Standard Telecommunication Laboratories

Harlow.

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R & D LAB. MEMO. NO. 111

WORKSHOP MANUAL FOR THE GAME-PLAYING MACHINE STOOOP.

R821/5/MRG

MG/2.

Michael R. Grimwood.

Stooop - Why?

The aim and reasons for Stooop are described elsewhere by it's inventor, Dr J.H.Andreae, and will not be discussed here.

The Power Supplies.

Switch S1 (diagram 2) switches the battery in to circuit. When the switch is in its central position, the battery is disconnected from both the game and the power supply.

Switching the switch in to either the LH or ~~kk~~ RH positions will connect the battery into circuit. The game will then be driven from the battery, which, when fully charged, will give about three hours continuous use.

Plugging in the mains lead will then cause a regulated power supply to take over from the battery in operating the game, and the battery is then connected up to an automatic battery charger, whiches switches itself off when the battery is fully charged.

It should be noted that when the game is being operated from the mains, switching off S1 will disconnect the battery. preventing further charging, but will leave the game operating.

The machine will operate over a mains voltage range of ± 110 volts to 250 without any adjustments being necessary.

It will be seen that when the machine is operated from the mains, the lamps will glow more brightly than when the battery is used. This is due to the circuitry used, and does not mean that the battery is flat.

Setting - up Procedure.

Normally, the game operates as follows: When a white button is pressed, the corresponding orange lamp lights up. Any of the lamps that are on may then be turned off by the machine, but only one per move. The intermediate stage is not seen.

When a particular combination of orange lights are on, the red reward light comes on. When this is pressed, the game is reset.

The game may also be operated in an inverted mode. Under this condition, pressing a white button will turn the correspon ding orange lamp off, and the machine may or may not turn the orange lamps on.

The probability with which the machine counters the player's move is controlled by S2. The LH position is "easy", and the RH position is "difficult".

For normal playing, S1 should be in the RH position. When in the LH position, the "Cheat" facility is in operation (described below).

Any of the white buttons may be used to operate any of the orange lights, by means of P1, etc. P1,2, and 3 are connected to L1, 2, and 3 (diagram 1), and their sockets connected to the white buttons. To use this facility, the plugs are interchanged.

Switches S6,7, and 8, are linked to L1, 2, and 3 respectively, and control the reward pattern. When a switch is in the same position as the corresponding switch above it, its corresponding lamp will contribute to the reward pattern when it is on, and with the switch in the opposite position to the one above, the lamp will be off for reward.

It should be noted that the lamps L1, 2, and 3 are always reset off, and are also turned off when the reward pattern is reached.

When S3, 4, or 5 are in their RH positions, the corresponding lamp is operating in the normal mode, and when in the LH position, the lamp will operate in the inverted mode.

All combinations of the plugs and switches are allowable, although the game becomes rather trivial with some combinations.

The "Cheat" Facility.

When S1 is in the LH position, the "cheat" facility is in operation, and lamps in the white buttons are illuminated to indicate a successful move has been made.

To get reward, simply press the buttons that are not illuminated, regardless of how the plugs and switches S3-S8 are arranged.

This facility has been provided purely for the benefit of the demonstrator and for servicing, and should not be used by experimental subjects, especially Stella.

Safeguards.

If one or two of the buttons are held down while the third one is pressed, the machine will ignore the ones that are being held down.

If the reset button is held down, the game is inoperative.

If two or three buttons are pressed down at once, they will either be treated as successive moves, or the machine will ignore the second human move and award itself an extra random move for the human cheating.

Routine Maintenance.

Every six months or so, the battery charging current should be checked. Firstly the battery voltage is measured, and the state of charge found from the Deac specifications. An Avo is then inserted in series with one of the battery leads, and the current flowing in to the battery measured.

This should be between 100mA if the battery is fully discharged and 5-10mA when the battery is almost fully charged. The chargeing current is controlled by VR1 (diagram 3).

The power supply voltage may be checked at the same time, by measuring the voltage across the power supply input to the printed circuit with the machine plugged in to the mains. This should be 8 volts, and should still be 1 volt greater than the fully charged battery voltage even when the power supply is run from 110 volt mains. VR2 provides the necessary adjustment.

Should the reward button become stiff, the top cover should be removed, by undoing the top bolts, and the screw holding the switch in place re-positioned, and the screw tightened again.

Replacement of bulbs: Remove top cover. The orange bulbs are simply unscrewed, but the push-button bulbs are a bit more difficult. The button head is carefully pulled off, and the bulb prised out with a rubber sucker or sellotape. These bulbs are 6 volt 40mA, and the others are 6 volt 60mA.

Should the electronics have to be removed, simply remove the top cover and lift out the entire assembly, pulling the mains lead through it's hole.

Circuit Details.

Refer to Diagram 4. B1-B5 comprise a ring-counter, which is either 4 or 5-way, according to the setting of S2. B10-12 comprise the store and drive the orange lamps and cheat lamps through S3-8. B13-15 are operated by the white buttons, and drive the store. B6-9 control the sequence in which the machine operates, and drives the necessary gating. T1-3 transfer the ring counter state to the store, and T4-6 control the win light and turn the orange lights off when reward is reached.

All bistables marked with a diagonal in the RH corner are reset by the reward button. Operating L4-6 causes the corresponding bistable to toggle and sends a pulse switching the corresponding store bistable B10-12, which also switches B8 off.

The next clock pulse from B9 switches B8 on again, which sends a pulse to switch B6 off, stopping the ring counter.

The pulse from B6 switches B7 off, turning T1-3 off, and transferring the state of the ring counter to the store. B6 and B7 are then set back to the on state and the ring counter re-started.

When the reward pattern is reached, T4 is turned off, switching T5 and the reward light on. This turns T6 off, which turns off the orange lights.

The power supply operates as follows:

The battery drives the game through the IS031 diode. When the power supply is connected to the mains, the upper part of the circuit behaves as a conventional power supply, with an output voltage 1 volt greater than the battery. The diode is therefore back-biassed, and effectively disconnected.

Under these conditions, the lower part of the circuit is a constant current supply tox the battery through the OA5. The battery voltage is monitored by the 2G374 through the zener diode, which reduces the charging current as the battery becomes more fully charged.

When the mains is turned off, current cannot flow from the battery in to the charger as the OA5 is back-biassed.

Diagram 1.

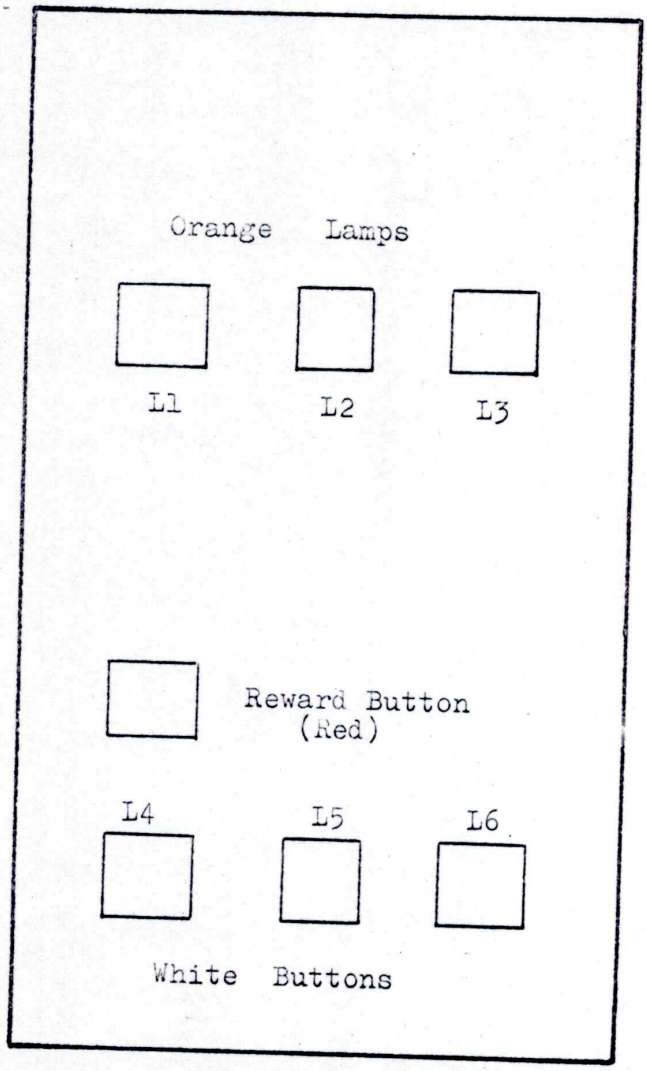
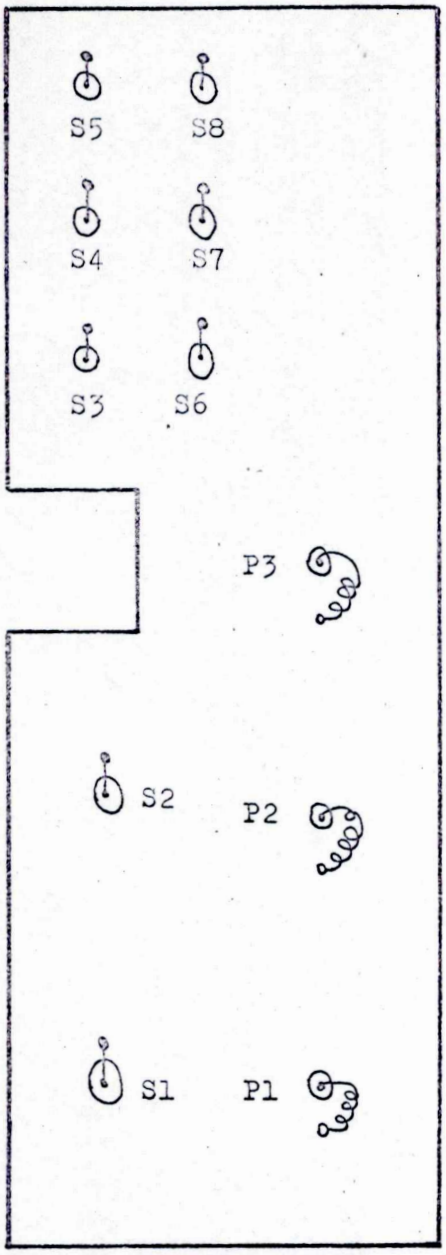
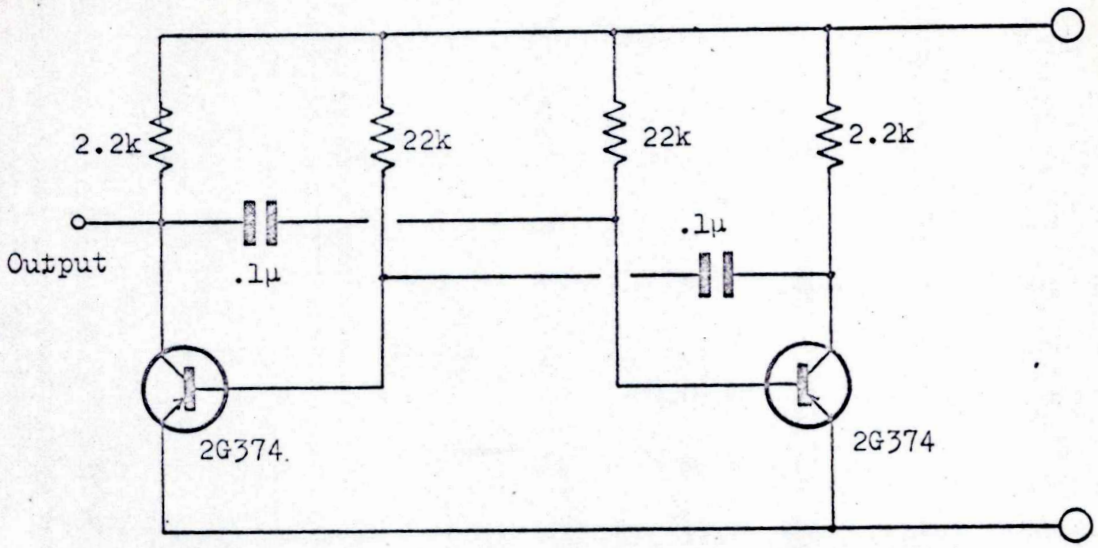

Orange Lamps
L1
L2
L3
Reward Button
(Red)
L4
L5
L6
White Buttons

Diagram 2.

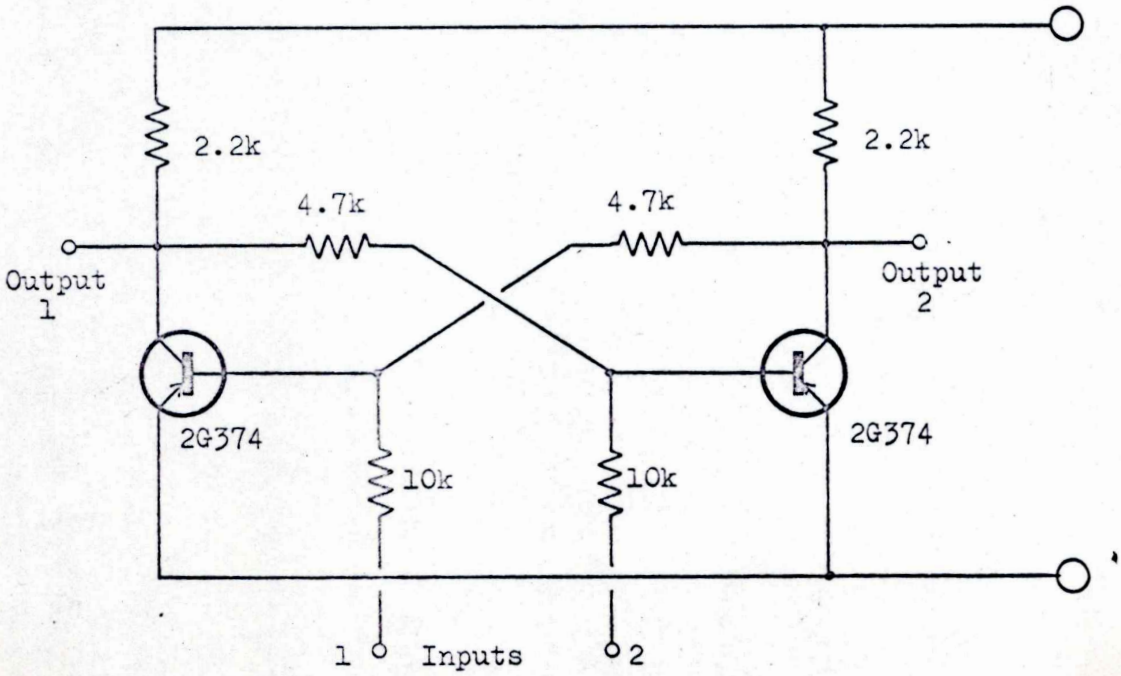


Control Panel (as seen from side)

Diagram 3.



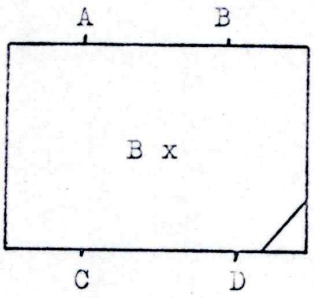
Clock Multivibrator - 1k/cs



Toggling Bistables

Diagram 3b.

Main Bistable Element.



NB The input capacitors are not on the bistable element boards

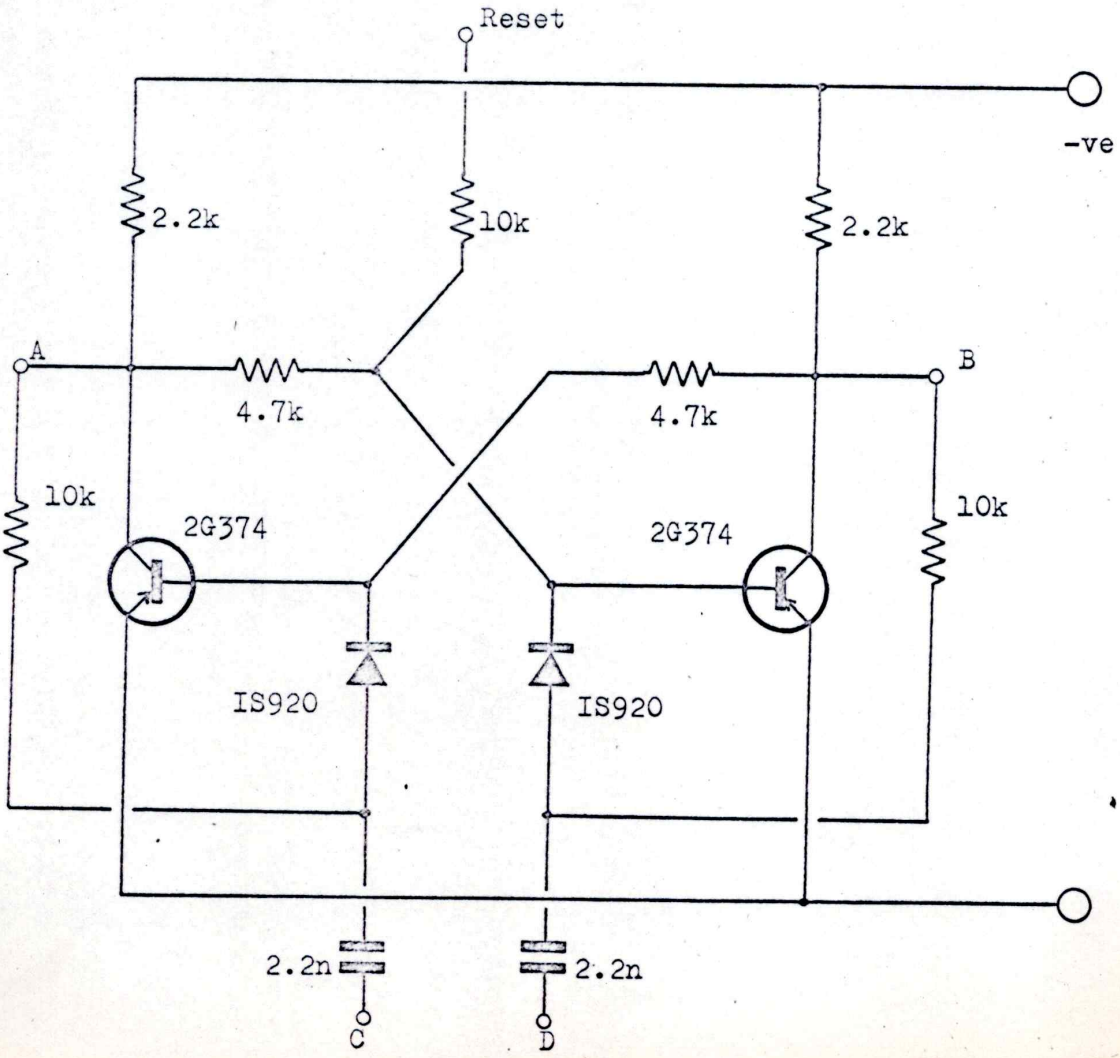


Diagram 4. Main Circuit Diagram.

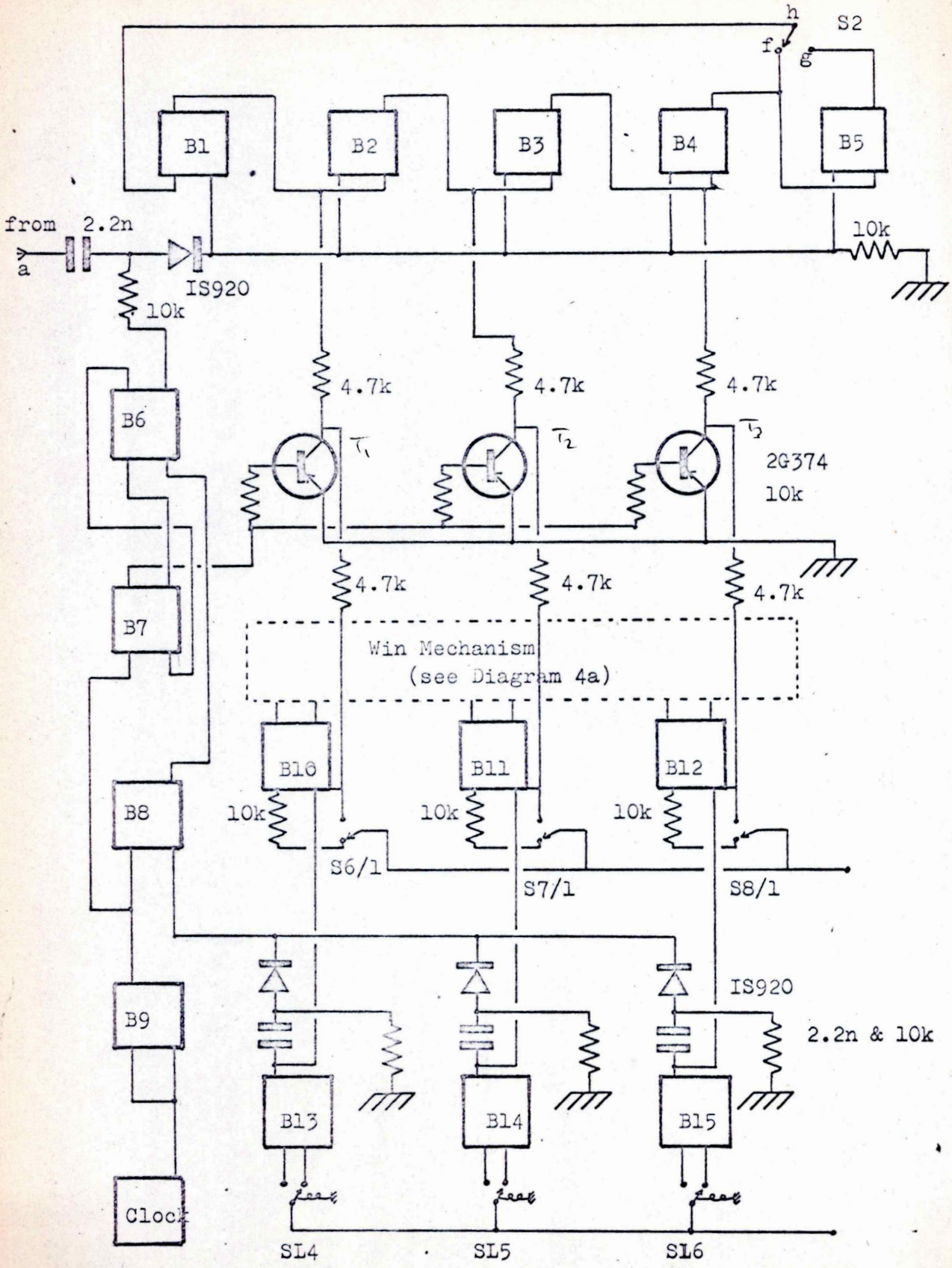


Diagram 4a

Win & Cheat Circuitry.

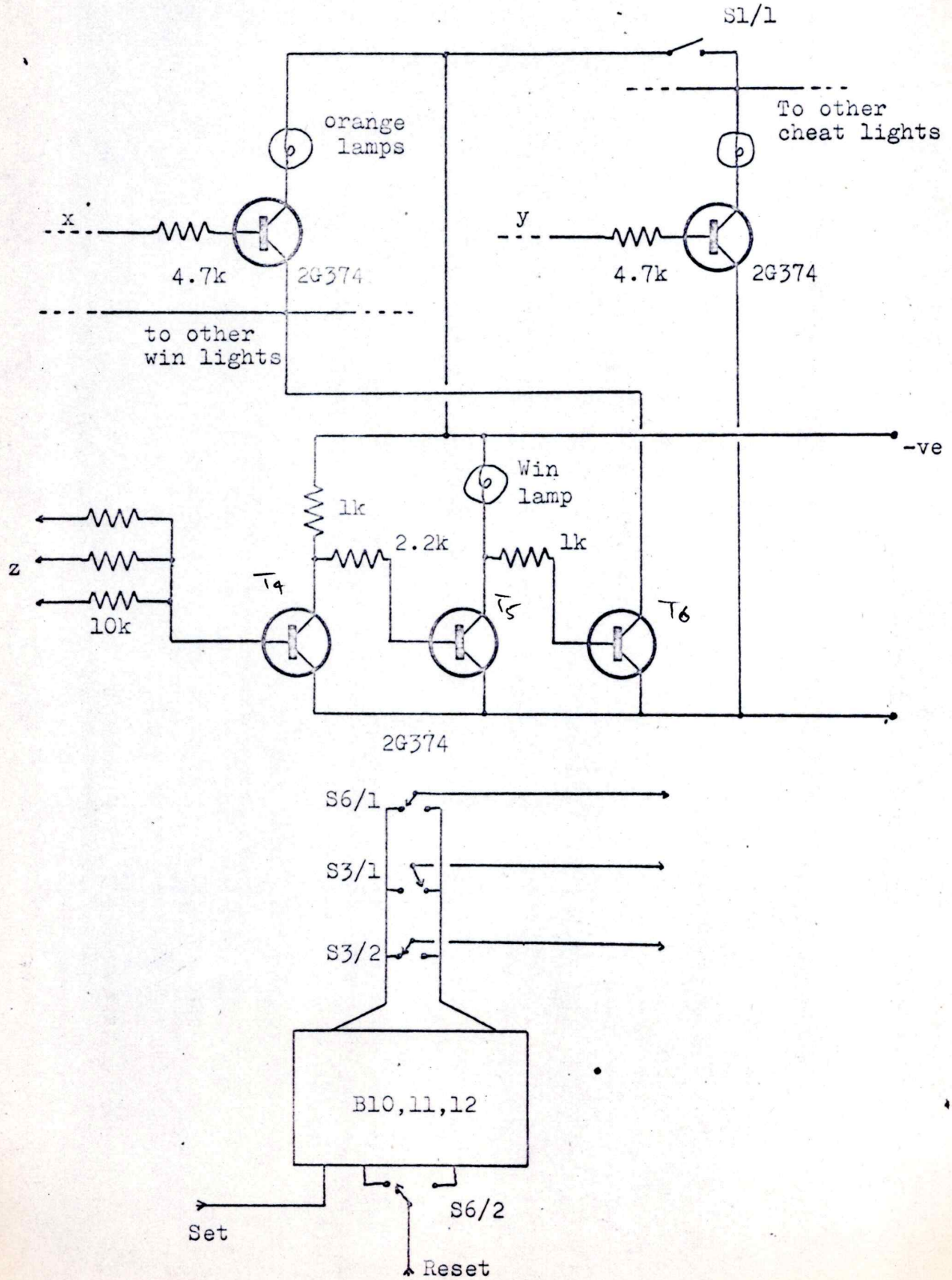


Diagram 5.

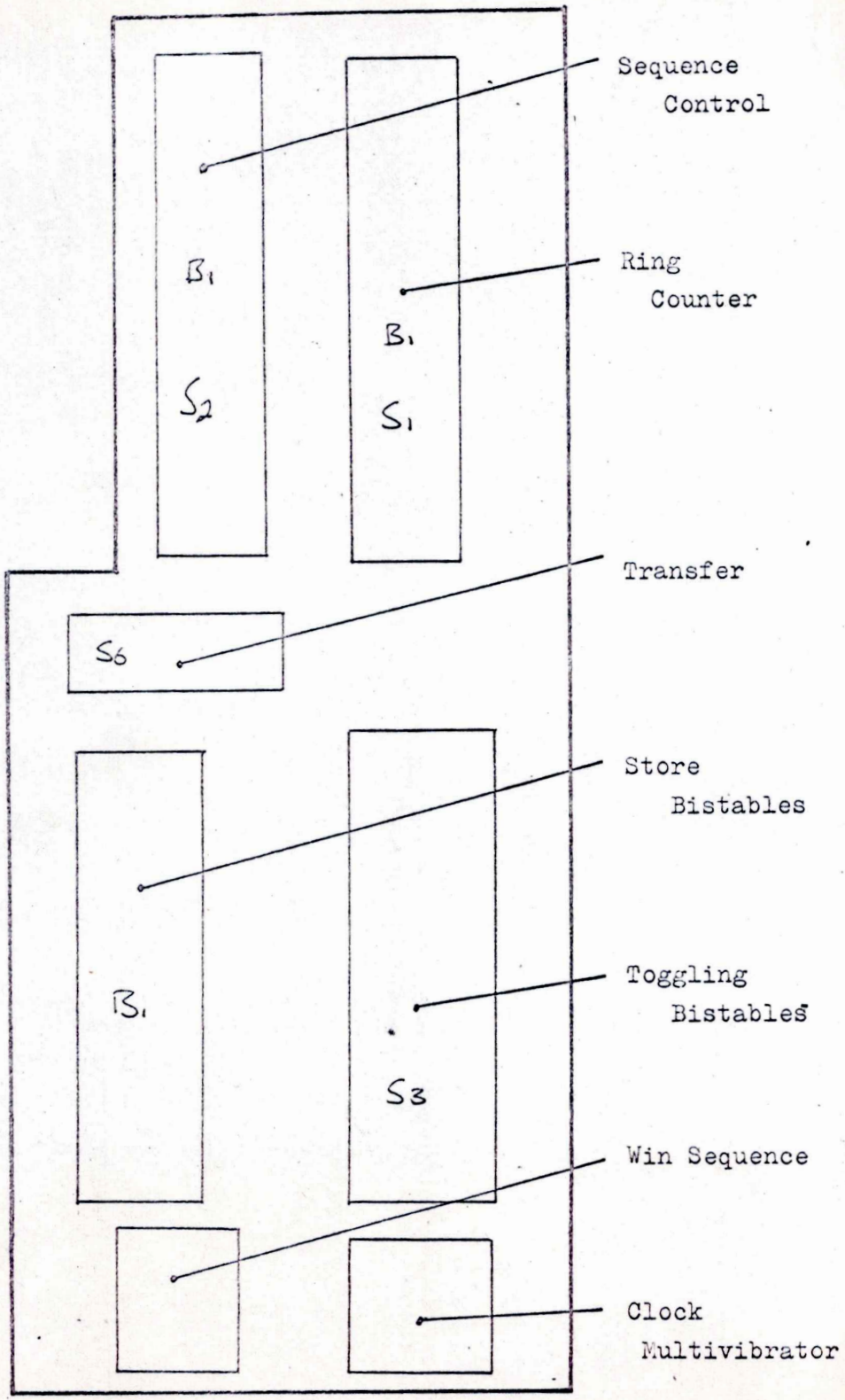
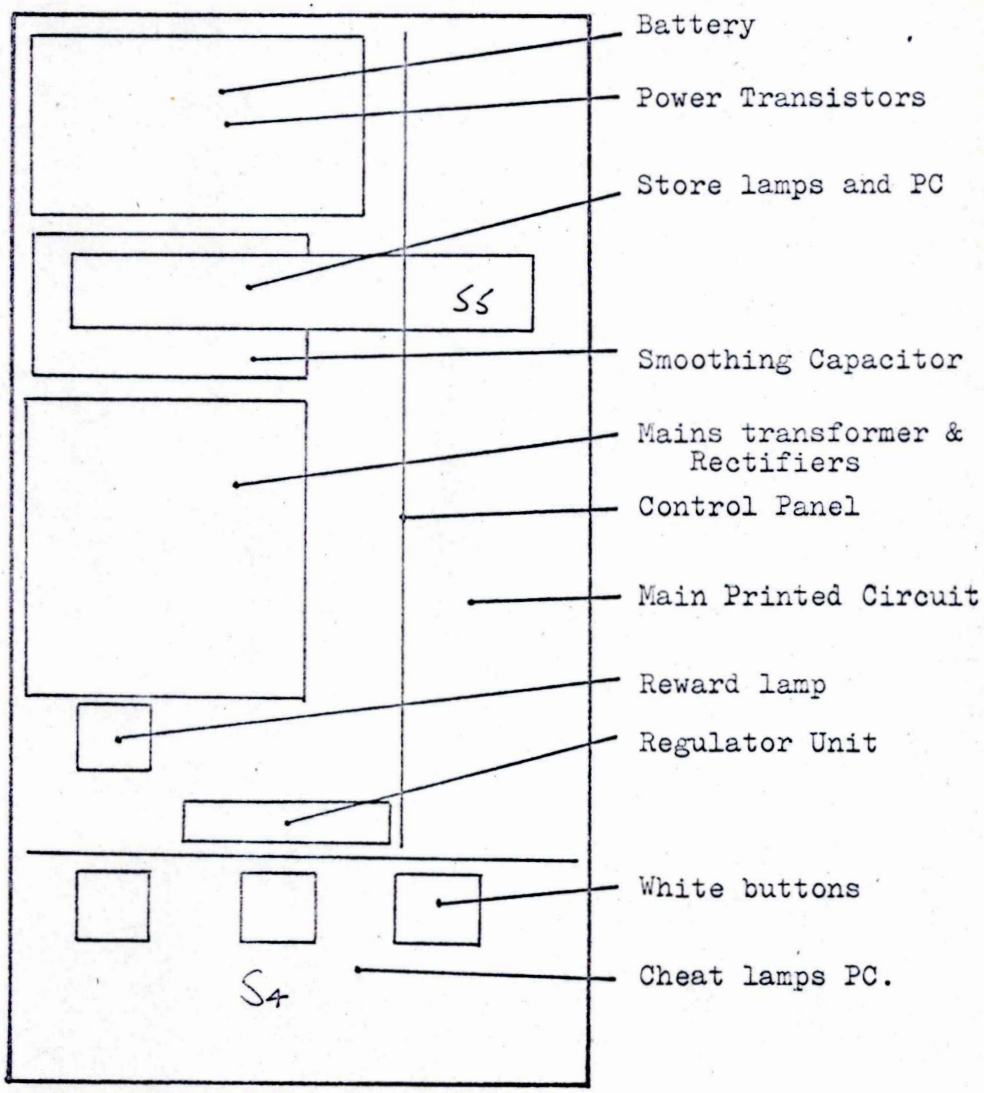
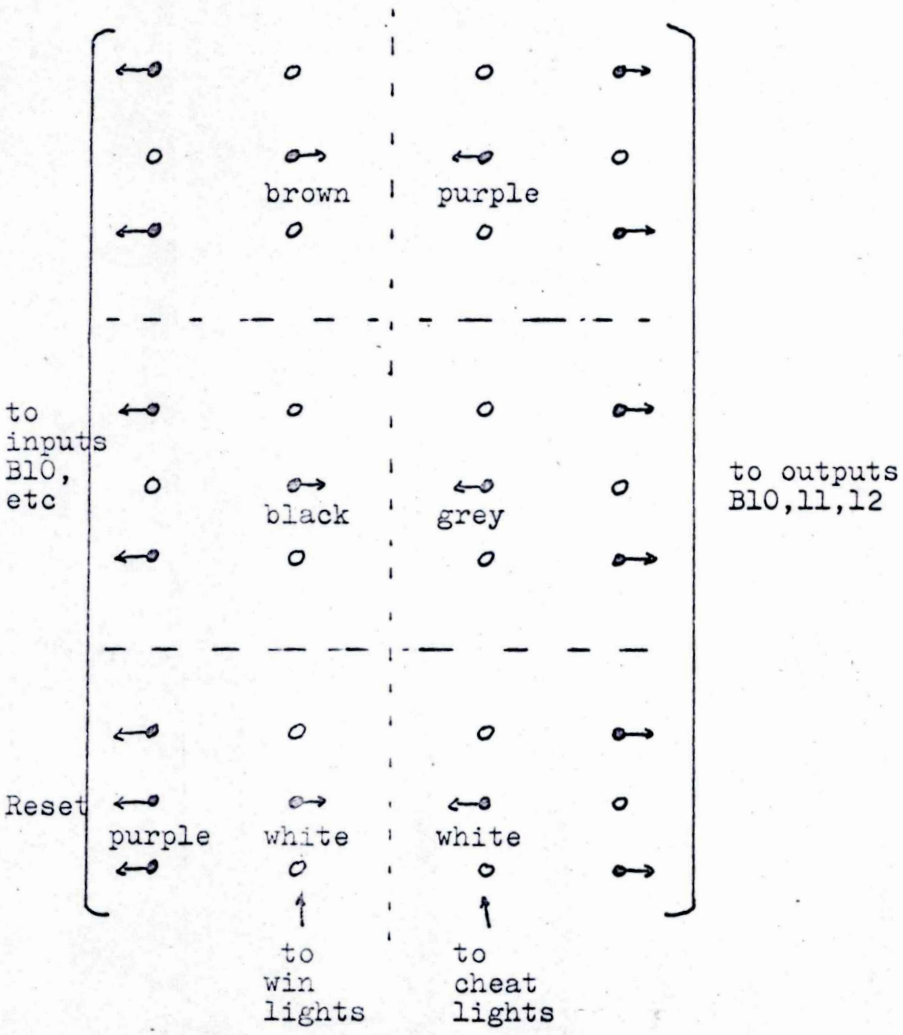

Sequence Control
Ring Counter
Transfer
Store Bistables
Toggling Bistables
Win Sequence
Clock Multivibrator
B1
S2
B1
S1
S6
B1
S3

Diagram 6.



Layout of Box

Diagram 7 Switch Wiring Diagram.



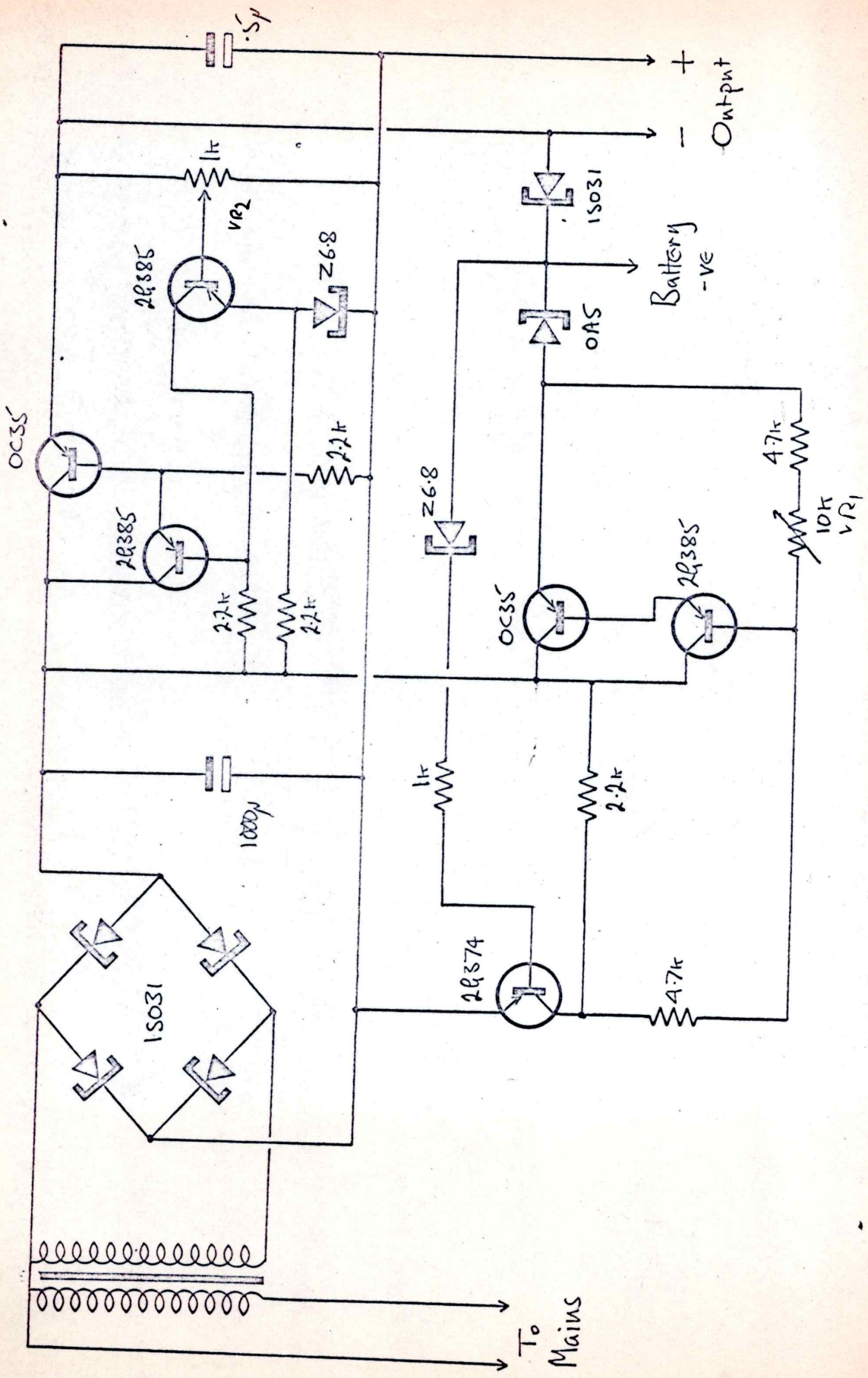
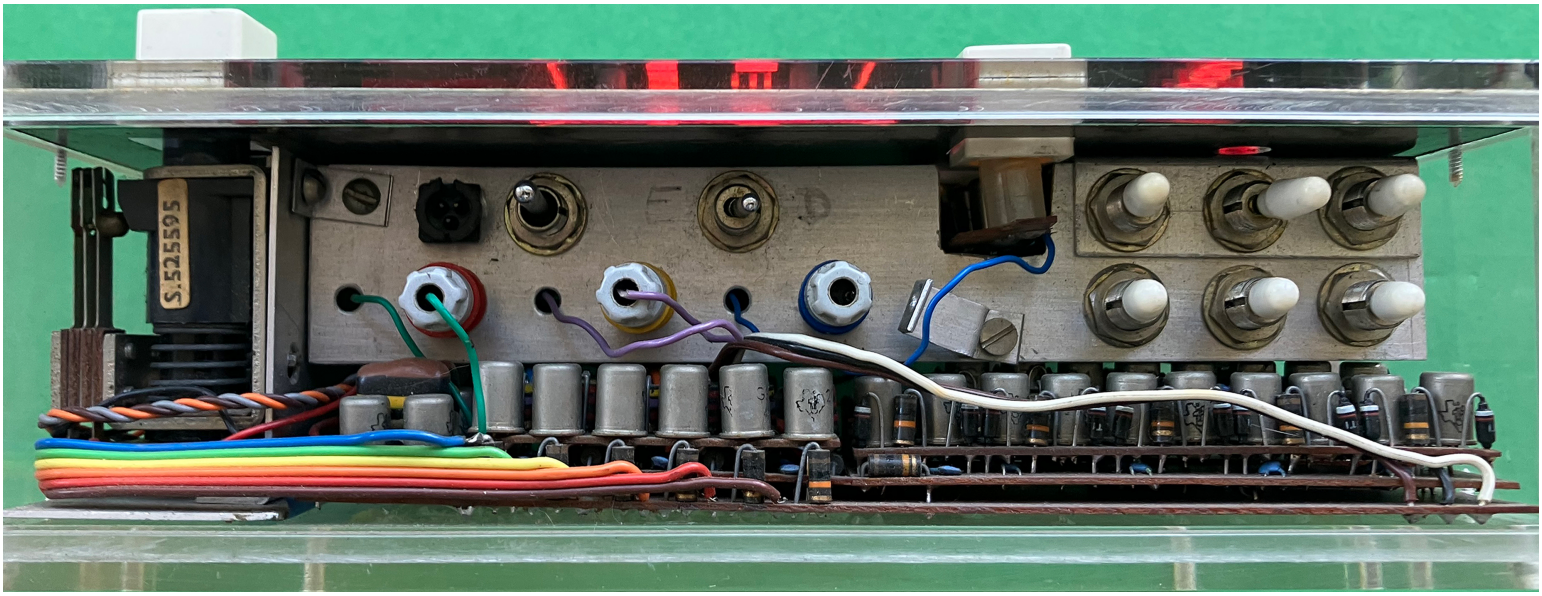


Diagram 8 Power Supply Circuit.


STooo P
LIGHT = REWARD
PRESS TO RESET


STooo P
LIGHT = REWARD
PRESS TO RESET


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