PM0015
Programming Manual

AT32 Bootloader CAN/CANFD Protocol

Introduction

This user manual describes the CAN/CANFD protocol used in the AT32 MCU bootloader, detailing the supported commands and their operating procedure. For more information about the CAN hardware resources and requirements for your device bootloader, refer to the document PM0007_AT32_Bootloader_Program_Manual.

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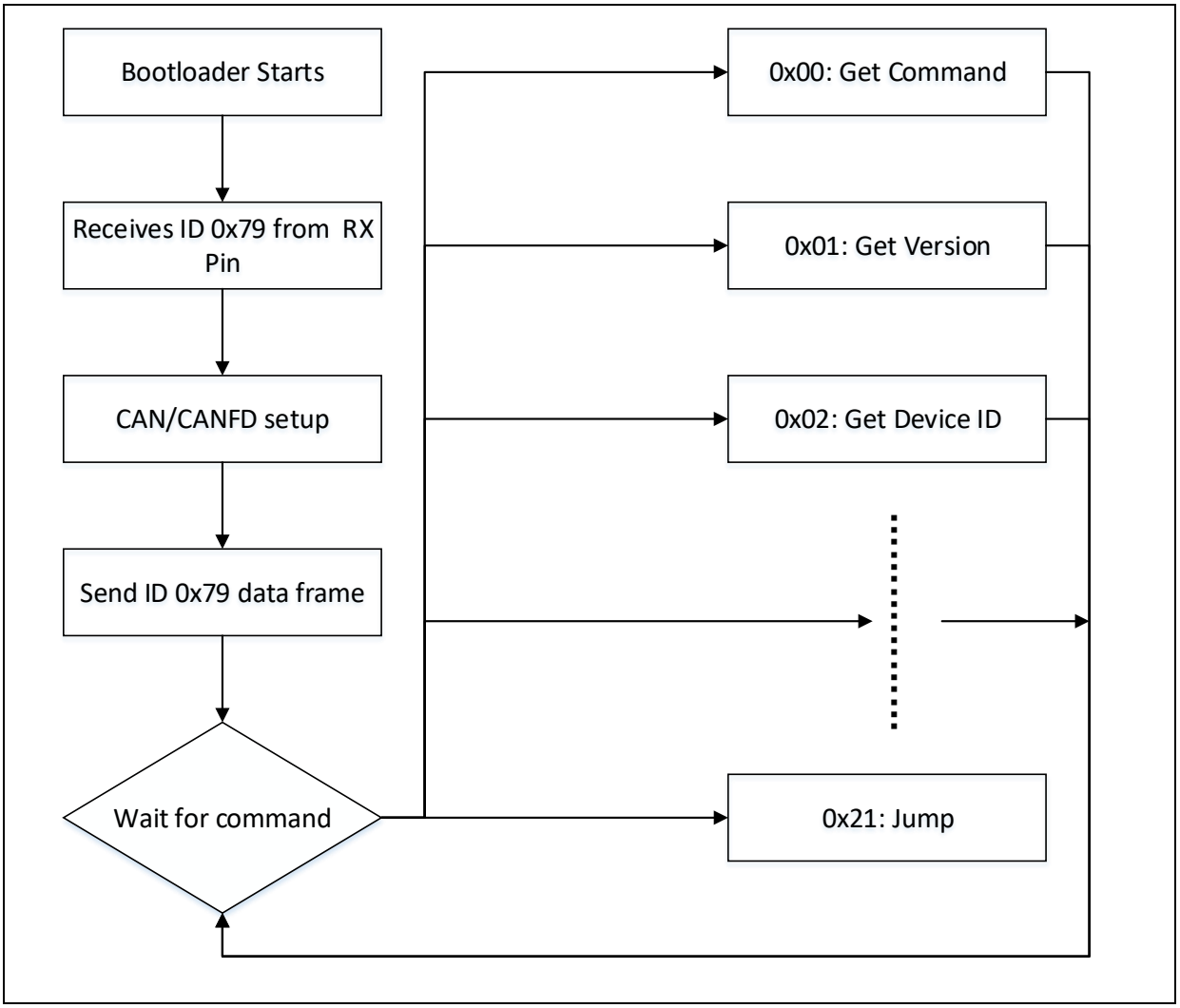
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1 CAN/CANFD bootloader code sequence

When the CAN/CANFD programming mode is enabled, the bootloader begins to scan the CAN/CANFD Rx pin, waiting to receive the data frame. Once detected (standard data frame ID: 0x79), the CAN/CANFD transmits an acknowledgement byte to the host, indicating the successful connection. Then the MCU waits for the host commands. All of the commands are expressed in the form of standard frame ID, as described in Figure below.

Note: If the CAN is used, it is necessary to use HEXT with the frequency of *4MHz, 6MHz, 8MHz, 12MHz, 14.7456MHz, 16MHz, 20MHz, 24MHz and 25MHz. In other words, the CAN programming mode is not supported if for other frequencies or without HEXT.*

Figure 1 Bootloader Main Loop



2 CAN/CANFD baud rate

2.1 CANFD baud rate

AT32 Bootloader uses the default CANFD configuration:

- Frame format: FD Mode and bit rate switching
- Mode：Normal Mode
- Identifier: Standard identifier
- CANFD_CLK = 40 Mhz
- Prescaler = 0x1
- Nominal Time Segment1 = 0x40
- Nominal Time Segment2 = 0x10
- Nominal SJW= 0x10
- Data Time Segment1 = 0x20
- Data Time Segment2 = 0x8
- Data SJW= 0x8

A CANFD data frame can be a maximum of 64 Byte.

When the host data is detected by the device, a CANFD baud rate is configured accordingly, and then an acknowledge byte (0x79) is transmitted to the host. After the 0x79 is received by the host, it represents a successful connection, and the host continues to send commands.

ACK = 0x79

NACK = 0x1F

2.2 CAN baud rate

The AT32 Bootloader uses the default CAN baud rate 500Kbps . A CAN data frame can be up to 8 Byte.

After a successful connection, the CAN baud rate is changeable through speed command. For more details about speed command, refer to the relevant command description.

ACK = 0x79

NACK = 0x1F

3 Bootloader command set

The number of the supported commands depends on the product series. However, for the same command set such as read, write or erase, they are entirely compatible across all the AT32 MCU series.

Bootloader commands

Command	Standard ID code	Description	Supported AT32 MCU series
Get Commands	0x00	Get the allowed commands supported by the device	MCU series with CAN/CANFD feature
Get Version	0x01	Get the protocol version of the bootloader	MCU series with CAN/CANFD feature
Get Device ID	0x02	Get the device ID.	MCU series with CAN/CANFD feature
Read memory	0x11	Read data of the memory starting from an address specified by the application	MCU series with CAN/CANFD feature
Jump	0x21	Jump to memory address executable application	MCU series with CAN/CANFD feature
Write memory	0x31	Write data to memory starting from an address specified by the application	MCU series with CAN/CANFD feature
Erase	0x44	Erase memory	MCU series with CAN/CANFD feature
Erase and program protect	0x63	Enable erase/program protection	MCU series with CAN/CANFD feature
Erase and program unprotect	0x73	Disable erase/program protection	MCU series with CAN/CANFD feature
Access Protect	0x82	Enable access protection	MCU series with CAN/CANFD feature
Access Unprotect	0x92	Disable access protection	MCU series with CAN/CANFD feature
Firmware CRC	0xAC	Compute a CRC value on a given memory area	MCU series with CAN/CANFD feature
Enable sLib	0xD0	Enable sLib	MCU series with CAN/CANFD feature
Disable sLib	0xD1	Disable sLib	MCU series with CAN/CANFD feature
Get sLib Status	0xD2	Get sLib status	MCU series with CAN/CANFD feature
Reset Device	0xD4	Reset device	AT32F403xx does not support
Advanced Access Protect	0xD6	Enable advanced access protection	MCU with advanced access protection and CAN/CANFD feature
Speed	0x03	Modify baud rate	MCU series with CAN/CANFD feature

4 Bootloader command description

This chapter describes the role and operating methods of each supported command and details the procedures on the host and the device sides.

All of the commands are identified through the ID of the CAN/CANFD standard frames. For example, for Get Command, its ID is 0.

Note: all of the bootloader commands are transmitted through standard data frames.

4.1 Get Command

This command is used to get the protocol version and the supported commands. The number of the supported commands depends on the MCU series.

When the bootloader receives the command, it transmit an “ACK” byte to the host. Then the bootloader sends the number of bytes (one byte) to the host, the protocol version and the supported commands and after that, transmits an ACK byte.

This command is allowed and executed when the access protection is enabled.

4.1.1 Flow chart on host and device sides

Figure 2 Get Commands: host side

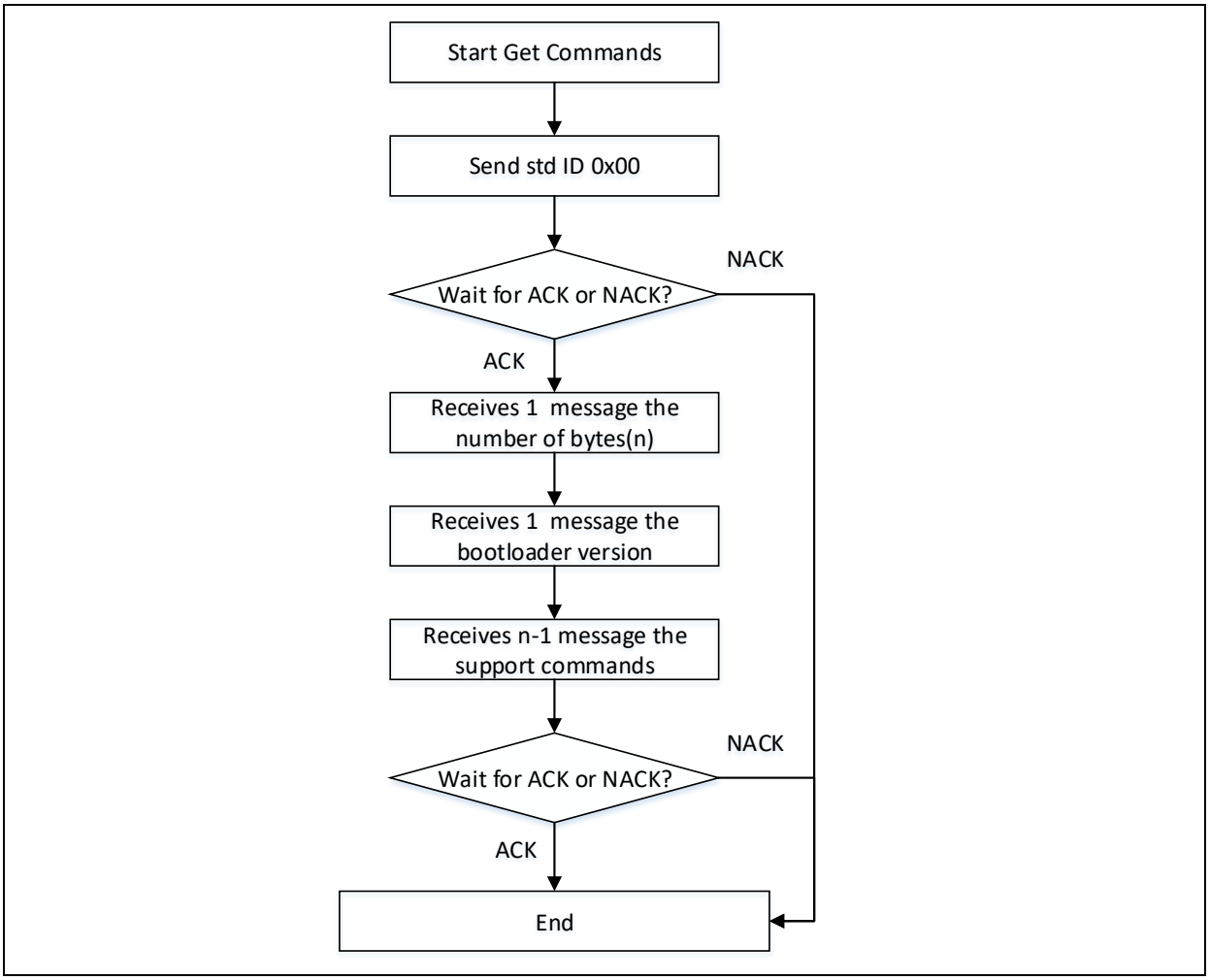
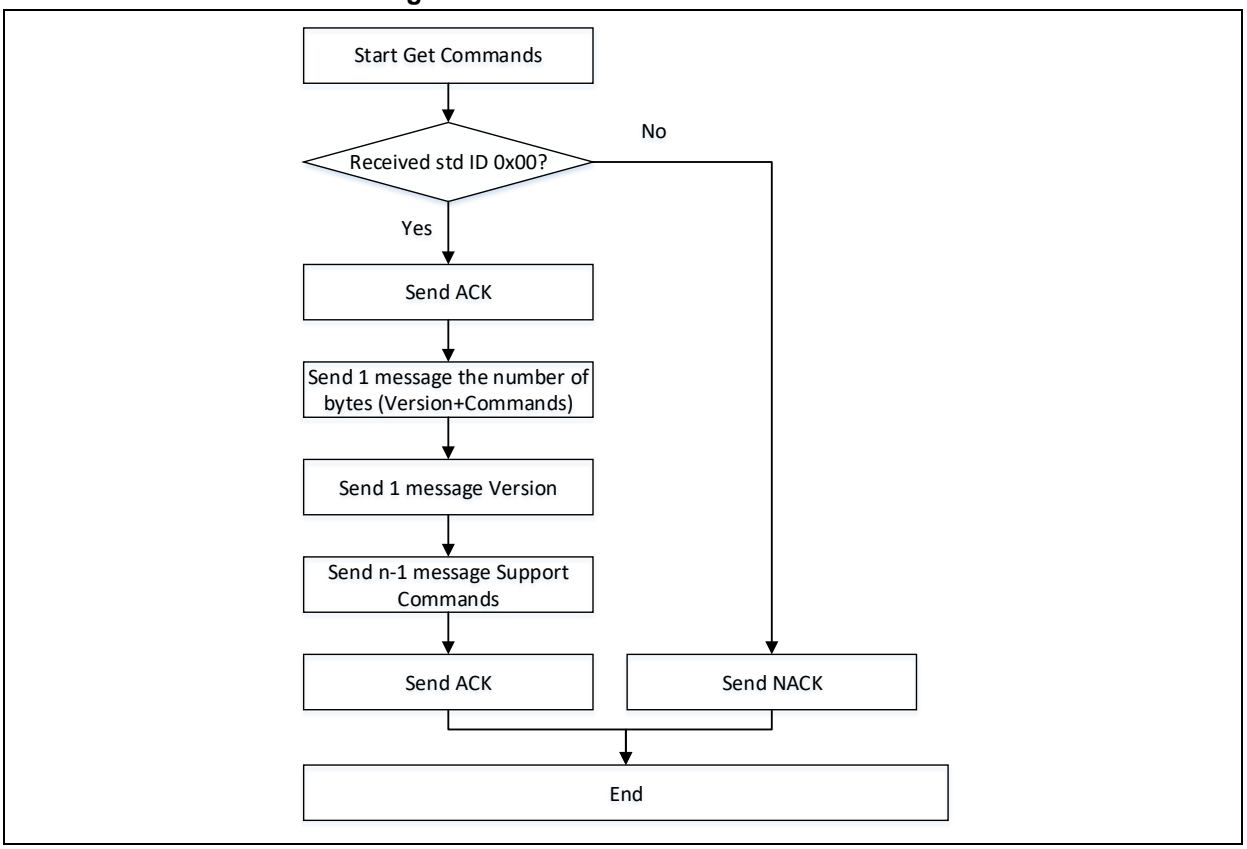


Figure 3 Get Commands: device side



4.1.2 Data transmit on host side

Send	Receive	Standard frame ID	Frame length DLC	Data	Description
1		0x00	-	-	The host sends Get Command
	1	0x00	1	ACK/NACK	When an NACK is received, it represents the end of the command.
	2	0x00	1	n-1	It represents the number of data to be received.
	3	0x00	1	*	Bootloader 的协议版本号
	4	0x00	1	0x00	1st Get Commands
	5	0x00	1	0x01	2nd command Get Version
	6	0x00	1	0x02	3rd command 令 Get Device ID
	7	0x00	1	0x11	4th command Read Memory
	8	0x00	1	0x21	5th command Jump
	9	0x00	1	0x31	6th command Write Memory
	10	0x00	1	0x44	7th command Erase
	11	0x00	1	0x63	8th Erase and Program Protect
	12	0x00	1	0x73	9th command Erase and Program Unprotect
	13	0x00	1	0x82	10th command Access Protect
	14	0x00	1	0x92	11th command Access Unprotect
	15	0x00	1	0xAC	12th command Firmware CRC
	16	0x00	1	0xD0	13 th command sLib Enable

Send	Receive	Standard frame ID	Frame length DLC	Data	Description
	17	0x00	1	0xD1	14th command sLib Disable
	18	0x00	1	0xD2	15th command Get sLib status
	19	0x00	1	0xD4	16 th command Reset Device
	20	0x00	1	0xD5	Reserved
	21	0x00	1	0xD6	17 th command Advanced access Protect
	22	0x00	1	0x03	Speed command
	23	0x00	1	ACK	End of command

4.2 Get Version command

This command is used to get the version of the bootloader. When the device receives the command, it transmits an ACK byte to the host. After the transmission of the ACK byte, the device sends the bootloader protocol version (1 byte) and the bootloader version code (BID, two bytes). After this operation, the device transmits the ACK byte to the host signaling the end of the command.

This command is allowed and executed when the access protection is enabled.

4.2.1 Flowchart on host and device sides

Figure 4 Get Version: host side

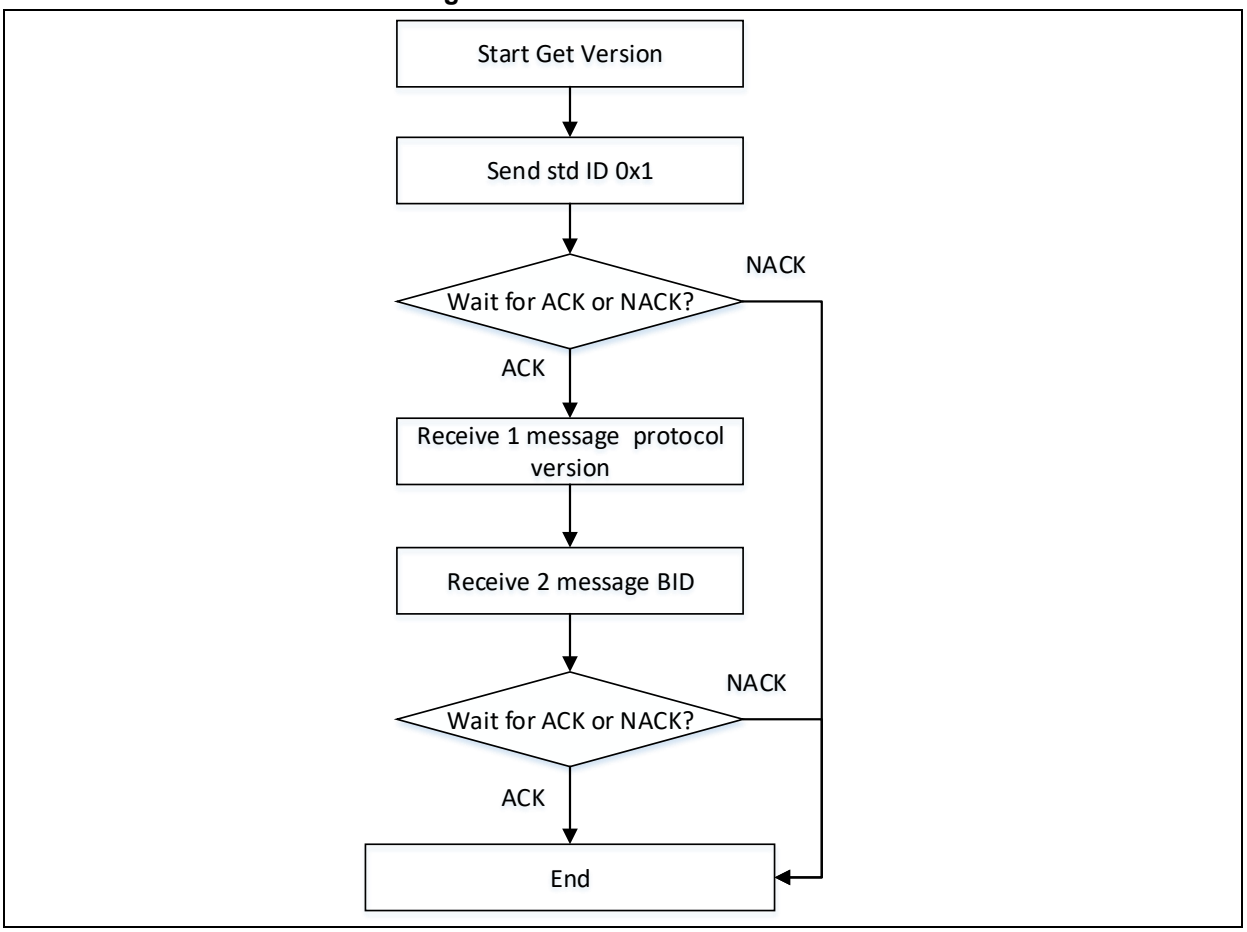
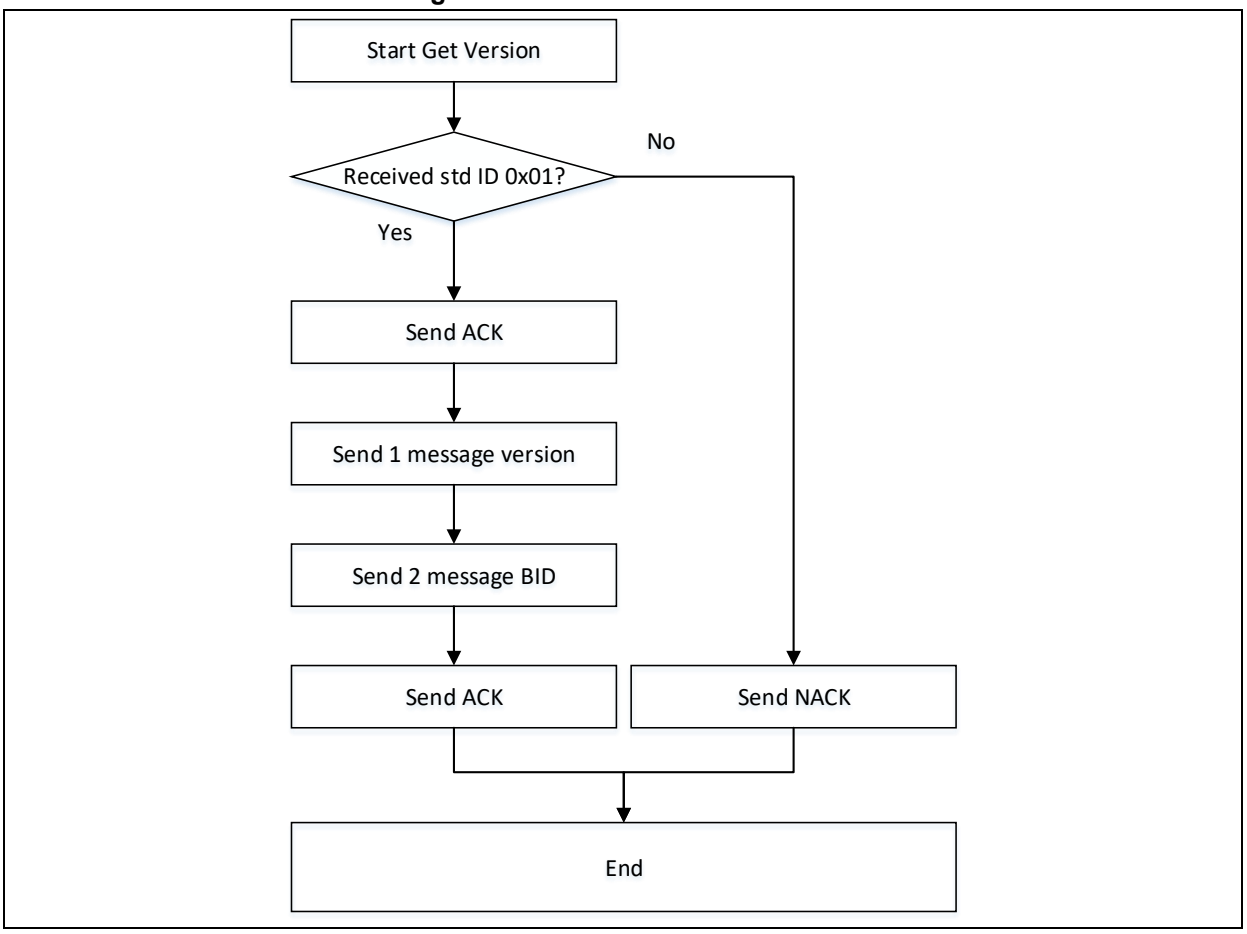


Figure 5 Get Version: device side



4.2.2 Data transmit on host side

Send	Receive	Standard frame ID	Frame length DLC	Data	Description
1		0x01	-	-	The host sends Get Version
	1	0x01	1	ACK/NACK	When an NACK is received, it represents the end of the command.
	2	0x01	1	*	Bootloader protocol version
	3	0x01	1	*	Bootloader version ID (BID)
	4	0x01	1	*	Bootloader version ID (BID)
	5	0x01	1	ACK	End of command

4.3 Get Device ID command

This command is used to get the identification code of the device. This ID data includes a 4-byte product ID and a 1-byte project ID. The “project ID” is used to identify which MCU series is being used, and the “product ID” is used to get the exact part number of the current MCU series in use. When the device receives this command, it transmits an “ACK” byte to the host. After the transmission of the ACK byte, the device sends a 1-byte data length indicating the number of data to be transmitted-- the value is the transmitted length minus 1 (for example, the transmitted data size is 5, then the value is 4), then sends another 4-byte product ID and 1-byte project ID. After this operation, the device transmits an ACK byte to the host.
This command is allowed and executed when the access protection is enabled.

4.3.1 Flowchart on host and device sides

Figure 6 Get Device ID: host side

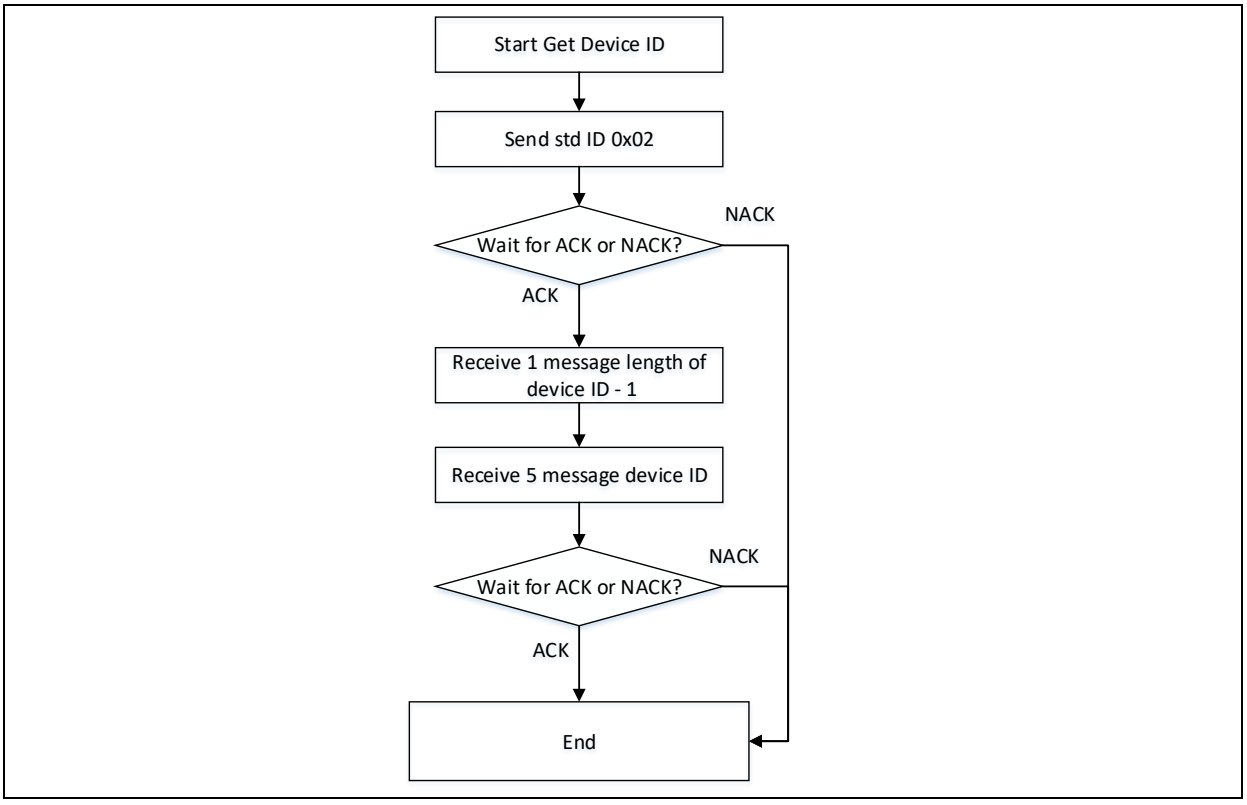
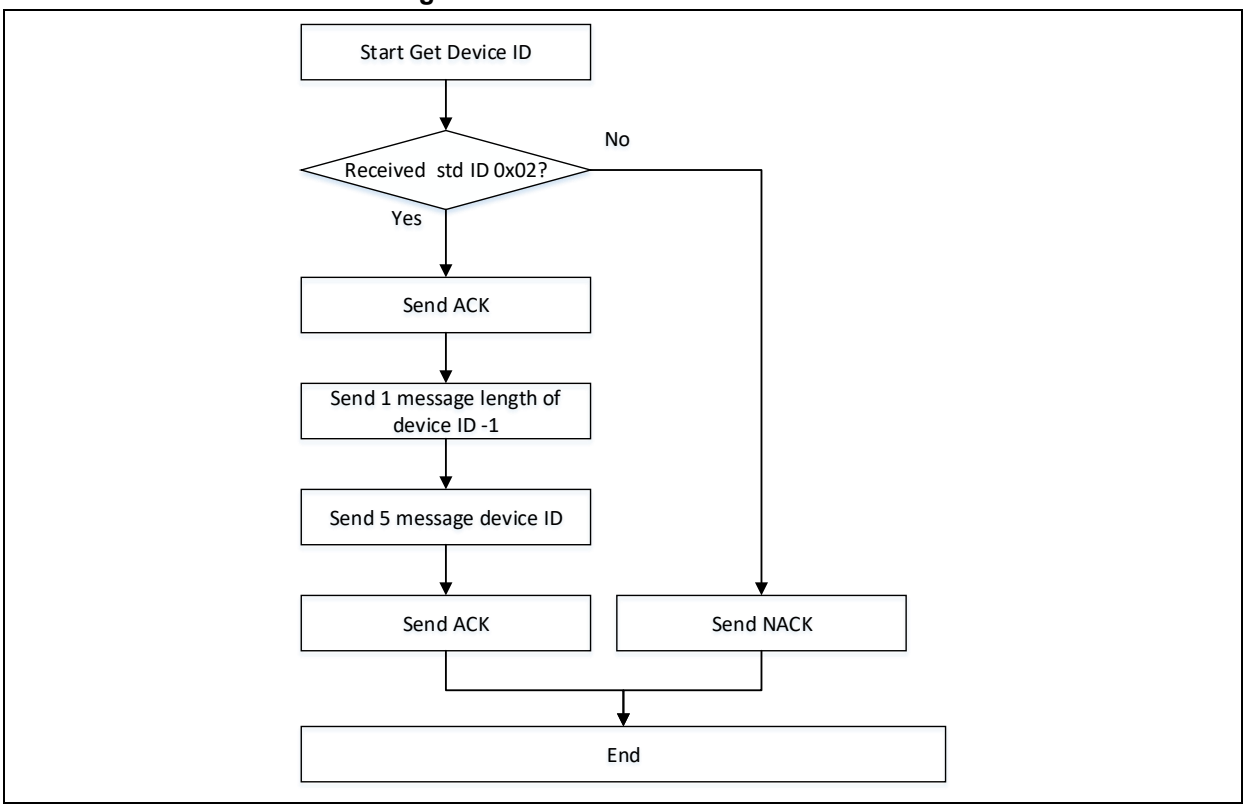


Figure 7 Get Device ID: device side



4.3.2 Data transmit on host side

Send	Receive	Standard frame ID	Frame length DLC	Data	Description
1		0x02	-	-	The host sends Get Device ID command
	1	0x02	1	ACK/NACK	When an NACK is received, it represents the end of the command.
	2	0x02	1	0x04	Device ID length minus 1
	3	0x02	1	*	Product ID [8-15]
	4	0x02	1	*	Product ID [0-7]
	5	0x02	1	*	Product ID [24-31]
	6	0x02	1	*	Product ID [16-23]
	7	0x02	1	*	Project ID
	8	0x02	1	ACK	End of command

4.4 Read Memory command

This command is used to read data from any valid memory address (refer to the product datasheets) in SRAM, boot memory and in the user system data area. For those MCUs with SPIM feature, SPIM must be enabled first (send Enable SPIM command) to read data from it.

When the device receives the command, it checks the following information:

1. Whether the access protection is enabled or not
2. Whether the address is valid or not

If the access protection is not enabled and the address is valid and correct, the device transmits the ACK byte to the host, or else an NACK byte.

After the transmission of the ACK byte, the device

This command is not allowed and executed when the access protection is enabled.

4.4.1 Flowchart on host and device sides

Figure 8 Read Memory: host side

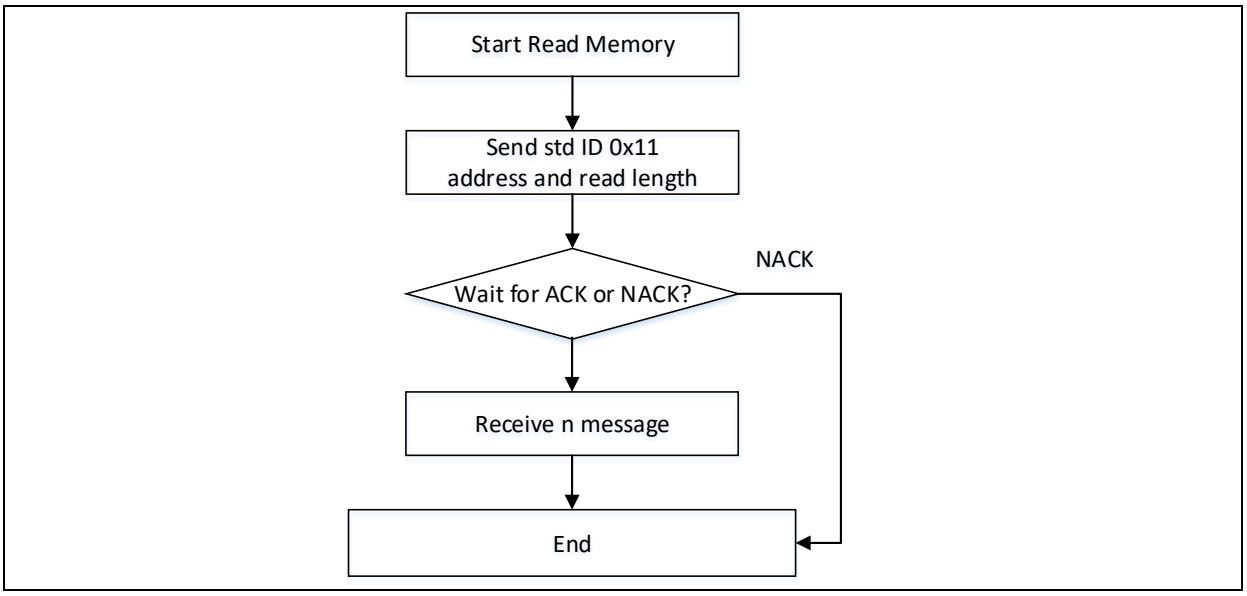
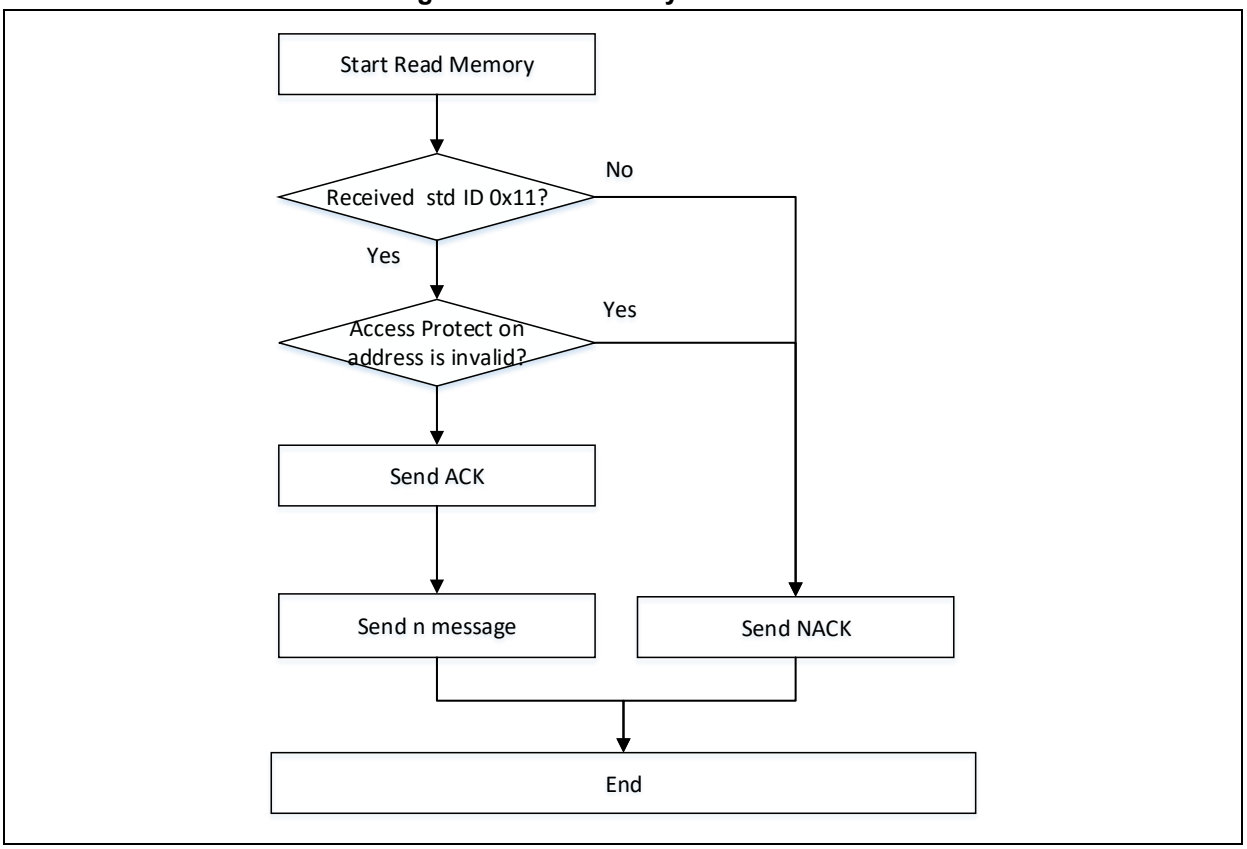


Figure 9 Read Memory: device side



4.4.2 Data transmit on host side

Send	Receive	Standard frame ID	Frame length DLC	Data	Description
1		0x11	5	1: Address MSB 2: Address 3: Address 4: Address LSB 5: Read length X– 1	The host sends Read Memory command and it includes start address (four bytes) and a 1-byte read length -1 (x)
	1	0x11	1	ACK/NACK	When an NACK is received, it indicates that the access protection is enabled or the address is invalid, the command is not executed.
	2	0x11	x1	*	Destination address data, x1 represents the length of a message CAN data length range: 1~8 CANFD data length range: 1~64
	…	0x11		…	Destination address data
	n	0x11	xn	*	Destination address data, x1+…+xn >= X,

Send	Receive	Standard frame ID	Frame length DLC	Data	Description
					When the received data is greater than the data to read (X), those data after X are deemed as invalid.

4.5 Jump command

This command is used to execute the code in a specified address. It can jump to main memory or SRAM to execute code. The address must be valid, which depends on the MCU series.

When the device receives the command, it checks the following information:

1. Whether the access protection is enabled or not
2. Whether the address is valid or not

If the access protection is not enabled and the address is valid and correct, the device transmits the ACK byte to the host, and jumps to the specified address.

If the access protection is enabled or the address is invalid, the device transmits an NACK byte to the host and stops the operation of the command.

This command is not allowed and executed when the access protection is enabled.

4.5.1 Flowchart on host and device sides

Figure 10 Jump: host side

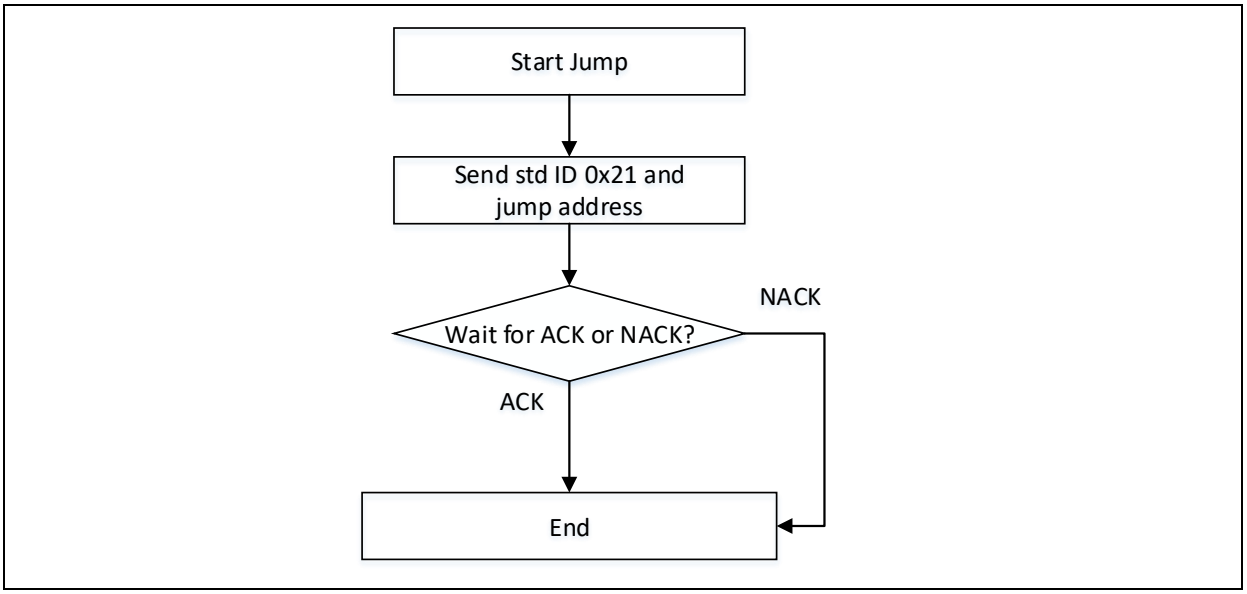
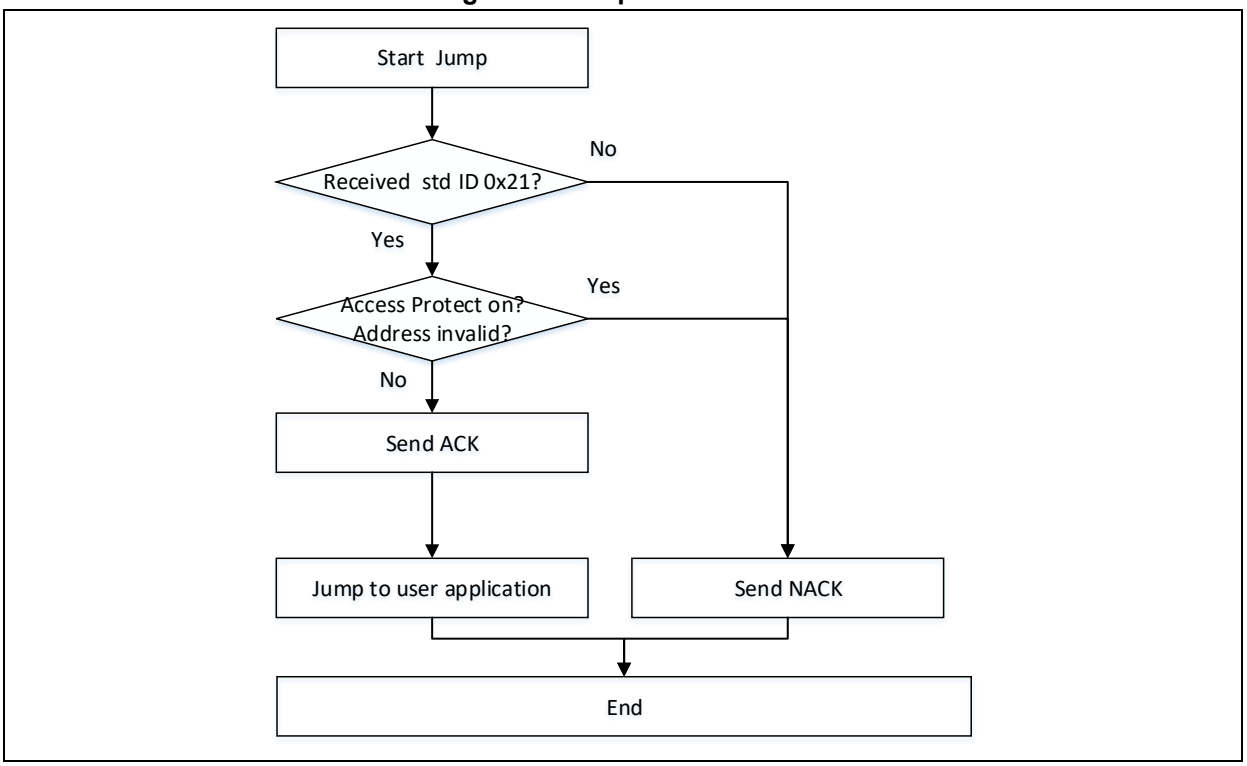


Figure 11 Jump: device side



4.5.2 Data transmit on host side

Send	Receive	Standard frame ID	Frame length DLC	Data	Description
1		0x21	4	1: Address MSB 2: Address 3: Address 4: Address LSB	The host sends Jump command, including a 4-byte start address
	1	0x21	1	ACK/NACK	When an NACK is received, it indicates that the access protection is enabled or the address is invalid. The devices stops the operation of the command.

4.6 Write Memory command

This command is used to write data to any valid memory address (depending on the product series) such as Flash memory, SRAM, or user system data area.

If the Write Memory command is issued to the Flash memory, all bytes are erased before writing the new values.

The size of the user system data area depends on the product series:

- User system data area smaller than 256 bytes
  Only a single Write Memory command is issued by the host to write data to the user system data area. When the device receives the command, it erases all bytes in the user system data area before writing to it and then performing a system reset.
- User system data area greater than 256 bytes
  Multiple Write Memory commands are issued by the host to write data to the user system data area.
  When the device receives the command, if the received address to write is the start address of the user system data area, the address is erased before written.
  If it is not the start address of the user system data area, no erase operation is performed and data are directly written.
  After the write operation (after all of data are written), a system reset is performed automatically.

When the device receives the command, it checks the following information:

1. Whether the access protection is enabled or not
2. Whether the address is valid or not

If the access protection is not enabled and the address is valid and correct, the device transmits the ACK byte to the host, and continues to receive data.

If the access protection is enabled or the address is invalid, the device transmits an NACK byte to the host and stops the operation of the command.

This command is not allowed and executed when the access protection is enabled.

4.6.1 Flowchart on host and device sides

Figure 12 Write Memory: host side

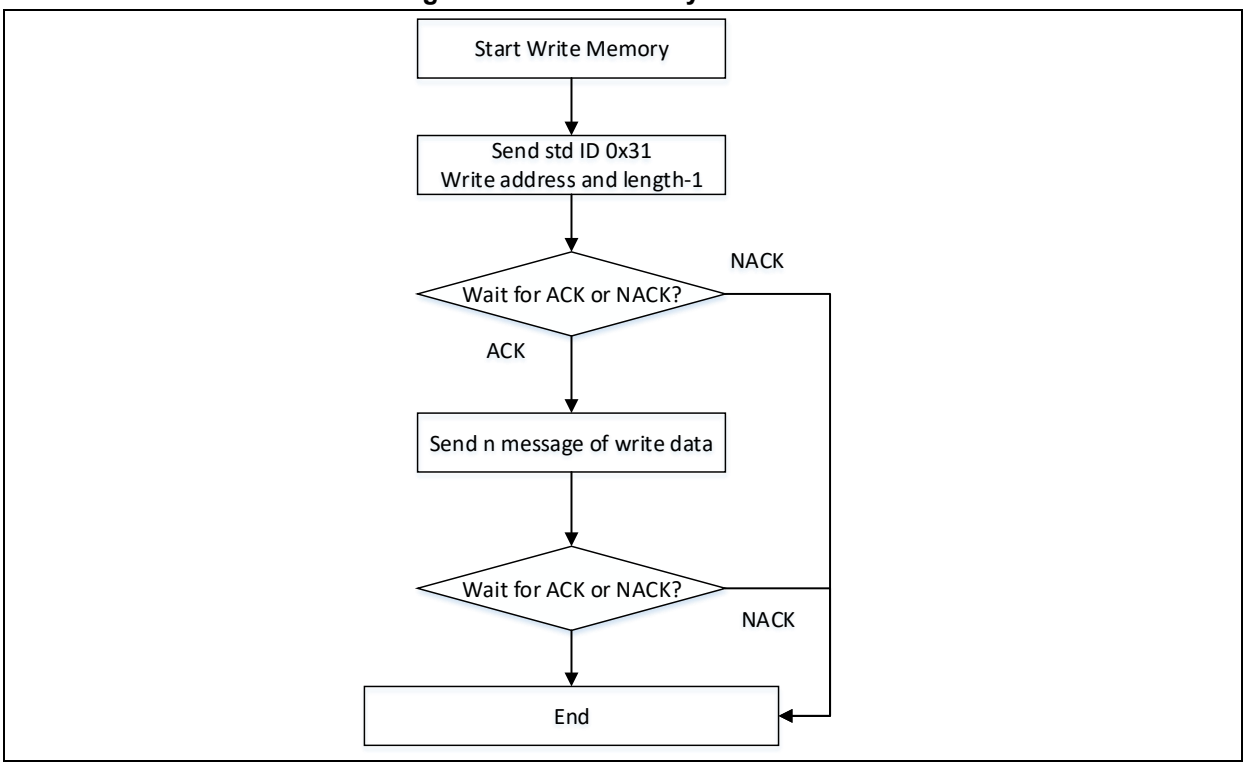
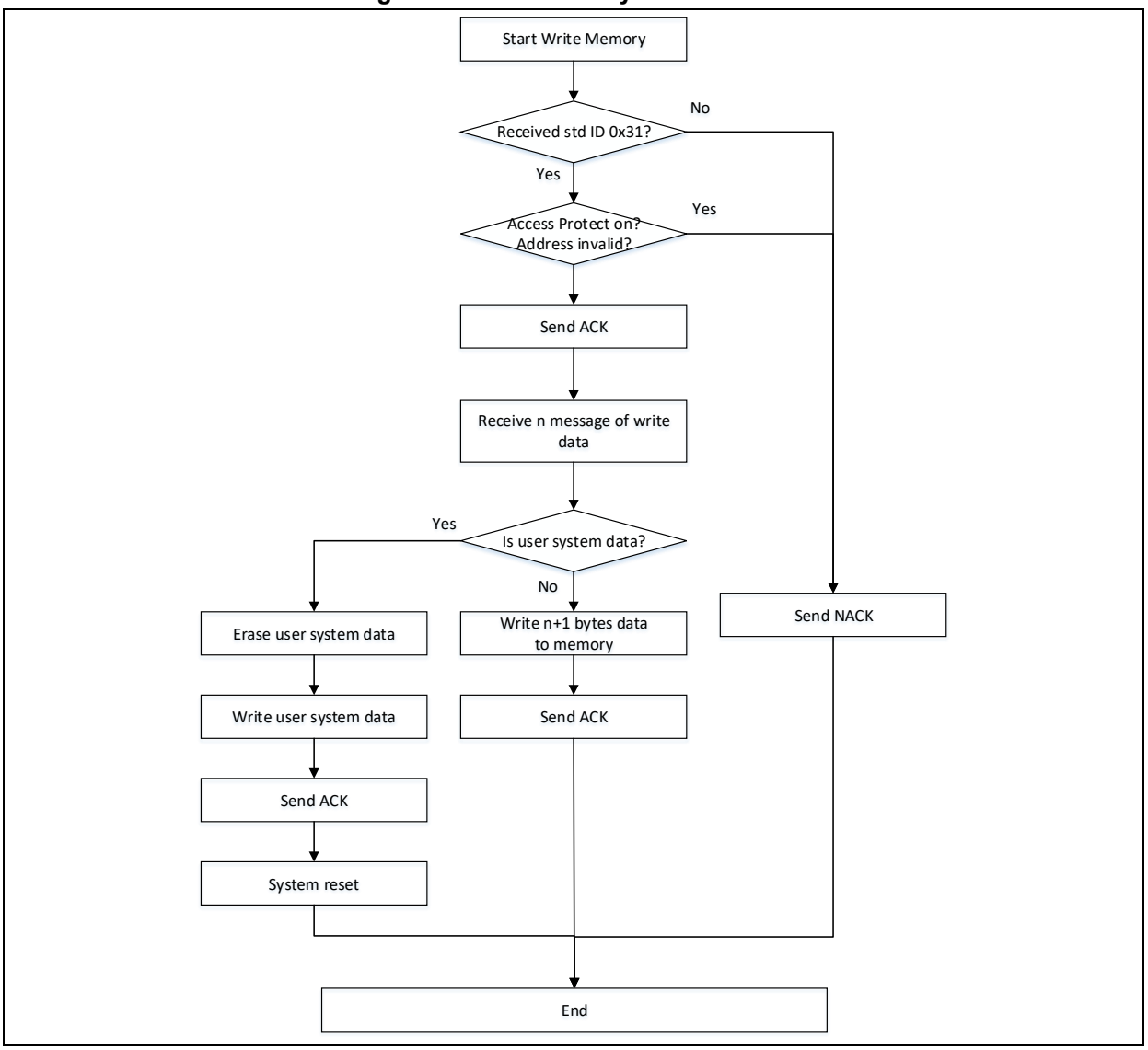


Figure 13 Write Memory: device side



4.6.2 Data transmit on host side

Send	Receive	Standard frame ID	Frame length DLC	Data	Description
1		0x31	5	1: Address MSB 2: Address 3: Address 4: Address LSB 5: Write length X–1	The host sends Write Memory command, which includes a 4-byte start address and one byte write length (X-1)
	1	0x31	1	ACK/NACK	When an NACK is received, it indicates that the access protection is enabled or the address is invalid, the device stops the operation of the demand.
2		0x31	x1	*	Write address data, x1

Send	Receive	Standard frame ID	Frame length DLC	Data	Description
					represents the length of a message CAN data length range: 1~8 CANFD data length range: 1~64
…		…	…	…	Data to write
n		0x31	xn	*	Write address data, x1+…+xn >= X When the data is greater than the data length to write (X), those data after X are deemed as invalid.
	3	0x31	1	ACK/NACK	End of command

4.7 Erase command

This command allows the host to erase Flash memory pages. It supports sector erase (sector size depends on the product series) and mass erase.

For those products that contain bank 1 and bank 2, this command can be used to erase bank 1 and bank 2.

When the device receives the command, if the access protection is not enabled, it transmits the ACK byte to the host. The device judges the type of erase based on sector index (two bytes).

Erase type:

- If it is Sector erase, the received data indicates the number of the sectors to be erased. Then the device receives the index of N sectors to be erased. After receiving the index, the device starts erasing the corresponding sector and then transmits an ACK byte to the host.
- If it is mass erase or bank erase, the device directly performs erase operation and then transmits the ACK byte to the host after the erase operation.

This command is not allowed and executed when the access protection is enabled.

Table 1 List of erase type

Erase type	Erase index	Erase area
Sector erase	0x00 0x00	Sector0
	0x00 0x01	Sector1
	…	…
	0x80 00	SPIM Sector0
	0x80 01	SPIM Sector1
	…	…
	0x8F 0xFF	SPIM Sector4096
Mass erase	0xFF 0xFF	All Flash
Bank erase	0xFF 0xFE	Bank1 Erase
	0xFF 0xFD	Bank2 Erase
	0xFF 0xFC	Bank3 Erase
Block erase	0xFF 0xFB	Block Erase

Note: the sector size is dependent on the product series.

4.7.1 Flowchart on host and device sides

Figure 14 Erase: host side

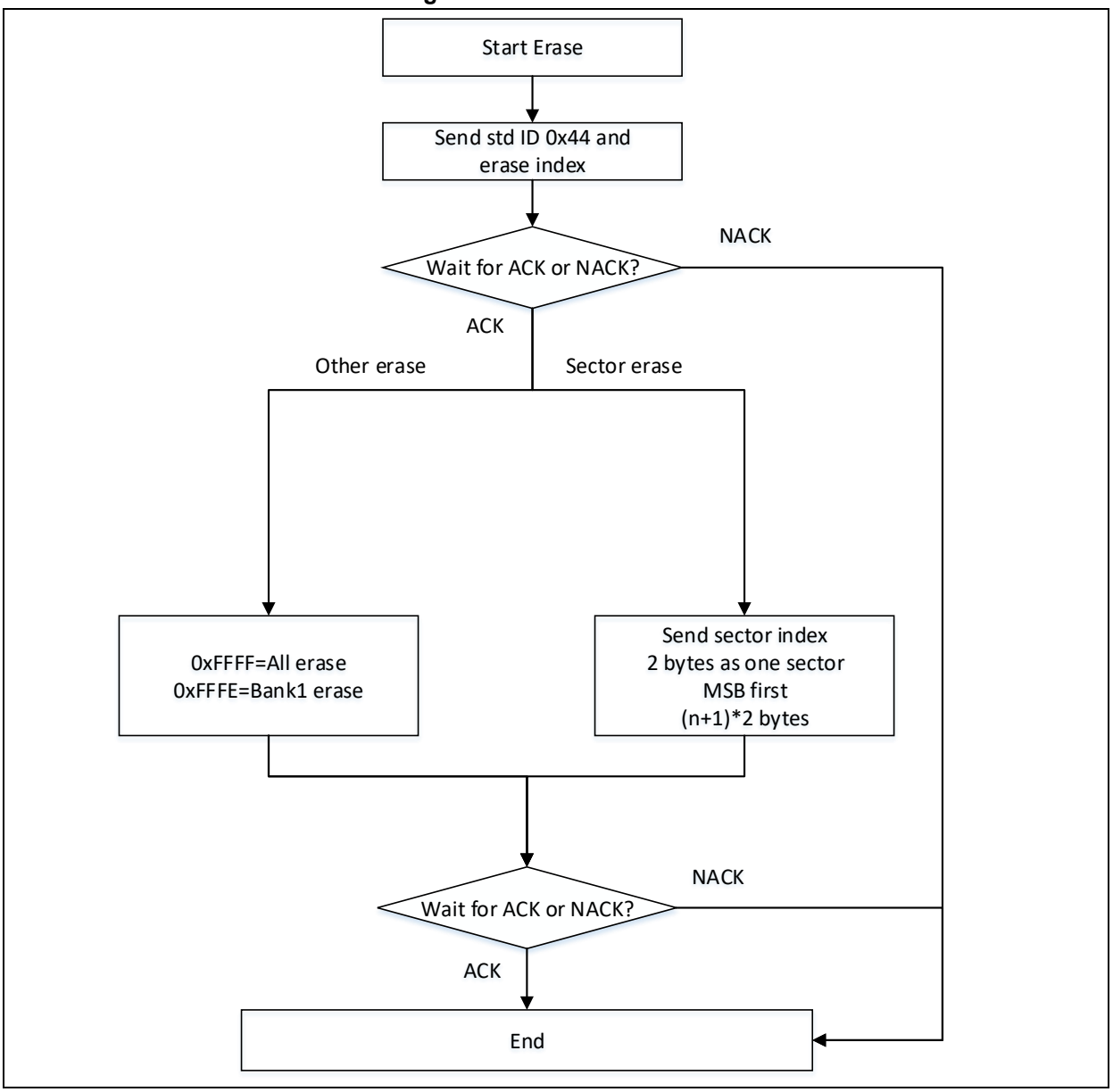
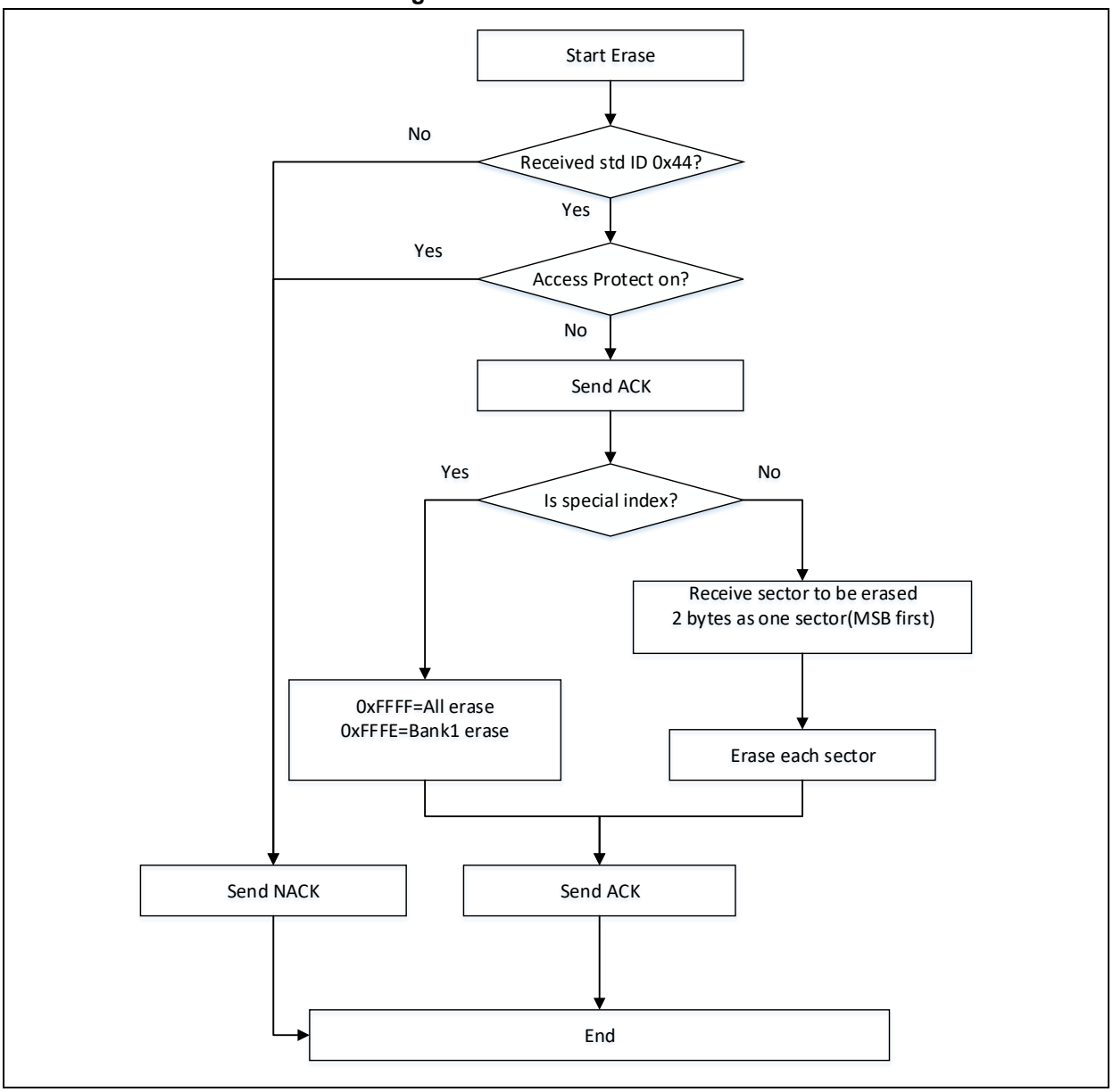


Figure 15 Erase: device side



4.7.2 Data transmit on host side

Sector erase

Send	Receive	Standard frame ID	Frame length DLC	Data	Description
1		0x44	2	SectorNum MSB SectorNum LSB	The host sends Erase command, which includes the number of sectors to erase X-1
	1	0x44	1	ACK/NACK	When an NACK byte is received, it represents the end of the command.
2		0x44	x1	*	Sector index (MSB First) X1 represents the size of a piece of message CAN data length range 1~8 CANFD data length range :1~64
…		0x44	…	*	Sector index (MSB)
n		0x44	xn	*	Sector index (MSB) x1+…+xn=X*2 (2byte represents a sector index)
	2	0x44	1	ACK	

Bank or mass erase

Send	Receive	Standard frame ID	Frame length DLC	Data	Description
1		0x44	2	1: 0xFF 2: 0xFF/0xFE	The host sends Erase command, which includes bank erase or mass erase index. The second byte is 0xFF: mass erase; The second byte is 0xFE: erase bank 1
	1	0x44	1	ACK/NACK	When an NACK is received, it represents the end of the command.
	2	0x44	1	ACK	

4.8 Erase and Program Protect command

This command is used to enable erase/program protection for the specified sectors.

When the device receives the command, if the access protection is not enabled, it transmits an ACK byte to the host. After the transmission of the ACK byte, it waits for one-byte length-1 (n), and then receives the index bit corresponding to the erase/program protection (n+1 bytes) ---refer to the corresponding product datasheet for more details about the bit definition --- and a checksum byte. If the checksum is correct, the device erases the user system data area (those data other than erase/program protect bytes are reserved), and writes the settings for erase/program protection, and transmits the ACK byte to the host before performing a system reset.

Note: The index bit (0, 1, 2…n) for erase/program protection corresponds to the bit (0-N) of the erase/program protection byte of the user system data area. See the corresponding product sheet for more details about the user system data area.

This command is not allowed and executed when the access protection is enabled.

4.8.1 Flowchart on host and device sides

Figure 16 Erase and Program Protect: host side

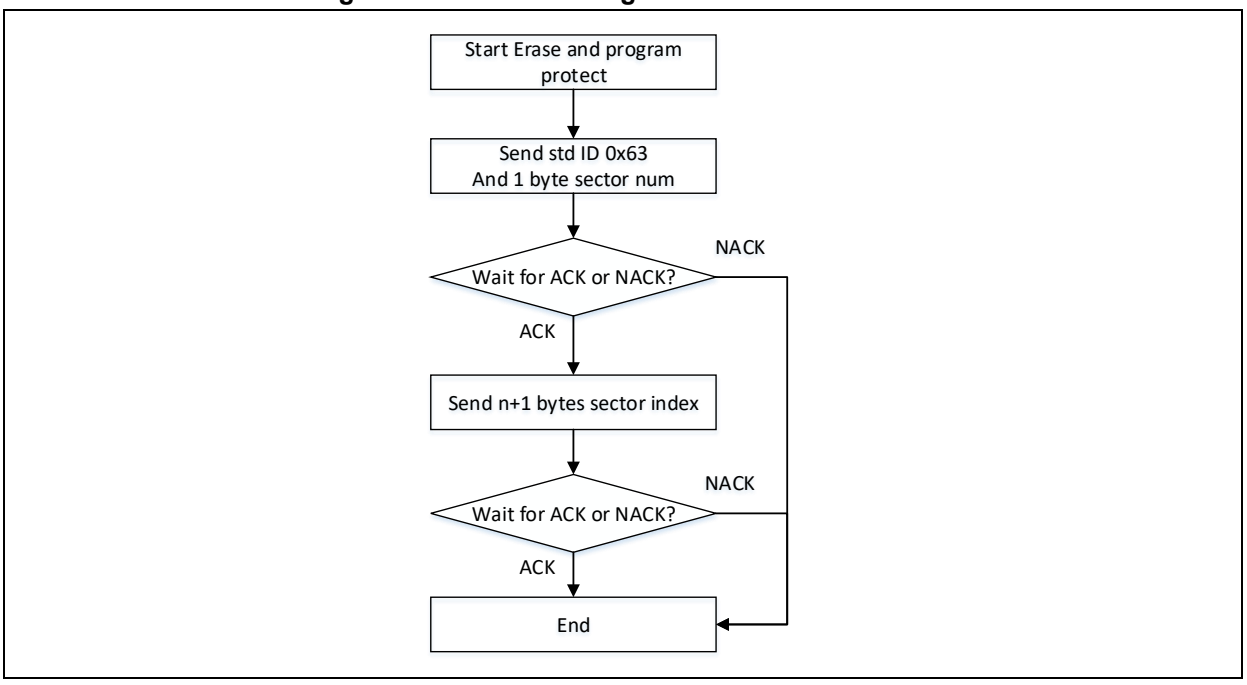
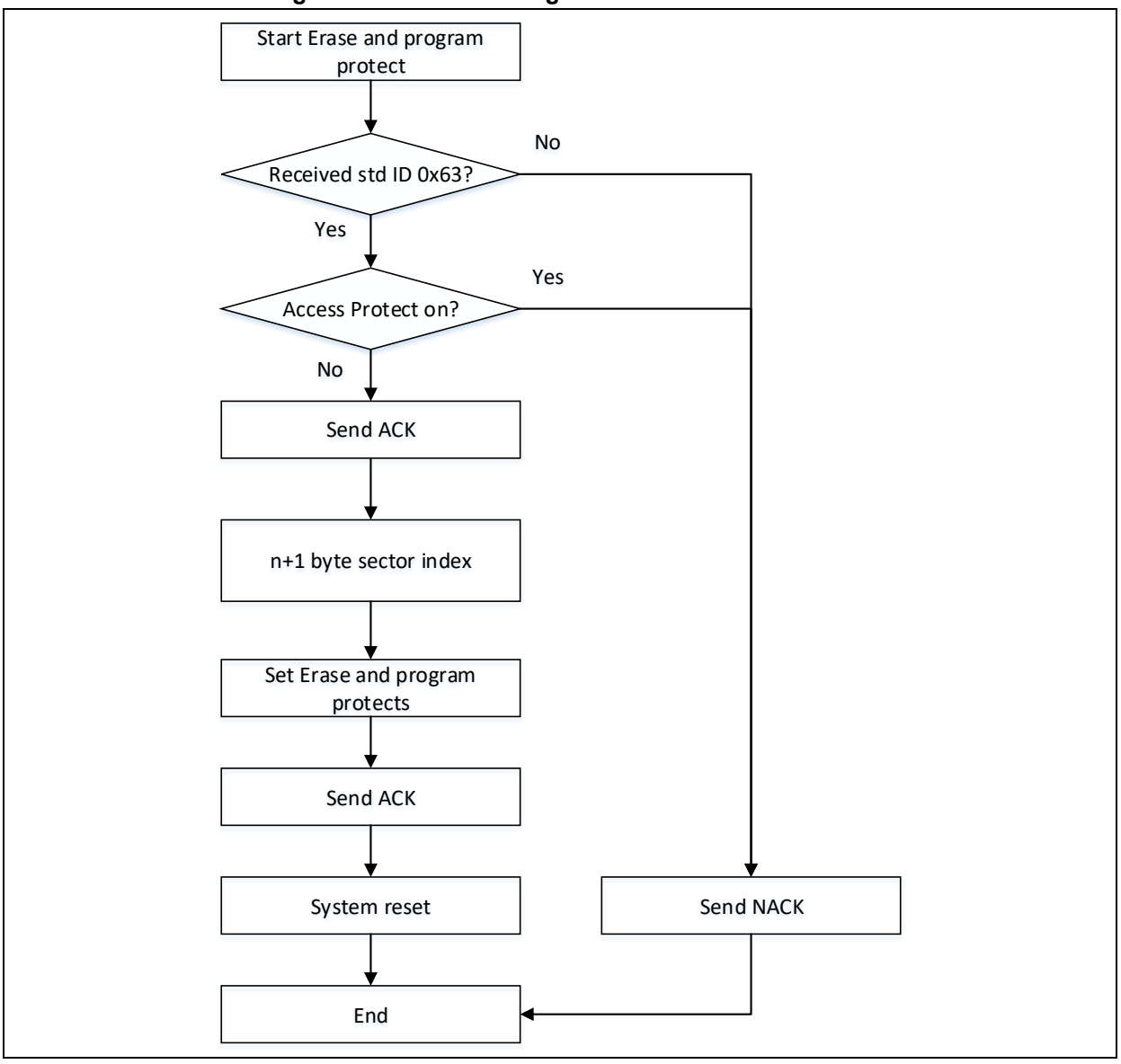


Figure 17 Erase and Program Protect: device side



4.8.2 Data transmit on host side

Send	Receive	Standard frame ID	Frame length DLC	Data	Description
1		0x63	1	Sector length	The host sends Erase and program protect command, which includes a 1-byte length X-1
	1	0x63	1	ACK/NACK	When an NACK byte is received, it represents the end of the command.
2		0x63	x1	Sector index	Sector index to be protected. X1 represents the size of a piece of message CAN data length range 1~8 CANFD data length

Send	Receive	Standard frame ID	Frame length DLC	Data	Description
					range :1~64
…		0x63	…	Sector index	Sector index to be protected
n		0x63	xn	Sector index	
	2	0x63	1	ACK	

4.9 Erase and Program Unprotect

This command is used to disable the erase/program protection of memory.
When the device receives the command, if the access protection is not enabled, it transmits the ACK byte to the host. After the transmission of the ACK byte, the device disables the erase/program protection of all the flash memory sectors. After the unprotection operation, the device transmits the ACK byte and performs a system reset.
This command is not allowed and executed when the access protection is enabled.

4.9.1 Flowchart on host and device sides

Figure 18 Erase and Program Unprotect: host side

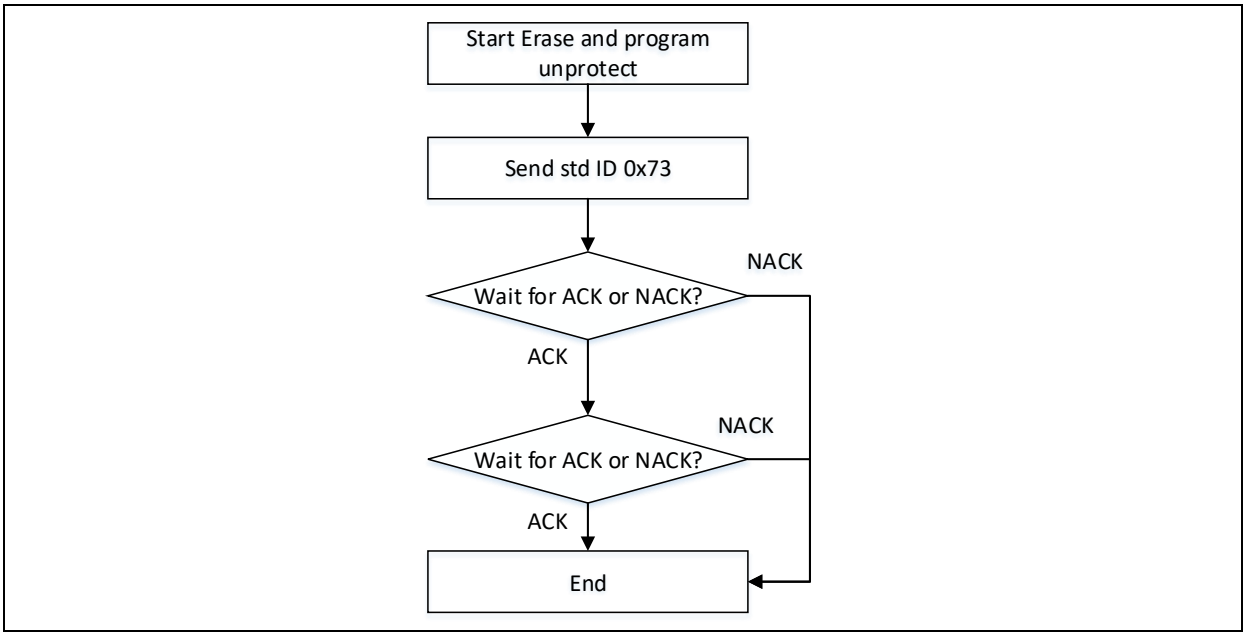
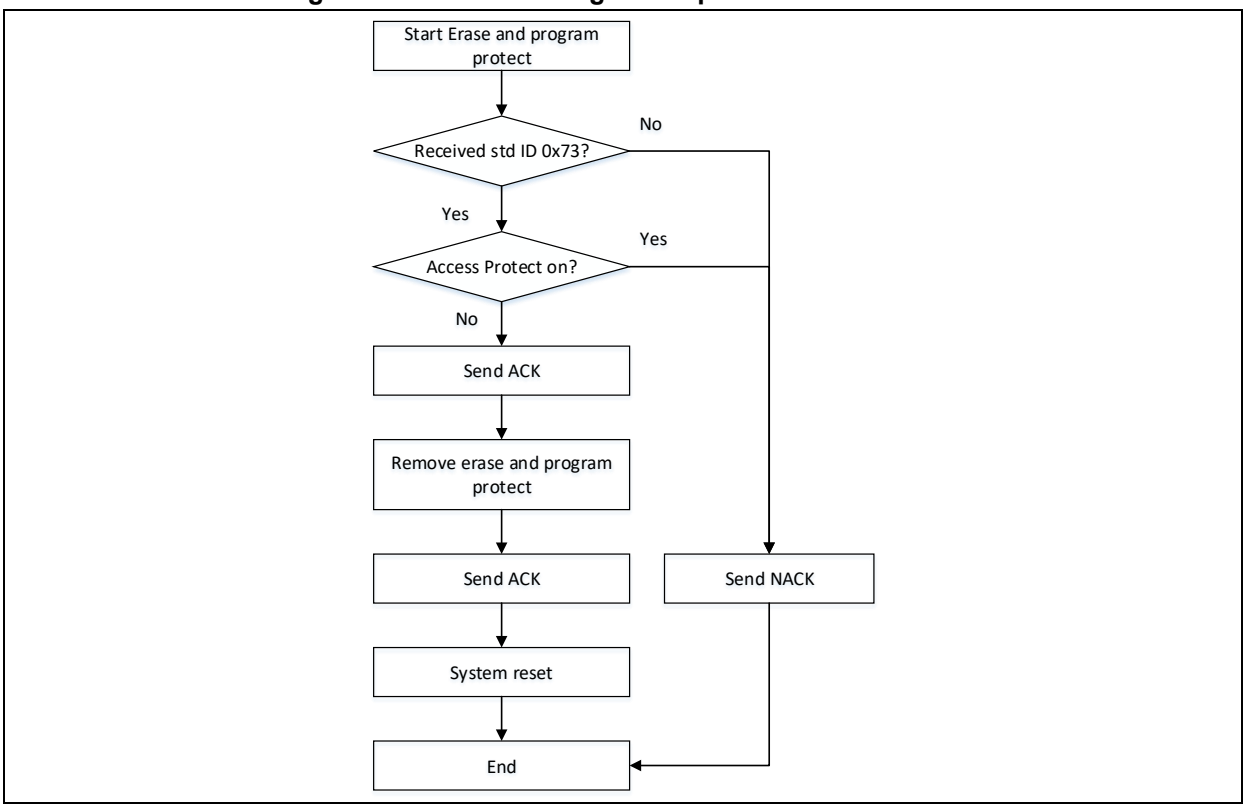


Figure 19 Erase and Program Unprotect: device side



4.9.2 Data transmit on host side

Send	Receive	Standard frame ID	Frame length DLC	Data	Description
1		0x73	-	-	The host sends Erase and program unprotect command
	1	0x73	1	ACK/NACK	When an NACK byte is received, it represents the end of the command.
	2	0x73	1	ACK	End of the command.

4.10 Access Protect command

This command is used to enable the flash memory access protection. After this command is enabled, it is not allowed to read data from flash memory.

When the device receives the command, if the access protection is not enabled, it transmits the ACK byte to the host. After the transmission of the ACK byte, the device enables the access protection for the flash memory. After the protection operation, the device transmits the ACK byte to the host and then performs a system reset.

This command is not allowed and executed when the access protection is enabled.

4.10.1 Flowchart on host and device sides

Figure 20 Access Protect: host side

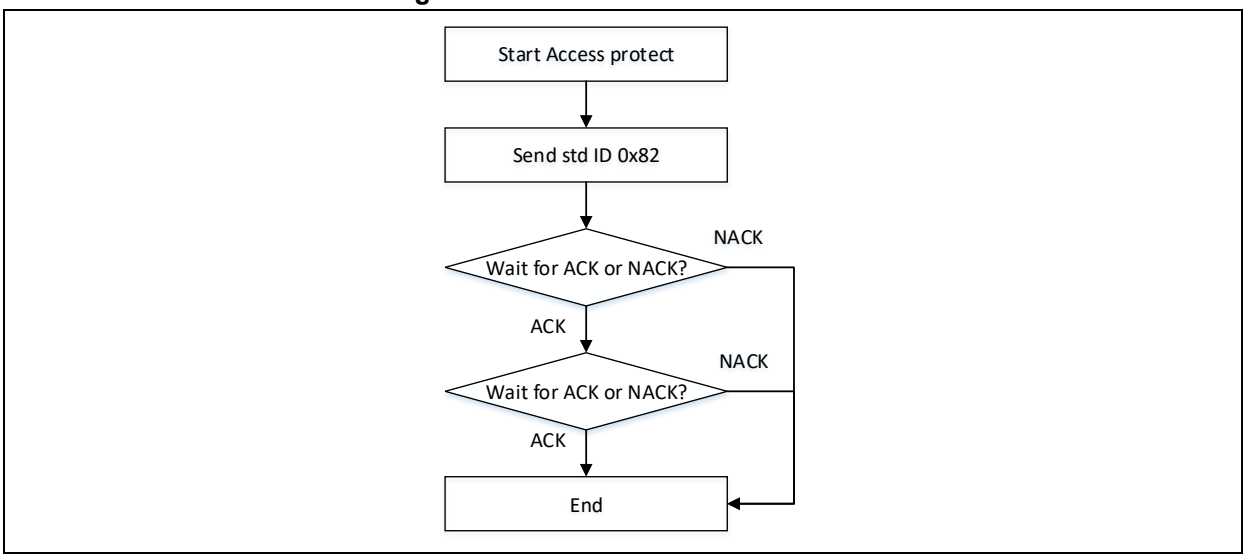
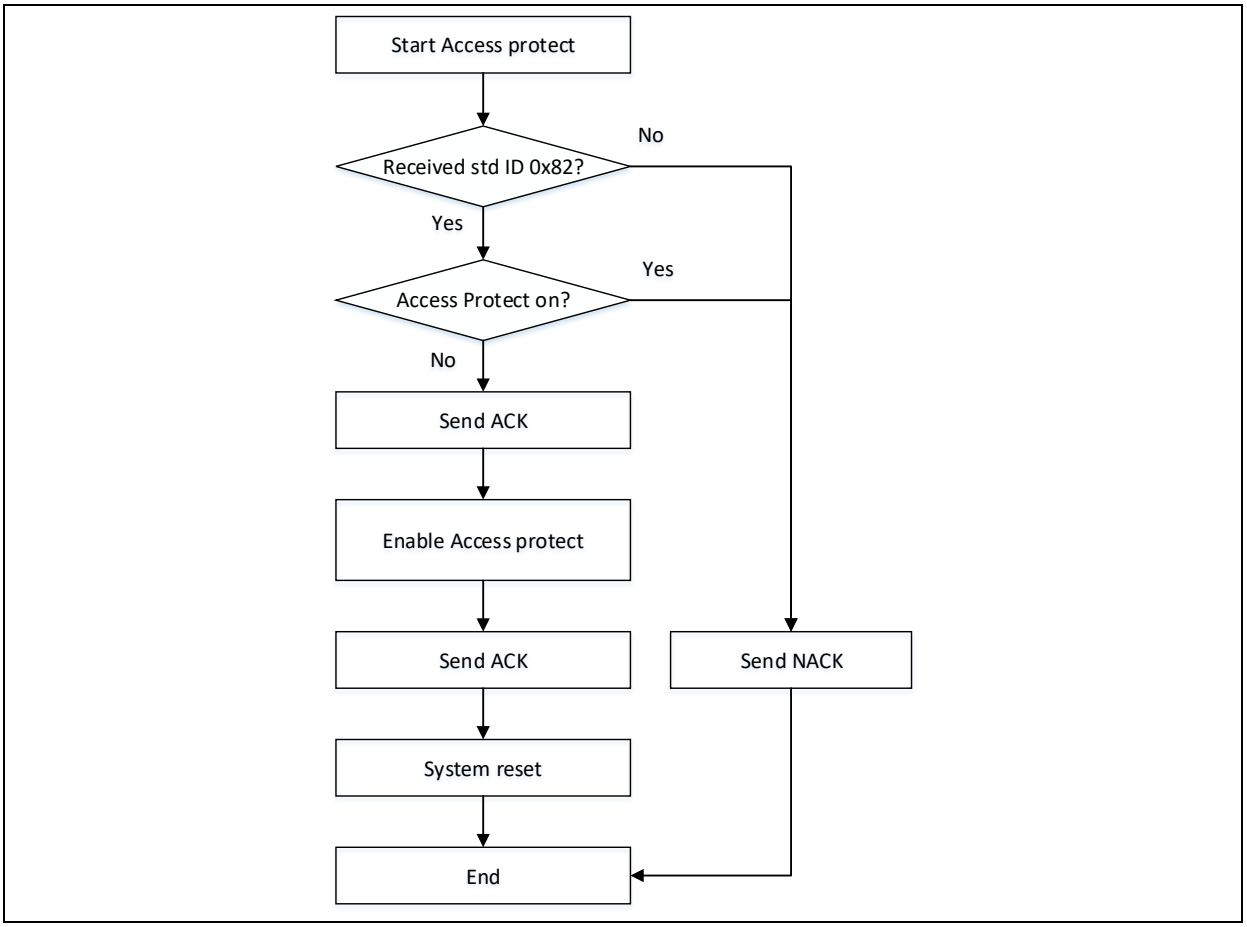


Figure 21 Access Protect: device side



4.10.2 Data transmit on host side

Send	Receive	Standard frame ID	Frame length DLC	Data	Description
1		0x82	-	-	The host sends Access protect command
	1	0x82	1	ACK/NACK	When an NACK byte is received, it represents the end of the command.
	2	0x82	1	ACK	End of the command.

4.11 Access Unprotect command

This command is used to disable the flash memory access protection. If the device is in Access protection mode, this command operation induces a mass erase of the flash memory.
When the device receives the command, it transmits the ACK byte to the host. After the transmission of the ACK byte, the devices disables the access protection of the flash memory. After the unprotection operation, the device transmits the ACK byte to the host and then performs a system reset.

4.11.1 Flowchart on host and device sides

Figure 22 Access Unprotect: host side

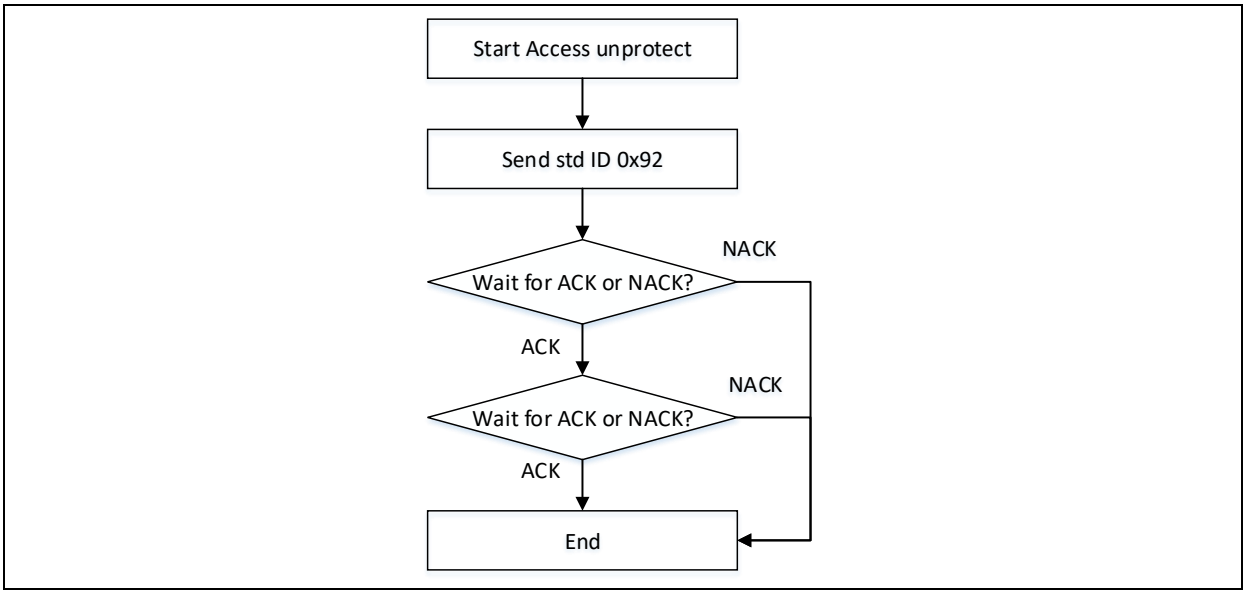
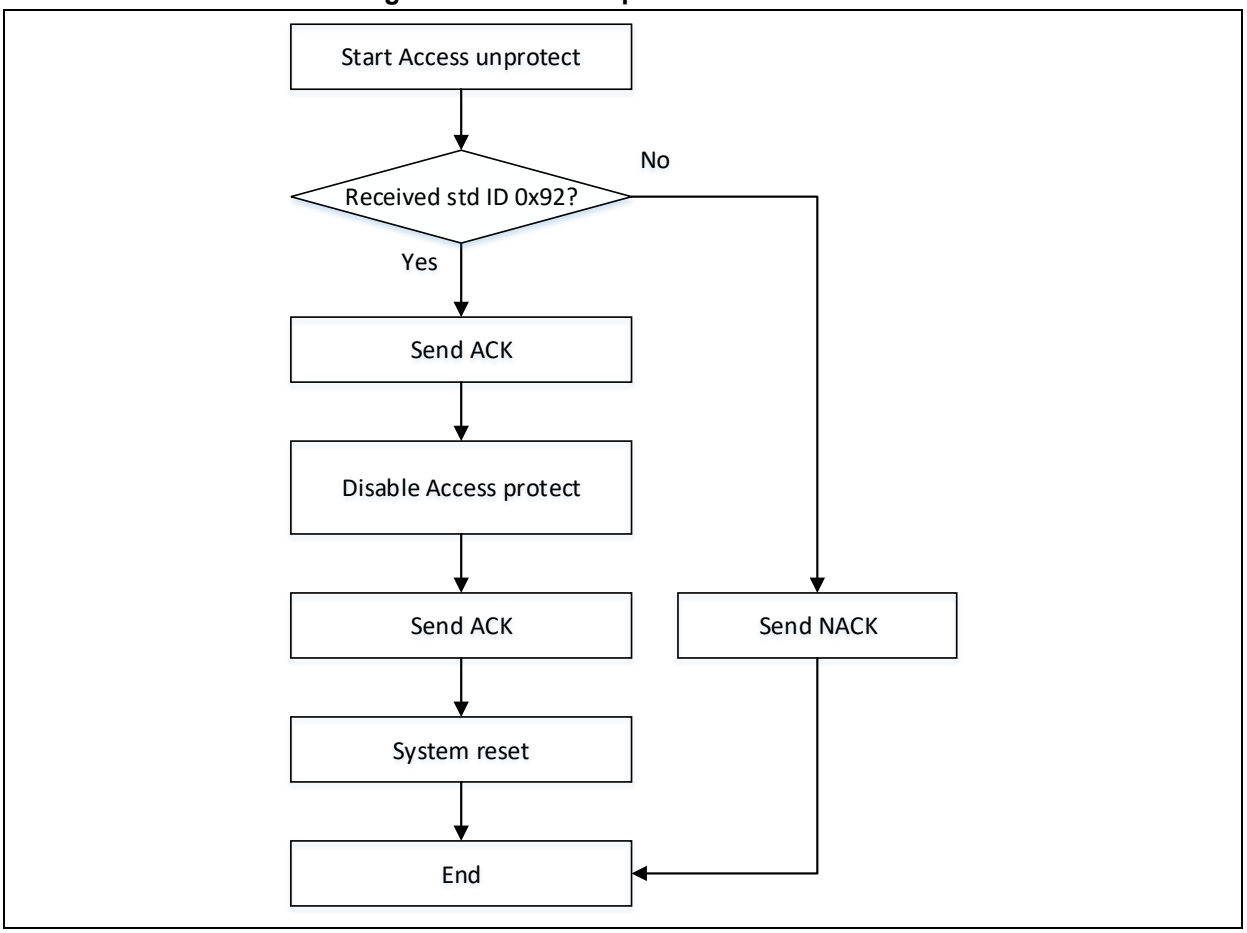


Figure 23 Access Unprotect: device side



4.11.2 Data transmit on host side

Send	Receive	Standard frame ID	Frame length DLC	Data	Description
1		0x92	-	-	Access unprotect command
	1	0x92	1	ACK/NACK	When an NACK byte is received, it represents the end of the command.
	2	0x92	1	ACK	End of the command.

4.12 Firmware CRC command

This command is used to check whether memory data is correct. The memory area is specified by the host but must be expressed in sector unit and its start address must be aligned with a sector. When the device receives the command, if the address is valid, it transmits the ACK byte to the host and starts computing CRC. After this calculating operation, the device transmit a 4-byte CRC to the host.

The Firmware CRC adopts the MPEG-2 CRC algorithm.

4.12.1 Flowchart on host and device sides

Figure 24 Firmware CRC: host side

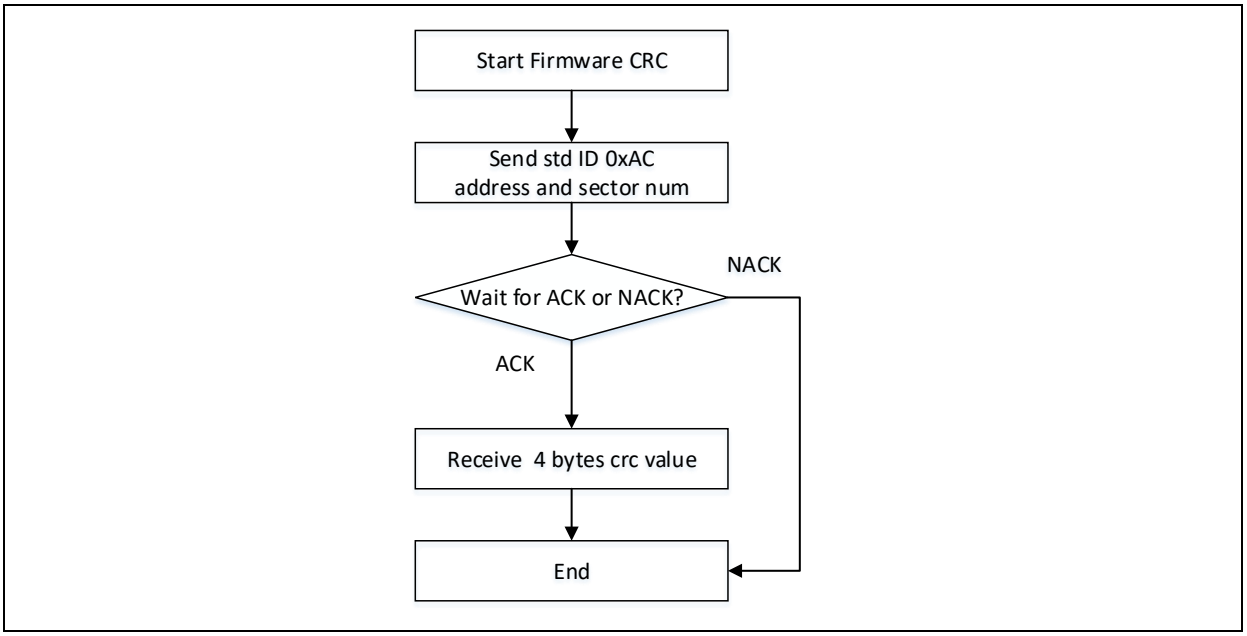
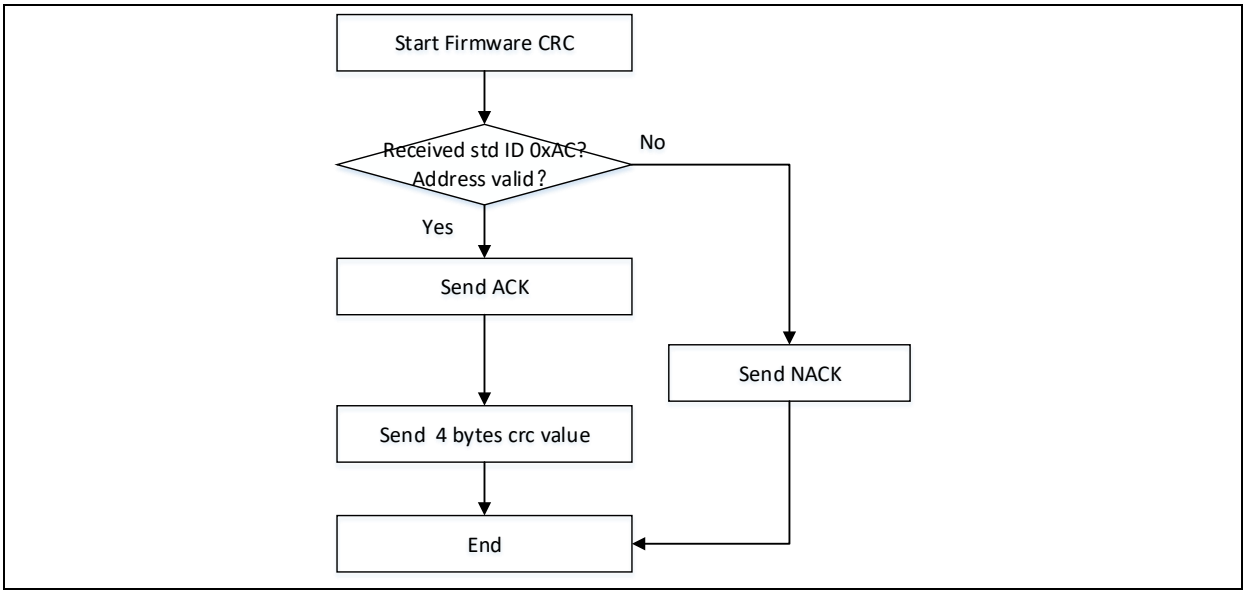


Figure 25 Firmware CRC: device side



4.12.2 Data transmit on host side

Send	Receive	Standard frame ID	Frame length DLC	Data	Description
1		0xAC	6	Address （MSB） Address Address Address （LSB） Number of sectors – 1 MSB（n） Number of sectors – 1 MSB（n）	The host sends Firmware CRC command, which includes a 4-byte start address and 2-byte sector number
	1	0xAC	1	ACK/NACK	When an NACK byte is received, it represents the end of the command.
	2	0xAC	4	CRC value (MSB) CRC value CRC value CRC value (LSB)	Return a 4-byte CRC value

4.13 Enable sLib

This command is used to enable security library (also called sLib). Refer to the sLib use manual for more details about it.

When the device receives the command, if the access protection is not enabled, it transmits an ACK byte to the host. After the transmission of the ACK byte, the device receives a piece of message which includes a 2-byte sLib start sector, a 2-byte sLib data/instruction start sector, and 2-byte sLib end sector. After this operation, the device starts setting the sLib. After the completion of the configuration, the device sends a 1-byte state and transmits an ACK byte to the host.

Note that a system reset has to be done for the sLib settings to take into account.

This command is not allowed and executed when the access protection is enabled.

sLib state:

- 1: sLib is enabled
- 0: sLib configuration success

4.13.1 Flowchart on host and device sides

Figure 26 Enable sLib: host side

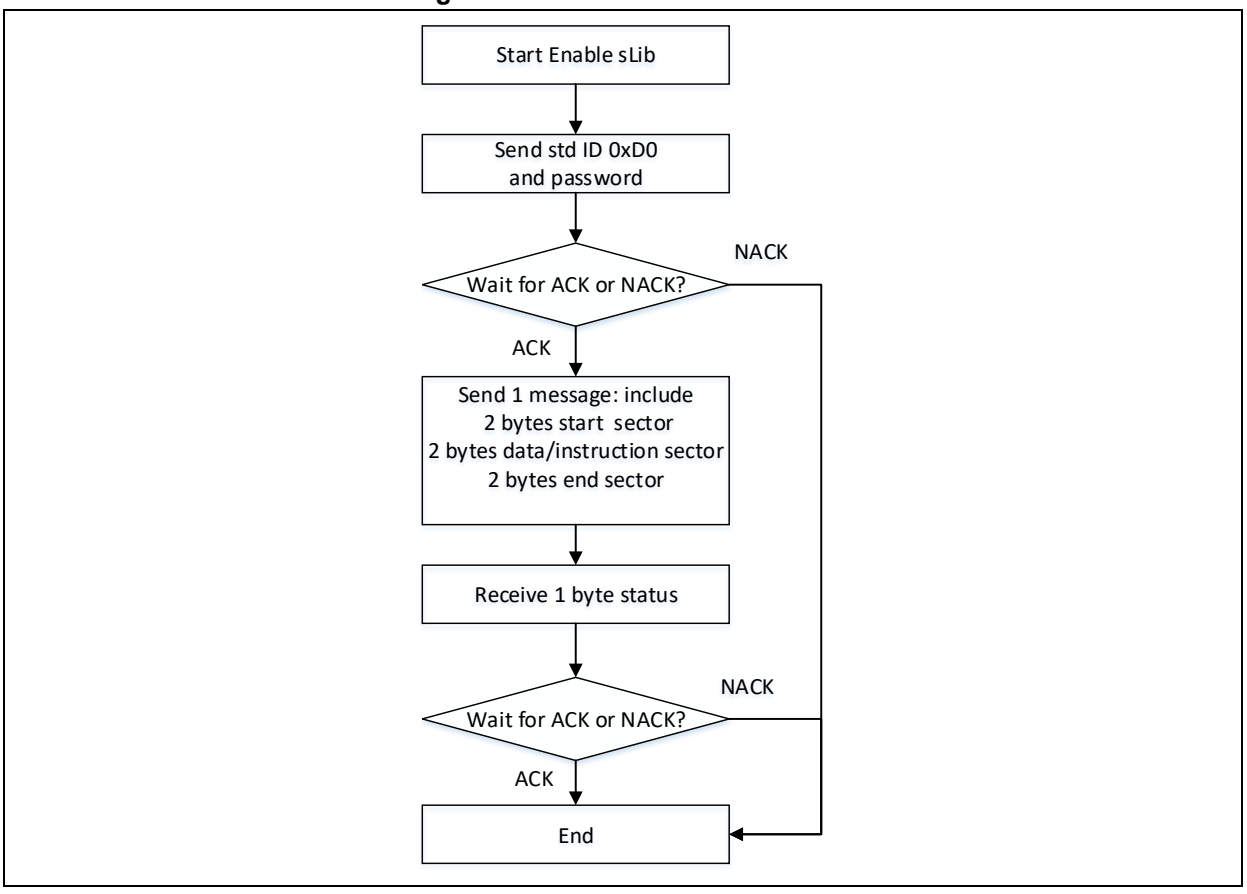
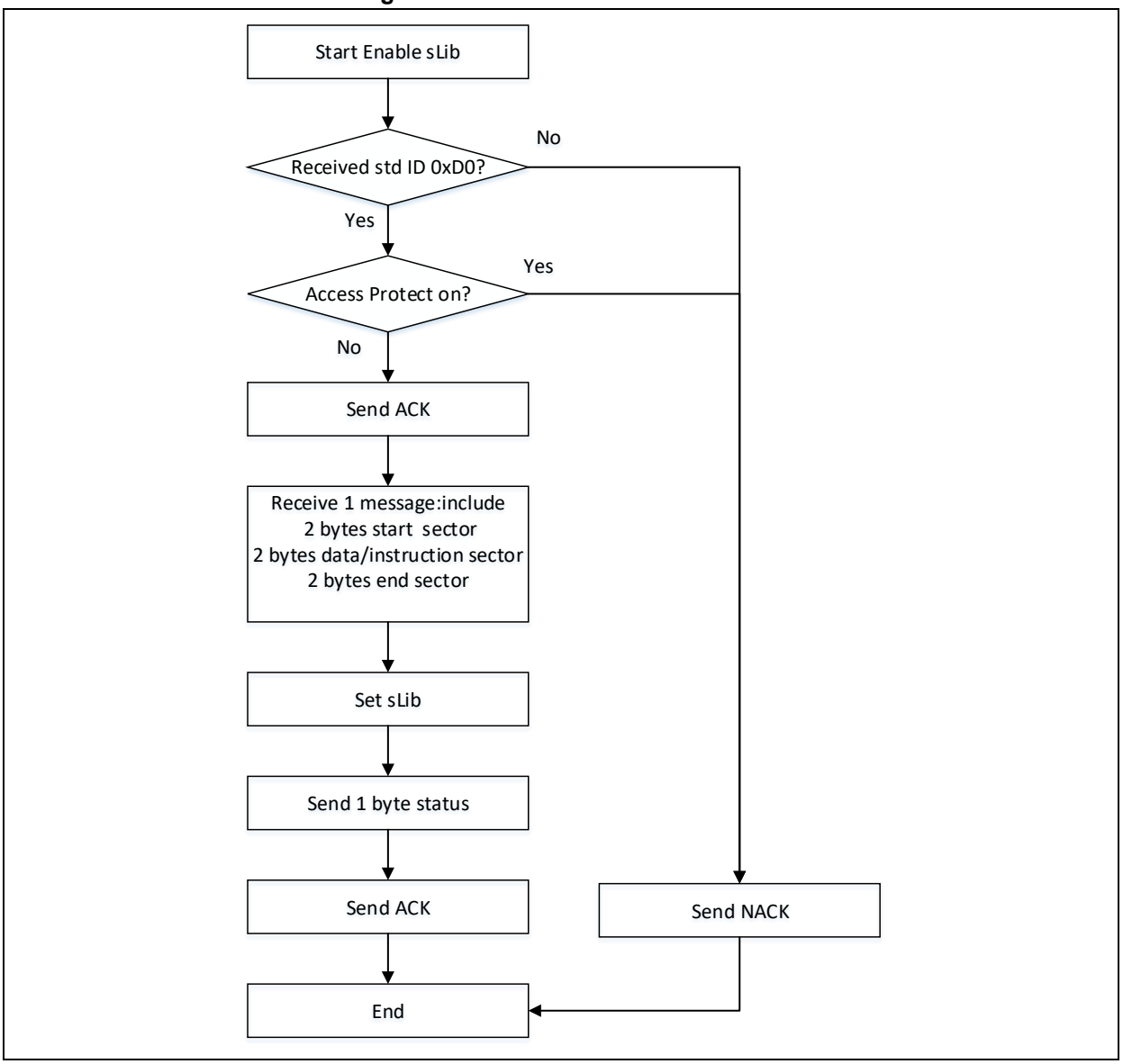


Figure 27 Enable sLib: device side



4.13.2 Data transmit on host side

Send	Receive	Standard frame ID	Frame length DLC	Data	Description
1		0xD0	4	Password（MSB） Password Password Password（LSB）	Enable sLib
	1	0xD0	1	ACK/NACK	When an NACK byte is received, it represents the end of the command.
2		0xD0	6	sLib start sector （MSB） sLib start sector（LSB） sLib data/instruction start sector（MSB） sLib data/instruction start sector（LSB） sLib end sector（MSB） sLib end sector（LSB）	SLib sector
	2	0xD0	1	0/1	sLib setting status
	3	0xD0	1	ACK	End of the command

4.14 Disable sLib

This command is used to disable sLib. This operation induces mass erase of the memory.
When the device receives the command, if the access protection is not enabled, it transmits an ACK byte to the host. After the transmission of the ACK byte, the device erases sLib, and returns a 1-byte status. After the operation, the device transmits the ACK byte to the host.
sLib disable state:

- 1: sLib password wrong
- 0: sLib is disabled.

This command is not allowed and executed when the access protection is enabled.

4.14.1 Flowchart on host and device sides

Figure 28 Disable sLib: host side

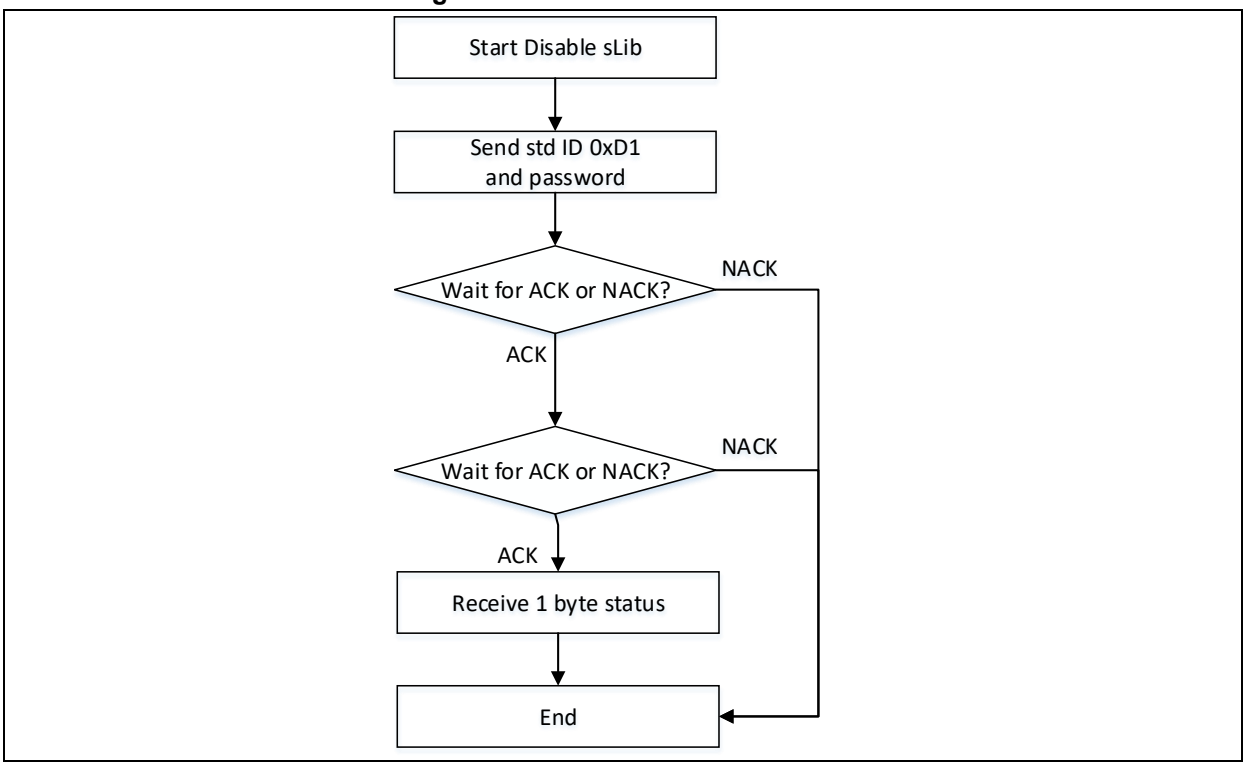
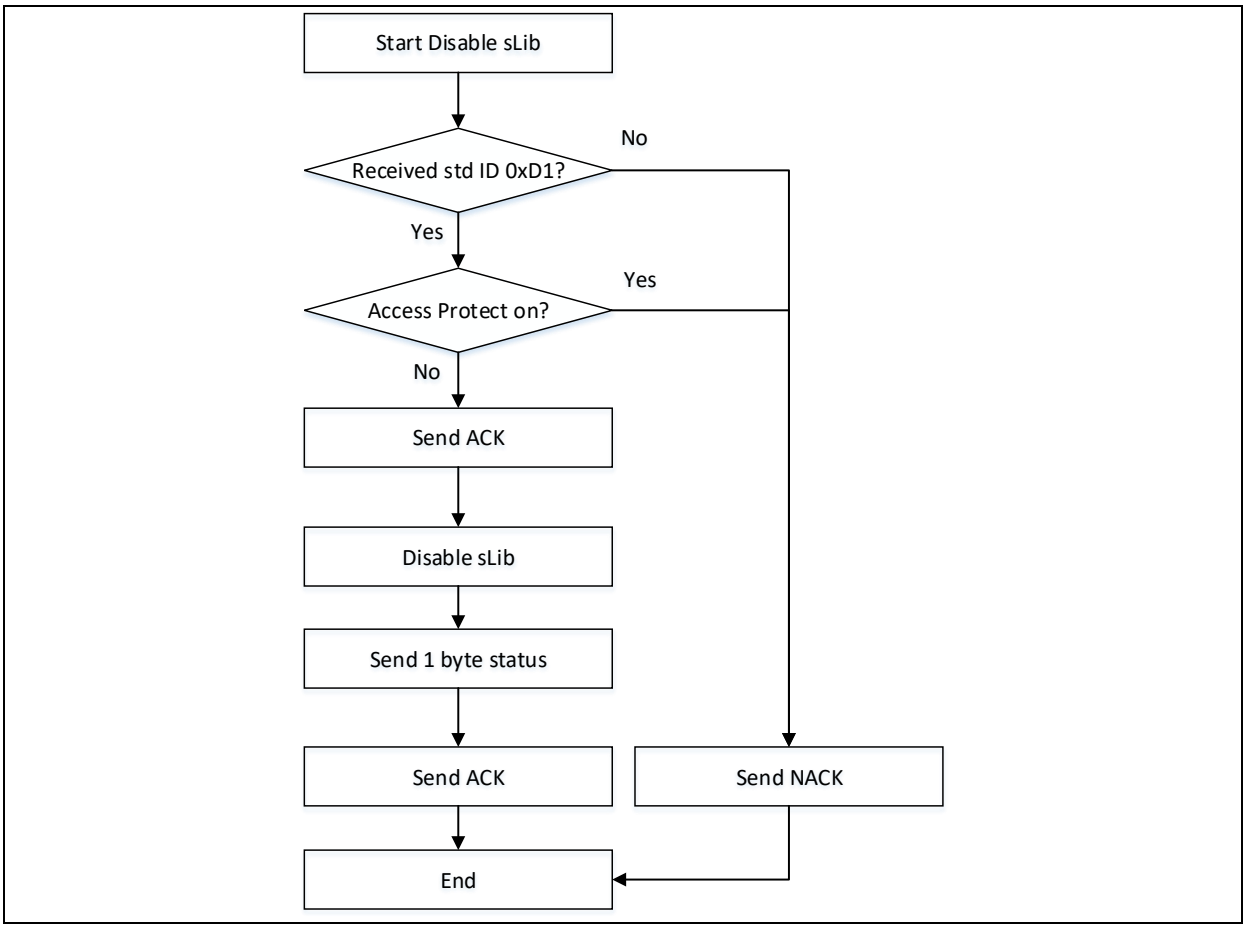


Figure 29 Disable sLib: device side



4.14.2 Data transmit on host side

Send	Receive	Standard frame ID	Frame length DLC	Data	Description
1		0xD1	4	Password（MSB） Password Password Password（LSB）	The host sends Disable sLib command, which includes a 4-byte password
	1	0xD1	1	ACK/NACK	When an NACK byte is received, it represents the end of the command.
	2	0xD1	1	0/1	sLib disable state
	3	0xD1	1	ACK	

4.15 Get sLib status

This command is used to get the current sLib state. It returns the corresponding sLib register value. For more details about the sLib, see the corresponding product datasheet.

When the device receives the command, it transmits the ACK byte to the host. After the transmission of the ACK byte, the device sends the values of the SLIB_STS0 register (four bytes), the SLIB_STS1 register (four bytes), and SLIB_MISC_STS register (four bytes). After the operation, the device transmits the ACK byte to the host.

Note: For AT32F403A, AT32F407 and AT32F413 series, this command is not allowed and executed when the access protection is enabled. For other product series, this command is still active when the access protection is enabled.

4.15.1 Flowchart on host and device sides

Figure 30 Get sLib status: host side

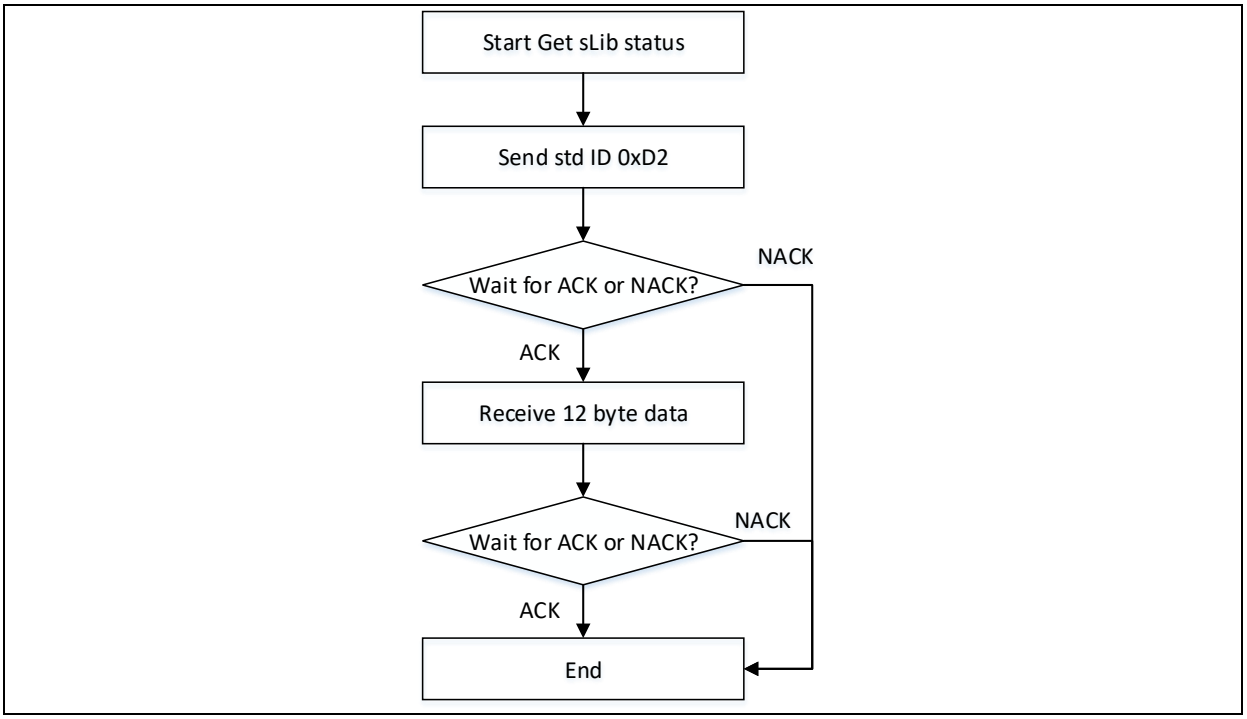
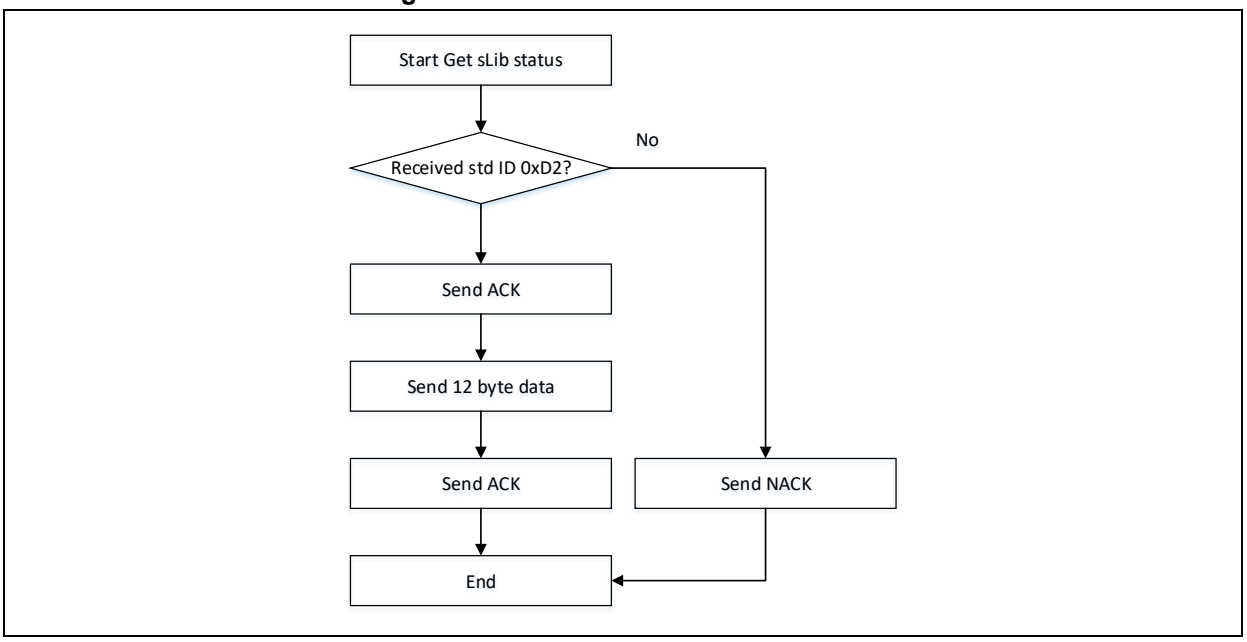


Figure 31 Get sLib status: device side



4.15.2 Data transmit on host side

Send	Receive	Standard frame ID	Frame length DLC	Data	Description
1		0xD2	-	-	The host sends Get sLib status command
	1	0xD2	1	ACK/NACK	When an NACK byte is received, it represents the end of the command.
	2	0xD2	8	*	SLIB_STS0（MSB） SLIB_STS0 SLIB_STS0 SLIB_STS0（LSB） SLIB_STS1（MSB） SLIB_STS1 SLIB_STS1 SLIB_STS1（LSB）
	3	0xD2	4	*	SLIB_MISC_STS（MSB） SLIB_MISC_STS SLIB_MISC_STS SLIB_MISC_STS（LSB）
	4	0xD2	1	ACK	

4.16 Reset Device

This command is used to enable a system reset.

When the device receives the command, it transmits the ACK byte to the host in two times and then performs a system reset.

4.16.1 Flowchart on host and device sides

Figure 32 Reset Device: host side

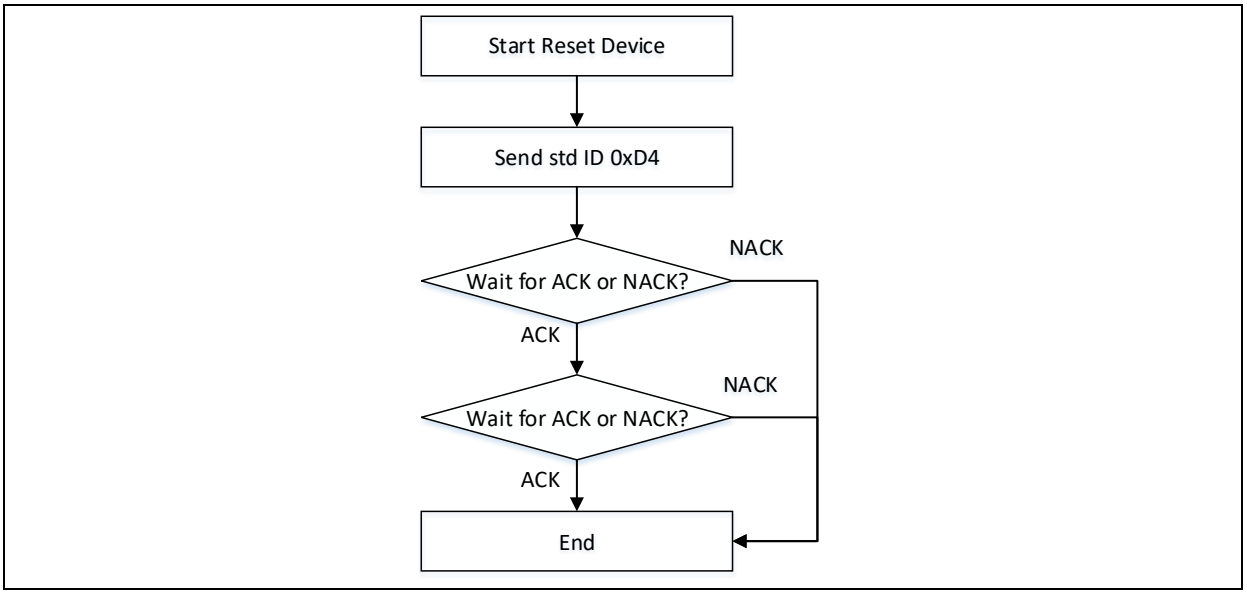
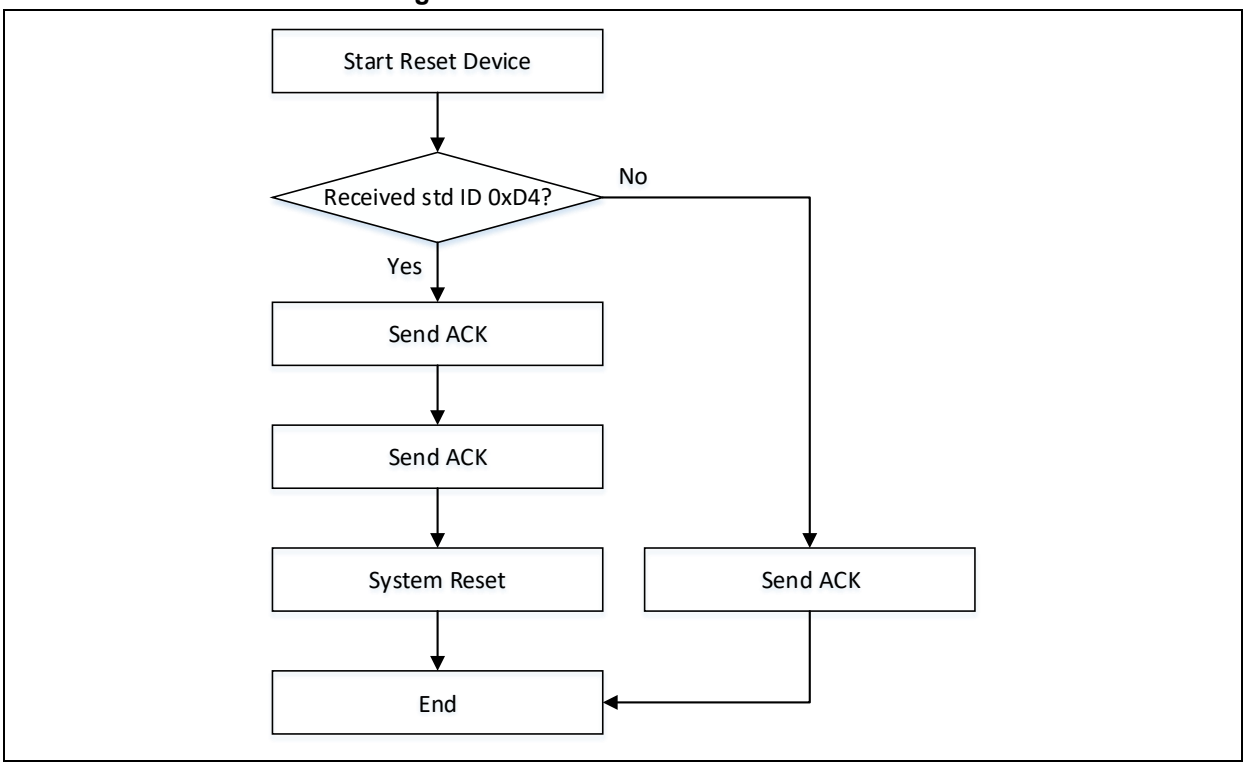


Figure 33 Reset Device: device side



4.16.2 Data transmit on host side

Send	Receive	Standard frame ID	Frame length DLC	Data	Description
1		0xD4	-	-	The host sends Reset Device command
	1	0xD4	1	ACK/NACK	When an NACK byte is received, it represents the end of the command.
	2	0xD4	1	ACK	

4.17 Advanced Access Protect

This command is used to enable advanced access protection. Refer to the corresponding product datasheet for more details about this protection.

When the device receives the command, if the access protection is not enabled, it transmits the ACK byte to the host. After the transmission of the ACK byte, the device starts configuring the advanced access protection and transmits the ACK byte to the host before performing a system reset.

This command is not allowed and executed when the access protection is enabled.

Note: the advanced access protection cannot be disabled for some product series. For details, refer to the corresponding user manual.

4.17.1 Flowchart on host and device sides

Figure 34 Advanced Access Protect: host side

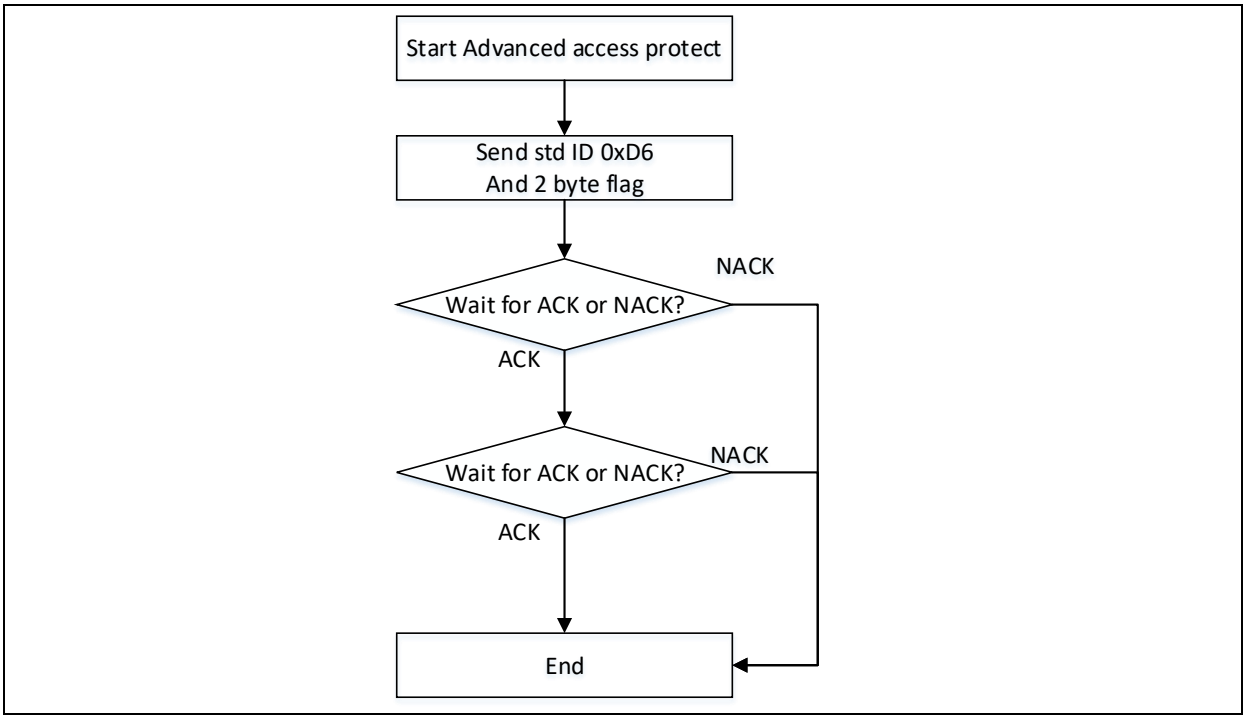
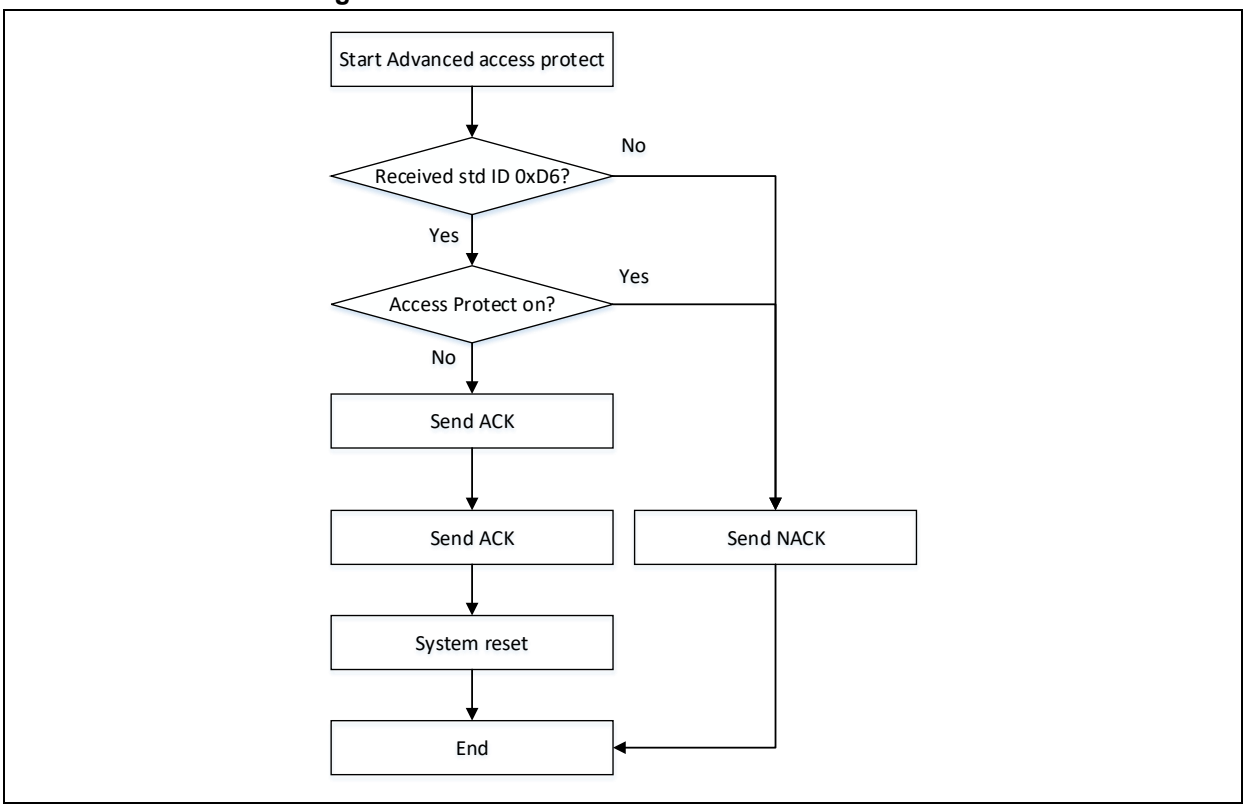


Figure 35 Advanced Access Protect: device side



4.17.2 Data transmit on host side

Send	Receive	Standard frame ID	Frame length DLC	Data	Description
1		0xD6	2	Flag ~Flag	The host sends Advanced access protect command, which includes a Flag and ~Flag
	1	0xD6	1	ACK/NACK	When an NACK byte is received, it represents the end of the command.
	2	0xD6	1	ACK	

4.18 Speed

With this command it is possible to change the baud rate. The baud rate is 500kbit/s by default. Thus if necessary, this rate is changeable through this command.
When the device receives the command, it transmits an ACK byte to the host. After the transmission of the ACK byte, the device starts setting a new baud rate. After the completion of the setting operation, the device then transmits an ACK byte to the host. The baud rate is expressed with a single byte.

CAN supported baud rate

Baud rate	Baud rate value
125kbit/s	0
250kbit/s	1
500kbit/s	2
1Mbit/s	3

CANFD supported baud rate

Baud rate	Baud rate value
125kbit/s	0
250 kbit/s	1
500 kbit/s	2
1Mbit/s	3
2Mbit/s	4
3Mbit/s	5
4Mbit/s	6
5Mbit/s	7

4.18.1 Flowchart on host and device sides

Figure 36 Speed: host side

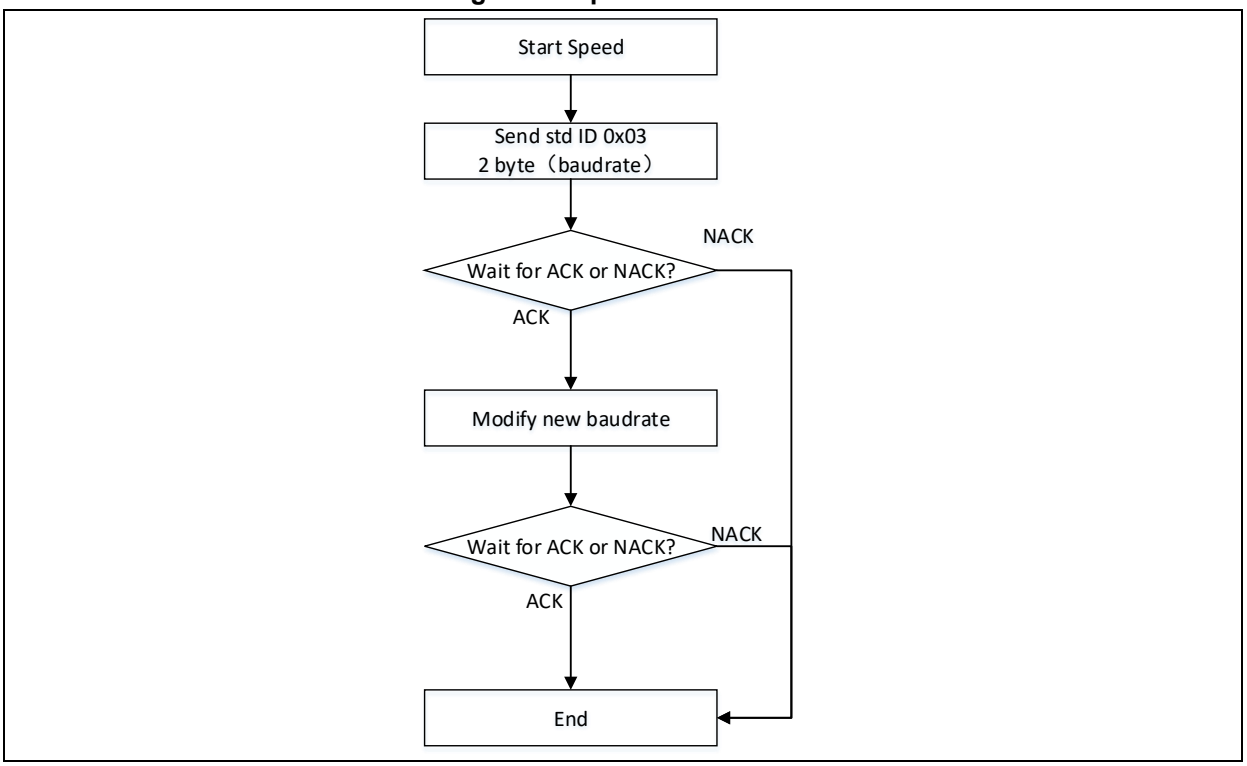
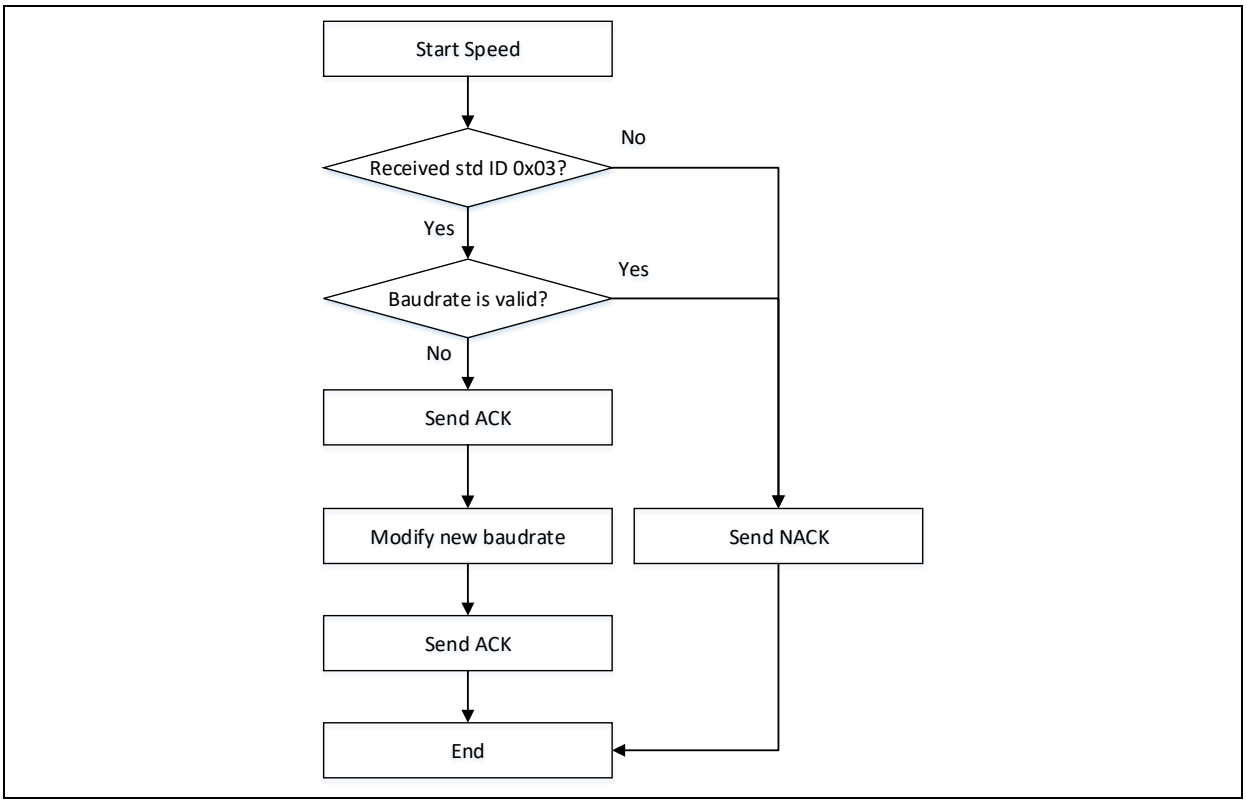


Figure 37 Speed: device side



4.18.2 Data transmit on host side

Send	Receive	Standard frame ID	Frame length DLC	Data	Description
1		0x03	2	Baudrate1 Baudrate2	The host sends speed command and a new baud rate. CAN: only use Baudrate1, Baudrate2 can be the same as Baudrate1 or any arbitrary value CANFD: Baudrate1: baud rate during connection stage Baudrate2: baud rate during data stage The baud rates for Baudrate1 and Baudrate2 are expressed with a value index. For the supported value index, refer to the CAN/CANFD supported baud rate list.
	1	0x03	1	ACK/NACK	When an NACK byte is received, it represents the end of the command.
	2	0x03	1	ACK	

5 Revision history

Table 2 Document revision history

Date	Revision	Changes
2023.06.30	2.0.0	Initial release
2024.12.11	2.0.1	1. Removed supported product list 2. Removed supported command list 3. Updated the description related to Speed command.

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