Communication Solutions, Inc.

CS-5040

VXI MICROWAVE TUNER

- ***0.5–18 GHz Coverage Standard***
- ***0.1–110 GHz Coverage Available***
- ***Low Phase Noise - 0.5º RMS Typical***
- ***1 GHz/500 MHz BW IF Out Standard***
- ***VXI Based Search/Set-on Applications***
- ***COMINT/ELINT Applications***

The CS-5040 VXI Microwave Tuner is a three-slot, high-performance microwave tuner that operates in the 0.5–18 GHz frequency range. Frequency coverage can be expanded to cover 0.1–22 GHz without the need for external extenders. A millimeter-wave downconverter interface can be included as an option, which allows the operator to attach remote downconverters covering the millimeter-wave range up to 110 GHz. The CS-5040 VXI Microwave Tuner can be used either independently as a tuner, or in conjunction with the CS-5045 VXI Demodulator to form a complete microwave receiver.

The CS-5040 is capable of operating in both sweep and CW tuning modes for both search and set-on applications in the COMINT and ELINT surveillance communities. This tuner is capable of processing complex, wideband signals of interest, such as radar, FDM, PCM, PSK, FSK, QAM, and many others. This VXI microwave tuner exhibits the same performance and features as the CS-5020C rack mount tuner but is housed in a removable three-slot VXI package.

CS-5040 tuner with Option 1b

The CS-5040 features a high dynamic range with very low noise figure (13 dB typical) and a very good third-order intercept (+2 dBm typical at the input). Extremely low, integrated phase noise (0.5° RMS typical) and group delay (3 ns over 80% of the IF bandwidth) permit the conversion of signals of interest without compromising signal content. This unique tuner offers fully synthesized operation including 100 Hz tuning resolution and phase coherence to either an internal 10 MHz low-phase noise crystal oscillator or an external 10 MHz system reference.

MECHANICAL

The three-slot VXI standard package derives power from the mainframe, as well as forced air cooling. The unit is designed to meet the requirements of MIL-STD-461 in the RF portion for low leakage; it employs mechanical shielding techniques such as EMI gasketing, and waveguide beyond cutoff hole patterns are used for cooling vents. The RF component section is fully EMI shielded, and the digital interface to the VXI bus is partially shielded.

Street Address:
10552 Philadelphia Rd.
White Marsh, MD 21162

Tel: (410) 344-9000 **Fax:** (410) 344-1790
Email: sales@comsol-inc.com
Website: www.comsol-inc.com

Mailing Address:
P.O. Box 43550
Baltimore, MD 21236-0550

A four-digit LED status display on the front panel presents codes based upon the condition of the tuner and automatically updates on a routine basis to display any changes in BITE status. All RF and millimeter-wave downconverter connectors, BITE LEDs, and an RS-232 interface are located on the front panel, along with test points for monitoring the health and activity of the unit.

INTERFACE

The unit is controlled through the VXI standard control bus, using either a message- or register-based interface. The CS-5040 can be programmed for auto-stop capability, as well as the monitoring of relative signal amplitude when the internal LOG is selected as an option. All parameters can be controlled and monitored through the VXI interface, including BITE. There is also an auxiliary 9-pin RS-232 interface port on the front panel.

OPTIONS

A number of options are available and are explained below. Consult with Communication Solutions (Com-Sol) for option compatibility.

Option 1 – IF Outputs

1a – 1 GHz/500 MHz BW IF Output – now standard
1b – Adds an IF output with a selectable frequency/BW of 70/50, 140/85, and 160/85 MHz.
1c – Adds an IF output with a selectable frequency/BW of 70/50, 140/100, and 160/100 MHz.

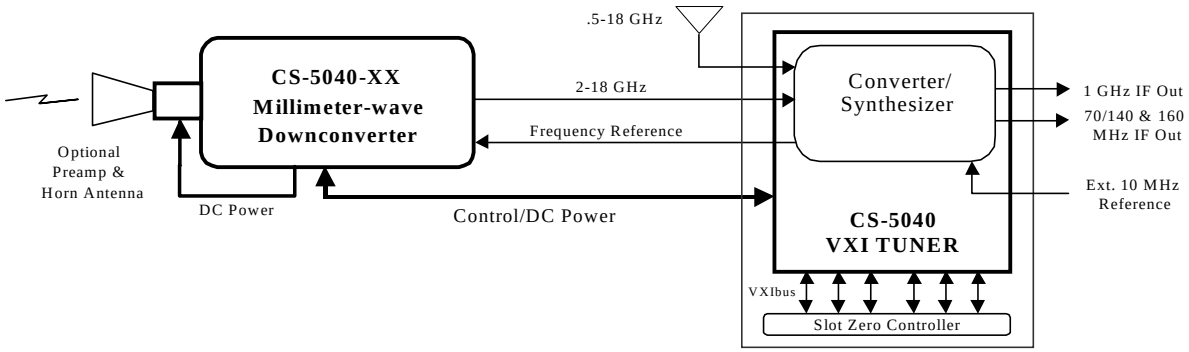
Option 2 – LOG Amplifier (Option 1b or 1c required)

2a – Wideband LOG amplifier providing the ability to auto-stop and also to measure CW input signal level
2b – Same as 2a with additional capability for pulse level measurement

Option 3 – Front Panel (now standard)

Option 4 – Frequency Extension

4a – Extends the lower frequency range from 0.5 to 0.1 GHz. The 1 GHz IF bandwidth is then limited to 85 MHz for tuned frequencies below 500 MHz.
4b – Extends the upper frequency range from 18 to 20 GHz.
4c – Extends the upper frequency range from 18 to 22 GHz.
4d – Adds the interfaces to connect millimeter-wave downconverters. The diagram below shows a typical millimeter-wave frequency extension configuration.



Simplified Block Diagram

Street Address:
10552 Philadelphia Rd.
White Marsh, MD 21162

Tel: (410) 344-9000 **Fax:** (410) 344-1790
Email: sales@comsol-inc.com
Website: www.comsol-inc.com

Mailing Address:
P.O. Box 43550
Baltimore, MD 21236-0550

The millimeter-wave downconverters are small modules that are connected to the CS-5040 via two coaxial cables and a control/power cable. This allows the downconverter to be located near the antenna, which avoids the use of longer cables or difficult waveguide runs that could degrade the signal. A preamplifier can be connected directly to the downconverter, with power routed through the downconverter from the tuner via an external power cable.

Millimeter-wave downconverter w/optional preamp and horn antenna

The CS-5040 uses direct frequency commanding for operation in the millimeter wave bands. For example, if the operator requires the tuner to be set to 39.7525 GHz, the direct frequency of 39.7525 GHz would be commanded to the tuner. Algorithm or look-up table conversions are not required by the operator for millimeter wave operation.

Option 5 – Variable Gain IF Output (Option 1b or 1c required) – Adds an IF output at 70, 140, and 160 MHz with manual (MGC) and automatic (AGC) gain control.

Option 6 – RF Input Blanking/Attenuator

6a – Two RF blanking inputs with polarity selection
6b – 70 dB RF attenuator, in 10 dB steps

Option 7 – Display Interface – Display/digitizer interface that allows the unit to be connected to the CS-5047VXI to obtain swept and set-on spectral displays with markers and many other functions to assist the operator with evaluating the spectrum.

Option 8 – COMINT/ELINT Filters

8a – ELINT operation: 1 GHz IF Gaussian filter replaces standard Chebyshev filter.
8b – Includes both standard Chebyshev and Gaussian filters with software selection.

Option 9 – Extended Warranty – Contact Com-Sol for details.

RELATED EQUIPMENT

CS-5040-XX Millimeter-wave Downconverters
CS-5047 VXI Display/Digitizer
CS-5045 VXI AM/FM/LOG Demodulator
CS-1097/1098 VXI IF to Baseband/Tape Converter
CS-824 VXI Multicoupler

Street Address:
10552 Philadelphia Rd.
White Marsh, MD 21162

Tel: (410) 344-9000 **Fax:** (410) 344-1790
Email: sales@comsol-inc.com
Website: www.comsol-inc.com

Mailing Address:
P.O. Box 43550
Baltimore, MD 21236-0550

SPECIFICATIONS – CS-5040 VXI MICROWAVE TUNER

Performance according to specifications is guaranteed over the stated operating temperature range unless otherwise noted.

Input Frequency	0.5–18 GHz range (standard) 0.1 to 0.5 GHz Extension (Option 4a) 18 to 20 GHz Extension (Option 4b) 18 to 22 GHz Extension (Option 4c) Provisions for mm-wave downconverters (Option 4d) Contact Com-Sol for other bands.
Maximum Input Signal Level	+20 dBm
LO Re-Radiation	-90 dBm max
Noise Figure (at 25° C)	13 dB typical for 0.1–17 GHz 15 dB max to 18 GHz 16 dB max to 20 GHz 17 dB max to 22 GHz
Input Third-Order Intercept (at 25° C)	+2 dBm typical 0 dBm min, 0.1–20 GHz -2 dBm min, 20–22 GHz
Image Rejection	70 dB min to 18 GHz
Internal Frequency Stability	
over temperature range	$\pm 3 \times 10^{-7}$ max
aging	5×10^{-9}/day after warm-up
External Reference	
frequency	10 MHz
amplitude	0 ± 3 dBm, automatically switched
connector	BNC female
Tuning Modes	Continuous wave and sweep
Settling Time (after last command bit)	10 ms max
Tuning Resolution	100 Hz
Internally Generated Spurious	-100 dBm max equivalent input
Integrated Phase Noise (100 Hz–10 MHz)	0.5º RMS typical 0.65º RMS max

Street Address:
10552 Philadelphia Rd.
White Marsh, MD 21162

Tel: (410) 344-9000 **Fax:** (410) 344-1790
Email: sales@comsol-inc.com
Website: www.comsol-inc.com

Mailing Address:
P.O. Box 43550
Baltimore, MD 21236-0550

SSB Phase Noise	Freq Offset / Phase Noise (typical)
	100 Hz: -65 dBc/Hz
	1000 Hz: -72 dBc/Hz
	10 kHz: -90 dBc/Hz
	100 kHz: -102 dBc/Hz
	1 MHz: -120 dBc/Hz
	10 MHz: -130 dBc/Hz
IF Output Frequency/Bandwidth	1.0 GHz/500 MHz standard 70 MHz/50 MHz (Option 1b, 1c) 140 MHz/85 MHz (Option 1b) 160 MHz/85 MHz (Option 1b) 140 MHz/100 MHz (Option 1c) 160 MHz/100 MHz (Option 1c)
RF/IF Gain	20 dB min
RF/IF Gain Flatness	±1 dB max over the 0.1–22 GHz range
Gain Control	60 dB min, 1 dB steps (Option 5)
Group Delay (1 GHz IF output)	3 ns over 80% of the IF bandwidth
Input VSWR	50 ohms, 2.5:1 max
Coaxial Connectors	
RF input	SMA female
1 GHz IF output	SMA female (standard)
70/140/160 MHz IF output	BNC female (Option 1b)
mm-wave downconverter IF input	SMA female (Option 4d)
240 MHz reference output	SMA female (Option 4d)
Function Controls	VXIbus message- or register-based
BITE	Power supply voltages, internal temperature, phase-lock status, phase-lock tuning voltages
Temperature	
operating	0 to +50º C
storage	-40 to +85º C
Cooling	Forced air
Humidity	20-95% non-condensing
Power	VXIbus standard power, 85 W nominal
Size	Three VXI “C” slots
Weight	16 lb (7.3 kg) typical

Street Address:
10552 Philadelphia Rd.
White Marsh, MD 21162

Tel: (410) 344-9000 **Fax:** (410) 344-1790
Email: sales@comsol-inc.com
Website: www.comsol-inc.com

Mailing Address:
P.O. Box 43550
Baltimore, MD 21236-0550

EMI shielding.....	Designed to meet or exceed MIL-STD 461, RE-02, CS-03 for RF components
International Standards.....	Designed for CE compliance

ORDERING INFORMATION

When placing an order, please specify the exact model and options. Each unit is supplied with a manual, a certificate of conformance, and acceptance test data.

All exports of the hardware and/or software referenced in this datasheet require a United States Department of State Export License, or exemption as regulated by the International Traffic in Arms Regulations (ITAR).

WARRANTY

Communication Solutions, Inc. is an ISO-9001 certified Engineering and Manufacturing facility serving the Signal Intelligence Community and the Test & Measurement Industry.

All units are warranted for a period of one year against manufacturing defects in materials or workmanship, provided that the unit is returned to the manufacturer's designated facility. This warranty is specifically limited to the repair or replacement of the unit, and does not include liability for consequential damages or physical damage caused by other parties.

Communication Solutions, Inc. reserves the right to change the features and/or specifications of the equipment described in this document at any time without notice.

Communication Solutions, Inc.

Com-Sol is ISO-9001 certified

Street Address:
10552 Philadelphia Rd.
White Marsh, MD 21162

Tel: (410) 344-9000 **Fax:** (410) 344-1790
Email: sales@comsol-inc.com
Website: www.comsol-inc.com

Mailing Address:
P.O. Box 43550
Baltimore, MD 21236-0550