# NEMO96HD/HD+ M-Bus extended protocol

*In according with EN1434-3*

## 1. Manufacturer Specific M-Bus commands

### 1.1 Editing data

#### 1.1.1 Writing and reading of KTV

To write KTV it is necessary to send a SND_UD telegram :

| Field Name | Number of byte | Value | Meaning |
|---|---|---|---|
| Start | 1 | 68h | Start |
| L-f | 1 | 08h | *Header* |
| L-f | 1 | 08h | |
| Start | 1 | 68h | |
| C-f | 1 | 53h/73h | *SND_UD* |
| A-f | 1 | ***PADR*** | Primary Address |
| CI-f | 1 | 51h | Data send |
| DIF | 1 | 02h | 16 Bit Integer |
| VIF | 1 | FFh | Manufacturer specific |
| VIFE | 1 | 12h | KTV |
| Value | 2 | B0B1 | Value (LSB before) |
| Check Sum | 1 | CS | |
| Stop | 1 | 16h | Stop |

B1B0 : 16 Bit Integer , from 10 (KTV = 1.0) to 100 (KTV = 10.0)

Value is in 1/10. This means that for writing KTV = 2.5 the value to be sent is 25, and if it is read 67 then KTV = 6.7.

To read KTV it is necessary to send a SND_UD telegram and then a REQ_UD2 :

| **Field Name** | **Number of byte** | **Value** | **Meaning** |
|---|---|---|---|
| Start | 1 | 68h | Start |
| L-f | 1 | 06h | *Header* |
| L-f | 1 | 06h | |
| Start | 1 | 68h | |
| C-f | 1 | 53h/73h | *SND_UD* |
| A-f | 1 | ***PADR*** | Primary Address |
| CI-f | 1 | 51h | Data send |
| DIF | 1 | 08h | Selection for Readout |
| VIF | 1 | FFh | |
| VIFE | 1 | 12h | KTV |
| Check Sum | 1 | CS | |
| Stop | 1 | 16h | Stop |

**Writing example of KTV=100 = 00 64h (10.0) :**

| | |
|---|---|
| SND_UD | 68 08 08 68 53 FE 51 02 FF 12 64 00 19 16 |
| E5h | E5 |

**Reading example of KTV=100 (10.0) :**

| | |
|---|---|
| SND_UD | 68 06 06 68 73 FE 51 08 FF 12 DB 16 |
| E5h | E5 |
| REQ_UD2 | 10 5B FE 59 16 |
| RSP_UD | 68 14 14 68 08 00 72 00 00 00 00 A8 15 00 02 5C 00 00 00 02 FF 12 64 00 0C 16 |

### 1.1.2 Writing and reading of KTA

To write KTA it is necessary to send a SND_UD telegram :

| Field Name | Number of byte | Value | Meaning |
|---|---|---|---|
| Start | 1 | 68h | Start |
| L-f | 1 | 08h | *Header* |
| L-f | 1 | 08h | |
| Start | 1 | 68h | |
| C-f | 1 | 53h/73h | *SND_UD* |
| A-f | 1 | ***PADR*** | Primary Address |
| CI-f | 1 | 51h | Data send |
| DIF | 1 | 02h | 16 Bit Integer |
| VIF | 1 | FFh | Manufacturer specific |
| VIFE | 1 | 11h | KTA |
| Value | 2 | B0B1 | Value (LSB before) |
| Check Sum | 1 | CS | |
| Stop | 1 | 16h | Stop |

B1B0 : 16 Bit Integer , from 1 to 9999

To read KTA it is necessary to send a SND_UD telegram and then a REQ_UD2 :

| Field Name | Number of byte | Value | Meaning |
|---|---|---|---|
| Start | 1 | 68h | Start |
| L-f | 1 | 06h | *Header* |
| L-f | 1 | 06h | |
| Start | 1 | 68h | |
| C-f | 1 | 53h/73h | *SND_UD* |
| A-f | 1 | ***PADR*** | Primary Address |
| CI-f | 1 | 51h | Data send |
| DIF | 1 | 08h | Selection for Readout |
| VIF | 1 | FFh | |
| VIFE | 1 | 11h | KTA |
| Check Sum | 1 | CS | |
| Stop | 1 | 16h | Stop |

**Writing example of KTA = 10 :**

| | |
|---|---|
| SND_UD | 68 08 08 68 73 FE 51 02 FF 11 0A 00 DE 16 |
| E5h | E5 |

**Reading example of KTA = 10 :**

| | |
|---|---|
| SND_UD | 68 06 06 68 53 FE 51 08 FF 11 BA 16 |
| E5h | E5 |
| REQ_UD2 | 10 5B FE 59 16 |
| RSP_UD | 68 14 14 68 08 00 72 00 00 00 00 A8 15 00 02 5D 00 00 00 02 FF 11 0A 00 B2 16 |

***NOTE :*** *If KTV or KTA are changed, Energy registers and Max Power Demand are resetted.*

### 1.1.4 Writing and reading of Baud rate

To write Baud rate it is necessary to send a SND_UD telegram :

| Field Name | Number of byte | Value | Meaning |
|---|---|---|---|
| Start | 1 | 68h | Start |
| L-f | 1 | 07h | *Header* |
| L-f | 1 | 07h | |
| Start | 1 | 68h | |
| C-f | 1 | 53h/73h | *SND_UD* |
| A-f | 1 | ***PADR*** | Primary Address |
| CI-f | 1 | ***51*** | |
| DIF | 1 | ***01*** | |
| VIF | 1 | ***FF*** | |
| VIFE | 1 | ***42*** | |
| Value | 1 | XXh | Data send |
| Check Sum | 1 | CS | |
| Stop | 1 | 16h | Stop |

Parameter :

XX h :

00 h -> 300 b/s
01 h -> 600 b/s
02 h -> 1200 b/s
03 h -> 2400 b/s
04 h -> 4800 b/s
05 h -> 9600 b/s

**NOTE**

When Slave receives this telegram, before it sends E5h as confirmation at current Baud rate and then changes the new Baud rate.

To read Baud rate it is necessary to send a SND_UD telegram and then a REQ_UD2 :

| **Field Name** | **Number of byte** | **Value** | **Meaning** |
|---|---|---|---|
| Start | 1 | 68h | Start |
| L-f | 1 | 06h | *Header* |
| L-f | 1 | 06h | |
| Start | 1 | 68h | |
| C-f | 1 | 53h/73h | *SND_UD* |
| A-f | 1 | ***PADR*** | Primary Address |
| CI-f | 1 | 51h | Data send |
| DIF | 1 | 08h | Selection for Readout |
| VIF | 1 | FFh | |
| VIFE | 1 | 42h | Baud rate |
| Check Sum | 1 | CS | |
| Stop | 1 | 16h | Stop |

**Writing example of Baud rate of 600 bit/s**

| | |
|---|---|
| SND_DU | 68 07 07 68 73 01 51 01 FF 42 01 08 16 |
| E5h | E5 |

**Reading example of Baud rate of 600 bit/s**

| | |
|---|---|
| SND_UD | 68 06 06 68 53 FE 51 08 FF 42 EB 16 |
| E5h | E5 |
| REQ_UD2 | 10 7B FE 79 16 |
| RSP_UD | 68 13 13 68 08 FD 72 01 00 00 00 A8 15 00 02 94 00 00 00 01 FF 42 01 0E 16 |

## 1.2 Standard M-Bus telegrams

### 1.2.1 Standard Data ( Answer for REQ_UD2)

**Initialization of Slave (SND_NKE)**

To start or initialize the communication Master sends this telegram to Slave :

| SND_NKE | |
|---|---|
| **CODE** | **Description** |
| 10h | Start |
| 40h | C field : initialization |
| PADR | A field : device address 0..250 /254/255 |
| CS | CheckSum = (10h+40h+PADR) mod 100h |
| 16h | Stop |

If Slave receives SND_NKE it resets TC counter of sending telegrams and answers with E5.

**Request for Data (REQ_UD2 )**

| REQ_UD2 | |
|---|---|
| **CODE** | **Description** |
| 10h | Start |
| 5B/7Bh | C field : Request for Data |
| PADR | A field : device address 0..250 /254 |
| CS | CheckSum = (10h+5B/7Bh+PADR) mod 100h |
| 16h | Stop |

When Master sends this telegram to a Slave, it answers a Standard Frame with RSP_UD multitelegram , where the last DIF in the user data part of the telegram is 0x1F to indicate that there are more data in the next telegram.

| Position | Description | Byte | Data type | Page |
|---|---|---|---|---|
| 1 | Active Positive Energy | 6 | Type A , 12 BCD digits | 1 |
| 2 | Active Positive Power 3-phase | 4 | Type H , IEEE Real | 1 |
| 3 | Reactive Positive Energy | 6 | Type A , 12 BCD digits | 1 |
| 4 | Reactive Positive Power 3-phase | 4 | Type H , IEEE Real | 1 |
| 5 | Active Negative Energy | 6 | Type A , 12 BCD digits | 1 |
| 6 | Active Negative Power 3-phase | 4 | Type H , IEEE Real | 1 |
| 7 | Reactive Negative Energy | 6 | Type A , 12 BCD digits | 1 |
| 8 | Reactive Negative Power 3-phase | 4 | Type H , IEEE Real | 1 |
| 9 | Power Factor 3-phase | 4 | Type H , IEEE Real with sign | 1 |
| 10 | Error | 1 | Type B , 8-bit Integer | 1 |
| 11 | Current I1 | 4 | Type H , IEEE Real | 2 |
| 12 | Current I2 | 4 | Type H , IEEE Real | 2 |
| 13 | Current I3 | 4 | Type H , IEEE Real | 2 |
| 14 | Voltage L1 | 4 | Type H , IEEE Real | 2 |
| 15 | Voltage L2 | 4 | Type H , IEEE Real | 2 |
| 16 | Voltage L3 | 4 | Type H , IEEE Real | 2 |
| 17 | Active Power L1 | 4 | Type H , IEEE Real with sign | 3 |
| 18 | Active Power L2 | 4 | Type H , IEEE Real with sign | 3 |
| 19 | Active Power L3 | 4 | Type H , IEEE Real with sign | 3 |
| 20 | Reactive Power L1 | 4 | Type H , IEEE Real with sign | 3 |
| 21 | Reactive Power L2 | 4 | Type H , IEEE Real with sign | 3 |
| 22 | Reactive Power L3 | 4 | Type H , IEEE Real with sign | 3 |
| 23 | Power Factor L1 | 4 | Type H , IEEE Real with sign | 3 |
| 24 | Power Factor L2 | 4 | Type H , IEEE Real with sign | 3 |
| 25 | Power Factor L3 | 4 | Type H , IEEE Real with sign | 3 |
| 26 | Voltage L1-L2 | 4 | Type H , IEEE Real | 3 |
| 27 | Voltage L2-L3 | 4 | Type H , IEEE Real | 3 |
| 28 | Voltage L3-L1 | 4 | Type H , IEEE Real | 3 |
| 29 | Neutral Current | 4 | Type H , IEEE Real | 3 |
| 30 | Frequency | 4 | Type H , IEEE Real | 3 |
| 31 | Current Transform KTA | 2 | Type B , 16-bit Integer | 3 |
| 32 | Voltage Transform KTV | 2 | Type B , 16-bit Integer | 3 |

### *1.2.1.1 Examples of telegram 1,2,3 readouts*

*Example of the 1st telegram (all values are hexadecimal).*

| **RSP_UD** | | | |
|---|---|---|---|
| **Field Name** | **Byte Number** | **Value** | **Meaning** |
| Start | 1 | 68 | Start byte |
| L-f | 1 | LEN | Frame number byte |
| L-f | 1 | LEN | Frame number byte |
| Start | 1 | 68 | Start byte |
| C-f | 1 | 08 | RSP_UD |
| A-f | 1 | ***PADR*** | 0..250 |
| CI-f | 1 | 72 | Variable structure ,LSB is trasmitted first |
| Secondary address | 4 | **IDENT** | XXXXXXXX (8 BCD digits) |
| Manufacturer code | 2 | A5 25 | "IME" = 25A5 |
| Device version | 1 | GEN | Version |
| Medium | 1 | 02 | Electricity |
| Access number | 1 | TC | *incremented by 1 for any aswered telegram* |
| Status | 1 | STAT | Status for EN 1434-3 (*) |
| Signature | 2 | 00 00 | *Not used* |
| DIF | 1 | 8E | Instantaneous Value, size 12 BCD digits |
| DIFE | 1 | 50 | Tariff 1 Unit 1 Storage number 0 |
| VIF | 1 | 04/05 | Units kWh with resolution 0,01k/0,1k Wh |
| Value | 6 | xxxxxxxxxxxx | Active Positive Energy ,Total |
| DIF | 1 | 85 | Instantaneous Value, 32-bit Real |
| DIFE | 1 | 50 | Tariff 1 Unit 1 Storage number 0 |
| VIF | 1 | 2B | Power W |
| Value | 4 | xxxxxxxx | Total Active Positive Power |
| DIF | 1 | 8E | Instantaneous Value, size 12 BCD digits |
| DIFE | 1 | 90 | Tariff 1 |
| DIFE | 1 | 40 | Unit 2 |
| VIF | 1 | 04/05 | Units kVArh with resolution 0,01k/0,1k VArh |
| Value | 6 | xxxxxxxxxxxx | Reactive Positive Energy ,Total |
| DIF | 1 | 85 | Instantaneous Value, 32-bit Real |
| DIFE | 1 | 90 | Tariff 1 |
| DIFE | 1 | 40 | Unit 2 |
| VIF | 1 | 2B | Power Var |
| Value | 4 | xxxxxxxx | Total Reactive Positive Power |
| DIF | 1 | 8E | Instantaneous Value, size 12 BCD digits |
| DIFE | 1 | 60 | Tariff 2 Unit 1 Storage number 0 |
| VIF | 1 | 04/05 | Units kWh with resolution 0,01k/0,1k Wh |
| Value | 6 | xxxxxxxxxxxx | Active Negative Energy, Total |
| DIF | 1 | 85 | Instantaneous Value, 32-bit Real |

| | | | |
|---|---|---|---|
| DIFE | 1 | 60 | Tariff 2 Unit 1 |
| VIF | 1 | 2B | Power W |
| Value | 4 | xxxxxxxx | Total Active Negative Power |
| DIF | 1 | 8E | Instantaneous Value, size 12 BCD digits |
| DIFE | 1 | A0 | Tariff 2 |
| DIFE | 1 | 40 | Unit 2 |
| VIF | 1 | 04/05 | Units kVArh with resolution 0,01k/0,1k VArh |
| Value | 6 | xxxxxxxxxxxx | Reactive Negative Energy ,Total |
| DIF | 1 | 85 | Instantaneous Value, 32-bit Real |
| DIFE | 1 | A0 | Tariff 2 |
| DIFE | 1 | 40 | Unit2 |
| VIF | 1 | 2B | Power Var |
| Value | 4 | xxxxxxxx | Total Reactive Negative Power |
| DIF | 1 | 05 | Instantaneous Value, 32-bit Real |
| VIF | 1 | FD | Power Factor |
| VIFE | 1 | 3A | Dimensionless |
| Value | 4 | xxxxxxxx | b31 = sign\| b30-b23 exponent\| b22-b0 value |
| DIF | 1 | 01 | Instantaneous Value, 8-bit integer |
| VIF | 1 | FD | Error flags (**) |
| VIFE | 1 | 17 | |
| Value | 1 | Yy | Error on 8 bit B7..B0 |
| DIF | 1 | 1F | more records will follow in next telegram |
| Value | 5 | 0000000000 | PAD bytes |
| Checksum | 1 | CS | |
| Stop | 1 | 16 | |

*Example of the 2nd telegram (all values are hexadecimal).*

| **RSP_UD** | | | |
|---|---|---|---|
| **Field Name** | **Byte Number** | **Value** | **Meaning** |
| Start | 1 | 68 | Start byte |
| L-f | 1 | LEN | Frame number byte |
| L-f | 1 | LEN | Frame number byte |
| Start | 1 | 68 | Start byte |
| C-f | 1 | 08 | RSP_UD |
| A-f | 1 | ***PADR*** | 0..250 |
| CI-f | 1 | 72 | Variable structure,LSB is trasmitted first |
| Secondary address | 4 | **IDENT** | XXXXXXXX (8 BCD digits) |
| Manufacturer code | 2 | A5 25 | "IME" = 25A5 |
| Device version | 1 | GEN | Version |
| Medium | 1 | 02 | Electricity |
| Access number | 1 | TC | *incremented by 1 for any aswered telegram* |
| Status | 1 | STAT | Status for EN 1434-3 (*) |
| Signature | 2 | 00 00 | *Not used* |
| DIF | 1 | 05 | Instantaneous Value, 32-bit Real |
| VIF | 1 | FD | Extension of VIF-codes |

| | | | |
|---|---|---|---|
| VIFE | 1 | DA | Units A with resolution mA |
| VIFE | 1 | FF | Next byte is manufacturer specific |
| VIFE | 1 | 01 | Line 1 |
| Value | 4 | xxxxxxxx | Current L1 |
| DIF | 1 | 05 | Instantaneous Value, 32-bit Real |
| VIF | 1 | FD | Extension of VIF-codes |
| VIFE | 1 | DA | Units A with resolution mA |
| VIFE | 1 | FF | Next byte is manufacturer specific |
| VIFE | 1 | 02 | Line 2 |
| Value | 4 | xxxxxxxx | Current L2 |
| DIF | 1 | 05 | Instantaneous Value, 32-bit Real |
| VIF | 1 | FD | Extension of VIF-codes |
| VIFE | 1 | DA | Units A with resolution mA |
| VIFE | 1 | FF | Next byte is manufacturer specific |
| VIFE | 1 | 03 | Line 3 |
| Value | 4 | xxxxxxxx | Current L3 |
| DIF | 1 | 05 | Instantaneous Value, 32-bit Real |
| VIF | 1 | FD | Extension of VIF-codes |
| VIFE | 1 | C8 | Units V with resolution 100 mV |
| VIFE | 1 | FF | Next byte is manufacturer specific |
| VIFE | 1 | 01 | Line 1 |
| Value | 4 | xxxxxxxx | Voltage L1-N |
| DIF | 1 | 05 | Instantaneous Value, 32-bit Real |
| VIF | 1 | FD | Extension of VIF-codes |
| VIFE | 1 | C8 | Units V with resolution 100 mV |
| VIFE | 1 | FF | Next byte is manufacturer specific |
| VIFE | 1 | 02 | Line 2 |
| Value | 4 | xxxxxxxx | Voltage L2-N |
| DIF | 1 | 05 | Instantaneous Value, 32-bit Real |
| VIF | 1 | FD | Extension of VIF-codes |
| VIFE | 1 | C8 | Units V with resolution 100 mV |
| VIFE | 1 | FF | Next byte is manufacturer specific |
| VIFE | 1 | 03 | Line 3 |
| Value | 4 | xxxxxxxx | Voltage L3-N |
| DIF | 1 | 1F | more records will follow in next telegram |
| Value | 5 | 0000000000 | PAD bytes |
| Checksum | 1 | CS | |
| Stop | 1 | 16 | |

*Example of the 3th telegram (all values are hexadecimal).*

| **RSP_UD** | | | |
|---|---|---|---|
| **Field Name** | **Byte Number** | **Value** | **Meaning** |
| Start | 1 | 68 | Start byte |
| L-f | 1 | LEN | Frame number byte |
| L-f | 1 | LEN | Frame number byte |
| Start | 1 | 68 | Start byte |
| C-f | 1 | 08 | RSP_UD |
| A-f | 1 | ***PADR*** | 0..250 |
| CI-f | 1 | 72 | Variable structure,LSB is trasmitted first |
| Secondary address | 4 | **IDENT** | XXXXXXXX (8 BCD digits) |

| | | | |
|---|---|---|---|
| Manufacturer code | 2 | A5 25 | "IME" = 25A5 |
| Device version | 1 | GEN | Version |
| Medium | 1 | 02 | Electricity |
| Access number | 1 | TC | *incremented by 1 for any aswered telegram* |
| Status | 1 | STAT | Status for EN 1434-3 (*) |
| Signature | 2 | 00 00 | *Not used* |
| DIF | 1 | 85 | Instantaneous Value, 32-bit Real |
| DIFE | 1 | 40 | Unit 1 |
| VIF | 1 | AB/AD | Power W/ 0,1 kW |
| VIFE | 1 | FF | Next byte is manufacturer specific |
| VIFE | 1 | 01 | Active Power Line 1 |
| Value | 4 | xxxxxxxx | b31 = sign\| b30-b23 exponent\| b22-b0 value |
| DIF | 1 | 85 | Instantaneous Value, 32-bit Real |
| DIFE | 1 | 40 | Unit 1 |
| VIF | 1 | AB/AD | Power W/ 0,1 kW |
| VIFE | 1 | FF | Next byte is manufacturer specific |
| VIFE | 1 | 02 | Active Power Line 2 |
| Value | 4 | xxxxxxxx | b31 = sign\| b30-b23 exponent\| b22-b0 value |
| DIF | 1 | 85 | Instantaneous Value, 32-bit Real |
| DIFE | 1 | 40 | Unit 1 |
| VIF | 1 | AB/AD | Power W/ 0,1 kW |
| VIFE | 1 | FF | Next byte is manufacturer specific |
| VIFE | 1 | 03 | Active Power Line 3 |
| Value | 4 | xxxxxxxx | b31 = sign\| b30-b23 exponent\| b22-b0 value |
| DIF | 1 | 85 | Instantaneous Value, size 32-bit Real |
| DIFE | 1 | 80 | |
| DIFE | 1 | 40 | Unit 2 |
| VIF | 1 | AB/AD | Power Var / 0,1 kVAr |
| VIFE | 1 | FF | Next byte is manufacturer specific |
| VIFE | 1 | 01 | Reactive Power L1 |
| Value | 4 | xxxxxxxx | b31 = sign\| b30-b23 exponent\| b22-b0 value |
| DIF | 1 | 85 | Istantaneous Value, size 32-bit Real |
| DIFE | 1 | 80 | |
| DIFE | 1 | 40 | Unit 2 |
| VIF | 1 | AB/AD | Power VAr/ 0,1 kVAr |
| VIFE | 1 | FF | Next byte is manufacturer specific |
| VIFE | 1 | 02 | Reactive Power L2 |
| Value | 4 | xxxxxxxx | b31 = sign\| b30-b23 exponent\| b22-b0 value |
| DIF | 1 | 85 | Instantaneous Value, size 32-bit Real |
| DIFE | 1 | 80 | |
| DIFE | 1 | 40 | Unit 2 |
| VIF | 1 | AB/AD | Power Var / 0,1 kVAr |
| VIFE | 1 | FF | Next byte is manufacturer specific |
| VIFE | 1 | 03 | Reactive Power L3 |
| Value | 4 | xxxxxxxx | b31 = sign\| b30-b23 exponent\| b22-b0 value |
| DIF | 1 | 05 | Instantaneous Value, 32-bit Real |
| VIF | 1 | FD | Power Factor |
| VIFE | 1 | BA | dimensionless |
| VIFE | 1 | FF | |
| VIFE | 1 | 01 | Power Factor Line 1 |
| Value | 4 | xxxxxxxx | b31 = sign\| b30-b23 exponent\| b22-b0 value |
| DIF | 1 | 05 | Instantaneous Value, 32-bit Real |
| VIF | 1 | FD | Power Factor |
| VIFE | 1 | BA | dimensionless |

| | | | |
|---|---|---|---|
| VIFE | 1 | FF | |
| VIFE | 1 | 02 | Power Factor Line 2 |
| Value | 4 | xxxxxxxx | b31 = sign\| b30-b23 exponent\| b22-b0 value |
| DIF | 1 | 05 | Instantaneous Value, 32-bit Real |
| VIF | 1 | FD | Power Factor |
| VIFE | 1 | BA | dimensionless |
| VIFE | 1 | FF | |
| VIFE | 1 | 03 | Power Factor Line 3 |
| Value | 4 | xxxxxxxx | b31 = sign\| b30-b23 exponent\| b22-b0 value |
| DIF | 1 | 05 | Instantaneous Value, size 32-bit Real |
| VIF | 1 | FD | Extension of VIF-codes |
| VIFE | 1 | C8 | Units V with resolution 0,1V |
| VIFE | 1 | FF | Next byte is manufacturer specific |
| VIFE | 1 | 04 | |
| Value | 4 | xxxxxxxx | Voltage L1-L2 |
| DIF | 1 | 05 | Instantaneous Value, size 32-bit Real |
| VIF | 1 | FD | Extension of VIF-codes |
| VIFE | 1 | C8 | Units V with resolution 0,1V |
| VIFE | 1 | FF | Next byte is manufacturer specific |
| VIFE | 1 | 05 | |
| Value | 4 | xxxxxxxx | Voltage L2-L3 |
| DIF | 1 | 05 | Instantaneous Value, size 32-bit Real |
| VIF | 1 | FD | Extension of VIF-codes |
| VIFE | 1 | C8 | Units V with resolution 0,1V |
| VIFE | 1 | FF | Next byte is manufacturer specific |
| VIFE | 1 | 06 | |
| Value | 4 | xxxxxxxx | Voltage L3-L1 |
| DIF | 1 | 05 | Instantaneous Value, size 32-bit Real |
| VIF | 1 | FD | Extension of VIF-codes |
| VIFE | 1 | DA | Units A with resolution 10 mA |
| VIFE | 1 | FF | Next byte is manufacturer specific |
| VIFE | 1 | 04 | |
| Value | 4 | xxxxxxxx | Neutral Current |
| DIF | 1 | 05 | Instantaneous Value, size 32-bit Real |
| VIF | 1 | FF | Next byte is Manufacturer specific |
| VIFE | 1 | 5A | Units Hz with resolution 0.1 Hz |
| Value | 4 | xxxxxxxx | Frequency |
| DIF | 1 | 02 | Instantaneous Value, size 16-bit integer |
| VIF | 1 | FD | |
| VIFE | 1 | 3A | dimensionless |
| Value | 2 | xxxx | Current Transform KTA |
| DIF | 1 | 02 | Instantaneous Value, size 16-bit integer |
| VIF | 1 | FD | |
| VIFE | 1 | 3A | dimensionless |
| Value | 2 | xxxx | Voltage Transform KTV *10 |
| DIF | 1 | 0F | Indicating that this is the last telegram |
| Value | 5 | 0000000000 | PAD bytes |
| Checksum | 1 | CS | |
| Stop | 1 | 16 | |

### *(*) Status*

*With this field various information about the status of counter, and faults wich have occurred, are communicated :*

| **Bit setted** | **EN 1434-3** | **NEMO96HD** |
|---|---|---|
| Bit 7 = 1 | Specific to manifacturer | Not used |

| | | |
|---|---|---|
| Bit 6 = 1 | Specific to manifacturer | Not used |
| Bit 5 = 1 | Specific to manifacturer | Not used |
| Bit 4 = 1 | Temporary Error | Not used |
| Bit 3 = 1 | Permanent Error | Incorrect voltage phase sequence |
| Bit 2 = 1 | Power low | Not used |
| Bit 1 = 1 | Application layer error 1 | Not used |
| Bit 0 = 1 | Application layer error 0 | Not used |

## (**) Error flags

Parameter : YY = b7b6b5b4b3b2b1b0 is a bit mapped 8 bit Integer.

| BIT number | Description |
|---|---|
| b7 = 1 | Not used |
| b6 = 1 | Not used |
| b5 = 1 | Not used |
| b4 = 1 | Not used |
| b3 = 1 | Calibration data Error |
| b2 = 1 | Not used |
| b1 = 1 | Setup data Error |
| b0 = 1 | Not used |

*Here is an example of requesting and answering telegrams :*

**Request**

10 5B 01 5C 16

**Answer**

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 68 | 64 | 64 | 68 | 08 | 01 | 72 | 78 | 56 | 34 | 02 | A5 | 25 | 1D | 02 | 00 |
| 00 | 00 | 00 | 8E | 50 | 04 | 00 | 00 | 00 | 00 | 00 | 00 | 85 | 50 | 2B | 00 |
| 00 | 00 | 00 | 8E | 90 | 40 | 04 | 00 | 00 | 00 | 00 | 00 | 00 | 85 | 90 | 40 |
| 2B | 00 | 00 | 00 | 00 | 8E | 60 | 04 | 00 | 00 | 00 | 00 | 00 | 00 | 85 | 60 |
| 2B | 00 | 00 | 00 | 00 | 8E | A0 | 40 | 04 | 00 | 00 | 00 | 00 | 00 | 00 | 85 |
| A0 | 40 | 2B | 00 | 00 | 00 | 00 | 05 | FD | 3A | 00 | 00 | 80 | 3F | 01 | FD |
| 17 | 00 | 1F | 00 | 00 | 00 | 00 | 00 | 5F | 16 | | | | | | |

**Meaning**

| Unit | Tariff | Storage | Data | Value | Funct. | VIB |
|---|---|---|---|---|---|---|
| 1 | 1 | 0 | BCD12 | 000000000000 | Inst. | Energy 10 [Wh] |
| 1 | 1 | 0 | REAL4 | 0.000000e+000 | Inst. | Power [W] |
| 2 | 1 | 0 | BCD12 | 000000000000 | Inst. | Energy 10 [Wh] |
| 2 | 1 | 0 | REAL4 | 0.000000e+000 | Inst. | Power [W] |
| 1 | 2 | 0 | BCD12 | 000000000000 | Inst. | Energy 10 [Wh] |
| 1 | 2 | 0 | REAL4 | 0.000000e+000 | Inst. | Power [W] |
| 2 | 2 | 0 | BCD12 | 000000000000 | Inst. | Energy 10 [Wh] |
| 2 | 2 | 0 | REAL4 | 0.000000e+000 | Inst. | Power [W] |
| 0 | 0 | 0 | REAL4 | 1.000000e+000 | Inst. | No VIF |
| 0 | 0 | 0 | INT1 | 0 | Inst. | Error Flags (binary) |
| 0 | 0 | 0 | Special | 00 00 00 00 00 | Inst. | |

**Request**

10 7B 01 7C 16

**Answer**

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 68 | 4B | 4B | 68 | 08 | 01 | 72 | 78 | 56 | 34 | 02 | A5 | 25 | 1D | 02 | 01 |
| 00 | 00 | 00 | 05 | FD | D9 | FF | 01 | 00 | 00 | 00 | 00 | 05 | FD | D9 | FF |
| 02 | 00 | 00 | 00 | 00 | 05 | FD | D9 | FF | 03 | 00 | 00 | 00 | 00 | 05 | FD |
| C8 | FF | 01 | 00 | 00 | 00 | 00 | 05 | FD | C8 | FF | 02 | 00 | 00 | 00 | 00 |
| 05 | FD | C8 | FF | 03 | 00 | 00 | 00 | 00 | 1F | 00 | 00 | 00 | 00 | 00 | 7D |
| 16 | | | | | | | | | | | | | | | |

**Meaning**

| Unit | Tariff | Storage | Data | Value | Funct. | VIB |
|---|---|---|---|---|---|---|
| 0 | 0 | 0 | REAL4 | 0.000000e+000 | Inst. | Current [mA]->Next VIFE Manufacturer specific->Too |
| 0 | 0 | 0 | REAL4 | 0.000000e+000 | Inst. | Current [mA]->Next VIFE Manufacturer specific->Stor |
| 0 | 0 | 0 | REAL4 | 0.000000e+000 | Inst. | Current [mA]->Next VIFE Manufacturer specific->Unit |
| 0 | 0 | 0 | REAL4 | 0.000000e+000 | Inst. | Voltage 100 [mV]->Next VIFE Manufacturer specific-> |
| 0 | 0 | 0 | REAL4 | 0.000000e+000 | Inst. | Voltage 100 [mV]->Next VIFE Manufacturer specific-> |
| 0 | 0 | 0 | REAL4 | 0.000000e+000 | Inst. | Voltage 100 [mV]->Next VIFE Manufacturer specific-> |
| 0 | 0 | 0 | Special | 00 00 00 00 00 | Inst. | |

**Request**

10 5B 01 5C 16

**Answer**

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 68 | 9E | 9E | 68 | 08 | 01 | 72 | 78 | 56 | 34 | 02 | A5 | 25 | 1D | 02 | 02 |
| 00 | 00 | 00 | 85 | 40 | AB | FF | 01 | 00 | 00 | 00 | 00 | 85 | 40 | AB | FF |
| 02 | 00 | 00 | 00 | 00 | 85 | 40 | AB | FF | 03 | 00 | 00 | 00 | 00 | 85 | 80 |
| 40 | AB | FF | 01 | 00 | 00 | 00 | 00 | 85 | 80 | 40 | AB | FF | 02 | 00 | 00 |
| 00 | 00 | 85 | 80 | 40 | AB | FF | 03 | 00 | 00 | 00 | 00 | 05 | FD | BA | FF |
| 01 | 00 | 00 | 80 | 3F | 05 | FD | BA | FF | 02 | 00 | 00 | 80 | 3F | 05 | FD |
| BA | FF | 03 | 00 | 00 | 80 | 3F | 05 | FD | C8 | FF | 04 | 00 | 00 | 00 | 00 |
| 05 | FD | C8 | FF | 05 | 00 | 00 | 00 | 00 | 05 | FD | C8 | FF | 06 | 00 | 00 |
| 00 | 00 | 05 | FD | D9 | FF | 04 | 00 | 00 | 00 | 00 | 05 | FF | 5A | 00 | 00 |
| 00 | 00 | 02 | FD | 3A | 01 | 00 | 02 | FD | 3A | 0A | 00 | 0F | 00 | 00 | 00 |
| 00 | 00 | 36 | 16 | | | | | | | | | | | | |

**Meaning**

| Unit | Tariff | Storage | Data | Value | Funct. | VIB |
|---|---|---|---|---|---|---|
| 1 | 0 | 0 | REAL4 | 0.000000e+000 | Inst. | Power [W]->Next VIFE Manufacturer specific->Too m |
| 1 | 0 | 0 | REAL4 | 0.000000e+000 | Inst. | Power [W]->Next VIFE Manufacturer specific->Storag |
| 1 | 0 | 0 | REAL4 | 0.000000e+000 | Inst. | Power [W]->Next VIFE Manufacturer specific->Unit n |
| 2 | 0 | 0 | REAL4 | 0.000000e+000 | Inst. | Power [W]->Next VIFE Manufacturer specific->Too m |
| 2 | 0 | 0 | REAL4 | 0.000000e+000 | Inst. | Power [W]->Next VIFE Manufacturer specific->Storag |
| 2 | 0 | 0 | REAL4 | 0.000000e+000 | Inst. | Power [W]->Next VIFE Manufacturer specific->Unit n |
| 0 | 0 | 0 | REAL4 | 1.000000e+000 | Inst. | No VIF->Next VIFE Manufacturer specific->Too many |
| 0 | 0 | 0 | REAL4 | 1.000000e+000 | Inst. | No VIF->Next VIFE Manufacturer specific->Storage n |
| 0 | 0 | 0 | REAL4 | 1.000000e+000 | Inst. | No VIF->Next VIFE Manufacturer specific->Unit numb |
| 0 | 0 | 0 | REAL4 | 0.000000e+000 | Inst. | Voltage 100 [mV]->Next VIFE Manufacturer specific-> |
| 0 | 0 | 0 | REAL4 | 0.000000e+000 | Inst. | Voltage 100 [mV]->Next VIFE Manufacturer specific-> |
| 0 | 0 | 0 | REAL4 | 0.000000e+000 | Inst. | Voltage 100 [mV]->Next VIFE Manufacturer specific->Da |
| 0 | 0 | 0 | REAL4 | 0.000000e+000 | Inst. | Current [mA]->Next VIFE Manufacturer specific->Tariff nu |
| 0 | 0 | 0 | REAL4 | 0.000000e+000 | Inst. | Manufacturer specific->5A |
| 0 | 0 | 0 | INT2 | 1 | Inst. | No VIF |
| 0 | 0 | 0 | INT2 | 10 | Inst. | No VIF |
| 0 | 0 | 0 | Special | 00 00 00 00 00 | Inst. | |

## 1.2.3 Reading of Instantaneous Active Power :

Reading of P, P1, P2, P3 is made with following SND_UD telegram :

| **Field Name** | **Number of byte** | **Value** | **Meaning** |
|---|---|---|---|
| Start | 1 | 68h | Start |
| L-f | 1 | 06h | *Header* |
| L-f | 1 | 06h | |
| Start | 1 | 68h | |
| C-f | 1 | 53h/73h | *SND_UD* |
| A-f | 1 | ***PADR*** | Primary Address |
| CI-f | 1 | 51h | Data send |
| DIF | 1 | 88h | Selection for Readout |
| DIFE | 1 | 0Xh | Parameter |
| VIF | 1 | 28h | |
| Check Sum | 1 | CS | |
| Stop | 1 | 16h | Stop |

DIFE :

0X h : 00 h -> P
01 h -> P1
02 h -> P2
03 h -> P3

Parameter in RSP_UD :

XXXXXXXX : 32 Bit Integer, before LSB .

For any KT value we have the following unit for Power :

| **KT = KTA * KTV** | **Unit** | **VIF** |
|---|---|---|
| < 5000 | 1 W | 2Bh |
| >= 5000 | 0,1 kW | 2Dh |

**Reading example of Active Power :**

| | |
|---|---|
| SND_UD | 68 06 06 68 73 FE 51 88 00 28 72 16 |
| E5h | E5 |
| REQ_UD2 | 10 5B FE 59 16 |
| RSP_UD | 68 16 16 68 08 01 72 00 00 00 00 A8 15 00 02 6B 00 00 00 84 00 2B 0E B0 03 00 7C 16 |

Received data 0E B0 03 00 h
Hexadecimal value = 00 03 B0 0E h
Decimal value = 241678 d

### 1.2.4 Reading of istantaneous phase voltages

To read V1,V2, V3 send the following SND_UD telegram and then REQ_UD2 :

| **Field Name** | **Number of byte** | **Value** | **Meaning** |
|---|---|---|---|
| Start | 1 | 68h | Start |
| L-f | 1 | 07h | *Header* |
| L-f | 1 | 07h | |
| Start | 1 | 68h | |
| C-f | 1 | 53h/73h | *SND_UD* |
| A-f | 1 | ***PADR*** | Primary Address |
| CI-f | 1 | 51h | Data send |
| DIF | 1 | 88h | Selection for Readout |
| DIFE | 1 | 0Xh | Parameter |
| VIF | 1 | FDh | |
| VIFE | 1 | 40h | Voltages |
| Check Sum | 1 | CS | |
| Stop | 1 | 16h | Stop |

DIFE :

0X h : 01 h -> V1
02 h -> V2
03 h -> V3

Parameter in RSP_UD :

XXXXXXXX : 32 Bit Integer before LSB.

| **KTV** | **Risolution** |
|---|---|
| 1 <= KTV < 10 | 0.01 V |
| 10 <= KTV < 100 | 0.1 V |
| 100 <= KTV | 1 V |

**Reading example of V1 :**

| | |
|---|---|
| SND_UD | 68 07 07 68 73 FE 51 88 01 FD 40 88 16 |
| E5h | E5 |
| REQ_UD2 | 10 7B FE 79 16 |
| RSP_UD | 68 17 17 68 08 01 72 11 11 11 11 A8 15 00 02 6F 00 00 00 84 01 FD **47** ED 59 00 00 FC 16 |

Received data ED 59 00 00 h
Hexadecimal value = 00 00 59 ED h
Decimal value = 23021 d

### 1.2.5 Reading of Istantaneous phase currents

To read I1, I2, I3 send the following SND_UD telegram and then REQ_UD2 :

| **Field Name** | **Number of byte** | **Value** | **Meaning** |
|---|---|---|---|
| Start | 1 | 68h | Start |
| L-f | 1 | 07h | *Header* |
| L-f | 1 | 07h | |
| Start | 1 | 68h | |
| C-f | 1 | 53h/73h | *SND_UD* |
| A-f | 1 | ***PADR*** | Primary Address |
| CI-f | 1 | 51h | Data send |
| DIF | 1 | 88h | Selection for Readout |
| DIFE | 1 | 0Xh | Parameter |
| VIF | 1 | FDh | |
| VIFE | 1 | 50h | Currents |
| Check Sum | 1 | CS | |
| Stop | 1 | 16h | Stop |

DIFE :

0X h : 01 h -> I1
02 h -> I2
03 h -> I3

Parameter in RSP_UD :

XXXXXXXX : 32 Bit Integer before LSB.

| **KTA** | **Risolution** |
|---|---|
| 1 <= KTA < 10 | 0.001 A |
| 10 <= KTA < 100 | 0.01 A |
| 100 <= KTA < 10000 | 0.1 A |

**Reading example of I1 :**

| | |
|---|---|
| SND_UD | 68 07 07 68 53 01 51 88 01 FD 50 7B 16 |
| E5h | E5 |
| REQ_UD2 | 10 7B FE 79 16 |
| RSP_UD | 68 17 17 68 08 01 72 11 11 11 11 A8 15 00 02 72 00 00 00 84 01 FD 59 AC 88 00 00 FF 16 |

Received data AC 88 00 00 h
Hexadecimal value = 00 00 88 AC h
Decimal value = 34988 d

### 1.2.6 Writing and reading of Primary Address

To write Primary Address send a SND_UD telegram :

| **Field Name** | **Number of byte** | **Value** | **Meaning** |
|---|---|---|---|
| Start | 1 | 68h | Start |
| L-f | 1 | 06h | *Header* |
| L-f | 1 | 06h | |
| Start | 1 | 68h | |
| C-f | 1 | 53h/73h | *SND_UD* |
| A-f | 1 | ***PADR*** | Primary Address |
| CI-f | 1 | 51h | Data send |
| DIF | 1 | 01h | 8 Bit Integer |
| VIF | 1 | 7Ah | BUS Address |
| Value | 1 | XX | Value |
| Check Sum | 1 | CS | |
| Stop | 1 | 16h | Stop |

Parameter :

XX : 0 .. 250

To read Primary Address send a SND_UD telegram and then REQ_UD2 :

| **Field Name** | **Number of byte** | **Value** | **Meaning** |
|---|---|---|---|
| Start | 1 | 68h | Start |
| L-f | 1 | 05h | *Header* |
| L-f | 1 | 05h | |
| Start | 1 | 68h | |
| C-f | 1 | 53h/73h | *SND_UD* |
| A-f | 1 | ***FE*** | Broadcast Address |
| CI-f | 1 | 51h | Data send |
| DIF | 1 | 08h | Selection for Readout |
| VIF | 1 | 7Ah | |
| Check Sum | 1 | CS | |
| Stop | 1 | 16h | Stop |

**Writing example of primary address 1 :**

| | |
|---|---|
| SND_UD | 68 06 06 68 73 FE 51 01 7A 01 3E 16 |
| E5h | E5 |

**Reading example of primary address 1 :**

| | |
|---|---|
| SND_UD | 68 05 05 68 53 FE 51 08 7A 24 16 |
| E5h | E5 |
| REQ_UD2 | 10 7B FE 79 16 |
| RSP_UD | 68 12 12 68 08 01 72 00 00 00 00 A8 15 00 02 9E 00 00 00 01 7A 01 54 16 |

## 1.2.7 Writing and reading of Secondary Address

To write Secondary Address send a SND_UD telegram and then REQ_UD2 :

| Field Name | Number of byte | Value | Meaning |
|---|---|---|---|
| Start | 1 | 68h | Start |
| L-f | 1 | 09h | *Header* |
| L-f | 1 | 09h | |
| Start | 1 | 68h | |
| C-f | 1 | 53h/73h | *SND_UD* |
| A-f | 1 | ***PADR*** | Primary Address |
| CI-f | 1 | 51h | Data send |
| DIF | 1 | 0Ch | 8 Bit Integer |
| VIF | 1 | 79h | |
| Value | 4 | X1X0X3X2X5X4X7X6 | LSB before |
| Check Sum | 1 | CS | |
| Stop | 1 | 16h | Stop |

To read Secondary Address send a SND_UD telegram and then REQ_UD2 :

| Field Name | Number of byte | Value | Meaning |
|---|---|---|---|
| Start | 1 | 68h | Start |
| L-f | 1 | 05h | *Header* |
| L-f | 1 | 05h | |
| Start | 1 | 68h | |
| C-f | 1 | 53h/73h | *SND_UD* |
| A-f | 1 | ***PADR*** | Primary Address |
| CI-f | 1 | 51h | Data send |
| DIF | 1 | 08h | |
| VIF | 1 | 79h | |
| Check Sum | 1 | CS | |
| Stop | 1 | 16h | Stop |

Parameter : in SND_UD and in RSP_UD
X1X0X3X2X5X4X7X6 => X7X6X5X4X3X2X1X0: 8 BCD digits.

**Writing example of secondary address 12345678 :**

| | |
|---|---|
| SND_UD | 68 09 09 68 53 FE 51 0C 79 78 56 34 12 3B 16 |
| E5h | E5 |

**Reading example of secondary address 12345678 :**

| | |
|---|---|
| SND_UD | 68 05 05 68 73 FE 51 08 79 43 16 |
| E5h | E5 |
| REQ_UD2 | 10 5B FE 59 16 |
| RSP_UD | 68 15 15 68 08 01 72 78 56 34 12 A8 15 00 02 0E 00 00 00 0C 79 78 56 34 12 F5 16 |

Received value = 78 56 34 12 h
Value 12345678

## 1.2.8 Writing of Baud Rate

To write Baud rate is necessary to send a SND_UD telegram :

| **Field Name** | **Number of byte** | **Value** | **Meaning** |
|---|---|---|---|
| Start | 1 | 68h | Start |
| L-f | 1 | 03h | *Header* |
| L-f | 1 | 03h | |
| Start | 1 | 68h | |
| C-f | 1 | 53h/73h | *SND_UD* |
| A-f | 1 | ***PADR*** | Primary Address |
| CI-f | 1 | BXh | Data send |
| Check Sum | 1 | CS | |
| Stop | 1 | 16h | Stop |

Parameter BXh

B8h => 300 bit/s BCh => 4800 bit/s
B9h => 600 bit/s BDh => 9600 bit/s
BAh => 1200 bit/s
BBh => 2400 bit/s

**Writing example of Baud rate of 9600 bit/s**

| | |
|---|---|
| SND_UD | 68 03 03 68 73 FE BD 2E 16 |
| E5h | E5 |

**NOTE :** as a consequence of a command to change any parameter, the device changes the internal data and then resets.

## 1.2.9 Application Reset

NEMO96HD allows application reset.
After this message NEMO96HD resets the answer counter, the pending selection frame, the error flags and responds with the ACK character (E5h) :

| Field Name | Number of byte | Value | Meaning |
|---|---|---|---|
| Start | 1 | 68h | |
| L-f | 1 | 03h | *Header* |
| L-f | 1 | 03h | |
| Start | 1 | 68h | |
| C-f | 1 | 53h/73h | *SND_UD* |
| A-f | 1 | ***PADR*** | Primary Address |
| CI-f | 1 | 50h | Application reset |
| Check Sum | 1 | CS | |
| Stop | 1 | 16h | |

## *1.3 Selection and Secondary Addressing*

*In an M-Bus network we can have at maximum 250 primary addresses, from 1 to 250, instead 0 is used for an unconfigurated device.*

*If there are more than 250 devices, we have to make an extension with secondary address.*

*Master sends the following SND_UD telegram to a Slave to select it :*

| **Field Name** | **Number of byte** | **Value** | **Meaning** |
|---|---|---|---|
| Start | 1 | 68h | |
| L-f | 1 | 0Bh | *Header* |
| L-f | 1 | 0Bh | |
| Start | 1 | 68h | |
| C-f | 1 | 53h/73h | *SND_UD* |
| A-f | 1 | ***FDh*** | Primary Address |
| CI-f | 1 | 52h | |
| Value | 4 | X1X0X3X2X5X4X7X6 | Secondary Address |
| Manufacturer code | 2 | A5 25 | "IME" = 25A5 |
| Device version | 1 | GEN | Version |
| Medium | 1 | 02 | Electricity |
| Check Sum | 1 | CS | |
| Stop | 1 | 16h | |

*If there is a Slave that has Secondary Address X7X6X5X4X3X2X1X0, with the right Manufacturer code, Device version and Medium it gives an ACK (0xE5) character as answer , otherwise there will be no answer.*

*If the Slave is correctly selected it change its state in "selected" . This means that it will answer to all commands REQ_UD2, made to the Slave with Primary Address 0xFD, with a RSP_UD. In other words Master uses Primary Address 253 (0xFD) to speak with Slave.*

*The Slave remains in a "selected" state until it receives either a selection command to a different Secondary Address or a SND_NKE command to Address 0xFD.*

*During the selection it is allowed to use 0xF wild card instead of any digit of Manufacturer code, Device version and Medium. For example 0xFFFF instead of 0xA525, 0xFF instead of 0x1D and 0xFF instead of 0x02.*

***Example***

*M -> S [68][0b][0b][68][53][fd][52][02][00][00][00][a5][25][1d][02][8d][16]*
*S -> M [e5]*
*M -> S [10][5b][fd][58][16]*
*M -> S*
*[68][64][64][68][08][01][72][02][00][00][00][a5][25][1d][02][04][00][00][00][8e]*
*[50][04][02][00][00][00][00][00 [16]*