



# NoiseTech Microwaves Ltd.

Product Technical Specifications of 100 MHz to 6GHz Controller and Impedance  
Generator for Cryo Applications

(P/N C-IG0160C)

Rev. 3 – July 8, 2019

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## 2. General

NoiseTech Microwave's 0.1MHz to 6GHz impedance generator (P/N C-IG0160C) is specifically designed for "cold" noise-parameter measurements.

C-IG0160C consists of a controller and an RF part that are interfaced with three low frequency control lines. The RF part is placed inside the dewar. Noise-parameter measurement accompanied with the "cold attenuator" method is recommended.

The small size and fully electronic design permit noise-parameter measurements of packaged and on-wafer devices extending to frequencies as low as 0.1 GHz. Proprietary wideband impedance generation method allows for quick and precise measurements of noise parameters for a large number of frequencies. On-board memory stores calibration data and documentation.

Three low-frequency interface lines between the controller and impedance generator minimize thermal load of the product.

C-IG0160C has been shown to work down to 15K of ambient temperature.



**Fig. 1: C-IG0160C Cryo Impedance Generator and Controller.**

### 3. Specifications

#### 3.1 Physical specifications

##### Controller

Parameter	Specification	Note	Comment
Housing/Enclosure Dimensions			Excluding connectors.
Width	4cm		
Length	8cm		
Height	2.5cm		
Non-RF connectors	USB-A (controller) Mini USB (controller) Three low-speed SMA (controller)	Fig. 1	To control other devices For power and control input
Total weight	125 g typ.		

##### Cryogenic RF Part

Parameter	Specification	Note	Comment
Housing/Enclosure Dimensions			Excluding connectors.
Width	4cm		
Length	8cm		
Height	2.5cm		
RF connectors	2 RF connectors	Fig. 1	- SMA standard (3.5mm or N type may be installed)
Non-RF connectors	3 low-speed SMA		
Total weight	150 g typ.		

#### 3.2 Electrical performance at 25C

##### 3.2.1 Digital

Parameter	Specification	Note	Comment
Communication protocol	USB 2.0		Connection thru micro-B USB
On-board RAM	192kB min.		
FLASH memory	5 MB min.		
Maximum COM Baud Rate	115.2 kbps		

##### 3.2.2 RF

Parameter	Specification	Note	Comment
Number of impedance states	4		Optimally selected for noise parameter measurements
Generated impedances within each of 4 regions	1		at each frequency within the operating range
THRU state return loss	20dB typ. 15dB min.		100MHz to 4GHz
	15dB typ. 10dB min.		4GHz to 6GHz
THRU state insertion loss	3dB typ		
Impedance switch time	1 ms max		
RMS repeatability	65 dB min	Fig. 2	
Input P1dB	33 dBm min		

##### 3.2.3 Noise Source port

Parameter	Specification	Note	Comment
Connector	USB-A		
Vbus pin	Voltage: Same as C-IG0160C supply voltage Output current: 50 mA max		Noise source power supply
D+	Noise source control		Output from IG0160C

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Parameter	Specification	Note	Comment
	$V_{OL}=0.4V_{max}$ $V_{OH}=3.0V_{min}$		
D-	Noise source temperature input (0V to 3V) Internal 10k pull up to 3.3V		Input to IG0160C
GND	Ground		

### 3.2.4 Non-RF interface (Controller)

Connector (Vdd): SMA female

Pin	Name	Description
Inner	Vdd = 4V typ $3.8V < V_{dd} < 4.2V$ Max. current source: 10mA min	Power supply for the RF part Typically supplied by the controller

Connector (S1): SMA female

Pin	Name	Description
Inner	RF part control #1 $V_{OL} < 0.4V$ $V_{OH} < 2.3V$ Max. current source: 50uA min	Control of the RF part

Connector (S2): SMA female

Pin	Name	Description
Inner	RF part control #2 $V_{OL} < 0.4V$ $V_{OH} < 2.3V$ Max. current source: 50uA min	Control of the RF part

### 3.2.5 Non-RF interface (RF part)

Connector (Vdd): SMA female

Pin	Name	Description
Inner	Vdd = 4V typ $3.6V < V_{dd} < 5V$ Current draw: 3mA max	Power supply to the RF part Typically supplied by the controller

Connector (S1): SMA female

Pin	Name	Description
Inner	RF part control #1 $-0.3V < V_{IL} < 0.6V$ $1.2V < V_{IH} < 3.6V$ Current: 50uA max	Typically supplied by the controller

Connector (S2): SMA female

Pin	Name	Description
Inner	RF part control #2 $-0.3V < V_{IL} < 0.6V$ $1.2V < V_{IH} < 3.6V$ Current: 50uA max	Typically supplied by the controller

### 3.2.6 Power supply

Parameter	Specification	Note	Comment
Supply voltage range (Controller)	4.75V to 5.25V	1	Per USB2.0 standard
Controller current draw	35 mA typ. 90 mA max.	1	Noise source is not connected.
RF-part current consumption	2mA max from 4V supply		Supplied by the controller or user's equipment

Note 1: power supplied through micro-B USB 2.0 receptacle, pin Vbus

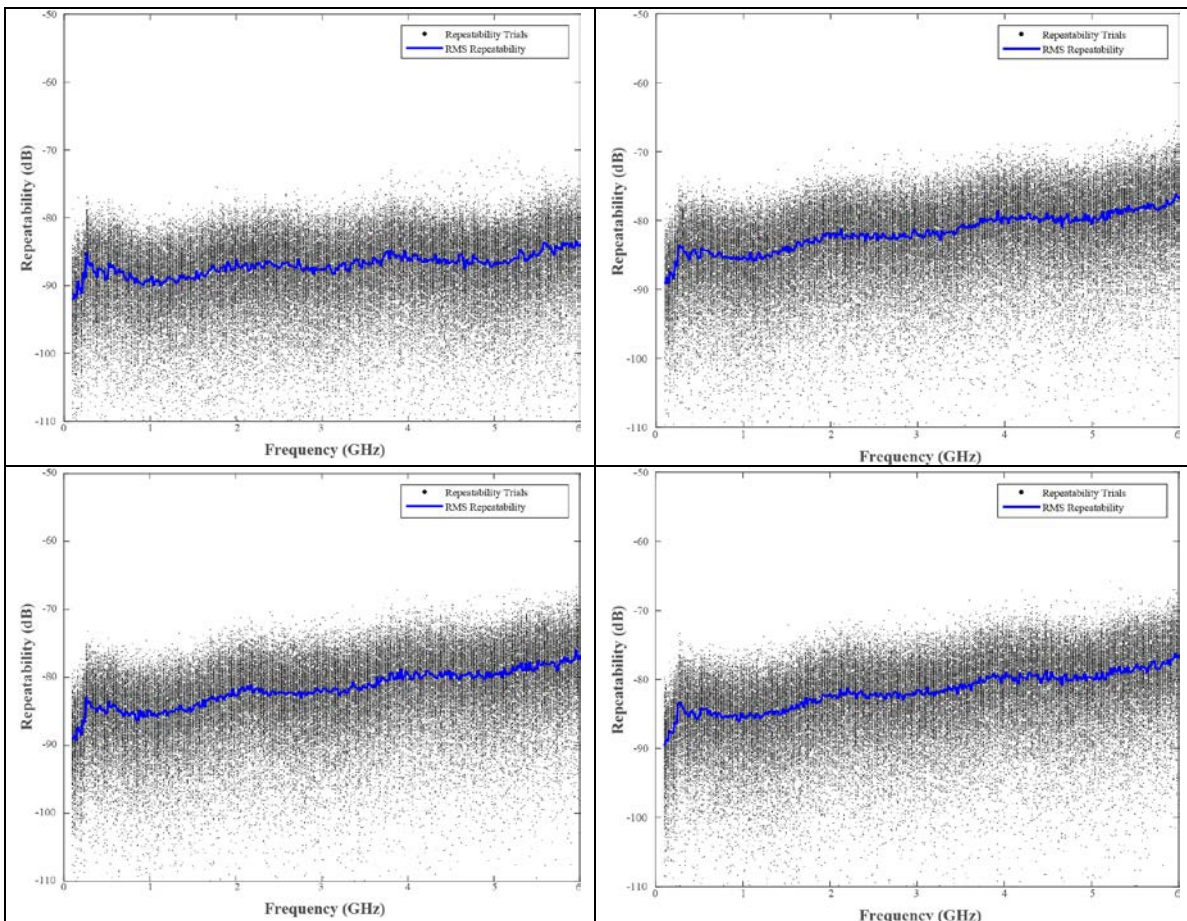
**3.2.7 Environmental**

Parameter	Specification	Note	Comment
Ambient temperature	<-258°C to 70°C		
Operating relative humidity	20% to 80% non-condensing		
Storage relative humidity	20% to 80% non-condensing		
ESD	2 kV HBM		

**3.2.8 Regulatory**

Parameter	Specification	Ref	Comment
ICES-3	Compliant		
FCC Part 15, Subpart B, Class A	Compliant		

**4. Repeatability**



**Fig. 2 Repeatability of the four tuner states (256 trials).**

**5. Revision notes**

- June 14, 2019: Added interface specifications between the controller and the RF part.
- July 8, 2019: Updated product photo.