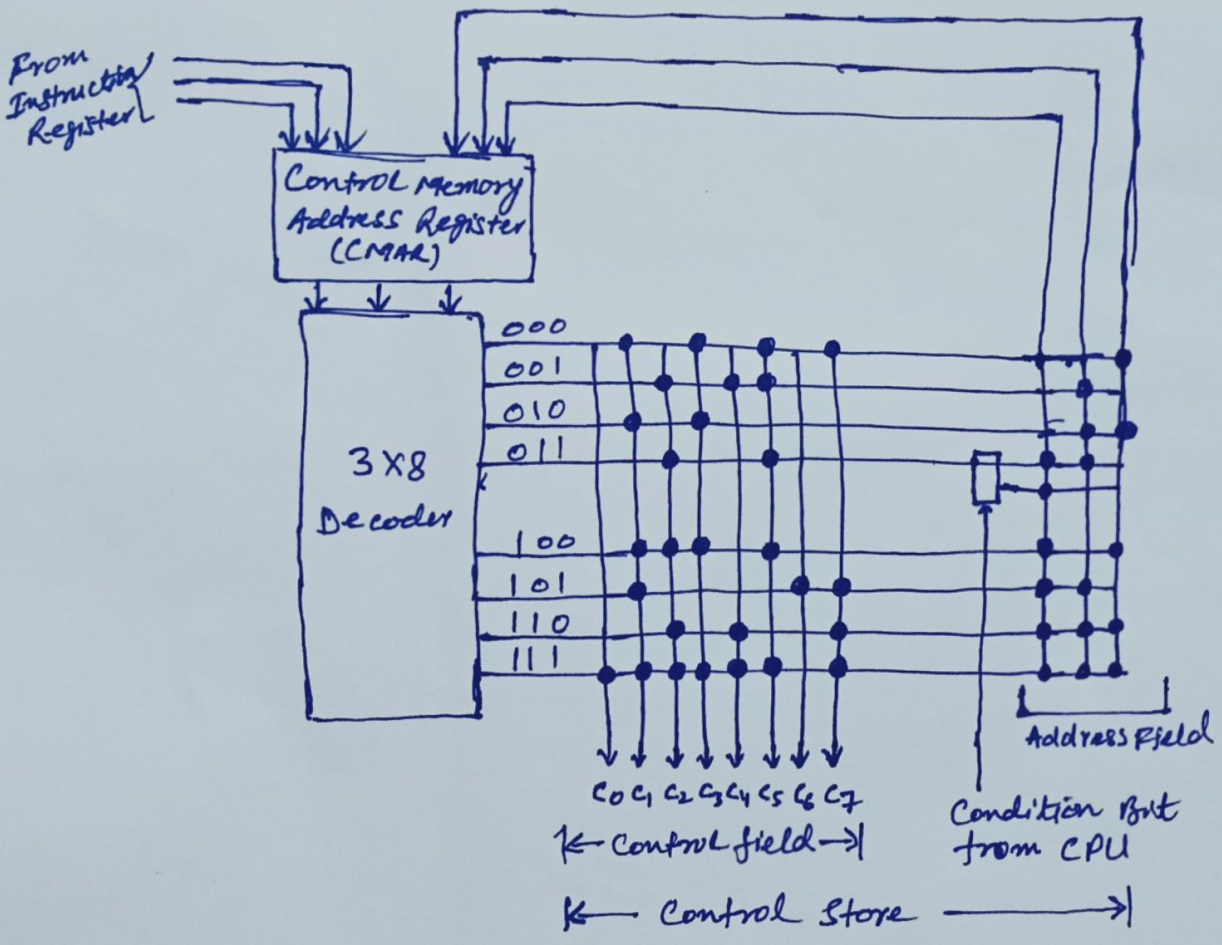
Wilkes Control

In 1951 Wilkes had proposed the use of microprogram control unit. In Wilkes design a micro-instruction has two major components :

(i) Control field and (ii) Address field.

The control field indicates the control lines which are to be activated and the address field provides the address of next micro-instruction to be executed. Figure below shows a simple example of Wilkes control unit design.



The control memory in this control is organised as a program Logic array like matrix made of diodes, a simple electronic device. This is partial matrix and

Consist of two components, the control signals and the address of next micro-instruction. The control memory access register (CMAR) can be loaded by the instruction code register or by the address field of the control matrix. The control memory address register on taking an input from the instruction register provides a 3-bit address to the 3×8 decoder. This is an entry point address to the control memory. On the basis of this address, decoder activate one of the eight output lines (horizontal). This activated line generates control signal and the address of next micro instruction to be executed. This address once again fed to the CMAR resulting in activation of another control line and address field. This cycle is repeated till the execution of the instruction is achived. For example, in the given figure, the instruction register's opcode 000 causes the decoder to have an entry address for a machine instruction in control memory at line 000. The decoder activate the lines in the sequence given below

Decode line activated	Control signals generated	Addr. of next micro-instruction
000	C_1, C_3, C_5, C_7	001
001	C_2, C_4, C_5	010
010	$C_1 C_3$	011
011	C_2, C_5	?

To get the address of the next micro-instructions after activitating the decode time 011, there are two possible options in the figure-2. A typical requirement of a control unit is that it must respond to an external control condition. Thus, making conditional jumps possible within a micro-program. This is demostrated in the wilkes control of the figure. The external condition switch causes the control unit to follow one of the two available paths:

Either

011	C_2, C_5	If external condition is true then 110
110	C_2, C_4, C_7	111
111	$C_0, C_1, C_2, C_3, C_4, C_5, C_7$	This may cause loading of next instruction in IR

OR

011	C_2, C_5	If external condition is false then 100
100	$C_1, C_2 C_3, C_5$	101
101	C_1, C_6, C_7	111
111	$C_0, C_1, C_2, C_3, C_4, C_5, C_7$	This may cause loading of next instruction in IR.