

JLIP Protocol Documentation

Documentation on controlling a JLIP-enabled DVD player through a serial port

Reverse engineered by Shaun Taylor (<http://www.dragonminded.com/>) with a Victor XV-D701 DVD player and captured commands from Mark Johnson (@billyjr82) that were recorded from a Beatmania IIDX Twinkle stack.

JLIP Serial Format

JLIP is found on many JVC devices, usually in an audio form factor and labelled with JLIP. The signals are RS-232 serial compatible. The Victor XV-D701 also has a standard serial port on the back that takes the same JLIP protocol so no adapter is needed. The serial settings are 9600 baud with an 8 bit byte, one stop bit and even parity. The JLIP protocol allows you to probe for faster speeds but the XV-D701 only supports 9600 baud.

Serial Packet Format

JLIP uses a fixed 11-byte packet with the following standard format. All numeric values are given in hexadecimal and presented in *fixed width*. The following packet is a request packet:

```
XX XX ID CC CC CC AA AA AA AA ZZ
```

- **XX XX** - The first two bytes are the packet header. They are always `FF FF` for a request packet.
- **ID** - The device JLIP ID. This is often found in the setup menu for the device. Valid ranges are `01` through `3F`. Response packets will carry the same ID as the request packet. Devices will only respond with data for the ID that they are set to. Therefore, the requesting device can command more than one JLIP device on the same serial line if care is taken to ensure no address collision.
- **CC CC CC** - The command issued to the device. Some commands have additional arguments that will be placed into the argument slots.
- **AA AA AA AA** - The arguments. Often interpreted as a set of four 8 bit values. If a command does not have arguments, these should all be set to `00`.
- **ZZ** - The command checksum. This is a 7 bit simple checksum that validates the rest of the packet including the packet header.

The following is a response packet:

```
XX XX ID SS DD DD DD DD DD DD ZZ
```

- **XX XX** - The first two bytes are the packet header. They are always `FC FF` for a response packet.
- **ID** - The device JLIP ID. This will always be the same ID as the requested packet.
- **SS** - The command status. This is often the only thing returned and signifies whether the command was recognized and acted on properly.
- **DD DD DD DD DD DD** - The requested data. If a packet was a data request instead of an execute request, up to 6 bytes of data will be returned here. Unused bytes of data packets are usually set to `7F` instead of `00`. For command packets, this is usually set to `00` and can safely be ignored.
- **ZZ** - The command checksum. This is a 7 bit simple checksum that validates the rest of the packet including the packet header.

Command Status Byte

The command status byte is always returned, even while the device is in standby mode. Essentially, if you get back a valid packet with a good checksum, you can assume that the data connection is good and the device is powered in some way. You cannot assume anything else unless you examine the status byte itself. The status has three known values:

- 01 - The command was unrecognized. This model might not support this command.
- 03 - The command was acted upon successfully.
- 05 - The command could not be executed for some reason.

Command Checksum

The command checksum is present on all packets and can be used to verify integrity to a limited extent. It is calculated by starting with 80 and subtracting each byte from the sum (allowing for overflow to occur) and then bit masking the resulting sum with 7F. Sample code to calculate the checksum is presented here:

```
#define PACKET_LEN 11
unsigned char CalcChecksum( const unsigned char * packet )
{
    unsigned char sum = 0x80;

    for( unsigned int i = 0; i < (PACKET_LEN - 1); i++ )
    {
        sum = sum - (packet[i] & 0x7F);
    }

    return sum & 0x7F;
}
```

If the checksum received on the device is invalid, the device will not return anything. From the requesting device's perspective, this appears as if the responding device did not receive the packet.

Packets

Most commands are organized logically into groups and subgroups based on what they do to the DVD player or request from the DVD player. An overview is presented here before individual commands are discussed in order to aid in additional reverse-engineering as well as understanding of the packet structure. This list is most likely not exhaustive. Some packets are not described in detail. In this case, it can be assumed that behavior is similar to other packets in the same subcommand group. Most packets will be acted upon in some respect even when the device is off.

- 0C - commands for media
 - 41 - drive commands
 - 61 - eject disk tray
 - 71 - close disk tray
 - 43 - play commands
 - 63 - rewind at 2x speed
 - 64 - rewind at 1x speed
 - 6D - pause playback
 - 73 - 5-second skip play
 - 74 - 20-second skip play
 - 75 - play current track or resume playback
 - 44 - stop commands
 - 60 - stop playback
 - 4C - disk parameter commands
 - 22 - get disk length in mm:ss:?? format
 - 23 - get number of chapters on the disk
 - 4E - disk status commands
 - 20 - get drive and playback status
 - 50 - seek commands
 - 20 - seek to specific chapter
 - 61 - seek to previous chapter
 - 63 - seek to start of track
 - 65 - seek to end of disk
 - 73 - seek to next chapter
 - 75 - seek to start of disk
- 3E - commands for power handling
 - 40 - power commands
 - 60 - turn device off
 - 70 - turn device on
 - 4E - power status commands
 - 20 - device power status
- 7C - commands for device management
 - 41 XX - set device to new JLIP ID

- 45 00 - query device for machine code
- 48 20 - query device for baud rate supported
- 49 00 - query device for device code
- 4C 00 - read first six bytes of device name as ascii string
- 4D 00 - read last six bytes of device name as ascii string
- 4E 20 - NOP (used for presence probes)

Eject Disk Tray Command

command: 0C 41 61

arguments: *none*

Instruct the DVD player to open the tray. If the device is in standby mode this will return an 05 status to indicate a failed eject. If the device is busy identifying a disk, this will return an 05 status to indicate busy. If the device has already ejected and the tray is open, this will return an 05 status to indicate inability to eject. If the device ejected the tray successfully, this will return an 03 status to indicate success.

Close Disk Tray Command

command: 0C 41 71

arguments: *none*

Instruct the DVD player to close or re-open the tray. If the device is in standby mode this will return an 05 status to indicate a failed insert. If the device tray is open, this will return an 03 status to indicate success in inserting the tray. If the device tray is closed, this will return an 03 status to indicate success in re-ejecting the tray. In order to determine whether the tray is open before executing this command to close it, use the Get Disk Status Command.

Pause Playback Command

command: 0C 43 6D

arguments: *none*

Instruct the DVD player to pause the currently playing track. If the device is off, this command has no effect and an 03 status is returned. If the device is idle, it queues up the first chapter and pauses at 0:00, returning an 03 status. If the device is playing, this pauses the disk at the current location and returns an 03 status. If the device is already paused, this command has no effect and an 03 status is returned.

Play Command

command: 0C 43 75

arguments: *none*

Instruct the DVD player to play or resume playback of the disk. If the device is off, the device will turn on and start playing at the first chapter, returning an 03 status. If the device is idle, it will

start playing at the first chapter and return an 03 status. If the device is paused, it will resume playback at the paused location and return an 03 status. If the device is already playing, this command has no effect and an 03 status is returned.

Stop Command

command: 0C 44 60

arguments: *none*

Instruct the DVD player to stop playing and return to idle mode. If the device is already idle or currently off, this command has no effect and an 03 status is returned. If the device is playing or paused, this returns the device to idle and an 03 status is returned.

Get Disk Length Command

command: 0C 4C 22

arguments: *none*

Instruct the DVD player to return the length of the currently inserted disk. The device returns six bytes of data. Each byte is in the range of 00-09. The first two bytes represent the length of the disk in minutes where the first byte is the 10's column and the second is the 1's column. Similarly, the next two bytes represent the fractional number of minutes and are interpreted as seconds. The last two bytes are presumed to be the fractional number of seconds interpreted as a millisecond value but there has been no effort to verify this. This command seems to always return an 03 status, electing to return all 00 data when no disk is present or the drive is busy.

Get Disk Chapters Command

command: 0C 4C 23

arguments: *none*

Instruct the DVD player to return the number of chapters on the disk. The device returns four bytes of data. Each byte is in the range of 00-09. The first two bytes are presumed to represent the number of logical separations on the disc and the value seen is always 00 01, representing one logical DVD or CD. The next two bytes are the number of chapters/tracks on the inserted disk where the first byte is the 10's column and the second byte is the 1's column. If there is no disk or the disk drive is not ready this returns an 05 status, otherwise it returns an 03 status with the requested data.

Get Disk Status Command

command: 0C 4E 20

arguments: *none*

Instruct the DVD player to return information about the current media in the drive. The device returns four bytes of data. The first byte represents the current state of the drive as documented

below. The second byte is unknown but common values are 00 and 01. The third and fourth bytes together represent the media type detected as documented below. This command seems to always return an 03 status.

The enumeration of drive states is as follows. This is not a complete list. During DVD playback values such as 42, 43 and 46 have been observed. It is presumed that this represents unskippable areas, menus and other playback modes of a typical DVD but this has not been investigated.

- 01 - Drive tray is ejected
- 02 - Drive tray is in the process of being closed
- 10 - The drive is reading an inserted disk
- 20 - The drive is idle
- 40 - The drive is playing a disk
- 50 - The drive is paused
- 6F - The drive is off because the device is on standby

The enumeration of disc types is as follows. Note that this is probably not a complete list and the values are most likely a bit field that hasn't been fully decoded yet.

- 40 40 - There is no disk in the drive
- 41 40 - The disk is an unrecognized CD (note that this may be a detection stage)
- 41 44 - The disk is a video CD
- 41 4E - The disk is an unrecognized CD
- 44 40 - The disk is an audio CD
- 48 40 - The disk is an unrecognized DVD (note that this might actually be single layer/dual layer or a detection stage)
- 4A 40 - The disk is a DVD

Seek to Chapter Command

command: 0C 50 20

arguments: XX YY

Instruct the DVD player to seek to a particular chapter/track on the disk. The first byte XX in the arguments should be the 10's value for the chapter. The second byte YY in the arguments should be the 1's value for the chapter. The third and fourth argument should be zeros. If you were seeking to chapter 35 you would provide the argument 03 05 00 00. If the device is off or the requested track/chapter is out of bounds, this will return an 05 status. If the device is idle, this will seek to the specified chapter and play, returning an 03 status. If the device is playing, this will seek to the new chapter and play, returning an 03 status. If the device is paused, this will seek to the new chapter and remain paused, returning an 03 status.

Seek to Previous Chapter Command

command: 0C 50 61

arguments: *none*

Instruct the DVD player to seek to the previous chapter/track on the disk. If the device is off or already on the first chapter, this will return an 05 status. If the device is idle, this will seek to chapter one and play, returning an 03 status. If the device is playing, this will seek to the previous chapter and play, returning an 03 status. If the device is paused, this will seek to the previous chapter and remain paused, returning an 03 status.

Seek to Next Chapter Command

command: 0C 50 73

arguments: *none*

Instruct the DVD player to seek to the next chapter/track on the disk. If the device is off or already on the last chapter, this will return an 05 status. If the device is idle, this will seek to chapter two and play, returning an 03 status. If the device is playing, this will seek to the next chapter and play, returning an 03 status. If the device is paused, this will seek to the next chapter and remain paused, returning an 03 status.

Turn Off Command

command: 3E 40 60

arguments: *none*

Instruct the DVD player to turn off. If the device is already in standby/off mode this will return an 05 status. If the device was successfully powered down into standby mode this will return an 03 status.

Turn On Command

command: 3E 40 70

arguments: *none*

Instruct the DVD player to turn on. If the device is already on this will return an 05 status. If the device was successfully powered on this will return an 03 status.

Get Power Status Command

command: 3E 4E 20

arguments: *none*

Instruct the DVD player to return the current power status. This command will always return an 03 status regardless of mode. This command returns two bytes of data. The first byte

represents the current power state with 00 being off and 01 being on. The second byte is unknown but a typically observed value is 20.

Set JLIP ID Command

command: 7C 41 XX

arguments: *none*

Change the JLIP ID of the device. This is the only known command that uses the third command byte as an argument. The device will return an 03 status to indicate that it has received the instructions and then set the JLIP ID to the new ID specified. All subsequent commands should be to this new ID. If the ID requested is out of range (01-3F) this will return an 05 status.

Get Machine Code Command

command: 7C 45 00

arguments: *none*

Request the machine code of the device. This will return six data bytes. One of the bytes represents the machine manufacturer but it is unclear which. None of the byte positions or exact meanings are known. This command will always return an 03 status, even when the device is off.

Get Device Baud Rate Command

command: 7C 48 20

arguments: *none*

Request the device maximum baud rate. This will return a single data byte representing the speed at which the device can operate. This command will always return an 03 status, even when the device is off. The known enumerations for the speed byte are documented below.

- 20 - Device supports 9600 baud.
- 21 - Device supports 19200 baud.
- 22 - Device supports 38400 baud.
- 23 - Device supports 115200 baud.

Get Device Code Command

command: 7C 49 00

arguments: *none*

Request the device code of the device. This will return six data bytes. Bytes that are unused are set to 7F. None of the byte positions or meanings are known. This command will always return an 03 status, even when the device is off.

Get Device Name Command

command: 7C 4C 00, 7C 4D 00

arguments: *none*

Request the device name from the device. The first command listed will return the first six ascii characters of the device name. The second command will return the last six ascii characters of the device name. Bytes that are unused are set to 7F. The resulting ascii string is appropriate for display. This command will always return an 03 status, even when the device is off.

No-Operation Command

command: 7C 4E 20

arguments: *none*

Perform no operation. This command always returns a status of 03. This is especially useful for probing the serial port to see if a JLIP-compatible device is available. A compatible program can sweep the list of known address ranges, sending a NOP command and waiting for a reply to determine if and where a device resides.

Additional Information

<http://garfield.planetaclix.pt/JVC/>

<http://www.remotecentral.com/cgi-bin/mboard/rs232-ip/thread.cgi?179>

<http://www.system16.com/hardware.php?id=827>

<http://gamerepair.info/hardware/3>