**OPPO BDT-101CI Blu-ray Transport**

**IP Control Protocol**

**(Version 1.0, November 18, 2015)**

**Note:** This document describes a preliminary version of the IP control protocol for OPPO BDT-101CI Blu-ray transports. This feature allows a network-connected device such as a PC or a smartphone to control the OPPO Blu-ray transport. The OPPO Blu-ray transport functions as a Server, which broadcasts the message, waits and listens to the port(s), responds to the client’s connection, receives the client’s commands, and performs the action. The network device functions as a Client, which receives and processes the broadcasting message, sets up the TCP connection with the Server, and sends the control commands. In the remainder of this document, we use “Server” for BDT-101CI Blu-ray transport and “Client” for the network device.

The complete client control procedure can be described in three sections: DISCOVER, CONNECT and COMMAND.

1. **DISCOVER**

Once the Server is running, it will automatically broadcast the UDP message every 10 seconds to notify any interested Client about its availability, as well as the IP address, the port number, and the Server’s name. The Client needs to receive this broadcasting message, extract the IP address, port number, Server name, and establish the connection with the Server. Once the connection is done, the Client should also discard any future broadcasting messages.

The address used for the Server’s message broadcast is: 239.255.255.251:7624

The format of the broadcasting message is:

 Notify: OPPO Player Start

 Server IP:

 Server Port:

 Server Name:

For example:

 Notify: OPPO Player Start

 Server IP: 192.168.0.2

 Server Port: 23

 Server Name: OPPO BDT-101CI

1. **CONNECT**

The Client will use the IP address and port number extracted from the broadcasting message to establish the TCP connection with the Server.

If the Client already knows the Server’s IP address, the Client can establish the connection directly by using the Server’s IP address.

1. **COMMAND**

Once the connection is established between the Server and the Client, the Client can send the commands to remotely control the Server.

**Command Structure:**

Each command starts with a # sign (ASCII 0x23), followed by a 3-character command code. If there are any parameters for the command, the parameters are given in text format, separated by a space (ASCII 0x20) from the command code. The # character(ASCII 0x23) must never appear in the parameters. A carriage return (ASCII 0x0d) indicates the end of the command. A line feed (ASCII 0x0a) can optionally follow the carriage return and will be ignored. Each command generally may not exceed 25 bytes including the start of the command and end of the command. (Certain special commands may exceed the 25 bytes limit and will not be available via the RS232 control port.)

The illustration of the command structure is as follows:

<Command> = <Start of Command><Command Code>[<sp><Parameters>]<End of Command>

<Start of Command> = #, ASCII 0x23

<Command Code> = <byte><byte><byte>

<sp> = space, ASCII 0x20

<Parameters> = command-specific

<End of Command> = CR, ASCII 0x0d[LF, ASCII 0x0a]

**Response Structure:**

Upon receiving a command, the player will try to execute the command and send back a response. The response starts with an “@” sign (ASCII 0x23), followed by the original command code and a space (ASCII 0x20), and a result code, either “OK” or “ER”. If there are any parameters or additional message, the parameters or message is given in text format, separated by a space (ASCII 0x20) from the result code. The @ character (ASCII 0x40) must never appear in the parameters or message. A carriage return (ASCII 0x0d) indicates the end of response. Each response generally may not exceed 25 bytes including the start of the response and the end of the response. (Certain special responses may exceed the 25 bytes limit and will not be available via the RS232 control port.)

The illustration of the response structure is as follows:

<Response> = <Start of Response><Command Code><sp><Result Code>

[<sp><Parameters>]<End of Response>

<Start of Response> = @, ASCII 0x40

<Command Code> = <byte><byte><byte>

<Result Code> = OK|ER

<sp> = space, ASCII 0x20

<Parameters> = command-specific

<End of Response> = CR, ASCII 0x0d

**Status Update Messages Structure:**

If the verbose mode is set to 2 or 3, the player will send status update messages automatically. These messages are not a response to any particular command. Any status change caused by commands from IP or RS232 control, front panel buttons, IR remote control, or playback progress may trigger status update messages.

The status update messages have the following structure:

<Update> = <Start of Update><Status Code>[<sp><Parameters>]<End of Update>

<Start of Update> = @, ASCII 0x40

<Status Code> = <byte><byte><byte>

<sp> = space, ASCII 0x20

<Parameters> = status-specific

<End of Response> = CR, ASCII 0x0d

**Command Sequence:**

Commands are executed in the order they are received. The control client should wait for a response from the player before sending the next command.

If the player receives a new command before executing the previous command, the player may execute the commands in sequence or discard the previous command, depending on the internal processing of the player. The control client should avoid sending multiple commands in sequence without waiting for a response.

If the host does not receive a response from the player 10 seconds after the command is issued, the host may consider the command or response lost during transmission, and can retransmit the command.

**Command List:**

1. Command that maps to a remote control button

This group of commands maps directly to the infrared remote control keys. No parameters are needed for these commands. The player handles the commands as if it receives the same IR remote commands. For actions that require a multiple-key sequence, such as go to a certain chapter (GOT command followed by multiple numeric key commands and the SEL command), the player responds to each command individually until the last command is received. At that time the player will respond with either OK or ER depending on the result of the action.

|  |  |  |  |
| --- | --- | --- | --- |
| **Command Code** | **Remote Key** | **Function** | **Response Example** |
| POW | POWER | Toggle power STANDBY and ON | OK ONOK OFF |
| EJT | OPEN | Open/close the disc tray | OK OPENOK CLOSE |
| PON | ON | Discrete on | OK ON |
| POF | OFF | Discrete off | OK OFF |
| DIM | DIMMER | Dim front panel display | OK ONOK DIMOK OFF |
| PUR | PURE AUDIO | Pure audio mode (no video) | OK ONOK OFF |
| VUP | VOL + | Increase volume | OK n (n is the volume number, 0 – 100) |
| VDN | VOL -  | Decrease volume | OK n (n is the volume number, 0 – 100) |
| MUT | MUTE | Mute audio | OK MUTEOK UNMUTE |
| NU1 | 1 | Numeric key 1 | OK |
| NU2 | 2 | Numeric key 2 | OK |
| NU3 | 3 | Numeric key 3 | OK |
| NU4 | 4 | Numeric key 4 | OK |
| NU5 | 5 | Numeric key 5 | OK |
| NU6 | 6 | Numeric key 6 | OK |
| NU7 | 7 | Numeric key 7 | OK |
| NU8 | 8 | Numeric key 8 | OK |
| NU9 | 9 | Numeric key 9 | OK |
| NU0 | 0 | Numeric key 0 | OK |
| CLR | CLEAR | Clear numeric input | OK |
| GOT | GOTO | Play from a specified location | OK |
| HOM | HOME | Go to Home Menu to select media source | OK |
| PUP | PAGE UP | Show previous page | OK |
| PDN | PAGE DOWN | Show next page | OK |
| OSD | DISPLAY | Show/hide on-screen display | OK |
| TTL | TOP MENU | Show BD top menu or DVD title menu | OK |
| MNU | POP-UP MENU | Show BD pop-up menu or DVD menu | OK |
| NUP | Up Arrow | Navigation | OK |
| NLT | Left Arrow | Navigation | OK |
| NRT | Right Arrow | Navigation | OK |
| NDN | Down Arrow | Navigation | OK |
| SEL | ENTER | Navigation | OK |
| SET | SETUP | Enter the player setup menu | OK |
| RET | RETURN | Return to the previous menu or mode | OK |
| RED | RED | Function varies by content | OK |
| GRN | GREEN | Function varies by content | OK |
| BLU | BLUE | Function varies by content | OK |
| YLW | YELLOW | Function varies by content | OK |
| STP | STOP | Stop playback | OK |
| PLA | PLAY | Start playback | OK |
| PAU | PAUSE | Pause playback | OK |
| PRE | PREV | Skip to previous | OK |
| REV | REV | Fast reverse play | OK 1X |
| FWD | FWD | Fast forward play | OK 1X |
| NXT | NEXT | Skip to next | OK |
| AUD | AUDIO | Change audio language or channel | OK |
| SUB | SUBTITLE | Change subtitle language | OK |
| ANG | ANGLE | Change camera angle | OK a/b (a: current angle number, b: total available angles) |
| ZOM | ZOOM | Zoom in/out and adjust aspect ratio | OK (zoom ratio text) |
| SAP | SAP | Turn on/off Secondary Audio Program | OK (audio track information)OK Off |
| ATB | AB REPLAY | Repeat play the selected section | OK A-OK A-BOK OFF |
| RPT | REPEAT | Repeat play | OK Repeat ChapterOK Repeat TitleOK OFF |
| PIP | PIP | Show/hide Picture-in-Picture | OK (PIP program info)OK Off |
| HDM | RESOLUTION | Switch output resolution | OK |
| SUH | SUBTITLE (hold) | Press and hold the SUBTITLE key. This activates the subtitle shift feature | OK |
| OPT | OPTION | Show/hide the Option menu | OK |
| M3D | 3D | Show/hide the 2D-to-3D Conversion or 3D adjustment menu | OK |
| SEH |  | Display the Picture Adjustment menu | OK |
| NOP |  | No operation.  | OK |

1. Query Commands

This group of commands issues queries to the player. The player will respond according to its current status.

|  |  |  |
| --- | --- | --- |
| **Command Code** | **Function** | **Response Example** |
| QVM | Query verbose mode | OK 0OK 1OK 2OK 3 |
| QPW | Query power status | OK ONOK OFF |
| QVR | Query firmware version | OK BDT101-xx-xxxx |
| QVL | Query volume | OK 100OK MUTE |
| QHD | Query HDMI resolution | OK Source DirectOK AUTOOK UHD\_AUTOOK UHD24OK UHD50OK UHD60OK 1080PAUTOOK 1080P24OK 1080P50OK 1080P60OK 1080I50OK 1080I60OK 720P50OK 720P60OK 576POK 576IOK 480POK 480I |
| QPL | Query playback status | OK NO DISCOK LOADINGOK OPENOK CLOSEOK PLAYOK PAUSEOK STOPOK STEPOK FREVOK FFWDOK SFWDOK SREVOK SETUPOK HOME MENUOK MEDIA CENTER |
| QTK | Query Track/Title | OK 02/10 |
| QCH | Query Chapter | OK 03/03 |
| QTE | Query Track/Title elapsed time | OK 00:01:34 |
| QTR | Query Track/Title remaining time | OK 01:20:23 |
| QCE | Query Chapter elapsed time | OK 00:01:34 |
| QCR | Query Chapter remaining time | OK 00:12:22 |
| QEL | Query Total elapsed time | OK 00:05:12 |
| QRE | Query Total remaining time | OK 01:34:44 |
| QDT | Query disc type | OK BD-MVOK DVD-VIDEOOK DVD-AUDIOOK SACDOK CDDAOK HDCDOK DATA-DISC |
| QAT | Query audio type | OK DD 1/1OK DD 1/5 EnglishOK DTS 2/5 EnglishOK LPCMOK DTS-HD 1/4 English |
| QST | Query subtitle type | OK OFFOK 1/1 English |
| QSH | Query subtitle shift | OK -10(valid returns are -10 .. 0 .. 10) |
| QOP | Query OSD position | OK 0(valid returns are 0 .. 5) |
| QRP | Query Repeat Mode | OK 00 Off(OK followed by a repeat mode code and text:00 Off01 Repeat One02 Repeat Chapter03 Repeat All04 Repeat Title05 Shuffle06 Random) |
| QZM | Query Zoom Mode | OK 00(OK followed by a zoom mode code:00 Off01 Stretch02 Full03 Underscan04 1.2x05 1.3x06 1.5x07 2x08 3x09 4x10 1/211 1/312 1/4) |

1. Advanced Commands

This group of commands instructs the player to perform an advanced operation in a single step.

|  |  |  |  |
| --- | --- | --- | --- |
| **Command Code** | **Parameters** | **Function** | **Response Example** |
| SVM | 0123 | 0 – Set Verbose Mode to off1 – Not in use (for backwards compatibility)2 – Enable unsolicited status update. Only major status changes are reported.3 – Enable detailed status update. When content is playing, the player sends out playback time update every second. | OK 0OK 1OK 2OK 3 |
| SHD | AUTOSRCUHD\_AUTOUHD24UHD50UHD601080P\_AUTO1080P241080P501080P601080I501080I60720P50720P60576P576I480P480I | Set HDMI output resolution for HDMI 2.480i – Standard definition interlaced 480i576P – Standard definition progressive 576PSRC – Source Direct | OK 480P(OK followed by the original parameter) |
| SZM | 1ARFSUS1.21.31.521/2341/31/4 | Set zoom ratio.AR – Aspect ratio correction (Stretch, Letterbox or Pillarbox)FS – Full ScreenUS – UnderscanFor HDMI Output: 1, AR, FS, US, 1.2, 1.3, 1.5, 2, 1/2;For Component Output: 1, 2, 3, 4, 1/2, 1/3, 1/4) | OK 1.2(OK followed by the zoom ratio)ER INVALID |
| SVL | 0 – 100MUTE | Set volume control | OK 100OK MUTE |
| SRP | CHTTALLOFFSHFRND | Repeat chapterRepeat title or CD trackRepeat allRepeat offShuffleRandom | OK CH(OK followed by the repeat mode)ER INVALID |
| SRH | T3C10C 0:00:34T 0:12:130:12:13 | Search to Title 3 Search to Chapter 10Search to 0:00:34 of the current chapter or trackSearch to 0:12:13 of the current title or discSearch to 0:12:13 of the current title or disc  | OKER INVALID |
| DPL |  | Direct play | OK |
| RST |  | Reset Command – Clean all command buffers, do not wait for any pending/executing commands. Start over again. | OK |
| SSH | -10 ... 10 | Set subtitle shift | OK -10 (OK followed by the shift level)ER INVALID |
| SOP | 0 … 5 | Set OSD position | OK 5 (OK followed by the position value)ER INVALID |
| STC | ERTXCK | Set the time information display:E – Total Elapsed timeR – Total Remaining timeT – Title Elapsed timeX – Title Remaining timeC – Chapter/track Elapsed timeK – Chapter/track Remaining time | OK E(OK followed by the display type)ER INVALID |

**Status Update Messages:**

The following status update messages are sent by the player automatically when the verbose mode is set to 2 or 3.

Verbose Mode 2:

**UPW** - Power Status Update:

 Sent when there is a change in power on/off status.

 *Possible parameters*: 1 digit

1 – Player is turned on

0 – Player is going off

 *Example*: UPW 1

**UPL** - Playback Status Update:

 Sent when there is a change in playback status.

 *Possible Parameters*: 4 chars

 DISC – No disc

 LOAD – Loading disc

 OPEN – Tray is open

 CLOS – Tray is closing

 PLAY – Playback is starting

 PAUS – Playback is paused

 STOP – Playback is stopped

 STPF – Forward frame-by-frame step mode

 STPR – Reverse frame-by-frame step mode

FFWn – Fast forward mode. Where n is a number of 1... 5 to indicate the speed level

FRVn – Fast reverse mode. Where n is a number of 1… 5 to indicate the speed level

SFWn – Slow forward mode. Where n is a number of 1…4 to indicate the speed level (1 = ½, 2 = ¼, 3 = 1/8, 4 = 1/16)

SRVn – Slow reverse mode. Where n is a number of 1…4 to indicate the speed level (1 = ½, 2 = ¼, 3 = 1/8, 4 = 1/16)

 HOME – in home menu

 MCTR – in media center

 *Example*: UPL PLAY

**UVL** - Volume Level Update:

 Sent when there is a change in volume level or mute status.

 *Possible Parameters*: 3 chars

 MUT – Mute is engaged

 000 .. 100 – Current volume level. Also sent when mute is cancelled.

 *Example*: UVL 095

**UDT** - Disc Type Update:

 Sent when a new disc type is detected.

 *Possible Parameters*: 4 chars

 BDMV - Blu-ray Disc

 DVDV – DVD-Video

 DVDA – DVD-Audio

 SACD

 CDDA

 HDCD

 DATA – Data disc

 VCD2 – VCD 2.0

 SVCD - SVCD

 *Example*: UDT DVDV

**UAT** - Audio Type Update:

 Sent when a new audio track is encountered.

*Parameters*: Type (2 chars), space, number (01/99, 5 chars), space, language (3 chars), space, channels (2 chars)

 *Type code*:

 DD – Dolby Digital

 DP – Dolby Digital Plus

 DT – Dolby TrueHD

 TS – DTS

 TH – DTS-HD High Resolution

 TM – DTS-HD Master Audio

 PC – LPCM

 MP – MPEG Audio

 CD – CD Audio

 UN – Unknown

*Number*: current audio track / available audio tracks in 2-digit number format. For example, 01/99 means the first of 99 available tracks; 02/05 means the second of 5 available tracks. If only one track is available, it is 01/01.

*Language*: Three-character language code: ENG for English, FRA for French, and so on (ISO3166). UNK for unknown.

*Channels*: 1.0 for mono, 2.0 for stereo, 5.1 or 7.1 for 5.1-channel or 7.1-ch surround, 0.0 for unknown.

 *Example*: UAT DD 01/05 ENG 5.1

**UST** - Subtitle Type Update:

 Sent when a new subtitle is selected.

 *Parameters*: number (01/99, 5 chars), space, language (3 chars)

*Number*: current subtitle track / available subtitle tracks in 2-digit number format. For example, 01/99 means the first of 99 available tracks; 02/05 means the second of 5 available tracks. If subtitle is set to off, use 00/xx where xx is the number of available subtitle tracks. If no subtitle is available, use 00/00.

*Language*: Three-character language code: ENG for English, FRA for French, and so on (ISO3166). UNK for unknown.

 *Example*: UST 02/05 ENG

Verbose Mode 3:

**UTC** - Time Code Update:

Sent every second when the playback time advances. The time information is the same as the front panel display. To switch to a different type of time information, please refer to the STC command.

*Parameters*: Title (3 digits), space, Chapter (3 digits), space, Type (1 chars), space, time (8 chars HH:MM:SS)

*Title*: Current title number. For example, 001. For discs without title numbers (CD), 001 is always used.

 *Chapter*: Current chapter or track number. For example, 003.

 *Type Code*:

 E – Total Elapsed time

 R – Total Remaining time

 T – Title Elapsed time

 X – Title Remaining time

 C – Chapter/track Elapsed time

 K – Chapter/track Remaining time

 *Example*: UTC 001 001 C 00:01:23

**UVO** - Video Resolution Update:

 Sent when the source content resolution or the output resolution is changed.

 *Parameters*: Source resolution (7 chars), space, Output resolution (7 chars)

 *Resolution Names*:

\_480I60 – 480i 60/59.94Hz

 \_480P60 – 480p 60/59.94Hz

 \_576I50 – 576i 50Hz

 \_576P50 – 576p 50Hz

 \_720P60 – 720p 60/59.94Hz

 \_720P50 – 720p 50Hz

 1080I60 – 1080i 60/59.94Hz

 1080I50 – 1080i 50Hz

 1080P60 – 1080p 60/59.94Hz

 1080P50 – 1080p 50Hz

1080P30 – 1080p 30Hz

1080P25 – 1080p 25Hz

 1080P24 – 1080p 24Hz

 1080P23 – 1080p 23.97Hz

\_UHD60\_ – 4Kx2K 60Hz/59.94Hz

\_UHD50\_ – 4Kx2K 50Hz

UHD6042 – 4Kx2K 60Hz/59.94Hz, 420 color space

UHD5042 – 4Kx2K 50Hz, 420 color space

\_UHD30\_ – 4Kx2K 30Hz

\_UHD25\_ – 4Kx2K 25Hz

\_UHD24\_ – 4Kx2K 24Hz

\_UHD23\_ – 4Kx2K 23.97Hz