

PDP-1 COMPUTER
ELECTRICAL ENGINEERING DEPARTMENT
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PDP-26

NEW MODE SEQUENCE BREAK SYSTEM FOR TIME SHARING

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For use in time sharing, a modification of the standard one channel sequence break system for the PDP-1 Computer has been added, which can be optionally requested by the users. It was primarily designed to allow easy interaction between external equipment connected to the machine and a user's program. It will also be connected to the standard IO devices in the computer.

The new SBS operates as follows:

If the computer is in sequence break mode, and the new mode is ON, a break will occur if any of 16 possible status bits are ON, and the corresponding enable channel is also ON; if all the channels are disabled, no break will occur. The channels, numbered from 0 to 17, are enabled or disabled by user instructions; the channel defines its priority. Thus, if more than one break request occurs at the same time, the break with the lowest number will be served first. When a service request is completed, the corresponding status bit should be OFF, and the break should be dismissed with a `jmp i 1` instruction. Then, another break may take place. Breaks cannot occur within breaks. Further, when a break occurs, the AC, PC, and IO are stored in registers 0, 1, and 2 respectively, and the number of the channel that caused the break is placed in the AC. This feature permits the programmer to take appropriate action with respect to the requesting device.

The programmer has effectively a 16 channel SBS, without worrying about possible breaks occurring during the time that a break is being serviced, because breaks will pile up and be automatically served in order of priority.

It should be pointed out that it is much easier with this system for an IO device to signal the time sharing system that a user's program should be brought into core as soon as possible to service the device.

The new SBS will be connected to the standard IO devices and also to a set of switches and knobs from the TS users to allow signaling to programs. Provision has also been made for the connection of external equipment to the two higher and the two lower priority channels.

The four instructions associated with the one channel sequence break system of the PDP-1 time sharing system at MIT are supplemented by six additional instructions for using the new sequence break system. These latter enable the user to turn on and off the new 16 channel sequence break system and to enable or disable the sixteen channels; the sixth instruction is used by the executive routine to reactivate a program if a break is waiting to be serviced. The new instructions are:

<u>Mnemonic Code</u>	<u>Octal Code</u>	<u>Operation</u>
1. nm ⁿ * [new mode on]	725377	sets the SBS to new 16-channel mode.
2. nm ^f [new mode off]	725477	sets the SBS to old 1-channel mode.

<u>Mnemonic Code</u>	<u>Octal Code</u>	<u>Operation</u>
3. dsc N×100 [deactivate sequence channel N]	720050+(N×100)	turns off channel N in the new SBS.
4. asc N×100 [activate sequence break channel N]	(720051)+(N×100)	turn on channel N in the new sequence break system.
5. cac [clear all channels]	720053	turns off all sixteen channels.
6. sbr [skip on break request]	722577	skips the next instruction if a break has been requested and is waiting to be serviced.

The other sequence break instructions are:

1. esm* [enter sequence break mode]	720055	turns on the Sequence Break System, allowing automatic interrupts to the main sequence to occur.
2. lsm [leave sequence break mode]	720054	turns off the Sequence Break System, thus preventing interrupts to the main sequence. Should interrupt requests occur while the system is off, the status bits will, nevertheless, continue to be set.
3. cbs [clear sequence break system]	720056	clears certain flip-flops in SBS thus nullifying the effect of any interrupt requests just granted or about to be granted (i.e., just prior to the transfer of the C(AC) to location zero.)
4. isb [initiate sequence break]	720052	initiates a sequence break; if new mode is on, then generates a break for the highest channel activated.

*NOTE: To turn on the new 16 channel SBS, the nmn instruction must be executed before esm.

The channels and their corresponding IO devices in the order of their priority are:

<u>Channel</u>	<u>Device</u>
0 } 1 }	high priority for user's external equipment
4	buttons
5	light pen
6	type-in
7	type-out
10	punch
11	drum
12	reader
16 } 17 }	low priority for user's external equipment

The following instructions provide an example of how the user turns on the New Sequence Break System; these allow the buttons and light pen to cause service breaks:

```
cbs  
nmn  
cac  
asc 400  
asc 500  
esm
```