Millitech series PLS Phase Locked Synthesizers provide a cost effective phase locked source in multiple bands between 14.6 and 211.2GHz. Ideally suited for Millitech’s Active Multiplier Chains (series AMC), these compact sources cover many popular millimeter-wave frequency bands.

The PLS can be locked to an external 10MHz reference, or to an internal oscillator for use as a system building block. The internal EEPROM can be programmed at Millitech to allow for a fixed frequency oscillator or a simple terminal driven RS-232 interface allows for the user to perform a non-volatile frequency change. Applications include millimeter wave frequency extension for antenna ranges, test measurement equipment, and L.O. sources for a variety of applications.

PLS-05, -08, -10, -15, and -28 series combines with Millitech AMC-XX for a Phase-locked source covering the respective waveguide band.

PLS-KU series does not include Active Multiplier Chain.
# Electrical Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>PLS-KU-R-001</td>
<td>PLS-KU-R-002</td>
</tr>
<tr>
<td>Frequency Range</td>
<td>14.6 to 16.4 GHz</td>
<td>15.6 to 17.6 GHz</td>
</tr>
<tr>
<td>Typical Phase Noise</td>
<td>Room Temp</td>
<td></td>
</tr>
<tr>
<td>1 kHz</td>
<td>-78 dBc/Hz</td>
<td>-78 dBc/Hz</td>
</tr>
<tr>
<td></td>
<td>Or 20logN of the reference;</td>
<td>whatever is worse</td>
</tr>
<tr>
<td>10 kHz</td>
<td>-75 dBc/Hz</td>
<td>-75 dBc/Hz</td>
</tr>
<tr>
<td>100 kHz</td>
<td>-96 dBc/Hz</td>
<td>-96 dBc/Hz</td>
</tr>
<tr>
<td>1 MHz</td>
<td>-124 dBc/Hz</td>
<td>-124 dBc/Hz</td>
</tr>
<tr>
<td>Output Power</td>
<td>&gt;15 dBm</td>
<td></td>
</tr>
<tr>
<td>Reference Input</td>
<td>SMA</td>
<td>10 MHz</td>
</tr>
<tr>
<td></td>
<td>&gt;0 dBm into 50 ohms</td>
<td></td>
</tr>
<tr>
<td>Lock Detect Output</td>
<td>+5V Pull-up, Open Collector Output</td>
<td>See schematic below</td>
</tr>
<tr>
<td>Temp</td>
<td>-40°C to +50°C operation</td>
<td></td>
</tr>
<tr>
<td>Power</td>
<td>+15VDC, 700 mA</td>
<td>695mA @ 9V AND 5mA @ 15V available</td>
</tr>
</tbody>
</table>

*Smaller step sizes are available upon request. Contact Millitech for details.*

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<th>Parameter</th>
<th>Specification</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>PLS-28-R-001</td>
<td>PLS-28-R-002</td>
</tr>
<tr>
<td>Frequency Range</td>
<td>29.2 to 32.8 GHz</td>
<td>31.2 to 35.2 GHz</td>
</tr>
<tr>
<td>Typical Phase Noise</td>
<td>Room Temp</td>
<td></td>
</tr>
<tr>
<td>1 kHz</td>
<td>-72 dBc/Hz</td>
<td>-72 dBc/Hz</td>
</tr>
<tr>
<td></td>
<td>Or 20logN of the reference;</td>
<td>whatever is worse</td>
</tr>
<tr>
<td>10 kHz</td>
<td>-69 dBc/Hz</td>
<td>-69 dBc/Hz</td>
</tr>
<tr>
<td>100 kHz</td>
<td>-90 dBc/Hz</td>
<td>-90 dBc/Hz</td>
</tr>
<tr>
<td>1 MHz</td>
<td>-118 dBc/Hz</td>
<td>-118 dBc/Hz</td>
</tr>
<tr>
<td>Output Power</td>
<td>See Plot Below</td>
<td></td>
</tr>
<tr>
<td>Reference Input</td>
<td>SMA</td>
<td>10 MHz</td>
</tr>
<tr>
<td></td>
<td>&gt;0 dBm into 50 ohms</td>
<td></td>
</tr>
<tr>
<td>Lock Detect Output</td>
<td>+5V Pull-up, Open Collector Output</td>
<td>See schematic below</td>
</tr>
<tr>
<td>Temp</td>
<td>-40°C to +50°C operation</td>
<td></td>
</tr>
<tr>
<td>Power</td>
<td>+15VDC, 5 mA</td>
<td>+9VDC 1.5A</td>
</tr>
<tr>
<td></td>
<td>Single Supply Available 1.5A @</td>
<td>+15V available</td>
</tr>
<tr>
<td></td>
<td>+15V available</td>
<td></td>
</tr>
<tr>
<td>Parameter</td>
<td>Specification</td>
<td>Comment</td>
</tr>
<tr>
<td>------------------------</td>
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<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Model</td>
<td>PLS-10-R-001 PLS-10-R-002</td>
<td>Includes x6 multiplier</td>
</tr>
<tr>
<td>Frequency Range</td>
<td>58.4 to 65.6 GHz 62.4 to 70.4 GHz</td>
<td>User specified in 40 MHz steps.</td>
</tr>
<tr>
<td>Typical Phase Noise</td>
<td></td>
<td>Room Temp</td>
</tr>
<tr>
<td>1 kHz</td>
<td>-62 dBC/Hz</td>
<td>Or 20logN of the reference; whatever is worse</td>
</tr>
<tr>
<td>10 kHz</td>
<td>-62 dBC/Hz</td>
<td>Or 20logN of the reference; whatever is worse</td>
</tr>
<tr>
<td>100 kHz</td>
<td>-80 dBC/Hz</td>
<td>Or 20logN of the reference; whatever is worse</td>
</tr>
<tr>
<td>1 MHz</td>
<td>-108 dBC/Hz</td>
<td>Or 20logN of the reference; whatever is worse</td>
</tr>
<tr>
<td>Output Power</td>
<td>See Plot Below</td>
<td>Internal reference is optional.</td>
</tr>
<tr>
<td>Reference Input</td>
<td>SMA 10 MHz &gt;0 dBm into 50 ohms</td>
<td>The internal reference disables when an external reference is present. Internal reference stability is &lt; 5 ppm.</td>
</tr>
<tr>
<td>Lock Detect Output</td>
<td>+5V Pull-up, Open Collector Output</td>
<td>See schematic below</td>
</tr>
<tr>
<td>Temp</td>
<td>-40°C to +50°C operation</td>
<td></td>
</tr>
<tr>
<td>Power</td>
<td>+15VDC 5 mA +9VDC 1.3A</td>
<td>Single supply available 1.35A @ +15VDC</td>
</tr>
</tbody>
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<tr>
<th>Parameter</th>
<th>Specification</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>PLS-15-R-001 PLS-15-R-002</td>
<td>Includes x4 multiplier</td>
</tr>
<tr>
<td>Frequency Range</td>
<td>58.4 to 65.6 GHz 62.4 to 70.4 GHz</td>
<td>User specified in 40 MHz steps.</td>
</tr>
<tr>
<td>Typical Phase Noise</td>
<td></td>
<td>Room Temp</td>
</tr>
<tr>
<td>1 kHz</td>
<td>-66 dBC/Hz</td>
<td>Or 20logN of the reference; whatever is worse</td>
</tr>
<tr>
<td>10 kHz</td>
<td>-63 dBC/Hz</td>
<td>Or 20logN of the reference; whatever is worse</td>
</tr>
<tr>
<td>100 kHz</td>
<td>-84 dBC/Hz</td>
<td>Or 20logN of the reference; whatever is worse</td>
</tr>
<tr>
<td>1 MHz</td>
<td>-112 dBC/Hz</td>
<td>Or 20logN of the reference; whatever is worse</td>
</tr>
<tr>
<td>Output Power</td>
<td>See Plot Below</td>
<td>Internal reference is optional.</td>
</tr>
<tr>
<td>Reference Input</td>
<td>SMA 10 MHz &gt;0 dBm into 50 ohms</td>
<td>The internal reference disables when an external reference is present. Internal reference stability is &lt; 5 ppm.</td>
</tr>
<tr>
<td>Lock Detect Output</td>
<td>+5V Pull-up, Open Collector Output</td>
<td>See schematic below</td>
</tr>
<tr>
<td>Temp</td>
<td>-40°C to +50°C operation</td>
<td></td>
</tr>
<tr>
<td>Power</td>
<td>+15VDC 5 mA +9VDC 1.3A</td>
<td>Single supply available 1.35A @ +15VDC</td>
</tr>
</tbody>
</table>
### PRELIMINARY INFORMATION

#### Consult Factory for Availability

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<th>Parameter</th>
<th>Specification</th>
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</thead>
<tbody>
<tr>
<td>Model</td>
<td>PLS-08-R-001</td>
<td>PLS-08-R-002</td>
</tr>
<tr>
<td>Frequency Range</td>
<td>116.8 to 131.2 GHz</td>
<td>124.8 to 140.8 GHz</td>
</tr>
<tr>
<td>Typical Phase Noise</td>
<td></td>
<td>User specified in 80 MHz steps.</td>
</tr>
<tr>
<td>1 kHz</td>
<td>-60 dBC/Hz</td>
<td>-60 dBC/Hz</td>
</tr>
<tr>
<td>10 kHz</td>
<td>-57 dBC/Hz</td>
<td>-57 dBC/Hz</td>
</tr>
<tr>
<td>100 kHz</td>
<td>-78 dBC/Hz</td>
<td>-78 dBC/Hz</td>
</tr>
<tr>
<td>1 MHz</td>
<td>-106 dBC/Hz</td>
<td>-106 dBC/Hz</td>
</tr>
<tr>
<td>Output Power</td>
<td>TBD dBM</td>
<td></td>
</tr>
<tr>
<td>Reference Input</td>
<td>SMA</td>
<td>10 MHz &gt;0 dBm into 50 ohms</td>
</tr>
<tr>
<td>Lock Detect Output</td>
<td>+5V Pull-up, Open Collector Output</td>
<td>See schematic below</td>
</tr>
<tr>
<td>Temp</td>
<td>-40°C to +50°C operation</td>
<td></td>
</tr>
<tr>
<td>Power</td>
<td>TBD mA @ 9V</td>
<td>5mA @ 15V</td>
</tr>
</tbody>
</table>

#### Parameter | Specification | Comment
---|----------------|----------------|
Model | PLS-05-R-001 | PLS-05-R-002 |
Frequency Range | 175.2 to 196.8 GHz | 187.2 to 211.2 GHz |
Typical Phase Noise | Room Temp |
1 kHz | -56 dBC/Hz | -56 dBC/Hz |
10 kHz | -53 dBC/Hz | -53 dBC/Hz |
100 kHz | -74 dBC/Hz | -74 dBC/Hz |
1 MHz | -102 dBC/Hz | -102 dBC/Hz |
Output Power | TBD dBM |
Reference Input | SMA 10 MHz >0 dBm into 50 ohms |
Lock Detect Output | +5V Pull-up, Open Collector Output |
Temp | -40°C to +50°C operation |
Power | TBD mA @ 9V | 5mA @ 15V |

Internal reference is optional. The internal reference disables when an external reference is present. Internal reference stability is < 5 ppm.

Contact Millitech for more information.
Consult Factory for Availability

Notes:
1. The units must be heat sunk to keep the case temperature at or below +50°C.
2. All testing will be at room temperature.
3. The maximum DC input current is 100 mA above the typical values.
4. Lock Detect Output has internal pull-up resistor to 5V, with diode protection so that the lock detect output can be pulled up to a higher voltage. Multiple PLS’s can have their lock detect outputs wire OR’d.

Schematic of Internal Lock Detect Circuit
Notes:
1. If a specific fixed frequency is desired, Millitech can program that frequency into the PLS before the PLS is shipped. All frequency information is non-volatile.
2. PLS-KU series does not include AMC, attenuator, mounting plate, or coaxial cable.
3. Contact Millitech about the availability of PLS-05 and PLS-08.

Example: To order a Phase Locked Synthesizer capable of 60 GHz Phase-Locked Oscillator that defaults to the external reference but automatically switches to the internal reference, specify PLS-15-A-001.

Applications Example: 94 GHz VNA Extension
Applications Example: 60 GHz Communications Receiver

Applications Example: 35 GHz Doppler Radar