

PROTEK 9305/9310/9320/9340/9380/93120
Digital Synthesized Function Generator /
Counter

User's Guide

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1 GENERAL DESCRIPTION

This is a precise test instrument used to output function signal and FM, AM, FSK, PSK, burst, frequency sweep signals. It is also capable of measuring frequency and counting. It is widely used by electronic engineers in electronic laboratory, production line, education and scientific research.

2 MAIN FEATURES

1. Using Direct Digital Synthesis (DDS) Technology.
2. 100 μ Hz ~ 120MHz (PROTEK 93120) Frequency Range for Main Waveforms.
3. 1mV Output Amplitude for Small Signal.
4. High Resolution of Pulse Duty Rate Up To 1/1000.
5. High Resolution and Accuracy of Digital FM.
6. Continuous Phase Adjustment Function in Burst Mode.
7. Arbitrary Setting of Start and Stop for Frequency Sweep Output.
8. 0.1 $^{\circ}$ Resolution of Phase Adjustment.
9. Arbitrary Setting of AM Modulation In 1% ~ 120%.
10. More Than 30 Kinds of Output Waveform.
11. Frequency Measurement and Counting Functions Available.
12. Elegant-looking of the Enclosure; Comfortable and Flexible of Key Operation.

3 TECHNICAL SPECIFICATIONS

(1) Function Generator

1, Waveform Characteristics

Main Waveform: Sine, Square, TTL

Waveform Amplitude resolution: 12 bits

Sample Rate: 200Msa/s

Harmonic Distortion of Sine Wave: -50dBc (frequency \leq 5MHz)
 -45dBc (frequency \leq 10MHz)
 -40dBc (frequency \leq 20MHz)
 -35dBc (frequency \leq 40MHz)
 -30dBc(frequency $>$ 40MHz)

Distortion of Sine Wave: 0.1% (20Hz ~ 100kHz)

Rising and Falling Time of Square Wave: \leq 25ns (9305, 9310)
 \leq 15ns (9320, 9340,9380,93120)

Note: Test conditions for harmonic distortion, sine distortion, rising/falling time: Output Amplitude 2Vp-p, Environmental temperature: 25°C \pm 5°C

Waveform Stored: 27 waveforms including sine, square, pulse, triangle, ramp, ladder waves.

Waveform Length: 4096 dots

Amplitude Resolution: 10 bits

Duty Factor of Pulse Wave: 0.1% ~ 99.9% (below 10kHz),
 1% ~ 99% (10kHz ~ 100kHz)

Rise/Fall Time: \leq 100ns

DC Amplitude: \leq 10mV – 10V (high impedance)

DC Accuracy: $\leq \pm 5\%$ of setting +10mV (high impedance)

2, Frequency Characteristics

Frequency Range: Main Waveform: 100 μ Hz ~ 5MHz (9305)
 100 μ Hz ~ 10MHz (9310)
 100 μ Hz ~ 20MHz (9320)
 100 μ Hz ~ 40MHz (9340)
 100 μ Hz ~ 80MHz (9380) (Square: 100 μ Hz ~ 40MHz)
 100 μ Hz ~ 120MHz (93120)

Stored Waveform: 100u Hz ~ 100kHz

Resolution: 1 μ Hz

Frequency Accuracy: $\leq \pm 5 \times 10^{-6}$

Frequency Stability: $\pm 1 \times 10^{-6}$

3, Amplitude Characteristics

Amplitude Range (Freq \leq 40MHz):2mV ~ 20Vp-p (high impedance), 1mV ~ 10Vp-p (50 Ω)

Amplitude Range (Freq $>$ 40MHz):2mV ~ 4Vp-p (high impedance), 1mV ~ 2Vp-p (50 Ω)

Max. Resolution: $2\mu\text{V}_{\text{p-p}}$ (high impedance), $1\mu\text{V}_{\text{p-p}}$ ($50\ \Omega$)
 Amplitude Accuracy: $\pm (1\%+0.2\text{mV})$ (sine wave relative to 1kHz)
 Amplitude Stability: $\pm 0.5\%$ /3 hours
 Flatness: Amplitude $\leq 2\text{V}_{\text{pp}}$: $\pm 3\%$ (frequency $\leq 5\text{MHz}$), $\pm 10\%$ ($5\text{MHz}<\text{frequency}\leq 40\text{MHz}$)
 Amplitude $>2\text{V}_{\text{pp}}$: $\pm 5\%$ (frequency $\leq 5\text{MHz}$), $\pm 10\%$ ($5\text{MHz}<\text{frequency}\leq 20\text{MHz}$),
 $\pm 20\%$ (frequency $>20\text{MHz}$)

Output Impedance: $50\ \Omega$

Output Units: V_{pp} , mV_{pp} , V_{rms} , mV_{rms} , dBm

4, Offset Characteristics

Offset Range(high impedance): $\pm 10\text{V}_{\text{pk}}$ ac + dc (Offset $\leq 2\times$ peak-to-peak amplitude)

Resolution: $2\mu\text{V}$ (high impedance), $1\mu\text{V}$ ($50\ \Omega$)

Offset Error: $\pm 1\%$ of setting +10mV (Ampl $\leq 2\text{V}_{\text{pp}}$ into high impedance)

$\pm 1\%$ of setting +20mV (Ampl $> 2\text{V}_{\text{pp}}$ into high impedance)

5, AM Characteristics

Carrier Waveform: sine or square

Carrier Frequency Range: Same as Main Waveform

Modulating Signal: internal or external

Modulating Waveform: 5 internal waveforms (sine, square, triangle, rising/falling ramp)

Frequency of modulating signal: $100\mu\text{Hz} \sim 20\text{kHz}$

Distortion: $\leq 2\%$

Modulation Depth: $1\% \sim 120\%$

$1\% \sim 80\%$ (frequency $>40\text{MHz}$, Ampl $> 2\text{V}_{\text{pp}}$ into high impedance)

Relative Modulation Error: $\pm (5\%+0.2)$ ($100\mu\text{Hz} < \text{frequency} \leq 10\text{kHz}$),

$\pm (10\%+0.5)$ ($10\text{kHz} < \text{frequency} \leq 20\text{kHz}$)

Amplitude of external input signal: $3\text{V}_{\text{p-p}}$ ($-1.5\text{V} \sim +1.5\text{V}$)

6, FM Characteristics

Carrier Waveform: sine or square

Carrier Frequency Range: Same as Main Waveform

Modulating Signal: internal or external

Modulating Waveform: 5 internal waveforms (sine, square, triangle, rising/falling ramp)

Frequency of modulating signal: $100\mu\text{Hz} \sim 10\text{kHz}$

Peak Frequency Deviation: Max. 50% of carrier frequency for internal FM

Max 10% of carrier frequency for external FM, input signal voltage $3\text{V}_{\text{p-p}}$
 ($-1.5\text{V} \sim +1.5\text{V}$)

FSK: either Frequency 1 or Frequency 2

Control Mode: internal or external (external: TTL level, low level F1, high level F2)

Alternation Rate: $0.1\text{ms} \sim 800\text{s}$

7, PM Characteristics

Waveform: sine or square

Frequency Range: Same as Main Waveform

PSK: Phase 1 (P1)and Phase 2 (P2)Range: $0.1 \sim 360.0^\circ$

Resolution: 0.1°

Alternation Time Interval: $0.1\text{ms} \sim 800\text{s}$

Control Mode: internal or external (external: TTL level, low level P1, high level P2)

8, Burst

Waveform: sine or square

Frequency Range: Same as Main Waveform

Burst Counting: 1 ~ 10000 periods

Alternation Time interval for burst signal: 0.1ms ~ 800s

Control Mode: internal (auto)/external (manual keying single trigger, external input TTL rising edge trigger)

9, Frequency Sweep Characteristics

Waveform: sine or square

Start F or Stop F: Same as Main Waveform

Sweep Time: 1ms ~ 800s (linear), 100ms ~ 800s (log)

Sweep Mode: Linear or Logarithmic

External trigger signal frequency: DC ~ 1KHz (linear) DC~10Hz (log)

Control Mode: (same as burst)

CAUTION: if sweep mode is Logarithmic, Start F must be lesser than Stop F.

10, Output of Modulating signal

Frequency: 100μHz ~ 20kHz

Waveform: sine, square, triangle, rising/falling ramp

Amplitude: 5Vp-p ± 2%

Output Impedance: 620 Ω

11, Storage Characteristics

Storage Parameters: signal frequency, amplitude, waveform, DC offset values and function state.

Storage Capacity: 10 signals

Reproducibility Mode: All stored signal can be recalled with corresponding number.

Storage Time: more than 10 years

12, Computing Characteristics

Either frequency or period, either amplitude rms or p-p, and dBm values can be used in data input and display.

13, Operation Characteristics

Besides direct input using numerical keys, data can also be continuously adjusted using adjusting knobs; and the operation method can be flexibly selected.

(2) COUNTER

1 Frequency Range

Frequency Measurement: 1Hz ~ 100MHz Count Frequency: 50MHz Max

2 Input Characteristics

a) Min. Input Voltage:

“ATT” opened: 50mV (f: 10Hz ~ 50MHz), 100mV(f: 1Hz ~ 100MHz)

“ATT” closed: 0.5V (f: 10Hz ~ 50MHz), 1V (f: 1Hz ~ 100MHz)

b) Max. Input Voltage Allowed: 100Vp-p (f≤100kHz), 20Vp-p (1Hz~100MHz)

c) Input Impedance: R>500k Ω C<30PF

d) Coupling: AC

- e) Waveform: sine or square
 - f) Low Pass Filter: cut off frequency about 100kHz
 - With internal attenuation: ≤ -3 dB
 - With external attenuation: ≥ -30 dB ($f > 1$ MHz)
- 3 Gate Time Setting: 10ms ~ 10s continuously adjustable
- 4 Display Bits: 8 (Gate Time $>$ 5s)
- 5 Counting Capacity: $\leq 4.29 \times 10^9$
- 6 Control Mode: manual or external gate control
- 7 Accuracy: time base error \pm trigger error (when signal SNR $>$ 40dB, trigger error \leq 0.3)
- 8 Time base:
- a) Type: small TCXO
 - b) Frequency: 10MHz
 - c) Stability: $\pm 1 \times 10^{-6}$ ($22^\circ\text{C} \pm 5^\circ\text{C}$)

(3) MISCELLANEOUS

1, Operating Conditions

Power Voltage: 198~242V, Frequency: 47~ 63Hz, Power consumption: < 35 VA, Environmental Temperature: 0 ~ 40°C

2, Physical Characteristics

Size of Enclosure: 255 \times 370 \times 100 (mm)

High reliability, small size and small weight

Owing to the use of LSI and SMT technology.

12-digit high brightness VFD display

3, Programmable Characteristics

RS-232C interface is standard. IEEE-488 (GPIB) interface is optionally. With these interface, the instrument can be formed into an automatic test system under the control of a host computer together with other instruments.

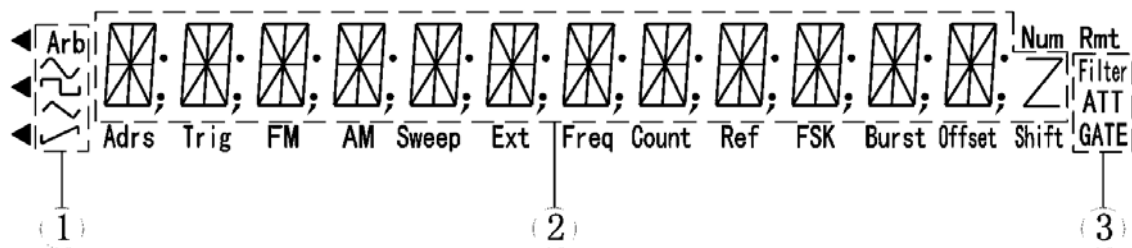
4, High Stability Time Base

High stability time base crystal is optionally.

4

PANEL DESCRIPTION

(1) Display



- ① Waveform Display Area
- ② Main Alphameric Display Area
- ③ Frequency Measurement/Counting Display Area
- ④ Others are state display areas

Waveform Display Area

- : Main waveform/carrier are sine wave
- : Main waveform/carrier are square or pulse wave
- : Standard Waveforms waveforms (carrier) are triangle wave
- : Standard Waveforms waveforms (carrier) are rising ramp wave
- Arb: Standard Waveforms waveforms (carrier) are other wave

Frequency Measurement/Counting function mode indication area

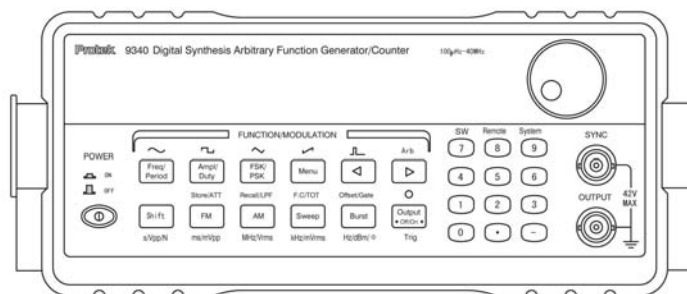
- Filter: Frequency measurement in low pass filter state.
- ATT: Frequency measurement in attenuation state.
- GATE: Gate opens in frequency measuring and counting.

State indication Area

- Adrs: the instrument is in remote state.
- Trig: Waiting for single trigger or external trigger.
- FM: FM function mode.
- AM: AM function mode.

- Sweep: Sweep function mode.
- Ext: External signal input state.
- Freq: (Ext) Frequency measurement function mode.
- Count: (Ext) Counting function mode.
- Ref: (Ext) External reference input state.
- FSK: Frequency shift function mode.
- ◀FSK: Phase shift function mode.
- Burst: Burst function mode.
- Offset: DC offset of output signal is not 0.
- Shift: 【shift】 key pressed, Press again 【shift】 key, “Shift” is disabled.
- Rmt: the instrument is in remote state.
- Z: Component of frequency unit Hz

(2) FRONT PANEL



Instructions for Keys

Numerical keys

Key Name	Main Function	Second Function	Key Name	Main function	Second Function
0	Input Digit 0	Not available	7	Input Digit 7	Enter point freq.
1	Input Digit 1	Not available	8	Input Digit 8	Exit remote control
2	Input Digit 2	Not available	9	Input Digit 9	Enter system
3	Input Digit 3	Not available	•	Input decimal point	Not available
4	Input Digit 4	Not available	—	Input negative symbol	Not available
5	Input Digit 5	Not available	◀	Flash digit left shift*	Select pulse wave
6	Input Digit 6	Not available	▶	Flash digit right shift**	Select arbitrary wave

*: Before inputting unit: Press this key to clear the lowest bit of display number. It can be use to correct the error number of current input.

*: In external counting: Press this key to stop counting, and display present counting value, press again to continue counting.

** : In external counting: Press this key to clear counting and start new counting.

Function Keys

Key name	Main Function	Second Function	Second Function for Counting	Unit Function
Freq./Period	Freq/Perio. Select.	Sine Wave Selection	Not Available	Not Available
Ampl./Pulse width	Amplitude Select.	Square Wave Select.	Not Available	Not Available
FSK/PSK	FSK/PSK Function Select	Triangle Wave Select	Not Available	Not Available
Menu	Menu Selection	Rising Ramp Wave Selection	Not Available	Not Available
FM	FM Function Select	Storage Function Select	Attenuation Selection	ms/mVpp
AM	AM Function Select	Recall Function Select	Low Pass Select	MHz/Vrms
Sweep	Sweep Function Select	Freq. Meas. Function Select	Freq. Meas./ Counting Select	kHz/mVrms
Burst	Burst Function Select	DC Offset Select	Gate Select	Hz/dBm

Other Keys

Key Name	Main Function	Others
Output	Signal Output On/Off	Single trigger for sweep and burst functions
Shift	Shift to 2'nd Function with other keys	Unit s/Vpp/N

Key Functions: 24 keys are available on front panel and a “di” sound will be heard when pressed.

Most of the keys have multi-function with their basic function marked on the surface. Simply press the key to use the basic functions.

Most keys have second functions that are marked in blue at the upper of the keys. To use the second function, **【shift】** key should be pressed first before pressing the function key.

A few keys can also be used as unit keys that are marked at the lower part of the keys. To use the unit function, a digit key should be pressed first before the unit key is pressed.

【shift】 key: Its basic function is for second function shifting. It is also used as Units “s/Vpp/N” to indicate time “s”, p-p value of amplitude “Vpp” and other uncertain units.

【0】【1】【2】【3】【4】【5】【6】【7】【8】【9】【•】【-】 keys: Data entry keys. where **【7】【8】【9】** keys have second functions for function selection of “Point Frequency” “Exit remote control” and “enter System”.

【◀】【▶】 key: The basic function is to move Flash digit right and left. The second function is to select “Pulse” or “Arbitrary” waveform. They are also used as “Counting Stop” or “Counting Clear” in counting.

【Freq/Period】 key: Frequency select key. If the present display is frequency, press this key to change the input and display to period. The second function is to select “sine” waveform.

【Ampl/Pulse Width】 key: Amplitude select key. If the present display is amplitude and the waveform is “pulse”, press this key to change the input and display to pulse width. The second function is to select “Pulse” waveform.

【FSK/PSK】 key: FSK function mode select key. If it’s in FSK mode at present, press this key to enter PSK function mode, and If it’s in PSK mode at present, press this key to enter FSK function mode. The second function is to select “triangle” waveform.

【Menu】 key: the **【menu】** key is used to select different items and change their parameters in FSK, PSK, FM, AM, sweep and burst function modes. In standard waveforms as well as amplitude function, this key is used to convert among pp, rms and dBm values. The second function is to select “rising ramp” waveform.

【FM】 key: FM function mode select key. Its second function is storage selection. It’s also

used as units “ms/mVpp”, indicating time “ms”, pp value of amplitude “mVpp”. It is used for “attenuation” selection in frequency measurement function.

【AM】 key: AM function mode selection key. The second function is for reproducibility selection. It is also used as units “MHz/Vrms”, indicating frequency unit “MHz”, rms value of amplitude “Vrms” and low pass filter selection key in “frequency measurement” function.

【Sweep】 key: Sweep function mode selection key. The second function is to select frequency measuring and counting function. It’s also used for units “kHz/mVrms” indicating frequency unit “kHz”, rms value of amplitude “mVrms”. In “Freq. Meas./counting” function, it is used with**【Shift】**key to select “Counting” the original function is “Freq. Meas.”, or to select “Freq. Meas.” if the original function is “Counting”.

【Burst】 key: Burst function mode selection key. The second function is to select DC offset. It’s also used for units “Hz/dBm/Φ”, indicating frequency unit “Hz”, amplitude unit “dBm”. In frequency measurement function, it is used for gate selection.

【Output】 key: Output key. The default state is having signal output, with the output lamp being on. Press**【Output】**key to stop signal output, and the lamp turns off. Press again the**【Output】** key to start signal output and the lamp turns on again. It is also used as “single trigger” key in “Burst” and “Sweep” function modes, and the lamp is on.

In different function modes, pressing of **【Menu】** key results in different menus:

Sweep Function Mode:

MODE → START F → STOP F → TIME →TRIG

- MODE:** Sweep mode, divided into linear sweep and logarithm sweep.
- START F:** Sweep start frequency
- STOP F:** Sweep stop frequency
- TIME:** Sweep time
- TRIG:** Sweep trigger mode

FM Function Mode:

FM DEVIA→ FM FREQ → FM WAVE → FM SOURCE

- FM DEVIA:** Peak frequency deviation
- FM FREQ:** Modulating signal frequency
- FM WAVE:** Modulating signal waveform, including 5 waveforms
- FM SOURCE:** The modulating signal is internal external.

AM Function Mode:

AM LEVEL → AM FREQ → AM WAVE → AM SOURCE

- AM LEVEL:** Modulating depth
- AM FREQ:** Modulating signal frequency
- AM WAVE:** Modulating signal waveform, including 5 waveforms
- AM SOURCE:** The modulating signal is from internal or external.

Burst Function Mode:

TRIG → COUNT → SPACE T → PHASE

- TRIG:** Burst trigger mode
- COUNT:** Burst cycles
- SPACE T:** Burst time spacing
- PHASE:** The starting phase of the burst

FSK Function Mode:

START F → STOP F → SPACE T → TRIG

- START F:** the first frequency of FSK
- STOP F:** the second frequency of FSK
- SPACE T:** FSK spacing time
- TRIG:** FSK trigger mode

PSK function Mode:

P1 → P2 → SPACE T → TRIG

- P1:** the first phase of PSK
- P2:** the second f phase PSK
- SPACE T:** PSK spacing time
- TRIG:** PSK trigger mode

System Function Mode:

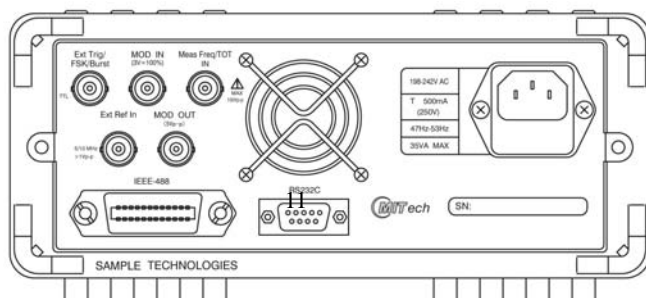
POWER ON → ADDRESS → OUT Z → INTERFACE→

BAUD → PARITY

- POWER ON:** “Power on” state
- ADDRESS:** GP-IB interface address
- OUT Z:** Output impedance
- INTERFACE:** Select RS232 or GP-IB (IEEE-488) interface
- BAUD:** Baud rate for the RS232 interface
- PARITY:** Parity for the RS232 interface

The adjusting knob and **【◀】【▶】** keys are used together to modify the flashing display digits.

(3) REAR PANEL



5

INSTRUCTIONS FOR OPERATION

(1) Preparations for Measurement and Test

Check the mains voltage to confirm it is within the operating voltage range of the instrument before plug the power cable into the power socket on the rear panel. Carefully check the power connection of the whole test system to confirm that they are well grounded. The enclosure of the instrument and all the exposed metal parts should be grounded and there should be no level difference between all the equipment connected.

(2) How to Use the Function Generator

1. Turning on the instrument: Press the power key on the front panel to turn on the power. After displaying “WELCOME” for 2 seconds and model number such as “PROTEK 9340” for 1 second in flashing manner. The instrument will enter into “standard waveforms” function state according the turning-on setting. In waveform display area, the current waveform “~” is displayed, with frequency of 10.00000000 kHz. It may also enter into the state of last operation before it was turned off.

2. Date entry: Two methods for data entry may be used:

2.1 Entry through digit keys: The ten digit keys can be used for data entry, with the method of shift entry from right to left. If more than 10 digits are entered, they will be overflowed from the left. **【●】** is used to enter decimal point. This key will not function if decimal point already exists. **【-】** is used to enter negative sign. If a negative sign already exists this key is used to cancel the negative sign. Digit keys are only used to “write” data into display area and they will not be immediately effective. They may be modified without affecting the output signal if there are any errors. When the entry is confirmed to be all right, press once the unit key and the entered data is now effective. The instrument will output signals according to the displayed data. The decimal point key and unit key are used together in data entry, and the instrument will display the data

uniformly.

Note: when using digit keys to enter data, the entry will not be effective without the entry of unit.

2.2 Entry through adjusting knob: Adjusting knob is used to continuously adjust the signal and the **【◀】【▶】** keys are used to move the flashing digit to left or right. Turning the knob clockwise may add 1 continuously and carry over for the flashing digit. Turning the knob counter clockwise may continuously subtract 1 and borrow for the flashing digit. Using this method the entry will be effective immediately without using the unit key. Move left the flashing digit may adjust the data coarsely while move right the flashing digit may adjust the data finely.

If the knob is not wanted, use the **【◀】【▶】** keys to eliminate the flashing digits and disable the knob.

3. Function Selection: The instrument will be in “standard waveforms” mode at turning on and output waveform of single frequency. Press “FM”, “AM”, “Sweep”, “Burst”, “Standard Waveforms”, “FSK” and “PSK” to have 7 different function modes.

4. Standard Waveforms function mode (SW).

In this mode, the instrument will output 27 standard waveforms such as sine, square, triangle, rising and falling ramp waves and noise, etc. For most waveforms you can set frequency, amplitude and DC offset. In other functions, press **【shift】** , then **【SW】** to enter into standard waveforms function. When transferred from standard waveforms to other function, the parameter set in standard waveforms is used as the parameter of carrier. All the same, the carrier parameter set in other functions will be used as that of standard waveforms when transferred to it.

(For example, when transferred from standard waveforms to FM, the parameter set in standard waveforms is used as the carrier parameter in FM, and vice versa.)

The carrier waveform or signal waveform of other function are sine or square only.

4.1 Frequency Setting: Press **【frequency】** key and current frequency value is displayed. This value may be entered through digit key or adjusting knob. Their will be now output of this signal at the output terminal of the instrument The frequency setting range is 100μHz ~ 40MHz (9340).

For example: To set a frequency value of 5.8kHz, the sequence of keying is as follows:

【frequency】【5】【.】【8】【kHz】 , (adjusting knob can also be used)

or: **【frequency】【5】【8】【0】【0】【Hz】** , (adjusting knob can also be used),

The display will be 5.80000000 kHz.

4.2 Period Setting: The signal frequency can also be displayed or entered in period value. If the current display is frequency, press the **【frequency/period】** key to display the current period value, which can be entered using digit key or adjusting knob.

For example: to set a period value of 10ms, the sequence of keying is as follows:

【Period】【1】【0】【ms】 (adjusting knob can also be used)

If the current display is period value, press **【frequency/period】** key to display current frequency value. If the current display is neither frequency nor period, pressing of **【frequency/period】** key will display current frequency of standard waveforms or carrier.

4.3 Amplitude Setting: Press **【amplitude】**key to display current amplitude value which may be entered using digit key or adjusting knob, and there will be output signal of this amplitude at the output terminal.

For example: To set an amplitude value of 4.6V peak-to-peak, the sequence of keying is as follows:

【Amplitude】【4】【.】【6】【Vpp】 (adjusting knob can also be used)

For “sine”, “square”, “triangle”, “rising ramp” and “pulse” waveforms, the entry and display of amplitude value have 3 forms: peak-to-peak value V_{p-p} , root mean square value V_{rms} and dBm value. For other waveforms, only peak-to-peak value V_{p-p} or DC value can be entered and displayed (DC value is also entered in units V_{pp} or mV_{pp}).

Note: when the output frequency is higher than 20MHz and the instrument works for long time, the output voltage should exceed 10V_{p-p}.

4.4 DC Offset Setting: Press **【shift】**key, then **【offset】**key, the current DC offset is displayed. If the DC offset of current output waveform is not 0, the offset symbol “Offset” will be displayed in the state display area. The DC offset value can be entered through digit keys or adjusting knob; and there will be output signal of this offset value at the output terminal of the instrument.

For example: to set an offset value -1.6V peak-to-peak, the sequence of keying is as follows:

【shift】【offset】【-】【1】【.】【6】【Vpp】 (adjusting knob can also be used)

or: **【shift】【offset】【1】【.】【6】【-】【Vpp】** (adjusting knob can also be used)

4.4.1 Zero Point Adjustment: In zero point adjustment for output signal, using of adjusting knob to adjust DC offset is more convenient than using digit keys. The plus and minus sign of DC offset will change automatically when passing through the zero point. The input range of amplitude and DC should satisfy the following equation: $|V_{offset}| + V_{pp}/2 \leq V_{max}$. where V_{pp} is peak-to-peak value of amplitude, $|V_{offset}|$ is the absolute value of DC offset, V_{max} is 10V at high impedance and 5V at 50Ω load.

The following table shows the corresponding relation between p-p value of amplitude and absolute value of DC offset at high impedance:

p-p value of AC signal	Absolute value of DC offset
4.001 V ~ 20V	0 ~ (10.000- $V_{pp}/2$) V
2.001 V ~ 4.001V	0 ~ (4.000- $V_{pp}/2$) V
633.0 mV ~ 2.000 V	0 ~ 2.000 V
201.0 mV ~ 632.9 mV	0 ~ 632.9 mV
63.00 mV ~ 200.9 mV	0 ~ 200.9 mV
2.000mV ~ 62.99mV	0 ~ 62.99mV

4.5 Output Waveform Selection: including selection of common waveforms and other

waveforms.

4.5.1 Selection of Common Waveforms: Press **【shift】** key, then press waveforms key to select 5 commonly used waveforms including sine, square, triangle, rising ramp, pulse waves. The corresponding waveform symbols will be displayed in waveform display area. They can also be selected using the method of described in **4.5.2**.

For example: to select square wave, the keying sequence is as follows:

【Shift】【square】

4.5.2 Selection of other waveforms: Press **【shift】**, then **【Arb】**, the number and name of current waveform will be displayed. For example, "6: NOISE" means the current waveform is noise. Use digit keys or adjusting knob to enter waveform number in waveform selection. If a number of common waveform mentioned in **4.5.1** is entered, the corresponding waveform prompt symbol will be displayed. If the entered number is not for common waveform, the prompt symbol "Arb" will be displayed.

For example: to select DC, the keying sequence is as follows:

【Shift】【Arb】【1】【0】【N】 (adjusting knob can also be used)

Waveforms and their numbers:

No.	Waveform Name	Prompt Symbol	No.	Waveform Name	Prompt Symbol
1	Sine wave	SINE	15	Half-wave rectification	COMMUT_H
2	Square wave	SQUARE	16	Sine transverse cut	SINE_TRA
3	Triangle wave	TRIANG	17	Sine vertical cut	SINE_VER
4	Ramp	UP_RAMP	18	Sine phase modulation	SINE_PM
5	Falling ramp	DOWM_RAMP	19	Logarithms function	LOG
6	Noise	NOISE	20	Exponent function	EXP
7	Pulse wave	PULSE	21	Half-round function	HALF_ROUND
8	Positive pulse	P_PULSE	22	SINX/X function	SINX/X
9	Negative pulse	N_PULSE	23	Square root function	SQUARE_ROOT
10	Positive DC	P_DC	24	Tangent function	TANGENT
11	Negative DC	O_DC	25	Cardiograph wave	CARDIO
12	Stair wave	STAIR	26	Earthquake wave	QUAKE
13	Coded pulse	C_PULSE	27	Combination wave	COMBIN
14	Full wave rectification	COMMUT_A			

4.6 Adjustment of duty factor: when the current waveform is pulse, if the amplitude is displayed, press **【pulse width】** key, the display will be pulse width value. If the display is neither amplitude nor pulse width, press twice **【pulse width】** key, the display will then be pulse width. If the current waveform is not pulse wave, this key can only be used for amplitude entry. When pulse width is displayed, by entering pulse width value using digit key or adjusting knob, the duty factor of pulse wave can be adjusted. The adjustment range is 0.1% ~ 99.9% when the frequency is lower than 10kHz, with high resolution of 0.1%. It is 1% ~ 99% in frequency of 10kHz~100kHz, with resolution of 1%.

For example: to enter the duty factor value 60.5%, the keying sequence:

【Pulse width】【6】【0】【.】【5】【N】 (adjusting knob can also be used)

4.7 Signal Output: Press **【output】** key to stop signal output, and the output signal indicator is off. Set waveform, frequency and amplitude for the signal, press **【output】** key again, the signal begin to output, and the output indicator is on. **【output】** key can be used to switch between “output” and “no output” again and again. The output indicator lamp is also changing from “on” (output) to “off” (no output).

5. Signal Store and Recall: Frequency, amplitude, waveform, DC offset and function state can be stored.

Ten groups of signal can be stored, numbering 1 ~ 10, that may be reproduced if necessary. The storage device used is non-volatile in which the stored signal will not miss when power is off. Frequently used signal may be stored for use at any time. The reproduced signal can be modified in parameter and stored again.

The state before turning off of the instrument is automatically stored in Unit No. 0. Therefore there are 11 groups of signal numbering 0 ~ 10 can be recalled.

Example: to store the current output signal in storage unit No. 1, the keying sequence:

【Shift】【Storage】【1】【N】

The following prompt symbol and number of storage unit will be displayed “STORE: 1”.

If storage unit No.1 has been occupied, the original stored signal will be replaced by new signal.

Example: to recall No. 1 stored signal as current output signal, the keying sequence:

【Shift】【recall】【1】【N】

The following prompt symbol and number of storage unit will be displayed “RECALL: 1”. Under reproducing function state, the stored signal can be continuously reproduced by only using the adjusting knob to enter serial number without separate entry of unit number.

In following description, the English symbol in [] means the corresponding display symbol. For example: sweep mode [MODE], MODE in [] is the display symbol of sweep mode. Press **【menu】** key, the flashing display MODE means the current selection is sweep mode.

6. Frequency sweep function mode: to out put signals with frequency changes only.

Press **【menu】**, the following menu will appear:

<p>MODE —> START F —> STOP F —> TIME —>TRIG</p>
--

MODE: sweep mode, including linear sweep and logarithms sweep

START F: sweep start frequency

STOP F: sweep stop frequency

TIME: sweep time

TRIG: sweep trigger mode

Press **【sweep】** key to enter frequency sweep function mode, and certain preset frequency is displayed. At the same time sweep function mode symbol “Sweep” is displayed in state displaying area. Press **【menu】** key consecutively, the following items will be displayed in sequence: Sweep mode [MODE], start frequency [START F], stop frequency [STOP F], sweep time [TIME] and trigger mode [TRIG]. When an item to be modified appears, stop pressing **【menu】** key. After displaying for 1 second in flashing, the parameter value of the current item is displayed automatically. The parameters of sweep mode [MODE], start frequency [START F], stop frequency [STOP F], sweep time [TIME] and trigger mode [TRIG] can be modified using digit keys or adjusting knob. A unit must be followed after data entry if using digit key, otherwise the entered data will not be effective. Continuous adjustment can be done using adjusting knob. After adjustment is finished, press once **【menu】** key to skip to next option. If no modification for current option, press **【menu】** to skip to next option.

6.1 Base signal: Press **【sweep】** key to enter into sweep function mode, displaying start frequency in the display area. The amplitude, waveform and DC offset can be set. The setting method and value ranges are the same as described in “**4. Standard Waveforms function mode (SW)**”. These parameters will be the same as the carrier (or standard waveforms) of the previous function if no setting is necessary.

In sweep, only sine or square waveforms can be selected.

Example: the amplitude of carrier signal can be set by pressing **【Amplitude】** keys. **【Shift】** key and **【offset】** key can be used to set DC offset value. Use **【shift】** key and waveform key to select waveform for signal.

6.2 Sweep mode [MODE]: Sweep mode [MODE] divides into linear (No.1) and log (No.2). In linear sweep mode, the output frequency changes linearly during the duration of the sweep. In log sweep mode, the signal frequency changes exponentially. The Spacing is automatically calculated by the instrument according to start frequencies, stop frequencies and sweep time.

After displaying in flashing sweep mode [MODE] for 1 second, number of current sweep mode and corresponding prompt symbol is displayed automatically (such as 1: LINEAR, 2: LOG). Either digit keys or adjusting knob can be used to select sweep mode by enter the number of sweep mode.

6.3 Start frequency [START F]: The frequency at sweep starting is called start frequency.

After displaying in flashing start frequency [START F] for 1 second, current start frequency is displayed automatically. Either digit keys or adjusting knob can be used to select start frequency value.

6.4 Stop frequency [STOP F]: The frequency at sweep ending is called stop frequency.

After displaying in flashing stop frequency [STOP F] for 1 second, current stop frequency is displayed automatically. Either digit keys or adjusting knob can be used to select stop frequency value.

When start frequency is lower than stop frequency, the frequency sweep increases gradually from start frequency (low frequency) to stop frequency (high frequency); When start frequency is higher than stop frequency, the frequency sweep decreases gradually from start frequency (high frequency) to stop frequency (low frequency).

The frequency range from start frequency to stop frequency is 100 μ Hz ~ 40MHz (9340) in linear sweep mode. The frequency range from start to stop frequency is 1mHz ~ 40MHz (9340) in log sweep mode.

6.5 Sweep time [TIME]: the time needed for one sweep from start to stop frequency is called sweep time.

The sweep time range is 1ms ~ 800s in linear Sweep mode or 100ms ~ 800s in log Sweep mode.

After displaying in flashing sweep time [TIME] for 1 second, current sweep time is displayed automatically. Either digit keys or adjusting knob can be used to enter sweep time value. The shorter the sweep time, the faster the sweep speed, and vice versa.

6.6 Trigger mode [TRIG]: The trigger mode of sweep divides into internal trigger and external trigger. The numbers and prompt symbols are 1: INT, 2: EXT. The default set is internal trigger. In internal trigger mode, it sweeps from start frequency to stop frequency and then returns to start frequency for second sweep, and so on according to the preset parameters. External trigger has two ways. One is single trigger using **【output】** key. When pressing once **【output】** key for a single sweep, The signal frequency varies from start frequency to stop frequency, and the sweep stops then. The other is to input trigger signal from the “external trigger” terminal on rear panel. In this operation, a single sweep is started at the rising edge of the trigger signal. In external trigger mode, symbols “Trig” and “Ext” are displayed.

After trigger mode [TRIG] is displayed in flashing for 1 second, the corresponding prompt symbol and number for current trigger mode is automatically displayed. The number of trigger mode can be entered using digit keys or adjusting knob.

6.7 Start and stop of sweep: Sweep starts when sweep function mode is selected. Sweep is done according to the preset parameters automatically. If you don't want to output the sweep signal, simply press **【output】** key to disable signal output, and the output lamp will be off. If you want to output sweep signal, press again **【output】** key, and the output output lamp will be on. In external trigger mode, **【output】** key is only used as single trigger key and has no more switching function for signal. The output lamp is on, and signal always outputs.

6.8 Sweep example:

Frequency sweep: frequency range 100Hz~200kHz, sweep time 10s, linear sweep, internal trigger mode, the keying sequence:

Press **【sweep】** key, (entering frequency sweep mode)

Press **【menu】** key, select sweep mode [MODE], press **【1】【N】** , (set sweep mode as linear)

Press **【menu】** key, select start frequency [START F], press **【1】【0】【0】【Hz】** , (set start frequency)

Press **【menu】** key, select stop frequency [STOP F], press **【2】【0】【0】【kHz】** , (set stop frequency)

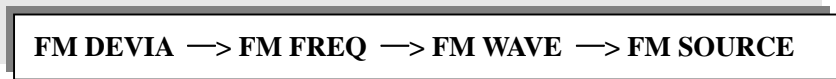
Press **【menu】** key, select sweep time [TIME], press **【1】【0】【s】** , (set sweep time)

Press **【menu】** key, select trigger mode [TRIG], press **【1】【N】** , (set trigger mode as internal trigger)

Tips: In frequency sweep function, the frequency set by pressing **【frequency】** key is the start frequency.

7, FM function mode: FM is the abbreviation of “frequency modulation”.

Press **【menu】** key, the following menu appears:



FM DEVIA: peak frequency deviation

FM FREQ: frequency of modulating signal

FM WAVE: waveform of modulating signal, 5 waveforms are available

FM SOURCE: internal or external modulating signal

Press **【FM】** key to enter into FM function mode, displaying the carrier frequency in display area and “FM” in state display area. Consecutively pressing **【menu】** key the display will be: Peak frequency deviation [FM DEVIA], modulating frequency [FM FREQ], modulating waveform [FM WAVE], modulating source [FM SOURCE] in sequence. When the item to be modified appears, stop pressing **【menu】** key. After displaying in flashing the current item for 1 second, its parameter value will be displayed automatically. Parameters of [FM DEVIA], [FM FREQ], [FM WAVE], [FM SOURCE] can be entered by digit keys or adjusting knob. When using digit keys in entry, the input data will only be effective with unit entered following the data. Continuously adjustment is possible when adjusting knob is used in entry. When adjustment is finished, press **【menu】** key to skip to next option. If no modification, press once **【menu】** key to skip to the next option.

7.1 Carrier signal: Press **【FM】** key to enter into FM function mode, displaying carrier frequency in the display area. The frequency, amplitude, waveform and DC offset of carrier signal can be set. The setting method and value ranges are the same as described in “4. Standard Waveforms function mode (SW)”. These parameters will be the same as the carrier (or standard waveforms) of the previous function if no setting is necessary.

In FM, only sine or square waves can be selected for carrier.

Example: the amplitude and frequency of carrier signal can be set by pressing **【Amplitude】**

or **【Frequency】** keys. **【Shift】** key and **【offset】** key can be used to set DC offset value. Use **【shift】** key and waveform key to select waveform for carrier signal.

7.2 Peak frequency deviation [FM DEVIA]: The variation in frequency of the modulating waveform from the carrier frequency (center frequency).

Range of deviation (**9340**): 100 μ Hz ~ 20MHz. The maximum value should not exceed half of the carrier frequency in internal FM, and 10% of carrier frequency in external FM; and frequency deviation plus carrier frequency should not exceed maximum operating frequency of the instrument.

After [FM DEVIA] is displayed in flashing for 1 second, current peak frequency deviation value will be displayed automatically. Peak frequency deviation value can be entered using digit keys or adjusting knob.

7.3 Modulating signal frequency [FM FREQ]: Frequency of the modulating signal.

The frequency range is 100 μ Hz ~ 10kHz.

After [FM FREQ] is displayed in flashing for 1 second, current modulating frequency value will be displayed automatically. Modulating frequency value can be entered using digit keys or adjusting knob.

7.4 Modulating signal waveform [FM WAVE]: Waveform of modulating signal. 5 waveforms (sine, square, triangle, rising/falling ramp) can be used for modulating signal, each with a number. Select modulating signal waveform by entering corresponding number. For waveforms and their numbers, refer to “**4.5.2**”.

After [FM WAVE] is displayed in flashing for 1 second, current number of modulating signal waveform will be displayed automatically. Number of waveform can be entered using digit keys or adjusting knob.

7.5 Modulating signal source [FM SOURCE]: Modulating signal includes internal signal and external input signal. Their number and prompt symbols are 1: INT, 2: EXT. The default is internal signal. External modulating signal is input from rear panel “Modulation Input” port (signal amplitude 3Vp-p).

When modulating signal source is selected “external”, the symbol “Ext” is displayed. At that time, inputs described in “**7.2**” “**7.3**” “**7.4**” are disabled. Parameter input is only effective for internal source.

After [FM SOURCE] is displayed in flashing for 1 second, corresponding prompt symbol and number of current modulating source will be displayed automatically. Number of modulating source can be entered using digit keys or adjusting knob in source selection.

7.6 Start and stop of FM: Fm output starts when the instrument is selected FM function mode. The instrument will automatically output signal according to the preset parameters. If output is not needed, press **【output】** key to disable the output, and the output lamp being off. If

output of signal is needed, press again **【output】** key, and the output lamp being on.

7.7 FM example:

Carrier signal is square, frequency is 1MHz, amplitude is 2V. The modulating signal is from internal. Carrier waveform is sine (No. 1). Frequency is 5kHz. Peak frequency deviation is 200kHz. The keying sequence:

Press **【FM】** key, (enter into FM function mode)

Press **【frequency】** key, press **【1】【MHz】** , (set carrier frequency)

Press **【amplitude】** key, press **【2】【V】** , (set carrier amplitude)

Press **【Shift】** and **【square】** key, (set carrier waveform)

Press **【menu】** key, select peak frequency deviation [FM DEVIA], press **【2】【0】【0】【kHz】**, (set FM deviation)

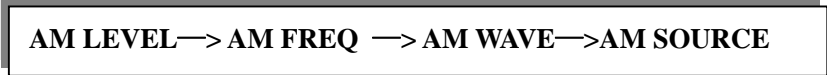
Press **【menu】** key, select FM frequency [FM FREQ], press **【5】【kHz】** , (set FM frequency)

Press **【menu】** key, select FM waveform [FM WAVE], press **【1】【N】** , (set FM waveform as sine)

Press **【menu】** key, select FM source [FM SOURCE], press **【1】【N】** (set FM source as internal)

8, AM function mode: AM means “amplitude modulation”.

Press **【menu】** and the following menu appears:



AM LEVEL: modulation depth

AM FREQ: frequency of modulating signal

AM WAVE: waveform of modulating signal, 5 waveforms available

AM SOURCE: internal or external modulating signal

Press **【AM】** key to enter into AM function mode, displaying carrier frequency. At the same time, the AM function mode symbol “AM” in state displaying area. Press **【menu】** key consecutively, the items [AM LEVEL], [AM FREQ], [AM WAVE], [AM SOURCE] are displayed in sequence:. When the item to be modified appears, stop pressing **【menu】** key. After the current item is displayed in flashing for 1 second, the parameter of current item will be displayed automatically. The parameters of modulation depth [AM LEVEL], modulating frequency [AM FREQ], modulating waveform [AM WAVE], modulating signal source [AM SOURCE] of AM can be entered using digit keys or adjusting knob. When digit key are used in data entry, the entered data will not be effective without a unit following the data. Continuous adjustment is possible if adjusting knob is used in data entry. When adjustment is finished, press **【menu】** key to skip to next option. If no modification is needed for the current item, press once the **【menu】** key to skip to the next option.

In AM Function Mode, to ensure normal signal output at 100% modulation depth, the instrument half reduces the peak-to-peak value of carrier. In AM only sine and square waves can be selected for carrier.

8.1 Carrier signal: Press **【AM】** key to enter into AM function mode, displaying carrier frequency. The frequency, amplitude, waveform and DC offset of carrier signal can be set. The setting method and value ranges are the same as described in “**4. Standard Waveforms function mode (SW)**”. These parameters will be the same as the carrier (or standard waveforms) of the previous function if no setting is necessary.

In AM only sine and square waves can be selected for carrier.

Example: press **【Amplitude】** key to set amplitude of carrier signal, press **【Frequency】** key to set frequency of carrier signal. **【Shift】** key and **【Offset】** can be used to confirm DC offset value. Use **【shift】** key and waveform key to select waveform of carrier signal.

8.2 Modulation depth [AM LEVEL]: The range of modulation depth is 1% ~ 120%.

After the modulation depth [AM LEVEL] is displayed in flashing for 1 second, the current AM depth value will be displayed automatically. Both digit key and adjusting knob can be used to enter AM depth value.

8.3 Modulating frequency [AM FREQ]: Frequency of modulating signal.

The frequency range is 100 μ Hz ~ 20kHz.

After the AM frequency [AM FREQ] is displayed in flashing for 1 second, the current AM frequency will be displayed automatically. Both digit key and adjusting knob can be used to ente8.4 Modulating signal waveform [AM WAVE]: waveform of modulating signal. 5 waveforms can be used as modulating signal, each with a number. Select waveforms by entering corresponding numbers that is shown in the table of “**4.5.2**”.

8.4 Modulating signal waveform [AM WAVE]: waveform of modulating signal. 5 waveforms (sine, square, triangle, rising/falling ramp) can be used as modulating signal, each with a number. Select waveforms by entering corresponding number that is shown in the table of “**4.5.2**”.

After AM waveform [AM WAVE] is displayed in flashing for 1 second, the current AM waveform number will be displayed automatically. Both digit key and adjusting knob can be used to select waveform by entering corresponding number.

8.5 Modulating signal source [AM SOURCE]: Including internal signal and external input signal. The number and prompt symbols are 1: INT, 2: EXT. The default of the instrument is internal signal. The external modulating signal is input through rear panel “Modulation Input” port (with signal amplitude 3Vp-p).

When the signal source is selected to be external, symbol “Ext” will be displayed. And here entries described in “**8.2**”, “**8.3**”, “**8.4**” are disabled. Parameters of those items are only effective

in internal mode.

After the modulating source [AM SOURCE] is displayed in flashing for 1 second, the corresponding prompt symbol and number of current AM source will be displayed automatically. Both digit key and adjusting knob can be used to enter number of AM source for selection of signal source.

8.6 Start and stop of AM: AM function starts when AM function mode is selected. The instrument automatically outputs signals according to the preset parameters. If output is not wanted, just press **【output】** key to disable the output, and the output lamp being off. If output is needed now, press once again **【output】** key, and the lamp being on.

8.7 AM example: carrier signal is square wave, frequency 1MHz, amplitude 2V, internal signal, modulating waveform sine wave (No.1), modulating signal frequency 5kHz, modulation depth 50%. The keying sequence:

Press **【AM】** key, (enter into AM function mode)

Press **【frequency】** key, press **【1】【MHz】** , (set carrier frequency)

Press **【amplitude】** key, press **【2】【V】** , (set carrier amplitude)

Press **【shift】** and **【square】** , (set carrier waveform)

Press **【menu】** key, select [AM LEVEL], press **【5】【0】【N】** , (set modulation depth)

Press **【menu】** key, select [AM FREQ], press **【5】【kHz】** , (set modulating signal frequency)

Press **【menu】** key, select [AM WAVE], press **【1】【N】** , (set AM wave as sine)

Press **【menu】** key, select [AM SOURCE], press **【1】【N】** , (set AM source as internal)

9, Burst function mode: To outputs pulse chain with unique frequency and certain period number in this function.

Press **【menu】** key and the following menu appears:

TRIG → COUNT → SPACE T → PHASE
--

TRIG: Burst trigger mode

COUNT: Burst cycles

SPACE T: Burst spacing time

PHASE: The starting phase of the burst

Press **【burst】** key to enter into burst function mode, displaying certain preset frequency. At the same time, the burst function mode symbol “Burst” is displayed in state displaying area. Press **【menu】** key consecutively, the following items will be displayed: Trigger mode [TRIG], burst counting [COUNT], burst spacing time [SPACE T] and burst start phase [PHASE]. When the item to be modified appears, stop pressing **【menu】** key. After current item is displayed in flashing for 1 second, the parameter value of current item will be displayed automatically. The burst trigger mode [TRIG], burst numbers [COUNT], burst spacing time [SPACE T] and the starting phase

of the burst [PHASE] can be entered using digit keys and adjusting knob. When digit keys are used in data entry, it will not be effective without a unit following the data. Continuous adjustment is possible using adjusting knob in data entry. When adjustment is finished, press **【menu】** key to skip to the next option. If no modification is needed for the current option, press once **【menu】** key to skip to next option.

9.1 Setting of basic burst signal: press **【burst】** key to enter into burst function mode. The frequency, amplitude, waveform and DC offset of carrier signal can be set. The setting method and value ranges are the same as described in “**4. Standard Waveforms function mode (SW)**”. These parameters will be the same as the carrier (or standard waveforms) of the previous function if no setting is necessary.

In burst only sine and square waves can be selected.

Example: press **【Amplitude】** key to set amplitude of carrier signal, press **【Frequency】** key to set frequency of carrier signal. **【Shift】** key and **【Offset】** can be used to confirm DC offset value. Use **【shift】** key and waveform key to select waveform.

9.2 Burst trigger mode [TRIG]: Burst trigger mode includes internal trigger and external trigger, with numbers and prompt symbols of 1: INT, 2: EXT. The default is internal trigger. In internal trigger, pulse chain with certain period number and fixed frequency is output according to the set parameter. External trigger has two forms. One is to use **【output】** key for single trigger. Press once **【output】** key to output pulse chain with certain period number for one time. The other is to input trigger signal through the rear panel “External Trigger Input” port. When trigger signal is input from rear panel, one burst is started at the rising edge of trigger signal. In external trigger mode, the symbol of “Trig” and “Ext” are displayed in state displaying area.

After displaying trigger mode [TRIG] in flashing for 1 second, the prompt symbol and number of current trigger mode will be automatically displayed. Both digit keys and adjusting knob can be used to enter numbers.

9.3 Burst counting [COUNT]: period number of waveform of each burst signal group.

The range of burst counting is 1 ~10000.

After displaying [COUNT] in flashing for 1 second, the current burst counting value will be displayed automatically. Burst counting value can be entered using digit keys or adjusting knob.

9.4 Burst spacing time [SPACE T]: time interval between burst signals with certain period number of each group.

Range of burst spacing time is 0.1ms ~ 800s.

After displaying [SPACE T] in flashing for 1 second, the current burst spacing time value will be displayed automatically. Burst spacing time value can be entered using digit keys or adjusting knob.

9.5 The starting phase of the burst [PHASE]: the start phase of burst signals with certain

period number of each group.

The range of burst start phase is $0.1^\circ \sim 360.0^\circ$.

After displaying [PHASE] in flashing for 1 second, the current start phase will be displayed automatically. Start phase can be entered using digit keys or adjusting knob.

9.6 Start and stop of burst signal: Burst signals begin to output when burst function is selected. The instrument will output burst signal according to the set parameter. If burst signal output is not needed, press **【output】** key to disable signal output, and the output lamp being off. If signal output is wanted, Press again the **【output】** key, and the output lamp being on. In external trigger mode, **【output】** key is only used for single trigger. The switch function for signal is disabled, the output lamp is on, and signal always outputs.

9.7 Burst example:

When burst output for sine wave with frequency 20kHz, amplitude 2V, 10 period for each group, spacing time between each group 10 ms, start phase 90.0° , is needed, the keying sequence:

Press **【burst】** key, (enter into burst function mode)

Press **【frequency】** key, press **【2】【0】【kHz】** , (set wave form frequency)

Press **【amplitude】** key, press **【2】【V】** , (set waveform amplitude)

Press **【shift】** and **【sine】** , (set waveform)

Press **【menu】** key, select trigger mode [TRIG] option, press **【1】【N】** , (set trigger mode as internal)

Press **【menu】** key, select burst counting [COUNT] option, press **【1】【0】【N】** , (set burst counting value)

Press **【menu】** key, select spacing time [SPACE T] option, press **【1】【0】【ms】** , (set spacing time)

Press **【menu】** key, select start phase [PHASE] option, press **【9】【0】【N】** , (set the start phase of burst)

10, FSK/FSK function: including frequency shift keying (FSK) and phase shift keying (PSK).

In frequency shift keying (FSK) function mode, the output signal jumps between the preset frequency 1 and frequency 2 in a specified time interval.

In phase shift keying (PSK) function mode, the start phase of output signal jumps between the preset phase 1 and phase 2 in a specified time interval.

Press **【FSK/FSK】** key to enter into frequency shift keying (FSK) mode, and displaying the set frequency. The symbol of frequency shifting keying function mode “FSK” is displayed in the state displaying area. Press again the **【FSK/FSK】** key to enter into phase shift keying (PSK) function mode, and displaying the set frequency. The symbol of phase shift keying function mode “◀” and “FSK” is displayed in the state displaying area. The parameter setting methods of the two function modes are quite similar, see below:

10.0 Enter into frequency shift keying (FSK) function mode.

Press **【menu】** key and the following menu appears:

START F → STOP F → SPACE T → TRIG
--

START F: the first frequency of FSK

STOP F: the second frequency of FSK

SPACE T: spacing time of FSK

TRIG: trigger mode of FSK

Consecutively press **【menu】** key, the following items will be displayed in sequence: Frequency 1 [START F], frequency 2 [STOP F], spacing time [SPACE T] and trigger mode [TRIG]. When the item to be modified appears, stop pressing **【menu】** key. After displaying the current item in flashing for 1 second, the parameter value of the current item will be displayed. The parameters of frequency 1 [START F], frequency 2 [STOP F], spacing time [SPACE T] and trigger mode [TRIG] of FSK can be entered using digit keys or adjusting knob. When digit keys are used, the data entry will not be effective without a unit entered after the data. Continuous adjustment is possible if adjusting knob is used in entry. When adjustment is finished, press once **【menu】** key to skip to next option. If no modification is needed for the current item, press once **【menu】** key to skip to next option.

10.1 FSK basic signal setting: In FSK function mode, the amplitude, waveform and DC offset of the FSK signal can be set. The setting method and value range are the same as described in “4. Standard Waveforms function mode (SW)”. If no setting, the above parameter will be the same as that of the carrier (or standard waveforms) of the previous function.

In FSK only sine and square waves can be selected.

Example: press **【Amplitude】** key to set amplitude of carrier signal. **【Shift】** key and **【Offset】** can be used to confirm DC offset value. Use **【shift】** key and waveform key to select waveform of carrier signal.

10.2 Trigger mode [TRIG]: the trigger modes of FSK include internal trigger and external trigger, with number and prompt symbol as 1: INT, 2: EXT. The default of the instrument is internal. In internal mode, signal with alternating frequency is consecutively output according to the set parameter. In external trigger mode, the trigger signal is input from the rear panel “External Trigger Input” port. The signal frequency output at high level of the trigger signal is frequency 2, while the signal frequency output at low level of the trigger signal is frequency 1. After displaying [TRIG] in flashing for a second, the prompt symbol and number corresponding to the current trigger mode will be automatically displayed. Both digit keys and adjusting knob can be used to enter the number of trigger mode.

10.3 Frequency 1 [START F]: First frequency of the two alternating frequencies of FSK.

After displaying Frequency 1 [START F] in flashing for 1 second, value of the current

frequency 1 [START F] is displayed automatically. Both digit keys and adjusting knob can be used to enter frequency value.

10.4 Frequency 2 [STOP F]: Second frequency of the two alternating frequencies of FSK. .

After displaying Frequency 1 [STOP F] in flashing for 1 second, value of the current frequency 2 [STOP F] is displayed automatically. Both digit keys and adjusting knob can be used to enter frequency value.

Frequency input range of frequency 1 and frequency 2 is 100μHz ~ Fmax.

(Fmax: 40MHz for 9340, 20MHz for 9320, 10MHz for 9310, 5MHz for 9305)

10.5 Spacing time [SPACE T]: Time interval between the alternating frequencies of out put signal.

Range of Spacing time is 1ms ~ 800s.

After displaying spacing time [SPACE T] in flashing for 1 second, value of spacing time [SPACE T] is displayed automatically. Both digit keys and adjusting knob can be used to enter spacing time value.

10.6 FSK example:

For sine signal of 2V output amplitude, alternating frequencies 20kHz and 600 kHz, alternating time interval 10ms, the keying sequence:

Press **【keying】** , (enter into FSK function mode)

Press **【amplitude】** key, press **【2】【V】** , (set waveform amplitude)

Press **【shift】** and **【sine】** , (set waveform)

Press **【menu】** key, select trigger mode [TRIG] options, press **【0】【N】** . (set trigger mode as internal)

Press **【menu】** key, select frequency 1 [START F] options, press **【2】【0】【kHz】** , (set frequency)

Press **【menu】** key, select frequency 2 [STOP F] options, press **【6】【0】【0】【kHz】** , (set frequency)

Press **【menu】** key, select spacing time [SPACE T] options, press **【1】【0】【ms】** , (set spacing time)

11. Phase shift keying (PSK) function mode.

Press **【menu】** key, the following menu appears:

P1 → P2 → SPACE T → TRIG
--

P1: The first phase of PSK

P2: The second phase of PSK

SPACE T: Spacing time of PSK

TRIG: Trigger mode of PSK

Consecutively press **【menu】** key, the following items are displayed in flashing one by one:: Phase 1 [P1], phase 2 [P2], spacing time [SPACE T] and trigger mode [TRIG]. When the item to be modified appears, stop pressing **【menu】** key. After displaying current item in flashing for 1 second, parameter value of the current item is displayed automatically. Both digit keys and adjusting knob can be used to enter parameters for phase 1 [P1], phase2 [P2], spacing time [SPACE T] and trigger mode.

If digit keys are used in data entry, the data will only be effective with a unit entered following the data. Continuous adjustment is possible if adjusting knob is used in data entry. When adjustment is finished, press once **【menu】** key to skip to next option. If no modification is needed for parameters of current item, press once **【menu】** key to skip to next option.

11.1 PSK basic signal setting: In PSK function mode, the frequency, amplitude, waveform and DC offset of carrier signal can be set. The setting method and value ranges are the same as described in “4. Standard Waveforms function mode (SW)”. These parameters will be the same as the carrier (or standard waveforms) of the previous function if no setting is necessary.

In PSK only sine and square waves can be selected.

Example: press **【Amplitude】** key to set amplitude of carrier signal, press **【Frequency】** key to set frequency of carrier signal. **【Shift】** key and **【Offset】** can be used to confirm DC offset value. Use **【shift】** key and waveform key to select waveform of carrier signal.

11.2 Trigger mode [TRIG]: the trigger modes of PSK include internal trigger and external trigger, with number and prompt symbol as 1: INT, 2: EXT. The default of the instrument is internal. In internal mode, signal with alternating frequency is consecutively output according to the set parameter. In external trigger mode, the trigger signal is input from the rear panel “External Trigger Input” port. The signal start phase output at high level of the trigger signal is phase 1, while the signal start phase output at low level of the trigger signal is phase 2.

After displaying [TRIG] in flashing for a second, the prompt symbol and number corresponding to the current trigger mode will be automatically displayed. Both digit keys and adjusting knob can be used to enter number of trigger mode.

11.3 Phase 1 [P1]: The first alternating start phase of PSK output signal. After displaying phase [P1] in lashing for 1 second, the value of current phase [P1] will be automatically displayed. Both digit keys and adjusting knob can be used to enter phase value.

11.4 Phase 2 [P2]: The second alternating start phase of PSK output signal. After displaying phase [P2] in lashing for 1 second, the value of current phase [P2] will be automatically displayed. Both digit keys and adjusting knob can be used to enter phase value.

Input range of phase 1 and phase 2 is 0.1°~ 360.0°.

11.5 Spacing time [SPACE T]: time interval between alternating start phases of output

signal.

Range of sweeping time is 1ms ~ 800s.

After displaying spacing time [SPACE T] in lashing for 1 second, the value of current spacing time [SPACE T] will be automatically displayed. Both digit keys and adjusting knob can be used to enter spacing time value.

11.6 PSK example:

For sine signals with 600 kHz output frequency, 2V amplitude, start phase alternating between 90.0° and 180.0°, alternating time interval is 10ms, the keying sequence:

Press **【keying】** key, (enter into PSK function mode)

Press **【frequency】** key, press **【6】【0】【0】【kHz】** , (set waveform frequency)

Press **【amplitude】** key, press **【2】【V】** , (set waveform amplitude)

Press **【shift】【sine】** , (set waveform)

Press **【menu】** key, select trigger mode [TRIG]options, press **【1】【N】** , (set trigger mode as internal)

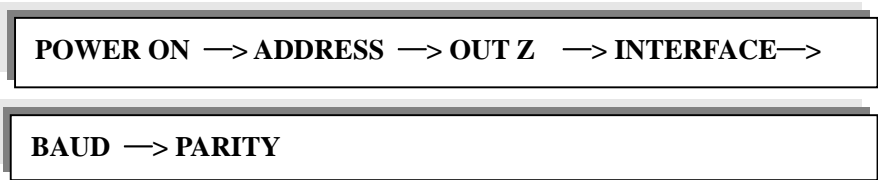
Press **【menu】** key, select start phase 1[P1] options, press **【9】【0】【N】** , (set phase 1)

Press **【menu】** key, select start phase 2 [P2] options, press **【1】【8】【0】【N】** , (set phase 2)

Press **【menu】** key, select spacing time [SPACE T] options, press **【1】【0】【ms】** , (set spacing time)

12, System function: the power on state, GP-IB address, output impedance, interface, the baud for RS232 interface and parity for the RS232 interface are settable.

Press **【menu】** key, the following menu appears:



POWER ON: State of power on

ADDRESS: GP-IB interface address

OUT Z: Output impedance

INTERFACE: Select RS232 or GP-IB (IEEE-488) interface

BAUD: Baud rate for the RS232 interface

PARITY: Parity for the RS232 interface

Press **【Shift】** and **【system】** key to enter into system setting function state, displaying “SYSTEM” in flash. Consecutively press **【menu】** key, the following items are displayed in flash one by one: Power on state [POWER ON], GP-IB address [ADDRESS], output impedance [OUT Z], interface [INTERFACE], the baud for RS232 interface [BAUD] and parity for the RS232 interface [PARITY]. When the item to be modified appears, stop pressing **【menu】** key. After

displaying current item in flash for 1 second, the parameter value of current item is automatically displayed. Both digit keys and adjusting knob can be used to enter the parameter values of those items. If digit keys are used in data entry, the data will only be effective with a unit entered following the data. Continuous adjustment is possible if adjusting knob is used in data entry. When adjustment is finished, press once **【menu】** key to skip to next option. If no modification is needed for parameters of current item, press once **【menu】** key to skip to next option.

12.1 Power on state [POWER ON]: The power on state of the instrument can be factory setting (number and symbol are 1: DEFAULT) and the last power off state (number and symbol are 2: LAST STATE). The factory is default. The power on state is stored in non-volatile memory that will never miss.

After displaying power on state [POWER ON] in flash for 1 second, the number and symbol are displayed automatically. Both digit keys and adjusting knob can be used to enter number of current power on state.

12.2 GP-IB address [ADDRESS]: The default of GP-IB interface address is 10. It can be set within 0 ~ 30.

After displaying GP-IB address [ADDRESS] in flash for 1 second, the current GP-IB address is displayed automatically. Both digit keys and adjusting knob can be used to enter current GP-IB address.

12.3 Output impedance [OUT Z]: The output impedance of the instrument can be set to high impedance (number and symbol are 1: HIGH Z) and 50Ω(number and symbol are 2: 50 OHM). The default is high impedance (number and symbol are 1: HIGH Z).

12.4 RS232 or GP-IB (IEEE-488) interface [INTERFACE]: RS232 or GP-IB (IEEE-488) interface of the instrument can be selected GP-IB (number and symbol are 1: GP-IB) and RS232 (number and symbol are 2: RS232). The default is RS232 (number and symbol are 2: RS232).

12.5 Baud rate for the RS232 interface [Baud]: Baud rate for the RS232 interface of this instrument can be selected 9600 (number and symbol are 1: 9600), 4800 (number and symbol are 2: 4800), 2400 (number and symbol are 3: 2400), 1200 (number and symbol are 4: 1200), 600 (number and symbol are 5: 600), 300 (number and symbol are 6: 300). The default is 9600 (number and symbol are 1: 9600).

12.6 Parity for the RS232 interface [PARITY]: Parity for the RS232 interface of the instrument can be selected No parity 8 bits (number and symbol are 1: NONE 8 BITS), ODD 7 bits (number and symbol are 2: ODD 7 BITS), Even 7 bits (number and symbol are 3: EVEN 7 BITS). The default is No parity 8 bits (number and symbol are 1: NONE 8 BITS).

12.7 Example for system function setting:

Set power on state [POWER ON] to default, GP-IB address [ADDRESS] to 13 and output impedance to 50Ω:

Press **【Shift】** and **【system】** key, (enter into system setting function state)

Press **【menu】** key, select power on state [POWER ON] options, press **【1】【N】**, (set power on state to default)

Press **【menu】** key, select GP-IB address [ADDRESS] options, press **【1】【3】【N】**, (set GP-IB address to 13)

Press **【menu】** key, select output impedance [OUT Z] options, press **【2】【N】**, (set output impedance to 50Ω)

(3) HOW TO USE THE COUNTER

1. Counter functions: Frequency measurement and counting.

1.1 Press **【Shift】** and **【Freq. Meas.】** keys to enter into function mode of frequency measurement. The symbols of frequency measurement function mode “Ext” and “Freq” are displayed in function state displaying area. Frequency measurement for external signal input from the rear panel “Freq. Meas./Count” terminal can be made now. If pressing again **【Shift】** key and **【Count】** key, the instrument is set to counting measurement function mode. The symbols of counting measurement function mode “Ext” and “Count” are displayed in the function state displaying area. Counting for period numbers of external signal input from rear panel “Freq. Meas./count” terminal can be made now.

Range of frequency measurement is 1Hz ~ 100MHz.

1.2 Gate time: In frequency measurement function mode, press **【Shift】** key and **【gate】** key to enter into gate time setting state. Both digit keys and adjusting knob can be used to enter gate time value. If the gate is open, the symbol “GATE” is displayed in the counter state displaying area on the right.

Range of gate time is 10ms ~ 10s.

1.3 Low pass filter: In frequency counter function mode, press **【Shift】** key and **【low pass】** key, the input signal will be measured through low pass filter. The low pass state symbol “Filter” is displayed in the state displaying area.

1.4 Attenuation: In frequency counter function mode, press **【Shift】** and **【attenuation】** keys, the input signal will be measured after attenuation. The attenuation state symbol “ATT” is displayed in state displaying area.

In counting function mode, press **【◀】** key to stop counting, and the current counted number is displayed. Press again **【◀】** key to continue counting.

In counting function mode, press **【▶】** key to clear counted value and restart counting.

6 INSTRUCTIONS FOR REMOTE OPERATION

(1) Preparations for Remote Operation

Two interfaces, i.e. RS232 (standard) and GPIB-488 (optional) are available on 9340 Series Function Generator. The remote control instructions used for the two interfaces are mostly the same. Before remote operation, necessary setting for the instrument according to your measurement requirement should be made. For the setting procedure, refer to instructions for operation for the system functions in Article 12, Sections 2 of Chapter 5 in this manual. The instrument enters into remote state after any instruction for remote operation is received and at the same time all the keys are locked except keys **【shift】** which can be used to return the instrument back to “local”. The instrument can also be returned to “local” by using the LOCAL instruction.

(2) Grammar of the SCPI instructions

APPLY instruction

APPLy: SINusoid [<frequency>, <amplitude>, <offset>]
 APPLy: SQUare [<frequency>, <amplitude>, <offset>]
 APPLy: TRIangle [<frequency>, <amplitude>, <offset>]
 APPLy: UP_RAMP [<frequency>, <amplitude>, <offset>]
 APPLy: DOWN_RAMP [<frequency>, <amplitude>, <offset>]
 APPLy: NOISe [<frequency>*, <amplitude>, <offset>]
 APPLy: DC [<frequency>*, <amplitude>, <offset>]
 APPLy?

*: if waveform is Noise or DC, the frequency data in command is invalid.

OUTPUT instructions

[SOURce:]
 FUNCtion: SHAPE {SINusoid|SQUare|TRIangle|UP_RAMP|DOWN_RAMP|
 NOISe|PULSE|P_PULSE|N_PULSE|P_DC|N_DC|STAIR|
 C_PULSE|COMMUT_FU|COMMUT_HA|SINE_TRA|

SINE_VER|SINE_PM|LOG|EXP|ROUND_HAL|
 SINX/X|SQU_ROOT|TANGent|CARDIO|QUAKE|COMBIN }

FUNCTION: SHAPe?

[SOURCE:]

FREQUency <frequency>

FREQUency?

[SOURCE:]

PULSe: DCYClE <percent>

PULSe: DCYClE?

[SOURCE:]

VOLTage <amplitude>

VOLTage?

VOLTage: OFFSet <offset>

VOLTage: OFFSet?

[SOURCE:]

OUTPut: LOAD {50|INFinity }

OUTPut: LOAD?

INPUT: FILTER <on|off>

INPUT: FILTER?

INPUT: ATTenuator <on|off>

INPUT: ATTenuator?

*SAV {0|1|2|3|4|5|6|7|8|9|10}. State 0 is the working state of the instrument before power off

*RCL {0|1|2|3|4|5|6|7|8|9|10}. States 1—10 are user defined working states

MODULATION instructions

[SOURCE:]

AM: DEPTH <depth in percent>

AM: DEPTH?

AM: INTernal: FUNCTion {SINusoid|SQUare|TRIangle|UP_RAMP|DOWN_RAMP|..... }

AM: INTernal: FUNCTion?

AM: INTernal: FREQUency <frequency>

AM: INTernal: FREQUency?

AM: SOURce {INTernal|EXTernal }

AM: SOURce?

AM: STATe {ON|OFF }

AM: STATe?

[SOURCE:]

FM: DEVIation <peak deviation in Hz>
 FM: DEVIation?
 FM: INTernal: FUNCTion {SINusoid|SQUare|TRIangle|UP_RAMP|DOWN_RAMP|.....}
 FM: INTernal: FUNCTion?
 FM: INTernal: FREQuency <frequency>
 FM: INTernal: FREQuency?
 FM: SOURce {INTernal|EXTernal}
 FM: SOURce?
 FM: STATe {ON|OFF}
 FM: STATe?

[SOURce:]
 BM: NCYCles <#cycles>
 BM: NCYCles?
 BM: PHASe <degrees>
 BM: PHASe?
 BM: INTernal: Space <time in second>
 BM: INTernal: Space?
 BM: SOURce {INTernal|EXTernal|SINGle}
 BM: SOURce?
 BM: STATe {ON|OFF}
 BM: STATe?

FSK instructions

[SOURce:]
 FSKey: FREQuency <frequency>
 FSKey: FREQuency?
 FSKey: INTernal: Space <time in second>
 FSKey: INTernal: Space?
 FSKey: SOURce {INTernal|EXTernal}
 FSKey: SOURce?

 FSKey: STATe {ON|OFF}
 FSKey: STATe?

PSK instructions

[SOURce:]
 PSKey: PHASe1 <degrees>
 PSKey: PHASe1?
 PSKey: PHASe2 <degrees>
 PSKey: PHASe2?
 PSKey: INTernal: Space <time in second>

PSKey: INTernal: Space?
 PSKey: SOURce {INTernal|EXTernal}
 PSKey: SOURce?
 PSKey: STATe {ON|OFF}
 PSKey: STATe?

SWEEP instructions

[SOURce:]
 FREQuency: START <frequency>
 FREQuency: START?
 FREQuency: STOP <frequency>
 FREQuency: STOP?

 [SOURce:]
 SWEep: SPACing {LINear|LOGarithmic}
 SWEep: SPACing?
 SWEep: TIME <time in second>
 SWEep: TIME?
 SWEep: SOURce {INTernal|EXTernal}
 SWEep: SOURce?
 SWEep: STATe {ON|OFF}
 SWEep: STATe?

COUNT instructions

[SOURce:]
 FUNction: TOTal INITial
 FUNction: TOTal START
 FUNction: TOTal STOP
 FUNction: TOTal CLEAR
 FUNction: TOTal?

FREQUENCY MEASUREMENT instructions

[SOURce:]
 FUNction: FREQuency MEASure
 FUNction: FREQuency?
 FUNction: FREQuency GATE <time>
 FUNction: FREQuency GATE?

TRIGGER instructions

TRIGger: SOURce {IMMediate|EXTernal|BUS}
 TRIGger: SOURce?

SYSTEM instructions

- *IDN?
- *RST?
- *SAV {0|1|2|3|4|5|6|7|8|9|10}
- *RCL {0|1|2|3|4|5|6|7|8|9|10}

RS232 special instructions

- SYSTem: LOCAL
- SYSTem: REMOTE

(3) Detailed Descriptions for SCPI Instructions

APPLy instructions

APPLy instructions are used to directly set the output of the function generator through the remote interface including waveform, frequency and offset. For example, to output a sine wave of 5kHz, 3Vp-p with -2.5V DC offset, the instructions are:

- “APPL: SIN 5 KHZ, 3.0 VPP, -2.5 V”
 - “APPL: SIN 5.0E+3,3.0, -2.5”
- Instructions of lower level can also be used:
- “FUNC: SHAPE SIN”, to output a sine wave
 - “FREQ 5.0 KHZ”, set frequency as 5kHz
 - “VOLT 3.0”, set voltage as 3 VPP
 - “VOLT:OFFSET -2.5”, set output offset as -2.5 V

APPLy?

Check the waveform, frequency, amplitude and offset of current function output. The returned data format is:

“SIN 5.000000000000E+03, 3.000000E+00, -2.500000E+00”

OUTPUT instructions

FUNCTION: SHAPe {SINusoid|SQUare|TRIangle|UP_RAMP|DOWN_RAMP|NOISe.....}

Select output waveforms of the function. 27 waveforms are available. In fixed frequency mode, each of the 27 kinds can be selected. In other modes, only sine and square waves can be selected.

FUNCTION: SHAPe?

Check the waveform of current function output. The returned data are SIN, SQU, TRI, UP_RAMP, etc.

FREQuency <frequency>

Set the frequency of function output

FREQuency?

Check the frequency of current main function output. The returned data unit is Hz.

PULSe: DCYClE <percent>

Set the duty cycle of pulse output.

Duty cycle: 0.1%—99.9%, in step of 0.1% ($f \leq 10$ KHz)

1%—99% in step of 1% ($10 \text{ kHz} < f \leq 100 \text{ kHz}$), default value 20%.

PULSe: DCYClE?

Check the duty cycle of current pulse output. The returned value is percentage.

VOLTage <amplitude>

Set the amplitude of current function output. The ranges of output amplitude should be $2\text{mVpp} \leq \text{ampl} \leq 20\text{Vpp}$ in high impedance output and $1\text{mVpp} \leq \text{ampl} \leq 10\text{Vpp}$ in 50Ω output. The output amplitude ranges of P_PULSE, N_PULSE, P_DC and N_DC should be $2\text{mVpp} \leq \text{ampl} \leq 10\text{Vpp}$ in high impedance output and $1\text{mVpp} \leq \text{ampl} \leq 5\text{Vpp}$ in 50Ω output. The above value is given based on a DC offset of 0V. If a DC offset exists, refer to *the setting of DC offset* described in Article 4, Section 2 of Chapter 5 of this manual for the relations between output amplitude and DC offset

VOLTage?

Check the output amplitude of current main function output.

VOLTage OFFSet <offset>

Set the DC offset of main function output. For the relations between setting of DC offset and output amplitude, refer to *The setting of DC offset* described in Article 4, Section 2 of Chapter 5 of this manual.

VOLTage OFFSet?

Check the DC offset of main function output.

OUTPut: LOAD {50|INFinity}

Set the output impedance of the function generator as 50Ω or high impedance (INFinity). The output amplitude ranges should be $1\text{mVpp} \leq \text{ampl} \leq 10\text{Vpp}$ in 50Ω and $2\text{mVpp} \leq \text{ampl} \leq 20\text{Vpp}$ in high impedance.

OUTPut: LOAD?

Check current output impedance of the function generator.

INPUT: FILTer {ON|OFF}

Set “on/off” of the low pass filter in input connector.

INPUT: FILTer?

Check the current “on/off” state of the low pass filter.

INPUT: ATTenuator {ON|OFF}

Set “on/off “of the input attenuator in frequency measurement

INPUT: ATTenuator?

Check current “on/off” state of the attenuator.

*SAV {0|1|2|3|4|5|6|7|8|9|10}

Save as many as 11 input states of the instrument. Among the 11 states, State 0 is the working state before power off of the instrument which is saved automatically; and State 1~10 are user defined.

*RCL {0|1|2|3|4|5|6|7|8|9|10}

Recall the 11 stored working states.

AM instructions

1. To set the carrier of output using APPLy instructions or FUNction, FREQuency, VOLTage, VOLTAGE: OFFSet instructions.
2. To set modulating waveform of AM using AM:INTernal: FUNction {SINusoid|SQUare|TRIangle.....} instructions
3. To set modulating frequency of AM using AM: INTernal: FREQuency <frequency> instructionsms.
4. To set the modulation depth of AM using AM: DEPT h {depth in percent} instructions
5. To set modulating source of AM using AM: SOURce {INTernal|EXTernal} instructions
6. To start AM using AM: STATe ON instructions.

AM: DEPT h {depth in percent}

Set modulation depth of AM .MIN=1%, MAX=120%.

AM: DEPT h?

Check current modulation depth of AM.

AM: INTernal: FUNction {SINusoid|SQUare|TRIangle.....}

Set the modulating waveform of AM within 27 waveforms.

AM:INTernal:FUNction?

Check current modulating waveform of AM. The returned data are “SIN”, “SQU”, TRI”, “UP_RAMP”, “DOWN_RAMP”

AM:INTernal: FREQuency <frequency>

Set frequency of modulating signal of AM. When internal modulating source is selected, the modulating frequency should be ≤ 10 kHz.

AM: INTernal: FREQuency?

Check the frequency of current modulating signal of AM.

AM: SOURce {INTernal|EXTernal}

Set modulating source of modulating signal of AM as internal (INTernal) or external (EXTernal).

AM: SOURce?

Check current modulating source of AM.

AM: STATe {ON|OFF}

Turn on AM mode (ON) or turn off AM mode (OFF).

AM:STATe?

Check the “on/off” state of AM mode. The returned data are “0” (OFF) or “1” (ON).In “off” state, the instrument turn back to fixed frequency mode.

FM instructions

1. To set the carrier of output using APPLy or FUNcTion, FREQuency, VOLTage, VOLTAGE: OFFSet instructions.
2. To set modulating waveform of FM using FM: INTernal: FUNcTion {SINusoid|SQUare|TRIangle.....} instructions
3. To set modulating frequency of FM using FM:INTernal: FREQuency <frequency> instructionms.
4. To set the modulating deviation of FM using FM: DEVIation <peak deviation in Hz> instructions
5. To set modulating source of FM using FM: SOURce {INTernal|EXTernal} instructions
6. To start FM using FM: STATe ON instructions.

FM: DEVIation <peak deviation in Hz>

Set the modulating deviation of FM. The maximum value should be half of carrier frequency in internal modulating source and 10% of carrier frequency in external modulating frequency.

FM:DEVIation?

Check current modulating deviation of FM.

FM:INTernal: FUNcTion {SINusoid|SQUare|TRIangle.....}

Set the modulating waveform of FM within 27 waveforms.

FM:INTernal:FUNcTion?

Check current modulating waveform of FM. The returned data are “SIN”, “SQU”, “TRI”, “UP_RAMP”, “DOWN_RAMP”.

FM:INTernal: FREQuency <frequency>

Set the frequency of modulating signal of FM. The modulating frequency should be $\leq 10\text{KHz}$

when internal modulating source is selected.

FM:INTernal: FREQuency?

Check the frequency of current modulating signal of FM.

FM: SOURce {INTernal|EXTernal}

Set modulating source of FM signal as internal (INTernal) or external (EXTernal).

FM:SOURce?

Check current modulating source of FM.

FM: STATe {ON|OFF}

Turn on FM mode (ON), turn off FM mode (OFF).

FM:STATe?

Check the “on/off” state of FM mode. The returned data are “0” (OFF) or “1” (ON). It returns to fixed frequency mode in “off” state.

Burst Mode instructions

1. To set carrier of output using APPLY instructions or FUNCtion, FREQuency, VOLTage, VOLTAGE: OFFSet instructions.
2. To set number of burst using BM: NCYCles <#cycles> instructions.
3. To set start phase of burst using BM: PHASe <degrees> instructions.
4. To set time interval between two bursts using BM:INTernal: SPACe <time> instructions.
5. To set trigger source of burst using BM: SOURce {INTernal|EXTernal|SINGle} instructions.
6. To turn on burst using BM: STATe ON instruction.

BM: NCYCles <#cycles>

Set waveform numbers of burst. $MAX \leq 10000$.

BM: NCYCles?

Check waveform numbers of burst.

BM: PHASe <degrees>

Set start phase of burst in 0—360° in step of 0.1°.

BM: PHASe?

Check the start phase of burst.

BM: INTernal: SPACe <time>

Set time interval between two bursts.

BM: INTernal: SPACe?

Check time interval between two bursts.

BM: SOURce {INTernal|EXTernal|SINGLE}

Set trigger source of burst as internal (INTernal), external (EXTernal) or single (SINGLE).

BM: SOURce?

Check current trigger source of burst.

BM: STATe {ON|OFF}

Turn on burst mode (ON) or turn off burst mode (OFF).

BM: STATe?

Check “on/off” state of burst mode. The returned data are “0” (OFF) or “1” (ON). It returns to fixed frequency mode in “off” state.

FSK Mode instructions

1. To set the output waveform, amplitude, DC offset and frequency 1 using APPLY instructions or FUNCTION, FREQUENCY, VOLTage, VOLTAGE:OFFSet instructions.
2. To set frequency 2 of FSK using FSKey: FREQUENCY <frequency> instruction.
3. To set time interval of frequency switching using FSKey:INTernal: SPACe <time> instruction.
4. To set trigger source of FSK using FSKey: SOURce {INTernal|EXTernal} instructions.
5. To turn on FSK using FSKey: STATe ON instruction.

FSKey: FREQUENCY <frequency>

Set frequency 2 of FSK.

FSKey: FREQUENCY?

Check frequency 2 of FSK.

FSKey: INTernal: SPACe <time>

Set time interval of frequency switching

FSKey: INTernal: SPACe?

Check time interval of frequency switching

FSKey: SOURce {INTernal|EXTernal}

Set trigger source of FSK as internal (INTernal) or external (EXTernal).

FSKey: SOURce?

Check current trigger source of FSK.

FSKey: STATe {ON|OFF}

Turn on FSK mode (ON) or turn off FSK mode (OFF).

FSKey: STATe?

Check the “on/off” state of FSK mode. The returned data are “0” (OFF) or “1” (ON). It returns to fixed frequency mode in “off” state.

PSK Mode instructions

1. To set the output waveform, amplitude, DC offset and frequency using APPLy instructions or FUNcTion, FREQUency, VOLTage, VOLTAGE:OFFSet instructions.
2. To set phase 1 of PSK using PSKey: PHASe1 <degrees> instruction.
3. To set phase 2 of PSK using PSKey: PHASe2 <degrees> instruction.
4. To set time interval of phase switching using PSKey:INTernal: SPACe <time> instruction.
5. To set trigger source of PSK using PSKey: SOURce {INTernal|EXTernal} instructions.
6. To turn on PSK using PSKey: STATe ON instruction.

FSKey: PHASe1 <degrees>

Set phase 1 of PSK in 0--360°.

PSKey: PHASe1 ?

Check phase 1 of PSK

PSKey: PHASe2 <degrees>

Set phase 2 of PSK in 0--360°.

PSKey:PHASe2?

Check phase 2 of PSK.

PSKey: INTernal: SPACe <time>

Set time interval of phase switching

PSKey: INTernal: SPACe?

Check time interval of phase switching

PSKey: SOURce {INTernal|EXTernal}

Set trigger source of PSK as internal (INTernal) or external (EXTernal).

PSKey: SOURce?

Check current trigger source of PSK.

PSKey: STATe {ON|OFF}

Turn on PSK mode (ON) or turn of f PSK mode (OFF).

PSKey: STATe?

Check the “on/off” state of PSK mode. The returned data are “0” (OFF) or “1” (ON). It returns to fixed frequency mode in “off” state.

Sweep Mode instructions

1. To set the output waveform, amplitude, DC offset and frequency using APPLy instructions or FUNcTion, FREQUency, VOLTage, VOLTAGE:OFFSet instructions.
2. To set start frequency of sweep using FREQUency: STARt <frequency> instruction.

3. To set stop frequency of sweep using P FREQUENCY: STOP<frequency> instruction.
4. To set sweep mode using SWEep: SPACing {LINear|LOGarithmic} instruction.
5. To set sweep time using SWEep: TIME <time> instructions.
6. To set trigger source of sweep using SWEep: SOURce {INTernal|EXTernal}instructions.
7. To turn on sweep using SWEep: STATe ON instruction.

FREQUENCY: START <frequency>

Set start frequency of sweep.

FREQUENCY: START?

Check starting frequency of sweep.

FREQUENCY: STOP <frequency>

Set stop frequency of sweep.

FREQUENCY: STOP?

Check stop frequency of sweep.

SWEep: SPACing {LINear|LOGarithmic}

Set sweep mode as linear (LINear) or logarithmic (LOGarithmic)

SWEep: SPACing?

Check sweep mode.

SWEep: TIME <time>

Set sweep time.

SWEep: TIME?

Check the sweep time.

SWEep: SOURce {INTernal|EXTernal}

Set trigger source of sweep as internal (INTernal) or external (EXTernal).

SWEep: SOURce?

Check current trigger source.

SWEep: STATe {ON|OFF}

Turn on sweep mode (ON) or turn off sweep mode (OFF).

SWEep: STATe?

Check the "on/off" state of sweep mode. The returned data are "0" (OFF) or "1" (ON). It returns to fixed frequency mode in "off" state.

Counting instructions

FUNCTION: TOTAl INITIal

Initialize the counter.

FUNCTION: TOTAl START

Set the counter to start counting.

FUNCTION: TOTAl STOP

Set the counter to stop counting.

FUNCTION: TOTAl CLEAR

Clear the counted value of the counter.

FUNCTION: TOTAl?

Record the current value of the counter.

Frequency Measurement instructions

FUNCTION: FREQUency MEASure

Enable frequency measurement function for the instrument to start a new frequency measurement.

FUNCTION: FREQUency?

Record last frequency value after frequency measurement is finished.

FUNCTION: FREQUency GATE <time>

Set gate time in the range of 10ms to 10s for frequency measurement.

FUNCTION: FREQUency GATE?

Check current gate time for frequency measurement.

Trigger instructions

TRIGger: SOURce {IMMEDIATE|EXTernal|BUS}

Set trigger source or modulating source for available functions as internal (IMMEDIATE), external (EXTernal) or single (BUS).

TRIGger: SOURce?

Check trigger source or modulating source of current function as internal (IMM), external, (EXT) or single (BUS).

System Related instructions

*IDN?

Read the identification label of company. The returned data is "Protek 9340 Series DDS Function Generator".

*RST?

Reset instruction. Enable the instrument to reset to the default turning-on state.

*SAV {0|1|2|3|4|5|6|7|8|9|10}

Save as many as 11 input states of the instrument. Among the 11 states, State 0 is the working state before power off of the instrument that is saved automatically; and State 1~10 are user defined.

*RCL {0|1|2|3|4|5|6|7|8|9|10}

Recall the stored 11 working states.

Special instructions for RS232

SYSTEM: LOCAL

This instruction makes the instrument enter into local state from remote state; and the control keys are enabled.

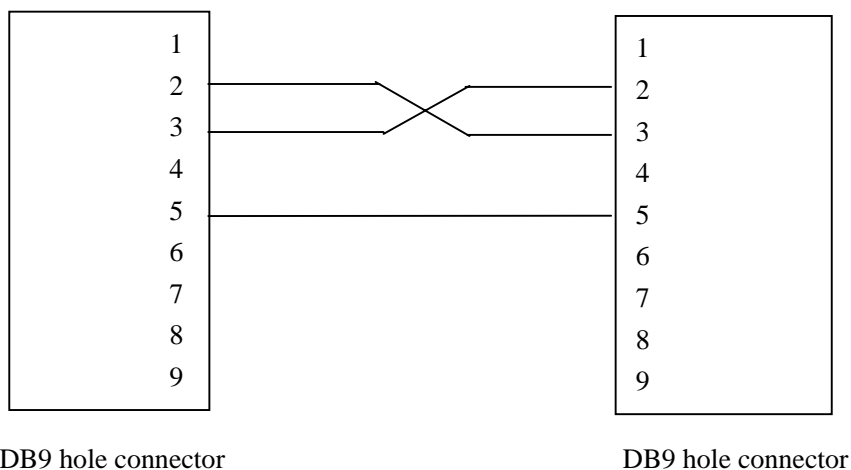
All the RS232 instructions should start at the communication address (HEX) before the corresponding SCPI instructions and stop at 00H after SCPI instructions.

SYSTEM: REMOTE

This instruction makes the instrument enter into remote state from local state; and all control keys are disabled except for keys **【shift】** which can be used to set the instrument back to local state.

All instructions of remote for RS232 interface is add GPIB ADDRESS (HEX) before instructions for GPIB interface and end of 0x00.

The wiring between RS232 interface and connection cable of computer:



7	NOTICE, MAINTENANCE AND REPAIR
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1. Solutions for erroneous operation

1.1 Prompt and solution for erroneous entry of value: If the entered value exceeds the rated range, the sound of “de” “ de” will be heard. If the entered value is less than the lower limit, the instrument will automatically change the entry to the lower limit. If the entered value is more than the upper limit, the instrument will automatically change the entry to the upper limit.

For example: entering 50MHz, the sound “de” “ de” will be heard to prompt erroneous entry, and the entry will automatically changes to 40MHz (PROTEK 9340).

1.2 Prompt and solution for meaningless key pressing: Sound of “de’ “de” to prompt error, and the instrument will not respond to the erroneous entry.

For example: Key **[-]** is pressed when entering frequency value. The instrument will not respond for the entry except for sound of “de” “de”.

2. Maintenance and repair

2.1 Large scale CMOS ICs and super high speed ECL TTL ICs are used in the instrument. To prevent for accident damage, never use an iron with a 2-core power cable. The enclosures of the instrument and other equipment must be well grounded.

2.2 Never repair the instrument with power on. As soon as the power cord is plugged into the power socket, the power supply unit and the crystal oscillator in the instrument are powered. Unplug the power cord before soldering.

2.3 When repairing, in general, first locate the external faults and visual faults, such as open circuit, short circuit or unreasonable settings parameters, etc. Secondly measure the voltage of each group to see whether it is normal. If all the voltages are normal, check the static working point of faulted circuit and check if there are any faults soldered points. Special carefulness should be paid to determine a fault IC. In repairing, the probe of oscilloscope or the pen of multimeter should not touch the test points and the adjacent point in order to avoid causing more troubles.

2.4 Contact our special agents for instant repair when the user is unable to repair by itself.

8 COMPLETE SET OF THE INSTRUMENT

PROTEK 9305 (or 9340, 9320, 9310) Digital Synthesized Function Generator/Counter	1 set
BNC-double-clip cable	1 pc
BNC test cable	1 pc
50 Ω impedance match (option)	1 pc
Power cable	1 pc
Instructions for operation	1 copy
Product certificate	1 pc
Warranty card and user registration form	1 pc
0.5A/220V fuse (already installed)	2 pcs