DCPMU and Programmable Loads

DC Parametrics
For the engineer - whether in Production, Design or Failure Analysis - DC Parametrics and Programmable Loads are valuable (perhaps even crucial) tools. But what should the settings be? This depends largely on the electrical characteristics of your DUT, but appearing on this page are some common settings for TTL devices. You can enter these settings in your DCPMU window, but first compare them to your DUTs electrical specifications. IOL and IOH values are not usually spec'd for TTL devices, so the values in the table for these tests are for CMOS at 3V Vcc.

Programmable Loads
The Programmable Loads provide an active current source to "load" the output pins of your device. They are enabled and defined on the Pin Setup window. General use of the loads would entail simply entering "nominal" IOH and IOL values from your specs. These values are based on how much current the DUT output pins can sink and source. The commutation voltage is the point along the logic transition where the loads "switch" from sinking to sourcing and vice versa.

If you want programmable loads to be available for I/O pins as well as outputs, you must execute this SpScript command:

    AllProgLoads

Loads as Pull-ups for Open Collector
For Open Collector Output situations, look at the circuit in the device spec that is recommended for loading. The IOH value is easy; just put some small amount of current such as 1 or 2mA. The resistor value in the device spec circuit for pull-up will dictate the current for IOL. This is the most sensitive value for the loads and often must be tweaked while you observe device performance under test. It all depends on how much drive your DUT has.

Here are some common starting values:

    IOL: .2mA (depends on spec.)
    IOH: 2mA
    Commutation Voltage = Logic hi

The Comm voltage typically is to be set to the rail of your logic high.

Programmable Loads don't always perform like resistive pull-ups, but you may be able to avoid mounting a forest of resistors on your DUT board if you have the patience to try loads first.

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If measuring time-to-tristate, the Comm voltage is usually set to or near the rail of the desired measurement transition:

    For Hi-to-Z, Comm = Hi
    For Lo-to-Z, Comm = Lo

Parallel Loads
The parallel load feature provides a voltage potential for DUT output pins through a 50Ω resistor. How is this done? Essentially, ETS2k simply enables the unused driver to drive the programmed voltage potential onto the tester channel. Remember that the driver

provides 50mA of drive current, so your DUT outputs must be able to overcome that force in order to get the output data to the testers receiver. You cannot use the parallel loads if the pin is defined as an input or an I/O pin (bidirectional) because ETS drivers do not change logic levels on the fly.

Connect test:
Force Current, Measure Voltage
Force -100uA
Limit 5V
Pass between -0.7 and -0.1V
Run OFF
DUT Power OFF

Opens test:
Force Voltage, Measure Current
Force -1.5V
Limit 10mA
Pass below -0.2mA
Run OFF
DUT Power OFF

Shorts test:
Force Voltage, Measure Current
Force -0.3V
Limit 10mA
Pass above -0.15mA
Run OFF
DUT Power OFF

VOH:
Force Current, Measure Voltage
Force -1mA
Limit 5V
Pass above 2.8 volts
Run to vector *where Outputs are hi*
DUT Power ON

VOL:
Force Current, Measure Voltage
Force 10mA
Limit 3V
Pass below 0.8 volts
Run to vector *where Outputs are lo*
DUT Power ON

IOH:
Force Voltage, Measure Current
Force 2.5V
Limit 100mA
Pass below -.8mA (typically about -1.6)
Run to vector *where Outputs are hi*
DUT Power ON

IOL:
Force Voltage, Measure Current
Force .4V
Limit 100mA
Pass above 3mA (typically about 4 to 6)
Run to vector *where Outputs are lo*
DUT Power ON

Also see:
Q'nApp #E9: Iddq testing
Q'nApp #E20: Power andGround
Q'nApp #E25: ETS Drivers and Receivers
Q'nApp #E45: Pin-to-Pin continuity
Q'nApp #E51: Fast continuity
Q'nApp #E59: Current Limit