

Document:	Phase Sensitive Detector Board
	Operations Manual-
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COMMERCIAL IN CONFIDENCE

Revision History

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9804sm01	20/11/06	0

Project Manager

Director

Name

Signed

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1 INTRODUCTION

The Phase Sensitive Detector board was designed as part of a complete four-channel phase detection system aimed as a measurement solution for the derivative spectroscopy market. The complete system consists of three printed circuit boards that can be mounted in a piggyback fashion in order to form a compact measurement solution.

The system consists of the following printed circuit boards;

- **Phase Generator Board;** The function of this pcb is to generate stable TTL pulse trains that can be used to control the Phase Sensitive Detector circuitry. In addition an 8 bit sine wave function synchronously locked to the fundamental TTL pulse train is made available for laser current modulation.
- **Phase Sensitive Detector Board;** The function of this pcb is to provide four channel phase sensitive detection of incoming signals.
- **Laser Driver Board;** An OEM laser diode driver module is utilised on this pcb to provide suitable drive currents for laser diodes and SLEDs.

The three boards can either be mounted in a compact piggyback format or used individually as OEM modules in customer equipment.

This operation manual deals with use of the Phase Sensitive Detector (PSD) board.

2 CIRCUIT LAYOUT

The main components on the PSD board can be seen in Figure 1 below.

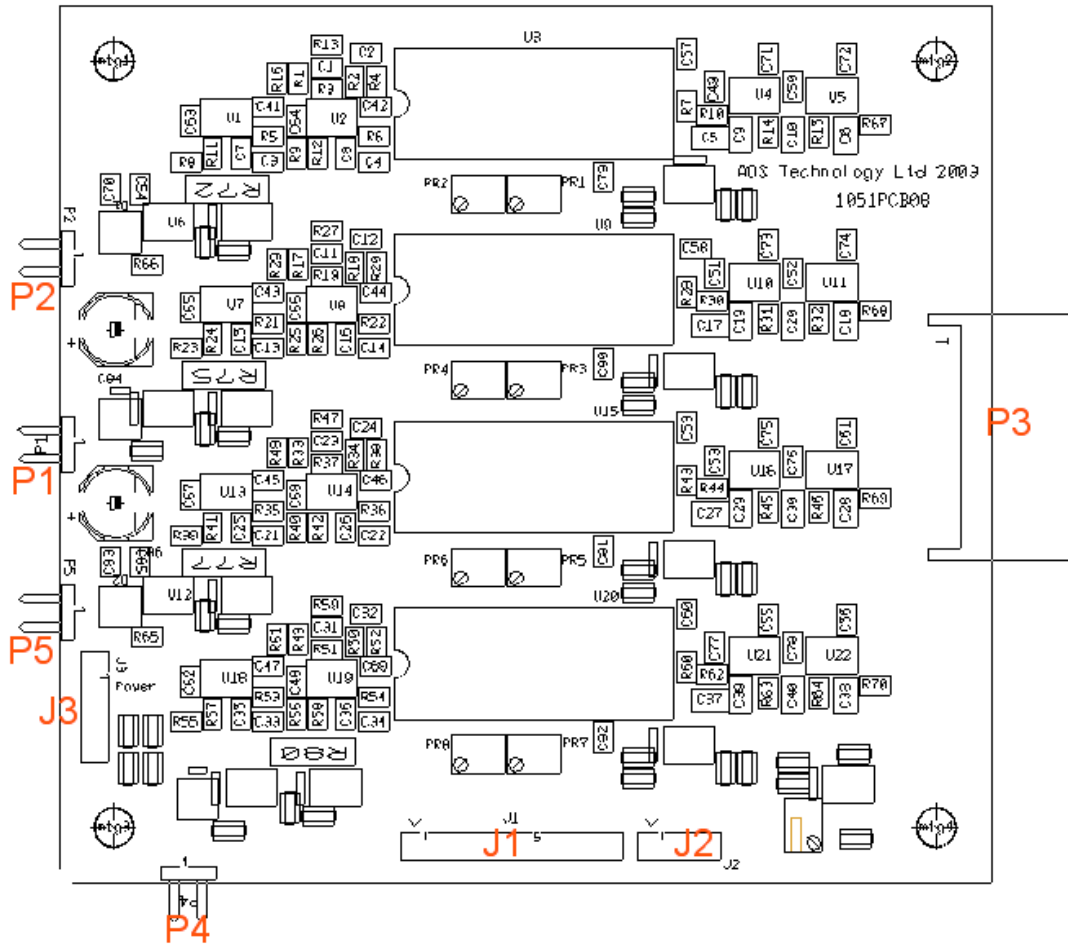


Figure 1. Schematic outline of the PSD board showing connector location

Pin 1 on connectors P2, 1 and 5 is the upper pin on the figure above. Pin 1 on connector P4 is the left most pin.

3 CIRCUIT DESCRIPTION

The PSD detection circuitry is based around a standard balanced modulator/demodulator chip, the AD630. From Figure 1 above it can be seen that there are four channels each with a dedicated input connector (P2,1,5 & 4). The operation of the AD630 chip can be found in the manufacturers application datasheet.

The phase reference signals for each of the four channels are generally derived from the AOS Phase Generator board, the operation of which is described in document 9806sm01. These signals should be presented to connector J1. For the correct operation of the PSD circuitry it is important that the correct reference frequency is presented at these inputs as the filtering in each of the PSD stages is dependent upon this.

Each PSD channel is made up from a number of similar circuit stages namely; input gain stage, multiple feedback filter stage, PSD detection stage and signal integration stage. Analog signals presented at P2,1,5 & 4 are fed through each stage and emerge on pins in connector P3.

The output integration stages are the same for all channels. The input gain of each channel can be changed by inserting a suitable gain resistor. The gain stage resistors are

Ch1	R72
Ch2	R75
Ch3	R77
Ch4	R80

The resistors can easily be identified, as they are the only through-hole components on the board.

Figure 2 shows the input stage design. Increasing the resistor value will increase the input gain. We recommend the use of high quality metal film resistors for these components

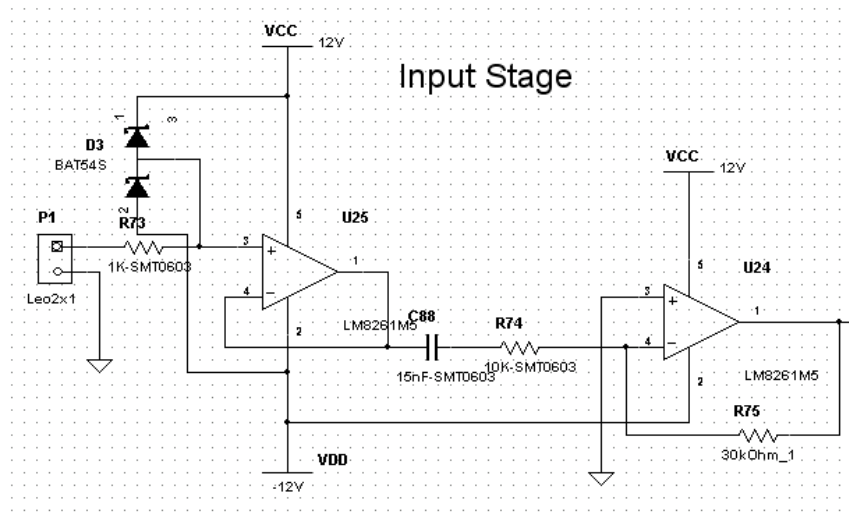


Figure 2. Input gain stage (identical on each input channel)

3.1 Channel frequencies.

Channel 1, input connector P2, is designed to operate at the fundamental frequency of 6.51kHz. The reference input for this channel should be presented at pin 2 of J1. Pin 1 of J1 is marked on the silk screen with a “v” symbol and is leftmost as viewed on Figure 1. The channel output can be found on pin 1 P3, Pin 1 is marked on the silk screen and is uppermost as viewed on Figure 1

Channel 2, input connector P1, is designed to operate at the first overtone frequency of 13.02kHz. The reference input for this channel should be presented at pin 4 of J1. The channel output can be found on pin 3 P3.

Channel 3, input connector P5, is designed to operate at the second overtone frequency of 19.53kHz. The reference input for this channel should be presented at pin 6 of J1. The channel output can be found on pin 5 P3.

Channel 4, input connector P4, is designed to operate at the first overtone frequency of 13.02kHz. There are two possible reference input signals for this channel, the synchronous 2f pulse train and the phase shifted 2f pulse train. The synchronous 2f signal should be presented at pin 3 of J1 and the phase controlled 2f signal at pin 4 of J1. Selection between the signals presented to the channel PSD is carried out by soldering a jumper wire across either pins 1 & 2 or pins 2 & 3 of J2. The

channel output can be found on pin 7 P3.

4 CONNECTOR DESCRIPTIONS

4.1 Channel Input Connectors

P2 Channel 1 (6.51kHz) Input Connector

Pin	Description
1	Input signal
2	gnd

P1 Channel 2 (13.02kHz) Input Connector

Pin	Description
1	Input signal
2	gnd

P5 Channel 3 (19.53kHz) Input Connector

Pin	Description
1	Input signal
2	gnd

P4 Channel 4 (13.02) Input Connector

Pin	Description
1	Input signal
2	gnd

4.2 Channel 4 Reference frequency Selector

J2 Channel 4 Frequency Selection

Pins	Description
1 to 2	13.02kHz synchronous pulse train
2 to 3	13.02kHz phased controlled pulse train

4.3 PSD Output Connector P3

P3 PSD Output Connector

Pin	Description
1	Channel 1 PSD OP
2	gnd
3	Channel 2 PSD OP
4	gnd
5	Channel 3 PSD OP
6	gnd
7	Channel 4 PSD OP
8	gnd

4.4 PSD Reference Frequency Input Connector

J1 PSD Reference Frequency Input connector

Pin	Description
1	Fundamental 6.5kHz (no phase control)
2	Fundamental 6.5kHz (phase controlled by bank1)
3	First Overtone 13kHz (no phase control)
4	First Overtone 13kHz (phase controlled by bank2)
5	Second Overtone 19kHz (no phase control)
6	Second Overtone 19kHz (phase controlled by bank3)
7	2 volt pk-pk analog voltage (no board Connection)
8	0 volts

4.5 PSD Board Power Connector

J3 PSD Power Connector

Pin	Description
1	+12 volts (yellow wire)
2	0 volts (black wire)
3	0 volts (black wire)
4	-12 volts (Blue wire)