User's Guide

SU5202G Pulse Generator

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Brief Introduction of SU5202G Series Pulse Generator

With large scale integrated circuits, programmable logical circuits, Digital Synthesis technology and SMT technologies, SU5202G Series Pulse Generator is a new digitizing instrument with small dimension, high accuracy high reliability, which is convenient to use. SU5202G takes quartz-crystal oscillator as time base, uses digital synthesis technology to generate settable standard pulse. User could set the pulse to single pulse or double pulse, outputting continuous, single or gate controlled synchronous pulse, the logical form of which is positive or negative, and the trigger mode of which is internal, external and manual. SU5202G Series Pulse Generator is widely used in experiment lab of colleges, navigation, communication and scientific research area, also departments using or producing radar system.

Features:

- With high-stable crystal oscillator, the generator is of high period accuracy, fine resolution and wide time range, users may set kinds of high-accuracy time parameters.
- With DDS technology, the generator is of high frequency accurate, fine resolution and wide frequency range, users may set kinds of high-accuracy pattern frequency parameters.
- Output kinds of pulse signal, continuously or in trigger way.
- Multi-channel of output, external trigger input channel and external standard frequency input channel.
- Burst and output the pulse signal singly or with count.
- 5.7" TFT true-color display screen, users may set parameters by numeric keys directly or adjust the parameters by knob continuously.
- Chinese-English-Russia user-interface

SU5202G Pulse Generator and accessories

- SU5202G Pulse Generator 1 set
- Three-core power cord 1 piece
- BNC testing cable 2 pieces
- CD 1 piece

Summary

Content

Notice: please excuse any modification of the contents without special notification. Besides, it is unavoidable for not-so-adequate description and wrong printing. The present document will not warrant in any form including, but not limited to, those for special aims.

Chapter 1 Guide of Basic Operation

1.1 Prepare to use

1.1.1Check-up the instrument and accessories:

Check whether the generator and the accessories are complete and ready. If the package is badly damaged, please keep it until the generator passes the performance testing.

1.1.2 Power on the generator

Operate the generator only under the following specified conditions.

1.1.2.1 Power condition

Voltage: AC220V（1±10％） Frequency: 50Hz（1±5％）

Power consumption: ＜50VA

1.1.2.2 Environment

Temperature: 0～40℃ Humidity: ＜80％

1.1.3 Booting

Plug into the power socket with earth wire and press the power switch on the panel to make the generator connected to power source. Now the initialization of the generator begins. The name of instrument and manufacturer are displayed first and then load the default parameters, and the instrument is ready to work.

Warning: To ensure the safety of operator, three-core power socket with safe earth wire must be used.

1.2 Front and Rear Panel and User Interface

1.2.1 Front panel

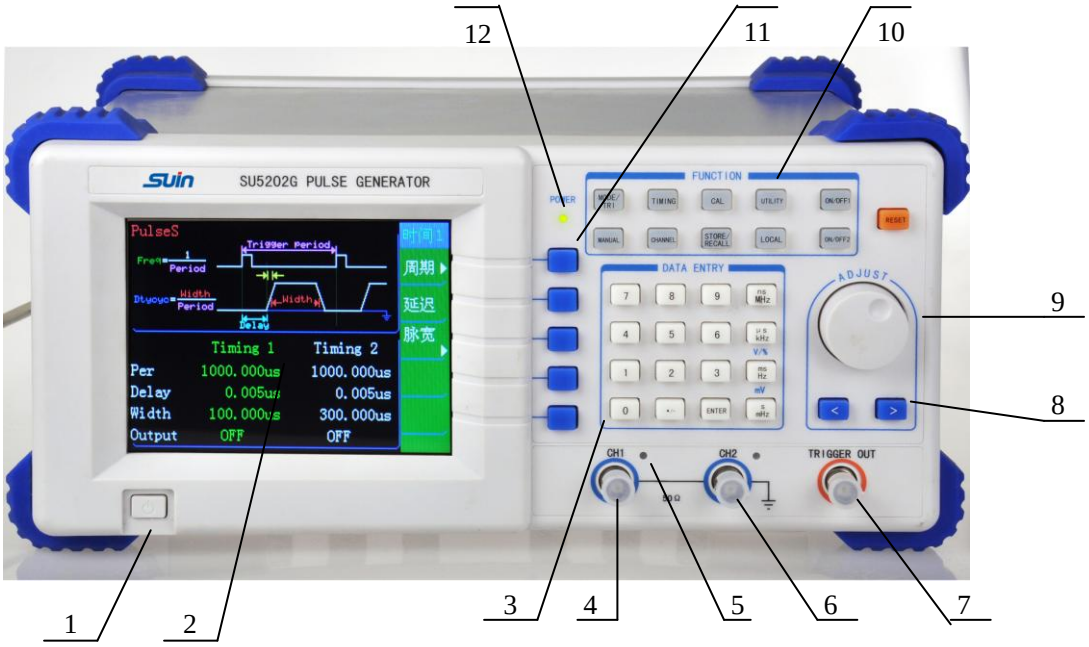

Fig. 1-1 Front panel

1. On/Off
2. Display screen
3. Numeric keys
4. CH 1
5. Output Indicator
6. CH 2
7. Synchronous output
8. Arrow keys
9. Knob
10. Function key
11. Soft key (controlling software)
12. Power indicator

NOTICE The two main and one synchronous output channels on the front panel, which will be burnt out and cause error to the generator when input signals, are ONLY used for signal output of the generator.

1.2.2 Rear panel

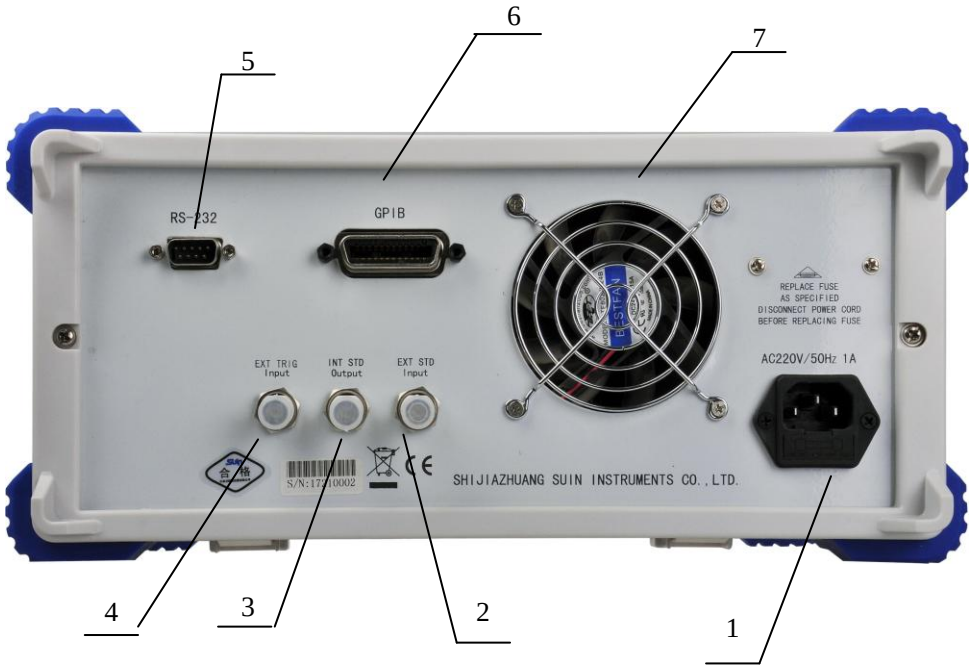

Fig. 1-2 Rear panel

1. Power Socket
2. External standard frequency input
3. Internal standards frequency output
4. External trigger input
5. RS232 Remote interface
6. GPIB Remote interface
7. Fan

1.2.3 Panel Description

Total 12 sections (Fig.1-1) on the front panel of the generator, mainly including:

Software key: software-controlled key, on the right side of the screen, which coordinates with the software information showed on the display screen.

Data entry key: Enter data, then press unit keys on the right to input unit for an data entry, synchronously end the entry.【ENTER】key is confirmation key.

Function selection key: function key, select and display directly corresponding functions. Among which the 【TIMING】and【CHANNEL】keys are loop keys, users may press this two keys to convert Pulse 1 and Pulse 2 and select corresponding parameters.

Knob: increase or decrease the number on the cursor position.

Cursor key: move the cursor left or right mainly, select storage address under "storage function".

Indicator of output: indicate output(on or off).

"CH1" and "CH2": the characteristics of the two are totally the same, including pulse amplitude control, offset control, form control, waveform selection etc.

"TRIGGER OUT" channel: output positive pulse only, could not control waveform or open/close output. When there is no load, the level is TTL/CMOS, and the output impedance is 50Ω. Pulse width is automatically adjusted along with the change of period, the duty cycle is fixed as 50%.

Power indicator: when the generator is power on, the indicator is lighted up. The on or off of the indicator indicates whether the generator is screen-protected or not. If the indicator is on and the display screen is dark, the generator is under screen protection state; if the indicator is off and the display screen is dark, the generator is shut down or disconnected from power.

1.3 Booting and Reset

Push the power button on the panel to connect the instrument to the power. The generator display its name and the information of the manufacturer firstly, initializing itself and recalls its default work state and parameters, then prepare to work after making a sound. Users may recall user-stored work states and parameters whenever pressing 【 STORE/RECALL 】 key and selecting corresponding parameter storage address, which makes the operation of the instrument more conveniently. Press【RESET】key to return to the initialized work sate and parameters when booting.

Initialized work state and parameters are set as follows:

Working state:

Continuous trigger, pulse work mode, internal trigger etc.

Pulse parameters:

"CH 1": single pulse P1, pulse width=100.000μs

"CH 2": single pulse P2, pulse width=300.000μs

"TRIGGER OUT": output synchronous pulse of P1（square）

Pulse period=1000.000μs, frequency=1000.0Hz

1.4 Data Entry

There are two ways to enter data: entry with the numeric keys, entry with the knob.

1.4.1 Entry with the numeric keys

Write in data to the display area with the numeric keys one by on from right to left，the number on the left will overflow and lost when the entry is more than 11 numbers. The sign【－】is also minus, under "offset" function, press this key to enter into a minus. The numeric keys only make digits writed into the display area, which are not valid till pressing unit keys(【ns】,【μs】,【ms】,【s】) after the entry, the instrument will send the data in the display area to corresponding memories and running sections based on different functions, and output signals with new parameters.

No matter what kind of combination of point and unit keys, the generator will display the data in a fixed form.

For example: Input 1.5ms or 0.0015s, the valid data will be displayed as 1500.000μs.

【ms】key is also the unit key of "Hz", "V" and "%".

【s】key is also the unit key of "mV" and "mHz".

The data entry must end with unit keys. Select frequency, time and voltage, the generator will display corresponding unit as: Hz, μs and Vp; no unit displayed when selecting "count".

【ENTER】is the confirmation key, confirming the sub-menu function selected by pressing corresponding softkey; confirming the number when inputting burst parameter; confirming the calibration value under calibration function.

1.4.2 Input with Knob

In practical application, users may continuously adjust the signal by rotating the knob. Press the direction key【<】or【>】to highlight a digit in the data display area and move the highlighted position left or right, rotating the knob on the panel right, the highlighted digit will increased by one continuously, do a carry to its higher position; rotating the knob left, the highlighted digit will decreased by one continuously, borrowing to its higher position. When using the knob to enter data, the data entered takes effect immediately and no need to press unit key. Users

could do rough adjustment to the data when moving the highlighted position left, and fine adjustment when moving the highlighted position right.

The knob is applicable in many functions, users may cancel the highlighted position with the direction key 【<】and 【>】 to make the rotation of knob invalid when there is no need to use it.

Notice: Since the pulse of the generator is generated in period, when setting frequency, some data will not increase or decrease by one continuously when rotating the knob.

1.4.3 Data Input Method Selection

For known data, it is the most convenient to use numeric keys as it can be gotten easily without the generating of transient data no matter how big the change of the data is, which is so important. For the modifying of the entered data or for entering sequence data, it will be more convenient to use the knob. So user should select neatly according to the different applications.

1.4.4 Function Selection

Press corresponding keys in the function area to select corresponding function module and enter into the display screen of this function.

【MODE/TRI】key: set the working mode, burst parameter, trigger edge, range etc., of trigger and pulse.

【MANUAL】 key: used as manual start source under external trigger mode; used as synchronous start signal under internal trigger mode.

【TIMING】and【CHANNEL】key: enter into TIMING parameter and CHANNEL parameter states of pulse and pattern respectively. Users may press this key to switch parameters of pulse 1 and pulse 2.

【CAL】: press this key to enter into calibration screen, including amplitude and offset calibration.

【STORE/RECALL】key: press this key to enter into storage screen, including disk selection, stored data type selection, parameter storage, parameter recall etc.

【LOCAL】key: press this key to return to keypad working state when under remote control working state.

【ON/OFF1】and 【ON/OFF2】key: open or close current channels, the indicator of the output port on the panel indicates the open/close of output.

【UTILITY】additional function key: set options of other functions, including language, screen protection, key sound, interface setting etc.

【RESET】key: Reset the generator to booting state.

1.5 Basic Screen

The main parameter generating pulse is set on three screens, the basic screen is used to set pattern.

1.5.1 Working Mode/Trigger Screen（MODE/TRI）

Press 【MODE/TRI】key to visit this screen, to set basic operation and working mode requested by signals.

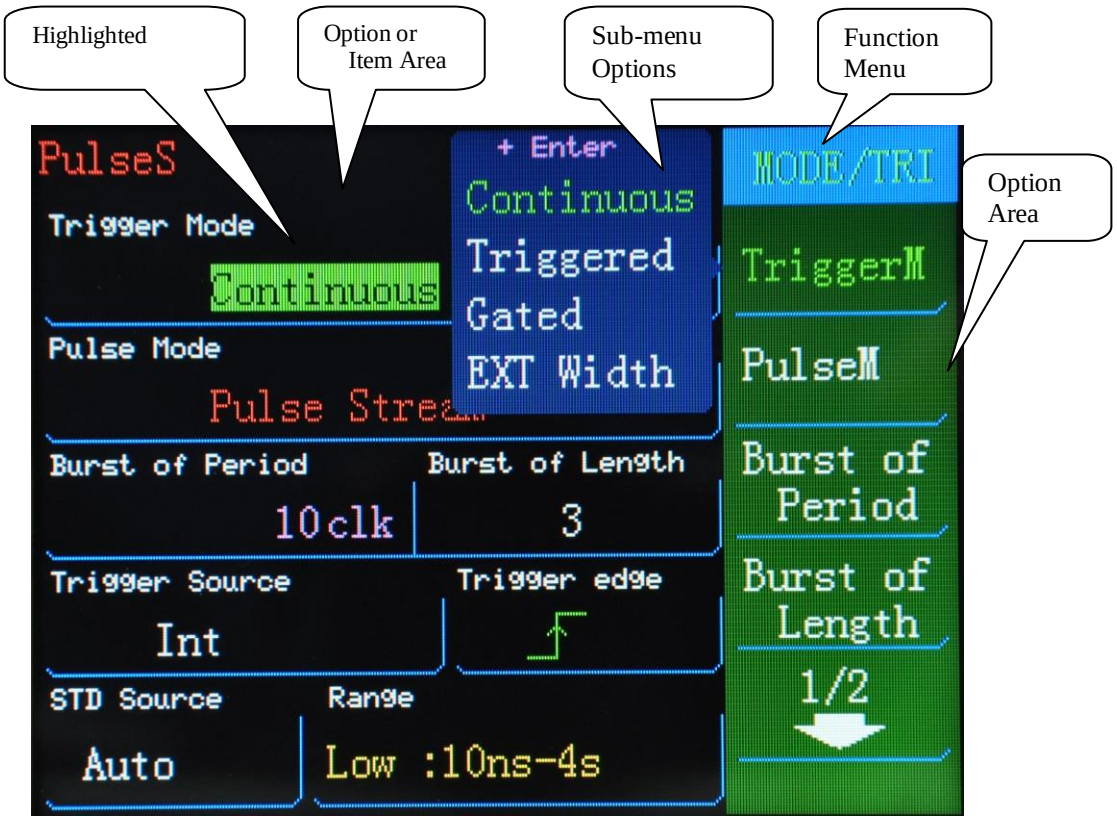

Fig. 1-3 Working Mode/Trigger screen display window

This screen includes function, the option area, the item area or parameters area and sub-menu options etc. When selecting trigger setting option, users may set the signal as

continuous, trigger or gate. When selecting the pulse setting, users may set the pulse as pulse stream, pulse string (one pause following a number of signals).

On the bottom of the screen, including the number of pulse intervals of burst, pulse numbers, the trigger source (changing with the change of working states), selection of the trigger edge, standard frequency source, the range and so on.

Press appropriate option soft key, the selected parameters will be highlighted, and users may set or adjust this option directly, while the rest unselected options could not be adjusted.

1.5.2 TIMING Screen (TIMING)

Press【TIMING】function key to visit this screen, to set the timing parameter of the almost to-be-generated signal based on its request.

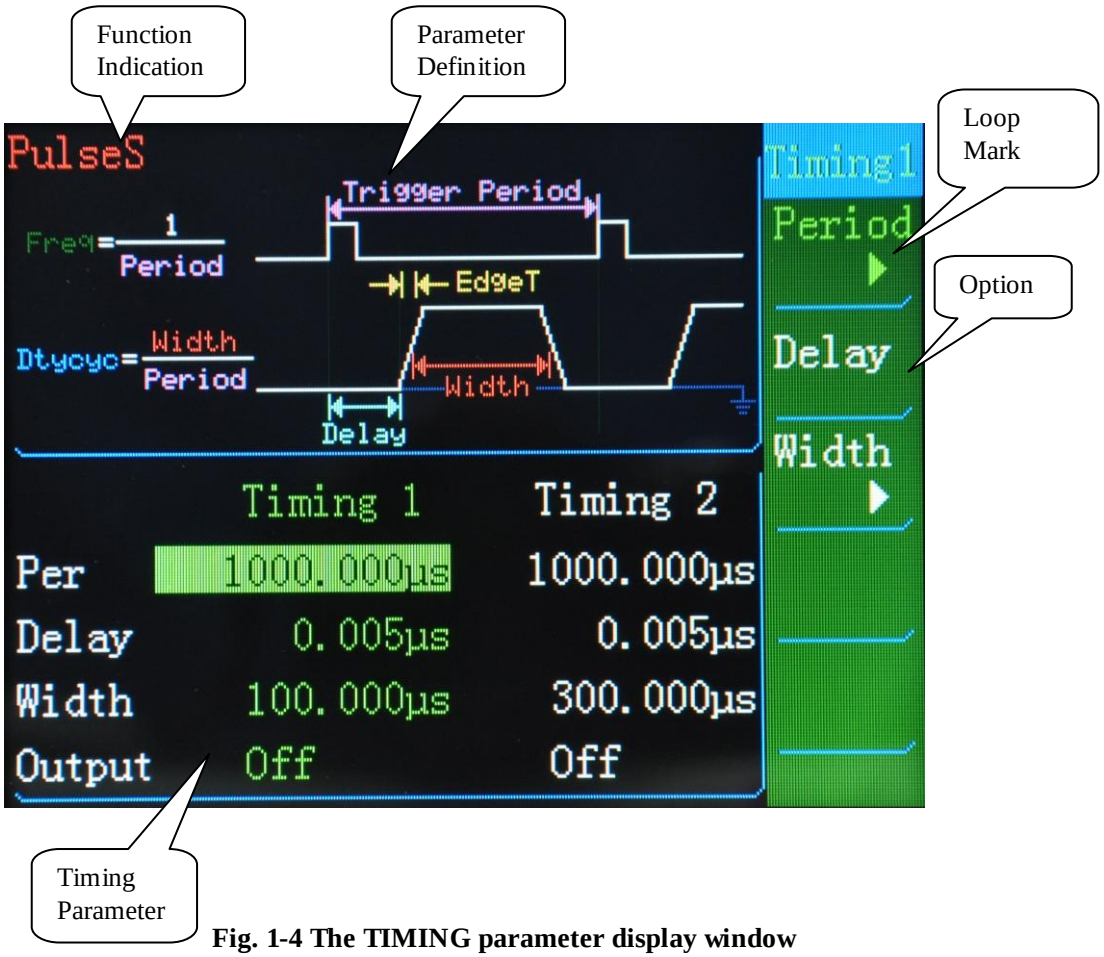

Fig. 1-4 The TIMING parameter display window

On TIMING screen, you could set clock period of CH1 and CH2, and the delay, pulse width, edge time etc. of signals.

"►" is a circular mark, all the "►" following softkeys are circular marks.

1.5.3 The Channel Screen（CHANNEL）

Press【CHANNEL】function key to visit this screen, you could set the level and state parameters of the to-be-generated signals of CH1 and CH2, and the display of output switch state etc.

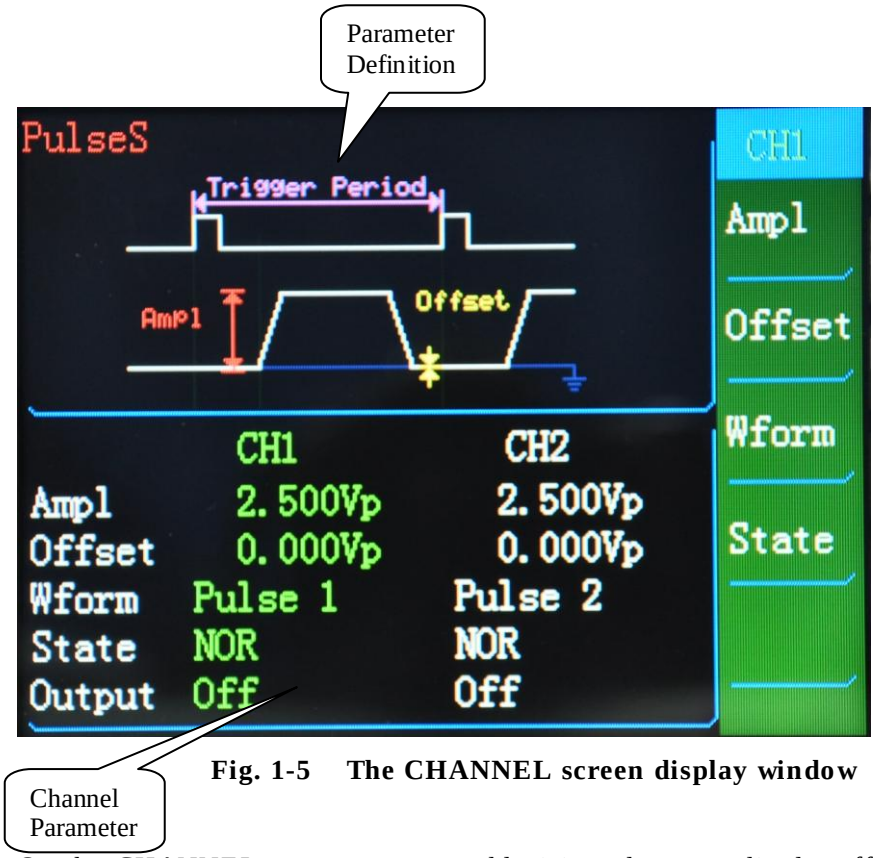

Fig. 1-5 The CHANNEL screen display window

On the CHANNEL screen, users could visit and set amplitude, offset, waveform and form etc. of two channels. On all screens, users may open or close the output of channels by pressing 【ON/OFF1】and【ON/OFF2】, the open or close of output is indicated with the LED next to the output connector. The OUTPUT on the CHANNEL screen indicates the output state (ON or OFF).

1.5.4 Special Function Keys

The generator provides below special function keys:

【MANUAL】key: Stop or run the generator. Users may use this key to start or trigger the generator manually (please refer to Mode/Trigger screen) under trigger or gate mode when no other trigger source is available.

【STORE/RECALL】key: store to or recall from the local memory of the generator the parameter setting. Local storage is state storage, indicating by "State * ", users may select corresponding storage position with the cursor, and store or recall working state by pressing 〖Store〗or〖Recall〗.

【LOCAL】key: unlock the lock of front panel during remote control.

1.6 Sample of Typical Signal Setting

This section provides steps of setting basic signals for the beginner of using the SU5202G.

This section include below samples:

·Set clock signal

·Set pulse signal

·Set double pulse signal

·Set pulse string (Burst) signal

The first example is the most detailed one, and the followed is based on it in a higher level.

1.6.1 Set clock signal

Mission: set continuous clock signal, with frequency of 10MHz, accuracy of internal crystal oscillator, duty cycle of 50%, high level of 3.5V, low level of 0V.

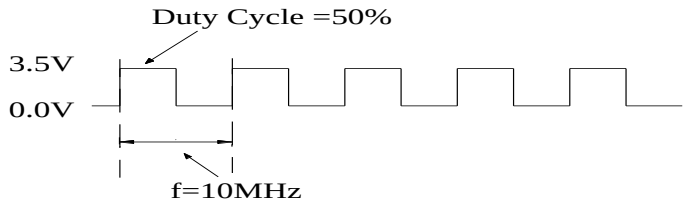

Fig. 1-6 Clock signal waveform

Instruction:

To set expected working mode and trigger mode:

1） Press【RESET】key to reset all parameters and working mode.

2） Press【MODE/TRI】key to enter into Mode/Trigger screen. The default trigger mode is Continuous, working mode is Pulse Stream。

3）Press【CHANNEL】key to enter into CHANNEL screen, set Wform as Pulse 1.

To set expected TIMING parameter:

1）Press【TIMING】key to enter into timing menu.

2）Press〖Period〗softkey repeatedly to select〖Frequency〗, input 10 MHz by pressing【1】+【0】+【MHz/ns】.

3）Press〖Pulse Width〗softkey repeatedly to select〖Duty Cycle〗, input 50% by pressing【5】+【0】+【Hz/V】.

To set expected level parameter:

1） Press【CHANNEL】key to enter into CHANNEL menu.

2） Press〖Amplitude〗softkey and select amplitude, input 3.5V by pressing【3】+【+/-】+【5】+【Hz/V】.

3） Press〖Offset〗key to select offset, input 0V by pressing【0】+【Hz/V】.

4） Press【ON/OFF1】key to open the output, the output indicator will be lighted at the same time.

1.6.2 Setting Pulse Signal

Mission: Set continuous pulse signal, of which the period is 100ns, pulse width is 40ns, amplitude is 3.3V, offset is 1V (high level is 4.3V, low level is 1.0V).

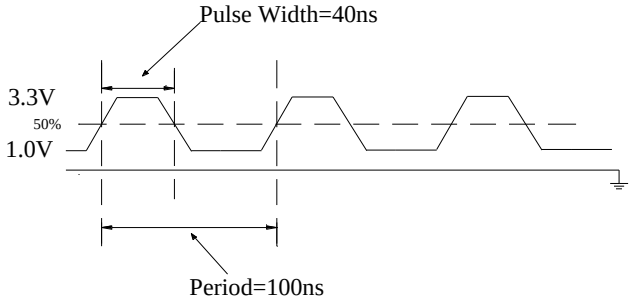

Fig. 1-7 Figure of pulse waveform

Instruction:

To set expected working mode and trigger working mode:

1） Press【RESET】key to reset all the parameters and working mode.

2） Press【MODE/TRI】key to enter into working mode/trigger screen. The default setting of trigger mode is Continuous, working mode is Pulse Stream.

3） Press【CHANNEL】key to set the Wform as Pulse 1.

To set expected timing parameter:

1） Press【TIMING】key to enter into timing menu.

2） Press〖Period〗softkey to select period, input 100ns by pressing【1】+【0】+【0】+【ns】.

3） Press〖Width〗softkey, input 40ns by pressing 【4】+【0】+【ns】40ns.

To set expected level parameter:

1） Press【CHANNEL】key to enter into channel menu.

2） Press〖Amplitude〗softkey to select amplitude, input 3.3V by pressing【3】+【 /-】+【3】+【Hz/V】.

3） Press〖Offset〗key to select offset, input 1V by pressing【1】+【Hz/V】.

4） Press 【ON/OFF1】key to open output, the output indicator is lighted on the same time.

1.6.3 Setting Pulse Sequence Signal

Mission: Set pulse sequence signal of 20ms period. One signal contains two pulse of which the periods are 1ms.

Level amplitude is 2Vpp, offset is 0V.

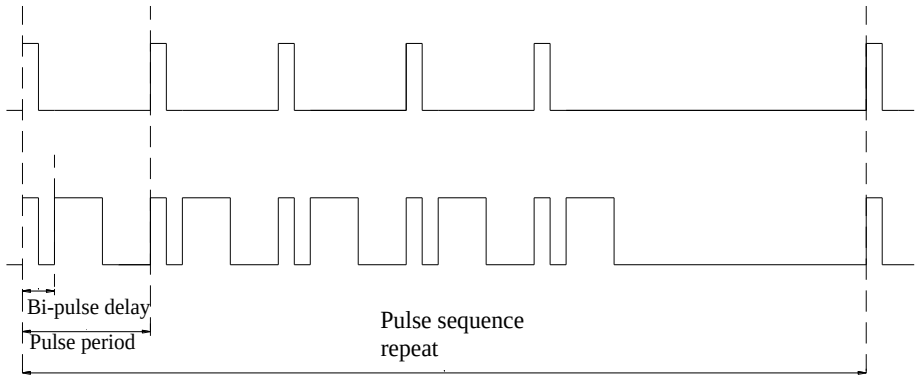

Fig. 1-8 Pulse Sequence waveform

Instruction:

To set expected working mode and trigger working mode:

1） Reset all parameters and working mode.

2） Press 【MODE/TRI】 softkey to enter into Mode/Trigger screen.

3） Press〖TriggerM〗to move to Continuous and press【ENTER】key to confirm, the default state of the generator is Continuous.

4） Move to Pulse and select Burst.

5） Press〖Burst of Period〗, input 20CLK by pressing 【2】+【0】+【ENTER】.

6） Press〖Burst of Count〗, input 5 by pressing【5】+【ENTER】.

To set expected TIMING parameter:

1） Press 【TIMING】softkey.

2） Output pulse period 1ms.

3） Regarding output 1, the output pulse width is 100μs.

4） Regarding output 2, the pulse delay is 250μs, pulse width is 150ns.

To set expected LEVEL parameter:

1） Press【CHANNEL】softkey.

2） Set the【Wform】of CH2 as Double P。

3） Regarding CH1, set the offset as 0.0mV, amplitude as 2.00V.

4） Regarding CH2, set the offset as 0.0mV, amplitude as 2.00V.

5） Press【ON/OFF1】and【ON/OFF2】key to open the output, the indicator of output is lighted on the same time.

Chapter 2 Guide for Advanced User

This chapter provides detailed setting method for advance user.

Including below setting:

·Mode/Trigger screen setting

·TIMING screen setting

·CHANNEL screen setting

·Store/Recall screen setting

·Calibration screen setting

·Additional system function setting

Below content make detailed explanation to each working screen.

2.1 Mode/Trigger Screen（MODE/TRI）

This section makes detailed explanation to Mode/Trigger screen.

Below is the setting window of MODE/TRI display screen:

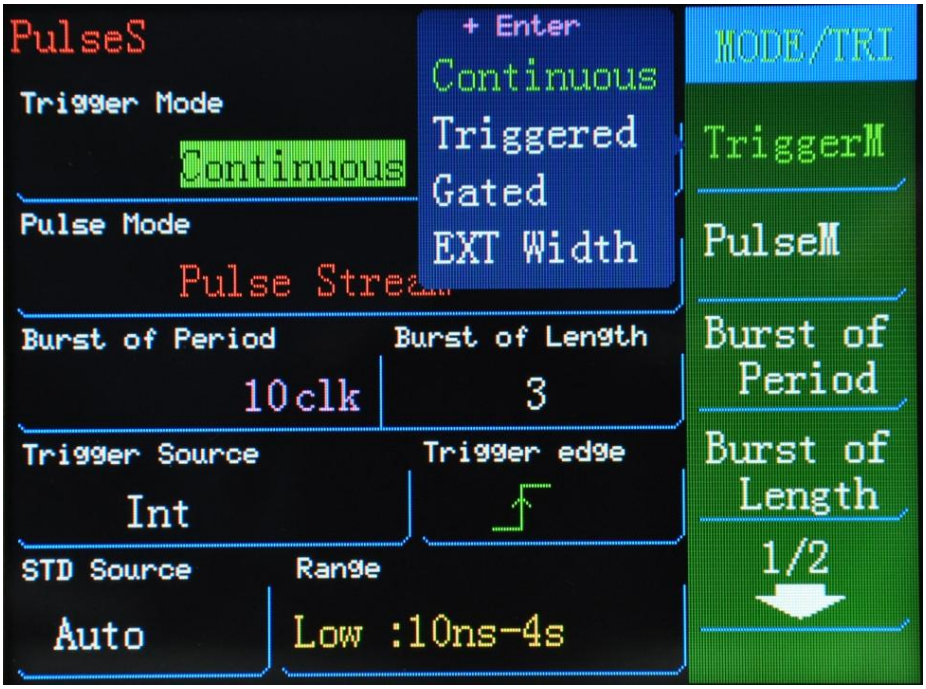

Fig. 2-1 Mode/Trigger screen display window

Users may set the working mode of the generator on this screen, including trigger and pulse working mode selection, burst parameter setting, trigger source selection, trigger edge, range and other parameters' setting.

Below table shows the relationship between working modes:

Trigger working mode	Continuous		Trigger		Gate		External pulse width
Trigger working mode	Pulse	Pulse String	Pulse	Pulse String	Pulse	Pulse String	
Pulse type	Single/Double		Single/Double		Single/Double		
Length		2-65535		2-65535		2-65535	
Period source	INT Osc		MAN EXT	INT Osc	INT Osc		
Start source			MAN key EXT		MAT key EXT		MAN key EXT
TRIGGER OUT	Mark each generated pulse period						

2.1.1 Typical Pulse Time Sequence

According to different settings of trigger and pulse working modes, below content gives a number of typical time sequence figures of corresponding working modes.

2.1.1.1 Continuous Pulse Working Mode

Below are time sequence figures of typical trigger working mode "Continuous" and pulse working mode "Pulse Stream" waveforms.

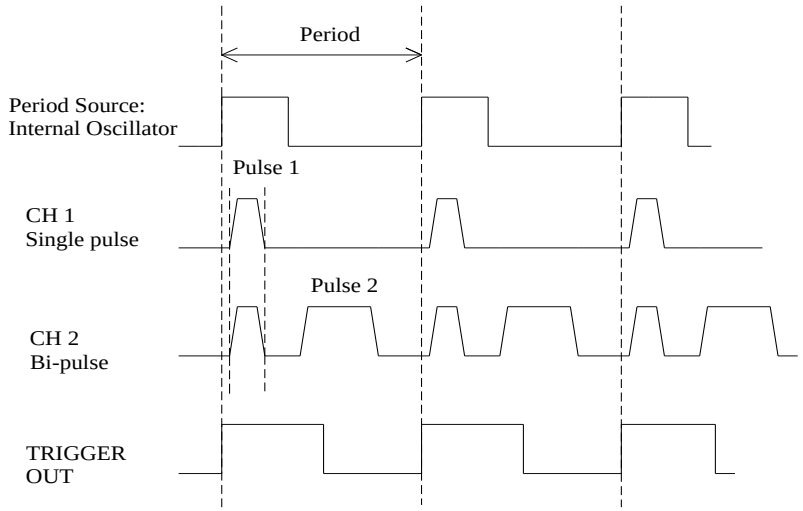

Fig. 2-2 Continuous pulse working mode waveform

It can be seen from the figure that CH2 output double pulses, of which the first pulse is actually "pulse 1" of "CH1", the "Pulse 2" is actually the single pulse P2 of "CH2", so when single pulse and double pulse work simultaneously, if the single pulse parameters are modified, the double-pulse parameters will change along with the modification, and vice versa.

Features: Continuous trigger of internal oscillator generates pulse period, TRIGGER OUT output each pulse period synchronously.

2.1.1.2 Continuous pulse string working mode

Below are time sequence figures of typical trigger working mode "Continuous" and pulse working mode pulse working mode "Burst" waveforms.

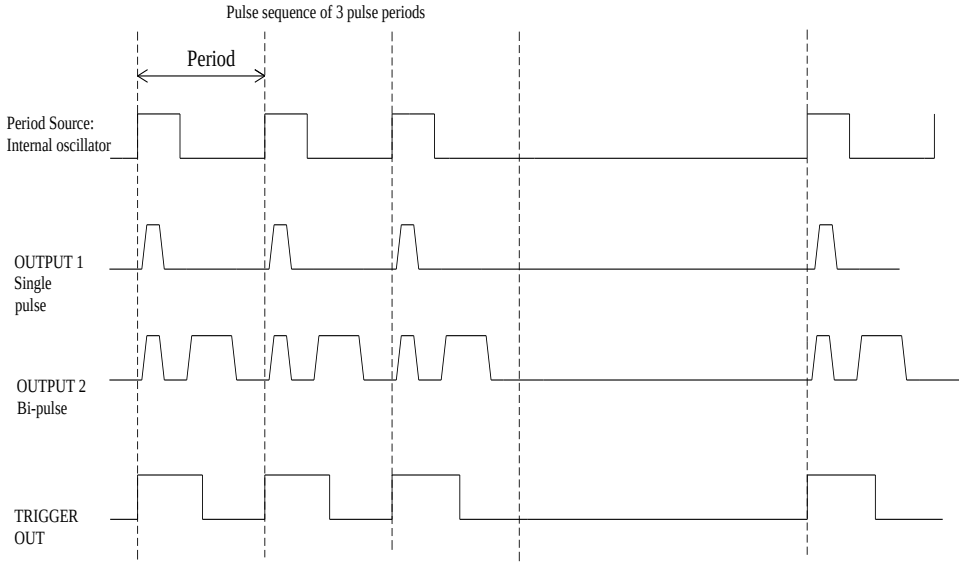

Fig. 2-3 Continuous pulse sequence working mode waveform

Features: continuously repeated pulse sequence period, users may select period of each pulse sequence with range of 2－65535, the period of each pulse is marked with TRIGGER OUT.

NOTICE: The burst period value must be more than the product of period value of pulse 1 and number of burst. If the periods of pulse 1 and pulse 2 are the same, pulse 2 bursts as well.

2.1.1.3 Trigger Pulse Working Mode

Below is the typical time sequence of trigger working mode TRG'D BY and pulse working mode PULSES.

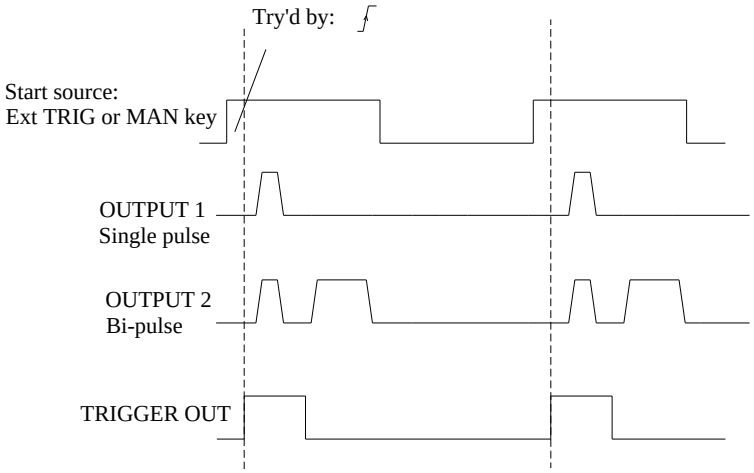

Fig. 2-4 Waveform of trigger pulse working mode

Features: Single-pulse period is triggered by the valid hop edge of selected starting source, users may press in the 【MANUAL】key on the front panel and trigger when releasing, or trigger with the rising or falling edge of EXT INPUT (External signal), mark each pulse period with TRIGGER OUT. The above figure is an example of trigger with rising edge.

2.1.1.4 Trigger Pulse String Working Mode

Below is the typical time sequence of trigger working mode TRIGGERED and pulse working mode BURST.

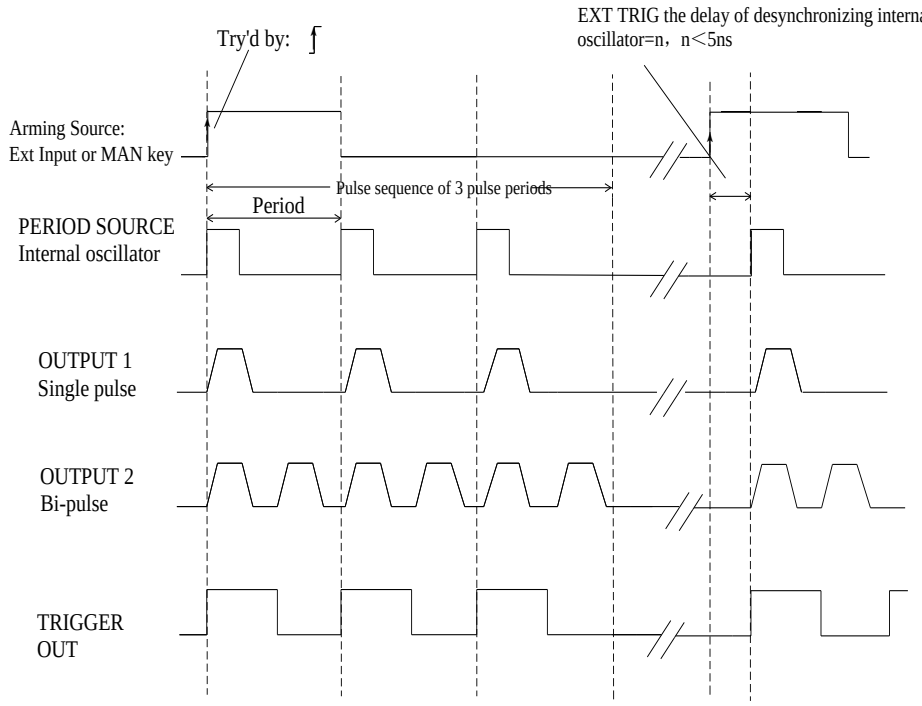

Fig. 2-5 Waveform of trigger pulse string working mode

Features:

- Pulse string period is triggered by the valid hop edge of the selected starting source.
  - Trigger by pressing and then releasing the 【MANUAL】on the front panel.
  - Trigger with the rising/falling edge of EXT INPUT (External signal).
- Select number of pulse period of each pulse string within the range of 2-65535.
- The TRIGGER OUT marks each pulse period.

2.1.1.5 Gate Pulse Working Mode

Below is the typical time sequence of trigger working mode GATED and pulse working mode PULSES.

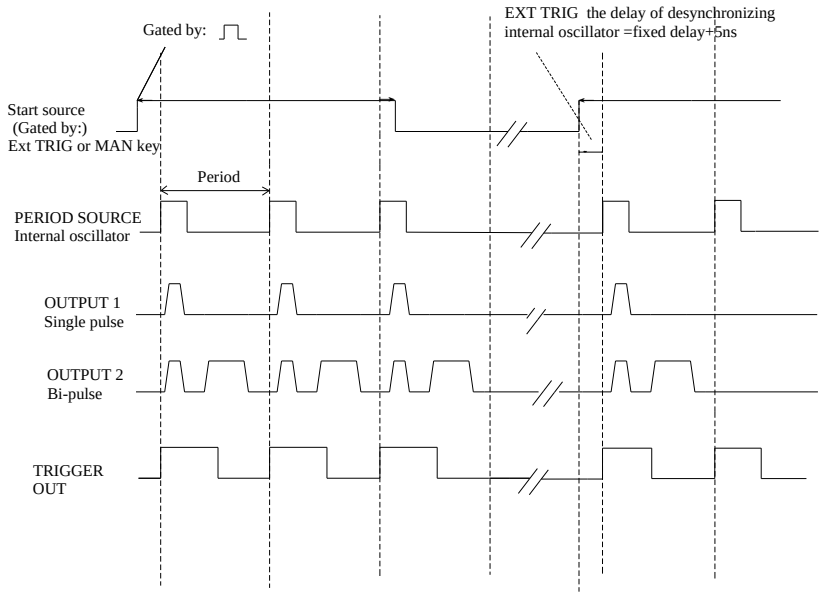

Fig. 2-6 Gate pulse working mode waveform

Features:

- The pulse period is opened by the valid level of selected starting source (open the gate):
  - Press the 【MANUAL】 key on the front panel to open the gate and release to close.
  - EXT INPUT (External signal) gate is opened by high level.
- The TRIGGER OUT marks each pulse period.
- Both of the 【MANUAL】 key on the front panel and external TRIGGER INPUT could be used as the gate switching signal, the two cannot be triggered simultaneously.

2.1.1.6 Gate Pulse String Working Mode

Below is the typical time sequence of trigger working mode GATED and pulse working mode BURST.

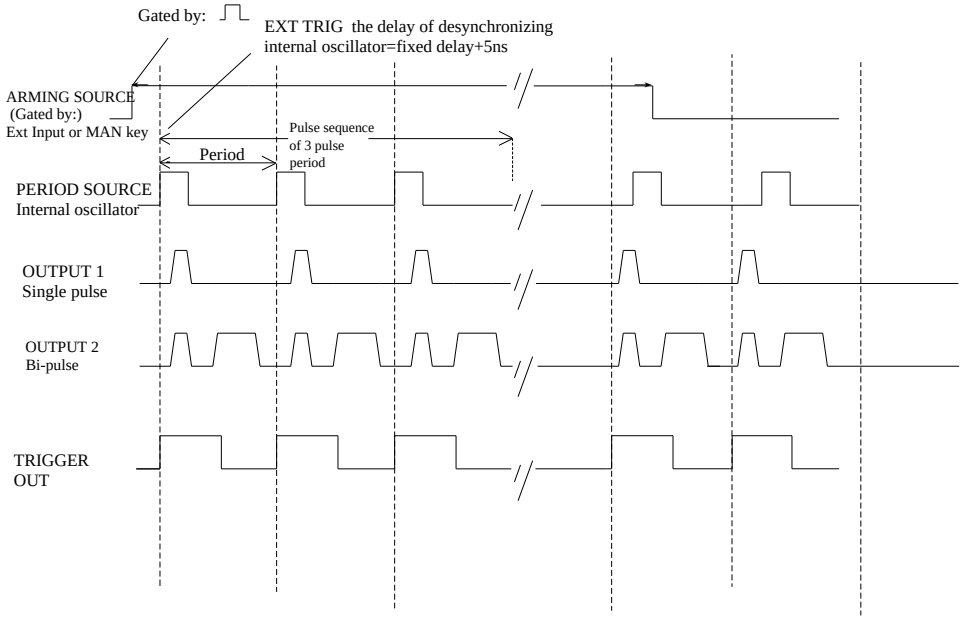

Fig. 2-7 Gate pulse string working mode waveform

Features:

- The pulse period of pulse string is started by the valid level of selected source (gate), both of which could not be triggered simultaneously:

  - press and release the 【MANUAL】key on the front panel the first time to open the gate, press again to close.

  - for EXT INPUT (External signal), open/close the gate with high and / or low level.
- Select number of pulse period of each pulse string within the range of 2-65535.
- The TRIGGER OUT marks each pulse period.

2.1.1.7 Working Mode of External Pulse Width

Under external pulse width working mode, the pulse width is determined by the external signal.

- The pulse signal is defined by the external signal:

  - 【MANUAL】 key: press this key to generate leading edge, press again to generate after edge.

  - EXT-TRIG: the rising edge of EXT INPUT generates leading edge, the falling edge of it generates after edge.

- Under this mode, users may not edit the period, delay and width of the output pulse, since these three parameters are defined by external signals.

2.1.2 Burst Parameter Setting

Burst function contains two parameters: burst period and burst length, the definition of parameter is:

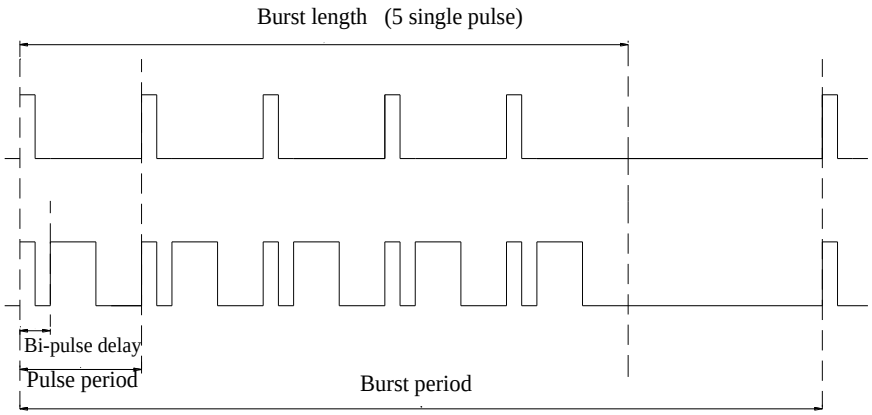

Fig. 2-8 Burst waveform

Burst length means the pulse numbers generated by single burst, burst period means the number of burst length of each pulse period, this length is the positive integer multiples of pulse period. Users may adjust these two parameters with numeric keys or knob, the entry with numeric keys must be natural numbers greater than 1 and less than 65535, and end with 【ENTER】 key. The relationship between the two is: Burst period greater than the product of burst length and the period of the single pulse.

2.1.3 Display of Trigger Source

The trigger source of the generator is not set with the keyboard directly, different trigger source is adjusted and displayed automatically along with the setting of the trigger mode.

2.1.4 Trigger Edge Setting

The pulse period is generated by the trigger of rising or falling of pulse edge, the trigger pulse source includes internal oscillator, external trigger and manual trigger. The trigger edge default of the generator is the rising edge. Press 〖trigger edge〗 softkey to set the trigger edge of the internal crystal oscillator and external trigger pulse, the trigger waveform is shown as below figure, manual trigger is not valid since no synchronous trigger output now.

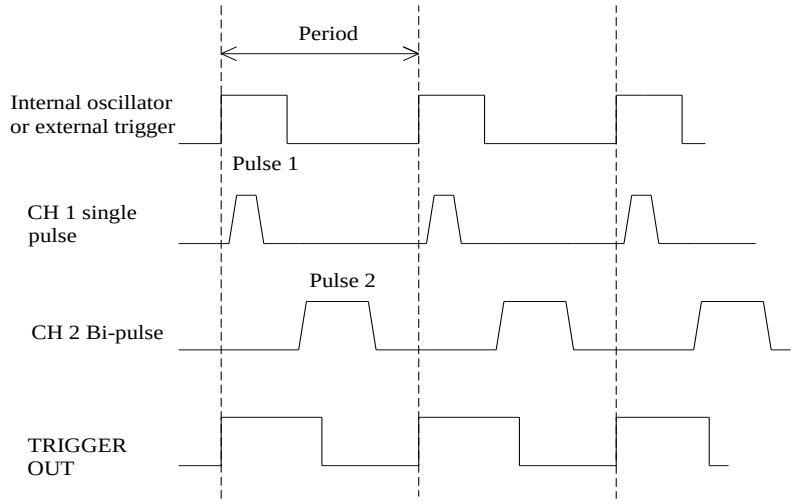

Fig. 2-9 Trigger of rising edge

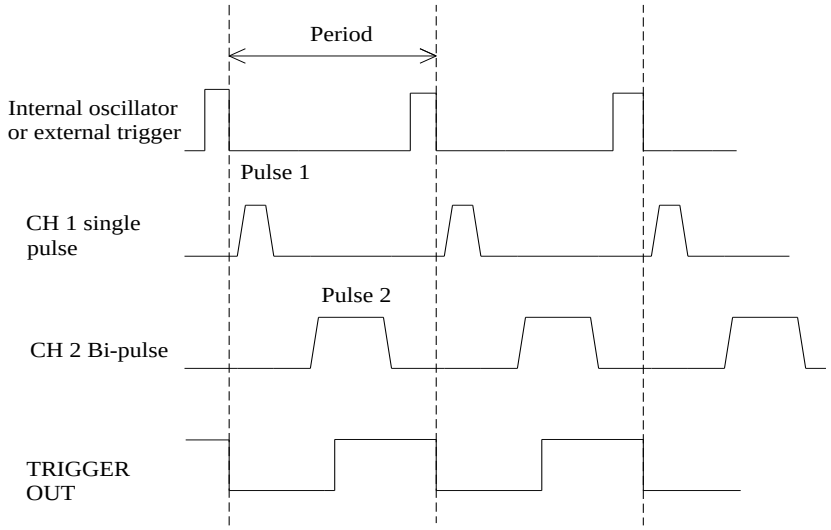

Fig. 2-10 Trigger of falling edge

2.1.5 Standard Frequency Selection Setting

In order to improve the measurement accuracy, users may use an external higher accurate crystal oscillator, or in order to eliminate measurement errors due to the impact of the crystal oscillator, the users may input external standard frequency to the "external standard frequency" port on the rear panel, so the measurement system will use a unified synchronous clock. When an external frequency is connect to the input port of the generator, an "EXT" mark will show on the upper of the display screen to indicate the success of input. The default setting of standard frequency selection of the generator is "Auto", that means the generator chooses external standard frequency when an external standard frequency is available, otherwise the internal standard frequency will be chosen by the generator. Users may set the standard frequency on the Mode/Trigger screen interface Manually. When use internal standard frequency, a 10MHz internal clock signal will output from the "internal standard frequency output" port, this signal may be used as a unified synchronous clock signal in measurement system.

2.1.6 Parameter Range Setting

Press softkey 〖Range〗 to select range conversion function, the generator will switch between high rang and low range while pressing this key repeatedly.

Low range: the minimum time interval is 5ns, the timing parameter setting range is 5ns ～ 4s , unit of time is "μs".

High range: the minimum time interval is 10μs, the timing parameter setting range is 0.01ms～10000s , unit of time is "ms".

Press softkey 〖Range〗repeatedly to switch between this two ranges circularly, the difference of this two ranges are marked by the time unit "ms" and "μs" .

NOTE: Parameter range setting is valid for all output channels and waveforms simultaneously.

2.2 The timing screen（TIMING）

Press【TIMING】key to visit timing screen.

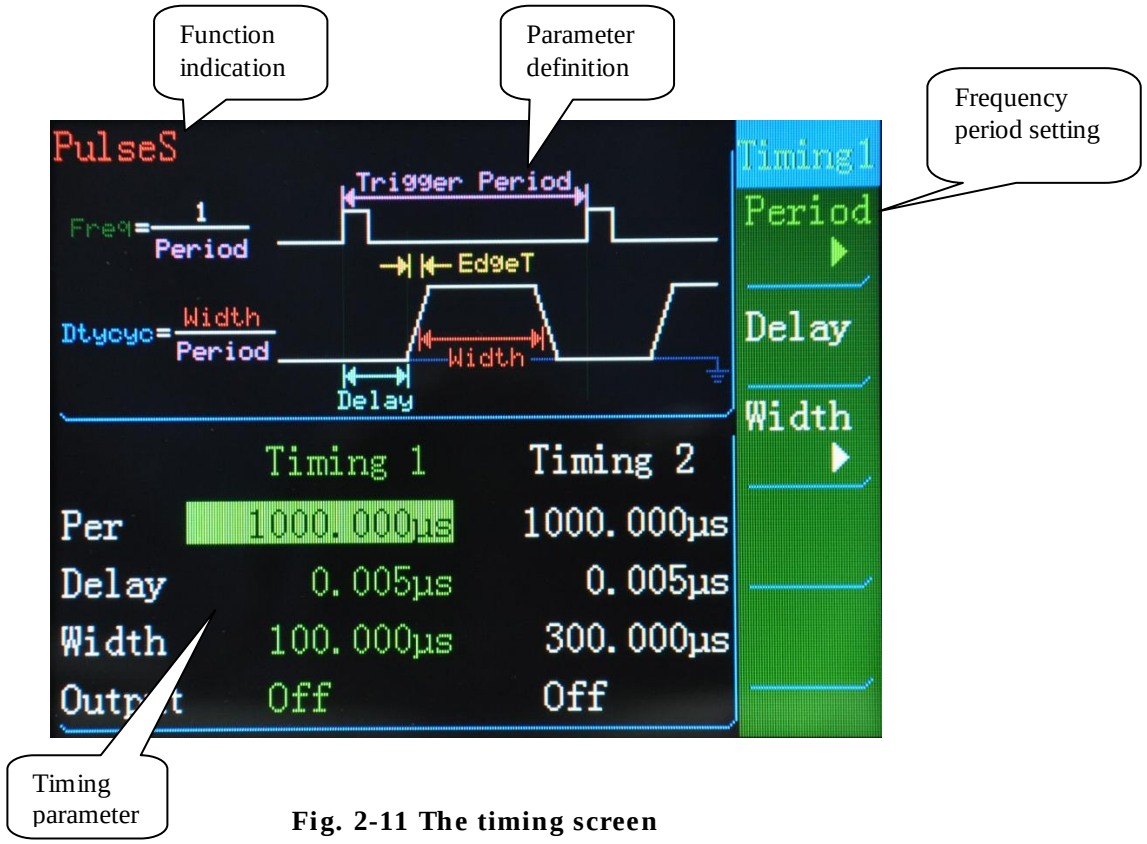

Fig. 2-11 The timing screen

On the timing screen, the characteristics of timing parameter is shown as below figure（Fig. 2-12）:

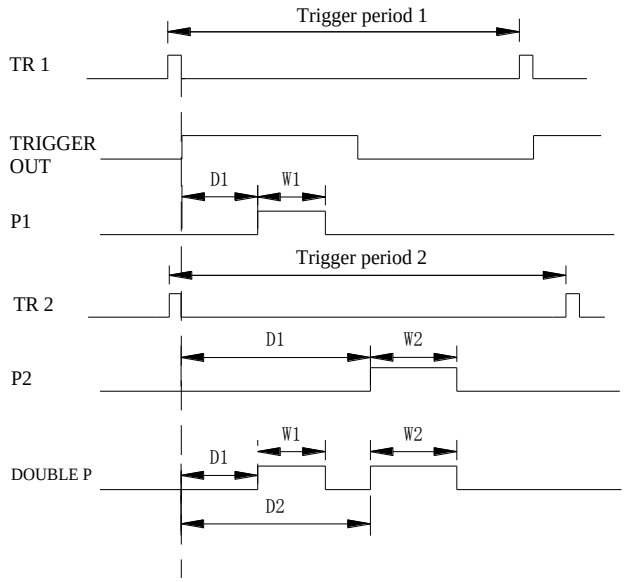

Fig. 2-12 Characteristics of pulse timing parameters

2.2.1 Setting of pulse frequency and period

It can be seen from the Figure 2-12, that periods of the trigger signal and the pulse signal are completely the same, the pulse period begin with the falling edge of the trigger signal TR 1 and TR 2, so the trigger signal TR 1 and TR 2 is a narrow pulse. Under the external trigger mode, trigger with the rising edge, after being synchronous with the internal 200M clock of the generator, the period will be triggered by the falling edge of the 200M clock. On the Timing screen, press the 〖Period〗softkey and select the period setting, press it again to convert to frequency setting, the period(frequency) could be set with the numeric keys or knob under internal trigger mode, under external mode, if the period(frequency)setting of external trigger signal is less than pulse width value plus delay time value, the over section of the pulse waveform will be cutoff or wrong waveform will happen, thus the generator will output incomplete pulse waveform.

Note: 1. Period setting is suggested to choose, since the internal trigger signal of the generator works with the period parameters, the frequency inputted and displayed is converted from the period with mathematical conversion, in order to ensure the minimum resolution of the period, when setting frequency, users may notice that, the display value is usually different from the setting value, especially when the frequency is comparatively high.

2. The generator will work with the new setting value of frequency only after the complete of current trigger period. This is acceptable when the current period is short, but it is inconvenient for the user to operate if the period last for a long time, in this case, users may just press the【Trigger】key, the generator will work with the new parameters immediately and start a new trigger period. This method can also make the output pulse with an external event (such as second hand of watches) manual synchronous.

2.2.2 Single Pulse Parameter Setting

There are two time parameters to set for single-pulse "delay" and "pulse width (duty cycle)". The time interval between the rising edges of sync pulse and of the single pulse P1 is delay time D1 of the single pulse, the time interval between the rising edge and the falling edge of the single pulse is the pulse width W1 of the single pulse. The definitions of delay time and pulse width of single pulse P2 is the same as of single pulse P1.

2.2.2.1 "Delay" Setting

It shows in the Figure 2-12 relationship between parameters that, "TRIGGER OUT" is taken as a time reference benchmark of other pulses, and only use the sync pulse as a benchmark of comparison, does the pulse delay time make sense. If there is no sync pulse as the benchmark of comparison, when single pulse waveforms output continuously, the time after the falling edge of a former pulse will be followed by the "delay time" of the next pulse, the sum of these two time could be defined as the time interval between the two pulses, which in fact equal to the pulse period minus the pulse width, the "delay time" of the pulse may be indistinguishable, so the users should set the delay time as its minimum when no synchronous signal used.

Press the soft key of【delay】and select the delay time value of pulse 1 or pulse 2. The selected value will be display in inverse light. The delay parameters can be set directly by the number keys. They can also be adjusted continuously by the hand-knob. "TRIGGER OUT" is always taken as the synchronic signal of P1 in "Channel 1". Because no synchronous signal for "Channel 2", it does not make any sense for the "Delay" parameter of "Channel 2" when "Channel 1" and "Channel 2" have the different periods. When "Channel 1" and "Channel 2" have the same periods, only by pressing the 【MANUAL】once can "TRIGGER OUT" have the same pulse phase as "Channel 2" so that "TRIGGER OUT" will be the synchronic signal simultaneously for "Channel 1" and "Channel 2". The "Delay"

parameters for the two signals stand for the time intervals between the up edge of the synchronic pulse and the up edge of the two pulses respectively.

2.2.2.2 Setting of "Pulse Width"

Press soft key〖Pulse Width〗key, select pulse width time value of pulse1 or pulse 2, then set pulse width parameter with numeric keys directly or adjust continuously with the knob. "Pulse Width" parameter means the time interval between the rising edge and the falling edge of the pulse.

2.2.2.3 Setting of "Duty Cycle"

Press soft key〖Pulse Width〗key to convert to duty cycle setting, select duty cycle value of pulse 1 or pulse 2, then set duty cycle parameter with numeric keys directly or adjust continuously with the knob. "Duty Cycle" means the percentage of pulse width value to its period, it is not an independent parameter, but just a mathematical value after the setting of pulse period and pulse width, the error of duty cycle will be comparatively large when the period is small or conflicts with time parameter, so users should better to not to use duty cycle. Based on usual use custom, the instrument is defined as: when setting duty cycle, the period is fixed, while the pulse width changes along with the setting; when setting period, the duty cycle is fixed, while the pulse width changes along with the setting. When setting pulse width, the period is fixed, while the duty cycle changes along with the setting. One point need to under consideration, a pulse period contains two parameters of pulse width and delay, the possible maximum value of pulse width is the difference between period value and delay value, if the delay is not the minimum, the upper limit of pulse width will be limited, that means setting the "delay " to its minimum will make the duty cycle changes within the range of 0.01%～99.99%.

2.2.2.4 Double pulse P12

Double pulse P12 is synthesized by single pulse P1 and P2, Fig 2-12 show that in the double pulse, the delay time of pulse 1 is D1, pulse width is W1; the delay time of pulse 2 is D2, pulse width is W2.

2.2.3 The relationship between pulse parameters

The individual parameter is independent of the pulse parameters. But there are some restriction relations as a whole. To ensure the output of pulse waveform, the period, delay and pulse width must follow below rules:

Period ≥Delay+ Pulse Width+10ns（low range）

Period≥Delay+ Pulse Width+20μs（high range）

Regarding the rules, the parameter of pulse delay is limited by the internal period numbers, the sum of pulse delay and pulse width is less than the period value, when the settings of parameters conflict, in order to ensure the output of pulse signal, the generator will automatically reduce the delay, if still could not meet the requirement the above rules even if the delay is down to the minimum, the generator will automatically reduce the pulse width to ensure the output of pulse.

2.2.4 Output Measurement

With 10^{-5} crystal oscillator, the generator outputs more accurate pulse period and time interval, meeting the needs of kinds of measurements.

2.2.4.1 Frequency and Period Measurement

CH1, CH2, and TRIGGER OUT can be directly used to measure frequency and period measurements, but the trigger signal of the internal instruments works according to the period parameters, the input and display of frequency are the result of mathematical conversion, so there may be some mathematics conversion error in frequency measurement, and period measurement is recommended in precise measurement.

2.2.4.2 Time Interval Measurement

Pulse waveform (Figure 2-12) shows that, the rising and falling edge of each pulse waveforms are strictly time-related each other, it has fixed time interval between the rising and falling edges. According to different application, you can use the rising and falling edges of single signal to measure single pulse width W1 and W2, use the rising edges of "TRIGGER OUT" and P1 to measure the delay time D1, when the period of the Pulse 1 and "Pulse 2 " are the same, set the delay time D1 of the pulse 1 to its minimum, set and measure pulse interval by changing the delay time D2, but sometimes users need to press the【MANUAL】 key to make the" TRIGGER OUT "and" Pulse 2 " phase-synchronous.

2.2.4.3 External Standard Frequency Input

In order to improve the measurement accuracy, users may use an external higher accurate crystal oscillator, or in order to eliminate measurement errors due to the impact of the crystal oscillator, the users may input external standard frequency to the "external standard frequency" port on the rear panel, so the measurement system will use a unified synchronous clock. When an external frequency is connected to the input port of the generator, an "EXT" mark will show on the upper of the display screen to indicate the

success of input. The default setting of standard frequency selection of the generator is "Auto", that means the generator chooses external standard frequency when an external standard frequency is available, otherwise the internal standard frequency will be chosen by the generator. Users may set the standard frequency on the Mode/Trigger screen interface manually. When use internal standard frequency, a 10MHz internal clock signal will output from the "internal standard frequency output" port, this signal may be used as a unified synchronous clock signal in measurement system.

2.3 Channel Screen（CHANNEL）

Press 【CHANNEL】 key to visit channel screen. This key is a circular key to select CH1 and CH2 circularly.

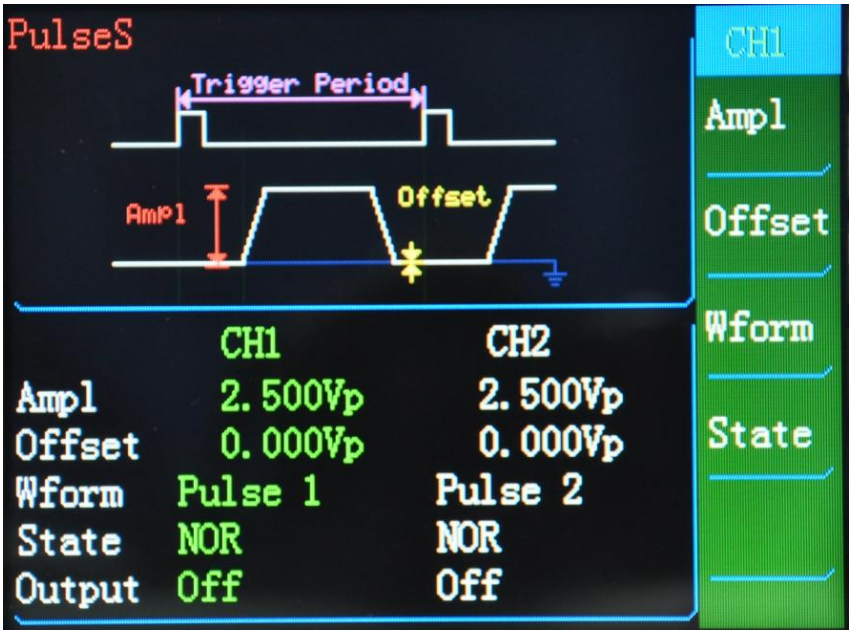

Fig. 2-13 Channel screen

Below content make detail explanation to the parameters on the screen.

2.3.1 Pulse Amplitude Setting

Press softkey〖Amplitude〗to display pulse amplitude value of current channel. The unit of amplitude value is single peak value Vp, users may input digits with the numeric keys, and the current channel will generate pulse signal based on the amplitude value sets; or adjust the amplitude continuously with the knob. In order to make the noise and distortion as small

as possible when using small signal, when the output amplitude is less than 1V, the amplitude is directly output without amplified by the power amplifier, and is adjusted with Schmidt method at 1V, converted when up to 1.1V, switched when down to 0.96V, to prevent the amplitude from being affected by frequent adjustment within a small range, and small signal will have high resolution and signal-noise ratio, while low distortion. But when switching, transient overshoot may happen sometimes, and the user must consider this point to prevent the connected device from being backing out.

2.3.2 Pulse Offset Setting

Press〖Offset〗 soft key, select DC offset value of the pulse of current channel, users may use the number keys to enter the "offset" value, and the output pulse of current channel will generate the setting DC offset. Users may also continuously adjust the pulse offset with the digital knob. With the pulse offset function, the output pulse could generate kinds of DC offsets to meet the requirement of different logic level like TTL, CMOS, PMOS, ECL and so on. When the offset is not zero, the channel will connect the power amplifier before outputting, the noise will be slightly larger.

2.3.3 Output Waveform Setting

Press〖Waveform〗 soft key to select single or double pulse, the two output channels have completely no relationship with each other when both of them output single pulse, the parameters will not affect each other and the users may set them independently. If one of the two channels selects double pulse, the output pulse frequencies and periods of two channels will be the same, and pulse width and delay time will affect each other as well, users may refer to next "Double pulse parameters setting" in next section about the setting.

2.3.4 Pulse Type

There are two types of pulse: single pulse and double pulse. Both of channel 1 and channel 2 could be set to output single/double pulse.

Single pulse: single pulse per cycle, the delay parameter is the value between the leading edge of synchronous signal and the leading edge of single pulse. The synchronous trigger pulse of channel 1 is the TRIGGER OUT signal, and when the periods of channel 2 and channel 1 are the same, channel 2 can also use the TRIGGER OUT signal as its synchronous trigger signal, if the periods of channel 2 and channel 1 are different, the delay parameter of channel 2 is not meaningful, and is best to be set as its minimum.

Double pulse: when one or both of channel 1 and channel 2 outputs double pulse, the generator will automatically set the periods of the two channels as the same, the former pulse parameter is the same as the pulse width and delay parameter of CH1, and the latter is the same as the pulse width and delay parameter of CH2. In other words, CH1 plus CH2 then output from the channel.

2.3.5 Double pulse Parameter Setting

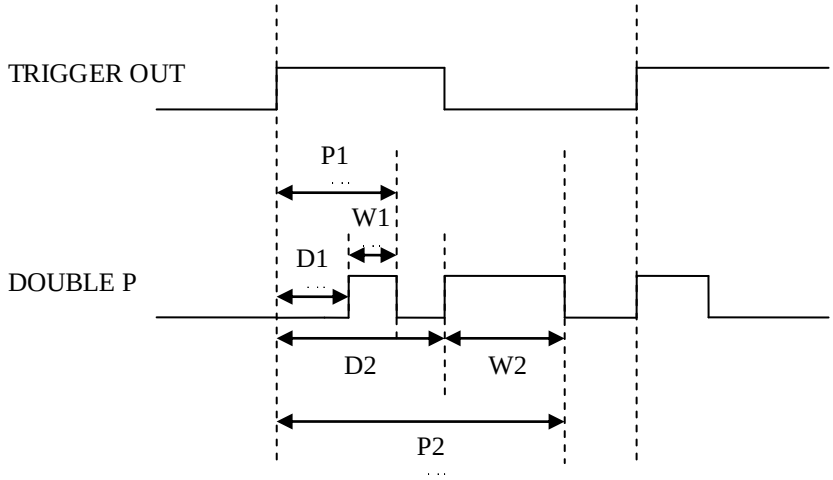

Fig. 2-14 Double pulse waveform relationship

Press 〖Waveform〗soft key and set current channel by selecting "DOUBLE P", the generator will automatically adjust double pulse time parameters according the above relationship to ensure the output, where D2> D1 + W1. Press function key 【TIMING】 to select "TIMING 1" and the "TIMING 2" of double pulse circularly, then set the "delay" and "pulse width" of pulse 1 and pulse 2 with setting method of single pulse. Both of CH1 and CH2 could be set to output double pulses, if that, the pulse periods of "CH1", "CH2" and "TRIGGER OUT" are the same.

2.3.6 Pulse Form Setting

Press 〖STATE〗soft key and choose "STATE" to enter into pulse state setting function, users may press this key to switch the state of current pulse circularly: "NOR" and "INV". Under "NOR" state, the delay time is low level, and the pulse width is high level; under "INV" state, the delay time is high level, while the pulse width is low level.

2.3.7 Other instruction

2.3.7.1 Output Impedance

The output impedance of the three output channels are all 50Ω, the amplitude and offset setting values are calibrated when outputting at full load, the "TRIGGER OUT" channel outputs high level 5V at idler load. When the load impedance is far larger than the output impedance 50Ω, the partial pressure ratio is close to 1, and the voltage loss on the output impedance is negligible, the actual voltage on the load is 2 times than its setting value. But when the load impedance is small, the voltage loss on the output impedance is not negligible, and one point needs to be noted that the actual voltage of the load is not consistent with its setting value. As a result of the adoption of source-end-matched with 50Ω impedance, usually the matched resistor should be added to the end when using 50Ω transmission cable, otherwise, the rising and falling edges of pulse may become worse, or overshoot or ringing may happen.

2.3.7.2 Output Switch

Press the switch key【ON/OFF1】or 【ON/OFF2】to open or close corresponding output of channel, if the output of current channel is open, press switch key to close it, and if the output is close, press switch to open it. When operating, users may connect or disconnect the connection of the generator and external equipment by controlling the output of the generator. The LED next to the connector indicates the output state at any time.

2.4 Store/Recall Screen（STORE/RECALL）

Press【STORE/RECALL】key to visit store/recall screen.

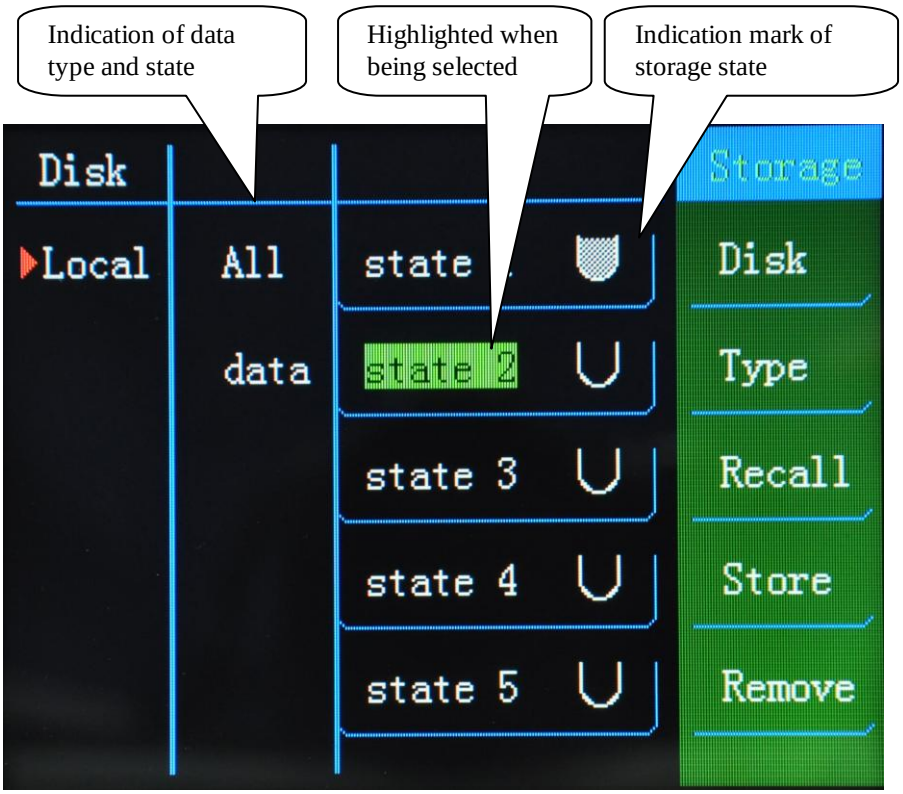

Fig. 2-15 Store/Recall screen

The following content will make detail explanation to the parameters on the screen.

2.4.1 Explanation of word:

Disk: disk selection, used to choose internal or external memory, currently the generator supports internal memory only.

Type: select data type, mainly used to select what to save, current working state or data? The generator support working state only.

Recall: after the content to be recalled selected, press〖Recall〗key, the stored working state will be downloaded to the generator.

Store: after the content to be stored selected(must be), press〖Store〗key, then current working state will be stored.

Delete: after the content to be deleted selected(must be), press〖Delete〗key,then data under current content will be deleted.

2.4.2 Detail Operation:

Type Selection: there are two types of storing data: the current working state data and pattern state data, users may press〖Type〗to select. All state data means all working states and parameters of the generator, including pulse function, pattern functional data and so on, pattern state data means pattern data and corresponding working state, the generator only store data under working sate.

Storage Operation: Select the item to be stored by the cursor key, the item to be stored must be , otherwise the generator will prompt "delete and then store", to prevent the useful data from being covered because of wrong operation, if you have selected the function, you may directly press〖Store〗to store the current working state.

Recall Operation: Select the item to be recalled by the cursor key, the item to be recalled must be , otherwise the generator will prompt "no data could be recalled", because there is no stored data for the current item. If you have selected this function, you may directly press 〖Recall〗to download the stored working state to the generator.

Delete Operation: select content to be deleted with the cursor key, if this function is already selected, user may press key directly to delete the stored working state from the memory, and will never be regained, the user must operate this function carefully.

2.5 Calibration Screen（CAL）

There is no necessary for the users to recalibrate the generator since it is already calibrated well by the manufacturer. **Do not calibrate the generator readily since improper calibration will lead into abnormal work of the generator.** Press【CAL】function key to enter into the calibration screen shown as below figure. With calibration function, users may calibrate edge time, amplitude, offset etc.

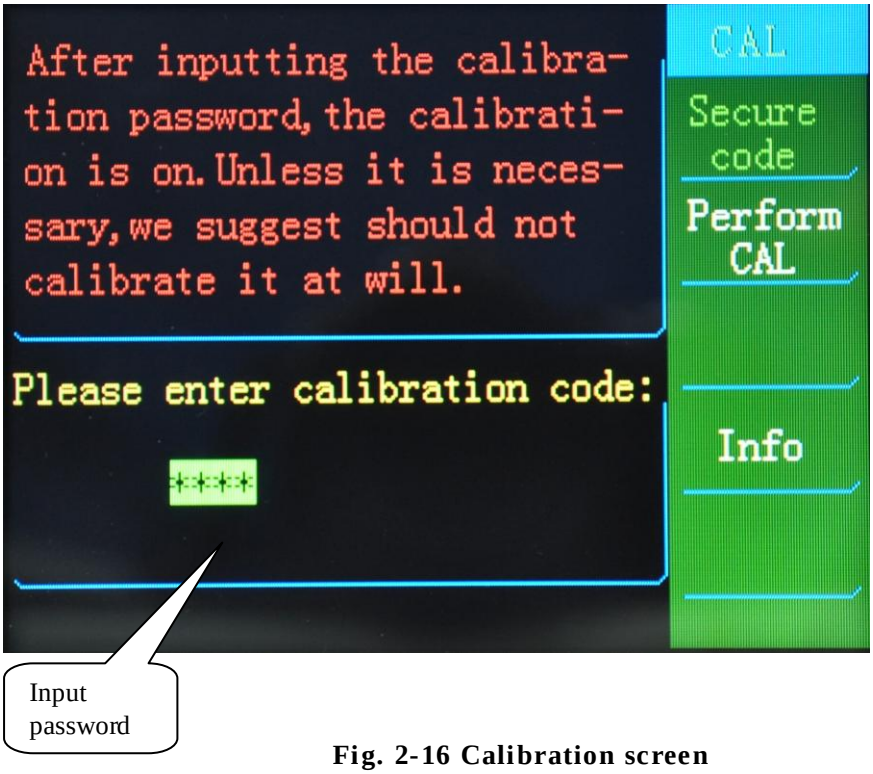

Fig. 2-16 Calibration screen

2.5.1 Calibration Password

Users need a calibration password to visit calibration function, the password makes the generator protected from being calibrated carelessly or by unauthorized operator. The generator may fail to work if calibrated incorrectly, so the calibration function need to be used carefully. Only input correct password, could the generator be calibrated. Press the soft key〖Calibration Password〗 and input correct password, then press【ENTER】 key to confirm the password, a prompt " Correct password, the generator is non-guaranteed " is show by the system. Now the safety is closed, press〖Run Calibration〗to enter into calibration interface.

The default password of the generator is "5202", which is stored in the nonvolatile memory and will not change even after the generator is power off or resetting the remote interfaces.

2.5.2 Calibration Method

Press〖Run Calibration〗to enter into calibration interface. The first soft key on the right side of the display screen is "Calibration Options" which is a circular key and indicated by"►", this option includes amplitude calibration and offset calibration two options, and each

option contains CH1 and CH2 two sub-options, so total four calibration options as: "Amplitude CH1", "Amplitude CH2", "Offset CH1" and "Offset CH2"(Fig. 2-17)。

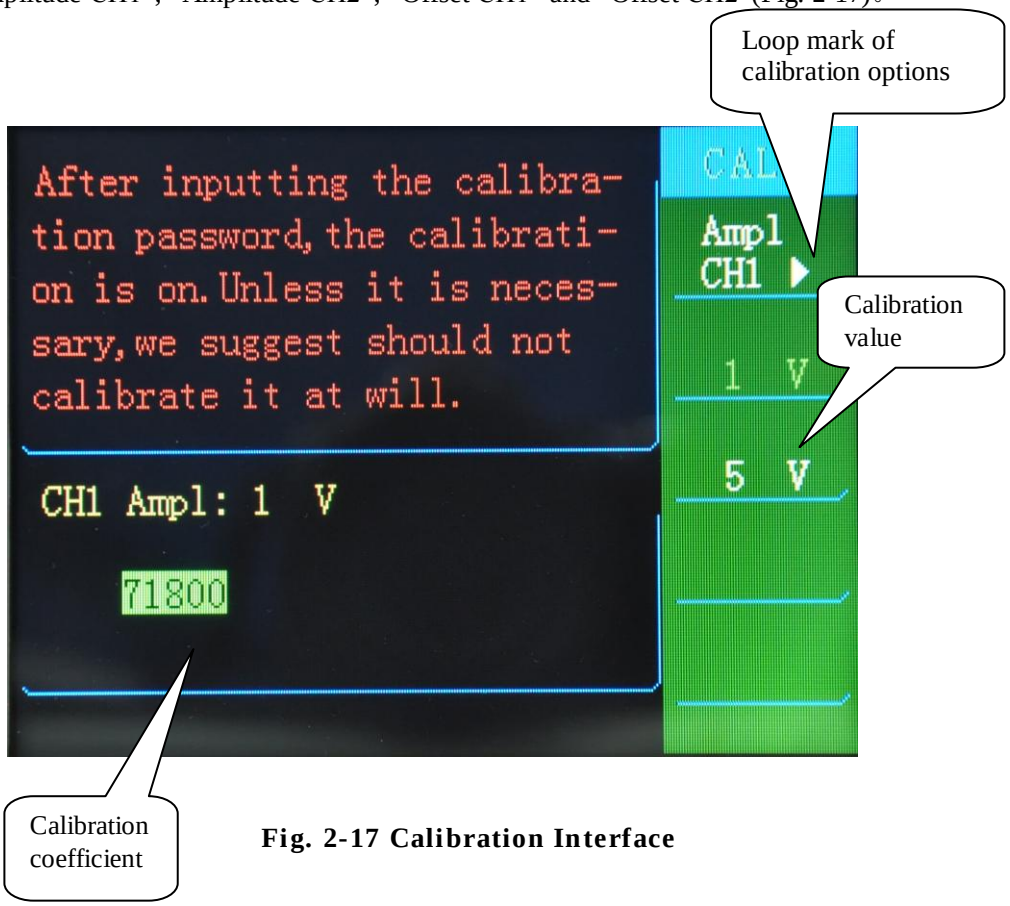

Fig. 2-17 Calibration Interface

Users must calibrate the generator with standard measuring instrument. The measuring instruments include: Oscilloscope(digital oscilloscope above 100MHz), FLUKE45 digital multi-meter etc.

2.5.2.1 Amplitude Calibration

Connection:

1. With digital voltmeter: add 50Ω standard load to the output of calibrated channel, and connect to a digital voltmeter with cable.

2. With oscilloscope: add 50Ω standard load to the input of oscilloscope, connected by matched cable.

Calibration:

Press "Calibration Selection" key circularly to enter into amplitude calibration interface, press corresponding〖Calibration Value〗softkey to select amplitude, including 1V and 5V

two options. Calibrate 1V firstly, move the cursor to the expected position by pressing the direction key, then rotate the knob to adjust the digits on the position till the output voltage is 1V; calibrate 5V in the same way, then press【ENTER】 to confirm and save the calibration. The calibrations of the two channels are the same.

2.5.2.2 Offset Calibration

Connection: the same as amplitude calibration.

Press "Calibration Selection" key circularly to enter into offset calibration interface, four softkey〖0 Vp〗,〖5 Vp〗,〖0 Vp〗and〖1 Vp〗match along with four offset calibration, users may calibrate one by one, then confirm and save the calibration by pressing 【ENTER】. The calibrations of the two channels are the same.

NOTE Please calibrate the generator under the guide of trained service personnel. If any error happened during the calibration, please contact the after-sales center of the manufacturer.

2.6 Additional System（UTILITY）

Press【UTILITY】key to enter into the setting of additional system.

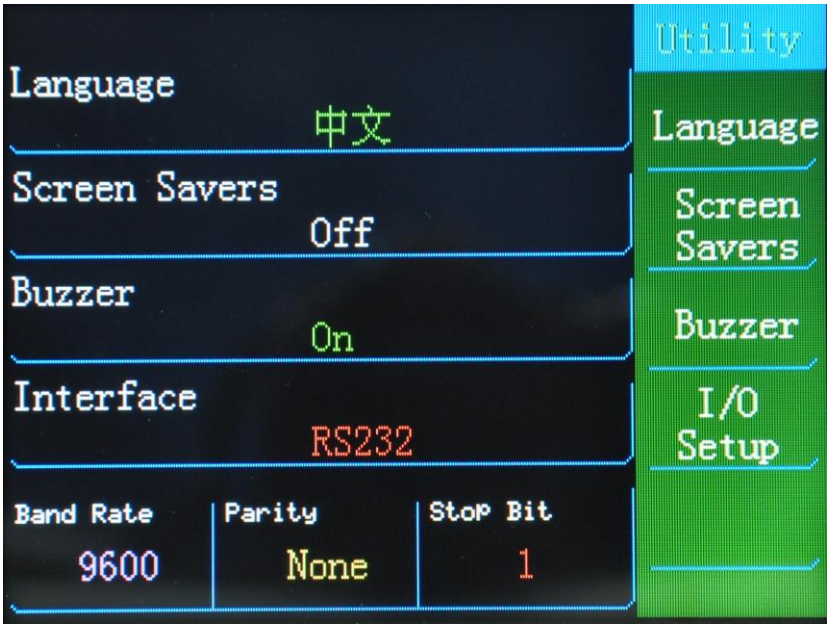

Fig.2-18 Screen of additional system

This screen includes four options: Language Selection, Screen Protection, Key Sound and Interface Setting. Press Language Selection to select Chinese or English or Russia menu; press Screen Protection to save battery and prolong the service life of the screen by power off the screen while keep the generator power on; press the Key Sound to open or close the key buzzer; press softkey〖Interface Setting〗 shown in Fig.（2- 19）to enter into interface setting menu, and set interfaces based on factual operation, currently the generator supports RS232 interface only.

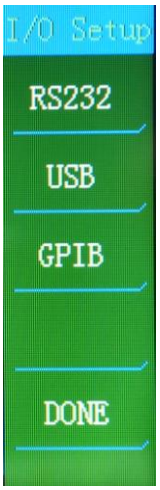

Fig. 2-19

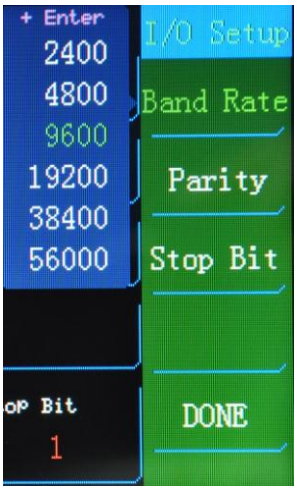

Fig. 2-20

Fig. 2-21

RS232 interface setting: press softkey〖RS232〗 to open RS232 interface setting menu(Fig.2-20)，of which there are three options: the baud rate, check bit and stop bit. The baud rate includes six kinds of common ones which respectively are: "2400", "4800", "9600", "19200", "38400", "56000" and so on, the users may select the baud rate by pressing〖Baud Rate〗soft key and then press【ENTER】 key to confirm. The check bit includes three kinds of "None", "Odd" and "Even".（Fig. 2-21）, about the setting method, the users may refer to the one of baud rate. The stop bit includes two kinds of "1" and "2", and the setting method is the same as above. Press〖Done〗to return back the menu step by step.

GPIB interface setting: press softkey〖GPIB〗to enter into the setting menu of GPIB interface and display the GPIB address. When selected, user can enter the data from 1 to 30 and press 【ENTER】 key to confirm the address setting. Finally press 〖Done〗to return back the menu step by step.

2.7 Power Amplifier

Power amplifier is an independent module installed in inner generator, the input port of which is connected to the "Power Amplifier Input" outlet of rear panel, and the output port connected to "Power Amplifier Output" outlet of rear panel. Using one testing cable to connect the input signal to input port and then get the amplifier signal from output port of rear panel, the input signal can be from CHA, or CHB, or SNYC CHA, or other generator.

2.7.1 Input voltage:

For SU5202W, the input is 50Ω matched, amplification factor is 10 and maximum amplitude is 50Vpp.

For SU5203, the amplifier input is high impedance, amplification factor is 15, and maximum amplitude is 150Vpp. The upper limit for maximum input amplitude is 10Vpp, once over the limit, the output signal will get some distortion.

2.7.2 Output range:

SU5202W: 10Hz to 1MHz

Max. Amplitude: 50Vpp, Max. Current: 120mA

SU5203: 10Hz to 500kHz

Max. Amplitude: 150Vpp, Max. Current: 100mA

Within this range, the flatness is better than 8%, the highest frequency for SU5202W can be 2MHz.

2.7.3 Output power:

When input Sine, the formula for power is:

P = V 2 / R

P is output power (unit is W), V is output amplitude RMS (unit is Vrms), R is load (unit is Ω).

When input Pulse, the formula for power is:

P = V * I * D

P is output power (unit is W), V is output amplitude, I is load current (unit is A), D is duty cycle of pulse (unit is %). For the reason of current limit, the maximum load for SU5202W is 416Ω and for SU5203 is 1500Ω. When working temperature is higher, or output frequency is higher, or request distortion lower, the max output power is less, should normally less than 16W.

2.7.4 Output protection

Power amplifier has current limiting protection, so not easy to be destroyed. But user should avoid the short output and over current limit. You' d better not take the limit of frequency, amplitude and load, especially two of them at the same time to protect the power amplifier from destroy.

Chapter3 Service and Support

3.1 Maintenance

Shijiazhuang Suin Instruments Co., Ltd will give one year's warranty to maintaining or replacing since consignment for the verified quality problem of the product.

Except for this explanation and the description in the warranty card, the factory has no other warranty, in proclamation or in implication. Under no circumstances, the factory will responsible for the direct, indirect or other secondary loss.

3.2 Contact us

For any inconvenience during the use of this product, please contact us freely:

Monday to Friday 8:00-17:00

Tel: 0311-86086971 Fax:0311-86018511

Or contact us by email: export@suintest.com

Our website is:

http://www.suintest.com

Chapter 4 Specifications

4.1 Waveform

Pulse waveform：single pulse and double pulse, logical positive and negative pulse

Rising/Falling time: ≤10ns

Overshoot: ≤ 10 ％ (amplitude: 2.5Vp)

4.2 Time

Pulse period range: 20ns～10000s

Time interval range: 5ns～10000s

Resolution: 5ns（T≤4s） 10μs(T≥4s)

Time interval error: ±(T×5×10^{-5}+ 5ns) （T≤4s）

4.3 Amplitude offset （CH1 and CH2）

Amplitude range: 50mVp～5Vp

Amplitude error: ±(2％ + 50mV) Amplitude resolution: 1mVp

Amplitude stability: ±2％/ 3 hours

Offset range: ±（50mV～5V） Offset resolution: 1mVp

Offset error: ±(5％ + 50mV)

Output impedance: 50Ω

Output protection: over-heat protection

4.4 TTL amplitude （TRIGGER OUT）

TTL/CMOS level: low level≤ 0.3V ， high level≥3V（ high-impedance load）

Output impedance: 50Ω

4.5 High-voltage Power Amplifier:

SU5202W: Max. Output voltage: 50V, Max. Output current: 120mA

Voltage Gain: 20dB Input Impedance: 50Ω

Protection: current limiting

SU5203: Max. Output voltage: 150V, Max. Output current: 100mA

Amplification factor: 15 Input Impedance: high impedance

Protection: current limiting

4.6 Trigger

Trigger mode: internal, external, manual

External trigger input:

frequency: 1Hz～10MHz(square) amplitude: 1Vp-p～20Vp-p

Input impedance: ≥100kΩ

4.7 Burst

Burst count: 2～65535 periods

Burst mode: continuous, single

4.8 External standard frequency input

Frequency: 10MHz Amplitude: ≥0.5Vrms

4.9 Operation

Fully key input, two-level menu display, adjust with knob continuously.

4.10 Display

5.7" TFT colorful liquid display, comfortable visually, large information content.

4.11 Dimension

330 mm×155 mm×300 mm Weight: 4.2 kg

4.12 Power condition

Voltage: AC220V（1±10％） Frequency: 50Hz（1±5％）

Power consumption: ＜50VA

4.13 Environment

Temperature: 0～40℃ Humidity: ＜80％

Appendix

Daily maintenance

Do not expose the LCD screen of the generator directly to the sun, or put the generator and its probe to mist, liquid or solvent to prevent it from being damaged.

Clean

In accordance with the requirements of operating conditions, the users should often check the generator and its probe. Please clean the external of the instrument following below steps:

Clean the dust on the generator and its probe with a cloth. Please be careful not to scratch the display screen.

To avoid damage to the surface of the generator or its probe, do not use any corrosive reagents or chemical cleaning reagents.