

The Alpha AXP, part 4: Bit 15. Ugh. Bit 15.

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Let's load each of the powers of two up to 2^{31} , in canonical form.

```
LDA Ra, 0x0001(zero) ; Ra = 0x00000000`00000001 ; bit 0
LDA Ra, 0x0002(zero) ; Ra = 0x00000000`00000002 ; bit 1
LDA Ra, 0x0004(zero) ; Ra = 0x00000000`00000004 ; bit 2
LDA Ra, 0x0008(zero) ; Ra = 0x00000000`00000008 ; bit 3
LDA Ra, 0x0010(zero) ; Ra = 0x00000000`00000010 ; bit 4
LDA Ra, 0x0020(zero) ; Ra = 0x00000000`00000020 ; bit 5
LDA Ra, 0x0040(zero) ; Ra = 0x00000000`00000040 ; bit 6
LDA Ra, 0x0080(zero) ; Ra = 0x00000000`00000080 ; bit 7
LDA Ra, 0x0100(zero) ; Ra = 0x00000000`00000100 ; bit 8
LDA Ra, 0x0200(zero) ; Ra = 0x00000000`00000200 ; bit 9
LDA Ra, 0x0400(zero) ; Ra = 0x00000000`00000400 ; bit 10
LDA Ra, 0x0800(zero) ; Ra = 0x00000000`00000800 ; bit 11
LDA Ra, 0x1000(zero) ; Ra = 0x00000000`00001000 ; bit 12
LDA Ra, 0x2000(zero) ; Ra = 0x00000000`00002000 ; bit 13
LDA Ra, 0x4000(zero) ; Ra = 0x00000000`00004000 ; bit 14
LDAH Ra, 0x0001(zero) ; \
LDA Ra, 0x8000(Ra) ; / Ra = 0x00000000`00008000 ; bit 15
LDAH Ra, 0x0001(zero) ; Ra = 0x00000000`00010000 ; bit 16
LDAH Ra, 0x0002(zero) ; Ra = 0x00000000`00020000 ; bit 17
LDAH Ra, 0x0004(zero) ; Ra = 0x00000000`00040000 ; bit 18
LDAH Ra, 0x0008(zero) ; Ra = 0x00000000`00080000 ; bit 19
LDAH Ra, 0x0010(zero) ; Ra = 0x00000000`00100000 ; bit 20
LDAH Ra, 0x0020(zero) ; Ra = 0x00000000`00200000 ; bit 21
LDAH Ra, 0x0040(zero) ; Ra = 0x00000000`00400000 ; bit 22
LDAH Ra, 0x0080(zero) ; Ra = 0x00000000`00800000 ; bit 23
LDAH Ra, 0x0100(zero) ; Ra = 0x00000000`01000000 ; bit 24
LDAH Ra, 0x0200(zero) ; Ra = 0x00000000`02000000 ; bit 25
LDAH Ra, 0x0400(zero) ; Ra = 0x00000000`04000000 ; bit 26
LDAH Ra, 0x0800(zero) ; Ra = 0x00000000`08000000 ; bit 27
LDAH Ra, 0x1000(zero) ; Ra = 0x00000000`10000000 ; bit 28
LDAH Ra, 0x2000(zero) ; Ra = 0x00000000`20000000 ; bit 29
LDAH Ra, 0x4000(zero) ; Ra = 0x00000000`40000000 ; bit 30
LDAH Ra, 0x8000(zero) ; Ra = 0xFFFFFFFF`80000000 ; bit 31
```

Bit 15. Ugh. Bit 15.

It's the only one that requires two instructions to calculate the 32-bit mask in canonical form.

This means that if you have a bitfield, bit 15 is slightly more expensive than the others.

Bonus chatter: In an internal discussion of byte manipulation on the Alpha AXP, I happened to have written “Bit 15. Ugh. Bit 15.” Gov Maharaj (co-host of [The Defrag Show](#) and [application compatibility master extraordinaire](#)) told me, “That needs to be the title of a blog post.” So here it is.

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