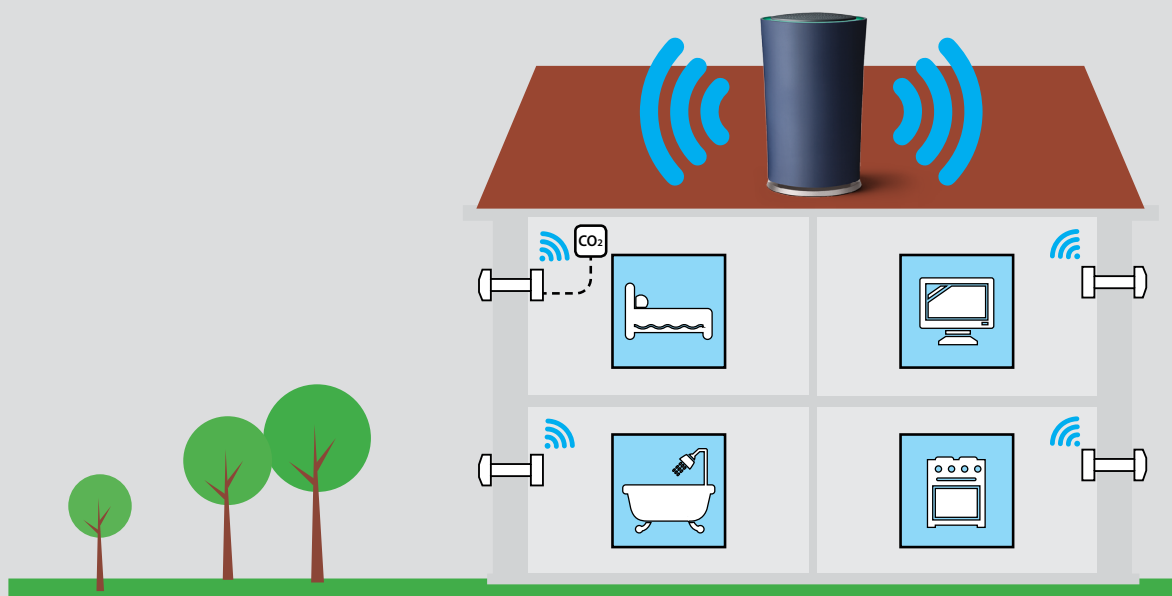


Smart House



Connection to a "Smart House" system

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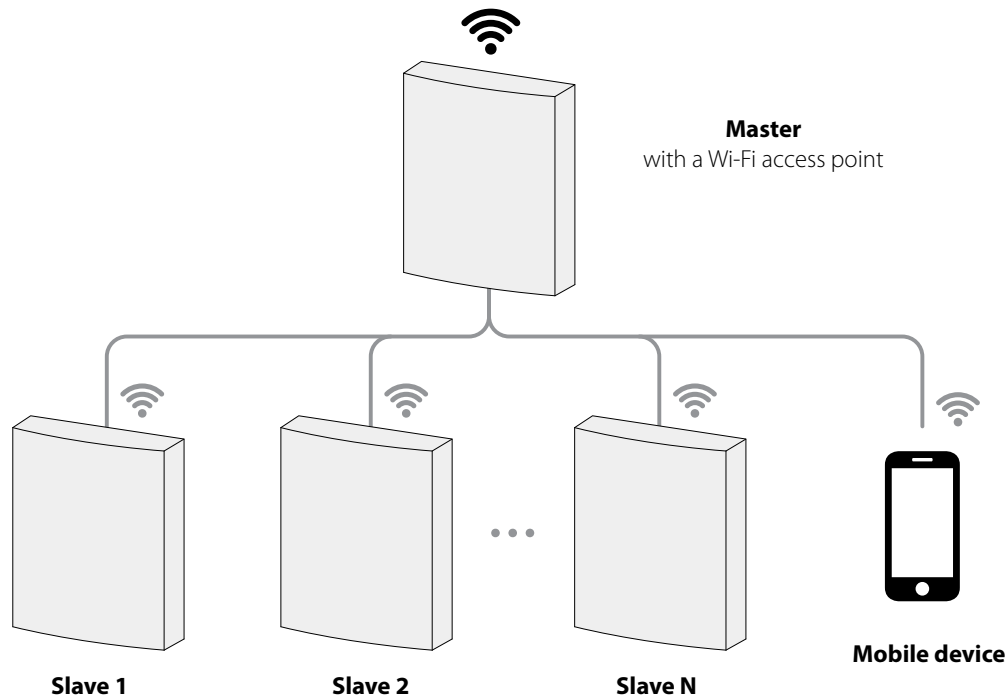
PURPOSE

This guide covers the connection of TwinFresh Expert RW V.2 (V.3) and TwinFresh Style Wi-Fi series of air handling units to a "Smart House" system.

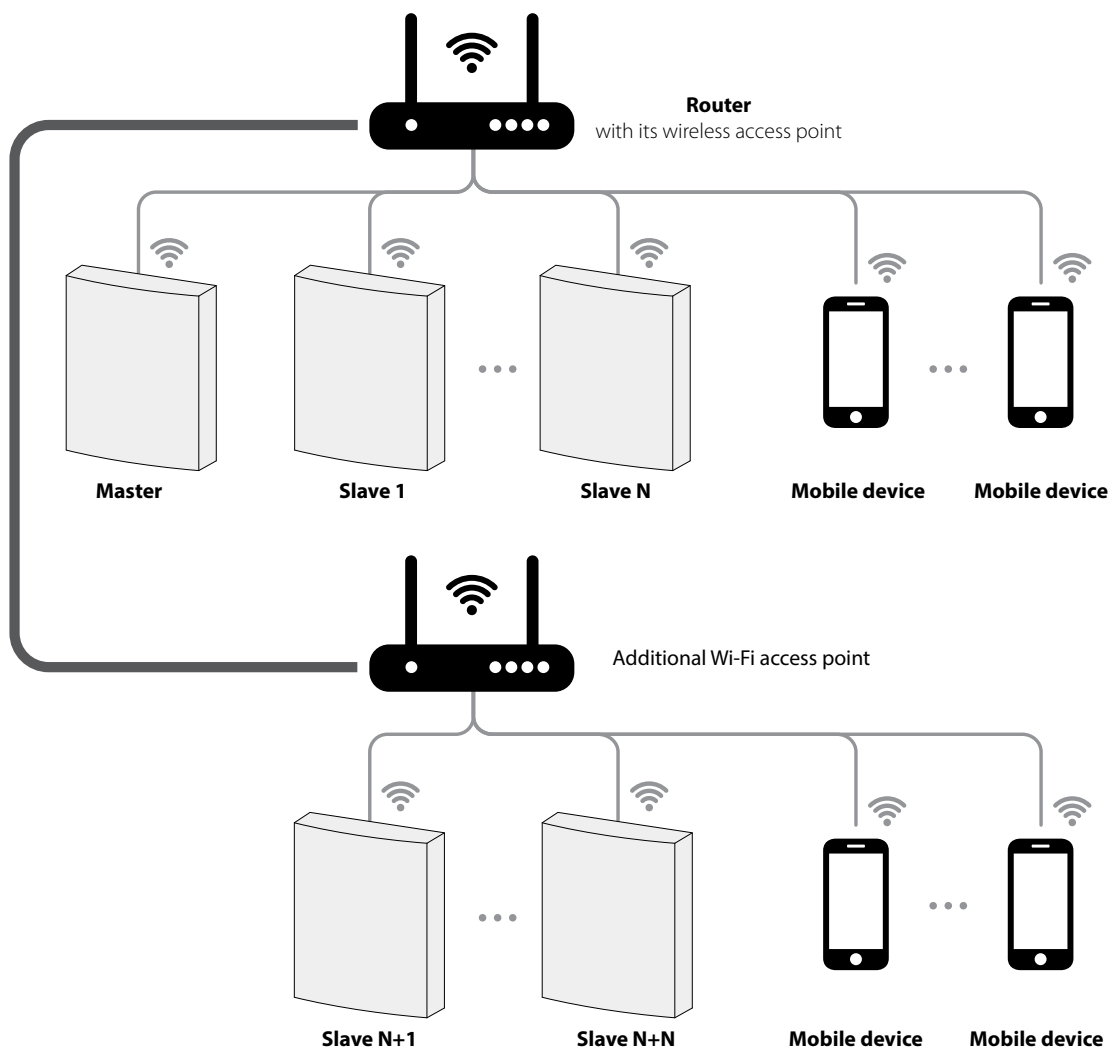
Control is provided only by Master devices. Slave devices, mobile devices, and "Smart House" system components are connected to master devices over Wi-Fi. Slave devices are controlled by means of commands received from master devices.

There are two wireless connection patterns available:

1. A master device with a Wi-Fi access point, which can accept up to eight slave connections. If all available eight connections of the master device are used, a mobile device or a "Smart House" system will not be able to connect to the master device.



2. Master devices, slave devices, mobile devices and a “Smart House” system connect to the Wi-Fi access point of the network router. In this case, the maximum number of available Wi-Fi connections is limited by the router functionality. If the number of necessary ventilation units is more than the router can accept, you may use an additional Wi-Fi access point to connect the remaining ventilation units. The router network may include several master devices to provide control by zones.



The connection is set up via the mobile application from the Connection –> Wi-Fi setup menu (see the unit data sheet).

NETWORK PARAMETERS

Data is exchanged via the UDP protocol (with broadcast support).

Master device IP address:

- 192.168.4.1 – if the master device runs without a router (connection pattern 1).
- If the master device is connected via a router (connection pattern 2), the IP address is set up via the mobile application (see unit data sheet) and can be defined as static or dynamic (DHCP).

Master device port: 4000.

Maximum packet size: 256 bytes.

PACKET STRUCTURE

0xFD	0xFD	TYPE	SIZE ID	ID	SIZE PWD	PWD	FUNC	DATA	Chksum L	Chksum H
------	------	------	---------	----	----------	-----	------	------	----------	----------

0xFD 0xFD : packet beginning character (2 bytes).

TYPE : protocol type (1 byte). Value = 0x02.

SIZE ID : ID block size (1 byte). Value = 0x10.

ID : controller ID. This number is printed on the label (16 characters) applied to the control circuit board or the unit casing.

You can also substitute the ID with "DEFAULT_DEVICEID" code word. The ID can be used:

- To control the master device if it runs without a router (connection pattern 1).
- To search for master devices on the network if a router is used (connection pattern 2). In this case, the device will respond to two parameters only: 0x007C and 0x00B9 (see parameter table).

SIZE PWD : PWD block size (1 byte). Possible values: from 0x00 to 0x08.

PWD : device password (permissible characters: "0...9", "a...z", and "A...Z"). The default password is "1111".

This password can be changed via the mobile application from the **Connection** → **At home** → **Settings menu** (see the unit data sheet).

FUNC : the function number (1 byte). It defines the action with the data and the **DATA** block structure:

- 0x01: parameter read.
- 0x02: parameter write. The controller does not send any response regarding the status of the given parameters.
- 0x03: parameter write with subsequent controller response regarding the status of the given parameters.
- 0x04: parameter increment with subsequent controller response regarding the status of the given parameters.
- 0x05: parameter decrement with subsequent controller response regarding the status of the given parameters.
- 0x06: controller response to the request (FUNC = 0x01, 0x03, 0x04, 0x05).

DATA : data block. It consists of parameter numbers and their values:

If FUNC = 0x01 or 0x04 or 0x05:

P1	P2	Pn
----	----	----

If FUNC = 0x02 or 0x03 or 0x06:

P1	Value 1	P2	Value 2	Pn	Value n
----	---------	----	---------	----	---------

Parameter numbers (see parameter table) consists of two bytes (the high byte is virtual). By default the high byte of each parameter number in each new packet equals 0x00. The high byte can be changed within a single packet using the special 0xFF command (see below).

P is the low byte of the parameter number. Possible values: 0x00 – 0xFB. The 0xFC – 0xFF values are special commands:

0xFC : change function (**FUNC**) number. The following byte must be the new function number ranging from 0x01 to 0x05. This command is used to organise several functions with different actions into a single packet.

0xFD : parameter not supported by the controller. The following byte is the low byte of the non-supported parameter. This command is used in controller response (**FUNC** = 0x06) to a non-supported parameter read or write request.

0xFE : change a size of the Value for one parameter which follows. The following byte must be the new parameter size followed by the low byte of the parameter number, and then – by the **Value** itself.

0xFF : change the high byte for parameter numbers within a single packet. The following byte must be the new high byte.

Value : parameter value (the default size of value is 1 byte). Byte ordering from least significant byte to most significant byte.

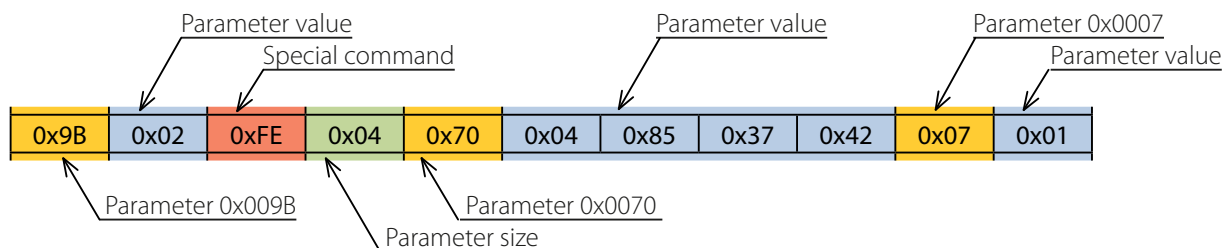
Chksum L Chksum H : checksum (2 bytes). This is calculated as the total of bytes beginning with the **TYPE** byte and ending with the final byte of the **DATA** block.

Chksum L: checksum low byte.

Chksum H: checksum high byte.

EXAMPLES OF USING SPECIAL COMMANDS IN THE DATA BLOCK

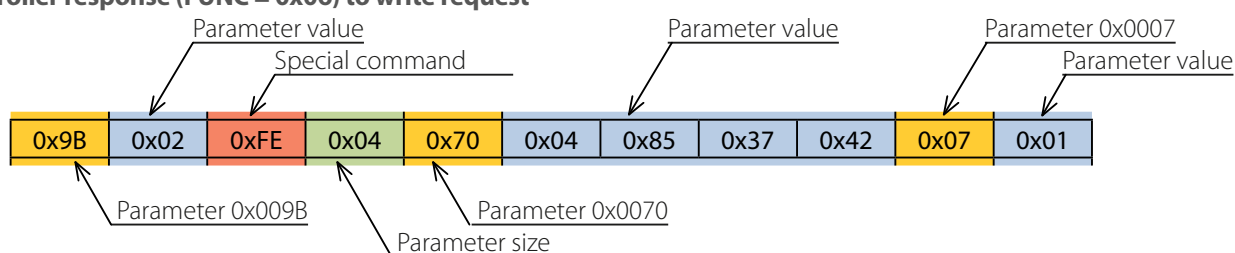
Write request (FUNC = 0x03) for parameters number 0x009B, 0x0070, and 0x0007



Write request details:

- Parameter 0x009B to be assigned the value of 0x02.
- Parameter 0x0070 to be assigned the value of 0x42378504. The value size is 4 bytes as indicated by the special command 0xFE + 0x04.
- Parameter 0x0007 to be assigned the value of 0x01.

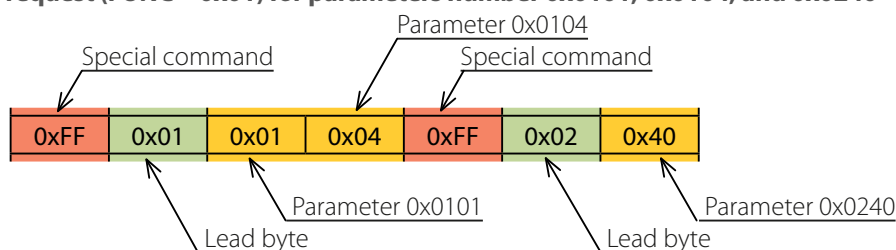
Controller response (FUNC = 0x06) to write request



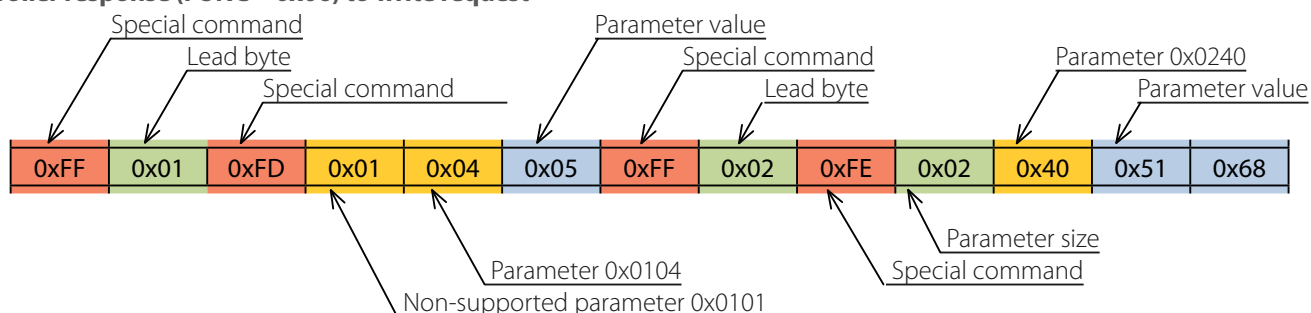
Controller response details:

- Parameter 0x009B equals 0x02.
- Parameter 0x0070 equals 0x42378504. The value size is 4 bytes as indicated by the special command 0xFE + 0x04.
- Parameter 0x0007 equals 0x01.

Read request (FUNC = 0x01) for parameters number 0x0101, 0x0104, and 0x0240



Controller response (FUNC = 0x06) to write request



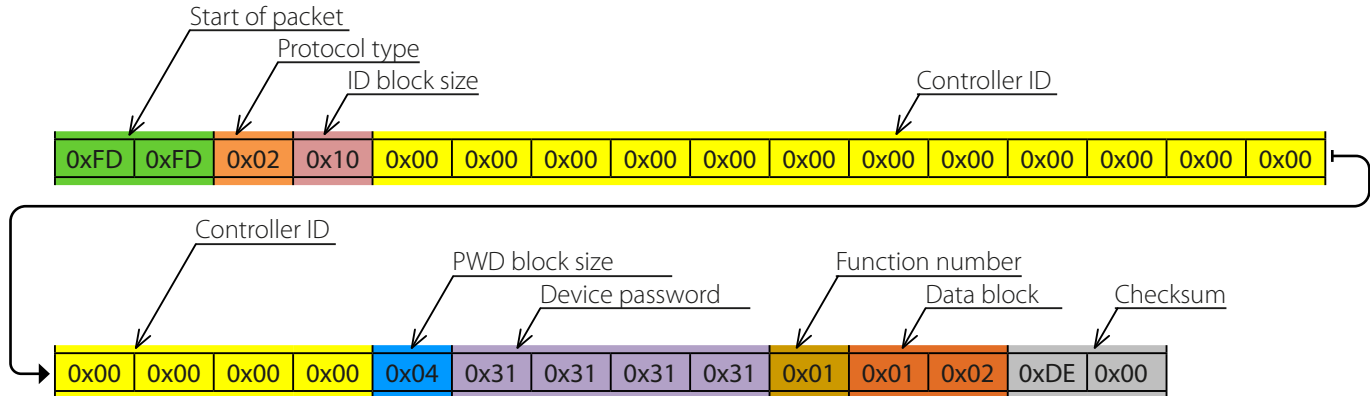
Controller response details:

- Parameter 0x0101 is not supported by the controller as indicated by the special command 0xFD.
- Parameter 0x0104 equals 0x05.
- Parameter 0x0240 equals 0x6851. The value size is 2 bytes as indicated by the special command 0xFE + 0x02.

COMPLETE PACKET EXAMPLES

Sending "Smart House→ Controller" packet

This packet contains a read request (FUNC = 0x01) for parameters number: 0x0001, 0x0002.

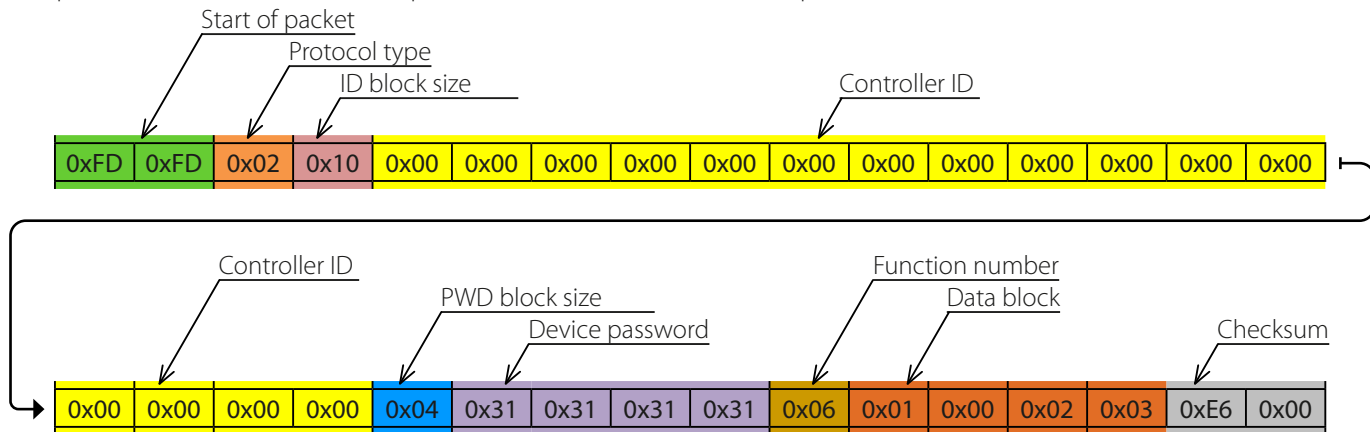


Request details:

- Checksum: 0x00DE.

Sending "Controller → Smart House" packet

This packet contains the controller response (FUNC = 0x06) to the write request.



Controller response details:

- Parameter 0x0001 equals 0x00.
- Parameter 0x0002 equals 0x03.
- Checksum: 0x00E6.

PARAMETER TABLE

Functions:

R – 0x01

INC – 0x04

RW – 0x03

W – 0x02

DEC – 0x05

Parameter number [Dec./Hex.]	Functions	Description	Possible values	Size [bytes]
1/0x0001	R/W/RW	Unit On/Off	0 — Off 1 — On 2 – Invert	1
2/0x0002	R/W/RW/INC/DEC	Speed number	1 – Speed 1 2 – Speed 2 3 – Speed 3 255 – manual speed setting mode (see parameter 68)	1
6/0x0006	R	Boost mode status	0 – Off 1 – On	1
7/0x0007	R/W/RW/INC/DEC	Timer mode (see parameters 770 and 771)	0 – Off 1 – Night mode 2 – Party mode	1
11/0x000B	R	Current countdown of the Timer mode	Byte 1 – seconds (0...59) Byte 2 – minutes (0...59) Byte 3 – hours (0...23)	3
15/0x000F	R/W/RW	Humidity sensor activation	0 – Off 1 – On 2 – Invert	1
20/0x0014	R/W/RW	Relay sensor activation	0 – Off 1 – On 2 – Invert	1
22/0x0016	R/W/RW	0–10 V* sensor activation	0 – Off 1 – On 2 – Invert	1
25/0x0019	R/W/RW/INC/DEC	Humidity threshold setpoint	40...80 RH%	1
36/0x0024	R	Current RTC battery voltage	0...5000 mV	2
37/0x0025	R	Current humidity	0...100 RH%	1
45/0x002D	R	Current 0–10 V* sensor signal value	0...100 %	1
50/0x0032	R	Current relay sensor state	0 – Off 1 – On	1
58/0x003A	R/W/RW/INC/DEC	Supply fan speed in 1st speed mode**	10...255	1
59/0x003B	R/W/RW/INC/DEC	Exhaust fan speed in 1st speed mode**	10...255	1
60/0x003C	R/W/RW/INC/DEC	Supply fan speed in 2nd speed mode**	10...255	1
61/0x003D	R/W/RW/INC/DEC	Exhaust fan speed in 2nd speed mode**	10...255	1
62/0x003E	R/W/RW/INC/DEC	Supply fan speed in 3rd speed mode**	10...255	1
63/0x003F	R/W/RW/INC/DEC	Exhaust fan speed in 3rd speed mode**	10...255	1
74/0x004A	R	Fan 1 speed	0...5000 rpm	2
75/0x004B	R	Fan 2 speed	0...5000 rpm	2
99/0x0063	R/W/RW/INC/DEC	Filter replacement timer setup**	70...365 days	2

Parameter number [Dec./Hex.]	Functions	Description	Possible values	Size [bytes]
100/0x0064	R	Timer countdown to filter replacement	Byte 1 – minutes (0...59) Byte 2 – hours (0...23) Byte 3 – days (0...181)	3
101/0x0065	W	Reset timer countdown to filter replacement	Any byte	1
102/0x0066	R/W/RW/INC/DEC	Setpoint of the Boost mode deactivation delay	0...60 minutes	1
111/0x006F	R/W/RW	RTC time	Byte 1 – RTC seconds (0...59) Byte 2 – RTC minutes (0...59) Byte 3 – RTC hours (0...23)	3
112/0x0070	R/W/RW	RTC calendar	Byte 1 – RTC number (1...31) Byte 2 – RTC day of the week (1...7) Byte 3 – RTC month (1...12) Byte 4 – RTC year (0...99)	4
114/0x0072	R/W/RW	Weekly schedule mode	0 – Off 1 – On 2 – Invert	1
119/0x0077	R/W/RW	Schedule setup In the read request you should use special command 0xFE and specify the size of the 0x02 parameter value required for selecting the necessary day of the week and time period number. The write request and the controller response use all the 6 bytes. The first time period always starts at 00:00 while the start of each following period begins at the end of the previous one. The final time period always ends at 24:00	Byte 1 – day of the week: 0 – all days (write only) 1 – Monday 2 – Tuesday 3 – Wednesday 4 – Thursday 5 – Friday 6 – Saturday 7 – Sunday 8 – Mon...Fri (write only) 9 – Sat...Sun (write only) Byte 2 – period number: 1...4 Byte 3 – speed number: 0 – standby 1...3 Byte 4 – reserved: any byte Byte 5 – minutes to end of period: 0...59 Byte 6 – hours to end of period: 0...23	6
124/0x007C	R	Device search on the local network, ID	Text ("0...9", "A...F")	16
125/0x007D	R/W/RW	Device password	Text ("0...9", "a...z", "A...Z")	0–8
126/0x007E	R	Machine hours	Byte 1 – minutes (0...59) Byte 2 – hours (0...23) Byte 3 and Byte 4 – days (0...65535)	4
128/0x0080	W	Reset alarms	Any byte	1
131/0x0083	R	Alarm/warning indicator	0 – no 1 – alarm (highest priority) 2 – warning	1
133/0x0085	R/W/RW	Cloud server operation permission	0 – Off 1 – On 2 – Invert	1

Parameter number [Dec./Hex.]	Functions	Description	Possible values	Size [bytes]
134/0x0086	R	Controller base firmware version and date	Byte 1 – firmware version (major) Byte 2 – firmware version (minor) Byte 3 – day Byte 4 – month Byte 5 and Byte 6 – year	6
135/0x0087	W	Restore factory settings	Any byte	1
136/0x0088	R	Filter replacement indicator	0 – filter replacement not required 1 – replace filter	1
148/0x0094	R/W/RW/INC/DEC	Wi-Fi operation mode	1 – Client 2 – Access Point	1
149/0x0095	R/W/RW	Wi-Fi name in Client mode	Text	1...32
150/0x0096	R/W/RW	Wi-Fi password	Text	8...64
153/0x0099	R/W/RW	Wi-Fi data encryption type	48 – OPEN 50 – WPA_PSK 51 – WPA2_PSK 52 – WPA_WPA2_PSK	1
154/0x009A	R/W/RW/INC/DEC	Wi-Fi frequency channel	1...13	1
155/0x009B	R/W/RW	Wi-Fi module DHCP	0 – STATIC 1 – DHCP 2 – Invert	1
156/0x009C	R/W/RW	IP address assigned to Wi-Fi module	Byte 1 – 0...255, Byte 2 – 0...255, Byte 3 – 0...255, Byte 4 – 0...255	4
157/0x009D	R/W/RW	Wi-Fi module subnet mask	Byte 1 – 0...255, Byte 2 – 0...255, Byte 3 – 0...255, Byte 4 – 0...255	4
158/0x009E	R/W/RW	Wi-Fi module main gateway	Byte 1 – 0...255, Byte 2 – 0...255, Byte 3 – 0...255, Byte 4 – 0...255	4
160/0x00A0	W	Apply new Wi-Fi parameters and quit Setup Mode	Any byte	1
162/0x00A2	W	Discard new Wi-Fi parameters and quit Setup Mode	Any byte	1
163/0x00A3	R	Current Wi-Fi module IP address	Byte 1 – 0...255, Byte 2 – 0...255, Byte 3 – 0...255, Byte 4 – 0...255	4
183/0x00B7	R/W/RW/INC/DEC	Ventilator operation mode	0 – ventilation 1 – heat recovery 2 – supply	1
184/0x00B8	R/W/RW/INC/DEC	0–10 V* sensor threshold setpoint	5...100 %	1
185/0x00B9	R	Unit type	0...65535, 3 - TwinFresh Expert RW1-50 V.2, TwinFresh Expert RW1-85 V.2 TwinFresh Expert RW1-100 V.2 4 - TwinFresh Expert Duo RW1-30 V.2 5 - TwinFresh Expert RW-30 V.2 14 - TwinFresh Style 26 - TwinFresh Atmo (old) 27 - TwinFresh Atmo 100 28 - TwinFresh Atmo 160	2
252/0x00FC	Special commands			
253/0x00FD				
254/0x00FE				
255/0x00FF				
298/0x012A	R/W/RW	Restore fan speed settings for all modes to factory defaults	1 - execute	1
770/0x0302	R/W/RW	Night mode timer setpoint	Byte 1 – minutes (0...59) Byte 2 – hours (0...23)	2

Parameter number [Dec./Hex.]	Functions	Description	Possible values	Size [bytes]
771/0x0303	R/W/RW	Party mode timer setpoint	Byte 1 – minutes (0...59) Byte 2 – hours (0...23)	2
772/0x0304	R	Humidity sensor status	0 – below setpoint 1 – over setpoint	1
773/0x0305	R	0–10 V* sensor status	0 – below setpoint 1 – over setpoint	1
810/0x032A	R/W/RW	Enable Boost mode in passive ventilation mode (only for TF Atmo)	0 – Off 1 – On 2 – Invert	1
811/0x032B	R/W/RW	Passive ventilation mode (only for TF Atmo). Has higher priority than parameter 183.	0 – Off 1 – On 2 – Invert	1

*Available for all models except TwinFresh Expert RW-30 V.2

**Available for TwinFresh Expert RW1-50 V.3, TwinFresh Style Wi-Fi, TwinFresh Style Wi-Fi Frost, TwinFresh Style Wi-Fi mini.

EXAMPLE OF PROCESSING PACKETS WRITTEN IN C

```
//===== Special commands =====//
#define BGCP_CMD_PAGE 0xFF
#define BGCP_CMD_FUNC 0xFC
#define BGCP_CMD_SIZE 0xFE
#define BGCP_CMD_NOT_SUP 0xFD
//=====//

#define BGCP_FUNC_RESP 0x06

uint8_t receive_data[256];
uint16_t receive_data_size;
uint8_t State_Power;
uint8_t State_Speed_mode;
char current_id[17] = "002D6E1B34565815"; // Controller ID

//***** Checksum and start of packet check *****//
uint8_t check_protocol(uint8_t *data, uint16_t size)
{
    uint16_t i, checksum1 = 0, checksum2 = 0;
    if((data[0] == 0xFD) && (data[1] == 0xFD))
    {
        for(i = 2; i <= size-3; i++)
            checksum1 += data[i];
        checksum2 = (uint16_t)(data[size-1] << 8) | (uint16_t)(data[size-2]);
        if(checksum1 == checksum2)
            return 1;
        else
            return 0;
    }
    else
        return 0;
}

//*****//

int main(void)
{
    ...

    if(check_protocol(receive_data, receive_data_size) == 1) // Checksum
    {
        if(receive_data[2] == 0x02) // Protocol type
        {
            if(memcmp(&receive_data[4], current_id, receive_data[3]) == 0) // ID
            {
```

```

uint16_t jump_size = 0, page = 0, param, param_size, r_pos;
uint8_t flag_check_func = 1, BGCP_func;

r_pos = 4 + receive_data[3];
r_pos += 1 + receive_data[r_pos]; // Position in array where FUNC block begins
//***** FUNC and DATA *****/
for(; r_pos < receive_data_size - 2; r_pos++)
{
    //===== Special commands =====//
    param_size = 1;
    //=== New function number
    if((flag_check_func == 1) || (receive_data[r_pos] == BGCP_CMD_FUNC))
    {
        if(receive_data[r_pos] == BGCP_CMD_FUNC)
        {
            r_pos++;
            flag_check_func = 0;
            BGCP_func = receive_data[r_pos];
            if(BGCP_func != BGCP_FUNC_RESP) // If the function number is not supported
                break;
            continue;
        }
        //=== New lead byte value for parameter numbers
        else if(receive_data[r_pos] == BGCP_CMD_PAGE)
        {
            page = receive_data[++r_pos];
            continue;
        }
        //=== New parameter size value
        else if(receive_data[r_pos] == BGCP_CMD_SIZE)
        {
            param_size = receive_data[++r_pos];
            r_pos++;
        }
        //=== If the parameter is not supported
        else if(receive_data[r_pos] == BGCP_CMD_NOT_SUP)
        {
            r_pos++;
            //***** Processing of non-supported parameters *****/
            param = (uint16_t)(page << 8) | (uint16_t)(receive_data[r_pos]);
            switch(param)
            {
                case 0x0001:
                    break;
                case 0x0002:
                    break;
                ...
            }
            //*****//
            continue;
        }
        jump_size = param_size;
        //=====//

        //***** Processing of supported parameters *****/
        param = (uint16_t)(page << 8) | (uint16_t)(receive_data[r_pos]);
        switch(param)
        {
            case 0x0001:
                State_Power = receive_data[r_pos+1];
                break;
            case 0x0002:
                State_Speed_mode = receive_data[r_pos+1];
                break;
            ...
        }
        //*****//
        r_pos += jump_size;
    }
    //*****//
}
}
}
}

```

