S1131 Signal Generator

User Manual

Saluki Technology Inc.

The manual applies to the signal generator of the following models:

- S1131 Signal Generator (100kHz-3GHz).

Standard Accessories of S1131 Signal Generator:

Item	Name	Qty
1	Main Machine	1 Set
2	Power Cord	1 pcs
3	CD	1 pcs

Preface

Thanks for choosing S1131 Signal Generator produced by Saluki Technology Inc. Please read this manual carefully for your convenience.

Manual No.

S1131-03-01

Version

Rev01 2017.03 Saluki Technology

Manual Authorization

The information contained in this Manual is subject to change without notice. The power to interpret the contents of and terms used in this Manual rests with Saluki.

Product Quality Assurance

The warranty period of the product is 18 months from the date of delivery.

Product Quality Certificate

The product meets the indicator requirements of the manual at the time of delivery. Calibration and measurement are completed by the measuring organization with qualifications specified by the state, and relevant data are provided for reference.

Quality/Environment Management

Research, development, manufacturing and testing of the product comply with the requirements of the quality and environmental management system.

Precautions

Warning

"Warning" indicates danger. It reminds the user to pay attention to a certain operation process, operation method or similar situations. Noncompliance with the rules or improper operation may result in personal injuries. You must fully understand the warning and all the conditions in it shall be met before the next step

Attention

"Attention" indicates important prompts and no danger. It reminds the user to pay attention to a certain operation process, operation method or similar situations. Noncompliance with the rules or improper operation may result in damage to the instrument or loss of important data. You must fully understand the caution and all the conditions in it shall be met before the next step.

Contacts

Service Tel:	886.2.2175 2930
Website:	www.salukitec.com
Email:	info@salukitec.com
Address:	No. 367 Fuxing N Road, Taipei 105， Taiwan (R.O.C.)

Content

1 Overview

1.1 Brief Introduction

S1131 is an economic signal generator for 3GHz span. It has good specification and multiple functions within a good looking small box. S1131 provide analog modulation and digital modulation as standard functions and is a good solution for RF R&D, test, maintenance and education.

1.2 Key Feature

- Frequency range
  - S1131: 100kHz – 3.0GHz
- Multi sweep mode, Step sweep, list sweep, frequency sweep and power sweep
- Standard low frequency output function, sine, square, triangle and saw tooth wave forms are supported
- Standard analog modulation functions, AM, FM, PM and Pulse modulation.
- Standard digital modulation functions, 2ASK, 2,4,8FSK, 2,4,8PSK supported.
- Standard IF input port
- SCPI supported.

2 Safety Instructions

Please read safety instruction carefully and Strictly follow!

Saluki spares no efforts to ensure that production process comply with latest safety standards so as to safeguard the safety of our users. The design and tests of our products and accessory equipment comply with relevant safety standards. We have established quality assurance system so that we can better supervise product quality and ensure that all products accord with standards in the system. To maintain the sound state of equipment and ensure safe operation, please comply with the following instruction. Please feel free to contact us with any questions.

It is also customer's responsibility to use this product in correct manner. Suitable for industrial, laboratory and education, this equipment, however, must be used in correct manner so as to prevent personal injuries and property damages. For problems caused by misuses, liabilities rest on users. By proper use, it means that users should use this product according to prescriptions in the product document and in the required conditions. As sufficient expertise is required, only professional technicians and people that have been strictly trained and have mastered necessary skills are qualified to use this product. Please keep safety manual and product document in a proper manner, and deliver them to the end user. To forestall personal injuries and property loss, please abide by these safety instructions. Prior to using this product, please read carefully and comply with these instructions accordingly.

2.1 Device safety

1) Use designated packing container in shipping and avoid falling or violent collisions in moving, which may cause damages to the device.
2) Use AC-DC adapter/ power cord shipped with the device to supply power/charge to the product. Using other power adapters/power cord may cause damages to internal hardware.
3) Ensure that power supply is well connected to the ground to prevent damages to the device caused by poor connection or false connection.
4) Injection of DC signal into input end is prohibited. Signal power needs to be lower than 0.5W. If not, damage to the device may occur.
5) Both insertions of objects into the gap of the device housing and dumping of liquids over device housing or into device are prohibited, which may cause short circuit, electric shock, fire or personal injuries.
6) Notches or gaps in the device, designed to help internal ventilation and whereby prevent overheat, must not be covered. The device must not be put on couch, wrapped with carpet, or placed in airtight housing unless ventilation is good
7) This device must not be placed on radiator, dish heater and other heating devices. Ambient temperature must not surpass the maximal temperature prescribed in this manual
8) Attention: Once this device is on fire, it may release toxic gases or liquids.
9) Please do not disassemble the instrument without permission
10) If any unusual phenomenon like smoke, smell, sparkle etc, occurs during start up, operation, please immediately turn off the instrument, cut off the power and contact Saluki.
11) Keep good ventilation and do not block the vent holes on the instrument. Check and clean the vent holes during routine maintenance.
12) Operate and store the instrument in the environment as required. Explosive matters are strictly forbidden
13) Pay more attention to ESD protection. Please use conductive mat and wrist ring during operation

2.2 Precautions on personal safety.

1) When moving the device, use proper tools and move the device softly so as to avoid personal injuries caused by the falling of the device.

2) Device should be proper grounded so as to prevent personal injuries caused by poor or false grounding

3) When cleaning the device, please unplug the device to avoid electric shock. Use dry or moist soft cloth to clean the device. Do not clean the internal of the device.

4) Before using this device, personnel need to be trained. When using the device, concentration is required. Operation by unqualified people may cause personal injuries and property losses.

5) Use of this device when power line is broken is prohibited. Regular check on power line is necessary. Proper measures should be taken to keep power line in good state and prevent stumble and electric shock.

6) Field use of the device when there is lightning is prohibited, which may cause personal injuries and property loss.

3 Brief Instruction

3.1 Unpacking

3.1.1 Model Confirmation

After opening the packing box, you will see the following items:

- S1131 Signal Generator x 1
- Three-wire Power Cord x 1
- CD x 1

Please check the above items against the Purchase Contract and the Packing List. If any problem, please contact Saluki and we will deal with the problem as soon as possible.

3.1.2 Appearance Inspection

Inspect carefully whether the instrument has any damage during transportation. If the instrument has obvious damage, it is strictly forbidden to be powered on. Please contact Saluki and we will repair or exchange it be as soon as possible.

3.1.3 Operating Environment

Refer to the part of environment adaptability in the technical specifications of appendix 1. In addition, pay special attention to the following requirements:

Power supply: 110 – 220V ±15%，50Hz – 60Hz ±5%，20W

Power socket: a three-wire supply socket that must be grounded reliably.

Instrument power cord: packed three-wire power cord

Warning

Before connecting the Signal Generator with the power supply, please carefully verify if the power supply voltage. Otherwise, it is much possible to damage the instrument or even cause personal injuries with wrong power supply.

Warning

To prevent or reduce the possible damage to the internal hardware of the signal generator due to the mutual interference caused by multi equipment through the power supply, especially the peak pulse interference caused by high-power equipment, it is best to use a 220V/110V AC stabilized-voltage power supply to supply power for the signal generator.

Warning

Bad grounding or failure of the power supply may cause damage to the instrument, even personal injury. Before connecting the power supply of signal generator, make sure ground wires of the instrument and its power supply are in good contact.

Use a power socket with protective grounding and do not substitute the protective ground wire with an external cable.

3.1.4 Electrostatic Protection

ESD can damage or destroy electronic components and equipment. Antistatic measures are usually taken to prevent ESD damage: conductive table–mat and wrist–strap combination as well as conductive floor–mat and heel–strap combination. Both types, when used together, provide a significant level of ESD protection. Among the two, only the table–mat and wrist–strap combination provides adequate ESD protection when used alone. To ensure user safety, the static–safe accessories must provide at least 1 MΩ resistance to ground.

Please use the following antistatic measures correctly to reduce the damage of electrostatics:

Ensure all the instruments are grounded correctly to prevent the electrostatics being generated.

Before touch the joint and core wire or do any assembly operation, do wear antistatic wrists or take other antistatic measures.

Warning

The above antistatic measures shall not be taken where the voltage is larger than 500V.

3.1.5 First Power Up

1) Connect the provided power cord instrument end to the power socket on rear panel.
2) Ensure the AC power is compliant to requirement.
3) Check the power switch on rear panel and ensure it is off (“O”)
4) Connect the other end to AC power
5) Turn on the switch on rear panel (“|”)
6) Press the power button on front panel.
7) Screen lighted and the instrument is on.
8) For an accurate measurement, please warm up the signal generator for at least 30min before measurement.

3.2 Routine Maintenance

It is required to check and clean the instrument after a period of use. Please proceed as the following procedures:

1) Shut down.
2) Unplug the power cord.
3) Use a clean and soft cloth with detergent to wipe the keys gently.
4) Wipe up the display with a clean and soft cloth.
5) Check other sides of the instrument and ensure no damage
6) Clean other sides of the instrument with a soft cloth. Please pay attention to the ports and interfaces, do not clean them and avoid any scratches which may impact the measurement in future.
7) Plug in the power cord after the display is dried out.

Attention

There is a layer of Anti Static Coatings (ASC) applied on the surface of the display screen, so never use the cleaner containing fluoride, acidic cleaner or alkali cleaner. Never spray cleaner over the display panel, otherwise the cleaner may seep into and damage the instrument.

4 Front and Rear Panels

4.1 Front Panel

Figure 4-1 S1131 Front Panel

No.	Description	No.	Description
1	USB Port	7	Soft Keys
2	LCD Screen	8	Output function switch keys
3	Function Keys	9	External IF input
4	Number Keys	10	LF Output
5	Knob and navigation keys	11	RF Output
6	Power Button		

4.1.1 Function Keys

Keys	Function
Preset	Preset the instrument to factory default status
FREQ	Frequency settings. Include CW frequency, frequency reference, frequency offset
AMPTD	Amplitude Settings. Include ALC settings, reference amplitude, amplitude deviations and cable loss compensation.
Sweep	Sweep settings. S1131 supports frequency sweep, power sweep, frequency + Power sweep. List sweep and step sweep are supported.
Fctn	All analog and digital modulation settings. LF output seetings
AUX	System settings, include IP address settings, SCPI settings and language.

4.1.2 Input Keys

S1131 has numeric keys, knob and navigation keys to do the input.

4.1.2.1 Knob and navigation keys

- Knob functions:
  - When entering numbers, step up (clockwise) or down (anticlockwise) the instrument parameters as specified;
  - To move the selection bar in the focus area (such as list)
  - When pressed, it has the same function with Enter key.

- Navigation key functions
  - To increase or decrease instrument parameters in steps;
  - To move the selection bar in the table;

4.1.2.2 Numeric Keyboard

- Number 1 – 9

To input number parameters.

- Decimal point

To inset one "." at cursor position.

- "-" key

To change symbols (+,-) of numeric parameters.

4.1.3 Output function switch keys

- Mod On/Off key: when modulation function is enabled in [Fctn] key and all settings are done, user still need to press this MOD key. When MOD key is pressed, the key is lighted green and the output signal is modulated as per the settings. Need to enable the RF on/off key first.
- LF On/Off key: to enable/disable the LF output, when LF output is enabled, the key is lighted green.

- RF On/Off: to enable/disable RF output through the RF Output port. When it is enabled, it is lighted green.

4.1.4 Front Panel Interfaces

4.1.4.1 USB

Use for external storage, U disk.

4.1.4.2 IF IN

IF In port is a 50ohm SMA port.

4.1.4.3 LF Out

LF Out port is a 50ohm SMA port. It is used to output low frequency signals in different waveform.

4.1.4.4 RF Out

RF Out port is a 50ohm N type port. It is the main output port of S1131.

4.2 Rear Panel

Figure 4-2 S1131 Signal Generator Rear Panel

No.	Description	No.	Description
1	AC power plug	5	Fan
2	Power switch	6	USB port
3	10M Reference Input	7	LAN port
4	External Trigger Input	8	RS232 port

4.3 UI

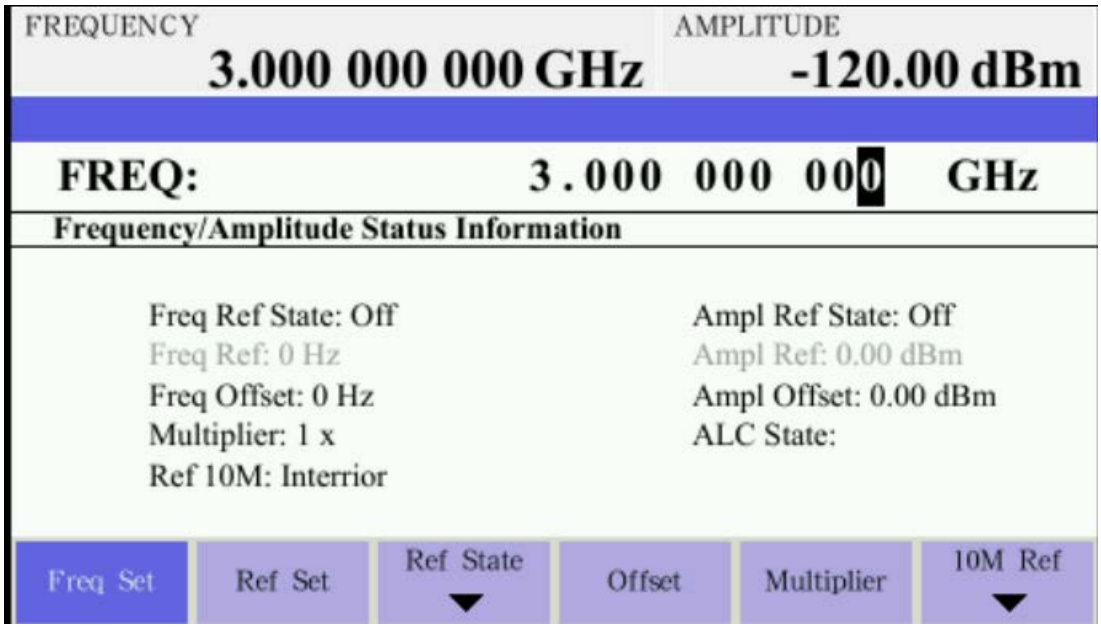


Figure 4-3 S1131 Signal Generator UI

1	Main configuration display
2	Setting input bar
3	Detail setting display
4	Soft menu

5 Typical Operation

This chapter will show how to use S1131 Signal Generator, following functions are included:

- Continuous wave output
- Step sweep output
- List sweep output
- AM signal output
- Digital modulation signal output
- LF internal modulation source output

5.1 Prepare

Press the power button to turn on S1131 signal generator.

This chapter means to show the basic operations of S1131 Signal Generator. Spectrum analyzer is used to simulate the receiver. In this menu, S3331B spectrum analyzer is used for signal analysis. For operation of S3331B please refer to document S3331-03-02 (S3331 series spectrum analyzer user manual).

Warning

Before any test, please ensure damage level of the spectrum analyzer to avoid any damaged.

5.2 Continuous Wave Output

This case will show how to set S1131 signal generator to generate a 100MHz, -10dBm continuous sine signal.

1) Connect S1131 to S3331 via a N type cable.
2) Preset the S1131, S3331
   - Press【PRESET】 key . The instrument will return to default settings.
3) Frequency settings
   - Press 【FREQ】 key..
   - Use number keys, knob or up/down arrow key to set the center frequency to 100MHz
4) Amplitude settings
   - Press【AMPTD】key .
   - Use number keys, knob or up/down arrow key to set amplitude to -10dBm.
5) Press 【RF】to enable the output. The 【RF】lights.
6) Set the S3331 accordingly. Please see following screenshot

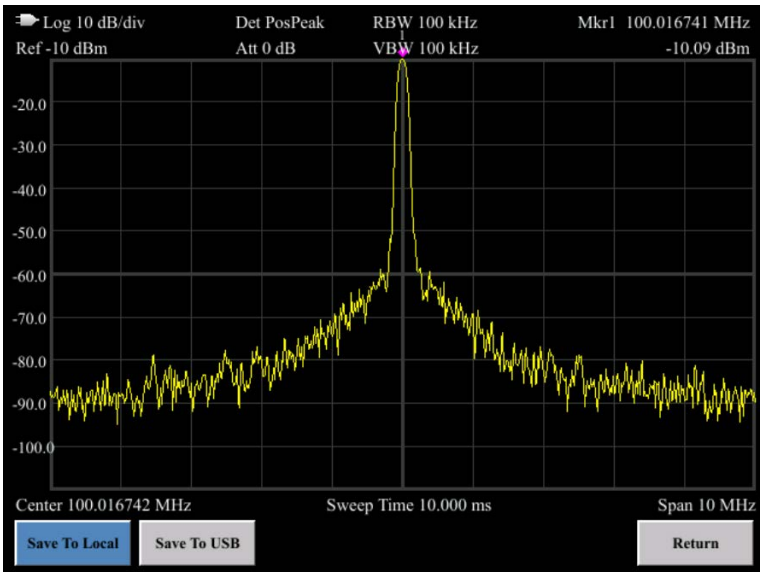


Fig 5-1: Continuous signal Test result

5.3 Step Sweep Output

S1131 supports step sweep function. Step sweep is supported by frequency, amplitude and frequency+amplitude. Following example will show how to set S1131 to enable the step sweep in frequency + amplitude mode.

Connect S1131 to S3331 via a N type cable

1) Preset the S1131, S3331

   ■ Press【PRESET】 key . The instrument will return to default settings.

2) Sweep settings

   ■ Press 【Sweep】 key.

3) Select [SWP Mode], select [Freq&Ampl] in submenu, means frequency+amplitude mode

4) Select [SWP Type]. Select [Step] in submenu, means step sweep

5) Select [SWP Repe], select [Cont] in submenu, means continuous sweep

6) Select [CFG Step], set the [start frequency] to 500MHz, [stop frequency] to 1GHz, [start amplitude] to -30dBm, [stop amplitude] to -10dBm, set the [sweep point] to 50 and [dwell] time to 100ms.

7) Press 【RF】to enable the output. The 【RF】lights. Now S1131 is freq+ampl step sweep mode.

8) Set the S3331 accordingly. Please see following screenshot

5.4 List Sweep Output

S1131 supports list sweep function. User can edit the point freely and create a sweep list. This example creates a 4 point sweep list.

1) Connect S1131 to S3331 via a N type cable

2) Preset the S1131, S3331

   ■ Press【PRESET】 key . The instrument will return to default settings.

3) Sweep settings

   ■ Press 【Sweep】 key.

4) Select [SWP Mode], select [Freq+Ampl] in submenu.

5) Select [SWP Type]. Select [List] in submenu, means list sweep

6) Select [SWP Repe], select [Cont] in submenu, means continuous sweep

7) Select [CFG List], click [Insert Row], add to 4 rows. Click [Goto Row], and enter 1, click [Confirm]. The selection box move to the first row [freq]. Click [Edit Item], Set the [freq] to 500MHz. Then click [Goto Row] again and use the knob to move the selection box to [Ampl], click [Edit Item] and set to -10dBm. Click [Goto Row], use the knob to move the selection box to [Dwell] and set to 50ms.

- Note: Knob can move the selection box when [Goto Row] is selected.

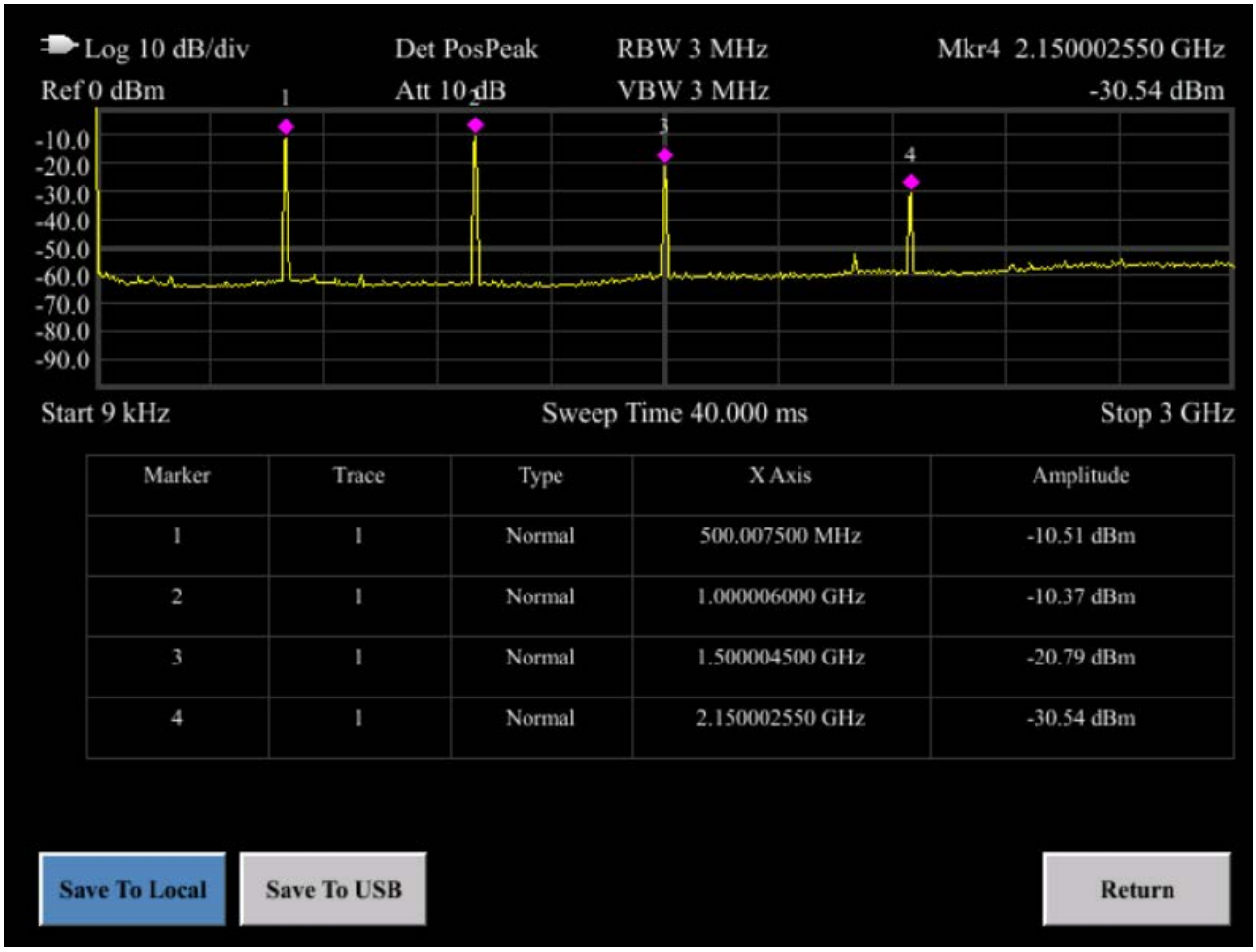
8) Rotate the knob and the selection table will go to row 2. User can also use [Goto Row] to move the conversation box to

row 2.

9) Set parameters in row 2 (1GHz/-10dBm/50ms), row 3 (2GHz/-20dBm/50ms), row 4 (2.15GHz/-30dBm/50ms)

10) Press 【RF】 to enable the output..

11) Set the S3331 accordingly. Please see following screenshot



Marker	Trace	Type	X Axis	Amplitude
1	1	Normal	500.007500 MHz	-10.51 dBm
2	1	Normal	1.000006000 GHz	-10.37 dBm
3	1	Normal	1.500004500 GHz	-20.79 dBm
4	1	Normal	2.150002550 GHz	-30.54 dBm

5.5 Analog Modulation Signal

S1131 supports analog modulation as a standard function, AM, FM, PM, Pulse modulation are supported. This example will show how to set an AM output signal.

1) Connect S1131 to S3331 via a N type cable

2) Preset the S1131, S3331

- Press【PRESET】 key . The instrument will return to default settings.

3) Frequency settings

- Press 【FREQ】 key..
- Use number keys, knob or up/down arrow key to set the center frequency to 100MHz

4) Amplitude settings

- Press【AMPTD】key .
- Use number keys, knob or up/down arrow key to set amplitude to -10dBm.

5) Press 【Fctn】key, click [Analog], then select AM in submenu.

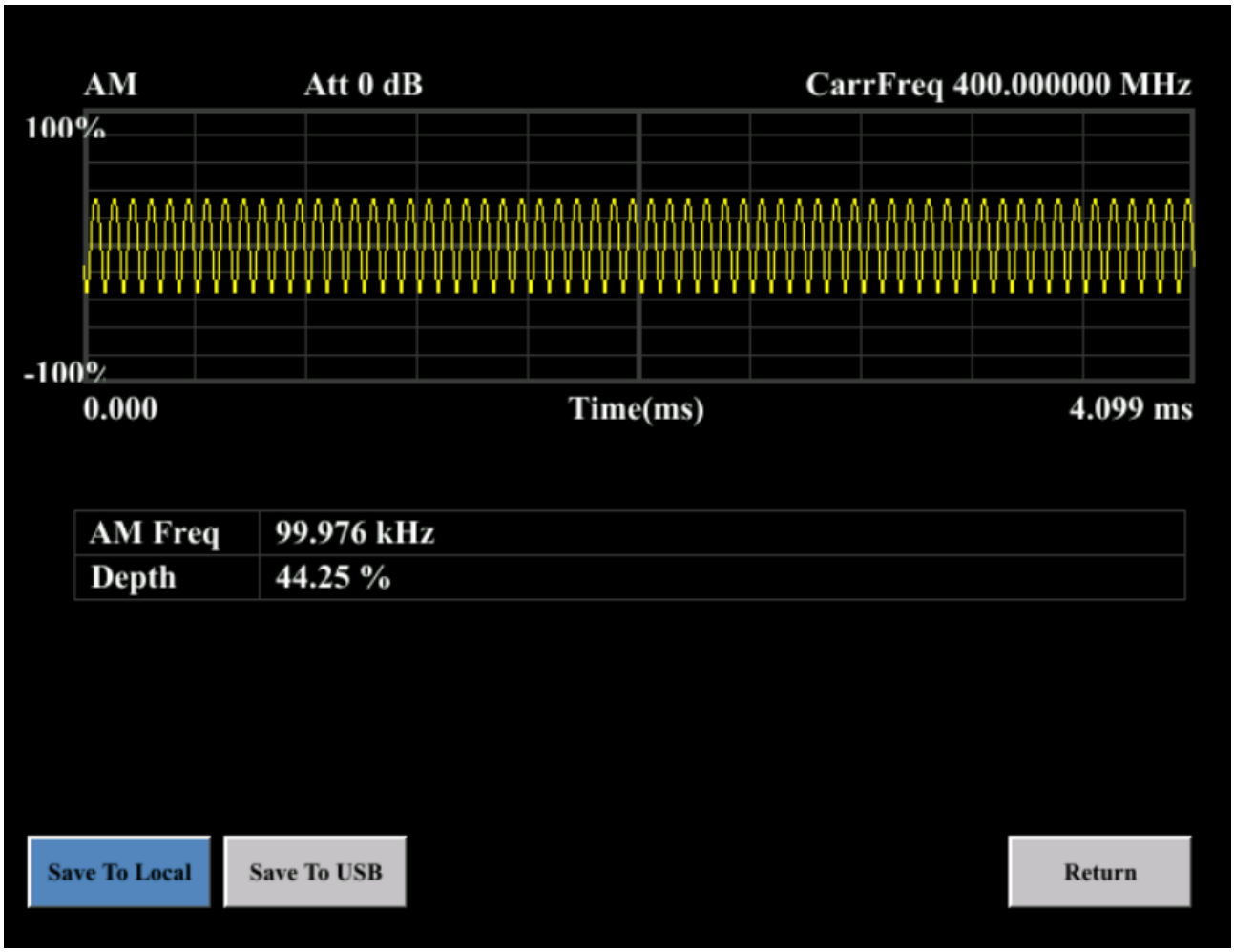
6) Select [State], click [On] to turn on AM modulation function

7) Select [Depth] and enter 50 [%] to set the modulation depth to 50%

8) Select [Rate] and enter 10 [kHz] to set the modulation rate to 10kHz.

9) Press 【RF】to enable the output. Press【MOD】key to enable modulation function.

10) Set the S3331 accordingly (AM demodulation function). Please see following screenshot



5.6 Digital Demodulation Signal

S1131 supports digital modulation as a standard function, following modulations are supported

- 2ASK
- 2FSK, 4FSK, 8FSK
- 2PSK, 4PSK, 8PSK

This example will show how to set an PSK output signal.

1) Preset the S1131

   ■ Press【PRESET】 key . The instrument will return to default settings.

2) Press 【Fctn】key, click [Digital], click [State] to turn [On] the digital modulation function.

3) Select [Type], and choose [PSK], [4PSK]

4) Select [Parameter] and set the [deviation] to 0 and [rate] to 10kHz

5) Press 【RF】to enable the output. Press【MOD】key to enable modulation function.

5.7 LF Output

S1131 support internal modulation source output. Sine, square, triangle and saw tooth waveforms are supported. This example will show how to set a Triangle wave output.

1) Preset the S1131

   ■ Press【PRESET】 key . The instrument will return to default settings.

2) Press 【Fctn】key, click [LF], click [Source] to select [Internal] modulation source output.

3) Select [Triangle]

4) Frequency settings

   ■ Press 【FREQ】 key..

   ■ Use number keys, knob or up/down arrow key to set the center frequency to 10kHz

5) Amplitude settings

   ■ Press【AMPTD】key .

   ■ Use number keys, knob or up/down arrow key to set amplitude to 1Vpp.

6) Press 【LF】to enable the output.

6 Menu Description

This chapter will provide a full function – menu mapping and will give description of each menu option.

6.1 Menu Structure

This section provides the structure of all buttons and soft-keys.

S1131 has following function keys on front panel. Following paragraphs will show the menu structure of these keys.

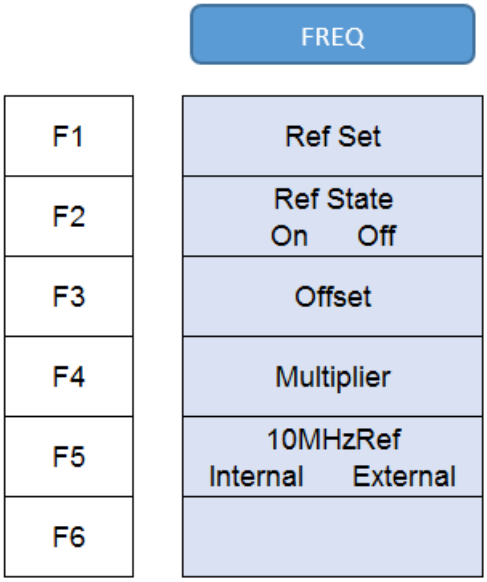
- FREQ
- AMPTD
- Sweep
- Fctn
- AUX

In following paragraphs, F1-F6 are corresponding soft keys to operate the menu shown in the screen. Different menu levels will be shown in different colors.

Level 1	Level 2	Level 3	Level 4

6.2 FREQ

The 【FREQ】 key on the front panel is used to set parameters related to the signal generator frequency, including [Ref Set], [Ref State], [Offset], [Multiplier], [10MHzRef]. Following diagram gives a direct view of the menu structure



- [Ref Set]

Menu description: To set the reference frequency

- [Ref State]

Menu description: To enable/disable reference frequency

- [Offset]

Menu description: to set the frequency offset, for example, set the [Offset] to 500MHz and set the output frequency to 3GHz, the output frequency will be 2.5GHz.

- [Multiplier]

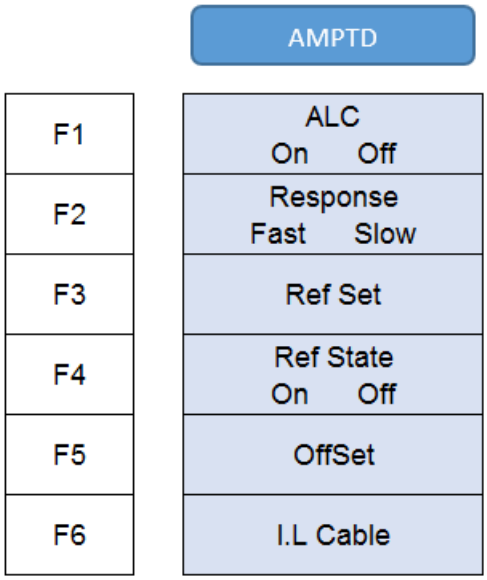
Menu description: to set the frequency multiplier, for example, set the [Multiplier] to 2 and set the output frequency to 3GHz, the final output signal frequency will be 1.5GHz

- [10MHzRef]

Menu description: to switch between internal 10MHz Reference source and external 10MHz source.

6.3 AMPTD

Pop up menus related to parameter setting of Amplitude, including [ALC], [Response], [Ref Set], [Ref State], [Offset] and [I.L Cable]. Please refer to following diagram for the menu structure.



- [ALC]

Menu description: to turn on/off the ALC function, ALC function provides a more stable output.

- [Response]

Menu description: to select the response speed, fast or slow

- [Ref Set]

Menu description: to set the amplitude reference.

- [Ref State]

Menu description: to turn on/off the amplitude reference.

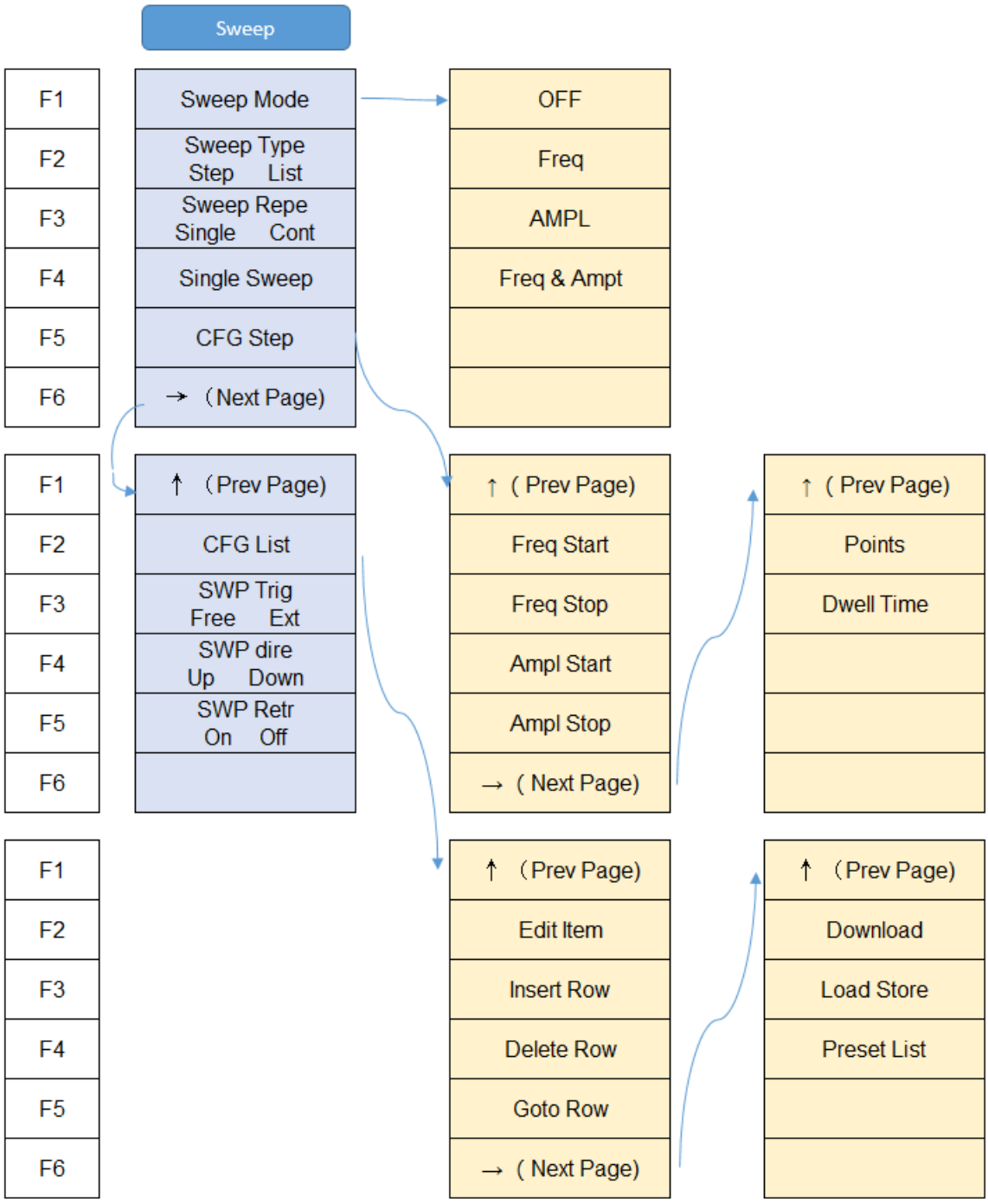
- [Offset]

Menu description: to set the amplitude offset, for example, set the [Offset] to 5dB and set the output amplitude to -5dBm, the output amplitude will be -10dBm..

- [I.L Loss]

Menu description: to set the compensation for cable insertion loss. For example, set [I.L Loss] to 5Db and set the output amplitude to -5dBm, the final output amplitude will be 0dBm.

6.4 Sweep



- [Sweep Mode]

Menu description: Select sweep mode between [Freq], [AMPL] and [Freq & Ampl].

- [Sweep Type]

Menu description: select sweep type, step sweep and list sweep are supported

- [Ref Repe]

Menu description: switch between single sweep and continuous sweep.

- [Single Sweep]

Menu description: when [Single] is selected in [Sweep Repe], [Single Sweep] acts as a trigger. S1131 sweeps each time when [Single Sweep] is clicked.

- [CFG Step]

Menu description: step sweep settings, include start/stop frequency, start/stop amplitude, sweep point and dwell time of each point.

- [CFG List]

Menu description: List sweep settings, user can edit the sweep list, add/delete sweep point. Frequency, amplitude and dwell time of each point can be edited.

- [SWP Trig]

Menu description: Switch between free run and external trigger.

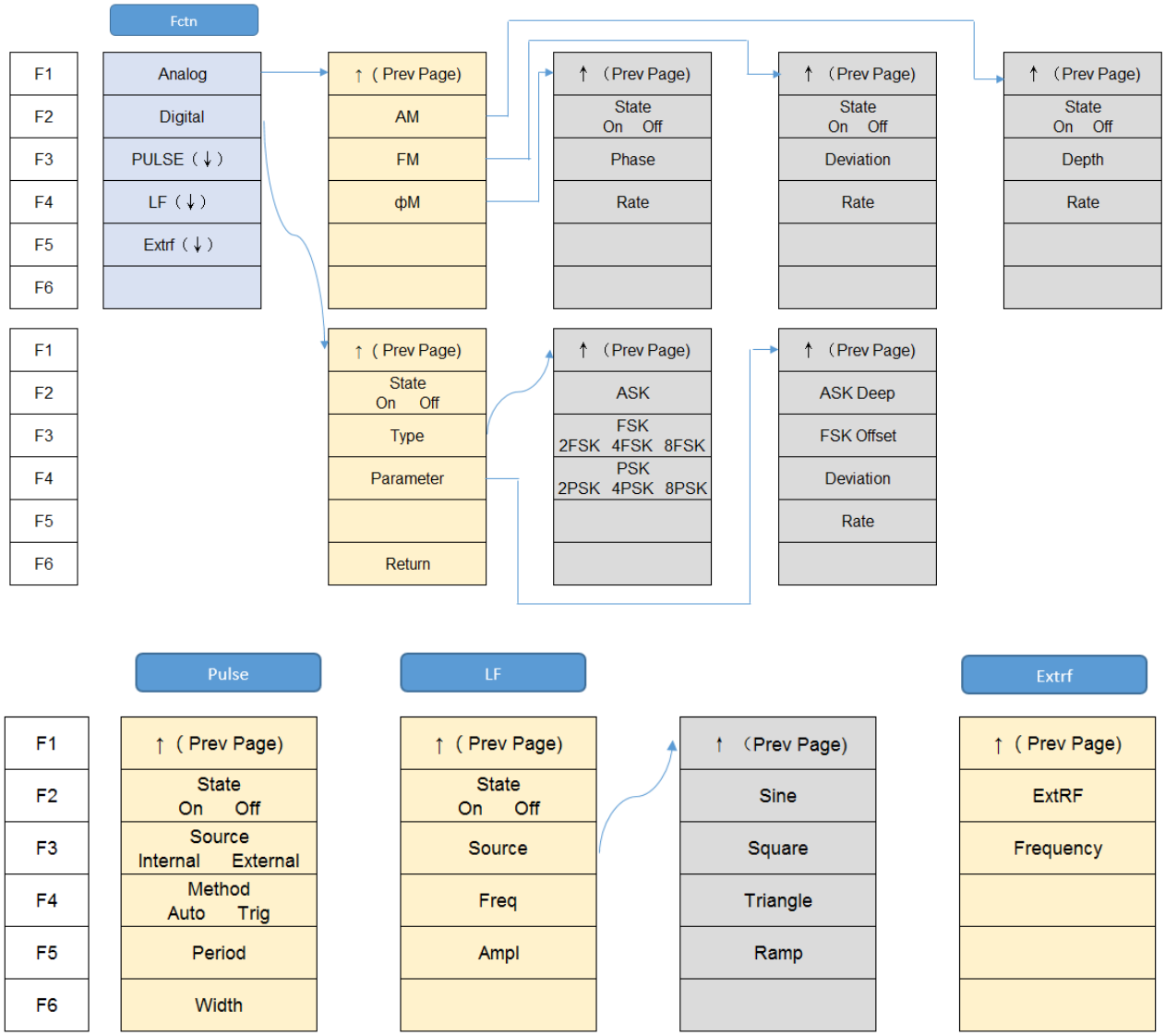
- [SWP Dire]

Menu description: to set the sweep direction, [down] means from start to stop, [UP] means from stop to start.

- . [SWP Retr]

Menu description: Enable/disable sweep return function. Sweep return function allows sweep from the first point to the last, and returns from the last point to the first.

6.6 Fctn



- [Analog]

Menu description: Analog modulation functions, [AM], [FM] and [Φ M] are supported.

- [AM]

Menu description: Amplitude modulation function, user can set [Depth] and [Rate] in submenu. Carrier wave output is configured in 【FREQ】 and 【AMPTD】, refer to section 6.2 and section 6.3.

- [FM]

Menu description: Frequency modulation function, user can set frequency [Deviation] and [Rate] in submenu. Carrier wave output is configured in 【FREQ】 and 【AMPTD】, refer to section 6.2 and section 6.3.

■ [ΦM]

Menu description: Phase modulation function, user can set [Phase] and [Rate] in submenu. Carrier wave output is configured in 【FREQ】 and 【AMPTD】, refer to section 6.2 and section 6.3.

- [Digital]

Menu description: S1131 support ASK, FSK, PSK modulation. 2ASK is supported, user can configure [ASK Deep] and [Rate] in submenu. 2FSK, 4FSK, 8FSK are supported, user can configure [FSK Offset] and [Rate]. 2PSK, 4PSK and 8PSK are supported, user can set [Deviation] and [Rate].

- [Pulse]

Menu description: S1131 supports pulse modulation, user can select [Internal] [Source], [External][Source] to do the modulation. User can configure the pulse [Period] and pulse [Width] in submenu.

- [LF]

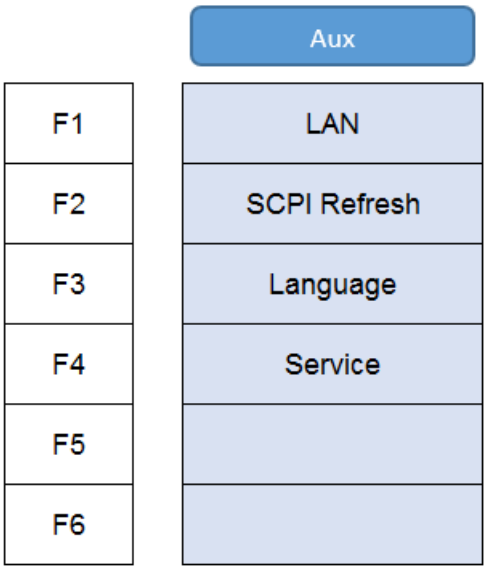
Menu description: LF function is provided to output the internal modulation source signal. Sine, square, triangle, ramp wave forms are supported.

- [Extrf]

Menu description: External IF input. Frequency of input signal should ≤300MHz

6.7 Aux

【Aux】contains [LAN], [SCPI Refresh], [Language] and [Service]



- [LAN]

Menu description: to set the IP address for the instrument