



Three LO sources in one single 6U VME package ideal for Multi-stage dual/treble down-converter Application.

The RA062-F2 is a multiple LO module used to generate three pairs of LO signals, each pair being phase matched in order to provide the capability drive two phase and amplitude matched, high sensitivity narrowband receivers such as required for EW receiver system with DF functionality. The following block diagram depicts the basic architecture of the RA62. The Stepped Frequency Synthesiser is based upon Direct Frequency Synthesis, DFS, technique, whereby the 1GHz input reference signals is multiplied, filtered and mixed accordingly to generate simultaneously a given number of isolated and filtered single tone CW signals from the 1GHz comb. A finely tuned signal is then generated using a multi-way switch to select between the 1GHz spaced CW tones and mixed with fine resolution signals generated using a bespoke

DDS/VCO PLL network. In this way finely tuned signals can be generated between 7.5GHz and 23GHz.

This signal is present at ports J1 and J2.

The 1GHz comb tones are also available as fixed CW frequency signals at ports J3 and J4. These tones are independently selected to the fine-tuned signal.

The 4 GHz fixed signal at the J5 and J6 outputs and the internally generated internal reference signals are generated using a VCO that is phase locked to the same externally or internally generated 100MHz reference signal as the other outputs. In the absence of the external reference signal, a high performance internally generated reference is automatically selected.

A number of BIT signals are generated, including supply voltage monitoring, PLL lock-detect, LO output power level threshold signal, temperature and runtime indication.

APPLICATIONS

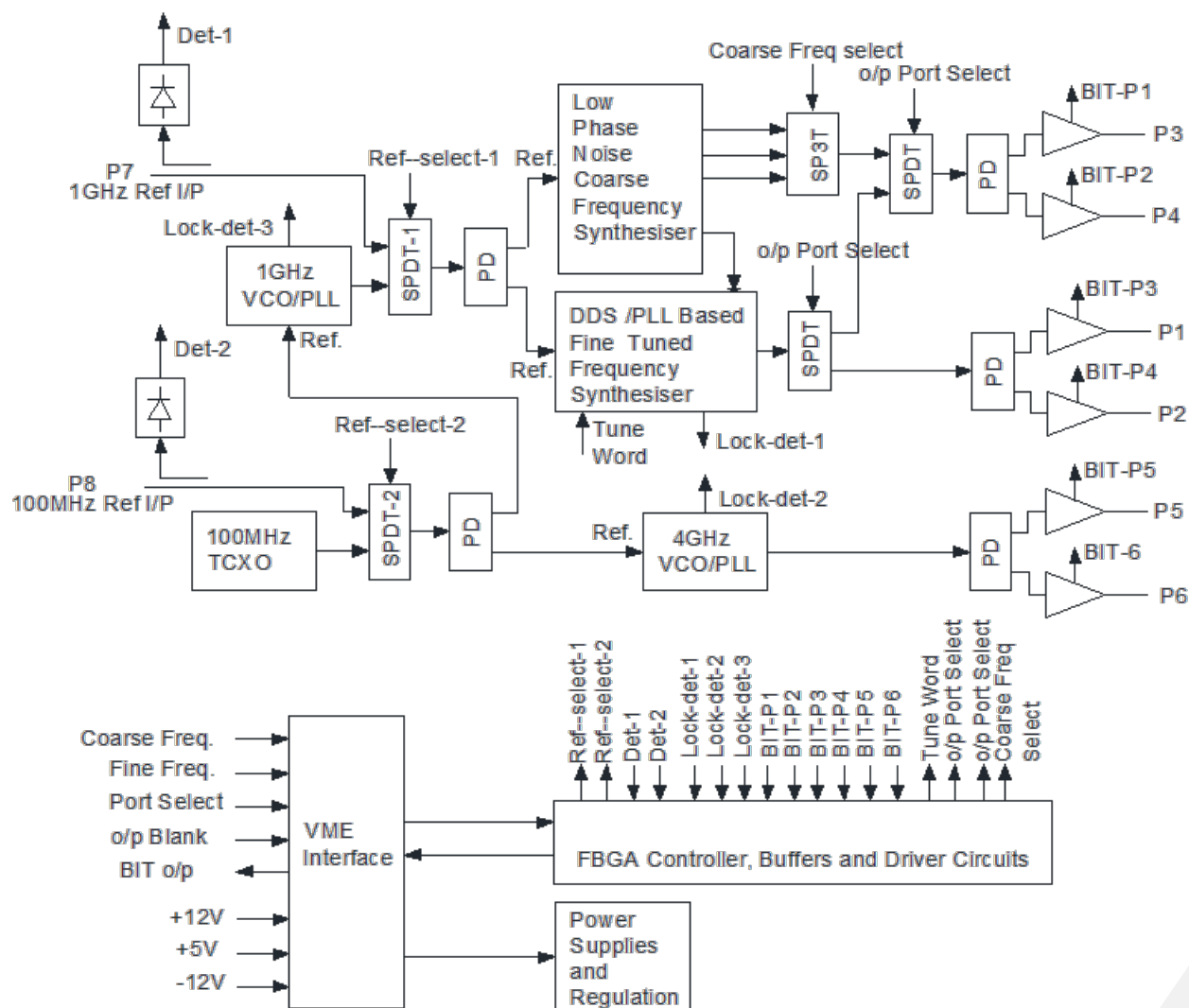
Military narrowband | EW Receivers | DF Receiver systems | Test LO sources

FEATURES

- Three separate LO outputs designed to drive mixers in three stage RF converters.
 - LO1. Fixed single tone CW frequency output with frequency selectable from three frequencies 10, 12 and 14 GHz.
 - LO2. Stepped LO output tuneable from 7.5GHz to 23GHz 1kHz step size as standard, 1Hz option.
 - LO3. Fixed 4GHz CW output as standard. Other frequencies available at low cost NRE.
- Matched Dual LO Outputs capable of driving matched receiver/converter systems.
- Tuning speed 200µs for standard product. Faster switching speed can be accommodated for customised versions.
- Very low phase noise (subject to reference source)
- Integrated Internal References as failsafe back-up that automatically switch in when external reference is lost
- Very low spurious signal level
- High RF power at all ports capable of driving converter mixer directly
- BITE
- VME, SPI, UART Interfaces (customer specific control interface can be accommodated)

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SCHEMATIC



PORT DEFINITION

J1, J2 Tuned output signal or disabled. A minimum of 80dB isolation is provided when disabled.

J3, J4 Provides one of three signals (10GHz, 12GHz or 14GHz). Alternatively, the stepped output signal can be available at these parts (ports J1 and J2). Minimum isolation between non-selected signals is 80dB (all can be disabled).
NOTE: the stepped output signal is only available at this port when J1 and J2 are disabled

J5, J6 4.00GHz fixed output only (note: this can be disabled with a minimum of 30dB isolation)

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MODES OF OPERATION

	Port J1 & J2	Ports J3 & J4	Ports J5 and J6
Mode 1	Tuned Output	Switched CW output	4 GHz
Mode 2	Tuned Output	High isolation	4 GHz
Mode 3	High Isolation	Tuned Output	4 GHz
Mode 4	High Isolation	High Isolation	High Isolation

SPECIFICATIONS

J7 – 1GHz Reference Input

Specification	Specification Level	Notes												
Input Power Level	7dBm +/- 2dB													
Impedance	50Ω													
Frequency Accuracy -20 to +85 °C	+/- 0.5PPM	Accuracy of reference signal used to measure the output frequency accuracy at ports J1 to J4.												
SSB Phase Noise	<table border="1"> <thead> <tr> <th>Offset kHz</th> <th>Level dBc/Hz</th> </tr> </thead> <tbody> <tr> <td>1.0</td> <td>-98</td> </tr> <tr> <td>10.0</td> <td>-120</td> </tr> <tr> <td>100.0</td> <td>-148</td> </tr> <tr> <td>1000.0</td> <td>-155</td> </tr> <tr> <td>10000.0</td> <td>-157</td> </tr> </tbody> </table>	Offset kHz	Level dBc/Hz	1.0	-98	10.0	-120	100.0	-148	1000.0	-155	10000.0	-157	Phase Noise of the input 1GHz reference signal used to measure the output frequency phase noise at ports J1 to J4.
	Offset kHz	Level dBc/Hz												
	1.0	-98												
	10.0	-120												
	100.0	-148												
1000.0	-155													
10000.0	-157													
BIT	External 1GHz reference signal level valid Bit													

J8 – 100MHz Reference Input Port

Specification	Specification Level	Notes												
Input Power Level	7dBm +/- 2dB													
Impedance	50Ω													
Frequency Accuracy -20 to +85 °C	+/- 0.5PPM	Accuracy of reference signal used to measure the output frequency accuracy at ports J5 & J6.												
SSB Phase Noise	<table border="1"> <thead> <tr> <th>Offset kHz</th> <th>Level dBc/Hz</th> </tr> </thead> <tbody> <tr> <td>1.0</td> <td>-136</td> </tr> <tr> <td>10.0</td> <td>-150</td> </tr> <tr> <td>100.0</td> <td>-161</td> </tr> <tr> <td>1000.0</td> <td>-162</td> </tr> <tr> <td>10000.0</td> <td>-163</td> </tr> </tbody> </table>	Offset kHz	Level dBc/Hz	1.0	-136	10.0	-150	100.0	-161	1000.0	-162	10000.0	-163	Phase Noise of reference signal used to measure the output frequency phase noise at ports J5 & J6.
	Offset kHz	Level dBc/Hz												
	1.0	-136												
	10.0	-150												
	100.0	-161												
1000.0	-162													
10000.0	-163													
BIT	External 100MHz Reference signal level valid bit													

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J1 & J2 – Tuned Frequency Output Ports

Specification	Specification Level	Notes												
Output frequency Range	7.5 to 23.0 GHz													
Frequency Step Size	1kHz	Optional 1.0 Hz step size												
Frequency Accuracy -20 to +85 °C	+/- 1.0 PPM	Directly dependent on the reference signal accuracy												
Output Power	17dBm +/- 2dB													
SSB Phase noise	<table border="1"> <thead> <tr> <th>Offset kHz</th> <th>Level dBc/Hz</th> </tr> </thead> <tbody> <tr> <td>1.0</td> <td>-63</td> </tr> <tr> <td>10.0</td> <td>-97</td> </tr> <tr> <td>100.0</td> <td>-98</td> </tr> <tr> <td>1000.0</td> <td>-120</td> </tr> <tr> <td>10000.0</td> <td>-130</td> </tr> </tbody> </table>	Offset kHz	Level dBc/Hz	1.0	-63	10.0	-97	100.0	-98	1000.0	-120	10000.0	-130	Phase noise dependent on the phase noise of the 1GHz reference input.
	Offset kHz	Level dBc/Hz												
	1.0	-63												
	10.0	-97												
	100.0	-98												
	1000.0	-120												
10000.0	-130													
Non-Harmonic Spurious Signals Level	-65dBc Maximum	Measured in band DC-24 GHz												
Harmonic Signal Level	-20dBc													
Isolation	80dB minimum	Once both J1 and J2 port are disabled												
Switching Speed	200µs	Time between 50% input command signal level to within 1dB steady state RF output level at new required frequency. See Note 1 below.												
BIT	Out Power Valid bit & DDS/PLL lock detect bit													

J3 & J4 - Switched Frequency Output Specification

Note: J3 and J4 can be alternated between discrete and tuned Frequency output under user command. In the mode where a tuned output is selected, the output signal specification is as that of ports J1 to J2 specification listed above.

Specification	Specification Level	Notes												
Output frequency Range <i>Output Switched to single tone Mode</i>	A single CW tone Selected from 10GHz, 12GHz or 14GHz.													
Output Frequency Range <i>Output switched to tuned frequency mode</i>	7.5GHz to 23GHz in steps of 1kHz.	The tuned output specification is similar to that specified above for the J1 and J2 output ports.												
Frequency Accuracy -20 to +85 °C	+/- 0.5PPM	Directly dependent on the reference signal accuracy												
Output Power	17dBm +/- 2dB													
SSB Phase noise (14GHz Tone)	<table border="1"> <thead> <tr> <th>Offset kHz</th> <th>Level dBc/Hz</th> </tr> </thead> <tbody> <tr> <td>1.0</td> <td>-66</td> </tr> <tr> <td>10.0</td> <td>-101</td> </tr> <tr> <td>100.0</td> <td>-123</td> </tr> <tr> <td>1000.0</td> <td>-128</td> </tr> <tr> <td>10000.0</td> <td>-134</td> </tr> </tbody> </table>	Offset kHz	Level dBc/Hz	1.0	-66	10.0	-101	100.0	-123	1000.0	-128	10000.0	-134	Phase noise at all offsets is dependent on the phase noise of the 1GHz reference input. Results shown are obtained with a reference as defined for J8 above.
	Offset kHz	Level dBc/Hz												
	1.0	-66												
	10.0	-101												
	100.0	-123												
	1000.0	-128												
10000.0	-134													
Non-Harmonic Spurious Signals Level	-65dBc Maximum	Measured in band DC-24 GHz												
Harmonic Signal Level	-20dBc													
Isolation between selected and deselected tones.	80dB minimum	When Ports J3 and J4 are disabled.												
Isolation between Switched and Stepped signals	80dB minimum													
BIT	Output Power level Valid bit plus DDS/PLL lock detected when ports J3 and J4 switched to tuned frequency output.													

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J5 & J6 - Fixed 4GHz Output.

Note: As a standard Port J5 and J6 output frequency is fixed at 4GHz. Other fixed frequencies between 2.0 and 4.5GHz are optional.

Specification	Specification Level	Notes												
Output frequency.	4GHz CW.	See note above.												
Frequency Accuracy -20 to +85 °C	+/- 0.5PPM													
Output Power	18dBm +/- 2dB													
SSB Phase noise	<table border="1"> <thead> <tr> <th>Offset kHz</th> <th>Level dBc/Hz</th> </tr> </thead> <tbody> <tr> <td>1.0</td> <td>-95</td> </tr> <tr> <td>10.0</td> <td>-94</td> </tr> <tr> <td>100.0</td> <td>-110</td> </tr> <tr> <td>1000.0</td> <td>-135</td> </tr> <tr> <td>10000.0</td> <td>-155</td> </tr> </tbody> </table>	Offset kHz	Level dBc/Hz	1.0	-95	10.0	-94	100.0	-110	1000.0	-135	10000.0	-155	Phase noise at 1MHz offset is dependent on the phase noise of the 100MHz reference input. Results shown are obtained with a reference as defined for J8 above.
Offset kHz	Level dBc/Hz													
1.0	-95													
10.0	-94													
100.0	-110													
1000.0	-135													
10000.0	-155													
Non-Harmonic Spurious Signals Level	-65dBc Maximum	Measured in band DC-24 GHz												
Harmonic Signal Level	-20dBc													
Isolation	30dB	When J5 and J6 are disabled												
BIT	J5 and J6 output power level Valid BIT and Lock detect Bit.													

Connector, Control and DC power Supplies

Note: All DC supplies provided through VME back plane connector

Specification	Specification Level	Notes
DC power Supplies	-12V ± 5% @ 300mA maximum +5V ± 5% @ 3000mA maximum +12V ± 5% @ 750mA maximum	Supplied through standard VME back plane connector power supply PINS
Control	The following control interfaces are offered as standard: <ol style="list-style-type: none"> 1. Geographically Addressed VME Slave Control using VME Standard Backplane <ol style="list-style-type: none"> a) Direct Tuning via VME Address Space b) VME Addressed Frequency Step Table, incremented via real-time differential LVTTTL input. 2. SPI interface – LVTTTL ¹ 3. Serial UART ¹ <ol style="list-style-type: none"> a) Single Ended LVTTTL b) Differential LVTTTL 	¹ Via VME user defined pins on VME P2 backplane connector.
RF Connectors Ports J1 to J8	SMA Female	8 Front Panel Connectors
Supply and Control Connectors	160 Pin Male, IEC61076-4113 Performance Levels According to DIN 41612	2 back plane connectors

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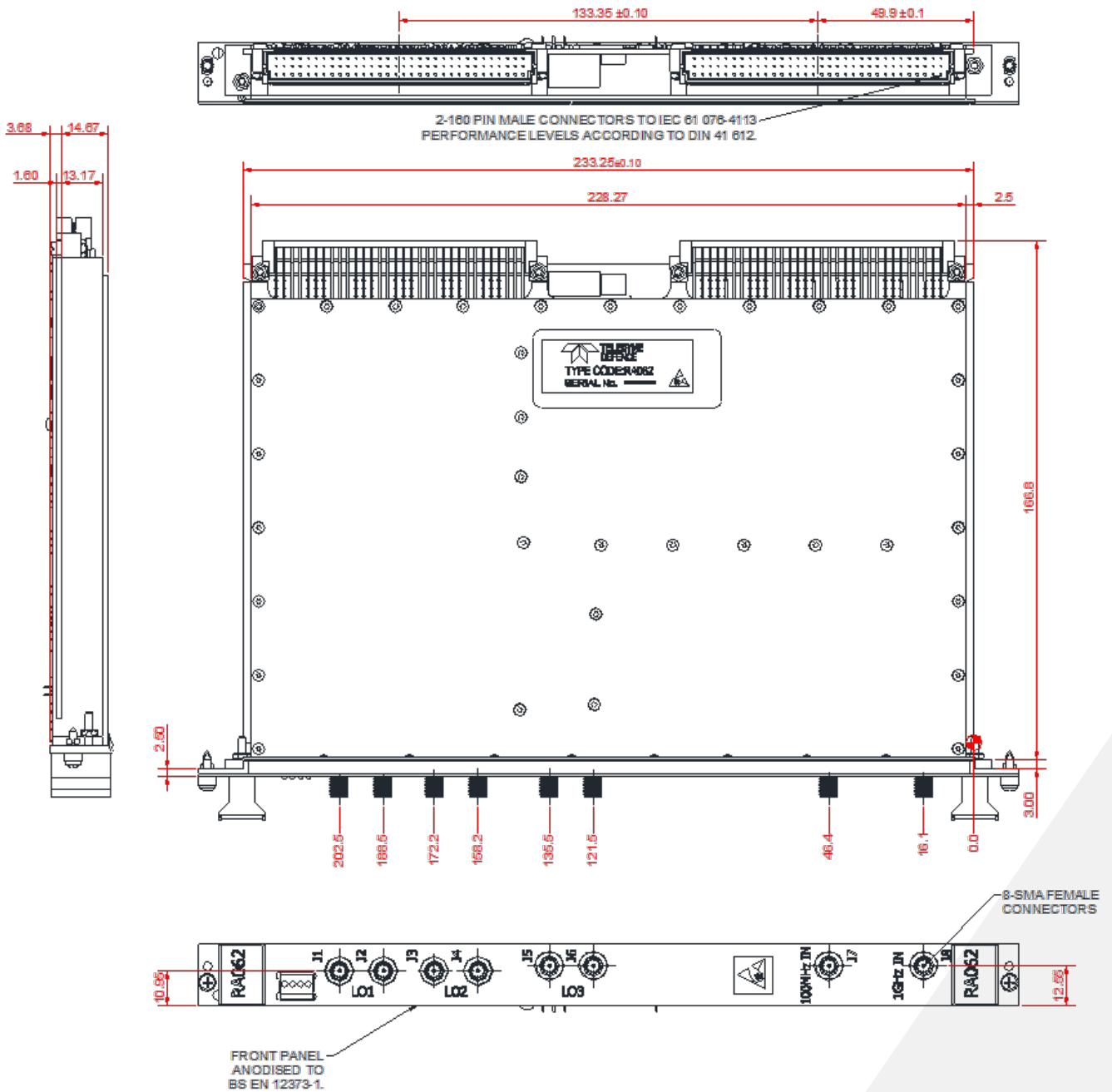
ENVIRONMENTAL SPECIFICATIONS

Specification	Specification Level	Notes
Operating Temperature	-20 °C to +85 °C RTCA-DO-160C sec 4 Cat A1	Optional -40 °C to +85 °C
Storage Temperature	-54 °C to +125 °C	
Altitude	15000 ft (4600m) RTCA-DO-160C sec 4 Cat A1	
Humidity	85% RTCA-DO-160C sec 6 Cat A	
Vibration	6.0g rms RTCA-DO-160C Fig 8-1 Cat B	
EMC	CE03, CE-04 See note in Appendix E MIL-STD-461C CS-01, CS-02 See note in Appendix E MIL-STD-461C	Including both Electromagnetic Capability and Susceptibility

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MECHANICAL OUTLINE

The synthesiser is packaged in a 6U 4HP VME compatible format



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