Prnt Off**. Note if the print option is **Prnt Off**, the periodic cell value printing will also be disabled for this step.

### 8.2 Process Menu

To access the process menu select **PROCESS**. The four available processes will be displayed to the right and each one can be selected by pressing the appropriate key, '**A**', '**B**', '**C**' or '**.**'.

If a process has been named it's name will show, if it has not been named the display will simply show **PROCESS #1**, **PROCESS #2**, **PROCESS #3** & **PROCESS #4**.

Once the process has been selected the display will show the process name date last modified and the basic step information.

Select **RENAME** to set a recognisable name.

Select **VIEW/EDIT** to view and edit the process steps.

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Select **PRINT** to make a hard copy of all the process steps.  
Select **EXECUTE** to start the process.

### 8.2.1 Renaming a process

A process name can consist of any types characters up to a maximum of ten.  
To create letters above C the '**A**' key must be pressed repeatedly to go through all the letters in the alphabet, upper case only. To create punctuation mark and space the '**'**' must be pressed repeatedly. Once the desired character has been selected a pause of approx. 1 second must be observed to move the cursor to the next character position on the next keypress.

### 8.2.2 View or Edit A Process

When view or edit is pressed the details of the first process step will be displayed. If the process step has no data the display will show ""**PRESS MODIFY TO CREATE STEP**".

Selecting **NEXT STEP** will advance the process step to the next, until the last empty slot, or step 6, where it will then revert back to Step 1.

Selecting **PREV STEP** will cause the display to step back one step. Once step #1 is reached it will then revert back to the last empty step or step #6.

Selecting **CLR STEP** will cause the current process step to be cleared. If a step is cleared the steps that follow this step will be moved down one place, i.e. If step 3 is cleared step 4 will replace it, step 4 will be replaced by step 5, step 5 replaced by step 6 and step 6 will be cleared to a no action step.

Selecting **MODIFY** will start the data entry procedure. The display will show SELECT MODE.

Select >> **NEXT** >> or << **PREV** << to change to either : -

**DISCHARGE BATTERY**

**CHARGE BATTERY**

Press **ENT** to select either mode of operation.

The display will then ask for the charge or discharge data as per 7.2 Entering Charge Data or 7.3 Entering Discharge Data. Once the data entry is complete the display will show the data that has been selected.

## 8.3 Process Execution

To execute a process one must already be defined and properly configured. To start the process the following procedure must be applied.

- Check battery is correctly connected and a voltage is displayed in the main

- menu.
- If using the cell monitor ensure that the cell monitor is connected correctly and check the cell readings using the **CELL MONIT** display window first.
- Select **PROCESS** menu.
- Select the process to be executed from the list shown.
- Select **EXECUTE** to start the process mode running.
- If printer fitted and battery serial number set to on, the battery serial number will be requested at this point.

At this point the unit will start execution of the process at step 1, continuing on through to the last step in the process tree.

### **8.4 Process Termination**

Each process step will be executed normally, but under certain conditions the unit will stop the process if these conditions which are not a successful charge or capacity test.

The following are termination conditions which will cause the next process to continue normally: -

BATTERY < TARGET VOLTS	Successful completion of capacity test before time up.
CHARGE COMPLETED	Successful completion of charge.
CAPACITY TEST COMPLETED	Successful completion of capacity test to time up.
DISCHARGE COMPLETE	Stopped as discharge is complete.

All other reasons are considered battery fault so therefore the process mode will stop for safety reasons.

At any point during the process the '**CLR**' key can be pressed to stop the process execution.

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## 9 Calibration

The Battery Charger Analyser has its own built in automatic calibration procedures which allow for quick adjustment of errors due to component ageing.

The calibration check is recommended done yearly and built into the Battery Charger Analyser is the ability to record the date of the last calibration and give indication on the printed report that the calibration has expired.

This is indicated by the line \*\*\*\*\* **Serviceable** \*\*\*\*\* when in date or \*\*\* **Calibration Due** \*\*\* when the calibration date has expired.

### 9.1 Equipment Required

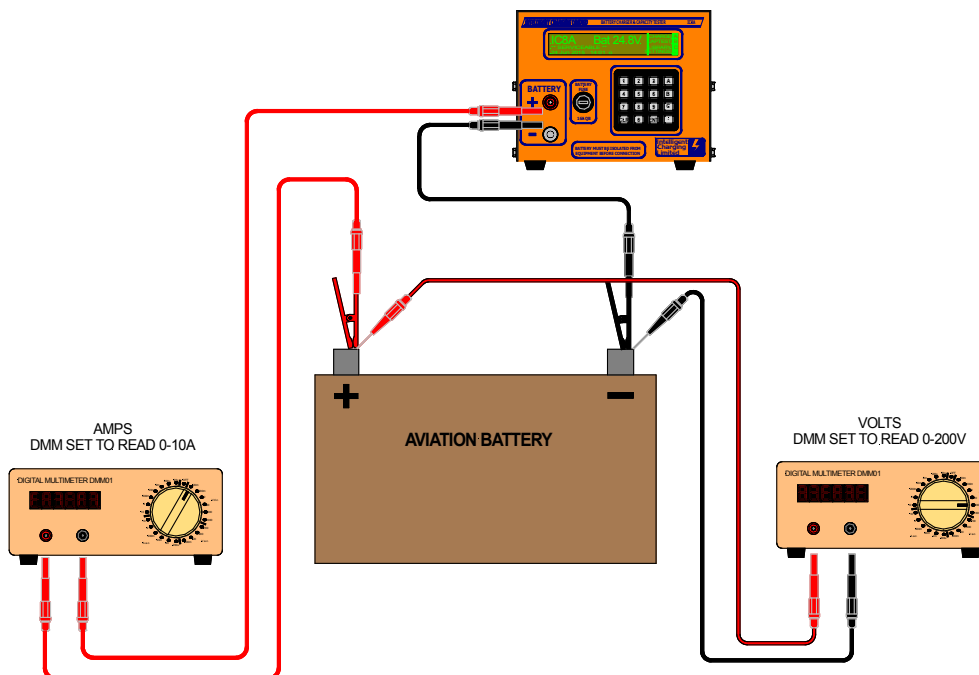
Calibrated Digital Multimeter capable of displaying 24V to two decimal places.

Calibrated Digital Ammeter capable of displaying 10.0A to two decimal places.

or

Calibrated Digital Multimeter capable of displaying 10.0mV to two decimal places and the SHUNT60A or equivalent 60A/60mV shunt.

### 9.2 Calibration Equipment Connection



### 9.3 Check Procedure

Once per year the following calibration procedure should be applied.

- Connect a good quality 24V battery to the Battery Charger Analyser.
- Measure battery voltage and verify the Battery Charger Analyser display is within



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tolerance.

- Perform a capacity test at approx 5.0A.
- Measure the current passing out of the battery and verify that the Battery Charger Analyser display is within tolerance.
- Perform a charge at approx 5.0A.
- Measure the current being passed to the battery and verify that the Battery Charger Analyser display is within tolerance.

If these parameters are outside of specification then the **Calibration Adjustment** procedure should be followed.

If these check show that the Battery Charger Analyser is within tolerance and no adjustment is necessary then the following procedure need to be applied to the Battery Charger Analyser to reset the calibration date to the current date.

Select **SETTINGS -> SYSTEM -> CALIBRATE -> RESET DATE**

- When requested enter the 4 digit serial number of the unit and press '**ENT**'.
- A confirmation screen will be displayed.

### **9.4 Making Calibration Adjustment**

If the calibration check has been performed and the unit is out of tolerance then a calibration adjustment will need to be performed. the following procedure needs to be observed in order to perform a calibration adjustment.

A good 24V battery and voltmeter and ammeter will need to be connected to the unit during this procedure.

- **SETTINGS -> SYSTEM -> CALIBRATE -> ADJUSTMENT**
- When requested enter the 4 digit serial number of the unit and press '**ENT**'
- When requested enter the measured battery voltage and press '**ENT**'
- The charger will then set up a charge of approximately 5.0A
- Allow the charge current to stabilise.
- When requested enter the charge current and press '**ENT**'
- The charge will then set up a discharge of approximately 5.0A
- Allow the capacity test current to stabilise.
- When requested enter the capacity test current and press '**ENT**'

Note the unit has a build-in calibration checking and if any of the entered data does not correlate to valid calibration values stored internally it will sound the alarm and display a warning message and the calibration will be discarded. This protects the unit from incorrectly entered values.

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The calibration procedure will have to be re-executed and if the error is repeated than the unit may have a fault and will need to be returned for service or repair.

### 9.5 **Reviewing Calibration Date**

The calibration parameters can be displayed or printed out on the built in printer. To perform this operation the following procedure must be observed.

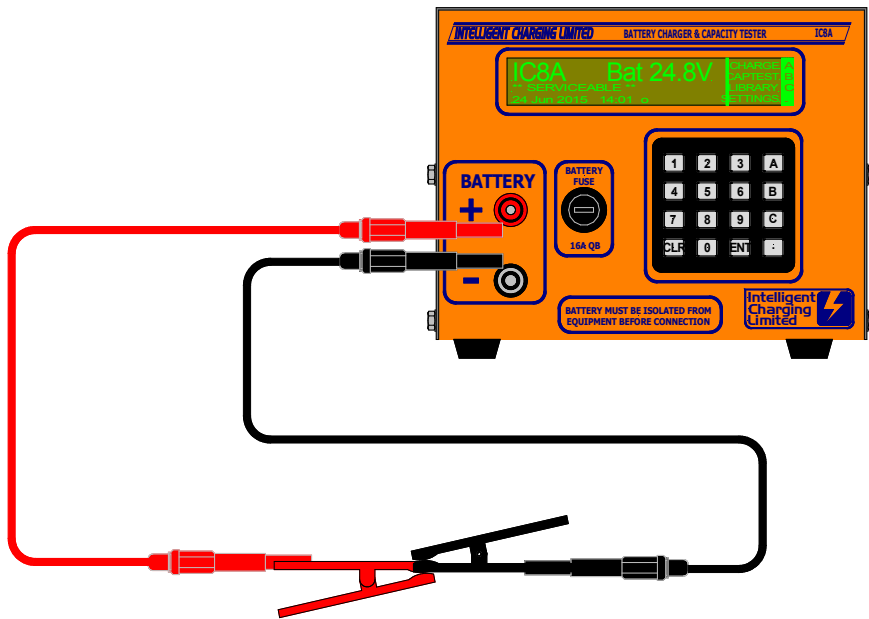
Select **SETTINGS** -> **PRINT** or **DISPLAY** -> **SYSTEM**

The unit will then print or display the calibration data.

### 9.6 **Setting the lead volt drop**

The IC8A has a simplified function for setting the lead voltage drop. This procedure should be followed whenever a different set of leads is used with the IC8A to ensure that the small drop in voltage is catered for because generally the leads are a fairly small cross sectional area and at higher current the voltage drop can become significant.

Connect the IC8A battery leads as follows: -



Select **SETTINGS** -> **SYSTEM** -> **CALIBRATE** -> **LEADS**

Follow the on screen instructions to perform the lead volt drop setting.

## 10 Miscellaneous Unit Functions

### 10.1 *Description Of Stop Codes*

- **NO VALID DATA TO SHOW**

This will not usually appear. It is used when the battery charger has been reset and the previous end of charge or discharge results are requested.

- **BATTERY < TARGET VOLTS**

Applies to **CAPACITY TEST TO 100%** mode only. It indicates that the battery terminal voltage has reached the **Target Volts** setting. This is a normal end of test condition and the capacity figure will be valid.

- **CHARGE COMPLETED**

Applies to all charge modes. It indicates that the **Charge Time** has been reached, or in **CONSTANT VOLTAGE CHARGE** an indication that the **Min Amps** point has been reached, in **CONSTANT CURRENT CHARGE** and **CELL MONITOR CC CHARGE** that the **Target Voltage** has been met where no **Extra Time** was specified.

- **CAPACITY TEST COMPLETED**

Applies to all capacity test modes. It indicates that the **Discharge Time** has been reached, or in **CAPACITY TEST TARGET** an indication that the **Target Voltage** has been met.

- **DISCHARGE COMPLETED**

Applies to all discharge modes. It indicates that the Discharge Time has been met.

- **OVERCHARGE VOLT REACHED**

Applies to **CONSTANT CURRENT CHARGE** and **MULTI-STEP CHARGE** modes. It is an indication that the **Overcharge Volts** set point has been reached.

- **BATTERY THRESHOLD AMPS**

Applies to **CONSTANT VOLTAGE CHARGE** only and indicates that the charge current has increased more than the **Amps Rise** threshold after the **Target Volts** had been achieved, indicating a potentially faulty battery.

- **STOPPED BY OPERATOR**

Applies to all modes. Indicates that the charge or discharge operation was stopped by the operator pressing the '**CLR**' key.

- **BATTERY REV OR < 0.1V**

Applies to all modes. Indicates that a battery voltage less than 0.1V has been

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detected at start of operation indicating no battery connected or battery reverse connected.

- **FAILURE TO REACH TARGET**

Applies to **CONSTANT VOLTAGE CHARGE**, **CONSTANT CURRENT CHARGE** and **CELL MONITOR CC CHARGE**. Indicates that the battery voltage did not reach the set **Target Volts** within the **Target Fail** time.

- **EXCHANGER OVERHEAT**

Applies to all modes. Indicates that the heat exchanger has become too hot. This could be caused by obstructions to the airflow for cooling, or the unit is being operated at in high ambient temperature >30°C or in high altitudes where the air is thinner and its cooling effect is less efficient.

- **TRANSFORMER OVERHEAT**

Applies to all charge modes only. Indicates that the power transformers supplying the charge current are overheating. This could be caused by obstruction to the airflow within the unit or by operating the unit in temperatures > 30°C.

- **PARAMETER OUT OF RANGE**

Applies to all modes. Indicates that an operation is being requested that contains invalid data. This could be caused by failure of the backup battery. Replace battery as described in the SERVICE section found elsewhere in this manual. Note after battery replacement the unit will require recalibration.

- **CAPTEST AMPS EXCEEDED**

This is an indication that the capacity test amps is much greater than expected and cannot be reduced.

- **CHARGE AMPS EXCEEDED**

This is an indication that the charge amps is much greater than expected and cannot be reduced.

- **CANNOT GET ANY AMPS**

This is an indication that the charge or capacity test amps cannot be attained and is usually an indication that the circuit breakers have not been engaged.

- **CELL VOLTS FALL EXCEEDED**

This is an indication that during a cell monitor charge one or more cell voltages have fallen below the threshold if set.

- **CAPTEST POWER OVERLOAD**

Applies to discharge modes only. After 10 minutes into a capacity test the unit verifies it that the discharge amps and battery voltage combination does not exceed 10% above the watts rating for the unit. This error occurs because the unit is being operated outside of its limitations.

- **BATT VOLTS > TARG VOLTS**

Applies to **CONSTANT VOLTAGE CHARGE** mode only. This occurs when the

battery voltage detected is 3.0V greater than the **Target Volts**. Note this can occur when a battery with a high impedance is connected to the unit. When current is applied to the battery its voltage rises dramatically high.

- **CELL MONITOR OFFLINE**

Applies to cell monitor charge and discharge modes only. It is an indication that the cell monitor is either not connected or has failed.

- **ERROR IN CELL VOLTAGES**

Applies to cell monitor charge and discharge modes only. This condition is reported if any cell voltage read goes below  $-2.0V$  or above  $+2.0V$  It can be caused by any of the cell input being disconnected. Use the cell monitor viewer to check connections.

- **MAINS POWER FAILURE**

This code will be displayed when a previous charge or discharge was stopped because of mains power failure. Note: If a timed start was active and the time had not elapsed the timed start will resume at the normal time.

- **CELL BELOW TARGET**

This code will be displayed when a cell monitor discharge which is used to obtain low cell values has been executed and has terminated with one or more cells below the target value.

## 10.2 ***Print Or Display Previous Operation Results***

The unit can print or display the last operation data.

Select **SETTINGS** -> **DISPLAY** or **PRINT** -> **PREVIOUS**

The last test results are stored in battery backed memory so the previous test results can be printed or displayed even if power had previously been removed from the unit. Note printing only applies to the IC8P.

## 10.3 ***Changing The Date Format And Date Time***

The unit has a battery backed built in clock and calendar which is used to time stamp test results and mark re-calibration events. It is important that the clock is set to the correct format, date and time for your region.

Select **SETTINGS** -> **SET CLOCK**

Select >> **NEXT** >> or << **PREV** << to change to either : -

<b>dd/mm/yyyy</b>	18/11/2019
<b>mm/dd/yyyy</b>	11/18/2019
<b>yyyy/mm/dd</b>	2019/11/18
<b>yyyy/dd/mm</b>	2019/18/11
<b>dd mmm yyyy</b>	18 Nov 2019

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mmm dd yyyy                      Nov 18 2019

Press **ENT** to confirm.

Depending on the date format selected above the date and time will be requested one at a time.

The clock will be set to these settings. Note the clock does not automatically adjust to daylight saving time.

### **10.4    *Modifying Display Intensity***

The display on the unit has brightness control and this can be changed by pressing the **↑↓** arrow key repeatedly to get to the level you require.

The setting is maintained even after power has been removed from the unit.

Note in some operations like data entry the display brightness cannot be changed.

### **10.5    *Automatic screen dim***

When the charger is left idle for more than 15 minutes the screen will automatically dim to the lowest setting. Pressing any key will cause the display to revert back to the original screen setting. This is to extend the life of the VFD display.

### **10.6    *Printing battery serial number (IC8P)***

The battery serial number can be included in the printed report. This is requested from the operator when **START** or **DELAYED START** is selected.

By default the serial number on print option is turned off. To turn the request and print of the battery serial number the default setting has to be changed.

Select **SETTINGS** -> **SYSTEM** -> **MORE...** -> **BATT S/N**

Select **>> NEXT >>** or **<< PREV <<** to change to either : -

**YES**

**NO**

Press **ENT** to confirm.

If this is changed to **"yes"** then each time the **START** or **DELAYED START** is selected the serial number will be requested. The previous serial number is remembered so when working with the same battery in one session it does not need to be entered each time. If the printer is not fitted this setting has no effect.

### **10.7    *Cooling Fan***

The charger is fitted with a cooling fan which is used to extract the heat energy generated when charging and discharging. The fan in new units is automatically controlled by the microprocessor to operate when a charge or capacity test has begun and to stop approximately minutes after the end of a charge or capacity test.

## 11 Service And Maintenance

### 11.1 Calibration

The Battery Charger Analyser must at one yearly intervals, be calibrated to ensure that the measurement circuits are still within specifications. Where these are outside of acceptable tolerance then a full calibration must be performed. This procedure is described in the calibration section.

### 11.2 Cleaning

At yearly intervals it is advisable to ensure that the airflow for the heat exchanger is not obstructed by dust and dirt. To clear any dust and debris the unit must be disconnected from the mains and remove the battery leads from the unit. The cover must be removed and the heat exchanger blown clear by the use of a high pressure air gun. Where this is not available the use of pipe cleaners or similar must be employed to clear the dust built up.

**Observe all safety precautions when using high pressure air. Wear ear defenders and safety goggles and do not point high pressure air at people or animals.**

### 11.3 Battery Backup

The internal parameters of the Battery Charger Analyser are maintained by a single coin cell mounted on the display PCB at the front of the unit. This should be changed every 4-5 years. If it should fail during use this will be indicated by the unit requesting the date and time when power is applied. Calibration data is unaffected as this is stored in FLASH memory.



The cell is a standard Lithium button cell number CR2032. When replacing the battery please observe the correct methods of disposal of the old battery in accordance with your local regulations.

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## 12 Specifications

Supply            240V a.c. 50Hz        5W – 280W

Accuracy better than  $\pm 1$  LSD or 1.0% whichever is the greater

Minimum Operating Temperature        0°C

Maximum Operating Temperature        40°C\*

\*High power discharging may need to be de-rated at high ambient temperatures.

Humidity        5% - 95% Non condensing

Altitude        0 to 3000 Metres.

### Charge Specifications:

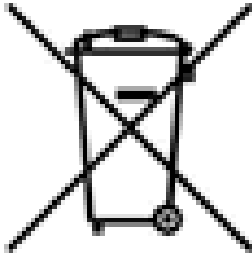
Max Output Volts	Max Output Amps	Max Output Watts
38.0V	12.0A	228W

### Discharge Specifications

Max Input Volts	Max Input Amps	Max Input Watts
38.0V	12.0A	150W



## 13 Product Disposal Instructions



The symbol shown here and on the product means that the product is classed as Electrical or Electronic Equipment and should not be disposed with other household or commercial waste at the end of its working life.

The Waste of Electrical and Electronic Equipment (WEEE) Directive (2002/96/EC) has been put in place to recycle products using best available recovery and recycling techniques to minimise the impact on the environment, treat any hazardous substances and avoid the increasing landfill.

### Product disposal instructions for residential users.

When you have no further use for it, please remove any batteries and dispose of them and the product as per your local authority's recycling processes. For more information contact your local authority or the retailer where the product was purchased.

### Product disposal instructions for business users.

Business users should contact their suppliers and check the terms and conditions of the purchase contract and ensure that this product is not mixed with other commercial waste for disposal.

## 14 Product Warranty

Your Intelligent Charging Limited product is guaranteed against faulty workmanship materials and malfunction for a period of 12 months from the date of purchase, unless agreed otherwise by Intelligent Charging Limited. Within this warranty period Intelligent Charging Limited will undertake to repair or replace the product proved to be faulty.

We recommend you keep all packaging for the duration of the 12 month warranty, after which you should dispose of all waste packaging in accordance with your local legislation

Products which have become faulty within the 12 month warranty period must be returned to Intelligent Charging Limited, where Intelligent Charging Limited will then investigate the warranty claim.

Intelligent Charging Limited products, when properly used, will render excellent service. Therefore, users must read the User Manual and any other literature supplied with the product carefully, and fully comply with all procedures shown in the literature and product training / familiarisation sessions, as misuse or failure to follow the instructions may render this warranty void.

This warranty is not transferable and excludes routine maintenance, consumables, parts subject to normal wear and tear, service maintenance kits and damage caused by misuse or negligence. Warranty claims attributable to improper, or careless, use or handling, and to normal wear, are excluded from this warranty.

Intelligent Charging Limited only obligation shall be to repair or replace such products that have proved to be faulty. Intelligent Charging Limited shall not be liable for any injury, loss or damage, direct or consequential, arising out of the use, or the inability to use the product. The customer shall determine the suitability of this product for its intended use, and the customer assumes all risks and liability whatsoever in connection herewith.

**Intelligent Charging Limited reserves the right to improve or modify this product without prior notice.**

**15 Owners Notes**

A series of horizontal lines for taking notes.