RGBlink OpenAPI

Usage Guide

D4

Address：S601 Weiye Building Torch Hi-Tech Industrial Development Zone Xiamen,Fujian P.R.C
Tel：4008 592 315 Fax：+86 592 5788216
Email: support@rgblink.com http://www.rgblink.com

Contents

Background

Many RGBlink products may be remote controlled or queried using string codes. On earlier products these commands were via a conventional Serial RS232 interface, and subsequently via USB (typically for computer connections). Today the modern products support remote connectivity over TCP/IP as UDP, opening up greater and extended usage applications.

Software

XPOSE

XPOSE is the software app from RGBlink that provides a rich GUI for users to configure, operate and inspect one or more connected universal or presentation processors. XPOSE leverages the RGBlink OpenAPI to communicate with connected processors from Windows®, macOS® or Linux operating systems

XPOSE mobile

For Android and iOS, XPOSE mobile allows selected processors to be remotely controlled and configured from a hand-held device.

D4

Overview

D4 is a very flexible video switching and scaling solution for 4K signals featuring multiple output modes, a comprehensive on board feature set and acclaimed RGBlink modular design.

Truly an All-In-One solution, D4 accept a wide range of input signals in a huge array of formats. Inputs can be converted, scaled, transcoded to standard to HDMI 2.0 outputs or output to optional ports including DP1.2, 12G/6G/3G/HD/SD SDI, Fiber port and HDBaseT.

Connection Method

1. Protocol: **UDP**
   DHCP client : **no**
   IP address : **192.168.0.100**
   IP mark : **255.255.255.0**
   Gateway : **none**
   Port: **1000**

Need to set the control PC IP address :

IP address : **192.168.0.99(from2-255,except 100)**
IP mark : **255.255.255.0**
Gateway : **none**

2. Protocol : **RS232**
   Baudrate : **115200bps**
   Start bit : **1bit**
   Stop bit : **1bit**
   Parity bit : **no**

Command structure

The command structure for sending and receiving are listed as below. The command data use ASCII code.

1. transmit

Header	Type	Protocol Data	End
<	T	ADDR * SN * CMD * DAT1 * DAT2 * DAT3 * DAT4 * CHKSUM	>
1	1	16	1

2. feedback

Header	Type	Protocol Data	End
<	F	ADDR * SN * CMD * DAT1 * DAT2 * DAT3 * DAT4 * CHKSUM	>
1	1	16	1

3. Protocol Data

Symbol	Byte	Definition	Remark
Header		The command start with “<”	

type		Transmit “T”, feedback “F”	
ADDR	1	Board Address, main board default value 0x00	No for customer
SN	1	Sequence number，default value 0x00	No for customer
CMD	1	Command type	
DAT1	1		
DAT2	1		
DAT3	1		
DAT4	1		
CHKSUM	1	Checksum, Sum of all protocol data	

4. Instruction Type

Header value describing whether string packet type is “To” the processor or “From” the processor

Values:

T To processor Transmit/ Action

F From processor Feedback/ Query Response

5. Address

Board Address, for Venus x3 main board default value is 0x00, usually set to “00”.

Values:One byte , hexadecimal value, 0xFF

6. Sequence Number

SN is used for flow control: start to establish the connection by setting up SN=0. When the PC software sends one command, the SN adds one. The command SN machine returns back should be same as the SN machine received. The machine should be capable of catching at least 5 receiving commands. The PC software should implement flow control according to SN of the sending command and SN of the receiving command. The precondition for PC software to send the fifth command is that it has already received the reply to the first command. SN flow control helps save time spent in receiving command after sending command.

Support for chaining of multiple instructions to be executed in sequence. Usually set to “00”.

Values:One byte , hexadecimal value, 0xFF

7. Command Type

Key to invokes the specified command

Values:One byte , hexadecimal value, 0xFF

8. Data Values

Set of four value keys. These data value may be used to call specific attributes of a command or may be used to contain a value payload for delivery to the processor.

Values:Set of Four one byte hexadecimal values.

9. Checksum

Calculation of the attributes above to confirm validity of the string packet.

Checksum is calculated by adding the hexadecimal values together.

CHKSUM = ADDR + SN + CMD + DAT1 +DAT2 + DAT3 + DAT4 .

Values:One byte , hexadecimal value, 0xFF

10. Example

[Address] 00

+ [Sequence Number] 00

+ [Command] 78 Set Operation Mode

+ [Data 1] 04

+ [Data 2] 00 Videowall Mode

+ [Data 3] 00

+ [Data 4] 00

= [Checksum] 7c

11. Error Answer

To return the following data when receiving unsupported command or errors:

Symbol	Byte	Definition	Remark
Header		<	
Feedback		F	
ADDR	1	0x00	
SN	1	0x00	
CMD	1	Command type	
DAT1	1	0xFF	
DAT2	1	0xFF	
DAT3	1	0xFF	
DAT4	1	0xFF	
CHKSUM	1		
End		>	

Commands

0x68 Write/read to set D4 in serial control mode

Preset Banks

Preset can be stored on board D4 for later recall. Preset are called “Bank”. Recalled bank need to add set or take command.
Set: <T000078140000008C>
Take: <T0000780000000078>

Load Bank(0x18)

Symbol	Byte	Definition	Remark
Header		<	The command start with ”<”
Transmit		T	
ADDR	1	0x00	
SN	1	0x00	
CMD	1	0x68	
DAT1	1	0x18	Load bank
DAT2	1	0x00~0x0f	Bank number
DAT3	1	0x00	No use
DAT4	1	0x00	No use
CHKSUM	1	0x80~0x8f	Check sum = ADDR + SD + CMD + DAT1 + DAT2 + DAT3 + DAT4
End		>	The command end with ”>”

Command list

Load bank	Header	Instruction Type	Address	SN	Command	Data 1	Data 2	Data 3	Data 4	Checksum	end
Load bank 1	<	T	00	00	68	18	00	00	00	80	>
Load bank 2	<	T	00	00	68	18	01	00	00	81	>
Load bank 3	<	T	00	00	68	18	02	00	00	82	>
Load bank 4	<	T	00	00	68	18	03	00	00	83	>
Load bank 5	<	T	00	00	68	18	04	00	00	84	>
Load bank 6	<	T	00	00	68	18	05	00	00	85	>
Load bank 7	<	T	00	00	68	18	06	00	00	86	>
Load bank 8	<	T	00	00	68	18	07	00	00	87	>
Load bank 9	<	T	00	00	68	18	08	00	00	88	>
Load bank 10	<	T	00	00	68	18	09	00	00	89	>
Load bank 11	<	T	00	00	68	18	0a	00	00	8a	>
Load bank 12	<	T	00	00	68	18	0b	00	00	8b	>
Load bank 13	<	T	00	00	68	18	0c	00	00	8c	>
Load bank 14	<	T	00	00	68	18	0d	00	00	8d	>
Load bank 15	<	T	00	00	68	18	0e	00	00	8e	>
Load bank 16	<	T	00	00	68	18	0f	00	00	8f	>

Typical Usage

Load bank	Send & Return	Result
Load bank 1	<T0000681800000080>	
	<F0000681800000080>	Load bank 1
Set	<T000078140000008C>	
	<T000078140000008C>	Load success
Load bank 3	<T0000681802000082>	
	<F0000681802000082>	Load bank 3
Set	<T000078140000008C>	
	<T000078140000008C>	Load success
Load bank 7	<T0000681806000086>	
	<F0000681806000086>	Load bank 7
Set	<T000078140000008C>	
	<T000078140000008C>	Load success
Load bank 12	<T000068180b00008b>	
	<F000068180b00008b>	Load bank 12
Take	<T0000780000000078>	
	<T000078140000008C>	Load success

Save Bank(0x1A)

Symbol	Byte	Definition	Remark
Header		<	The command start with ”<”
Transmit		T	
ADDR	1	0x00	
SN	1	0x00	
CMD	1	0x68	
DAT1	1	0x1A	Save bank
DAT2	1	0x00	No use
DAT3	1	0x00~0x0f	Bank number
DAT4	1	0x00	No use
CHKSUM	1	0x82~0x91	Check sum = ADDR + SD + CMD + DAT1 + DAT2 + DAT3 + DAT4
End		>	The command end with ”>”

Command list

Save bank	Header	Instruction Type	Address	SN	Command	Data 1	Data 2	Data 3	Data 4	Checksum	end
Save bank 1	<	T	00	00	68	1A	00	00	00	82	>
Save bank 2	<	T	00	00	68	1A	00	01	00	83	>
Save bank 3	<	T	00	00	68	1A	00	02	00	84	>
Save bank 4	<	T	00	00	68	1A	00	03	00	85	>
Save bank 5	<	T	00	00	68	1A	00	04	00	86	>
Save bank 6	<	T	00	00	68	1A	00	05	00	87	>
Save bank 7	<	T	00	00	68	1A	00	06	00	88	>
Save bank 8	<	T	00	00	68	1A	00	07	00	89	>
Save bank 9	<	T	00	00	68	1A	00	08	00	8a	>
Save bank 10	<	T	00	00	68	1A	00	09	00	8b	>
Save bank 11	<	T	00	00	68	1A	00	0a	00	8c	>

Save bank 12	<	T	00	00	68	1A	00	0b	00	8d	>
Save bank 13	<	T	00	00	68	1A	00	0c	00	8e	>
Save bank 14	<	T	00	00	68	1A	00	0d	00	8f	>
Save bank 15	<	T	00	00	68	1A	00	0e	00	90	>
Save bank 16	<	T	00	00	68	1A	00	0f	00	91	>

Typical Usage

Save Bank	Send & Return	Result
Save bank 2	<T0000681A00010083>	
	<F0000681A00010083>	Save bank 2 success
Save bank 6	<T0000681A00050087>	
	<F0000681A00050087>	Save bank 6 success
Save bank 10	<T0000681A0009008B>	
	<F0000681A0009008B>	Save bank 10 success
Save bank 16	<T0000681A000f0091>	
	<F0000681A000f0091>	Save bank 16 success

0x78 System mode selection

Set System Mode(0x04)

Symbol	Byte	Definition	Remark
Header		<	The command start with ”<”
Transmit		T	
ADDR	1	0x00	
SN	1	0x00	
CMD	1	0x78	
DAT1	1	0x04	Set system mode
DAT2	1	0x00~0x0f	System mode number 00: Standard Mode 01: PIP Mode 02: Switch Mode 03: Presentation Mode 04: Dual Mode 05: Split Mode 06: Mindelay Mode
DAT3	1	0x00	No use
DAT4	1	0x00	No use
CHKSUM	1	0x7C~0x82	Check sum = ADDR + SD + CMD + DAT1 + DAT2 + DAT3 + DAT4
End		>	The command end with ”>”

Command list

Set system mode	Header	Instruction Type	Address	SN	Command	Data 1	Data 2	Data 3	Data 4	Checksum	end
Standard Mode	<	T	00	00	78	04	00	00	00	7C	>
PIP Mode	<	T	00	00	78	04	01	00	00	7D	>
Switch Mode	<	T	00	00	78	04	02	00	00	7E	>
Presentation Mode	<	T	00	00	78	04	03	00	00	7F	>
Dual Mode	<	T	00	00	78	04	04	00	00	80	>
Split Mode	<	T	00	00	78	04	05	00	00	81	>
MinDelay Mode	<	T	00	00	78	04	06	00	00	82	>

Typical Usage

Set system mode	Send & Return	Result
Set Standard mode	<T000078040000007C>	
	<F000078040000007C>	Set Standard mode success
Set PIP mode	<T000078040100007D>	
	<F000078040100007D>	Set PIP mode success
Set Dual mode	<T0000780404000080>	
	<F0000780404000080>	Set Dual mode success
Set Split mode	<T0000780405000081>	
	<F0000780405000081>	Set Split mode success

The following command need D4 Version from V3.30_20191021.

0x72 Source switch in Standard /PIP/Dual Mode

Source switch(0x00)

Symbol	Byte	Definition	Remark
Header		<	The command start with ”<”
Transmit		T	
ADDR	1	0x00	
SN	1	0x00	
CMD	1	0x72	
DAT1	1	0x00	Source switch
DAT2	1	0x00~0x01	Under PIP/Dual Mode: 00: Layer A/CH 1 01: Layer B/CH 2
DAT3	1	0x00~0x03	Source switch 00: IN1 01: IN2 02: IN3 03: IN4
DAT4	1	0x00	No use
CHKSUM	1	0x82~0x91	Check sum = ADDR + SD + CMD + DAT1 + DAT2 + DAT3 + DAT4
End		>	The command end with ”>”

Command list in Standard Mode

Switch signal source	Header	Instruction Type	Address	SN	Command	Data 1	Data 2	Data 3	Data 4	Checksum	end
Switch to IN1	<	T	00	00	72	00	00	00	00	72	>
Switch to IN2	<	T	00	00	72	00	00	01	00	73	>
Switch to IN3	<	T	00	00	72	00	00	02	00	74	>
Switch to IN4	<	T	00	00	72	00	00	03	00	75	>

Command list in PIP /Dual Mode

Switch signal source	Header	Instruction Type	Address	SN	Command	Data 1	Data 2	Data 3	Data 4	Checksum	end
Switch to IN1 (Layer A/CH 1)	<	T	00	00	72	00	00	00	00	72	>
Switch to IN2 (Layer A/CH 1)	<	T	00	00	72	00	00	01	00	73	>
Switch to IN3 (Layer A/CH 1)	<	T	00	00	72	00	00	02	00	74	>
Switch to IN4 (Layer A/CH 1)	<	T	00	00	72	00	00	03	00	75	>
Switch to IN1 (Layer B/CH 2)	<	T	00	00	72	00	01	00	00	73	>
Switch to IN2 (Layer B/CH 2)	<	T	00	00	72	00	01	01	00	74	>
Switch to IN3 (Layer B/CH 2)	<	T	00	00	72	00	01	02	00	75	>
Switch to IN4 (Layer B/CH 2)	<	T	00	00	72	00	01	03	00	76	>

Typical Usage

Switch signal source	Send & Return	Result
Set Standard Mode	<T000078040000007C>	
	<F000078040000007C>	Set Standard Mode success
Switch to IN1	<T0000720000000072>	
	<F0000720000000072>	Source switch to IN1 success
Switch to IN4	<T0000720000030075>	
	<F0000720000030075>	Source switch to IN4 success
Set PIP Mode	<T000078040100007D>	
	<F000078040100007D>	Set PIP Mode success
Switch to IN1 (Layer A)	<T0000720000000072>	
	<F0000720000000072>	Source switch to IN1 success
Switch to IN4 (Layer A)	<T0000720000030075>	
	<F0000720000030075>	Source switch to IN4 success
Switch to IN2 (Layer B)	<T0000720001010074>	
	<F0000720001010074>	Source switch to IN2 success
Switch to IN3 (Layer B)	<T0000720001020075>	
	<F0000720001020075>	Source switch to IN3 success
Set Dual Mode	<T0000780404000080>	
	<F0000780404000080>	Set Dual Mode success
Switch to IN1 (CH 1)	<T0000720000000072>	
	<F0000720000000072>	Source switch to IN1 success
Switch to IN4 (CH 1)	<T0000720000030075>	
	<F0000720000030075>	Source switch to IN4 success
Switch to IN2 (CH 2)	<T0000720001010074>	
	<F0000720001010074>	Source switch to IN2 success
Switch to IN3 (CH 2)	<T0000720001020075>	
	<F0000720001020075>	Source switch to IN3 success

The following command need D4 Version from V3.85_2020.04.09.

0XF2 Write layer attributes and layer setting

In order to more efficiently and quickly control the parameters of the layer, the following command adds a string of data blocks after the original command. Data block definition:

The data block begins with '[' and ends with'] 'd. The content of the data block is the property to be set. The content consists of the property name (small letters and underscores), then '=' , and the number (decimal).Properties are separated by ", ".

The specific structure is as follows：

<T0000F200010000F3>[scale_posx=100,scale_posy=50,scale_width=3000,scale_height=2000]

Layer setting(0x00)

D4 has at most 4 layers in presentation mode, counting from 00, and each layer attribute includes scale/crop/input/alpha. After setting the layer's properties, need to switch the set parameters to output by using the TAKE key command.

Symbol	Byte	Definition	Remark
Header		<	The command start with "<"
Transmit		T	
ADDR	1	0x00	
SN	1	0x00	
CMD	1	0xF2	0xF2 (write)
DAT1	1	0x00	Layer setting
DAT2	1	0x00~0xFF	Layer select，0- 3
DAT3	1	0x00	No use
DAT4	1	0x00	No use
CHKSUM	1		Check sum = ADDR + SD + CMD + DAT1 + DAT2 + DAT3 + DAT4
End		>	The command end with ">"
data block		[	The data block start with "["
		crop_posx	Layer crop x position
		crop_posy	Layer crop y position
		crop_width	Layer crop width
		crop_height	Layer crop height
		scale_posx	Layer scale x position
		scale_posy	Layer scale y position
		scale_width	Layer scale width
		scale_height	Layer scale height
		Input	Input channel: 0,1,4,5.(Input source 1,2,3,4 correspond to 0,1,4,5 respectively)
		alpha	Layer alpha，0 - 128
		]	The data block end with "]"

Command list

Load bank	Header	Instruction Type	Address	SN	Command	Data 1	Data 2	Data 3	Data 4	Checksum	end	data block
Write layer 1 scale properties	<	T	00	00	F2	00	00	00	00	F2	>	[scale_posx=100,scale_posy=50,scale_width=3000,scale_height=2000]
Write layer 2 crop properties	<	T	00	00	F2	00	01	00	00	F3	>	[crop_posx=45,crop_posy=90,crop_width=2780,crop_height=1200]
Write layer 3 input properties	<	T	00	00	F2	00	02	00	00	F4	>	[input=3]
Write layer 4 alpha properties	<	T	00	00	F2	00	03	00	00	F5	>	[alpha=64]
Invoke TAKE	<	T	00	00	78	00	00	00	00	78	>	

Typical Usage

Function	Send &Return	Result
Set Standard mode	<T000078040000007C>	
	<F000078040000007c>	Set Standard mode success
Write layer 1 scale and TAKE	<T0000F200010000F3>[scale_posx=100,scale_posy=50,scale_width=3000,scale_height=2000]<T0000780000000078>	
	<F0000f200010000f3>	Set properties of layer 1 success
Set PIP mode	<T000078040100007D>	
	<F000078040100007d>	Set PIP mode success

Address：S601 Weiye Building Torch Hi-Tech Industrial Development Zone Xiamen,Fujian P.R.C
Tel：4008 592 315 Fax：+86 592 5788216
Email: support@rgblink.com http://www.rgblink.com

Write sub layer properties and TAKE	<T0000F200000000F2>[scale_posx=100,scale_posy=50,scale_width=3000,scale_height=2000,crop_posx=45,crop_posy=90,crop_width=2780,crop_height=1200,input=0,alpha=64]<T0000780000000078>	
	<F0000f200010000f3>	Set properties of sub layer success
Write main layer input and TAKE	<T0000F200010000F3>[input=4]<T0000780000000078>	
	<F0000f200010000f3>	Set properties of main layer success
Set Presentation mode	<T000078040300007F>	
	<F000078040300007f>	Set Presentation mode success
Write layer 1 properties and TAKE	<T0000F200000000F2>[scale_posx=50,scale_posy=760,scale_width=850,scale_height=850 ,input=0]<T0000780000000078>	
	<F0000f200000000f2>	Set properties of layer 1 success
Write layer 2 properties and TAKE	<T0000F200010000F3>[scale_posx=1200,scale_posy=100,scale_width=700,scale_height=1800,crop_posx=45,crop_posy=90,crop_width=2780,crop_height=1200,input=1]<T0000780000000078>	
	<F0000f200010000f3>	Set properties of layer 2 success
Write layer 3 properties and TAKE	<T0000F200020000F4>[scale_posx=2000,scale_posy=760,scale_width=850,scale_height=850,input=4]<T0000780000000078>	
	<F0000f200020000f4>	Set properties of layer 3 success
Write layer 4 properties and TAKE	<T0000F200030000F5>[input=5]<T0000780000000078>	
	<F0000f200030000f5>	Set properties of layer 4 success

Reference

Decimal to Hexadecimal

Decimal	Binary	Hexadecimal	Decimal	Binary	Hexadecimal
0	00 00 00 00	00	50	00 11 00 10	32
1	00 00 00 01	01	51	00 11 00 11	33
2	00 00 00 10	02	52	00 11 01 00	34
3	00 00 00 11	03	53	00 11 01 01	35
4	00 00 01 00	04	54	00 11 01 10	36
5	00 00 01 01	05	55	00 11 01 11	37
6	00 00 01 10	06	56	00 11 10 00	38
7	00 00 01 11	07	57	00 11 10 01	39
8	00 00 10 00	08	58	00 11 10 10	3a
9	00 00 10 01	09	59	00 11 10 11	3b
10	00 00 10 10	0a	60	00 11 11 00	3c
11	00 00 10 11	0b	61	00 11 11 01	3d
12	00 00 11 00	0c	62	00 11 11 10	3e
13	00 00 11 01	0d	63	00 11 11 11	3f
14	00 00 11 10	0e	64	01 00 00 00	40
15	00 00 11 11	0f	65	01 00 00 01	41
16	00 01 00 00	10	66	01 00 00 10	42
17	00 01 00 01	11	67	01 00 00 11	43
18	00 01 00 10	12	68	01 00 01 00	44
19	00 01 00 11	13	69	01 00 01 01	45
20	00 01 01 00	14	70	01 00 01 10	46
21	00 01 01 01	15	71	01 00 01 11	47
22	00 01 01 10	16	72	01 00 10 00	48
23	00 01 01 11	17	73	01 00 10 01	49
24	00 01 10 00	18	74	01 00 10 10	4a
25	00 01 10 01	19	75	01 00 10 11	4b
26	00 01 10 10	1a	76	01 00 11 00	4c
27	00 01 10 11	1b	77	01 00 11 01	4d
28	00 01 11 00	1c	78	01 00 11 10	4e
29	00 01 11 11	1d	79	01 00 11 11	4f
30	00 01 11 10	1e	80	01 01 00 00	50
31	00 01 11 11	1f	81	01 01 00 01	51
32	00 10 00 00	20	82	01 01 00 10	52
33	00 10 00 01	21	83	01 01 00 11	53
34	00 10 00 10	22	84	01 01 01 00	54
35	00 10 00 11	23	85	01 01 01 01	55
36	00 10 01 00	24	86	01 01 01 10	56
37	00 10 01 01	25	87	01 01 01 11	57

38	00 10 01 10	26	88	01 01 10 00	58
39	00 10 01 11	27	89	01 01 10 01	59
40	00 10 10 00	28	90	01 01 10 10	5a
41	00 10 10 01	29	91	01 01 10 11	5b
42	00 10 10 10	2a	92	01 01 11 00	5c
43	00 10 10 11	2b	93	01 01 11 01	5d
44	00 10 11 00	2c	94	01 01 11 10	5e
45	00 10 11 01	2d	95	01 01 11 11	5f
46	00 10 11 10	2e	96	01 10 00 00	60
47	00 10 11 11	2f	97	01 10 01 01	61
48	00 11 00 00	30	98	01 10 01 10	62
49	00 11 00 01	31	99	01 10 01 11	63

ASCII

Bin	OCT	Dec	Hex	Abbreviation
0000 0000	0	0	00	NUT(null)
0000 0001	1	1	01	SOH(start of headline)
0000 0010	2	2	02	STX (start of text)
0000 0011	3	3	03	ETX (end of text)
0000 0100	4	4	04	EOT (end of transmission)
0000 0101	5	5	05	ENQ (enquiry)
0000 0110	6	6	06	ACK (acknowledge)
0000 0111	7	7	07	BEL (bell)
0000 1000	10	8	08	BS (backspace)
0000 1001	11	9	09	HT (horizontal tab)
0000 1010	12	10	0A	LF (NL line feed, new line)

0000 1011	13	11	0B	VT (vertical tab)
0000 1100	14	12	0C	FF (NP form feed, new page)
0000 1101	15	13	0D	CR (carriage return)
0000 1110	16	14	0E	SO (shift out)
0000 1111	17	15	0F	SI (shift in)
0001 0000	20	16	10	DLE (data link escape)
0001 0001	21	17	11	DC1 (device control 1)
0001 0010	22	18	12	DC2 (device control 2)
0001 0011	23	19	13	DC3 (device control 3)
0001 0100	24	20	14	DC4 (device control 4)
0001 0101	25	21	15	NAK (negative acknowledge)
0001 0110	26	22	16	SYN (synchronous idle)
0001 0111	27	23	17	ETB (end of trans. block)
0001 1000	30	24	18	CAN (cancel)
0001 1001	31	25	19	EM (end of medium)
0001 1010	32	26	1A	SUB (substitute)
0001 1011	33	27	1B	ESC (escape)
0001 1100	34	28	1C	FS (file separator)
0001 1101	35	29	1D	GS (group separator)
0001 1110	36	30	1E	RS (record separator)
0001 1111	37	31	1F	US (unit separator)

0010 0000	40	32	20	(space)
0010 0001	41	33	21	!
0010 0010	42	34	22	"
0010 0011	43	35	23	#
0010 0100	44	36	24	$
0010 0101	45	37	25	%
0010 0110	46	38	26	&
0010 0111	47	39	27	'
0010 1000	50	40	28	(
0010 1001	51	41	29	)
0010 1010	52	42	2A	*
0010 1011	53	43	2B	+
0010 1100	54	44	2C	,
0010 1101	55	45	2D	-
0010 1110	56	46	2E	.
00101111	57	47	2F	/
00110000	60	48	30	0
00110001	61	49	31	1
00110010	62	50	32	2
00110011	63	51	33	3
00110100	64	52	34	4

00110101	65	53	35	5
00110110	66	54	36	6
00110111	67	55	37	7
00111000	70	56	38	8
00111001	71	57	39	9
00111010	72	58	3A	:
00111011	73	59	3B	;
00111100	74	60	3C	<
00111101	75	61	3D	=
00111110	76	62	3E	>
00111111	77	63	3F	?
01000000	100	64	40	@
01000001	101	65	41	A
01000010	102	66	42	B
01000011	103	67	43	C
01000100	104	68	44	D
01000101	105	69	45	E
01000110	106	70	46	F
01000111	107	71	47	G
01001000	110	72	48	H
01001001	111	73	49	I

01001010	112	74	4A	J
01001011	113	75	4B	K
01001100	114	76	4C	L
01001101	115	77	4D	M
01001110	116	78	4E	N
01001111	117	79	4F	O
01010000	120	80	50	P
01010001	121	81	51	Q
01010010	122	82	52	R
01010011	123	83	53	S
01010100	124	84	54	T
01010101	125	85	55	U
01010110	126	86	56	V
01010111	127	87	57	W
01011000	130	88	58	X
01011001	131	89	59	Y
01011010	132	90	5A	Z
01011011	133	91	5B	[
01011100	134	92	5C	¥
01011101	135	93	5D	]
01011110	136	94	5E	^

01011111	137	95	5F	_
01100000	140	96	60	`
01100001	141	97	61	a
01100010	142	98	62	b
01100011	143	99	63	c
01100100	144	100	64	d
01100101	145	101	65	e
01100110	146	102	66	f
01100111	147	103	67	g
01101000	150	104	68	h
01101001	151	105	69	i
01101010	152	106	6A	j
01101011	153	107	6B	k
01101100	154	108	6C	l
01101101	155	109	6D	m
01101110	156	110	6E	n
01101111	157	111	6F	o
01110000	160	112	70	p
01110001	161	113	71	q
01110010	162	114	72	r
01110011	163	115	73	s

01110100	164	116	74	t
01110101	165	117	75	u
01110110	166	118	76	v
01110111	167	119	77	w
01111000	170	120	78	x
01111001	171	121	79	y
01111010	172	122	7A	z
01111011	173	123	7B	{
01111100	174	124	7C	|
01111101	175	125	7D	}
01111110	176	126	7E	~
01111111	177	127	7F	DEL (delete)