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Satellite Box test Plan

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This is an internal working note
of the Advanced LIGO Project, prepared by members of the UK team.

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Contents

1. Introduction

This report describes the tests conducted on each pre-production Satellite Box, using a specially designed manual test box.

For production, the plan is to use automatic test equipment derived from the manual system, where the switches are replaced by analogue switches under computer control. The automatic test equipment will be controlled by a PC, programmed in Visual Basic. The plan is to generate the test reports automatically.

The Automatic Test Equipment is being developed at the time of writing.

2. Manual Satellite Box test Equipment

The Pre Production satellite Boxes were tested by means of a specially made test box. On the front of the test box are two switches.

The unit under test is connected to the test box, and the switches are set at each position in turn. In each switch position, a parameter is measured by means of a precision DVM, and recorded on the test sheet.

Switch A is set to each position in turn. The last position of switch A brings Switch B into play. Switch B is then set to each position in turn.
The following measurements were made on each satellite box.

The tables on the next page give details of the tests performed.

Table 1 DC Measurements

These measurements use the internal -10v bias reference with a series 1M resistor

Switch A Position	**Switch B Position**	**Parameter**	**Measurement**
1		5v supply	Measures the 5V rail
2		-ve supply	Measures the -14v rail
3		+ve supply	Measures the +14v rail
4		Ref A	Measures 2.5v reference A
5		Ref B	Measures 2.5v reference B
6		Ref C	Measures 2.5v reference C
7		Ref D	Measures 2.5v reference D
8		LED I A	Measures LED current source A
9		LED I B	Measures LED current source B
10		LED I C	Measures LED current source C
11		LED I D	Measures LED current source D
12	1	Amp gain A	Differential PD Amp A output with 10µA input
12	2	Mon gain A	Differential PD Mon A output with 10µA input
12	3	Bias V A	Measures the channel A -10v LIGO1 OSEM bias
12	4	Amp gain B	Differential PD Amp B output with 10µA input
12	5	Mon gain B	Differential PD Mon B output with 10µA input
12	6	Bias V B	Measures the channel B -10v LIGO1 OSEM bias
12	7	Amp gain C	Differential PD Amp C output with 10µA input
12	8	Mon gain C	Differential PD Mon C output with 10µA input
12	9	Bias V C	Measures the channel C -10v LIGO1 OSEM bias
12	10	Amp gain D	Differential PD Amp D output with 10µA input
12	11	Mon gain D	Differential PD Mon D output with 10µA input
12	12	Bias V D	Measures the channel D -10v LIGO1 OSEM bias

Table 2 AC Measurements

These measurements use a signal generator with a series 1M resistor.

Switch A	Switch B	
12	1	Amp A frequency response
12	2	Mon A frequency response
12	4	Amp B frequency response
12	5	Mon B frequency response
12	7	Amp C frequency response
12	8	Mon C frequency response
12	10	Amp D frequency response
12	11	Mon D frequency response

The r.m.s output is measured at 5Hz, 10Hz, 100Hz, 1KHz and 5 KHz with 1v r.m.s input.

The test report on the next page is designed to summarise the tests and record the results of the tests for each unit.

Table 3 Test Result Sheet

Board								supply current
Date					+17V			
					-17V			
A					B			Bias V / 1Mohm
1		SAMPLE			1	SAMPLE		
2					2			
3					3			
4					4			
5					5			
6					6			
7					7			
8					8			
9					9			
10					10			
11					11			
12	switch B				12			

A					B			
1	5V supply				1	Amp gain A		
2	-ve supply				2	Mon gain A		
3	+ve supply				3	Bias V A		
4	Ref A				4	Amp gain B		
5	Ref B				5	Mon gain B		
6	Ref C				6	Bias V B		
7	Ref D				7	Amp gain C		
8	Led I A				8	Mon gain C		
9	Led I B				9	Bias V C		
10	Led I C				10	Amp gain D		
11	Led I D				11	Mon gain D		
12	switch B				12	Bias V D		

FREQUENCY RESPONSE

i/p								
							Test Box Switchs	
								A12 B1
								A12 B2
								A12 B4
								A12 B5
								A12 B7
								A12 B8
								A12 B10
								A12 B11

E&OE RWP

3. Proposed Automatic Test Unit

The idea of the auto test box is to make the testing of the satellite boxes easier, quicker and more consistent.

The unit will be connected to the satellite boxes via the four connectors J1, J2, J3 and J4 and will provide the necessary power.

Test unit will measure and record:

Time, date and serial number.

The +/-17V supplies current and voltages.

The internal regulated supply voltages (scaled +/-14V and 5V).

The internal reference voltages (1.00V)

The LED drive currents (35mA). The operation of the out of range indicators will be done visually.

The gain of the amplifiers. Differential output, dc gain and ac gain at selected frequencies

Photo diode bias voltages (10V)

3.1 Automatic Test Unit

It will carry out its own internal checks: amplifier dc and ac signal levels.

The signal selection will be done with analogue switches and relays controlled by an 8bit word from a computer interface.

There will be voltage regulators for the internal circuit and for output to the satellite box, also a voltage reference for the gain measurements together with signal conditioning amplifiers.

3.2 Auxiliary Equipment

Bench supply: +/- 24V
KEITHLEY DVM with IEEE interface
HP signal generator with IEEE interface
USB to IEEE pod
Computer
Connection leads

4. Conclusion

The manual test equipment was used to test the Pre-Production units quickly and efficiently. As large numbers of production units are planned, the planned Automatic test equipment will make the testing of the Production units easier and quicker, with consistent results.