UM0932
User manual

ST7580 - FSK, PSK multi-mode power line networking system-on-chip

Introduction

This user manual, which targets application developers, provides complete information on how to use the ST7580 device in applications by describing the embedded functions and protocol layers, with a focus on the commands and parameters available to the user to control and operate the device through its host interface.

For ordering information, mechanical and electrical device characteristics, please refer to the ST7580 datasheet available from www.st.com.

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1 Documentation conventions

List of abbreviations

The following abbreviations are used:

Table 1. List of abbreviations

Abbreviation	Description
MIB	Management information base
PGA	Programmable gain amplifier
ZC	Zero-crossing
PHY	Physical layer
DL	Data link layer
CRC	Cyclic redundancy check
AES	Advanced encryption standard
UART	Universal asynchronous receiver transmitter
T_{ic}	Inter character timeout
T_{ack}	Acknowledge timeout
T_{sr}	Service request timeout
SS	Security services
BIO	Basic input output
HI	Host interface

2 Functional overview

The ST7580 device provides to the external host a complete physical layer (PHY) and some data link layer (DL) services for power line communication. It is mainly developed for smart metering applications in CENELEC A band, but suitable also for other control applications and remote load management in CENELEC B band.

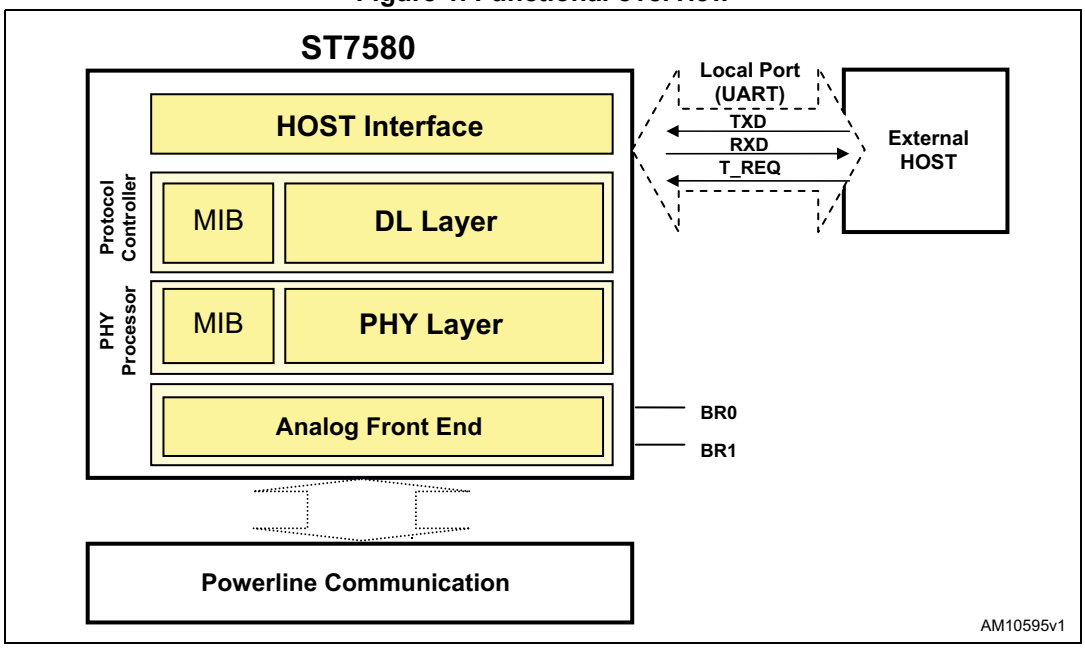
A UART host interface is available for communication with an external host, exporting all the functions and services required to configure and control the device and its protocol stack.

2.1 Protocol stack

Below is a list of the protocol layers and functions embedded in the ST7580:

- Physical (PHY) layer: hosted in the PHY processor, implements two different modulation schemes for communication through power line: a B-FSK modulation up to 9.6 kbps and a multi-mode PSK modulation with channel quality estimation, dual channel receiving mode and convolutional coding, delivering a throughput up to 28.8 kbps.
- Data link (DL) layer: the embedded DL layer hosted in the protocol controller offers framing and error correction services. A further security service (SS) based on 128-bit AES algorithm is also available for crypting / decrypting frames.
- Management information base (MIB): an information database with the data required for proper configuration of the system.
- Host interface: all of the services of the PHY, DL and MIB are exported to an external host through the local UART port.

Figure 1. Functional overview



2.2 ST7580 Power line frames: structure

The ST7580 device can be configured by the external host to transmit and receive frames over the power line in accordance with three different frames structures:

1. Physical (PHY) frames, built with some differences between PSK and FSK modulations (see [·]), as represented in *Figure 2*:

Figure 2. Physical frame structure

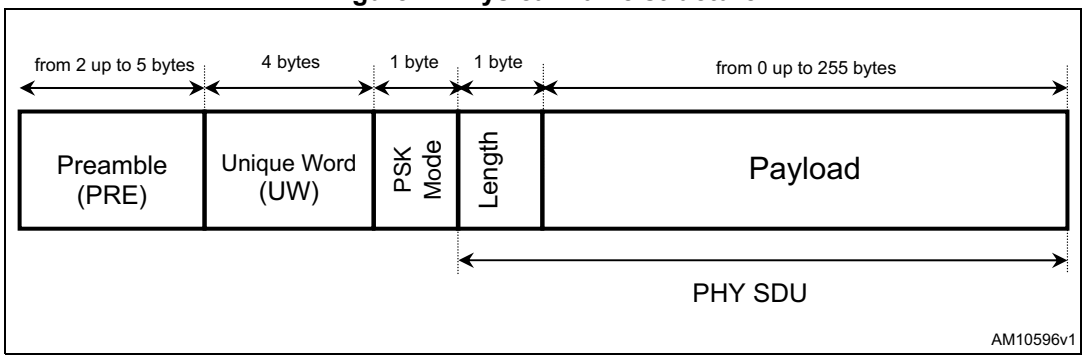


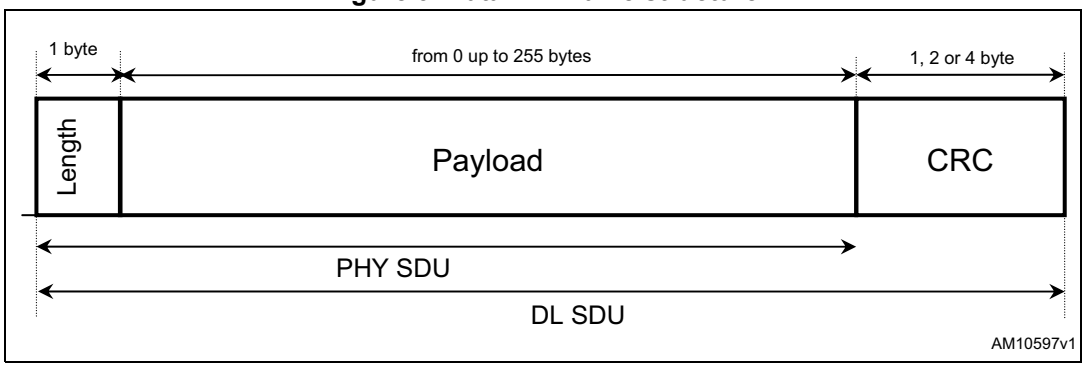
Table 2 lists the fields of PHY frame.

Table 2. PHY frame description

Field name	Length	Description and values
Length	1	Payload length. Allowable values: from 0 up to 255
Payload	Length	Data bytes

2. Data Link (DL) frames, adding CRC field to physical SDU.
   Figure 3 shows the frame structure:

Figure 3. Data link frame structure



The external host is allowed to choose the CRC algorithm used (length, endianness, fields involved in calculation) through a dedicated MIB object (modem configuration 00h, *Section 4.2.1*).

The length field is automatically handled by ST7580 and its value is by default equal to the length of payload and CRC fields.

Table 3 lists the fields of DL frame.

Table 3. DL frame description

Field name	Length	Description and values
DL length	1	Total length of payload and CRC fields.
Payload	DL length – length of CRC	Data bytes
CRC	1, 2 or 4	CRC calculated in accordance with algorithm chosen in dedicated MIB object (modem configuration 00h, *Section 4.2.1*).

3. Security services (SS) frames, providing authentication to payload using cryptographic algorithms based on AES with 128-bit keys. Authentication is provided appending to user data an AES-CMAC digest. A dedicated key (stored in the MIB object SS key 02h, *Section 4.2.3*) is used for both transmitting and receiving frames. *Figure 4* shows the SS frame structure.

Figure 4. Security services frame structure

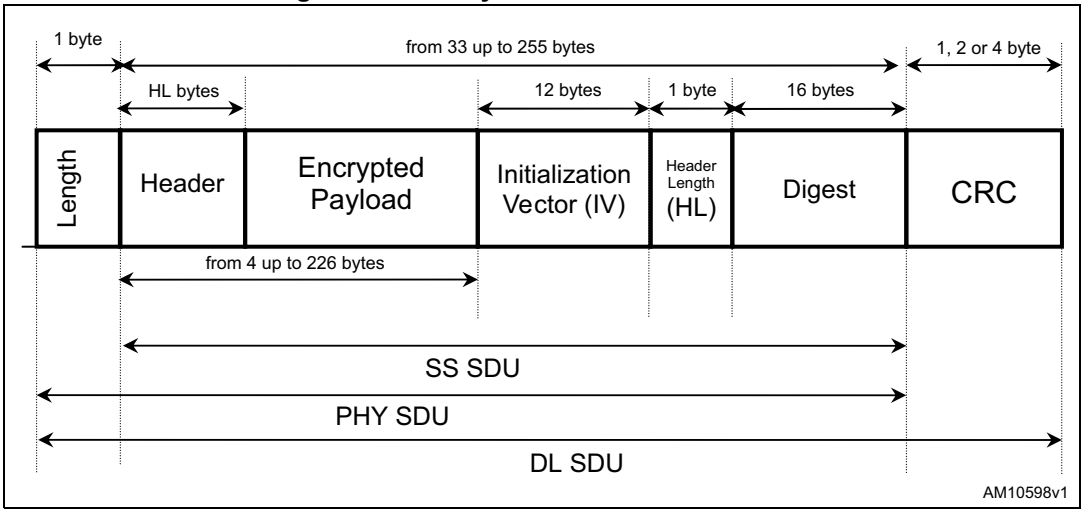


Table 4 lists the fields of SS frame.

Table 4. SS frame description

Field name	Length	Description and values
Header	HL	Part of user data transmitted in clear.
Encrypted payload	LEN-29-HL	Part of user data transmitted ciphered.
IV	12	Initialization vector of AES-CTR algorithm.
HL	1	Header field length.
Digest	16	AES-CMAC digest computed on header, encrypted payload, IV and HL fields.

2.3 Power line data transmission

In order to manage data transmission to the power line, three different dedicated services are available to the external host.

1. PHY_Data transmission, with frames structured as in *Figure 2*, requiring the payload as the only external parameter and building automatically the length field.
2. DL_Data transmission, with frames structured as in *Figure 3*, requiring the payload as the only external parameter and building automatically the length and CRC fields.
3. SS_Data transmission, with frames structured as in *Figure 4*, requiring the payload and header length (greater than 3) as external parameters, building automatically the length, CRC and HL field, deciding an arbitrary initialization vector and encrypting the payload.

The external host is allowed to access the ST7580 device and choose which among the three frame structures are utilized for transmitting data over the power line by selecting the corresponding available service.

2.4 Power line data reception

In order to manage data reception from the power line, the ST7580 can be configured to be able to receive in accordance with only one frame structure.

The external host is allowed to set, through a dedicated MIB object (modem configuration, 00h *Section 4.2.1*), the only frame structure the ST7580 is able to receive.

The ST7580 embeds three corresponding available services:

1. PHY_Data indication: generated as soon as a frame in compliance with PHY frame structure (*Figure 2*) has been received, it exports the PHY payload field
2. DL_Data indication: generated as soon as a frame in compliance with DL frame structure (*Figure 3*) has been received, it exports the DL payload field
3. SS_Data indication: generated as soon as a frame in compliance with SS frame structure (*Figure 4*) has been received, it exports the SS payload field.

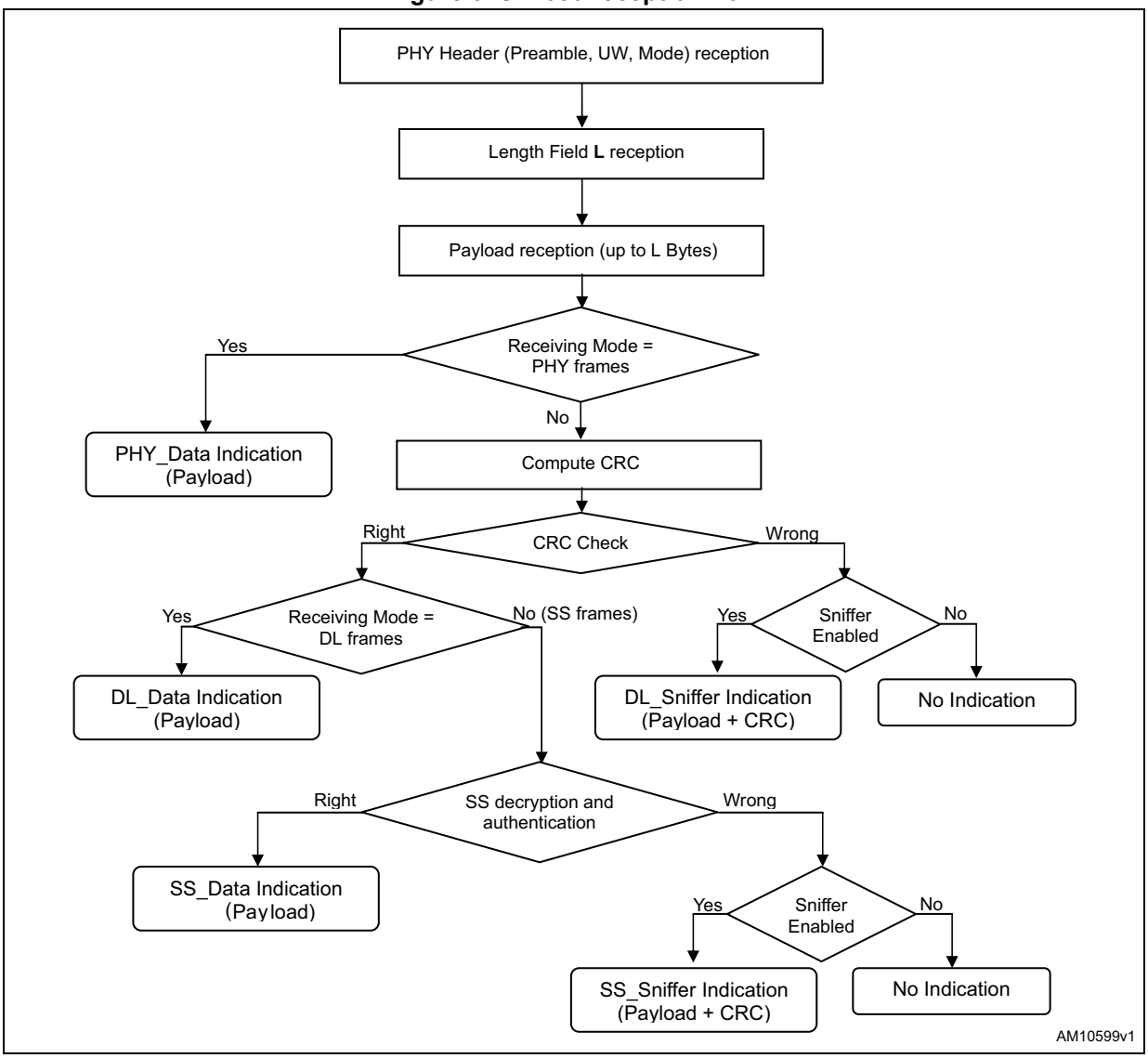
A further feature of ST7580 configuration is the Sniffer flag. It can be activated by the external host through a dedicated MIB object (modem configuration, 00h *Section 4.2.1*) and it makes two further services available:

1. DL_Sniffer indication: generated as soon as a frame in compliance with DL frame structure (*Figure 3*) with a wrong CRC has been received, it exports both DL payload and wrong CRC fields.
2. SS_Sniffer indication: generated as soon as a frame in compliance with SS frame structure (*Figure 4*) that couldn't be correctly decrypted or authenticated has been received, it exports the whole SS_SDU field.

ST7580 reception flow

The reception flow for incoming frames is depicted in *Figure 5*:

Figure 5. ST7580 reception flow



3 Host interface

The host interface is a communication port used by the external host to exchange data with the ST7580 device.

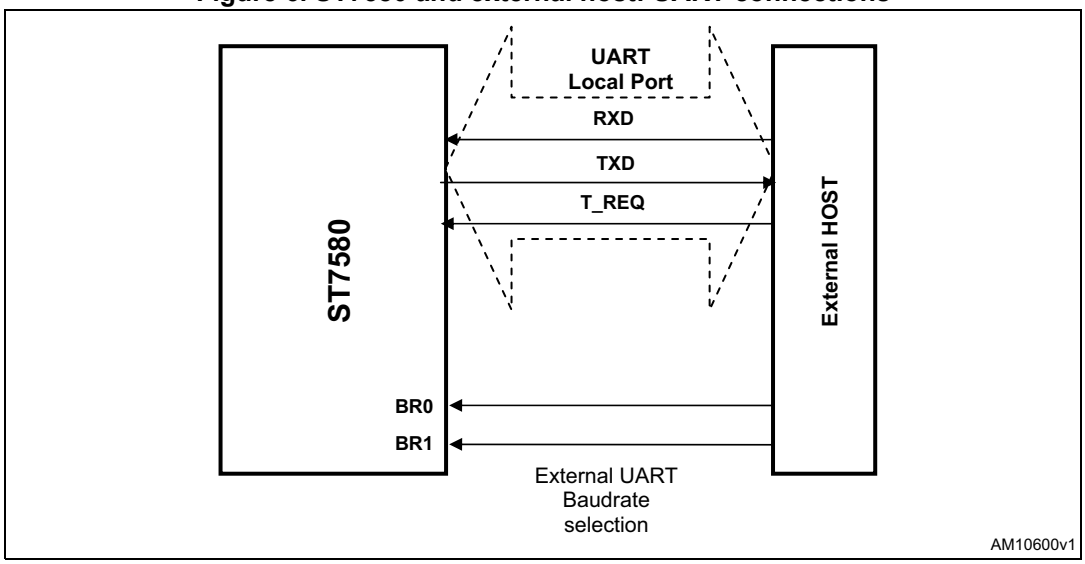
The host interface consists of a local port (a standard UART), a communication protocol and a set of commands exchanged between ST7580 and the external host. It manages the communication and arbitration on the local port, and provides access to ST7580 internal services.

3.1 UART

The local communication is a half duplex asynchronous serial link (UART) using a receiving input (RXD), a transmitting output (TXD) and a T_REQ signal to manage the communication.

The connection diagram of the ST7580 using UART as host interface port is shown in *Figure 5*.

Figure 6. ST7580 and external host: UART connections



The communication baud rate is selected after the ST7580 reset, in accordance with the status of local input ports BR0, BR1 listed in *Table 5*:

Table 5. UART baud rate

BR1	BR0	Baudrate (b/s)
0	0	9600
0	1	19200
1	0	38400
1	1	57600

The UART interface has two data channels:

- TXD carries data from the ST7580 to the host
- RXD carries data from the host to the ST7580

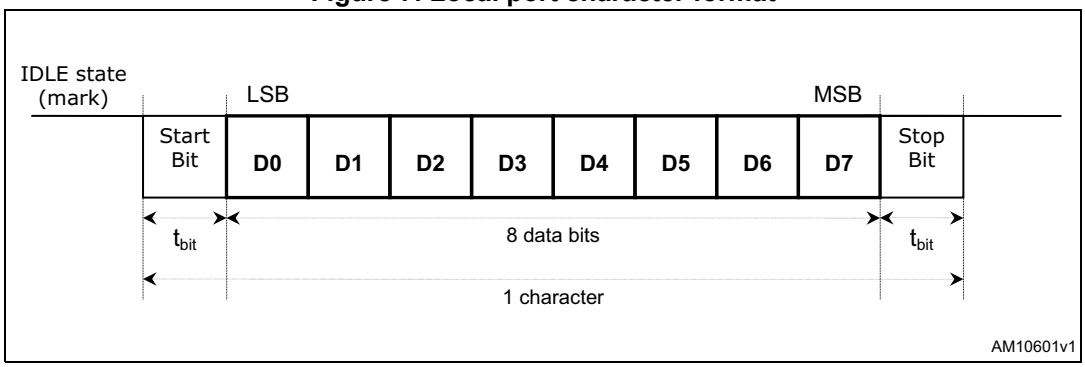
A local request input signal is implemented on the T_REQ pin.

ST7580 UART is a half duplex asynchronous serial port without hardware control flow. UART settings used are:

- Half duplex mode
- Standard NRZ bit coding
- LSBit first transmission: the bits within each byte are sent LSBit to MSBit
- The exchanged frames are composed of characters
- A single character is composed of 1 start bit, 8 data bits and 1 stop bit
- 0-5 V or 0-3.3 V levels on TXD, RXD, T_REQ signals.

Figure 7 shows the character format:

Figure 7. Local port character format



3.2 Communication protocol

The host interface process implemented in the ST7580 device performs the following tasks:

- The frame format definition
- The reception mechanism: the UART standard on half duplex data channel is implemented and collisions are avoided
- The acknowledgement to received frames
- The timeout management
- The error checking: length, syntax and checksum field of a received frame are controlled and a repetition is requested in case of error.

3.2.1 Frame types

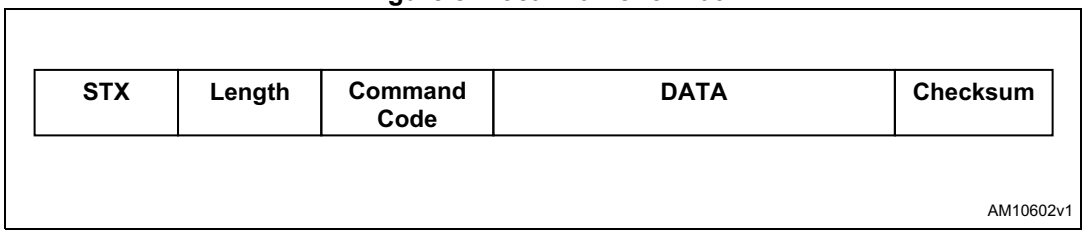
A frame is a sequence of one or more characters encapsulating a data exchanged between the ST7580 device and the host controller. The communication protocol defines several frame formats for the different steps of the communication protocol (access to ST7580 services, acknowledgement, device status).

All the ST7580 resources and services (PHY layer, DL layer and MIB management) are available through local commands and they can be handled by the external host using the local communication serial interface and the commands defined in the following paragraphs.

3.2.2 Local frame

The format of the frame used in the local communication between the ST7580 and the external host is graphically represented in *Figure 8*:

Figure 8. Local frame format



The frame fields are described in *Table 6*:

Table 6. Local frame format

Field	Byte length	Value	Description
STX	1	02h or 03h	Start of text delimiter
Length	1	0 … 255	Byte length of data field
Command code	1	0 … FFh	Command code
Data	0 … 255		Data field (255 byte max.)
Checksum	2		The checksum of the local frame is the result of the addition of the elements of the frame, from length up to the last data byte, or up to the command byte if there is no data byte.

Byte endianness for fields (data and checksum) with a length greater than one byte is:

- Data field: structured in sub-fields in accordance with command code specifications described in *Section 3.3*.
- Checksum field: it is sent LSByte first.

3.2.3 Acknowledgment messages

After receiving a local frame on the host interface, both external host and the ST7580 must send, through either TXD (ST7580) or RXD (external host), an acknowledgement or not acknowledgement message.

The two messages have the same format for both ST7580 and external host and they are 1-byte long.

Table 7 lists their fixed codes.

Table 7. ACK and NAK messages codes

Symbol	Definition	Code
ACK	Acknowledgement	06h
NAK	Not acknowledgement	15h

3.2.4 Status message

The status message is a frame sent by the ST7580 to the host controller when the T_REQ signal is pulled down.

It is composed of 2 bytes filled in accordance with ST7580 status and configuration. The first byte (byte index 0) is always the character “?” (ASCII code 3Fh). Other bytes are set as in *Table 8*:

Table 8. Status message composition

Byte index	Bit index	Description	Available values
0		Status message first byte	3Fh
1	0	Configuration status	0: autoreconfiguration correctly occurred 1: autoreconfiguration occurred with errors or at least one among MIB objects 00h (Modem Config), 01h (PHY Config), 02h (SS Key) hasn’t changed its default value after boot
	1	Transmission status	0: the ST7580 is not transmitting a power line frame 1: the ST7580 is transmitting a power line frame
	2	Reception status	0: the ST7580 is not receiving a power line frame 1: the ST7580 is receiving a power line frame
	3-4	Active layer	0: PHY layer 1: DL layer 2: SS layer 3: ST7580 not configured
	5	Overcurrent flag	0: no overcurrent event on last transmission 1: last transmission generated at least one overcurrent event
	6-7	Estimated ST7580 temperature	0: T < 70 °C (typical) 1: 70 °C < T <100 °C (typical) 2: 100 °C < T < 125 °C (typical) 3: T > 125 °C (typical)

3.2.5 Local port arbitration rules

The ST7580 modem is always the communication master. In case of no local transfer, the ST7580 can initiate a local communication without taking into account the external host status. On the other hand, when the external host wants to send a local frame, it must first send a request through the T_REQ (transmitting request) input port. Then the ST7580 answers with a status message allowing or not the reception of a frame (or any other command).

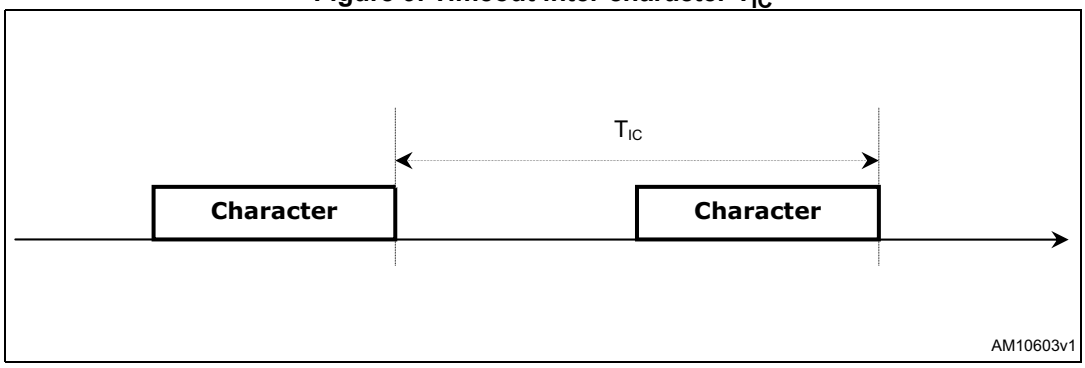
3.2.6 Frame delimitation

Data coming from the UART serial port are an asynchronous flow of bytes. In order to divide the bytes flow into a frames flow, the ST7580 communication protocol uses two methods: length and timeout.

When the number of bytes received reaches the expected frame length, in accordance with the frame type's characteristics, the frame reception ends.

The time interval between two consecutive characters (two local frames including start and stop bits) in a local frame must not exceed T_{IC} (timeout inter-character): the receiving part (ST7580 host interface or external host) no longer accepts any character after this delay expiration.

Figure 9. Timeout inter character T_{IC}



The timeout inter character (T_{IC}) is set by default at 10 ms after a reset and it can be modified by writing a dedicated MIB object (host interface timeout 09h, *Section 4.2.9*).

If the length and the checksum are both correct, the received frame is accepted, otherwise all previous characters are discarded.

3.2.7 Data communication from the ST7580 to the external host

When the ST7580 needs to transmit a frame to the host, it can directly send it without any previous request. The local frame is automatically built with an STX value equal to 02h.

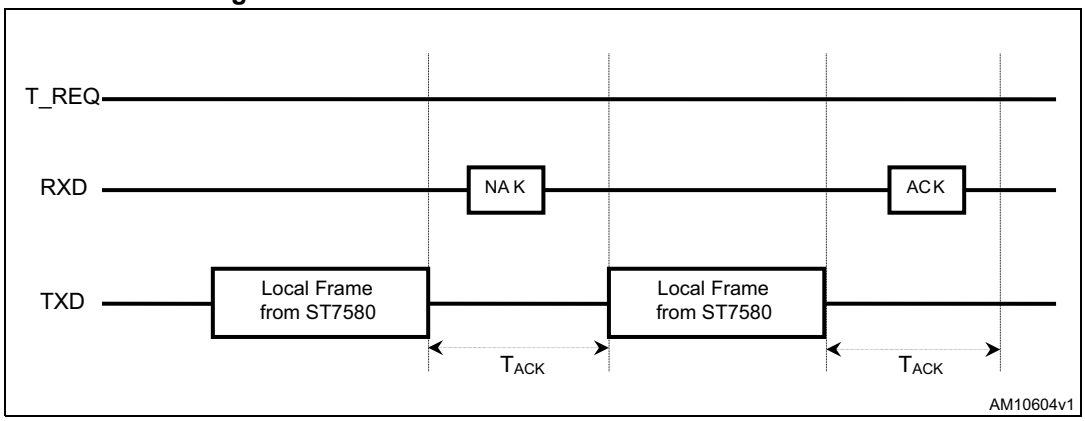
If the length and the checksum of the local frame are both correct, the external host acknowledges with an ACK character. In other cases, it answers with a NAK character.

If one of the following cases is verified on the RXD line:

- Negative acknowledgement (NAK)
- Any other frame
- No frame within T_{ACK} interval.

The ST7580 device repeats the frame only once after a delay corresponding to T_{ACK}, changing the STX value to 03h. Acknowledgement to re-transmitted frames is considered positive by default, even if the host controller answers with a negative acknowledgement.

Figure 10. Data flow from ST7580 to the external host

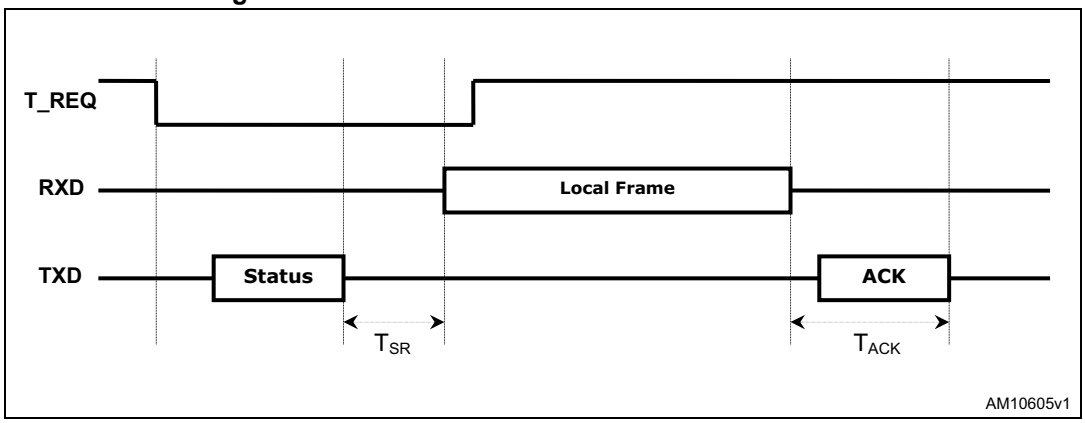


3.2.8 Data communication from external host to the ST7580

When the external host needs to initiate a data transfer to the ST7580, it must set the T_REQ signal at low level. As soon as the ST7580 is not busy, it answers with the status message confirming or not the data channel availability.

If the communication is possible, the external host can start sending a local frame (built with STX field equal to 02h) within the T_{SR} delay. The T_REQ signal is set to high logic value as soon as the STX field of the local frame (see *Section 3.2.2*) has been sent. If the first byte of the local frame is not received before the T_{SR} delay, the ST7580 ignores it.

Figure 11. Data flow from external host to the ST7580



At the end of the data reception on the RXD line, the ST7580 sends an acknowledgement message on the TXD line to inform about the status of the transmission (ACK or NAK) within a T_{ACK} interval.

If the length and the checksum of the local frame are both correct, the ST7580 acknowledges with an ACK character. In other cases, it answers with a NAK character.

In case of a NAK response or no acknowledgement from the ST7580 within the T_{ACK} time-out, a complete sequence must be restarted to repeat the communication.

3.2.9 Host interface timeouts

All the default values of host interface timeouts are reported in *Table 9*.

Table 9. Communication protocol timeouts

Timeout	Default value [ms]
T_{ic}	10
T_{ack}	40
T_{sr}	200

3.3 Command codes

Each command frame exchanged between the external host and the ST7580 carries a command, identified by a unique command code (declared in the command code field as in *Figure 8*:)

It is possible to distinguish four different command types:

- Request commands sent by the external host to use a ST7580 service
- Confirm commands sent by the ST7580 to answer a previous request command correctly executed
- Error commands sent by the ST7580 to answer a previous request command not executed
- Indication commands sent by the ST7580 to inform the external host about a change on its services; these are unsolicited commands not following any request.

Request commands

Request commands are sent by the external host to perform an action on ST7580. ST7580 executes the command and answers the external host through either a confirm command or an error command.

Table 10 shows all request commands: their syntax and data fields are explained in the next paragraphs.

Table 10. Request command codes

Group	Request command	Code
Reset	BIO_ResetRequest (*Section 3.3.1*)	3Ch
MIB	MIB_WriteRequest (*Section 3.3.4*)	08h
	MIB_ReadRequest (*Section 3.3.6*)	0Ch
	MIB_EraseRequest (*Section 3.3.8*)	10h
Ping	PingRequest (*Section 3.3.10*)	2Ch
Data	PHY_DataRequest (*Section 3.3.12*)	24h
	DL_DataRequest (*Section 3.3.15*)	50h
	SS_DataRequest (*Section 3.3.19*)	54h

Confirm commands

Confirm commands are sent by the ST7580 to the external host after a previous request command, if the request itself has been correctly executed.

Table 11 lists confirm command codes: their syntax and data fields are explained in the next paragraphs.

Table 11. Confirm command codes

Group	Confirm command	Code
Reset	BIO_ResetConfirm (*Section 3.3.2*)	3Dh
MIB	MIB_WriteConfirm (*Section 3.3.5*)	09h
	MIB_ReadConfirm (*Section 3.3.7*)	0Dh
	MIB_EraseConfirm (*Section 3.3.9*)	11h
Ping	PingConfirm (*Section 3.3.11*)	2Dh
Data	PHY_DataConfirm (*Section 3.3.13*)	25h
	DL_DataConfirm (*Section 3.3.16*)	51h
	SS_DataConfirm (*Section 3.3.20*)	55h

Error commands

Error commands are sent by the ST7580 to the external host after a previous request command, if it has not been executed or if an error has occurred while it was executing.

Table 12. Error command codes

Group	Error command	Code
Reset	BIO_ResetError	3Fh
MIB	MIB_WriteError	0Bh
	MIB_ReadError	0Fh
	MIB_EraseError	13h
Data	PHY_DataError	27h
	DL_DataError	53h
	SS_DataError	57h
Syntax error	CMD_SyntaxError	36h

The data field of the correspondent local frames presents a same syntax for all error command codes, with the exception of CMD_SyntaxError (*Section 3.3.23*). It is composed of 1 byte and it is coded in accordance with the values listed in *Table 14*.

Table 13. Error commands: syntax

Source	Command (Args)	Possible response
ST7580	CommandError (ErrorData)	---

Table 14. Error commands: ErrorData

Error cause	Value	Description
Wrong parameter length (WPL)	02h	Data field length in the previous request was wrong
Wrong parameter value (WPV)	03h	At least one of the parameters values in the previous request was invalid.
Busy	04h	System busy, operation couldn't be performed.
Thermal error	0Bh	Device internal temperature within threshold 4 [*Section 5*], ST7580 refused to transmit.
General error	FFh	Generic error code.

Indication commands

Indication commands are sent by the ST7580 to the external host. They notify a reset event or a power line data reception. *Table 15* lists all the indication commands: their syntax and data fields are explained in the next paragraphs.

Table 15. Indication command codes

Group	Command	Code
Reset	BIO_ResetIndication (*Section 3.3.3*)	3Eh
Data	PHY_DataIndication (*Section 3.3.14*)	26h
	DL_DataIndication (*Section 3.3.17*)	52h
	DL_SnifferIndication (*Section 3.3.18*)	5Ah
	SS_DataIndication (*Section 3.3.21*)	56h
	SS_SnifferIndication (*Section 3.3.22*)	5Eh

3.3.1 BIO_ResetRequest (3Ch)

This command is used by the external host to force software reset in the ST7580.

Table 16. BIO_ResetRequest: syntax

Source	Command(Args)	Possible response
Ext. host	CMD_ResetRequest()	BIO_ResetConfirm

3.3.2 BIO_ResetConfirm (3Dh)

This command is sent by the ST7580 after the correct reception of a BIO_ResetRequest (*Section 3.3.1*) command.

Table 17. BIO_ResetConfirm: syntax

Source	Command(Args)	Possible response
ST7580	BIO_ResetConfirm(ConfirmData)	---

The ConfirmData field is always composed of 1 byte equal to 00h.

3.3.3 BIO_ResetIndication (3Eh)

This command is sent by the ST7580 to notify the host about a reset or a power-on event.

Table 18. BIO_ResetIndication: syntax

Source	Command(Args)	Possible response
ST7580	BIO_ResetIndication(ResetData)	---

Table 19. BIO_ResetIndication: ResetData

Byte index	Bit index	Label	Description
0	0 - 1	Reset Cause	0: RESETN pin at low state (Hardware Reset) or Power-ON 1: watchdog 2: BIO_ResetRequest (see *Section 3.3.1*) command
	2	Autoreconfiguration Error	0: autoreconfiguration correctly occurred 1: autoreconfiguration occurred with errors or at least one among MIB objects 00h (Modem Config), 01h (PHY Config), 02h (SS Key) hasn't changed its default value after power-on
	3	Autoreconfiguration: Modem Config Object Error	0: autoreconfiguration on MIB object 00h (Modem Config) correctly occurred, if such an object has been written by host through MIB_WriteRequest command after power-on 1: errors during Autoreconfiguration on MIB object 00h (Modem Config) or the object hasn't been changed its default value after power-on
	4	Autoreconfiguration: PHY Config Object Error	0: autoreconfiguration on MIB object 01h (PHY Config) correctly occurred, if such an object has been written by host through MIB_WriteRequest command after power-on 1: errors during Autoreconfiguration on MIB object 01h (PHY Config) or the object hasn't been changed its default value after power-on
	5	Autoreconfiguration: SS KeyObject Error	0:autoreconfiguration on MIB object 02h (SS Key) correctly occurred, if such an object has been written by host through MIB_WriteRequest command after power-on 1: errors during Autoreconfiguration on MIB object 02h (SS Key) or the object hasn't been changed its default value after power-on
	6 - 7	Unused	

3.3.4 MIB_WriteRequest (08h)

This command is used by the external host to access an object of the MIB.

The ST7580 checks the parameters for validation:

- If the check is valid, the object is updated in the database and the ST7580 replies with a MIB_WriteConfirm (*Section 3.3.5*).
- If the check is not valid, the request is rejected and the ST7580 replies with a MIB_WriteError (*Table 12*).

Table 20. MIB_WriteRequest: Syntax

Source	Command(Args)	Possible response	Source
Ext. host	MIB_WriteRequest (RequestData)	Request accepted: MIB_WriteConfirm Request rejected: MIB_WriteError (ErrorData)	Ext. host

Table 21. MIB_WriteRequest: RequestData

Byte index	Label	Description
0	INDEX	MIB database entry index. Refer to the MIB table (*Table 52*) for available objects allowed to be written.
1 … n	DATA	Data to be written in the MIB location INDEX.

3.3.5 MIB_WriteConfirm (09h)

This command is sent by the ST7580 to acknowledge an MIB_WriteRequest (see *Section 3.3.4*), if the request has been accepted and executed without errors.

Table 22. MIB_WriteConfirm: syntax

Source	Command(Args)	Possible response
ST7580	MIB_WriteConfirm ()	None

3.3.6 MIB_ReadRequest (0Ch)

This command is used by the external host to read the current value of an MIB object.

The ST7580 checks the parameters for validation:

- If the check is valid, the object is updated in the database and the ST7580 replies with a MIB_ReadConfirm (*Section 3.3.7*).
- If the check is not valid, the request is rejected and the ST7580 replies with a MIB_ReadError (*Table 12*).

Table 23. MIB_ReadRequest: Syntax

Source	Command(Args)	Possible response
Ext. host	MIB_ReadRequest (RequestData)	Request accepted: MIB_ReadConfirm (ConfirmData) Request rejected: MIB_ReadError (ErrorData)

Table 24. MIB_ReadRequest: RequestData

Byte index	Label	Description
0	INDEX	MIB database entry index. Refer to the MIB table (*Table 52*) for available objects.

3.3.7 MIB_ReadConfirm (0Dh)

This command is sent by the ST7580 to acknowledge an MIB_ReadRequest (see *Section 3.3.6*) if the request has been accepted and executed without errors.

Table 25. MIB_ReadConfirm: Syntax

Source	Command(Args)	Possible response
ST7580	MIB_ReadConfirm(ConfirmData)	None

Table 26. MIB_ReadConfirm: ConfirmData

Byte index	Label	Description
1 … n	DATA	Current value of the MIB object with INDEX expressed in the previous MIB_ReadRequest command (*Section 3.3.6*).

3.3.8 MIB_EraseRequest (10h)

This command is used by the external host to erase the value of an MIB object and set it to 0. This command is valid for erasable MIB objects only (*Table 52*).

The ST7580 checks the parameters for validation:

- If the check is valid, the object is updated to a value equal to 0 in the database and the ST7580 replies with an MIB_EraseConfirm (*Section 3.3.9*).
- If the check is not valid, the request is rejected and the ST7580 replies with an MIB_EraseError (*Table 12*).

Table 27. MIB_EraseRequest: Syntax

Source	Command(Args)	Possible response
Ext. host	MIB_EraseRequest(RequestData)	Request accepted: MIB_EraseConfirm
		Request rejected: MIB_EraseError (ErrorData)

Table 28. MIB_WriteRequest: RequestData

Byte index	Label	Description
0	INDEX	MIB database entry index. Refer to the MIB table (*Table 52*) for available objects.

3.3.9 MIB_EraseConfirm (11h)

This command is sent by the ST7580 to acknowledge an MIB_EraseRequest (see *Section 3.3.8*) if the request has been accepted and executed without errors.

Table 29. MIB_EraseConfirm: Syntax

Source	Command(Args)	Possible response
ST7580	MIB_EraseConfirm ()	None

3.3.10 PingRequest (2Ch)

This command is sent by external host to test the robustness of the local port link with the ST7580.

If accepted, the ST7580 answers with a PingConfirm command (*Section 3.3.11*).

Table 30. PingRequest: Syntax

Source	Command(Args)	Possible response
External Host	PingRequest(RequestData)	Request accepted: PingConfirm (ConfirmData)

Table 31. PingRequest: RequestData

Byte index	Label	Description
0 - n	DATA	Payload with variable length

3.3.11 PingConfirm (2Dh)

This command is sent by the ST7580 to notify the reception of a PingRequest. The payload field of the local frame presents the same data received in the previous PingRequest.

Table 32. PingConfirm: Syntax

Source	Command(Args)	Possible response
ST7580	PingConfirm(ConfirmData)	--

Table 33. PingConfirm: ConfirmData

Byte index	Label	Description
0 - n	DATA	Payload with the values received in the previous PingRequest (*Section 3.3.10*)

3.3.12 PHY_DataRequest (24h)

This command is sent by the external host to request data transmission and it exports the PHY_Data transmission service (*Section 2.3*).

- If accepted, the ST7580 constructs a PHY frame (*Figure 2*) that is transmitted over the power line in accordance with the details expressed in RequestData field (*Table 35*). A positive PHY_DataConfirm (*Section 3.3.13*) is generated at the end of the transmission.
- If refused, the modem generates a PHY_DataError (*Table 12*).

Table 34. PHY_DataRequest: Syntax

Source	Command(Args)	Possible response
External host	PHY_DataRequest(RequestData)	Request accepted: PHY_DataConfirm (ConfirmData) Request rejected: PHY_DataError (ErrorData)

Table 35. PHY_DataRequest: RequestData

Byte index	Bit index	Label	Description and available values
0	0	Custom / MIB frequency	Selection of frequency to use between MIB and custom frequency 0: TX frequency is the high or low frequency as in PHY_Config (*Table 54*) MIB object 1: TX frequency is specified in bytes [1 … 3] (TX frequency)
	1	Frequency overwrite	Selection of PHY_Config MIB object overwrite (*Table 54*). This field is taken into account if the Custom / MIB frequency" bit is equal to "1" only. 0: TX frequency expressed in the following bytes (1 – 3) won't overwrite the frequency in PHY_Config (*Table 54*) MIB object 1: TX frequency expressed in the following bytes (1 – 3) overwrites frequency in PHY_Config (*Table 54*) MIB object
	2	Frequency set	Selection of frequency in PHY_Config MIB object 0: TX frequency is the LowFrequency in PHY_Config MIB object 1: TX frequency is the HighFrequency in PHY_Config MIB object
	3	Gain selector	Selection of TX gain for frame transmission 0: TX gain set as in PHY Config MIB object (TX Gain parameter (*Table 54*)) 1: TX gain is specified in the following TX gain byte (2 or 4)
	4-6	Frame modulation	Modulation of the frame to be transmitted 0: B-PSK 1: Q-PSK 2: 8-PSK 3: B-FSK 4: B-PSK coded 5: Q-PSK coded 6: Reserved 7: B-PSK coded with Peak Noise Avoidance
	7	Zero crossing synchronization	0: transmission frame starts on any instant 1: transmission frame start after ZC delay value defined in PHY Config MIB object (*Table 54*)
1 - 3		TX Frequency	Frequency value (in Hz) that the output signal is modulated around, to be expressed if "Custom / MIB frequency" bit is equal to "1" only.
4 (or 1)	0 – 4	TX Gain	TX gain [·] to be expressed if Gain Selector bit is equal to "1" only.
	5 – 7	Unused	
5 … 254 (or 1 … 254, 2 … 254, 4 … 254)		Payload	Payload to be sent (up to 254 bytes)

3.3.13 PHY_DataConfirm (25h)

This command is sent by the ST7580 to provide a positive confirmation to a PHY_DataRequest (see *Section 3.3.12*) previously requested by the external host.

Table 36. PHY_DataConfirm: Syntax

Source	Command(Args)	Possible response
ST7580	PHY_DataConfirm (ConfirmData)	None

Table 37. PHY_DataConfirm: ConfirmData

Byte index	Bit index	Label	Description
0	0 – 1	Max. temp.	Max temperature reached during PHY frame transmission. 0: T < 70 °C (typical) 1: 70 °C < T < 100 °C (typical) 2: 100 °C < T < 125 °C (typical) 3: T > 125 °C (typical)
	2 – 6	Max. gain	If current control feature (MIB object PHY config 01h, *Section 4.2.2*) is active, max. gain used during last transmission. If current control feature is not active, gain used during last transmission.
	7	Unused	
1	0 – 1	Min. temp	Min. temperature reached during PHY frame transmission. 0: T < 70 °C (typical) 1: 70 °C < T < 100 °C (typical) 2: 100 °C < T < 125 °C (typical) 3: T > 125 °C (typical)
	2 – 6	Min. gain	If current control feature (MIB object PHY Config 01h, *Section 4.2.2*) is active, min. gain used during last transmission. if current control feature is not active, gain used during last transmission.
	7	Unused	
2	0 – 6	Overcurrent events number	Number of overcurrent events reached during PHY frame transmission. Valid if the current control feature is active only.
	7	Overcurrent notification	Notification about the overcurrent reached during last transmission. Valid whether the current control is active or not. 0: max. output current [·] value not reached 1: max. output current [·] value reached
3 - 4		ZC delay	Delay between the last transmitted UW last bit and the mains zero-crossing (signed value), expressed in 13 µs step.

3.3.14 PHY_DataIndication (26h)

This command is sent by the ST7580 device after a reception of a power line frame in compliance with PHY frame specification (*Figure 3*) and it exports the PHY_Data indication service (*Section 2.4*).

The command notification occurs if the modem is set at PHY layer only at MIB object Modem Config 00h (*Section 4.2.1*), as in the diagram flow in *Figure 5*.

Table 38. PHY_DataIndication: Syntax

Source	Command(Args)	Possible response
ST7580	PHY_DataIndication (IndicationData)	None

Table 39. PHY_DataIndication: indicationData

Byte Index	Bit Index	Label	Description and available values
0	0 - 2	Frame modulation	Frame modulation on the last data indication received 0: B-PSK 1: Q-PSK 2: 8-PSK 3: B-FSK 4: B-PSK coded 5: Q-PSK coded 6: Reserved 7: B-PSK coded with Peak Noise Avoidance
	3	RX channel	RX channel on the last data indication received 0: low channel 1: high channel
	4 - 7	PGA value	PGA value on the last data indication received
1		SNR	SNR estimated over the Unique Word reception (signed value, valid for PSK received frames only, equal to 255 – no meaning – for FSK received frames)
2 - 3		ZC delay	Delay between the received UW last bit and the mains zero-crossing (signed value), expressed in 13 µs step
4 - 254		PHY payload	Received payload (up to 251 bytes)

3.3.15 DL_DataRequest (50h)

This command is sent by the external host to request data transmission and it exports the DL_Data transmission service (*Section 2.3*).

- If accepted, the ST7580 constructs a DL frame (*Figure 3*) that is transmitted over the power line according to the details expressed in RequestData field (same format as PHY_DataRequest,*Table 35*) and with automatically appended CRC field with the format selected in MIB object Modem Config (00h, *Section 4.2.1*). A positive DL_DataConfirm (*Section 3.3.16*) is generated at the end of the transmission
- If refused, the modem generates a DL_DataError (*Table 12*).

Table 40. DL_DataRequest: Syntax

Source	Command(Args)	Possible Response
External host	DL_DataRequest(RequestData)	Request accepted: DL_DataConfirm (ConfirmData) Request rejected: DL_DataError (ErrorData)

3.3.16 DL_DataConfirm (51h)

This command is sent by the ST7580 to provide a positive confirmation to a DL_DataRequest (*Section 3.3.15*) previously requested by the external host.

Table 41. DL_DataConfirm: Syntax

Source	Command(Args)	Possible response
ST7580	DL_DataConfirm (ConfirmData)	None

The ConfirmData field has the same format as for PHY_DataConfirm (see *Table 37*).

3.3.17 DL_DataIndication (52h)

This command is sent by the ST7580 after a reception of a power line frame in compliance with DL frame specification (*Figure 3*, i.e. with a CRC correct field) and it exports the DL_Data indication service (*Section 2.4*). The command notification occurs if the modem is set for receiving DL or SS frames at MIB object Modem Config 00h (*Section 4.2.1*), as in the diagram flow in *Figure 5*.

The IndicationData fields are the same as for PHY_DataIndication (*Table 39*).

Table 42. DL_DataIndication: Syntax

Source	Command(Args)	Possible response
ST7580	DL_DataIndication (IndicationData)	None

3.3.18 DL_SnifferIndication (5Ah)

This command is sent by the ST7580 after a reception of a power line frame in compliance with DL frame specification (*Figure 3*, i.e. with a wrong CRC field) and it exports the DL_Sniffer indication service (*Section 2.4*). The command notification occurs if the modem is set for receiving DL or SS frames at MIB object Modem Config 00h (*Section 4.2.1*), as in the diagram flow in *Figure 5*.

The IndicationData fields are the same as for PHY_DataIndication (*Table 39*). The payload field presents the wrong CRC bytes also.

Table 43. DL_SnifferIndication: Syntax

Source	Command(Args)	Possible response
ST7580	DL_SnifferIndication (IndicationData)	None

3.3.19 SS_DataRequest (54h)

This command is sent by the external host to request data transmission and it exports the SS_Data transmission service (*Section 2.3*).

- If accepted, the ST7580 constructs an SS frame (*Figure 4*) that is transmitted over the power line in accordance with the details expressed in RequestData field (*Table 46*). A positive SS_DataConfirm (*Section 3.3.20*) is generated at the end of the transmission.
- If refused, the modem generates an SS_DataError (*Table 12*).

Table 44. SS_DataRequest: Syntax

Source	Command(Args)	Possible response
External host	SS_DataRequest(RequestData)	Request accepted: SS_DataConfirm (ConfirmData) Request rejected: SS_DataError (ErrorData)

Table 45. SS_DataRequest: RequestData

Byte index	Bit index	Label	Description and available values
0	0	Custom / MIB frequency	Selection of frequency to use between MIB and custom frequency 0: TX frequency is the high or low frequency as in PHY_Config (*Section 4.2.2*) MIB object. 1: TX frequency is specified in bytes [1 … 3] (TX frequency).
	1	Frequency overwrite	Selection of PHY_Config MIB object overwrite (*Section 4.2.2*). This field is taken into account if the Custom / MIB frequency bit is equal to “1” only. 0: TX frequency expressed in the following bytes (1 – 3) won't overwrite the frequency in PHY_Config (*Section 4.2.2*) MIB object 1: TX frequency expressed in the following bytes (1 – 3) overwrites frequency in PHY_Config (*Section 4.2.2*) MIB object
	2	Frequency set	Selection of frequency in PHY_Config MIB object 0: TX frequency is the LowFrequency in PHY_Config MIB object 1: TX frequency is the HighFrequency in PHY_Config MIB object
	3	Gain selector	Selection of TX gain for frame transmission 0: TX gain set as in PHY Config MIB object (TX gain parameter (*Section 4.2.2*)). 1: TX gain is specified in the following TX Gain byte (2 or 4).
	4 – 6	Frame modulation	Modulation of the frame to be transmitted 0: B-PSK 1: Q-PSK 2: 8-PSK 3: B-FSK 4: B-PSK coded 5: Q-PSK coded 6: Reserved 7: B-PSK coded with Peak Noise Avoidance
	7	Zero crossing synchronization	0: Transmission frame starts on any instant 1: Transmission frame start after ZC delay value defined in PHY Config MIB object (*Table 54*)
1 - 3		TX frequency	Frequency value (in Hz) that the output signal is modulated around, to be expressed if “Custom / MIB frequency” bit is equal to “1” only.
4 (or 1)	0 – 4	TX gain	TX gain to be expressed if Gain Selector bit is equal to “1” only.
	5 – 7	Unused	
5 (or 2 or 4)		Header length	Length of header field. If payload is not empty, it must be: 4 = Header Length = Payload length < 226). If payload is empty, it must be: 16 = Header Length < 226).
6 … 231 (or 3 … 228, 5 … 230)		Header and payload	Header and payload to be sent (from 0 to 226 byte: Header and Payload to be sent as unique buffer).

- If payload field is present, must be greater than or equal to 4
- If payload field is not present, must be greater than or equal to 16.

3.3.20 SS_DataConfirm (55h)

This command is sent by the ST7580 to provide a positive confirmation to a SS_DataRequest (*Section 3.3.15*) previously requested by the external host.

Table 46. SS_DataConfirm: Syntax

Source	Command(Args)	Possible response
ST7580	SS_DataConfirm (ConfirmData)	None

The ConfirmData field has the same format as for PHY_DataConfirm (see *Table 37*).

3.3.21 SS_DataIndication (56h)

This command is sent by the ST7580 after a reception of a power line frame in compliance with SS frame specification (*Figure 4*, i.e. with a CRC correct field and encrypted according to SS_Key MIB object, *Section 4.2.3*) and it exports the SS_Data indication service (*Section 2.4*). The command notification occurs if the modem is set for receiving SS frames at MIB object Modem Config 00h (*Section 4.2.1*), as in the diagram flow in *Figure 5*.

Table 47. SS_DataIndication: Syntax

Source	Command(Args)	Possible response
ST7580	SS_DataIndication (IndicationData)	None

Table 48. SS_DataIndication: IndicationData

Byte index	Bit index	Label	Description and available values
0	0 – 2	Frame modulation	Frame modulation on the last DataIndication received 0: B-PSK 1: Q-PSK 2: 8-PSK 3: B-FSK 4: B-PSK coded 5: Q-PSK coded 6: Reserved 7: B-PSK coded with Peak Noise Avoidance
	3	RX channel	RX channel on the last DataIndication received 0: low channel 1: high channel
	4 – 7	PGA value	PGA value on the last DataIndication received
1		SNR	SNR estimated over the Unique Word reception (signed value, valid for PSK received frames only, equal to 255 – no meaning – for FSK received frames)
2 – 3		ZC delay	Delay between the received UW last bit and the mains zero-crossing (signed value), expressed in 13 µs step
4 - 229		SS header and payload	Received header and payload (up to 226 bytes)

3.3.22 SS_SnifferIndication (5Eh)

This command is sent by the ST7580 after a reception of a power line frame that couldn't be decrypted through the key value stored in the MIB object SS_Key 02h (*Section 4.2.3*) and it exports the SS_Sniffer indication service (*Section 2.4*). The command notification occurs if the modem is set for receiving SS frames at MIB object Modem Config 00h (*Section 4.2.1*), as in the diagram flow in *Figure 5*.

The IndicationData fields are the same as for PHY_DataIndication (*Table 39*). The payload field won't present the wrong CRC bytes.

Table 49. SS_SnifferIndication: Syntax

Source	Command(Args)	Possible response
ST7580	SS_SnifferIndication (IndicationData)	None

3.3.23 CMD_SyntaxError (36h)

This command is sent by the ST758 to the external host after receiving a local frame with the value declared in command code not corresponding to any command listed in *Table 10*.

Table 50. CMD_SyntaxError: Syntax

Source	Command(Args)	Possible response
ST7580	CMD_SyntaxError(ErrorData)	None

Table 51. CMD_SyntaxError:ErrorData

Byte index	Label	Description
0	ERROR	Wrong command code declared in the previous local frame by external host

4 Management information base (MIB)

The management information base collects all the parameters that allow the host to set and control the modem operation.

As explained in *Section 3*, the MIB objects can be directly accessed to update and read their values through dedicated commands (*Section 3.3.4*, *3.3.63.3.6*, and *3.3.8*).

4.1 MIB table

Table 52 lists all the available MIB objects, with the related indexes, the default values and the allowed operation (read write).

Table 52. Management information base (MIB) objects

Index	Name	Factory default value	Length [byte]	R/W/E
00h	Modem configuration	11h	1	R/W
01h	PHY configuration	014FF00119400E15000002359B58h	14	R/W
02h	SS key	00000000000000000000000000000000h	16	R/W
03h	Reserved	00h	1	R
04h	Last data indication	00000000h	4	R
05h	Last TX confirm	0000000000h	5	R
06h	PHY_Data	00000000000000000000h	10	R/E
07h	DL_Data	0000000000000000h	8	R/E
08h	SS_Data	00000000000000000000h	10	R/E
09h	Host interface timeout	C8280Ah	3	R/W
0Ah	Firmware version	00420097h	4	R

4.2 MIB parameters

In this section all the MIB object is described in detail.

4.2.1 00h (Modem configuration)

This object stores the setting used to functionally configure the modem. It can be read or written.

Table 53. MIB object 00h: MIB_WriteRequest and MIB_ReadRequest data format

Byte index	Bit index	Label	Description and available values	Factory default value
0	0 – 1	Access mode	Active layer for received frames 0: PHY layer 1: DL layer 2: SS layer	1 (DL layer)
	2	Sniffer mode	Sniffer feature on received frames (active on DL and SS layer only) 0: not active 1: active	0 (not active)
	3 - 4	CRC length	CRC length on DL frames 0: 1 byte (CRC-8) 1: 2 byte (CRC-16), big endian 2: 4 byte (CRC-32), little endian 3: 4 byte (CRC-32), big endian	2
	5	Reserved	Always equal to 0	0
	6	DL CRC on PHY length	Fields of DL frame (*Figure 3*) involved in CRC calculation active on handled DL and SS frames only) 0: CRC calculated over DL payload only 1: CRC calculated over DL payload and PHY length	0
	7	Unused	Unused value	0

4.2.2 01h (PHY layer configuration)

This object stores the settings used to configure the modem at physical layer. It can be read or written.

Table 54. MIB object 01h: MIB_WriteRequest and MIB_ReadRequest data format

Byte index	Bit index	Label	Description and available values	Factory default value
0 … 2		High frequency	High frequency used for communication [Hz]. Any value in CENELEC band A, B, C, D.	86000 (014FF0h)
3 … 5		Low frequency	Low frequency used for communication [Hz]. Any value in CENELEC band A, B, C, D.	72000 (011940h)

Table 54. MIB object 01h: MIB_WriteRequest and MIB_ReadRequest data format (continued)

Byte index	Bit index	Label	Description and available values	Factory default value
6	0	RX mode	Active channels for reception 0: high channel only 1: dual channel	0 (high channel)
	1	RX high channel modulation	Functional modulation on high channel 0: FSK 1: all allowed PSK modulations	1 (PSK)
	2	RX low channel modulation	Functional modulation on low channel (ignored if RX mode is high channel only) 0: FSK 1: all allowed PSK modulations	1 (PSK)
	3	Current control	TX current limiting enable flag 0: disabled 1: enabled	1 (enabled)
	4 - 7	Unused	Unused bits	0
7	0 - 4	TX gain	Default TX gain value to be used in transmission (when Gain Selector parameter in any DataRequest- see *Table 35*, is equal to 0)	15h (21)
	5 - 7	Reserved	Reserved bits	0
8 - 9		ZC delay	If ZC delay parameter in any DataRequest is equal to 1 (*Table 35*), delay set during transmission between the outgoing frame start and the mains zero-crossing (signed value), expressed in 13 µs step	0
10	0 - 1	PSK preamble length	Preamble length for PSK communication. 0: 16 bit 1: 24 bit 2: 32 bit 3: 40 bit	2 (32 bit)
	2 - 7	Unused	Unused bits	0

Table 54. MIB object 01h: MIB_WriteRequest and MIB_ReadRequest data format (continued)

Byte index	Bit index	Label	Description and available values	Factory default value
11	0 - 1	FSK bit rate	Bit rate for FSK communication. 0: 1200 bps 1: 2400 bps 2: 4800 bps 3: 9600 bps	1 (2400 bps)
	2	FSK deviation	Deviation for FSK communication. 0: 0.5 1: 1	1
	3 – 4	FSK preamble length	Preamble length for FSK communication. 0: 16 bit 1: 24 bit 2: 32 bit 3: 40 bit	2 (32 bit)
	5	FSK unique word length	Unique word length for FSK communication. 0: 8 bit 1: 16 bit	1 (16 bit)
	6	Reserved	Reserved bit	0
	7 – 8	Unused	Unused bits	0
12		FSK unique word MSByte	FSK modulation unique word MSB (used if unique word length is 16 bits only)	9Bh
13		FSK unique word LSByte	FSK modulation unique word LSB	58h

4.2.3 02h (SS Key)

This object holds the key used by the SS sub-system to encrypt and decrypt transmitted and received data. It can be read or written.

Table 55. MIB object 02h: MIB_WriteRequest and MIB_ReadRequest Data format

Byte index	Label	Description and available values	Factory default value
0 … 15	SS Key	128-bit AES key used to process transmitted and received frames.	00000000000000000000000000000000

4.2.4 04h (Last data indication)

This object stores information about the last indication message received (among PHY_DataIndication *Section 3.3.14*, DL_DataIndication *Section 3.3.17*, SS_DataIndication *Section 3.3.21*, DL_SnifferIndication *Section 3.3.17*, SS_SnifferIndication *Section 3.3.22*).

Its field values are equal to those notified by the last indication message and presented in the four first bytes (0 … 3) of the IndicationData (*Table 39*, *48*). It can be read only.

Table 56. MIB object 04h: MIB_WriteRequest and MIB_ReadRequest data format

Byte index	Bit index	Label	Description and available values	Factory default value
0	0 – 2	Frame modulation	Frame modulation on the last indication received (Data/Sniffer, PHY, DL, SS) 0: B-PSK 1: Q-PSK 2: 8-PSK 3: B-FSK 4: B-PSK coded 5: Q-PSK coded 6: Reserved 7: B-PSK coded with Peak Noise Avoidance	0
	3	RX channel	RX channel on the last Indication received 0: low channel 1: high channel	0
	4 – 7	PGA Value	PGA value on the last indication received	0
1		SNR	SNR estimated over the Unique Word reception (signed value, valid for PSK received frames only, equal to 255 – no meaning – for FSK received frames)	00h
2 – 3		ZC Delay	Delay between the received UW last bit and the mains zero-crossing (signed value), expressed in 13 µs step	0000h

4.2.5 05h (Last TX Confirm)

This object stores information about last confirm message received (among PHY_DataConfirm *Section 3.3.13*, DL_DataConfirm *Section 3.3.16*, SS_DataConfirm *Section 3.3.20*).

Its field values are equal to those notified by last confirm message and presented in the first five bytes (0 … 2) of the ConfirmData (*Table 37*). It can be read only.

Table 57. MIB object 05h: MIB_WriteRequest and MIB_ReadRequest data format

Byte index	Bit index	Label	Description	Factory default value
0	0 – 1	Max. temp.	Max. temperature reached during PHY frame transmission. 0: T < 70 °C (typical) 1: 70 °C < T < 100 °C (typical) 2: 100 °C < T < 125 °C (typical) 3: T > 125 °C (typical)	0
	2 – 6	Max. gain	If current control feature (MIB object PHY Config 01h, *Table 54*) is active, max. gain used during the last transmission. If current control feature is not active, gain used during last transmission.	0
	7	Unused		0
1	0 – 1	Min. temp	Min. temperature reached during PHY frame transmission. 0: T < 70 °C (typical) 1: 70 °C < T < 100 °C (typical) 2: 100 °C < T < 125 °C (typical) 3: T > 125 °C (typical)	0
	2 – 6	Min. gain	If current control feature (MIB object PHY Config 01h, *Table 54*) is active, min. gain used during last transmission. If current control feature is not active, gain used during last transmission.	0
	7	Unused		0
2	0 – 6	Overcurrent events number	Number of overcurrent events reached during PHY frame transmission. Valid if the current control feature is active only.	0
	7	Overcurrent notification	Notification about the overcurrent reached during last transmission. Valid whether the current control is active or not. 0: max. output current [·] value not reached 1: max. output current [·] value reached	0
3 - 4		ZC Delay	Delay between the last transmitted UW last bit and the mains zero-crossing (signed value), expressed in 13 µs step	0

4.2.6 06h (PHY Data)

This object stores counters of power line frames transmitted or received by the ST7580 in compliance with physical frame features. It can be read or erased only.

Table 58. MIB object 06h: MIB_WriteRequest and MIB_ReadRequest Data format

Byte index	Label	Description	Factory default value
0 – 1	Received unique word counter	Counter of preamble and unique word sequences received	0000h
2 - 3	PHY valid received frames counter	Counter of valid received PHY frame (right preamble, UW). If the modem is set at DL or SS layer (through MIB object Modem Configuration 00h, *Section 4.2.1*), it includes any wrong and malformed frames (CRC wrong, invalid key) also. Unsigned value.	0000h
4 - 5	PHY transmitted frames counter	Counter of valid transmitted PHY frames (PHY_DataConfirm number). Unsigned value.	0000h
6 – 7	PHY refused transmission counter	Counter of refused transmissions on PHY frames (PHY_DataError number). Unsigned value.	0000h
8 - 9	Network period	Mains period, expressed in 13 µs step, updated during last reception or transmission	0000h

4.2.7 07h (DL Data)

This object stores counters of power line frames transmitted or received by the ST7580 in compliance with data link frame features. It can be read or erased only.

Table 59. MIB object 07h: MIB_WriteRequest and MIB_ReadRequest data format

Byte index	Label	Description	Factory default value
0 – 1	DL valid received frames counter	Counter of valid received DL frames (right CRC). If the modem is set the SS layer (through MIB object Modem Configuration 00h, *Section 4.2.1*), it includes any SS wrong and malformed frames (invalid key) as well. Unsigned value.	0000h
2 - 3	DL invalid received frames counter	Counter of invalid received DL frames (wrong CRC). Unsigned value.	0000h
4 - 5	DL transmitted frames counter	Counter of valid transmitted DL frames (DL_DataConfirm number). Unsigned value.	0000h
6 – 7	DL refused transmission counter	Counter of refused transmissions on DL frames (DL_DataError number). Unsigned value.	0000h

4.2.8 08h (SS Data)

This object stores counters of power line frames transmitted or received by the ST7580 in compliance with data link frame features. It can be read or erased only.

Table 60. MIB object 08h: MIB_WriteRequest and MIB_ReadRequest Data format

Byte index	Label	Description	Factory default value
0 – 1	SS valid received frames counter	Counter of valid received SS frames (SS_DataIndication number). Unsigned value.	0000h
2 – 3	SS not authentic received frames counter	Counter of not authentic received SS frames (wrong digest). Unsigned value.	0000h
4 – 5	SS malformed received frames	Counter of malformed received SS frames (wrong length). Unsigned value.	0000h
6 – 7	SS transmitted frames counter	Counter of valid transmitted SS frames (SS_DataConfirm number). Unsigned value.	0000h
8 - 9	SS refused transmission counter	Counter of refused transmissions on SS frames (SS_DataError number). Unsigned value.	0000h

4.2.9 09h (host interface timeout)

This object stores the host interface timeout values that the ST7580 can handle (*Table 6*). It can be read or written.

Table 61. MIB object 09h: MIB_WriteRequest and MIB_ReadRequest Data format

Byte index	Label	Description and available values	Factory default value
0	T_{SR}	T_{SR} timeout value [ms]	200 (C8h)
1	T_{ACK}	T_{ACK} timeout value [ms]	40 (28h)
2	T_{IC}	T_{IC} timeout value [ms]	10 (0Ah)

4.2.10 0Ah (firmware version)

This object stores the embedded firmware version (ST internal reference). It can be read only.

Table 62. MIB object 0Ah: MIB_WriteRequest and MIB_ReadRequest data format

Byte index	Label	Description and available values	Factory default value
0 - 3	FW version	FW release number (ST internal reference)	00420097h

5 Reference

- STMicroelectronics, ST7580 datasheet.

6 Revision history

Table 63. Document revision history

Date	Revision	Changes
04-Nov-2011	1	Initial release
23-Oct-2012	2	– Corrected parameter (length fields) at *Table 6*, *35*, *39* and *52* – Added parameters values on *Table 45*
02-Oct-2013	3	– Updated *Table 8* and *Table 19*. – Minor modifications throughout document.