HILEVEL Technology, Inc.

Q'n Apps #P37

Q: How do I use the MultiSite Mode?

MultiSite Testing

MultiSite testing has one singular purpose: *To improve testing throughput*. MultiSite simply means that multiple devices are tested concurrently. The ETS788 supports concurrent testing of 2, 4, 8 and 16 *identical* devices.

MultiSite invariably implies increased hardware along with increased hardware *cost*. While the price of the tester increases with number of sites, the improved performance will typically far outweigh the extra cost. For instance, a 25% increase in tester cost may yield an 800% improvement in throughput performance. Moreover, adding to the savings, the higher throughput also improves utilization of equipment tied to the tester.

The resources associated with MultiSite are:

1) Pin Electronic Modules to support total pin requirements.
2) Multiple Power supplies to allow for concurrent testing.
3) Multiple PMUs for concurrent DC tests.

The allocation of these resources, while obviously limited by hardware, may to some extent be confined by software. The following allocation, which is a sufficient condition for MultiSite, has restrictions - essentially dictated by software - that serve two important purposes: *Clarity* and *Simplicity*.

In the case of the ETS788, pin resource requirements are proportional to the number of pins used, regardless of a pin being a functional duplicate of another pin. Furthermore, the allocation of pins is tied to ñsite granularityò, which for ETS788 is 32-pins per site. This means that the size of each site *must* be a multiple of 32. Hence, the MultiSite size of a 512-pin system is either 32-pins (allowing up to 16 sites), 64-pins (allowing up to 8 sites), 128-pins (allowing up to 4 sites) or 256-pins (allowing two sites). Also, for every 32 pins there is one power supply and a precision DC PMU available; these resources also determine the parallelism of the system (the more DC PMUs, the better the throughput). The number of available power supplies also increases with site size. The need for two power supplies per site is relatively common, although for large site sizes, chances are that not all supplies will be needed.

Table 1 illustrates the MultiSite configurations available with an ETS788 System.

Pins	Sites	Size	PS	Pmu	Sites	Size	PS	Pmu	Sites	Size	PS	Pmu	Sites	Size	PS	Pmu
256	8	32	1	1	4	64	2	2	2	128	4	4	1	256	8	8
512	16	32	1	1	8	64	2	2	4	128	4	4	2	256	8	8

Table 1 –MultiSite Configurations (shown for 256 and 512 pin systems)

Note that our description of the MultiSite Test System applies fully to AutoTest and the Interactive Test Mode. However, using ASP C code with ACT, the user could potentially allocate resources in ways that might enhance utilization of tester resources at the expense of complexity. Another reason for confining MultiSite to the topology of the hardware is MATCHMODE.

MATCHMODE implies that the execution of the test program is not 100% deterministic. The device needs to wait for an internal condition before advancing to the next level of testing (i.e., the next vector); the extent of the wait may be unknown (though within a maximum value). Supporting the most general form of MATCHMODE per site is a challenging proposition that entails an independent state machine per site. However, a ñpoor manõs MultiMatchò is a standard HiLevel feature. Employing the concept of a *branch tree*, the tester advances to a new node of the tree if and when a site is ready. Upon detection of 1) all sites ready, 2) one or more but not all sites ready, or 3) no sites ready (after the prescribed time-out), the program will continue in a distinct path to signify which, if any, of the sites are ready (that is, the DUT is operating properly). Hence, for a four-site system, fifteen distinct paths can be traversed for testing, and one path in the event no good DUT is detected. This means that if the test vectors for a single site is 1K, the test vectors needed for 4 sites are approximately16K (given 4M of vector memory that may not necessarily amount to a problem).

As indicated above, in the optional ñHardware MatchMode per Siteò, each site has its own program memory for controlling vector sequencing. Essentially, each site is an independent state machine with its own resources to test when a DUT is ready to continue testing. The increased power may be required for some DUTs (e.g. SmartCard).

Figure 1 shows the ETS788 PMI32, the MultiSite resource for Power and DC PMU. The PMI32 is mounted on PEBs (Pin Electronics Boards).

The physical connectivity of the PMU to the DUT pins is an important aspect of MultiSite testing. The PMU, when mounted on the PEB, forms a PMU subsystem applicable to the system channels on that particular PEB. During testing, relays are closed so that one pin on the PEB is connected to the PMU of the corresponding PMI32. Since there are multiple PEBs, there are consequently multiple PMU sub-systems, all of which may be testing the DC characteristics of selected pins.

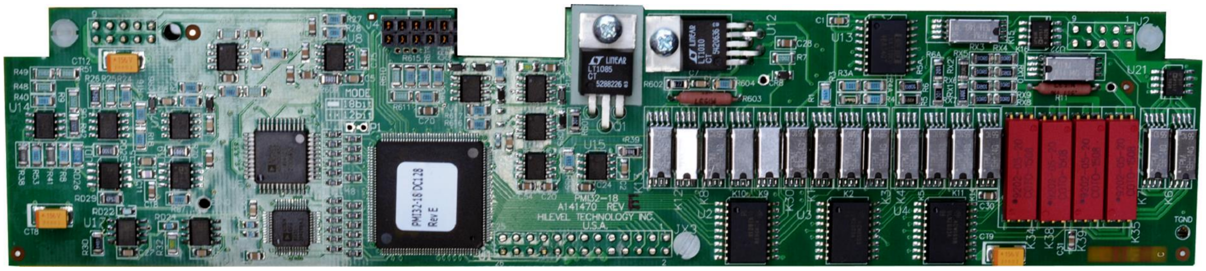


Figure 1: PMI32, Precision PMU per 32 pins

The HILEVEL MultiSite architecture is straightforward while offering significant flexibility. It has been ñallegedò that MultiSite should be excluded for IDD testing. Perhaps that is true under special circumstances; nevertheless, the choice of applying such limitations is and should be the userôs prerogative.

An important aspect of MultiSite testing is the preparation of test vectors and test parameters. This begins after vectors and test parameters for single site testing are completed. To expand the vectors and apply test parameters to all sites, the Presto software offers a simple tool.

Importantly, however, the user doesnôt necessarily need to expand his test vectors in the aforementioned way. The expansion can be done in the C-program (even though no special function in ACT or ASP is designed for that purpose). Nevertheless, it is recommended that this expansion be considered a part of the engineering preparation.

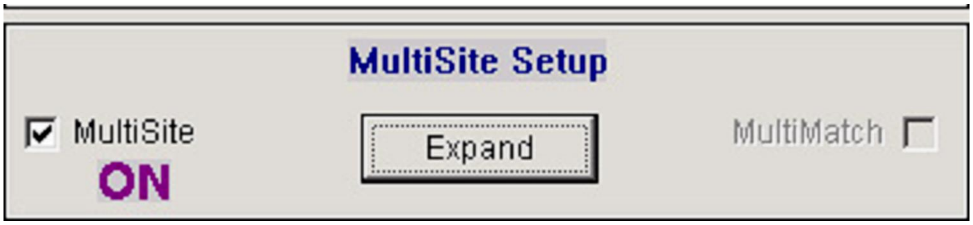
Preparing for MultiSite with Presto

Preparation for MultiSite may readily, though not necessarily easily, be done in C code. Alternatively, test vectors can be expanded in different ways (along with repetition of pins) to effectively make a MultiSite case become a ñvirtual single site caseò as far as input files are concerned. In a way, this indeed is what is entailed when preparation for MultiSite is performed in the interactive mode. The method is easy and convenient and does not violate the basic tenet of TexTest since the outcome of this preparation only results in expanded input files.

First of all, before expanding anything into MultiSite, we need a completed single site test as a starting point. Then the expansion process begins with the invocation of the Presto software, and the single site test ï the object of expansion ï is loaded. In the Test Setup window, check **MultiSite** on the ñMultiSite Setupò, as shown in Figure 2. This will enable the **Expand** button, which is next clicked. Figure 3 shows the next screen.

In the uppermost edit boxes, use the scrolling buttons to select the number of sites and the size of each site. Then for the supply chosen, select the output voltage and the current limit. Now, simply expand the pins by pressing the **Pins** button, press the **Vectors** button to expand the vectors, and press the **Power** button to expand the power supply settings. Note that special care applies to the power expansion. If multiple power supplies are used per site, and if not all of these power supply settings are identical, then the user needs to individually adjust power supply settings so it conforms with the intended setup.

Importantly, if the user wants to modify the setup and/or vectors of an already expanded file, he needs to go into the screen of Figure 3 and press the **Make Single Site** button before making any modification to the test or vector setup (lest he finds himself in the tedium of making the changes multiple times). After making the changes, the above expansion process should be repeated.

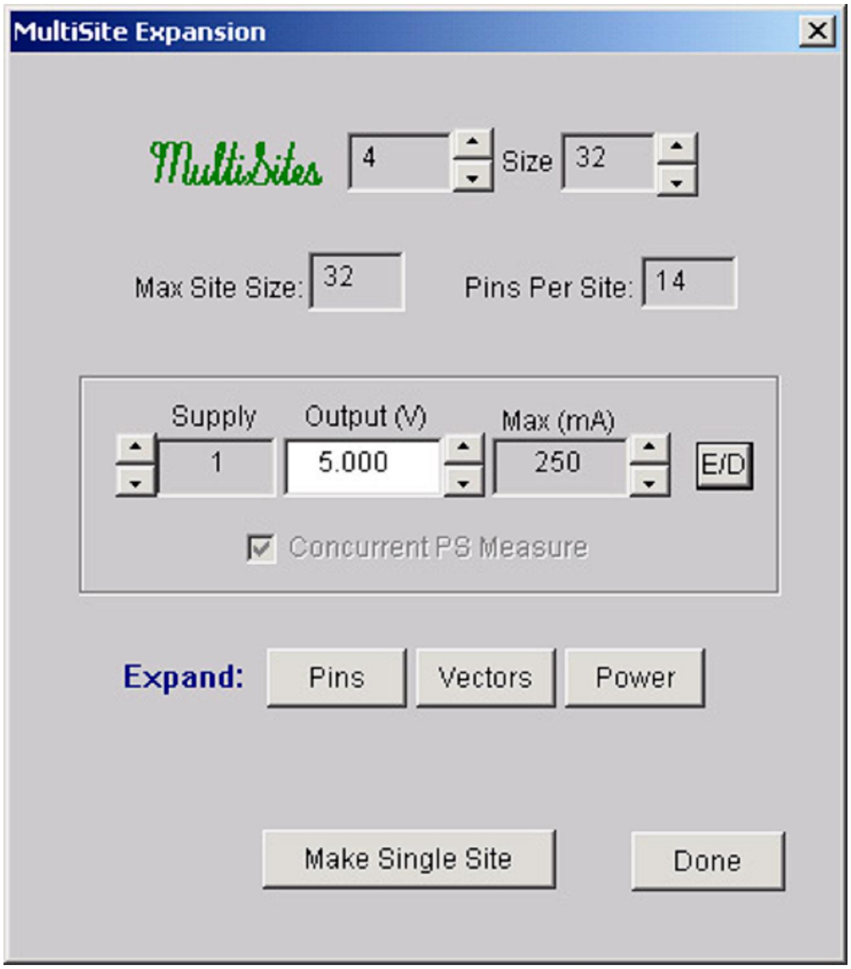


MultiSite Setup

☑ MultiSite ON

MultiMatch □

Figure 2: MultiSite Setup on the Test Setup Window



MultiSite Expansion

MultiSites 4 Size 32

Max Site Size: 32 Pins Per Site: 14

Supply 1 Output (V) 5.000 Max (mA) 250

☑ Concurrent PS Measure

Figure 3: The MultiSite Expansion Screen

Also See:
Q'nApp #P12: AutoTest
Q'nApp #P14: Production test
Q'nApp #P26: Functional Test
Q'nApp #P51: Fast Continuity
Q'nApp #P56: Timeout
Q'nApp #P57: AutoTest timestamp