Application Note: JN-AN-1007

Boot Loader Serial Protocol

The boot loader contained with the JN51xx ROM provides functions that allow an external Flash memory (connected to the JN51xx using the SPI port) to be reprogrammed. This Application Note describes the Boot Loader Serial Protocol that is used to communicate with the JN51xx when downloading data to the external Flash memory device.

Protocol Description

The protocol defines a message structure and set of messages that allow a client to communicate with the JN51xx chip, and hence perform operations on the external Flash memory.

The JN5139 boot loader supports three different Flash types (ST M25P10 A, SST 25VF0101 and ATMEL AT25F512). The controlling PC application must first determine and select the desired Flash type before issuing erase, read or write commands. Serial communication between the PC and boot loader is implemented as 8,N,1,38K4.

Message Structure

A message contains four fields and is structured as follows:

Field	1	2	3	4
Bytes	1	1	(x)	1
Data	Length	Message Type	Message Data	Checksum

Table 1: Message Structure

Length The number of bytes in the rest of the message, including the checksum. Note that the maximum total message size is 255 bytes.

Message Type Defined below

Message Data Variable length and dependent on message type. May be zero length (i.e. not present)

Checksum Calculated over the preceding part of the message, including the Length field, by implementing a logical Exclusive-OR operation on the previous bytes.

Messages are always transferred in pairs, with one message in each direction – the original message and a response. The response may contain data as a result of the original message or may be an acknowledgement.

When a message is transmitted, the checksum is calculated and sent with the message. When a message is received, the checksum is calculated on the received data and compared with the received checksum. If there is a difference between the two checksums, the message is discarded.

When an original message is sent, a timeout period is started. If no response is received before the timeout period has expired, an error is assumed and the transaction is aborted. The duration of the timeout period can be dependent on the message type. At any time, there can be a maximum of one original/response message pair in progress in each direction.

Message Types

Message types are as follows (N/A means that an optional field is not present):

Message Type Value	Meaning	Message Data	Response Message Type
0x00 to 0x06	Reserved	N/A	N/A
0x07	Flash erase request	N/A	0x08
0x08	Flash erase response	0x00: Erase successful 0xFF: Parameter error	N/A
0x09	Flash program request	4 bytes: Flash address, LSB first Up to 256 bytes of data	0x0A
0x0A	Flash program response	0x00: Program successful 0xFF: Readback verify failed	N/A
0x0B	Flash read request	4 bytes: Flash address, LSB first 2 bytes: Length, LSB first (should not be greater than 0x00FC)	0x0C
0x0C	Flash read response	1 byte: Always 0 (success) *x* bytes: Bytes read from Flash	N/A
0x0D	Sector erase request	1 byte: Flash sector to erase (values 0 to 3 are valid)	0x0E
0x0E	Sector erase response	0x00: Erase successful 0xFF: Erase error	N/A
0x0F	Write SR request	1 byte: Value to program into Flash memory status register	0x10
0x10	Write SR response	0x00: Write successful 0xFF: Write error	N/A
0x11 to 0x1C	Reserved	N/A	N/A
0x1D	RAM write request	4 bytes: RAM address, LSB first *x* bytes: Bytes to write into RAM	0x1E
0x1E	RAM write response	1 byte: Always 0 (success)	N/A
0x1F	RAM read request	4 bytes: RAM address, LSB first 2 bytes: Number of bytes to read, LSB first (should not be greater than 0x00FC)	0x20
0x20	RAM read response	1 byte: Always 0 (success) *x* bytes: Bytes read from RAM	N/A
0x21	Run request	4 bytes: Address to jump to, LSB first	0x22

Message Type Value	Meaning	Message Data	Response Message Type
0x22	Run response	1 bytes: Always 0 (success)	N/A
0x25	Read Flash ID request (JN5139 only)	N/A	0x26
0x26	Read Flash ID response (JN5139 only)	1 byte: Status 1 byte: Flash manufacturer ID 1 byte: Flash device ID	N/A
0x27 to 0x2B	Reserved	N/A	N/A
0x2C	Select Flash type (JN5139 only)	1 byte: Flash type (see table below for mapping) 4 bytes: Custom programming jump address (set to 0000), LSB first	0x2D
0x2D	Select Flash type response (JN5139 only)	1 byte: Status	N/A
0x2E to 0xFF	Reserved	N/A	N/A

Table 2: Message Types

Mapping Flash IDs to Flash Types

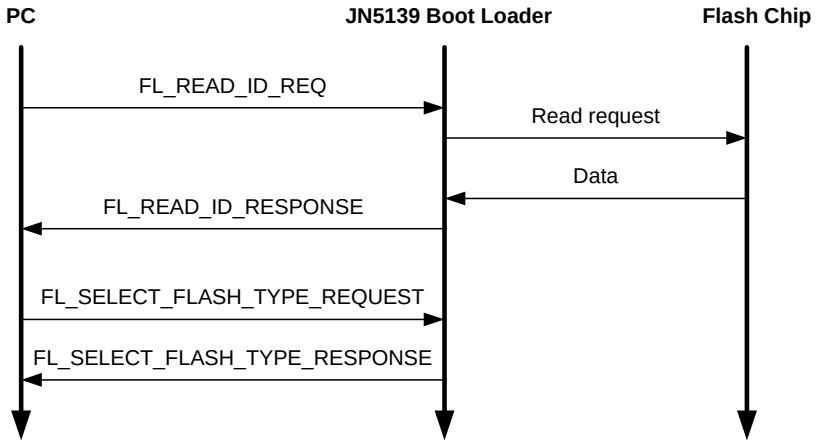
Manufacturer ID	Device ID	Type	Jennic ID
0x10	0x10	ST M25P10-A	0
0xBF	0x49	SST 25VF010A	1
0x1F	0x60	Atmel 25F512	2

Response Status Code

Status Type	ID
OK	0
Not supported	0xFF
Write fail	0xFE
Invalid response	0xFD
CRC error	0xFC
Assert fail	0xFB
User interrupt	0xFA
Read fail	0xF9
TST error	0xF8
Auth error	0xF7
No response	0xF6

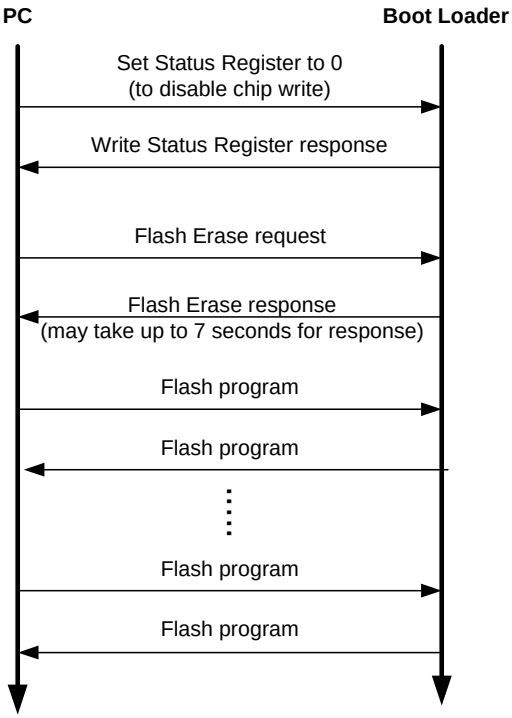
Example Programming Sequence

On the JN5139 device (only), the PC application must dynamically determine which Flash device is connected to the wireless microcontroller. This is achieved by issuing the FL_READ_ID_REQ message. The response will give the Manufacturer ID and Device ID of the Flash device attached.



Once the Flash type is known, the type can be set within the boot loader by sending a FL_SELECT_FLASH_TYPE_REQUEST.

After the Flash type has been selected, the programming sequence is the same for all JN51xx devices, as illustrated below.



Revision History

Version	Notes
1.0	Initial release
1.1	Additional message types added
1.2	Corrected flash read response information
1.3	Re-templated
1.4	Made generic for JN51xx series
1.5	Added information about JN5139 and example programming sequence
1.6	Added serial port settings and maximum message size

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