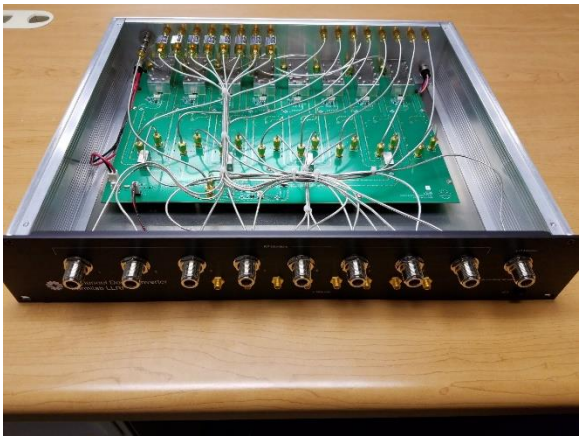
PIP-II LLRF 325MHz 8-Channel Precision Receiver Rev B

Features



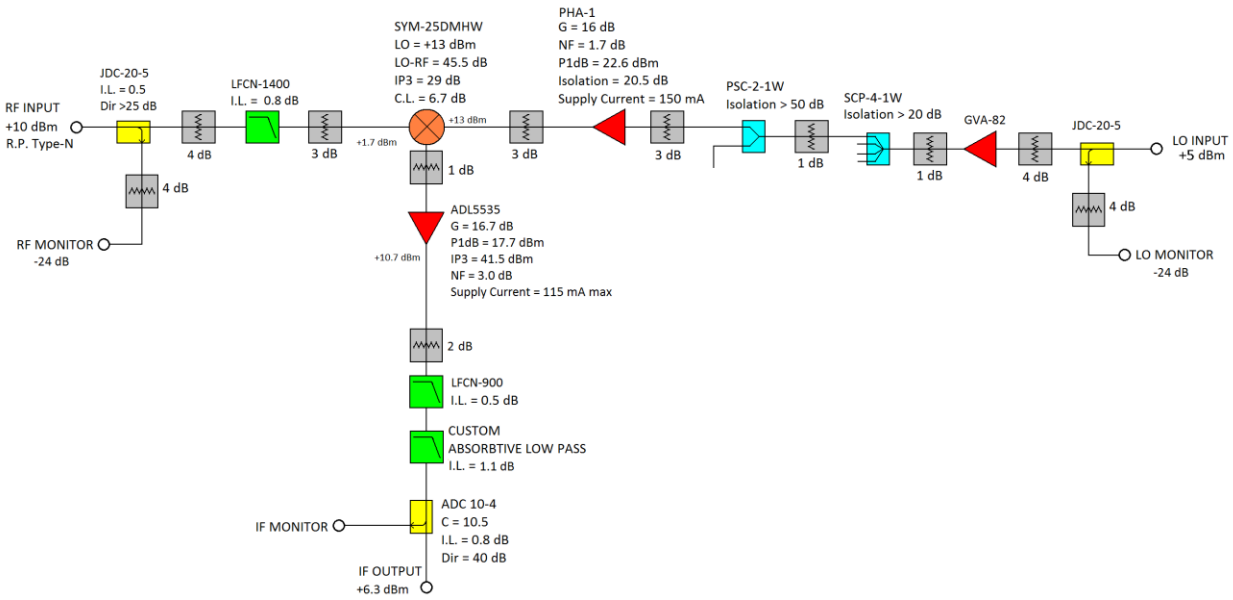
- 325 MHz RF Input, +10 dBm max.
- 325 MHz dBm LO @ +4 dBm
- ~5.4 dB Conv. Loss typ @ 325 MHz.
- Channel to Channel Isolation > 90 dB
- Output Noise = -160 dBc/sqrt(Hz)
- Integrated 1/f output noise from 0.02 Hz to 20 Hz = 0.77 fs
- Output linearity < +/- 1%
- 18 dB RF Monitors (front and rear)
- 21 dB LO Input Monitor
- 10 dB IF Output Monitors
- RF input Return loss < -21 dB
- LO input Return loss < -30 dB
- Amplitude Stability ~0.08% / deg C
- Phase Stability ~0.02 deg / deg C
- Absorptive 30 MHz Low Pass IF Filter
- Power Supply 6V, 2.0 Amp

Description

The PIP-II LLRF 8-channel receiver is a RF board designed to convert 352 MHz RF signals to 20 MHz IF signals for digital signal processing. The board is designed with careful attention to channel to channel isolation, linearity of RF to IF conversion, and output noise floor. To minimize channel to channel isolation, the board receives RF signals using Type-N connectors bolted through the rear panel into a shielding enclosure, providing a continuously enclosed path to the RF section of the board. The Type-N connections bolted through the rear-panel also provide a rugged connection to RF signals arriving over rigid cable. Other design features to improve isolation include the selection of a mixer with high RF-LO isolation, an amplifier and an attenuator driving the LO port of each mixer, and high isolation splitters in the LO distribution section. To design for maximum linearity, a mixer and IF amplifier with a high IP3 were selected. Careful placement of attenuators around the mixer is required to balance the linearity and output noise floor. Selection of a good low noise IF amplifier minimized the noise floor at the IF output. The board includes vertical launch SMA monitor points for all RF inputs, IF outputs, and the LO signal that could be sent to the front panel of the chassis. High directivity directional couplers are used on all monitors to minimize the corruption of the RF signals due to monitor connections. Additional shielding around radiating RF components are used to minimize chassis spurious signal radiation and coupling.

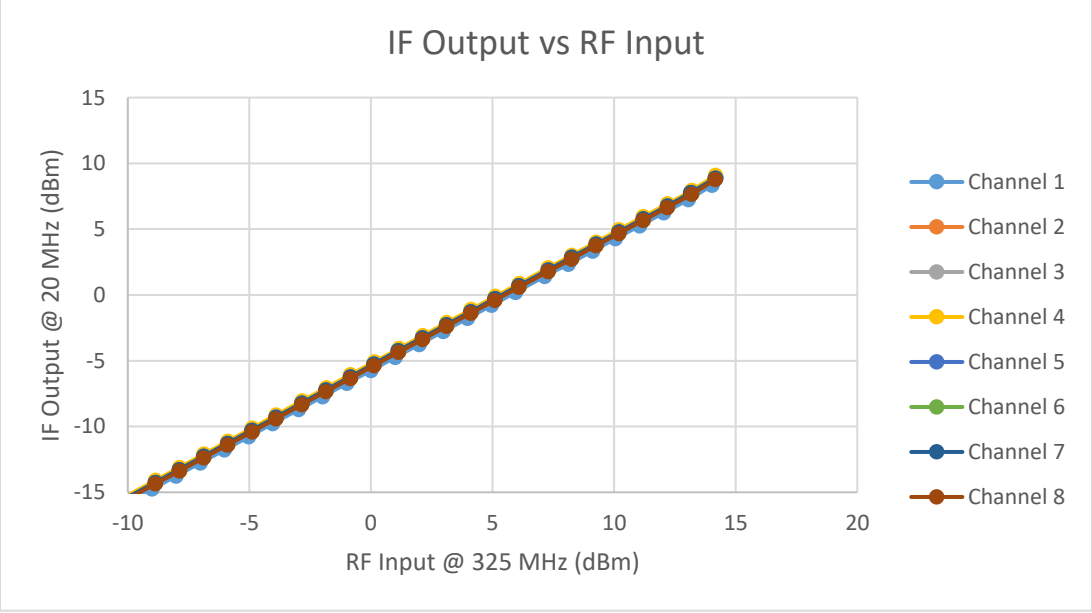
Block Diagram

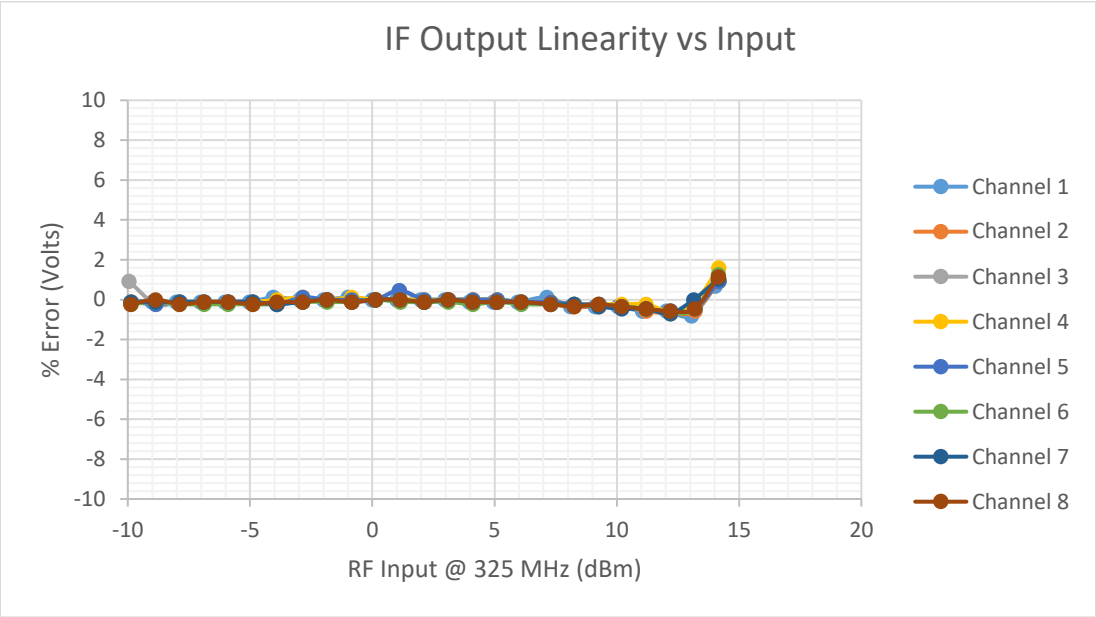
- All values from components datasheet.
- Output power values are expected values.
- For revision B, JDC-20-5 on LO monitor is replaced with ADC-15-5. Future revisions will have the JDC-20-5 as shown



Measurement Data

RF to IF Conversion:





Channel to Channel Isolation:

- Values are dB (driven IF to measured IF)

Channel #	1	2	3	4	5	6	7	8
1		-111	-118	-114	-124	-120	-118	-124
2	-90		-102	-118	-122	-118	-120	-120
3	-114	-108		-109	-116	-115	-115	-122
4	-123	-117	-94		-98	-114	-113	-114
5	-114	-113	-113	-97		-102	-116	-118
6	-110	-111	-113	-112	-97		105	-111
7	-120	-113	-115	-118	-107	-96		-103
8	-120	-120	-117	-116	-113	-115	-93	