

Micro-instruction

A micro-instruction is an instruction of a micro-program. It specifies one or more micro-operations, which can be executed simultaneously. On executing a microinstruction, a set of control signals are generated which in turn cause the desired micro-operation.

Types of micro-instruction:-

In general, the micro-instruction can be categorized in two general types. These are branching and non-branching. A non-branching micro-instruction is one, in which the next micro-instruction which is executed is the one following the current micro-instruction. However, this sequence of microinstructions is relatively small and lasts only for 3 or 4 micro-instruction.

A branching micro-instruction is a desirable instruction. The condition which is to be tested is a conditional variable or a flag generated by an ALU operation. Normally the branch address is contained in the micro-instruction itself.

Micro-instruction Format:-

The format of micro-instruction must include the following fields.

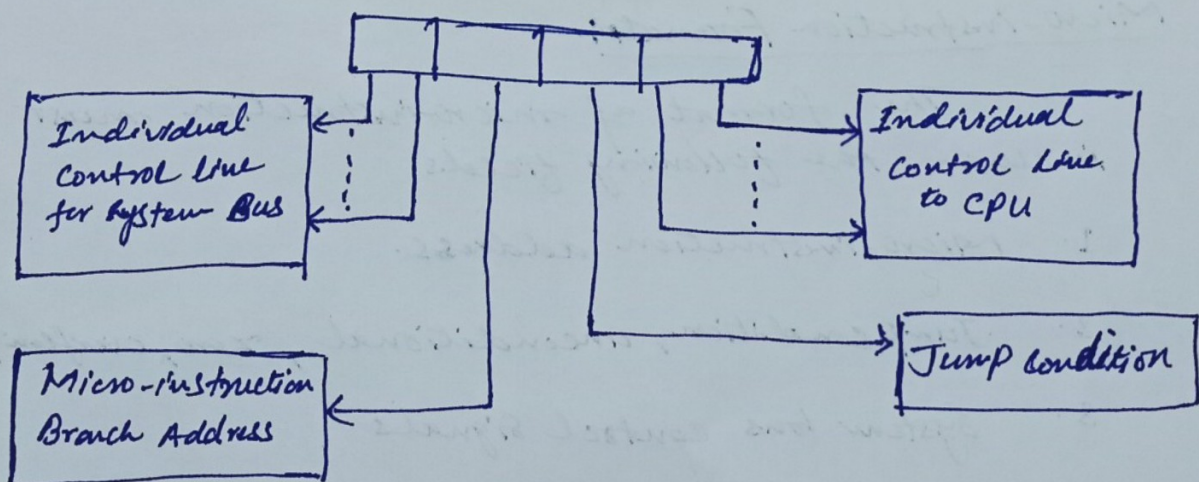
1. Micro-instruction address.
2. Jump condition, unconditional, zero, overflow, etc.
3. System bus control signals
4. Internal CPU control signals.

Types of Micro-instruction Format:

1. Horizontal Micro-instruction Format:

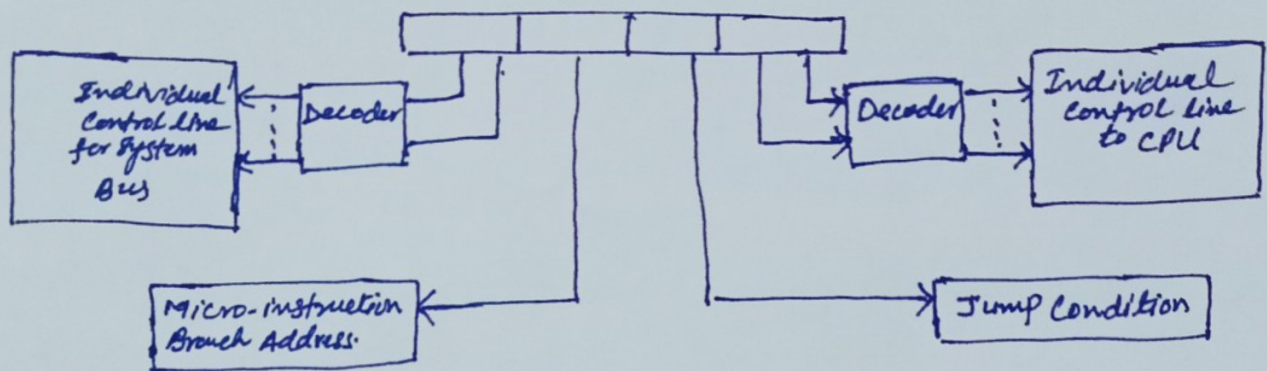
In horizontal micro-instruction, there is one bit for each internal processor control line and one bit for each system bus control line, therefore, the length of such micro-instruction may be 100 bits. Such micro-instructions may be executed as follows:

- To execute micro-instruction, turn ON all the control lines indicated by 1 and leave OFF all the control lines indicated by 0 bit. The resulting control signal will cause one or more micro-operations to be performed.
- If the condition indicated by condition bit is FALSE, execute the next instruction in the sequence.
- If the condition indicated by condition bit is TRUE, the next micro-instruction to be executed is indicated in the address field.



Horizontal Micro-instruction Format

2. Vertical micro-instruction Format:



In vertical micro-instruction format, instructions are shorter in length and require decoder. In this format, many similar control signals can be encoded into few micro-instruction bits. For example, for 16 ALU operations, which may require 16 individual microdecoder in horizontal micro-instruction, only 4 encoded bits are needed in vertical micro-instruction.

Difference b/w Horizontal and Vertical micro-instruction Format

<u>Horizontal Micro-instruction Format</u>	<u>Vertical Micro-instruction Format</u>
① In a horizontal micro-instruction every bit in the control field attaches to a control line	In vertical micro-instruction, a code is used for each action to be performed and the decoder translates this code into individual control signals
② They do not have decoder	They have decoder.
③ more number of bits	less number of bits
④ They are faster	They are slower
⑤ Not complex	Complex
⑥ They are easy to design	Hard to design.
⑦ Less use of ROM (Control Memory)	more use of ROM
⑧ No additional hardware	Additional hardware required.