USB HUB TEST DESCRIPTION
for Evaluating the Vendor's Silicon

Below is a list of a few bugs that TI has found with the early beta reference design of the USB SIE that was provided to all silicon vendors and most have based their SIE design. See below.

BUG DESCRIPTION	RESULTING OPERATION
1.) Synch field ends with the wrong value	Causes device to not function with OHCI
2.) End of packet state machine bug	Causes timing that sends SIE into unknown state
3.) Time-out detection	Causes time out conditions to be ignored
4.) 2 or 3 traffic handling changes needed for hubs	Causes traffic to be reflected thus confusing the SIE
5.) False end of synch	Causes packets to be ignored for certain timing conditions
6.) Synchronizing end of packet detect	Causes end of packet to be ignored for some timing conditions
7.) DPLL locking to synch field	Causes false end of synch for some timing conditions

Looking at the above bugs you can see that TI knows the SIE inside and out. The SIE is the heart of any USB device because it functions on the packet level of USB traffic. If there are bugs and the vendor has not found all of them, they will not be able to pass the below test. I do not want to name any vendor by name because I have no way to legally prove that all versions of their product exhibit one or more of the above bugs, but I will simply say, please read the next paragraph to see how to test them for yourself.

The above bugs numbered 5-7 cause a very subtle failure response. The way to detect the bugs is to take 5 hubs from the same vendor and connect them serially. Once 5 hubs are connected serially in a stack, the next thing to do is to run the USB Chapter 9 test in a endless loop using a 6th hub as the peripheral at the end of the 5th hub. The endless chapter 9 test loop causes high-speed traffic to be passed through all the hubs. Because this is the worst case scenario for timing and passing traffic at high-speed, the test will eventually stop for hubs that have bugs because the hub will be dropped by the software. The reason the hub is dropped from the software is because the various bugs cause the hub to not respond correctly for certain timing conditions. Once the hub responses incorrect a finite number of times, the software drops the device as it should. The more bugs that are present the faster the hub will be dropped. Before we found all the above bugs, the failure times for old versions of silicon was after 20 minutes up to as much as 4 hours. However, the latest version of TI hub silicon is rock-solid because we have run this endless loop test for 2 weeks non-stop without any failures. I challenge you to please check the other vendor's hubs in your lab by running this test overnight.

Extra Notes:

The latest USB Chapter 9 & 11 test can be downloaded from the USB IF web page or our external TI USB web page under "application notes".

The Chapter 9 test can be put in an endless loop by clicking a field in the bottom left corner of the application box.