L20&L30&L50 Patch User Guide

GPS Module Series

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Quectel Wireless Solutions Co., Ltd.
7th Floor, Hongye Building, No.1801 Hongmei Road, Xuhui District, Shanghai 200233, China
Tel: +86 21 5108 6236
Email: info@quectel.com

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About the Document

History

Revision	Date	Author	Description
1.0	2019-04-25	Jenn XIANG	Initial

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1 Introduction

The L20&L30&L50 modules allow application of a limited number of firmware patches. This document mainly introduces how to download a patch to the L20&L30&L50 module.

2 One Socket Protocol

The One Socket Protocol, OSP, is the binary protocol interface that enables customer device host software to access GPS module. The protocol uses the big-endian order.

2.1. Message Structure

Table 1: Generic Packet Format

Start Sequence	Payload Length	PAYLOAD	Checksum	End Sequence
0xA0, 0xA2	2 Bytes(15 bits)	Up to (2^{10} - 1) Bytes	2 Bytes	0xB0, 0xB3

2.1.1. Start Sequence

This field contains 2 fixed bytes that indicated the start of the sequence.

2.1.2. Payload Length

This field uses 2 bytes (15 bits) to indicate the length of payload field.

NOTE

Even though the protocol has a maximum length of (2^{15}-1) bytes, practical considerations require the GPS module implementation to limit this value to a smaller number.

2.1.3. Payload

This field is the main data of the sequence. The payload always starts with a one byte long Message ID (MID) field. Depending on the MID value, a one byte Sub ID (SID) field may follow the MID field. Subsequently, and again depending on the value of the MID field on the value of the SID field if it exists, a

variable number of message parameter fields follow.

2.1.4. Checksum

The checksum is a 15-bit checksum of the bytes in the payload data. The following pseudo code defines the algorithm used:

```
UINT16 Checksum(UINT8 *Data, UINT32 DataLength)
{
    UINT16 result = 0;
    UINT32 i = 0;
    for(i = 0; i < DataLength; i++)
    {
        result += *(Data + i);
    }
    return (result & 0x7FFF)
}
```

2.1.5. End Sequence

This field contains 2 fixed bytes that indicated the end of the sequence.

2.2. Patch Protocol MID/SID

Table 2: MID/SID of the Patch Command/Response

Host Patch Message	MID/SID	Host Patch Message	MID/SID
Patch Manager Start Request	0xB2, 0x28	Patch Manager Prompt	0xB2, 0x90
Patch Memory Load Request	0xB2, 0x22	Patch Manager Acknowledgement	0xB2, 0x91
Patch Manager Exit Request	0xB2, 0x26	Patch Manager Acknowledgement	0xB2, 0x91

3 ROM Patch Procedures

Patches are sent into operating L20&L30&L50 module using simple One Socket Protocol (OSP) patch protocol serial messages. If backup battery power is lost or if BBRAM is corrupted, the patch contents must be re-sent to the operating receiver through the serial port. After pushes the patch data file into patch RAM, the receiver performs internal reset and restarts itself.

3.1. ROM Patch Operation

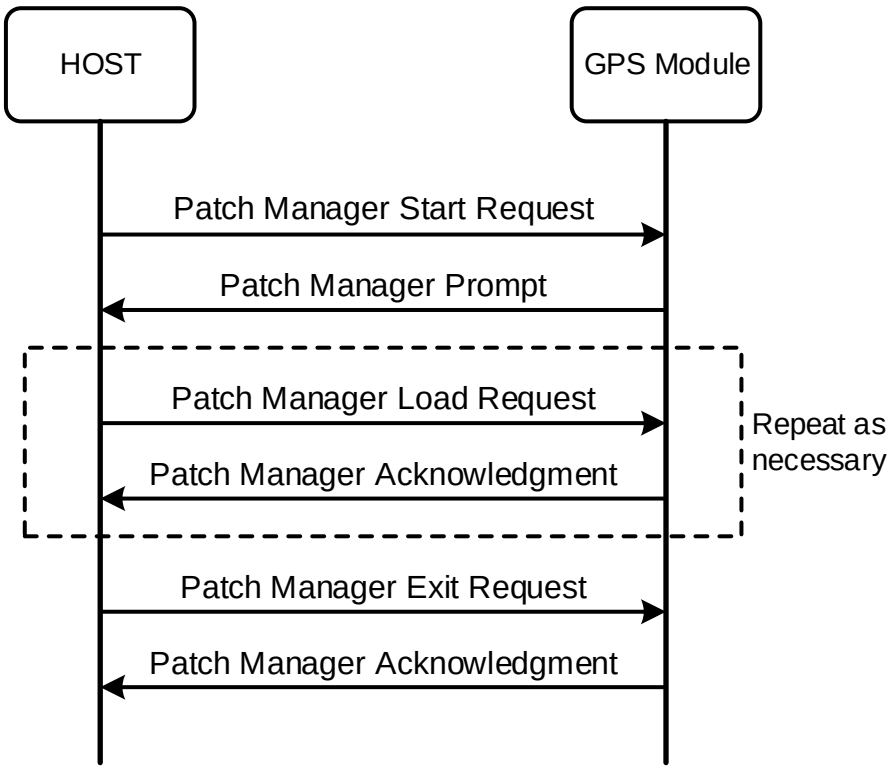

Figure 1: Patch Load Message Sequence

A typical sequence of download patches:

1. Open the serial communication port using 4800bps because GPS ROM is defaulted to start up in NMEA 4800bps.
2. Set up and verify communication with GPS ROM using OSP 115200bps.

In order to make switching more robust, two commands are used:

- Using command **$PSRF100,1,115200,8,1,0*05** to switch from NMEA 4800bps to NMEA 115200bps.
- Using command **$PSRF100,0,115200,8,1,0*04** to switch from NMEA 115200bps to OSP 115200bps.

3. Set up the GPS ROM into full power mode if necessary.
4. Verify host patch file is valid.
5. Initiate the Patch Manager Start Request.
6. GPS ROM sends Patch Manager Prompt reporting the Chip/Silicon IDs and ROM/Patch versions.
7. If the current patch is valid and of the same or newer revision as the host patch file, then exit the process.
8. Load the patch file.
9. Send the Patch Manager Exit command. On receiving this command, the GPS ROM verifies the content of the patch RAM and saves it to I2C serial flash if necessary. An internal cold start is performed to apply the patch data.
10. Restore the initial power mode settings of the GPS if necessary.
11. Restore the initial communication settings of the GPS if necessary.
12. Close the com port.

3.2. Verify the SW Version

After patching is completed, the SW version can be polled to confirm the correct patch was loaded.

Command:

```
$PSRF125*21
```

Result:

```
$PSRF195,GSD4e_X.X.X-P1_RPATCH.YY-    <Data> <Julian Day>*<Checksum>
```

Where:

Argument	Description
X.X.X	ROM
YY	Patch version
Data	-
Julian Day	-
Checksum	Hexadecimal checksum

Example:

```
$PSRF125*21
$PSRF195,GSD4e_4.1.2-P1_RPATCH.10- 04/25/2019 115*5E
```

3.3. OSP for Patch

3.3.1. Patch Manager Start Request

Start Request Format:

Byte	Value	Description
0	0xA0	Start
1	0xA2	
2	0x00	Payload length
3	0x02	
4	0xB2	MID
5	0x28	SID
6	0x00	Checksum
7	0xDA	
8	0xB0	End
9	0xB3	

Response Format:

Byte	Value	Description
0	0xA0	Start
1	0xA2	
2	0x00	Payload length
3	0x0A	
4	0xB2	MID
5	0x90	SID
6	-	Chip ID
7	-	

8	-	Silicon ID
9	-	
10	-	ROM version code
11	-	
12	-	Patch revision code
13	-	
14	-	Checksum
15	-	
16	0xB0	End
17	0xB3	

Example:

Send:
A0 A2 00 02 B2 28 00 DA B0 B3
Response:
A0 A2 00 0A B2 90 00 41 00 01 00 1A 00 06 01 A4 B0 B3

3.3.2. Patch Memory Load Request

Load request format:

if sequence number = 1

Byte	Value	Description
0	0xA0	Start
1	0xA2	
2	-	Payload length
3	-	
4	0xB2	MID
5	0x22	SID
6	-	sequence number, = 1 indicates that this load message contains patch

7	-	overlay data.
8	0x50	If Load Patch Memory Request is being used to load patch data, then this value is set to ‘P’
9	0x4D	If Load Patch Memory Request is being used to load patch data, then this value is set to ‘M’
10	-	ROM version code
11	-	
12	-	Patch revision code
13	-	
14	-	Patch data base address
15	-	
16	-	
17	-	
18	-	Patch data length, The total byte length of the patch overlay and non-overlay sections CRC bytes found in the patch file being loaded
19	-	
20	-	Patch RAM start offset, value is the offset indicating the start of the patch non-overlay section which also includes the bytes of CRC value of the patch overlay section. If patch non-overlay section is not available, then this value is 0.
21	-	
22 ~ n	-	Patch load data, The sequence of bytes to be loaded in the patch overlay section of Patch RAM. There may be one or more segment offset, segment type, segment length and segment data values embedded in the Patch Load Data and the last bytes contain CRC value of the patch overlay section.
n+1	-	Checksum
n+2	-	
n+3	0xB0	End
n+4	0xB3	

if sequence number > 1

Byte	Value	Description

0	0xA0	Start
1	0xA2	
2	-	Payload length
3	-	
4	0xB2	MID
5	0x22	SID
6 ~ n	-	Patch load data, the sequence of bytes to be loaded in the patch overlay section of Patch RAM. The max length of the patch load data is 1016 in one sequence.
n+1		Checksum
n+2		
n+3	0xB0	End
n+4	0xB3	

Response Format:

Byte	Value	Description
0	0xA0	Start
1	0xA2	
2	0x00	Payload length
3	0x0A	
4	0xB2	MID
5	0x91	SID
6	-	Message Sequence Number
7	-	
8	0x22	The Host Sub Id message being acknowledged
9	-	Acknowledge Status, Status response, see ***Table 3***
10	-	Checksum

11	-	
12	0xB0	End
13	0xB3	

Table 3: Acknowledge Status

Bit1	Bit0 (LSB)	Status
1	1	Message successfully received, Operation successful
1	0	Message successfully received, Operation unsuccessful

3.3.3. Patch Manager Exit Request

Exit Request Format:

Byte	Value	Description
0	0xA0	Start
1	0xA2	
2	0x00	Payload length
3	0x02	
4	0xB2	MID
5	0x26	SID
6	0x00	Checksum
7	0xD8	
8	0xB0	End
9	0xB3	

Response Format:

Byte	Value	Description

0	0xA0	Start
1	0xA2	
2	0x00	Payload length
3	0x06	
4	0xB2	MID
5	0x91	SID
6	0x00	Message Sequence Number
7	0x00	
8	0x26	The Host Sub Id message being acknowledged
9	-	Acknowledge Status, Status response, see ***Table 3***
10		Checksum
11		
12	0xB0	End
13	0xB3	

4 Appendix A References

Table 4: Related Documents

SN	Document Name	Remark
[1]	Quectel_L20_GPS_Protocol_Specification	Quectel L20 Protocol Specification

Table 5: Terms and Abbreviations

Abbreviation	Description
OSP	One Socket Protocol
RAM	Random Access Memory
ROM	Read Only Memory