



इ रि से ट
बाहरी दूरसंचार प्रयोगशाला
प्रयोग नं: पी पी - 4

IRISET
OUTDOOR TELECOMMUNICATION
LABORATORY
EXPERIMENT NO.: PP - 4

नाम

Name : _____

अनुक्रमांक

Roll No : _____

पाठ्यक्रम

Course : _____

दिनांक

Date : _____

प्राप्त अंक

Marks Awarded : _____

अनुदेशक का अधाक्षर

Instructor Initial : _____

STUDY OF AUTOMATIC BATTERY CHARGER

OBJECTIVE: At the end of the Lab session you will learn,

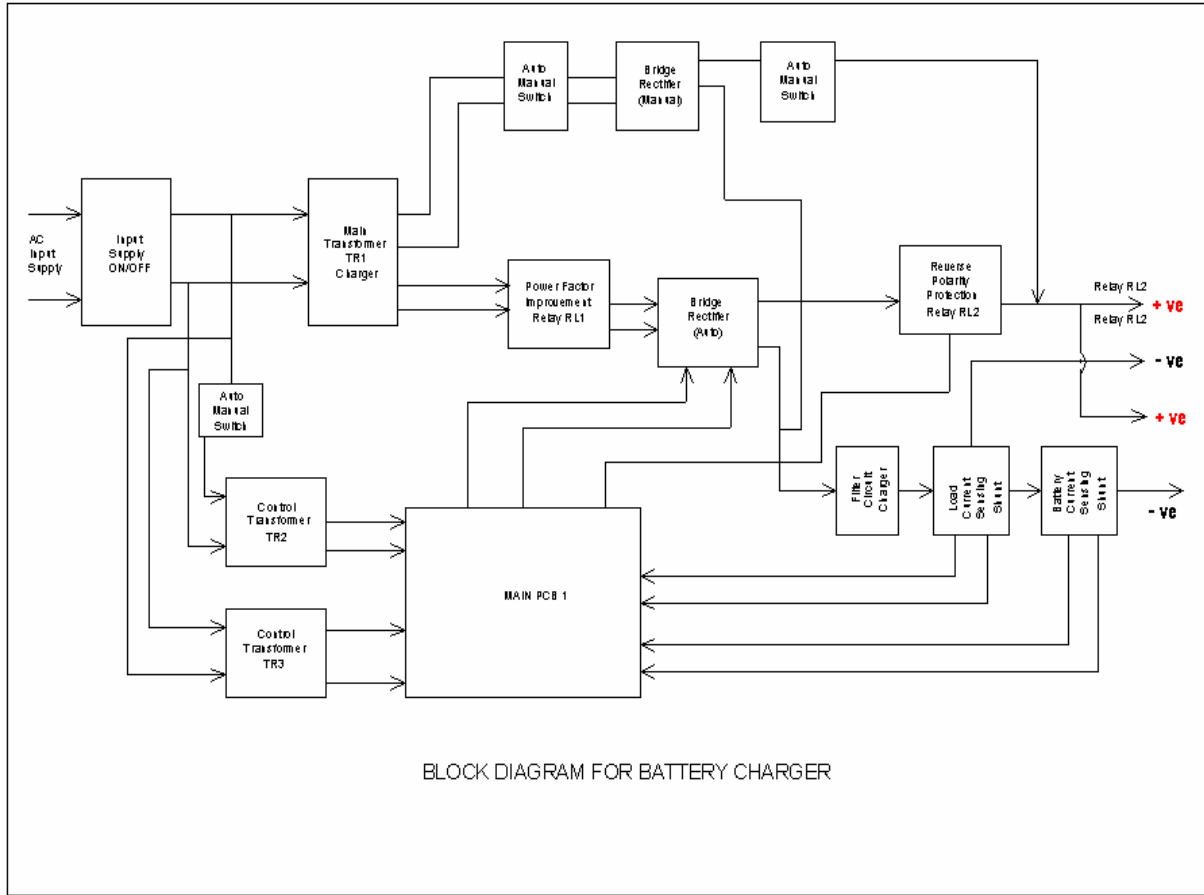
- 1) Familiarization with battery charger.
- 2) Its controls & Indications.
- 3) Calculation of Voltage & Current regulations
- 4) Measurement of ripple voltage.

EQUIPMENT REQUIRED:

THEORY: Block diagram & front view of Automatic battery charger under specification number IRS.S.86 / 2000(with amendment I) is shown under. It can also be operated in Manual mode if Auto mode fails.

In Automatic mode the circuit consists of mains transformer T1, a half controlled bridge rectifier, an I-C filter, the control circuit and the protection circuits. The half controlled bridge rectifier consists of two diodes and two SCR's. The SCR's conduction angle is controlled to maintain the output voltage constant in Float Mode and to maintain constant current in the Boost Mode.

If the charger fails to operate in the Automatic Mode the charger can be made to operate in manual mode by putting the mode selector switch into manual mode. When the selector switch is in manual mode the circuit essentially consists of mains transformer(T1), full wave diode bridge rectifier and LC filter. The mains transformer secondary to half controlled bridge is disconnected and also the AC input to the auxiliary transformer(T2) is disconnected and energises the auxiliary transformer T3 and T4.



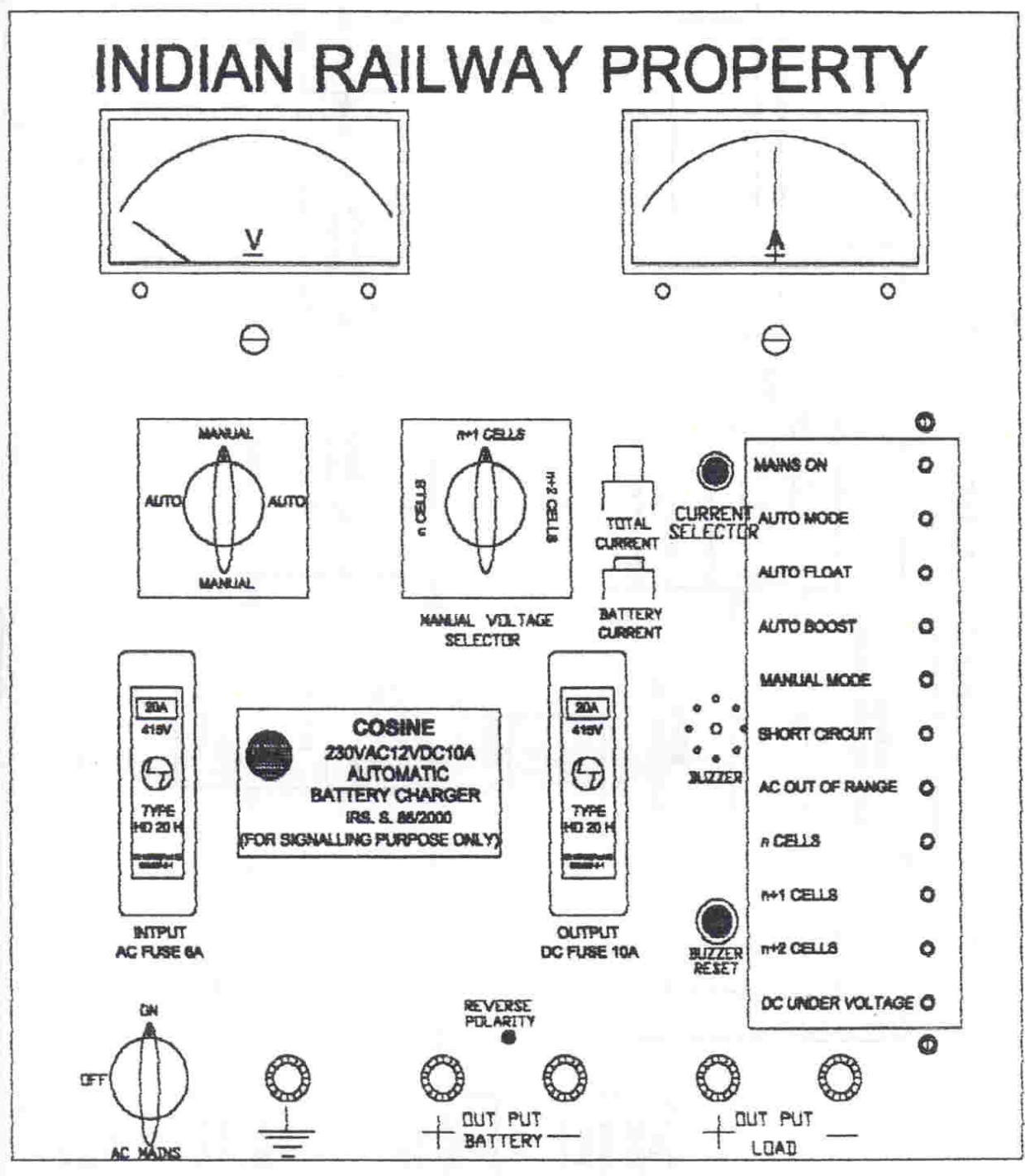
In this mode the Manual Mode selector switch mounted on the front panel controls the output DC voltage. When the voltage selector switch is in the first position, ie. 'n' cells position the output voltage is $N \times 2.25\text{V/cell}$ at rated input voltage and rated output current. When the switch is in 'n+1' position the output voltage is $(n+1) \times 2.25\text{V/cell}$ at the rated input voltage and rated output current. When the switch is in the 'n+2' position the output voltage is $(n+2) \times 2.25\text{V/cell}$ at the rated input voltage and rated output current.

Functions of PCB's:

PCB 001: It consists of the power supply to the control circuit, firing circuit, cell selector circuit, soft circuit, CMK, constant control circuit, total current limit circuit, short circuit protection circuit, over voltage protection circuit, reverse polarity protection circuit, auto changeover circuit and battery charging limit selection circuit.

PCB 002: It mainly consists of AC out of range circuit, buzzer and reset, overload and Auto mode fail indication circuits.

PCB 003: It is an auxiliary PCB fitted on the rare side of ammeter on which multi turn potentiometers mounted to carryout the calibration.



Technical Specifications: -

Input parameters:

1. Nominal input voltage: 230V AC, Single phase.
2. Permissible input voltage variation: 160V AC -270 V AC.

Output parameters:

1. Nominal Output Voltage :12V DC
2. Output Voltage:
 - (a) Auto Float Mode: Between 2.12 to 2.3 V/cell pre selectable
 - (b) Auto Boost Mode; 2.4V/cell
3. Output current:
 - (a) Auto Float Mode:0A to 10A
 - (b) Auto Boost Mode:0A to 10
4. Output Voltage in **MANUAL MODE** of working:
 - (a) 1st Position : $n \times 2.25\text{V/cell}$
 - (b) 2nd Position : $(n+1) \times 2.25\text{V/cell}$
 - (c) 3rd Position : $(n+2) \times 2.25\text{V/cell}$
5. Ripple : Less than 5% of the nominal value
6. Operating Temperature range: 0 to 55 °C

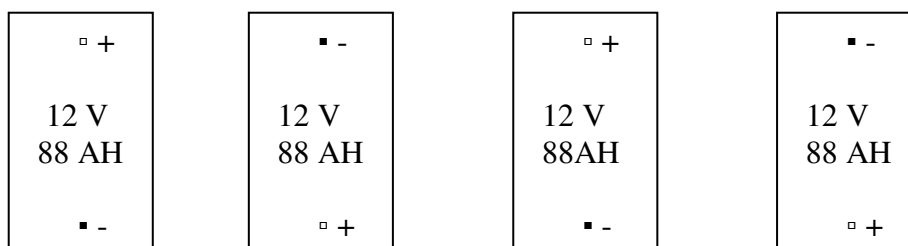
PROCEDURE:

- 1) Observe the front view of the given battery charger and indicate the function of each part ?

- 2) Inter connect the 4 numbers of 12 V batteries(each) in series fashion and record the total voltage of the whole battery and record.

Total battery voltage = -----

Total battery capacity = -----



3) Operate the charger as per the given instructions: -

AUTOMATIC MODE OF WORKING

- i) Apply 230V AC to the A.C. input terminals of battery charger.
- ii) Switch ON the input ON-OFF switch.
- iii) Glowing of GREEN LED indicates the mains is presence.
- iv) Put the MODE SELECTOR SWITCH at AUTO position.
- v) Without connecting the battery at battery terminals, the charger shows Auto Float indication.
- vi) Adjust the output voltage to the required value by adjusting the Potentiometer P1 taking 2.15V/cell.
- vii) Switch OFF the charger and connect the battery-to-battery terminals on charger output with correct polarity.
- viii) Switch ON battery charger. Depending on the condition of the battery, the charger changeover to Auto Boost / Auto Float condition. Observe the LED's indication and state the working mode of the charger.

Working mode of the charger is _____ (Auto float / Auto Boost)

LED's glowing _____

- ix) When the charger is in Auto Boost mode, adjust the current control potentiometer P2 @ to C/10 of the battery ampere-hour capacity to charge the battery.

Value of battery current: _____

LED's glowing: _____

x) Connect the lamp load to the "LOAD TERMINALS" of the charger.

NOTE: The charger to be switched OFF during connecting the load.
Now switch ON the charger and note down the following:

Battery current: _____ Amps.

Total Current: _____ Amps.

xi) When the battery reaches fully charged condition the charger automatically switches to "AUTO FLOAT CONDITION"

LED's glowing: _____

MANUAL MODE OF WORKING:-

When the Auto Mode fails, the charger is to be operated in 'MANUAL MODE'.

- (i) Keep the mode selector switch BS1 to "Manual Mode" position.
- (ii) Select the position of "Manual mode selector switch" either n, n+1 or n+2 position.

NOTE: When the charger working in Manual Mode attention is necessary.

(i) Indicate the switches to be operated in Manual Mode:

(ii) Charge the battery under 'Manual Mode' and now indicate the LED's glowing:

4) Measuring the Regulation of the battery charger:

i) Line Regulation:- It can be defined as the percentage change in the output voltage for a given change in the line voltage. It is usually expressed in units of %/V

$$\text{Line regulation} = \frac{(\Delta V_{\text{out}} / V_{\text{out}}) 100\%}{\Delta V_{\text{in}}} \quad (\Delta \text{ means "a change in"})$$

Take the readings and calculate the Line regulation and compare.

Sl.No	AC input voltage	DC input to rectifier	DC ΔV_{in}	DC output of charger	DC ΔV_{out}	Regulation $\text{In}\% / \text{V}$

ii) Load regulation: It can be defined as the percentage change in output voltage for a given change in load current. It is usually expressed in units of % / ma

$$\text{Load regulation} = \frac{(V_{nl} - V_{fl}) \times 100\%}{V_{fl}}$$

Take the readings and record in the given table and compare them.

Sl.No	No load voltage	Full load voltage	Regulation in% /mA

5) Measurement of ripple voltage:

- (i) Put the Auto/Manual selector switch in "Auto mode" position.
- (ii) Put the cell selector switch (mounted on PCB) in 'n' position.

(iii) Measure the DC output voltage of the charger (without connecting the battery to battery terminals) on the 'Battery'.

NOTE; While measuring keep the multi meter selector switch on DC range.

(iv) Now keep the selector switch of multi meter in AC position in suitable range and measure the ripple voltage on the terminals marked 'Battery'.

(v) Turn the cell selector switch to n+1 position. Repeat the above steps and note down the DC output voltage & ripple voltage and record the readings.

(vi) Carry out the experiment by keeping the cell selector switch in n+2 position and record the readings as above.

(vii) All the above readings to be entered in the given table.

(viii) Calculate the % ripple.

Sl.No	DC output Voltage of Charger in Volts	Ripple voltage Before filter (rms value) in mV	Ripple voltage after filter (rms value) in mV	% ripple

(ix) Now switch off the charger. Connect the 12V battery to the battery terminals on the charger.

NOTE: Keep the cell selector switch on PCB to 'n' position.

(x) Switch on the charger. Measure the values of the DC output voltage and corresponding 'ripple voltage'. Record the readings in the given table.

Sl.No	DC output Voltage of Charger in Volts	Ripple voltage Before filter (rms value) in mV	Ripple voltage after filter (rms value) in mV	% ripple

Review questions:

1) What is the function of control card PCB 001?

2) Note down the ratings of the Output fuses?

3) If there is no output on the charger, give your procedure of testing?

4) Identify the filter capacitors used in the charger and record the values?

5) What is the effect if load is connected to battery terminals & battery is connected to load terminals?

6) If the ripple is more than the nominal value, what may be the fault in the above battery charger?

7) Find out the V_{peak} , V_{av} for the recorded ripple voltages in the above table?

Date:

Signature of Trainee