TD production test procedure

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1. Multimeter check:

* Check the resistance between the powers (+12 V, -12 V, +5 V, -5 V, two +3.3 V, two +1 V, +1.2 V, +2.5 V, +1.8 V) and ground. The resistances should be greater than 100 Ohm.

1. Hardware setup

* Put on the alignment pin. Make sure that the alignment pin is tight on PCB;
* Put on the eight optic transceivers (HFBR-7924), three screws per transceivers are used;
* Put on the heat sink for the FPGA;
* Put on the front panel;
* Set switches: SC01: to 11110100, S1: 00011111, S2: 00011111, SC1: 00000001 (default is 1)

1. Power up

* Plug the TD board into any of the payload slot #1 to slot #16 in the global trigger distribution crate. The TS (or a specially configured TID board) and SD board are required in the crate. All the Power-Good LED near the power regulators should be OFF.
* Check the Voltage on the board (+12 V, -12 V, +5 V, -5 V, two +3.3 V, two +1.0 V, +1.2 V, +2.5 V, +1.8 V), the voltage reading should be within 3% of the nominal value;
* The FPGA-Program-Done LED (near the PROM) should be ON. The front panel LED (quad pack) should be OFF.

1. FPGA firmware loading

* From ‘phecda’ X-terminal, telnet to the VME6100 controller. No username or password is required to login. After login:
* >ld < usrTempeDma\_AM.o; //user defined AM code 0x19 can be used
* >ld < trigger.o; //Gu’s test software package
* >EMload(TD’s VME slot number); // load the firmware to the TD. The board type is TD, and the serial number can be read from the sticker on the PCB. The information will be saved in the PROM on the PCB. The firmware loading takes about five minutes. After the above command, the FPGA-Program-Done LED should be off, the left LED on the front panel should be ON, and the other three LEDs on front panel should be OFF.
* >FPGAusercode(slot); //FPGA user-code shows the firmware version, and firmware type
* >PROMusercode(slot); //PROM user-code shows the board type and serial number

>TDtest4(TD\_slot), it loads the firmware, and check the usercode. Either “PASSED” or “FAILED” will be printed at the end of the test.

1. FPGA/VME test, continue from step 4 X-terminal:

* >TSSetup(TS slot); //set the TS in the global trigger distribution crate
* >TDSetup(TD slot); //Set up the TD in the global trigger distribution crate
* >m 0x90300000,4; //TD board status read back, assuming it is in VME slot #6

1. Optic transceiver test:

* Connect the eight fiber optic transceivers to eight TI boards in TI crate (The eight TI boards can be in the same crate, if there is no SD in that crate);
* At the TI crate, connect the X-terminal (assuming the \*.o files are loaded) Do the TI initialization: >TIcrate; // set the all the TI boards in the crate as a slave board;
* On the TS control, do:
* >TDSstart(21); // link reset etc
* >TIDSstart(21); // trigger start
* All the TI should have trigger. All the TI data should have their event timing synchronized.

>TDtest6 test. This is divided into several steps as some commands are for TS/TD crae, and some commands are for TI crates, which are using different VME controllers.

TDtest6\_1(TD\_slot, TI\_Config), Set up the TS (in slot#21), SD (in switch slot #B) and the TD fibers (TI\_config = 11, for fiber #1; TI\_config = 12, for fiber #2; …… ; TI\_config = 18, for Fiber#8; TI\_config =1, for fiber# 1, 3, 6, and 7; TI\_config = others for fiber#2, 4, 5, and 8)

TDtest6\_2(TI\_config) , executes on the TI crate. Assuming that the TI boards are in slot#3, 4, 5, and 6 in T-frame crate. When TI\_config = 11, 12, ……, 18, only TI in slot#3 is setup (to save test time).

TDtest6\_3, start triggers from TS

TDtest6\_4 (TI\_config), executes on the TI crate. TI data readout, event number and timing comparison; TI backpressure test. (this is the test proposed in section#7). When TI\_config = 11, 12, ……, 18, only TI in slot#3 is tested.

After this, go back to TDtest6\_1 with different TI\_config to test other HFBR transceiver(s).

1. TD backpressure test:

* Enable the infinite TS trigger, the trigger will stop after the block threshold is reached.
* Do the following in the TI crate:
* >\*(0x90300100)=0x80; // repeat this 8 times for the first TI board;
* >\*(0x90380100)=0x80; // repeat this 7 times for the second TI board;
* ….. //repeat this 9 times for the eighth TI boards, the trigger should re-start, and stop
* >\*(0x90780100)=0x80; //repeat this 9 times for the seventh TI board, the trigger should re-start and stop;
* …… // repeat this 9 times for the first TI board, the trigger should re-start and stop.
* If this works as expected, the TD back pressure and busy status is working.

If the test fails at any step, stop and record the failure in the test summary file. Some of the steps will be automated for less user interactions.