Connection test procedure

June 21, 2006

1 Introduction

This document describes the cable connection test procedure for the inner tracker ladders.

From the acquisition electronics point of view, the AMS-02 tracker is subdivided into 8 groups, named "octants" (see figure 1 for the inner tracker). Ladders are cabled along a half column and are then tested. A half column is composed at maximum of three ladders (see figures 2 to 5).

The test procedure is simple: it consists in testing the cable lines in applying the power supply to both hybrids and checking with the standard production test system that the readout electronics is properly working. In this configuration, guard ring voltages of -2.0 V for the S-side and +5.0 V for the K-side are applied. It is thus possible to measure the leakage current of the silicon under a 7.0 V bias voltage, which is sufficient to check if the cable bias line is working or not. Even in these conditions, it is mandatory that the tracker is not exposed to light, thus black curtains will be installed all around the Tracker Assembly Frame.

The next section describes the test procedure.

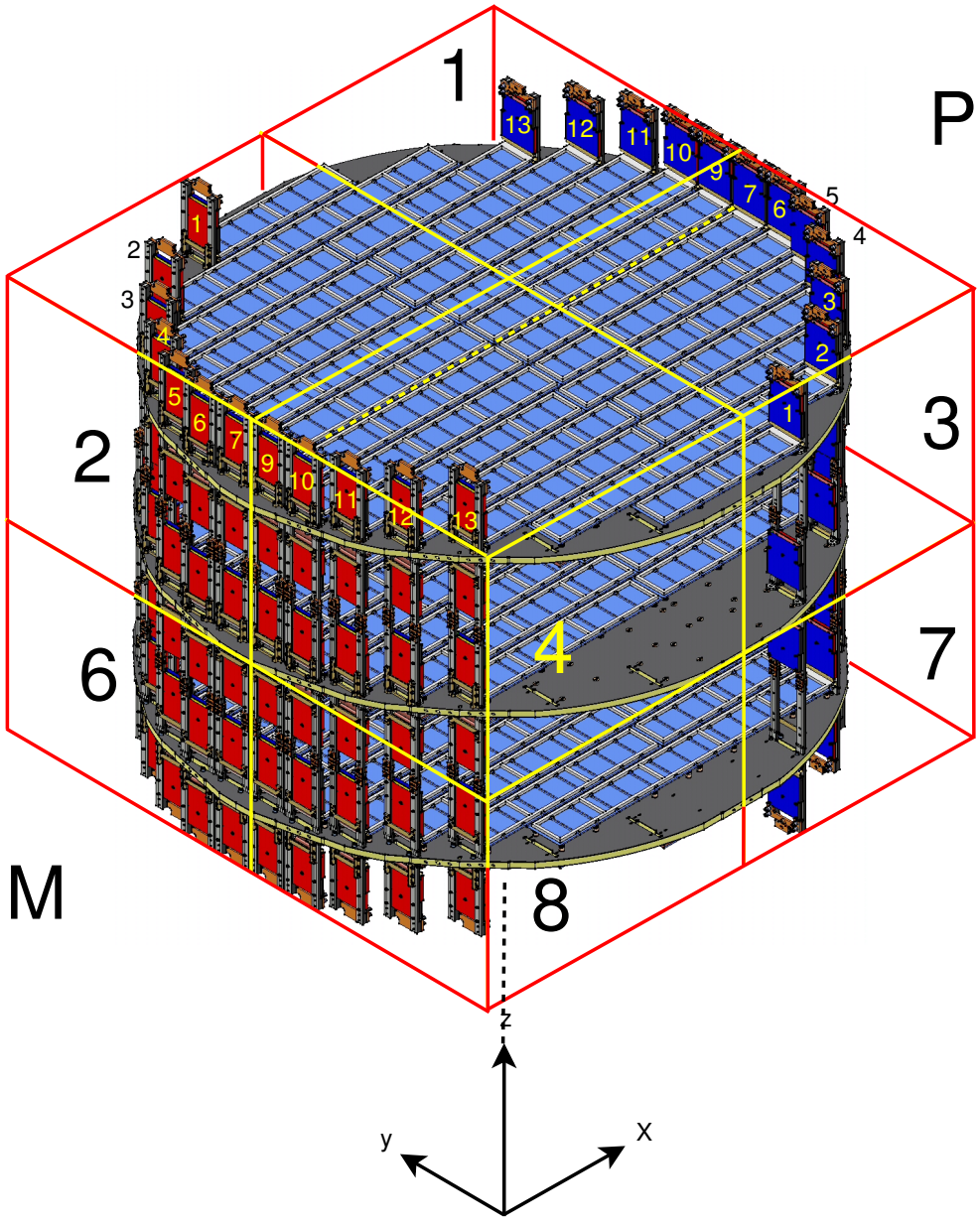

Figure 1: The inner tracker (planes 2 to 4) and its subdivision into octants.

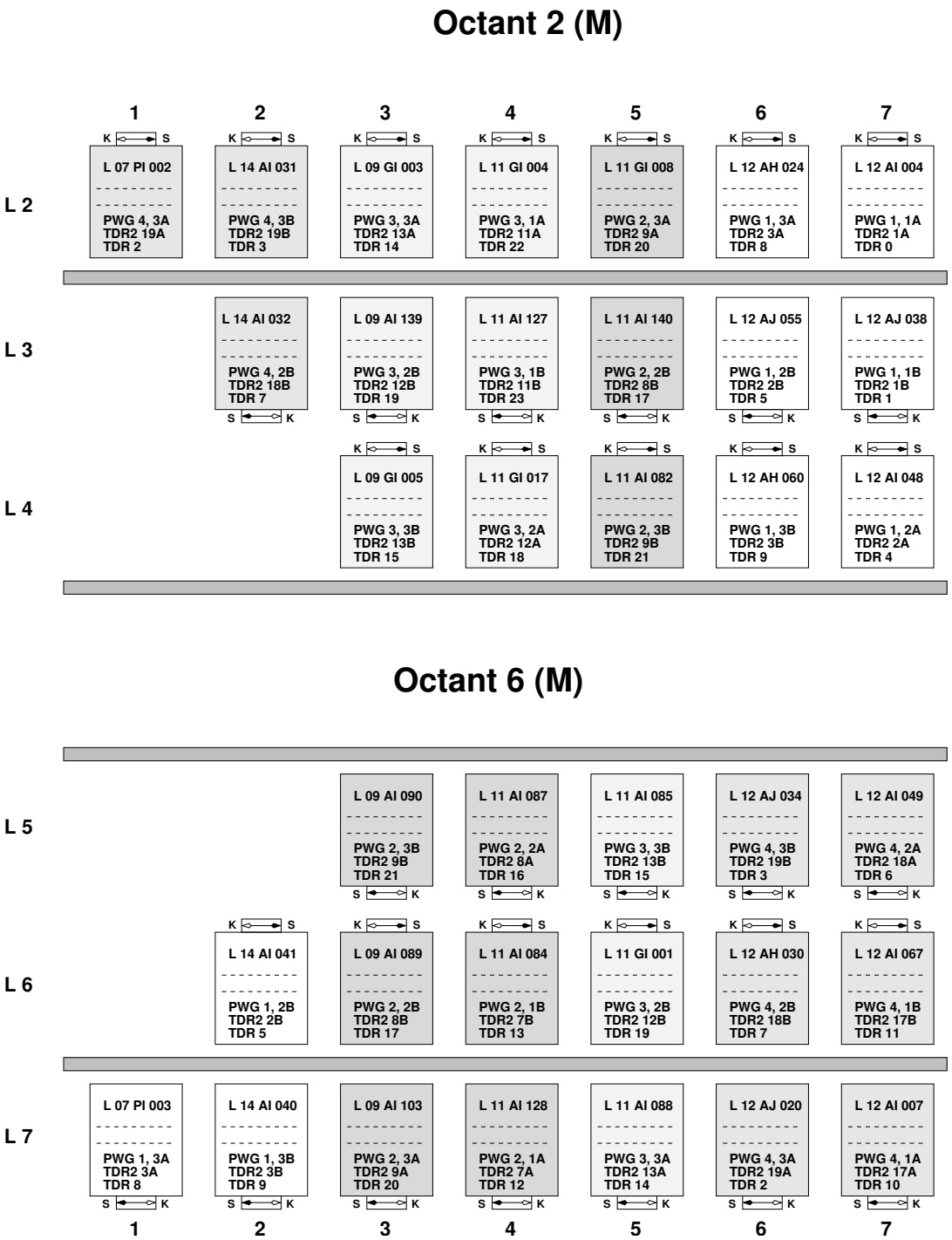

Figure 2: Inner tracker: octants 2 and 6

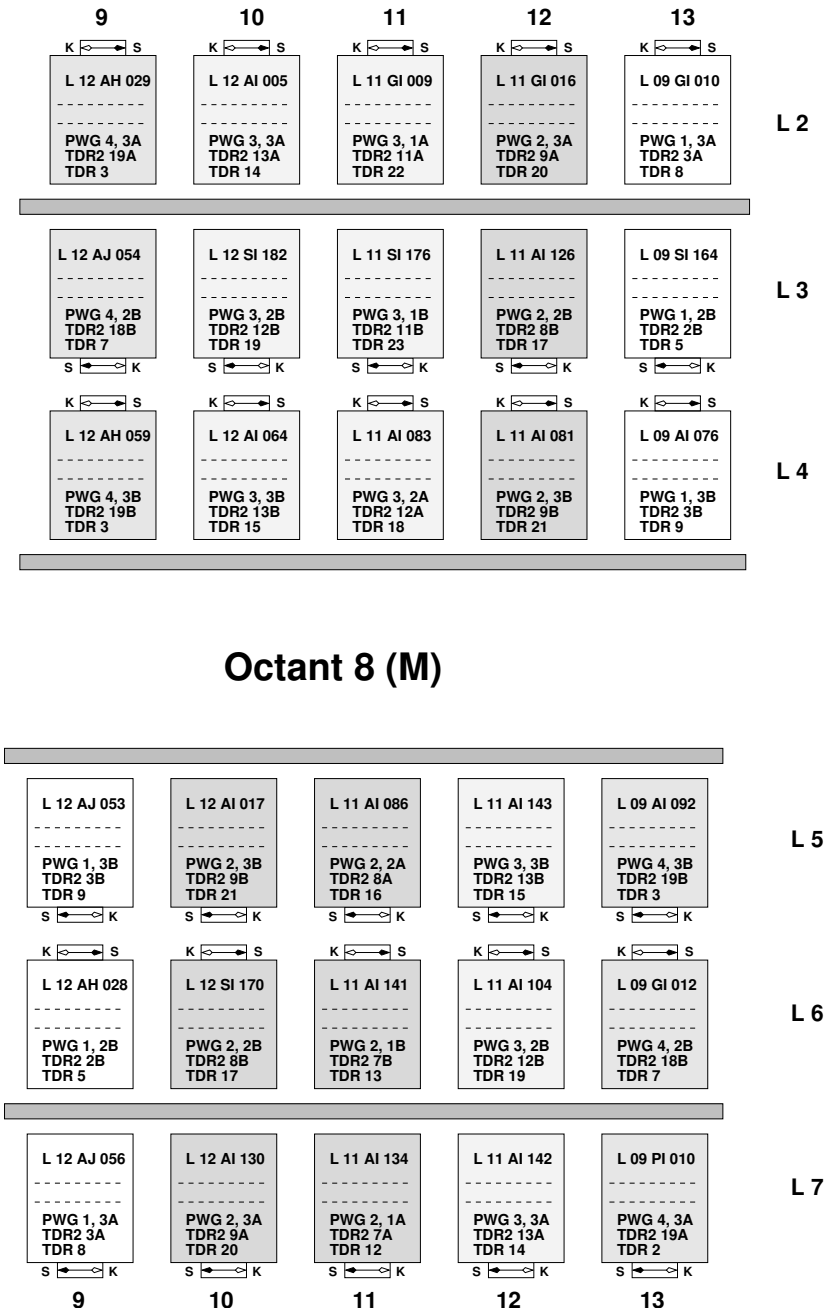

Figure 3: Inner tracker: octants 4 and 8

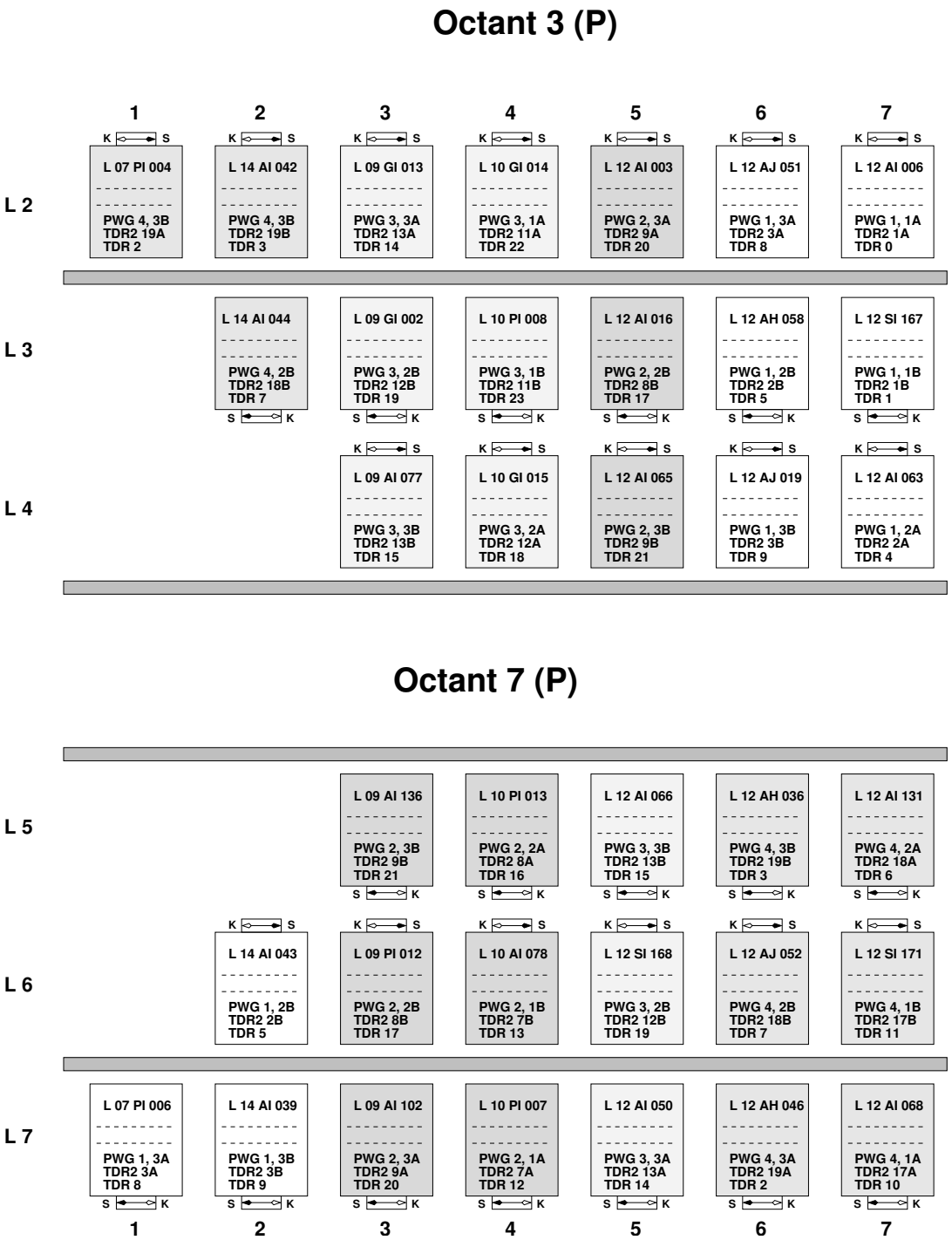

Figure 4: Inner tracker: octants 3 and 7

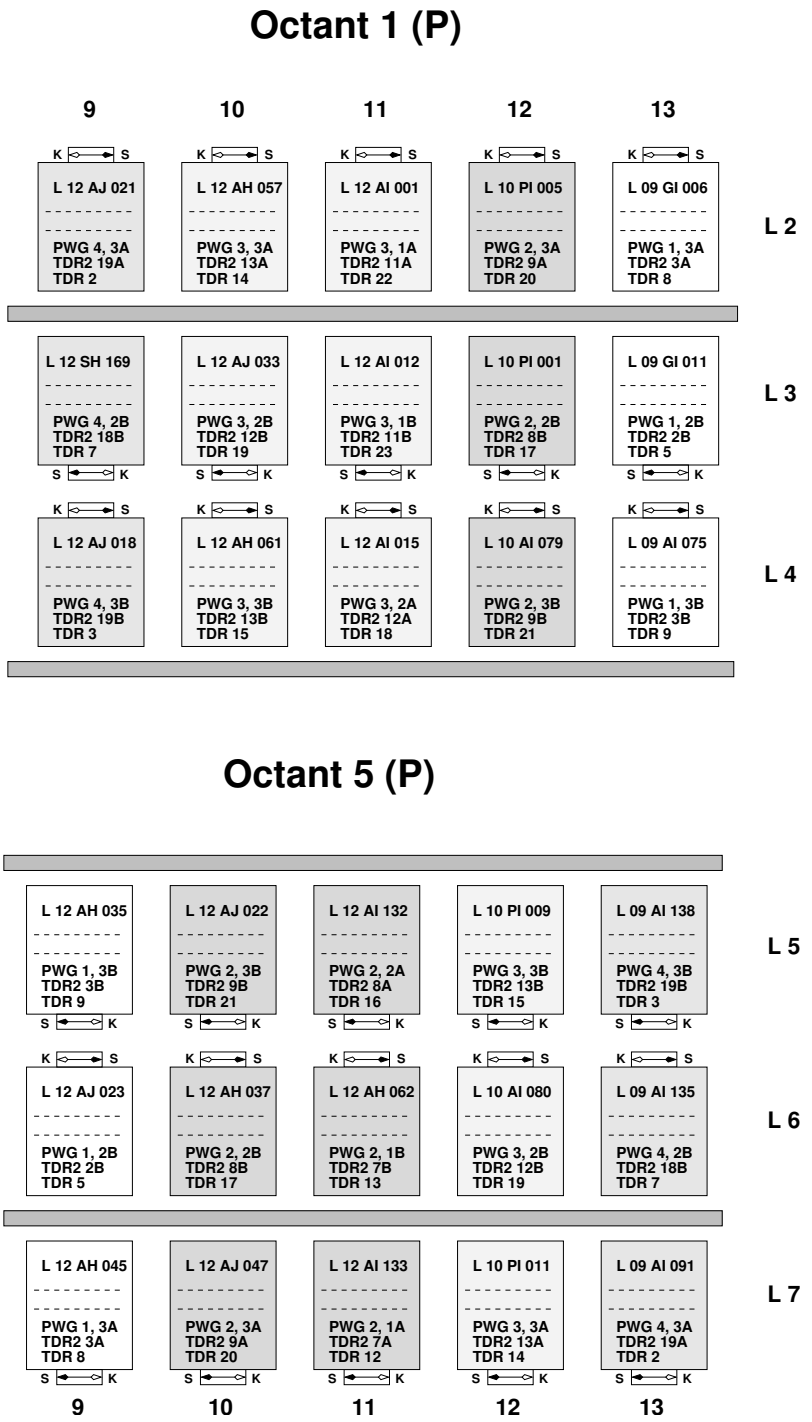

Figure 5: Inner tracker: octants 1 and 5

2 Connection test procedure

Before starting the cabling and test procedures, the operators should start the TDR program, version 2.7.0 minimum (`cd ~/src/TDRv2.7.0 ; TDR`).

1. Check that the tracker is not exposed to light.
2. Check that the S-side, K-side and bias power supplies are off.
3. Connect the ladder cables to the test system cables, pay attention to pin 1 location (dot on cable sleeve).
4. In the TDR program, enter the ladder name (`File` → `New Ladder` → `AMS Ladder`).
5. Check that the TDR program loaded the reference calibration (see figure 6).
6. Start a run in `Raw Data` mode, displaying the `Scope` histogram (see figure 6).
7. Switch on the S-side power supply, check that the S-hybrid is working. If no signal is visible (flat line) then there probably is a power line failure. Check the cable.
8. Switch on the K-side power supply, check that the K-hybrid is working. If no signal is visible (flat line) then there probably is a power line failure. Check the cable.
9. Set the display to the `Signal` histogram. This will subtract the pedestals from the reference calibration file and subtract the common mode noise. If the reference calibration corresponds to the connected ladder, the plot should be limited in a region between -50 and 50 adcs. If this not the case, there are two solution:
   (a) The reference calibration does not correspond to the connected ladder. Check the test system is connected to the right ladder.
   (b) There is a failure of the outP or outM line. In such case, the plot should reflect a shape similar to the one of the pedestals. Check the cables.
10. Check that the plot is limited in the range (-50;50) on the y-axis (see previous step).
11. Check that the bias voltage control is set to 0 V.
12. Switch on the bias power supply, check that the current is larger than 0.0 μA. If the current is 0.0 μA, the bias line is very probably damaged, and the cables need to be checked.
13. Switch off the bias power supply, wait for the relay to switch off.
14. Set the display to the `Scope` histogram.
15. Switch off the K-side power supply.
16. Switch off the S-side power supply.
17. Stop the acquisition run.
18. Disconnect the cables.

A test form guides the operators through the test (see figure 7).

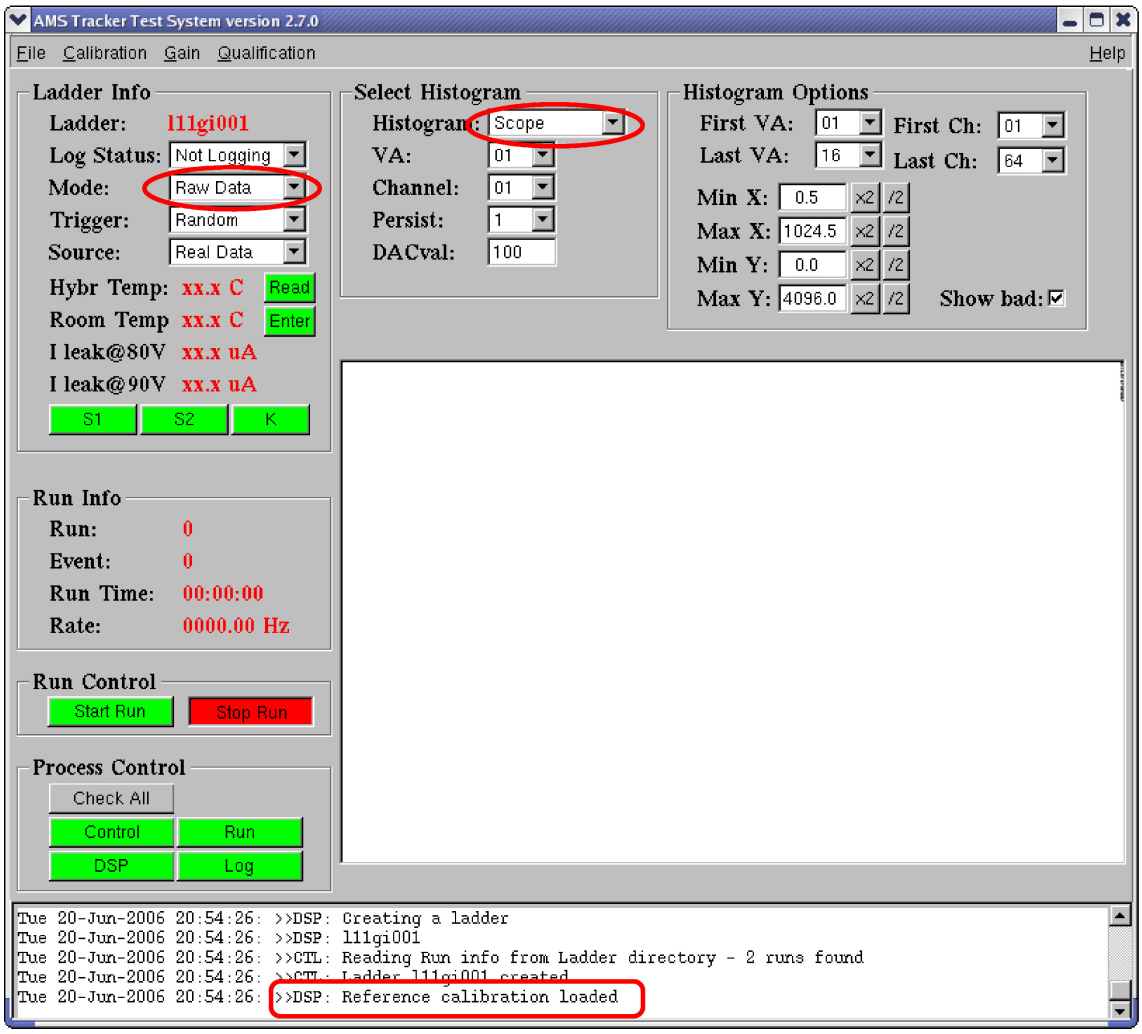

Figure 6: TDR program: reference calibration message, acquisition mode and displayed histogram settings are shown.

AMS-02 Tracker: connection test

Date: ..../..../200....	Time:	Controlled by: .....
Ladder:	Octant:	Column: .....

1 Test procedure

		Ok	Comment
1.	Check that the tracker is not exposed to light.	❑	.....
2.	Check that the S-side, K-side and bias power supplies are off:		
	S-side	❑	.....
	K-side	❑	.....
	Bias	❑	.....
3.	Connect the cable to the test system cables, pay attention to pin 1 location (dot on cable sleeve).	❑	.....
4.	In the TDR program, enter the ladder name (`File` → `New Ladder` → `AMS Ladder`).	❑	.....
5.	Check that the TDR program loaded the reference calibration.	❑	.....
6.	Start a run in `Raw Data` mode, displaying the `Scope` histogram.	❑	.....
7.	Switch on the S-side power supply, check that the S-hybrid is working.	❑	.....
8.	Switch on the K-side power supply, check that the K-hybrid is working.	❑	.....
9.	Set the display to the `Signal` mode.	❑	.....
10.	Check that the plot is limited in the range (-50;50) on the y-axis.	❑	.....
11.	Check that the bias voltage control is set to 0 V.	❑	.....
12.	Switch on the bias power supply, check that the current is larger than 0.0 μA.	❑	Current= ..... μA
13.	Switch off the bias power supply, wait for the relay to switch off.	❑	.....
14.	Set the display to the `Scope` mode.	❑	.....
15.	Switch off the K-side power supply.	❑	.....
16.	Switch off the S-side power supply.	❑	.....
17.	Stop the run.	❑	.....
18.	Disconnect the cables.	❑	.....

Figure 7: Connection test form