Goldshell-HS1& HS1PLUS Serial communication protocol

V0.6

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REVISION HISTROY

Version	Date	Description
V0.1	2020.6.12	Preliminary Version.
V0.2	2020.6.22	Add process description.
V0.3	2020.7.2	Added warning sign for fan power.
V0.4	2020.7.15	Add command to send restart and set LED.
V0.5	2020.8.27	1. Modify the receiving device information command and delete the HashRate Info field. 2. Shorten SN bytes to 18 bytes, HS1 and HS1PLUS ModelName are 16 and 20 bytes in length respectively. This change is for HS1 V0.0.4 and HS1PLUS machines. 3. The HS1 V0.0.4 software protocol version is changed to 0x20, the JOBID of HS1 V0.0.4 and HS1PLUS is set to 1-255, and the HS1 V0.0.3 is 1-15.
V0.6	2020.9.21	Added the description of the programming mode process.

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Catalog

1 Overview

This paper mainly introduces the communication protocol between Goldshell' small blockchain terminal equipment and PC and other upper computer terminals.

2 Goldshell-HS1 Protocol

2.1 Communication Protocol Introduction

0xA53C96	PKT...	0x69C35A

A complete communication consists of the start verification section 0xA53C96, the transmission packet PKT, and the end section 0x69C35A.PKT includes many types, such as sending JOB packets, reading Nonce packets, etc. PKT consists of headers and data content.

2.1.1 Set upgrade mode

Field name	describe	Start（byte）	length（byte）	value
Type	Packet type	**0**	**1**	0xA3
Version	Protocol version	**1**	**1**	0x10
Length	Packet length	**2**	**4**	

2.1.2 Send firmware package

Field name	describe	Start（byte）	length（byte）	value
Type	Packet type	**0**	**1**	0xAA
Version	Protocol version	**1**	**1**	0x10
Length	Packet length	**2**	**4**	
Id	Current package number	**6**	**4**	**0-447**

Pagesize	Actual page size	**10**	**4**	**256**
CurLen	Current packet length	**14**	**4**	**256**
Completed	Transfer complete flag	**18**	**1**	0x00:undone 0x01:Last bag
CRC	CRC check	**19**	**4**	
ImageData	Current package firmware content	**23**	**256**	

2.1.3 Query device information[TX]

Field name	describe	Start（byte）	length（byte）	value
Type	Packet type	**0**	**1**	0xA4
Version	Protocol version	**1**	**1**	0x10
Length	Packet length	**2**	**4**	

2.1.4 Send Job data[TX]

Field name	describe	Start（byte）	length（byte）	value
Type	Packet type	0	1	0xA1
Version	Protocol version	1	1	0x10
Length	Packet length	2	4	
Target	JOB target value	6	8	0x0000ffffffffffff
StartNonce	Calculate start value	14	8	0x00000000
EndNonce	Calculate end value	22	8	0xffffffffffffffff
JobNum	Job number	30	1	1
JobID	This JOB ID number	31	1	1-255
JobData	This JOB data	32	128	

2.1.5 Set device parameters[TX]

Field name	describe	Start（byte）	length（byte）	value
Type	Packet type	0	1	0xA2
Version	Protocol version	1	1	0x10
Length	Packet length	2	4	
Flag	Set parameters or query device status	6	1	0xA2:Device parameters 0x52:Check status
Voltage	Set working	7	2	

	voltage mV			
Freq	Set working frequency	9	2	
Mode	Extended Algorithm Mode	11	4	
Temp	Target operating temperature	15	1	65

2.1.6 Send restart command[TX]

Field name	describe	Start（byte）	length（byte）	value
Type	Packet type	0	1	0xAC
Version	Protocol version	1	1	0x10
Length	Packet length	2	4	3

2.1.7 Send LED commands[TX]

Field name	describe	Start（byte）	length（byte）	value
Type	Packet type	0	1	0xA6
Version	Protocol version	1	1	0x10
Length	Packet length	2	4	
Set	Whether to turn on the LED	6	1	0x0:LED off 0x1:LED on
LED	Set LED status	7	4	Bit[0:15]LED on time(ms) Bit[16:31]Led off time(ms)

2.1.8 Receive nonce[RX]

Field name	describe	Start（byte）	length（byte）	value
Type	Packet type	0	1	0x51
Version	Protocol version	1	1	0x10
Length	Packet length	2	4	
JobID	JobID corresponding to Nonce	6	1	1-15
ChipID	ChipID corresponding to Nonce	7	1	1-255
CoreID	CoreID corresponding to	8	1	

	Nonce			
Nonce		9	8	0xffffffff
HashExist	Whether to return the hash value	17	1	1-255
Hash	Hash value	18	32	Hashvalue

2.1.9 Receiver status[RX]

Field name	describe	Start（byte）	length（byte）	value
Type	Packet type	0	1	0x52
Version	Protocol version	1	1	0x10
Length	Packet length	2	4	
Chips	Number of chips	6	1	
Cores	Number of chip cores	7	1	9
Goodcores	Number of good cores	8	1	9
scanbits	How many bits are in the scan range	9	1	32
scantime	Scan full space time（100ms）	10	2	
Voltage	Current working voltage(mv)	12	2	
Freq	Current working frequency(MHz)	14	2	
Mode	Current work expansion algorithm mode	16	4	
Temp	Equipment temperature（℃）	20	1	
Rebootcnt	Chip restart times	21	1	
Tempwarn	Temperature warning sign	22	1	
Fanwarn	Fan warning sign	23	1	
Powerwarn	Power warning sign	24	1	
Rpm	Speed of the fan	25	2	

2.1.10 Receive device information[RX]

HS1 firmware version V0.0.3:

Field name	describe	Start（byte）	length（byte）	value
Type	Packet type	0	1	0x54

Version	Protocol version	1	1	0x10
Length	Packet length	2	4	
ModelName Length	ModelName effective length	6	1	**10**
ModelName	ModelName	7	16	Goldshell-HS1
FWV Length	Firmware version length	23	1	5
FirmwareVersion	Current firmware version	24	8	0.0.3
SN	Bar code	33	32	Byte[0]:Effective length Byte[1:31]:Bar code
HashRate Info	HashRate information	65	32	Byte[0]:Effective length Byte[1:31]: information
Workdepth	Work depth	97	1	

HS1 firmware version V0.0.4:

Field name	describe	Start（byte）	length（byte）	value
Type	Packet type	0	1	0x54
Version	Protocol version	1	1	0x20
Length	Packet length	2	4	
ModelName Length	ModelName effective length	6	1	**10**
ModelName	ModelName	7	16	Goldshell-HS1
FWV Length	Firmware version length	23	1	
FirmwareVersion	Current firmware version	24	8	0.0.4
SN	Bar code	33	18	Byte[0]:Effective length Byte[1:31]:Bar code
Workdepth	Work depth	51	1	

HS1PlUS:

Field name	describe	Start（byte）	length（byte）	value
Type	Packet type	0	1	0x54
Version	Protocol version	1	1	0x10
Length	Packet length	2	4	
ModelName Length	ModelName effective length	6	1	
ModelName	ModelName	7	20	Goldshell-HS1-Plus
FWV Length	Firmware	23	1	

	version length			
FirmwareVersion	Current firmware version	24	8	0.0.1
SN	Bar code	33	18	Byte[0]:Effective length Byte[1:31]:Bar code
Workdepth	Work depth	54	1	

2.1.11 Receive mode setting result[RX]

Field name	describe	Start（byte）	length（byte）	value
Type	Packet type	0	1	0x53
Version	Protocol version	1	1	0x10
Length	Packet length	2	4	6

2.1.12 Receive firmware package status [RX]

Field name	describe	Start（byte）	length（byte）	value
Type	Packet type	0	1	0x5A
Version	Protocol version	1	1	0x10
Length	Packet length	2	4	
Id	Packet sequence number	6	4	
Flag		10	1	0x01: Success 0x02: Retransmission

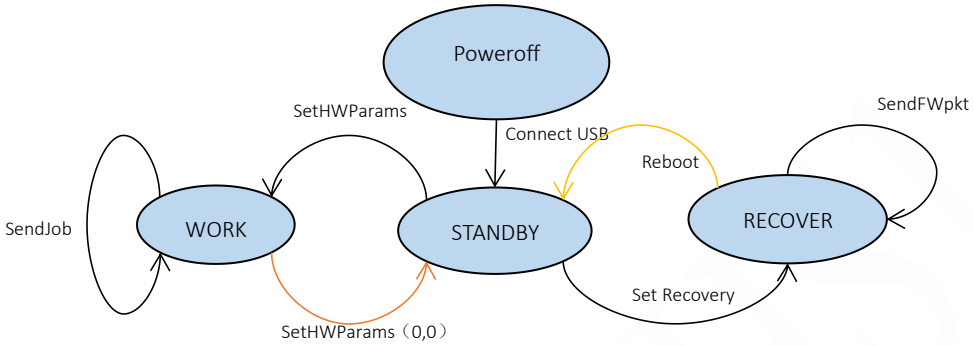
2.1.13 Respond to the Job result command sent[RX]

Field name	describe	Start（byte）	length（byte）	value
Type	Packet type	0	1	0x55
Version	Protocol version	1	1	0x10
Length	Packet length	2	4	

3 Introduction of software scheme

3.1 Finite State Machine

3.1.1 Goldshell-HS1 State transition



3.1.2 LED Indicator definition

status	Led status description	Remarks
STANDBY	Flash（on）	
WORK	Flash（on 300ms，off 100ms）	
RECOVERY	Flash（on 300ms，off 100ms）	
EXCEPTION	Flash（on 100ms，off 1s）	

4 Typical workflow

4.1 Specific workflow

1.Send quiry device information packet (A4), wait for receiving device information packet (54), check whether the USB channel is connected

send：
A53C96A4100600000069C35A
HS1 V0.0.3 version receives byte stream：
A53C96541061000000D476F6C647368656C6C2D48533100000005302E302E33
0000000E48313042303237324539304539440000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000
0000000469C35A
HS1 V0.0.4 version receives byte stream：
A53C96542033000000D476F6C647368656C6C2D48533100000005302E302E340000000
E48313042303237324539304539440000000469C35A
HS1PLUS receive byte stream:
A53C96541037000000012476F6C647368656C6C2D4853312D506C7573000005302E302E3
20000000E4831314230333530333945414436000000869C35A

2.Send setting device parameter packet (A2), wait for receiving device status packet (52)

send：
A53C96A21010000000A2EE026400040000005069C35A
receive：
A53C96521017000000002280020FFFFEE026400040000000000069C35A

When the Flag field of the device parameter packet is A2, it means the device parameter is set. At this time, it is necessary to set the device voltage and frequency to a non-zero value.
The device will run. When it is 52, it is to query the device parameters. At this time, the current device status package is returned. When the voltage and frequency are set to 0, the device will stop working and return to the standby state.

3.Send JOB data packet (A1), waiting to receive response packet (55)

send：
A53C96A1109C0000006F000000000000000000000FFFFFFFFFFFFF
FF010C000000000000000000000000962B1C413636E85858FDF91D15

2B42056662B7FC000000000000005B20195AFE280A27276D4517C7F8
0F5A61843EAC78B1AF2C82962B1C413636E80378E4A3E33D2165220B
27A03B7F0EB30BB515B160961657AF5B9F8AF4996C2566621ECD0F71
C6A77CF80C2E6B6E816AAE44D07D91830CAA0769C35A

receive：

A53C9655100A0000000000000069C35A

The total amount of JOB packets sent is the number of workdepth in the first step of querying the device information，then send in sequence，After receiving the response packet, send the next JOB package until the end of sending. You cannot send multiple JOB packages at the same time before receiving the corresponding package. Set the upper 32 bits of startnonce as ntime value. The JOB scanning cycle is to obtain the scantime in the device parameter value. When the scantime arrives, the new work is updated to avoid repeated calculation. JOBID is 1-255(HS1 V0.0.3 is 1-15). Assuming that workdepth is 4, the JOBID of 4 consecutive JOBs are updated in turn with 4 different consecutive IDs in each group. For example, this JOBID is 1, 2, 3, 4, and the next one is 5, 6, 7, 8. When it comes to 255, the next ID starts from 1. The received nonce can judge which JOB is generated by the current JOB via the ID number if the workdepth is 8, et cetera.

4.Polling to receive NONCE packets(51)

A53C96510120000000C0103B7F29202000000000069C35A

4.2 Specific upgrade process

1. Only when the miner is in standby state can the firmware upgrade function be realized. If the miner is in the work state at this time, please send the setting device parameter package (A2) and wait for receiving the device status package (52). At this time, set the equipment voltage and frequency to 0 to make the miner return to the standby state, and then upgrade the firmware.

2. Send upgrade mode packet (A3) and wait for receiving device packet (53)

Send:

A53C96A3100600000069C35A

Receive：

A53C9653100600000069C35A

3. HS1 & HS1PLUS firmware package structure:

The total size of firmware package is 114752 bytes, including 64 byte header and 114688 bytes of real firmware package,

The structure of the header is as follows:

hs1header {

magic = 0x20190428 //4 Byte

model_name = “Goldshell-HS1” //16 Byte
version //example 0.0.4 8 Byte
crc //4 Byte CRC32 value of real firmware package
reserve //32 Byte
}

hs1plusheader {
magic = 0x20190428 //4 Byte
model_name = “Goldshell-HS1-Plus” //20 Byte
version //example 0.0.4 8 Byte
crc //4 Byte CRC32 value of real firmware package
reserve //28Byte
}

Before upgrading, you can read the header of the firmware to determine whether the firmware package meets the requirements of the upgrade package, so as to avoid unforeseen exceptions during the upgrade process, which may lead to machine firmware damage and repair.

The real firmware package is 114688 bytes in total. During the upgrade process, it is divided into 448 pieces, and each 256 byte block package is sent to the machine in sequence. The final upgrade can be successful.
send:
A53C96AA1017010000……
For the specific package format, please refer to the sending firmware package format
receive:
A53C965A100B000000350100000169C35A
When the received firmware status package flag is 0x01, it means that the current transmission package is valid; if it is 0x02, it means that the current package has not been transmitted successfully. Please try again.