HS2 Control Protocol V1.4

The protocol contains all the underlying control interfaces and can access all the data within the HS2. If you want to DIY or extended development, Please refer to it.

Data communication is transmitted via the HS2's built-in sound card. HS2 can transmit data, read and write data through sound card. The HS2 transmits modulation data when it is set to USB mode, and IQ data when it is set to SDR mode.

The control protocol data can be controlled through Bluetooth SPP, BLE, RS232 and USB interface, and the protocol follows the serial port standard.

Note: BLE

Service UUID: 0000FFF0-0000-1000-8000-00805F9B34FB

Writing characteristics: 0000FFF2-0000-1000-8000-00805F9B34FB

Notify the characteristics: 0000FFF1-0000-1000-8000-00805F9B34FB

Protocol Format

0XA5	0XA5	0XA5	0XA5	BodyLength	Command Type	DATA	CRC High	CRC Low

BeginString *: Using four 0XA5 as BeginString.*

0XA5	*0XA5*	*0XA5*	*0XA5*

BodyLength: *in bytes, is verified by counting the number of characters in the message following the BodyLength field up to, and including, the delimiter immediately preceding the CheckSum field.*

Command Type*: Reference protocol contents*

DATA: *Reference protocol contents*

Verification*: Adopt CRC check method, From BodyLength to CRC, reference Appendix 1 for the algorithm.*

PTT Command, use it to control the transceiver PTT press and release.

APP transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	07	PTT	CRC High	CRC Low

PTT: 0X00, press PTT; 0X01, release PTT。

Transceiver reply:

0XA5	0XA5	0XA5	0XA5	BodyLength	07	PTT	CRC High	CRC Low

Frequency Setting Command, use it to set transceiver frequency.

APP transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	09	VFOA Frequency	VFOB Frequency	CRC High	CRC Low

Frequency: Maximum decimal 2000000000, four-byte length.

Transceiver reply:

0XA5	0XA5	0XA5	0XA5	BodyLength	09	VFOA Frequency	VFOB Frequency	CRC High	CRC Low

Mode Setting Command, use it to set transceiver mode.

APP transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X0A	VFOA Mode	VFOB Mode	CRC High	CRC Low

Mode:

0: USB

1: LSB

2: CWR

3: CWL

4: AM

5: WFM

6: NFM

7: DIGI

8: PKT

Transceiver reply:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X0A	Mode	CRC High	CRC Low

Spectrum Data.

Transceiver transmit:

0X7e	0X7e	0X7e	0X7e	Spectrum data

Spectrum data BodyLength is 512 bytes, no BeginString and CRC.

***Spectrogram**: The size represents the height of the Y-axis, and the position represents the x position plot.*

***Waterfall chart**: The size represents color (blue + current value)，and the position represents the x position plot.*

Status Acquisition Command

APP transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X0B		CRC High	CRC Low

Transceiver reply:

0XA5		0XA5	0XA5	0XA5	BodyLength	0X0B	Transmitting and receiving state	VFOA Mode	VFOB Mode	VFOA Frequency	VFOB Frequency	A/B	NR/NB
RXT	XIT	Filter bandwidth	spectral bandwidth	voltage	UTC time		Status bar, Status	S/PO Table-valued		SWR/AUD/ALC		CRC High	CRC Low

***Transmitting and receiving state**: 1-byte*

***0**: Receiving state*

***1**: Transmitting state*

***VFOA Mode**: 1-byte*

***0**: USB*

***1**: LSB*

***2**: CWR*

***3**: CWL*

***4**: AM*

***5**: WFM*

***6**: NFM*

***7**: DIGI*

***8**: PKT*

***VFOB Mode**: 1-byte*

***0**: USB*

***1**: LSB*

***2**: CWR*

***3**: CWL*

***4**: AM*

***5**: WFM*

***6**: NFM*

***7**: DIGI*

***8**: PKT*

***VFOA frequency**: Maximum decimal 2000000000, four-byte length.*

***VFOB frequency**: Maximum decimal 2000000000, four-byte length.*

***A/B**: 1-byte*

***0**: A Band*

***1**: B Band*

***NR/NB**:*

***0**: NR/NB OFF*

***1**: NR ON*

***2**: NB ON*

***RIT**: 1-byte*

0~120

***XIT**: 1-byte*

0~120

***Filter bandwidth**: 1-byte*

0~50 (See the attached table for the sequence number corresponding filter)

***Spectral bandwidth**: 1-byte*

***0**: 48K*

***1**: 24K*

***2**: 12K*

***3**: 6K*

***4**: 3K*

***5**: 1.5K*

***Voltage**: 1-byte*

Decimal Value /10.

***UTC Time**: 3-byte*

***Hour**: 0~24*

***Minute**: 0~60*

***Second**: 0~60*

***Status bar**: 1-byte*

*Bit0: **1** Bluetooth connection successful **0** Bluetooth disconnect*

*Bit1: **1** GPS module connection **0** GPS module disconnect*

*Bit2: **1** LORA module connection **0** LORA module disconnect*

*Bit3: **1** Electronic compass module connection **0** Electronic compass module disconnection*

*Bit4: **1** Antenna tuner on **0** Antenna tuner off*

*Bit5: **1** High power **0** Low power*

***S/PO Table-valued**: 1-byte*

***The receiving state is S table**: 0~34 (When BIT7 is 0, it is Table S.)*

***The receiving state is PO table**: 0~34 (When BIT7 is 1, it is table PO.)*

***SWR/AUD/ALC**: 1-byte*

***SWR**: 0~34 (When BIT7 and BIT6 are 00, it is table SWR.)*

***ALC**: 0~34 (When BIT7 and BIT6 are 01, it is table ALC.)*

***ADU**: 0~34 (When BIT7 and BIT6 are 10, it is table ADU.)*

Shutdown Command, turn off the radio.

APP transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X0C	0	CRC High	CRC low

0: turn off; 1:turn on;

AF Menu:

Speaker Volume Adjust Command

APP transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X0D	volume	CRC High	CRC Low

Volume: 0~30

Earpiece Volume Adjust Command

APP transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X0E	Earpiece volume	CRC High	CRC Low

***Earpiece volume**: 0~80*

MIC Gain Adjust Command

APP transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X0F	MIC gain	CRC High	CRC Low

***MIC gain**: 0~100*

Volume Compansion Radio Adjust Command

APP transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X10	compansion radio	CRC High	CRC Low

***Compansion radio**: 0~14*

Bass EQ Adjust Command

APP Transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X11	Bass EQ	CRC High	CRC Low

***Bass EQ**: 0~40*

Treble EQ Adjust Command

APP transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X12	Treble EQ	CRC High	CRC Low

***Treble EQ**: 0~40*

RF Menu:

RF Gain (RFG) Adjust Command

APP transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X13	RF Gain	CRC High	CRC Low

***RF Gain**: 0~100*

IF Gain (IFG) Adjust Command

APP transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X14	IF Gain	CRC High	CRC Low

***IF Gain**: 0~80*

Squelch (SQL) Adjust Command

APP transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X15	squelch	CRC High	CRC Low

***Squelch**: 0~20*

Automatic Gain Control (AGC) Command

APP transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X16	Automatic Gain	CRC High	CRC Low

***Automatic Gain**: 0~5*

Prime Amplifier (AMP) Command

APP transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X17	Prime Amplifier	CRC High	CRC Low

***Prime Amplifier**: **0**: AMPA **1**: AMPB*

Filter Command

APP transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X18	Filter	CRC High	CRC Low

Filter:

<250_550>	<275_575>	<300_600>	<325_625>	<350_650>	<375_675>	<400_700>	<425_725>	<450_750>	<475_775>
<275_775>	<325_825>	<375_875>	<425_925>	<475_975>	<370_1.7k>	<450_2.0k>	<500_2.3k>	<0_1.4k>	<0_1.6k>
<0_1.8k>	<0_2.1k>	<0_2.3k>	<0_2.5k>	<0_2.7k>	<0_2.9k>	<0_3.2k>	<0_3.4k>	<0_3.6k>	<0_3.8K>
<0_4.0k>	<0_4.2k>	<0_4.4K>	<0_4.6k>	<0_4.8k>	<0_5.0k>	<0_5.5k>	<0_6.0k>	<0_6.5k>	<0_7.0k>
<0_7.5k>	<0_8.0k>	<0_8.5k>	<0_9.0k>	<0_9.5k>	<0_10.0k>				

NR Command

APP Transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X19	NR	CRC High	CRC Low

***0**: NR OFF **1**: NR ON*

NB Command

APP transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X1A	NB	CRC High	CRC Low

***0**: NB OFF **1**: NB ON*

AB Frequency Command

APP transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X1B	AB	CRC High	CRC Low

***0**: A Frequency **1**: B Frequency **2**: A=B Frequency*

Split Command

APP transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X1C	SPLIT	CRC High	CRC Low

***0**: Split OFF **1**: Split ON*

Band Selection Command

APP transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X1D	Band	CRC High	CRC Low

Band:

1.8	3.5	5	7	10	14	18
21	24	28	50	144	430	

NR Threshold Setting Command

APP transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X1E	NR threshold	CRC High	CRC Low

***NR threshold**: 1~200*

NB Threshold Setting Command

APP transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X1F	NR threshold	CRC High	CRC Low

***NR threshold**: 0~15*

PEAK Threshold Setting Command

APP transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X20	NR threshold	CRC High	CRC Low

NR threshold: 0~20

Antenna Tuner Setting Command

APP transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X21	Antenna tuner	CRC High	CRC Low

***0**: Antenna tuner OFF **1**: Antenna tuner ON **2**: Begin tuning*

Spectral Bandwidth Command

APP transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X22	SPAN	CRC High	CRC Low

***Span**: 0~5*

Spectral Reference Level Command

APP transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X23	REF	CRC High	CRC Low

REF: 1~20

Spectral Refresh Rate Command

APP transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X24	SPEED	CRC High	CRC Low

Speed: 1~30

Spectrum Display Mode Command

APP transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X25	Spectrum display mode	CRC High	CRC Low

***0**: Spectrum and waterfall are shown at the same time*

***1**: Spectrum only*

***2**: waterfall only*

***3**: Spectrum and waterfall are off*

CTCSS

APP transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X26	Transmit CTCSS	Receive CTCSS	Tone burst	CRC High	CRC Low

Transmit CTCSS:

0	67.0	69.3	71.9	74.4	77.0	79.7
82.5	85.4	88.5	91.5	94.8	97.4	100.0
103.5	107.2	110.9	114.8	118.8	123.0	127.3
131.8	136.5	141.3	146.2	150.0	151.4	156.7
159.8	162.2	165.5	167.9	171.3	173.8	177.3
179.9	183.5	186.2	189.9	192.8	196.6	199.5
203.5	206.5	210.7	213.8	218.1	221.3	225.7
229.1	233.6	237.1	241.8	245.5	250.3	254.1

Receive CTCSS:

0	67.0	69.3	71.9	74.4	77.0	79.7
82.5	85.4	88.5	91.5	94.8	97.4	100.0
103.5	107.2	110.9	114.8	118.8	123.0	127.3
131.8	136.5	141.3	146.2	150.0	151.4	156.7
159.8	162.2	165.5	167.9	171.3	173.8	177.3

179.9	183.5	186.2	189.9	192.8	196.6	199.5
203.5	206.5	210.7	213.8	218.1	221.3	225.7
229.1	233.6	237.1	241.8	245.5	250.3	254.1

Tone burst:

0	1750	2135	

Device Type Recognition Command

APP transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X27	Device type	CRC High	CRC Low

Transceiver reply:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X27	Device type	CRC High	CRC Low

***Device type**: 0: HS2*

Transmit Power Level Setting Command

APP transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X28	power level	CRC High	CRC Low

***Power level**: 0~100*

Transceiver reply:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X28	power level	CRC High	CRC Low

Receive Frequency Deviation Setting Command

APP transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X29	RIT	CRC High	CRC Low

***RIT**: 0~120*

Transceiver reply:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X29	RIT	CRC High	CRC Low

Transmit Frequency Deviation Setting Command

APP transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X2A	XIT	CRC High	CRC Low

***XIT**: 0~120*

Transceiver reply:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X2A	XIT	CRC High	CRC Low

Tone Burst Transmit Duration Setting Command

APP transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X2B	L-TIME	CRC High	CRC Low

***L-TIME**: 50 - 300*

Transceiver reply:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X2B	L-TIME	CRC High	CRC Low

High & Low Power Level Setting Command

APP transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X2C	Power level	CRC High	CRC Low

***0**: Low power*

***1**: High power*

Transceiver reply:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X2C	L-TIME	CRC High	CRC Low

Synchronization commands for SWR, S, ALC, TX power stable(polling at the control end)

APP transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X2D	CRC High	CRC Low

Transceiver Transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X2D	TX power/S stable	SWR/AUD/ALC	CRC High	CRC Low

S stable: 0~34(BIT7=0);

TX Power: 0~34(BIT7=1);

SWR/AUD/ALC: 1- byte;

SWR: 0~34(BIT7, BIT6=00);

ALC: 0~34(BIT7, BIT6=01);

AUD: 0~34(BIT7, BIT6=10);

Parameter synchronization command (timing polling to achieve synchronization)

APP transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X2E	Data packet	CRC High	CRC Low

Transceiver Transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X2E	SVOL	HVOL	MIC	CMP	BAS	TRB	RFG	IFG

SQL	AGC	AMP	NR	NB	PEAK	SPAN	REF	SPEED	T-CTSS	R-CTSS	L-VOICE	L-TIME	KEY_MODE

TX_RX	TRANING	STF	STG	KEY_SPEED	DECODE	THRESHOLD	Data Format	CRC High	CRC Low

Key type set command

APP transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X2F	Key Type	CRC High	CRC Low

Key Type:

0: AUTO-L

1: AUTO-R

2: KEY

Transceiver Transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X2F	Key Type	CRC High	CRC Low

Side tone volume setting command

APP transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X30	Side tone volume	CRC High	CRC Low

Side tone volume: 0~15, STEP=1

Transceiver Transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X30	Side tone volume	CRC High	CRC Low

Side tone frequency setting command

APP transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X31	Side tone frequency	CRC High	CRC Low

Side tone volume: 40~20, STEP=2

Transceiver Transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X31	Side tone frequency	CRC High	CRC Low

When the radio station receives it, it has to multiply by 10

Send and receive conversion time setting commands

APP transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X32	conversion time	CRC High	CRC Low

Side tone volume: 0~50, STEP=1

Transceiver Transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X32	conversion time	CRC High	CRC Low

When the radio station receives it, it has to multiply by 40

USB data format setting command

APP transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X33	Data Format	CRC High	CRC Low

Data Format:

0: Audio; 1: IQ

Transceiver Transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X33	Data Format	CRC High	CRC Low

CW Practice Mode Settings command

APP transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X34	TRAINING	CRC High	CRC Low

CW Practice Mode:

0: OFF 1: ON

Transceiver Transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X34	TRAINING	CRC High	CRC Low

CW auto key speed setting command

APP transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X35	KEY_SPEED	CRC High	CRC Low

Automatic key speed: 5~48, Step=1

Transceiver Transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X35	KEY_SPEED	CRC High	CRC Low

CW decoding setup command

APP transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X36	DECODE	CRC High	CRC Low

decoding switch:

0: OFF 1: ON

Transceiver Transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X36	DECODE	CRC High	CRC Low

CW decoding threshold setting command

APP transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X37	THERSHOLD	CRC High	CRC Low

CW decoding threshold: 1~50, Step=1

Transceiver Transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X37	THERSHOLD	CRC High	CRC Low

Mesh RTTY(support Lora, 2FSK, 4FSK)

APP transmit:

0XA5	0XA5	0XA5	0XA5	BodyLength	0X38	Data packet	CRC High	CRC Low

Data packet:

0x7e	0x7e	source address	objective address	MESH hop	Total Packages	Bale No	Data	FEC	

Source address: *2- byte*

Objective address: *2- byte*

MESH hop: *1- byte*

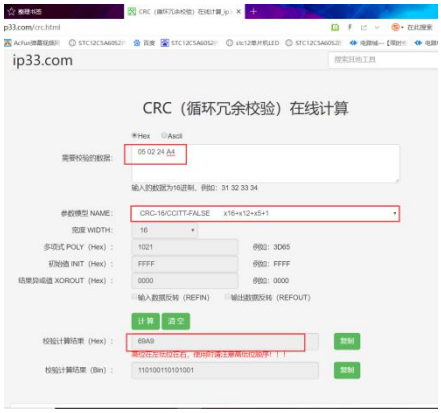
Total Packages: *1- byte*

Bale No: *1- byte*

Data: *fixed 225- byte*

Appendix 1

CRC (Cyclic Redundancy Check), Result verification url: http://www.ip33.com/crc.html




```
//****************************************************
//** Function name: CRC16Check
//** Imput:    buf    The data to be verified;
//**              len    the length of the data to be verified
//** Output: Verify value
//** Functional description: CRC16
//** Note: Verify mode is CRC16/CCITT-FALSE, Notice the variable type
//****************************************************/
unsigned int CRC16Check(unsigned char *buf, unsigned char len)
{
    unsigned char    i, j;
    unsigned int uncrcReg = 0xFFFF;
    unsigned int uncur;
    for (i = 0; i < len; i++)
    {
        uncur = buf[i] << 8;
        for (j = 0; j < 8; j++)
        {
            if ((int)(uncrcReg ^ uncur) < 0)
```

```
                {
                        uncrcReg = (uncrcReg << 1) ^ 0x1021;
                }
                else
                {
                         uncrcReg <<= 1;
                }
                uncur <<= 1;
            }
        }
        return uncrcReg;
}
```