SECTION 8 - CONTROL CONSOLE

The control console has three panels, on the left the operators panel, on the right the engineers panel, and in the centre the monitor. Below the monitor are two rows each of switches and lights having thirty six in each row, for use in conjunction with the operator's panel. The monitor, lights and switches, and operator's panel are illustrated on page 2. No illustration is given of the engineers panel, nor is it here dealt with any further since it does not directly concern the programmer.

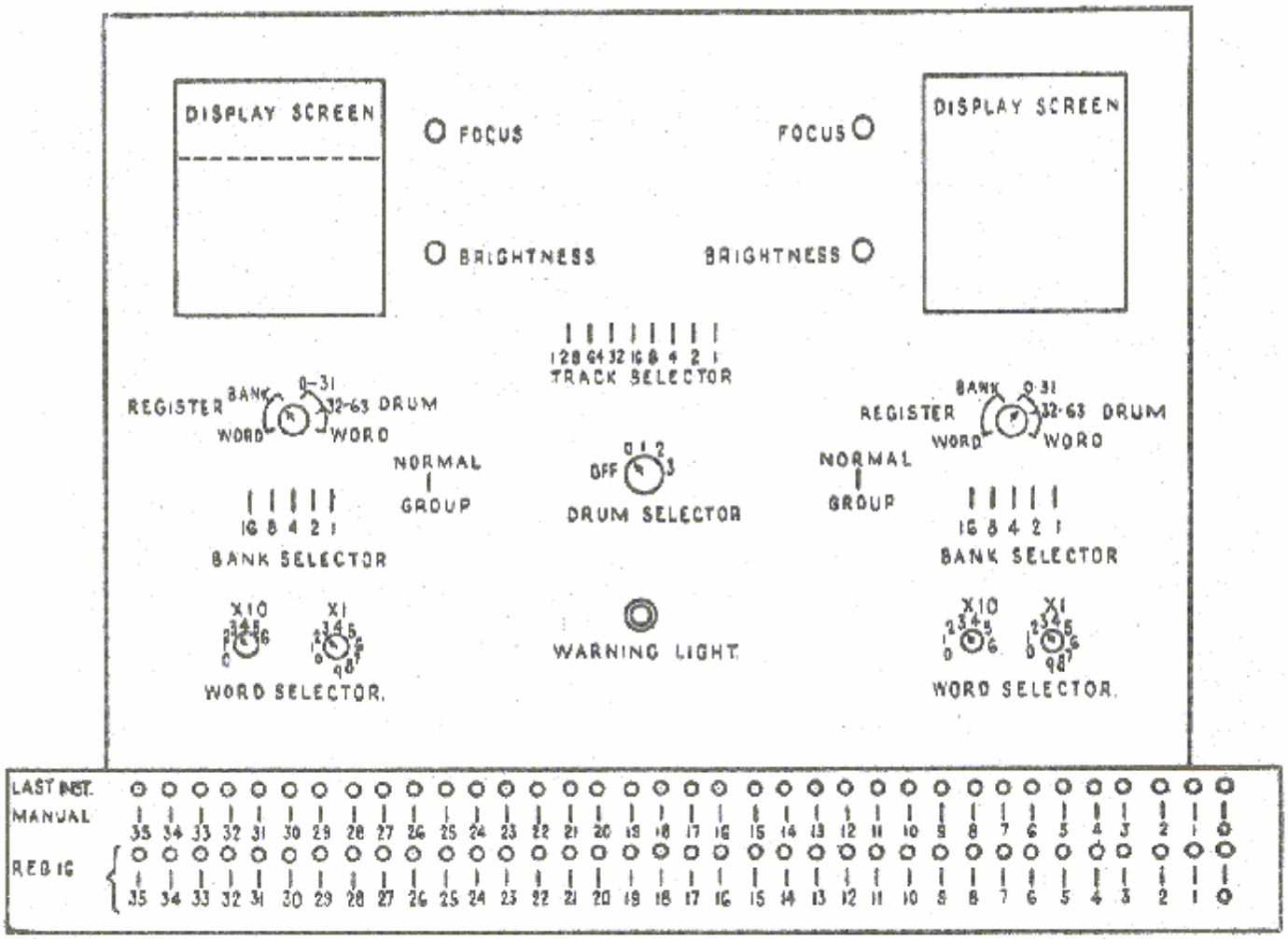
The central, monitor, portion of the console is used to inspect the storage contents of the computer, and two monitor screens are provided each consisting of a cathode ray tube on which any of the contents of the drum or core stores may be displayed, whether or not the program is in progress.

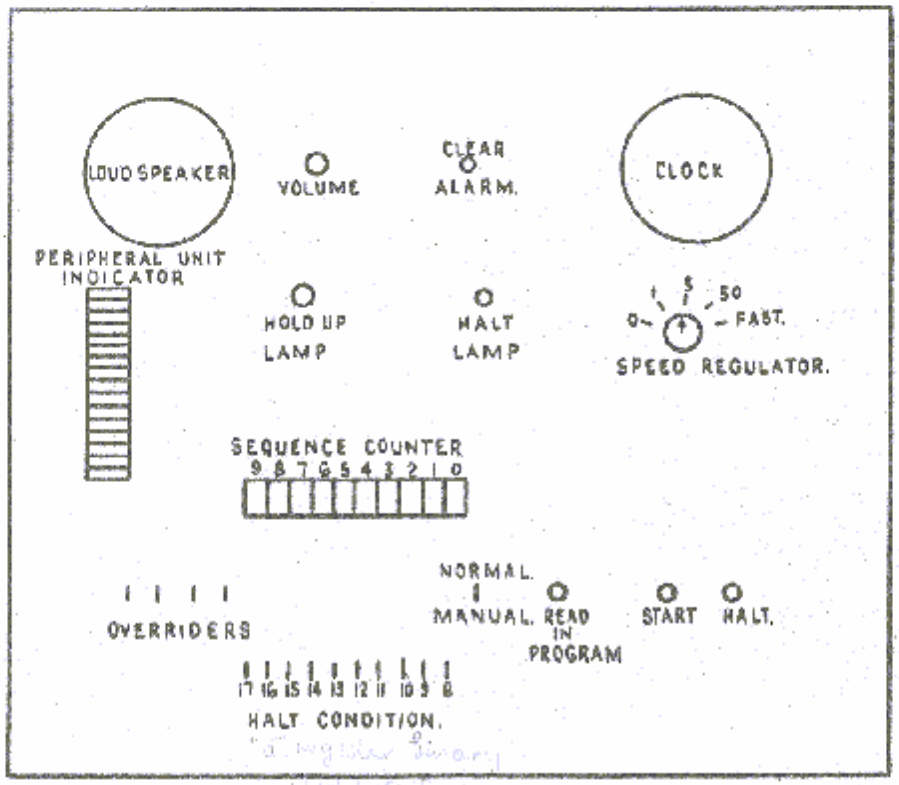
The cathode ray tube displays a panel of 32 lines each of 36 bits, a bit being represented by an illuminated dot. This dot is brightened and elongated when it represents a "one".

For the purposes of the monitor display the registers are considered in "banks" of 32 registers each. On each of the screens it is possible to display either a "bank" or a single word. In the core store registers 0-31 are "bank" 1, registers 32-63 bank 2, registers 64-95 bank 3, and so on.

Using the left-hand screen, suppose we want to display bank 13 of the Core Store. Then the bank selector switches are set to give this number, i.e. switches 8, 4 and 1 are put down. The top knob is set to Register-Bank, and the 32 registers of bank 13 will then appear as 32 lines on the screen. Should we want only a single word of this bank, say word 14, then the top knob would be set to Register-Word, and the decimally-numbered lower knobs will be set to 14, i.e. the left-hand (tens) knob will be set to 1, and the right-hand (units) one to 4. A single line representing register 14 will then appear on the screen.

For displaying drum storage we work in tracks, or rather half-tracks, since the capacity of the screen is 32 words or one half-track. If we want to inspect the contents of track 93 of drum 1, then the drum selector switch in the centre of the panel is set to 1, and the track is selected by setting the track selector switches 64, 16, 8, 4 and 1. The top left-hand knob is set to Drum - 0-31, and the screen will then display the 32 registers constituting the first half of the track. To display the other half the top knob is turned to 32-63. Should only a single word be required from this track, then the top knob is set to Drum - Word, and the number of the wanted


DISPLAY SCREEN
FOCUS
BRIGHTNESS
FOCUS
BRIGHTNESS
DISPLAY SCREEN
1 2 8 6 4 3 2 1 6 8 4 2 1
TRACK SELECTOR
REGISTER BANK 0-31 32-63 DRUM
WORD WORD
NORMAL
GROUP
OFF 0 1 2 3
DRUM SELECTOR
NORMAL
GROUP
REGISTER BANK 0-31 32-63 DRUM
WORD WORD
16 8 4 2 1
BANK SELECTOR
16 8 4 2 1
BANK SELECTOR
X10 X1
WORD SELECTOR.
WARNING LIGHT
X10 X1
WORD SELECTOR.
LAST INST.
MANUAL
REG 16
35 34 33 32 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0


LOUDSPEAKER
VOLUME
CLEAR ALARM.
CLOCK
PERIPHERAL UNIT INDICATOR
HOLD UP LAMP
HALT LAMP
0 1 5 50 FAST.
SPEED REGULATOR.
SEQUENCE COUNTER
9 8 7 6 5 4 3 2 1 0
OVERRIDERS
NORMAL
MANUAL. READ IN PROGRAM
START
HALT.
17 16 15 14 13 12 11 10 9 8
HALT CONDITION.

word is set up on the lower decimally-numbered word selector knobs.

The Normal-Group switch on the right of the bank selector controls the form of the line representing a word which is displayed on the screen. If the switch is "normal" then we get a continuous line of equally spaced dots, thus:-

If, however, the switch is set to Group, then the line appears in groups of three and five digits, thus:-

Reading from the right-hand end, the first three bits are equivalent to the modifier, the next five to the function, the next two groups of five to the 's' address, the following two groups of five to the 'b' address, and the final two groups of five and three, to the 'c' address. This group form therefore facilitates the recognition of the binary contents of a register.

The operation of the right-hand screen is exactly the same as that of the left-hand one, and they may both be used together for any purpose. Thus they could together display the two halves of a drum track, or one could display a bank of registers while the other showed a single register from that bank. It is not however possible to show drum information on both screens unless all the information is contained within one track.

It should be noted that in some cases the transfer of information to the monitor screen results in a slowing of the machine operation. The control positions on the panel which result in such a slowing are marked in light red and when the controls are in such positions a warning light is lit to indicate that time is being lost and a return to "normal" positions should be effected as soon as possible.

8.1. Operator's Panel

The operator's panel has at the top left-hand side a loud-speaker which emits the "machine rhythm". The loud-speaker will also broadcast a distinctive alarm note which is set off by the presence of a D28 in a halt instruction (function 0), and can be subsequently turned off either by a D29 in a further halt instruction, or by the manual "clear alarm" button.

On the top right-hand side of the panel is a clock which measures the machine operation time.

Running down the left of the panel is the peripheral unit indicator, using lights to indicate the various peripheral units which are currently

being used by the computer. Should there be a hold-up on one of the peripheral units the red hold-up light will be lit, and the only light remaining in the peripheral unit indicator will be that of the unit causing the hold-up.

On the right of the panel is the Speed Regulator which can be set so that the computer performs single shot operations, that is, that is stops after effecting each single instruction. Alternatively instructions may be carried out at rates of one, five or fifty instructions per second, or the machine may be set to "fast" i.e. continuous full-speed operation.

In the centre of the panel is the sequence counter, which indicates by a row of lights the number of the next instruction to be carried out.

The operator's panel also carries four overrider switches, the "halt condition" switches, and a manual/normal switch, together with buttons for "Start", "Halt", and "Read in Program". The rows of switches and lights at the foot of the monitor panel consist of:

(i) A row of 36 lights showing the last instruction which has been performed.

(ii) A row of 36 switches on which instruction digits may be set up manually.

(iii) A row of 36 lights displaying the contents of register 16.

(iv) A row of 36 switches on which digits may be introduced into register 16.

8.2. Manual Operations

In general, there are five types of manual operation for which the control console will be used. These are the introduction of a new program, the introduction of a single manual instruction, the transfer of control (that is, a change of sequence in a stored program), the alteration of stored information, and the setting up of halt conditions.

For reading in a program the machine must first be in the "halt" condition and set to "manual". The program is then loaded on a magnetic tape unit (No.1) and the "Read in Program" button is pressed. If the control is then reset to "normal" and the "start" button pressed, the computer will start to read in the program.

To perform a single manual instruction the normal/manual switch is first switched to manual, which automatically halts the machine. The required instruction is then set up by selecting the appropriate digits on the 36 "manual" switches.

The machine is now set up and if it is re-started it will perform the "manual" instruction repeatedly at a speed determined by the "Speed Regulator". It is therefore necessary to set this regulator to "Single Shot". The "start" button may now be pressed and the machine will then perform the "manual" instruction once only, and then halt. It may now be switched back to "normal".

The transfer of control involves a "jump" from one program instruction to another, that is, an alteration in the sequence in which the instructions are to be carried out. The form of instruction used for such a jump is the "unconditional transfer" 11 0 R ... or 13 0 R ... (See Section 3.10).

It would be possible to effect the required alteration by setting this instruction up on the register 16 switches, as outlined above for a single manual instruction. However, to avoid wasting time in setting up switches, the computer is provided with four special-purpose over-ride switches which automatically set up certain basic instructions.

The four functions provided are:-

No.	Purpose	C2	C1	B	A	Fn.	Mod.
1	Transfer to Register	0	0	←X→	16	1	0
2	Transfer to Control	0	0	←X→	0	13	0
3	Amending Drum Store	1	←——X——→		17	15	0
4		1	←——X——→		17	16	0

The positions marked "X" will be set up on the "manual" switches as required in each case, but the rest of the function is in each case automatic. The normal/manual switch is set to manual, and the over-riding function is then performed as soon as the over-ride key is pressed.

For transfer of control, over-ride key No.2 is used, and it therefore is only necessary to set up on the "manual" switches in the 'b' address position the number of the instruction to which control is to be transferred.

The over-ride keys are also used for the amendment of stored information. If it is required to amend a register in the core store, over-ride key 1 is used, which effects a transfer from register 16 (i.e. the second row of switches). It is therefore necessary to switch the computer to "manual", set up in the 'b' address position on the "manual" switches the variable part of the transfer function i.e. the destination address which is to be amended, then set up on the register 16 switches the actual information to be transferred into the address specified on the "manual" switches, and then operate over-ride key number 1. The computer is subsequently switched back to "normal"

It is not possible to amend the drum directly, and it is therefore necessary, when amending the drum, to transfer the information to registers, to amend it there, and then transfer back. Furthermore the transfer to registers must be of a four-word block since a single word cannot be transferred.

The procedure for amending the drum is therefore as follows:-

First the manual/normal switch is set to "manual". Then we set up on the "manual" switches the address of the block which we want to amend. Then the over-ride key No.3 is depressed, which transfers the block from the drum into registers 17 - 20. Any one or all of these registers are then amended by the use of over-ride key No.1, as outlined above. After which over-ride key 4 is used to replace the block on the drum.

The ten halt-condition switches are used for setting to correspond with digits previously entered in programmed halt instructions, to give a conditional halt. (See also Section 3.3. Halt).

Register 16 is designed specially for use with the control console. When this register is addressed as a destination the number which it contains is displayed on the row of 36 lights beneath the display panel. A number which is transferred in this way cannot however be recovered from register 16. When register 16 is addressed as a source the number taken is always the number which has been set up on 36 switches provided on the console. As this number is taken it will be transferred to the Register 16 lights.