Eltako BR14

This document describes the steps to read out data from DSZ14DRS, DSZ14WDRS, DSZ14DRSZ, and WSZ14DRS without using FAM14 (master).

The user must replace the functionality of FAM14 described in this document.

A FTDI cable converter USB - RS485 can be used to generate the RS485 interface, when using a PC with USB Ports.

After Power On, the master must first do the address scan for all device addresses 1-254. (see address_Scan). The master must store all device addresses from devices that answers within the timeout to the address scan into a device list.

With this device list it can send out answer requests and listen to the answers from the meters to collect their data sequentially.

The user can decide how often it requests answers from the meter. The minimum time between request telegrams is 100ms.

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BR14-RS485-Bus General description

BR14 is a single master RS485 bus-system. FAM14 is the master which controls each bus activity. It buffers received RF-telegrams and then send them to the bus. Moreover, it cyclically (100ms slots) requests status answers from all BR14-devices connected to the bus. If they are answering it can transmit the answers into RF-telegrams.

For this reason every device connected to the bus needs to get a unique address. This address is one byte, which allows a maximum of 254 devices. FAM14 has always the fixed address of 255. All other devices can receive addresses with a special addressing telegram from the bus master.
None of the devices actively sends any telegrams to the bus except the FAM14 is requesting this. -> Single Master principle.

The parameters for the serial communication are:
58KBaud (usual 57,6KBaud is working too), 8 data bits, No parity bit, 1 stop bit

It uses a telegram structure as shown in the box with a fixed length of 14 Bytes. The first 2 bytes are fixed to synchronize a telegram.

Bit 7	Bit 0
SYNC_BYTE1 (A5 Hex)	
SYNC_BYTE0 (5A Hex)	
H_SEQ	LENGTH
ORG	
DATA_BYTE3	
DATA_BYTE2	
DATA_BYTE1	
DATA_BYTE0	
ID_BYTE3	
ID_BYTE2	
ID_BYTE1	
ID_BYTE0	
STATUS	
CHECKSUM	

SYNC_BYTE 0..1	(8 bit each)	Synchronization Bytes
H_SEQ	(3 bit)	Header identification (see table below)
LENGTH	(5 bit)	Number of octets following the header octet (11 dec)
ORG	(8 bit)	Type of telegram (see detailed description below)
DATA_BYTE 0..3	(8 bit each)	Data bytes 0..3 (see detailed description below)
ID_BYTE 0..3	(8 bit each)	32-bit transmitter ID[5]
		For transmission of unique ID enter 0x0000_0000
STATUS	(8 bit)	Status field (see detailed description below)
CHECKSUM	(8 bit)	Checksum (Last LSB from addition of all octets except sync bytes and checksum)

General Bus-timing: (Very Important!)

Before answering to any request a device must wait 5ms. So, after receiving a complete request telegram a delay of 5ms has to be started before an answer is sent to the bus.
Maximum delay until a completed answer telegram must be less than 16ms!

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In the following description all bytes not mentioned are 0x00 except CHECKSUM

Address-scan

Addressscan,Sequence from FAM14 or PCT14:
H_SEQ=0xAB, ORG=0xF0, STATUS=Device-Address (0..254)

Answer of a Device to an Address-Scan:
H_SEQ=0x8B
ORG=0xF0
DATA_BYTE3: Device-Address
DATA_BYTE2: 0x01, fixed
DATA_BYTE1: 0x05, amount of 8-byte data blocks of memory content relevant for the device
DATA_BYTE0: 0x08, fixed
ID_BYTE3: 0x04, fixed
ID_BYTE2: device type: 0x64 (DSZ14DRS) , 0x65 (DSZ14WDRS), 0x6A (DSZ14WDRSZ)
            0x67 (F3Z14D), 0x68 (WSZ14DRS)
ID_BYTE1: software version, starting with 0x12. (V1.2)
ID_BYTE0: Group number (default 0x00)
STATUS=0x00

A device in normal mode must only answer to an address scan of its own device address. If a device has no device address yet (0 = default) it must not answer even to any address scan even not for address 0!

Set a device address to a device, Sequence from FAM14 or PCT14:
H_SEQ=0xAB, ORG=0xF8, STATUSBYTE=Device-Address (**0..254**)

A device which received a device address due to the above sequence must answer with the **Answer of a Device to an Address-Scan** with its new device address.

Hints:

Only one device connected to the bus must be set into address receiving mode once at a time. Due to the fact, that this mode can be set via rotary switch or via menu the user must take care of this by its own! A device can only be set to address receiving mode manually by a person.

Only if the device is in address receiving mode it must answer to an address-scan for device address 0 even if it already had become a device address before. In this mode it must not answer to its previous address.

Once a device has been set to the address receiving mode it waits for 60 seconds to receive the device address. After that time (timeout) it leaves address receiving mode automatically and it keeps its previous address.

Once a device received a device address it must answer with the **Answer of a Device to an Address-Scan** with its new device address and leave the address receiving mode automatically.

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Sequence for optical identification

To be able to identify devices with a valid device address there is a sequence to activate an optical reaction of the device. The device must not answer to this sequence.

Some devices light up the built in LED, in case of display devices e.g. DSZ14(W)DRS the backlight of the display must be turned on for 2 seconds.

Optical identification sequence from PCT14:
H_SEQ=0xAB, ORG=0xFD, STATUSBYTE =device address (1..254)

The sequence is repeated as long as PCT14 sends the telegram. So after the last telegram the light goes off after 2 seconds.

This sequence is also useful to detect double device addresses in a bus. Therefor it is important that devices do not answer to this sequence with a bus telegram.

Connect-Sequence to PCT14

Sequence from PCT14 to FAM14:
H_SEQ=0xAB, ORG=0xFF, STATUS=0xFF

Answer of FAM14 to PCT14:
H_SEQ=0x8B, ORG=0xF0, DATA_BYTE3=0xFF, DATA_BYTE2=0x01, DATA_BYTE1: 0x7F, DATA_BYTE0=0x00, ID_BYTE3=0x07, ID_BYTE2=0xFF, ID_BYTE1=0x15 (SW-Version, may vary) ID_BYTE0=0x00, STATUS=0x00

DSZ14(W)DRS must ignore the sequence from PCT14 t or FAM14 and must not react in any way on RS485 bus!

Disconnect-Sequence to PCT14

Sequence from PCT14 to FAM14:
H_SEQ=0xAB, ORG=0xFF, STATUS=0x00

Answer of FAM14 to PCT14:
H_SEQ=0x8B, ORG=0xF0, DATA_BYTE3=0xFF, DATA_BYTE2=0x01, DATA_BYTE1: 0x7F, DATA_BYTE0=0x00, ID_BYTE3=0x07, ID_BYTE2=0xFF, ID_BYTE1=0x15 (SW-Version, may vary) ID_BYTE0=0x00, STATUS=0x00

DSZ14(W)DRS must ignore the sequence from PCT14 t or FAM14 and must not react in any way on RS485 bus!

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Read out memory content from devices

EEPROM Memory content of a device can be read out in 8 byte sized blocks.

Memory read out sequence from PCT14:
H_SEQ=0xAB, ORG=0xF1, ID_BYTE0=number of 8-byte block, STATUSBYTE=device address (1..254)

After receiving this sequence the device answers with the following telegram to transfer the content of the desired data block.

Answer of the device:
H_SEQ=0x8B, ORG=0xF1,
DATA_BYTE3= 1. Byte of memory block
DATA_BYTE2= 2. Byte of memory block
DATA_BYTE1= 3. Byte of memory block
DATA_BYTE0= 4. Byte of memory block
ID_BYTE3= 5. Byte of memory block
ID_BYTE2= 6. Byte of memory block
ID_BYTE1= 7. Byte of memory block
ID_BYTE0= 8. Byte of memory block
STATUS = 1..127 (Number of the 8-byte sized memory block) in case of DSZ14(W)DRS 1..5

The content of the EEPROM memory blocks are defined as follows:

Block Number 1 = counter value tariff 1
Block Number 2 = partial counter value tariff 1
Block Number 3 = counter value tariff 2
Block Number 4 = partial counter value tariff 2
Block Number 5 = serial number of meter
If a readout sequence for Block number 5..127 appears the meter shall answer with all 8 Bytes = 0x00.

Each digit of the counter values must be sent in one byte of 0x00 to 0x09. MSB=1.Byte, LSB=8.Byte
Example: Counter values must be sent in this order:

012345,6:	987654,3:
DATA_BYTE3= 0x00	DATA_BYTE3= 0x00
DATA_BYTE2= 0x00	DATA_BYTE2= 0x09
DATA_BYTE1= 0x01	DATA_BYTE1= 0x08
DATA_BYTE0= 0x02	DATA_BYTE0= 0x07
ID_BYTE3= 0x03	ID_BYTE3= 0x06
ID_BYTE2= 0x04	ID_BYTE2= 0x05
ID_BYTE1= 0x05	ID_BYTE1= 0x04
ID_BYTE0= 0x06	ID_BYTE0= 0x03

PS: Write memory content into device is not allowed for meters

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Cyclic request of device specific answering telegrams

In normal running mode the FAM14 is cyclically requesting answers from all connected devices with valid device addresses. Each device can send device specific telegrams after each request from FAM14. The device decides by its own if it has to answer and what content the answer will include. A normal actuator (FSR14-2x) with relay switch output is sending its state (On/Off) every time it changes. A dimmer (FUD14) is sending its actual dimming value after each change of brightness. There is also a request sequence that forces the device to answer to each request regardless if something changed or not.

In normal mode the meters DSZ14(W)DRS are sending 5 different telegrams in the following order after each request.
Additionally there is another telegram called learn telegram which can be activated by the user.

Request for a device specific answer, sequence from FAM14:
H_SEQ=0xAB, ORG=0xFC, STATUS=device address (1..254)

After this request the device decides by its own, if it has to answer or not.
The description of the data to send for DSZ14(W)DRS is described on the next pages.

Request for a forced answer, sequence from FAM14:
H_SEQ=0xAB, ORG=0xFE, STATUS=Geräteadresse (0..255)

After this request the device has to answer always! Regardless the 20 second timing limit.

There are 6 different telegrams that can be sent as answer to the above request:
 Counter value tariff 1
 Actual power value
 Counter value tariff 2 (only available for DSZ14DRS)
 Serial number part 1
 Serial number part 2
Learn telegram

Values of actual power and counters are sent as a 3 byte binary number
HSEQ=0x8B, ORG=0x07
DATA_BYTE3 = Data Byte 3 (MSB)   0…16777215
DATA_BYTE 2 = Data Byte 2   0…16777215
DATA_BYTE 1 = Data Byte 1 (LSB)   0…16777215
DATA_BYTE0 defines what kind of value is sent in the above 3 bytes:
DATA_BYTE 0 = 0x09 -> counter 1 (tariff 1) in **0,1kWh**
                0x19 -> counter 2 (tariff 2) in **0,1kWh (only DSZ14DRS)**
                0x0C -> actual power in **W**, if tariff 1 is active
                0x1C -> actual power in **W**, if tariff 2 is active
                0x08 -> counter 1 (tariff 1) in **1kWh (only DSZ14WDRS if display shows no decimal)**
ID_byte3 = 0x00
ID_byte2 = 0x00
ID_byte1 = 0x00
ID_byte0 = device address (1..254)
STATUS = 0x00

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In <mark>extended mode</mark> the meters DSZ14(W)DRS are sending <mark>8</mark> different telegrams in the following order after each request.
Additionally there is another telegram called learn telegram which can be activated by the user.

Request for a device specific answer, sequence from FAM14:
H_SEQ=0xAB, ORG=0xFC, STATUS=device address (1..254)

After this request the device decides by its own, if it has to answer or not.
The description of the data to send for DSZ14(W)DRS is described on the next pages.

Request for a forced answer, sequence from FAM14:
H_SEQ=0xAB, ORG=0xFE, STATUS=Geräteadresse (0..255)

After this request the device has to answer always! <mark>*Regardless the 20 second timing limit.*</mark>

There are <mark>9</mark> different telegrams that can be sent as answer to the above request:
Counter value tariff 1
Actual power value total
<mark>*Actual power value phase 1*</mark>
<mark>*Actual power value phase 2*</mark>
<mark>*Actual power value phase 3*</mark>
Counter value tariff 2 (only available for DSZ14DRS)
Serial number part 1
Serial number part 2
Learn telegram

Values of actual power and counters are sent as a 3 byte binary number
HSEQ=0x8B, ORG=0x07

    DATA_BYTE3 = Data Byte 3 (MSB)   0…16777215
    DATA_BYTE 2 = Data Byte 2   0…16777215
    DATA_BYTE 1 = Data Byte 1 (LSB)   0…16777215
    DATA_BYTE0 defines what kind of value is sent in the above 3 bytes:
    DATA_BYTE 0 = 0x09 -> counter 1 (tariff 1) in **0,1kWh**
              0x19 -> counter 2 (tariff 2) in **0,1kWh (only DSZ14DRS)**
              0x0C -> actual power in **W**, if tariff 1 is active
              0x1C -> actual power in **W**, if tariff 2 is active
              <mark>0xBC -> actual power in **W phase 1** (regardless active tariff)</mark>
              <mark>0xCC -> actual power in **W phase 2** (regardless active tariff)</mark>
              <mark>0xDC -> actual power in **W phase 3** (regardless active tariff)</mark>
              0x08 -> counter 1 (tariff 1) in **1kWh (only DSZ14WDRS if display shows no decimal)**
    ID_byte3 = 0x00
    ID_byte2 = 0x00
    ID_byte1 = 0x00
    ID_byte0 = device address (1..254)
    STATUS = 0x00

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Serial number is sent within 2 telegrams:
Assumed the meter has a serial number 00987654 the 2 telegrams are as follows:

First Part:
HSEQ=0x8B, ORG=0x07
DATA_BYTE3 = 0x98   (3rd and 4th digit of serial)
DATA_BYTE 2 = 0x00   (1st and 2nd digit of serial)
DATA_BYTE 1 = 0x00   (0x00 = 1st Telegram)
DATA_BYTE0 = 0x8F   (0x8F = serial number Telegram)
ID_byte3 = 0x00
ID_byte2 = 0x00
ID_byte1 = 0x00
ID_byte0 = device address (1..254)
STATUS = 0x00

Second Part:
HSEQ=0x8B, ORG=0x07
DATA_BYTE3 = 0x54   (7th and 8th digit of serial)
DATA_BYTE 2 = 0x76   (5th and 6th digit of serial)
DATA_BYTE 1 = 0x01   (0x01 = 2nd Telegram)
DATA_BYTE0 = 0x8F   (0x8F = serial number Telegram)
ID_byte3 = 0x00
ID_byte2 = 0x00
ID_byte1 = 0x00
ID_byte0 = device address (1..254)
STATUS = 0x00

Note:
The serial number printed on the label of the meter must be stored in EEPROM of the meter interface while production.

A special fixed Learn-Telegram can be sent if activated via meter menu in the display:

HSEQ=0x8B, ORG=0x07
DATA_BYTE3 = 0x48
DATA_BYTE 2 = 0x08
DATA_BYTE 1 = 0x0D
DATA_BYTE0 = 0x80
ID_byte3 = 0x00
ID_byte2 = 0x00
ID_byte1 = 0x00
ID_byte0 = device address (1..254)
STATUS = 0x00

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As already said the device (meter) is permanently requested for answers. In <mark>normal mode</mark> After Power on it has to send a packet of these 5 telegrams in the following order:

1.Request: Counter value tariff 1
2.Request: Actual power value total
3.Request: Counter value tariff 2 (only DSZ14DRS)
4.Request: Serial number part 1
5.Request: Serial number part 2

In <mark>extended mode</mark> After Power on it has to send a packet of these 8 telegrams in the following order:

1.Request: Counter value tariff 1
2.Request: Actual power value total
<mark>*3.Request: Actual power phase 1*</mark>
<mark>*4.Request: Actual power phase 2*</mark>
<mark>*5.Request: Actual power phase 3*</mark>
6.Request: Counter value tariff 2 (only DSZ14DRS)
7.Request: Serial number part 1
8.Request: Serial number part 2

When entering the address receiving mode menu (see meter manual) the user can activate the meter to send a Learn telegram by pressing the Mode key shortly. Then after the next request the <u>Learn telegram will be sent as an answer</u>.

In normal running mode the sending must follow the following rules:

- If no value changes (e.g. no power consumption) the 5 telegrams has to be sent in the same order like after Power on every 10 Minutes.
- If counter value of tariff 1 increases in Display (normally 0,1kWh steps) the new value of the tariff 1 has to be sent.
- If counter value of tariff 2 increases in Display (normally 0,1kWh steps) the new value of the tariff 2 has to be sent.
- If there is a significant change (5%) in actual power the new value of actual power has to be sent
- The serial number (2 telegrams) must be sent every 10 minutes
- The minimum waiting time between 2 identical telegram types.
  That means even if a value changes in less than 20 seconds the sending for this value starts after 20 seconds.

Attention:

When the meter measures a negative actual power (showing a minus in display) the answer the 2nd request (Actual power value), <mark>and 3rd, 4th, and 5th request (actual power values Phase 1-3 in extended mode)</mark> must always be 0. In this case an answer is necessary only every 10 minutes because actual power value for RS-bus does not change.

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Menu for switching from normal to extended mode.

The extended mode can be set or unset by display and buttons.

Note:
Mode toggling between normal and extended mode is only possible if device address is 000!

- Short press SELECT. Backlight goes on.
- Long press (>3s) SELECT. Display shows ADR000
- Short press MODE toggles the mode between normal and extended mode.
- Normal mode (default by delivery) shows no extension ADR000, extended mode shows ADR000 E

Selected mode must be kept in EEPROM and must remain in the device until user change it.

If the device has a device address (e.g. 5) the display shows depending on selected mode

- ADR005

or

- ADR005 E

Pressing mode shortly forces the device to send a Learn-Telegram, followed by data telegrams. (as it was before) Toggling of mode is not possible anymore.

If mode must be changed even if the device has a device address, the device address must be deleted first. (set to 000) This can always be done be pressing select >5s. (as it was before).