

HF Broadband Precision Tuner CDR-3370



DESCRIPTION

The CDR-3370 is an HF broadband tuner with exceptionally high dynamic range (>110 dB). It provides a precision 2 MHz wide IF as an RF front end to a wideband processing system. To achieve the high dynamic range, uncompromising precision components are used including a high performance mixer, triplexers, wide dynamic range RF amplifier, cavity 1st IF filter, precision attenuator, and low noise synthesizer. To maintain in-band intermodulation characteristics the 2nd Mixer and 2nd IF Amplifier also have wide dynamic range. The synthesizer is a novel hybrid switched VCO/DDS which provides for an exceptionally low phase noise and low spurious.

The CDR-3370 is packaged in a single 1.75" (1RU) 19" rack unit including the required synthesizers with rear panel loopback. This packaging lends itself to stacking channels in a multichannel application for a very compact configuration.

FEATURES

- Frequency range: 2 to 30 MHz, tuning resolution 50 kHz
- Extreme dynamic range: >110 dB
- Bandwidth: 2 MHz
- Low phase noise: <-115 dBc at 10 kHz offset
- In-band 3rd order output intercept: >+50 dBm
Out-of-band 3rd order input intercept: >+35 dBm
Out-of-band 2nd order input intercept: >+80 dBm
- RS-232C/RS-422 control at rates from 19.2 kbaud to 1.23 Mbaud
- Fast settling
- Precision amplitude and phase tracking for multichannel operation
- Compact size: 1.75" high (1RU), 19" rack-mount



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CDR-3370 HF BROADBAND PRECISION TUNER SPECIFICATION

SIGNAL FLOW

The incoming RF signal is applied through the rear panel ANTENNA connector to a lowpass input filter. This filter attenuates signals from 35 to 150 MHz, rejecting out-of-band signals up to 100 dB and achieving high IF and image rejection. An overload detector circuit protects the circuits by switching the RF line open if the signal level exceeds approximately +20 dBm. Protection is provided for inputs up to 10 watts. (See block diagram on opposite page).

The signal is then applied to the 1st mixer having a high third-order intercept point of +45 dBm to avoid intermodulation products from high level out-of-band signals. The signal is mixed with the 1st LO providing a 1st IF frequency of 53.75 MHz. The 1st LO input is fed via a LO bandpass filter to the 1st mixer. The LO Bandpass Filter is used to prevent noise from the high power 1st LO from leaking into the IF passband. The output of the mixer is terminated over the full frequency range by a triplexer which ensures that any out-of-band products are correctly terminated and do not interfere with the operation of the mixer.

The signal is then applied by the 1st IF amplifier. This amplifier has been tailored to have stable amplitude and phase matching for multichannel operations. Tracking from unit to unit is within approximately 0.1 dB. From the 1st IF amplifier the signal is applied to a bandpass filter allowing only the 1st IF signal to pass. The first IF filter is a cavity filter, capable of absorbing the full transient power output of the 1st IF amplifier. The characteristics of the cavity filter are a carefully controlled Chebyshev bandpass shape with 2 MHz bandwidth centered at 53.75 MHz. A precision tracking resistive attenuator is used for manual gain control, and to ensure that channels track each other precisely to within 0.1 dB over a wide range of attenuator settings. The attenuator is controlled by the ATTEN CONT signal from the fast control interface. The 1st IF signal is then applied to the 2nd mixer along with the 2nd LO at 50 MHz. The signals are mixed producing the 2nd IF at 3.75 MHz.

The 2nd IF circuits comprise a lowpass filter, two high linearity amplifiers to maximize dynamic range, and a high performance LC bandpass filter with maximum selectivity.

This minimizes the generation of intermodulation components from inband signals at the output. Rapid attenuation occurs at the edges of the filter to greater than -90 dB. This filter complements the selectivity of the cavity filter.

Both analog and digital (optional) signals can be provided depending on the configuration. The analog output will be 2 MHz wide centered at 3.75 MHz. The optional 14-bit A/D converter has superior performance with a sub-picosecond aperture jitter approaching 700 fsec. The A/D converter can be clocked from the customer's stable external source or from an internal 20 MHz source. The digital TTL output is provided via a 25-pin 'D' type connector.

SYNTHESIZER

The attributes of exceptionally low phase noise and fast settling are a result of a novel synthesizer design comprising a combination of phase locked loops (PLL) and direct digital synthesis (DDS).

Operation is from an external 10 MHz reference or an internal OCXO. The reference may be daisy-chained to other units for coherent requirements.

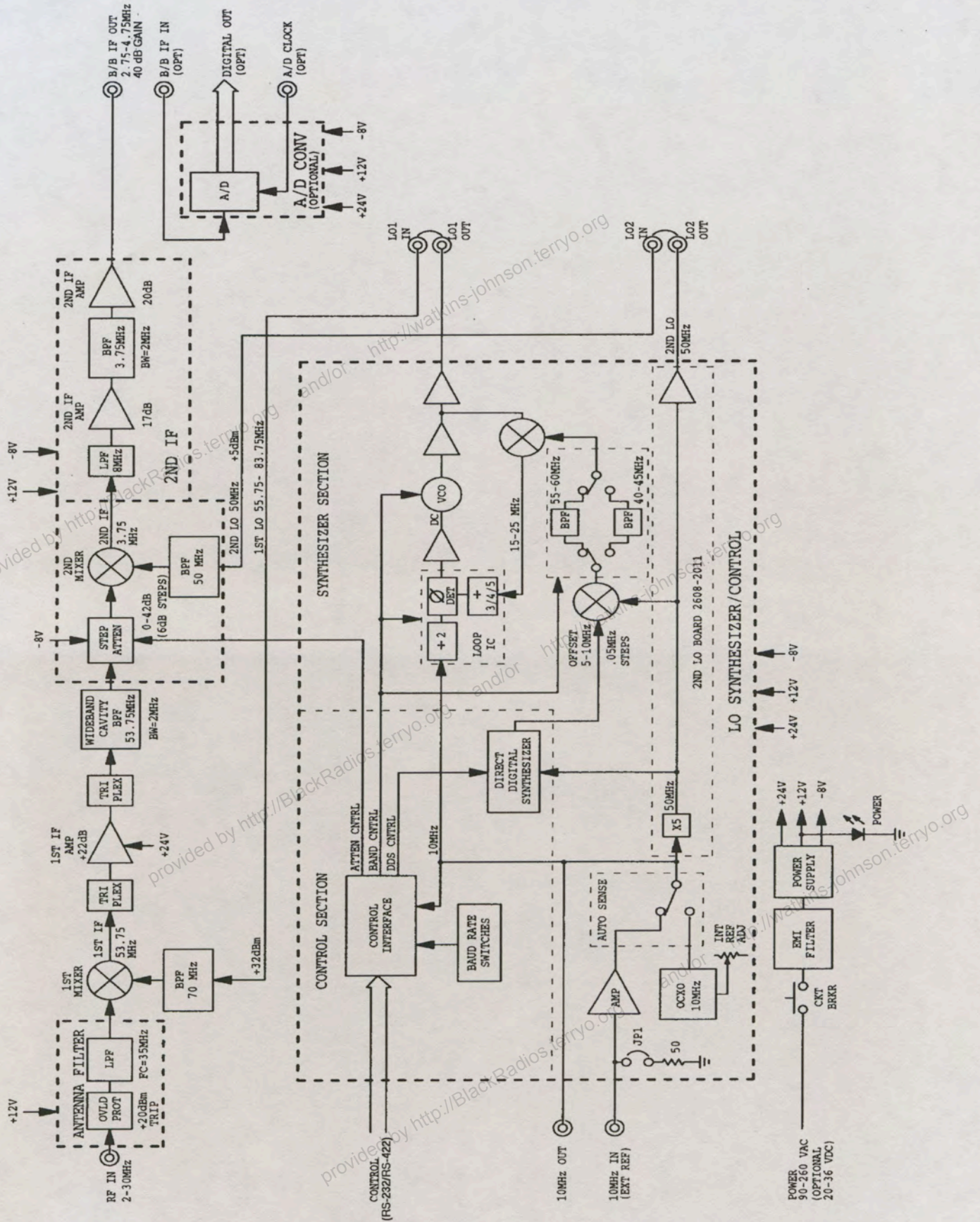
The frequency of the 1st LO VCO is set by sending a command from the control interface to the DDS. The output of the DDS loop reflecting the new frequency is mixed with the VCO output, and the resulting difference signal is frequency and phase compared with the 10 MHz reference to produce a DC control voltage. The DC control voltage is applied to the VCO to change frequencies. The 1st LO output is routed to the LO bandpass filter in line with the 1st mixer.

The 2nd LO signal is produced by multiplying the 10 MHz reference by five providing a fixed precision clean frequency of 50 MHz.

CONTROL

The CDR-3370 is controlled via an RS-232C or RS-422 interface bus which can be configured to handle data from 19.2 kbaud to 1.23 Mbaud. The baud rate can be selected by dip switches mounted on the control board inside the synthesizer housing. The default is 19.2 kbaud.

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CDR-3370 BLOCK DIAGRAM

CDR-3370 HF BROADBAND PRECISION TUNER SPECIFICATION

FREQUENCY

Tuning Range: 2 to 30 MHz
Tuning Step Size: 50 kHz

RF SECTION

Input Impedance: 50 ohms
Input VSWR: 1.7:1
Noise Figure: 14 dB, maximum
RF Protection: Up to 10 watts. Automatic reset.
-40 dB reflective attenuation when protection active.
Protection activates between +10 dBm and +20 dBm RF input
RF Gain: +40 dB
MGC: Bus controllable over 41.3 dB range in 5.9 dB steps accurate to <0.5 dB

IF SECTION

First IF: 53.75 MHz
Second IF: 3.75 MHz

INTERFERENCE IMMUNITY

IF Rejection: >110 dB
Image Rejection: >80 dB
Oscillator Reradiation (up to 1 GHz): <-90 dBm
Generated Spurious: <-100 dBm
Intermodulation Distortion:
In-band 3rd order intercept point: +50 dBm
Out-of-band 2nd order intercept point: +80 dBm
Out-of-band 3rd order intercept point: >+35 dBm

POWER

90 - 260 VAC, 47 - 440 Hz, 85 Watts maximum,
Optional 20 - 36 VDC, 4 Amps

SYNTHESIZER

Synthesizer Tuning Speed: <50 μ sec for 50 kHz steps
Internal Standard: 0.5 ppm of tuned frequency OCXO
External Standard: 10 MHz
1st LO: 55.75 to 83.75 MHz, +32 dBm
2nd LO: 50 MHz, +2 dBm
Synthesizer Phase Noise: <-115 dBc/Hz @ 10 kHz offset

OUTPUT

Analog: 3.75 MHz, 2 MHz bandwidth,
 \pm 2V into 50/75 ohms
Digital: TTL

CONTROL

RS-232C/RS-422: Rate selectable from 19.2 kbaud to 1.23 Mbaud. Default setting is 19.2 kbaud

OPERATING TEMPERATURE

Temperature: 5° to 45° C

SIZE AND WEIGHT

Dimensions: 1.75" high (4.4 cm)
19" wide (48.3 cm)
24" deep (60.9 cm)
Weight: 12.5 lbs. (5.7 kg)

Ordering Information

Model	Part Number	Description
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Specifications subject to change without prior notice

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