

External Communication Protocol

Version: B12.2

Date: 2005/04/20

External communication protocol include two parts : A. setup connecting, B. send command.

BenQ default Serial Port :

Baud Rate: 19200

Parity: none

Data bits: 8

Stop bits: 1

Flow Control: none

A. Setup Connecting

A typical Packet transaction session is shown in Figure 1

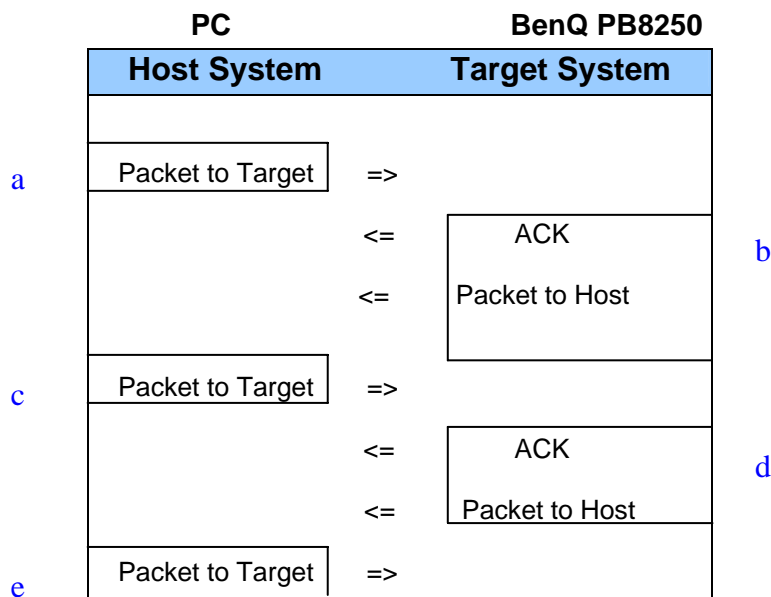


Figure 1

a. 1st Packet to Target (BenQ PB8250) structure like as below (Table 1)

	Byte0	0xBE	Magic Number
	Byte1	0xEF	
	Byte2	0x01	Packet Type

	Byte3	0x05	Packet size (Low)
	Byte4	0x00	Packet size (High)
	Byte5	0xD1	CRC (Low)
	Byte6	0xFA	CRC (High)
Packet Payload	Byte7	0x01	System Info Type
	Byte8	0x02	Version Number
	Byte9	0x00	
	Byte10	0x00	Object ID
	Byte11	0x00	Level

Table 1

b. The Ack of Packet to Host (PC) (Table 2)

Ack	Byte0	0x1E	PAK
Packet Header	Byte1	0xBE	Magic Number
	Byte2	0xEF	
	Byte3	0x01	Packet Type
	Byte4	0x05	Packet size (Low)
	Byte5	0x00	Packet size (High)
	Byte6	0xD1	CRC (Low)
	Byte7	0xFA	CRC (High)
Packet Payload	Byte8	0x01	System Info Type
	Byte9	0x02	Version Number
	Byte10	0x00	
	Byte11	0x00	Object ID
	Byte12	0x00	Level

Table 2

PAK means that PC will follow the received Packet data

c. Packet same as 1st Packet (Table 1)

d. Same as Ack (Table 2)

e. Packet to Target (BenQ PB8250) structure (Table 3)

Packet Header	Byte0	0xBE	Magic Number
	Byte1	0xEF	
	Byte2	0x01	Packet Type
	Byte3	0x05	Packet size (Low)
	Byte4	0x00	Packet size (High)
	Byte5	0xA9	CRC (Low)
	Byte6	0xC6	CRC (High)
Packet Payload	Byte7	0x00	System Info Type
	Byte8	0x00	Version Number
	Byte9	0x00	
	Byte10	0x00	Object ID
	Byte11	0x00	Level

Table 3

B. Send Command

1. Introduction

Command packets consist of “Header” and “Payload”. The Packet Header is consistent for all packets. The Packet Payload type and content varies based on the type of packet sent. The entire packet size is variable, being the sum of the fixed-size Packet Header and variable-sized Packet Payload.

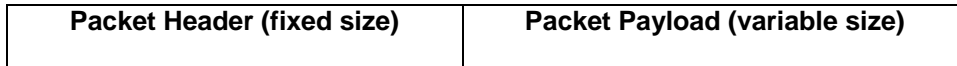


Figure 2 Packet Format

Packet Header Format

All Packets use the same Packet Header format illustrated [Figure 3](#).

Byte 0	1	2	3	4	5	6
Magic Number		Type	Packet Payload Size		CRC	
0xBE	0xEF	type	size_lo	size_hi	crc_lo	crc_hi

Figure 3 Packet Format

The Packet Header size is fixed at seven bytes (Intel byte ordering is used). The following code fragments are taken from these source files

The Packet Header definition is shown below:

```
typedef struct
{
    BYTE ePacketType; // type of the payload
    WORD nPacketSize; // size of the payload
    WORD nCRCPacket; // CRC for the entire packet
} PACKET_HEADER;
```

Magic Number

The Magic Number is a fixed value that is used to insure packet alignment if there are partial packets received or bytes lost. The Magic Number is a WORD in length (2 bytes). The Magic Number value is *0xEFBE*. Because Intel byte ordering is used, the ls-byte of the word is sent first (byte0 = 0xBE), then the ms-byte (byte1 = 0xEF).

Packet Type

The Packet Type (ePacketType) is a BYTE in length number that defines the type of data in the packet. The following entries are valid packet typess:

Table 4
Packet Types

Packet Type Name	Packet Type Number	Description
pt_INVALID	0	Invalid Packet Type
RESERVED	1	RESERVED
pt_EVENT	2	Host can send any event defined in BenQ PB8250 software.
pt_OPERATION	3	Host can send any operation defined in BenQ PB8250 software.

Packet Payload Size

The Packet Payload Size (nPacketSize) is a BYTE that defines the size of the Payload portion of the packet. If the packet contains only header information, this is zero. Therefore, the total byte count of any packet = nPacketSize plus 7 (since the Packet Header is seven bytes long).

Packet Checksum (CRC)

Each packet is CRC'ed using the tables later in this document. This number is the CRC value for the complete packet including the Packet Header and Packet Payload. The CRC is calculated with the nCRCPacket value initialized to zero.

2. Packet Payload Definition

Event Packet Type

The Event packet is used by the host system to send virtual events (such as Zoom, Source, Auto Adjust, etc.) to the target system. Packet payload size is 6 bytes.

Byte	Field Name	Field Value	Description
0-1	Virtual Event		Virtual Event ID as defined through Configurator
2-5	Parameter		Parameter that can be associated with the event.

. Table 5 Event Packet Type Format

The source code definition of the Message packet data structure is:

```
typedef struct
{
    WORD    eEvent;
    DWORD   dwParam;
} EVENT_MESSAGE;
```

This lets you send any event defined in Configurator to the system including all remote, IR, or special events

Operation Packet Type

The Operation packet is used by the host system to execute operations (such as Brightness, Contrast, Image Position, etc) in the target system. The Operation packet payload size is 25 bytes.

Byte	Field Name	Field Value	Description
0	Operation Type	1	OPERATION_SET
		2	OPERATION_GET
		3	OPERATION_INCREMENT
		4	OPERATION_DECREMENT
		5	OPERATION_EXECUTE
1-2	Operation		Operation ID as defined in Configurator
3-4	Is Avail		Operation is available
5-8	Operation Target		Used for Operation with Targets. These Targets are defined in configurator. For instance, op_BRIGHTNESS has a Target of either MAIN or PIP window..
9-12	Operation Value		Value of the Set on a set or the Value of the Get on a Return.
13-16	Operation Value of minimum.		The Minimum Value of the set for operation command.
17-20	Operation Value of maximum		The Maximum Value of the set for operation command.
21-24	Operation Value of Increment		The Increment Value of the set for operation command.

Table 6 Operation Packet Payload Format

The source code definition of the Operation packet data structure is:

```
typedef struct
{
    eOPERATION_TYPE    eOpType;

    WORD               eOperation;

    WORD               bisAvail;

    DWORD              dwTarget;

    DWORD              dwValue;

    DWORD              lmMin;

    DWORD              lmMax;

    DWORD              lmInc;
} OPERATION_MESSAGE;
```

This lets the user directly perform logical operations such as “Set Contrast = 80”.

3. Send Command

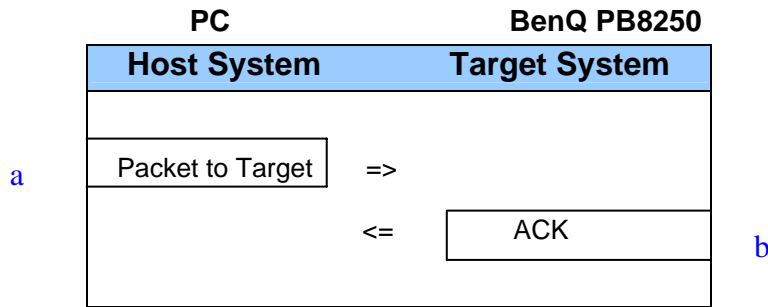


Figure 4

- a. The structure of Command (EX. input select) send to Target (BenQ PB8250) like as below (Table 7)

Packet Header	Byte0	0xBE	Magic Number
	Byte1	0xEF	
	Byte2	0x02	Packet Type
	Byte3	0x06	Packet size (Low)
	Byte4	0x00	Packet size (High)
	Byte5	0x80	CRC (Low)
	Byte6	0xC7	CRC (High)
Packet Payload	Byte7	0xC9	Virtual Event ID
	Byte8	0x00	
	Byte9	0x00	Parameter
	Byte10	0x00	
	Byte11	0x00	
	Byte12	0x00	

Table 7

- b. Target return to Host (PC) Ack like as below Table 8

Ack	Byte0	0x06	ACK
------------	-------	------	-----

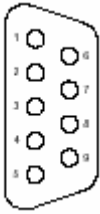
Table 8

C. Serial Communication Cable and Parameters

For external serial communication from a computer to BenQ projector, BenQ recommends manufactures use RS-232 communications over a straight through serial cable a 9 pin female D-sub9 connector.

The standard D-sub9 connector on the computer is a male connector, and BenQ projector, too. The wiring between the computer and BenQ projector is a straight through cable. A 9 pin female to 9 pin female straight through cable is a very standard part and readily available in many lengths.

Female D-sub9 pin-out numbering and definitions on both terminal :

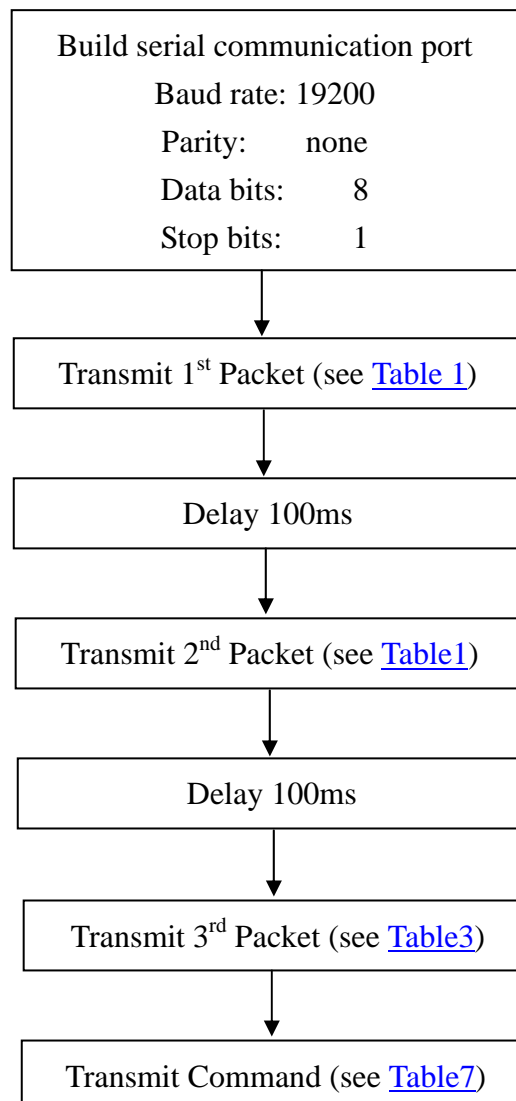


Pin number	Name
2	Transmit
3	Receive
5	Ground

PW Serial uses the following default serial port settings:

- . Baud Rate: 19200
- . Parity: none
- . Data bits: 8
- . Stop bits: 1
- . Flow Control: none

D. Software Flow Chart



Command List

Event Packet Type command:

Command	Packet Header (7 bytes)	Packet Payload (6 bytes)
Power	BE EF 02 06 00 E6 C7	CF 00 00 00 00 00
Auto	BE EF 02 06 00 07 CD	BE 00 00 00 00 00
Input select	BE EF 02 06 00 34 CD	BD 00 00 00 00 00
Menu	BE EF 02 06 00 D6 CC	BF 00 00 00 00 00
Exit	BE EF 02 06 00 9D C6	C4 00 00 00 00 00
Zoom +	BE EF 02 06 00 DC C5	D5 00 00 00 00 00
Zoom -	BE EF 02 06 00 EF C5	D6 00 00 00 00 00
Vol +	BE EF 02 06 00 6B C4	D2 00 00 00 00 00
Vol -	BE EF 02 06 00 BA C5	D3 00 00 00 00 00
PIP Source	BE EF 02 06 00 31 C1	E8 00 00 00 00 00
Freeze	BE EF 02 06 00 89 C5	D0 00 00 00 00 00
Ratio	BE EF 02 06 00 CE C1	E7 00 00 00 00 00
RS232 Power ON	BE EF 02 06 00 38 C3	F1 00 00 00 00 00
RS232 Power OFF	BE EF 02 06 00 0B C3	F2 00 00 00 00 00
Mute	BE EF 02 06 00 58 C4	D1 00 00 00 00 00
Blank	BE EF 02 06 00 0D C4	D4 00 00 00 00 00

Operation Packet Type Commands

General Controls

Command	Packet Header (7 bytes)	Packet Payload (25 bytes)
Select PC 1	BE EF 03 19 00 C8 4B	01 DA 02 CC CC 00×8 CC×12
Select PC 2	BE EF 03 19 00 58 8A	01 DA 02 CC CC 00×4 01 00 00 00 CC×12
Select DVI	BE EF 03 19 00 A9 CA	01 DA 02 CC CC 00×4 02 00 00 00 CC×12
Select YPbPr	BE EF 03 19 00 0B 49	01 DA 02 CC CC 00×4 04 00 00 00 CC×12
Select S-Video	BE EF 03 19 00 6A C8	01 DA 02 CC CC 00×4 06 00 00 00 CC×12
Select Video	BE EF 03 19 00 FA 09	01 DA 02 CC CC 00×4 07 00 00 00 CC×12
English Language	BE EF 03 19 00 01 DB	01 0B 02 CC CC FF FF FF FF 00 00 00 00 CC×12
Keystone +	BE EF 03 19 00 AB E7	03 65 02 CC CC 00 00 00 00 CC×16
Keystone -	BE EF 03 19 00 C5 4D	04 65 02 CC CC 00 00 00 00 CC×16

Power Controls

Command	Packet Header (7 bytes)	Packet Payload (25 bytes)
Power ON	BE EF 03 19 00 83 A9	01 23 03 CC CC FF FF FF FF 01 00 00 00 CC×12
Power Off	BE EF 03 19 00 13 68	01 23 03 CC CC FF FF FF FF 00 00 00 00 CC×16

PC Picture Controls

Command	Packet Header (7 bytes)	Packet Payload (25 bytes)
Brightness +	BE EF 03 19 00 44 A0	03 C7 02 CC CC 00 00 00 00 CC×16
Brightness -	BE EF 03 19 00 2A 0A	04 C7 02 CC CC 00 00 00 00 CC×16
Contrast +	BE EF 03 19 00 2E 19	03 C5 02 CC CC 00 00 00 00 CC×16
Contrast -	BE EF 03 19 00 40 B3	04 C5 02 CC CC 00 00 00 00 CC×16

YPbPr Picture Controls

Command	Packet Header (7 bytes)	Packet Payload (25 bytes)
Brightness +	BE EF 03 19 00 7B 14	03 D9 02 CC CC FF FF FF FF CC×16
Brightness -	BE EF 03 19 00 15 BE	04 D9 02 CC CC FF FF FF FF CC×16
Contrast +	BE EF 03 19 00 FA 6A	03 F1 02 CC CC FF FF FF FF CC×16

Contrast -	BE EF 03 19 00 94 C0	04 F1 02 CC CC FF FF FF FF CC×16
------------	----------------------	----------------------------------

S-Video / Composite Video Picture Controls

Command	Packet Header (7 bytes)	Packet Payload (25 bytes)
Brightness +	BE EF 03 19 00 E9 18	03 35 02 CC CC 00 00 00 00 CC x16
Brightness -	BE EF 03 19 00 87 B2	04 35 02 CC CC 00 00 00 00 CC x16
Contrast +	BE EF 03 19 00 16 FC	03 36 02 CC CC 00 00 00 00 CC x16
Contrast -	BE EF 03 19 00 78 56	04 36 02 CC CC 00 00 00 00 CC x16
Color +	BE EF 03 19 00 83 A1	03 37 02 CC CC 00 00 00 00 CC X16
Color -	BE EF 03 19 00 ED 0B	04 37 02 CC CC 00 00 00 00 CC x16
Tint +	BE EF 03 19 00 00 0F	03 4A 02 CC CC 00 00 00 00 CC x16
Tint -	BE EF 03 19 00 6E A5	04 4A 02 CC CC 00 00 00 00 CC x16
Sharpness +	BE EF 03 19 00 43 D0	03 38 02 CC CC 00 00 00 00 CC x16
Sharpness -	BE EF 03 19 00 2D 74	04 38 02 CC CC 00 00 00 00 CC x16

Misc Controls

Command	Packet Header (7 bytes)	Packet Payload (25 bytes)
Color Temp -50 (0)	BE EF 03 19 00 C7 42	01 53 02 CC CC 00 00 00 00 CE FF FF FF CC CC CC CC CC CC CC CC CC CC CC CC
0 (10)	BE EF 03 19 00 36 02	01 53 02 CC CC 00 00 00 00 00 00 00 00 CC CC CC CC CC CC CC CC CC CC CC CC
50 (20)	BE EF 03 19 00 ED 3C	02 53 02 CC CC 00 00 00 00 32 00 00 00 CC CC CC CC CC CC CC CC CC CC CC CC

PIP Controls

PIP Size		
Off	BE EF 03 19 00 15 02	01 8C 02 CC CC 01 00 00 00 03 00 00 00 CC CC CC CC CC CC CC CC CC CC CC CC
Small	BE EF 03 19 00 E4 42	01 8C 02 CC CC 01 00 00 00 00 00 00 00 CC CC CC CC CC CC CC CC CC CC CC CC
Medium	BE EF 03 19 00 74 83	01 8C 02 CC CC 01 00 00 00 01 00 00 00 CC CC CC CC CC CC CC CC CC CC CC CC
Large	BE EF 03 19 00 85 C3	01 8C 02 CC CC 01 00 00 00 02 00 00 00 CC CC CC CC CC CC CC CC CC CC CC CC
PIP Position		
Upper-Left	BE EF 03 19 00 1D 66	01 43 02 CC CC 01 00 00 00 00 00 00 00 CC CC CC CC CC CC CC CC CC CC CC CC
Upper-Center	BE EF 03 19 00 8D A7	01 43 02 CC CC 01 00 00 00 01 00 00 00 CC CC CC CC CC CC CC CC CC CC CC CC
Upper-right	BE EF 03 19 00 7C E7	01 43 02 CC CC 01 00 00 00 02 00 00 00 CC CC CC CC CC CC CC CC CC CC CC CC
Mid-Left	BE EF 03 19 00 EC 26	01 43 02 CC CC 01 00 00 00 03 00 00 00 CC CC CC CC CC CC CC CC CC CC CC CC
Mid-Center	BE EF 03 19 00 DE 64	01 43 02 CC CC 01 00 00 00 04 00 00 00 CC CC CC CC CC CC CC CC CC CC CC CC
Mid-Right	BE EF 03 19 00 4E A5	01 43 02 CC CC 01 00 00 00 05 00 00 00 CC CC CC CC CC CC CC CC CC CC CC CC
Lower-Left	BE EF 03 19 00 BF E5	01 43 02 CC CC 01 00 00 00 06 00 00 00 CC CC CC CC CC CC CC CC CC CC CC CC
Lower-Center	BE EF 03 19 00 2F 24	01 43 02 CC CC 01 00 00 00 07 00 00 00 CC CC CC CC CC CC CC CC CC CC CC CC
Lower-Right	BE EF 03 19 00 DB 61	01 43 02 CC CC 01 00 00 00 08 00 00 00 CC CC CC CC CC CC CC CC CC CC CC CC
PIP Source		

S-Video	BE EF 03 19 00 E8 36	01 DA 02 CC CC 01 00 00 00 03 00 00 00 CC CC CC CC CC CC CC CC CC CC CC CC
Video	BE EF 03 19 00 16 DD	01 39 02 CC CC 01 00 00 00 04 00 00 00 CC CC CC CC CC CC CC CC CC CC CC CC
PIP Brightness -50 (48)	BE EF 03 19 00 FE 0B	01 35 02 CC CC 01 00 00 00 CE FF FF FF CC CC CC CC CC CC CC CC CC CC CC CC
0 (126)	BE EF 03 19 00 8B CB	01 35 02 CC CC 01 00 00 00 00 00 00 00 CC CC CC CC CC CC CC CC CC CC CC CC
50 (204)	BE EF 03 19 00 FE 5E	01 35 02 CC CC 01 00 00 00 32 00 00 00 CC CC CC CC CC CC CC CC CC CC CC CC
PIP Contrast -50 (58)	BE EF 03 19 00 01 EF	01 36 02 CC CC 01 00 00 00 CE FF FF FF CC CC CC CC CC CC CC CC CC CC CC CC
0 (131)	BE EF 03 19 00 74 2F	01 36 02 CC CC 01 00 00 00 00 00 00 00 CC CC CC CC CC CC CC CC CC CC CC CC
50 (204)	BE EF 03 19 00 01 BA	01 36 02 CC CC 01 00 00 00 32 00 00 00 CC CC CC CC CC CC CC CC CC CC CC CC
PIP Color -50 (129)	BE EF 03 19 00 94 B2	01 37 02 CC CC 01 00 00 00 CE FF FF FF CC CC CC CC CC CC CC CC CC CC CC CC
0 (157)	BE EF 03 19 00 E1 72	01 37 02 CC CC 01 00 00 00 00 00 00 00 CC CC CC CC CC CC CC CC CC CC CC CC
50 (185)	BE EF 03 19 00 94 E7	01 37 02 CC CC 01 00 00 00 32 00 00 00 CC CC CC CC CC CC CC CC CC CC CC CC
PIP Tint -50 (0)	BE EF 03 19 00 17 1C	01 4A 02 CC CC 01 00 00 00 CE FF FF FF CC CC CC CC CC CC CC CC CC CC CC CC
0 (128)	BE EF 03 19 00 62 DC	01 4A 02 CC CC 01 00 00 00 00 00 00 00 CC CC CC CC CC CC CC CC CC CC CC CC
50 (255)	BE EF 03 19 00 17 49	01 4A 02 CC CC 01 00 00 00 32 00 00 00 CC CC CC CC CC CC CC CC CC CC CC CC

Status Query Commands

Status Item	HEX sent to the projector (32 bytes) HEX return from the projector (32 bytes) (Query item inversed, INTEL HEX format)
Input Source	(to projector) BE EF 03 19 00 83 B4 02 DA 02 CC CC 00×8 CC×12 (from projector) 1E BE EF 03 19 00 00 00 02 DA 02 01 00×5 01 00 00 00 CC×12
Lamp Hour	(to projector) BE EF 03 19 00 7A B1 02 07 02 CC CC FF×4 00×4 CC×12 (from projector) 1E BE EF 03 19 00 00 00 02 07 02 01 00 FF×4 AC 10 00 00 CC×12
Power Status Off: 0 On: 1 Cooling: 2	(to projector) BE EF 03 19 00 58 97 02 23 03 CC CC FF×4 00×4 CC×12 (from projector) 1E BE EF 03 19 00 00 00 02 23 03 01 00 FF×4 00 00 00 00 CC×12
PC Brightness	(to projector) BE EF 03 19 00 BC B1 02 C7 02 CC CC 00×8 CC×12 (from projector) 1E BE EF 03 19 00 00 00 02 C7 02 01 00×5 20 00 00 00 CC×12
PC Contrast	(to projector) BE EF 03 19 00 D6 08 02 C5 02 CC CC 00×8 CC×12 (from projector) 1E BE EF 03 19 00 00 00 02 C5 02 01 00×5 20 00 00 00 CC×12
Video Brightness	(to projector) BE EF 03 19 00 11 09 02 35 02 CC CC 00×8 CC×12 (from projector) 1E BE EF 03 19 00 00 00 02 35 02 00 00×5 20 00 00 00 CC×12
Video Contrast	(to projector) BE EF 03 19 00 EE ED 02 36 02 CC CC 00×8 CC×12 (from projector) 1E BE EF 03 19 00 00 00 02 36 02 00 00×5 20 00 00 00 CC×12
YPbPr Brightness	(to projector) BE EF 03 19 00 83 05 02 D9 02 CC CC FF×4 00×4 CC×12 (from projector) 1E BE EF 03 19 00 00 00 02 D9 02 01 00 FF×4 80 00 00 00 CC×12
YPbPr Contrast	(to projector) BE EF 03 19 00 02 7B 02 F1 02 CC CC FF×4 00×4 CC×12 (from projector) 1E BE EF 03 19 00 00 00 02 F1 02 01 00 FF×4 A9 00 00 00 CC×12

