

Quality Control Planning for the Mother Boards

1. Overview

The quality control is divided into two phases. First a series of acceptance tests are done on a fraction of the cards during manufacturing to ensure that the production is proceeding as planned. In a second phase, burn-in and detailed testing is done on each set of Mother Boards before delivery to the drawer assembly sites.

2. Acceptance Tests

Once production is ready to begin, a group of 5 cards will be prepared by the manufacturer and tested at the University of Chicago. Production will be placed in a hold status until these tests are complete and satisfactory. This step will require the fully-assembled cards to be at Chicago for 2 days.

Once production resumes, 1 card will be removed from the production stream every hour. The boards will be sent to Chicago on a daily basis for testing. The results should be available after one day in Chicago. Manufacturing flaws will require production to be halted until any error is corrected.

3. Organization of Detailed Testing

It is planned to burn-in and test 5 Mother Board sets per week. The four boards of each set will first be visually inspected for manufacturing flaws and barcode labels will be applied. Next the boards will be equipped with mezzanine cards. This includes 9 LVL1 adder cards, 1 integrator ADC card, and 1 interface control card. The adders and integrator card will already have already been burned-in and tested at Rio and Barcelona respectively.

Each Mother Board set will be mounted on a 3-m-long stiff mechanical support. The interconnection cables will be installed and 48 3-in-1 cards will be inserted. The support will have a full set of digitizer boards mounted on the underside to allow testing the proper operation of the 3-in-1 cards. The set will then be subject to the tests described below.

Once the tests have been passed, the 5 sets will be powered and burned-in for 1 week. Because of the unwieldy size of the assembly it is planned to cover each Mother Board set with simple heated enclosure. The details of the burn-in process are described elsewhere.

At the conclusion of burn-in, the sets will be re-tested and successful ones will be packaged for shipment to the drawer assembly sites. It is expected to ship groups of about 20 sets at a time, or once a month.

4. Specification of Detailed Tests

1. Confirm functioning of the serial data bus and read-back at each 3-in-1 card position.
 - § Reject on any failure.
2. Confirm the functioning of charge injection at each 3-in-1 card position.
 - § Inject a standard 20 pC signal and confirm proper response using digitizer.
3. Confirm functioning of integrator at each 3-in-1 card position.
 - § Set DAC to 1 V
 - § Confirm operation of gate to integrator bus (open and closed)
 - § Confirm correct amplitude signal
4. Confirm operation of charge injection timing adjustment on each of the 4 Mother Boards sections.
 - § Inject a standard 20 pC signal on one channel of each Mother Board section and confirm that each bit of delay operates as expected.
5. Test TTC and CANbus individually for full control functions
 - § For one 3-in-1 slot, check write and read to all registers
 - § For one 3-in-1 slot, run the charge injection (CIS) linearity test and verify that the pedestal noise, slope, and linearity are within the required range
6. Test results to be logged with serial number of card, date of test, name of operator.