



M-Bus specification

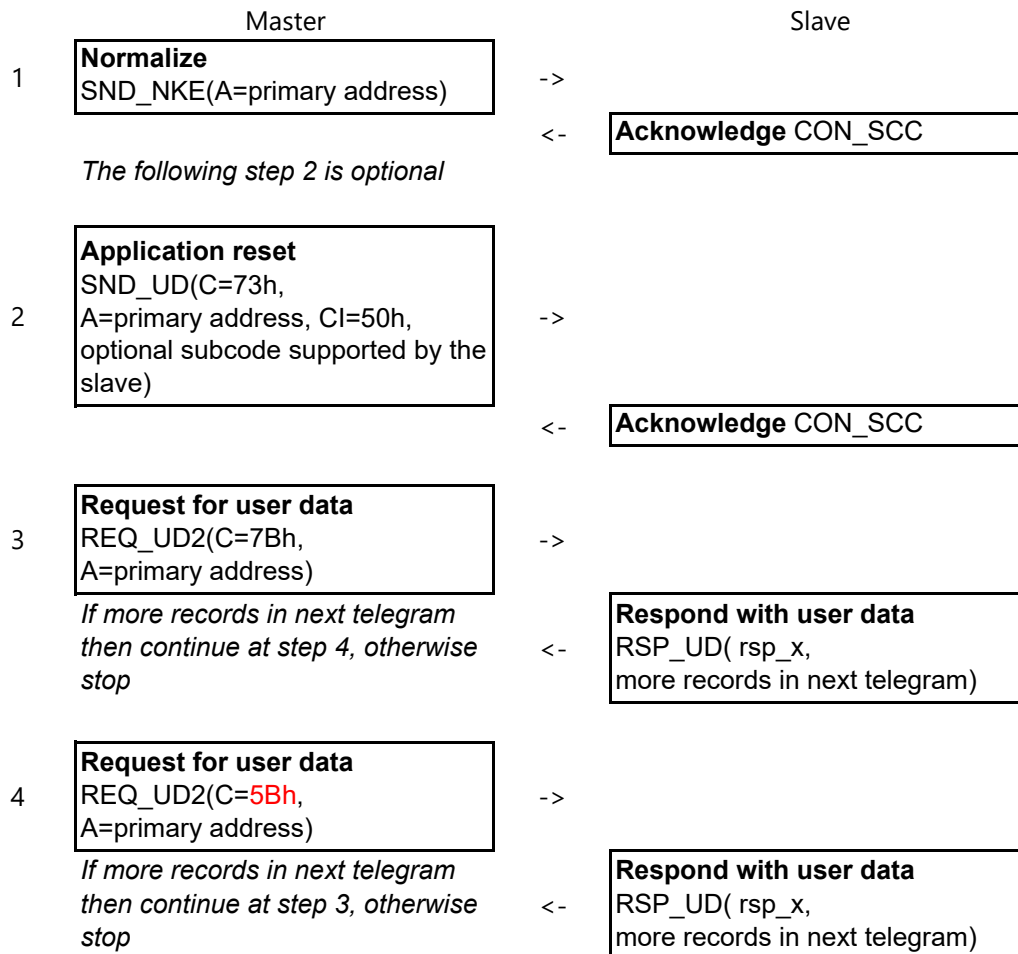
Heat Meter

Supercal 5

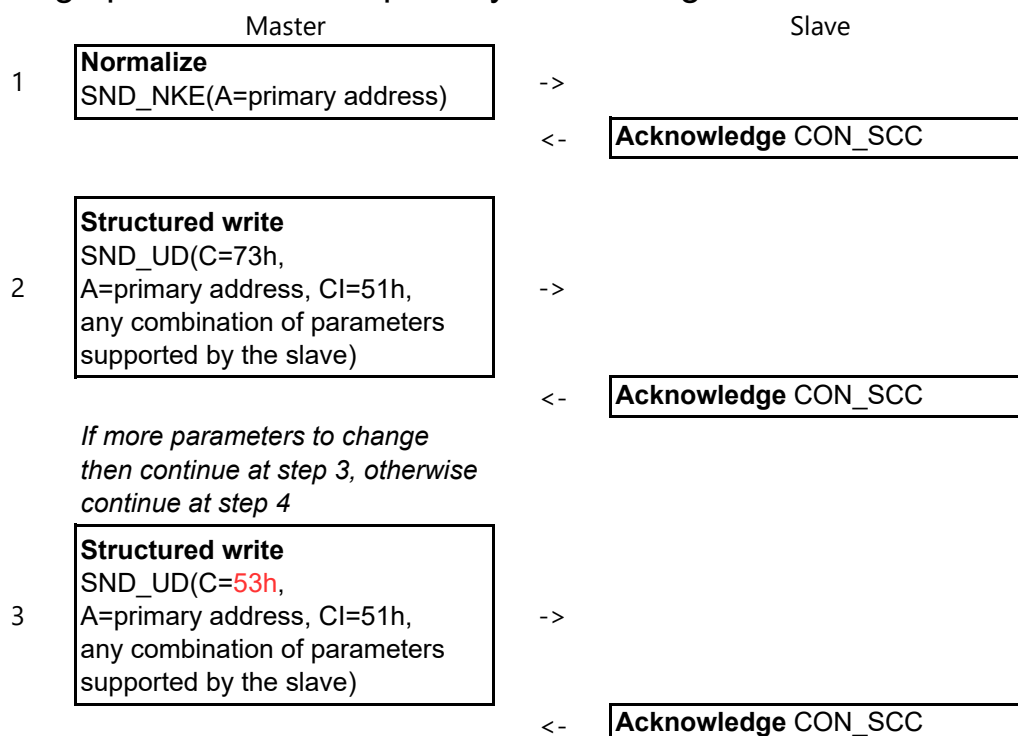
Issue: Rev. 2024-11-18
Document: M-Bus_Frames_SC5_2024-11-18
Firmware: SC5 V1.0.5 ÷ V1.0.x
Frame Spec.: NeoVac specific LoRaWAN M-Bus frames

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Read data with primary addressing



Change parameters with primary addressing



If more parameters to change
then continue at step 2, otherwise
continue at step 4

4 **Request for user data**
REQ_UD2(C=7Bh,
A=primary address) ->

Check for M-Bus application error
in Status field. <-

Respond with user data
RSP_UD(rsp_x,
more records in next telegram)

Read data with secondary addressing

Master
1 **Normalize**
SND_NKE(A=253) ->

Slave

The slaves don't answer.

2 **Selection of slave**
SND_UD(C=73h | 53h, A=253,
CI=52h, identification number,
manufacturer id, ...)
You must select only one slave. <-

Acknowledge CON_SCC

The following step 3 is optional

3 **Application reset**
SND_UD(C=73h, A=253, CI=50h,
optional subcode supported by the
slave) ->

Acknowledge CON_SCC

4 **Request for user data**
REQ_UD2(C=7Bh, A=253) ->

Keys

	Optional record			
xx	Value LSByte first			
yy	Value MSByte first			
br	Baudrate			
	0	2380 bit/s		
	1	300 bit/s		
	2	600 bit/s		
	3	1200 bit/s		
	4	2400 bit/s		
	5	4800 bit/s		
ch	ASCII character			
	The LCD supports only the character codes 20h..7Eh			
cs	The value of Check Sum is calculated from arithmetical sum modulo 256 of each			
di	INx pulse factor display unit	Allowed only if		
	00	m3/pulse		
	01	pulse/m3		
	02	L/pulse	Counter INx unitiu iu = vu v	
	03	pulse/L		
	04	gal/pulse		
	05	pulse/gal		
	06	kWh/pulse		
	07	pulse/kWh		
	08	MJ/pulse		
	09	pulse/MJ	Counter INx unitiu iu = eu e	
	0A	kBtu/pulse		
	0B	pulse/kBtu		
	0C	Mcal/pulse		
	0D	pulse/Mcal		
	0E	unit/pulse	Counter INx unitiu iu = 00, 00	
	0F	pulse/unit		
dt	Device type	Flowmeter position		
	04	Heat	outlet, return	cold pipe
	0A	Cooling	outlet, return	hot pipe
	0B	Cooling	inlet, flow	cold pipe
	0C	Heat	inlet, flow	hot pipe
	0D	Heat / Cooling load meter		
en en en	Physical unit coding of energy (depends on Energy unit "eu eu")			en en En
	03	0.001 kWh		03
	04	0.01 kWh		04
	05	0.1 kWh		05
	06	1 kWh 0.001 MWh	kWhMWh	06

07	0.01 MWh		07
85 7D	0.1 MWh		85 7D
FB 01	1 MWh		FB 01
0B	0.001 MJ		0B
0C	0.01 MJ		0C
0D	0.1 MJ		0D
0E	1 MJ 0.001 GJ	MJGJ	0E
0F	0.01 GJ		0F
FB 08	0.1 GJ		FB 08
FB 09	1 GJ		FB 09
80 3D	0.001 kBtu		80 3D
81 3D	0.01 kBtu		81 3D
82 3D	0.1 kBtu		82 3D
83 3D	1 kBtu 0.001 MBtu	kBtuMBtu	83 3D
84 3D	0.01 MBtu		84 3D
85 3D	0.1 MBtu		85 3D
86 3D	1 MBtu		86 3D
FB 8C 74	0.001 Mcal		FB 8C 74
FB 8C 75	0.01 Mcal		FB 8C 75
FB 0C	0.1 Mcal		FB 0C
FB 0D	1 Mcal 0.001 Gcal	McalGcal	FB 0D
FB 0E	0.01 Gcal		FB 0E
FB 0F	0.1 Gcal		FB 0F
FB 8D 7D	1 Gcal		FB 8D 7D

er er er

Detailed errors Supercal 5

- bit0 AD ref1 error
- bit1 AD ref2 error
- bit2 AD Pt sensor 1
- bit3 AD Pt sensor 2
- bit4 Temperature 1 below min
- bit5 Temperature 1 above max
- bit6 Temperature 2 below min
- bit7 Temperature 2 above max
- bit8 Sum of all temperatures and AD errors
- bit9 Flow in saturation
- bit10 Case is open
- bit11 Main power cut
- bit12 Module 1 error
- bit13 Module 2 error
- bit14 Firmware checksum error
- bit15 Radio error
- bit16 Unknown C field
- bit17 Unknown CI field
- bit18 Unknown record
- bit19 Access right violation.
- bit20 Bad record size
- bit21 Bad record value
- bit22 Incorrect password
- bit23 †

† Not used

eu eu	Energy unit	en en en
01 03	0.001 kWh	03
01 02	0.01 kWh	04
01 01	0.1 kWh	05
01 00	1 kWh	06
02 03	0.001 MWh	06
02 02	0.01 MWh	07
02 01	0.1 MWh	85 7D
02 00	1 MWh	FB 01
03 03	0.001 MJ	0B
03 02	0.01 MJ	0C
03 01	0.1 MJ	0D
03 00	1 MJ	0E
04 03	0.001 GJ	0E
04 02	0.01 GJ	0F
04 01	0.1 GJ	FB 08
04 00	1 GJ	FB 09
05 03	0.001 kBtu	80 3D
05 02	0.01 kBtu	81 3D
05 01	0.1 kBtu	82 3D
05 00	1 kBtu	83 3D
06 03	0.001 MBtu	83 3D
06 02	0.01 MBtu	84 3D
06 01	0.1 MBtu	85 3D
06 00	1 MBtu	86 3D
07 03	0.001 Mcal	FB 8C 74
07 02	0.01 Mcal	FB 8C 75
07 01	0.1 Mcal	FB 0C
07 00	1 Mcal	FB 0D
08 03	0.001 Gcal	FB 0D
08 02	0.01 Gcal	FB 0E
08 01	0.1 Gcal	FB 0F
08 00	1 Gcal	FB 8D 7D

in in in Physical unit coding of counter INx (depends on Counter INx unit "iu iu")

FD BA 73	0.001 unit	
FD BA 74	0.01 unit	unit
FD BA 75	0.1 unit	
FD 3A	1 unit	
vo vo	see Physical unit coding of volume	
en en en	see Physical unit coding of energy	

ip ip ip Physical unit coding of INx pulse factor (depends on Counter INx unit "iu iu")

FD BA 28	Unit [unit/pulse]
96 28	Volume [m3/pulse]
88 28	Energy [J/pulse]

iu iu

Counter INx unit

		in in in	ip ip ip
00 03	0.001 unit	FD BA 73	FD BA 28
00 02	0.01 unit	FD BA 74	FD BA 28
00 01	0.1 unit	FD BA 75	FD BA 28
00 00	1 unit	FD 3A	FD BA 28
vu vu	see Volume unit	vo vo	96 28

eu eu see Energy unit

en en en 88 28

Le Length of the M-Bus frame. The fields Start, Length, Check Sum and Stop (6

Ln Length of the ASCII character string
The allowed range is indicated in the "Coding" column.

Warning: according to the M-Bus standard, the first byte following the length byte is the rightmost character of the string, and the last byte is the leftmost character.

Lw Length of the wM-Bus frame. The field Length itself and the CRCs are not

me me Module error

Common to all modules

- bit0 Module missing
- bit1 Insufficient support
- bit2 Incompatible power supply
- bit3 Reserved
- bit4 Reserved
- bit5 Reserved
- bit6 Reserved
- bit7 Reserved

Specific to module D/A

- bit8 Frame error
- bit9 Application error
- bit10 Parameter error
- bit11 Power fail
- bit12 Reserved
- bit13 Reserved
- bit14 Reserved
- bit15 Reserved

mo More records in next telegram :

- 0Fh no
- 1Fh yes

Selected frames

	M-Bus wire	Optical	NFC	Radio	wM-Bus
bit0	r1: Customisable M-Bus frame 1		yes		no
bit1	r2: Customisable M-Bus frame 2		yes		no
bit2	r3: Customisable M-Bus frame 3		yes		no
bit3	r4: Customisable M-Bus frame 4		yes		no
bit4	r5: Current totalizers: energy, volume, IN1, IN2	Insta	yes		no
bit5	r6: Totalizers at set day 1 and set day 2(energy, volu		yes		no
bit6	r7: IN3, IN4		yes		no
bit7	r8: IN5, IN6		yes		no
bit8	wM: Wireless M-Bus, OMS		no		yes
bit9	h1: History 1 of totalizers		yes		no
bit10	h2: History 2 of totalizers		yes		no
bit11	h3: History 3 of totalizers		yes		no
bit12	h4: History 4 of totalizers		yes		no
bit13	h5: History of average values		yes		no
bit14	h6: History of peak values		yes		no
bit15	he: Events log		yes		no
bit16..31	Reserved		no		no

st	Status	Supercal 5	M-Bus standard
bit1..0		Application	Application
00b		No error	No error
01b		†	Application busy
10b		Any application error	Any application error
11b		†	Reserved
bit2		Main power cut	Power low
bit3		†	Permanent error
bit4		Temporary error	Temporary error
bit5		Flow in saturation	Manufacturer specific
bit6		Temperature	Manufacturer specific
bit7		Case is open	Manufacturer specific

vo vo Physical unit coding of volume (depends on volume unit "vu vu")

10	0.001 L	
11	0.01 L	
12	0.1 L	
13	1 L 0.001 m3	Lm3
14	0.01 m3	
15	0.1 m3	
16	1 m3	
90 3D	0.001 gal	
91 3D	0.01 gal	
92 3D	0.1 gal	
93 3D	1 gal 0.001 kgal	galkgal
94 3D	0.01 kgal	
95 3D	0.1 kgal	
96 3D	1 kgal	

vu vu Volume unit vo vo

09 03	0.001 L		10
09 02	0.01 L		11
09 01	0.1 L		12
09 00	1 L		13
0A 03	0.001 m3	Lm3	13
0A 02	0.01 m3		14
0A 01	0.1 m3		15
0A 00	1 m3		16
0B 03	0.001 gal		90 3D
0B 02	0.01 gal		91 3D
0B 01	0.1 gal		92 3D
0B 00	1 gal		93 3D
0C 03	0.001 kgal	galkgal	93 3D
0C 02	0.01 kgal		94 3D
0C 01	0.1 kgal		95 3D
0C 00	1 kgal		96 3D

† Not used.

Respond with user data RSP_UD, Variable structure response (slave to master)

Frame SPF 7-9

						<MbusRecord> XML attributes					
Field	Frame bytes in hex (Note 1)	Byte	Coding	Comment	Name	SubUnit	Tariff	Storage	Function‡	Origin	
User Data	Control Information	78	1		Variable structure respond						
			0								
	Device identification M-Bus	02, FF, 59 dt, vm	5	C, 16 bits	§ Device type and version	DeviceSpecificValue25	0	0	0	0	
	Fabrication Number	0C, 78, xx xx xx xx	6	A, 32 bits	Ⓜ	FabricationNumber	0	0	0	0	
	Energy totalizer tariff 0	04, en en en, xx xx xx xx	8	B, 32 bits	· Ⓟ; Note 2	Energy	0	0	0	0	
	Energy totalizer tariff 1	84 10, en en en, xx xx xx xx	9	B, 32 bits	· Ⓟ; Note 2	Energy	0	1	0	0	
	Counter IN1 totalizer	84 40, in in in, xx xx xx xx	9	B, 32 bits	· ⓘ; Note 4	Dimensionless Volume Energy	1	0	0	0	
	Counter IN2 totalizer	84 80 40, in in in, xx xx xx xx	10	B, 32 bits	· ⓘ; Note 4	Dimensionless Volume Energy	2	0	0	0	
	Counter IN1 identification	8C 40, 79, xx xx xx xx	7	A, 32 bits	· ⓘ	IdentificationNumber	1	0	0	0	
	Counter IN2 identification	8C 80 40, 79, xx xx xx xx	8	A, 32 bits	· ⓘ	IdentificationNumber	2	0	0	0	
			0								
	High temperature	02, 59, xx xx	4	B, 16 bits	· Ⓒ [0.01 °C]	FlowTemperature	0	0	0	0	
	Low temperature	02, 5D, xx xx	4	B, 16 bits	· Ⓒ [0.01 °C]	ReturnTemperature	0	0	0	0	
	Flow	04, 39, xx xx xx xx	6	B, 32 bits	· Ⓒ [0.01 l/h]	VolumeFlow	0	0	0	0	
	Power	04, 2B, xx xx xx xx	6	B, 32 bits	· Ⓒ [1 W]	Power	0	0	0	0	
	Detailed errors	03, FF 2C, er er er	6	D, 24 bits	Ⓒ §	ManufacturerErrorFlags	0	0	0	0	
	Running hours	03, 22, xx xx xx	5	B, 24 bits	Ⓜ [h]	OnTime	0	0	0	0	
			0								
	Volume totalizer tariff 0	04, vo vo, xx xx xx xx	7	B, 32 bits	· Ⓟ; Note 3	Volume	0	0	0	0	
	Volume totalizer tariff 1	84 10, vo vo, xx xx xx xx	8	B, 32 bits	· Ⓟ; Note 3	Volume	0	1	0	0	
		0									
Counter IN2 totalizer	84 80 40, in in in, xx xx xx xx	10	B, 32 bits	· ⓘ; Note 4	Dimensionless Volume Energy	2	0	0	0		

Records

Max frame size: 119 bytes

Symbols

‡ Function: 0=instantaneous, 1=maximum, 2=minimum, 3=during error state

§ manufacturer specific VIFE

Notes

1. For non hexadecimal or lower case digits see the detailed description in the Keys sheet.
2. The value of "en en en" depends on Energy unit, see key "eu eu"
3. The value of "vo vo" depends on Volume unit, see key "vu vu"
4. The value of "in in in" depends on Counter INx unit, see key "iu iu"

- Ⓒ No special access right is needed to change this value.
- Ⓘ The installer access right (or higher) is needed to change this value.
- Ⓥ The verifier access right (or higher) is needed to change this value.
- Ⓜ The manufacturer access right (or higher) is needed to change this value.
- Ⓡ This value is read only.

Respond with user data RSP_UD, Variable structure response (slave to master)

Frame SPF 10-12

						<MbusRecord> XML attributes					
						Name	SubUnit	Tariff	Storage	Function‡	Origin
Field	Frame bytes in hex (Note 1)	Byte	Coding	Comment							
User Data	Control Information	78	1	Variable structure respond							
			0								
	Device identification M-Bus	02, FF, 59 dt, vm	5	C, 16 bits	§ Device type and version	DeviceSpecificValue25	0	0	0	0	
	Fabrication Number	0C, 78, xx xx xx xx	6	A, 32 bits	Ⓜ	FabricationNumber	0	0	0	0	
	Energy totalizer tariff 0	04, en en en, xx xx xx xx	8	B, 32 bits	· Ⓥ; Note 2	Energy	0	0	0	0	
	Energy totalizer tariff 1	84 10, en en en, xx xx xx xx	9	B, 32 bits	· Ⓥ; Note 2	Energy	0	1	0	0	
	Counter IN1 totalizer	84 40, in in in, xx xx xx xx	9	B, 32 bits	· ⓘ; Note 4	Dimensionless Volume Energy	1	0	0	0	
	Counter IN2 totalizer	84 80 40, in in in, xx xx xx xx	10	B, 32 bits	· ⓘ; Note 4	Dimensionless Volume Energy	2	0	0	0	

Max frame size: 48 bytes

Symbols

‡ Function: 0=instantaneous, 1=maximum, 2=minimum, 3=during error state

§ manufacturer specific VIFE

Notes

1. For non hexadecimal or lower case digits see the detailed description in the Keys sheet.

2. The value of "en en en" depends on Energy unit, see key "eu eu"

3. The value of "vo vo" depends on Volume unit, see key "vu vu"

4. The value of "in in in" depends on Counter INx unit, see key "iu iu"

Ⓒ No special access right is needed to change this value.

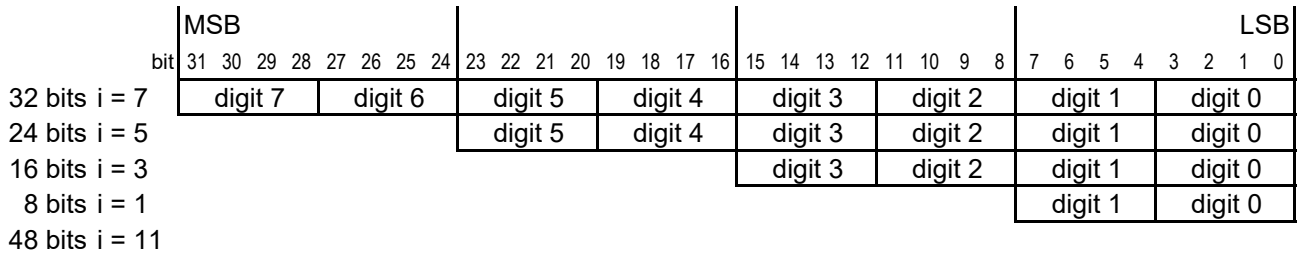
ⓘ The installer access right (or higher) is needed to change this value.

Ⓥ The verifier access right (or higher) is needed to change this value.

Ⓜ The manufacturer access right (or higher) is needed to change this value.

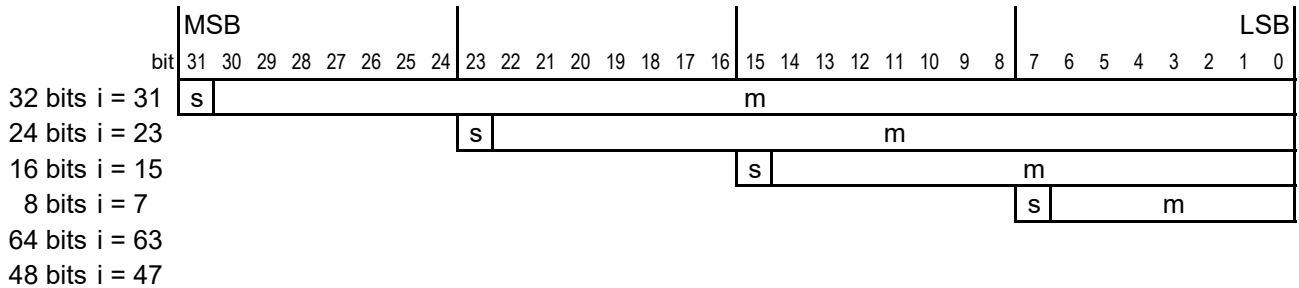
Ⓡ This value is read only.

Type A Unsigned integer BCD



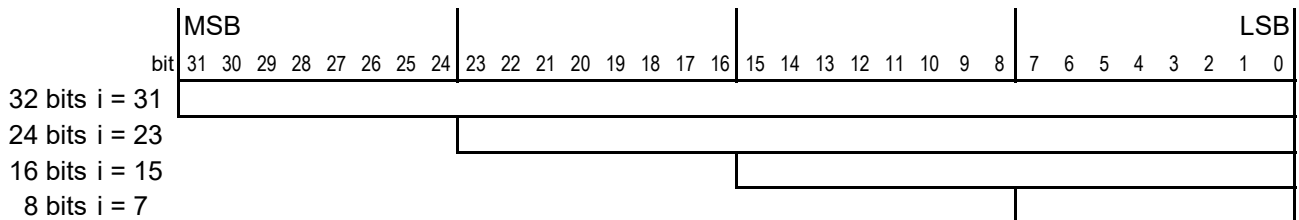
bit[x] : 0, 1
 digit[x] : 0 .. 9
 $digit[x] = bit[x*4+3]*2^3 + bit[x*4+2]*2^2 + bit[x*4+1]*2^1 + bit[x*4+0]*2^0$
 $number = digit[i]*10^i + digit[i-1]*10^{(i-1)} + digit[i-2]*10^{(i-2)} + \dots + digit[0]*10^0$
 range : 0 .. 10^(i+1)-1

Type B Binary integer



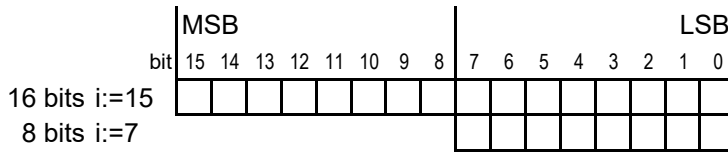
bit[x] : 0, 1
 $m = bit[i-1]*2^{(i-1)} + bit[i-2]*2^{(i-2)} + \dots + bit[0]*2^0$
 Sign : 0=positive, 1=negative
 If Sign(bit[i]) = positive Then number = m
 If Sign(bit[i]) = negative Then number = m - 2^i
 range : -2^i .. +(2^i)-1

Type C Unsigned integer



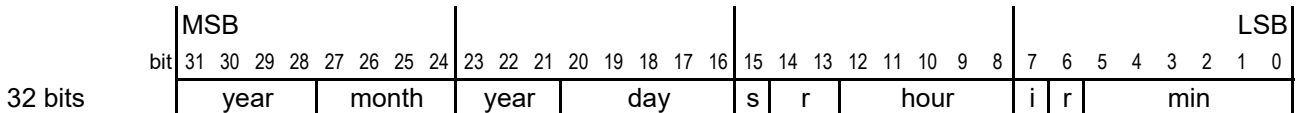
bit[x] : 0, 1
 $number = bit[i]*2^i + bit[i-1]*2^{(i-1)} + bit[i-2]*2^{(i-2)} + \dots + bit[0]*2^0$
 range : 0 .. +2^(i+1)-1

Type D Array of Boolean



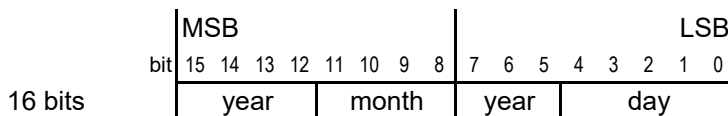
bit[x] : 0, 1
 Boolean : 0=false, 1=true
 Flag[i] = Boolean(bit[i])
 Flag[i-1] = Boolean(bit[i-1])
 ...
 Flag[0] = Boolean(bit[0])

Type F Date and Time



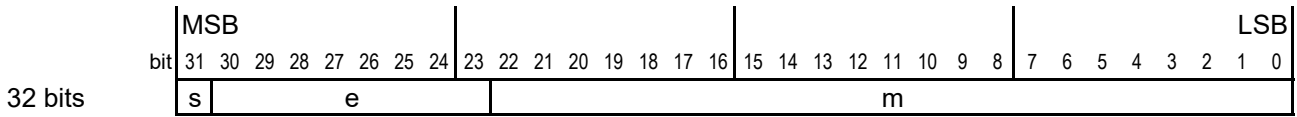
bit[x] : 0, 1
 min : 0 .. 59 min = bit[5]*2^5 + ... + bit[0]*2^0
 hour : 0 .. 23 hour = bit[12]*2^4 + ... + bit[8]*2^0
 day : 1 .. 31 day = bit[20]*2^4 + ... + bit[16]*2^0
 month : 1 .. 12 month = bit[27]*2^3 + ... + bit[24]*2^0
 year : 0 .. 99 year = bit[31]*2^6 + ... + bit[28]*2^3 + bit[23]*2^2 + ... + bit[21]*2^0
 s : standard time (bit[15]=0), summer time (bit[15]=1)
 i : valid (bit[7]=0), invalid (bit[7]=1)
 r : reserved (bit[6],bit[13],bit[14] are always 0)

Type G Date



bit[x] : 0, 1
 day : 1 .. 31 day = bit[4]*2^4 + ... + bit[0]*2^0
 month : 1 .. 12 month = bit[11]*2^3 + ... + bit[8]*2^0
 year : 0 .. 99 year = bit[15]*2^6 + ... + bit[12]*2^3 + bit[7]*2^2 + ... + bit[5]*2^0

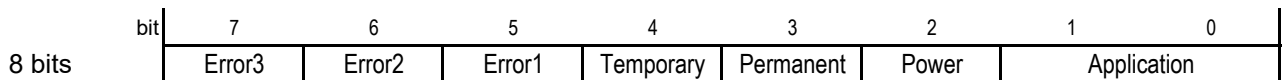
Type H Floating point (IEEE STD 754)



$bit[x] : 0, 1$
 $m = bit[22]*2^{-1} + bit[21]*2^{-2} + \dots + bit[0]*2^{-23}$
 $e = bit[30]*2^7 + bit[29]*2^6 + \dots + bit[23]*2^0$
 $s = -1^{bit[31]}$

- If (e>0) AND (e<255) Then number = s * 2^(e-127) * (1 + m)
- If (e=0) AND (m<>0) Then number = s * 2^(e-126) * m
- If (e=0) AND (m=0) Then number = s * 0
- If (e=255) AND (m=0) Then number = s * infinite
- If (e=255) AND (m<>0) Then number = not a number

Type Ds Status, array of boolean



- $bit[x] : 0, 1$
 Application = $bit[1]*2^1 + bit[0]*2^0$
 Application: 0=no error, 1=busy, 2=error, 3=reserved
 Power: 1=power low
 Permanent: 1=permanent error
 Temporary: 1=temporary error
 Error1: manufacturer specific
 Error2: manufacturer specific
 Error3: manufacturer specific