How to Test a GLAST Ladder

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(J:\glast\tracker\doc\HowToTestLadder.doc)

1 Preparation

1.1 Setup Instruments

Connect all cables from the backside prober to Keithley 238 through a coax-to-triax conversion box.
For cap-test, also connect Hpot to Hcur, Lpot to Lcur of the LCR meter HP4284.

1.2 Invoke icv_curve.vi

Double click icv_curve.vi in "Programs for Testing" directory on the desktop.
Actual file is J:\glastlab\labview\detectorTest\icv_curve.vi.

Set values for "Voltage Scan" as follows:

	For Detector	For Ladder
GPIB address	12	12
Start voltage	10.0 V	10.0 V
Stop voltage	200.0 V	200.0 V
Voltage step	10.0 V	10.0 V
compliance	1 μA	20 μA
Measurement waiting time	1 s	5 s

Set "Constant Voltage Supply" to "Don't Use".
Set "LCR meter" to "Don't Use".

1.3 Invoke c_auto2.vi (for cap-test only)

Double click c_auto2.vi in "Programs for Testing" directory on the desktop.
Actual file is J:\glastlab\labview\detectorTest\c_auto2.vi.

Set values for "LCR meter" as follows:

GPIB address	3
Function Type	CSRS (6)
Frequency	1.0E+3 (1 kHz)
Voltage Level	1 V

Also, set values on the panel as follows:

How many strips	320
X-step	0.0
Y-step	-0.194

1.4 Open Databases

Open ladders.fp3 with FileMaker Pro and select a layer shown in a table below.
For post-glue IV measurement, open detectors.fp3 with FileMaker Pro and select a layer shown in a table below.

	Layout in ladder database "ladders.fp3" to open	Layout in detector database "detectors.fp3" to open
Post-glue IV	Ladder	PostGlue Current Entry
Post-bond IV & cap-test	CapTest Entry	None
Post-pot IV	PostPot Current Entry	None

2 Test Proceedure

2.1 Load a Ladder onto Probe Station

Load a ladder to be tested on the chuck of the probe station as follows:

1) Put a vacuum tube on the fixture. Turn on the vacuum.
2) Put a fixture on a backside prober. Use alignment pins to guide it.
3) Put the fixture on a dove-tail holder on a chuck of the probe station together with the backside prober. Be sure not to drop the backside prober when you lift the fixture.
4) Tighten screws on the sides of the dove-tail holder by hand.
5) Remove the cover of the fixture.

2.2 Put a Probe Down on a Bias Pad

Locate a bias pad of the detector and probe it with a steel probe as follows:

1) Make sure there is enough clearance under a stage of the probe station and under a probe tip and press "Home" on LabMaster.
2) Locate a bias pad depending on your measurement as follows:

Measurement	Bias pad used
Post-glue IV	A bias pad on the bias resistor side of detector A in a ladder, next to strip 1
Post-bond IV & Cap-test	A bias pad on the electronics side of detector A in a ladder, next to strip 1
Post-pot IV	Same as above

3) Bring the bias pad roughly at the center of a monitor.
4) Press "Fine Up" on LabMaster.
5) Put a probe tip down on the bias pad. Press "Find Down" then "Fine Up", and confirm a good contact through a microscope on the probe station.
6) Press "Fine Down" and put a cover on the Al box.
7) Press "Fine Up". Check a good contact through the monitor.

2.3 Do Your Measurement

Actual procedure of measurement depends on a production step. Perform 2.3.1, 2.3.2, or 2.3.3 depending on the production step you are in.

2.3.1 Post-glue Detector IV Measurement

1) Turn off all the lights in the box.
2) Find the ladder being tested in the ladder database and click one of detectors in a picture of a ladder on the top-right corner. The detector database comes up. Press "Sort" on the page.
3) On a window of icv_curve.vi, choose "Detector" to measure, put detector ID, temperature, and humidity.
4) Run icv_curve.vi. You will be asked to select a directory and a filename to put measurement results are stored. Use a filename as suggested by the program. Choose a directory "J:\glast\tracker\PrototypeTower1\detector\Ln", where n is a ladder ID of the ladder to be measured, and press "Save" to start a measurement.
5) Write down currents at 100 V and 150 V in a log book. Put the numbers into the detector database. Put date and your initial on the same line. Choose "accepted" or "rejected" depending on the measurement result.
6) Press "Fine Down" and move the chuck to the next detector.
7) Adjust XY so that a probe tip can touch a bias pad of the detector.
8) Press "Fine Up". Check a good contact through the monitor.
9) Repeat 14) to 19) until all detectors in a ladder are measured.

2.3.2 Post-Bond Ladder IV Measurement and Capacitance Test

1) Turn off all the lights in the box.
2) On a window of icv_curve.vi, choose "Ladder" to measure, put ladder ID, temperature, and humidity.
3) Run icv_curve.vi. You will be asked to select a directory and a filename to put measurement results are stored. Use a filename as suggested by the program. Choose a directory "J:\glast\tracker\PrototypeTower1\detector\Ln", where n is a ladder ID of the ladder to be measured, and press "Save" to start a measurement.
4) Write down currents at 100 V and 150 V in a log book. Put the numbers into the ladder database. Put date and your initial on the same line. Choose „accepted" or „rejected" depending on the measurement result.
5) Press "Fine Down".
6) Change cable connections for capacitance test and turn on all the lights in the box.
7) Align strips of detector A to X-axis of chuck motion.
8) Move the chuck to probe strip 1.
9) Press "Fine Up". Check a good contact through the monitor.
10) On a window of c_auto2.vi, put ladder ID, temperature, and humidity.
11) Run c_auto2.vi. You will be asked to select a directory and a filename to put measurement results are stored. Use a filename as suggested by the program. Choose a directory "J:\glast\tracker\PrototypeTower1\detector\Ln", where n is a ladder ID of the ladder to be measured, and press "Save" to start a measurement.
12) Capacitance you have just measured should be about 1.8 nF for all strips. If you find a coupling capacitance of other than 1.8 nF, write it down on a log book and put a comment on a ladder data sheet. Put the comment into the ladder database. Locate a strip with a problem and repair it if necessary. See a table below for typical cases.
13) Resume cable connections for current measurement.

Falure mode	Coupling capacitance	What to be done
Coupling shourt	A couple of μF	Remove wire(s) to the shorted detector
Al strip break	Less than 1.8 nF	Locate the break, take a picture of the break, and store it in a directory "photo"
Al strips shorted	3.6 nF, 5.4 nF, or multiplet of 1.8 nF	Locate the short and repair it. If impossible to repair, remove the closest wires on the shorted strips.
Missing wire	1.2 nF or 0.6 nF	Locate the wire and repair it. Measure coupling capacitance of the strip after the repair.

2.3.3 Post-Pot Ladder IV Measurement

1) Turn off all the lights in the box.
2) On a window of icv_curve.vi, choose "Ladder" to measure, put ladder ID, temperature, and humidity.
3) Run icv_curve.vi. You will be asked to select a directory and a filename to put measurement results are stored. Use a filename as suggested by the program. Choose a directory "J:\glast\tracker\PrototypeTower1\detector\Ln", where n is a ladder ID of the ladder to be measured, and press "Save" to start a measurement.
4) Write donw currents at 100 V and 150 V in a log book. Put the numbers into the ladder database. Put date and your initial on the same line. Choose "accepted" or "rejected" depending on the measurement result.

2.4 Unload the Ladder

Unload the ladder from the probe station as follows:

1) Press "Gross Down".
2) Double click anywhere on a video image to bring a window titled "AWP1080ATC". Press "Unload".
3) Remove a cover from the Al box.
4) Put a cover on the fixture and screws it down.
5) Loose the screws on the side of the dove-tail holder and remove the fixture and the backside prober from the dove-tail holder.
6) Carefully lift the fixture on the backside prober to separate them.
7) Turn off the vacuum and remove a vacuum tube from the fixture.

2.5 Update the Ladder Database after Post-Glue measurement

If you are measuring post-glue currents of detectors in a ladder, update the ladder database as follows. Otherwise, the database has already been updated during the measurement procedure described above.

1) On the detector database, press "Go to Ladder Database". The ladder database comes up.
2) Read summed currents at 100 V and 150 V from the page shown up. They are located right below a word "Survey" on the page. Write down the numbers on a paper version of the data sheet.

3) Put date and your initial on the left.
4) Click “accepted” or “rejected” depending on measurement result.
5) Store the fixture with the data sheet paper for wire-bonding.

3 After Measurements

After all measurements in a day, you should keep testing area clean and secure. Check following points before you leave the room.

1) Put a protection on the back side prober. Use empty fixture to cover it.
2) Turn all the lights off in the Al box. Put a cover on the Al box.
3) Turn off instruments.
4) Minimize a LabMaster window. Do not exit from LabMaster.
5) If you are the last person to leave the room, turn the room lights off and lock the door.