# An Example of Using an ISE16™ to Debug an NS32008 Design

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If you have an NS32008 hardware design that you would like to test out, it can under the correct circumstances be done using an ISE16. No hardware modifications are required to the ISE16 nor to your target system under many circumstances.

Since the NS32008 and the NS32016 are packaged in 48 pin DIP packages with very similar pin-outs no mechanical interconnect problems exist. The ISE16 must be run with the MMU switch in the OFF position. Your NS32008 design will function perfectly well even if it has an NS32081 FPU. No problems will arise.

What is the trick you might ask? The NS32008 fetches data a byte at a time and the NS32016 fetches it a word at a time. Your target hardware is all organized for byte fetches and byte writes.

Here is the catch. The user's program MUST reside in the 30k of ISE memory within the ISE16. It must not reside in the target system (be it RAM or ROM). All scratch pad RAM must also be mapped into the ISE16 memory. All program related memory accesses MUST be mapped to the 30k of ISE16 memory.

I/O however can still reside in the target. There are a few restrictions however. All target I/O must be aligned on even addresses. All I/O by the nature of the NS32008 will be set up for byte access and if you use only the even addresses, the upper byte of the ISE16 data bus will be ignored by the target. Your software must be designed to be consistent with the target hardware. It will need to understand that when it reads I/O data, the CPU in the ISE16 (which is still an NS32016) will read garbage data in the upper byte. The software you are debugging will have to be structured to ignore this.

Because the software you are debugging resides totally within the ISE, it will function in a normal manner, giving you adequate software debugging tools and an opportunity to verifiy that the target board I/O design is correct. Since NS32008 and NS32016 software are upward/downward compatible, your software when moved to the target system should still run.

The limitations this procedure imposes includes the following:

1.) All program must reside within the 30k of ISE memory.

2.) All I/O must be on even addresses.

3.) All software timing will reflect NS32016 as opposed to NS32008 timing. In most cases, the performance of the emulation using the ISE will exceed that which will be obtained with the NS32008 when it is installed in the target system.

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**National Semiconductor Corporation**
1111 West Bardin Road
Arlington, TX 76017
Tel: 1(800) 272-9959
Fax: 1(800) 737-7018

**National Semiconductor Europe**
Fax: (+49) 0-180-530 85 86
Email: cnjwge@tevm2.nsc.com
Deutsch Tel: (+49) 0-180-530 85 85
English Tel: (+49) 0-180-532 78 32
Français Tel: (+49) 0-180-532 93 58
Italiano Tel: (+49) 0-180-534 16 80

**National Semiconductor Hong Kong Ltd.**
13th Floor, Straight Block,
Ocean Centre, 5 Canton Rd.
Tsimshatsui, Kowloon
Hong Kong
Tel: (852) 2737-1600
Fax: (852) 2736-9960

**National Semiconductor Japan Ltd.**
Tel: 81-043-299-2309
Fax: 81-043-299-2408