STAR Cryoelectronics

MS-OSC User's Manual

Mr. SQUID 44 GHz Oscillator

STAR Cryoelectronics

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Santa Fe, NM 87508
U. S. A.

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Revision Record		
Date	**Revision**	**Description**
December 15, 2010	1.0.0	Initial Release

TECHNICAL SUPPORT

If you have any questions or comments about this product or other products from STAR Cryoelectronics, please contact:

STAR Cryoelectronics

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Technical Support:

Tel.: (505) 424-6454
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WARRANTY

STAR Cryoelectronics Limited Warranty

STAR Cryoelectronics warrants this product for a period of twelve (12) months from date of original shipment to the customer. Any part found to be defective in material or workmanship during the warranty period will be repaired or replaced without charge to the owner. Prior to returning the instrument for repair, authorization must be obtained from STAR Cryoelectronics or an authorized STAR Cryoelectronics service agent. All repairs will be warranted for only the remaining portion of the original warranty, plus the time between receipt of the instrument at STAR Cryoelectronics and its return to the owner.

This warranty is limited to STAR Cryoelectronics products that are purchased directly from STAR Cryoelectronics, its OEM suppliers, or its authorized sales representatives. It does not apply to damage caused by accident, misuse, fire, flood or acts of God, or from failure to properly install, operate, or maintain the product in accordance with the printed instructions provided.

This warranty is in lieu of any other warranties, expressed or implied, including merchantability or fitness for purpose, which are expressly excluded. The owner agrees that STAR Cryoelectronics' liability with respect to this product shall be as set forth in this warranty, and incidental or consequential damages are expressly excluded.

SAFETY PRECAUTIONS

Do not remove product covers or panels.

Do not operate without all covers and panels in place.

Do not attempt to repair, adjust, or modify the instrument. This could cause nullification of any warranty. For service, return the instrument to STAR Cryoelectronics or any authorized representative.

Do not operate this instrument in a volatile environment, such as in the presence of any flammable gases or fumes.

Do not leave power applied to the oscillator unnecessarily; the oscillator should be powered on to record the Shapiro step positions and then powered off.

1 Overview

The Model MS-OSC Mr. SQUID Oscillator accessory for STAR Cryoelectronics' Mr. SQUID Educational Demonstration System is a 44 GHz microwave oscillator for the Mr. SQUID Shapiro step experiment. The Mr. SQUID Oscillator accessory is compatible with all STAR Cryoelectronics' Mr. SQUID probes and MS-EB03 control electronics.

The Mr. SQUID Oscillator is powered using the DC power source provided with the Mr. SQUID control electronics box. A 5-pin DIN cable included with the Oscillator accessory is used to power the Mr. SQUID electronics box through the Oscillator box. A coaxial cable with 1/4-wave antenna is included to couple the 44 GHz microwave signal to Mr. SQUID.

1.1 Unpacking and Inspection

Prior to unpacking the Mr. SQUID Oscillator, inspect the shipping carton(s) for any signs of damage that may have occurred during shipment. If damage is observed, notify the carrier immediately to allow for a possible insurance claim.

The following sections list the items included with the Mr. SQUID Oscillator. If any items are missing, notify your STAR Cryoelectronics representative immediately.

MS-OSC	Mr. SQUID 44 GHz Oscillator.
CBL-SS405-13SW-13SW-36	Flex cable, 2.92 mm straight plug each end, 36".
CBL-1020-05SF	Antenna, installed on flex cable.
CBL-5DIN-24	Power cable, five-pin DIN plugs both ends, 24".

1.2 Additional Equipment Required

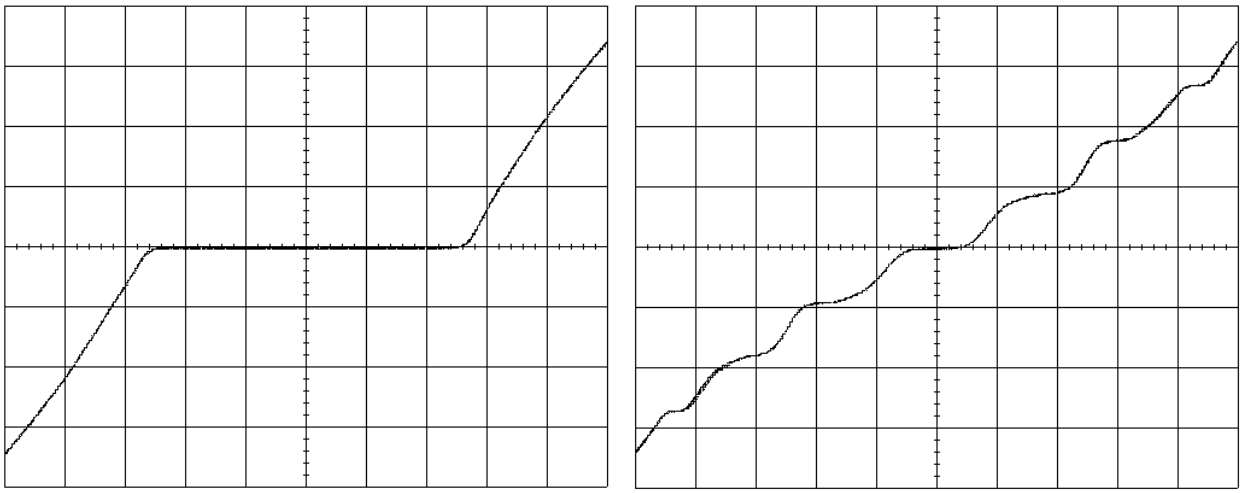
The MS-OSC oscillator is intended for operation together with STAR Cryoelectronics' MS-EB03 Mr. SQUID electronics box and Mr. SQUID Educational Demonstration System.

2 Operation

To set up the Shapiro step experiment, the Mr. SQUID voltage-current (*V-I*) characteristic is displayed using an oscilloscope or data acquisition unit, then the microwave power can be turned on using a switch on the front panel of the Oscillator box. The step positions on the *V-I* characteristic can then be recorded. To revert back to the original *V-I* characteristic, simply switch off the power to the Oscillator box

1. Check that the output coaxial cable and ¼ wavelength antenna is securely connected to the output connector on the front panel of the MS-OSC oscillator. This cable must be connected before powering up the MS-OSC unit to prevent damage to the oscillator.
2. Set up the Mr. SQUID system as described in Sec. 3 or Sec. 4 of the Mr. SQUID User's Guide, except use the five-pin DIN cable to connect the Power Out jack on the rear panel of the MS-OSC oscillator to the power in jack on the rear panel of the MS-EB03 control electronics box.
3. Check that the power switches on the MS-EB03 control electronics and MS-OSC oscillator are in the OFF position.

4. Turn on the MS-EB03 control electronics and adjust so that the Mr. SQUID *V-I* characteristic is visible on the oscilloscope or data acquisition device as described in the Mr. SQUID User's Guide.
5. Insert the ¼-wav antenna into the slot in the foam cap that covers the top of the Mr. SQUID dewar. It is not generally necessary that the antenna protrude through the cap, it just needs to be held firmly in place.
6. Turn on the MS-OSC oscillator, and adjust the scale settings on the display device to see one or more steps in the Mr. SQUID *V-I* characteristic. Note the positions of these steps as described in Sec. 7.4 of the Mr. SQUID User's Guide to determine the value of *h/e*.
7. Turn off the MS-OSC oscillator; the steps in the *V-I* characteristic should disappear.



Mr. SQUID® *V-I* curves without (left) and with (right) 44 GHz microwave signal provided by STAR Cryoelectronics' Model MS-OSC oscillator (50 µA/div horizontal, 100 µV/div vertical).

3 Specifications

Parameter	Value
Oscillator	44 GHz Gunn diode
Output Connector	2.92 mm (F) connector
Power Requirements	±12, +5 V DC
Size	5.40" × 4.18" × 1.33" (137 × 106 × 34 mm)
Weight	8.8 oz (249 g)

Specifications subject to change without prior notice.