DDS SIGNAL FUNCTION

THE USER MANUAL

Chapter 1 Content

Introduction of the instrument

Large scale integrated circuits, super-speed ECL, TTL circuits and high-speed micro-processor technique are adopted into the instrument. Anti-interference technique has been improved greatly by surface plating technique in internal circuits. Interactive menu in English is adopted for the operation interface. And the performances of the keys have been improved effectively so that users do not need to operate keys frequently. DDS equipment with dual signal output. This instrument has such signal generating function as,frequency modulation, amplitude modulation, phase modulation, FSK, ASK, PSK, frequency sweeping, phase sweeping, etc, and any counts generation function for function signals. The frequency of main signal can reach to the maximum of 40MHzand frequency resolution can reach to1μHz. Furthermore, this instrument has both frequency measurement and counting function. It is an ideal device for electronic engineers, lab, production lines, teaching, scientific research, etc.

Main features

DDS (direct digital synthesis) and FPGA techniques have been adopted, ultra-low power con-

sumption ,

Sine wave, in main wave signal output frequency: 1μHz~10MHz/20MHz/30MHz/40MHz ;

Square wave, pulse wave in main wave output frequency: 10mHz~1MHz;

Sine wave ,square wave,triangle wave(adjustable duty cycle);

Sine wave, square wave,triangle wave in sub wave signal output frequency: 10mHz~200kHz.

Internal automatic precise attenuation circuit enable weak signal output more accurate.

The resolution of wave form frequency reaches to 10mHz.

With the functions such as frequency modulation, amplitude modulation, phase modulation and external frequency modulation.

With frequency key-control function, amplitude key-control function and phase key-control function.

With frequency modulation, sweeping functions at random starting and ending points.

With frequency-measuring, cycle-measuring, pulse width measuring and counting functions.

All parameters can be adjusted by internal program.

The depth of internal frequency modulation is between 0% and 120%.

The depth of internal amplitude modulation is between 0% and 100%.

The depth of internal phasic modulation is between 0% and 360%.

Iinteractive menu in English so that operators can see at a glance .

The cabinet design is artistic, key operating is easy and comfortable.

Technical index of signal generator/Counter

Wave form feature:

Main wave form: sine wave, square wave, triangle wave,TTL wave,random wave;

Sine wave distortion: 0.3% (20Hz~20 kHz);

Square wave rising & falling time :< 20ns;

Duty cycle: 1%~99%(sine wave, square wave, triangle wave);

Sub wave form: sine wave,square wave,triangle wave;

Frequency characteristics:

Main wave

main wave form: Sine, Square, Triangle, TTL, Arbitrary

Frequency range:

1μHz ~10MHz/20MHz/30MHz/40MHz ,

Precision: 1μHz

Frequency error: $\pm 5\times10^{-6}$

Frequency stability: $\pm 1\times10^{-6}$

Sub wave

Frequency range: main wave form:10mHz~200kHz

Precision: 10mHz

Frequency error: $\pm 5\times10^{-6}$

Frequency stability: $\pm 1\times10^{-6}$

Amplitude characteristics:

Main wave

Impedance:50Ω±10%

Amplitude range: 10mVp-p~20Vp-p(1μHz~20MHz); 10mVp-p~10Vp-p(20MHz~40MHz)

(the minimum signal amplitude < 1mV when the output is - 60dB)

Amplitude precision: 10mV

Amplitude stability: ±0.5%,each 5 hours

Amplitude error: ±(1%+2mV) (1kHz,20Vp-p)

Sub wave

Impedance:50Ω±10%

Amplitude range: 100mVp-p~20Vp-p (the minimum signal amplitude < 100mV when the output is - 60dB)

Amplitude precision: 100mV

Amplitude stability: ±0.5%,each 5 hours

Amplitude error: ±(1%+2mV)(1kHz,20Vp-p)

Bias characteristics:

Bias range:-5V~+5V

Bias precision: 10mV

Frequency modulation characteristics:

Modulation mode: internal,external;

Modulation signal: sine (FM), Square wave (FSK),triangle;ext-signal;

Modulation ferq: 0~200kHz(internal);1Hz~100kHz(external);

Depth: 100%of carried wave frequency.

Amplitude modulation characteristics:

Modulation mode: internal and external modulation

Modulation signal: sine (AM), Square wave (ASK) ,triangle(internal modulation)

external input signal (external modulation)

Modulation frequency:0~200kHz (internal modulation)

1Hz~100kHz (external modulation)

Modulation depth: 0%~120% (internal modulation)

Note: external modulation input is on the back base of the instrument, please choose proper scope when you use.

Phase modulation characteristics:

Modulation signal: sine (AM), Square wave (ASK) ,triangle(internal modulation)

Modulation frequency:0~200kHz (internal modulation)

1Hz~100kHz (external modulation)

Phase modulation range: 0°-360.0°

Definition: 1°

Sweep frequency characteristics:

Sweep frequency range: 10mHz~10MHz/20MHz/30MHz/40MHz,

Sweep time: 10ms - 50s

Sweep mode: linear sweep frequency, logarithmic sweep frequency

Technical index of Frequency/counter:

Frequency measuring range: 1Hz~60MHz,

Min.input voltage: internal attenuator open: 1V

internal attenuator close:100mV

max.allowable input voltage :20V

Measuring gate time: 0.1s (fast) 1s (slow)

"Internal low pass" characteristics:

frequency ending:100kHz

Counting capacity: 10 bits (decimal system)

Control mode: manually

Power output:

Power output: ≥10W(4Ω load)

Output Waveform: Sine

The range of frequency: 0Hz~40kHz(main wave output)

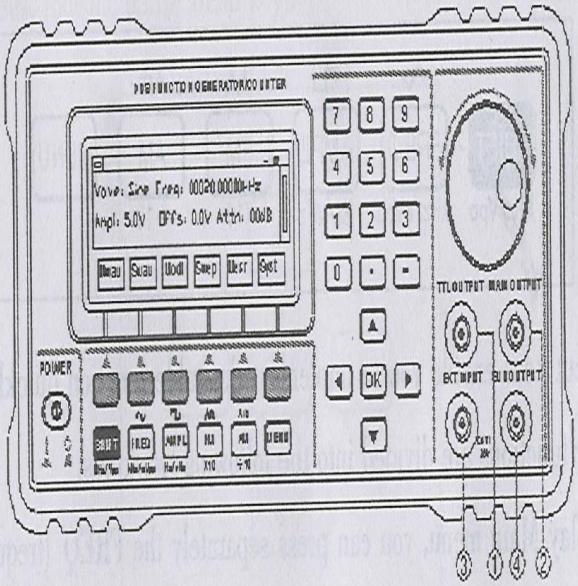
USB interface;

Chapter 2 Basic Operations

Elementary operations

Adopting interactive menu in English and easy keys, lead to a very easy operation. Such as display panel, a classified menu is adopted. If you don't know how to operate, you may try to use keys row in the lower part of the screen and the direction keys, it probably helps you understand the way of operating the instrument.

Controls and description of front panel



Input/Output interface introduction

(1) TTL output interface

(2) Main wave output interface

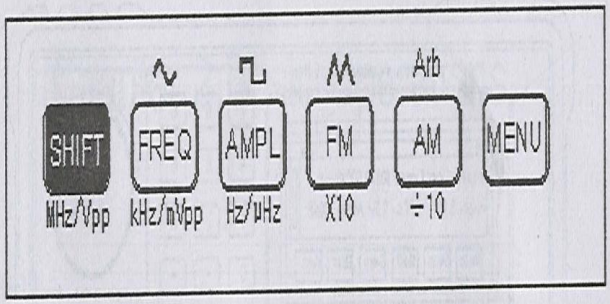
(3) Exit signal input interface

(4) Sub-wave output interface

Key introduction

The keys are including the followings(refers to fig)

Short-cut keys



These short-cut keys enable you to implement desirable function quickly and they are keys in common use. Their functions are divided into the following two kinds:

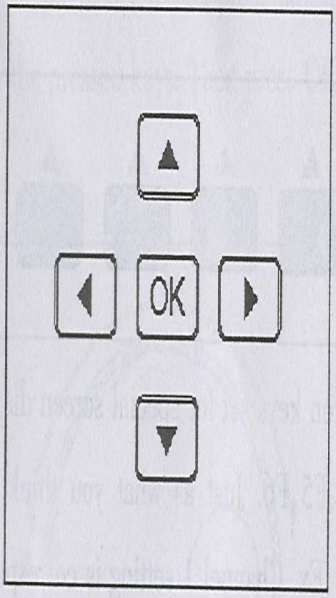
1. when display Main menu, you can press separately the FREQ (frequency)key, AMPL (amplitude)key, FM (frequency modulation)key and AM (amplitude modulation) key accessing to frequency function, amplitude function, frequency modulation and amplitude modulation output function. In any cases, you also can press shift key together with FREQ.AMPL.FM.AM.MENU key, you can get outputs of sine, square wave, triangle wave, arbitrary wave, upper slope wave separately, corresponding to the character string above the keys.

2. When display frequency setting up, the functions of the short-cut key are units of setting up, ie. The character string below the keys. ex. in frequency setting up, if you press 8, then press a, you can input 8MHz frequency value.

Note: The function of character on shortcut keys is not valid for any menu, except for the

above mentioned 2 cases. (not including Menu key).

Direction keys



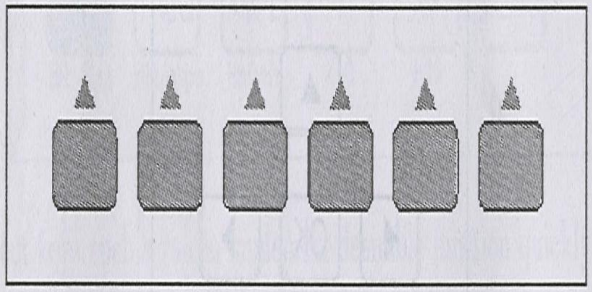
Then the function of the 5 direction keys, UP、DOWN、LEFT、RIGHT、OK, are to shift cursor and select function of setup mode .ex. when waveforms have been setup, you can choose respective waveform by moving direction keys .The desired waveform will display to you by changing white .

When engaged in counting function, OK key is pause/continuous switch key. When you press the key at the first time will start counting, and then press the key will switch the counting state between pause and continuous.

Note: Direction key can not be used for pull menu which can be selected by screen key.

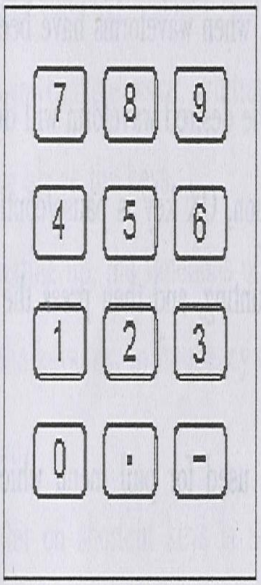
Please read the followings.

Screen keys



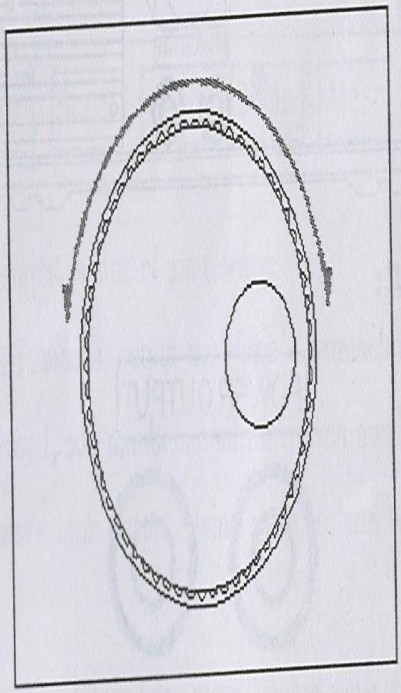
Screen keys are special function keys set for special screen display. From left to right ,they are respectively called F1、F2、F3、F4、F5、F6. Just as what you think, they are fictitious keys corresponding to the screen one by one .Ex. Channel 1 setting is corresponding to screen wave form ,frequency, amplitude ,bias and return.

Digital keys



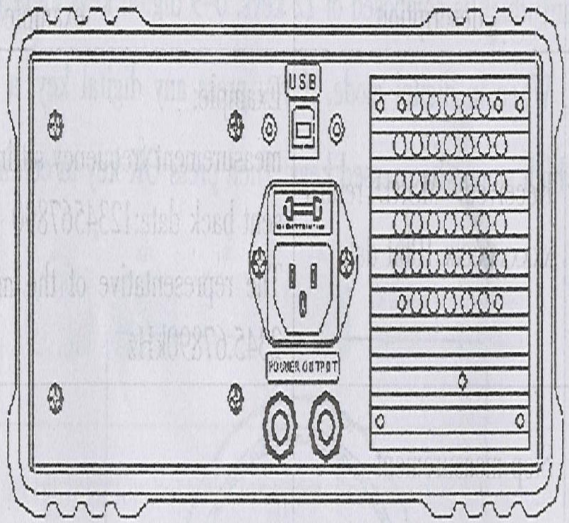
The digital keyboard which is composed of 12 keys, 0-9 digital keys and (.),(-), is designed for fast inputting numbers. When in digital mode, if you press any digital key, a dialogue block will appear on the screen which stores the pressed keys. Then press OK key to confirm.

Rotary pulse switch:

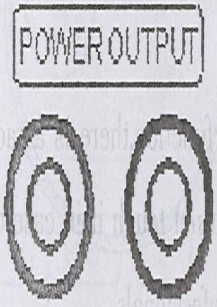


By using rotary pulse switch, you can quickly add or subtract the value which cursor points to, Inputting numbers by this way, it will be more convenient.

Back panel:



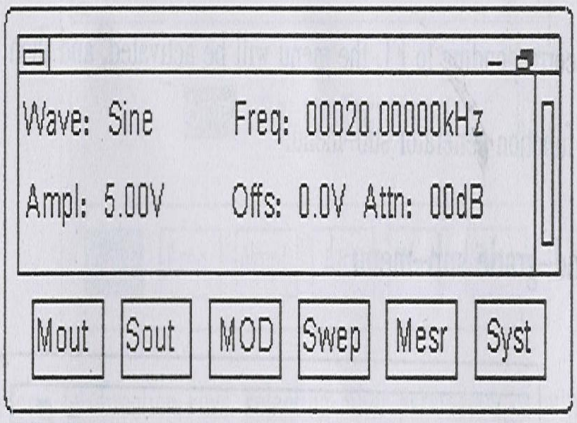
Interface of the power output:



Display menu introduction

Adopting LCD modules with high definition and wide visual angle for display, enable you know the present state of the instrument. Interactive menu in English display panels are as followings:

Main menu:



1. sine, pulse means: output is sine of main wave.

2. 5.00V 100.000000kHz means: output waveform's parameter.

3. represents: shift pressed, odd numbers confirmed even numbers are cancelled

4. "Mout" is main wave form output (sine wave, square wave, triangle wave,random wave) second-grade sub-menu.

5. "Sout" is sub wave form output (sine wave, square wave, triangle wave) second-grade sub-menu

6. Mod"modulation" is modulation function, second-grade sub-menu.

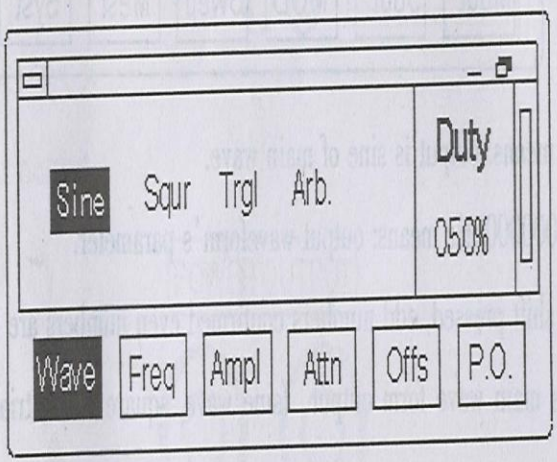
7. Swep"sweep" is sweep function ,second-grade sub-menu.

8. Mesr"measure" is measurement function, second-grade sub-menu.

9. Syst"system" is system function ,second-grade sub-menu

Ex. Press "WAV" corresponding to F1, the menu will be activated, and then you will enter into parameters setting of function generator sub-menu.

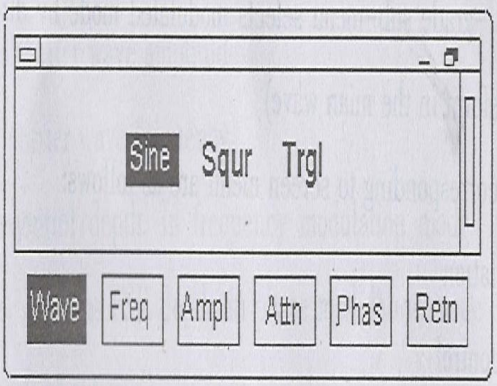
Main wave second-grade sub-menu



Selecting waveform by direction keys, selecting other parameters of output wave put waveform by F1-F6.

Note: to select waveform, you only need to press direction keys. Waveform turning to white means the desired one, no need to press OK key to confirm.

sub wave second-grade sub-menu

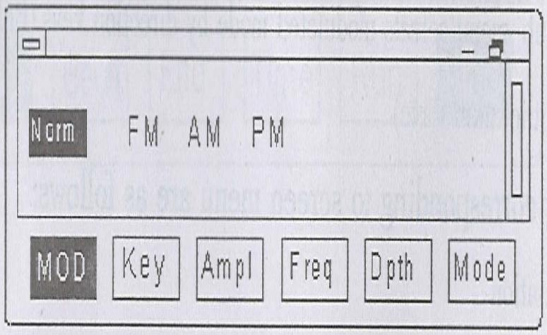


Selecting waveform by direction keys, selecting other parameters of output wave put waveform by F1-F6 (sine wave, square wave, triangle wave).

Note: to select waveform, you only need to press direction keys. Waveform turning to white means the desired one, no need to press OK key to confirm.

Press screen key corresponding to modulation, you are entering into modulation second-grade sub-menu

Modulation second-grade sub-menu



Modulation second-grade sub-menu selects modulated mode by direction keys.(Before setting up the modulation waveform in the mian wave)

Functions setting corresponding to screen menu are as follows:

1. Mod: modulation
2. Key: key-control
3. Ampl: amplitude is carrier wave amplitude
4. Freq: frequency is carrier wave frequency
5. Dpth Depth: modulation depth. In frequency modulation mode, it means frequency, in amplitude modulation mode, it means AM depth, in phase modulation mode ,it means PM depth
6. Mode: choose(internal or external)

"Key-control" third-grade sub-menu

In modulation second-grade sub-menu,it has a modulation third - grade sub-menu, modulation third - grade sub-menu selects modulated mode by direction keys.(Before setting up the modulation waveform in the mian wave)

Functions setting corresponding to screen menu are as follows:

1. Mod: modulation

2. Key: key-control

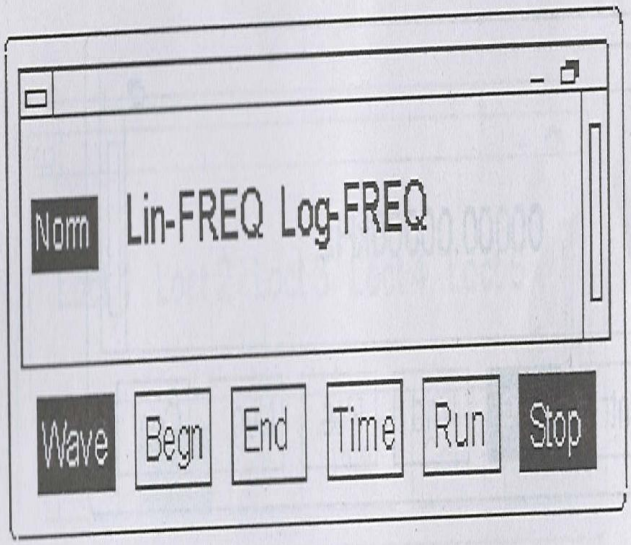
3. Ampl: amplitude is carrier wave amplitude

4. Freq: frequency is carrier wave frequency

5. Dpth Depth: key-control depth. In frequency modulation mode, it means frequency, in amplitude modulation mode, it means FSK depth, in phase modulation mode ,it means PSK depth

6. Mode: choose(internal or external)

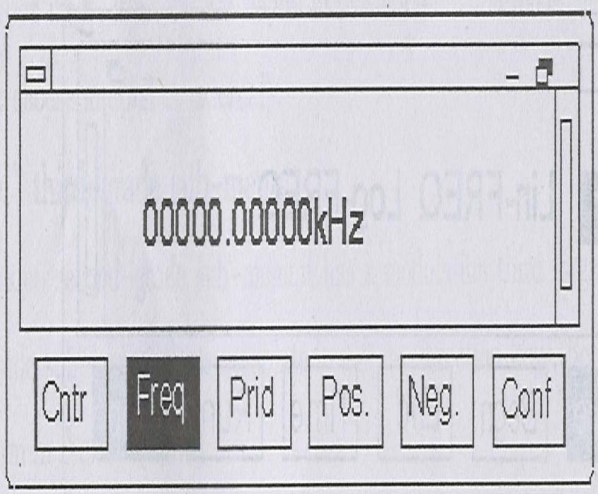
Sweep second-grade sub-menu



Select output waveforms by direction keys. Functions correspondently to screen menu setting:

1. Wave wave form selecting sweep waveforms: linear, logarithmic
2. Begn frequency sweep starting point
3. End sweep ending point
4. Time the speed of sweep wave (from starting point to ending point)
5. Run
6. Stop pause

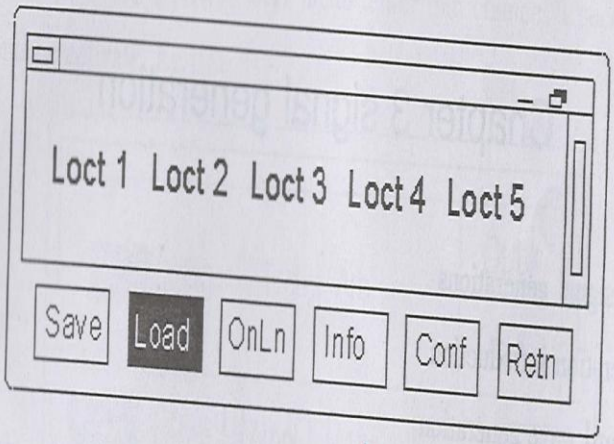
measurement second-grade sub-menu



functions for screen keys setting:

1. Cntr count: counting function
2. Freq frequency: frequency measurement function
3. Prid cycle: cycle measurement function
4. Pos. positive-going pulse the width of positive-going pulse measurement function
5. Neg. negative-going pulse the width of negative-going pulse measurement function
6. Conf configuration state whether or not select attenuation or low pass setting when making measurement

system menu



Menu function is defined as follows:

1. OnLn :online ;and computer communications (USB)

2. as about some information of this instrument, including serial no. software version No ect.

3. Save :5 groups of user settings can be stored

4. Info :as sbout some information of this instrument ,including serial no.software version No ect.

5. Conf: configuration

Note: if you found the setting in disorder, you may perform soft reset by "system" > "reset" keys.

Chapter 3 signal generation

Example for several signal generations

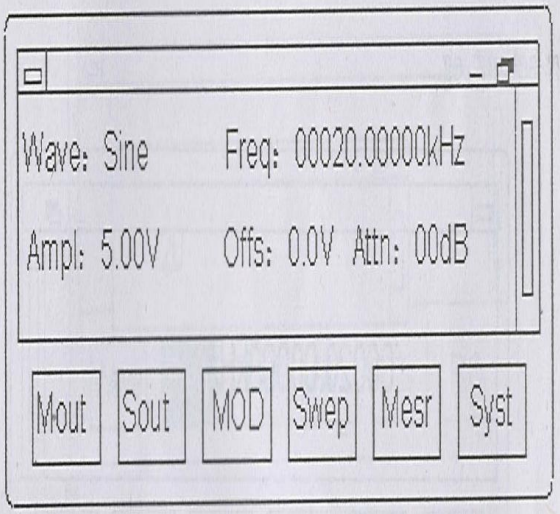
Function signal generation introduction

MAIN WAVE standard wave generation

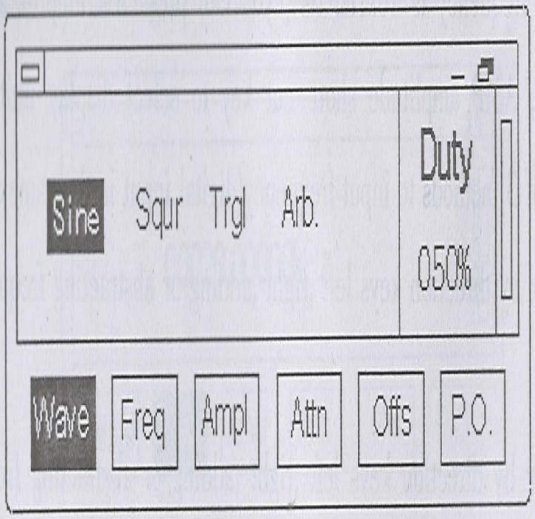
Objective: To generate a sine wave with 20kHz, peak value is 5V. DC bias is - 2V

Steps:

1. make sure the correct connection and plug in (power) waiting for welcome display and self-inspection, then main menu appears .eg.



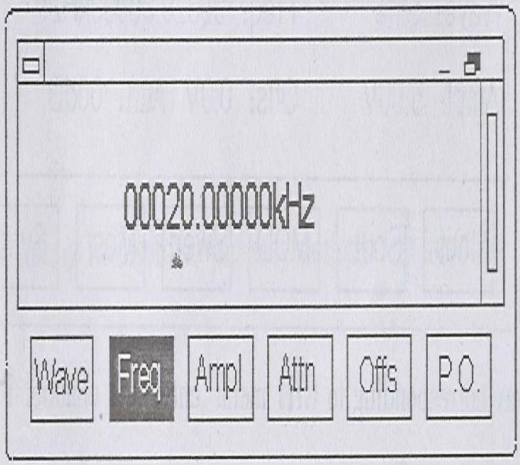
2. press F1 Mwav corresponding to CH1 menu ,enter into channel 1 second-grade sub-menu and waveform menu be activate. Eg.



the consent wave is already pointed to sine ,no need to move .(if you desire to produce square wave, press right direction key)

3. press F2 Freq corresponding to frequency menu which now be activated .

enter into frequency setting .eg.



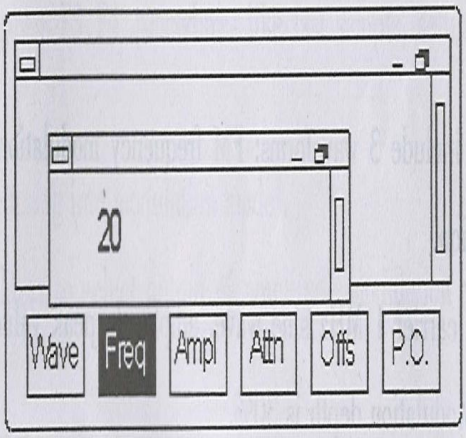
The desirable frequency is 20kHz. Now you can press AM amplitude modulation. FM Frequency modulation, AMP amplitude short-cut key to select display unit Hz,kHz,MHz. you can choose either way of 3 methods to input frequency(digital input is the same):

1) shift cursor by direction keys left ,right ,adding or abstracting frequency value by up .down keys

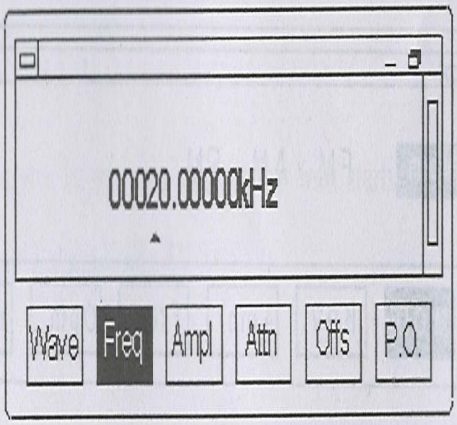
2) shift cursor by direction keys left ,right ,adding or abstracting frequency value by rotary

pulse switch, clockwise or anticlockwise

3) input frequency value by number keyboard, in frequency setting mode, press digit key, the digit will display on the small window. eg



After desired digits had been input, press OK key to confirm the present unit, you also can press amplitude modulation frequency modulation. Press amplitude key to choose Hz, kHz or MHz unit for frequency value. By finishing frequency input, the result is as follows:



4) use the same method to select amplitude. Bias menu, and input amplitude 5V,bias －2V , the desired wave is now explored

SUB WAVE with the MAIN WAVE settings.

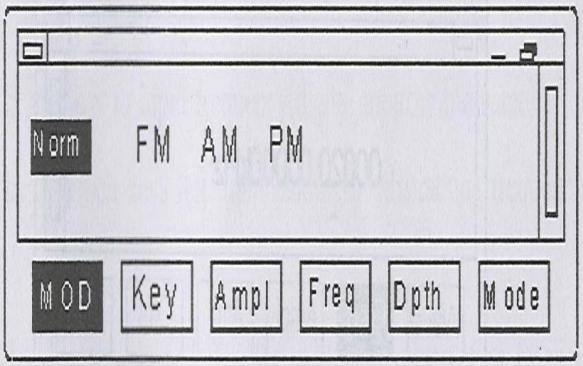
Modulation waves

Modulated waves include 3 waveforms: FM frequency modulation, AM amplitude modulation and PM phase modulation.

Objective: To generate carrier 1 MHz sine wave, amplitude peak value is 5V. Modulate wave frequency is 10kHz and Modulation depth is 30%.

Steps:

1. press menu key entering into main menu, then press F3 Mod . entering into modulation second-grade sub-menu, the following display appears on screen:



2. return to the main mean to set the sub wave(frequency=10kHz)

3. press F5, point into depth value to set up modulation depth, i.e. frequency deviation of modulation. Set to 30%

4. setting up carrier,press F3、F4 ,procedures like last sample, setting to 1MHz ,peak value 5V sine wave as the carrier.

5. press return key entering into modulation mode .

using the same procedures to select output of amplitude modulation wave ,phase modulation wave

Note: Mode menu will appear for amplitude modulation, key frequency and key amplitude, indicates the mode of modulation, through internal logic, internal amplitude modulation and external amplitude modulation can be realized.

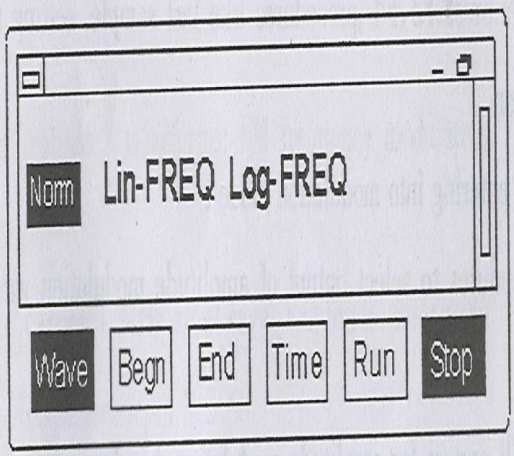
Sweep wave

Objective: generate a square logarithmic sweep wave with starting frequency 100 kHz, ending frequency 500kHz, sweep time 1s .amplitude 5V

Steps:

1. enter into channel 1 menu ,set up square wave ,amplitude 5V

2. press F4 pointing to sweep menu ,enter into sweep mode ,select logarithmic sweep frequency menu, displaying "



3. press F2 pointing to starting point menu ,set up starting frequency 100kHz

4. press F3 pointing to ending point menu ,set up ending frequency 400kHz

5. press F4 pointing to time menu ,set up sweep time 1second.

But now, you have finished setting up a sweep wave, you also can set up the numbers of output sweep frequency wave by setting up turn menu.

Note: the step value of sweep wave is calculated by micro-processor in instrument, you need only set the sweep time

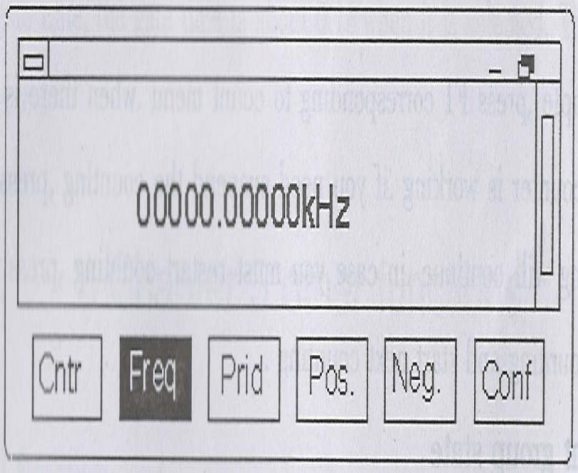
Chapter 4 frequency measurement and counting

Frequency measurement

Steps:

1. external signal input be correctly connected ,then turn on .entering into main menu or press menu key entering into main menu .press F6 corresponding to measurement menu ,you are now accessing to measurement second-grade sub-menu.

Display



2. press F2 corresponding to frequency to realize frequency measurement.

Note: the value of frequency measurement and the unit are displayed automatically by the in-

strument .you need only set up gate time and group state.

Cycle measurement

Steps :

1. external signal input be correctly connected .then turn on .entering into main menu or press menu key entering into main menu .press F5 corresponding to measurement menu entering into measurement second-grade sub-menu.

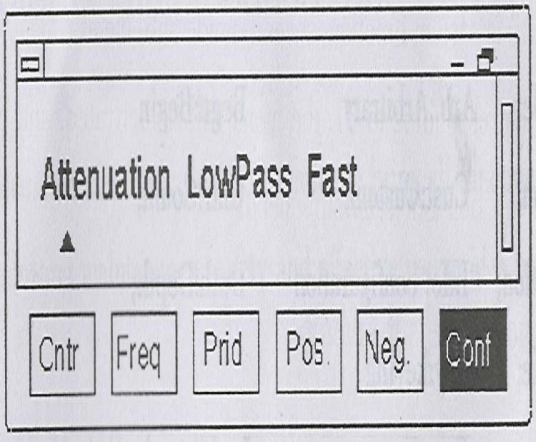
2. press F3、F4、F5 corresponding to cycle to realize cycle, positive-going pulse width , negative-going pulse width measurement

Counter function

Just like last sample ,press F1 corresponding to count menu .when there is external signal input, you can see the counter is working .if you need suspend the counting ,press OK key, press Ok key again, the counting will continue .in case you must restart counting ,press direction key Left key to clear present counting and start next counting .

Set up measurement group state

Group state function can make pre-handling of measured signal, enabling you realize perfect measuring objective.



The group state includes: "attenuation", "low pass filter", "fast" functions. Return white by direction key left right to select, then press Ok key to change the state.

Note: "Fast" is gate time, the gate time is about 0.1s when it is selected. The gate time is about 1s when it is not selected.

Chapter 5 other functions

program-control function

This instrument contains standard USB interface selectable fitting which may enlarge the function and produce automatic measurement system controlled by computer.

Help:

Ampl:Amplitude; Arb.:Arbitrary Begn:Begin

Attn:Attenuation; Cust:Custom; Cntr:Count;

Conf:Configuration; Info: configuration Dpth:Depth;

Duty:Duty Cycle; key:keying

Ext:External; Freq:Frequency; Int:Internal;

Lang:Language; Mout:MainWave output;

Mesr:Measure Mod:Modulation;

Norm:Normal; Neg.:Negative;

Offs:Offest; OnLn:Online; Paus:Pause;

Phas:Phase; Prid:Periods Pos.:Positive;

Puls:Pulse; Retn:Return; Squr:Square;

Sout:SubWave output;Swep:Sweep; Syst:System;

Trgl:Triangle;

Chapter 6 maintenance and repair

This instrument is a precision electronic device. In order to bring all functions into full play, please read carefully the following maintenance, safety and effective use guides before operation.

Points for attention:

Power supply: 200–240V ,47–53Hz must be assured .

Don't strike sharply or close up chemistry goods to avoid eroding, because LCD is easy to break up and erode. Please wipe it carefully with cloth when there is dust on the LCD.

Working temperature :–10–50℃.storing temperature :–20~–70℃.

Don't try to open the instrument .damaged seal wall result in guarantee cease to be effective . maintenance and repair can only be carried out by appointed agencies.

Please avoid laying lighting candles, cups full of water, corrosive chemistry goods ect. on the surface of instrument so as not to damage the instrument.

Don't touch or impact the screen which is easily polluted and fragile .child plays with this instrument is prohibited

Don't move the instrument violently during normal working so as not to damage internal

circuits which can not be repaired.

Fuse is located on the rear panel power socket, Fuse specification: 250V, T1A.

IP protection class: IP20.

Troubleshooting

In normal condition, keys with clear and melodious sound. without this sound means key damaged or internal circuits damaged .please contact the supplier.

For above mentioned problems, if you switch on once more and can't put it right . please contact the supplier!

Guarantee repair and after-sale's service

Thank you purchasing product for the sake of effective use of the new product ,we suggest you take the following steps:

1:read carefully the safety and operation guide

2:read guarantee repair terms and conditions

3:keep the original invoice for possible guarantee repair or claim

Appendix

complete set of instrument and auxiliary

DDS function generator / counter-------1 set

Power cable-------1pc

User's manual-------1book

Software and electronic file

USB interface cable -------1pc[optional]

Signal output cable-----2pcs

Fuse ----------2pcs

List of program control instruction

orders	description	example
RDTY	Read	PC to the machine enter RDTY, the local response to the type
MWAV xxxx	Set waves: SINE SQURTRGL ARBI	MWAV SINE Set the main wave to sine wave
MFRQ xxxxx.xxxxx	Set Frequency (Main wave), Units:KHz	MFRQ 00345.67890 Set the main wave frequency: 345.67890kHz
MAMP xx.xx	Set Amplitude, Units:V	MAMP 12.34 Set the main wave amplitude: 12.34V
MATT xx	Set Attenuation (Main wave), Uints:dB 00:00dB 10:10dB 20:20dB 30:30dB 40:40dB 50:50dB 60:60dB	MATT 10 Set the main wave attenuation: 10dB

orders	description	example
MOFS xx.xx	Set DC(Main wave), Uints:V	MOFS +2.31 DC:2.31V MOFS -3.58 DC-3.58V
DUTY xx	Set Duty, Uints:%	DUTY 32 Duty:32%
SWAV xxxx	Set Sub wave: SINE SQUR TRGL	SWAV SINE Set the sub wave to sine wave
SFRQ xxxxx.xxxxx	Set Frequency (sub wave), uints:KHz	SFRQ 00345.67890 The sub wave frequency setting: 345.67890kHz
SAMP xx.xx	Set Amplitude (sub wave), Uints:V	SAMP 05.30 The sub wave amplitude setting:5.3V
SATT xx	Set Attenuation (Sub wave)Uints:dB 00:00dB 20:20dB	SATT 00 The sub wave attenuation setting:0dB

orders	description	example
SPHA xxx	Set Phase, Uints:°	SPHA 120 The sub wave phase setting:120°
MODU xx	Modulation mode settings: NO: Normal FM AM PM	MODU AM Modulation mode setting:AM
MKEY xxx	Key-control mode settings: NOR FSK ASK PSK	MKEY FSK The key-control mode setting :FSK
FMDP xxx	FM depth range:000-100	FMDP 050 Modulation depth:50%(FM)
AMDP xxx	AM depth range:000-120	AMDP 080 Modulation depth setting:80%(AM)

orders	description	example
PMDP xxx	PM depth range:000-359	FMDP 240 Modulation depth setting:240°
MMOD xxx	Modulation mode: INT:sine EXT: squr	MMOD EXT
SWEP xxx	Set Sweep: NOR:normal LIN LOG	SWEP LIN The sweep mode setting:linear
SWST xxxxx.xxxxx	Set start frequency, uints: kHz	SWST 00001.00000 Start frequency setting:1KHz
SWEN xxxxx.xxxxx	Set End fequency uints:kHz	SWEN 00010.00000 End frequency:10KHz
SWTI xx.xx	Sweep time, uints:s	SWTI 10.00 Set time:10s

orders	description	example
SWRP xxx	RUN: normal PLS: stop	SWRP PLS
MSEL xxx	CNT:count FRQ: frequency PER: cycle POS: NEG:	MSEL FRQ Frequency Measurement
MCFG xxxx	Set measurement group state: ATT0: no attenuation ATT1: atten 20dB LPF0: close lowpass LPF1: open lowpass SPD0:slow SPD: Fast	MCFG ATT1 Measurement attenuation setting:20dB

orders	description	example
MSRD	Received MSRD, return xxxxxxxxxx 10bit data	Example: measurement frequency sitting: sent back data:1234567890 The representative of the measurement results: 2345.67890kHz
MSST	Stop measurement	

Attention:

If it is a device with a Power out function,there is a radiator in the back panel. If the instrument have worked a long time,please do not touch it in case of any hurt.

Please do not open the case for non-professionals.