



QM1013 | DC – 6 GHz Frequency Up-Converter

Typical Applications

- Frequency Conversion
- Laboratory Test Equipment
- Digital Receiver Exciter (DREX) Systems
- Digital RF Memory (DRFM) Kernel
- Communication systems, SATCOM
- EW, ELINT, SIGINT, DF
- Wideband systems
- Phased array antenna systems
- Radar systems

RF Frequency Range

1.0 MHz – 6.0 GHz

IF Frequency

2.5 GHz (+/- 0.25 GHz)

Options

- | | |
|-----|-------------------------------|
| 101 | Single-channel, internal LOs |
| 102 | Dual-channel, no internal LOs |

Features

- Upconversion from DAC input signal (typically 2.5 GHz center) to a 1 MHz – 6.0 GHz output signal
- High-quality low-phase noise LO tuners

Form-Factor

- 1U 19" Rack module



QM1013, 1U 19" Rack-Mount. Connector locations may vary from locations shown here

General Description

The QM1013 is a 1.0 MHz – 6.0 GHz upconverter based off of our successful QM1004 line of wideband frequency converters. This new product is designed to accept an analog IF input from a DAC or other source centered on 2.5 GHz and upconvert to the 1.0 MHz – 6.0 MHz frequency range. Either internal (option 101) or external (option 102) local oscillators are used to tune the output to the desired RF frequency below 6.0 GHz.

The QM1013 is controlled via USB or TCP/IP and uses VISA control drivers with the USBTMC protocol, enabling seamless integration into Windows®, Linux®, and Macintosh® environments. A Windows® GUI is provided.

All QM1013 Series specifications are customizable upon request. Please contact sales@quonsetmicrowave.com for more information. Detailed performance specifications are also available upon request.



Electrical Specifications
Upconverter/Transmitter Channel

Parameter	Min.	Typ.	Max.	Units
IF Input Center Frequency		2.5		GHz
RF Output Frequency Range	0.001		6.0	GHz
Instantaneous Usable Bandwidth		160		MHz
Gain (preliminary)	-80		10	dB
Noise Figure (preliminary)		20		dB
Attenuation Range		90		dB
Attenuation Step Size		0.5		dB
Calibrated Amplitude Uncertainty		0.1		dB
Calibrated Phase Uncertainty		0.1		deg

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Internal Synthesizers (Option 101)

Parameter	Min.	Typ.	Max.	Units
Tuning Frequency Resolution (Option 101)		0.001		Hz
Tuning Speed (Option 101)			50	us
LO1 (Tunable) Phase Noise @ 10 kHz		-115	-110	dBc/Hz
LO2 (Fixed) Phase Noise @10 kHz		-110		dBc/Hz
LO2 (Fixed) Phase Noise @ 100 kHz		-120	-114	dBc/Hz

Internal 100 MHz Reference (Option 101)

Parameter	Min.	Typ.	Max.	Units
Frequency Stability vs Temp (0 to 50 degC)		+/- 5		ppb
Frequency Stability vs Internal Regulated Supply Voltage		+/- 20		ppb
Warm-Up @ 25 degC (< 3 minutes)		+/- 100		ppb
Daily Aging (after 30 days)		+/- 1		ppb
Yearly Aging		+/- 100		ppb
10-year Aging		+/- 500		ppb
Ref Phase Noise @ 1 Hz		-90		dBc/Hz
Ref Phase Noise @ 10 Hz		-120		dBc/Hz
Ref Phase Noise @ 100 Hz		-135		dBc/Hz
Ref Phase Noise @ 1 kHz		-145		dBc/Hz
Ref Phase Noise @ 10 kHz		-150		dBc/Hz
Ref Phase Noise @ 100 kHz		-150		dBc/Hz
Ref Phase Noise @ 1 MHz		-150		dBc/Hz

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Additional External Electrical Specifications

Parameter	Min.	Typ.	Max.	Units
Operating Voltage		+15		VDC
Current Draw			5	Amps
External Tunable LO1 Input Frequency Range	10.0		16.0	GHz
External LO1 Input Power		0		dBm
External Fixed LO2 Input Frequency Range		12.5		GHz
External LO2 Input Power		0		dBm
External Reference Input	10		100	MHz
External Reference 1 Output		100		MHz
External Reference 2 Output		10		MHz

Environmental Specifications

Parameter	Min.	Typ.	Max.	Units
Operating Temperature	0		50	degC
Storage Temperature	-20		70	degC
Operating Humidity, Non-Condensing	10		90	%

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QM1013 Series System Block Diagrams

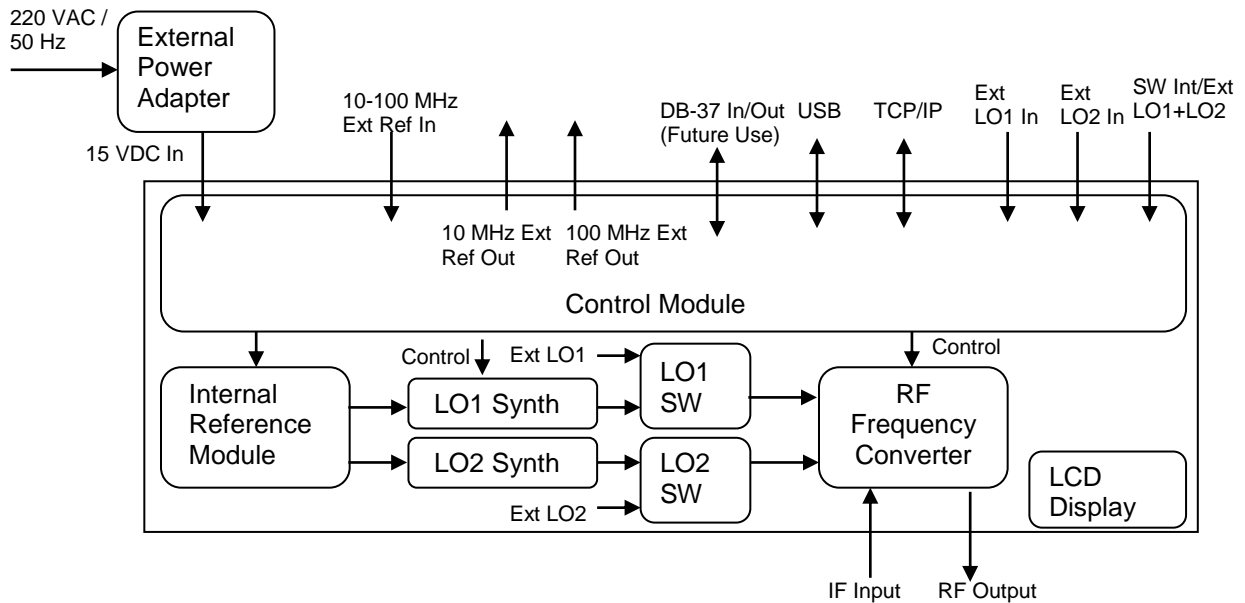


Figure 1. QM1013 block diagram – Option 101 with Internal LO

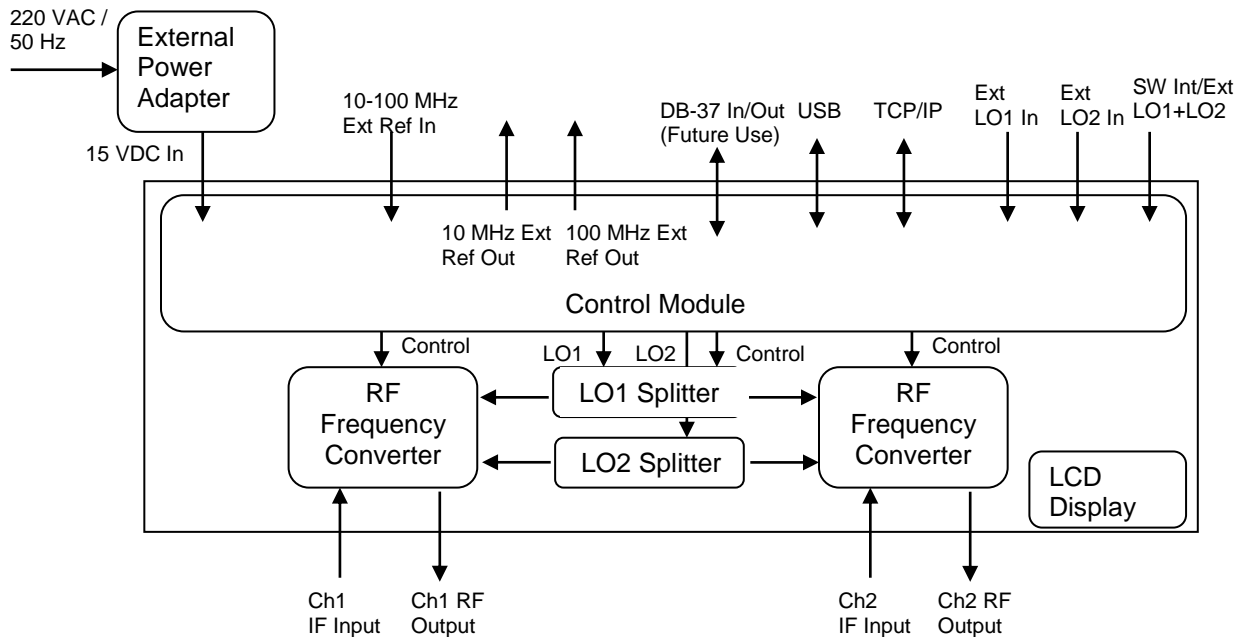


Figure 2. QM1013 block diagram – Option 102 without Internal LO

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RF Signal Chain

QM1013 Wideband Up Converter uses a dual stage conversion architecture to convert frequencies up and down from a 2.5 GHz center-frequency IF to an RF centered between 0.001 and 6.0 GHz. The block diagram are shown in Figure 1 (Option 101 – single channel with internal LOs) and Figure 2 (dual-channel without internal LOs).

Controlling QM1013 Upconverters

QM1013 Rack Mount Upconverters with internal LOs have been designed to be VISA and USBTMC compliant. VISA drivers are provided by many Test and Measurement companies, including Agilent Technologies, National Instruments, and Tektronix. USB and TCP/IP communication and command structure is discussed in detail in the frequency conversion programming manual. A lightweight GUI, supported in Windows®, will be provided for units with internal LOs, providing control of all commonly used commands.

Interface Connections

The necessary front and back panel input/output connections on a QM1013 frequency converter is summarized in Table 1. The front-panel connections are shown in **Error! Reference source not found.** while the rear-panel connections are shown in Figure 4.



Figure 3. Front panel connections to QM1013 (figure is only representative, there will be slight changes).



Figure 4. Rear-panel connections to QM1013 (figure is only representative, there will be slight changes).

Table 1. Input and output connections for QM1013 (19" Rack-Mount Form-Factor)

Parameter	Connector Style	Type	Location
Upconverter IF Input – Ch1	SMA	Female	Front Panel
Upconverter RF Output – Ch1	SMA	Female	Front Panel
Upconverter IF Input – Ch2	SMA	Female	Front Panel
Upconverter RF Output – Ch2	SMA	Female	Front Panel
Reference Input (10-100 MHz)	BNC	Female	Rear Panel
Reference 1 Output (100 MHz)	BNC	Female	Rear Panel
Reference 2 Output (10 MHz)	BNC	Female	Rear Panel
LO1 Input (10-16 GHz)	SMA	Female	Rear Panel
LO1 Int/Ext Switch	Toggle	SPDT Switch	Rear Panel
LO2 Input (12.5 GHz)	SMA	Female	Rear Panel

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LO2 Int/Ext Switch	Toggle	SPDT Switch	Rear Panel
Int/Ext Ref Switch	Toggle	SPDT Switch	Rear Panel
USB	Micro-USB	Female	Rear Panel
TCP/IP	RJ-45	Female	Rear Panel
Power Jack	2.5 mm ID, 5.5mm OD Barrel	Male	Rear Panel
TTL Input (Frequency Tuning, Attenuation Control, Lock Status)	DB-37	Female	Rear Panel

Power Interface

The QM1013 Combined Up/Downconverter requires a DC input voltage of 15V applied at the power jack (2.5mm ID, 5.5mm OD barrel) on the back panel of the instrument. An AC-DC power adapter is supplied with the unit.

Absolute Maximums

Operating Temperature	+50 °C
RF Input Power	+20 dBm



ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

Ordering Information

QM1013-[Options]

where

Options= 101 (single-channel, internal LOs)
102 (dual-channel, no internal LOs)