

CASE 5:

(Physics)

Manufacturing a Battery Charger

The following letter was received by Freeway Electric, a small electrical equipment manufacturing company:

National Testing Labs

Our File: 68-01-01

Date: 17 July

Freeway Electric Ltd.,
1621 Kent Road,
Battledale, Saskatchewan

Gentlemen:

Thank you for your letter of inquiry concerning your battery charger. If you will provide us with the information listed below, the equipment and a fee of \$200 we would be pleased to carry out our standard evaluation.

The fee is a minimum deposit which will cover the examination and tests, a final report, and publication of approval. The total investigatory engineering charges are accumulated at an hourly rate, and they will be billed separately at the completion of approval.

At that time you will be asked to sign a re-examination service agreement and arrange for the annual fee.

From time to time, one of our authorized inspectors will make on-the-spot assessments of your processes to ensure that the terms of the agreement are being followed.

When you are prepared to proceed would you please provide the following information:

1. The full name and address of your factory
2. The amperage and voltage at each output
3. A schematic wiring diagram (two copies) for each unit
4. A detailed list of the components included
5. A list of model designations to be used, and
6. An explanation of the circuit in operation.

Yours truly,

W. Bracewell,
Chief Inspector

You have been given the job of handling this whole procedure though your only specific knowledge of the charger is that, in normal application, together with a battery, it provides full emergency supply for fire and vandal alarms. As you begin to gather data and specifications, you find that most of the information is still in the form of rough notes and rough sketches, so all will have to be rewritten and arranged in the form of a proposal consisting of a cover sheet, a table of contents, a main section to include (where appropriate) the specific items mentioned in the letter, and a letter of transmittal. The equipment itself looks like (Figures 1-6.)

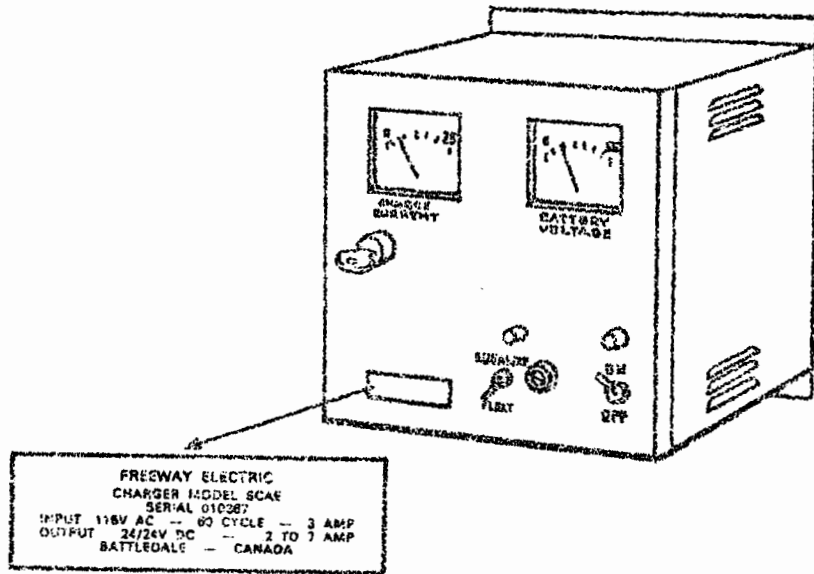


Figure 1: General View

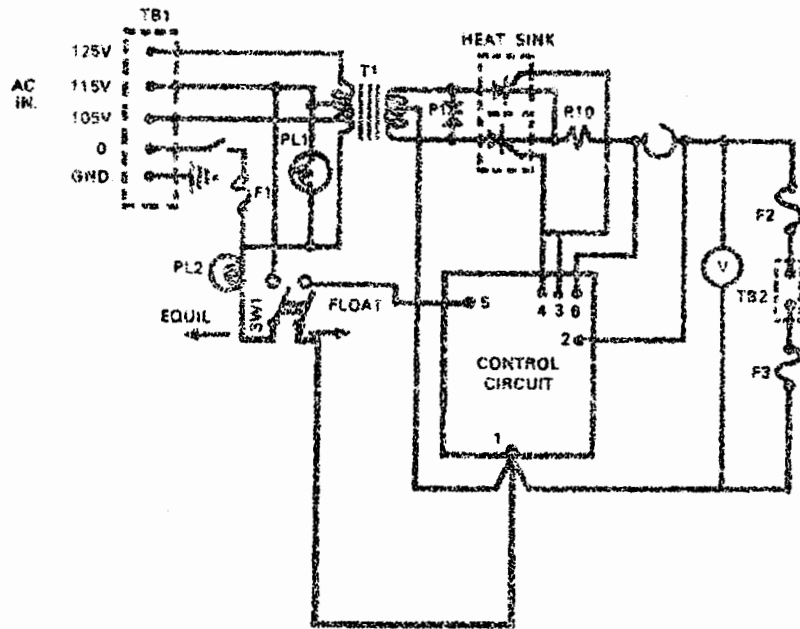


Figure 2: Schematic

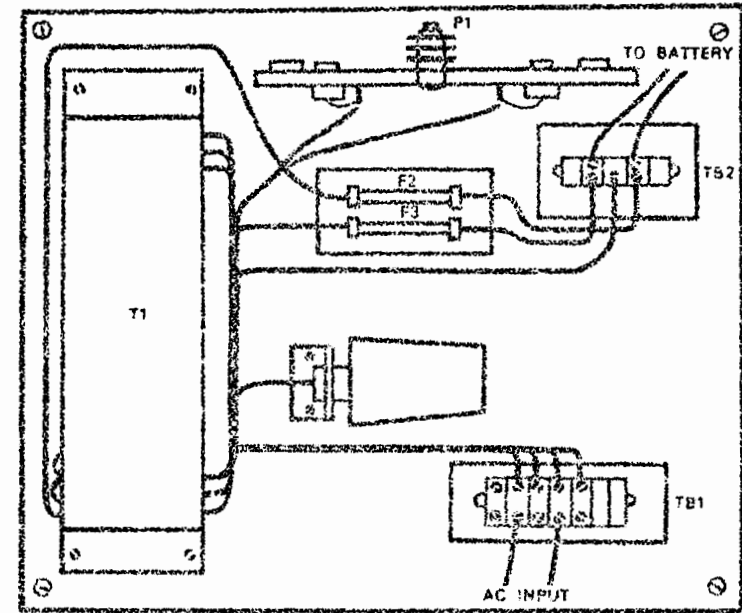


Figure 3: Panel: View with Door Open

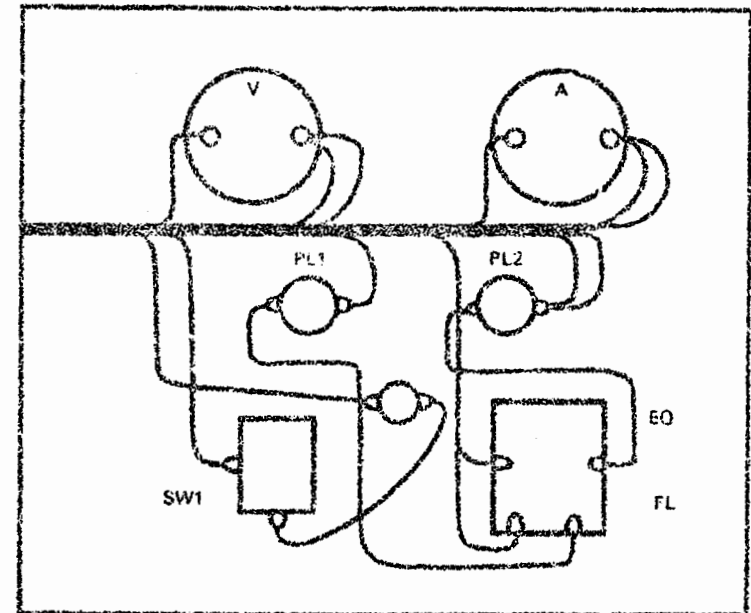


Figure 4: Door: Rear View

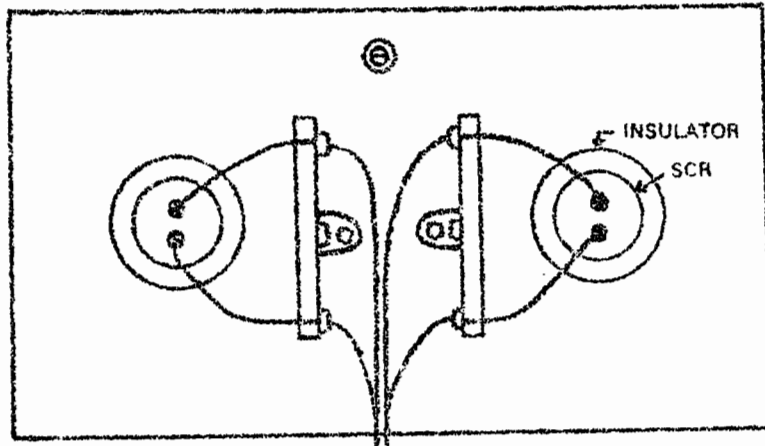


Figure 5: Shelf: Bottom View

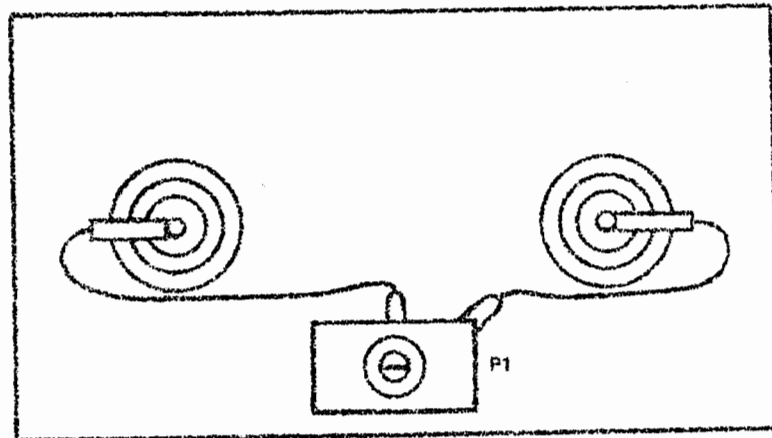


Figure 6: Shelf: Top View

Several pages in the development notebook are devoted to the charger. The first appears to be the basis for a specification sheet:

Out	.1 to 4 amps at constant volts— current adjusts automatically according to the load and battery needs.		
In	105 - 125 v	60w	1Φ
Misc.	On-off sw	Hi-lo factory set	
	DC voltm. & am.	AC-DC fuses	

Optional Equip.

- | | |
|---------------------------|--------------|
| AC failure relay | } need these |
| DC " " | |
| Timer | |
| AC circuit breaker | |
| LC filter for smoothed DC | |

The second is a partially completed parts list:

- | | | | |
|-----|--|------------------------|----------------|
| T1 | 1 - xfmr | 105-110-115-120-125/CT | |
| | | 45-47-49v @ 10A | |
| SCR | 2 - SCR | MCR 1308 | |
| R1 | 1 - 3.9K | 1/2w | } Control Unit |
| R2 | 1 - 1K | 1/2w | |
| R3 | 1 - 1K | 1/2w pot. | |
| R4 | 1 - 5.1K | 1/2w | |
| R5 | 10Ω | 1w | |
| R6 | 10Ω | 1w | |
| R7 | 2.2K | } for 24v unit only | |
| R8 | 100K | | |
| R9 | 24K | | |
| R10 | 1Ω | may not be used | |
| V1 | 1 - Voltmeter | 50v | |
| A1 | 1 - Ammeter | 25A | |
| T2 | 1 - special wound for SCR triggering - | Control | |

Delete all items for control unit—non-replaceable items potted in epoxy after assembly.

- | | | |
|-----|------------------|------------------------|
| SW1 | SPST | 5A |
| SW2 | DPST | Equalize/Float current |
| F1 | | |
| F2 | | |
| F3 | | |
| P1 | Surge Protector, | Sarkes Tarzian S-487 |
| PL1 | Molded neon type | |
| PL2 | | |
| S | Octal socket | (6 pins used) |

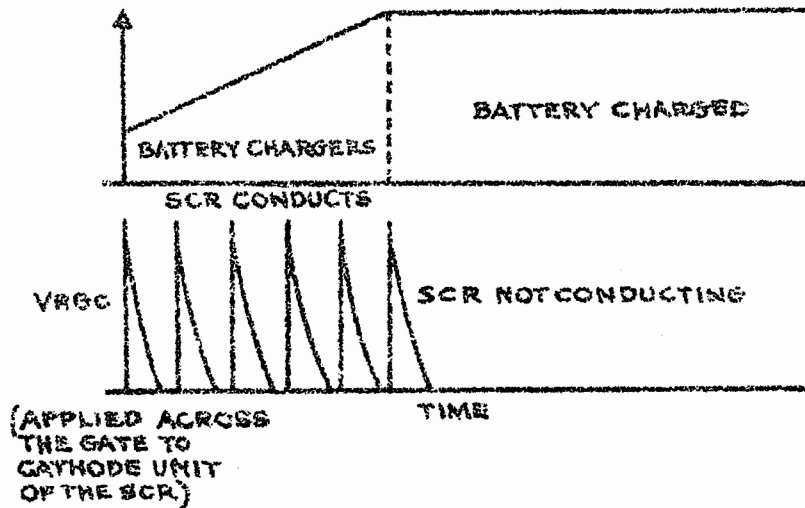
The third page has some basic information on the operation of the charger, but the writer had little notion of formats or style, so it will have to be rewritten.

Advantages: no work unless battery there,
 + - must be correct
 : Batt. volt. controls charge
 : full charge, charger off
 automatically

Item 1: charging current comes thru the silicon controlled rectifier when triggered.

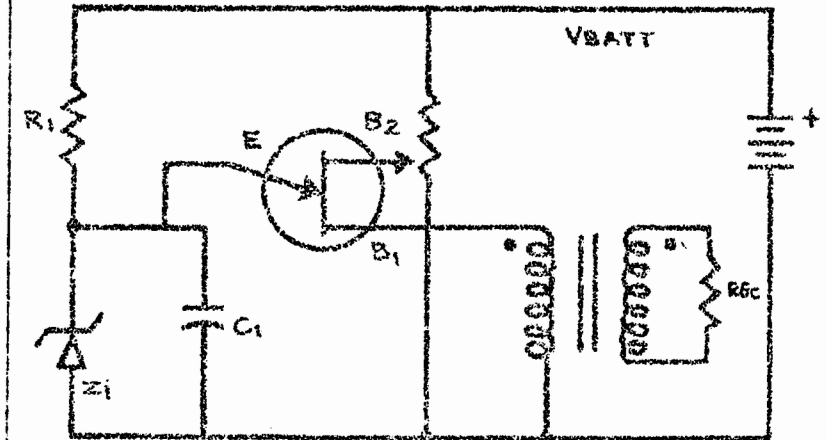
Item 2: Trigger pulses relaxation osc.
 low battery voltage sets this going so oscillator pulses continue to let charge current thru SCR until battery voltage high enuf to stop oscillator

like this:



Item 3: Charge level is set by a variable pot (in the control unit) which sets up an RC in the emitter circuit of the relax. osc.

Circuit like this:



Item 4: Oscillator needs to see volt. between 3 v. and the cut-off setting, with polarity as given.

Item 5: Then SCR not conduct { short circ.
 open circ.
 reverse polarity
 therefore, this is a foolproof charger.

ASSIGNMENTS

- A. Write the original letter of inquiry from Freeway Electric which would have resulted in the letter from the National Testing Labs.
- B. Write the complete proposal to accompany the equipment to be tested.
- C. Write a letter from the National Labs. advising that the approval has been held-up until the engineering drawings have been

The Technologist as Writer

revised to include a suitable interlock switch in the primary circuit to protect personnel when the door is open.

- D. Write an answering letter which:
- (a) complies with the request, but which
 - (b) argues to have the request reconsidered on the grounds that the lock keeps idle hands out and maintenance personnel would need to bypass the interlock anyway.
- E. Write a memo, for the record, to the development engineer Frank Ross suggesting that the output connections should have some kind of foolproof, polarized connections to avoid battery reversal. (Hint: this could be a touchy subject and the memo must be carefully written to gain co-operation, not hostility. At the same time it should not be servile.)