



82407/NB/A/QA/B/C/D
Frequency Extending Module
User Manual

China Electronics Technology Instruments Co., Ltd

Foreword

Thank you for choosing the 82407 series frequency extension module produced by China Electronics Technology Instruments Co., Ltd (CETI). This product is high-end, precise, sophisticated and excellent, and embraces a high cost performance compared with competitors of the same class. This product is produced adhering to the ISO9000 standards and the principle of "Customer is God and Quality is Life"... Please carefully read this manual for your convenience. We are devoted to providing for you high-quality products and first-class after-sales service with your most concerns and demands in mind. Following the consistent tenet of "High Quality and Considerable Service", we are committed to provide for our customers satisfactory products and services, and sincerely hope that we will bring convenience to your work. For any questions, please contact us:

Tel.	+86-0532-86896691
Website	www.ceyear.com
Email	sales@ceyear.com
Address:	No. 98 Xiang Jiang Road, Huangdao District, Qingdao City, China
Postal code	266555

This manual introduces the applications, performance & features, basic principle, operation method, and maintenance and precautions of the 82407/NB/A/QA/B/C/D extension modules, which is intended to help you be familiar with and master the operation methods and key points of the controller as soon as possible. Please carefully read this manual to use this product in a better way and create higher economic benefits.

However, due to time constraints and limitations of the author, the manual may be subject to errors or deficiencies. We sincerely welcome your corrections! We apologize for any inconvenience caused by our mistake in our work.



Statement:

This manual is the second version of the 82407/NB/A/QA/B/C/D Frequency Extending Module User Manual, with the version number of A.2.

This manual may be subject to change without notice. China Electronics Technology Instruments Co., Ltd reserves right of final interpretation of the content and the terms of this manual.

This manual is the property of CETI. Without our permission, any organizations or individuals shall neither alter/temper nor duplicate/transmit this manual for profits; otherwise, CETI reserves the right to pursue any liabilities therefrom.

Author
May 23, 2018

Table of Contents

User Manual	错
误!未定义书签。	
Chapter I Overview	1
1 Overview	1
2 Product compositions	2
3 Precautions	2
Part I Operation Instructions	4
Chapter II Operation Instructions and Operation Methods	5
Section I Structure and description of the frequency extension module	5
1 Product appearance	5
2 Introduction to the structure	5
Section II Operation instructions of the frequency extension module	7
Section III Operation methods of the frequency extension module	7
1 Connection	7
2 Test	7
Part II Technical Specification	9
Chapter III Main Technical Indexes and Working Principles	10
Section I Main technical indicators and environmental conditions	10
Section II Working principles of the frequency extension module	12
Part III Maintenance Instructions	13
Chapter IV Maintenance and Troubleshooting Methods of the Frequency Extending Module ..	14
1 Maintenance of the 82407 series frequency extension module	14
2 General troubleshooting	14
3 After-sales service	14

Chapter I Overview

1 Overview

This manual is applicable to the 82407/NB/A/QA/B/C/D frequency extension module (hereinafter referred to as the frequency extension module). The frequency extension module is mainly used for testing frequency extension of signal/spectrum analyzer, and it can realize the spectrum parameter test of 50 GHz~325 GHz signal spectrums by frequency band. The module shall be kept clean and avoided from strong vibration or impact during use.

The 82407 series frequency extension module includes 82407, 82407NB, 82407A, 82407QA, 82407B, 82407C and 82407D products. The model description is as shown in Table 1.

Table 1-1 Model Description of the 82407 Series Frequency Extending Module

No.	Model	Description
1	82407	Frequency range: 50 GHz~75 GHz; Number of harmonics: 5; Frequency conversion loss (maximum value): 24 dB; Displayed average noise level (4051 host, H40 option, maximum value): -132 dBm/Hz; RF maximum input power: 20 dBm; 1 dB compression point of RF input (typical value): -5 dBm; RF input interface: WR15 standard rectangular waveguide.
2	82407NB	Frequency range: 60GHz~90GHz; Number of harmonics: 6; Frequency conversion loss (maximum value): 26dB; Displayed average noise level (4051 host, H40 option, maximum value): -132 dBm/Hz; RF maximum input power: 20 dBm; 1 dB compression point of RF input (typical value): -5 dBm; RF input interface: WR12 standard rectangular waveguide.
3	82407A	Frequency range: 75GHz~110GHz; Number of harmonics: 7; Frequency conversion loss (maximum value): 28dB; Displayed average noise level (4051 host, H40 option, maximum value): -130 dBm/Hz; RF maximum input power: 20 dBm; 1 dB compression point of RF input (typical value): -5 dBm; RF input interface: WR10 standard rectangular waveguide.
4	82407QA	Frequency range: 90GHz~140GHz; Number of harmonics: 8; Frequency conversion loss (maximum value): 32dB; Displayed average noise level (4051 host, H40 option, maximum value): -126 dBm/Hz; RF maximum input power: 20 dBm; 1 dB compression point of RF input (typical value): -5 dBm; RF input interface: WR08 standard rectangular waveguide.
5	82407B	Frequency range: 110GHz~170GHz; Number of harmonics: 9; Frequency conversion loss (maximum value): 36dB; Displayed average noise level (4051 host, H40 option, maximum value): -120 dBm/Hz; RF maximum input power: 20 dBm;

		1 dB compression point of RF input (typical value): -5 dBm; RF input interface: WR06 standard rectangular waveguide.
6	82407C	Frequency range: 170GHz~220GHz; Number of harmonics: 7; Frequency conversion loss (maximum value): 40dB; Displayed average noise level (4051 host, H40 option, maximum value): -115 dBm/Hz; RF maximum input power: 20 dBm; 1 dB compression point of RF input (typical value): -5 dBm; RF input interface: WR05 standard rectangular waveguide.
7	82407D	Frequency range: 220GHz~325GHz; Number of harmonics: 9; Frequency conversion loss (maximum value): 46dB; Displayed average noise level (4051 host, H40 option, maximum value): -110 dBm/Hz; RF maximum input power: 20 dBm; 1 dB compression point of RF input (typical value): -5 dBm; RF input interface: WR05 standard rectangular waveguide.

2 Product compositions

The basic compositions of the 82407 product name are as shown in Table 1-2.

Table 1-2 Standard Configuration of the 82407 Series Frequency Extending Module

No.	Name	Quantity	Remarks
1	82407 series frequency extension module	1	Host
2	USB2.0 cable assembly	1	Accessories
3	82407-H01 2.4 mm RF cable	1	Accessories
4	82407-H02 SMA RF cable	1	Accessories

3 Precautions

Rational utilization and cautious management of the 82407 series frequency extension module can keep its performance index for a long time and extend its service life. Please pay attention to followings during use:

The static electricity is destructive to electronic components and equipment. Generally, we will use two anti-static measures, including combination of conductive table mat and wrist combination as well as combination of conductive floor mat and ankle. If these two combinations are used together, a good anti-static protection can be provided. If the combination is used separately, only the former can provide protection. In order to ensure user's safety, anti-static parts shall provide at least 1MΩ isolation resistance to ground.

The coaxial connector of the frequency extension module and the internal conductor of the USB connector are directly connected with the internal electronic components, please be careful of static prevention. Otherwise, the frequency extension module will be permanently damaged!

This manual includes four chapters:

The Chapter I introduces the characteristics, application, basic compositions and precautions of the 82407 series frequency extension module.

The Chapter II introduces the operation instructions and methods of the 82407 series frequency extension module.

The Chapter III introduces the main technical indicators and working principles of the 82407 series frequency extension module.

The Chapter IV introduces the maintenance and simple repair methods of the 82407 series frequency extension module.

We hope that we can make your work convenient and quick and create higher benefits. We sincerely welcome to contact us.

Part I Operation Instructions

Chapter II Operation Instructions and Operation Methods

Section I Structure and description of the frequency extension module

1 Product appearance

The appearance of the 82407 series frequency extension module is as shown in Figure 2-1.



Figure 2-1 Photos of the 82407 Series Frequency Extending Module

2 Introduction to the structure

The frequency extension module has a modular structure, which has small size and light weight. It can flexibly change the placement angle and realize the overturn, thus facilitating interconnection with other test instruments or parts.

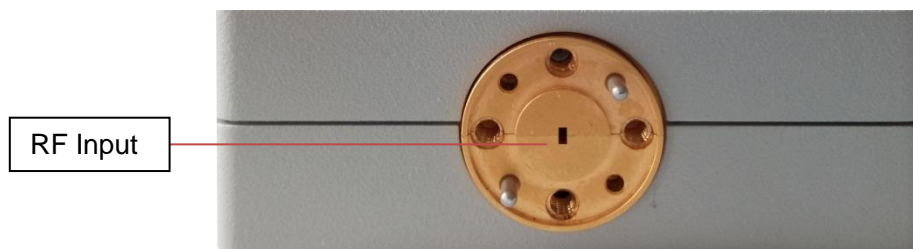


Figure 2-2 Front Panel of the 82407 Series Frequency Extending Module



Figure 2-3 Rear Panel of the 82407 Series Frequency Extending Module

2.1 RF input interface

It is used for RF signal to input the frequency extension module, which is a standard rectangular waveguide port and is connected with the DUT port.

2.2 Local oscillator input interface

It is used for local oscillator signal to input the frequency extension module, which is a 2.4 mm female coaxial interface and is connected with the local oscillator output port of the spectrum analyzer host.

2.3 Intermediate frequency output interface

It is used for intermediate frequency signal to output of the frequency extension module, which is a SMA female coaxial interface and is connected with the intermediate frequency input port of the spectrum analyzer host.

2.4 USB2.0 interface

It is used to connect to the host by the frequency extension module with USB cable.

Section II Operation instructions of the frequency extension module

After a period of use, the frequency extension module port shall be cleaned. Please operate according to the following steps:

- a) Turn off the spectrum analyzer host.
- b) Remove the connection and control cable.
- c) Dip a piece of clean and soft cotton cloth into the alcohol, and gently wipe off the USB, local oscillator, intermediate frequency port and RF waveguide flange with it.
- d) After that, wipe off the USB, local oscillator, intermediate frequency port and RF waveguide flange with a piece of clean and soft cotton cloth, and there shall be no residuals inside.
- e) Connect cables after the cleaning agent is dried.

Section III Operation methods of the frequency extension module

1 Connection

The 82407 series frequency extension module shall be connected with the 4051 series spectrum analyzer for use according to the following steps:

- 1) Connect the [LO IN] port of the frequency extension module with the [LO OUT] on the spectrum analyzer host panel with 2.4 mm RF cable;
- 2) Connect the frequency extension module and the [IF OUT] port with the [IF IN] on the spectrum analyzer host panel with SMA RF cable;
- 3) Insert one end of the USB cable into the USB interface of the frequency extension module, and connect the other end with the USB interface of the spectrum analyzer host. The spectrum analyzer host will automatically identify the frequency extension module, set the spectrum analyzer frequency range to the corresponding working frequency range of the frequency extension module, automatically read and compensate the frequency conversion loss data of the frequency extension module, and connect the frequency extension module of the spectrum analyzer with the host.

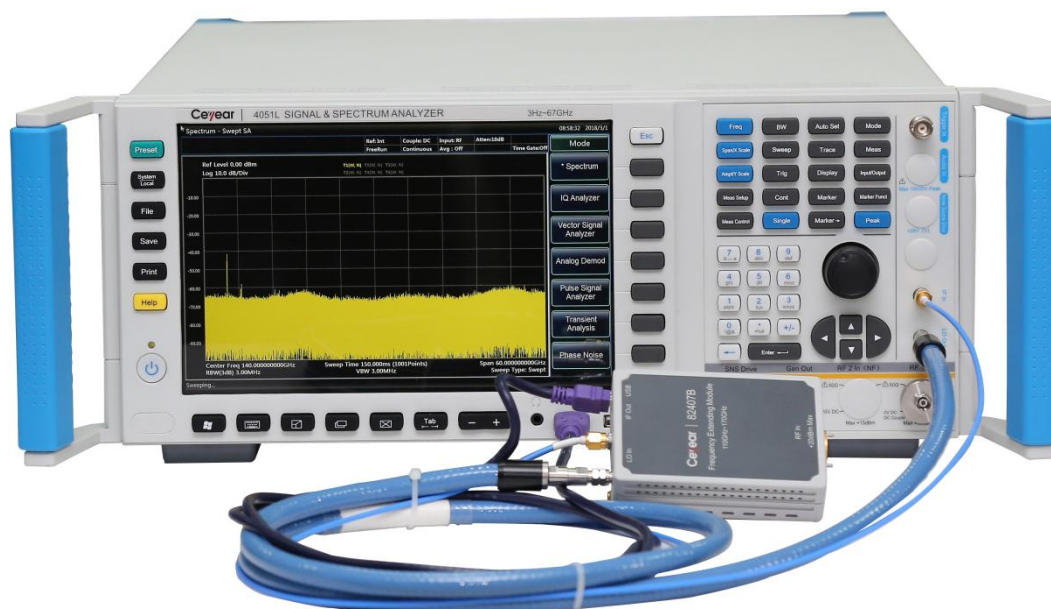


Figure 3-1 Interconnection of the Frequency Extending Module and the Host

2 Test

During the test, connect the waveguide port of the frequency extension module with the tested part or the tested port of the instrument, and then press down [Input/Output] key on the panel of the spectrum

analyzer host, and find and click [Signal Identify On/Off] menu and activate the “Signal Identification” function. The measured signal can be found and its frequency and power information can be read with mark functions of the spectrum analyzer.

In order to accurately measure the measured signal power, please disable the “Signal Identification” function, set the host screen to only display the measured frequency, and the accurate power information of the measured frequency signal can be obtained with the “Peak Value Search” function.

When the signal power is higher than +20 dBm (100 mW), it is not recommended to carry out measurement directly with the frequency extension module of the spectrometer, otherwise, the frequency extension module will be damaged!



**Please
note that:**

The power of the measured signal shall not be higher than +20 dBm (100 mW), otherwise, its index will be degraded even though the frequency extension module of the spectrum analyzer is not burnt.

Part II Technical Specifications

Chapter III Main Technical Indexes and Working Principles

Section I Main technical indicators and environmental conditions

1 Environmental conditions for operation

Requirements of environmental conditions for operation of the 82407 series frequency extension module:

- a) Working temperature: 0°C~+40°C
- c) Working humidity: Lower than 95%RH (no condensation)
- d) Storage temperature: -40°C~+70°C;
- e) Storage humidity: No condensation

For details of requirements of working, storage environment and working power supply of the frequency extension module, please refer to descriptions of technical parameters in Chapter III. Before the frequency extension module is connected with the machine, please ensure that the matched power voltage is supplied to the frequency extension module and all safety measures are applied.

Do not use the frequency extension module in flammable and explosive environment

Do not use the frequency extension module in the environment containing combustible gas or smoke.

Do not remove or install any parts of the frequency extension module without permission

Please do not remove or install any parts of the frequency extension module without permission. The part replacement and internal adjustment can only be carried out by China Electronics Technology Instruments Co., Ltd (CETI) or its authorized maintenance personnel.



Attention:

The following general safety measures shall be applied at any stage of the module. Failure to apply these safety measures or observe the warnings and precautions specified in this manual will lead to violation of the safety standards for the design, manufacturing and use of the fusion splicer. China Electronics Technology Instruments Co., Ltd (CETI) will not be responsible for the consequences caused by users' violation of these requirements!

2 Functional characteristics

While connection to the spectrum analyzer host, it will automatically identify the frequency extension module, set the spectrum analyzer frequency range to the corresponding working frequency range of the frequency extension module, automatically read and compensate the frequency conversion loss data of the frequency extension module, and connect the frequency extension module of the spectrum analyzer with the host.

3 Main technical indicators

Table 3-1 Main Technical Indexes of the 82407 Series Frequency Extending Module

Technical indicators	82407	82407NB	82407A	82407QA	82407B	82407C	82407D
Frequency range (GHz)	50~75	60~90	75~110	90~140	110~170	170~220	220~325
RF input interface (Waveguide port/flange)	WR15/ UG385U-M	WR12/ UG387U	WR10/ UG387U-M	WR8/ UG387U-M	WR6/ UG387 U-M	WR5/ UG387 U-M	WR3/ UG387U-M
Number of harmonics	5	6	7	8	9	7	9
Frequency conversion loss	24	26	28	32	36	40	46

(maximum, dB)							
Average noise level (dBm/Hz, maximum)	-132	-132	-130	-125	-120	-115	-110
1 dB compression point of RF input (dBm, typical value)	-5	-5	-5	-5	-5	-5	-5
Local oscillator power range (dBm)	8~12	8~12	8~12	8~12	8~12	8~12	8~12
RF maximum input power (dBm)	20	20	20	20	20	20	20



Warning:

- 1) If the input power of the RF signal is higher than +20 dBm, the frequency extension module may be permanently damaged!
- 2) The coaxial connector of the frequency extension module and the internal conductor of the USB connector are directly connected with the internal electronic components, please be careful of static prevention! Otherwise, the frequency extension module will be permanently damaged

4 Dimensions and weight

Table 3-2 Main Tactical Indicators of the 82407 Series Frequency Extending Module

Power consumption	≤5 W;
Temperature range	Working temperature: 0°C~50°C; Storage temperature: -40°C~+70°C;
Dimensions (W×H×D)	82407/A/B/C/D: 72 mm×26 mm×112 mm;
Interface form	RF interface: Standard rectangular waveguide port; Intermediate frequency interface: SMA (female), 50Ω; Local oscillator interface: 2.4 mm coaxial (female), 50Ω; Communication interface: Mini USB (female, USB2.0);
Weight	≤350 g.

5 Accessories

Table 3-3 Accessories of the 82407 Series Frequency Extending Module

No.	Name	Function
1	2.4 mm RF cable	It is used to connect the local oscillator output port of the host with the local oscillator input port of the frequency extension module
2	SMA RF cable	It is used to connect the intermediate frequency input port of the host with the intermediate frequency output port of the frequency extension module
3	USB2.0 component cable	It is used to connect the host with the USB port of the frequency extension module

Section II Working principles of the frequency extension module

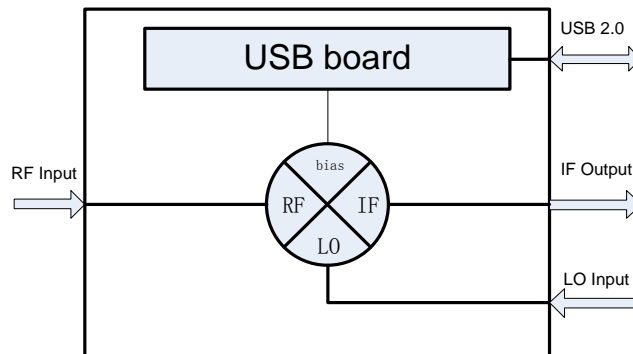


Figure 3-1 Principle Block Diagram of the Frequency Extending Module

The 82407 series frequency extension module will convert the high frequency millimeter-wave signal to the intermediate frequency signal through the millimeter-wave harmonic mixer, and save the frequency range and frequency conversion loss data of the frequency extension module through the USB interface control board, so as to facilitate the spectrum analyzer host to read data, as shown in Figure 3-1.

Part III Maintenance Instructions

Chapter IV Maintenance and Troubleshooting Methods of the Frequency Extending Module

1 Maintenance of the 82407 series frequency extension module

1.1 Pay attention to dust prevention and dust removal

The RF input waveguide interface, local oscillator and intermediate frequency coaxial connector and USB2.0 interface shall be kept clean, and shall be covered by dust cover when not used.

1.2 Prevent strong impact or vibration

When the frequency extension module shall be moved or transported, it shall be handled gently. In addition, the module shall be placed into the carrying case and the transportation box during long distance transportation.

1.3 Storage

When it is not used for a long time, it shall be connected with the spectrum analyzer host and powered on at least once half a year. It shall be frequently started in high humidity season, and desiccant shall be placed in the packaging box to prevent mildew of the internal devices.

1.4 Precautions during use

- a) When it is interconnected with the host, connect the local oscillator output end of the frequency extension module with the local oscillator input end of the host with 2.4 mm RF cable, and then connect the intermediate frequency output end of the module with the intermediate frequency input end of the host with SMA RF cable, and finally connect the module with the host USB port with USB cable;
- b) During use of the frequency extension module, the gap between the RF input waveguide interface and the measured port shall be small as much as possible;
- c) When the frequency extension module is connected with the host, the coaxial connector and conductor in the USB connector shall not be touched by hand directly, otherwise, internal electronic components may be destroyed and the frequency extension module will be damaged due to static electricity carried by the human body!

2 General troubleshooting

Table 4-1 gives the general troubleshooting method. Please contact the manufacturer directly when problems can't be solved.

Table 4-1 Common Fault and Troubleshooting Method

Abnormality	Cause and troubleshooting method
The difference between the measured power and the test value of the power meter is obvious	The RF input power is higher than the 1 dB compression point of the RF input of the frequency extension module. The attenuator can be added at the RF input end of the frequency extension module to make the input power of the frequency extension module lower than the 1 dB compression point of the RF input.
There is no test power in the whole frequency band	Disconnect the frequency extension module interconnection from the host, and measure the barrier value between the inter and the outer conductivity of the intermediate frequency port forwards and backwards. If any measured value is beyond 0.7 V~0.8 V range, it can be deemed that the frequency extension module is damaged, and it shall be returned for maintenance.

3 After-sales service

Generally, the problems come from hardware, software or improper use of users. If there is any problem, please contact us timely. If the frequency extension module you purchased is still within the warranty, we will repair your frequency extension module free of charge according to the commitment in the warranty certificate. If it is beyond the warranty, we will only collect the cost. However, if the following conditions

occur, the module will not be covered by the free-of-charge warranty.

- Fault or damage caused by force majeure such as natural disasters.
- Damage or performance degradation of the frequency extension module due to human factors such as failure to observe steps specified in the specification.
- The frequency extension module can only be repaired by China Electronics Technology Instruments Co., Ltd (CETI) or its authorized repair unit. It is illegal for the unit or individual to remove, install or repair the fusion splicer without our authorization, and the fusion splicer will not be covered by warranty, and China Electronics Technology Instruments Co., Ltd (CETI) will reserve the right to pursue legal responsibilities against the infringer.
- When the frequency extension module shall be returned due to repair or maintenance, please place the fusion splicer into the carrying case and use the original packaging for transportation. If the fusion splicer is damaged due to improper packaging during return, it will not be covered by warranty.

No part within the frequency extension module can be repaired by the users. If there is any fault, please it return to us for repair, and contact with our service consultation center according to the contact information specified in the foreword. And please send the detailed data of the fault and error information of the instrument or the copy of the test report of the instrument with the original packing case to us.



Instructions:

China Electronics Technology Instruments Co., Ltd (CETI) reserves the right to change the design and structure of the frequency extending module at any time, but it has no obligation and responsibility to make the corresponding free-of-charge improvement or replacement of the sold product
