Founded in 1991, EM Research has been delivering high performance frequency synthesizers and signal converters for a broad range of applications worldwide. Since our inception we have developed an extensive library of products. We are your ultimate source for frequency generation, signal conversion, and integrated microwave assemblies. Browse the full spectrum of our products on our website.

WWW.EMRESEARCH.COM
### HF BAND

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<th>Frequency Range</th>
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**Phase-Locked Crystal Oscillators**

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**If you have source control drawings, we have a capable in-house team ready to engineer a form fit and function product to match your specification. Call now to discuss your design needs.**
FREQUENCY GENERATION

FIXED FREQUENCY SYNTHESIZERS

SURFACE MOUNT
SLX Series
2LX Series
LX Series
CLX Series
HFS Series
HLX Series

CONNECTORIZED
SLFS Series
ESP Series

MODULE MOUNT
LT Series
THOR Series

SPECIAL CAPABILITIES
LCO Series
MRO Series

PROGRAMMABLE FREQUENCY SYNTHESIZERS

SURFACE MOUNT
SLX Series
LX Series
HFS Series
HLX Series

CONNECTORIZED
SLS Series
MBS Series
MBS-XC Series
SBC Series
ZFR Series
KB Series

MODULE MOUNT
LT Series
THOR Series

SPECIAL CAPABILITIES
FST Series
DDSPLL Series
FMCW Series

PHASE LOCKED CRYSTAL OSCILLATORS

SURFACE MOUNT
PLXO Series

CONNECTORIZED
PLXO Series

SPECIAL CAPABILITIES
XLT Series
GDX Series

REFERENCE OSCILLATORS

SURFACE MOUNT
REF Series
RDS Series

CONNECTORIZED
REF Series
RDS Series

FREQUENCY MULTIPLIERS

SURFACE MOUNT
M10X Series

MODULE MOUNT
M10X Series

FREQUENCY DIVIDERS

CONNECTORIZED
FD Series
FREQUENCY GENERATION

SLX Series
Small Size Synthesizer
0.5” x 0.5” x 0.15”
- Sub-miniature, SMT package (0.5” Square)
- MLI, Fixed frequencies up to 8 GHz
- Buffered output power available
- Low power consumption
- 70 MHz to 8 GHz Within Selected Bands

ZLX Series
Small Footprint Synthesizer
0.6” x 0.6” x 0.15”
- Excellent phase noise
- Industry standard SMT package (0.6” Square)
- Optional internal reference
- Output power up to +10 dBm
- 200 MHz to 8.3 GHz Within Selected Bands

LX Series
LX with CRO Oscillator
0.75” x 0.75” x 0.15”
- Exceptionally low phase noise
- Miniature, SMT package (0.75” Square)
- Optional internal reference
- Fixed frequencies up to 9 GHz
- Output power up to +12 dBm
- 90 MHz to 9 GHz Within Selected Bands

CLX Series
LX with CRO Oscillator
0.75” x 0.75” x 0.25”
- Exceptionally low phase noise
- Miniature, SMT package (0.75” Square)
- Fixed frequencies up to 4.5 GHz
- 90 MHz to 4.5 GHz Within Selected Bands

UPN Series
Upgraded PLL
0.9” x 0.9” x 0.21”
- Exceptionally low phase noise
- Fixed frequencies up to 14.5 GHz
- Robust design for extended temperature and high vibe environments available
- 70 MHz to 14.5 GHz Within Selected Bands

HFS Series
High Frequency Synthesizer
1.25” x 1” x 0.25”
- Broadband designs available
- Optional internal reference
- Optional Reference Detect Switch
- Internal reference output available
- 10 MHz to 14 GHz Within Selected Bands

HLX Series
Hybrid LX Synthesizer
0.8” x 0.8” x 0.15”
- Ruggedized, Surface-Mount package (0.8” Square)
- Hermetic sealed option per MIL-STD-883
- Extreme shock and vibration tolerance
- Output power up to +14 dBm
- 750 MHz to 14 GHz Within Selected Bands

SLFS Series
Single Loop Fixed Synthesizer
1.5” x 1.5” x 0.6”
- Fixed frequencies up to 12.5 GHz
- Output power up to +10 dBm
- Optional internal reference
- Compact, connectorized package
- 6 MHz to 12.5 GHz Within Selected Bands

ESP Series
Fixed Source PLL DRO Replacement
2.25” x 2.25” x 0.6”
- Exceptionally low phase noise
- Robust designs for extended temperature and high vibe environments available
- Optional internal/external reference detect circuit
- ESP exhibits no aging
- Optional internal reference (TCXO and OCXO Available)
- 80 MHz to 46 GHz Within Selected Bands

LT Series
Little THOR
1.3” x 1.1” x 0.4”
- Ruggedized, modular-mount package
- Removable SMA connectors for surface mount-ability
- Hermetic sealed option per MIL-STD-883
- Extreme shock and vibration tolerance
- 10 MHz to 19 GHz Within Selected Bands

THOR Series
Rugged Frequency Synthesizer
2” x 1” x 0.4”
- Ruggedized, modular-mount package
- Removable SMA connectors for surface mount-ability
- Hermetic sealed option per MIL-STD-883
- High shock and vibration tolerance
- 160 MHz to 17 GHz Within Selected Bands

LCO Series
Legendary Calibration Oscillator
3.5” x 2.5” x 0.6”
- Extremely low output power variation ± 0.05 dB
- Fixed frequencies up to 30.5 GHz
- Output power up to +10 dBm
- Optional internal reference
- 1 to 30.5 GHz Within Selected Bands
### MRO Series
Mechanical Replacement Oscillator
- 3.05" x 2.02" x 1.62"
- Mechanically tuned cavity replacement oscillator
- Superior stability
- Exceptional phase noise
- Mechanical tuning replaced with precise digital control of output frequency
- 3.25 to 10.8 GHz Within Selected Bands

### SLX Series
Smallest Size Synthesizer
- 0.75" x 0.75" x 0.15"
- Sub-Miniature, SMT package (0.75" Square)
- Programmable frequencies up to 9 GHz
- Buffered output power available
- Low power consumption
- 70 MHz to 8 GHz Within Selected Bands

### LX Series
High Frequency Synthesizer
- 0.75" x 0.75" x 0.15"
- Programmable frequencies up to 75 MHz
- Miniature, SMT package (0.75" Square)
- Optional internal reference
- Output power up to +10 dBm
- 5 MHz to 10.5 GHz Within Selected Bands

### HFS Series
High Frequency Synthesizer
- 1.25" x 1" x 0.25"
- Programmable frequencies up to 15 GHz
- Broadband designs available
- Optional internal reference
- Internal reference output available
- 120 MHz to 15 GHz Within Selected Bands

### HLX Series
Hybrid LX
- 0.8" x 0.8" x 0.15"
- Ruggedized, SMT package (0.8" Square)
- Programmable frequencies up to 17 GHz
- Hermetic sealed option per MIL-STD-883
- Extreme shock and vibration tolerance
- 100 MHz to 17 GHz Within Selected Bands

### SLS Series
Single Loop Synthesizer
- 3.5" x 1.5" x 0.6"
- Programmable frequencies up to 14 GHz
- Output power up to +18 dBm
- Optional internal reference
- Compact, connectorized package
- 5 MHz to 14 GHz Within Selected Bands

### MBS Series
Multiple Band Synthesizer
- 3.5" x 2.5" x 0.6"
- Produces multi-octave bandwidths
- Programmable frequencies up to 14 GHz
- Output power up to +14 dBm
- Low power consumption
- 10 MHz to 21 GHz Within Selected Bands

### MBS-XC Series
Multiple Band Synthesizer - Extra Coverage
- 3.5" x 2.5" x 0.6"
- Produces multi-octave bandwidths
- Programmable frequencies up to 6 GHz
- Output power up to +14 dBm
- Low power consumption
- 200 MHz to 6 GHz Within Selected Bands

### SBC Series
Small Step Broadband Synthesizer
- 3.5" x 2.5" x 1"
- Fine-resolution design (step sizes down to 1 Hz)
- Broadband designs available (up to 3 octaves)
- Low phase noise
- Ultra-low spurs
- Optional internal reference
- 10 MHz to 18 GHz Within Selected Bands

### ZFR Series
Fast Switching Frequency Synthesizer
- 4.5" x 2.5" x 0.6"
- Programmable frequencies up to 31 GHz
- Small step sizes (down to 1 MHz)
- Broadband designs available (up to 4 octaves)
- Fast switching units available (<100 μsec)
- 8 MHz to 31 GHz Within Selected Bands

### KB Series
Ka Band Synthesizer
- 5.5" x 2.5" x 0.6"
- 1 to 2 GHz of programmable range
- Step size down to 1 MHz
- Narrow Band replacement for bulky bench-top generators
- Non-volatile memory of frequency set point
- Redundant internal reference with Reference Detect Switch
- 25 to 46 GHz Within Selected Bands

### LT Series
Little THOR
- 3.5" x 1.1" x 0.40"
- Ruggedized, modular-mount package
- Hermetic sealed option per MIL-STD-883
- Extreme shock and vibration tolerance
- Fast switching units available (<100 μsec)
- 100 MHz to 16.5 GHz Within Selected Bands
**THOR Series**
Rugged Frequency Synthesizer
2.5” x 11” x 0.4”
- Ruggedized, modular-mount package
- Removable SMA connectors for surface mount-ability
- Fixed switching units available (≤100 μSec)
- High shock and vibration tolerance
- Hermetic sealed option

**FST Series**
Fast Switching Synthesizer
2.5” x 5.0” x 0.69”
- Fast switching designs (down to 500 nSec)
- Programmable frequencies up to 13.5 GHz
- Low phase noise
- Optional internal reference

**DDSPPLL Series**
DDS Phase Locked Synthesizer
2.5” x 4.5” x 0.6”
- Direct digital synthesizer with phase-locked loop
- Very fine step size, below 1 Hz
- Exceptional phase noise
- Typical jitter of 500 fs
- Fast switching speed < 1 μsec
- Multi-octave capability
- Internal reference available

**FMCW Series**
Freq. Modulated Continuous Wave
5.5” x 2.5” x 0.5”
- Ka band synthesizer
- Four swept FMCW bands each 50 to 500 MHz wide
- 250 MHz FM sweep in 220 seconds
- Automatic reset and ready to fire next sweep in less than 10 μsec

**PLXO Series**
Phase Locked Crystal Oscillator
0.9” x 0.9” x 0.25”
- Fixed frequencies up to 400 MHz
- Small, SMT package (0.3” x 0.3” x 0.25”)

**PLXO Series**
Phase Locked Crystal Oscillator
1.5” x 1.5” x 0.6”
- Fixed frequencies up to 500 MHz
- Low phase noise
- Internal OCXO or TCXO options
- Stability, ±0.003 ppm possible
- Compact, connectorized package

**XLT Series**
Exemplary Little THOR
0.5” x 0.5” x 0.15”
- Ruggedized, modular-mount package
- Removable SMA connectors for surface mount-ability
- Hermetic sealed option per MIL-STD-883
- Extreme shock and vibration tolerance

**PLC Series**
Fast Switching Synthesizer
2.5” x 5.0” x 0.69”
- Fast switching designs (down to 500 nSec)
- Programmable frequencies up to 13.5 GHz
- Low phase noise
- Optional internal reference

**GDX Series**
GPS Disciplined Oscillator
3.5” x 2.5” x 0.6”
- 1 PPS input from GPS receiver
- Up to four fixed-frequency RF Outputs (1 MHz to 100 MHz)
- Optional loss of lock and holdover alarm outputs
- Extremely low phase noise

**REF Series**
Reference Oscillator
0.5” x 0.5” x 0.15”
- Standard internal TCXO (±2.5 ppm, stability)
- Tighter stability available
- Fixed frequencies up to 100 MHz
- Also available in a connectorized package

**RDS Series**
Reference Detect Switch
2.0” x 1.5” x 0.6”
- Standard internal TCXO (±2.5 ppm, stability)
- Optional internal OCXO (±0.003 ppm, stability)
- Fixed frequencies up to 500 MHz

**RDS Series**
Reference Detect Switch
2.0” x 1.5” x 0.6”
- Standard internal TCXO (±2.5 ppm, stability)
- Optional internal OCXO (±0.003 ppm, stability)
- Fixed frequencies up to 500 MHz

**RDS Series**
Reference Detect Switch
2.0” x 1.5” x 0.6”
- Standard internal TCXO (±2.5 ppm, stability)
- Optional internal OCXO (±0.003 ppm, stability)
- Fixed frequencies up to 500 MHz

**RDS Series**
Reference Detect Switch
2.0” x 1.5” x 0.6”
- Standard internal TCXO (±2.5 ppm, stability)
- Optional internal OCXO (±0.003 ppm, stability)
- Fixed frequencies up to 500 MHz

**RDS Series**
Reference Detect Switch
2.0” x 1.5” x 0.6”
- Standard internal TCXO (±2.5 ppm, stability)
- Optional internal OCXO (±0.003 ppm, stability)
- Fixed frequencies up to 500 MHz
The past 28 years have seen countless advancements in the capabilities of aerospace systems, from low-orbit satellites to unmanned aerial vehicles, to military and commercial aviation. EM Research products are critical components to these complex systems, both in the air and on the ground.

### AEROSPACE

**FULL SPECTRUM EXPLORATION**

<table>
<thead>
<tr>
<th>M10X Series</th>
<th>10 MHz input to 100 MHz output (x10 Multiplication)</th>
<th>10 MHz to 3 GHz</th>
<th>100 MHz to 400 MHz</th>
<th>100 MHz</th>
<th>Within Selected Bands</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency Multiplier</td>
<td>Small, SMT Package (0.9” Square)</td>
<td>100 MHz</td>
<td>100 to 400 MHz Within Selected Bands</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **M10X Series**
  - 10 MHz input to 100 MHz output (x10 Multiplication)
  - Small, SMT Package (0.9” Square)
  - 100 MHz to 400 MHz Within Selected Bands

- **M10X Series**
  - 10 MHz input to 100 MHz output (x10 Multiplication)
  - Ruggedized, module-mount package
  - Removable SMA connectors for surface mount-ability
  - Extreme shock and vibration tolerance
  - 10 MHz to 3 GHz | Within Selected Bands

- **FD Series**
  - Frequency divider
  - Integrated signal conditioning, amplification, supply regulation
  - Wide input power range
  - Greater harmonic rejection and square wave outputs available
  - 5 V, 8 V, or 12 V operation
  - Vibration testing available
  - 10 MHz to 3 GHz | Within Selected Bands
EM Research, Inc. offers the most complete lineup of standard and custom-designed signal control products in the wireless industry. The company specializes in miniature surface-mount, modular and connectorized phase-locked oscillators and frequency synthesizers from 5 MHz to over 40 GHz. Founded in 1991, EM Research has been delivering high performance semi-custom signal sources to a broad range of applications worldwide. Since its inception, EM Research has developed a library of over 30,000 individual products.
SIGNAL CONVERSION

CHANNELIZED CONVERTERS

CONNECTORIZED
- UPCV Series
- DCV Series

BLOCK UP-CONVERTERS

CONNECTORIZED
- BUC Series

BLOCK DOWN-CONVERTERS

CONNECTORIZED
- BDC Series
- LNB Series

DCV Series
Channelized Down-Converter
5.0" x 2.5" x 0.6"
- Wide choice of frequency ranges
- Integrated filters
- Gain control
- Low power consumption, phase noise, and spurs
- CAN, RS-232, I2C, or SPI Control
- 1.5 to 2.1 GHz Within Selected Bands

UPCV Series
Channelized Up-Converter
5.0" x 2.5" x 0.6"
- Wide choice of frequency ranges
- Integrated filters
- Gain control
- Low power consumption, phase noise, and spurs
- CAN, RS-232, I2C, or SPI Control
- 1.5 to 2.1 GHz Within Selected Bands

BUC Series
Block Up-Converter
4.25" x 3.0" x 0.95"
- Wide choice of frequency ranges
- Integrated filters
- Gain control
- Low power consumption, phase noise, and spurs
- CAN, RS-232, I2C, or SPI Control
- 13.5 to 31 GHz Within Selected Bands

DBUC Series
Dual Band Block Up-Converter
4.0" x 2.5" x 1.2"
- Wide choice of frequency ranges
- Integrated filters
- Gain control
- Low power consumption, phase noise, and spurs
- CAN, RS-232, I2C, or SPI Control
- 29 to 31 GHz Within Selected Bands

BDC Series
Block Down-Converter
5.0" x 2.5" x 0.6"
- Wide choice of frequency ranges
- Integrated filters
- Gain control
- Low power consumption, phase noise, and spurs
- CAN, RS-232, I2C, or SPI Control
- 4 to 12.7 GHz Within Selected Bands
# INTEGRATED MICROWAVE ASSEMBLIES

## MULTI-TONE SOURCES

<table>
<thead>
<tr>
<th>Rack Mount</th>
<th>MTS Series</th>
</tr>
</thead>
</table>

## IQ MODULATORS

<table>
<thead>
<tr>
<th>Connectorized</th>
<th>IQM Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>IQ Modulator</td>
<td>2.5” x 3.5” x 0.97”</td>
</tr>
<tr>
<td>Capable of receiving RF and LO frequency inputs, and outputting RF frequencies</td>
<td></td>
</tr>
<tr>
<td>Internal low noise oscillator and reference</td>
<td></td>
</tr>
<tr>
<td>Buffered modulator</td>
<td></td>
</tr>
<tr>
<td>Balanced IQ</td>
<td></td>
</tr>
<tr>
<td>Optimized for low EVM</td>
<td></td>
</tr>
</tbody>
</table>

## IQ DEMODULATORS

<table>
<thead>
<tr>
<th>Connectorized</th>
<th>IQD Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>IQ Demodulator</td>
<td>2.5” x 3.5” x 0.97”</td>
</tr>
<tr>
<td>Capable of receiving RF and LO frequency inputs, and outputting from DC to 500 MHz</td>
<td></td>
</tr>
<tr>
<td>Internal low noise oscillator and reference</td>
<td></td>
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<tr>
<td>Buffered demodulator</td>
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## AMPLIFIERS

<table>
<thead>
<tr>
<th>Connectorized</th>
<th>SAM Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>Synthesizer Amplifier Modulator</td>
<td>2.5” x 2.5” x 1.60”</td>
</tr>
<tr>
<td>Interface between VSAT Modems and Frequency Converters</td>
<td></td>
</tr>
<tr>
<td>Robust housing is gasket sealed for weather resistance</td>
<td></td>
</tr>
<tr>
<td>Low phase noise OCXO</td>
<td></td>
</tr>
<tr>
<td>Single or dual multiplexer</td>
<td></td>
</tr>
<tr>
<td>Single or dual Bias Tee</td>
<td></td>
</tr>
</tbody>
</table>

## REFERENCE-MULTIPLEXERS

<table>
<thead>
<tr>
<th>Connectorized</th>
<th>MOX Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master Oscillator Multiplexer</td>
<td>2.55” x 2.0” x 1.83”</td>
</tr>
<tr>
<td>4 watts linear power</td>
<td></td>
</tr>
<tr>
<td>Transceiver pair support dual polarization</td>
<td></td>
</tr>
<tr>
<td>Low EVM</td>
<td></td>
</tr>
<tr>
<td>Output unit IP68 compliant</td>
<td></td>
</tr>
<tr>
<td>Single or dual modulator</td>
<td></td>
</tr>
<tr>
<td>Concept/Eval unit tested to 1024-QAM</td>
<td></td>
</tr>
</tbody>
</table>

## SPECIAL CAPABILITIES

<table>
<thead>
<tr>
<th>TRANSCEIVERS</th>
<th>TCVR Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transceiver</td>
<td>6.5” x 2.76” x 1.70”</td>
</tr>
<tr>
<td>4 watts linear power</td>
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</tr>
<tr>
<td>Transceiver pair support dual polarization</td>
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</tbody>
</table>

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**MTS Series**
- Standard 2U Rack Mount
- Up to 14 independent fixed output frequencies
- Excellent Phase Noise
- Internal Cooling Fans and Heat Sinks
- LED Lock Indication
- 37 pin micro-D on/off control
- 50 MHz to 40 GHz
- Within Selected Bands

**IQM Series**
- IQ Modulator
- 1.25 to 1.65 GHz
- Within Selected Bands

**IQD Series**
- IQ Demodulator
- 1.25 to 1.65 GHz
- Within Selected Bands

**SAM Series**
- Synthesizer Amplifier Modulator
- 100 MHz to 6 GHz
- Within Selected Bands

**MOX Series**
- Master Oscillator Multiplexer
- 10 to 50 MHz
- Within Selected Bands

**TCVR Series**
- Transceiver
- 25 to 31.3 GHz
- Within Selected Bands
Customers can purchase programming kits (demo boards, programming modules and reference modules) to assist in system design utilizing EM Research synthesizers and phase-locked oscillators. Integrate your existing breadboard for quick system performance demonstrations. Use demo boards to view layout and bypassing techniques for your PCB design.

Consult the factory or visit www.emresearch.com for more details.

Solutions Available for Easy Prototype and Bench Top Testing

1 Demo Boards
- Available for all modular and surface-mount products
- Products factory-mounted to demo boards
- CD-ROM with PC-executable programming software available
- PC-to-demo board programming cable included

2 Reference Modules
- Low phase noise, 10 MHz frequency references
- Female SMA connector
- CD-ROM with PC-executable programming software available
- Reference modules with integrated +3V battery available (includes selectable +3.3V, +5V or +9V DC supply)

3 Programming Modules
- Preconfigured to demonstrate device communications and control
- Integrated up/down buttons simplify frequency control
- Selectable multiplier scales frequency steps
- Plugs directly into demo board via DB9 cable
- Requires +6V to +15V source
- Easy step-by-step instructions included
- LED version available (shown below)