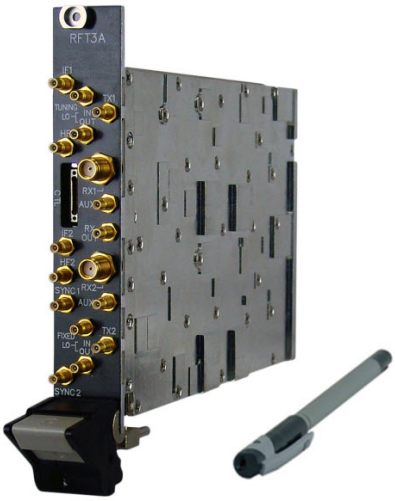
Digital Receiver Technology, Inc.

Approved for Public Release

RFT3A-40

Dual-Channel 20-3000 MHz Wideband Tuner
Rx/Rx, Tx/Tx, and Rx/Tx Capable



DESCRIPTION

The RFT3A-40 is a dual-channel, fast-tuning digital tuner covering 0.5 to 3000 MHz. The two channels may be configured via software command as two receivers, as two transmitters, or as one receiver and one transmitter. As a 20-3000 MHz receiver, a channel converts and outputs a 40-MHz bandwidth IF, either as a 14-bit digital IF or as an analog IF. As a 20-3000 MHz transmitter, a channel accepts such an IF, either in digital form from a WPM3 module, or in analog form from the front panel input, and can output the converted spectrum at up to +24 dBm. HF is received or transmitted directly from a channel's HF port.

The RFT3A-40 occupies one 3U-size CompactPCI slot.

- RF: 20-3000 MHz frequency range, 40-MHz bandwidth per channel, 5-MHz step size. Channels can be configured so that a single RFT3 can supply 80-MHz instantaneous RF bandwidth.
- HF: 0.5-32 MHz
- 85-dB typical dynamic range for both RF and HF receive configurations (two tones, -40 dBm each)
- Interfaces directly with WPM3A processor/exciter module. Can be installed in DRT 3rd-Generation ("C") systems, including the DRT11xxC, DRT12xxC, and DRT23xxC.
- Coherent operation of multiple tuners without LO distribution modules; software-reconfigurable
- Flexible Antenna I/O, all software-reconfigurable:
  - Two RF inputs per channel allows attachment of multiple antennas without external switches
  - RF daisy-chaining, to allow single-antenna operation of both channels and multiple RFT3As
  - Separate transmit output connectors
  - Dedicated HF connectors
  - DC Bias available at RX1 and RX2 ports (each programmable +11V or +4.5V; 100 mA with short-circuit protection).
- Single-slot 3U CompactPCI form factor and standard control interface (32-bit PCI via J1 connector)
- Receive-only version available, as well as custom gain/intermodulation performance versions (call factory)

RECEIVER OPERATION

RX and AUX Input Ports

Each channel's RX and AUX input ports are functionally the same. The control software selects which port is connected to the receiver path. The AUX1 input is usually cabled to the adjacent RFT3's RX OUT port to allow receive daisy-chaining of an intercept antenna, as well as the DRT system's BIT signal. The AUX2 input is usually cabled to the adjacent TX2 output port to allow transmit daisy-chaining (combining) of multiple 40-MHz bandwidths to a single transmit antenna.

- Input Frequency Range: 20 to 3000 MHz
- Final IF Bandwidth: 40 MHz
- Center Frequency Tuning Range: 40 to 2980 MHz
- Tuning Resolution: 5 MHz
- VSWR: 2.5:1 maximum
1.25:1 to 2:1 typical across 20-3000 MHz frequency range
- Maximum Input without Damage: +30 dBm continuous (RF)
12 VDC (antenna DC bias must be Off)
- Connectors: SMA jack (RX1 and RX2)
SSMC jack (AUX1 and AUX2)

HF Ports

Each channel's HF port is software-reconfigurable for both RX and TX modes.

- Input Frequency Range: 0.5 to 32 MHz (full specifications 1.7 to 30 MHz)
- VSWR: 2.5:1 maximum
- Maximum Input without Damage: +30 dBm continuous
- Connectors: SSMC jack (HF1 and HF2)
- Full-Scale Input (0 dB attenuation): -23 dBm, single-tone

IF Ports (analog outputs in receiver operation)

- 3-dB Bandwidth: 40 MHz minimum
- IF Passband: 100 to 140 MHz
- Spectral Sense: Inverted relative to RF input
- Anti-alias filtering: 80 dB minimum (relative to Fs = 96 MHz)
- Full-scale output power level (receive): -1 dBm (high-level analog output mode)
-30 dBm (digital output "monitor" mode)

RX OUT Port (antenna daisy chain)

The Channel 1 RF or AUX input may be internally daisy-chained to Channel 2 through a preamp or passive splitter (software-selectable). In turn, this daisy-chained antenna input, or either of the Channel 2 RF inputs, may be directed to the RX OUT port to feed another RFT3A-40. This allows one antenna to feed multiple tuner modules, and also serves to distribute the DRT system's BIT signal.

Digital IF Outputs

In Receiver applications, the digital IFs are outputs to the CompactPCI backplane via the J2 connector.

- Sample Rate: 96 Msps
- Sample Resolution: 14 bits
- 3-dB Bandwidth: 40 MHz minimum
- Effective Center Frequency: 24 MHz
- Anti-alias filtering: 80 dB minimum
- Spectral Sense: Noninverted
- Format: 14-bit parallel TTL, two's-complement
- Connector: J2 (CompactPCI backplane interface)

TRANSMITTER OPERATION

TX Output Ports

- Output Frequency Range: 20 to 3000 MHz
- 3-dB Bandwidth: 40 MHz minimum
- Passband Amplitude Ripple: 3 dB peak-to-peak, maximum; 1 dB peak-to-peak, maximum, with digital equalization
- Tuning Resolution: 5 MHz
- Power Level: -30 to +24 dBm with full-scale analog or digital input
- VSWR: 2.5:1 maximum

HF Ports

Each channel's HF port is software-reconfigurable for both RX and TX modes.

- Output Frequency Range: 0.5 to 32 MHz (full specifications 1.7 to 30 MHz)
- Power Level: -14.5 to +10 dBm with maximum digital input
- VSWR: 2.5:1 maximum
- Passband Amplitude Ripple: 2 dB peak-to-peak, maximum

Digital IF Inputs

The digital IF buses of the J2 CompactPCI connector are inputs during TX applications. The digital IFs are typically generated by a WPM3 module.

- Sample Rate: 96 Msps
- Sample Resolution: 14 bits
- 3-dB Bandwidth: 40 MHz minimum
- Anti-alias filtering: 80 dB minimum
- Spectral Sense: Non-Inverted or Inverted (software-selectable)
- Format: 14-bit parallel TTL, two's-complement
- Connector: J2 (CompactPCI backplane interface)

IF Ports (analog inputs in transmitter operation)

- IF Passband: 100 to 140 MHz
- 3-dB Bandwidth: 40 MHz minimum
- Spectral Sense: Inverted (relative to TX output)
- Anti-alias filtering: 80 dB minimum (relative to Fs = 96 MHz)
- Full-Scale Input power level: -3 dBm

LO PORTS

FIXED LO IN and OUT Front-Panel Ports

A DRT REF3 module provides a fixed-frequency LO signal to the RFT3A-40. This LO is daisy-chained out the front panel in order to provide the same coherent reference to other DRT tuners.

TUNING LO IN and OUT Front-Panel Ports

The RFT3A-40 has a flexible tuning LO structure, allowing coherent and independent configurations. The modes of operation are software-reconfigurable.

CONTROL

- Normal tuning, attenuation, and other mode settings are controlled through the CompactPCI bus interface (J1 connector).
- The SYNC1 and SYNC2 connectors accept external LVTTL-level triggers to step the tuner to the next frequency in the table. The SYNC ports are flexible in that they may also output triggers, and one SYNC port can control both channels. The stepping may also be triggered via the backplane CompactPCI J2 connector.

PHYSICAL/ENVIRONMENTAL

Operating Temperature Range: -20 to +60 ºC (-4 to +140 °F) (Inlet air temperature of any DRT system in which the RFT3A-40 is installed. RFT3A-40 components withstand +85 ºC (+185 ºF) temperatures, so the systems in which these modules are installed must maintain an internal rise of 85 – 60 = +25 ºC (+45 ºF) or less.)

Size: Single-slot 3U CompactPCI, approximately 0.8 in wide x 4 in high x 6.5 in deep (2 cm wide x 10 cm high x 16.5 cm deep)

Weight: < 1.75 lbs. (794 g)

Power Consumption: 30 watts maximum Less consumption in Sleep and other modes

Front Panel I/O Definitions and Characteristics

Port Label	Connector Type	Function	Electrical Characteristics
RX1 / RX2	SMA jack	Ch1 / Ch2 20-3000 MHz Receive Input	-29 dBm single-tone full-scale input (no RF attenuation) +7 dBm clipping +30 dBm maximum without damage Antenna Bias, software-selectable, +4.5V/+11V/OFF
TX1 / TX2	SSMC jack	Ch1 / Ch2 20-3000 MHz Transmit Output	-30 to +24 dBm single-tone output Note: For module-to-module TX Combining, TX2 will be connected to the next module's AUX2
AUX1	SSMC jack	20-3000 MHz, Auxiliary Ch1 Receive Input (usually configured as module-to-module Antenna Distribution Input)	-29 dBm single-tone full-scale input (no RF attenuation) +7 dBm clipping +30 dBm maximum without damage
AUX2	SSMC jack	20-3000 MHz Input, used for either Auxiliary Ch2 Receive Input or as input for module-to-module TX Combining	• As Ch2 Receive Input -29 dBm single-tone full-scale input (no RF attenuation) +7 dBm clipping +30 dBm maximum without damage • As module-to-module TX Combining Input -10 dBm Typical Input Level (exact power level is dependent upon desired output power, and will be configured automatically via software)
RX OUT	SSMC jack	20-3000 MHz Output, used for distributing Ch2's receive signal to another RFT3A-40. [note: Ch1 feeds Ch2 internally, and Ch2 feeds RX OUT]	Typical application would be antenna connected to RX1, with Ch1 preamp on, simultaneously feeding (internally) Ch2 with preamp off, and then Ch2 feeding RX Out. In this configuration, net gain is ~ 0 dB from RX1 input to RX Out output.
HF1 / HF2	SSMC jack	Ch1 / Ch2 0.5 – 32 MHz Receive Input or Transmit Output	• As HF Receive Input -23 dBm single-tone full-scale input (no RF attenuation) +10 dBm clipping +30 dBm maximum without damage • As HF TX Output: -14.5 to +10 dBm single-tone output
IF1 / IF2	SSMC jack	Ch1 / Ch2 100 – 140 MHz Analog Input or Output	• As Analog Receive IF Output -1 dBm (high-level analog output mode) -30 dBm (digital output "monitor" mode) +10 dBm maximum without damage • As Analog Transmit IF Input: -3 dBm Input Level
TUNE LO IN/OUT	SSMC jack	Tuning LO Input and Output jacks	+0 dBm Nominal Input and Output Levels (-3 to +3 allowable)
FIXED LO IN/OUT	SSMC jack	Fixed LO Input and Output jacks	+0 dBm Nominal Input and Output Levels (-3 to +3 allowable)
I/O	15-pin Nanonics Dualobe	Multi-pin I/O: • RS-232 #1 (TX, RX, GND) • RS-232 #2 (TX, RX, GND) • Qty 6 GPIO (3 GND pins for these 6 GPIO lines)	• GPIO, 0/+5V Logic

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