

BDP-LX91 BDP-09FD

Communication Interface User's Manual

We recommend using the latest software.

Version 1.00

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1 Introduction

This unit is a BD player allowing playback of BDs, DVDs and CDs.

In addition to the basic operations on the main unit and using the remote control, the player is also equipped with an RS-232C-compatible serial control interface allowing connection to a computer.

This manual explains procedures and cautions related to controlling the player using this interface. For instructions on using the buttons on the remote control and front panel, refer to the operating instructions included with the player.

2 Serial control

2.1 Interface Specifications

2.1.1 Signal level

RS-232C level

2.1.2 Data format

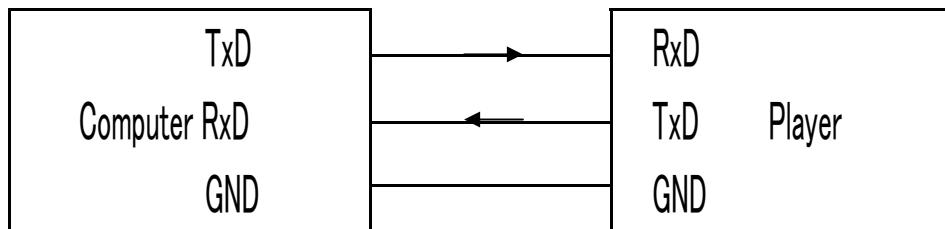
Data length : 8 bits
Stop bit : 1 bit
Parity : None

2.1.3 Signal transfer rate (baud rate)

The baud rate is fixed to 115200 (bps).

2.2 Connection to a Computer

The computer and player are connected with three wires, as shown on the diagram below.



The player accepts commands whenever the power is turned on.

Thus, when using with a standard RS-232C port on the computer, there is no need to connect any

control wires other than TxD and RxD.

With some computers, however, hardware processing of the CTS input is required for operation.

In this case a DTR output can be used. As long as signal transfer is possible, a positive potential is output for DTR. Connect the DTR output to the computer's CTS input.

2.3 Commands and Status

Processing differs for the remote control button commands and other commands.

When the player receives a remote control button command, it sends the "Completed" message (R<CR>) and conducts the same operation as the remote control button.

As the basic protocol for commands other than "remote control button" commands, the computer issues the command to the player and the player returns the status.

Examples:	<u>Computer</u>	<u>Player</u>
(1) "Stop playback"		→ (2) Playback stops.
	99RJ<CR>	
		← (3) "Completed"
		R<CR>
(4) "Open disc tray"		→ (5) Disc tray opens.
	OP <CR>	
		← (6) "Completed"
		R<CR>

Once execution of the command is fully completed, the player sends the "Completed" message (R<CR>).

If an error occurs, the player sends the error code, for example "04<CR>".

The function for returning the status automatically with respect to execution of commands is called "Auto status".

The auto status function notifies the computer of the timing for issuing the next command.

If the computer does not use this function, the next command must be issued after fully considering the command processing time.

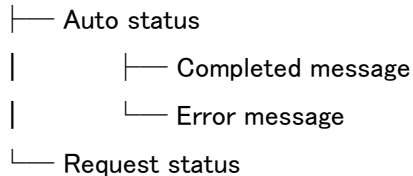
There is also the "Request status" function for checking the player's status, making it possible to learn player information and such disc information as the operating mode, time, etc.

The main request status functions are as shown below.

-
- ?P – To know the player's operating mode.
 - ?A, ?R, ?C, ?T, ?I – To know the current time, chapter, title/track number, etc.
 - ?L, ?E, ?Z – To know the player's information.

The status function is as follows:

Status report



3 Commands

3.1 Power on Processing

When the remote control button "Power" command is sent by RS-232C command while the power is off, power on processing is performed.

Even if other commands are received simultaneously with the remote control button "Power" command, only power on processing is performed.

When the remote control button "Play" command is received as well, power on processing is performed and playback is started.

3.2 Command Structure

3.2.1 Command mnemonics

Commands use ASCII English letters and are expressed in two letters.

There is no distinction between capital and small letters.

Arguments are added to commands to specify chapter numbers or titles, etc.

3.2.2 Arguments

Arguments are expressed in ASCII decimal numbers, placed in front of the command.

If a command requiring an argument has no argument, an error is generated.

3.2.3 Command string buffer

When commands are received, a command string of up to 32 characters is buffered. Characters beyond the 32nd character are ignored.

3.2.4 Command string termination

When the <CR> code is received, this terminates the command.

3.2.5 Command processing

Buffered commands are extracted in order and the operation is started.

Once execution of the command is fully completed, the "Completed" message (R<CR>) is sent.

If <SPACE> or <LF> (line feed) is included in the received command string, it is ignored.

If the command is unusable, the error message in 3.3.7 is sent.

If an error is generated, subsequent commands are not executed.

3.2.6 "Completed" message

"Completed" messages used with the auto status function are expressed "R".

3.2.7 Error messages

Error messages are expressed as "E" followed by a two-digit error code.

Example: E04<CR>

Error messages are returned when the issued command cannot be executed, obstructing continued control.

3.2.8 Exception processing

If a different command is received while executing another command, execution of the previous command is interrupted and the new command is executed.

3.2.9 Request status

Commands including a "?" indicate a request status. Information associated with the command is sent, terminated with <CR> and returned.

If multiple request commands are issued within the command string, a status terminated by <CR> is returned for each.

Example: ? R? C<CR> → 01<CR>
 05<CR>

3.3 Error Messages

If an error is generated while a command is being executed, an error code such as "E04<CR>" on the table below is returned.

Only the most recent error code is stored, and is canceled when the power is turned off.

The initial value of the error code is "00".

Code	Error type	Explanation
E04	Feature not available	Attempt to execute a function that is not usable was made · Command mnemonics are wrong · That mode cannot be used
E06	Missing Argument	Proper parameter has not been specified
E12	Search Error	Search address cannot be found
E99	Panic Error	Fatal error has occurred · Disc cannot be loaded · Player has stopped due to mechanical error · Player has stopped because playback cannot continue, etc.

3.4 List of Commands

Below is a list of RS-232C commands.

For details on individual commands, see *3.5 Command Details*.

Playback-related commands(*1) are only valid for BDMV, BDAV, DVD-Video, DVD VR, CD-DA and DTS-CD discs.

(*1) Playback-related commands: Stop, Play, Pause, Still, Search & Play, Current Address Request, Time Code Request, Title/Track Number Request, Chapter Number Request and Index Number Request

Operation-related commands(*2) do not operate when any screen other than a screen displayable in the play mode(*3) is displayed.

(*2) Operation-related commands: Stop, Play, Pause, Still, Search & Play, Menu Call, Numeric Button, Button Select, Enter Button and Slow

(*3) Screens displayable in the play mode: Now Playing screen, play mode screen, picture quality adjustment screen, audio adjustment screen, etc.

An address can be specified for commands for which "Address" is indicated in the command mnemonic.

The specified address operates according to the address mode.

The types of applications and address modes that can be specified are shown below.

The initial value of the address mode is "TM(Time)".

		BDMV	BDAV	DVD-Video	DVD VR	CD-DA	DTS-CD
Address mode	TM (Time)	○	○	○	○	○	○
	TI (Title)	○	○	○	○	×	×
	CH (Chapter)	○	○	○	○	×	×

An argument can be specified for commands for which "Argument" is indicated in the command mnemonic.

For details about arguments, see the separate commands under *3.5 Command Details*.

RS-232C Command

No.	Command Name	Mnemonic	Function
1	Open	OP	Opens the disc tray.
2	Close	CO	Closes the disc tray.
3	Stop	99RJ	Stops playback.
4	Key Lock	(Argument)KL	Controls button and tray locking.
5	Current Address Request	?A	Returns all information on currently playing title/chapter number, etc.
6	Time Code Request	?T	Returns currently playing time.
7	Title/Track Number Request	?R	Returns currently playing title/track number.
8	Chapter Number Request	?C	Returns currently playing chapter number.
9	Index Number Request	?I	Returns currently playing track number and index number.
10	Player Active Mode Request	?P	Returns player's current operating status.
11	Error Code Request	?E	Returns the latest error code.
12	Firmware Version Request	?Z	Returns the firmware version.
13	Player Model Name Request	?L	Returns the player's model name, including destination code.
14	Slow	(Argument)SW	Sets slow motion playback.
15	Remote control Button	/(Argument)/RU	Conducts the same operation as the remote control buttons. For the correspondence between the remote control buttons and arguments, see Remote Control Button Commands and Arguments below.

Remote Control Button Command

Commands and arguments are assigned to the buttons on the player's remote control unit.
In cases in which operation differs from that of the remote control button, the explanation is given under *Function*.

No.	Command Name	Argument	Function
1	STANDBY/ON	A181AFBC	Turns the power on and off.
2	OPEN/CLOSE	A181AFB6	Opens and closes the disc tray.
3	AUDIO	A181AFBE	Switches the audio.
4	SUBTITLE	A181AF36	Switches the subtitles.
5	ANGLE	A181AFB5	Switches the BDMV or DVD-Video disc angle.
6	SECONDARY VIDEO	A181AFBF	When this command is received while playing a BDMV disc containing secondary video (Picture in Picture), the player
7	SECONDARY AUDIO	A181AFBD	When this command is received while playing a BDMV disc containing secondary audio, the player switches to the secondary
8	PLAY MODE	A181AF7F	Displays/turns off the play mode screen.
9	VIDEO ADJUST	A181AF30	Displays/turns off the picture quality adjustment screen.
10	HOME MEDIA GALLERY	A181AFF7	Displays/turns off the Home Media Gallery.
11	TOP MENU	A181AFB4	Displays the top menu screen for the BDMV or DVD-Video disc.
12	HOME MENU	A181AFB0	Displays/turns off the Home Menu.
13	MENU (POPUP MENU)	A181AFB9	Displays the menu screen for the BDMV or DVD-Video disc.
14	UP	A184FFFF	Used to select items, change settings, move the cursor, etc.
15	DOWN	A185FFFF	* Not compatible with long-press operation, cannot be used for
16	LEFT	A187FFFF	moving among selected items, changing settings or moving the
17	RIGHT	A186FFFF	cursor through long-press operation.
18	ENTER	A181AFEF	Used to execute the selected item, set the changed setting, etc.
19	RETURN	A181AFF4	Returns to the previous screen.
20	TOOLS	A181AFB3	Displays/turns off the tools menu.
21	0	A181AFA0	Used to specify and play the title/chapter/track to be played, to select items on menu screens, etc.
22	1	A181AFA1	
23	2	A181AFA2	
24	3	A181AFA3	
25	4	A181AFA4	
26	5	A181AFA5	
27	6	A181AFA6	
28	7	A181AFA7	
29	8	A181AFA8	
30	9	A181AFA9	
31	CLEAR	A181AFE5	Used when a mistake has been made inputting a number, etc. * Not compatible with long-press operation, so cannot be used for
32	DISPLAY	A181AFE3	Displays disc information.
33	PLAY	A181AF39	Starts playback.
34	Stop	A181AF38	Stops playback.
35	PAUSE	A181AF3A	Stops playback temporarily. Playback resumes when this command is received again.
36	REV SCAN/SLOW/STEP	A181AFEA	Sets reverse scan when received during playback, step reverse when received in the pause mode. * Not compatible with long-press operation, so cannot be used for reverse scanning or reverse slow play through long-press
37	FWD SCAN/SLOW/STEP	A181AFE9	Sets forward scan when received during playback, step forward when received in the pause mode. * Not compatible with long-press operation, so cannot be used for forward scanning or forward slow play through long-press
38	PREVIOUS	A181AF3E	Cues to beginning of previous title/chapter/track/file. * Not compatible with long-press operation, so cannot be used for page switching on list screens through long-press operation.
39	NEXT	A181AF3D	Cues to beginning of next title/chapter/track/file. * Not compatible with long-press operation, so cannot be used for page switching on list screens through long-press operation.
40	OUTPUT RESOLUTION (UP)	A181AFFA	Switches the resolution of the video signals output from the HDMI OUT (MAIN/SUB) terminals or Component Video terminal.
41	OUTPUT RESOLUTION (DOWN)	A181AFFC	
42	VIDEO SELECT	A181AFB8	Switches the video output terminal to be viewed between the HDMI OUT (MAIN) and HDMI OUT (SUB) or the ANALOG OUT, COMPONENT VIDEO, S-VIDEO and VIDEO terminals.
43	FL DIMMER	A181AFF9	Adjusts the player front panel display's brightness. When Off is selected, the FL OFF indicator on the player's front panel lights.
44	BLUE	A181AF66	Used to operate the BDMV menu screens.
45	RED	A181AF64	
46	GREEN	A181AF65	
47	YELLOW	A181AF67	
48	POWER ON	A181AFBA	Turns the power on.
49	POWER OFF	A181AFBB	Turns the power off.

3.5 Command Details

Below is a description of the functions of the RS-232C commands.

For status return timing, see *Description of function* and *Execution examples* under the individual commands.

If not clearly indicated in the function description, basically the status is returned directly after the command is received.

"Pause" refers to both pausing with the Still command and pausing with the Pause command, unless otherwise specified.

For the resume function, resume storage and cancellation are conducted even with operation by command, unless otherwise specified.

When the PN, PL and remote control button "Power" and "Play" commands are received when the power is off, the power turns on and the command operation is performed.

For commands with arguments specified, if anything other than the defined argument is specified, an error (E06) is returned, unless otherwise specified.

For operation when the buttons are locked, see *3.5.4 Key Lock*.

3.5.1 Open

- ◆ Command mnemonics
OP

- ◆ Description of function

When the tray status is "closing completed", "stop" or "play", the tray opens when the OP command is received and the completed status (R) is returned once opening is completed.

If the OP command is received while a disc is loading, the tray opens once the processing below is completed, and the completed status (R) is returned once opening is completed.

- Disc physical information loading completed
 - "Disc physical information loading" refers to identifying whether or not there is a disc on the tray, and if there is, the type of disc (BD, DVD or CD).
- Disc information loading completed

When the OP command is received while the tray status is "opening", the opening operation continues and the completed status (R) is returned once opening is completed.

When the OP command is received while the tray status is "closing", the tray opens once closing is completed, and the completed status (R) is returned once opening is completed. If the OP command is received when the tray status is "opening completed", an error (E04) is returned.

- ◆ Execution examples

Command	Status return	BD player operation
OP <CR>		Tray opens.
	R<CR>	Tray closing completion

3.5.2 Close

- ◆ Command mnemonics
CO

- ◆ Description of function

When the CO command is received while the tray status is "opening completed", the tray is closed and the completed status (R) is returned once closing is completed.

When the CO command is received while the tray status is "opening", the tray closes once opening is completed and the completed status (R) is returned once closing is completed.

When the CO command is received while the tray status is "closing", the closing operation continues and the completed status (R) is returned once closing is completed.

If the CO command is received when the tray status is "closing completed", "stop", "play" or "disc loading", an error (E04) is returned.

If an "irregular operation during tray opening/closing" is detected when the tray status is "closing", an error (E99) is returned immediately after the first tray closing failure.

- ◆ Execution examples

Command	Status return	BD player operation
CO<CR>		Tray closes.
	R<CR>	Tray closing completion

3.5.3 Stop

◆ Command mnemonics

99RJ

◆ Description of function

When the 99RJ command is received in the play, pause, forward/reverse scanning or forward/reverse slow mode, playback is stopped and the completed status (R) is returned.

When the 99RJ command is received in the stop mode, the player remains in the stop mode and the completed status (R) is returned.

Unlike the [Stop] button on the remote control, resume clearing is not performed, even when the 99RJ command is received while in the stop mode.

Operation of the BD player is the same as when the remote control's [Stop] button is pressed in the play, pause, forward/reverse scanning or forward/reverse slow mode.

◆ Execution examples

Command	Status return	BD player operation
		During playback
99RJ<CR>	R<CR>	Playback stops.

3.5.4 Key Lock

◆ Command mnemonics

(Argument)KL

◆ Description of function

When the KL command is received, according to the argument, player and remote control button operation input is locked or unlocked and the tray is locked or unlocked, then the completed status (R) is returned.

When the argument is set to "0", locking with the KL command is unlocked.

When the argument is set to "1", player and remote control button operation input is locked (buttons do not operate). This is a function for locking operation by buttons, so operation by RS-232C command is possible.

When the argument is set to "2", the tray is locked. The tray does not open even when the OP command is received.

Tray locking can be set after completion of loading of a playable disc containing anything other the PC files.

If the OP command is received when the tray is locked, an error (E04) is returned.

If for some reason the disc on the tray cannot be played due to one of the reasons below while the tray is locked, the tray locking is released.

- No disc
- Error disc (including non-supported discs)

If 1KL is received while the tray is opened, all the buttons are locked with the tray still opened.

Once the buttons are locked, the tray cannot be closed by button.

The following indicates the arguments and functions.

Argument	Function
0	Locking released.
1	All buttons locked.
2	Tray locked.

◆ Execution examples

Command	Status return	BD player operation
1KL<CR>	R<CR>	All buttons locked.
0KL<CR>	R<CR>	Locking released.
2KL<CR>	R<CR>	Tray locked.

* The tray locking and button locking functions are controlled exclusively.

If 2KL is received when the buttons are locked with the 1KL command, button locking is released and the tray is locked.

If 1KL is received when the tray is locked with the 2KL command, tray locking is released and the buttons are locked.

3.5.5 Current Address Request

- ◆ Command mnemonics

?A

- ◆ Description of function

When the ?A command is received, the information on the table below is returned.

An error (E04) is returned if the value cannot be acquired.

The following indicates the application and the information returned.

Application	Information returned
BDMV, BDAV	Title number (3 digits), chapter number (3 digits), time (6 digits)
DVD-Video, DVD VR	Title number (3 digits), chapter number (3 digits), time (6 digits)
CD-DA, DTS-CD	Track number (2 digits), index number (2 digits), time (4 digits)

- ◆ Execution examples

Command	Status return	BD player operation
?A<CR>	1201033545<CR>	During CD-DA playback (track 12, index 1, 3 minutes 35 seconds)
?A<CR>	001035001247<CR>	During DVD-Video playback (title 1, chapter 35, 12 minutes 47 seconds)

3.5.6 Time Code Request

- ◆ Command mnemonics

?T

- ◆ Description of function

When the ?T command is received, the current playing time is returned, in 3 or 4 digits for the minutes, 2 digits for the seconds.

An error (E04) is returned if the value cannot be acquired.

- ◆ Execution examples

Command	Status return	BD player operation
?T<CR>	11742<CR>	During playback (117 minutes 42 seconds)

3.5.7 Title/Track Number Request

- ◆ Command mnemonics

?R

- ◆ Description of function

When the ?R command is received, the value of the title number (3 digits) is returned for BDMV/BDAV/DVD-Video/DVD VR discs, the track number (2 digits) for CD-DA/DTS-CD discs.

An error (E04) is returned if the value cannot be acquired.

- ◆ Execution examples

Command	Status return	BD player operation
?R<CR>	12<CR>	During CD-DA playback (track 12)

3.5.8 Chapter Number Request

- ◆ Command mnemonics

?C

- ◆ Description of function

When the ?C command is received, the value of the chapter number (3 digits) is returned for BDMV/BDAV/DVD-Video/DVD VR discs.

Some discs do not include chapter numbers. In this case, an error (E04) is returned.

An error (E04) is returned if the value cannot be acquired.

- ◆ Execution examples

Command	Status return	BD player operation
?C<CR>	012<CR>	During DVD-Video playback (chapter 12)

3.5.9 Index Number Request

◆ Command mnemonics

?I

◆ Description of function

When the ?I command is received, the value of the track number (2 digits) and index number (2 digits) is returned for CD-DA/DTS-CD discs.

An error (E04) is returned if the value cannot be acquired.

◆ Execution examples

Command	Status return	BD player operation
?I<CR>	0102<CR>	During CD-DA playback (track 1, index 2)

3.5.10 Player Active Mode Request

◆ Command mnemonics

?P

◆ Description of function

When the ?P command is received, the player's operating mode is returned.

The table below shows the operating modes and BD player statuses.

Operating mode	BD player status
P00	Tray opening completed. Status from tray closing operation through disc physical information loading.
P01	No disc loaded in tray with tray opening completed. Disc loading completed, disc physical information loading completed and disc not playing.
P02	Disc information loading
P03	Tray opening
P04	Normal playback
P05	Still play
P06	Pause
P07	Search operation Not including searching through repeat operation.
P08	Forward/reverse scanning
P09	Forward/reverse slow play

◆ Execution examples

Command	Status return	BD player operation
		During playback
?P<CR>	P04<CR>	
ST<CR>	R<CR>	Still play
?P<CR>	P05<CR>	

3.5.11 Error Code Request

◆ Command mnemonics

?E

◆ Description of function

When the ?E command is received, the code of the latest error that has occurred after the power has turned on is returned.

The "error code" refers to the error status (E04, E06, etc.) returned by the player in response to the different commands.

If this command is received when there is no latest error code, 00 is returned.

◆ Execution examples

Command	Status return	BD player operation
?E<CR>	00<CR>	(Status with no error command returned)
?E<CR>	E04<CR>	(When the latest error code returned was E04)

3.5.12 Firmware Version Request

- ◆ Command mnemonics
?Z

- ◆ Description of function

When the ?Z command is received, the BD player's firmware version is returned.

- ◆ Execution examples

Command	Status return	BD player operation
?Z<CR>	1.00<CR>	(Firmware version 1.00)

3.5.13 Player Model Name Request

- ◆ Command mnemonics
?L

- ◆ Description of function

When the ?L command is received, the player's model name, including destination code, is returned.

- ◆ Execution examples

Command	Status return	BD player operation
?L<CR>	BDP-LX91/JJ<CR>	(Player model name BDP-LX91/JJ)

3.5.14 Slow

- ◆ Command mnemonics
(Argument)SW

- ◆ Description of function

When the (Argument)SW command is received, slow play begins at the speed and in the direction specified by the argument, and the completed status (R) is returned.

When the (Argument)SW command is received in the stop mode, an error (E04) is returned.

If slow play is not possible, an error (E04) is returned.

If a direction or speed not supported by the application is specified, an error (E04) is returned.

The following indicates the arguments and directions of slow play.

Argument	Direction	Speed
1	Forward	1/16
2	Forward	1/8
3	Forward	1/4
4	Forward	1/2
5	Reverse	1/16

- ◆ Execution examples

Command	Status return	BD player operation
1SW	R<CR>	Slow play starts in the forward direction at 1/16 speed.

3.5.15 Remote control Button

- ◆ Command mnemonics
/(Argument)/RU

- ◆ Description of function

When the /(Argument)/RU command is received, the completed status (R) is returned, and the same operation as the remote control button is performed.

However, if the remote control button "Power" and "Play" commands are received when the power is off, the completed status (R) is not returned after the operation is completed.

See *Remote Control Button Commands and Arguments* under *3.4 List of Commands* for the combinations of remote control button commands and arguments.

See *Function at Remote Control Button Commands and Arguments* under *3.4 List of Commands* for a brief description of the operation.

- ◆ Execution examples

Command	Status return	BD player operation
		While logo screen displayed
/A181AFB0/RU<CR>	R<CR>	Home menu displayed.
		During playback
/A181AF38/RU<CR>	R<CR>	Playback stopped.

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