

**NSN 6130-99-391-3441 (TS1340+)**  
**BATTERY CHARGER ANALYSER**  
**OPERATOR MANUAL**





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## **1 Manual Revision History**

Rev	Date	Description
0	04-05-2001	First written.
1	05-06-2001	First released.
2	18-02-2003	Display amendments.
3	27-01-2005	Added battery charging modes descriptions.
4	04-04-2005	Updated image & added display brightness control.
5	16-03-2006	Added warning that Cable must be connected for using the internal diagnostics.
6	15-09-2006	Added amendments referring to up rated version (TS1340+ BAF50A).
7	03-10-2006	Added references to specifications.
8	19-10-2006	Added the installed battery library to the manual.
9	27-07-2010	Added information about the "CRASHED" message.
10	03-01-2013	Added calibration set up diagram.
11	21-07-2015	Formatting changes.
12	25-01-2018	Updated comment on supply operation.

## 2 Equipment Description

The TS1340+ Battery Charger / Analyser is an electronically controlled combined universal battery charging unit with built in battery analysing capabilities. It is housed in a heavy-duty metal enclosure designed for wall mounting via six M8 fixing points on the rear. As it is supplied it is configured for use from a standard ship's supply of 110V-115V 50/60Hz, it can be alternatively supplied for use with 220V-240V 50/60Hz supplies. The technical manual will describe how the voltage selection can be changed.

Equipment control is via an interactive alphanumeric two-line 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 full Nato Stock Numbers (NSN) of batteries to be used. During operation the display will show the instantaneous values of battery voltage, current and time elapsed through the selected program. An alternative display is available which reports more technical information on the TS1340+'s internal status.

Battery data is stored internally in the TS1340+ in non-volatile memory. A complete list of NSN batteries is included along with the accepted charging and testing data. The operator can extend this list by entering the details of the battery to be included on the display and keyboard. The battery library data can be updated by remote control as and when required.

Batteries are connected to the front of the TS1340+ by means of two individual multi-pole connectors. Within the connecting leads multi-core cables are employed which allow the incorporation of two wire voltage sensing, this feature means that the TS1340+ measures the battery voltage at the battery and does not experience the effect of voltage drops due to cable losses. Connection to the battery has to be made via the appropriate connectors for that battery. The TS1340+ has provision for battery temperature monitoring this is not a functional feature at this time.

The TS1340+ has extended operating capabilities compared to its predecessor the TS1340. Maximum charge current has been increased to 25A for batteries 20V to 30V and 40A for batteries 1.2V to 20V. (Note for TS1340+ BAF50A this rating has been increased to 50A). Capacity testing has been increased to a maximum of 50A for a 28V battery and 60A for a 12V battery. (Note for batteries less than 10V discharge current has to be de-rated to allow for the TS1340+'s internal resistance). In all instances the power graphs need to be referred to as the ratings are for typical batteries, the maximum ratings are subject to de-rating for voltage. See the power graphs in the technical manual for more details.

The TS1340+ contains two hi flow rate fans to extract the heat energy generated internally when running in capacity test mode. In situations of extreme ambient temperature the TS1340+ is protected from overheating and thermal runaway by internal temperature sensors. When the heat thresholds are reached the operator is initially warned of the problem via an alarm and the display. When the maximum heat value is reached the TS1340+ will stop charging or testing and inform the operator by the display and audible alarm.

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There is one capacity test program built into the TS1340+. This will discharge the battery connected at the current specified for the test duration specified. 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.

There are six charging regimes built into the TS1340+. For Lead Acid (Pb) there are two, constant current and constant voltage. For Nickel Cadmium (NiCd) there are four, 0.1C charge, 0.2C charge, Two-step charge and Three-step charge. All these charging regimes are discussed later in the document. For all capacity tests and charge regimes the reason for the test being terminated is reported on the display.

The TS1340+ has a Top Hat capability built into the unit. This is currently not available and will appear in later revisions.

The TS1340+ contains the software that will allow it to be calibrated by the operator in the field. The equipment needed is a good 24V battery, an ammeter capable of reading up to 40A (or a shunt and milli-voltmeter combination) and a voltmeter capable of reading up to 30V. The re-calibration process only takes a few minutes and this is done without the need to access the internals of the TS1340+.

The TS1340+ has been designed in such a manner that the software can execute some preliminary fault finding tasks in order to track down the source of a fault in the event of breakdown.

Inbuilt into the TS1340+ is the ability to provide a hard copy of library lists and results of charge and test operations. This is achieved by connected a standard ASCII compatible serial printer to the relevant connector on the TS1340+.

### 3 Battery Charger Analyser TS1340+ Overview

#### 3.1 Battery Room Specifics

This manual deals only with the scope of use of the equipment and does not cover battery room specifics such as handling, filling, fume extraction etc. These items will be covered in other relevant documentation.

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:

- a) Not powered up, or
- b) Powered up and not executing a charge or test function.

The battery **SHOULD NEVER BE CONNECTED OR DISCONNECTED** from the TS1340+ when a charge or test is in progress. Doing so would damage the equipment, and possibly 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.

#### 3.2 General Operation

When power is applied to the TS1340+, it will perform some internal self-tests and the following display will be shown:

```

*** TS1340+ ***** Issue 2 17.02.2003
Performing Self Test . . . . . Please Wait .
    
```

Once internal test are complete, (this takes only two to three seconds) the following main screen will be shown:

```

TS1340+ MAIN MENU 7-05-2001 16:30:15
PERFORM CHARGE / TEST USING NSN NUMBER ↓
    
```

Using the up and down arrow keys on the keypad the alternative TS1340+ functions can be accessed. The function displays are as follows:

Press 

```

TS1340+ MAIN MENU 7-05-2001 16:30:15
PREVIEW RESULTS OF LAST CHARGE OR TEST ↓
    
```

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Press 

```
TS1340+  MAIN MENU    7-05-2001  16:30:15
PRINT RESULTS OF LAST CHARGE OR TEST  ↓
```

Press 

```
TS1340+  MAIN MENU    7-05-2001  16:30:15
MODIFY CURRENT TIME OF DAY AND DATE  ↓
```

Press 

```
TS1340+  MAIN MENU    7-05-2001  16:30:15
CREATE OR MODIFY CUSTOM LIBRARY ENTRY  ↓
```

Press 

```
TS1340+  MAIN MENU    7-05-2001  16:30:15
SEND INTERNAL LIBRARY TO PRINTER  ↓
```

Press 


```
TS1340+  MAIN MENU    7-05-2001  16:30:15
CALIBRATE TS1340+ VOLTAGE AND CURRENT  ↓
```

Press 

```
TS1340+  MAIN MENU    7-05-2001  16:30:15
PERFORM ELECTRICAL TESTS  ↓
```

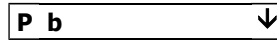
Press  and the functions are repeated

```
TS1340+  MAIN MENU    7-05-2001  16:30:15
PERFORM CHARGE / TEST USING NSN NUMBER  ↓
```

The desired function is selected as shown above and subsequently accessed by pressing the  key.

### 3.3 Numeric Data Input

Most charger operations only require the input of either field data denoted by the down arrow key shown next to the modifiable data thus:



or the use of numeric data shown by preloaded numeric values and a flashing cursor thus:



For field data input repeated use of the down arrow key would cycle through all the available permutations for the particular example. Once the desired value is found this is selected by pressing


the  key.

For numeric data input the use of the



keys will insert corresponding numbers and decimal point as appropriate. The back arrow

key  will erase the previously entered number allowing for corrections.

At any time with any data entry or menu selections the  key will abort whatever is being done and revert back to the charger default screen.

## 4 Connecting A Battery

Provided with the TS1340+ is one set of leads terminated with 8mm Ring Crimp Connectors. These leads are specially made and have a separate sense wires running in parallel with each of the heavy current charge/discharge wires. The 8mm ring crimps should be fitted with suitable battery connectors to suit the battery being charged.

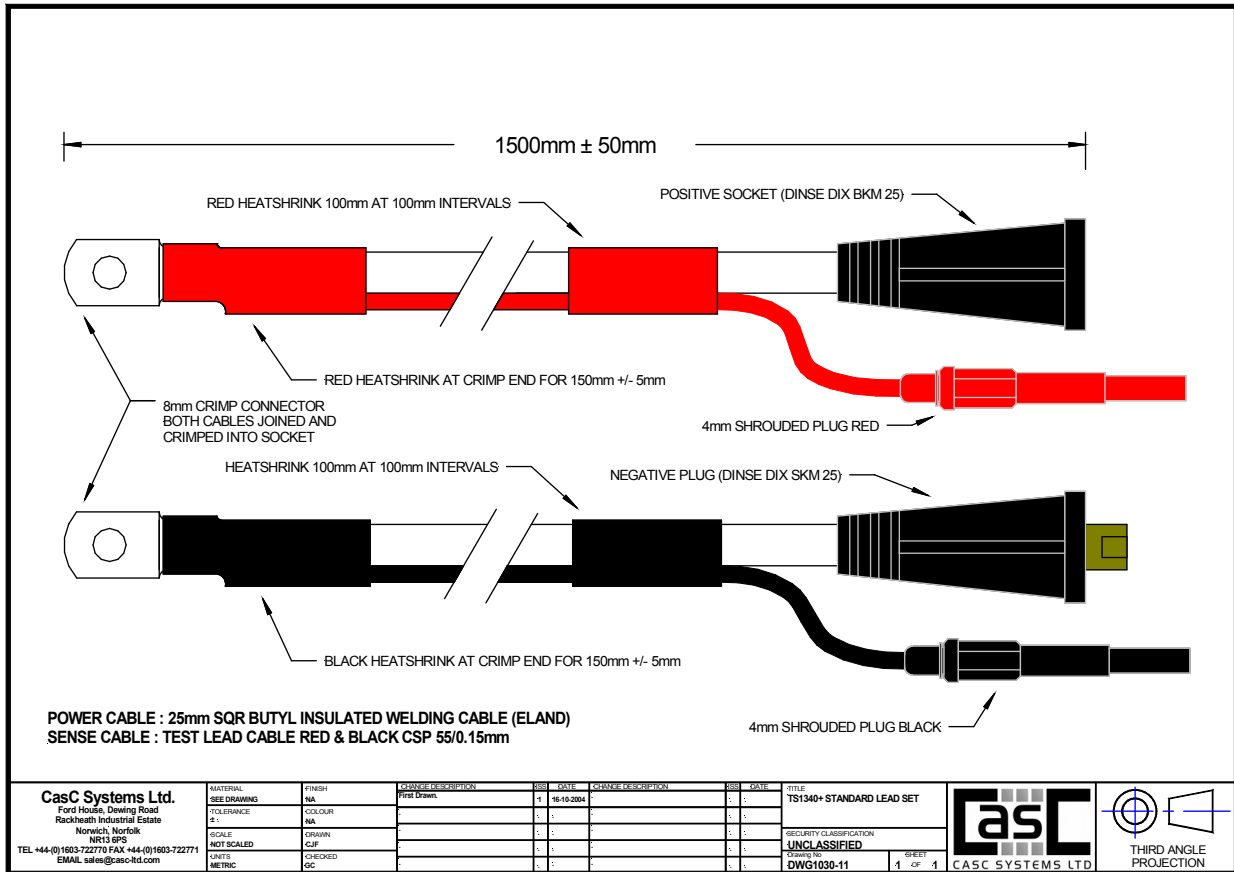
Always connect the battery leads to the TS1340+ before attempting to connect the battery to be charged/tested. All four leads must be connected to the TS1340+. The heavy welding style connectors first and then the appropriate sense wires. Black plug to Black Socket and Red plug to Red socket.



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Once the charger leads are connected to the TS1340+ then the battery can be connected.

**STANDARD LEAD SET SUPPLIED WITH EQUIPMENT**



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

## 5 Battery Discharge Operation

The modes of operation are the same for both lead acid and alkaline batteries, so discharge parameters entered are the same for both types. Therefore the references in this section will be made to refer to either type.

### 5.1 Parameters Required

The TS1340+ requires three basic parameters to be entered for this function.

a) Test Trip Voltage.

The test trip voltage is important and must be entered on custom library data because the TS1340+ uses this to define the point at which the battery has reached it's set discharged point

b) Test discharge current.

During the period of discharge the TS1340+ will regulate the current drawn from the battery at this level, regardless of terminal voltage.

c) Test time.

The maximum time that the test must perform, before being terminated.

### 5.2 Test Operation

The test is performed by discharging the battery by the current set in (b), for a maximum time set in (c).

If a battery achieves this target it is considered to be 100% or more efficient.

If the battery terminal voltage falls to (a), then the TS1340+ will terminate the process and report the capacity as a percentage of elapsed time.

It is important that when entering custom library entries that the manufacturers recommendations are referred to for capacity test parameters.

As a general guide it is usual to have typically the ampere/hour rating of the battery as the discharge current and the time set to one hour. The termination voltage us set to typically 20V for a 24V battery.

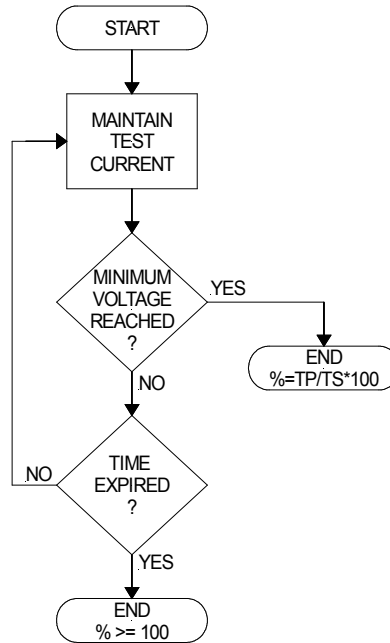
Example:

For a 24V 44A/H battery the following parameters would set.

Trip Voltage	20	Volt
Discharge Current	44	Ampere
Time	1	Hour

If the battery under test fails with by falling to the trip voltage after 55 minutes then it's capacity will be reported as 91.6%. Calculated thus: -  $(55m / 60m * 100\%) = 91.6\%$

CAPACITY TEST PROCESS FLOW



### 5.3 Starting A Capacity Test

Follow the following instructions for performing a capacity test on a NSN listed battery. In this example we use battery NSN 6140-99-770-2058 as an example. Please substitute the correct battery NSN where appropriate.

Connect battery.  
 Apply power to the TS1340+

```

TS 1340+   MAIN MENU   7 - 05 - 2001   16 : 30 : 15
PERFORM CHARGE / TEST USING NSN NUMBER   ↓
    
```

Press 

```

ENTER BATTERY NUMBER
NSN 6140 - - -
    
```

Press             

```

HAWKER 9750 - 0741   REFER : AP113C - 0001 - 1
NSN 6140 - - -       RE - ENTER TO CONFIRM
    
```

Verify that the correct battery has been selected.

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Press

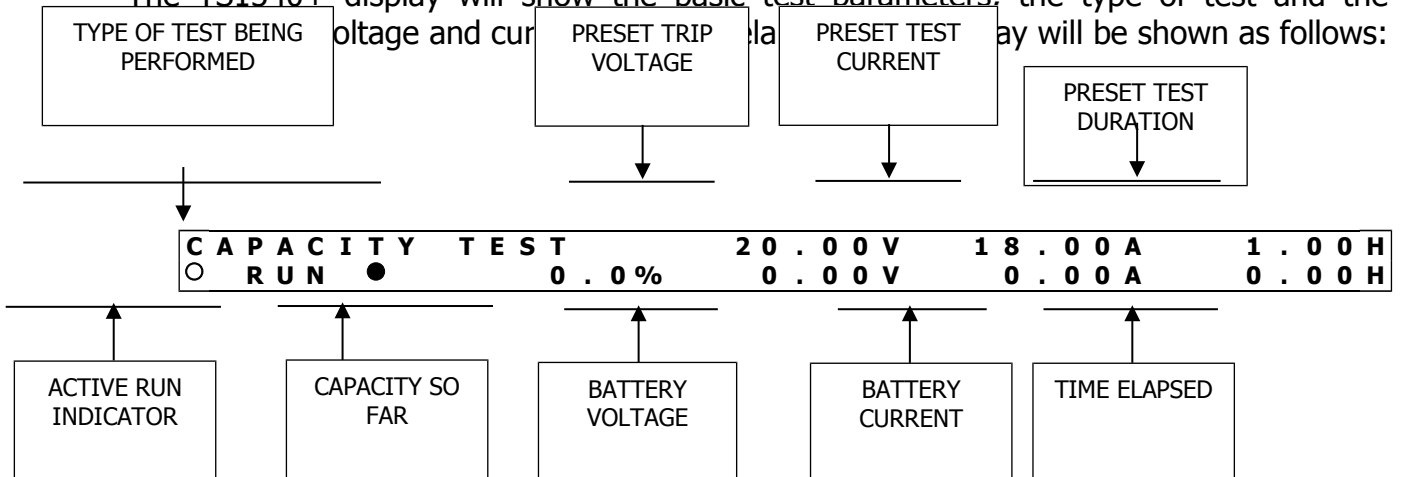
SELECT PROCESS REQUIRED FOR THIS BATTERY CAPACITY TEST ↓

Press

START CAP TEST  
END VOLTS 20.0V AMPS 18.0A TIME 1.0H

Press

The TS1340+ display will show the basic test parameters, the type of test and the voltage and current. The display will be shown as follows:



### 5.4 Capacity Test Termination

Following the end of test, the TS1340+ will sound the audible alarm until any key on the key panel is pressed. The display will show the capacity test values until another key is pressed, at which time if a printer is connected will print the test results. The display will then resume the normal default mode as follows:

TS1340+ MAIN MENU 7-05-2001 16:30:15  
PERFORM CHARGE/TEST USING NSN NUMBER ↓

## **6 Battery Charge Operation**

### **6.1 Lead Acid Constant Voltage Charge**

#### **6.1.1 Parameters Required**

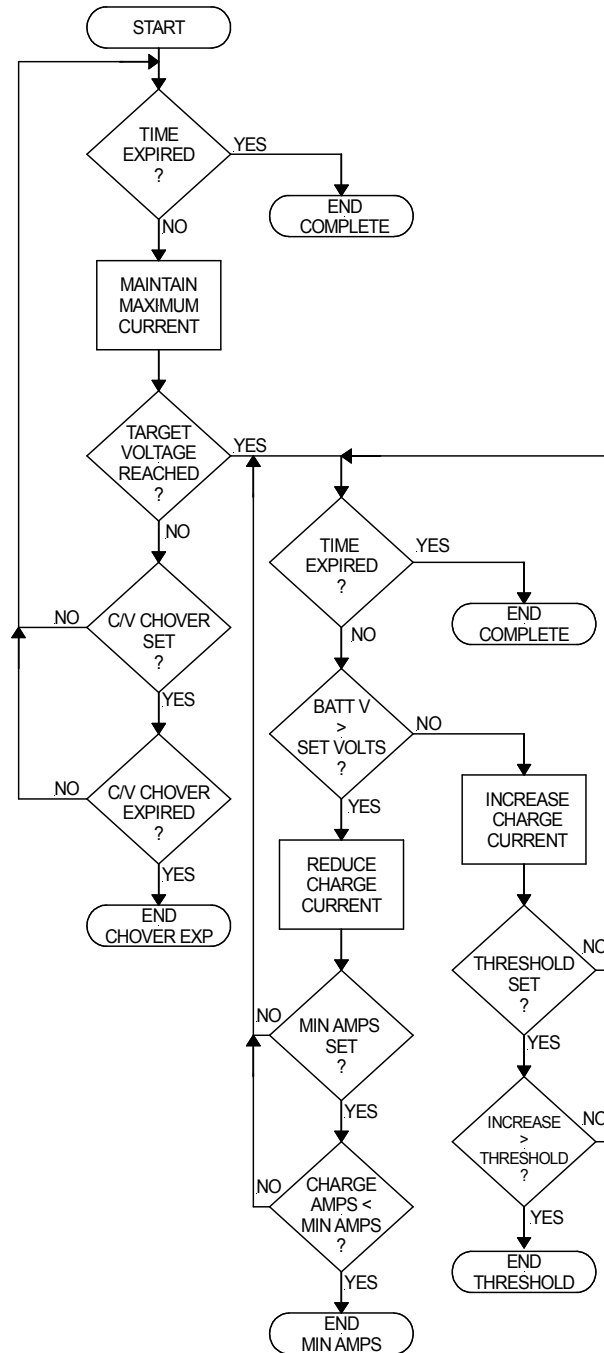
- a) Target constant voltage.  
This is the constant voltage target value that the charger will maintain during the charge cycle.
- b) Maximum charge current.  
This value of current is the maximum current that the charger will charge the battery at before it achieves its constant voltage mode.
- c) Duration of complete charge.  
This time is the maximum time that the charger is to charge the battery before termination.
- d) Minimum charge current.  
Sets the value of current that when reached terminates the charge process.  
  
This value is optional and should be set to zero if not required.
- e) Current threshold.  
This sets a safety point that once the charger has reached its maximum current: the current would normally fall. If the charge current then proceeds to rise to a value greater than this setting then the charge process is terminated, indicating that there is a potential problem with the battery.  
  
This value is optional and should be set to zero if not required.
- f) Current to potential changeover time.  
If the target voltage has not been reached within this time then the charge process is terminated indicating a battery fault.  
  
This value is optional and should be set to zero if not required.

### **6.1.2 Charge Operation**

The charge process consists of charging the battery at the maximum current (b) until the battery voltage (a) is met. Upon this time it will maintain the battery terminal voltage (a) by regulating the charge current, until either of the following parameters are met.

- The maximum charge time elapsed (c).
- Optionally the charge current drops below the minimum charge threshold (d).
- Optionally the falling charge current rising to a value greater than the current threshold (e).
- Optionally the charger unable to reach the target battery voltage with the preset time (f).

CONSTANT VOLTAGE CHARGE PROCESS FLOW



## **6.2 Lead Acid Constant Current Charge**

### **6.2.1 Parameters Required**

- a) Battery Nominal Voltage.  
This is the normal nominal voltage of the battery to be charged.
- b) Battery charge current.  
This is constant current required to charge the battery.
- c) Battery overcharge voltage.  
This is the overcharge voltage of the battery.

### **6.2.2 Charge Operation**

At the start of charge the charger will monitor the open circuit voltage of the battery before starting. It will use this value to calculate the approximate duration of the constant current charge.

This is based on the following algorithm: -

$$\text{DURATION} = -(\text{OCV} - (\text{NOMINAL} + (\text{NOMINAL} * 0.075))) * (199.2 / \text{NOMINAL})$$

Where:

DURATION: LENGTH OF CHARGE IN HOURS  
 OCV: BATTERY OPEN CIRCUIT VOLTAGE  
 NOMINAL: BATTERY NOMINAL VOLTAGE

This algorithm has been derived from the specifics of MINISTRY OF DEFENCE - AIRCRAFT BATTERIES GENERAL AND TECHNICAL INFORMATION AP113c-0001-1 3rd edition.

The following table illustrates the source of data that was used to derive the algorithm.

Typical charge rates are:

Battery Capacity	Constant Current Charge Rate
40AH	3.0A
25AH	2.0A
18AH	1.4A

Typical Charge Times would be:

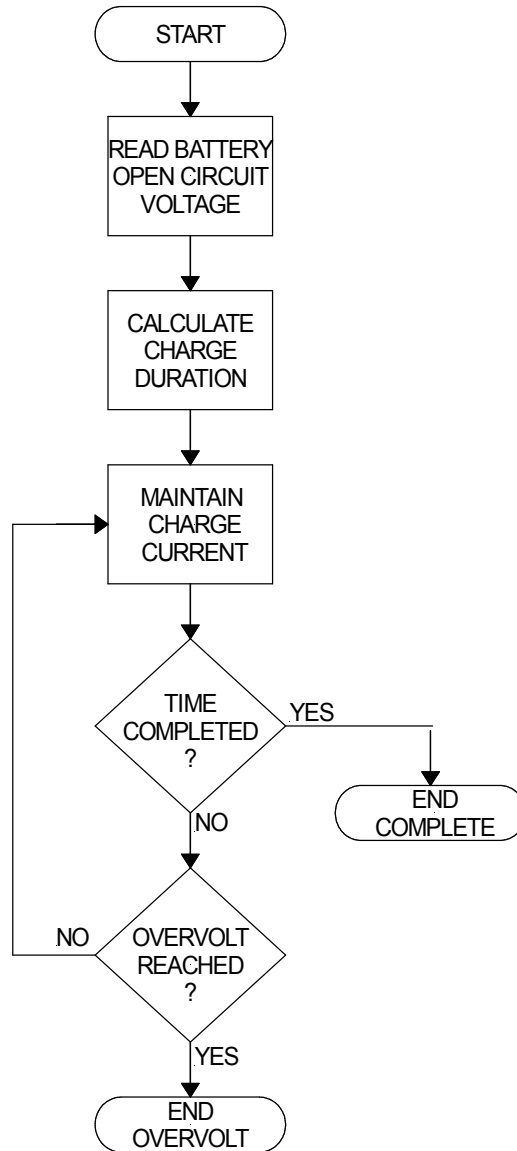
Battery OCV	Approximate Capacity	Charge Time Hours
25.8V	100%	0H
25.5V	80%	3H
25.2V	65%	5.5H
24.8V	50%	8H
24.6V	40%	9.5H



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Battery OCV	Approximate Capacity	Charge Time Hours
24.2V	20%	13H
24.0V	10%	14.2H
<23.8V	0%	16H

CONSTANT CURRENT CHARGE PROCESS FLOW



## **6.3 Alkaline 0.1c & 0.2c Charge**

### **6.3.1 Parameters Required**

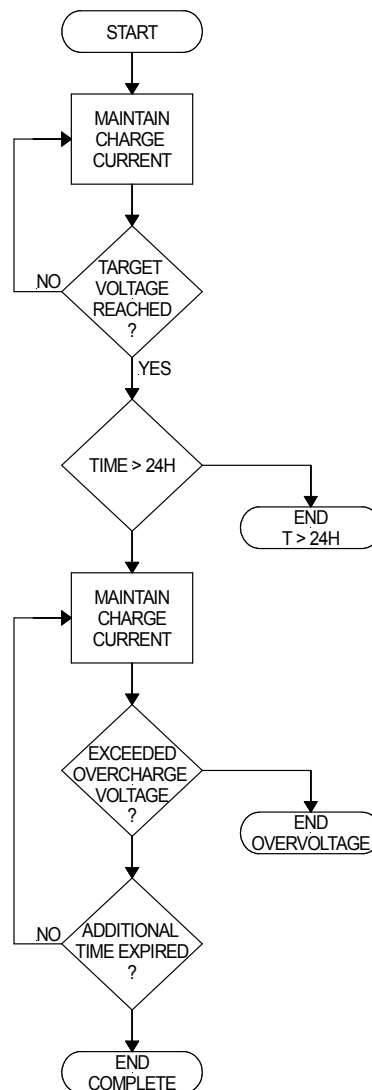
- a) Overcharge Voltage  
This voltage is the setting, which defines when the battery has reached an overcharged state.
- b) Target Voltage  
This voltage is the charge voltage aimed for.
- c) Charge Current  
This is usually one tenth for 0.1C or one fifth for 0.2C of the battery capacity, i.e. for a 44A/H battery this would be set to 4.4A or 8.8A respectively
- d) Additional Charge Time  
This time defines the additional charge time upon the target voltage being achieved.

### 6.3.2 Charge Operation

The TS1340+ will charge the battery at the current defined in (c) until the target voltage (b) is reached, at which time it will then continue to charge the battery at the current (c) until the additional time (d) has passed at which time the charge will stop. If during the additional time (d) the battery terminal voltage reached the overcharge voltage (a) then the charge will stop.

Note if the target voltage is not attained within 24 Hours the charger will stop the process with a "time greater than 24H" warning.

#### 0.1C & 0.2C PROCESS FLOW



## ***6.4 Alkaline Two And Three Step Charge***

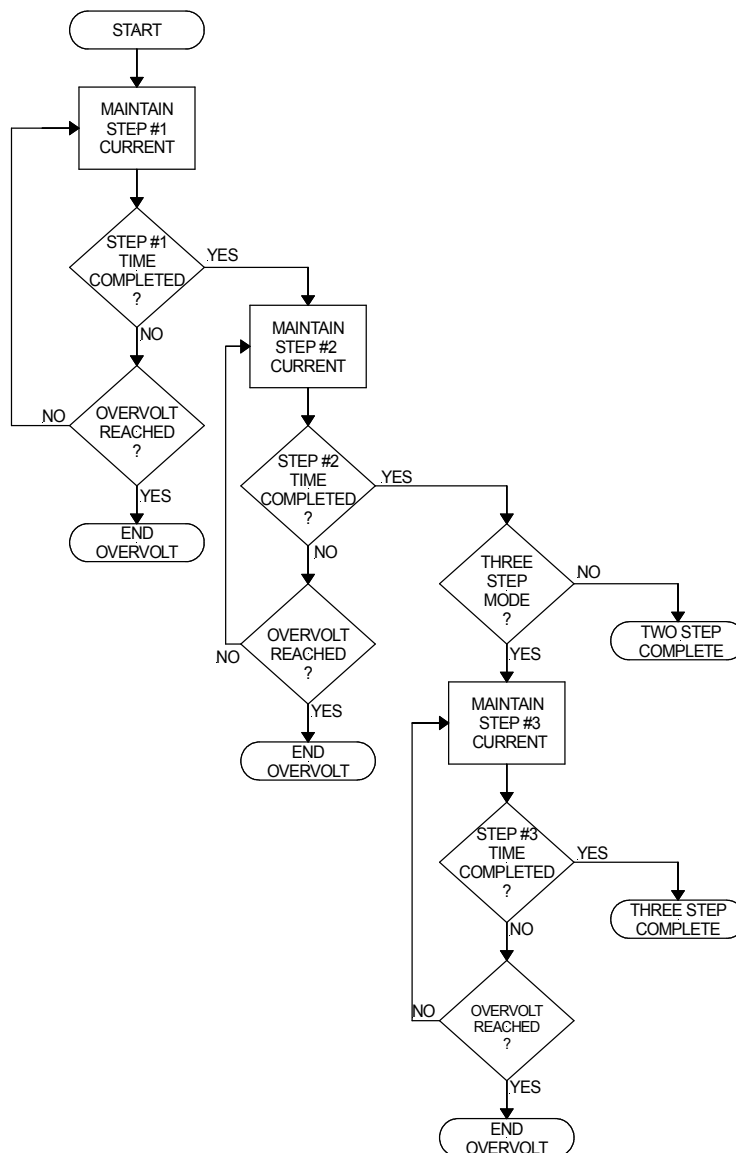
### **6.4.1 Parameters Required**

- a) Step charge current  
This consists of one two or three charge current values.
- b) Step charge duration  
For each step a value of time for the duration of the charge must be set.
- c) Battery Overcharge Voltage  
This voltage is the setting, which defines when the battery has reached an overcharged state.

### 6.4.2 Charge Operation

In this mode the charger will start the charge at the step one current (a) for the duration of charge (b). Once the duration for this step has expired it will switch to step two and charge at the step two current for the duration specified. Once this step has expired it will then switch to step three and perform the charge using the step three parameters. During all steps of the charge it will monitor the battery terminal voltage and stop the charge if this is exceeded. If no current is specified during any one of the steps but a valid duration the charge will effectively rest for that duration. This is a useful feature where using three-step charge the middle step can "rest" the battery before completing the final charge.

TWO AND THREE STEP PROCESS FLOW



## 6.5 Charging Lead Acid (Pb) Batteries

Follow the following instructions for performing a charge on a NSN listed battery.

Connect battery.

Apply power to the TS1340+

```
TS1340+  MAIN MENU      7-05-2001   16:30:15
PERFORM CHARGE/TEST USING NSN NUMBER  ↓
```

Press



```
ENTER BATTERY NUMBER
NSN 6140 - - -
```

Press



```
HAWKER 9750-0741      REFER: AP113C-0001-1
NSN 6140 - - -      RE-ENTER TO CONFIRM
```

Verify that the correct battery has been selected.

Press



```
SELECT PROCESS REQUIRED FOR THIS BATTERY
CAPACITY TEST  ↓
```

Press



### 6.5.1 For Cv Charge

```
SELECT PROCESS REQUIRED FOR THIS BATTERY
CV CHARGE      ↓
```

Press



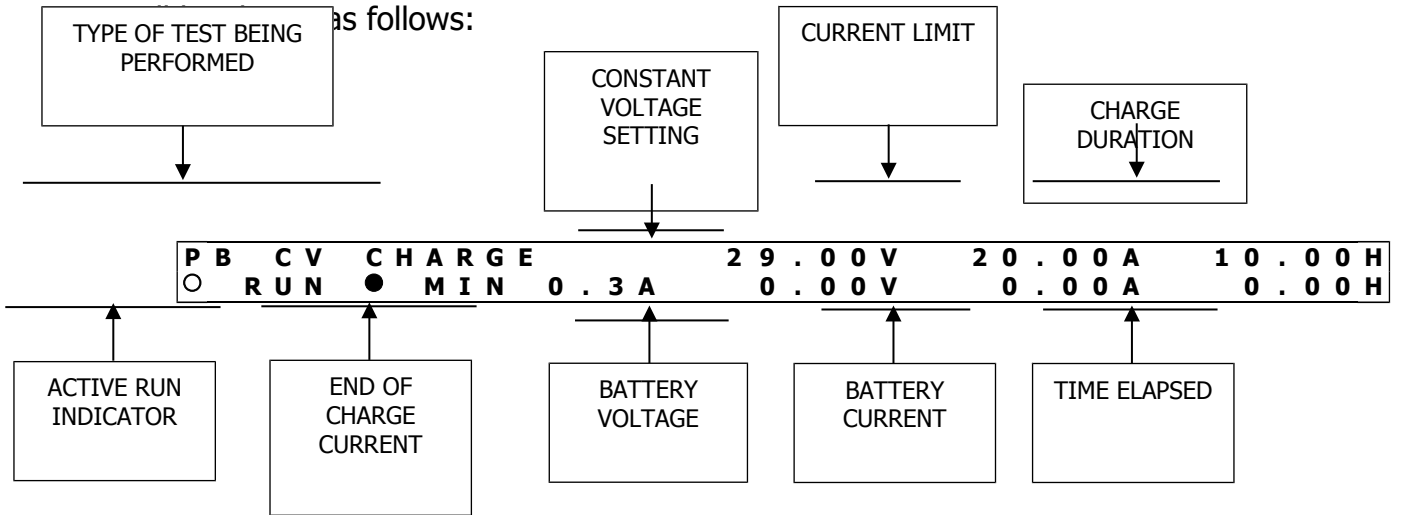
```
START CV CHARGE 29.0V  20.0A  HRS  4.0H
MIN AMPS 0.25A  CHOVER 1.0H  CTHSH 1.0A
```

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Press 

The TS1340+ display will show the basic **CONSTANT VOLTAGE CHARGE** parameters, the type of test and the present valid voltage and current and time elapsed. This display

as follows:



### 6.5.2 For CC Charge

Press 

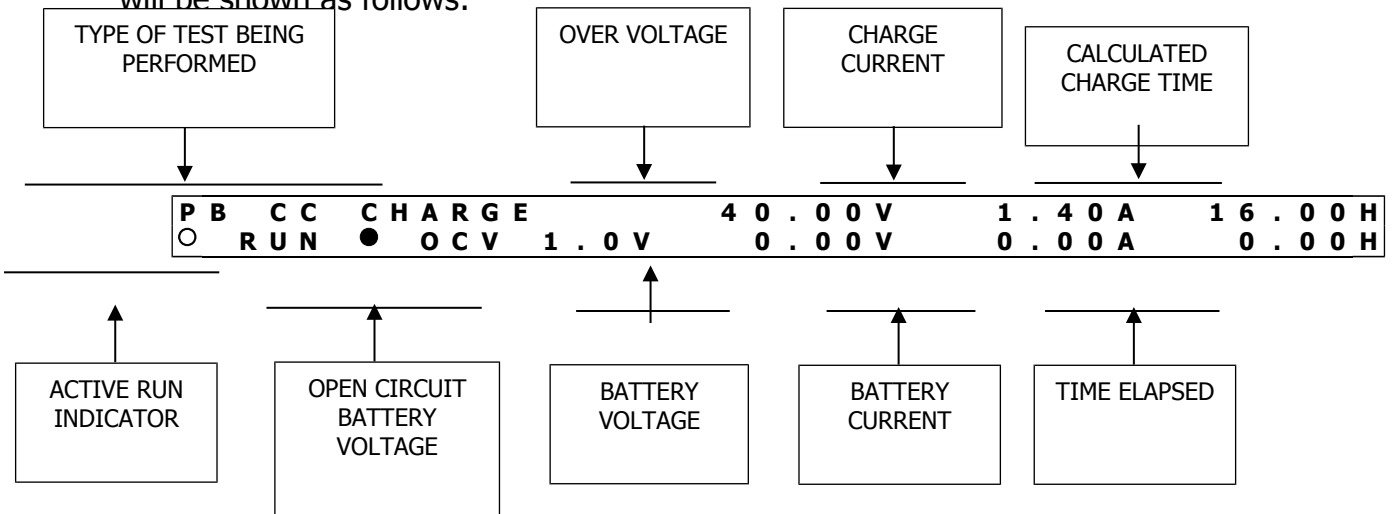
SELECT PROCESS REQUIRED FOR THIS BATTERY  
 CC CHARGE ↓

Press 

START CC CHARGE      BATTERY VOLTAGE 24.0A  
 MAX VOLTS 40.0V      AMPS 1.4A      TIME 16.0H

Press 

The TS1340+ display will show the basic **CONSTANT CURRENT CHARGE** parameters, the type of test and the present valid voltage and current and time elapsed. This display will be shown as follows:





## **6.6 Charging Nickel Cadmium (NiCd) Batteries**

Follow the following instructions for performing a charge on a NSN listed battery.

- i. Connect battery.
- ii. Apply power to the TS1340+

```
TS1340+  MAIN MENU  7-05-2001  16:30:15
PERFORM CHARGE/TEST USING NSN NUMBER  ↓
```

Press



```
ENTER BATTERY NUMBER
NSN 6140 - - -
```

Press



```
VARTA F20/40H1C  REFER: AP113C-0001-1
NSN 6140 - - -  RE-ENTER TO CONFIRM
```

Verify that the correct battery has been selected.

Press



```
SELECT PROCESS REQUIRED FOR THIS BATTERY
CAPACITY TEST  ↓
```

### 6.6.1 For Three Step Charge

Press 

```

SELECT PROCESS REQUIRED FOR THIS BATTERY
3 STAGE CHARGE ↓
    
```

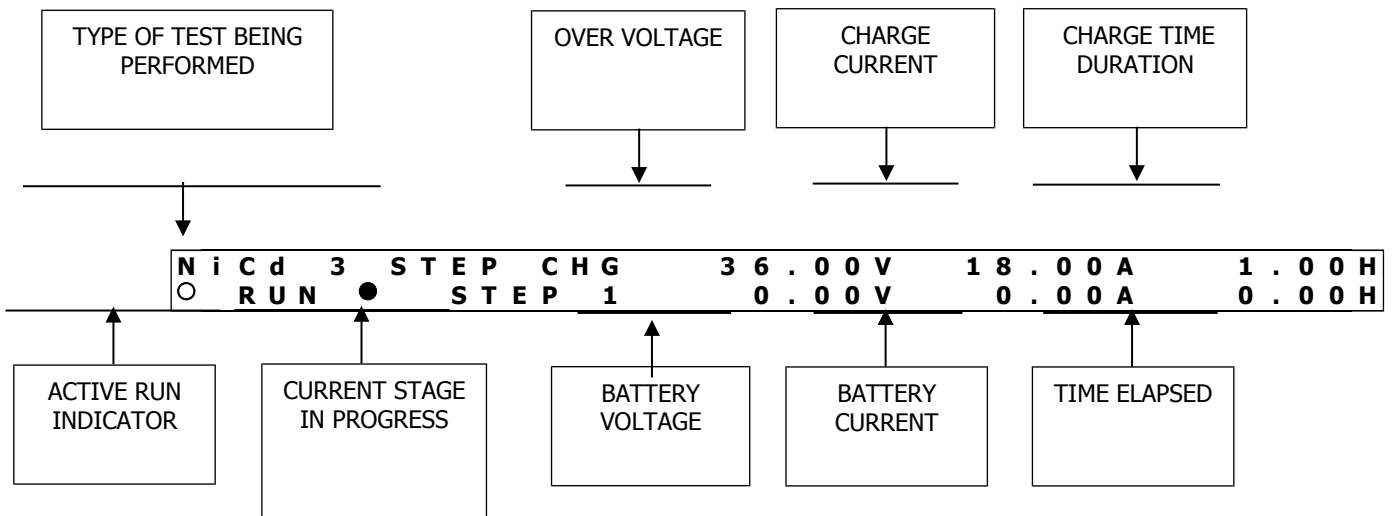
Press 

```

START THREE STEP CHARGE #1 18.0A 1.0H
#2 9.0A 2.0H #3 4.0A 7.0H OCHG 36.0V
    
```

Press 

The TS1340+ display will show the basic **THREE STEP CHARGE** parameters, the type of test and the present valid voltage and current and time elapsed. This display will be shown as follows:



### 6.6.2 For Two Step Charge

Press 

**S E L E C T   P R O C E S S   R E Q U I R E D   F O R   T H I S   B A T T E R Y**  
**3   S T A G E   C H A R G E   ↓**

Press 

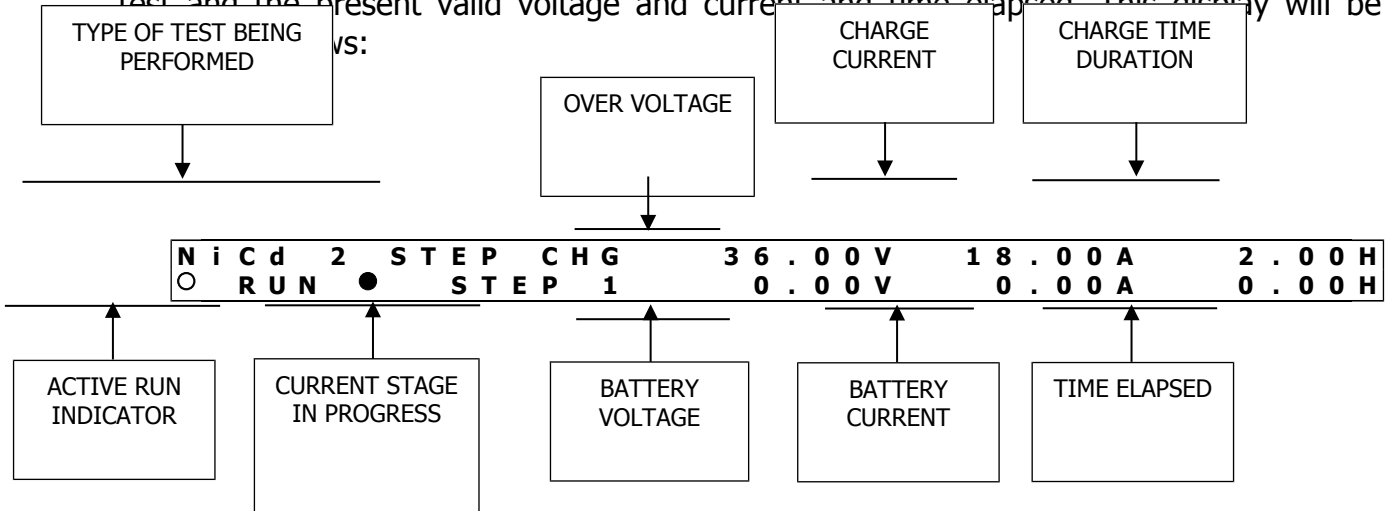
**S E L E C T   P R O C E S S   R E Q U I R E D   F O R   T H I S   B A T T E R Y**  
**2   S T A G E   C H A R G E   ↓**

Press 

**S T A R T   T W O   S T E P   C H A R G E**                      **# 1   1 8 . 0 A   2 . 0 H**  
**# 2   8 . 0 A   2 . 5 H**    **0 C H G   3 6 . 0 V**

Press 

The TS1340+ display will show the basic **TWO STEP CHARGE** parameters, the type of test and the present valid voltage and current and time elapsed. This display will be



### 6.6.3 For C \* 0.1 Charge

Press 

SELECT PROCESS REQUIRED FOR THIS BATTERY  
3 STAGE CHARGE ↓

Press 

SELECT PROCESS REQUIRED FOR THIS BATTERY  
2 STAGE CHARGE ↓

Press 

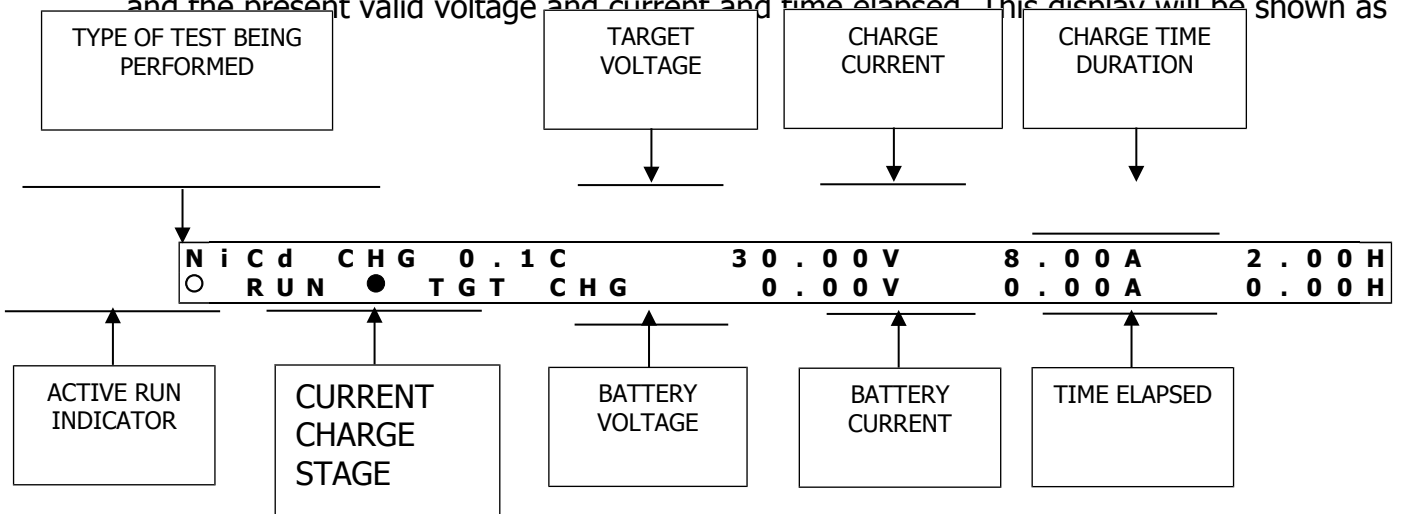
SELECT PROCESS REQUIRED FOR THIS BATTERY  
C \* 0.1 CHARGE ↓

Press 

START 0.1C CHARGE TGT V 30.0V AMPS 8.0A  
OVERCHG VOLTS 36.0V ADD CHG TIME 2.0H

Press 

The TS1340+ display will show the basic **0.1C CHARGE** parameters, the type of test and the present valid voltage and current and time elapsed. This display will be shown as



### 6.6.4 For C \* 0.2 Charge

Press 

S E L E C T   P R O C E S S   R E Q U I R E D   F O R   T H I S   B A T T E R Y  
3   S T A G E   C H A R G E ↓

Press 

S E L E C T   P R O C E S S   R E Q U I R E D   F O R   T H I S   B A T T E R Y  
2   S T A G E   C H A R G E ↓

Press 

S E L E C T   P R O C E S S   R E Q U I R E D   F O R   T H I S   B A T T E R Y  
C   \*   0 . 1   C H A R G E ↓

Press 

S E L E C T   P R O C E S S   R E Q U I R E D   F O R   T H I S   B A T T E R Y  
C   \*   0 . 2   C H A R G E ↓

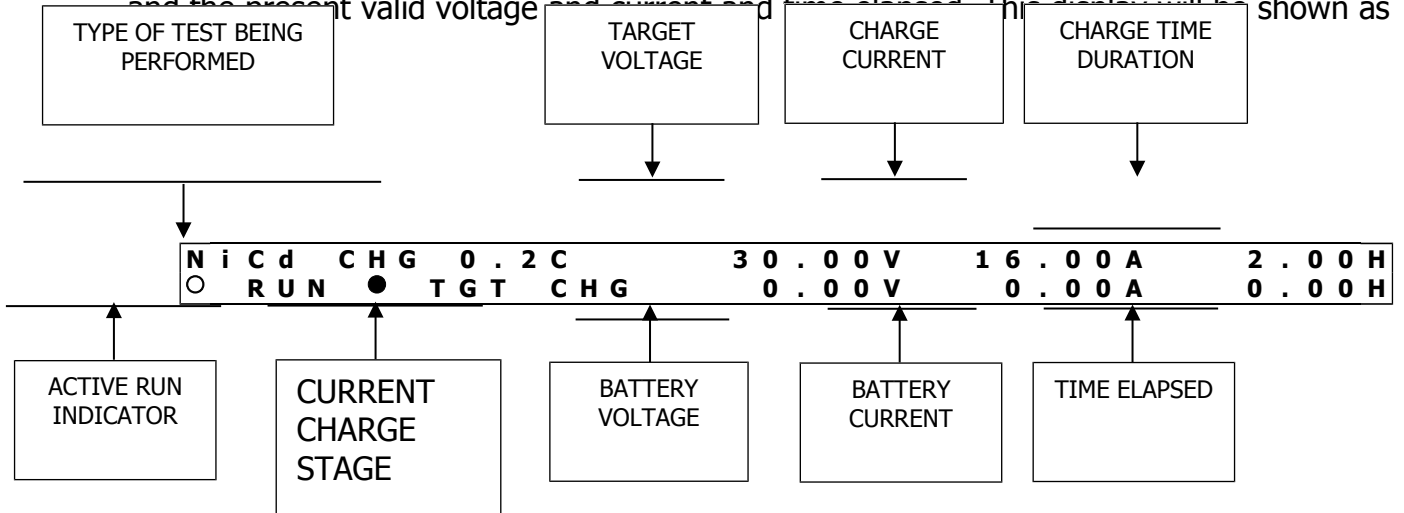
Press 

S T A R T   0 . 2 C   C H A R G E   T G T   V   3 0 . 0 V   A M P S   1 6 . 0 A  
O V E R C H G   V O L T S   3 6 . 0 V   A D D   C H G   T I M E   2 . 0 H

Press 

**Battery Charger Analyser : Operator Manual**

The TS1340+ display will show the basic **0.2C CHARGE** parameters, the type of test and the present valid voltage and current and time elapsed. This display will be shown as



## 7 End Of Process Conditions

For each process there are common sets of conditions, which terminate a charge or test. These are listed separately here with their effects on each mode of operation.

### **STOPPED**

This condition is met when the charger has no previous process results to display.

### **↓VOLTS↓**

In test mode3 this indicates that the test trip voltage has been met.

### **↑VOLTS↑**

In charge mode where applicable this indicates that the charge was stopped due to an over voltage condition being met. This is an indication of a faulty battery or incorrect charge regime being used for the battery connected.

### **TIME UP**

In both Charge and Test modes, this condition will be met when the process has reached the maximum time set.

### **↑TEMP↑↑**

This condition indicates a problem with the TS1340+. It indicates that the heat sink temperature has exceeded the maximum operating conditions. This could be due to a fault on the heat sink board, calibration data out of specification, or extreme ambient temperature exceeding the recommended limitations of the unit.

### **↓AMPS↓↓**

This condition is met when using constant voltage charging of lead acid batteries. It indicates that the minimum current has been met and the battery is now fully charged.

### **THRESH**

This condition is met when using lead acid batteries in Constant Voltage charge mode. During charging the current will fall from the maximum current limit set once the battery becomes charged. If the current should rise above the current threshold value then the charge will terminate, and the battery is deemed to be faulty.

### **ABORTED**

This condition is met when the operator pressing the STOP key terminates the charge or

test.

**CV FAIL**

This condition is specific to Lead Acid batteries being charged in constant voltage mode. If the current being applied to the battery does not fall below the current limit value within the current voltage changeover time then this condition is met and the battery is considered faulty.

**BATTREV**

This condition will terminate and Tests or Charges if the TS1340+ detects reverse battery connection.

**T > 24H**

This condition is met if on a 0.1C or 0.2C charge the switch over voltage is not reached. This prevents the charger continually charging the battery in case a fault condition has occurred.

**PSUFAIL**

This condition is met if on charge one or both of the power supplies drop out. This condition can occur if the thermal trips fitted to the transformers fail or if there is an electrical failure. Allow the unit to cool down before starting another test. If this condition is shown upon starting a test then one or both of the power supplied have failed and service of the unit will be required.

**? ERROR ?**

This condition will occur if there is a problem with the demand circuit. This can occur if battery is being capacity tested at voltages & currents outside the units capabilities.

**↑VOLTS↑**

This condition will occur in constant voltage charge mode, if the battery voltage is approximately 8.0V or more above the constant voltage set point.



## **8 Report Of Crashed Message**

This applies to units with firmware revisions below 11. Firmware issues including and above 11.0 do not have this facility as it is not required. The unit has a built in facility which ensured that it is restarted should a fault occur with the microprocessor part. This has been implemented to force the unit to restart so that the battery connected is not subjected to high rates of current during the fault condition. If during operation the unit beeps and displays the message "**CRASHED**" on the display, followed by the normal powered up display, this is indicative of this condition arising. If this repeatedly occurs along with other anomalies the unit has developed a fault and should be taken out of commission and moved to the repair facility.

## 9 Preview Previous Test Results

The TS1340+ has the ability to re-display the end results of the last test performed by selecting the correct menu and pressing enter as follows.

Display Shows:

```

TS1340+  MAIN MENU      7-05-2001  16:30:15
PERFORM CHARGE / TEST  USING NSN NUMBER  ↓
    
```

Press 

```

TS1340+  MAIN MENU      7-05-2001  16:30:15
PREVIEW RESULTS OF LAST CHARGE OR TEST  ↓
    
```

Press 

```

NiCd CHG 0.2C          30.00V  16.00A  2.00H
ABORTED TGT CHG       0.00V   0.00A  0.00H
    
```

↑  
 DISPLAYS THE REASON THE LAST TEST WAS TERMINATED

The display will show this information until any key on the keypad is pressed.

## 10 Printing Previous Results

After an operation has been completed the previous results can be re-printed by accessing this function as follows:

```
TS1340+   MAIN MENU       7-05-2001   16:30:15
PERFORM CHARGE / TEST USING NSN NUMBER   ↓
```

Press  

```
TS1340+   MAIN MENU       7-05-2001   16:30:15
PRINT RESULTS OF LAST CHARGE OR TEST     ↓
```

Press 

If a printer is connected and ready the previous test results will be sent to it and the display will resume to the main menu.

An example of the print is shown below:

```
RESULTS OF ACTION PERFORMED BY TS1340+

      NSN: BATTERY NSN 6140-12-326-1798
      MODEL: VARTA F20/40H1C
      TYPE: NiCd
      NOMINAL VOLTS: 24.0V
      DATE: 5-06-2001
      START TIME: 10:15
      END TIME: 10:21
      MODE: CHARGE 0.2C
      OVERCHARGE VOLTS: 36.0V
      TARGET VOLTAGE: 30.0V
      CHARGE CURRENT: 8.0A
      ADDITIONAL TIME: 2.0H
      TERMINATED BY: USER ABORTED
      END VOLTAGE: 0.0V
      END TIME: 0.09H
```

## 11 Entering Or Correcting Time Of Day And Date

The TS1340+ has an inbuilt clock calendar, which is used for time stamping charge and test operations. Usually the time set does not need changing, but from time to time the clock may need to be reset to cater for time zones etc. To change the clock the following operations must be observed.

```

TS1340+   MAIN MENU       7-05-2001   16:30:15
PERFORM CHARGE/TEST USING NSN NUMBER   ↓
    
```

Press   

```

TS1340+   MAIN MENU       7-05-2001   16:30:15
MODIFY CURRENT TIME OF DAY AND DATE   ↓
    
```

Press 

```

ENTER TIME AND DATE
5-06-2001   11:08:09
    
```

To change the date and time to 12<sup>th</sup> February 2000 at 12:15:00 the following sequence of key presses must be observed:



The display will then show:

```

* * * * TIME & DATE CHANGED * * * *
    
```

For a period of two seconds before reverting back to the main menu. If any data is entered incorrectly the display will show:

```

* * * * ERROR ! INVALID ENTRY * * * *
    
```

For a period of two seconds before reverting back to the Date and Time entry screen whereby the correct data can be entered.

## 12 Creating Or Modifying Custom Library Entry

The TS1340+ has the standard set of Nato Stock Listed batteries as used by the UK Ministry of Defence. The data held in the charger for these entries cannot be user modified in any way. From time to time batteries may require servicing which are not part of this set or existing batteries which may require different charge or test parameters. The TS1340+ has the facility to add new part numbers (based on the NSN format) and modify them as and when required.

To create or modify a new entry (for our example we will create NSN 6140-99-000-0000) follow these steps.

TS 1340+	MAIN MENU	7 - 05 - 2001	16 : 30 : 15
PERFORM CHARGE / TEST USING NSN NUMBER			↓

Press    

TS 1340+	MAIN MENU	7 - 05 - 2001	16 : 30 : 15
CREATE OR MODIFY CUSTOM LIBRARY ENTRY			↓

Press 

ENTER BATTERY NUMBER			
NSN	6 14 0 -	-	-

Press      


At this point the display will ask for battery type. Follow the instructions according to type as follows:

### 12.1 Creating Lead Acid (Pb) Library Entry




NEW CUSTOM BATTERY : SELECT TYPE  
P B ↓

Press 




BATTERY NOMINAL VOLTAGE 0.0V

Type the batteries nominal voltage and 




CAPACITY TEST  
END VOLTS 0.0V AMPS xx.xA TIME xx.xH

Type the termination voltage then  followed by the test current then  then the test duration (usually 1.0H) followed by .



Pb CV CHARGE  
VOLTS 0.0V MAX AMPS xx.xA TIME xx.xH

Type the constant voltage charge value followed by  then the current limit amps then  and the max charge duration and .

Pb CV CHARGE  
MIN AMPS 0.00A CHOVER xx.xA CTHSH xx.xA

Type the end of charge minimum current followed by  the current potential changeover and  the current threshold amps and .

Pb CC CHARGE  
CHRG AMPS 0.0A MAX VOLTS xx.xV

Type the constant current amps and  then the max volts and . The battery charger will then display the following:

ENTRY WRITTEN TO MEMORY

The display will then return to the main menu, where this new battery can now be selected.

## 12.2 Creating Nickel Cadmium (NiCd) Library Entry

```
NEW CUSTOM BATTERY : SELECT TYPE
PB ↓
```

Press 


```
NEW CUSTOM BATTERY : SELECT TYPE
NICD ↓
```

Press 



```
BATTERY NOMINAL VOLTAGE 0.0V
```

Type the batteries nominal voltage and 


```
CAPACITY TEST
END VOLTS 0.0V AMPS xx.xA TIME xx.xH
```

Type the termination voltage then  followed by the test current then  then the test duration (usually 1.0H) followed by .

```
NiCd CHG 0.1C
TARGET VOLTS 0.0V CHARGE AMPS xx.xA
```

Type in the target voltage then  and then the charge current followed by 

```
NiCd CHG 0.1C
OVERCHG VOLTS 0.0V ADD CHG TIME xx.xH
```



Type in the overcharge voltage then  and then the additional charge time followed by

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```
N i C d   C H G   0 . 2 C
T A R G E T   V O L T S   0 . 0 V   C H A R G E   A M P S   x x . x A
```

Type in the target voltage then  and then the charge current followed by 



```
N i C d   C H G   0 . 2 C
O V E R C H G   V O L T S   0 . 0 V   A D D   C H G   T I M E   x x . x H
```

Type in the overcharge voltage then  and then the additional charge time followed by 



```
N i C d   2   S T E P   C H G
S T E P   # 1   A M P S   0 . 0 A   T I M E   x x . x H
```

Type in the step 1 amps then  and then the charge time followed by 



```
N i C d   2   S T E P   C H G
S T E P   # 2   A M P S   0 . 0 A   T I M E   x x . x H
```

Type in the step 2 amps then  and then the charge time followed by 



```
N i C d   3   S T E P   C H G
S T E P   # 1   A M P S   0 . 0 A   T I M E   x x . x H
```

Type in the step 1 amps then  and then the charge time followed by 

```
N i C d   3   S T E P   C H G
S T E P   # 2   A M P S   0 . 0 A   T I M E   x x . x H
```

Type in the step 2 amps then  and then the charge time followed by 

```
N i C d   3   S T E P   C H G
S T E P   # 3   A M P S   0 . 0 A   T I M E   x x . x H
```

Type in the step 3 amps then  and then the charge time followed by  The battery charger will then display the following:



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**E N T R Y   W R I T T E N   T O   M E M O R Y**

The display will then return to the main menu, where this new battery can now be selected.

## 13 Default Battery Library

### 13.1 Lead Acid (PB) Batteries

NSN		MAKE/MODEL		NOMINAL VOLTAGE	
<b>6140-00-406-2633</b>		<b>CONCORDE BB 638/U</b>		<b>24.0V</b>	
TEST	<b>31.0A</b>	TIME	<b>1.0H</b>	TRIP	<b>21.0V</b>
CC CHG	<b>NOT SET</b>	TIME	<b>NOT SET</b>	OCHGV	<b>NOT SET</b>
CVCHG	<b>29.0V</b>	TIME	<b>6.0H</b>	MAXA	<b>20.0A</b>
CHEND	<b>0.25A</b>	THRH	<b>1.00A</b>	C/V CHOVER	<b>NOT SET</b>

NSN		MAKE/MODEL		NOMINAL VOLTAGE	
<b>6140-99-016-0102</b>		<b>HAWKER 9750T0663</b>		<b>24.0V</b>	
TEST	<b>25.0A</b>	TIME	<b>1.0H</b>	TRIP	<b>20.0V</b>
CC CHG	<b>2.0A</b>	TIME	<b>0.0H</b>	OCHGV	<b>40.0V</b>
CVCHG	<b>29.0V</b>	TIME	<b>6.0H</b>	MAXA	<b>20.0A</b>
CHEND	<b>0.25A</b>	THRH	<b>1.0A</b>	C/V CHOVER	<b>1.5H</b>

NSN		MAKE/MODEL		NOMINAL VOLTAGE	
<b>6140-99-111-5238</b>		<b>OLDHAM</b>		<b>12.0V</b>	
TEST	<b>50.0A</b>	TIME	<b>1.0H</b>	TRIP	<b>10.0V</b>
CC CHG	<b>0.0A</b>	TIME	<b>0.0H</b>	OCHGV	<b>0.0V</b>
CVCHG	<b>14.5V</b>	TIME	<b>8.0H</b>	MAXA	<b>20.0A</b>
CHEND	<b>0.25A</b>	THRH	<b>1.0A</b>	C/V CHOVER	<b>0.0H</b>

NSN		MAKE/MODEL		NOMINAL VOLTAGE	
<b>6140-99-164-2097</b>		<b>SONNENSCHN A512/6.5S</b>		<b>12.0V</b>	
TEST	<b>6.5A</b>	TIME	<b>1.0H</b>	TRIP	<b>10.0V</b>
CC CHG	<b>0.0A</b>	TIME	<b>0.0H</b>	OCHGV	<b>0.0V</b>
CVCHG	<b>14.4V</b>	TIME	<b>4.0H</b>	MAXA	<b>3.25A</b>
CHEND	<b>0.25A</b>	THRH	<b>0.0A</b>	C/V CHOVER	<b>0.0H</b>

NSN		MAKE/MODEL		NOMINAL VOLTAGE	
<b>6140-99-172-1889</b>		<b>SONNENSCHN A512/24</b>		<b>24.0V</b>	
TEST	<b>24.0A</b>	TIME	<b>1.0H</b>	TRIP	<b>20.0V</b>
CC CHG	<b>0.0A</b>	TIME	<b>0.0H</b>	OCHGV	<b>0.0V</b>
CVCHG	<b>28.8V</b>	TIME	<b>6.0H</b>	MAXA	<b>15.00A</b>
CHEND	<b>0.25A</b>	THRH	<b>1.0A</b>	C/V CHOVER	<b>0.0H</b>

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NSN		MAKE/MODEL		NOMINAL VOLTAGE	
<b>6140-99-185-3799</b>		<b>SONNENSCHNEIN A506/10S</b>		<b>6.0V</b>	
TEST	<b>10.0A</b>	TIME	<b>1.0H</b>	TRIP	<b>5.0V</b>
CC CHG	<b>NOT SET</b>	TIME	<b>NOT SET</b>	OCHGV	<b>NOT SET</b>
CVCHG	<b>7.25V</b>	TIME	<b>4.0H</b>	MAXA	<b>5.0A</b>
CHEND	<b>0.25A</b>	THRH	<b>NOT SET</b>	C/V CHOVER	<b>NOT SET</b>

NSN		MAKE/MODEL		NOMINAL VOLTAGE	
<b>6140-99-187-1815</b>		<b>SONNENSCHNEIN A200</b>		<b>12.0V</b>	
TEST	<b>40.0A</b>	TIME	<b>1.0H</b>	TRIP	<b>10.0V</b>
CC CHG	<b>NOT SET</b>	TIME	<b>NOT SET</b>	OCHGV	<b>NOT SET</b>
CVCHG	<b>14.4V</b>	TIME	<b>8.0H</b>	MAXA	<b>20.0A</b>
CHEND	<b>0.25A</b>	THRH	<b>1.0A</b>	C/V CHOVER	<b>NOT SET</b>

NSN		MAKE/MODEL		NOMINAL VOLTAGE	
<b>6140-99-250-6597</b>		<b>HAWKER ENERGY 9750D07545</b>		<b>24.0V</b>	
TEST	<b>18.0A</b>	TIME	<b>1.0H</b>	TRIP	<b>20.0V</b>
CC CHG		TIME		OCHGV	
CVCHG	<b>29.0V</b>	TIME	<b>4.0H</b>	MAXA	<b>9.0A</b>
CHEND	<b>0.25A</b>	THRH	<b>1.0A</b>	C/V CHOVER	

NSN		MAKE/MODEL		NOMINAL VOLTAGE	
<b>6140-99-306-9711</b>		<b>YUASA NP-24-12B</b>		<b>12.0V</b>	
TEST	<b>24.0A</b>	TIME	<b>1.0H</b>	TRIP	<b>10.0V</b>
CC CHG		TIME		OCHGV	
CVCHG	<b>14.4V</b>	TIME	<b>6.0H</b>	MAXA	<b>20.0A</b>
CHEND	<b>0.25A</b>	THRH	<b>1.0A</b>	C/V CHOVER	

NSN		MAKE/MODEL		NOMINAL VOLTAGE	
<b>6140-99-428-3101</b>		<b>CIBL 6XNM11WL</b>		<b>12.0V</b>	
TEST	<b>64.0A</b>	TIME	<b>1.0H</b>	TRIP	<b>10.0V</b>
CC CHG		TIME		OCHGV	
CVCHG	<b>14.5V</b>	TIME	<b>8.0H</b>	MAXA	<b>20.0A</b>
CHEND	<b>0.25A</b>	THRH	<b>1.0A</b>	C/V CHOVER	

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NSN		MAKE/MODEL		NOMINAL VOLTAGE	
<b>6140-99-500-4803</b>		<b>AC DELCO 30-55</b>		<b>12.0V</b>	
TEST	<b>55.0A</b>	TIME	<b>1.0H</b>	TRIP	<b>10.0V</b>
CC CHG		TIME		OCHGV	
CVCHG	<b>14.5A</b>	TIME	<b>8.0H</b>	MAXA	<b>20.0A</b>
CHEND	<b>0.25A</b>	THRH	<b>1.0A</b>	C/V CHOVER	

NSN		MAKE/MODEL		NOMINAL VOLTAGE	
<b>6140-99-513-2645</b>		<b>TUNGSTONE 12C48</b>		<b>12.0V</b>	
TEST	<b>48.0A</b>	TIME	<b>1.0H</b>	TRIP	<b>10.0V</b>
CC CHG		TIME		OCHGV	
CVCHG	<b>14.5V</b>	TIME	<b>8.0H</b>	MAXA	<b>20.0A</b>
CHEND	<b>0.25A</b>	THRH	<b>1.0A</b>	C/V CHOVER	

NSN		MAKE/MODEL		NOMINAL VOLTAGE	
<b>6140-99-547-1608</b>		<b>LUCAS 15</b>		<b>12.0V</b>	
TEST	<b>50.0A</b>	TIME	<b>1.0H</b>	TRIP	<b>10.0V</b>
CC CHG		TIME		OCHGV	
CVCHG	<b>14.5V</b>	TIME	<b>8.0H</b>	MAXA	<b>20.0A</b>
CHEND	<b>0.25A</b>	THRH	<b>1.0A</b>	C/V CHOVER	

NSN		MAKE/MODEL		NOMINAL VOLTAGE	
<b>6140-99-643-9411</b>		<b>SONNENSCHN A508/3.5S</b>		<b>8.0V</b>	
TEST	<b>3.5A</b>	TIME	<b>1.0H</b>	TRIP	<b>6.7V</b>
CC CHG		TIME		OCHGV	
CVCHG	<b>9.6V</b>	TIME	<b>4.0H</b>	MAXA	<b>2.0A</b>
CHEND	<b>0.25A</b>	THRH		C/V CHOVER	

NSN		MAKE/MODEL		NOMINAL VOLTAGE	
<b>6140-99-730-1885</b>		<b>GATES ENERGY 0809- 0010</b>		<b>4.0V</b>	
TEST	<b>5.0A</b>	TIME	<b>1.0H</b>	TRIP	<b>3.3V</b>
CC CHG		TIME		OCHGV	
CVCHG	<b>4.85V</b>	TIME	<b>4.0H</b>	MAXA	<b>2.0A</b>
CHEND	<b>0.25A</b>	THRH		C/V CHOVER	

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NSN		MAKE/MODEL		NOMINAL VOLTAGE	
<b>6140-99-743-1832</b>		<b>YUASA NP2.6-6</b>		<b>6.0V</b>	
TEST	<b>2.6A</b>	TIME	<b>1.0H</b>	TRIP	<b>5.0V</b>
CC CHG		TIME		OCHGV	
CVCHG	<b>7.25V</b>	TIME	<b>4.0H</b>	MAXA	<b>1.0A</b>
CHEND	<b>0.25A</b>	THRH		C/V CHOVER	

NSN		MAKE/MODEL		NOMINAL VOLTAGE	
<b>6140-99-748-7815</b>		<b>AC DELCO 20-55</b>		<b>12.0V</b>	
TEST	<b>55.0A</b>	TIME	<b>1.0H</b>	TRIP	<b>10.0V</b>
CC CHG		TIME		OCHGV	
CVCHG	<b>14.5V</b>	TIME	<b>8.0H</b>	MAXA	<b>20.0A</b>
CHEND	<b>0.25A</b>	THRH	<b>1.0A</b>	C/V CHOVER	

NSN		MAKE/MODEL		NOMINAL VOLTAGE	
<b>6140-99-770-2058</b>		<b>HAWKER 9750-0741</b>		<b>24.0V</b>	
TEST	<b>18.0A</b>	TIME	<b>1.0H</b>	TRIP	<b>20.0V</b>
CC CHG	<b>1.4A</b>	TIME	<b>CALC BY TV</b>	OCHGV	<b>40.0V</b>
CVCHG	<b>29.0V</b>	TIME	<b>4.0H</b>	MAXA	<b>20.0A</b>
CHEND	<b>0.25A</b>	THRH	<b>1.0A</b>	C/V CHOVER	<b>1.0H</b>

NSN		MAKE/MODEL		NOMINAL VOLTAGE	
<b>6140-99-770-2813</b>		<b>HAWKER ENERGY 9750F0540</b>		<b>24.0V</b>	
TEST	<b>40.0A</b>	TIME	<b>1.0H</b>	TRIP	<b>20.0V</b>
CC CHG	<b>3.0A</b>	TIME	<b>CALC BY TV</b>	OCHGV	<b>40.0V</b>
CVCHG	<b>29.0V</b>	TIME	<b>8.0H</b>	MAXA	<b>20.0A</b>
CHEND	<b>0.25A</b>	THRH	<b>1.0A</b>	C/V CHOVER	<b>2.5H</b>

NSN		MAKE/MODEL		NOMINAL VOLTAGE	
<b>6140-99-777-1867</b>		<b>YUASA NP4-6</b>		<b>6.0V</b>	
TEST	<b>4.0A</b>	TIME	<b>1.0H</b>	TRIP	<b>5.0V</b>
CC CHG		TIME		OCHGV	
CVCHG	<b>7.25V</b>	TIME	<b>4.0H</b>	MAXA	<b>2.0A</b>
CHEND	<b>0.25A</b>	THRH	<b>1.0A</b>	C/V CHOVER	

# NSN 6130-99-391-3441 (TS1340+)

## Battery Charger Analyser : Operator Manual



NSN		MAKE/MODEL		NOMINAL VOLTAGE	
<b>6140-99-798-3845</b>		<b>HAWKER 9750-0647</b>		<b>24.0V</b>	
TEST	<b>25.0A</b>	TIME	<b>1.0H</b>	TRIP	<b>20.0V</b>
CC CHG	<b>2.0A</b>	TIME	<b>SET BY TV</b>	OCHGV	<b>40.0V</b>
CVCHG	<b>29.0V</b>	TIME	<b>6.0H</b>	MAXA	<b>20.0A</b>
CHEND	<b>0.25A</b>	THRH	<b>1.0A</b>	C/V CHOVER	<b>1.5H</b>

NSN		MAKE/MODEL		NOMINAL VOLTAGE	
<b>6140-99-798-3846</b>		<b>HAWKER 9750-0751</b>		<b>24.0V</b>	
TEST	<b>25.0A</b>	TIME	<b>1.0H</b>	20.0V	
CC CHG	<b>2.0A</b>	TIME	<b>SET BY T.V.</b>	OCHGV	<b>40.0V</b>
CVCHG	<b>29.0V</b>	TIME	<b>6.0H</b>	MAXA	<b>18.0A</b>
CHEND	<b>0.25A</b>	THRH	<b>1.0A</b>	C/V CHOVER	<b>1.5H</b>

NSN		MAKE/MODEL		NOMINAL VOLTAGE	
<b>6140-99-799-4478</b>		<b>OLDHAM CROMPTON 4v10</b>		<b>4.0V</b>	
TEST	<b>10.0A</b>	TIME	<b>1.0H</b>	TRIP	<b>3.3V</b>
CC CHG		TIME		OCHGV	
CVCHG	<b>4.85V</b>	TIME	<b>4.0H</b>	MAXA	<b>5.0A</b>
CHEND	<b>0.25A</b>	THRH		C/V CHOVER	

NSN		MAKE/MODEL		NOMINAL VOLTAGE	
<b>6140-99-805-4474</b>		<b>HAWKER ENERGY 97500640</b>		<b>24.0V</b>	
TEST	<b>25.0A</b>	TIME	<b>1.0H</b>	TRIP	<b>20.0V</b>
CC CHG	<b>2.0A</b>	TIME	<b>SET BY T.V.</b>	OCHGV	<b>40.0V</b>
CVCHG	<b>29.0V</b>	TIME	<b>6.0H</b>	MAXA	<b>20.0A</b>
CHEND	<b>0.25A</b>	THRH	<b>1.0A</b>	C/V CHOVER	<b>1.5A</b>

NSN		MAKE/MODEL		NOMINAL VOLTAGE	
<b>6140-99-910-1534</b>		<b>OLDHAM C</b>		<b>12.0V</b>	
TEST	<b>40.0A</b>	TIME	<b>1.0H</b>	TRIP	<b>10.0V</b>
CC CHG		TIME		OCHGV	
CVCHG	<b>14.5V</b>	TIME	<b>8.0H</b>	MAXA	<b>20.0A</b>
CHEND	<b>0.25A</b>	THRH	<b>1.0A</b>	C/V CHOVER	

NSN		MAKE/MODEL		NOMINAL VOLTAGE	
<b>6140-99-910-1543</b>		<b>CHLORIDE 6 MNA 17</b>		<b>12.0V</b>	
TEST	<b>2.5A</b>	TIME	<b>1.0H</b>	TRIP	<b>10.8V</b>
CC CHG		TIME		OCHGV	
CVCHG	<b>14.5V</b>	TIME	<b>4.0H</b>	MAXA	<b>1.0A</b>
CHEND	<b>0.25A</b>	THRH		C/V CHOVER	

NSN		MAKE/MODEL		NOMINAL VOLTAGE	
<b>6140-99-915-3777</b>		<b>YUASA NP38-12</b>		<b>12.0V</b>	
TEST	<b>38.0A</b>	TIME	<b>1.0H</b>	TRIP	<b>10.0V</b>
CC CHG		TIME		OCHGV	
CVCHG	<b>14.4V</b>	TIME	<b>8.0H</b>	MAXA	<b>20.0A</b>
CHEND	<b>0.25A</b>	THRH	<b>1.0A</b>	C/V CHOVER	

NSN		MAKE/MODEL		NOMINAL VOLTAGE	
<b>6140-99-925-2393</b>		<b>HAWKER ENERGY 9750T0675</b>		<b>24.0V</b>	
TEST	<b>25.0A</b>	TIME	<b>1.0H</b>	TRIP	<b>20.0V</b>
CC CHG	<b>2.0A</b>	TIME	<b>SET BY T.V.</b>	OCHGV	<b>40.0V</b>
CVCHG	<b>29.0V</b>	TIME	<b>6.0H</b>	MAXA	<b>20.0A</b>
CHEND	<b>0.25A</b>	THRH	<b>1.0A</b>	C/V CHOVER	<b>1.5A</b>



**13.2 Lead Acid User Battery Library**

These blank tables are here for you to enter your own custom library entries.

NSN		MAKE/MODEL		NOMINAL VOLTAGE	
		<b>CUSTOM</b> _____			
TEST		TIME		TRIP	
CC CHG		TIME		OCHGV	
CVCHG		TIME		MAXA	
CHEND		THRH		C/V CHOVER	

NSN		MAKE/MODEL		NOMINAL VOLTAGE	
		<b>CUSTOM</b> _____			
TEST		TIME		TRIP	
CC CHG		TIME		OCHGV	
CVCHG		TIME		MAXA	
CHEND		THRH		C/V CHOVER	

NSN		MAKE/MODEL		NOMINAL VOLTAGE	
		<b>CUSTOM</b> _____			
TEST		TIME		TRIP	
CC CHG		TIME		OCHGV	
CVCHG		TIME		MAXA	
CHEND		THRH		C/V CHOVER	

NSN		MAKE/MODEL		NOMINAL VOLTAGE	
		<b>CUSTOM</b> _____			
TEST		TIME		TRIP	
CC CHG		TIME		OCHGV	
CVCHG		TIME		MAXA	
CHEND		THRH		C/V CHOVER	



**13.3 Nickel Cadmium (NiCd) Batteries**

NSN				MAKE/MODEL				NOMINAL VOLTAGE					
<b>6140-00-449-9839</b>				<b>MARATHON CA54-3</b>				<b>22.8V</b>					
TEST		<b>5.50A</b>		TIME		<b>1.0H</b>		TRIP		<b>19.0V</b>			
CHG 01.C	TGT	<b>29.0V</b>		CHG	<b>0.50A</b>		ADDLTM	<b>2.0H</b>		OCHGV	<b>35.0V</b>		
CHG 0.2C	TGT	<b>0.0V</b>		CHG	<b>0.0A</b>		ADDLTM	<b>0.0H</b>					
2STEP		FIRST STEP				SECOND STEP							
		CHG	<b>1.3A</b>		TIME	<b>7.0H</b>		CHG	<b>0.0A</b>		TIME	<b>0.0H</b>	
3STEP		FIRST STEP				SECOND STEP				THIRD STEP			
		CHG	<b>0.0A</b>		TIME	<b>0.0H</b>		CHG	<b>0.0A</b>		TIME	<b>0.0H</b>	

NSN				MAKE/MODEL				NOMINAL VOLTAGE					
<b>NSN6140-01-034-9122</b>				<b>GRIMES 61-0478-1</b>				<b>6.4V</b>					
TEST				TIME				TRIP					
CHG 01.C	TGT	<b>8.4V</b>		CHG	<b>0.3A</b>		ADDLTM	<b>2.0H</b>		OCHGV	<b>11.0V</b>		
CHG 0.2C	TGT			CHG			ADDLTM						
2STEP		FIRST STEP				SECOND STEP							
		CHG	<b>0.3A</b>		TIME	<b>16H</b>		CHG			TIME		
3STEP		FIRST STEP				SECOND STEP				THIRD STEP			
		CHG			TIME			CHG			TIME		

NSN				MAKE/MODEL				NOMINAL VOLTAGE					
<b>6140-01-134-2277</b>				<b>MARATHON BB 432B/A</b>				<b>22.8V</b>					
TEST		<b>10.0A</b>		TIME		<b>1.0H</b>		TRIP		<b>19.V</b>			
CHG 01.C	TGT			CHG			ADDLTM			OCHGV	<b>35.0V</b>		
CHG 0.2C	TGT			CHG			ADDLTM						
2STEP		FIRST STEP				SECOND STEP							
		CHG	<b>7.5A</b>		TIME	<b>2.0H</b>		CHG	<b>3.0A</b>		2.0H		
3STEP		FIRST STEP				SECOND STEP				THIRD STEP			
		CHG			TIME			CHG			TIME		

NSN				MAKE/MODEL				NOMINAL VOLTAGE					
<b>6140-01-200-4773</b>				<b>LITTON 510018</b>				<b>22.5V</b>					
TEST		<b>14.0A</b>		TIME		<b>1.0H</b>		TRIP		<b>19.0V</b>			
CHG 01.C	TGT			CHG			ADDLTM			OCHGV	<b>35.0V</b>		
CHG 0.2C	TGT	<b>29.45V</b>		CHG	<b>3.0A</b>		ADDLTM	<b>5.0H</b>					
2STEP		FIRST STEP				SECOND STEP							
		CHG	<b>7.0A</b>		TIME	<b>2.0H</b>		CHG	<b>1.4A</b>		TIME	<b>5.0H</b>	
3STEP		FIRST STEP				SECOND STEP				THIRD STEP			
		CHG			TIME			CHG			TIME		

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NSN				MAKE/MODEL				NOMINAL VOLTAGE			
<b>6140-01-265-6802</b>				<b>MARATHON TSP900AT</b>				<b>24.0V</b>			
TEST		<b>24.0A</b>		TIME		<b>1.0H</b>		TRIP		<b>20.0V</b>	
CHG 01.C	TGT		CHG		ADDLTM		OCHGV	<b>35.0V</b>			
CHG 0.2C	TGT		CHG		ADDLTM						
2STEP	FIRST STEP				SECOND STEP						
	CHG	<b>14.0A</b>	TIME	<b>2.0H</b>	CHG	<b>5.6A</b>	TIME	<b>2.0H</b>			
3STEP	FIRST STEP			SECOND STEP			THIRD STEP				
	CHG		TIME		CHG		TIME		CHG		TIME

NSN				MAKE/MODEL				NOMINAL VOLTAGE			
<b>6140-01-267-2559</b>				<b>GRIMES 61-2275-1</b>				<b>16.8V</b>			
TEST		<b>0.75A</b>		TIME		<b>1.0H</b>		TRIP		<b>14.0V</b>	
CHG 01.C	TGT	<b>20.0V</b>	CHG	<b>0.75A</b>	ADDLTM	<b>2.0H</b>	OCHGV	<b>24.5V</b>			
CHG 0.2C	TGT		CHG		ADDLTM						
2STEP	FIRST STEP				SECOND STEP						
	CHG	<b>0.75A</b>	TIME	<b>16.0H</b>	CHG		TIME				
3STEP	FIRST STEP			SECOND STEP			THIRD STEP				
	CHG		TIME		CHG		TIME		CHG		TIME

NSN				MAKE/MODEL				NOMINAL VOLTAGE			
<b>6140-01-272-6017</b>				<b>SAFT 715737-2</b>				<b>28.0V</b>			
TEST		<b>1.9A</b>		TIME		<b>1.0H</b>		TRIP		<b>24.0V</b>	
CHG 01.C	TGT	<b>36.0V</b>	CHG	<b>0.19A</b>	ADDLTM	<b>4.0H</b>	OCHGV	<b>43.2V</b>			
CHG 0.2C	TGT	<b>36.0V</b>	CHG	<b>0.38A</b>	ADDLTM	<b>4.0H</b>					
2STEP	FIRST STEP				SECOND STEP						
	CHG		TIME		CHG		TIME				
3STEP	FIRST STEP			SECOND STEP			THIRD STEP				
	CHG		TIME		CHG		TIME		CHG		TIME

NSN				MAKE/MODEL				NOMINAL VOLTAGE			
<b>6140-01-278-5793</b>				<b>SAFT 5103</b>				<b>26.4V</b>			
TEST		<b>50.0A</b>		TIME		<b>1.0H</b>		TRIP		<b>22.0V</b>	
CHG 01.C	TGT		CHG		ADDLTM		OCHGV	<b>38.5V</b>			
CHG 0.2C	TGT		CHG		ADDLTM						
2STEP	FIRST STEP				SECOND STEP						
	CHG	<b>25.0A</b>	TIME	<b>2.0H</b>	CHG	<b>5.0A</b>	TIME	<b>5.0H</b>			
3STEP	FIRST STEP			SECOND STEP			THIRD STEP				
	CHG		TIME		CHG		TIME		CHG		TIME

NSN		MAKE/MODEL				NOMINAL VOLTAGE					
<b>6140-12-155-8347</b>		<b>VARTA F19/40H1</b>				<b>22.8V</b>					
TEST	<b>36.0A</b>		TIME	<b>1.0H</b>		TRIP	<b>19.0V</b>				
CHG 01.C	TGT	<b>28.5V</b>	CHG	<b>3.6A</b>	ADDLTM	<b>5.0H</b>	OCHGV	<b>33.25V</b>			
CHG 0.2C	TGT		CHG		ADDLTM						
2STEP	FIRST STEP				SECOND STEP						
	CHG		TIME		CHG		TIME				
3STEP	FIRST STEP			SECOND STEP			THIRD STEP				
	CHG		TIME		CHG		TIME		CHG		TIME

NSN		MAKE/MODEL				NOMINAL VOLTAGE						
<b>6140-12-172-8177</b>		<b>VARTA F20/25H1</b>				<b>24.0V</b>						
TEST	<b>23.0A</b>		TIME	<b>1.0H</b>		TRIP	<b>20.0V</b>					
CHG 01.C	TGT	<b>30.0V</b>	CHG	<b>2.3A</b>	ADDLTM	<b>5.0H</b>	OCHGV	<b>36.0V</b>				
CHG 0.2C	TGT		CHG		ADDLTM							
2STEP	FIRST STEP				SECOND STEP							
	CHG	<b>11.5A</b>	TIME	<b>2.0H</b>	CHG	<b>2.3A</b>	TIME	<b>5.0H</b>				
3STEP	FIRST STEP			SECOND STEP			THIRD STEP					
	CHG	<b>11.5A</b>	TIME	<b>1.0 H</b>	CHG	<b>5.75 A</b>	TIME	<b>2.0 H</b>	CHG	<b>2.3A</b>	TIME	<b>5.0H</b>

NSN		MAKE/MODEL				NOMINAL VOLTAGE						
<b>6140-12-172-8178</b>		<b>VARTA F20/40H1WT</b>				<b>24.0V</b>						
TEST	<b>36.0A</b>		TIME	<b>1.0H</b>		TRIP	<b>20.0V</b>					
CHG 01.C	TGT		CHG		ADDLTM		OCHGV	<b>35.0V</b>				
CHG 0.2C	TGT	<b>30.0V</b>	CHG	<b>8.0A</b>	ADDLTM	<b>2.0H</b>						
2STEP	FIRST STEP				SECOND STEP							
	CHG	<b>18.0A</b>	TIME	<b>2.0H</b>	CHG	<b>8.0A</b>	TIME	<b>2.5H</b>				
3STEP	FIRST STEP			SECOND STEP			THIRD STEP					
	CHG	<b>18.0A</b>	TIME	<b>1.0 H</b>	CHG	<b>9.0 A</b>	TIME	<b>2.0H</b>	CHG	<b>4.0A</b>	TIME	<b>5.0H</b>

NSN		MAKE/MODEL				NOMINAL VOLTAGE						
<b>6140-12-311-6638</b>		<b>VARTA F20/40H1CWT</b>				<b>24.0V</b>						
TEST	<b>36.0A</b>		TIME	<b>1.0H</b>		TRIP	<b>20.0V</b>					
CHG 01.C	TGT		CHG		ADDLTM		OCHGV	<b>35.0V</b>				
CHG 0.2C	TGT	<b>30.0V</b>	CHG	<b>8.0A</b>	ADDLTM	<b>2.0H</b>						
2STEP	FIRST STEP				SECOND STEP							
	CHG	<b>18.0A</b>	TIME	<b>2.0H</b>	CHG	<b>8.0H</b>	TIME	<b>2.5H</b>				
3STEP	FIRST STEP			SECOND STEP			THIRD STEP					
	CHG	<b>18.0A</b>	TIME	<b>1.0 H</b>	CHG	<b>9.0 A</b>	TIME	<b>2.0H</b>	CHG	<b>4.0A</b>	TIME	<b>5.0H</b>

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NSN		MAKE/MODEL				NOMINAL VOLTAGE													
<b>6140-12-326-1798</b>		<b>VARTA F20/40H1C</b>				<b>24.0V</b>													
TEST		<b>36.0A</b>		TIME		<b>1.0H</b>		TRIP		<b>20.0V</b>									
CHG 01.C	TGT			CHG			ADDLTM			OCHGV	<b>36.0V</b>								
CHG 0.2C	TGT	<b>30.0V</b>		CHG	<b>8.0A</b>		ADDLTM	<b>2.0H</b>											
2STEP		FIRST STEP				SECOND STEP													
		CHG	<b>18.0A</b>		TIME	<b>2.0H</b>		CHG	<b>8.0A</b>		TIME	<b>2.5H</b>							
3STEP		FIRST STEP				SECOND STEP				THIRD STEP									
		CHG	<b>18.0A</b>		TIME	<b>1.0H</b>		CHG	<b>9.0A</b>		TIME	<b>2.0H</b>		CHG	<b>4.0A</b>		TIME	<b>5.0H</b>	

NSN		MAKE/MODEL				NOMINAL VOLTAGE													
<b>6140-14-040-4254</b>		<b>SAFT 4000A1</b>				<b>24.0V</b>													
TEST		<b>40.0A</b>		TIME		<b>1.0H</b>		TRIP		<b>20.0V</b>									
CHG 01.C	TGT	<b>30.0V</b>		CHG	<b>4.0A</b>		ADDLTM	<b>5.0H</b>		OCHGV	<b>35.0V</b>								
CHG 0.2C	TGT			CHG			ADDLTM												
2STEP		FIRST STEP				SECOND STEP													
		CHG	<b>20.0A</b>		TIME	<b>2.0H</b>		CHG	<b>4.0A</b>		TIME	<b>5.0H</b>							
3STEP		FIRST STEP				SECOND STEP				THIRD STEP									
		CHG	<b>20.0A</b>		TIME	<b>1.0H</b>		CHG	<b>10.0A</b>		TIME	<b>2.0H</b>		CHG	<b>34.0A</b>		TIME	<b>5.0H</b>	

NSN		MAKE/MODEL				NOMINAL VOLTAGE													
<b>6140-99-111-5903</b>		<b>SAFT 19-VO-7LK</b>				<b>22.8V</b>													
TEST		<b>5.5A</b>		TIME		<b>1.0H</b>		TRIP		<b>21.0V</b>									
CHG 01.C	TGT			CHG			ADDLTM			OCHGV	<b>35.0V</b>								
CHG 0.2C	TGT			CHG			ADDLTM												
2STEP		FIRST STEP				SECOND STEP													
		CHG	<b>3.0A</b>		TIME	<b>2.0H</b>		CHG	<b>0.6A</b>		TIME	<b>5.0H</b>							
3STEP		FIRST STEP				SECOND STEP				THIRD STEP									
		CHG	<b>3.0A</b>		TIME	<b>1.0H</b>		CHG	<b>1.5A</b>		TIME	<b>2.0H</b>		CHG	<b>0.6A</b>		TIME	<b>5.0H</b>	

NSN		MAKE/MODEL				NOMINAL VOLTAGE													
<b>6140-99-164-4214</b>		<b>Unknown Bat170</b>				<b>22.8V</b>													
TEST		<b>23.0A</b>		TIME		<b>1.0H</b>		TRIP		<b>20.0V</b>									
CHG 01.C	TGT	<b>30.0V</b>		CHG	<b>2.3A</b>		ADDLTM	<b>5.0H</b>		OCHGV	<b>36.0V</b>								
CHG 0.2C	TGT			CHG			ADDLTM												
2STEP		FIRST STEP				SECOND STEP													
		CHG			TIME			CHG			TIME								
3STEP		FIRST STEP				SECOND STEP				THIRD STEP									
		CHG			TIME			CHG			TIME			CHG			TIME		

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NSN		MAKE/MODEL				NOMINAL VOLTAGE							
<b>6140-99-172-9540</b>		<b>SAFT 10VR2C</b>				<b>12.0V</b>							
TEST		<b>1.6A</b>		TIME		<b>1.0H</b>		TRIP		<b>10.0V</b>			
CHG 01.C	TGT			CHG			ADDLTM			OCHGV	<b>17.5V</b>		
CHG 0.2C	TGT			CHG			ADDLTM						
2STEP		FIRST STEP				SECOND STEP							
		CHG	<b>0.2A</b>		TIME	<b>16.0H</b>		CHG			TIME		
3STEP		FIRST STEP				SECOND STEP				THIRD STEP			
		CHG			TIME			CHG			TIME		

NSN		MAKE/MODEL				NOMINAL VOLTAGE							
<b>6140-99-520-6916</b>		<b>SUPERCEDED!</b>											
TEST				TIME				TRIP					
CHG 01.C	TGT			CHG			ADDLTM			OCHGV			
CHG 0.2C	TGT			CHG			ADDLTM						
2STEP		FIRST STEP				SECOND STEP							
		CHG			TIME			CHG			TIME		
3STEP		FIRST STEP				SECOND STEP				THIRD STEP			
		CHG			TIME			CHG			TIME		

NSN		MAKE/MODEL				NOMINAL VOLTAGE							
<b>6140-99-539-0660</b>		<b>SAFT/VARTA 10/RSH 1.3</b>				<b>12.0V</b>							
TEST		<b>1.2A</b>		TIME		<b>1.0H</b>		TRIP		<b>10.0V</b>			
CHG 01.C	TGT	<b>15.0V</b>		CHG	<b>0.12A</b>		ADDLTM	<b>5.0H</b>		OCHGV	<b>18.0V</b>		
CHG 0.2C	TGT	<b>15.0V</b>		CHG	<b>0.24A</b>		ADDLTM	<b>4.0H</b>					
2STEP		FIRST STEP				SECOND STEP							
		CHG			TIME			CHG			TIME		
3STEP		FIRST STEP				SECOND STEP				THIRD STEP			
		CHG			TIME			CHG			TIME		

NSN		MAKE/MODEL				NOMINAL VOLTAGE							
<b>6140-99-539-5139</b>		<b>AEA/SAFT 10/KRH 35/92</b>				<b>12.0V</b>							
TEST		<b>7.0A</b>		TIME		<b>1.0H</b>		TRIP		<b>10.0V</b>			
CHG 01.C	TGT	<b>15.0V</b>		CHG	<b>0.7A</b>		ADDLTM	<b>0.0H</b>		OCHGV	<b>18.0V</b>		
CHG 0.2C	TGT	<b>15.0V</b>		CHG	<b>1.4A</b>		ADDLTM	<b>4.0H</b>					
2STEP		FIRST STEP				SECOND STEP							
		CHG			TIME			CHG			TIME		
3STEP		FIRST STEP				SECOND STEP				THIRD STEP			
		CHG			TIME			CHG			TIME		



NSN		MAKE/MODEL				NOMINAL VOLTAGE							
<b>6140-99-543-9182</b>		<b>UNIVERCELL Unknown</b>				<b>8.4V</b>							
TEST		<b>1.2A</b>		TIME		<b>1.0H</b>		TRIP		<b>7.0V</b>			
CHG 01.C	TGT	<b>10.5V</b>		CHG	<b>0.12A</b>		ADDLTM	<b>5.0H</b>		OCHGV	<b>12.6V</b>		
CHG 0.2C	TGT			CHG			ADDLTM						
2STEP		FIRST STEP				SECOND STEP							
		CHG			TIME			CHG			TIME		
3STEP		FIRST STEP				SECOND STEP				THIRD STEP			
		CHG			TIME			CHG			TIME		

NSN		MAKE/MODEL				NOMINAL VOLTAGE							
<b>6140-99-558-4673</b>		<b>AEA/SAFT KRH 44/91/HBG</b>				<b>12.0V</b>							
TEST		<b>10.0A</b>		TIME		<b>1.0H</b>		TRIP		<b>10.0V</b>			
CHG 01.C	TGT	<b>15.0V</b>		CHG	<b>1.0A</b>		ADDLTM	<b>5.0H</b>		OCHGV	<b>18.0V</b>		
CHG 0.2C	TGT	<b>15.0V</b>		CHG	<b>2.0A</b>		ADDLTM	<b>4.0H</b>					
2STEP		FIRST STEP				SECOND STEP							
		CHG			TIME			CHG			TIME		
3STEP		FIRST STEP				SECOND STEP				THIRD STEP			
		CHG			TIME			CHG			TIME		

NSN		MAKE/MODEL				NOMINAL VOLTAGE							
<b>6140-99-620-0881</b>		<b>AEA/SAFT unknown</b>				<b>12.0V</b>							
TEST		<b>10.0A</b>		TIME		<b>1.0H</b>		TRIP		<b>10.0V</b>			
CHG 01.C	TGT	<b>15.0V</b>		CHG	<b>1.0A</b>		ADDLTM	<b>5.0H</b>		OCHGV	<b>18.0V</b>		
CHG 0.2C	TGT	<b>15.0V</b>		CHG	<b>2.0A</b>		ADDLTM	<b>4.0H</b>					
2STEP		FIRST STEP				SECOND STEP							
		CHG			TIME			CHG			TIME		
3STEP		FIRST STEP				SECOND STEP				THIRD STEP			
		CHG			TIME			CHG			TIME		

NSN		MAKE/MODEL				NOMINAL VOLTAGE							
<b>6140-99-620-8057</b>		<b>unknown Bat285</b>				<b>24.0V</b>							
TEST		<b>4.0A</b>		TIME		<b>1.0H</b>		TRIP		<b>20.0V</b>			
CHG 01.C	TGT	<b>30.0V</b>		CHG	<b>0.4A</b>		ADDLTM	<b>0.0H</b>		OCHGV	<b>36.0V</b>		
CHG 0.2C	TGT	<b>30.0V</b>		CHG	<b>0.8A</b>		ADDLTM	<b>4.0H</b>					
2STEP		FIRST STEP				SECOND STEP							
		CHG			TIME			CHG			TIME		
3STEP		FIRST STEP				SECOND STEP				THIRD STEP			
		CHG			TIME			CHG			TIME		

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NSN		MAKE/MODEL				NOMINAL VOLTAGE			
6140-99-624-5203		SAFT 10VR7F				12.0V			
TEST	7.0A		TIME	1.0H		TRIP	10.0V		
CHG 01.C	TGT		CHG		ADDLTM	OCHGV	18.0V		
CHG 0.2C	TGT		CHG		ADDLTM				
2STEP	FIRST STEP				SECOND STEP				
	CHG	0.7A	TIME	16.0H	CHG		TIME		
3STEP	FIRST STEP			SECOND STEP			THIRD STEP		
	CHG		TIME		CHG		TIME		

NSN		MAKE/MODEL				NOMINAL VOLTAGE			
6140-99-636-2521		unknown KRH 35/92/HHG				1.2V			
TEST	7.0A		TIME	1.0H		TRIP	1.0V		
CHG 01.C	TGT	1.5V	CHG	0.7A	ADDLTM	5.0H	OCHGV	1.8V	
CHG 0.2C	TGT	1.5V	CHG	1.4A	ADDLTM	4.0H			
2STEP	FIRST STEP				SECOND STEP				
	CHG		TIME		CHG		TIME		
3STEP	FIRST STEP			SECOND STEP			THIRD STEP		
	CHG		TIME		CHG		TIME		

NSN		MAKE/MODEL				NOMINAL VOLTAGE						
6140-99-636-2863		SAFT Bat161 (25106)				24.0V						
TEST	23.0A		TIME	1.0H		TRIP	20.0V					
CHG 01.C	TGT	30.0V	CHG	2.3A	ADDLTM	5.0H	OCHGV	36.0V				
CHG 0.2C	TGT		CHG		ADDLTM							
2STEP	FIRST STEP				SECOND STEP							
	CHG	11.5A	TIME	2.0H	CHG	2.3A	TIME	5.0H				
3STEP	FIRST STEP			SECOND STEP			THIRD STEP					
	CHG	11.5A	TIME	1.0H	CHG	5.75A	TIME	2.0H	CHG	2.3A	TIME	5.0H

NSN		MAKE/MODEL				NOMINAL VOLTAGE						
6140-99-636-5773		SAFT 40100				24.0V						
TEST	40.90A		TIME	1.0H		TRIP	20.0V					
CHG 01.C	TGT	30.0V	CHG	4.0A	ADDLTM	5.0H	OCHGV	35.0V				
CHG 0.2C	TGT		CHG		ADDLTM							
2STEP	FIRST STEP				SECOND STEP							
	CHG	20.0A	TIME	2.0H	CHG	4.0A	TIME	5.0H				
3STEP	FIRST STEP			SECOND STEP			THIRD STEP					
	CHG	20.0A	TIME	1.0H	CHG	10.0A	TIME	2.0H	CHG	4.0A	TIME	5.0H

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NSN				MAKE/MODEL				NOMINAL VOLTAGE			
<b>6140-99-636-8902</b>				<b>SAFT 20-VO-3KHC</b>				<b>24.0V</b>			
TEST		<b>3.0A</b>		TIME		<b>1.0H</b>		TRIP		<b>20.0V</b>	
CHG 01.C	TGT		CHG		ADDLTM		OCHGV	<b>35.0V</b>			
CHG 0.2C	TGT		CHG		ADDLTM						
2STEP		FIRST STEP				SECOND STEP					
	CHG	<b>1.5A</b>	TIME	<b>2.0H</b>	CHG	<b>0.3A</b>	TIME	<b>5.0H</b>			
3STEP		FIRST STEP			SECOND STEP			THIRD STEP			
	CHG		TIME		CHG		TIME		CHG		TIME

NSN				MAKE/MODEL				NOMINAL VOLTAGE			
<b>6140-99-640-3433</b>				<b>VARTA unknown</b>				<b>48.0V</b>			
TEST		<b>1.8A</b>		TIME		<b>1.0H</b>		TRIP		<b>40.0V</b>	
CHG 01.C	TGT		CHG		ADDLTM		OCHGV	<b>72.0V</b>			
CHG 0.2C	TGT		CHG		ADDLTM						
2STEP		FIRST STEP				SECOND STEP					
	CHG		TIME		CHG		TIME				
3STEP		FIRST STEP			SECOND STEP			THIRD STEP			
	CHG		TIME		CHG		TIME		CHG		TIME

NSN				MAKE/MODEL				NOMINAL VOLTAGE				
<b>6140-99-655-7308</b>				<b>SAFT 23396 / VP230KH</b>				<b>24.0V</b>				
TEST		<b>22.0A</b>		TIME		<b>1.0H</b>		TRIP		<b>20.0V</b>		
CHG 01.C	TGT	<b>30.0V</b>	CHG	<b>2.2A</b>	ADDLTM	<b>5.0H</b>	OCHGV	<b>35.0V</b>				
CHG 0.2C	TGT		CHG		ADDLTM							
2STEP		FIRST STEP				SECOND STEP						
	CHG	<b>11.0A</b>	TIME	<b>2.0H</b>	CHG	<b>2.2A</b>	TIME	<b>5.0H</b>				
3STEP		FIRST STEP			SECOND STEP			THIRD STEP				
	CHG	<b>11.0A</b>	TIME	<b>1.0H</b>	CHG	<b>5.5A</b>	TIME	<b>2.0H</b>	CHG	<b>2.2A</b>	TIME	<b>5.0H</b>

NSN				MAKE/MODEL				NOMINAL VOLTAGE				
<b>6140-99-713-9833</b>				<b>SAFT 20-VO-23 KHP</b>				<b>24.0V</b>				
TEST		<b>23.0A</b>		TIME		<b>1.0H</b>		TRIP		<b>20.0V</b>		
CHG 01.C	TGT	<b>30.0V</b>	CHG	<b>2.3A</b>	ADDLTM	<b>5.0H</b>	OCHGV	<b>35.0V</b>				
CHG 0.2C	TGT		CHG		ADDLTM							
2STEP		FIRST STEP				SECOND STEP						
	CHG	<b>11.5A</b>	TIME	<b>2.0H</b>	CHG	<b>2.3A</b>	TIME	<b>5.0H</b>				
3STEP		FIRST STEP			SECOND STEP			THIRD STEP				
	CHG	<b>11.5A</b>	TIME	<b>1.0H</b>	CHG	<b>5.75A</b>	TIME	<b>2.0H</b>	CHG	<b>2.3A</b>	TIME	<b>5.0H</b>



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NSN			MAKE/MODEL			NOMINAL VOLTAGE			
<b>6140-99-720-4113</b>			<b>VARTA 5KBM 344/100</b>			<b>6.0V</b>			
TEST		<b>0.55A</b>	TIME		<b>1.0H</b>	TRIP		<b>5.0V</b>	
CHG 01.C	TGT	<b>7.5V</b>	CHG	<b>0.06A</b>	ADDLTM	<b>5.0H</b>	OCHGV	<b>9.0V</b>	
CHG 0.2C	TGT	<b>7.5V</b>	CHG	<b>0.12A</b>	ADDLTM	<b>4.0H</b>			
2STEP	FIRST STEP				SECOND STEP				
	CHG		TIME		CHG		TIME		
3STEP	FIRST STEP			SECOND STEP			THIRD STEP		
	CHG		TIME		CHG		TIME		

NSN			MAKE/MODEL			NOMINAL VOLTAGE			
<b>6140-99-728-4358</b>			<b>VARTA 62256</b>			<b>4.5V</b>			
TEST		<b>0.11A</b>	TIME		<b>1.0H</b>	TRIP		<b>4.0V</b>	
CHG 01.C	TGT	<b>6.0V</b>	CHG	<b>0.01A</b>	ADDLTM	<b>5.0H</b>	OCHGV	<b>7.2V</b>	
CHG 0.2C	TGT	<b>6.0V</b>	CHG	<b>0.02A</b>	ADDLTM	<b>4.0H</b>			
2STEP	FIRST STEP				SECOND STEP				
	CHG		TIME		CHG		TIME		
3STEP	FIRST STEP			SECOND STEP			THIRD STEP		
	CHG		TIME		CHG		TIME		

NSN			MAKE/MODEL			NOMINAL VOLTAGE			
<b>6140-99-748-5557</b>			<b>UNIVERCELL unknown</b>			<b>2.4V</b>			
TEST		<b>7.0A</b>	TIME		<b>1.0H</b>	TRIP		<b>2.0V</b>	
CHG 01.C	TGT	<b>3.0V</b>	CHG	<b>0.7A</b>	ADDLTM	<b>5.0H</b>	OCHGV	<b>3.6V</b>	
CHG 0.2C	TGT	<b>3.0V</b>	CHG	<b>1.4A</b>	ADDLTM	<b>4.0H</b>			
2STEP	FIRST STEP				SECOND STEP				
	CHG		TIME		CHG		TIME		
3STEP	FIRST STEP			SECOND STEP			THIRD STEP		
	CHG		TIME		CHG		TIME		

NSN			MAKE/MODEL			NOMINAL VOLTAGE			
<b>6140-99-778-5526</b>			<b>ALCAD 5XM 325</b>			<b>6.0V</b>			
TEST		<b>32.0A</b>	TIME		<b>1.0H</b>	TRIP		<b>5.0V</b>	
CHG 01.C	TGT	<b>7.5V</b>	CHG	<b>3.2A</b>	ADDLTM	<b>0.0H</b>	OCHGV	<b>9.0V</b>	
CHG 0.2C	TGT	<b>7.5V</b>	CHG	<b>6.4A</b>	ADDLTM	<b>4.0H</b>			
2STEP	FIRST STEP				SECOND STEP				
	CHG		TIME		CHG		TIME		
3STEP	FIRST STEP			SECOND STEP			THIRD STEP		
	CHG		TIME		CHG		TIME		

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NSN		MAKE/MODEL				NOMINAL VOLTAGE													
<b>6140-99-779-3594</b>		<b>SAFT A40279-1</b>				<b>24.0V</b>													
TEST		<b>37.0A</b>		TIME		<b>1.0H</b>		TRIP		<b>20.0V</b>									
CHG 01.C	TGT	<b>30.0V</b>		CHG	<b>3.7A</b>		ADDLTM	<b>5.0H</b>		OCHGV	<b>35.0V</b>								
CHG 0.2C	TGT			CHG			ADDLTM												
2STEP		FIRST STEP				SECOND STEP													
		CHG	<b>18.5A</b>		TIME	<b>2.0H</b>		CHG	<b>3.7A</b>		TIME	<b>5.0H</b>							
3STEP		FIRST STEP				SECOND STEP				THIRD STEP									
		CHG	<b>18.5A</b>		TIME	<b>1.0 H</b>		CHG	<b>9.25 A</b>		TIME	<b>2.0 H</b>		CHG	<b>3.7A</b>		TIME	<b>5.0H</b>	

NSN		MAKE/MODEL				NOMINAL VOLTAGE													
<b>6140-99-791-0476</b>		<b>VARTA F20/40H1</b>				<b>24.0V</b>													
TEST		<b>36.0A</b>		TIME		<b>1.0H</b>		TRIP		<b>20.0V</b>									
CHG 01.C	TGT			CHG			ADDLTM			OCHGV	<b>35.0V</b>								
CHG 0.2C	TGT	<b>30.0V</b>		CHG	<b>8.0A</b>		ADDLTM	<b>2.0H</b>											
2STEP		FIRST STEP				SECOND STEP													
		CHG	<b>18.0A</b>		TIME	<b>2.0H</b>		CHG	<b>8.0A</b>		TIME	<b>2.5H</b>							
3STEP		FIRST STEP				SECOND STEP				THIRD STEP									
		CHG	<b>18.0A</b>		TIME	<b>1.0 H</b>		CHG	<b>9.0 A</b>		TIME	<b>2.0H</b>		CHG	<b>4.0A</b>		TIME	<b>5.0H</b>	

NSN		MAKE/MODEL				NOMINAL VOLTAGE													
<b>6140-99-799-7814</b>		<b>SAFT KRK 35/62/HBG</b>				<b>1.2V</b>													
TEST		<b>4.0A</b>		TIME		<b>1.0H</b>		TRIP		<b>1.0V</b>									
CHG 01.C	TGT	<b>1.5V</b>		CHG	<b>0.4A</b>		ADDLTM	<b>5.0H</b>		OCHGV	<b>1.8V</b>								
CHG 0.2C	TGT	<b>1.5V</b>		CHG	<b>0.8H</b>		ADDLTM	<b>4.0H</b>											
2STEP		FIRST STEP				SECOND STEP													
		CHG			TIME			CHG			TIME								
3STEP		FIRST STEP				SECOND STEP				THIRD STEP									
		CHG			TIME			CHG			TIME			CHG			TIME		

NSN		MAKE/MODEL				NOMINAL VOLTAGE													
<b>6140-99-883-8660</b>		<b>SAFT 40200</b>				<b>24.0V</b>													
TEST		<b>40.0A</b>		TIME		<b>1.0H</b>		TRIP		<b>20.0V</b>									
CHG 01.C	TGT	<b>30.0V</b>		CHG	<b>4.0A</b>		ADDLTM	<b>5.0H</b>		OCHGV	<b>35.0V</b>								
CHG 0.2C	TGT			CHG			ADDLTM												
2STEP		FIRST STEP				SECOND STEP													
		CHG	<b>20.0A</b>		TIME	<b>2.0H</b>		CHG	<b>4.0A</b>		TIME	<b>5.0H</b>							
3STEP		FIRST STEP				SECOND STEP				THIRD STEP									
		CHG	<b>20.0A</b>		TIME	<b>1.0 H</b>		CHG	<b>10.0 A</b>		TIME	<b>2.0 H</b>		CHG	<b>4.0A</b>		TIME	<b>5.0H</b>	

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NSN		MAKE/MODEL				NOMINAL VOLTAGE						
<b>6140-99-924-4628</b>		<b>AEA 1420-0009</b>				<b>24V</b>						
TEST		<b>1.2A</b>		TIME		<b>1.0H</b>		TRIP		<b>1.0V</b>		
CHG 01.C	TGT	<b>1.5V</b>		CHG	<b>0.12A</b>		ADDLTM	<b>0.0H</b>		OCHGV	<b>1.8V</b>	
CHG 0.2C	TGT	<b>1.5V</b>		CHG	<b>0.28A</b>		ADDLTM	<b>4.0H</b>				
2STEP	FIRST STEP				SECOND STEP							
	CHG	-----	TIME	-----	CHG	-----	TIME	-----				
3STEP	FIRST STEP			SECOND STEP			THIRD STEP					
	CHG	-----	TIME	-----	CHG	-----	TIME	-----	CHG	-----	TIME	-----

NSN		MAKE/MODEL				NOMINAL VOLTAGE						
<b>6140-99-949-9955</b>		<b>SAFT 20-VO-35</b>				<b>24.0V</b>						
TEST		<b>35.0A</b>		TIME		<b>1.0H</b>		TRIP		<b>20.0V</b>		
CHG 01.C	TGT	-----		CHG	-----		ADDLTM	-----		OCHGV	<b>35.0V</b>	
CHG 0.2C	TGT	-----		CHG	-----		ADDLTM	-----				
2STEP	FIRST STEP				SECOND STEP							
	CHG	<b>3.5A</b>		TIME	<b>15.0H</b>		CHG	-----		TIME	-----	
3STEP	FIRST STEP			SECOND STEP			THIRD STEP					
	CHG		TIME		CHG		TIME		CHG		TIME	

NSN		MAKE/MODEL				NOMINAL VOLTAGE						
<b>6140-99-979-0799</b>		<b>VARTA F20/25H1C</b>				<b>24.0V</b>						
TEST		<b>23.0A</b>		TIME		<b>1.0H</b>		TRIP		<b>20.0V</b>		
CHG 01.C	TGT	<b>30.0V</b>		CHG	<b>2.3A</b>		ADDLTM	<b>5.0H</b>		OCHGV	<b>35.0V</b>	
CHG 0.2C	TGT			CHG			ADDLTM			OCHGV	<b>35.0V</b>	
2STEP	FIRST STEP				SECOND STEP							
	CHG	<b>11.5A</b>		TIME	<b>2.0H</b>		CHG	<b>2.3A</b>		TIME	<b>5.0H</b>	
3STEP	FIRST STEP			SECOND STEP			THIRD STEP					
	CHG	<b>11.5A</b>	TIME	<b>1.0H</b>	CHG	<b>5.75A</b>	TIME	<b>2.0H</b>	CHG	<b>2.3A</b>	TIME	<b>5.0H</b>

**13.4 Nickel Cadmium User Battery Library**

These blank tables are here for you to enter your own custom library entries.

NSN			MAKE/MODEL				NOMINAL VOLTAGE				
			<b>CUSTOM</b> _____								
TEST				TIME				TRIP			
CHG 01.C	TGT		CHG		ADDLTM			OCHGV			
CHG 0.2C	TGT		CHG		ADDLTM						
2STEP	FIRST STEP				SECOND STEP						
	CHG		TIME		CHG		TIME				
3STEP	FIRST STEP			SECOND STEP			THIRD STEP				
	CHG		TIME		CHG		TIME		CHG		TIME

NSN			MAKE/MODEL				NOMINAL VOLTAGE				
			<b>CUSTOM</b> _____								
TEST				TIME				TRIP			
CHG 01.C	TGT		CHG		ADDLTM			OCHGV			
CHG 0.2C	TGT		CHG		ADDLTM						
2STEP	FIRST STEP				SECOND STEP						
	CHG		TIME		CHG		TIME				
3STEP	FIRST STEP			SECOND STEP			THIRD STEP				
	CHG		TIME		CHG		TIME		CHG		TIME

NSN			MAKE/MODEL				NOMINAL VOLTAGE				
			<b>CUSTOM</b> _____								
TEST				TIME				TRIP			
CHG 01.C	TGT		CHG		ADDLTM			OCHGV			
CHG 0.2C	TGT		CHG		ADDLTM						
2STEP	FIRST STEP				SECOND STEP						
	CHG		TIME		CHG		TIME				
3STEP	FIRST STEP			SECOND STEP			THIRD STEP				
	CHG		TIME		CHG		TIME		CHG		TIME

## 14 Printing Ts1340+ Library

An additional facility built into the TS1340+ is to print the entire contents of the library. This is useful where a number of custom library entries have been made and these need to be documented. To use this facility follow the following steps.

```

TS 1340+   MAIN MENU       7 - 0 5 - 2 0 0 1   1 6 : 3 0 : 1 5
PERFORM CHARGE / TEST USING NSN NUMBER      ↓
    
```

Press 

```

TS 1340+   MAIN MENU       7 - 0 5 - 2 0 0 1   1 6 : 3 0 : 1 5
SEND INTERNAL LIBRARY TO PRINTER            ↓
    
```

Press 

Upon selecting this function the entire library contents will be displayed on the printer. The following is an extract from the full print.

```

BATTERY LIBRARY FROM TS1340+ I 1 20-05-2001
NSN6140-00-406-2633 PB 24.0V CONCORDE BB 638/U
TEST DISCHG 31.00A TIME 1.0H TRIP 21.0V
CC CHG 0.00A TIME 0.0H OCHGV 0.00V
CV CHG 29.00V TIME 6.0H MAXA 20.00V CHEND 0.3A THRH 1.00A C/V CHOVER 0.0H

NSN6140-99-016-0102 PB 24.0V HAWKER 9750T0663
TEST DISCHG 25.00A TIME 1.0H TRIP 20.0V
CC CHG 0.00A TIME 0.0H OCHGV 40.00V
CV CHG 0.00V TIME 0.0H MAXA 0.00V CHEND 0.0A THRH 0.00A C/V CHOVER 0.0H

NSN6140-00-449-9839 NICD 22.8V MARATHON CA54-3
TEST DISCHG 5.50A TIME 1.0H TRIP 19.0V
CHG 0.1C TGT 29.00V CHG 0.50A ADDLTM 2.0H OCHGV 35.00V
CHG 0.2C TGT 0.00V CHG 0.00A ADDLTM 0.0H OCHGV 35.00V
2STEP 1:CHG 1.30A 7.0H 2:CHG 0.00A 0.0H OCHGV 35.00V
3STEP 1:CHG 0.00A 0.0H 2:CHG 0.00A 0.0H 3:CHG 0.00A 0.0H OCHGV 35.00V
    
```

## 15 Calibration

The TS1340+ has built in auto calibration facilities, which allows it to be re-calibrated in the field with only the minimal set of tools.

### 15.1 Tools Required

- TS1340+ to be calibrated.
- Digital voltmeter capable of reading 24.00V.
- Digital ammeter with 40A capability or 60A shunt and appropriate milli-voltmeter.
- A good 24V battery capable of delivering 40A for one minute.

### 15.2 Calibration Procedure

#### 15.2.1 Equipment Connection

#### 15.2.2 Reviewing Last Calibration Date

Connect the battery to the charger in the normal manner and apply power to the TS1340+.

Enter the calibration function as follows:

```
TS1340+   MAIN MENU       7-05-2001   16:30:15
PERFORM CHARGE / TEST USING NSN NUMBER   ↓
```



Press      

```
TS1340+   MAIN MENU       7-05-2001   16:30:15
CALIBRATE TS1340+ VOLTAGE AND CURRENT   ↓
```

Press 

The display will show the previous calibration date as shown:

```
LAST CALIBRATION : 12-02-2001
PRESS START TO RE-CALIBRATE
```


Press  to begin the calibration procedure else press  to abort the calibration process and return to the main menu.

### 15.2.3 Performing Calibration

Display Shows:

```
V O L T A G E   C A L I B R A T I O N   C o n n e c t   B a t t e r y
E n t e r   v o l t a g e   m e a s u r e d   o n   m e t e r   0 . 0 V
```

Connect Voltmeter across battery and measure the battery voltage. Enter this value on the

TS1340+ and press 

This display will use this value and the value it reads from measuring the battery voltage to calculate a scaling factor, which is used in all voltage readings.


```
C U R R E N T   C A L I B R A T I O N   C o n n e c t   S h u n t   &   B a t t
P R E S S   E N T R   T O   C O N T I N U E
```

Connect both a suitable shunt and milli-voltmeter in line with one of the battery

connections, or use a suitable ammeter. Then press 

```
C U R R E N T   C A L I B R A T I O N   C o n n e c t   S h u n t   &   B a t t
E n t e r   c u r r e n t   m e a s u r e d   o n   m e t e r   4 0 . 0 0 A
```

The TS1340+ will run in test mode and draw approximately 40.00A from the battery, once this current can be seen to be stable the value read on the meter must be typed in and

then press . The value of current measured will be used with the chargers own reading of current to calculate a scaling factor, which will be used to calculate all future current readings.

The display will then return to the main menu.

## 16 Internal Electrical Tests

The TS1340+ contains some simple procedures for establishing common faults that could occur within the unit. This procedure can be followed to determine if a component malfunction has occurred when the unit does not operate correctly. The following procedure has to be followed to execute this task.

**WARNING**  
**The battery leads must be connected to the battery charger so that the voltage sense connections are made.**  
**DO NOT CONNECT TO A BATTERY.**

TS 1340+    MAIN MENU    7 - 0 5 - 2 0 0 1    1 6 : 3 0 : 1 5  
 PERFORM CHARGE / TEST USING NSN NUMBER    ↓

Using the up and down arrow keys on the key pad the alternative TS1340+ functions can be accessed. The function displays are as follows:

Press        

TS 1340+    MAIN MENU    7 - 0 5 - 2 0 0 1    1 6 : 3 0 : 1 5  
 PERFORM ELECTRICAL TESTS    ↓

Press 

ELECTRICAL TESTS PRESS START WHEN READY  
 \* \* \* \* \* DISCONNECT BATTERY \* \* \* \* \*

At this stage the TS1340+ is ready to perform the electrical tests. Note it is important that any batteries are disconnected from the unit during this operation as damage to the unit and/or the battery may occur and the test results will be inaccurate.

Press 

TR2 LIVE TEST

Two second delay

TR2 LIVE TEST PASSED  
 PRESS A KEY TO CONTINUE . . . .



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Press 

TR1 LIVE TEST

Two second delay

TR1 LIVE TEST PASSED  
PRESS A KEY TO CONTINUE . . . .

Press 

TR1 & TR2 LIVE TEST

Two second delay

TR1 & TR2 LIVE TEST PASSED  
PRESS A KEY TO CONTINUE . . . .

Press 

CHECK TR1 SUPPLY

Two second delay

TR1 OK  
PRESS A KEY TO CONTINUE . . . .

Press 

CHECK TR2 SUPPLY

Two second delay

TR2 OK  
PRESS A KEY TO CONTINUE . . . .

Press 

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PARALLEL SWITCH TEST

Two second delay

PARALLELLING OK  
PRESS A KEY TO CONTINUE . . . .

Press



SERIES SWITCH TEST

Two second delay

SERIES SELECTION OK  
PRESS A KEY TO CONTINUE . . . .

Press



TEST ON FET DRIVE

Two second delay

FET DRIVE OK  
PRESS A KEY TO CONTINUE . . . .

Press



CAPACITY TEST SWITCH CHECK

Two second delay

TEST SWITCH OK  
PRESS A KEY TO CONTINUE . . . .

Press



12V SWITCH CHECK

12V SWITCH OK

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P R E S S   A   K E Y   T O   C O N T I N U E . . . .

Press 

E N D   O F   F U N C T I O N A L   T E S T S

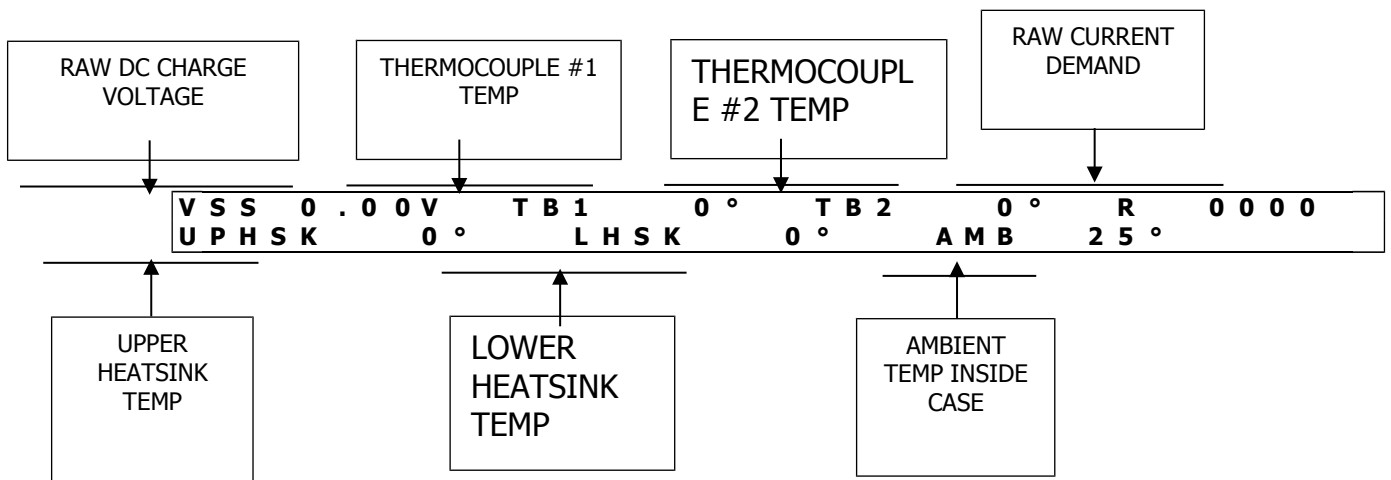
There will be a two second delay and the main menu will be re-displayed.


**Any of the tests failing is indication of a fault and the equipment must be rendered unserviceable and either returned to the manufacturer or agent for repair.**

## 17 Status Display

During charge or test there is the availability of a diagnostic display. Service engineers to track down potential problems use this as a tool. It is described here but will be covered in more detail in the technical manual.

To access the display while running press  the display will then change to the following:



To return back to the main display press  .

Details of the meanings of these values will be covered in the technical manual.

## 18 Display Brightness Control

The display on the charger has four brightness settings. These are selected by simply hitting 1 2 3 or 4 when the charger is idle or performing a charge/test. Once the level is set it will be remembered next time the unit is powered on.

## **19 Charge And Test Current Specifications**

### **19.1 Charge Mode**

Typical charge parameters are as follows: -

Battery Voltage	Maximum Charge Current
Standard Model	
12V	40A
24V	25A
BAF50A Model	
12V	50A
24V	25A

These current are quoted as nominal maximums. They must be de-rated for terminal voltages exceeding certain levels as follows: -

For Battery Voltage Less than 19V parallel mode		
Maximum current	Cut-off Voltage	Current drop per V thereafter
40A - Standard	16.2V	4A
50A - BAF50A	14.6V	4A

For Battery Voltage Equal or Greater than 19V		
Maximum current	Cut-off Voltage	Current drop per V thereafter
25A - Both Models	40.15V	4A

**19.2 Test Mode**

Typical battery test parameters are as follows: -

Battery Voltage	Maximum Test Current
12V	60A
24V	50A

These currents are quoted as nominal maximums. When the battery voltage drops there is a point where the units internal resistance is too high to maintain the quoted currents. Therefore the unit will require de-rating for battery voltage outside the nominal. These can be calculated as follows: -

For Battery Voltage Less than 16V		
Maximum current	Cut-off Voltage	Current drop per V thereafter
60A	10V	6.5A

For Battery Voltage Equal or Greater than 16V		
Maximum current	Cut-off Voltage	Current drop per V thereafter
50A	15.5V	6.5A

Where batteries of higher voltages are to be discharged then maximum power ratings have to be taken into account. The unit has a maximum discharge capacity of 1400W, this is a thermal limitation. So for upper (starting) voltages we must de-rate as follows: -

Max Current	Max Voltage	De-rating per 1V thereafter
50A	28V	1.7A

### **19.3 Accuracy**

Final accuracy is dependant on the accuracy of the calibration. At the point of calibration i.e ~24V then the accuracy figures are worst case for voltages that deviate away from this point. I.e. at 40V displayed voltage could be worst case 0.5% in error. This also applies to the current calibration.

#### **19.3.1 Voltage**

Displayed Voltage vs Measured Voltage is better than 0.5%

#### **19.3.2 Current**

Displayed Current vs Measured Current is better than 1%

#### **19.3.3 Time**

The internal RTC is crystal controlled and the manufacturers quoted figures for the accuracy of this produce a time error of one to five seconds in a one year period

#### **19.3.4 Temperature**

No accuracy figures are quoted for the displayed temperature readings as these are for guidance only and could be 10% of the actual displayed figures.

## **20 Internal Battery**

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 5-6 years. If it should fail during use this will be indicated by the unit not keeping the correct time, and custom library data being "lost".



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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