144MHz - 146 MHz to 28MHz - 30MHz
VHF down converter
for SDR radios.

Suitable for analogue radios

User manual. Rev 01
(June 2014)
The Heros Tech 144-146MHz to 28-30MHz VHF Down Converter introduced here expands the frequency range of any Software Define Radio (SDR) or analogue shortwave receivers covering 28MHz to 30MHz (10m band) allowing reception of the exciting 144MHz-146MHz band (2m band).

The Converter is connected between the antenna and a SDR or analogue HF radio (called IF receiver). When turned ON the 144MHz-146MHz band is mirrored on 28MHz-30MHz band.

For example, if the IF receiver is tuned on 28.430 MHz, you are receiving the frequency of 144.430 MHz, (allocated segment of frequencies for beacons according to the 2m band plan.) Tuning to 29MHz you are receiving 145MHz and so on.

The Converter allows the reception of all amateur radio services assigned to the 2m band such as SSB, CW, FM, RTTY, FAX transmission modes, internet voice gateway, digital communications, repeaters space communications, ( ISS International Space Station, space-Earth link), amateur satellites and many more stimulating activities.

The Heros Tech 144-146MHz to 28-30MHz VHF Down Converter is designed taken in account the wide range of signal variability that are expected to be received. Those conditions demand for very low noise, good front end filtering, high dynamic range performance, excellent IMD characteristics and good IF receiver isolation.

**Technical Specifications:**

- Converter class: Superheterodyne. Mirrored down.
- Frequency range: 144MHz-146MHz (2m band).
- Gain: 40 dB.
- Noise figure: 0.5dB.
- IP3: > 38dB.
- Input/Output impedance: 50 Ω
- VHF Front-End preselector:
  - Dual helical filter.
  - 146 MHz seven poles Elliptic Low Pass Filter.
  - FM broadcast band rejection filtering.
  - ESD protection.
  - Dual high dinamic range E-PHEMT enhanced technology VHF preamplifier.
- Mixer:
  - High L-R/L-I ports isolation double balanced mixer.
- Crystal oscillator: High stability, very low jitter, 116MHz synthetised crystal oscillator.
- IF receiver output:
  - Frequency: 28MHz-30MHz.
  - 3 sections 28MHz-30MHz Band Pass Filter.
  - 80dB high isolation IF amplifier.
  - 0dB-15dB variable gain range. User regulable.
- Power supply: 12volts/350mA
- Enclosure: Aluminium
- Size: 165mmx80mmx45mm (6.5x3.15x1.78in)
144-146MHz to 28-30MHz down converter. Diagram

VHF Front-End preselector section

- Antenna Input 144MHz-146MHz (50Ω)
- ESD protection Gas Discharge Tube
- FM Broadcast band trap
- 130MHz HPF
- TOKO 144-146MHz Helical BPF
- 146MHz 7 poles Elliptic LPF

Local oscillator section

- 144-146MHz Helycal BPF
- 144-146MHz Helycal BPF
- 28-30MHz BPF
- 116MHz BPF
- 116MHz synthetised crystal oscillator
- AD8907
- High Isolation IF amplifier
- 29MHz Diplexer
- 28-30MHz BPF
- AD8907
- High Isolation IF amplifier
- 3dB attenuator
- 0-15dB IF gain adjust
- 28-30MHz Output to IF receiver (50Ω)

- 120MHz 7 poles Elliptic LPF
- Buffer amplifier
- 116MHz BPF
- 116MHz synthetised crystal oscillator
- Low noise power reg

- SBL-2LH+
- High Isolation double balanced mixer
- +10dBm
- RF
- LO
- IF

- LO
- RF
- IF
- +10dBm
- 3dB attenuator
- 0-15dB IF gain adjust
- 28-30MHz Output to IF receiver (50Ω)
144-146MHz to 28-30MHz VHF Down Converter for SDR radios

Front panel

- IF gain adjusting knob. 0dB-15dB range.
- Power OFF switch position
- IF output BNC connector (to receiver)
- LED power ON

Rear panel

- Earth terminal
- RF input BNC connector (from antenna)
- 2.5mm power plug
**144-146MHz to 28-30MHz VHF Down Converter for SDR radios**

Illustration of connection to generic radios

- **Antenna input (rear panel)**
- **IF output (front panel)**
- **Receiver antenna Input**

**Generic SDR receiver** (tuned on 28-30MHz band)

**144-146MHz to 28-30MHz VHF Down Converter**

- **Antenna input (rear panel)**
- **IF output (front panel)**
- **Receiver antenna Input**

**Generic analogue receiver** (tuned on 28-30MHz band)
144-146MHz to 28-30MHz VHF Down Converter for SDR radios

FlexRadios connection illustration

Antenna input (rear panel)

IF output (front panel)

PowerSDR configuration

Flex 5000

Flex 15000

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