

# **EBBETT BATTERY CHARGER**

OR BATTERY ELIMINATOR / DC POWER SUPPLY OPTION

## **OPERATORS MANUAL**

8/10/91

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## **Section 1:**

### **SCOPE**

The scope of the hand book is to provide the user with sufficient information to be able to engineer and carry out the installation of an Ebbett Charger in such a way as to be able to maximise the features and benefits of the unit, and achieve a convenient and reliable power supply system within the battery capability. Sufficient information is also provided to establish the origin of any problems with the system, or faults with a unit, and refer back to the seller for repair or replacement.

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## Section 2:

### Technical Specification

Output Load:	200VA	400VA	800VA	1600VA
Output Voltage:	12V 24V	12V 24V	12V 24V	24V
Rated Time 2hrs:	15A 8A	25A 15A	45A 25A	45A
Cont Pwr Spply Optn:	10A 5A	15A 10A	30A 15A	30A
Weight:	10kg	12kg	15kg	20kg
Physical Dimensions: (H x W x D)	300x210x100	320x230x115	360x340x145	360x340x190
Regulation:	Within plus or minus 1%.			
Input Voltage:	220-240V / 110-120V selectable.			
Frequency:	50-60 Hz.			
Ambient Temp:	0-50 deg C normal mount heat sinks vertical. Above 20 deg C derate duty cycle ≈1% per deg C. Horizontal mount, derate ≈ 15%. Fan cooling increase rating ≈ 20%.			
Operating Humidity:	0-90%.			
Power Input:	2m flex & 3 pin plug.			
Battery Leads:	2m cable & battery clips.			
Enclosure:	Mild steel epoxy powdercoated.			
Protection:	Electronic current-limiting. Thermal overload with auto-reset. Miniature circuit-breaker for output isolation.			
Elec Safety:	Manufactured to NZS 6200 requirements. Complies with NZECP 29:1989, Boat Mariners & Pleasure Craft; NZECP 1:1988, Caravans & Caravan Parks.			
Elec Interference:	RFI emission less than 60 microvolts. Output filtered to minimise battery ripple-current.			
Options:	Mounting straps for permanent installation. Ammeter, Voltmeter. Standard specified voltages. Output factory set for float-charging. Other voltages & currents available. Separate isolated outputs for dual battery system. No automatic boost-charge on power up. Extra output-filter for DC power supply.			

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### **Section 3:**

#### **THEORY OF OPERATION**

For optimum performance and long life, batteries must be correctly charged. This means maintaining a very precise "float voltage" that contains minimal "ripple", and also limiting the maximum charge current to a specified level for a particular type of battery. Further, the "taper" from maximum current to zero should be very steep so that batteries receive maximum current for as long as possible before becoming fully charged. Overall recovery time is then reduced.

The Ebbett Battery Charger achieves this by continuously monitoring operation while under charge, and controlling output voltage by turning the power devices on for varying lengths of time during every conduction half-cycle. This technique is commonly known as "phase angle control". High efficiency is achieved when silicon controlled rectifiers (SCRs) are substituted for the normal bridge rectifier. Output currents are filtered to reduce ripple, and advanced electronic techniques are used to control output parameters to very close tolerances.

Much care has been taken in the design to ensure a robust system with "idiot proof" operation. Automatic protection, and other control circuits are included to accommodate such occurrences as dead flat battery, reverse polarity connection, overload, short circuit etc.

However, optimum performance cannot be obtained without a good battery and correct installation.

**Read the directions. Check the specifications.**

## **Section 4:**

### **LOAD RATING**

#### **(1) Battery**

Many types of battery are now available, from nickel-cadmium through to lead-acid, sealed, and maintenance-free. For optimum performance batteries should be chosen for a specific purpose, according to type of load and duty.

The life of automotive batteries is limited by low discharge, and specially designed deep cycle, heavy duty, marine, low loss, industrial standby and traction batteries are available. Consult the supplier for specifications.

Batteries in standby applications are generally held at a "float-charge voltage" whereas batteries in cycled use are "boost charged" to an initially higher voltage.

All batteries have maximum charge and discharge current rates specified, and these should be observed when calculating the load and charger requirements. Sealed lead-acid batteries are unable to "gas" like conventional vented types, and it is essential that the battery charger be sized so as not to exceed the specified maximum charge rate. Consult the battery manufacturer.

Automotive batteries are now rated by "Reserve Capacity" rating which is defined as the time in minutes a new fully-charged battery can deliver 25 amps continuously before the voltage falls to a specified end point. Most manufacturers specify 1.68 to 1.7 volts per cell (10.08 to 10.2 battery volts). For a battery with "Reserve Capacity of 90 minutes", a load drawing 25 amps would last for 90 minutes. If the battery was being charged at the same time by a 30 amp battery charger, then the load discharge would be less than the charging capacity, and the battery would last indefinitely.

Other types of battery are rated in ampere-hours capacity (AH) at given discharge rates. For example, specification curves show a battery to have a capacity of 40 AH if discharged at the rate of 10 amps.

The battery will last for, 40 AH divided by 10 amps = 4 hours.

Loads such as static inverters draw current pulses. If charged at the same time, the battery experiences ripple currents that it must be of sufficient size to cope with. Consult the inverter manufacturer first.

#### **A good battery is essential.**

In the event of accidental reverse-polarity connection or other fault, the battery must be capable of supplying sufficient current to trip circuit breakers instantaneously; otherwise, heating, explosion, or serious damage to the battery may occur.

#### **(2) Charger**

The charger is capable of supplying all types of battery mentioned, but it is factory-set as a general-purpose, lead-acid battery charger, in unattended use for long periods. The factory settings are for a float-charge voltage, and a maximum current to the name-plate rating. These ratings will generally be satisfactory for most applications, including deep discharge.

However for nickel-cadmium systems or continuous deep cycle, the voltage can be altered or the boost-charge option, ordered.

The charger size should be selected according to maximum current requirements.

**Sealed batteries may require a factory-setting for a reduced maximum current.**

## **Section 5:**

### **OPERATION**

#### **On-Off-Reset:**

Both input and output circuits are isolated by the operation of the miniature circuit breaker (MCB) on the front of the unit. This should be operated upwards to turn the unit on. In the event of certain faults it will automatically trip, and must be turned off and on again to reset.

It should be turned on only after a battery has been connected.

#### **Power On:**

When the charger is turned on, the "Power On" indication LED on the front cover will light up. It will increase in intensity as the charge rate increases.

#### **Overload:**

No additional indication is necessary.

- (1) **Maximum Current:** Factory set to 100% of name-plate rating. Automatic current limiting means that the unit can never supply more than its specified maximum output. The "Power On" LED reduces in intensity as this point is reached.
- (2) **Thermal Protection:** Long term rating is limited primarily by the thermal rise of the transformer. A temperature sensor in the windings shuts the unit down until it has cooled sufficiently. It will then reset automatically. This is indicated by the "Power On" LED extinguishing and then resetting.
- (3) **Gross Overload:** Faults such as a load short circuit, reverse polarity connection of the battery, or component failure, will trip the front MCB.

#### **No Load:**

A fully charged or disconnected battery will require no current, and the "Power On" LED will extinguish.

## **Section 6:**

### **INSTALLATION**

Unpack, and examine for any signs of in-transit damage due to impact, vibration or moisture. Select a dry, well ventilated place, and position the unit, preferably vertically.

#### **Before connection note warnings and special notes section 7.**

##### Portable Unit:

Supplied as standard. With multi-purpose chargers, merely clip leads onto correct battery polarity and turn on (red positive, black negative). Rubber feet are fitted to the base for free standing use.

##### Permanent Installation:

Large chargers (and units with dual output) are not supplied with clip leads. This is because they require very high currents to trip protection circuits and it is desirable to reduce the possibility of incorrect connection (refer Section 4:1 Battery). The unit can be wall-mounted by using the four holes provided in the back plate. These holes are threaded to enable fastening by way of 6 mm metric bolts from the rear, or by removing the cover and using 8 gauge x 1 inch wood or PK screws from the front. A 5mm spacer should be used behind the cabinet. Alternatively, optional aluminium mounting straps are available and can be screwed to the rear of the cabinet first.

Permanent installations require a battery isolator, and all models come fitted with an electromechanical circuit-breaker fitted in the front panel for this purpose. However, installations using dual outputs and external blocking diodes etc, will require additional isolators at the battery itself (ref diagram Section 12).

The suggested automotive or marine installation uses an optional auxiliary battery and blocking diode. The auxiliary battery is automatically charged with the main battery, but can be flattened without affecting the essential power source.

Optional ammeter and voltmeter are connected as shown.

Output ratings are for a specified time and ambient temperature. These can be increased by the addition of external fan cooling to assist natural convection.

Battery lead length must be as short as possible and no longer than one and a half times that supplied. (Volt drop causes incorrect charge voltage).

Battery eliminator / DC options come with output terminals under the front cover instead of leads.

## **Section 7:**

### **WARNINGS AND SPECIAL NOTES**

- \* - The charger is a high voltage apparatus that must be used in accordance with the electrical wiring regulations and treated with the same respect as other 230V appliances.
  
- \* - Under no circumstances should the front cover be removed while the charger is connected to a battery or the main power. Before removing the cover, disconnect the main power and battery leads, turn the MCB on and short the output battery leads to dissipate any dangerous charges retained in capacitors.
  
- \* - The charger must be connected only to the specified battery voltage.  
  
Connection to a higher voltage can cause serious damage to electronic components and invalidate the warranty.
  
- \* - Ensure the battery is of sufficient size to match the charger output current.
  
- \* - Ensure correct polarity battery-connection. Incorrect connection can cause battery damage.
  
- \* - Turn the charger off while connecting and disconnecting to avoid sparking and minimise the risk of explosion of hydrogen gas from the battery.
  
- \* - Ventilation is required for cooling. House the unit in a separate compartment from batteries to avoid risk of a hydrogen explosion.
  
- \* - Keep battery leads as short as possible.

Detection devices are built into the design to tell us if any failure is a result of abuse that would invalidate the warranty.



## Section 8:

### ELECTRONIC CONTROL CARD

#### (1) ADJUSTMENTS

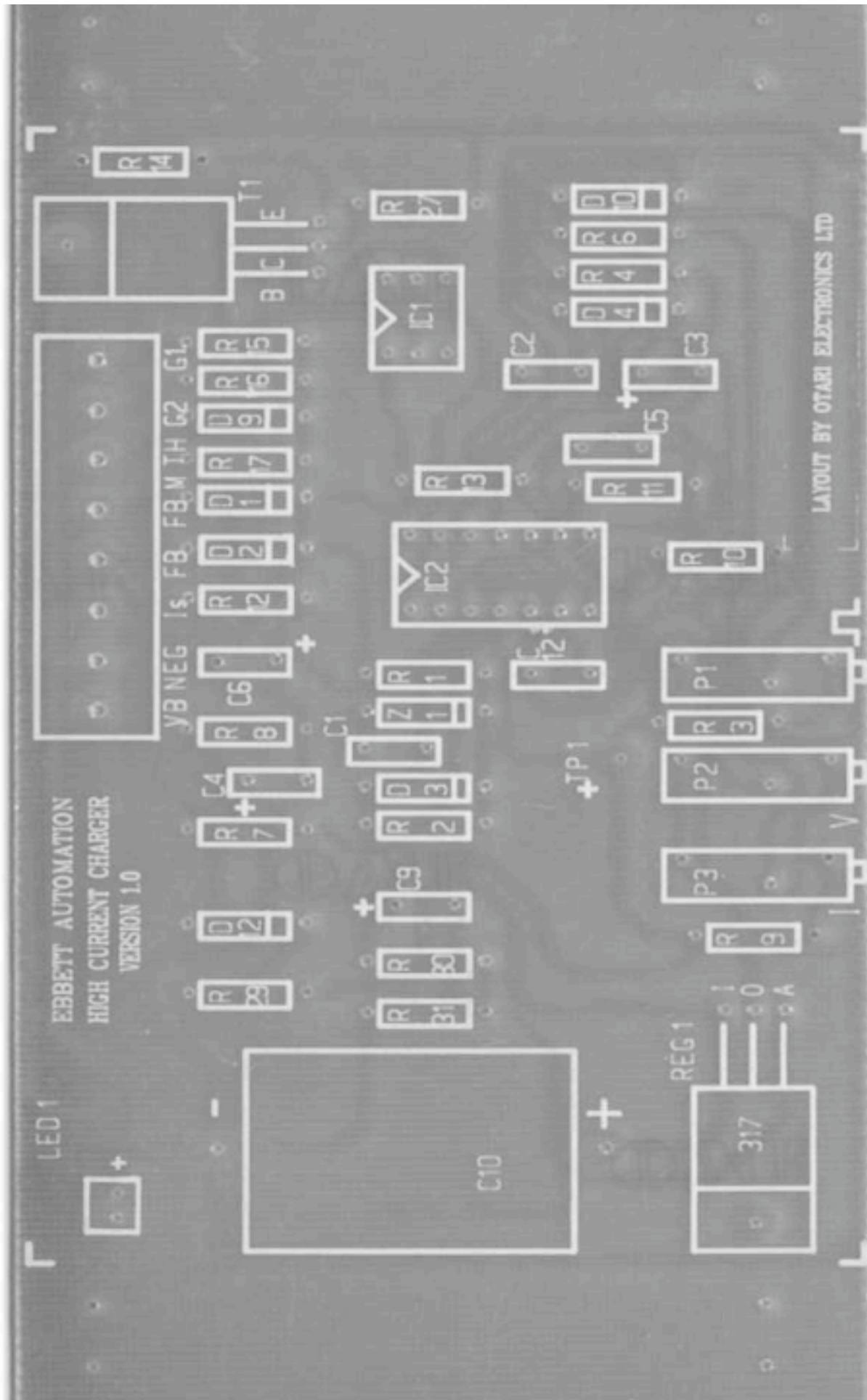
All on electronic control card, are factory-set, and should require no field adjustment.

P1 - Electronic Alignment - Factory set for correct synchronisation.  
Breaking of seal will invalidate warranty.

P2 - Output Voltage - Factory set for float voltage of lead acid batteries.  
Can be altered to suit alternative batteries.

P3 - Maximum Current - Factory set to specified maximum load.  
Must not be altered.  
Breaking of seal will render warranty invalid.  
Settings for other types of battery should be specified ex factory.

(2) PCB V1 LAYOUT



## **Section 9:**

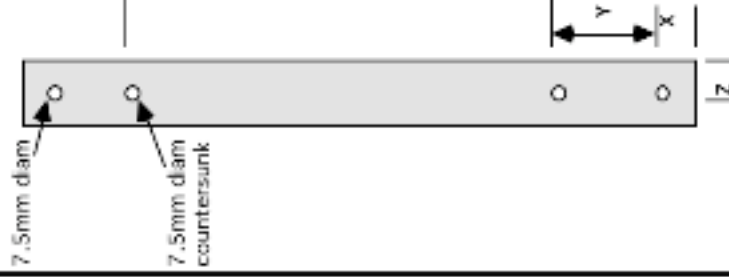
### **FAULT FINDING CHART**

<b><u>Problem</u></b>	<b><u>Cause</u></b>	<b><u>Remedy</u></b>
(1) Output failure; no indicator light	Battery fully charged.	Normal condition, confirm with voltmeter.
	Circuit breaker turned off.	Operate upwards for "on".
	Circuit breaker faulty	Refer seller, repair / replacement
	No battery connection.	Clean, reclamp terminals.
	Battery faulty (open circuit).	Replace battery.
	Overtemp trip, - long term rating exceeded.	Wait for unit to cool.
	Overtemp trip, - insufficient cooling.	Clear louvres, vent enclosure.
	Electronics failure.	Refer seller, repair / replacement.
(2) Output failure; circuit-breaker trips immediately.	Battery connected reverse polarity.	Correct connection.
	Battery short circuited.	Replace shorted wiring, or check / replace battery.
	Electronics failure.	Refer seller, repair / replacement.

**Section 10 (1):**

Mounting Strap  
(2 off aluminium strap 40x4mm)

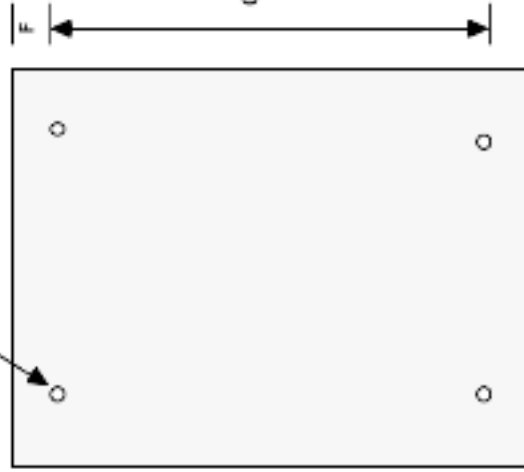
Rear Mounting



7.5mm diam

7.5mm diam countersunk

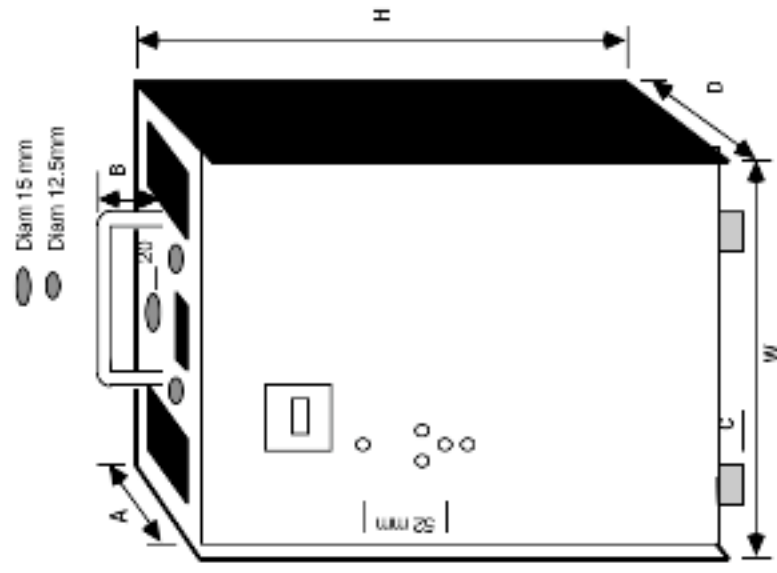
threaded 6mm



H W D A B C E F G X Y Z

200VA	290	210	115	100	30	10	50	25	240	15	55	19
400VA	310	250	120	115	30	10	50	25	260	15	55	19
800VA	350	340	155	145	30	10	75	25	300	15	55	19
1600VA	350	340	195	185	30	10	75	25	300	15	55	19

**EBBETT CHARGER**



○ Diam 15 mm  
● Diam 12.5mm

TITLE: Charger Mounting & Dimensions

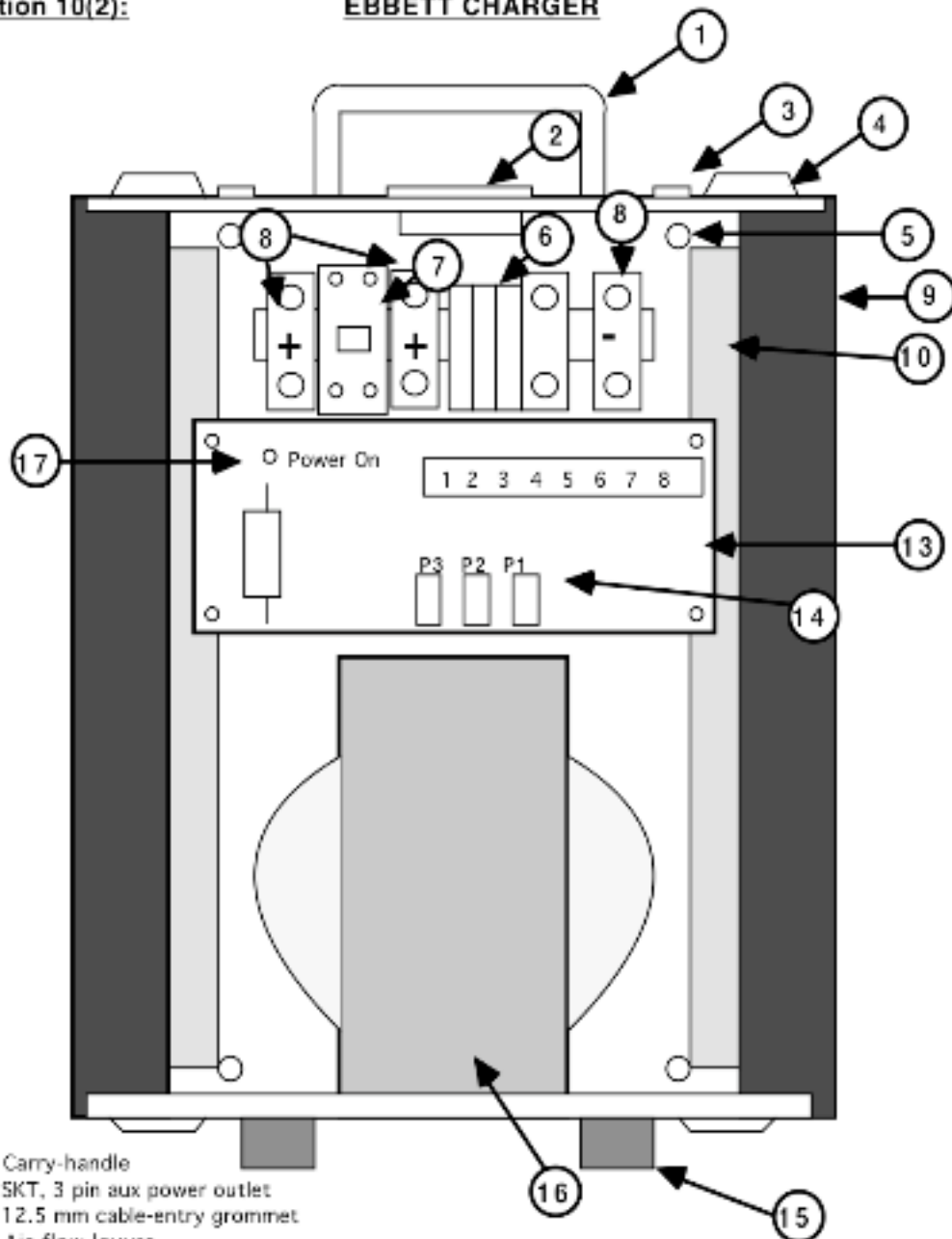
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## Section 10(2):

## EBBETT CHARGER



- 1 - Carry-handle
- 2 - SKT, 3 pin aux power outlet
- 3 - 12.5 mm cable-entry grommet
- 4 - Air-flow louvre
- 5 - 6mm mounting hole
- 6 - TM1, optional input terminals
- 7 - MCB, battery circuit breaker (on/off)
- 8 - TM2, battery terminals (plus optional terminal for dual output)
- 9 - Heat-sink
- 10- Power transistor mounting bracket

- 13- PCB, control circuit board
- 14- Adjustment potentiometers
- 15- Rubber foot
- 16- CH, power transformer
- 17- Indicator LED

TITLE: Physical Layout

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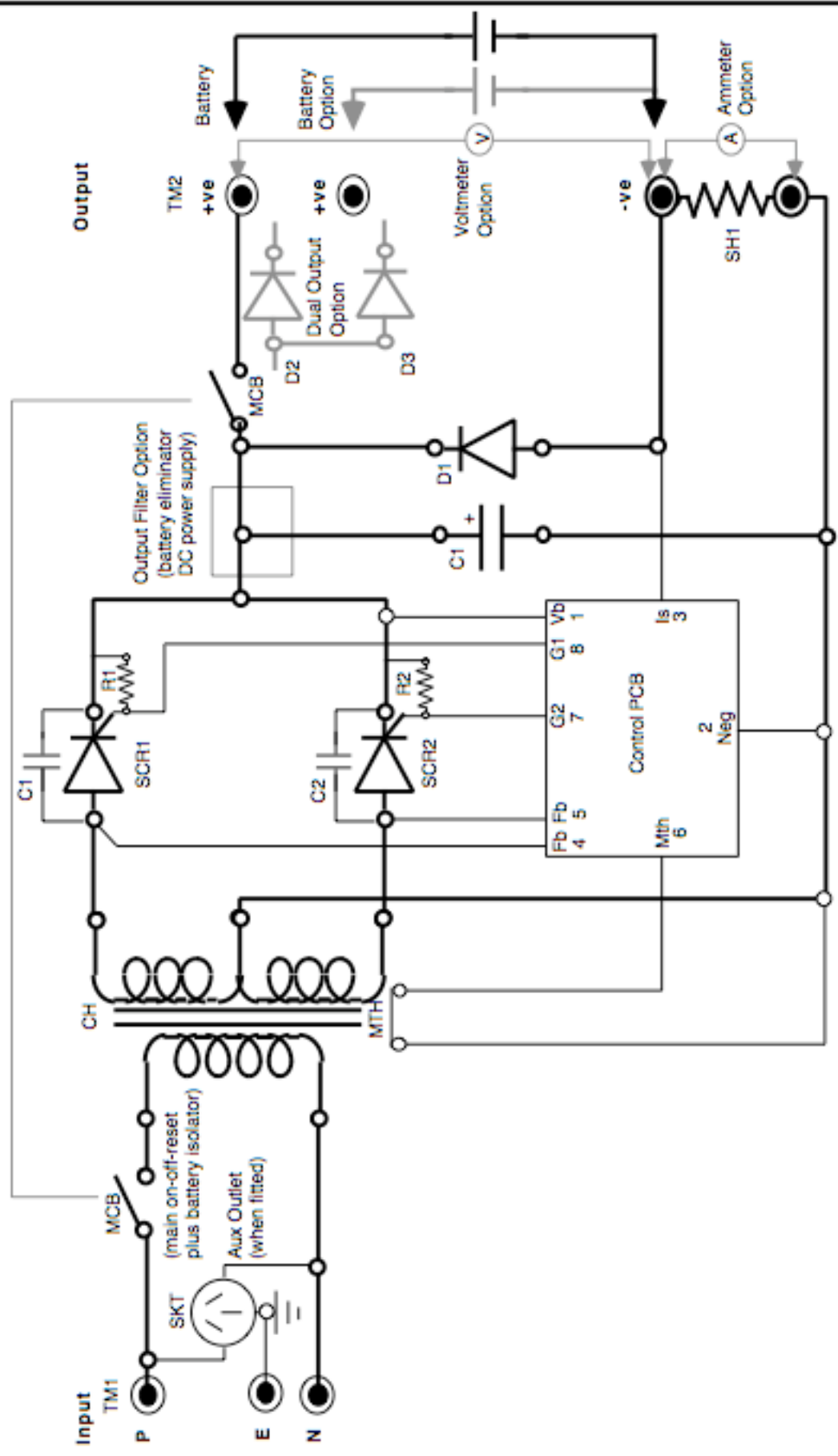
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**Section 11:**

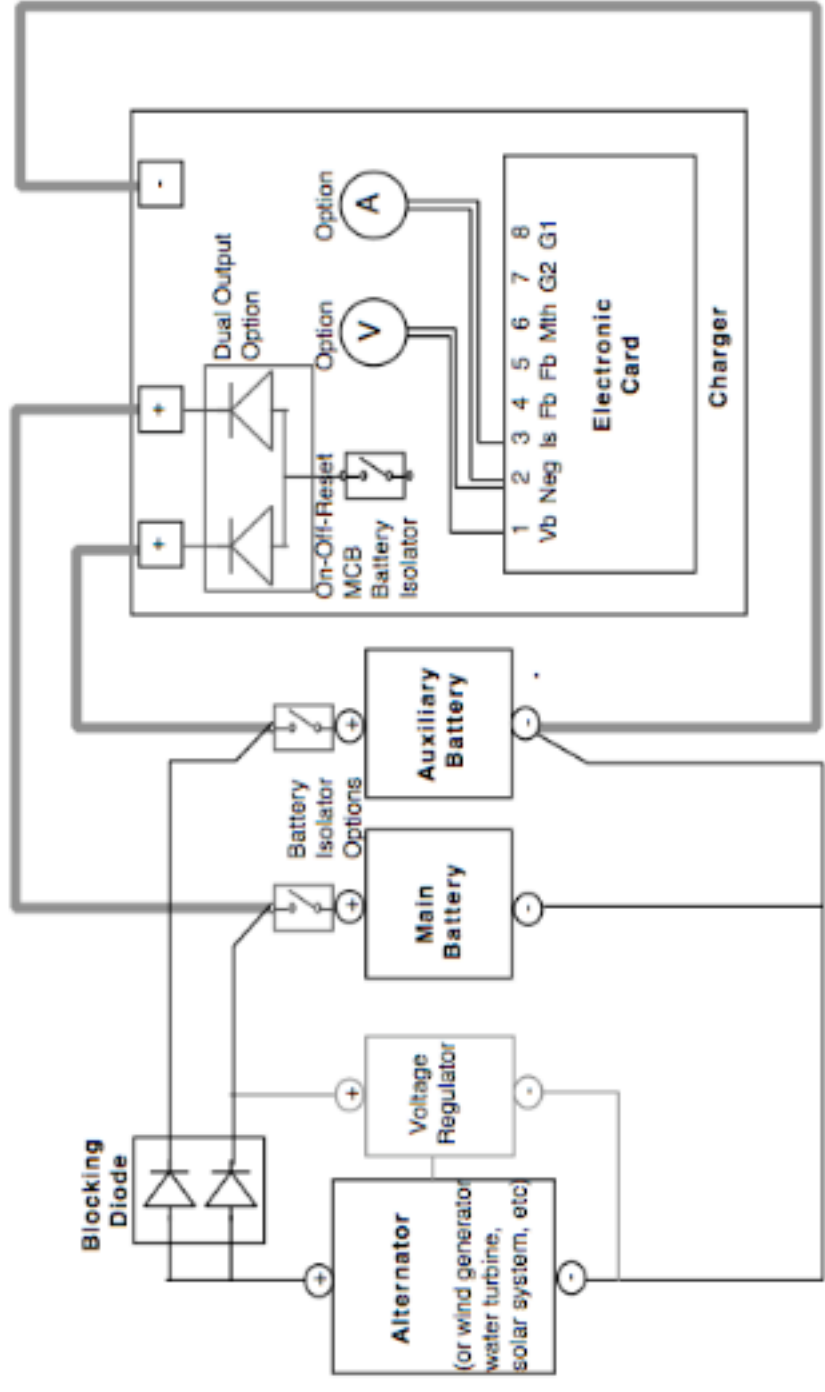
**EBBETT CHARGER**



TITLE: Electrical Schematic	
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**Section 12 :**

**INSTALLATION EXAMPLE - AUTOMOTIVE / MARINE**



TITLE: Charger Battery Connection Diagram

SCALE: Not to scale

DRAWN BY: GAE DATE: 20/1/89

**Section 13:**

**EBBETT AUTOMATION - CONDITIONS OF SALE**

**Warranty:** The Company warrants that the equipment shall remain free from defect in material and workmanship for 12 months from date of dispatch from the Seller's factory.

In the event of any such defect occurring, the Seller, at his option, will repair, or replace free of charge and F.O.B. his factory, the part of the equipment found to be defective, provided that the Purchaser, at his own cost, shall have previously returned to the Seller's factory for examination, the part alleged to be defective, and the Seller agrees that such part of the equipment has been supplied by the Seller and is in fact defective.

This warranty shall not apply to defects in the equipment caused by or resulting from fair wear and tear, wilful damage, negligent or unskilled use in operation or storage, or storage or use in unsuitable conditions by the Purchaser or any third party after delivery by the Seller.

The Seller shall not be liable for any consequential losses, damages or expenses whatsoever incurred by or resulting from defects in the equipment supplied by the Seller.

**Prices:** Current prices are subject to change without notice.

**Sales Tax:** Unless stated otherwise, all prices quoted are not inclusive of sales tax where applicable.

**Payment:** Unless otherwise agreed in writing, all sales are on a basis of cash prior to delivery.

For credit arrangements, all goods remain the property of the Seller until full and final payment is received, and until that time, the Seller reserves the right to take back into his possession any goods held by the buyer or any third party.

**Freight:** Freight is extra.