Device SPI Protocol Specification

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Contents

1 Introduction

This document is the SPI Protocol Specification for connected home appliances (devices) that are being designed and developed by external suppliers. It defines the interface between the device and the Embedded Connectivity System (ESC) comprising WiFi and cellular for connection of the devices to the internet.

2 Protocol Overview

The Embedded Connectivity System acts as master in the SPI communication and the device acts as slave. The Embedded Connectivity System sends requests to the device with following format:

Start Byte	**Command**	**Data Item**	**Checksum**	**Stop Byte**
0x7E	Request byte	Item byte	Checksum byte	0x7E

Each request is opened with the start byte 0x7E following by the request command and related data item. Then the checksum is sent. The request is closed with the stop byte 0x7E.

The device responses to requests as follows:

Start Byte	**Command re**	**Data Length**	**Item 1**	**Item 1 Length**	**Item 1 Data**	**…**
0x7E	Response byte	Total length	Item byte	Item length	Item data	…

…	**Item n**	**Item n Length**	**Item n Data**	**Checksum**	**Stop Byte**
…	Item byte	Item length	Item data	Checksum byte	0x7E

The response is opened with the start byte 0x7E following by the response to the received command and total data length of the data sent to the ECS. Then the data items, data items length and data payload of each item are sent. Finally the checksum is sent. The request is closed with the stop byte 0x7E.

3 Commands

There are three commands that are sent from the Embedded Connectivity System to the device and three replies that are sent from the device to the Embedded Connectivity System in response. Table 1 shows the overview of all commands.

from ESC to Device		
0x00	DEVICE_INFO_REQ	Request device information
0x02	RFID_REQ	Request RFID scan
0x04	DEVICE_CTRL_REQ	Request to control the device
from Device to ESC		
0x01	DEVICE_INFO_RES	Response to device information request
0x03	RFID_RES	Response to RFID scan request

0x05	DEVICE_CTRL_RES	Confirmation response to device control request

Table 1: Overview of SPI commands

4 Data Exchange Items

Table 2 shows the summary of all device data items. If the request from ECS contains 0x00 in the data item byte the device sends all data to the ECS. The reserved items are not included in the protocol and are provisioned for extendibility.

1 Device Info				
Device name	0x10	< 255 bytes	DEVICE_NAME	Item 10
RF ID scan	0x11	< 255 bytes	RFID_SCAN	Item 11
Error code	0x12	6 bytes	ERROR_CODE	Item 12
Total operating time	0x13	6 bytes	TOT_OP_TIME	Item 13
Firmware version	0x14	< 255 bytes	DEVICE_FW_VERSION	Item 14
2 Boolean Sensors				
Device status	0x20	1 byte	DEVICE_STATUS	Item 1
Switch 1 status	0x21	1 byte	SWITH_1_STATUS	Item 2
Switch 2 status	0x22	1 byte	SWITH_2_STATUS	Item 3
Switch 3 status	0x23	1 byte	SWITH_3_STATUS	Item 4
Switch 4 status	0x24	1 byte	SWITH_4_STATUS	Item 5
Switch 5 status	0x25	1 byte	SWITH_5_STATUS	Item 6
3 Analog Sesors				
Temperature Sensor 1	0x30	4 bytes	TEMP_SENSOR_1	Item 7
Temperature Sensor 2	0x31	4 bytes	TEMP_SENSOR_2	Item 8
reserved	0x32	4 bytes	--	
reserved	0x33	4 bytes	--	
Motor rotating speed	0x34	4 bytes	MOTOR_ROT_SPEED	Item 9
4 Controls				
Device off	0x40	1 byte	DEVICE_OFF	Item 17
Device on	0x41	1 byte	DEVICE_ON	Item 18
Device start	0x42	1 byte	DEVICE_START	Item 19
Remote RFID	0x44	64 bytes	REMOTE_RFID	Item 20

Table 2: Summary of device data items

5 Protocol Examples

There are examples given below for different requests from the Embedded Connectivity System and responses from the device.

Request for info (get all data):

Start Byte	Command	Data Item	Checksum	Stop Byte
0x7E	0x00	0x00	0x00	0x7E

Request for scanned RFID (get scanned RFID):

Start Byte	Command	Data item	Checksum	Stop Byte
0x7E	0x02	0x00	0x2A	0x7E

Request for control (switch device on):

Start Byte	Command	Data item	Checksum	Stop Byte
0x7E	0x04	0x41	Checksum	0x7E

Request for send remote RFID (send modified RFID):

Start Byte	Command	Data item	Data	Checksum	Stop Byte
0x7E	0x04	0x44	RFID data (64 bytes)	Checksum	0x7E

The responses from device to the requests are described with following parameters.

Response to info request:

Start Byte	Command re	Data Length	Item 1	Item 1 Length	Item 1 Data	…
0x7E	0x01	0x46	0x21	0x01	0x00	…

…	Item 15	Item 15 Length	Item 15 Data	Checksum	Stop Byte
…	0x01	0x01	0x01	Checksum byte	0x7E

Response to RFID request (sending scanned RFID):

Start Byte	Command re	Data Length	Item 11	Item 11 Length	Item 11 Data	…
0x7E	0x03	0x42	0x11	0x40	…	…

…	Item 11 Data	Checksum	Stop Byte
…	…	Checksum byte	0x7E

Response to control request (successfully switched device on):

Start Byte	Command re	Data Length	Item 17	Item 17 Length	Item 17 Data
0x7E	0x05	0x03	0x41	0x01	0x01

Checksum	Stop Byte
Checksum byte	0x7E

Item 17 Data contains the information about executed command. If the command was executed (for example the device was switched on) 0x01 is sent. Otherwise 0x00 is sent in the Item 17 Data.

Response to received remote RFID (accepted by the device):

Start Byte	Command re	Data Length	Item 20	Item 20 Length	Item 20 State
0x7E	0x05	0x03	0x44	0x01	0x01

Checksum	Stop Byte
Checksum byte	0x7E

Item 20 State contains the information about acceptance or rejection of the RFID code sent to the device. In acceptance case 0x01 is sent and in the case of rejection 0x00 is sent in the Item 20 State.