

Inter-Office Memorandum

To	Alto Users	Date	19 August 1975
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Subject	Alto II Microcode	Organization	CSL

XEROX

This memo is a description of the changes which have been made in the standard Alto microcode for the second build. These changes will not affect the operation of the present software (except to make it work better in some cases), but they will make it possible to run Lisp, and make certain constructs simpler for those who wish to write special purpose microcode.

The changes are:

- 1) A bug which sometimes caused a M44 disk to get spurious data late errors when the processor executed the BLT or BLKS instruction has been fixed.
- 2) The constant memory has been expanded.
- 3) Unused opcodes 61022-61037, which if executed would produce bizarre results, now trap.
- 4) A bug which caused unused parameterless opcodes in the ranges 61013-61017 and 61022-61377 to occasionally trap to the incorrect location has been fixed. This bug will be fixed on all present machines, as well as on the second build.
- 5) Currently, all unused opcodes which replace the Nova I/O instructions trap to a location determined by bits 3-7 of their opcodes. There is a prom (DISP) which maps these instructions into the single microlocation TRAP. The Bytelisp system requires that this be changed; All unused opcodes except 77400b (which is used by Swat) now transfer to microlocation U16, which executes:

U16: SWMODE, :TRAP;

The result of this is that if your machine has a control RAM, these instructions will cause control to enter it at a location which is equal to TRAP in the PROM microcode. If no RAM is present, things will work normally.

6) A feature has been added to the Ethernet microcode which causes it to reject truncated packets at the microcode level, rather than posting them to the software.

7) Currently, the IDISP function produces the following values, which are ORed with NEXT:

IR[01],IR[02]	Value
0 0	IR[02],IR[03]
0 1	4
1 0	5
1 1	if IR[03]-IR[07]=16b then
	6 else 1

To allow passing of up to 16 return address indices to subroutines, the final case

above has been changed to:

IR[01],IR[02]	Value
1 1	if IR[04]-IR[07]= 16b then 6 elseif IR[04]-IR[07]= 6 then 16b elseif IR[04]-IR[07] = 0 then 1 elseif IR[04]-IR[07] = 1 then 0 else IR[04]-IR[07]

The constants sr0 through sr17 have been defined in the standard constant memory so that a subroutine can be called from one of sixteen places thusly:

```
retX:      IR← srX, :subr;  
          foo,mumble;
```

The subroutine does:

```
subr:      bletch;  
subr17:    mumble;  
          foo;  
          zort, IDISP;  
          :ret0;
```

The return addresses are all predefined to lie in a contiguous 16 element vector ending at a location which is 17b mod 20b. Note that since IR← has itself the side effect of doing a 16 way branch, subr17 must be at a location which is 17b mod 20b.

8) The cursor vertical size has been increased from its present 15 to its advertised 16 scan lines.

The microcode to which these changes are added is the X10 version. The new microcode is designated ALTOCODE.X13. The DISP prom which must accompany this version is designated DISP14. ALTOCODE.X13 and DISP14.SR, which is the source of the BCPL program used to generate the DISP prom, may be found on the <altosource> directory on MAXC.

Note: Many of the new machines have an incorrect version of the DISP prom (DISP13). A bug was discovered after these proms were installed. The effect of the bug is to cause the CYCLE instruction to fail in certain circumstances. These proms will be replaced soon with the correct version.