



SIGNAL MEASUREMENT

Obsolete Product - for Reference Only

RF Receiver & Signal Analyzer Model 2551



- 10kHz to 30MHz Tuning Range with 1Hz Tuning Resolution
- Low LO Phase Noise
- Quadrature Digital IF Output (I&Q)
- ISB, LSB, USB, CW, AM, FM and FSK Detection Modes
- Phase-locked Local Oscillators for Multiple Channel Applications
- 51 Standard Bandwidths

The 2551 Receiver is a high performance VXIbus 10kHz to 30MHz DSP Receiver. Systems using instrumentation can now include the latest in receiver technology. All of your LF/HF communication as well as Test & Measurement requirements are accomplished utilizing Digital Signal Processing (DSP) design for superior performance, higher reliability and lower cost.

Signal Analyzer

In production ATE systems, where known frequencies need to be checked for

spurious or harmonic content, the Model 2551 may be used as a signal level analyzer. The cost savings over a spectrum analyzer are significant.

Automated RF Monitoring

Applications that require frequency occupancy or remote monitoring can now utilize up to 12 Model 2551's in a single mainframe. This "system" may be powered from a 24VDC supply and located in the back of a vehicle or unmanned location. A program to control and gather data from the receivers can

be built onto an embedded computer. The gathered data can be sent over radio or land line to a central location.

Diverse Applications

Radio frequency occupancy monitoring, surveillance, propagation studies, direction finding and RF interference locating are some applications which are typical for this diverse receiver.

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This DSP receiver offers significant improvements over analog receivers. These improvements include increased stability and precisely controlled filter characteristics which translates into greater reliability and performance.

Flexible Scan and Sweep Modes

Scan up to 250 pre-selected channels at a preset scan rate (up to 100 ch/s) and squelch level (ranging from 6 to 30dB). Channels may be scanned with dwell and bridge times of up to 9s. Each channel may be individually excluded from sweep by setting skip flags to skip up to 100 channels.

Sweep through up to 125 user-selectable bands with dwell and bridge times of up to 9 seconds. Step size may be specified in sweep mode.

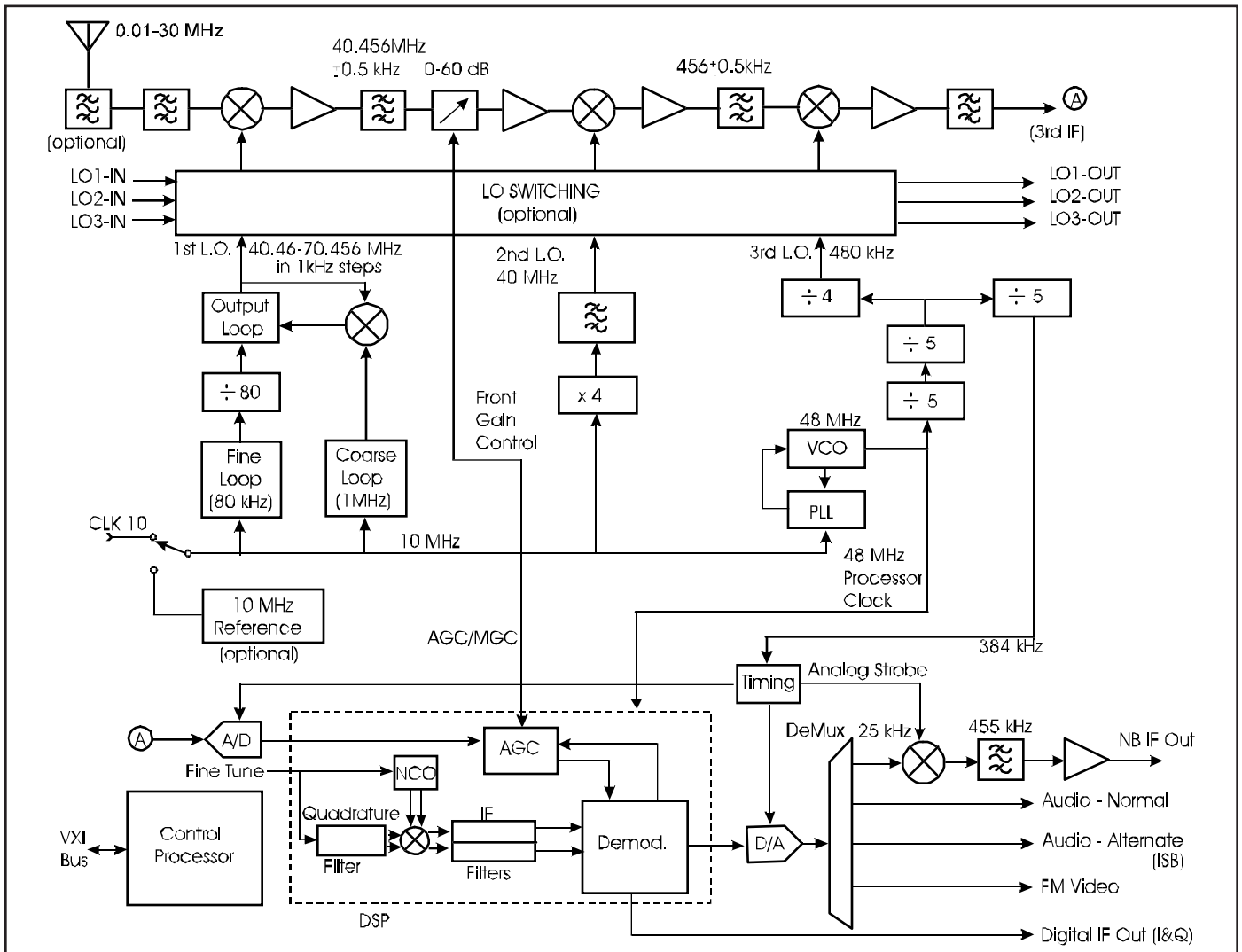
Complex DSP Functions in Flash Memory

Harness the power of DSP technology by loading the 2551's on-board flash with user-specified demodulation schemes, filtering or complex functions. Flash memory may be re-programmed any time over the VXIbus transforming the 2551 into a custom receiver for special applications. If special access modes are required for custom DSP commands, the receiver's command set itself may be modified in a separate on-board flash memory.



Receiver Control Panel from VXIplug&play Soft Front Panel

2551 LF/HF DSP Receiver Simplified Block Diagram



This LF through HF receiver is a triple-conversion superheterodyne design in which the final IF filtering and demodulation are accomplished with Digital Signal Processing (DSP) for superior accuracy and flexibility. The three Intermediate Frequencies (IFs) are 40.456MHz, 456kHz, and 24kHz. Having the first IF above the entire tuning range assures spurious-free reception. At the third IF the signal is converted to digital form. A DSP chip then provides fine tuning, IF filtering to the selected bandwidth and AM, FM or product detection according to the operating mode. Fifty-one bandwidths are offered from 100Hz to 16kHz. The demodulated signals are converted back to analog form for output to a speaker, stereo headphones or balanced lines.

2551 Specifications

FREQUENCY

Tuning Range

10kHz to 30MHz (0-10kHz with reduced performance)

Tuning Step Size Resolution

1Hz to 10MHz

Synthesizer Tuning Speed (maximum)

$\Delta f < 100\text{kHz}$: <1ms

$\Delta f < 1\text{MHz}$: <1.5ms

$\Delta f < 10\text{MHz}$: <2ms

Receiver Tuning Time

<10ms

Tuning Accuracy

External Frequency Standard (10MHz): Tuned frequency equal to accuracy of external standard in ppm.

DETECTION MODES

AM, FM

All bandwidths

USB LSB, CW

Bandwidths $\leq 6\text{kHz}$

ISB

2.8kHz bandwidth per sideband

SIGNAL LEVEL ANALYSIS

Signal Level Range

-110dBm to 0 dBm

Signal Level Resolution

1dB

SQUELCH CONTROL

(Carrier-to-noise ratio for SCAN and SWEEP modes)

Programmable Range

113dB

Resolution

1dB

DWELL & BRIDGE CONTROL

(For SCAN and SWEEP modes)

Dwell Time

Time to "dwell" on a scanned channel or swept frequency with a signal strength exceeding the squelch threshold.

Dwell Time Range

0 to 9s

Bridge Time

If a scanned channel or swept frequency's signal strength drops below the squelch threshold during dwell, this is the amount of time the receiver waits for the signal to return before it leaves the channel.

Bridge Time Range

0 to 9s

SCAN MODE

Channel Presets

250

Channel Parameters Stored

Frequency	Detection Mode	BW
De-emphasis	Squelch Value	BFO
Step Size	Dwell Time	AGC
AGC Decay	Bridge Time	MGC
Skip Flag	IF Shift	

Scan Range

1 to 250 channels

Scan Rate

1 to 100 channels/s

SWEEP MODE

Sweep Types

Single-band: Sweep between 2 consecutive channels
Multi-band: 2 to 125 sweep bands

Sweep Rate

1 to 100 channels/s

RF SECTION

Input Impedance

50 Ω

Input VSWR

< 1.5:1 (typical)

<2.5:1 (maximum at tuned frequency)

Sensitivity of 10dB SINAD (above 1.6MHz)

AM (6kHz BW): -105dBm, 50% modulation

CW (500Hz BW): -122dBm

SSB (3kHz BW): -113dBm

FM (5kHz deviation, 400Hz modulation, 16kHz BW):

-98dBm for 20dB SINAD

Noise Figure (above 1.6MHz)

15dB (max)

RF PROTECTION

50dB reflective attenuation. Activates at signal levels between +10dBm and +20dBm. Protects from input signals up to 10 Watts. Automatic reset.

PRESELECTOR

Eight one-half octave bandpass preselector filters used from 1.6 to 30MHz. Two lowpass filters for frequencies <1.6MHz. Filter selection is automatic with tuned frequency selection.

AUTOMATIC GAIN CONTROL (AGC)

SSB & CW Attack Time

Fast: <2ms for 50dB change (sweep and scan only)

Nominal: <10ms for 50dB change

Decay Time Range (nominal for 50dB change)

0ms to 4s (programmable)

Dynamic Range

Output level held within $\pm 1\text{dB}$ over a 110dB range.

Threshold

Set to -112 dBm

Dump Time

<2ms

AM Attack and Decay Time (50dB change)

50ms (nominal)

MANUAL GAIN CONTROL (MGC)

Dynamic Range

127dB

Resolution

1dB

IF SECTION

First IF

40.456MHz

Second IF

456kHz

Third IF

24kHz

Fourth IF (DSP)

51 Standard Bandwidths from 100Hz to 16kHz

Shape Factor (3dB to 60dB)

Better than 2:1, 400Hz and above

Inband Ripple (max)

1dB

INTERFERENCE IMMUNITY

IF Rejection

>100dB

Image Rejection

>100dB

Cross Modulation

Unmodulated desired signal of -60dBm together with a modulated (30% AM at 1kHz) undesired signal of -10dBm, spaced 100kHz apart, will produce less than 10% cross modulation of the desired signal.

Blocking

Attenuation of a desired RF signal of -60dBm by an unmodulated signal of +10 dBm spaced 100kHz away is less than 3dB.

Synthesizer Phase Noise

(@1kHz spacing, nominal)

-110 dBc/Hz

Oscillator Re-radiation (1GHz)

-110dBm

Spurious Responses

(equivalent or less for -50dBm input signals)

$\leq -120\text{dBm}$

Generated Spurs (above 1.6MHz)

No more than 5: <-110dBm

All other spurs: <-120dBm

2551 Specifications Continued

INTERMODULATION DISTORTION

Second Order Intercept

100kHz -1.6MHz: +45dBm
1.6MHz - 30MHz: +60dBm

Third Order Intercept (typical)

+30dBm

Inband

-50dBc (2 equal tones separated by >1kHz, input level up to -20dBm)

FRONT PANEL INPUTS

Antenna

SMA (50Ω)

1st, 2nd, 3rd LO (jack)

Coaxial D-sub

External Reference

SMB male: 10MHz, 0dBm

FRONT PANEL OUTPUTS

Wideband IF (30dB gain@<-60dBm input)

SMA female ($f_c=456\text{kHz}$, $BW=30\text{kHz}$)

Narrowband IF (-10dB signal level)

SMA female, ($f_c=455\text{kHz}$)

1st, 2nd, & 3rd LO (plug)

Coaxial D-sub

Stereo Headphone Jack

(0 to 5V_{pk-pk} signal level)

1/8" connector: 8Ω

DSP Signals (12-pin, female circular connector)

Line audio: 600Ω balanced (0dBm ±3dBm)

Alternate Line Audio: 600Ω balanced (2nd ISB signal)

Wideband Video: 3V_{pk-pk}, 75Ω

Digital I&Q: TTL

VXIbus INTERFACE DATA

(Single-slot, message-based, VXIbus 1.4 compliant)

Drivers

LabVIEW, LabWindows/CVI, VXIplug&play (WIN, WIN95, WIN NT Frameworks)

Status Lights

Red: Self-test failure

Weight

5 lbs. (2.3kg)

Peak Current & Power

Consumption

	+12	+5	-5.2	-12
I_{Pm}	1.1A	1.2A	.06A	0.5A

Total Power: <26 Watts

ENVIRONMENTAL DATA

Temperature Range

Operating: 0 °C to 50°C
Storage: -40°C to +71°C

Humidity

10% to 90% non-condensing

EMI

Equipment designed to intent of the applicable requirements of MIL-STD 461/462 as a guide.

EMC (Council Directive 89/336/EEC)

CISPR 11 (Class A), IEC801-2,3,4

Safety (Low Voltage Directive 73/23/EEC)

EN61010-1, IEC1010-1, UL31111-1, CSA22.2#1010

MTBF (MIL-HDBK-217F, Naval Sheltered)

11,000 hours

CE The CE Mark indicates that the product has completed and passed rigorous testing in the area of RF Emissions, Immunity to Electromagnetic Disturbances and complies with European electrical safety standards.

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ORDERING INFORMATION		
Model	Description	Part Number
2551	LF/HF DSP Receiver	RVXI-3250



<http://www.racalinst.com>

