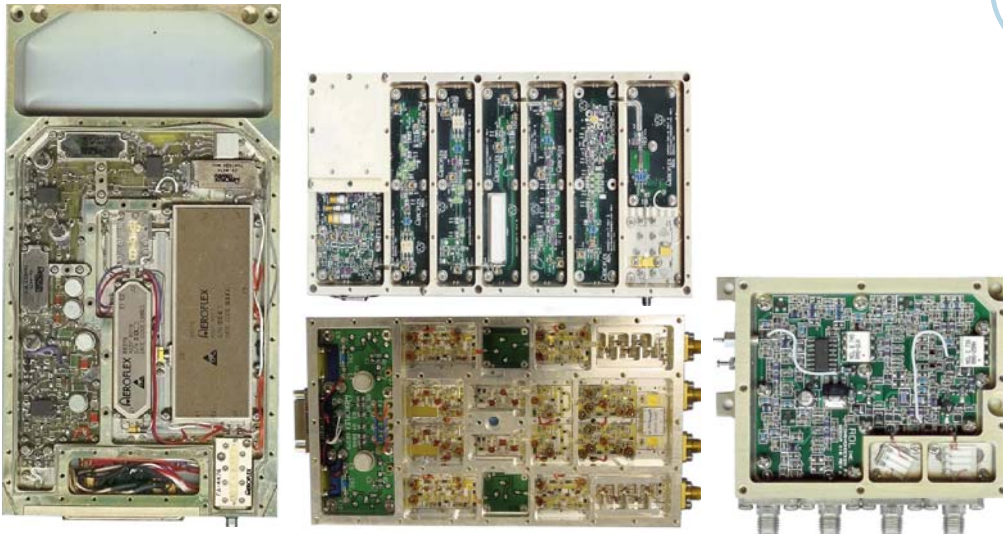


IMAS (Integrated Microwave Assemblies)



Aeroflex is a leading supplier of High Performance Frequency generation/translation products for demanding applications. We utilize our decades of experience of designing broadband, fast switching, low-noise synthesizers to design and manufacture custom products with unmatched performance/cost balance. Aeroflex has been a major supplier for standard and custom design products for the world's most demanding defense and commercial applications and environments.

Customers choose Aeroflex's IMAs based upon our:

- Low phase noise, fast-switching heritage
- Broadband, low spurious and harmonics capabilities
- Wide range of design and manufacturing technologies
- Cost-effective compliance for various harsh environments
- Strong combination of system-level and component-level design expertise, which enable superior IMA design that meet the most demanding customer specifications
- Decades of experience as a world class supplier of high reliability microwave and RF IMAs

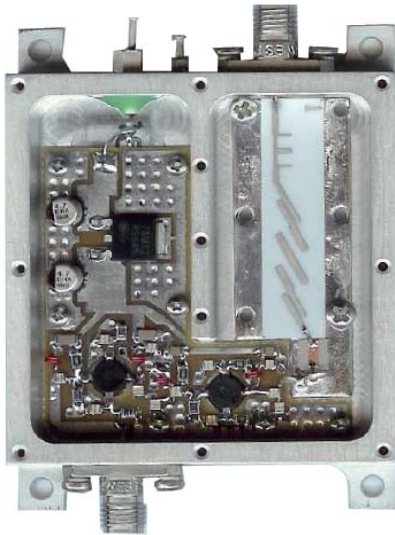
Categories of RF Modules and typical IMAs we have recently manufactured include:

- Frequency converters
- Frequency generators
- Multipliers
- Down/up converters
- Receivers
- Switch filter banks
- High performance oscillators
- Digitally controlled oscillators
- Custom frequency synthesizers

X4 MULTIPLIER

Features:

- Small size
- Broad operating temperature range
- On board voltage regulation



ELECTRICAL SPECIFICATION

Input Frequency

1760 MHz

RF Power Input

+9 ±2 dBm

Output Frequency

7040 MHz

RF Power Output

+13 ±2 dBm

Spurious

-45 dBc (max)

Power Supply

+15 Vdc @ 120 ma (max)

Phase Noise

Offset(KHz)	Noise Level (dBc/Hz)
0.1	-120
0.3	-128
1.0	-130
10.0	-135
30.0	-137
100.0	-137
1000.0	-137

ENVIRONMENTAL SPECIFICATION

TEMPERATURE

Operating

-15 to +85°C

Storage

-25 to +90°C

MECHANICAL SPECIFICATIONS

Size (excluding connector) (W x H x D)

67 mm x 51 mm x 11 mm (2.65" x 2.0" x .418")

Connectors

Field removable GPO connectors

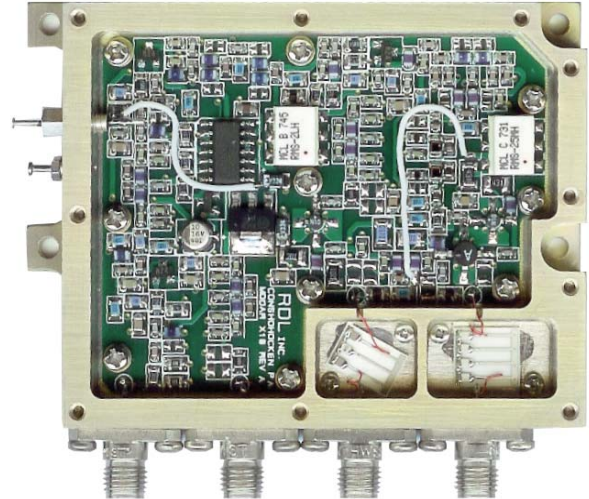
TYPICAL APPLICATIONS

Airborne radar

X10 MULTIPLIER

Features:

- Low noise
- X2 and X6 output in addition to X10
- Broad operating temperature range



ELECTRICAL SPECIFICATION

Input

160 MHz @ +10 dB ±2 dBm

Outputs

X2: 320 MHz @ +10 ±2 dBm

X6: 960 MHz @ +7 ±2 dBm

X10: 1600 MHz @ +10 ±2 dBm

Harmonics on all ports

Spurious

-85 dBc

Harmonics

-45 dBc

Phase Noise

Offset (KHz)	Noise Level (dBc/Hz)
0.1	-128
0.3	-129
1.0	-135
3.0	-140
10	-142
30	-143
100	-143
1000	-143

Power Supply

+15 vdc @ 225 ma (max)

ENVIRONMENTAL SPECIFICATION

TEMPERATURE

Operating

-15 to +80°C

Non-Operating

-40 to +90°C

Environment

100% Humidity, shock and vibration

MECHANICAL SPECIFICATIONS

Size (excluding connectors)

70 mm x 58 mm x 10 mm (2.75" x 2.3" x 0.4")

Connectors

Field removable GPO connectors

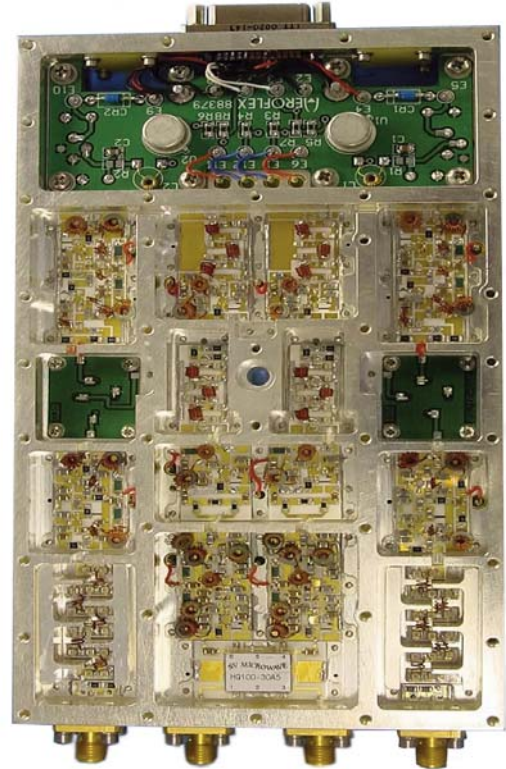
TYPICAL APPLICATIONS

Airborne - aircraft and missile

X115 MULTIPLIER

Features

- Dual redundancy
- Two equivalent channels
- Built in test indicators
- High MTBF
- Designed for space application



STANDARD ELECTRICAL SPECIFICATIONS

Input Frequency

10.23 MHz (Nominal)

Input Power

5.5 dBm \pm 3 dBm

Isolation Between Input Ports

\leq 15 dB

Output Multiplication

X115

Output Power

+5 dBm (min), +12 dBm (max)

Residual Phase Noise

Offset(Hz)	Noise (dBc/Hz)
10	-78
100	-89
1000	-93
10000	-98
50000	-98
100 K to 2 M	-110
2 M to 4 M	-114
4 M to 40 M	-130

Harmonics

-45 dBc

Power Supply

+15 vdc \pm 75 vdc

Current

275 ma (max)

ENVIRONMENTAL SPECIFICATION

TEMPERATURE

Operating

-25 to +70°C

Storage

-40 to +80°C

Environment

Design for space

MECHANICAL SPECIFICATION

Size (excluding connectors) (W x H x D)

185 mm x 91 mm x 20 mm (7.3" x 3.6" x .8")

Weight

22 oz (max)

Connectors

RF Input/Output

SMA/(F)

Power, Ground and Bite

25 pin receptacle

OPTIONAL CONFIGURATIONS

Input Frequency Range

5 to 55 MHz

Output Frequency Range

50 to 2000 MHz

Multiplication Factors

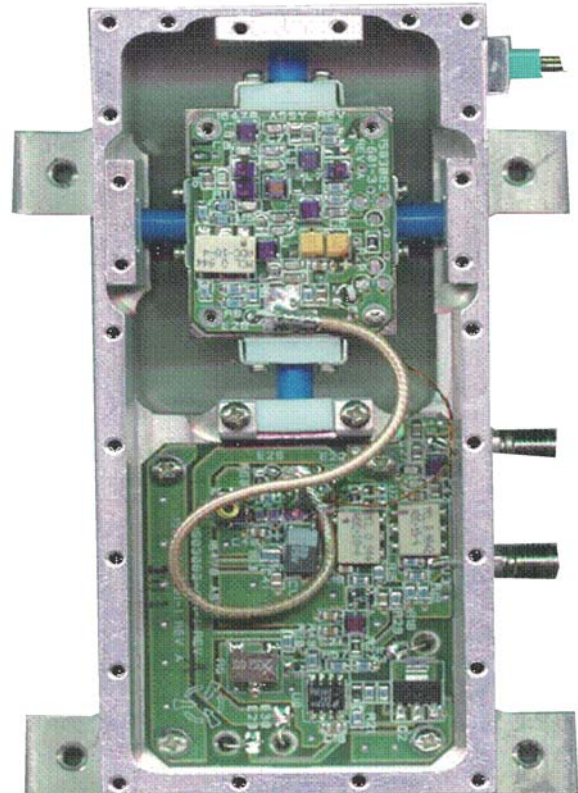
Any integer from 10 to 400 (Input/Output frequencies must be within ranges as stated above).

Different Input/Output frequencies for each channel.

MASTER OSCILLATOR ASSEMBLY

Features

- Oven controlled Crystal Oscillator designed to function in severe environments
- Suitable for aircraft radars and missiles
- Excellent phase noise under random vibration
- Self-contained bit circuit for power monitoring
- Small size
- MTBF > 100,000 hours in AUF environment



ELECTRICAL SPECIFICATION

100 MHz Output

@ 20.0 \pm 1.5 dBm (J1) (-54 to +85°C)

@ 0 \pm 2.0 dBm (J2) (-54 to +85°C)

Frequency Stability

\pm 10 ppm (-54 to +85°C)

\pm 1 ppm (-45 to +50°C)

DC Power

+15 \pm 1 vdc

1.0 amps max at turn on

Harmonics and Sub-Harmonics

-45 dBc max (J1)

-20 dBc max (J2)

Discrete Spurious

-90 dBc (max) at 100 Hz offset

-116 dBc (max) above 3.5 KHz offset

Load VSWR

1.2:1 max

Allen Variance (1 sec. Average)

-1×10^{-10}

G Sensitivity

$2.5 \times 10^{-10}/G$ per axis

ENVIRONMENTAL SPECIFICATION

TEMPERATURE

Operating

-54 to +85°C

Storage

-62 to +95°C

ENVIRONMENT

Shock

30 Gs (1/2 Sine)

Humidity

100%

Random Vibration

~10 GRMS total (15 Hz to 2000 Hz), typical

MECHANICAL SPECIFICATION

Size (excluding connectors) (W x H x D)

121 mm x 51 mm x 36 mm (4.75" x 2.0" x 1.4")

Weight

<.75 lbs

Connectors

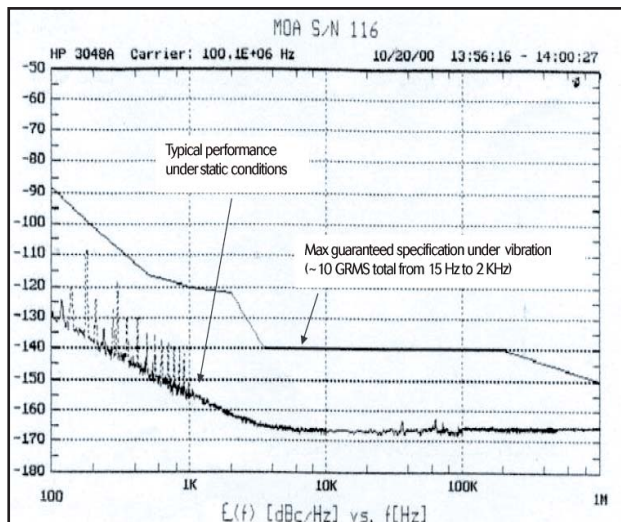
SMA(F)

MASTER OSCILLATOR ASSEMBLY

MASTER REFERENCE OSCILLATOR (MRO)

Features

- Outputs at 100 MHz, 400 MHz and 1 GHz
- Frequency adjustable via tuning screw ± 3 ppm range
- Small size
- MTBF >100,000 hours in AUF environment



ELECTRICAL SPECIFICATION

100 MHz output

@ +13 dBm ± 1.0 dB

400 MHz output

@ +7 dBm ± 1.5 dB

Four 1 GHz outputs

@ +13 dBm each ± 1

Frequency accuracy initially set to ± 0.1 ppm

Absolute Frequency Accuracy (including aging and temperature)

1 ppm/yr max

Vibration sensitivity per axis

$< 5 \times 10^{-10}/G$

18 Hz Mechanical isolation system

1 GHz Outputs are phase matched to less than 5°C

Harmonics < -60 dBc

Non-Harmonics < -50 dBc

Frequency Stability $< \pm 1$ ppm (-30 to +40°C)

DC Power

+15 vdc

1.12 A @ turn-on

900 mA after warm-up

Warm-up from -40°C, less than 5 minutes

ENVIRONMENTAL SPECIFICATION

TEMPERATURE

Ambient Operating

-40 to +71°C

Storage

-54 to +95°C

ENVIRONMENT

Designed to operate under severe vibration and shock environment

MECHANICAL SPECIFICATION

Size (excluding connectors) (W x H x D)

163 mm x 56 mm x 38 mm (6.4" x 2.21" x 1.5")

Connectors

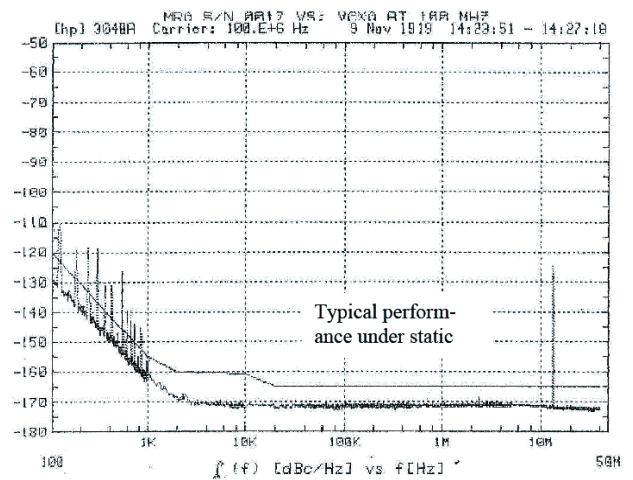
SMA(F)

Weight

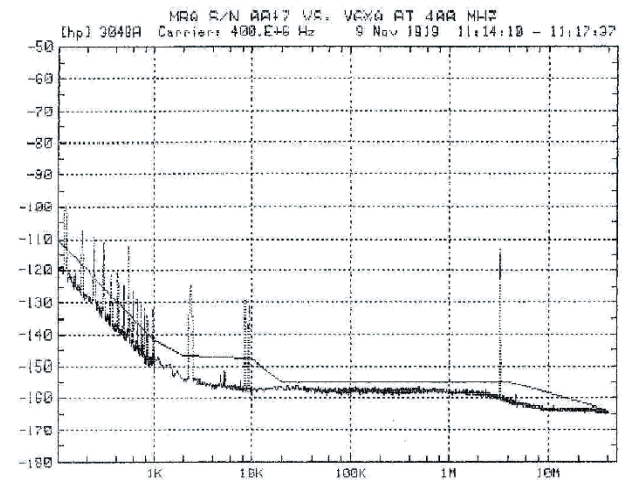
<17 oz

TYPICAL APPLICATIONS

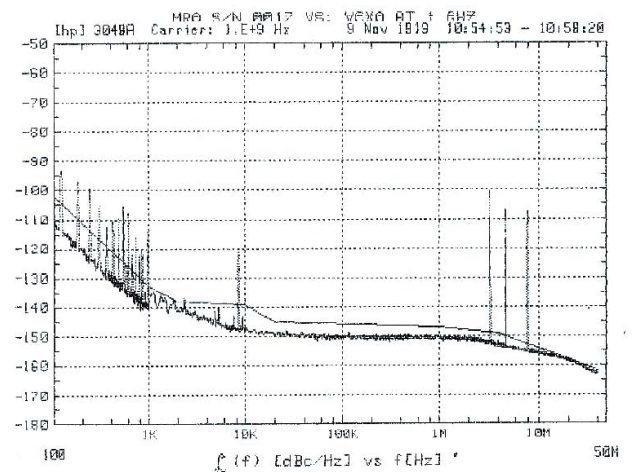
Airborne - missile and aircraft



MRO Phase Noise (100 MHz)



MRO Phase Noise (400 MHz)



MRO Phase Noise (1000 MHz)

MASTER REFERENCE OSCILLATOR (S BAND OUTPUT)

Features

- Low noise SC ovenized VCXO
- Proprietary mechanical vibration isolation system
- Low noise multiplier/filter chain
- Built in test indicators



ELECTRICAL SPECIFICATIONS

Internal ovenized VCXO at ~80 MHz

Low G sensitivity crystal ($<1.5 \times 10^{-10}/G$ per axis)

Free running or externally tuned over $> \pm 2$ ppm

Extremely Low Phase Noise

Offset (Hz)	SSB Phase noise (dBc/Hz)
10	-72
100	-103
1000	-133
100000	-158

Output Frequency

~2560 MHz (multiplied up from internal VCXO)

Output Power

$> +21$ dBm

Non-harmonic Spurs

< -100 dBc

Sub-harmonics

< -80 dBc

Harmonics

< -30 dBc

Warm-up

< 5 minutes

Optional FM capability

DC Power

+20 V

1.35 A @ turn-on

< 1 A after warm-up

ENVIRONMENTAL SPECIFICATION

TEMPERATURE

Operating

-10 to 60°C

Storage

-40 to $+70^{\circ}\text{C}$

Environment

Shipboard

MTBF

$> 70,000$ hours

MECHANICAL SPECIFICATION

Size (excluding connectors) (W x H x D)

~ 254 mm x 127 mm x 32 mm (~ 10 " x 5 " x 1.25 ")

RF Connectors

SMA(F)

Power, Control and BIT

9 pin D-type

TYPICAL APPLICATIONS

Military shipboard applications, commercial - laboratory application

MICROWAVE LANDING RECEIVER

Features

- Full mil spec
- Built-in test indicators
- Dual conversion
- Front end limiter
- MTBF 20,000 hours, AUF



ELECTRICAL SPECIFICATION

Frequency Range

15,412 to 15,688 MHz

Tuning Increment

12 MHz

Tuning via a 5-bit TTL control

Total Receiver noise figure

11 dB

TSS

-75 dB

Maximum Safe RF Input

+30 dBm CW, +53 dBm pulse at 1.5 usec max pulse width

Gain Control Linearity

80 dB range

2 dB from Linear

Dual Video Output

0 - 5 V

3rd Order Input Intercept Point

+5 dBm

1ST IF

1624 MHz

2ND IF

83.5 MHz

LO Re-radiation

-80 dBm (max)

L01

13,776 to 14,064 MHz @ +11 dBm

L02

1540.5 MHz @ +13 dBm

ENVIRONMENTAL SPECIFICATION

TEMPERATURE

Operating

-54 to +71°C

Storage

-55 to +95°C

Temperature Shock

-57 to +71°C, per MIL-STD-810B, method 5003.3

Humidity

100% Rel.

Sand and Dust

MIL-STD-810C

Salt Fog

MIL-STD-810C

Vibration

MIL-STD-810C

Shock 30g, 11 ms shock pulse

EMI/EMC

MIL-STD-461

Power Supply

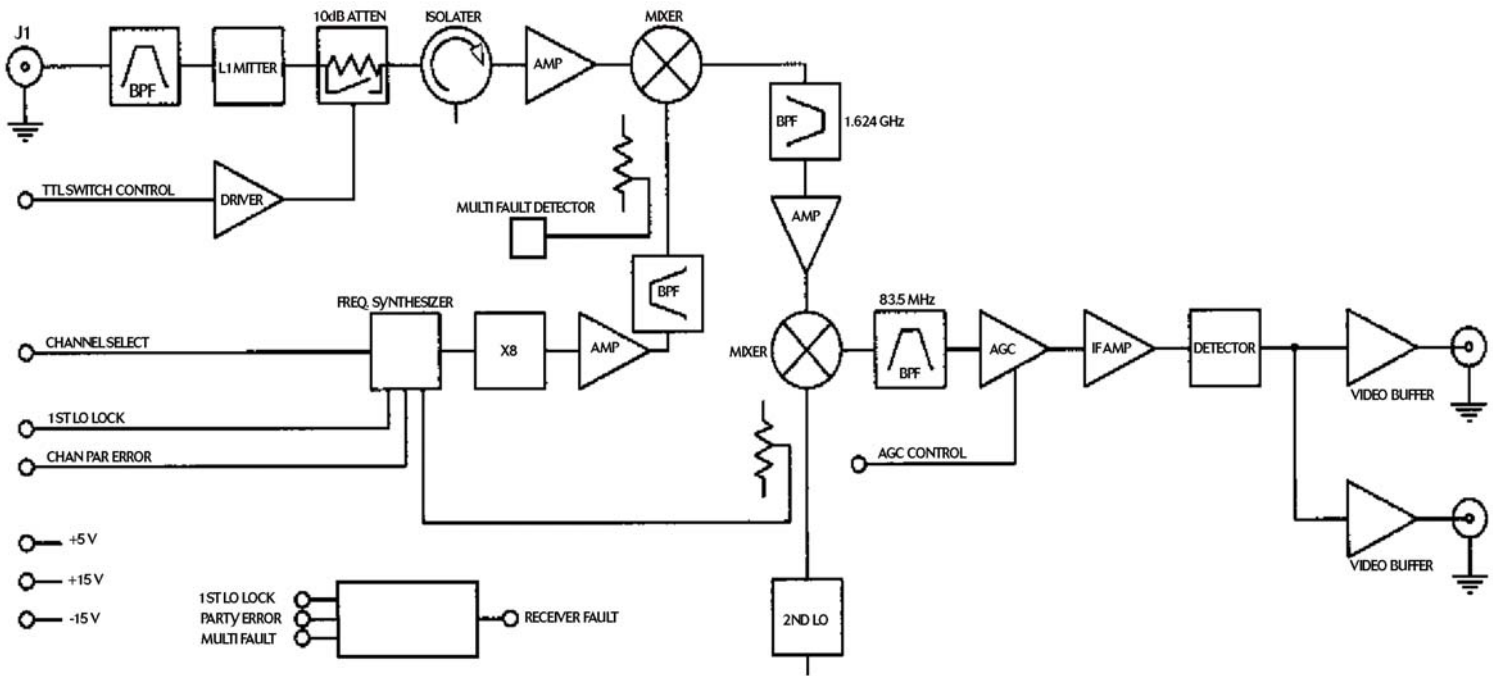
+15 V, -15 V and +5 V

Weight

30 oz

TYPICAL APPLICATIONS

Airborne fighter



Microwave landing receiver block diagram

DUAL X-BAND DOWN CONVERTER

Features

- High gain (adjustable)
- Low spurious -100 dBc (Typ.)
- Low noise figure with high IP3
- Built-in-test indicators
- Modular design, easily adapted to other frequency bands/schemes



ELECTRICAL SPECIFICATIONS

Input Frequency

4 bands from 9-10 GHz

Note: Each band includes a 40 MHz skin channel and a 40 MHz transponder channel. These channels are separated by 300 MHz at X Band and converted to be adjacent at VHF.

Dual Down Conversion

X to L-Band

L-Band to VHF

Output Power

> +16 dBm

Gain Adjustable

From 18 to 48 dB

Noise Figure

~4.5 dB

Spurious

<-80 dBc (max), <-100 dBc (Typ.)

Harmonics

<-70 dBc 2nd and 3rd order

OIP3

> +35 dBm at nominal 38 dB gain

Flatness

<1.5 dB for each sub band

Input Power

Survives +35 dBm CW power

+40 dBm peak power

DC Power Consumption

<1.0 A @ +6.3 vdc

<0.8 A @ +15 vdc

<0.1 A @ -6.3 vdc

ENVIRONMENTAL SPECIFICATION

Operating Temperature

+25 to +45°C

Environment

100% Humidity, shock and vibration

MECHANICAL SPECIFICATION

Size (W x H x D)

267 mm x 203 mm x 41 mm (10.5" x 8" x 1.6") (not including connectors or waveguide)

Connectors

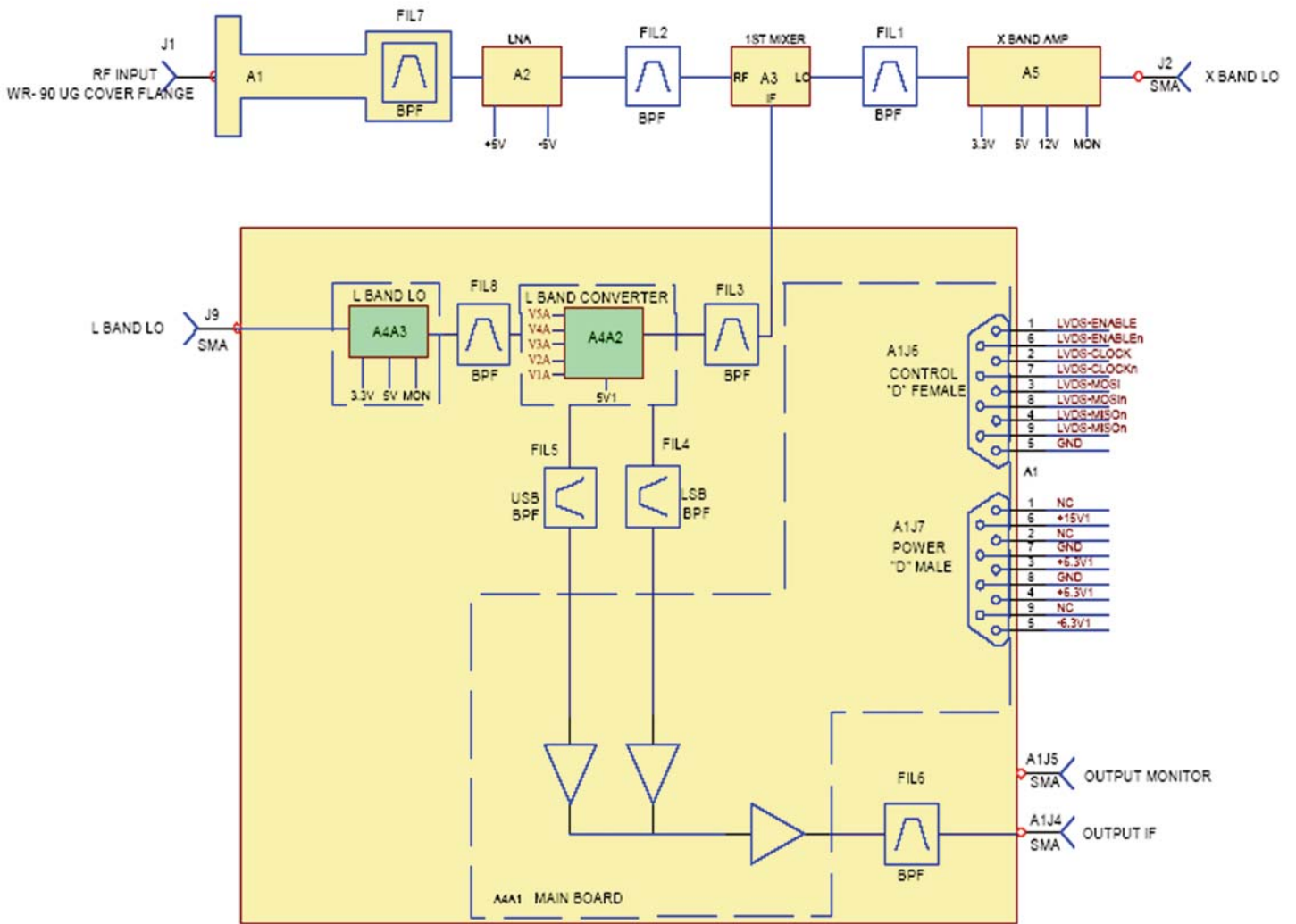
WR-90 waveguide input

SMA LO ports

SMA VHF outputs

TYPICAL APPLICATIONS

Ground mobile phase array tracking radar

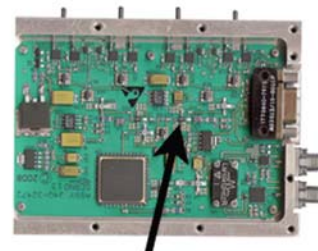


Dual X-band down converter block diagram

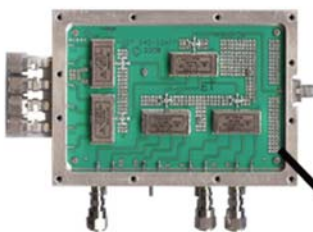
4-12 GHZ DOWNCONVERTER

System Build Up

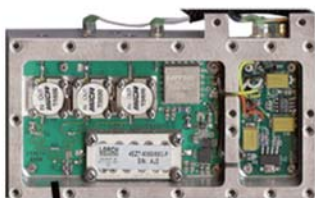
- Design with weight limitations
- Very good inter-mod performance -70 dBc
- High isolation
 - Spurs <-70 dBc
- 6 x 8 switch matrix
 - Fast switching
- Excellent frequency response
- Low noise figure 3:1 RF and IF bandwidth



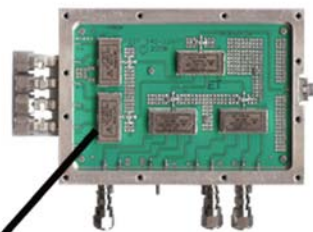
30 MHz to 3000 MHz 14 way power divider



Low Band Module



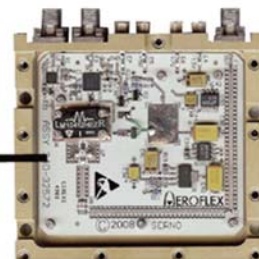
LO Generator



Converter Modules

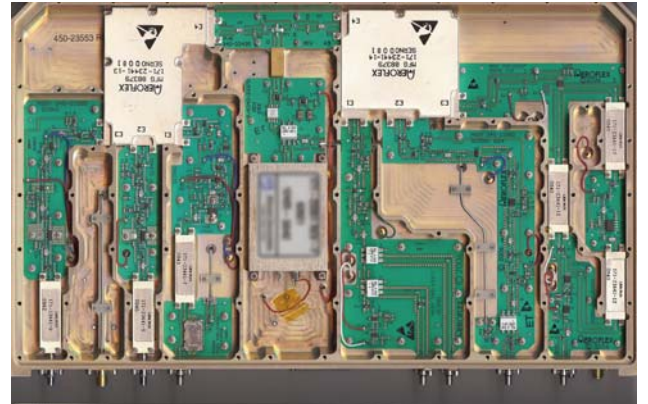
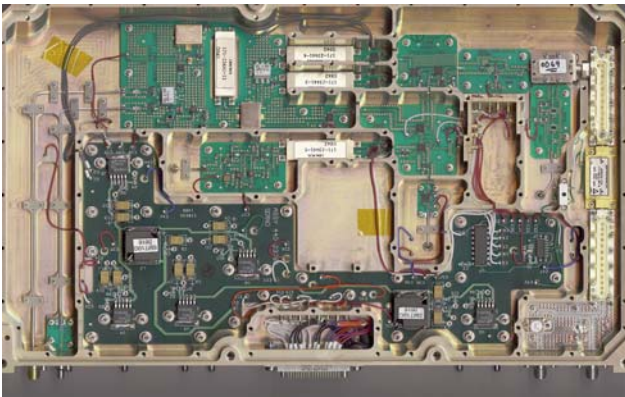
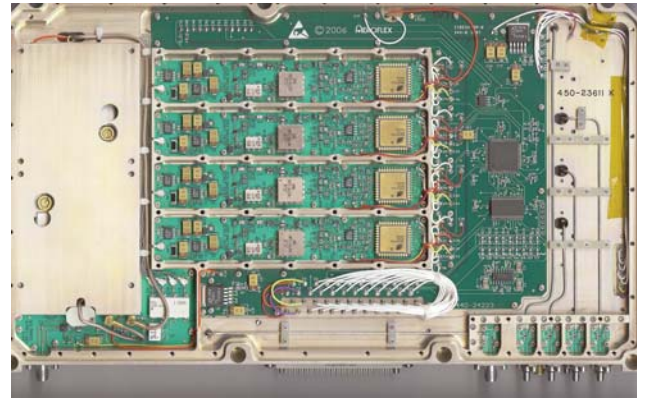
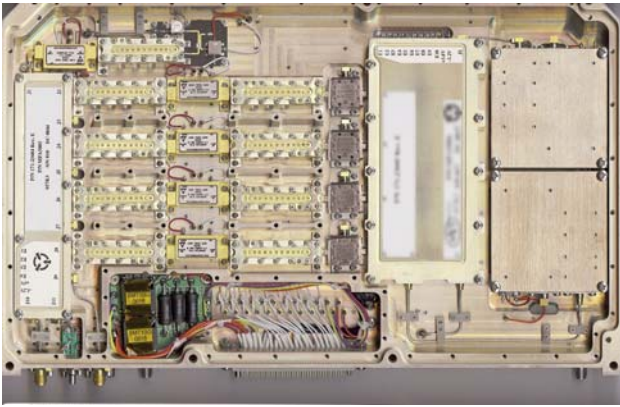


Switch Modules



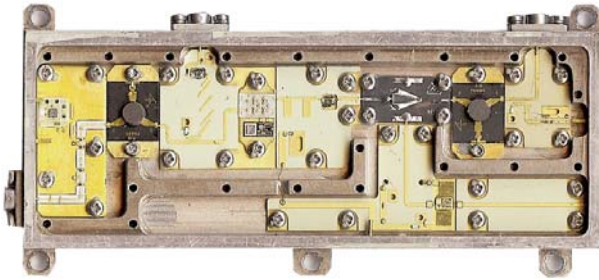
Band A1 Module

FIVE CHANNEL X-BAND SYNTHESIZER



Specification

- X-Band outputs
- Multi-channel
- Fast switching
- Low spurious/phase noise
- Designed for weight/size
- High reliability
- Military airborne environment



- Airborne fighter
- 10-15 GHz
- Hermetic package with full mil screening
- Low noise figure with 200 W peak power

DIGITALLY CONTROLLED XTAC OSCILLATOR (DCXO)



Features

- Low noise
- Built-in test (BITE)
- Suitable for aircraft and missile application
- Broad operating temperature range

ELECTRICAL SPECIFICATION

Output Frequency

Customer specified

RF Power Output

+9.0 dBm \pm 0.8 dB

Power Supply

+19 vdc

+28 vdc

Frequency Stability

Short term: $\pm 1.0 \times 10^{-7}$ in any 0.10 second period

Long Term: $\pm 0.6 \times 10^{-6}$ per year

Temperature

$\pm 1.0 \times 10^{-6}$ over temperature range of -30 to +60°C

Frequency Offset Control

160 bit binary controlled for the fine frequency

High Linearity

Low harmonics and spurious

ENVIRONMENTAL SPECIFICATIONS

TEMPERATURE

Operating

-20 to +60°C

Non-Operating

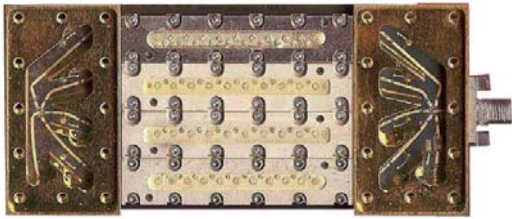
-45 to +71°C

MECHANICAL SPECIFICATION

Size (excluding connectors) (W x H x D)

191 mm x 114 mm x 51 mm (7.5" x 4.5" x 2.0") (approx.)

4.8 GHz to 13.5 GHz Switched Filter Bank



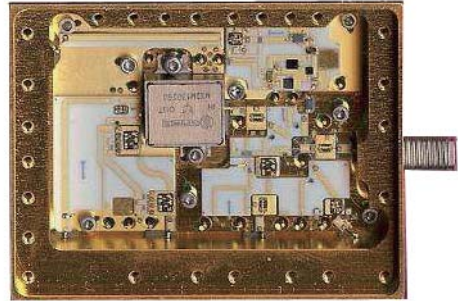
- SP4T/SP5T - 4.8 GHz to 13.5 GHz- switched filter bank
- Low insertion loss
- Fast switching
- -20 dB out of band rejection

X-Band Switch/Amp/Mixer



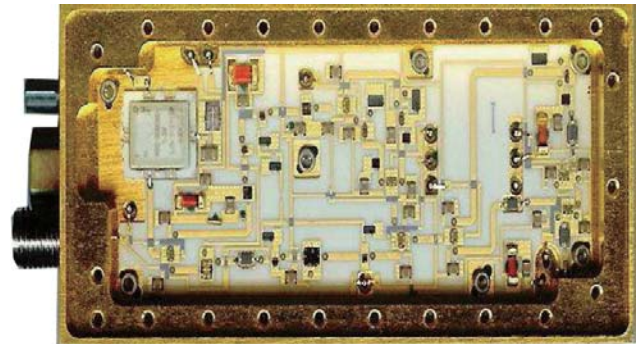
- X Band switch/amp.mixer
- Low conversion loss
- Supports 2 LO inputs
- Fast switching (<120 ns)

Microwave/Doubler Amplifier

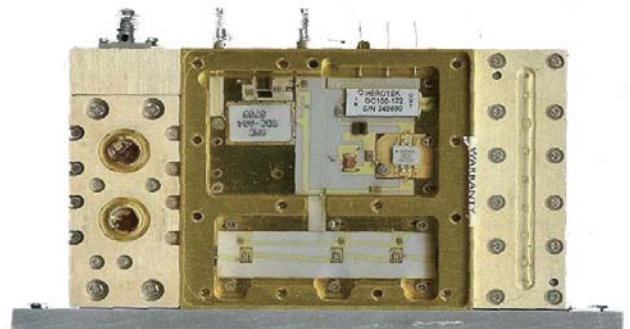


- Microwave doubler/amplifier
- 2.4 to 20 GHz
- 20 dB gain
- Fast switching

Wideband Scaler: C to Ku in, VHF to C out



X-Band Fixed LO Source



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Our passion for performance is defined by three attributes represented by these three icons: solution-minded, performance-driven and customer-focused.