Memo To: Richard Wolf

Memo From: Frank Durda IV   x2865   24-Sep-86   609242

Subject: Proposal to drop support for the DaisyWheel II in Xenix 3.2

We have a problem with DaisyWheel II support with XENIX 3.2 and this
memo is to propose the abandonment of support for that particular
printer.

The problem arises from the fact that the DWII is the only printer in
the entire Tandy line (and all other known Centronics-compatible printers)
that does not generate the ACK signal to inform the host processor that a
character has been accepted and another one can be presented on the
parallel port. (The pin reserved for ACK is marked No Connection on the DWII.)

Instead, the ACK signal (which basically does exist within the printer)
is internally combined with the BUSY signal. The BUSY bit is supposed to be
an indication of processing or head movement in the printer and
is not really meant to be used as part of the handshake for data
transfer, but can be in an inefficient manner when there is no other
signal available.

On the Model II/12/16/6000 hardware, the ACK signal is connected to
the PIO (Parallel I/O controller) who generates an interrupt when
another character can be loaded into the PIO. Once the PIO has
a character, it will hold it until the printer sends an ACK signal,
or the host simply overwrites the character in the chip.
Setting or clearing the BUSY bit generates no interrupt, but the
bit can be examined by reading from a data port. (This is the same
problem that prevents the Daisy Wheel II from working under 3000 XENIX.)

In earlier versions of 16/6000 XENIX, the printer was interrupt-driven
and polled the device in case it was a DWII.
Because of fact that the interrupts were not a reliable indication
for the DWII, when an interrupt was received, the driver had to poll
the printer to see if it really was ready for another character. This
code specifically covers the DWII. Sadly, it also had the effect of
making interrupts partly useless for the DMP series. The DMP series accepts
a character by strobing ACK, then raises BUSY while it determines if
the character was a line terminating character. Most of the time it
would not be, so BUSY would drop very quickly. But the interrupt to
the Z80 was triggered by the ACK, so the Z80 would enter the interrupt
service routine, check the printer BUSY signal and would frequently
find it set to BUSY. It would then disregard the interrupt and exit.

The way the DWII printers (and the DMP's when the above scenario occured)
continue to function was that the old XENIX system would also poll the
printer about 100-130 times a second to see if it could take another
character. This would restart the interrupt chain (albeit briefly) on
the DMP printers, and would keep the DWII chugging along.

However, this double strategy puts a significant load on the Z80, which
is already overloaded. This excess load helped cause serial lines
to lose characters and slowed system overall performance.
In addition, the maximum printing speed that could be achieved was between
130 and 150 characters per second on an idle system. As the system
speed increases, the printing speed would decline further.
To the owner of our newer "high speed" printers, this would be quite
intolerable, particulary if you owned a DMP-2200, which is listed at
a maximum printing speed of 380 characters per second. The owner of
a DMP-2200 would never see more than 40% of the potential printing speed
because of the polling bottleneck. At interrupt-driven rates,
the printing speed limit switches to the application programs ability
to queue characters to be printed.

Therefore, we request that XENIX 3.2 be allowed to drop support for
the DaisyWheel II printer. The remaining DaisyWheel printers we sell or
have sold (DWP210, DWP410, DWIIB, DWP510, etc.) correctly generate the ACK
signal, and therefore will work properly in an interrupt-driven
environment.

We also suggest that the hardware groups look into a hardware modification
to convert the internal STROBE RESET signal (within the printer) into a ACK
signal. With a modification of this type in place, the DaisyWheel II
printer would behave like all other printers. (It may be simpler to
offer existing customers to exchange the DWII interface board for the
interface board used in the DWIIB than to pursue a modification to the
older boards.)

A possible software alternative that has not been investigated is
to cause the BUSY flag to generate an interrupt. Because of the Model
II/12/16/6000 hardware configuration, the printer BUSY signal would appear to
XENIX as a floppy disk interrupt and would have to be decoded. This
may have unforseen side effects on floppy disk performance, but can
be researched if desired. To determine feasibility of this alternative,
then implement and test it should require about 1 man week.

Please let us know how to proceed on this issue as soon as possible.
Currently the 3.2 test release does not support the DaisyWheel II printer.

                                             Frank Durda IV