



SMR Series Monitoring Receiver Module Programming Manual



Saluki Technology Inc.

Content

1	Overview.....	1
1.1	Programming Overview.....	1
1.2	Introduction to SCPI commands.....	1
1.2.1	Command format	2
1.2.2	Symbol Description.....	2
1.2.3	Parameter Type.....	3
1.2.4	Command abbreviation.....	4
2	Comamands subsystem.....	5
2.1	IEEE488.2 System commands.....	5
(1)	*IDN?	5
(2)	*RST	5
2.2	ABORT commands.....	5
2.3	INITiate commands.....	6
2.4	[:SENSe]commands.....	6
(1)	[:SENSe]:FREQuency	6
(2)	[:SENSe]:FREQuency:MODE	6
(3)	[:SENSe]:FREQuency:STOP	7
(4)	[:SENSe]:FREQuency:START	7
(5)	[:SENSe]:FREQuency:STEP	7
(6)	[:SENSe]:FREQuency:SPAN	8
(7)	[:SENSe]:BAND	8
(8)	[:SENSe]:POWer:RF:ATTenuation	9
(9)	[:SENSe]:POWer:IF:ATTenuation	9
(10)	[:SENSe]:DEModulation	9
(11)	[:SENSe]:DEModulation:FREQuency	10
(12)	[:SENSe]:DEModulation:BAND	10
(13)	[:SENSe]:DEModulation:FSTRength:TYPE	11
(14)	[:SENSe]:DEModulation:FSTRength:STATe	11
(15)	[:SENSe]:DEModulation:FSTRength:DATA?	11
(16)	[:SENSe]:DEModulation:GAIN:TYPE	12
(17)	[:SENSe]:DEModulation:GAIN:MGC:MODE	12
(18)	[:SENSe]:DEModulation:GAIN:AGC:FACTor	12
(19)	[:SENSe]:DEModulation:IQData:DEPTh	13
(20)	[:SENSe]:DEModulation:IQData:COLLect	13
(21)	[:SENSe]:DEModulation:IQData:END	13
(22)	[:SENSe]:DEModulation:IQData:DATA?	13
(23)	[:SENSe]:TEAM:MODE	14
(24)	[:SENSe]:SWEep:STEP:MODE	14
(25)	[:SENSe]:SWEep:NEXT	14
(26)	[:SENSe]:Scan:SWEep:Mode	14

(27)	[:SENSe]:DEModulation:DIGItal:TYPE	15
(28)	[:SENSe]:DEModulation:DIGItal:SYMBol:RATE	16
(29)	[:SENSe]:DEModulation:AUDIo:DATA:START	16
(30)	[:SENSe]:DEModulation:AUDIo:DATA:STOP	16
2.5	SYSTem commands.....	16
(1)	:SYSTem:AUDIo:VOLume	16
(2)	:SYSTem:COMMunicate:LAN:ADDRess	17
(3)	:SYSTem:COMMunicate:LAN:SMASk	17
(4)	:SYSTem:COMMunicate:LAN:DGATeway	17
(5)	:SYSTem:COMMunicate:LAN:PORT	17
2.6	UDP commands.....	18
(1)	:UDP:REMOte:IP	18
(2)	:UDP:REMOte:PORT	18
(3)	:UDP:SERVice:STARt	18
(4)	:UDP:SERVice:STOP	19
(5)	:UDP:REMOte:IQ:NUMBers	19
3	Example of instruction usage process.....	19
3.1	SWEEP	19
3.2	IFSPAN	20
3.3	IQ Data.....	20
4	Programming examples.....	21
5	Appendix.....	23
Appendix 1	Status Byte Register	23
Appendix 2	Standard event enable register	24
Appendix 3	Standard Event Status Register (ESR)	24
Appendix 4	Operation Status Register (OSR)	25
Appendix 5	Example of using the IF analysis command	26
Appendix 6	Example of using frequency sweep command	26
Appendix 7	IQ data acquisition instruction usage example	26
Appendix 8	Example of using digital demodulation instructions, under development	27
Appendix 9	Demodulated audio data.....	27
Appendix 10	Frequency Sweep.....	28
Appendix 11	IF data format	31
Appendix 12	IQ	31
Appendix 13	Audio data format	31

1 Overview

This chapter provides an overview of remote command programming and introduces the relevant provisions of SCPI commands. Mainly includes the following content:

- Programming Overview
- Introduction to SCPI commands
 - Command format
 - Symbol Description
 - Parameter Type
- Command abbreviation

1.1 Programming Overview

The monitoring receiver and computer can communicate through the following interface: LAN interface. For the usage of various communication interfaces, please refer to the product's "User Manual".

When using commands for programming, all command words are sent and recognized in the form of ASCII strings to facilitate user control and secondary development.

The following operating instructions take the SMR008 monitoring receiver as an example:

You can do the following programmatically:

- Set up SMR008
- Take measurements
- Obtain data from SRM080 (instrument working status and measurement data results)

1.2 Introduction to SCPI commands

SCPI (Standard Commands for Programmable Instrument) is a standard command set for programmable instruments based on IEEE 488.2. SCPI commands are divided into two parts: IEEE 488.2 common commands and SCPI instrument-specific control commands.

Public commands are commands that instruments specified in IEEE 488.2 must support, and their syntax and semantics comply with the regulations of IEEE 488.2. Common commands are independent of measurement and are used to control reset, self-test, and status operations. For an introduction to SCPI public commands, please refer to the introduction in the IEEE 488.2 section.

SCPI instrument-specific control commands are used for measuring, reading data, switching switches, etc., including all measurement functions and some special function functions.

1.2.1 Command format

The SCPI command is a tree-like hierarchical structure, including multiple subsystems. Each subsystem consists of a root keyword and one or several hierarchical keywords. The command line usually starts with a colon ":"; keywords are separated by a colon ":", and the keywords are followed by optional parameter settings; a question mark "?" is added after the command line to indicate querying this function; commands and parameters Separate with "space".

For example:

```
:CALCulate:BANDwidth:NDB <rel_ampl>
```

```
:CALCulate:BANDwidth:NDB?
```

CALCulate is the root keyword of the command, and BANDwidth and NDB are the second-level and third-level keywords respectively. The command line starts with a colon ":" and separates the keywords at each level. <rel_ampl> represents the settable parameters; the question mark "?" represents the query; use a "space" between the command: CALCulate:BANDwidth:NDB and the parameter <rel_ampl> "separate. In some commands with parameters, multiple parameters are usually separated by commas ",", for example:

```
:SYSTEM:DATE <year>,<month>,<day>
```

1.2.2 Symbol description

The following four symbols are not part of the SCPI command, but are usually used to assist in explaining the parameters in the command.

1.2.2.1 Braces { }

Parameters in curly brackets are optional and may not be set, or may be set once or multiple times. For example:

```
[:SENSe]:CORRection:CSET<n>:DATA <freq>,<rel_ampl>{,<freq>,<rel_ampl>}
```

command, the frequency and amplitude in {,<freq>,<rel_ampl>} can be omitted, you can also set one or more pairs of frequency and amplitude parameters.

1.2.2.2 Vertical lines |

Vertical bars are used to separate multiple parameter options, one of which must be selected when sending a command. For example:

In the `:DISPlay:MENU:STATe OFF|ON|0|1` command, the selectable command parameters are "OFF", "ON", "0" or "1".

1.2.2.3 Square brackets []

The content in square brackets (command keywords) is optional and will be executed regardless of whether it is omitted. For example:

```
[ :SENSe]:CORRection:OFFSet[:MAGNitude]?
```

Sending the following three commands has the same effect:

```
:CORRection:OFFSet?
```

```
:CORRection:OFFSet:MAGNitude?
```

```
:SENSe:CORRection:OFFSet?
```

1.2.2.4 Triangle brackets <>

Parameters enclosed in triangle brackets must be replaced with a valid value. For example:

```
:DISPlay:BRIGtness <integer>
```

```
:DISPlay:BRIGtness 10
```

1.2.3 Parameter type

The parameters contained in the commands introduced in this manual can be divided into the following six types: Boolean, keyword, integer, continuous real, discrete, and ASCII string.

1.2.3.1 Boolean

The parameter value is "OFF", "ON", "0" or "1". For example:

```
:DISPlay:MENU:STATe OFF|ON|0|1
```

1.2.3.2 Keywords

The parameter values are the listed values. For example:

```
:DISPlay:AFUnction:POSition BOTTOm|CENTer|TOP
```

The parameters are "BOTTOm", "CENTer" or "TOP".

1.2.3.3 Integer type

Unless otherwise stated, parameters can take on any integer value within the valid range.

Note, please do not set the parameter to decimal format at this time, otherwise an exception will occur. For example:

```
:DISPlay:BRIGtness <integer>
```

Parameter <integer> can be any integer in the range of 0 to 255.

1.2.3.4 Continuous real type

Parameters can be arbitrarily set within the range of valid values according to precision requirements (usually the default precision is six digits of valid values after the decimal point). For example:

```
:CALCulate:BANDwidth:NDB <rel_ampl>
```

The parameter <rel_ampl> can take a real number between -100 and 100.

1.2.3.5 Discrete

Parameters can only take on specified values, and these values are not consecutive. For example:

```
:CALCulate:MARKer<n>:MAXimum:MAX
```

Parameter <n> can only take the value 1, 2, 3 or 4.

1.2.3.6 ASCII string

The parameter value is a combination of ASCII characters. For example:

```
:SYSTEM:DATE <year>,<month>,<day>
```

The parameter is the set date format string.

1.2.4 Command abbreviation

All commands are not case sensitive, you can use all uppercase or lowercase.

However, if you want to abbreviate, you must enter all capital letters in the command format, for example:

:CALCulate:BANDwidth:NDB? can be abbreviated to: :CALC:BAND:NDB?

2 Commands subsystem

This chapter introduces the sub-command system of the SMR series in the order of the first letters A ~ Z (with the exception of IEEE 488.2 standard commands).

Note: In this command set, if there is no special explanation, when the queried function is an option and has not been installed, "N/A" (without quotation marks) will be returned.

When the queried function is not enabled or the type does not match, "ERR" (without quotes) is returned. Each instruction ends with a semicolon (;)

2.1 IEEE488.2 system commands

(1) *IDN?

*IDN?	
Command format	*IDN?
Function description	Query instrument ID string *IDN? Company, MSA830, SN20000101 V1.8.0.1033
Return type	String
Note	The ID string consists of four parts: Company abbreviation + device type + serial number + version number

(2) *RST

*RST	
Command format	*RST
Function description	Reset the device to its reset settings
Return type	
Note	

2.2 ABORT command

:ABORT	
Command format	:ABORT;
Function description	Stop data transfer
Description	When setting parameters, you need to stop SRM080_interrupt first and use it with ":INITiate"

2.3 INITiate command

:INITiate[:IMMediate]	
Command format	:INITiate; :INITiate:IMMediate;
Function description	Start data transfer
Description	After the change is completed, interrupts need to be enabled and used in conjunction with ":ABORT"
Default value	

2.4 [:SENSe] command

(1) [:SENSe]:FREQuency

[:SENSe]:FREQuency	
Command format	[:SENSe]:FREQuency <freq> [:SENSe]:FREQuency?
Function description	Set the panoramic intermediate frequency center frequency, unit: GHz, MHz, KHz, Hz; the default unit is Hz, for example: :FREQ 200000000 or: FREQ 200000000Hz Query returns 200000000
Description	<freq>value range9KHz~8GHz/18GHz
Default value	89.5MHz

(2) [:SENSe]:FREQuency:MODE

[:SENSe]:FREQuency:MODE	
Command format	[:SENSe]:FREQuency:MODE<value> [:SENSe]:FREQuency:MODE?
Function description	Set frequency mode SWEep: Sweep mode FIXed: Panoramic IF mode NONE: No mode Default is NONE
Description	
Default value	NONE

(3) [:SENSe]:FREQuency:STOP

[:SENSe]:FREQuency:STOP	
Command format	[:SENSe]:FREQuency:STOP <freq> [:SENSe]:FREQuency:STOP?
Function description	Set the stop frequency, unit: GHz, MHz, KHz, Hz; the default unit is Hz, for example: :FREQ:STOP 1000000000 or :FREQ:STOP 1GHz Query returns 1000000000
Description	<freq>value range 9KHz~8GHz/18GHz
Default value	94.5MHz

(4) [:SENSe]:FREQuency:START

[:SENSe]:FREQuency:START	
Command format	[:SENSe]:FREQuency:START <freq> [:SENSe]:FREQuency:START?
Function description	Set the star frequency, unit: GHz, MHz, KHz, Hz; the default unit is Hz, for example: :FREQ:start 20000000; or :FREQ:start 20MHz; Query returns 20000000
Description	<freq>value range9KHz~8GHz/18GHz
Default value	84.5MHz

(5) [:SENSe]:FREQuency:STEP

[:SENSe]:FREQuency:STEP	
Command format	[:SENSe]:FREQuency:STEP<freq> [:SENSe]:FREQuency:STEP?
Function description	Set the sweep frequency step, unit: GHz, MHz, KHz, Hz; the default unit is Hz, for example: :FREQ:STEP 200000 or :FREQ:STEP 200KHz; Query returns 200000
Description	<freq>value range125Hz~400kHz
Default value	

(6) [:SENSe]:FREQuency:SPAN

[:SENSe]:FREQuency:SPAN	
Command format	[:SENSe]:FREQuency:SPAN <Value> [:SENSe]:FREQuency:SPAN?
Function description	Set the IF bandwidth in units: GHz, MHz, KHz, Hz; the default unit is Hz, for example: :FREQ:SPAN 1000000 or :FREQ:SPAN 1MHz Query returns 1000000
Description	<Value>The value must be in the following list 40MHz 20MHz 10MHz 5MHz 2MHz 1MHz 500kHz 200kHz 100kHz 50kHz 20kHz 10kHz
Default value	10MHz

(7) [:SENSe]:BAND

[:SENSe]:BAND	
Command format	[:SENSe]:BAND<Value> [:SENSe]:BAND?
Function description	Set the resolution bandwidth in units: GHz, MHz, KHz, Hz; the default unit is Hz, for example: :BAND:RES 1000 or :BAND:RES 1KHz Query returns 1000
Description	<Value>The value must be in the following list 400kHz 200kHz 100kHz 50kHz 25kHz 12.5kHz 6.25kHz

	3.125kHz 2.5kHz 1.25kHz 625Hz 500Hz 250Hz 125Hz
Default value	100kHz

(8) [:SENSe]:POWer:RF:ATTenuation

[:SENSe]:POWer:RF:ATTenuation	
Command format	[:SENSe]:POWer[:RF]:ATTenuation <value> [:SENSe]:POWer[:RF]:ATTenuation?
Function description	Set up the RF attenuator. For example: :POW:ATT 10.0 or :POW:ATT 10.0dB query Return 10.0
Description	<value>>range 0~30dB
Default value	0dB

(9) [:SENSe]:POWer:IF:ATTenuation

[:SENSe]:POWer:IF:ATTenuation	
Command format	[:SENSe]:POWer:IF:ATTenuation <value> [:SENSe]:POWer:IF:ATTenuation?
Function description	Set the mid-range attenuator. For example: POW:IF:ATT 10.0 Return 0
Description	<value>range 0,10,20,30dB
Default value	0

(10) [:SENSe]:DEModulation

[:SENSe]:DEModulation	
Command format	[:SENSe]:DEModulation <Value> :DEModulation?
Function description	Set the mediation type as: :DEModulation FM;

	query instructions; :DEModulation? Return to FM
Description	<Value> value must be in the following list AM: amplitude modulation FM: frequency modulation CW: continuous wave

(11) **[[:SENSE]:DEModulation:FREQuency**

[[:SENSE]:DEModulation:FREQuency	
Command format	[[:SENSE]:DEModulation:FREQuency <Value> [[:SENSE]:DEModulation:FREQuency?
Function description	Set the demodulation center frequency, such as :DEM:FREQ 89.56MHz The query returns 89560000
Description	<Value>value is used in combination with the receiver operating frequency and IF analysis bandwidth.
Default value	89.56MHz

(12) **[[:SENSE]:DEModulation:BAND**

[[:SENSE]:DEModulation:BAND	
Command format	[[:SENSE]:DEModulation:BAND <Value> [[:SENSE]:DEModulation:BAND?
Function description	Set the demodulation bandwidth, demodulation bandwidth ≤ IF analysis bandwidth
Description	<Value>value must be in the following list 40MHz 20MHz 10MHz 5MHz 2MHz 1MHz 500kHz 300kHz 200kHz 150kHz 120kHz 50kHz 30kHz 15kHz

	9kHz 6kHz 2.4kHz 1.5kHz
Default value	200kHz

(13) [:SENSe]:DEModulation:FSTReNgtH:TYPE

[:SENSe]:DEModulation:FSTReNgtH:TYPE	
Command format	[:SENSe]:DEModulation:FSTReNgtH:TYPE <Value> [:SENSe]:DEModulation:FSTReNgtH:TYPE?
Function description	Set the field strength measurement detection type, :DEM:FSTR PEAK Query returns PEAK
Description	<Value> types include: PEAK peak AVG average SAMPle sampling RMS valid
Default value	PEAK

(14) [:SENSe]:DEModulation:FSTReNgtH:STATe

[:SENSe]:DEModulation:FSTReNgtH:STATe	
Command format	[:SENSe]:DEModulation:FSTReNgtH:STATE ON OFF ON 0 1 [:SENSe]:DEModulation:FSTReNgtH:STATE?
Function description	Set the field strength measurement switch state, the default is off, for example: :DEM:FSTR:STATE OFF Query returns
Description	ON 1 on OFF 0 off
Default value	OFF

(15) [:SENSe]:DEModulation:FSTReNgtH:DATA?

[:SENSe]:DEModulation:FSTReNgtH:DATA?	
Command format	[:SENSe]:DEModulation:FSTReNgtH:DATA?
Function description	:DEModulation:FSTReNgtH:DATA?;

	Return -29.58
Description	
Default value	

(16) [:SENSe]:DEModulation:GAIN:TYPE

[:SENSe]:DEModulation:GAIN:TYPE	
Command format	[:SENSe]:DEModulation:GAIN:TYPE <Value> [:SENSe]:DEModulation:GAIN:TYPE?
Function description	Set gain mode :dem:gain:type MGC; Return to MGC
Description	<Value> types include: MGC: Manual gain control AGC: automatic gain control
Default value	MGC

(17) [:SENSe]:DEModulation:GAIN:MGC:MODE

[:SENSe]:DEModulation:GAIN:MGC:MODE	
Command format	[:SENSe]:DEModulation:GAIN:MGC:MODE <Value> [:SENSe]:DEModulation:GAIN:MGC:MODE?
Function description	Set MGC mode Such as :dem:gain:mgc:mode LNOISE; Return: LNOISE
Description	<Value> types include: LNOISE: low noise NORMAl: normal mode LD: low distortion mode
Default value	NORMAl

(18) [:SENSe]:DEModulation:GAIN:AGC:FACTor

[:SENSe]:DEModulation:GAIN:AGC:FACTor	
Command format	[:SENSe]:DEModulation:GAIN:AGC:FACTor <Value> [:SENSe]:DEModulation:GAIN:AGC:FACTor?
Function description	Set AGC coefficient factor: :dem:gain:agc:fact fast; return FAST;
Description	<Value> types include:

	FAST: fast NORMAL:Normal SLOW: slow
Default value	SLOW

(19) [:SENSE]:DEModulation:IQData:DEPTH

[:SENSE]:DEModulation:IQData:DEPTH	
Command format	[:SENSE]:DEModulation:IQData:DEPTH <Value> : [:SENSE]:DEModulation:IQData:DEPTH?
Function description	Set IQ data depth :dem:IQDA:dep 8192; return 8192;
Description	<Value>return 1~4294967295
Default value	8192

(20) [:SENSE]:DEModulation:IQData:COLLECT

[:SENSE]:DEModulation:IQData:COLLECT	
Command format	[:SENSE]:DEModulation:IQData:COLLECT
Function description	IQ data collection starts
Description	
Default value	

(21) [:SENSE]:DEModulation:IQData:END

[:SENSE]:DEModulation:IQData:END	
Command format	[:SENSE]:DEModulation:IQData:END
Function description	IQ data collection stopped
Description	
Default value	

(22) [:SENSE]:DEModulation:IQData:DATA?

[:SENSE]:DEModulation:IQData:DATA?	
Command format	[:SENSE]:DEModulation:IQData:DATA?
Function description	IQ data reading
Description	

Default value	
---------------	--

(23) [:SENSe]:TEAM:MODE

[:SENSe]:TEAM:MODE	
Command format	[:SENSe]:TEAM:MODE <Value> [:SENSe]:TEAM:MODE?
Function description	Set the single/dual machine working mode, Value is SINGLE DOUBLE :TEAM:MODE?; return SINGLE;
Description	SINGLE stand-alone work DOUBLE dual-machine work
Default value	Stand-alone working mode

(24) [:SENSe]:SWEep:STEP:MODE

[:SENSe]:SWEep:STEP:MODE	
Command format	[:SENSe]:SWEep:STEP:MODE<int> [:SENSe]:SWEep:STEP:MODE?
Function description	Set sweep mode CONTINUOUS: continuous sweep SINGLE: Single sweep The default value is CONTINUOUS
Description	
Default value	CONTINUOUS

(25) [:SENSe]:SWEep:NEXT

[:SENSe]:SWEep:NEXT	
Command format	[:SENSe]:SWEep:NEXT
Function description	Perform a scan
Description	
Default value	

(26) [:SENSe]:Scan:SWEep:Mode

[:SENSe]:Scan:SWEep:Mode	
---------------------------------	--

Command format	: [SENSE]:Scan:SWEEP:Mode <value>,<int> : [SENSE]:Scan:SWEEP:Mode?
Function description	Set scan speed <value>: FAST NORMAL SLOW <int> If <value>FAST , set the range [1ms,10ms] If <value>NORMAL , set the range [10ms,40ms] If <value>SLOW , set the range [40ms,80ms] For example: : Scan:SWEEP:Mode FAST,10ms
Description	
Default value	NORMAL,40ms

(27) `:[SENSE]:DEModulation:DIGItal:TYPE`

<code>:[SENSE]:DEModulation:DIGItal:TYPE</code>	
Command format	: [SENSE]:DEModulation:DIGItal:TYPE <value> : [SENSE]:DEModulation:DIGItal:TYPE?
Function description	Set the digital demodulation type, such as: : DEM:DIGI:TYPE QPSK; The query returns QPSK
Description	<value> types include: 2ASK 2FSK BPSK QPSK 8PSK GMSK QAM16 QAM64
Default value	None

(28) [:SENSE]:DEModulation:DIGItal:SYMBol:RATE

[:SENSE]:DEModulation:DIGItal:SYMBol:RATE	
Command format	:[:SENSE]:DEModulation:DIGItal:SYMBol:RATE <value> [:[:SENSE]:DEModulation:DIGItal:SYMBol:RATE?
Function description	Set the modulation rate, such as: :DEM:DIGI:SYMB:RATE 1000000
Description	
Default value	None

(29) [:SENSE]:DEModulation:AUDIo:DATA:START

[:SENSE]:DEModulation:AUDIo:DATA:START	
Command format	:[:SENSE]:DEModulation:AUDIo:DATA:START
Function description	Start demodulating audio data
Description	
Default value	None

(30) [:SENSE]:DEModulation:AUDIo:DATA:STOP

[:SENSE]:DEModulation:AUDIo:DATA:STOP	
Command format	:[:SENSE]:DEModulation:AUDIo:DATA:STOP
Function description	Stop demodulating audio data
Description	
Default value	None

2.5 SYSTEM command**(1) :SYSTem:AUDio:VOLume**

:SYSTem:AUDio:VOLume	
Command format	:SYSTem:AUDio:VOLume <Value> :SYSTem:AUDio:VOLume?
Function description	Set the audio demodulation volume, such as :SYST:AUD:VOL 60 query returns 60
Description	<Value>value range0~255

Default value	50
---------------	----

(2) :SYSTem:COMMunicate:LAN:ADDRess

:SYSTem:COMMunicate:LAN:ADDRess	
Command format	:SYSTem:COMMunicate:LAN:ADDRess <ip> :SYSTem:COMMunicate:LAN:ADDRess?
Function description	Set the machine's IP address. For example :SYST:COMM:LAN:ADDR 192.168.1.10 The query returns 192.168.1.10
Description	<ip>IP address to be set

(3) :SYSTem:COMMunicate:LAN:SMASK

:SYSTem:COMMunicate:LAN:SMASK	
Command format	:SYSTem:COMMunicate:LAN:SMASK <mask> :SYSTem:COMMunicate:LAN:SMASK?
Function description	Set the subnet mask address of the machine, for example :SYST:COMM:LAN:SMASK 255.255.255.0 The query returns 255.255.255.0
Description	

(4) :SYSTem:COMMunicate:LAN:DGATeway

:SYSTem:COMMunicate:LAN:DGATeway	
Command format	:SYSTem:COMMunicate:LAN:DGATeway <gate> :SYSTem:COMMunicate:LAN:DGATeway?
Function description	Set the gateway address of the machine, for example :SYST:COMM:LAN:DGAT 192.168.1.1 The query returns 192.168.1.1
Description	

(5) :SYSTem:COMMunicate:LAN:PORT

:SYSTem:COMMunicate:LAN:PORT	
Command format	:SYSTem:COMMunicate:LAN:PORT <port> :SYSTem:COMMunicate:LAN:PORT?

Function description	Set the port of the machine, for example :SYSTEM:COMMunicate:LAN:PORT5555 The query returns 5555
Description	

2.6 UDP command

(1) :UDP:REMOte:IP

:UDP:REMOte:IP	
Command format	:UDP:REMOte:IP<ip> :UDP:REMOte:IP?
Function description	Set UDP remote IP, such as :UDP:REMOte:IP 192.168.1.17 The query returns 192.168.1.173
Description	<ip>IP address to be set
Default value	

(2) :UDP:REMOte:PORT

:UDP:REMOte:PORT	
Command format	:UDP:REMOte:PORT <Port> :UDP:REMOte:PORT?
Function description	Set the UDP remote port, such as :UDP:REMOte:PORT 5555 The query returns 5555
Description	<Port>> 1024

(3) :UDP:SERVice:STARt

:UDP:SERVice:STARt	
Command format	:UDP:SERVice:STARt
Function description	Start IQ data collection
Description	

(4) **:UDP:SERVice:STOP**

:UDP:SERVice:STOP	
Command format	:UDP:SERVice:STOP
Function description	Turn off IQ data collection
Description	

(5) **:UDP:REMote:IQ:NUMBers**

:UDP:REMote:IQ:NUMBers	
Command format	:UDP:REMote:IQ:NUMBers <Numbers>
Function description	Set the IQ collection data transmission length, such as: UDP:REMote:IQ:NUMBers 8192 IQ stops transmitting data after collecting 1 frame of 32kb data.
Description	

3 Example of instruction usage process

3.1 SWEEP

When frequency/segment scanning, you need to set three parameters: start frequency, end frequency and frequency step. The scan results are calculated based on the above three parameters, and the calculation formula is:

$$\text{Points} = (\text{Stop} - \text{Start}) / \text{Step} + 1$$

Points: Scan result points

Stop: Stop frequency

Start: starting frequency

Step: frequency step

For example:

Start = 50MHz, Stop = 150MHz, Step = 1MHz, the number of scan result points returned is 101

The returned frame hexadecimal is: 23 33 31 30 31 DH DL...DH DL D0 07

Return data format:

Starter	Length identification	Length 1	...	Length n	Data 1	...	Terminator
---------	-----------------------	----------	-----	----------	--------	-----	------------

Starting character: #, one byte

Length: BCD code representation, variable length bytes, such as length 101, occupying 3 bytes, value range: 1~9 length 1... length n: actual frequency point data length

Data: Each data occupies two bytes. By default, the high bit is first and the low bit is last. After conversion, divide by 10 to get the engineering value.

Terminator: 0xD0 0x07, occupies 2 bytes

After the frequency scan mode is successfully triggered, the device will automatically return the scan data in a loop. The triggering process is as follows:

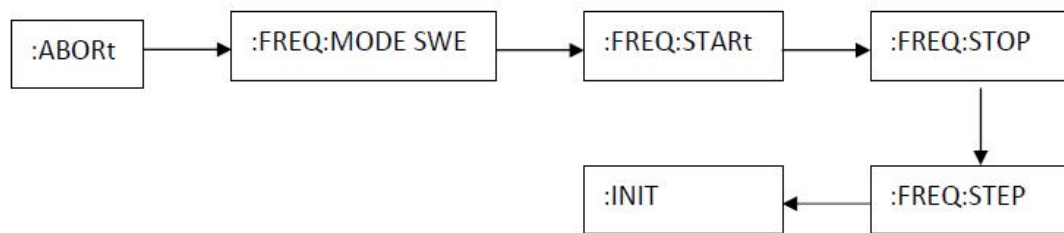


Figure 3-1 SWEEP instruction flow chart

3.2 IFSPAN

The data format is the same as SWEEP

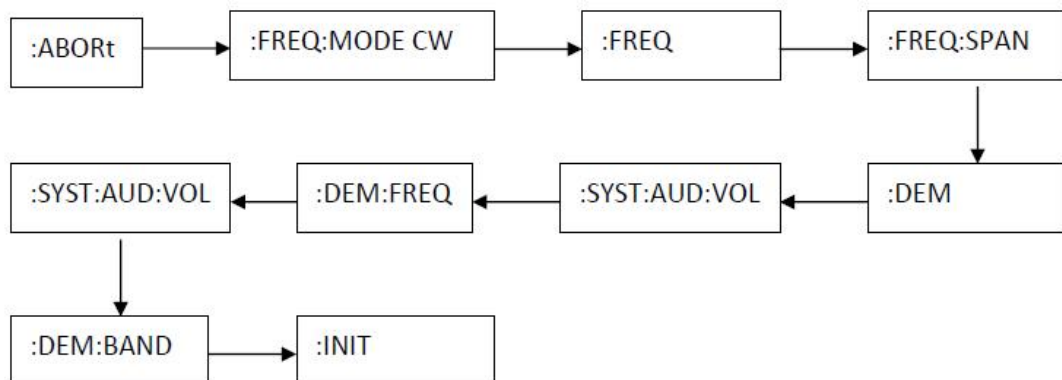
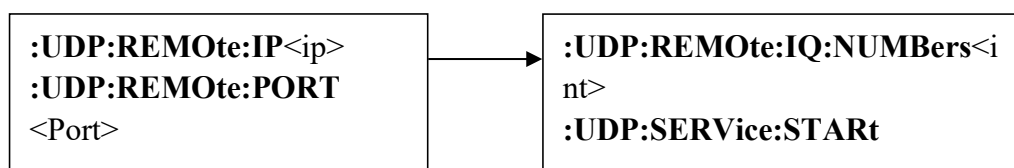


Figure 3-2 IFSPAN instruction flow chart

3.3 IQ data

IQ data acquisition process



4 Programming examples

This article gives an example of a demo routine produced using the SDK to communicate through a LAN interface instrument. Run program

● Run demo program

名称	修改日期	类型	大小
audio	2022/6/2 11:30	文件夹	
audioData	2022/6/2 11:30	文件夹	
bearer	2022/6/2 11:30	文件夹	
iconengines	2022/6/2 11:30	文件夹	
imageformats	2022/6/2 11:30	文件夹	
iqData	2022/3/8 9:20	文件夹	
log	2022/6/2 11:30	文件夹	
mediaservice	2022/6/2 11:30	文件夹	
platforms	2022/6/2 11:30	文件夹	
playlistformats	2022/6/2 11:30	文件夹	
styles	2022/6/2 11:30	文件夹	
translations	2022/6/2 11:30	文件夹	
D3Dcompiler_47.dll	2014/3/11 18:54	应用程序扩展	3,386 KB
libEGL.dll	2020/11/6 13:30	应用程序扩展	23 KB
libGLSLv2.dll	2020/11/6 13:30	应用程序扩展	2,869 KB
libmrm280.dll	2022/5/18 11:15	应用程序扩展	218 KB
MRM280Example.exe	2022/5/18 11:15	应用程序	301 KB
opengl32sw.dll	2016/6/14 21:08	应用程序扩展	15,621 KB
Qt5Core.dll	2020/11/6 13:29	应用程序扩展	5,256 KB
Qt5Gui.dll	2020/11/6 13:29	应用程序扩展	5,756 KB
Qt5Multimedia.dll	2020/11/6 17:09	应用程序扩展	580 KB
Qt5Network.dll	2020/11/6 13:29	应用程序扩展	1,027 KB
Qt5Svg.dll	2020/11/6 16:23	应用程序扩展	258 KB
Qt5Widgets.dll	2020/11/6 13:30	应用程序扩展	4,355 KB
vc_redist.x86.exe	2021/5/31 22:27	应用程序	13,459 KB

Figure 4-1 Run demo program

● Connect



Figure 4- 2 Connection

- Send command



Figure 4-3 Send command

- Test IF data



Figure 4-4 Test IF data

5 Appendix

Appendix 1 Status Byte Register

Status Byte Register(STB)

Table 5- 1 Status Byte Register

Bit	Name	Description
0	Not used(NU)	0
1	Not used(NU)	0
2	Error events (EAV)	1 The error event queue is not empty. You can read the error information or clear the error event queue by sending the :SYST:ERR? command; 0 no error message
3	Not used(NU)	0
4	Output queue messages (MAV)	1 There is a message in the output queue 0 There are no messages in the output queue
5	Standard Event State (ESB)	1 One/more standard events occur 0 No standard status event occurred
6	Not used(NU)	0

7	Operating status	1 One/multiple operational events occur 0 No operating status event occurred
---	------------------	---

Appendix 2 Standard event enable register

Standard Event Status Enable Register(ESE)

Table 5- 2 Standard event enable register

Bit	Name	Description
0	Operation Completed (OPC)	1 Enable ESR Bit0 0 Disables ESR Bit0
1	Request Control (RQC)	1 Enable ESR Bit1 0 Disables ESR Bit1
2	Query error (QUE)	1 Enable ESR Bit2 0 Disables ESR Bit2
3	Device Error (DDE)	1 Enable ESR Bit3 0 Disables ESR Bit3
4	Execution error(E)	1 Enable ESR Bit4 0 Disables ESR Bit4
5	Command error (CME)	1 Enable ESR Bit5 0 Disables ESR Bit5
6	Not used (NU)	0
7	Power supply (PON)	1 Enable ESR Bit7 0 Disables ESR Bit7

Appendix 3 Standard Event Status Register (ESR)

Standard Event Status Register(ESR)

Table 5- 3 Standard event status register

Bit	Name	Description
0	Operation Completed (OPC)	1 operation completed 0 operation not completed
1	Request Control (RQC)	1 is in controlled mode 0 is in local control mode
2	Query error (QUE)	1 The output queue is abnormal or lost 0 no errors reported
3	Device Error (DDE)	1 There is a fault in the equipment self-test 0 The device is normal

4	Execution error(E)	1 Command data overflow error 0 command data is normal
5	Command error (CME)	1 Wrong command or unsupported command 0 normal command
6	Not used (NU)	0
7	Power supply (PON)	1 Power on 0 Power off

Appendix 4 Operation Status Register (OSR)

Table 5- 4 Operation status register

Bit	Name	Description
0	The instrument is being calibrated	1 being calibrated 0 not being calibrated
1	The instrument is waiting for signal connection	1 waiting for signal connection 0 not waiting for signal connection
2	The instrument is switching range	1 switching 0 not switching
3	The instrument is scanning	1 scanning 0 not scanning
4	The instrument is measuring	1 measuring 0 not measuring
5	The instrument is waiting for trigger status	1 waiting for trigger status 0 not waiting for trigger status
6	The instrument is waiting for ARM status	1 waiting for ARM status 0 not waiting for ARM status
7	The instrument is being calibrated	1 being calibrated 0 not being calibrated
8	Not used	0
9	Not used	0
10	Not used	0
11	Not used	0
12	Not used	0
13	One of the multi-logic instruments is reporting operating status	1 reporting error status 0 not reporting error status

14	User program is currently running	1 running 0 not running
15	Not used	0

Appendix 5 Example of using IF analysis instructions

```
:abort; //Stop all current measurements
:freq:mode fixed; //Set working mode, IF analysis
:freq 93.500000 MHz; //Set center frequency
:freq:span 10 MHz; //Set IF bandwidth
:dem FM; //Set demodulation mode
:syst:aud:vol 50; //Set the volume
:dem:freq 93.500000 MHz; //Set demodulation frequency
:dem:band 200 kHz; //Set demodulation bandwidth
:dem:fstr:type PEAK; //Set the field strength measurement detection
type
:dem:fstr:state 1; //Set field strength measurement switch
:init; //Execute
:DEModulation:FSTR:DATA?; //Query the field strength and return
the field strength value
```

Appendix 6 Example of using frequency sweep command

```
:abort; //Stop all current measurements
:freq:mode swe; //Set working mode, sweep frequency
:swe:step:mode continuous; //Set mode
:freq:start 50.000000 MHz; //Set the start frequency
:freq:stop 150.000000 MHz; //Set the stop frequency
:freq:step 100 kHz; //Set frequency sweep step size
:init; //Execution parameters
```

Appendix 7 IQ data acquisition instruction usage example

```
:udp:remote:ip 192.168.1.175; //Set udp address and port
:udp:remote:port 8333;
:UDP:REMOte:IQ:NUMBers 8192; //Set the IQ data length to 8192 as one frame
32kByte size
:udp:service:start; //Enable udp transmission
:udp:service:stop; //Close UDP transmission. After the data transmission is
completed, the user decides when to close it.
```

Note: The sub-command set is only a separate command operation for extracting IQ data. In actual applications, it should be used in combination with the command set of IF analysis, for example:

```
:abort;
:freq:mode fixed;
:freq 93.500000 MHz;
:freq:span 10 MHz;
:dem FM;
:syst:aud:vol 50;
:dem:freq 93.500000 MHz;
:dem:band 200 kHz;
:dem:fstr:type PEAK;
:dem:fstr:state 1;
:init;
:udp:remote:ip 192.168.1.175;
:udp:remote:port 8333;
:UDP:REMOte:IQ:NUMBers 8192;
:udp:service:start;
```

Appendix 8 Digital demodulation instruction usage example, under development

```
:freq:mode fixed;
:freq 100.0 MHz;
:freq:span 10 MHz;
:dem am;
:dem:freq 100.0 MHz;
:dem:band 5 MHz;
:init;
:abort;
:DEModulation:DIGItal:TYPE qpsk;
:DEModulation:DIGItal:SYMBOL:RATE 1000000;
:udp:remote:ip 127.0.0.1;
:udp:remote:port 8333;
:UDP:REMOte:IQ:NUMBers 81920;
:udp:service:start;
//Result
EVM RMS: 3.683%; EVM Peek: 7.352%, @230.00Sym
```

Appendix 9 Demodulated audio data

```
:freq:mode fixed;
:freq 87.6 MHz;
:freq:span 5 MHz;
```

```

:dem FM;
:dem:freq 87.6 MHz;
:dem:band 200 kHz;
:SYSTem:AUDio:VOLume 120;
:init;
:abort;
:DEModulation:AUDIo:DATA:START;
//To start demodulating audio data, to end demodulation, just change START to
STOP, save the audio file, and click "Save to file" in the network debugging tool.

```

Appendix 10 Frequency Sweep

The receiver sweep frequency and IF data are transmitted through TCP. Each frame of data consists of data header + frame data length + delimiter + data + data tail. Shown: Data header "#" (one byte) + frame data length number of digits (1 byte) + frame data length + data + data tail (0xd0 0x07).

The following data is an example:

1. 0x23(#) is the header (1 byte)
2. 0x34 is the header (1 byte), the number of digits in the frame data length. Expressed in ASCII and converted to decimal

$$0x34 - 0x30 = 4,$$

Note that the "frame length bit" is 4 bits.

3. The next 4 digits are the frame length, which is also expressed in ASCII as 0x31, 0x36, 0x30, 0x31 and converted into decimal length.

$$(0x31 - 0x30) * 1000 + (0x36 - 0x30) * 100 + (0x30 - 0x30) * 10 + (0x31 - 0x30) = 1601$$

4. Next is the data, two bytes representing an amplitude value.

Take the last set of data, as shown in Figure 5f 84

For example, the highest bit of 0x845f, 1, represents a negative number.

0x845f is parsed as -1119, and then divided by 10; it is -111.9dbm

Note: The overall data is enlarged 10 times for transmission, so the overall data is reduced 10 times when using the data. (The highest bit represents the sign bit: 1 represents a negative number, 0 represents a positive number) Example of one frame of data (displayed in hexadecimal):

2334 31 36 30 31 77 84 7e 84 52 84 76 84 bb 84 6c 84 7c 84 58 84 55 84 8a 84 15 85 49 84 1c 84 58
84 8b 84 54 84 54 84 6c 84 8a 84 61 84 4d 84 7c 84 b1 84 fb 84 65 84 5b 84 b3 84 8b 84 55 84 5f 84
65 84 67 84 5d 84 82 84 a6 84 89 84 c7 84 5e 84 3a 84 11 84 13 84 42 84 6c 84 77 84 b5 84 ba 84 47
84 26 84 43 84 59 84 60 84 34 84 3a 84 54 84 36 84 23 84 49 84 a2 84 93 84 7b 84 eb 84 3e 85 6b 84
43 84 8e 84 32 84 8a 84 a1 84 49 84 4d 84 86 84 80 84 12 84 0f 84 2a 84 42 84 8c 84 93 84 4b 84 1a
84 27 84 5a 84 61 84 52 84 5b 84 67 84 27 84 17 84 3f 84 4e 84 44 84 53 84 77 84 c1 84 b1 84 77 84
31 84 41 84 8a 84 47 84 4f 84 86 84 9d 84 51 84 3d 84 57 84 45 84 64 84 be 84 9d 84 2f 84 4a 84 8e
84 6f 84 5f 84 38 84 47 84 7a 84 49 84 8d 84 37 84 11 84 29 84 81 84 8b 84 96 84 4f 84 95 84 5b 84
48 84 5f 84 68 84 59 84 47 84 4f 84 59 84 a5 84 a5 84 63 84 40 84 52 84 28 85 c9 84 55 84 55 84 be
84 cc 84 da 84 60 84 31 84 37 84 53 84 22 84 17 84 2b 84 62 84 8e 84 53 84 63 84 72 84 3e 84 3d 84
69 84 43 84 bd 84 5e 84 72 84 69 84 33 84 86 84 a6 84 6e 84 76 84 e4 84 ba 84 b3 84 20 85 65 84 44
84 30 84 1c 84 14 84 0f 84 35 84 66 84 31 84 3d 84 81 84 ae 84 f3 84 9c 84 75 84 85 84 61 84 3b 84
31 84 41 84 55 84 65 84 aa 84 9f 84 90 84 6b 84 5f 84 4d 84 4a 84 65 84 5d 84 55 84 43 84 7a 84 87
84 4f 84 79 84 68 84 54 84 5f 84 5f 84 93 84 5b 84 3e 84 56 84 2d 84 1d 84 3b 84 6b 84 4f 84 97 84 55
84 53 84 58 84 02 85 62 84 51 84 ba 84 65 84 3f 84 31 84 33 84 45 84 52 84 06 84 06 84 27 84 36 84
57 84 b2 84 73 84 54 84 21 84 1c 84 4c 84 5d 84 67 84 86 85 47 84 22 84 29 84 72 84 78 84 65 84 61
84 67 84 90 84 a9 84 91 84 59 84 58 84 80 84 6d 84 7b 84 4b 84 5a 84 d5 84 43 85 35 84 0a 84 37 84
ab 84 42 84 4d 84 d2 84 2f 84 2d 84 60 84 78 84 c0 84 7f 84 84 84 03 85 58 84 74 84 a8 84 8e 84 dc
84 71 84 30 84 23 84 50 84 75 84 a2 84 40 85 7f 84 58 84 5f 84 6c 84 65 84 3e 84 58 84 6f 84 35 84
38 84 94 84 6c 84 2e 84 23 84 6a 84 81 84 63 84 74 84 e1 84 77 84 8f 84 62 84 2a 84 3a 84 ac 84 55
84 5c 84 74 84 49 84 3f 84 85 84 5d 84 40 84 45 84 62 84 59 84 40 84 4b 84 5a 84 35 84 31 84 50 84
67 84 59 84 4e 84 78 84 a3 84 56 84 58 84 58 84 7c 84 66 84 4e 84 40 84 4a 84 dd 84 74 84 97 84 83
84 32 84 20 84 20 84 43 84 cb 84 00 85 47 84 31 84 7e 84 a1 84 72 84 7e 84 4c 84 4b 84 a5 84 3b 84
40 84 8c 84 28 84 27 84 65 84 7e 84 72 84 46 84 4f 84 b8 84 4f 84 4c 84 bb 84 5a 84 4b 84 7c 84 7d
84 91 84 7c 84 66 84 75 84 3e 84 0c 84 10 84 35 84 73 84 75 85 03 85 39 84 f4 83 e2 83 0e 84 69 84
94 84 65 84 50 84 98 84 93 84 83 84 79 84 3f 84 18 84 1c 84 43 84 71 84 7b 84 3e 84 4a 84 89 84 24
84 17 84 26 84 51 84 b6 84 af 84 46 85 54 84 3d 84 82 84 66 84 61 84 72 84 71 84 9b 84 64 84 44 84
6b 84 a0 84 4b 84 41 84 7e 84 80 84 70 84 63 84 57 84 34 84 4b 84 44 84 41 84 8a 84 5d 84 23 84 0b
84 3c 84 41 84 1a 84 2c 84 2c 84 0a 84 2b 84 82 84 25 84 65 84 5c 84 82 84 c8 84 8e 84 64 84 7a 84
50 84 3e 84 4a 84 45 84 4a 84 48 84 67 84 57 84 74 84 b1 84 7b 84 65 84 7a 84 6e 84 4f 84 37 84 4a
84 8d 84 8f 84 4e 84 4a 84 36 84 2d 84 41 84 41 84 41 84 66 84 63 84 af 84 66 84 43 84 42 84 44 84
46 84 7d 84 3a 84 42 84 c1 84 8e 84 44 84 1d 84 2f 84 65 84 a1 84 bd 84 91 84 b5 84 5d 84 57 84 25
84 0c 84 11 84 29 84 36 84 89 84 59 84 1a 84 1e 84 58 84 f7 84 4b 84 45 84 30 84 47 84 aa 84 81 84
d8 84 a0 84 4b 84 35 84 4e 84 5e 84 37 84 42 84 55 84 28 84 32 84 80 84 3e 84 48 84 a3 84 33 84 41
84 81 84 3a 85 6e 84 2f 84 2e 84 31 84 4a 84 a5 84 6a 84 6b 84 78 84 65 84 79 84 c5 84 6b 84 3f 84 93
84 ca 84 64 84 4f 84 86 84 88 84 bc 84 28 84 1a 84 31 84 44 84 8e 84 55 84 5a 84 6a 84 69 84 7d 84
8c 84 47 84 58 84 50 84 32 84 4b 84 6c 84 9f 84 5a 84 55 84 34 84 12 84 15 84 58 84 72 84 66 84 7a
84 7f 84 70 84 78 84 97 84 b8 84 42 84 19 84 2c 84 3e 84 8c 84 92 84 1b 85 76 84 68 84 4c 84 59 84
6f 84 56 85 c7 84 7d 84 69 84 a9 84 7e 84 67 84 b2 84 73 84 67 84 45 84 52 84 c1 84 40 84 4b 84 68
84 5e 84 43 84 5f 84 5e 84 4e 84 2b 84 13 84 3b 84 77 84 81 84 c1 84 89 84 39 84 40 84 78 84 2f 84
31 84 66 84 3d 84 47 84 61 84 6a 84 2c 85 6c 84 81 84 89 84 97 84 4e 84 23 84 24 84 79 84 fb 84 cf
84 51 84 31 84 56 84 80 84 80 84 92 84 60 84 39 84 47 84 5d 84 53 84 58 84 43 84 2f 84 35 84 57 84
b7 84 7a 84 67 84 5e 84 d9 84 78 84 22 84 02 84 02 84 49 84 47 84 58 84 46 84 23 84 5c 84 59 84 44
84 37 84 31 84 33 84 4c 84 36 84 1b 84 43 84 2e 85 63 84 55 84 78 84 72 84 4b 84 23 84 15 84 54 84

d2 84 83 84 a9 84 4f 84 3f 84 33 84 33 84 4e 84 52 84 1b 84 0c 84 16 84 63 84 48 84 06 84 ff 83 1f 84
 49 84 d4 84 ba 84 43 84 4e 84 3d 84 35 84 5b 84 44 84 6a 84 09 85 40 84 0f 84 1c 84 45 84 79 84 69
 84 2a 84 18 84 23 84 30 84 2f 84 44 84 95 84 1f 84 35 84 65 85 7a 84 93 84 f4 84 5e 84 25 84 3b 84 cc
 84 5f 84 3d 84 68 84 7e 84 76 84 9f 84 22 84 14 84 1a 84 17 84 36 84 68 84 b2 84 56 84 30 84 29 84
 61 84 d2 84 87 84 74 84 34 84 38 84 b9 84 4d 84 b9 84 4a 84 9e 84 2e 84 f3 83 06 84 5d 84 a2 84 47
 84 30 84 66 84 7e 84 bd 84 23 84 2b 84 8f 84 fb 84 54 84 4a 84 65 84 64 84 83 84 66 84 28 84 16 84
 41 84 8b 84 50 84 2a 84 29 84 33 84 62 84 d5 84 ae 84 63 84 51 84 53 84 49 84 8d 84 37 84 22 84 24
 84 67 84 78 84 86 84 ab 84 c0 84 ab 84 a8 84 58 84 0e 84 03 84 1b 84 64 84 5e 84 3d 84 3c 84 51 84
 73 84 77 84 3b 84 11 84 28 84 71 84 56 84 55 84 31 84 38 84 73 84 49 84 3d 84 41 84 4b 84 23 84 1c
 84 65 84 75 84 15 84 fd 83 fc 83 19 84 bc 84 36 84 36 84 b7 84 dc 84 ab 84 75 84 50 84 53 84 47 84
 45 84 74 84 6e 84 45 84 5c 84 a8 84 ed 84 71 84 f8 84 8c 84 95 84 64 84 82 84 4e 84 34 84 3c 84 64
 84 46 84 4b 84 cb 84 4e 84 47 84 55 84 63 84 62 84 4d 84 5e 84 4f 84 60 84 8f 84 b0 84 35 84 41 84
 7e 84 8b 84 61 84 5f 84 59 84 34 84 50 84 9c 84 90 84 97 84 35 84 09 84 10 84 50 84 c9 84 54 85 b3
 84 83 84 47 85 39 84 05 84 09 84 37 84 2d 84 0c 84 2d 84 76 84 6d 84 a7 84 46 84 56 84 55 84 2f 84
 3f 84 70 84 64 84 87 84 69 84 7d 84 71 84 41 84 d1 84 41 84 42 84 e0 84 5d 84 44 84 49 84 9f 84 f4
 84 c2 84 5b 84 66 84 4c 84 63 84 6a 84 a7 84 a6 84 8e 84 ac 84 52 84 2b 84 48 84 9b 84 63 84 66 84
 86 84 bf 84 a5 84 85 84 9e 84 31 84 fb 83 fe 83 32 84 98 84 23 84 3a 84 99 84 49 84 8a 84 40 84 11 84
 2f 84 77 84 71 84 45 84 31 84 3c 84 a3 84 af 84 6f 84 50 84 4e 84 81 84 5f 84 5c 84 63 84 43 84 03 84
 fa 83 3a 84 e3 84 a9 84 56 84 23 84 2b 84 89 84 7a 84 8a 84 80 84 52 84 b6 84 93 84 19 85 75 84 4f
 84 49 84 5f 84 71 84 6f 84 a8 84 eb 84 ac 84 8e 84 42 84 6c 84 59 84 3a 84 30 84 20 84 3c 84 c2 84 73
 84 31 84 21 84 27 84 1a 84 29 84 46 84 63 84 56 84 46 84 39 84 39 84 44 84 2f 84 34 84 78 84 9d 84
 41 84 35 84 73 84 68 84 20 84 43 84 62 84 36 84 85 84 cc 84 5a 84 30 84 51 84 5f 84 e6 84 96 84 e4
 84 57 84 26 84 34 84 4f 84 6f 84 8a 84 85 84 5b 84 74 84 79 84 83 84 4c 84 3b 84 26 84 00 84 02 84
 3c 84 4d 84 3a 84 95 84 a7 84 60 84 31 84 63 84 c0 84 a3 84 52 84 26 84 7a 84 64 84 6b 84 b2 84 5b
 84 50 84 28 84 25 84 30 84 50 84 50 84 4b 84 34 84 01 84 31 84 ab 84 82 84 91 85 63 84 81 84 90 84
 7c 84 71 84 4e 84 22 84 3b 84 9a 84 2f 84 16 84 3a 84 66 84 91 84 af 84 fd 84 59 84 76 84 a3 84 86 84
 85 84 94 84 91 84 57 84 8b 84 4b 84 f6 83 fe 83 45 84 ab 84 a9 84 84 84 50 84 35 84 55 84 b9 84 6a
 84 47 84 b2 84 c0 84 80 84 39 84 38 84 1a 84 15 84 2c 84 2c 84 30 84 45 84 8c 84 ef 84 f0 84 75 84
 34 84 44 84 7d 84 95 84 8c 84 72 84 3c 84 40 84 4c 84 7c 84 95 84 a2 84 b6 84 91 84 b5 84 9f 84 97
 84 56 84 84 84 a3 84 63 84 52 84 79 84 c0 84 54 84 24 84 29 84 38 84 41 84 42 84 62 84 9a 84 8d 84
 7e 84 82 84 75 84 4b 84 54 84 66 84 9a 84 30 84 20 84 34 84 40 84 1d 84 44 84 6a 84 40 84 54 84 3a
 84 24 84 28 84 27 84 1a 84 10 84 0d 84 28 84 6e 84 f9 84 7c 84 5b 84 8a 84 94 84 8a 84 53 84 72 84
 58 84 17 84 2e 84 45 84 4f 84 ce 84 21 84 18 84 1e 84 06 84 fa 83 28 84 4e 84 39 84 d7 84 3a 84 61 84
 4d 84 3b 84 69 84 85 84 36 84 33 84 46 84 6e 84 53 84 45 84 a3 84 49 84 21 84 5f 84 99 84 50 84 57
 84 33 84 98 84 49 84 58 84 74 84 65 84 5d 84 61 84 6c 84 88 84 8d 84 2c 84 48 84 31 84 46 84 67 84
 23 84 1e 84 58 84 fe 84 87 84 62 85 bd 84 99 84 3f 84 27 84 19 84 20 84 46 84 54 84 63 84 94 84 b0
 84 6b 84 5a 84 55 84 31 84 23 84 39 84 34 84 2e 84 59 84 7e 84 67 84 3a 84 7a 84 41 84 29 84 4e 84
 3a 85 a2 84 85 84 ab 84 70 84 a0 84 69 84 4a 84 7c 84 83 84 69 84 46 85 7b 84 44 84 45 84 54 84 45
 84 a3 84 58 84 3f 84 7c 84 53 84 80 84 a3 84 96 84 7f 84 74 84 a1 84 c0 85 51 84 62 84 ea 84 5f 84 44
 84 9f 84 fl 84 86 84 4b 84 2d 84 36 84 43 84 46 84 57 84 85 84 78 84 54 84 45 84 2b 84 24 84 48 84
 5f 84 50 84 58 84 5d 84 54 84 9a 84 b4 84 67 84 3c 84 50 84 2f 84 0b 84 25 84 89 84 fl 84 68 84 49
 84 65 84 6a 84 6e 84 6b 84 67 84 56 84 76 84 d6 84 93 84 62 84 4b 84 32 84 25 84 32 84 4a 84 3b 84
 49 84 90 84 3b 84 49 84 80 84 b6 84 57 84 46 84 92 84 a4 84 91 84 db 84 4e 84 2d 84 38 84 63 84 90
 84 45 84 57 84 5a 84 37 84 59 84 b8 84 70 84 47 84 62 84 91 84 51 84 7a 84 62 84 6b 84 72 84 4a 84

48 84 8b 84 2c 84 09 84 18 84 52 84 48 84 1c 84 1c 84 42 84 52 84 52 84 ad 84 76 84 57 84 4b 84 83
84 50 84 2b 84 35 84 31 84 39 84 53 84 c3 84 5e 84 49 84 4f 85 4a 84 53 84 af 84 2c 85 a0 84 c1 84 3e
84 1f 84 29 84 81 84 99 84 4b 84 07 84 0c 84 71 84 5d 84 7d 84 7b 84 3e 84 2b 84 a5 84 3d 84 2c 84
48 84 67 84 97 84 92 84 56 84 20 84 1c 84 5c 84 4b 84 5a 84 ee 84 51 84 25 84 26 84 37 84 68 84 93
84 bf 84 95 84 c9 84 b6 84 40 84 2f 84 79 84 47 84 38 84 42 84 3f 84 63 84 a5 84 3a 85 5c 84 3f 84 50
84 60 84 8c 84 80 84 6c 84 94 84 30 84 16 84 47 84 92 84 61 84 8e 84 7d 84 39 84 17 84 09 84 1a 84
2d 84 39 84 cb 84 35 84 4f 84 67 84 91 84 98 84 7c 84 61 84 57 84 7f 84 90 84 71 84 75 84 4c 84 41
84 86 84 6e 84 5e 84 a4 84 71 84 6e 84 82 84 2f 84 31 84 33 84 4c 84 7a 84 4a 84 50 84 2a 84 0d 84
22 84 55 84 db 84 9a 84 42 84 44 84 b8 84 35 84 1a 84 38 84 3e 84 3b 84 70 84 5f 84 d0 07

Appendix 11 IF data format

Similar to frequency sweep, the data of intermediate frequency is fixed to 1601 points, each point is 2 bytes, data header "#" (one byte) + frame data length number of digits (1 byte) + frame data length + data + Data tail (0xd0 0x07).

Appendix 12 IQ

IQ data is a 4-byte Unix timestamp + data stream;

The data stream does not have control characters such as data header, data tail, data length, and data delimiter; direct data body transmission;

I comes first and Q comes last. I and Q are 16 bits each.

Appendix 13 Audio data format

Audio data has no data control characters, that is, there are no control characters such as data header, data tail, data length, and data delimiter; direct data body transmission.