Phase Frequency Discriminator

Description

The dual channel phase-frequency discriminator is a 1U chassis that compares the phase of two periodic signals. In contrast to a mixer circuit the phase-frequency discriminator has a memory which allows it to compare frequency rather than phase, if the two signals are far away in frequency. The phase-frequency discriminator board is made to be interchangeable with the advanced LIGO IQ demodulator board. It employs the same connectors and form factor and can be swapped within the same chassis. Due to its nature the phase-frequency discriminator requires the RF signal to have a minimum strength. The board implements an RF preamplifier and a fast comparator which is fed into the discriminator. As with the advanced LIGO demodulator it measures the signal strength on both the LO and RF inputs using a logarithmic RF power detector. It also provides a monitor of the RF input at the front panel. It outputs the measured phase as a differential signal, but also provides a single-ended monitor (I-phase). Since the orthogonal phase corresponds to a straight forward 90 degree phase shift, no Q-phase output signal is provided. Instead the Q-phase signal is used to determine the sign of the I-phase output. It is a nominally pulled high TTL signal. The sign is changed by pulling it low. The unit requires ±24V and ±16.5V.

Specifications

DCC: l 1000450-v1

Frequency range:

- 5 MHz to 500 MHz minimum

LO Input:

- +10 dBm nominal
- TNC female (front)

RF Input:

- -50 dBm minimum
- SMA female (front)

RF Monitor:

- -20dB splitting ratio
- SMA female (front)

Power Detectors (LO and RF):

- 5 to 400 MHz log detector
- 90 dB dynamic range

- 60mV/dBm (single-ended)
- Tip (front)
- 15-pin D-sub female (rear)

Signal output:

- Sensitivity: 36º/V
- Range: ±180º at low frequency
- Noise: TBD
- Offset: TBD
- TNC female (differential, front)
- BNC female (single-ended, front)

Signal Sign:

- TTL, pulled-up
- TNC female (front)
- BNC female (front)
- 15-pin D-sub female (rear)

Power:

- ±24.0V, ±10% tolerance, current <0.2A
- ±16.5V, -3%/+12% tolerance, current <1A
- Power D-sub male (2x rear)

Physical:

- 19" rack mount
- 1U chassis
- Operating temperature: 10ºC - 30ºC