PDP-1 COMPUTER
ELECTRICAL ENGINEERING DEPARTMENT
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PDP-27

KNOBS AND BUTTONS

February 9, 1965

A console of four knobs and eighteen buttons (nine buttons and nine switches) has been added to the PDP-1 time-sharing system to facilitate the communication between the user and the computer. This addition was designed so that three more similar consoles may be added to the system later. The knobs permit analog voltage from 0 to -10 volts to be converted into a binary word which can be placed into the IO register. The knobs operate as follows:

1. Assignment and deassignment of knobs is accomplished by executing the following instructions:

```
law k"
lio M      / where M is a 4-bit mask for consoles
arq          to be assigned, or left assigned (on a
             deassignment), to the user. [The mask
             represents the four possible sets of
             knobs; at present only one set is avail-
             able which is the left-most mask bit;
             thus M=10.]
```

2. If those knobs are not already assigned to another user, they will be assigned to the user requesting them. If the assignment was successful, the instruction following the arq (above) will be skipped. On a deassignment, the knobs will be dismissed and can then be assigned to any user; the instruction following the arq (above) is skipped.

3. The instruction IOT xx27 (ckn) reads the value of knob xx into the lower bits (8-17) of the IO register. The first "x" of the instruction (bits 8-9) determines which of the four possible sets of knobs is selected [the only set at present is 0] while the second "x" (bits 10-11) indicates the knob (numbered from 0 to 3 from left to right) that is to be read. (Other bits are unused.)

4. If a user executes IOT xx27 when the knobs are not assigned to him, this instruction will cause an illegal trap.

The buttons operate in a similar way.

5. The assignment and deassignment are accomplished by executing the following instructions:

```
law b"
lio M        / where M is a 4-bit mask for consoles
arq            to be assigned, or left assigned, in the
               case of deassignment, to the user.  [The
               four possible consoles are indicated by
               four bits, the first or left most of them
               being for console 0, the last or right
               most, for console 3.]  Only console at
               present is 0, ie. M=10.
```

As in the case of knobs, if those buttons are not already assigned to another user, they will be assigned to the user requesting them. If the assignment was successful, the instruction following the arq (above) will be skipped. The instruction following the arq on the deassignment will be skipped also if the set specified can be or already is assigned to another user.

6. The instruction IOT x237 (rbn) reads the value of the buttons and switches into the IO register. The x corresponds to bits 8-9 for the four possible sets of knobs (other bits are unused). The resulting left nine bits of the IO will contain the state of the buttons from left to right.

7. If a user executes IOT x237 when the buttons and switches are not assigned to him, the instruction will cause an illegal trap.

Note: When one or more sets of knobs and/or buttons are assigned to a user the program will refer to them by the number specified in the corresponding instructions.

Considering the mask used for the assignment of knobs or buttons, the left most 1 in that mask will be referred to as set 0, and other 1's will be referred to in increasing order, regardless of the fact that they are contiguous or not. Thus, for the programer, sets of knobs are always numerated from 0 up.