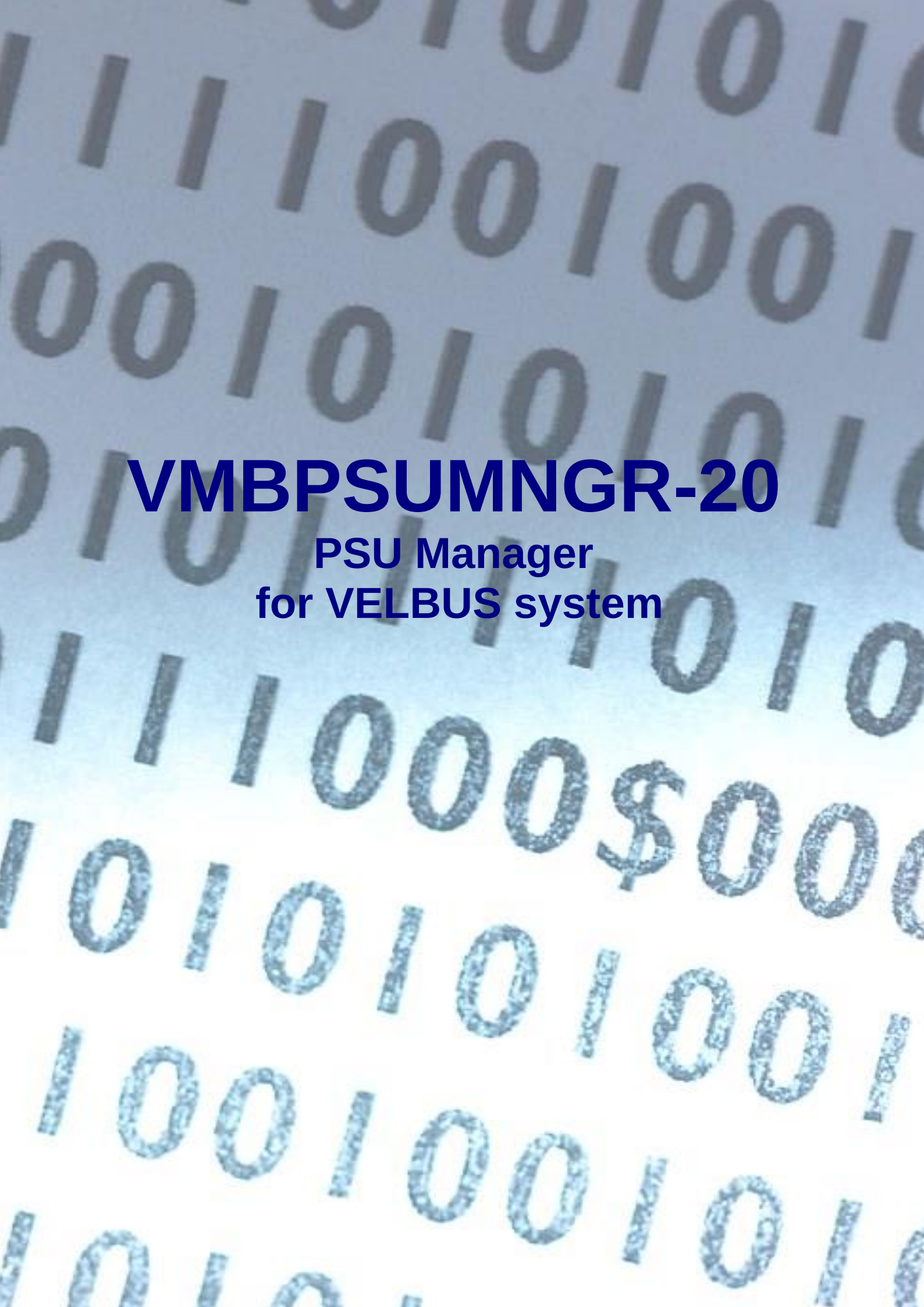

VMBPSUMNGR-20

PSU Manager
for VELBUS system

Contents

Velbus Packet Format

Binairy format:

<SOF-SID10...SID0-RTR-IDE-r0-DLC3...0-DATABYTE1...DATABYTEn-CRC15...CRC1-CRCDEL-ACK-ACKDEL-EOF7...EOF1-IFS3...IFS1>

bits	***Description***
SOF	Start Of Frame (always 0)
SID10 & SID9	Priority (00: highest … 11: lowest priority)
SID8…SID1	Address
SID0	Always 0
RTR	Remote Transmit Request
IDE	Identifier Extension (always 0)
r0	reserved (always 0)
DLC3…DLC0	Data Length Code (0…8)
Databyte1	Command
Databyte2	Parameter
Databyte3	Parameter
Databyte4	Parameter
Databyte5	Parameter
Databyte6	Parameter
Databyte7	Parameter
Databyte8	Parameter
CRC15…CRC1	Cyclic Redundancy Checksum
CRCDEL	CRC Delimiter (always 1)
ACK	Acknowledge slot (transmit 1 readback 0 if received correctly)
ACKDEL	Acknowledge Delimiter (always 1)
EOF7...EOF1	End Of Frame (always 1111111)
IFS3...IFS1	InterFrame Space (always 111)

Changelog

V1: Init protocol
V2: Updated Memory map
V3: Updated Memory map (Build 2437)
V4: Updated Memory map (Build 2444)

Transmit Packets

0xAB: Power up message

SID10-SID9 = 11 (lowest priority)
SID8...SID1 = 0x00
RTR = 0
DLC3...DLC0 = 2 data byte to send
DATABYTE1 = COMMAND_POWER_UP (0xAB)
DATABYTE2 = module address

0xD7: Real time clock status request

SID10-SID9 = 11 (lowest priority)
SID8...SID1 = 0x00
RTR = 0
DLC3...DLC0 = 1 data byte to send
DATABYTE1 = COMMAND_REALTIME_CLOCK_STATUS_REQUEST (0xD7)

0xD8: Real time clock status

SID10-SID9 = 11 (lowest priority)
SID8...SID1 = Module address
RTR = 0
DLC3...DLC0 = 4 data bytes to send
DATABYTE1 = COMMAND_REALTIME_CLOCK_STATUS (0xD8)
DATABYTE2 = Day

Contents	Day
0	Monday
1	Tuesday
2	Wednesday
3	Thursday
4	Friday
5	Saturday
6	Sunday

DATABYTE3 = Hour (0…23)
DATABYTE4 = Minute (0…59)

0xB7: Date status

SID10-SID9 = 11 (lowest priority)
SID8...SID1 = Module address
RTR = 0
DLC3...DLC0 = 5 data bytes to send
DATABYTE1 = COMMAND_DATE_STATUS (0xB7)
DATABYTE2 = Day (1…31)
DATABYTE3 = Month (1…12)
DATABYTE4 = High byte of Year
DATABYTE5 = Low byte of Year

0xAF: Daylight savings status

SID10-SID9 = 11 (lowest priority)
SID8...SID1 = Module address
RTR = 0
DLC3...DLC0 = 2 data bytes to send
DATABYTE1 = COMMAND_DAYLIGHT_SAVING_STATUS (0xAF)
DATABYTE2 = 0 =disabled / 1 = enabled

0x00: Alarm status

SID10-SID9 = 00 (highest priority)
SID8...SID1 = Module address, sub-address1
RTR = 0
DLC3...DLC0 = 4 data bytes to send
DATABYTE1 = COMMAND_PUSH_BUTTON_STATUS (0x00)
DATABYTE2 = Channel just pressed
DATABYTE3 = Channel just released
DATABYTE4 = Channel long pressed (Never used, fixed 0)

Contents	Description
B'xxxxxxx1'	PSU1 Offline
B'xxxxxx1x'	PSU2 Offline
B'xxxxx1xx'	Warranty Expired(High if expired)
B'xxxx1xxx'	PSU1 Alarm 1
B'xxx1xxxx'	PSU1 peak load > xx% (not implemented)
B'xx1xxxxx'	PSU2 Alarm 1
B'x1xxxxxx'	PSU2 peak load > xx% (not implemented)
B'1xxxxxxx'	PSUOut Alarm 1

Sub Address 1

Contents	Description
B'xxxxxxx1'	PSU1 Alarm 2
B'xxxxxx1x'	PSU1 Alarm 3
B'xxxxx1xx'	PSU1 Alarm 4
B'xxxx1xxx'	PSU2 Alarm 2
B'xxx1xxxx'	PSU2 Alarm 3
B'xx1xxxxx'	PSU2 Alarm 4
B'x1xxxxxx'	PSUOut Alarm 2
B'1xxxxxxx'	PSUOut peak load > xx% (not implemented)

0xFF: Module type

SID10-SID9 = 11 (lowest priority)
SID8...SID1 = Module address
RTR = 0
DLC3...DLC0 = 8 data bytes to send
DATABYTE1 = COMMAND_MODULE_TYPE (0xFF)
DATABYTE2 = VMBPSUMNGR-20 type (0x04)
DATABYTE3 = High byte of serial number
DATABYTE4 = Low byte of serial number
DATABYTE5 = Memory map version
DATABYTE6 = Build year
DATABYTE7 = Build week
DATABYTE8 = Properties

Contents	Output channel
B'xxxxxxx0'	Terminator open
B'xxxxxxx1'	Terminator closed
B'xxxx000x'	Hardware version number
B'xxx0xxxx'	Velbus connection type
B'xx0xxxxx'	Only standard CAN allowed
B'xx1xxxxx'	CAN FD support

0xB0: Module subtype

SID10-SID9 = 11 (lowest priority)
SID8...SID1 = Module address
RTR = 0
DLC3...DLC0 = 8 data bytes to send
DATABYTE1 = COMMAND_SUBTYPE (0xB0)
DATABYTE2 = VMBPSUMNGR-20 type (0x04)

DATABYTE3 = High byte of serial number
DATABYTE4 = Low byte of serial number
DATABYTE5 = Subaddress1 (0xFF sub-address disabled)
DATABYTE6 = Subaddress2 (0xFF sub-address disabled)
DATABYTE7 = Subaddress3 (0xFF sub-address disabled)
DATABYTE8 = Subaddress4 (0xFF always disabled)

0xED: Module status

SID10-SID9 = 11 (lowest priority)
SID8...SID1 = Module address
RTR = 0
DLC3...DLC0 = 8 data bytes to send
DATABYTE1 = COMMAND_MODULE_STATUS (0xED)
DATABYTE2 = Alarm status

Contents	Description
B'xxxxxxx1'	PSU1 Offline
B'xxxxxx1x'	PSU2 Offline
B'xxxxx1xx'	Warranty Expired(High if expired)
B'xxxx1xxx'	PSU1 Alarm 1
B'xxx1xxxx'	PSU1 peak load > xx% (not implemented)
B'xx1xxxxx'	PSU2 Alarm 1
B'x1xxxxxx'	PSU2 peak load > xx% (not implemented)
B'1xxxxxxx'	PSUOut Alarm 1

DATABYTE3 = Alarm status part 2

Contents	Description
B'xxxxxxx1'	PSU1 Alarm 2
B'xxxxxx1x'	PSU1 Alarm 3
B'xxxxx1xx'	PSU1 Alarm 4
B'xxxx1xxx'	PSU2 Alarm 2
B'xxx1xxxx'	PSU2 Alarm 3
B'xx1xxxxx'	PSU2 Alarm 4
B'x1xxxxxx'	PSUOut Alarm 2
B'1xxxxxxx'	PSUout peak load > xx% (not implemented)

DATABYTE4 = PSU1 Load %
DATABYTE5 = PSU2 Load %
DATABYTE6 = PSUOut Load %
DATABYTE7 = alarm & program selection

Contents	***Selected program***
B'xxxxxx00'	None
B'xxxxxx01'	Program group 1
B'xxxxxx10'	Program group 2
B'xxxxxx11'	Program group 3
B'xxxxx0xx'	Clock alarm 1 off
B'xxxxx1xx'	Clock alarm 1 on
B'xxxx0xxx'	Local clock alarm 1
B'xxxx1xxx'	Global clock alarm 1
B'xxx0xxxx'	Clock alarm 2 off
B'xxx1xxxx'	Clock alarm 2 on
B'xx0xxxxx'	Local clock alarm 2
B'xx1xxxxx'	Global clock alarm 2
B'x0xxxxxx'	Sunrise related program steps are disabled
B'x1xxxxxx'	Sunrise related program steps are enabled
B'0xxxxxxx'	Sunset related program steps are disabled
B'1xxxxxxx'	Sunset related program steps are enabled

DATABYTE8 = auto send interval
10…255s fixed interval
5…9 = auto send on change with 2s as minimum interval
1…4 = auto send on change disabled
0 = no change on auto send interval

Remark: the auto send interval is common for all channels

0xDA: Bus error counter status

SID10-SID9 = 11 (lowest priority)
SID8...SID1 = Module address
RTR = 0
DLC3...DLC0 = 4 data bytes to send
DATABYTE1 = COMMAND_BUSERROR_COUNTER_STATUS (0xDA)
DATABYTE2 = Transmit error counter
DATABYTE3 = Receive error counter
DATABYTE4 = Bus off counter

0xFE: Memory data

SID10-SID9 = 11 (lowest priority)
SID8...SID1 = Module address
RTR = 0
DLC3...DLC0 = 4 data bytes to send
DATABYTE1 = COMMAND_MEMORY_DATA (0xFE)
DATABYTE2 = High memory address
DATABYTE3 = LOW memory address
DATABYTE4 = memory data

Remark: address range: 0x0000 to 0x07FF

0xCC: Memory data block (4 bytes)

SID10-SID9 = 11 (lowest priority)
SID8...SID1 = Module address
RTR = 0
DLC3...DLC0 = 7 data bytes to send
DATABYTE1 = COMMAND_MEMORY_DATA_BLOCK (0xCC)
DATABYTE2 = High start address of memory block
DATABYTE3 = LOW start address of memory block
DATABYTE4 = memory data1
DATABYTE5 = memory data2
DATABYTE6 = memory data3
DATABYTE7 = memory data4

Remark: address range: 0x0000 to 0x07FC

0xCC: Memory data block (5...60 bytes)(only allowed for CAN FD frames)

SID10-SID9 = 11 (lowest priority)
SID8...SID1 = Module address
RTR = 0
DLC3...DLC0 = number of data bytes to send

Contents	*Number of data bytes*
0x09	12 data bytes
0x0A	16 data bytes
0x0B	20 data bytes
0x0C	24 data bytes
0x0D	32 data bytes
0x0E	48 data bytes
0x0F	64 data bytes

DATABYTE1 = COMMAND_MEMORY_DATA_BLOCK (0xCC)
DATABYTE2 = High start address of memory block
DATABYTE3 = LOW start address of memory block
DATABYTE4 = memory block length (5…60)
DATABYTE5 = memory data 1
…
DATABYTE12 = memory data 8 (end of data for DLC3...DLC0 = 0x09)
…
DATABYTE16 = memory data 12 (end of data for DLC3...DLC0 = 0x0A)
…
DATABYTE20 = memory data 16 (end of data for DLC3...DLC0 = 0x0B)
…
DATABYTE24 = memory data 20 (end of data for DLC3...DLC0 = 0x0C)
…
DATABYTE32 = memory data 28 (end of data for DLC3...DLC0 = 0x0D)
…
DATABYTE48 = memory data 44 (end of data for DLC3...DLC0 = 0x0E)
…
DATABYTE64 = memory data 60 (end of data for DLC3...DLC0 = 0x0F)

Remark:
Contents of unused data bytes = 0x55
Address range: 0x0000 to (0x0800 – memory block length)

0xF0: First part of channel name

SID10-SID9 = 11 (lowest priority)
SID8...SID1 = Module address
RTR = 0
DLC3...DLC0 = 8 data bytes to send
DATABYTE1 = COMMAND_CHANNEL_NAME_PART1 (0xF0)
DATABYTE2 = channel number 1…10
DATABYTE3 = Character 1 of the channel name
DATABYTE4 = Character 2 of the channel name
DATABYTE5 = Character 3 of the channel name
DATABYTE6 = Character 4 of the channel name
DATABYTE7 = Character 5 of the channel name
DATABYTE8 = Character 6 of the channel name

0xF1: Second part of the channel name

SID10-SID9 = 11 (lowest priority)
SID8...SID1 = Module address
RTR = 0
DLC3...DLC0 = 8 data bytes to send
DATABYTE1 = COMMAND_CHANNEL_NAME_PART2 (0xF1)
DATABYTE2 = Channel number 1…10
DATABYTE3 = Character 7 of the channel name
DATABYTE4 = Character 8 of the channel name
DATABYTE5 = Character 9 of the channel name
DATABYTE6 = Character 10 of the channel name
DATABYTE7 = Character 11 of the channel name
DATABYTE8 = Character 12 of the channel name

0xF2: Third part of the channel name

SID10-SID9 = 11 (lowest priority)
SID8...SID1 = Module address
RTR = 0
DLC3...DLC0 = 6 data bytes to send
DATABYTE1 = COMMAND_CHANNEL_NAME_PART3 (0xF2)
DATABYTE2 = channel number 1…10
DATABYTE3 = Character 13 of the channel name
DATABYTE4 = Character 14 of the channel name
DATABYTE5 = Character 15 of the channel name
DATABYTE6 = Character 16 of the channel name

Remarks:
Unused characters contain 0xFF.

0xA1: Warranty counter status

SID10-SID9 = 11 (lowest priority)
SID8...SID1 = Module address
RTR = 0
DLC3...DLC0 = 5 data bytes to send
DATABYTE1 = COMMAND_WARRANTY_COUNTER_STATUS (0xA1)
DATABYTE2 = 1st byte of 31 bit value
DATABYTE3 = 2nd byte of 31 bit value
DATABYTE4 = 3rd byte of 31 bit value
DATABYTE5 = bit of expiration status + 7 bits of 31 bit value

B7	B6	B5	B4	B3	B2	B1	B0
Warranty status 0 = valid 1 = expired	X	X	X	X	X	X	X

31bit value is amount of hours in operation
Limit is 10 years => 87660hours

0xA2: PSU load status

SID10-SID9 = 11 (lowest priority)
SID8...SID1 = Module address
RTR = 0
DLC3...DLC0 = 5 data bytes to send
DATABYTE1 = COMMAND_WARRANTY_COUNTER_STATUS (0xA2)
DATABYTE2 = PSU Mode (0x01 = balance load, 0x02 = boost mode, 0x03 = back-up mode)
DATABYTE3 = Load PSU1 (0…100%)
DATABYTE4 = Load PSU2 (0…100%)
DATABYTE5 = Load PSUOut (0…100%)

0xA3: PSU values status

SID10-SID9 = 11 (lowest priority)
SID8...SID1 = Module address
RTR = 0
DLC3...DLC0 = 8 data bytes to send
DATABYTE1 = COMMAND_WARRANTY_COUNTER_STATUS (0xA3)
DATABYTE2 = channel + 4 bits wattage (MSB)(mW)

B7	B6	B5	B4	B3	B2	B1	B0
Channel: 1 => PSU1 2 => PSU2 3 => PSUOut				X	X	X	X

DATABYTE3 = middle byte wattage (mW)
DATABYTE4 = low byte wattage (mW)
DATABYTE5 = high byte voltage(mV)
DATABYTE6 = low byte voltage(mV)
DATABYTE6 = high byte amperage(mA)
DATABYTE6 = low byte amperage(mA)

Wattage = 0…1048575mW
Voltage = 0…65535mV
Amperage = 0…65535mA

Receive

0xA0: Warranty Counter Request

SID10-SID9 = 11 (lowest priority)
SID8...SID1 = Module address
RTR = 0
DLC3...DLC0 = 1 data byte received
DATABYTE1 = COMMAND_POWER_UP (0xA0)

0xAB: Power up message

SID10-SID9 = 11 (lowest priority)
SID8...SID1 = 0x00
RTR = 0
DLC3...DLC0 = 2 data byte received
DATABYTE1 = COMMAND_POWER_UP (0xAB)
DATABYTE2 = module address

0xB5: CAN FD enable

SID10-SID9 = 11 (lowest priority)
SID8...SID1 = 0x00
RTR = 0
DLC3...DLC0 = 2 data byte received
DATABYTE1 = COMMAND_SET_CLR_LEARN_RF_CODE (0xB5)
DATABYTE2 = enable/disable (0 = disable CAN FD / 1 = enable CAN FD)

0xD7: Real time clock status request

SID10-SID9 = 11 (lowest priority)
SID8...SID1 = Module address
RTR = 0
DLC3...DLC0 = 1 data byte to send
DATABYTE1 = COMMAND_REALTIME_CLOCK_STATUS_REQUEST (0xD7)

0xD8: Set real time clock

SID10-SID9 = 11 (lowest priority)
SID8...SID1 = 0x00
RTR = 0
DLC3...DLC0 = 4 data bytes to send
DATABYTE1 = COMMAND_SET_REALTIME_CLOCK (0xD8)
DATABYTE2 = Day of week

Contents day of week'	***Description***
0	Monday
1	Tuesday
2	Wednesday
3	Thursday
4	Friday
5	Saterday
6	Sunday

DATABYTE3 = Hours (0…23)
DATABYTE4 = Minutes (0…59)

0xB7: Set date

SID10-SID9 = 11 (lowest priority)
SID8...SID1 = 0x00
RTR = 0
DLC3...DLC0 = 5 data bytes to send

DATABYTE1 = COMMAND_SET_REALTIME_DATE (0xB7)
DATABYTE2 = Day (1…31)
DATABYTE3 = Month (1…12)
DATABYTE4 = High byte of Year
DATABYTE5 = Low byte of Year

0xAF: Set daylight savings

SID10-SID9 = 11 (lowest priority)
SID8...SID1 = 0x00
RTR = 0
DLC3...DLC0 = 2 data bytes to send
DATABYTE1 = COMMAND_SET_DAYLIGHT_SAVING (0xAF)
DATABYTE2 = 0 =disabled / 1 = enabled

0xAE: Enable/disable global sunrise/sunset related actions

SID10-SID9 = 11 (lowest priority)
SID8...SID1 = 0x00
RTR = 0
DLC3...DLC0 = 3 data bytes to send
DATABYTE1 = COMMAND_ENA_DIS_SUNRISE_SUNSET (0xAE)
DATABYTE2 = Channel (0xFF)
DATABYTE3 = enable/disable flags

Contents	***Description***
B'xxxxxxx0'	Disable sunrise related actions
B'xxxxxxx1'	Enable sunrise related actions
B'xxxxxx0x'	Disable sunset related actions
B'xxxxxx1x'	Enable sunset related actions

0xAE: Enable/disable local sunrise/sunset related actions' command received:

SID10-SID9 = 11 (lowest priority)
SID8...SID1 = Module address
RTR = 0
DLC3...DLC0 = 3 data bytes to send
DATABYTE1 = COMMAND_ENA_DIS_SUNRISE_SUNSET (0xAE)
DATABYTE2 = Channel (0xFF)
DATABYTE3 = enable/disable flags

Contents	***Description***
B'xxxxxxx0'	Disable sunrise related actions
B'xxxxxxx1'	Enable sunrise related actions
B'xxxxxx0x'	Disable sunset related actions
B'xxxxxx1x'	Enable sunset related actions

0xC3: Set global clock alarm

SID10-SID9 = 11 (lowest priority)
SID8...SID1 = 0x00
RTR = 0
DLC3...DLC0 = 7 data bytes to send
DATABYTE1 = COMMAND_SET_ALARM_CLOCK (0xC3)
DATABYTE2 = Alarm number (1 or 2)
DATABYTE3 = Wake up hour (0…23)
DATABYTE4 = Wake up minute (0…59)
DATABYTE5 = Go to bed hour (0…23)
DATABYTE6 = Go to bed minute (0…59)
DATABYTE7 = Clock alarm enable flag (0 = disabled / 1 = enabled)

0xC3: Set local clock alarm

SID10-SID9 = 11 (lowest priority)
SID8...SID1 = Module address
RTR = 0
DLC3...DLC0 = 7 data bytes to send
DATABYTE1 = COMMAND_SET_ALARM_CLOCK (0xC3)
DATABYTE2 = Alarm number (1 or 2)
DATABYTE3 = Wake up hour (0…23)
DATABYTE4 = Wake up minute (0…59)
DATABYTE5 = Go to bed hour (0…23)
DATABYTE6 = Go to bed minute (0…59)
DATABYTE7 = Clock alarm enable flag (0 = disabled / 1 = enabled)

(Scan) Module type request

SID10-SID9 = 11 (lowest priority)
SID8...SID1 = Module address
RTR = 1
DLC3...DLC0 = 0 data bytes received

0xFA: Module status request

SID10-SID9 = 11 (lowest priority)
SID8...SID1 = Module address
RTR = 0
DLC3...DLC0 = 2 data bytes received
DATABYTE1 = COMMAND_MODULE_STATUS_REQUEST (0xFA)
DATABYTE2 = don't care
Response sequence: 0xED, 0xA3(psu1),0xA3(psu2),0xA3(psuOut),0xA2,0xA1

0xEF: Channel name request

SID10-SID9 = 11 (lowest priority)
SID8...SID1 = Module address
RTR = 0
DLC3...DLC0 = 2 data bytes received
DATABYTE1 = COMMAND_CHANNEL_NAME_REQUEST (0xEF)
DATABYTE2 = Channel number 1…16 for alarms (255 for all channels)

0xFD: Read data from memory

SID10-SID9 = 11 (lowest priority)
SID8...SID1 = Module address
RTR = 0
DLC3...DLC0 = 3 data bytes received
DATABYTE1 = COMMAND_READ_DATA_FROM_MEMORY (0xFD)
DATABYTE2 = High memory address
DATABYTE3 = LOW memory address

Remark: address range: 0x0000 to 0x07FF

0xCB: Memory dump request

SID10-SID9 = 11 (lowest priority)
SID8...SID1 = Module address
RTR = 0
DLC3...DLC0 = 1 data bytes received
DATABYTE1 = COMMAND_MEMORY_DUMP_REQUEST (0xCB)

0xC9: Read data block from memory

SID10-SID9 = 11 (lowest priority)
SID8...SID1 = Module address
RTR = 0
DLC3...DLC0 = 3 data bytes for standard CAN received / 4 data bytes for CAN FD response
DATABYTE1 = COMMAND_READ_MEMORY_BLOCK (0xC9)
DATABYTE2 = High memory address
DATABYTE3 = LOW memory address
DATABYTE4 = memory block length (5…60)

Remark:
address range: 0x0000 to 0x07FC for standard CAN response
address range: 0x0000 to (0x0800 – memory block length) for CAN FD response

0xFC: Write data to memory

SID10-SID9 = 11 (lowest priority)
SID8...SID1 = Module address
RTR = 0
DLC3...DLC0 = 4 data bytes received
DATABYTE1 = COMMAND_WRITE_DATA_TO_MEMORY (0xFC)
DATABYTE2 = High memory address
DATABYTE3 = LOW memory address (0x00...0xFF)
DATABYTE4 = memory data to write

Remark:
Wait at least 10ms for sending a next command on the velbus.
Address range: 0x0000 to 0x07FF
Terminate always with a write command at the last memory location.

0xCA: Write memory block

SID10-SID9 = 11 (lowest priority)
SID8...SID1 = Address of the module
RTR = 0
DLC3...DLC0 = 7 data bytes received
DATABYTE1 = COMMAND_WRITE_MEMORY_BLOCK (0xCA)
DATABYTE2 = High memory address
DATABYTE3 = LOW memory address
DATABYTE4 = memory databyte1 to write
DATABYTE5 = memory databyte2 to write
DATABYTE6 = memory databyte3 to write
DATABYTE7 = memory databyte4 to write

Or

SID10-SID9 = 11 (lowest priority)
SID8...SID1 = Address of the module
RTR = 0
DLC3...DLC0 = number of data bytes to send

Contents	***Number of data bytes***
0x09	12 data bytes
0x0A	16 data bytes
0x0B	20 data bytes
0x0C	24 data bytes
0x0D	32 data bytes
0x0E	48 data bytes
0x0F	64 data bytes

DATABYTE1 = COMMAND_WRITE_MEMORY_BLOCK (0xCA)
DATABYTE2 = High memory address
DATABYTE3 = LOW memory address

DATABYTE4 = memory block length (5…60)
DATABYTE5 = memory data 1 to write
…
DATABYTE12 = memory data 8 to write (end of data for DLC3...DLC0 = 0x09)
…
DATABYTE16 = memory data 12 to write (end of data for DLC3...DLC0 = 0x0A)
…
DATABYTE20 = memory data 16 to write (end of data for DLC3...DLC0 = 0x0B)
…
DATABYTE24 = memory data 20 to write (end of data for DLC3...DLC0 = 0x0C)
…
DATABYTE32 = memory data 28 to write (end of data for DLC3...DLC0 = 0x0D)
…
DATABYTE48 = memory data 44 to write (end of data for DLC3...DLC0 = 0x0E)
…
DATABYTE64 = memory data 60 to write (end of data for DLC3...DLC0 = 0x0F)

Remark:
Wait for 'memory data block' feedback before sending a next command on the velbus.
address range: 0x0000 to 0x07FC for standard CAN response
address range: 0x0000 to (0x0800 – memory block length) for CAN FD response
Contents of unused data bytes = 0x55
Terminate always with a write command at the last memory location.

0xD9: Bus error counter status request

SID10-SID9 = 11 (lowest priority)
SID8...SID1 = Module address
RTR = 0
DLC3...DLC0 = 1 data bytes to send
DATABYTE1 = COMMAND_BUS_ERROR_CONTER_STATUS_REQUEST (0xD9)

Memory map

Addr	*Contents*	*Addr*	*Contents*
0x0000	Alarm 1 Parameters	0x0001	Alarm 1 Activation Level
0x0002	Alarm 1 Deactivation Level	0x0003	Alarm 1 Interval
0x0004	Alarm 1 Name char 1	0x0005	Alarm 1 Name char 2
…	…	…	…
0x0012	Alarm 1 Name char 15	0x0013	Alarm 1 Name char 16
…	…	…	…
0x012C	Alarm 16 Parameters	0x012D	Alarm 16 Activation Level
0x012E	Alarm 16 Deactivation Level	0x012F	Alarm 16 Interval
0x0130	Alarm 16 Name char 1	0x0131	Alarm 16 Name char 2
…	…	…	…
0x013E	Alarm 16 Name char 15	0x013F	Alarm 16 Name char 16
0x0140	autoStatusInterval(Can not be changed: Default 0x3C)	0x0141	PSU1 Voltage
0x0142	PSU2 Wattage	0x0143	PSU2 Voltage
0x0144	PSU2 Wattage	0x0145	Padding = 0xFF
0x0146	Padding = 0xFF	0x0147	Padding = 0xFF
0x0148	Alarm clock configuration (byte1)	0x0149	Alarm clock configuration (byte2)
0x014A	Alarm clock configuration (byte3)	0x014B	Alarm clock configuration (byte4)
0x014C	Wake up 1 hour (0…23)	0x014D	Wake up 1 minutes (0…59)
0x014E	Go to bed 1 hour (0…23)	0x014F	Go to bed 1 minutes (0…59)
0x0150	Wake up 2 hour (0…23)	0x0151	Wake up 2 minutes (0…59)
0x0152	Go to bed 2 hour (0…23)	0x0153	Go to bed 2 minutes (0…59)
0x0154	Sunrise hour at 21 December (0…23)	0x0155	Sunrise minutes at 21 December (0…59)
0x0156	Sunrise 21 January – sunrise 5 January (-128’...127’)	0x0157	Sunrise 5 February – sunrise 21 January (-128’...127’)
0x0158	Sunrise 21 February – sunrise 5 February (-128’...127’)	0x0159	Sunrise 5 March – sunrise 21 February (-128’...127’)
0x015A	Sunrise 21 March – sunrise 5 March (-128’...127’)	0x015B	Sunrise 5 April – sunrise 21 March (-128’...127’)
0x015C	Sunrise 21 April – sunrise 5 April (-128’...127’)	0x015D	Sunrise 5 May – sunrise 21 April (-128’...127’)
0x015E	Sunrise 21 May – sunrise 5 May (-128’...127’)	0x015F	Sunrise 5 June – sunrise 21 May (-128’...127’)
0x0160	Sunrise 21 June – sunrise 5 June (-128’...127’)	0x0161	Sunrise 5 July – sunrise 21 June (-128’...127’)
0x0162	Sunrise 21 July – sunrise 5 July (-128’...127’)	0x0163	Sunrise 5 August – sunrise 21 July (-128’...127’)
0x0164	Sunrise 21 August – sunrise 5 August (-128’...127’)	0x0165	Sunrise 5 September – sunrise 21 August (-128’...127’)
0x0166	Sunrise 21 September – sunrise 5 September (-128...127’)	0x0167	Sunrise 5 October – sunrise 21 September (-128’...127’)
0x0168	Sunrise 21 October – sunrise 5 October (-128’...127’)	0x0169	Sunrise 5 November – sunrise 21 October (-128’...127’)
0x016A	Sunrise 21 November – sunrise 5 November (-128’...127’)	0x016B	Sunrise 5 December – sunrise 21 November (-128’...127’)
0x016C	Sunrise 21 December – sunrise 5 December (-128’...127’)	0x016D	Sunrise 5 January – sunrise 21 December (-128’…127’)

Addr	*Contents*	*Addr*	*Contents*
0x016E	Not used	0x016F	Not used
0x0170	Sunset hour at 21 December (0…23)	0x0171	Sunset minutes at 21 December (0…59)
0x0172	Sunset 21 January – sunrise 5 January (-128’...127’)	0x0173	Sunset 5 February – sunrise 21 January (-128’...127’)
0x0174	Sunset 21 February – sunrise 5 February (-128’...127’)	0x0175	Sunset 5 March – sunrise 21 February (-128’...127’)
0x0176	Sunset 21 March – sunrise 5 March (-128’...127’)	0x0177	Sunset 5 April – sunrise 21 March (-128’...127’)
0x0178	Sunset 21 April – sunrise 5 April (-128’...127’)	0x0179	Sunset 5 May – sunrise 21 April (-128’...127’)
0x017A	Sunset 21 May – sunrise 5 May (-128’...127’)	0x017B	Sunset 5 June – sunrise 21 May (-128’...127’)
0x017C	Sunset 21 June – sunrise 5 June (-128’...127’)	0x017D	Sunset 5 July – sunrise 21 June (-128’...127’)
0x017E	Sunset 21 July – sunrise 5 July (-128’...127’)	0x017F	Sunset 5 August – sunrise 21 July (-128’...127’)
0x0180	Sunset 21 August – sunrise 5 August (-128’...127’)	0x0181	Sunset 5 September – sunrise 21 August (-128’...127’)
0x0182	Sunset 21 September – sunrise 5 September (-128’...127’)	0x0183	Sunset 5 October – sunrise 21 September (-128’...127’)
0x0184	Sunset 21 October – sunrise 5 October (-128’...127’)	0x0185	Sunset 5 November – sunrise 21 October (-128’...127’)
0x0186	Sunset 21 November – sunrise 5 November (-128’...127’)	0x0187	Sunset 5 December – sunrise 21 November (-128’...127’)
0x0188	Sunset 21 December – sunrise 5 December (-128’...127’)	0x0189	Sunset 5 January – sunrise 21 December (-128’...127’)
0x018A	Not used	0x018B	Not used

Remark:
Unused locations contain 0xFF

Alarm Parameters

B0	B1	B2	B3	B4	B5	B6	B7
Enable = 1 Disable = 0	Alarm Channel PSU1 = 00 PSU2 = 01 PSUOUT = 10		Alarm unit VOLT = 00 AMPERE = 01 WATT = 10 *YEARS = 11		Alarm Type LARGER_THAN = 00 SMALLER_THAN = 01 PEAK_DETECTED = 10 WARRANTY_EXPIRED = 11		

***Remark years can only have a warranty expired type and channel doesn't matter**

Alarm ActivationLvl

Alarm unit	**Value**
VOLT	1…255 volt
AMPERE	1… 255 ampere
WATT	1…255 watt
YEARS	1…255 year

Valid reaction times

Contents	***Reaction time***
0x01	Immediately (0.065s) (default)
0x1C	1s
0x38	2s
0x54	3s
0xFF	Channel disabled

Channel x start/end function

Contents	***Function***
1	Channel 1
2	Channel 2
...	...
7	Channel 7
8	Channel 8

Remark:

For a normal one function button, the start and end function channel are the same.
For a multi-function button, the start function channel must be less than the end function. At every press the next channel will be send. When the end function channel is reached, the start channel will be send again at the next press.
For a dual function button, the start function channel will be send at a short press or the end function will be send at a long press.

Channels mode

Contents	***Description***
B'xxxxxxx0'	Dual function disabled (default)
B'xxxxxxx1'	Dual function enabled
B'xxxxxx0x'	Multi-function auto reset disabled (default)
B'xxxxxx1x'	Multi-function auto reset enabled
B'xxxxx0xx'	Led backlight off
B'xxxxx1xx'	Led backlight on
B'xxxx0xxx'	Led monitor mode
B'xxxx1xxx'	Led feedback mode (default)
B'xxx0xxxx'	Slow blinking led feedback disabled
B'xxx1xxxx'	Slow blinking led feedback enabled (default)
B'xx0xxxxx'	Fast blinking led feedback disabled
B'xx1xxxxx'	Fast blinking led feedback enabled (default)
B'x0xxxxxx'	Very fast blinking led feedback disabled
B'x1xxxxxx'	Very fast blinking led feedback enabled (default)
B'0xxxxxxx'	Channel inverted
B'1xxxxxxx'	Channel normal

Remark:

When auto reset is enabled, the start function will be loaded again after 3 seconds inactivity of the channel.
For a dual function button, the start function channel will be send at a short press or the end function will be send at a long press.

The dual function overwrites the multi-function mode.

Valid long pressed delay

Contents	*Reaction time*
0x17	0.8s
0x2E	1.6s

Valid dual function long pressed times

Contents	*Long pressed time*
0x1C	1s
0x38	2s
0x54	3s

Alarm clock configuration

Contents	*Channel locked/unlocked*
B'xxxxxxx0'	Alarm 1 disabled
B'xxxxxxx1'	Alarm 1 enabled
B'0xxxxx0x'	Local alarm 1
B'1xxxxx1x'	Global alarm 1
B'xxxxx0xx'	Alarm 2 disabled
B'xxxxx1xx'	Alarm 2 enabled
B'xxxx0xxx'	Local alarm 2
B'xxxx1xxx'	Global alarm 2
B'xxx0xxxx'	Sunrise disabled
B'xxx1xxxx'	Sunrise enabled
B'xx0xxxxx'	Sunset disabled
B'xx1xxxxx'	Sunset enabled
B'x0xxxxxx'	Daylight savings disabled
B'x1xxxxxx'	Daylight savings enabled

Counter pulses per unit

Contents high byte	*Contents low byte*	*Counter unit*
B'00000000'	B'00000000'	Counter input disabled
B'00000000'	B'00000001'	1 pulse per unit (/kWh, /m^3 or /l)
B'00000000'	B'00000010'	2 pulses per unit (/kWh, /m^3 or /l)
…	…	…
B'11111111'	B'11111111'	65535 pulses per unit (/kWh, /m^3 or /l)

Counter units

Contents	*Counter unit*
0	reserved
1	liter
2	m^3
3	kWh (default)

Counter alarm conditons

Contents	*Condition*
B'xxxxxx00'	Counter value equal with activation level in Wh, l or ml
B'xxxxxx01'	Counter value equal with multiples of activation level in Wh, l or ml
B'xxxxxx10'	Power greater than or equal with activation level in W
B'xxxxxx11'	Power less than activation level in W
B'0xxxxxxx'	Alarm disabled
B'1xxxxxxx'	Alarm enabled

Remark:
The alarm modes 'counter value equal with' does not use the reaction times and de-activation level

Assigned counter channel

Contents	*Assigned channel*
0	Input counter 1
1	Input counter 2
…	…
7	Input counter 8

Alarm condition activation / de-activation reaction time

contents	*Reaction time*
0	0s
1	1s
2	2s
...	
59	59s
60	1min
61	1min1s
...	
…	
119	1min59s
120	2min
121	2min15s
...	
131	4min45s
132	5min
133	5min30s
...	
181	29min30s
182	30min
183	31min
...	
211	59min
212	1h

Address	*Contents*	*Address*	*Contents*
0x018C	Links in use byte 0 (LSB)	0x018D	Links in use high byte1
0x018E	Links in use low byte 2	0x018F	Links in use low byte 3 (MSB)
	Linked Push button 1 module address		Linked Push button 1 bit number
	Linked Push button 1 action		Linked Push button 1 parameter 1
	Linked Push button 1 parameter 2		…
	...		...
	…		Linked Push button 80 module address
	Linked Push button 80 bit number		Linked Push button 80 action
	Linked Push button 80 parameter 1		Linked Push button 80 parameter 2

Remark: Unused locations contain 0xFF

Action

Action Byte	Action
B'0xxxxxxx'	Execute action at button pressed or during closed switch
B'1xxxxxxx'	Execute action at button released or during open switch*
B'x0000000'	Action number 0
…	…
B'x1111111'	Action number 127

Action

Action number	Action	Parameter 1	Parameter 2
1	Lock channel at closed/open switch	-	Channel 1…32
2	Lock channel	Timeout	Channel 1…32
3	Lock/unlock channel	Timeout	Channel 1…32
4	Unlock channel	-	Channel 1…32
5	Disable channel program at closed/open switch	-	Channel 1…32
6	Disable channel program channel	Timeout	Channel 1…32
7	Disable/enable channel program	Timeout	Channel 1…32
8	Enable channel program	-	Channel 1…32
9	Select no programs	-	-
10	Select program group 1	-	-
11	Toggle program group 1	-	-
12	Select program group 2	-	-
13	Toggle program group 2	-	-
14	Select program group 3	-	-
15	Toggle program group 3	-	-
16	Enable Alarm 1 at closed/open switch	-	-
17	Disable Alarm 1 at closed/open switch	-	-
18	Enable Alarm 1	-	-
19	Enable/Disable Alarm 1	-	-
20	Disable Alarm 1	-	-
21	Enable Alarm 2 at closed/open switch	-	-
22	Disable Alarm 2 at closed/open switch	-	-
23	Enable Alarm 2	-	-
24	Enable/Disable Alarm 2	-	-
25	Disable Alarm 2	-	-
26	Enable Sunrise at closed/open switch	-	-
27	Disable Sunrise at closed/open switch	-	-
28	Enable Sunrise	-	-
29	Enable/Disable Sunrise	-	-
30	Disable Sunrise	-	-
31	Enable Sunset at closed/open switch	-	-
32	Disable Sunset at closed/open switch	-	-
33	Enable Sunset	-	-
34	Enable/Disable Sunset	-	-
35	Disable Sunset	-	-

Time parameter

Time parameter	Timeout
0	0s (No timer)
1	1s
2	2s
...	
119	1min59s
120	2min
121	2min15s
...	
131	4min45s
132	5min
133	5min30s
...	
181	29min30s
182	30min
183	31min
...	
211	59min
212	1h
213	1h15min
...	
227	4h45min
228	5h
229	5h30min
...	
237	9h30min
238	10h
239	11h
...	
251	23h
252	1d
253	2d
254	3d
255	infinite

Address	*Contents*	*Address*	*Contents*
0x0320	Program steps used byte 0 (LSB)	0x0321	Program steps used byte 1
0x0322	Program steps used byte 2	0x0323	Program steps used byte 3 (MSB)
	Program step 1 byte1		Program step 1 byte2
	Program step 1 byte3		Program step 1 byte4
	Program step 1 byte5		Program step 1 byte6
	..		..
	Program step 68 byte1		Program step 68 byte2
	Program step 68 byte3		Program step 68 byte4
	Program step 68 byte5		Program step 68 byte6

Contents program byte1	*Description*
B’000xxxxx’	Disable program step
B’001xxxxx’	Absolute time
B’010xxxxx’	Wake up time 1 + relative time
B’011xxxxx’	Go to bed time 1 + relative time
B’100xxxxx’	Wake up time 2 + relative time
B’101xxxxx’	Go to bed time 2 + relative time
B’110xxxxx’	Sunrise + relative time
B’111xxxxx’	Sunset + relative time
B’xxx01111’	Rel. time = 3h45min
…	
B’xxx00001’	Rel. time = 15min
B’xxx00000’	Rel. time = 0
B’xxx11111’	Rel. time = -15min
…	
B’xxx10000’	Rel. time = -4h

Remark: Wake up, Go to bed, sunrise & sunset time are only allowed for weekly programs

Contents program byte2	*Description*
B’xxxx0000’	Weekly program
B’xxxx0001’	January
B’xxxx0010’	February
B’xxxx0011’	March
B’xxxx0100’	April
B’xxxx0101’	May
B’xxxx0110’	June
B’xxxx0111’	July
B’xxxx1000’	August
B’xxxx1001’	September
B’xxxx1010’	October
B’xxxx1011’	November
B’xxxx1100’	December
B’xxxx1101’	Monthly program
B’xxxx1110’	Monthly program
B’xxxx1111’	Monthly program

Contents program byte3	*Description*
B’xxx00000’	0h
B’xxx00001’	1h
…	…
B’xxx10111’	23h
B’xx1xxxxx’	Program group 1
B’x1xxxxxx’	Program group 2
B’1xxxxxxx’	Program group 3

Contents program byte4	*Description*
B’xx000000’	0min
B’xx000001’	1min
…	…

B’xx111011’	59min

Contents program byte4	*Contents program byte2*	*Description*
B’00xxxxxx’	B’0000xxxx’	Never
B’00xxxxxx’	B’0001xxxx’	Day 1of the month
B’00xxxxxx’	B’0010xxxx’	Day 2of the month
…	…	…
B’01xxxxxx’	B’1111xxxx’	Day 31of the month
B’10xxxxxx’	B’0000xxxx’	Never
B’10xxxxxx’	B’0001xxxx’	Every Monday
B’10xxxxxx’	B’0010xxxx’	Every Tuesday
…	…	…
B’10xxxxxx’	B’0111xxxx’	Every Sunday
B’10xxxxxx’	B’1000xxxx’	Every weekend (sa & su)
B’10xxxxxx’	B’1001xxxx’	Every working day (mo…fr)
B’10xxxxxx’	B’1010xxxx’	Every day except Sunday
B’10xxxxxx’	B’1011xxxx’	Every day
B’10xxxxxx’	B’1100xxxx’	Never
…	…	…
B’11xxxxxx’	B’1111xxxx’	Never

Contents program byte5	**Action**
252	No action
…	…
255	No action

Contents program byte6	**Channel**
1	Channel 1
2	Channel 2
…	…
10	Channel 10

Address	*Contents*	*Address*	*Contents*
0x07B8	Location id low byte	0x07B9	Location id high byte
0x07BA	Group id low byte	0x07BB	Group id high byte
0x07BC	Module name character 1	0x07BD	Module name character 2
…	..	..	..
0x07FA	Module name character 63	0x07FB	Module name character 64
0x07FC	Not used	0x07FD	Not used
0x07FE	Not used	0x07FF	Used for flash writing