# KC901V Program Manual

## 0,Overview

KC901V uses CSCAD, which is also called ASCII, to do the data communication. The data is physically connected through the USB port or RJ-45 port and transferred into serial data in 901V to be identified by the main CPU. Users can operate 901V directly with command line or write the application software by themselves and use it for the instructions and meter communications, which are provided by this manual.

So far, the operational order of 901V is non-hierarchical language, which is easy to be understood and it can be mastered quickly without learning the knowledge about protocol logic.

In this manual, "Upper computer" means the PC or other control devices which control 901V. The "lower computer" means KC901V.

## 1, Command format

Communicate between KC901V and computer based on data package. Package start as "$" and end as "\n". The data inside the package are divide by "," for each element.

### 1.1, Send command format

$[command],[option],[parameter 1],[parameter 2],[parameter N]\n

### 1.2, Return data format

$start,[package name]\n     ;Every line start as "$" end as "\n" "start" mean start
$[package data]\n            ;Package data divide by ","
$end\n                       ;"end" mean the end of package

### 1.3, Format Specification

1, It's not every command must include options and parameters. Please use it following the manual.

2, The double bracket [] is only for the convenient expression in this manual, so it doesn't need to be input actually.

3, Except the specific specification, the capital letters and the small letters have the same meaning.

4, When sending a wrong command content to KC901V it will return a error notice and discard the command package.

5, When sending a wrong command format to KC901V it will discard the wrong format part and use the right format part.

1.4，Communication Example

To get the KC901V system time, need to send this command.

$[command],[option]\n

$date,get\n

This is the all step of communication. Purple is the computer send, Blue is the KC901V return.

$date,get\n


$start,date\n
$2015,4,22,10,36,39\n     ;YYYY,M,DD,HH,MM,SS
$end\n

1.5, Communication parameter

    Baud rate      : 921600
    Data bit        : 8
    Stop bit        : 1
    No Data check
    Command Buffer :32kb
    The command in the buffer well execute in order. When the buffer be full then KC901V will not receive the new command
    Data Buffer : 32kb
    The date in the buffer will return in order. When the buffer be full it will stop execute.

    The return date in remote mode not been rounding off for values. User need to do rounding off for values in program.


# 2, How to connect KC901V


2.1, Install the USB driver

When using the USB port to connect to the KC901V it will need the USB driver.

Usually the Windows system can install the driver automatically when connect the KC901V to computer via USB cable. If the auto driver install is nor work well we can download the driver program and install the driver manually.

Driver Download:http://www.ftdichip.com/Drivers/VCP.htm

When using the network port to connect the KC901V will not require a special driver.

2.2, Use a development software

To make the program simple the KC901V have no command echoing and just return /n character. So it is necessary to setting the development software to make the display properly.

We suggest use SecureCRT to do debug program, and do a few setting:

Select [View] -> [Command(Chat)Window] option. It will open a command input window. After entering command then press ENTER to send the command.
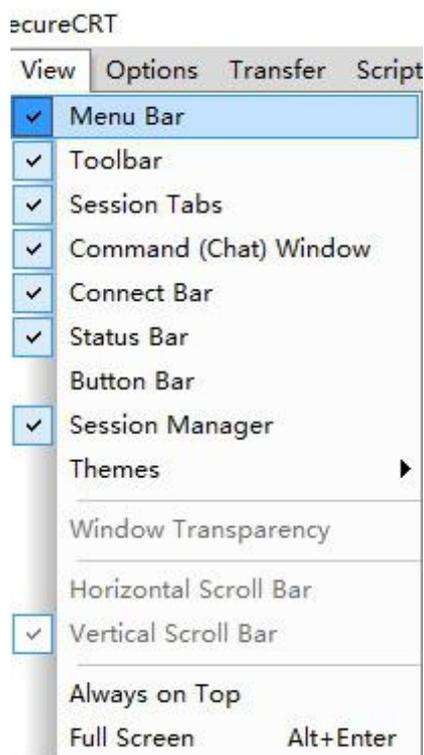


Select [Options] -> [Session Option] -> [Terminal] -> [Emulation] -> [Modes]
And enable the[New Line Mode] then it will display the \n as newlines.
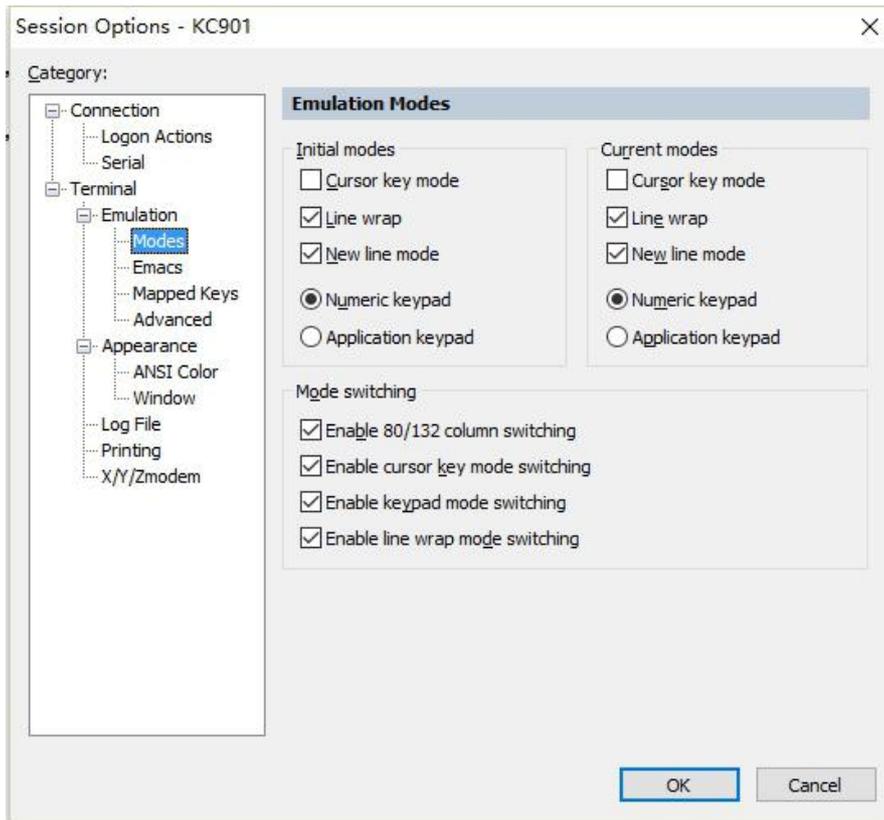
2.3, Network Connection

2.3.1,Enable the the network function

Before connect the KC901V to computer via network, we need to set the KC901V to enable the network function. Press FUNC button and change the Network to ON. If the network function set enable then the network port will light up. Enable the network function will take more batter power. When we don't use this function it should be not active.

2.3.2,Setting the net work parameter

Go to the FUNC interface and chose the IP SET to set the IP parameter of KC901V. After setting and save the parameter if the KC901V connect to the network succeed the green light in the network port will blink.
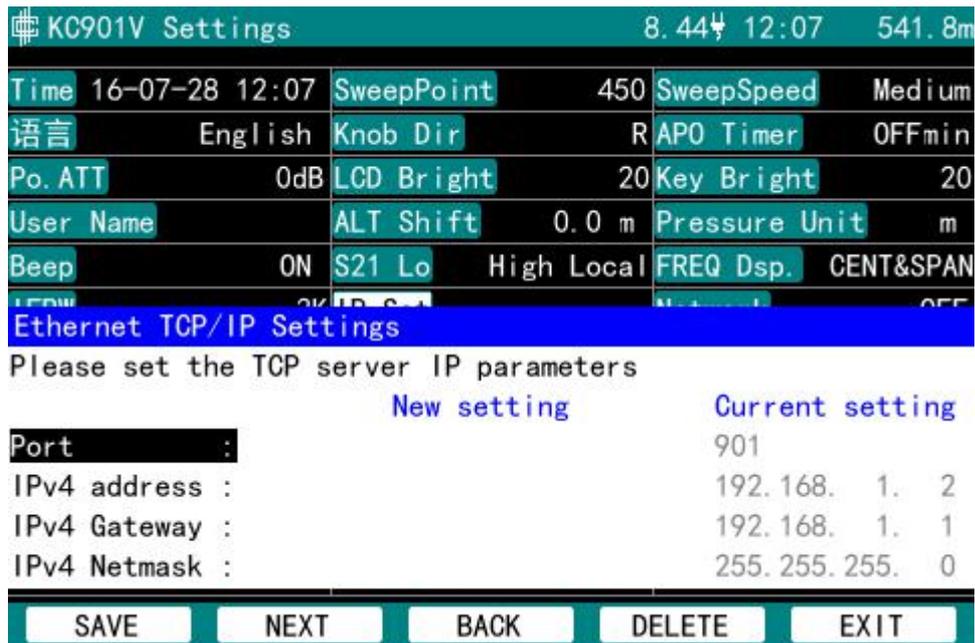
Port: IP port of KC901V.Please note the development software need to set with same port and make sure it can pass through your network firewall.

IPv4 address: Please make sure the address can be use in your network.

IPv4 Gateway:Set as your router address.

IPv4 Netmask:Set with your network. Usually 255.255.255.0

Usually it need a router to connect the KC901V. And the KC901V and computer all as a terminal device in that network. When connect the KC901V to computer use a network cable directly that like a computer connected to computer so it may need a reverse cable to connect.

2.4, Handshake with KC901V
   Note: Please make the KC901V not in any window display(E.g. About) or it will return a warning string

$start,ConFail\n
$Please exit the window operation first.\n
$end\n

In this situation please exit the the window on KC901V and then do handshake.

**Control the KC901V**

  Send C

Wait for about 1s it will return [KC901V] and the SN. Then the KC901V into remote mode.

2.5,Disconnect the KC901V

  There are 2 ways to disconnect the KC901V:
    1, Send the disconnect command to KC901V. See 3.2.16 Exit the remote mode
    2, Press the [SHIFT]+[MODE] button in KC901V to disconnect

If the communication of KC901V was disconnected by unplug the cable or other situation, KC901V can't to exit the remote mode automatically then it need to press [SHIFT]+[MODE] to exit.

2.5,End the data return

    In computer operation press [Ctrl]+[C] (Hex values 0x03) to end the data return when KC901V is consecutively returning data. KC901V will stop execute the received command then return the measured data until the buffer is empty.

    Note:

    When the KC901V end the data return then it will back to initial status. After end the data return need to initialization the measurement mode to restart the measurement.
    If choose the SecureCRT to connect the KC901V it need to click the data window then the [Ctrl]+[C] will work.

# 3.Command description

    In this part it will introduce the all KC901V commands and show with example.
    Note:
    Purple is the computer send, Blue is the KC901V return.

Send or return command all have an ENTER code \n but it will not show
Between the command,option and parameter it will separated by commas
After the ; are the notes in one line

3.1The command Classification

The command can be classified into 3 classifications

1. The System Setting Command
   It belongs to downstream Command, like setting the LCD
   brightness or transmitter output attenuation.
2. Measurement Control Command
   It belongs to downstream Command, like using S11 mode to
   measure S parameter which is under the corresponding frequency.
3. Warning
   It belongs to upstream command, like overload warning or
   high-temperature warning.

3.2 System Command

3.2.1 System Time

| Command | Option | Specification |
|---------|--------|---------------|
| date | get | Acquire Time |
|      | set | Time Setting, the format is shown below:<br>Year/Month/Day/Hour/Minute/Second<br>XXXX-XX-XX,XX:XX:XX |

Example:
Get KC901V system time

$date, get\n

$start, date\n

$2015, 4, 22, 12, 22, 8\n  ; YYMMDDHHMMSS

$end\n

Set KC901V system time

$date, set, 2016-4-22, 13-51-00\n

Note: The inputted year should be in 2000-2099

### 3.2.2 System Language Setting

| Command. | Option | Instruction |
|----------|--------|-------------|
| lang | en | Currently it support simplified Chinese and English. |
|  | cn |  |

Example:

Set the system language as English

$lang, en\n

### 3.2.3 Knob Direction Setting

| Command | Option | Specification |
|---------|--------|---------------|
| encoder | right | Turn it to counterclockwise direction, the quantity increases |
|  | left | Turn it to clockwise direction, the quantity increases |

Example:

Set the knob turn to counterclockwise direction to add the value:

$encoder, right\n

### 3.2.4 Output Attenuation Setting

| Command | Option | Specificaiton |
|---------|--------|---------------|
| outAtt | None | Parameter value range: 0~25<br>Unit: dB |

Example:

Output Attenuator, Set 10dB attenuate

$outAtt, 10\n

### 3.2.5 Brightness Setting

| Command | Option | Specification |
|---------|--------|---------------|
| light | lcd | LCD value range 1-100 |
| | key | Key value range1-100 |

Example:

Set the LCD brightness as 100%

$light, lcd, 100\n

### 3.2.6 Barometer

| Command | Option | Parameter | Specification |
|---------|--------|-----------|---------------|
| press | set | Numerical value | Set the absolute altitude compensation<br>Unit: m<br>Range:-999.9--- 999.9 |
| | get | None | Read the data of barometer<br>It can use hPa or m as unit |

Example:

Absolute altitude is plus 100 meter

$press, set, 100. 0\n

Get the barometer value

$press, get\n

$start, press\n

$950. 412, 536. 802\n    ; (hPa), (m)

$end\n

### 3.2.7 Key Beep

| Command | Option | Specification |
|---------|--------|---------------|
| beep | off | off → Turn off |
|  | on | on → Turn on |

Example:
Enable the key beep

$beep, on\n

### 3.2.8 S11 Cable Offset

| Command | Option | Specification |
|---------|--------|---------------|
| cable | len | Cable Length, unit: m, value range: 0-99.999 |
|  | loss | Cable Loss, unit: dB, value range: 0-99.99 |
|  | freq | Cable Loss's corresponding frequency, unit: MHz |

Example:
Set the cable length attenuation as 10.123 meter.

$cable, len, 10. 123\n

### 3.2.9 S11 System Calibration Calibrator Setting

| Command | Option | Specificaiton |
|---------|--------|---------------|
| kit_s11 | None | Input SHORT OPEN LOAD calibrator electric length(0-99.99 mm) in turn |

Example:
Set the SHORT OPEN LOAD calibrator electric length as 0.12mm,0.34mm,0.56mm in turn.

$kit_s11,0.12,0.34,0.56\n

### 3.2.10 S21 System Calibration Calibrator Setting

| Command | Option | Specificaiton |
|---------|--------|---------------|
| kit_s21 | None | Input calibrator length and attenuation in turn.<br>Length range 0-999.99 mm<br>Attenuation range 0-99.99 dB<br>Attenuation frequency 0-9999 MHz |

Example:

Set the calibrator length as 100.00mm and 0.1dB attenuation

$kit_s21,100,0.1\n

### 3.2.11 Get the device information

| Command | Option | Specification |
|---------|--------|---------------|
| device | None | It will return the specification of the character string |

When it receives this testing command, KC901V will return as the following format shows:

$start,device\n

$<--------------------KC901V network analyzer----------------->\n

$<-User @ : username >\n

$<-SoftWare Ver:Software version ------------------------------------>\n

$<-HardWare Ver:Hardware version ------------------------------------>\n

$<-Serial num:SN ------------------------------------------>\n

$<-Copyright:KeXinShe Co.,Ltd & KeChuang measurement association>\n

$<------------------------------------------------------------>\n

$end\n

Example:

$device\n

$start,device\n

$<---------------------KC901V network analyzer----------------->\n

$<-User @ :BBBB567895>\n

$<-Software ver:V2.0.8------------------------------------>\n

$<-Hardware ver:MB-V1.2 RB-V1.1--------------------------->\n

$<-Serial num:002015123456------------------------------->\n

$<-Copyright:KeXinShe Co.,Ltd & KeChuang measurement association>\n

$<----------------------------------------------------->\n

$end\n

## 3.2.12 Get the voltage information

| Command | Option | Specificaiton |
|---------|--------|---------------|
| Voltage | None | Return the power adapter voltage and the batter voltage. |

Example:
Get the battery voltage

$voltage\n

$start,voltage\n

$10.82,8.06\n   ;The power adapter and battery voltage

$end\n

### 3.2.13 Get Temperature information inside KC901V

| Command | Option | Specification |
|---------|--------|---------------|
| temp | None | Unit: ℃ |

Example:

Read inside temperature

$temp\n

$start, temp\n

$44.2\n

$end\n

### 3.2.14 Get KC901V time information

| Command | Option | Specification |
|---------|--------|---------------|
| times | None | Boot times, Run time,Total using time |

Example:

Get the time information

$times\n

$start,times\n

$1223,2,52,51,2,2,52,51\n;Boot times, Run time(H,M,S),Total using time(D,H,M,S)

$end\n

### 3.2.15 Set the REF level in spectrum function

| Command | Option | Specification |
|---------|--------|---------------|
| specref | None | In +20-40 range, dBm |

Example:
Set the REF level as -20dBm

$specref,-20\n

### 3.2.16 Exit the remote mode

| Command | Option | Specification |
|---------|--------|---------------|
| local | None | Disconnect to the computer control |

Example:

$local\n

When KC901V received this command it will stop all processing and exit the remote mode.

### 3.2.17 Set the network parameter

| Command | Option | Specification |
|---------|--------|---------------|
| netinfo | None | View the network parameter |
| ip | None | Ip address of KC901V |
| gw | None | Network gateway address |
| msk | None | Network mask |

| port | None | Port (<65535) |
|------|------|---------------|
|      |      |               |

Example:

View the network information

$netinfo\n

$start,NetInfo\n

$192,168,1,2\n          ;IP address

$192,168,1,1\n          ;Network gateway

$255,255,255,0\n        ;Network mask

$901\n                  ;Network Port

$end\n

Set the ip address：

$ip,192.168.1.2\n

Set the network gateway address：

$gw,192.168.1.1\n

Set the network mask：

$msk,255.255.255.0\n

Set the network port：

$port,901\n

3.2.18 Set the bandwidth

| Command | Option | Specification |
|---------|--------|---------------|
| bw | 1k<br>3k<br>10k<br>30k | Set the sampling bandwidth |

Example:
Set the sampling bandwidth to 10kHz

$bw, 10k\n

3.2.19 Firmware update

| Command | Option | Specification |
|---------|--------|---------------|
| update | None | Update the firmware via TF card |

Before send this command to KC901V please make sure the update package is storage in the TF card. KC901V will reboot to update the firmware when it receive this command. KC901V will return the update information in the USB serial port.

Notice:

1, If the the KC901V crash in firmware update, reboot the KC901V and it will update again.

Example:

$update\n

2, In the firmware update mode the USB serial port baud rate is fixed 9216000

### 3.2.20 Reset the KC901V setting

| Command | Option | Specification |
|---------|--------|---------------|
| reset | None | Reset all setting to factory and replace the system calibration to factory calibration |

Example:

$reset\n

$start,reset\n   ;

$Restore the factory settings,confirm?[Yes/no]\n ;

$end\n

 $yes\n or $no\n

Notice:

After reset to the factory mode the network setting will reset too. It may need to set the network parameter again.

### 3.2.21 S11 System Calibration

| Command | Option | Specification |
|---------|--------|---------------|
| cal_s11 | None | S11 system calibration |

After send this command KC901V will return a string to communicate with user via serial port to make a SOL calibration. And then KC901V will use this calibration set in measurement. Use [reset] command it will replace factory calibration to the system calibration. For computer program it just need to read the package head string and no need to match the package data.

Example:

$cal_s11\n

$start,s11cal_confirm\n

$******S11 calibration******\n

$Do you want to be calibrated?[Yes/no]\n

$end\n

$yes\n

$start,s11cal_wait\n          ;Wait for 5s hardware warm-up

$Wait for the circuit stability...\n

$end\n

$start,s11cal_step\n

$Start the calibration,Please follow the steps:\n

$end\n

$start,s11cal_short\n              ;Connect the short calibrator

$Step 1:Please connect the short module then send 'yes'.\n

$end\n

$yes\n (Notice： After send yes it will need about 16s measurement to calibrate and it will no data return in this

time)

$start,s11cal_open\n            ;Connect the open calibrator

$Step 2:Please connect the open module then send 'yes'.\n

$end\n

$yes\n(Notice ： After send yes it will need about 16s measurement to calibrate and it will no data return in this time)

$start,s11cal_load\n        ;Connect the load calibrator

$Step 3:Please connect the load module then send 'yes'.\n

$end\n

$yes\n(Notice ： After send yes it will need about 16s measurement to calibrate and it will no data return in this time)

$start,s11cal_process\n       ;Calibration data processing

$Step 4:Being processed(Wait please).\n

$end\n

$start,s11cal_save\n          ;Storage the calibration data

$Saving,wait please......\n

$end\n


$start,s11cal_completed\n               ;Calibration done

$Calibration completed!\n

$end\n


In calibration step if send 'exit\n' to KC901V when it is waiting for user confirm it will exit the calibration.

Example:

$exit\n


$start,s11cal_exit\n

$Exit calibration\n

$end\n

### 3.2.22 S21 System Calibration

| Command | Option | Specification |
|---------|--------|---------------|
| cal_s21 | None | S21 system calibration |

After send this command KC901V will return a string to communicate with user via serial port to calibration. And then KC901V will use this calibration set in measurement. Use [reset] command it will replace factory calibration to the system calibration. For computer program it just need to read the package head string and no need to match the package data.

$cal_s21\n


$start,s21cal_confirm\n

$\*\*\*\*\*\*S21 calibration\*\*\*\*\*\*\n          ;wait for calibration command

$Do you want to be calibrated?[Yes/no]\n

$end\n


$yes\n


$start,s21cal_wait\n       ;wait for warm up, about 5s no data return

$Wait for the circuit stability...\n

$end\n


$start,s21cal_step\n

$Start the calibration,Please follow the steps:\n

$end\n


$start,s21cal_NC\n                    ;disconnect the port1 and port2

$Step 1: Please let [SOURCE] port and [RF IN] port NC then press

send 'yes'.\n

$end\n


$yes\n (wait about 16s to do the NC calibration,no data return)


$start,s21cal_connect\n                    ;connect the port1 and port 2

$Step 2: Please connect [SOURCE] port and [RF IN] port then send

'yes'.\n

$end\n


$yes\n(wait about 16s to do the short calibration,no data return)


$start,s21cal_process\n                    ;calibration data processing

$Step 3:Being processed(Wait please).\n

$end\n


$start,s21cal_save\n                         ;saving the calibration data

$Saving,wait please......\n

$end\n


$start,s21cal_completed\n                    ;calibration done

$Calibration completed!\n

$end\n




### 3.3 Control Command

3.3.1 S11 measurement command

There are some parameters which are related with this function.
3.2.4 Output Attenuation Setting.    3.2.8 Cable Compensation

| Command | Option | Parameter 1 | Parameter 2 | Parameter 3 | Parameter 4 | Parameter 5 | Parameter 6 |
|---------|--------|-------------|-------------|-------------|-------------|-------------|-------------|
| S11 | init | | ri | | | | |
| | run | cal0n | ma | ** | cs | ** | ** |
| | | cal0ff | vswr | | ss | | |
| | stop | | z | | | | |

Specification:
1.   Option
Init  →  Initialize S11 function. (This command must be done before using S11 function.)
Run  →  Run S11 to do the sweep-frequency acquisition.
Stop  →  Stop and turn off the S11 function. (This command must be done before

2.    Parameter 1:

CalOn  →  Turn on the system calibration.

CalOff  →  Turn off the system calibration.

When using the remote control, KC901V is not able to use user calibration. If you need to use the user calibration, the relevant calibrated calculations should be achieved in upper computer.

3.    Parameter 2:

ri  →  Return real component and imaginary component data.

ma      →  Return with reflection coefficient and angles data.

vswr  →  Return vswr data.

z        →  Return impedance data

4.    Parameter 3 is used for setting sweeping point. Currently the maximum number of the points it can sweep is 1000 points. If it needs to sweep over 1000 points, it can run S11 command several times to do the subsection sweeping.

It can only measure 1 point, that is point=1. If the measurement is running continuous in this time, the instrument will send a measured result of frequency to the upper computer constantly.

5.    Parameter 4:

cs  →  Confirm the sweeping range with Cent and Span.

ss  →  Confirm the sweeping range with Start and Stop.

If the setting of parameter 3 only sweeps 1 frequency point, then the parameter 4 only can choose CS.

If the parameter 4 setting for 1 sweep point, Then the parameter 5 set to SS or CS is the same function.

6.    Parameter 5 and 6 can be used for setting central frequency and sweeping, or starting and terminating the frequency. It takes Hz as unit. According the setting of parameter 4, it needs only one way to input the data.

Central frequency range: 5500Hz-6999999500Hz

Sweeping range: 1000Hz-6999995000Hz

Start frequency range: 5000Hz-6999999000Hz

Stop frequency range: 6000Hz-7000000000Hz

Stop frequency should be larger than the start frequency.

If the parameter 4 setting for 1 sweep point, Then the parameter 6 is the point frequence.

7.    Example:

When the sweep point >1

$s11, run, caloff, ri, 2, cs, 100000000, 50000000\n


$start, s11, ri\n

$75000000, 0.528, -0.269\n    ;Frequence, Real, Imaginary

$100000000, 0.471, -0.406\n

$125000000, 0.370, -0.475\n

$end\n


$s11, run, caloff, ma, 2, cs, 100000000, 50000000\n

$start, s11, ma\n

$75000000, 0.5847, -26.497\n  ;Frequence, Reflection coefficient, Phase

$100000000, 0.6171, -40.609\n

$125000000, 0.5934, -51.820\n

$end\n


$s11, run, caloff, vswr, 2, cs, 100000000, 50000000\n

$start, s11, vswr\n

$75000000, 3.7347\n     ;Frequence,  VSWR

$100000000, 4.1275\n

$125000000, 3. 7658\n

$end\n


$s11, run, caloff, z, 2, cs, 100000000, 50000000\n

$start, s11, z\n

$75000000, 137. 9871, 109. 6309, -83. 7945\n                              ;

Frequence, Impedance, Impedance model, Resistance, Reactance

$100000000, 113. 8715, 70. 5131, -89. 4127\n

$125000000, 91. 2070, 52. 7077, -74. 4354\n

$end\n

When the sweep point =1

$s11, run, caloff, ri, 1, cs, 100000000\n


$start, s11, ri\n

$100000000, 0. 456, -0. 391\n

$end\n


$start, s11, ri\n

$100000000, 0. 458, -0. 392\n

$end\n

3.3.2 S21 measurement command

There are some parameters which are related with this function.
3.2.4 Output Attenuation Setting.

| Command | Option | Parameter 1 | Parameter 2 | Parameter 3 | Parameter 4 | Parameter 5 | Parameter 6 | Parameter 7 |
|---------|--------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| S21 | init<br><br>run<br><br>stop | cal0n<br>cal0f<br>f | ri<br>ma | lowlo<br>highlo | ** | cs<br>ss | ** | ** |

Specification:
1.  Option
Init  →  Initialize S21 function. (This command must be done before using S21 function.)
Run  →  Run S21 to do the sweep-frequency acquisition.
Stop  →  Stop and turn off the S21 function. (This command must be done before using other working modes.)

2. Parameter 1:

CalOn → Turn on the system calibration.

CalOff → Turn off the system calibration.

When using the remote control, KC901V is not able to use user calibration. If you need to use the user calibration, the relevant calibrated calculations should be achieved in host computer.

3. Parameter 2:

ri → Return real component and imaginary component data.

ma → Return with reflection coefficient and angles data.

4. Parameter 3:

lowlo -> Sweep with Low Local Oscillator

highlo -> Sweep with High Local Oscillator

5. Parameter 4 is used for setting sweeping point. Currently the maximum number of the points it can sweep is 1000 points. If it needs to sweep over 1000 points, it can run S21 command several times to do the subsection sweeping.

It can only measure 1 point, that is point=1. If the measurement is running continuous in this time, the instrument will send a measured result of frequency to the upper computer constantly.

6. Parameter 5:

cs → Confirm the sweeping range with Cent and Span.

ss → Confirm the sweeping range with Start and Stop.

If the setting of parameter 3 only sweeps 1 frequency point, then the parameter 4 only can choose CS.

If the parameter 4 setting for 1 sweep point, Then the parameter 5 set to SS or CS is the same function.

7. Parameter 6 and 7 can be used for setting central frequency and sweeping span, or starting and terminating the frequency. It takes Hz as unit. According the setting of parameter 4, it needs only one way to input the data.

Central frequency range: 5500Hz-6999999500Hz

Sweeping range: 1000Hz-6999995000Hz

Start frequency range: 5000Hz-6999999000Hz

Stop frequency range: 6000Hz-7000000000Hz

Stop frequency should be larger than the start frequency.

If the parameter 4 setting for 1 sweep point, Then the parameter 6 is the point frequence.

8.   Example:

When the sweep point >1

$s21, run, caloff, ri, lowlo, 2, cs, 100000000, 50000000\n


$start, s21, ri\n

$75000000, -0.442, 0.000\n   ;Frequence, Real, Imaginary

$100000000, -0.419, 0.174\n

$125000000, -0.418, 0.219\n

$end\n

$s21, run, caloff, ma, lowlo, 2, cs, 100000000, 50000000\n

$start, s21, ma\n

$75000000, -7.097, 180.000\n  ;Frequence, Lose, Phase

$100000000, -6.758, 157.210\n

$125000000, -6.402, 150.816\n

$end\n


When the sweep point =1

$s21, run, caloff, ma, lowlo, 1, cs, 100000000\n


$start, s21, ma\n

$100000000, -6.744, 156.693\n

$end\n

$start, s21, ma\n

$100000000, -6.766, 156.762\n

$end\n

$start, s21, ma\n

$100000000, -6.773, 156.731\n

$end\n

### 3.3.3 Spectrum measurement command

There are some parameters which are related with this function.
3.2.4 Output Attenuation Setting.

| Command | Option | Parameter 1 | Parameter 2 | Parameter 3 | Parameter 4 | Parameter 5 | Parameter 6 |
|---|---|---|---|---|---|---|---|
| spec | init | cal0n | lowlo | ** | cs | ** | ** |
| | run | | highlo | | | | |
| | stop | cal0ff | | | ss | | |

Specification:

1.  Option
Init → Initialize SPEC function. (This command must be done before using SPEC function.)
Run → Run SPEC to do the sweep-frequency acquisition.
Stop → Stop and turn off the SPEC function. (This command must be done before using other working modes.)

2.  Parameter 1:

CalOn → Turn on the system calibration.
CalOff → Turn off the system calibration.

3.  Parameter 2:
lowlo    -> Sweep with Low Local Oscillator
highlo    -> Sweep with High Local Oscillator

4.  Parameter 3:
Parameter 3 is used for setting sweeping point. Currently the maximum number of the points it can sweep is 1000 points. If it needs to sweep over 1000 points, it can run S11 command several times to do the subsection sweeping.
It can only measure 1 point, that is point=1. If the measurement is running continuous in this time, the instrument will send a measured result of frequency to the host constantly.

5.  Parameter4:
   cs → Confirm the sweeping range with Cent and Span.
   ss → Confirm the sweeping range with Start and Stop.
   If the setting of parameter 3 only sweeps 1 frequency point, then the parameter 4 only can choose CS.

   If the parameter 3 setting for 1 sweep point, Then the parameter 5 set to SS or CS is the same function.

6.  Parameter 5:
Parameter 5 and 6 can be used for setting central frequency and sweeping span, or starting and terminating the frequency. It takes Hz as unit. According the setting of parameter 4, it needs only one way to input the data.
Central frequency range: 5500Hz-6999999500Hz
Sweeping range: 1000Hz-6999995000Hz
Start frequency range: 5000Hz-6999999000Hz
Stop frequency range: 6000Hz-7000000000Hz
Stop frequency should be larger than the start frequency.

If the parameter 4 setting for 1 sweep point, Then the parameter 6 is the point frequence.

7.  Example:

When the sweep point >1

$spec, run, caloff, lowlo, 10, cs, 100000000, 50000000\n


$start, spec\n

$75000000, -74.166\n    ;Frequence, Level(dBm)

$80000000, -74.385\n

$85000000, -74.228\n

$90000000, -74.249\n

$95000000, -74.125\n

$100000000, -74.456\n

$105000000, -74.422\n

$110000000, -74.147\n

$115000000, -74.077\n

$120000000, -74.295\n

$125000000, -74.314\n

$end\n


When the sweep point =1

$spec, run, caloff, lowlo, 1, cs, 100000000\n


$start, spec\n

$100000000, -74.307\n

$end\n

$start, spec\n

$100000000, -74.540\n

$end\n

$start, spec\n

$100000000, -74.310\n

$end\n

### 3.3.4 Field measurement command

There are some parameters which are related with this function.
3.2.4 Output Attenuation Setting.

| Command | Option | Parameter 1 | Parameter2 |
|---------|--------|-------------|------------|
| field | init | lowlo | |
| | run | highlo | ** |
| | stop | | |

Specification:

1. Option
Init → Initialize FIELD function. (This command must be done before using FIELD function.)
Run → Run FIELD to do the sweep-frequency acquisition.
Stop → Stop and turn off the FIELD function. (This command must be done before using other working modes.)

2. Parameter 1:
lowlo    -> Sweep with Low Local Oscillator
highlo    -> Sweep with High Local Oscillator

3. Parameter 2:
Measurement frequence. Unit: Hz
Frequence range: 0-7000000000Hz

4. Example:

$field, run, lowlo, 100000000\n

$start, field\n

$100000000, -121. 917\n

$end\n

$start, field\n

$100000000, -122. 337\n

$end\n

$start, field\n

$100000000, -122. 087\n

$end\n

### 3.3.5 RFSource command

| Command | Option | Parameter 1 | Parameter 2 | Parameter 3 | Parameter 4 | Parameter 5 | Parameter 6 |
|---------|--------|-------------|-------------|-------------|-------------|-------------|-------------|
| rfsource | init | off | Port1 | ** | ** | ** | ** |
| | run | | | | | | |
| | stop | ask | Port2 | | | | |

Specification:

1.  Option
Init → Initialize RFSOURCE function. (This command must be done before using RFSOUCE function.)
Run → Run RFSOUCE to do the signal generate.
Stop → Stop and turn off the RFSOUCE function. (This command must be done before using other working modes.)

2.  Parameter 1:
off    -> None modulation, This time not need to set the parameter4 and 5
ask    -> Use ASK modulation

3.  Parameter 2:
port1 -> Set the output port to port1
port2 -> Set the output port to port2

4.  Parameter3:
CW frequence. Unit Hz. Range:0-7000000000Hz

5.  Parameter4:
Cw output level. Unit dBm

The output level range will change with selected port and frequence.

When the command set level is high than the max output level then the instrument will return warring information and generate the signal at max output level.

$start,warn_gtr\n

$warn:It is greater than the maximum output!\n

$end\n

When the command set level is low than the min output level then the instrument will return warring information and generate the signal at min output level.

`$start,warn_lt\n`

`$warn:It is less than the minimum output!\n`

`$end\n`


6. Parameter5:
Modulation frequence. Unit Hz. Range: 0-3000Hz

7. Parameter6:
Modulation depth, It can set to a few fixed value: 0, 5, 10, 15, 20, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90.

8. Example:

Set the RFSOURCE output, Using ASK modulation, carrier frequence 1GHz, None output attenuation, modulation frequence 1KHz, modulate depth 90%。

Initial the RFSOURCE:

`$rfsource, init\n`

Start the RFSOURCE:

`$rfsource, run, ask, port1, 1000000000, 0, 1000, 90\n`

Stop the RFSOURCE:

`$rfsource, stop\n`


8. Processing:

1), When input the Init, The KC901V will start initial the RFSOURCE part.

2),When input the stop, The KC901V will close the RFSOURCE part.

3),When input the run, The KC901V will generate the signal by the user's setting

4),When the RFSOURCE is outputting signal, if the user not send the stop command then the RFSOURCE will continuously output.

### 3.3.6 AFSource command

| Command | Option | Parameter 1 | Parameter 2 | Parameter 3 | Parameter 4 | Parameter 5 | Parameter 6 |
|---------|--------|-------------|-------------|-------------|-------------|-------------|-------------|
| afsource | init<br>run<br>stop | off<br>ask<br>fm<br>pm | afout<br>Port1<br>Port2 | ** | ** | ** | ** |

Specification:

1. Option
Init → Initialize RFSOURCE function. (This command must be done before using AFSOUCE function.)
Run → Run AFSOUCE to do the signal generate.
Stop → Stop and turn off the AFSOUCE function. (This command must be done before using other working modes.)

2. Parameter 1:
off    -> None modulation, This time not need to set the parameter4 and 5
ask    -> Use ASK modulation
fm    -> Use frequence modulation
pm    -> Use phase modulation

3. Parameter 2:
afout -> Set the output port to af port
port1 -> Set the output port to port1
port2 -> Set the output port to port2

4. Parameter3:
CW frequence. Unit Hz. Range:0-7000000000Hz

5. Parameter4:
Cw output level
When the port select to afout, unit is mV(VPP), range 0-3000mV

When select the port to port1 or port2 ,Unit dBm

The output level range will change with selected port and frequence.

When the command set level is high than the max output level then the instrument will return warring information and generate the signal at max output level.

$start,warn_gtr\n

$warn:It is greater than the maximum output!\n

$end\n


When the command set level is low than the min output level then the instrument will return warring information and generate the signal at min output level.

$start,warn_lt\n

$warn:It is less than the minimum output!\n

$end\n


6.   Parameter5:
Modulation frequence. Unit Hz.

When the mode is ASK, Range: 0-3000Hz
When the mode is FM or PM, range: 16-10000Hz

7.   Parameter6:
Modulation depth,
In ASK, range: 0-100%
In FM, range:0-1MHz
In PM, range: -180°- +180°

8.   Example:

Set the AFSOURCE output, Using ASK modulation, carrier frequence 10MHz,

output level 1.3V(VPP),modulation frequence 1KHz, modulate depth 100%。

Initial the AFSOURCE:

$afsource, init\n

Start the AFSOURCE:

$afsource, run, ask, afout, 10000000, 1300, 1000, 100\n

Stop the AFSOURCE:

$afsource, stop\n


8. Processing:

1), When input the Init, The KC901V will start initial the AFSOURCE part.

2),When input the stop, The KC901V will close the AFSOURCE part.

3),When input the run, The KC901V will generate the signal by the user's setting

4),When the AFSOURCE is outputting signal, if the user not send the stop command then the AFSOURCE will continuously output.


3.4 Up-link command

The KC901V return information use to warring and notice, every warring is a package. In software program, just reading the package head can get the warring type and no need to match the package document.


3.4.1 When send a wrong command

$start, err_cmd\n

$error:Command input error!\n

$end\n


3.4.2 When send a wrong option

$start, err_opt\n

$error:Option input error!\n

```
$end\n
```

### 3.4.3 When send a wrong parameter

```
$start,err_parX\n      ;parameter X wrong
$error:ParameterX input error!\n
$end\n
```

### 3.4.4 Need to Initialization this mode before use

```
$start,err_uninit\n
$error:Please initialize the mode first!\n
$end\n
```

### 3.4.5 Rf output unlock

```
$start,err_RfUnlock\n
$error:RF PLL unLock!\n
$end\n
```

### 3.4.6 LO PLL unlock

```
$start,err_LoUnlock\n
$error:Lo PLL unLock!\n
$end\n
```

### 3.4.7 need to stop other running mode before use

```
$start,err_S11Stop\n      ;need to stop the S11 mode
$error:Please stop S11 mode first!\n
$end\n
```

```
$start,err_S21Stop\n      ;need to stop the S21 mode

$error:Please stop S21 mode first!\n

$end\n



$start,err_SpecStop\n     ;need to stop the spec mode

$error:Please stop Spec mode first!\n

$end\n



$start,err_FieldStop\n     ;need to stop the field mode

$error:Please stop Field mode first!\n

$end\n



$start,err_RfStop\n       ;need to stop the rfsource mode

$error:Please stop RFSource mode first!\n

$end\n



$start,err_AfStop\n       ;need to stop the afsource mode

$error:Please stop AFSource mode first!\n

$end\n
```

### 3.4.8 low battery

```
$start,err_BatVolLow\n

$error:Low battery!\n
```

$end\n

3.4.9 Power input voltage too high

$start,err_ExVolHigh\n

$error:External Voltage is too high!\n

$end\n

3.4.10 over temperature

$start,err_TempHigh\n

$error:Temperature is too high!\n

$end\n

3.5 Version

This manual support the 1.1.0 and new firmware in KC901V