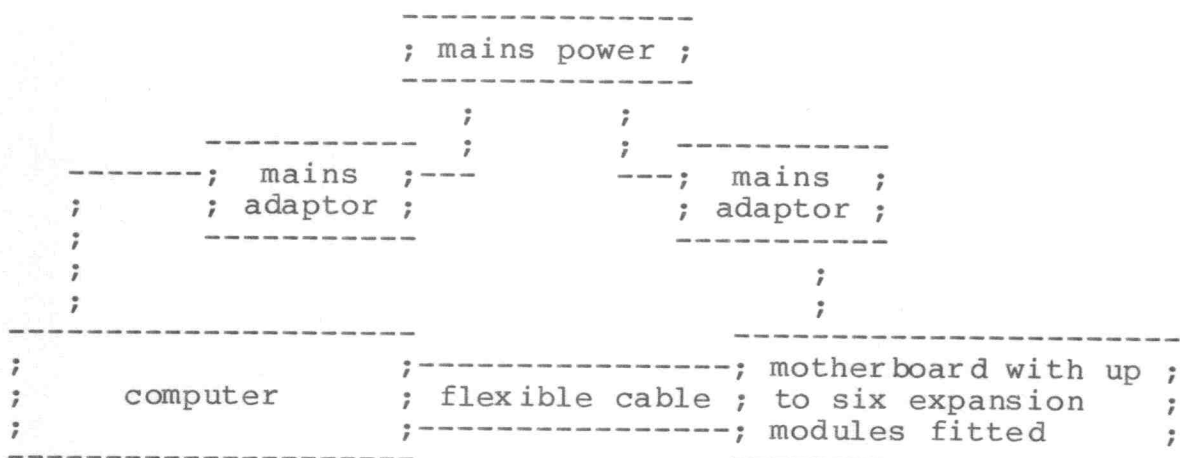CONFIDENTIAL - INTELLIGENT SOFTWARE & ENTERPRISE COMPUTERS LTD.

        Document PER-11
        Title .... Enterprise 64/128 System Expansion
        Issue 4
        Date .... 11th August 1985

Expansion modules may be added to the Enterprise 64/128 computers
in one of two ways:-

1. A six-slot motherboard is connected to the computer expansion
bus via a flexible ribbon cable with a pcb edge connector at the
end. Expansion modules plug into and draw power from the
motherboard, which has its own internal supply generating +5
volts, +12 volts, and -12 volts. The computer must still be
powered from its original mains adaptor. Modules to be plugged
into the motherboard must meet the timing and maximum load
specifications given in document PER-7.

```
-----------------------------------------------------------------

                      -----------------
                      ; mains power ;
                      -----------------
                            ;           ;
          -----------       ;           ;   -----------
-------; mains  ;---             ---; mains  ;
   ;      ; adaptor ;                 ; adaptor ;
   ;      -----------                 -----------
   ;                                        ;
   ;                                        ;
--------------------------           ----------------------
   ;                      ;-----------------; motherboard with up ;
   ;      computer        ; flexible cable ; to six expansion     ;
   ;                      ;-----------------; modules fitted       ;
--------------------------           ----------------------
```

SYSTEM EXPANSION WITH MOTHERBOARD

```
-----------------------------------------------------------------
```

2.   A single expansion module is connected to the computer by
means of a short flexible cable with an edge connector at each
end. Power is supplied to the module from the computer's 9V
output via a 5V regulator built into the flexible cable. A jack
is also incorporated into the cable for an external 9V input in
case the computer cannot supply enough current. This jack is of a
different design to the one on the computer to prevent incorrect
connection, and will disconnect the computer's 9V output when a
booster supply is used. An expansion module connected in this way
will appear in the same memory and I/O space as if it were
inserted in slot 1 of a motherboard. The +/-12V supplies are not
available for a module in this system configuration. The module
should meet the timing and maximum load specifications given in
document PER-6.

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```
---------------------------------------------------------------------
                        ---------------
                        ; mains power ;
                        ---------------
                            ;           ;
          ----------        ;           ;   -----------
       ---; mains    ;---             ---; optional ;
       ;  ; adaptor  ;                   ;  mains    ;
       ;  ----------                  ---; adaptor   ;
       ;                                 ;  -----------
       ;                                 ;
   ---------------------         ;       -------------------------
   ;                   ;    ;---------------;                     ;
   ;     computer      ;    ; flexible cable ; expansion module  ;
   ;                   ;    ;---------------;                     ;
   ---------------------                    -------------------------
```

                SYSTEM EXPANSION WITHOUT MOTHERBOARD

It is important for either expansion system that power is applied
to the expansion module or motherboard before the computer, as
the operating system only looks for peripheral devices on a cold
reset. If power is applied simultaneously, or to the computer
first, the reset button will need to be pressed twice to log in
the expansion modules.

If an expansion module is connected directly to the computer and
the full available bus driving ability is used by the module then
power should not be applied for any length of time to the expan-
sion module without powering the computer, else there is a slight
possibility of damage occuring to MOS devices in the computer.
Conversely, if power is left applied to the computer without
power on a directly connected expansion module, MOS devices in
the expansion module which are not buffered from the bus by TTL
chips may suffer damage. This is not a problem if the motherboard
is used, as the ALS buffers in the motherboard are able to
withstand voltage on their inputs while unpowered, and the 0.2mA
maximum input curent of the buffers in the low state is too small
to cause damage to the unpowered devices in the computer. The
only danger is the motherboard data buffer, but with no power on
the computer this will be disabled.