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The english version follows on page 13

1. Grundlagen des Bussystems

Steckerbelegung : RS 232 serielle Schnittstelle

- 1) ---
- 2) TXD
- 3) RXD
- 4) ---
- 5) ---
- 6) ---
- 7) DTR
- 8) CTS
- 9) ---

Datenformat :

Bidirektionaler Uart Bus (asynchron)

Baudrate : 57.600 Bd

CTS-Leitung von Zentralen-Interfaxce kontrolliert die Datenmenge

Datenformat : 1 StartBit , 8 DataBits , 1 StopBit , NoParity

Ruf (von Zentrale) : 1..9 Byte inclusive Header (XOR Prüfung über alle Byte)

Antwort (vom PC) : 1..255 Byte inclusive Header (XOR Prüfung über alle Byte)

Alle Busdaten von Busgeräten werden auch an den PC gesendet.

Das Zeitverhalten von Ruf und Antwort sowie das ID-Polling wird im Anhang (Abs.4.0) beschrieben !

Daten Beispiele :

Gruppe 2. Daten vom PC zur Zentrale (Interface)

| | | | | | |
|------------|-----------|-----------|-----------|-----------|-----------|
| Fahrbehl : | 011 00001 | xxxx xxxx | T0aa aaaa | aaaa aaaa | rggg gggg |
|------------|-----------|-----------|-----------|-----------|-----------|

Paketlänge des Befehls (wird immer ohne Header und XOR berechnet)

Befehlsgruppe (z.B. Lokbehl)

Gruppe 3. Daten von der Zentrale zum PC

| | | | | | | |
|----------------------------------|-----------|-----------|-----------|-----------|---------|-----------|
| Fahrzeug (Lokadresse) abgemeldet | 010 00000 | xxxx xxxx | 0000 0011 | 00 AAAAAA | AAAAAAA | device ID |
|----------------------------------|-----------|-----------|-----------|-----------|---------|-----------|

Befehlsgruppe (z.B. Lokbehl)

Paketlänge des Befehls (wird immer ohne Header , XOR und Länge berechnet)

device ID .. Nummer des Busgerätes, welches den Befehl gesendet hat.

Berechnung XOR :

Byteweise "Exklusive Oder" Ergänzung auf '0' für gesamte Antwort (Incl. Header)

Voraussetzungen :

Die Zentrale muß als Softwareversion mindestens V2.3 haben.

2. Daten vom PC zur Zentrale

2.0 Befehle für Modellbahnfahrzeuge : Steuern der Geschwindigkeit, Richtung und Sonderfunktionen. Systemdatenhandling zur An-, Ab- und Belegtmeldung von Adressen sowie zur Konfiguration der Einstellungen.

| 2.000 Befehl | Header | Xor | Data1 | Data2 | Data3 | Data4 | Data5 | Data6 | Data7 |
|-----------------|------------|-----------|-----------|-----------|-----------|-------|-------|-------|-------|
| Lok Fahrdaten : | 011 00 001 | xxxx xxxx | T0AA AAAA | AAAA AAAA | rggg gggg | | | | |

Fahrbefehl für Loks mit 14, 28 und 128 Fahrstufen (Die Fahrstufenanzahl ergibt sich aus den Konfigurationsdaten)

Bytelänge = 3 (5) - Header = 1

A13 .. A0 = Lokadresse (0..10239) - r = Fahrtrichtung (1=vorwärts) - g6 .. g0 = Geschwindigkeit (nach NMRA) – T = [1] Lok in Traktion verwendet, [0] nicht verwendet

| 2.010 Befehl | Header | Xor | Data1 | Data2 | Data3 | Data4 | Data5 | Data6 | Data7 |
|----------------------|------------|-----------|-----------|-----------|-----------|-------|-------|-------|-------|
| Lok Funktionsdaten : | 011 00 010 | xxxx xxxx | T0AA AAAA | AAAA AAAA | L0ws ssss | | | | |

Funktionsbefehl für Loks (Standardfunktionen und Licht)

Bytelänge = 3 (5) - Header = 2

A13 .. A0 = Lokadresse (0..10239) - L = Lichtbefehl (1=an) - w = Funktionszustand (1=an) - s4 .. s0 = Funktionsnummer (1..31)

Lichtbefehl wird nur ausgewertet, wenn Funktionsnummer = 0 – T = [1] Lok in Traktion verwendet, [0] nicht verwendet

| 2.020 Befehl (V1.4) | Header | Xor | Data1 | Data2 | Data3 | Data4 | Data5 | Data6 | Data7 |
|---------------------|------------|-----------|-----------|-----------|-----------|-------|-------|-------|-------|
| Lok an-/abmelden : | 011 00 100 | xxxx xxxx | T0AA AAAA | AAAA AAAA | kk0k 0000 | | | | |

Anmeldung und Abmeldung von Loks

Bytelänge = 3 (5) - Header = 4

A13 .. A0 = Lokadresse (0..10239) - k7 = [1] bedingungslose Anmeldung – k6 aktiv (1) / passiv (0) Abmelden - k4 = Anmelden (1) / Abmelden (0) – T = [1] Lok in Traktion verwendet, [0] nicht verwendet

| 2.030 Befehl (V1.4) | Header | Xor | Data1 | Data2 | Data3 | Data4 | Data5 | Data6 | Data7 |
|---------------------|------------|-----------|-----------|-----------|-----------|-----------|-------|-------|-------|
| Lok konfigurieren : | 100 00 101 | xxxx xxxx | T0AA AAAA | AAAA AAAA | kk00 kkkk | tttt tttt | | | |
| Lok loeschen | 010 00 101 | xxxx xxxx | 00AA AAAA | AAAA AAAA | | | | | |

Konfiguration von angemeldeten Loks

Bytelänge = 4 (6) - Header = 5

A13 .. A0 = Lokadresse (0..10239) - k7 = dauerhaft in EE (1) / flüchtig in Ram (0) speichern - k6 = unused – k5 = unused – k4 = unused -

k3 = Lok nach NMRA [0], Motorola [1] - k2 = parallele [1] serielle [0] Funktionen - k1..k0 = 14 [00] / 28[01] / 128 [10] Fahrstufen

t7 .. t0 = Loktypnummer (Bild) – T = [1] Lok in Traktion verwendet, [0] nicht verwendet

Löschen von gespeicherten Loks

Bytelänge = 2 (4) - Header = 5

2.1 Schalt- und Meldedaten : Befehle für Zusatzfunktionen wie Weichen oder Signale Schalten. Rückmeldungen für automatischen Betrieb von Adressleseköpfen, Kontakten oder Belegtmeldern.

| 2.100 Befehl | Header | Xor | Data1 | Data2 | Data3 | Data4 | Data5 | Data6 | | |
|--------------------------|------------|-----------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|--|--|
| NMRA Befehl (3..6 Byte): | LLL 01 000 | xxxx xxxx | NMRA <byte1> | NMRA <byte2> | NMRA <byte3> | NMRA <byte4> | NMRA <byte5> | NMRA <byte6> | | |

NMRA Befehl : sendet beliebiges NMRA-Packet auf Gleis
 Bytelänge [for packet size 3 .. 6] = 3 .. 6 (5 .. 8) - Header = 8
 LLL = Packetgröße für NMRA packet 3 .. 6

| 2.110 Befehl | Header | Xor | Data1 | Data2 | Data3 | Data4 | Data5 | Data6 | Data7 |
|-------------------|------------|-----------|------------|------------|-----------|-----------|-------|-------|-------|
| Adresslesegerät : | 100 01 001 | xxxx xxxx | 00 aa aaaa | 00 AA AAAA | AAAA AAAA | rggg gggg | | | |

Adresslesemeldung (mit Loknummer, Richtung + Geschwindigkeit)
 Bytelänge = 4 (6) - Header = 9
 a6 .. a0 = Gerätenummer (Lesekopf) - A13 .. A0 = gelesene Lokadresse - r = Fahrtrichtung (1=vorwärts) - g6 .. g0 = Geschwindigkeit (noch ungenormt)

| 2.120 Befehl | Header | Xor | Data1 | Data2 | Data3 | Data4 | Data5 | Data6 | Data7 |
|-------------------|------------|-----------|-----------|-----------|-------|-------|-------|-------|-------|
| Weiche schalten : | 010 01 010 | xxxx xxxx | 00ss ssss | ssss SSzr | | | | | |

Funktionsbefehl (Für Weichen, Signale, ...)
 Bytelänge = 2 (4) - Header = 10
 s13 .. s4 = Weichengruppennummer (4er Block) - S3 .. S2 = Unteradresse - z = Schaltzustand (1=Aktiv) - r = Richtung (0=rechts)

| 2.130 Befehl | Header | Xor | Data1 | Data2 | Data3 | Data4 | Data5 | Data6 | Data7 |
|------------------|------------|-----------|-----------|-----------|-------|-------|-------|-------|-------|
| Rückmeldemodul : | 010 01 011 | xxxx xxxx | 00ss ssss | ssss ss0r | | | | | |

Rückmeldung (Kontakte, Belegtmelder, Schaltpulte, ...)
 Bytelänge = 2 (4) - Header = 11
 s13 .. s4 = Weichengruppennummer (4er Block) - S3 .. S2 = Unteradresse - r = Richtung (0=rechts)

2.2 Notaus und Programmierbefehle : Systembefehle für Notausfunktionen (Stromloses Gleis, Resetpackete, Betrieb) Automatikfunktionen Lok + Weiche

| 2.200 Befehl | Header | Xor | Data1 | Data2 | Data3 | Data4 | Data5 | Data6 | Data7 |
|-------------------|------------|-----------|-------|-------|-------|-------|-------|-------|-------|
| Notaus aufheben : | 000 10 000 | xxxx xxxx | | | | | | | |

Normalen Fahrbetrieb nach einer beliebigen Notausmeldung wieder aufnehmen.

Bytelänge = 0 (2) - Header = 16

Keine weiteren Datenbytes nötig.

| 2.210 Befehl | Header | Xor | Data1 | Data2 | Data3 | Data4 | Data5 | Data6 | Data7 |
|-------------------|------------|-----------|-------|-------|-------|-------|-------|-------|-------|
| Notaus auslösen : | 000 10 001 | xxxx xxxx | | | | | | | |

Notausbefehl : Schaltet das Gleis sofort stromlos.

Bytelänge = 0 (2) - Header = 17

Keine weiteren Datenbytes nötig.

| 2.220 Befehl | Header | Xor | Data1 | Data2 | Data3 | Data4 | Data5 | Data6 | Data7 |
|------------------------|------------|-----------|-------|-------|-------|-------|-------|-------|-------|
| Nothalt (Resetpaket) : | 000 10 010 | xxxx xxxx | | | | | | | |

Notausbefehl : Veranlasst das senden von Resetpacketen auf dem Gleis. Alle Loks halten an.

Bytelänge = 0 (2) - Header = 18

Keine weiteren Datenbytes nötig.

| 2.230 Befehl (V1.6) | Header | Xor | Data1 | Data2 | Data3 | Data4 | Data5 | Data6 | Data7 |
|----------------------------|------------|-----------|---------------|---------------|------------|-----------|-----------|-----------|-------|
| Automatik : Lok / Kontakt | 110 10 011 | xxxx xxxx | K0 ssssss (1) | ssss ss0r (1) | 00 AA AAAA | AAAA AAAA | TA00 RRRR | tttt tttt | |
| Automatik : Weiche / Kont. | 110 10 011 | xxxx xxxx | K0 ssssss (1) | ssss ss0r (1) | 00ss ssss | ssss ssZr | TA00 0000 | tttt tttt | |

An- bzw. Abmeldung einer Lokpendelsteuerung

Bytelänge = 6 (8) - Header = 19

K = Anschalten (1) / Abschalten (0) - s12 ..s1/r0 = Rückmeldenummer - A13 .. A0 = Lok-/Weichenadresse (0..10239) -

t = Aufenthaltszeitwert 1bis250 sec. (00h = Zeitwert deaktiv) - T = Fahrbefehl [0], Schaltbefehl [1] - A = Rückmelder [0], Adressleser [1] – rr = löse Aktion aus, wenn eingehende Richtungsinformation nur vorwärts [00], nur rückwärts [01], beide Richtungen [10], reserved [11] – RRRR = ausgehendes Kommando Vorwärtsfahrt [0000], Rückwärtsfahrt [0001], gleiche Richtung [0010], inverse Richtung [0011], Halt [0100], Langsamfahrt (50%) [0101], Originalgeschwindigkeit herstellen [0110], reserved [0111..1111]

2.3 Befehle zum Programmieren und Auslesen der Dekodereinstellungen im Register und CV-Mode.

| 2.300 Befehl | Header | Xor | Data1 | Data2 | Data3 | Data4 | Data5 | Data6 | Data7 |
|--------------------------|------------|-----------|-----------|-----------|-------|-------|-------|-------|-------|
| Programmieren Register : | 010 10 100 | xxxx xxxx | 0000 0aaa | dddd dddd | | | | | |

Programmierbefehl : Programmiert einen Dekoder auf dem Programmiergleis im Registermode (nach NMRA).

Bytelänge = 2 (4) - Header = 20

aaa = Registernummer 1(0_h) bis 8(7_h) - dddd dddd = Zu programmierender Wert.

Nach diesem Befehl wird der Bus angehalten und in einem folgenden 'C0'-Ruf die Antwort gesendet. (Siehe : Daten von Zentrale zu Busgerät)

| 2.310 Befehl | Header | Xor | Data1 | Data2 | Data3 | Data4 | Data5 | Data6 | Data7 |
|--------------------|------------|-----------|-----------|-----------|-----------|-------|-------|-------|-------|
| Programmieren CV : | 011 10 101 | xxxx xxxx | 0000 00aa | aaaa aaaa | dddd dddd | | | | |

Programmierbefehl : Programmiert einen Dekoder auf dem Programmiergleis im CV-Direktmode (nach NMRA).

Bytelänge = 3 (5) - Header = 21

aa aaaa aaaa = CV-Nummer 1(000_h) bis 1024(3FF_h) - dddd dddd = Zu programmierender Wert.

Nach diesem Befehl wird der Bus angehalten und in einem folgenden 'C0'-Ruf die Antwort gesendet. (Siehe : Daten von Zentrale zu Busgerät)

| 2.320 (V1.3 | Header | Xor | Data1 | Data2 | Data3 | Data4 | Data5 | | Data7 |
|---------------------|------------|-----------|-----------|-----------|-----------|-----------|-----------|--|-------|
| Programmieren POM : | 101 10 101 | xxxx xxxx | 0000 00aa | aaaa aaaa | dddd dddd | 00AA AAAA | AAAA AAAA | | |

Programmierbefehl : Programmiert einen Dekoder auf dem Fahrgleis mittels POM (nach NMRA).

Bytelänge = 5 (7) - Header = 21

a9 .. a0 = CV-Nummer 1(000_h) bis 1024(3FF_h) - d7 .. d0 = Zu programmierender Wert - A13 .. A0 = gewählte Lokadresse

| 2.330 Befehl | Header | Xor | Data1 | Data2 | Data3 | Data4 | Data5 | Data6 | Data7 |
|---------------|------------|-----------|-----------|-----------|-------|-------|-------|-------|-------|
| Auslesen CV : | 010 10 110 | xxxx xxxx | 0000 00aa | aaaa aaaa | | | | | |

Programmierbefehl : Liest einen Dekoder auf dem Programmiergleis im CV-Direktmode aus (nach NMRA).

Bytelänge = 2 (4) - Header = 22

aa aaaa aaaa = CV-Nummer 1(000_h) bis 1024(3FF_h)

Nach diesem Befehl wird der Bus angehalten und in einem folgenden 'C0'-Ruf die Antwort gesendet. (Siehe : Daten von Zentrale zu Busgerät)

2.4 Systembefehle : Geräte An- und Abmeldung, Busbelegung, ...

| 2.400 Befehl (V1.5) | Header | XOR | Data1 | Data2 | Data3 | Data4 | Data5 | Data6 | Data7 |
|-------------------------|------------|-----------|-------|-------|-------|-------|-------|-------|-------|
| Zentralen Konfiguration | 000 11 101 | xxxx xxxx | | | | | | | |

Busbefehl : Speichert die aktuellen Lokeinstellungen inclusive aktuellen Fahr- und Funktionsbefehlen im EEPROM.

Bytelänge = 0 (2) - Header = 29

| 2.410 Befehl | Header | XOR | Data1 | Data2 | Data3 | Data4 | Data5 | Data6 | Data7 |
|---------------------------|-----------|-----------|-----------|-----------|-----------|----------------------|---------------------|-------|-------|
| Interface konfigurieren : | 101 11000 | xxxx xxxx | 0000 000k | 0000 0000 | 0000 0000 | manufacturer ID high | manufacturer ID low | | |

Grundeinstellungen für das DiMAX-Interface

packetlength = 5 (7) - Header = 24

k0 ... Statusmeldungen an PC senden (3.030) [1] = aktiv, [0] = inaktiv ;

data3 ... Prüfbits für Massoth interne Testzwecke (immer auf 0 setzen)

data4..data5 ... = Herstellerkennung

Dieser Befehl muß immer als erstes an die Zentrale gesendet werden. Nur bei einer gültigen Herstellerkennung wird das Interface aktiviert.

3. Daten von Zentrale zum PC

3.0 Systemruf (Message) : Statusmeldungen des Masters (Zentrale) an den PC

| 3.000 Befehl | ID | XOR | Größe | Data1 | Data2 | Data3 | Data4 | Data5 | Data6 |
|---------------------|-----------|------------|--------------|-----------------|--------------|--------------|--------------|--------------|--------------|
| Systemstatus : | 00 h | xxxx xxxx | 0000 0001 | 100 FSnn | | | | | |

Masterruf : Zyklisch wiederkehrender Universalruf an alle angeschlossenen Busgeräte und PC mit einer Statusmeldung

Bytelänge = 1 (4) - Header = 00

E = Busfehler (=1) - U = Zentrale im Updatemodus - S = Reset durchführen (= 1) - nn = Notausstatus (00=Betrieb, 01=Stromlos, 10 = Resetpakete)

| 3.010 Befehl | ID | XOR | Größe | Data1 | Data2 | Data3 | Data4 | Data5 | Data6 |
|---------------------|-----------|------------|--------------|--------------|-----------------|--------------|--------------|--------------|--------------|
| Updatemeldung : | 00 h | xxxx xxxx | 0000 0010 | 100 01000 | <u>00</u> ttttt | | | | |

Masterruf : Busruf an alle angeschlossenen Busgeräte und PC zum Start des Bootloaderupdates eines Busgerätes.

Bytelänge = 2 (5) - Header = 00

ttttt = Gerätenummer des gewünschten Gerätes (09h = 400h , 11h = 4FE433 , = 600A)

– Bei einem laufenden Update muß der PC den Betrieb einstellen. Erst nach einem Zentralenneustart kann die Verbindung wieder aufgebaut werden.

| 3.020 (Future use) | ID | XOR | Größe | Data1 | Data2 | Data3 | Data4 | Data5 | Data6 |
|---------------------------|-----------|------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Message ausgeben : | 00 h | xxxx xxxx | 0000 0001 | 101 mmmmm | | | | | |

Masterruf : Busruf an alle angeschlossenen Busgeräte und mit einer Nachrichten-Nummer

Bytelänge = 1 (4) - Header = 00

mmmmm = Nummer der anzuzeigenden Nachricht.

| 3.030 Befehl | ID | XOR | Größe | Data1 | Data2 | Data3 | Data4 | Data5 | Data6 |
|---------------------|-----------|------------|--------------|-------------------|--------------|------------------|--------------|-------------------|--------------|
| Systembelastung : | 00 h | xxxx xxxx | 0000 0101 | 110 <u>0</u> bbbb | iiii iiii | <u>00</u> zzzzzz | vvvv vvvv | <u>00</u> YYYYYYY | |

Masterruf : Zyklisch wiederkehrender Universalruf an alle angeschlossenen Busgeräte und PC mit einer Belastungsmeldung.

Bytelänge = 5 (8) - Header = 0

bbbb = Strombegrenzungswert (1=1A .. 15=15A) - iiii = aktuelle Strombelastung (100mA Schrittweite) -

vvvvvvv = Softwareversion (4Bit Vorkommastelle + 4Bit Nachkommastelle) - YYYYYY = Lokrestmenge der maximal möglichen Anmeldungen.

zzzzz = Zentralentyp (\$01=DiMAX1200Z , \$02=DiMAX800Z , \$05=MZS3 , \$09=XPressNet , \$0A=LocoNet)

3.1 **Sofortige Systemantwort (Answer) : Wird in direktem Anschluß an einen Befehl gesendet, wenn der Befehl auf diesen Ruf eine sofortige Antwort erfordert..**

| 3.100 Befehl (erw. V1.8) | ID | XOR | Größe | Data1 | Data2 | Data3 | Data4 | Data5 | Data6 | Data7 | Data8 |
|--------------------------|------|-----------|----------|-----------|----------|-----------|-----------|-----------|----------------------------|---------------------------|-----------|
| Lokadresse frei : | 40 h | xxxx xxxx | 000 1000 | 00 AAAAAA | AAAAAAAA | LkkQ kkkk | tttt tttt | rggg gggg | ffff ffff _{16..9} | ffff ffff _{8..1} | Geräte-ID |

Masterruf : Antwort auf Lokanmeldung, wenn Lok frei, mit aktuellem Lokkonfig und Lokzustand.

Bytelänge = 8 (11) - Header = 40h

A = Lokadresse (0..10239) - L = Lichtzustand [1] An - k6 = Lok in Automatikbetrieb [1], Normalbetrieb [0] - k5 = belegt (gestohlen) - k4 = unused -

k3 = Lok nach NMRA [0], Motorola [1] - k2 = Funktionsart parallel[1] / seriell [0] - k1/k0 = Fahrstufenanzahl 00=14 / 01=28 / 10=128) -

t = Loktypnummer (Lokbild) - r = Fahrtrichtung [1] vorwärts - g = Geschwindigkeit (nach NMRA)

f_{16..1} = Zustand der jeweiligen Funktion [1] An

| 3.110 Befehl | ID | XOR | Größe | Data1 | Data2 | Data3 | Data4 | Data5 | Data6 |
|----------------------------|------|-----------|-----------|------------|-----------|----------|-----------|-------|-------|
| Lokadresse nicht nutzbar : | 40 h | xxxx xxxx | 0000 0100 | 10 000 ccc | 00 AAAAAA | AAAAAAAA | Geräte-ID | | |

Masterruf : Antwort auf Lokanmeldung, wenn Lok belegt oder unbekannt. Wenn unbekannt, muß vor erneuter Anmeldung ein Lokkonfig gesendet werden (Siehe 2.050)

Bytelänge = 4 (7) - Header = 40 h

ccc = Rückmeldecode (000 = Anzahl aktiver Loks erreicht , 001 = Lokadresse unbekannt - 010 = Lokadresse belegt , 011 = Lokliste voll , 100 = mehr als 5 Loks)

| 3.120 Befehl | ID | XOR | Größe | Data1 | Data2 | Data3 | Data4 | Data5 | Data6 |
|-------------------------|------|-----------|-----------|-----------|----------|-----------|-------|-------|-------|
| Lokadresse abgemeldet : | 60 h | xxxx xxxx | 0000 0011 | 00 AAAAAA | AAAAAAAA | Geräte-ID | | | |

Masterruf : Antwort auf erfolgreiche Lokabmeldung. Wenn diese Antwort nicht kommt, muß erneut abgemeldet werden.

Bytelänge = 3 (6) - Header = 60 h

A = Lokadresse (0..10239)

| 3.130 Befehl | ID | XOR | Größe | Data1 | Data2 | Data3 | Data4 | Data5 | Data6 |
|--------------------------|-----------|------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Programmierbestätigung : | 80 h | xxxx xxxx | 0000 0010 | 100 EEE 00 | Geräte-ID | | | | |

Masterruf : Antwort auf einen Programmierbefehl

Bytelänge = 2 (5) - Header = 80 h

EEE = Rückmeldecode (000 = keine Rückmeldung , 001 = Kurzschluß auf Gleis , 100 = Erfolgreiche Programmierung , 010 = Fremdspannung auf Programmiergleis)

| 3.231 Befehl | ID | XOR | Größe | Data1 | Data2 | Data3 | Data4 | Data5 | Data6 |
|----------------------|-----------|------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| CV-Ausleseergebnis : | 80 h | xxxx xxxx | 0000 0100 | 100 EEEAA | AAAA AAAA | dddd dddd | Geräte-ID | | |

Masterruf : Antwort auf einen CV-Auslesebefehl (Siehe 2.260).

Bytelänge = 4 (7) - Header = 80 h

EEE = Rückmeldecode (000 = keine/falsche Rückmeldung , 001 = Kurzschluß auf Gleis , 100 = Erfolgreiches Lesen) - A = gelsene CV - d = gelesener Wert.

| 3.140 Befehl | ID | XOR | Größe | Data1 | Data2 | Data3 | Data4 | Data5 | Data6 |
|------------------------|-----------|------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| XOR-Fehler in Befehl : | 40 h | xxxx xxxx | 0000 0001 | 111 11111 | | | | | |

Masterruf : Antwort auf einen beliebigen Befehl, dessen XOR-Prüfung ungleich '0' war. Der gleiche Befehl sollte im nächsten Ruf wiederholt werden.

Bytelänge = 1 (4) - Header = 40 h

4. Anhang

4.0 Zeitverhalten , Busruf + Polling

- Minimale Zeitdauer zwischen Befehl und Antwort = 0 msec.
- Maximale Zeitdauer zwischen Befehl und Antwort = 2 msec.

4.1 Befehls-Übersicht

| Nr. | Befehl | Header | Xor | Data1 | Data2 | Data3 | Data4 | Data5 | Data6 | Data7 | Ver. | S. |
|-------|--------------------------|------------|-----------|---------------|---------------|------------|-----------|-----------|-----------|-------|------|----|
| 2.000 | Lok Fahrdaten : | 011 00 001 | xxxx xxxx | T0AA AAAA | AAAA AAAA | rggg gggg | | | | | 1.0 | 3 |
| 2.010 | Lok Funktionsdaten : | 011 00 010 | xxxx xxxx | T0AA AAAA | AAAA AAAA | LQws ssss | | | | | 1.0 | 3 |
| 2.020 | Lok an-/abmelden : | 011 00 100 | xxxx xxxx | T0AA AAAA | AAAA AAAA | kk0k 0000 | | | | | 1.0 | 3 |
| 2.030 | Lok konfigurieren : | 100 00 101 | xxxx xxxx | T0AA AAAA | AAAA AAAA | k000 kkkk | tttt tttt | | | | 1.0 | 3 |
| | Lok löschen | 010 00 101 | xxxx xxxx | 00AA AAAA | AAAA AAAA | | | | | | 1.0 | 3 |
| 2.100 | NMRA Befehl (3..6 Byte): | LLL 01 000 | xxxx xxxx | NMRA <b1> | NMRA <b2> | NMRA <b3> | NMRA <b4> | NMRA <b5> | NMRA <b6> | | 1.3 | 4 |
| 2.110 | Adresslesegerät : | 100 01 001 | xxxx xxxx | Qsss ssss | Q0aa aaaa | aaaa aaaa | rggg gggg | | | | 1.0 | 4 |
| 2.120 | Weiche schalten : | 010 01 010 | xxxx xxxx | Q0ss ssss | ssss SSzr | | | | | | 1.0 | 4 |
| 2.130 | Rückmeldemodul : | 010 01 011 | xxxx xxxx | Q0ss ssss | ssss ss0r | | | | | | 1.0 | 4 |
| 2.200 | Notaus aufheben : | 000 10 000 | xxxx xxxx | | | | | | | | 1.0 | 5 |
| 2.210 | Notaus auslösen : | 000 10 001 | xxxx xxxx | | | | | | | | 1.0 | 5 |
| 2.220 | Nothalt (Resetpaket) : | 000 10 010 | xxxx xxxx | | | | | | | | 1.0 | 5 |
| 2.230 | Automatikfunktion Lok | 110 10 011 | xxxx xxxx | KQ ssssss (1) | ssss ss0r (1) | Q0 AA AAAA | AAAA AAAA | T000 RRRR | tttt tttt | | 1.2 | 5 |
| | Automatikfunktion Weiche | 110 10 011 | xxxx xxxx | KQ ssssss (1) | ssss ss0r (1) | Q0ss ssss | ssss ssZr | TA00 0000 | tttt tttt | | 1.2 | 5 |
| 2.300 | Programmieren Register : | 010 10 100 | xxxx xxxx | 0000 0aaa | dddd dddd | | | | | | 1.0 | 5 |
| 2.310 | Programmieren CV : | 011 10 101 | xxxx xxxx | 0000 00aa | aaaa aaaa | dddd dddd | | | | | 1.0 | 5 |
| 2.320 | Programmieren POM : | 101 10 101 | xxxx xxxx | 0000 00aa | aaaa aaaa | dddd dddd | 00AA AAAA | AAAA AAAA | | | 1.3 | 6 |
| 2.330 | Auslesen CV : | 010 10 110 | xxxx xxxx | 0000 00aa | aaaa aaaa | | | | | | 1.0 | 6 |
| 2.400 | Speichere Lokeinstellung | 000 11 101 | xxxx xxxx | | | | | | | | --- | 7 |
| 2.410 | Interface anmelden : | 101 11000 | xxxx xxxx | ssss ssss | ssss ssss | ssss ssss | ID-high | ID-lo | | | 1.2 | 7 |

4.2 Ruf-Übersicht + Direkte Antworten

| Nr. | Funktion | Ruf | Xor | Data1 | Data2 | Data3 | Data4 | Data5 | Data6 | Data7 | Data8 | D9 | Ver. | S. |
|-------|----------------------------|-----------|-----------|-----------|------------|-----------|-----------|-----------|-----------|----------------------------|---------------------------|----|------|----|
| 3.000 | Systemstatus : | 000 00000 | xxxx xxxx | 0000 0001 | 100 EUSnn | | | | | | | | 1.2 | 8 |
| 3.010 | Updatemeldung : | 000 00000 | xxxx xxxx | 0000 0011 | 100 01000 | 00 ttttt | device ID | | | | | | 1.2 | 8 |
| 3.020 | Message ausgeben : | 000 00000 | xxxx xxxx | 0000 0001 | 101 mmmmm | | | | | | | | 1.2 | 8 |
| 3.030 | Systembelastung : | 000 00000 | xxxx xxxx | 0000 0101 | 110 0 bbbb | iiii iii | 00 zzzzzz | vvvv vvvv | 00YYYYYY | | | | 1.2 | 8 |
| 3.110 | Lokadresse frei : | 010 00000 | xxxx xxxx | 0000 1000 | 00 AAAAAA | AAAAAAA | Lk00 kkkk | tttt tttt | rggg gggg | ffff ffff _{16..9} | ffff ffff _{8..1} | ID | 1.2 | 9 |
| 3.111 | Lokadresse nicht nutzbar : | 010 00000 | xxxx xxxx | 0000 0100 | 100 00 ccc | 00 AAAAAA | AAAAAAA | device ID | | | | | 1.2 | 9 |
| 3.120 | Lokadresse abgemeldet : | 011 00000 | xxxx xxxx | 0000 0011 | 00 AAAAAA | AAAAAAA | device ID | | | | | | 1.2 | 9 |
| 3.130 | Programmierbestätigung : | 100 00000 | xxxx xxxx | 0000 0010 | 100 EEE 00 | device ID | | | | | | | 1.2 | 10 |
| 3.131 | CV-Ausleseergebnis : | 100 00000 | xxxx xxxx | 0000 0100 | 100 EEEAA | AAAA AAAA | dddd dddd | device ID | | | | | 1.2 | 10 |
| 3.140 | XOR-Fehler in Befehl : | 001 00000 | xxxx xxxx | 0000 0001 | 1111 1111 | | | | | | | | 1.2 | 10 |

4.3 Hinweise

4.4 Revisionen

| Datum | version | Änderungen | Benötigte Zentralen-Software |
|----------|--------------|----------------------------------------------------|------------------------------|
| 13.10.06 | V1.2 beta1 | - Befehl 2.100 "NMRA-Befehl" hinzugefügt [Page 4] | V2.3 |
| 31.10.06 | V1.2 beta2 | - Befehl 2.030 "Lok löschen" überarbeitet [Page 3] | V2.3 |
| 12.12.06 | V1.2 | - Herstellerkennung eingefügt [Seite 7] | V2.3 |
| 21.06.08 | V1.2 Deutsch | --- | |

Irrtümer und Änderungen vorbehalten.

Massoth Interface-protokoll for DiMAX central stations:

Release: 11/06/2010 – V1.2a – (NR)

| | | | |
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1. Basics of the interface protokoll

connection :

RS232

- 1) ---
- 2) TXD
- 3) RXD
- 4) ---
- 5) ---
- 6) ---
- 7) DTR
- 8) CTS
- 9) ---

data format :

- bidirektional uart (asynchron) – baudrate : 57600 Baud
- data format : 1 start bit , 8 data bits , 1 stop bit , no parity
- call: 1 to 9 Bytes per instruction includes header and XOR-check over all bytes
- answer: 1 to 255 byte includes header, XOR (over all bytes) and packet length
- complete reflection of all traffic received on massoth-bus system
- CTS handshake from interface

packet definition:

Group: 2. Data from PC to Interface

example:

| | | | | | |
|-----------------|-----------|-----------|-----------|-----------|-----------|
| Drive command : | 011 00001 | xxxx xxxx | T0aa aaaa | aaaa aaaa | rggg gggg |
|-----------------|-----------|-----------|-----------|-----------|-----------|

packet length without xor and header byte (example: 3 Byte)

Group: 3. Data from interface to PC

example:

| | | | | | | |
|-------------------|-----------|-----------|-----------|-----------|-------|-----------|
| Vehilce log out : | 010 00000 | xxxx xxxx | 0000 0011 | 00 AAAAAA | AAAAA | device ID |
|-------------------|-----------|-----------|-----------|-----------|-------|-----------|

packet length without xor, header byte and packetlength itself (example: 3 Byte)

group header (f.e. vehicle commands)

device ID .. ID of the device for which the answer is intended

min. version of central firmware required:

V2.3

ID numbers :

- ID 01..20 =
- ID 21..28 =
- ID 29, 30, 32..64 =
- ID 31 =
- ID 100 =

- cable device ID's (Navigator, feedback module, etc.)
- wireless device ID's (receiver)
- reserved for future
- converter MZSII -> MZSIII DiMAX600A
- 'built in' interface

2. Data from PC to Interface

2.0 Commands for modell vehicles : controlling of speed, direction and function control.

Datahandling for execution: announce- , log out and allocation of addresses. Also for configuration and attitudes.

| 2.000 command | Header | Xor | Data1 | Data2 | Data3 | Data4 | Data5 | Data6 | Data7 |
|-----------------|-----------|-----------|-----------|-----------|-----------|-------|-------|-------|-------|
| Drive command : | 011 00001 | xxxx xxxx | T0aa aaaa | aaaa aaaa | rggg gggg | | | | |

Drive command for vehicles with 14, 28 and 128 drive steps (definition given in vehilce configuration)

packet size = 3 (5) - Header = 1

A13 .. A0 = vehicle address (0..10239) - r = direction (1=forward), (0=backward) - g6 .. g0 = speed (NMRA) - T = [1] loko part of traction, [0] not part [future use, data ignored]

| 2.010 command | Header | Xor | Data1 | Data2 | Data3 | Data4 | Data5 | Data6 | Data7 |
|--------------------|------------|-----------|-----------|-----------|-----------|-------|-------|-------|-------|
| Function command : | 011 00 010 | xxxx xxxx | T0AA AAAA | AAAA AAAA | L0ws ssss | | | | |

Funktions command for vehicles with light

packet size = 3 (5) - Header = 2

A13 .. A0 = vehicle address (0..10239) - L = Light on[1]/ off[0] - w = [1] funktion on/ [0] funktion off – s4 .. s0 = function number (1..31) – s = 0 -> evaluate light (L-bit) -

T = [1] loko part of traction, [0] not part [future use, data ignored]

INFO: Light instruction is only evaluated, if funktion number s = 0

| 2.020 command | Header | Xor | Data1 | Data2 | Data3 | Data4 | Data5 | Data6 | Data7 |
|------------------------|------------|-----------|-----------|-----------|-----------|-------|-------|-------|-------|
| Vehicle announcement : | 011 00 100 | xxxx xxxx | T0AA AAAA | AAAA AAAA | kk0k 0000 | | | | |

Announcement and log out of vehicles. Possible answers: 3.100, 3.110, 3.120

packet size = 3 (5) - Header = 4

A13 .. A0 = vehicle address (0..10239) – k7 [1] unconditional registration – k6 = vehicle deselect [1] active, [0] passiv – k4 = vehicle select [1], vehicle deselect [0] –

T = [1] loko part of traction, [0] not part [future use, data ignored]

| 2.030 command | Header | Xor | Data1 | Data2 | Data3 | Data4 | Data5 | Data6 | Data7 |
|-------------------------|------------|-----------|-----------|-----------|-----------|-----------|-------|-------|-------|
| Vehicle configuration : | 100 00 101 | xxxx xxxx | T0AA AAAA | AAAA AAAA | kkkk kkkk | tttt tttt | | | |
| Delete Vehicle : | 010 00 101 | xxxx xxxx | 00AA AAAA | AAAA AAAA | | | | | |

Configuration of announced vehicles

packet size = 4 (6) - Header = 5

packet size = 2 (4) - Header = 5

A13 .. A0 = vehicle address (0..10239) – k7 [1] store vehilce config in non volatile memory, [0] temporaly in RAM – k6 = unused – k5 = unused – k4 = unused -

k3 = vehicle address NMRA [0], Motorola [1] - k2 = Funktion parallel [1], serial [0] – k1..k0 = Speedsteps [00] = 14, [01] = 28, [10] = 128 - t7 .. t0 = picture of vehicle -

T = [1] loko part of traction, [0] not part [future use, data ignored]

Notes for handling the 'Delete Vehicle' command: The PC may only delete vehicle they: 1st. actually announced by the PC itself or, 2nd not announced by another bus device. If the command is used, and the loko is occupied from the PC, the vehilce must be logged out before [use command 2.020]. To recognize the vehilce announcement, the PC can monitor all the reflected commands which sent from the interface to PC.

2.1 Switch- and feedback commands : Commands for additional functions f.e. turnouts, signals and feedback information to make possible automatik control with addressreaders, contact, and occupied-moduls

| 2.100 command | Header | Xor | Data1 | Data2 | Data3 | Data4 | Data5 | Data6 | | |
|---------------------------|------------|-----------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----|------------------|
| NMRA command (3..6 Byte): | LLL 01 000 | xxxx xxxx | NMRA <byte1> | NMRA <byte2> | NMRA <byte3> | NMRA <byte4> | NMRA <byte5> | NMRA <byte6> | | |
| NMRA command (>6 Byte): | 111 01 000 | xxxx xxxx | packet size | NMRA <byte1> | NMRA <byte2> | NMRA <byte3> | NMRA <byte4> | NMRA <byte5> | ... | NMRA <byte n> |

NMRA command : includes a complete NMRA packet with XOR; the command may be used in a time interval more largely 50msec; the command is repeated three times directly on the track

packet size [for packetsize 3 .. 6] = 3 .. 6 (5 .. 8) - Header = 8

LLL = packet size for NMRA packet 3 .. 6

| 2.110 command (1) | Header | Xor | Data1 | Data2 | Data3 | Data4 | Data5 | Data6 | Data7 |
|-------------------|------------|-----------|------------|------------|-----------|-----------|-------|-------|-------|
| address reader : | 100 01 001 | xxxx xxxx | 00 aa aaaa | 00 AA AAAA | AAAA AAAA | rggg gggg | | | |

addressreadcommand (with vehicle number, direction + speed)

packet size = 4 (6) - Header = 9

a6 .. a0 = devicenumber (reading-head) - A13 .. A0 = readed vehicleaddress - r = direction forward [1], backward [0] - g6 .. g0 = speed (not yet specified!!!)

| 2.120 command | Header | Xor | Data1 | Data2 | Data3 | Data4 | Data5 | Data6 | Data7 |
|-------------------|------------|-----------|-----------|-----------|-------|-------|-------|-------|-------|
| turnout control : | 010 01 010 | xxxx xxxx | 00ss ssss | ssss SSzr | | | | | |

Switching command (for turnout, signals ...)

packet size = 2 (4) - Header = 10

s13 .. s2 = turnout address - r = direction right [1], left [0] - z = Port On/Off

| 2.130 command (1) | Header | Xor | Data1 | Data2 | Data3 | Data4 | Data5 | Data6 | Data7 |
|-------------------|------------|-----------|-----------|-----------|-------|-------|-------|-------|-------|
| feedback data : | 010 01 011 | xxxx xxxx | 00ss ssss | ssss ss0r | | | | | |

Feedback message of contacts, occupied-modul

packet size = 2 (4) - Header = 11

s13 .. s2 = switching address - r = direction right [1], left [0]

2.2 Emergency and programming instructions : Commands for emergency stop and go (power off track, NMRA resetpackets)

| 2.200 command | Header | Xor | Data1 | Data2 | Data3 | Data4 | Data5 | Data6 | Data7 |
|------------------------|------------|-----------|-------|-------|-------|-------|-------|-------|-------|
| Reset Emergency stop : | 000 10 000 | xxxx xxxx | | | | | | | |

Switch to normal drivemode after a Emergency condition.
packet size = 0 (2) - Header = 16
Requires no additional data.

| 2.210 command | Header | Xor | Data1 | Data2 | Data3 | Data4 | Data5 | Data6 | Data7 |
|----------------------|------------|-----------|-------|-------|-------|-------|-------|-------|-------|
| Set Emergency stop : | 000 10 001 | xxxx xxxx | | | | | | | |

Turn-off railpower.
packet size = 0 (2) - Header = 17
Requires no additional data.

| 2.220 Command | Header | Xor | Data1 | Data2 | Data3 | Data4 | Data5 | Data6 | Data7 |
|------------------------|------------|-----------|-------|-------|-------|-------|-------|-------|-------|
| Set NMRA-Resetpakets : | 000 10 010 | xxxx xxxx | | | | | | | |

Rail switches to NMRA Resetpackets.
packet size = 0 (2) - Header = 18
Requires no additional data.

| 2.230 Command V1.2 | Header | Xor | Data1 | Data2 | Data3 | Data4 | Data5 | Data6 | Data7 |
|------------------------------|------------|-----------|---------------|---------------|------------|-----------|------------|-----------|-------|
| Automatik-fkts vehilce: | 110 10 011 | xxxx xxxx | K0 ssssss (1) | ssss ss0r (1) | 00 AA AAAA | AAAA AAAA | TA00 RRRR | tttt tttt | |
| Automatik-fkts turnout: | 110 10 011 | xxxx xxxx | K0 ssssss (1) | ssss ss0r (1) | 00ss ssss | ssss ssZr | TA00 0000 | tttt tttt | |
| Automatik : veh. / reader | 110 10 011 | xxxx xxxx | K0 aaaaaa | 0000 0000 | 00 AA AAAA | AAAA AAAA | TA rr RRRR | tttt tttt | |
| Automatik : turnout / reader | 110 10 011 | xxxx xxxx | K0 aaaaaa | ssss ssZr | 00 AA AAAA | AAAA AAAA | TA rr 0000 | tttt tttt | |

Announce and log out of vehilce shuttle configurations, automatik funktionen

packet size = 6 (8) - Header = 19

K = Option activate[1], deactivate[0] - s12 ..s1/r0 = number of feedback contact - A13 .. A0 = vehilce-/ turnoutaddress (0..10239/ 2048) -

t = delaytime 1bis250 sec. [00h = no delay] - T = drive command [0], switch command [1] - A = feedback [0], adressreader [1] automatik – rr = perform action if loko drive in reader direction forward [00], in reader direction backward [01], independent from reader direction [10], reserved [11] – RRRR = action performed: drive forward [0000], drive backward [0001], no direction change [0010], toggle direction [0011], STOP [0100] , drive slowly 50% [0101], back to real speed [0110], reserved [0111..1111]

2.3 Commands for programm and read out decoders. Register and CV-modes used.

| 2.300 command | Header | Xor | Data1 | Data2 | Data3 | Data4 | Data5 | Data6 | Data7 |
|------------------------|------------|-----------|-----------|-----------|-------|-------|-------|-------|-------|
| Programming Register : | 010 10 100 | xxxx xxxx | 0000 0aaa | dddd dddd | | | | | |

Programming command: programm decoders on the seperate programming track (Register-mode NMRA conform).

packet size = 2 (4) - Header = 20

aaa = Registernumber 1(0_h) bis 8(7_h) – d7 .. d0 = programming value

After this command it is necessary to wait until the direct 3.130 answer is received ('C0' header – look at data from interface to PC)

| 2.310 command | Header | Xor | Data1 | Data2 | Data3 | Data4 | Data5 | Data6 | Data7 |
|------------------------|------------|-----------|-----------|-----------|-----------|-------|-------|-------|-------|
| Programming CV value : | 011 10 101 | xxxx xxxx | 0000 00aa | aaaa aaaa | dddd dddd | | | | |

Programming command: programm decoders on the seperate programming track (CV-mode NMRA conform).

packet size = 3 (5) - Header = 21

aa aaaa aaaa = CV-number 1(000_h) bis 1024(3FF_h) – d7 .. d0 = programming value

After this command it is necessary to wait until the direct answer 3.130 is received ('C0' header – look at data from interface to PC)

| 2.320 command | Header | Xor | Data1 | Data2 | Data3 | Data4 | Data5 | Data6 | Data7 |
|-------------------|------------|-----------|-----------|-----------|-----------|-----------|-----------|-------|-------|
| Programming POM : | 101 10 101 | xxxx xxxx | 0000 00aa | aaaa aaaa | dddd dddd | 00AA AAAA | AAAA AAAA | | |

Programming command: programm decoders on the main track (POM-mode NMRA conform).

packet size = 5 (7) - Header = 21

a9 .. a0 = CV-Nummer 2(001_h) bis 1024(3FF_h) – d7 .. d0 = programming value – A13 .. A0 = selected vehilceaddress

| 2.330 command | Header | Xor | Data1 | Data2 | Data3 | Data4 | Data5 | Data6 | Data7 |
|---------------------|------------|-----------|-----------|-----------|-------|-------|-------|-------|-------|
| Read back CV value: | 010 10 110 | xxxx xxxx | 0000 00aa | aaaa aaaa | | | | | |

Programming command: read back CV value of decoders on the seperate programming track (CV-read NMRA conform)

packet size = 2 (4) - Header = 22

aa aaaa aaaa = CV-number 1(000_h) bis 1024(3FF_h)

After this command it is necessary to wait until the direct answer 3.131 is received ('C0' header – look at data from interface to PC)

| 2.340 command * | Header | Xor | Data1 | Data2 | Data3 | Data4 | Data5 | Data6 | Data7 |
|---------------------|------------|-----------|-------|-------|-------|-------|-------|-------|-------|
| Read vehilce data : | 000 10 110 | xxxx xxxx | | | | | | | |

Programming command: reads back the most important CV values of decoders on the seperate programming track (CV-read NMRA conform)

packet size = 0 (2) - Header = 22

Requires no additional data.

After this command it is necessary to wait until a direct answer is received ('C0' header – look at data from interface to PC)

2.4 Systemcommand : Data storage, interface configuration

| 2.400 command * | Header | XOR | Data1 | Data2 | Data3 | Data4 | Data5 | Data6 | Data7 |
|----------------------------|------------|-----------|-------|-------|-------|-------|-------|-------|-------|
| Data storing of vehicles : | 000 11 101 | xxxx xxxx | | | | | | | |

Stores the actual data of announced vehicles in central station (speed, direction, funktions)

These data are being sent to the vehicles after a power of period.

packet size = 0 (2) - Header = 29

Requires no additional data.

| 2.410 Systemcommand | Header | XOR | Data1 | Data2 | Data3 | Data4 | Data5 | Data6 | Data7 |
|---------------------------|-----------|-----------|-----------|-----------|-----------|-------------------------|------------------------|-------|-------|
| Interface konfiguration : | 101 11000 | xxxx xxxx | 0000 000k | 0000 0000 | 0000 0000 | manufacturer ID high | manufacturer ID low | | |

Configures the internal interface

packetlength = 5 (7) - Header = 24

k0 ... ext. status messages (3.030) to PC [1], no message [0];

data3 ... manufacturer (Massoth) use only, always write to '0x00'

data4..data5 ... manufacturer-ID of the PC software using the interface. These packet must be sent bevor any other data communication is established.

3. Data from interface to PC

3.0 System status (message) : Status information from interface to PC

| 3.000 info | ID | XOR | packet size | Head / Data1 | Data2 | Data3 | Data4 | Data5 | Data6 |
|-----------------|-----------|-----------|-------------|--------------|-------|-------|-------|-------|-------|
| system status : | 000 00000 | xxxx xxxx | 0000 0001 | 100 EUSnn | | | | | |

Statusmessage, includes infos, emergency conditions, transmission error on the massoth bus system

packet size = 1 (4) - Header = 00h

E = data transmission error on the bus system[1] - U = central station in update mode[1] - S = software reset of the system[1] - nn = no emergency condition[00], emergency STOP[01], send reset packets on main track[10], reserved[11]

| 3.010 info | ID | XOR | packet size | Head / Data1 | Data2 | Data3 | Data4 | Data5 | Data6 |
|------------------|-----------|-----------|-------------|--------------|----------|-------|-------|-------|-------|
| Update message : | 000 00000 | xxxx xxxx | 0000 0010 | 100 01000 | 00 ttttt | | | | |

System in update mode, no further communication possible -> PC stops communication as long as a systemstatus with S-Bit = '1' received (softwarereset see also 3.000).

packet size = 2 (5) - Header = 00h

ttttt = device type of the hardware that updating will is (09h = 400h , 11h = 4FE433 , = 600A)

- With an update only one bus equipment should be attached at the bus.
- If the bus equipment has the identical unit number, it changes automatically in the Booloadermodus.
- If the unit number is not identical, the bus receipt up to the next CONTROLLER RESET becomes closed.

| 3.020 info * | ID | XOR | packet size | Head / Data1 | Data2 | Data3 | Data4 | Data5 | Data6 |
|----------------|-----------|-----------|-------------|--------------|-------|-------|-------|-------|-------|
| Message send : | 000 00000 | xxxx xxxx | 0000 0001 | 101 mmmmm | | | | | |

Info message from any bus device

packet size = 1 (4) - Header = 00h

mmmmm = number of messages being displayed (not yet specified)

| 3.030 info | ID | XOR | packet size | Head / Data1 | Data2 | Data3 | Data4 | Data5 | Data6 |
|----------------------|-----------|-----------|-------------|--------------|-----------|-----------|-----------|----------|-------|
| ext. system status : | 000 00000 | xxxx xxxx | 0000 0101 | 110 0 bbbb | iiii iiii | 00 zzzzzz | vvvv vvvv | 00YYYYYY | |

Message with information about system load, typ of central station, number of vehicles being used

packet size = 5 (8) - Header = 00h

b3 .. b0 = value of current limiting (1=1A .. 15=15A) – i7 .. i0 = aktuell load (100mA steps) – v7 .. v0 = Softwareversion of central station (4Bit major + 4Bit minor) – Y5 .. Y0 = remaining quantity of vehicles which could announced (see system menu of central station to select the number of active vehicles on the main track) – z6 .. z0 = typ of central station (01h=DiMAX1200Z , 02h=DiMAX800Z)

3.1 direkt answers : This answer is sent immediately to a command which needs a direkt answer. The communication is stopped until the answer one sent.

| 3.100 answer | ID | XOR | packet size | Head / Data1 | Data2 | Data3 | Data4 | Data5 | Data6 | Data7 | Data8 |
|------------------------------|-----------|-----------|-------------|--------------|----------|-----------|-----------|-----------|----------------------------|---------------------------|-----------|
| Vehicle address not in use : | 010 00000 | xxxx xxxx | 0000 1000 | 00 AAAAAA | AAAAAAAA | Lk00 kkkk | tttt tttt | rggg gggg | ffff ffff _{16..9} | ffff ffff _{8..1} | device ID |

Answer for vehicle announcement.

packet size = 8 (11) - Header = 40h

A13 .. A0 = vehicle address (0..10239) - L = Light on[1]/ off[0] - k6 = vehilce under automatik control[1], normal control[0] - k5 = unused - k4 = unused -

k3 = vehicle address NMRA [0], Motorola [1] - k2 = funktion parallel [1], serial [0] – k1..k0 = speed steps [00] = 14, [01] = 28, [10] = 128 - t7 .. t0 = picture of vehicle -

f_{16..1} = settings of funktionsbits[1] on, [0] off

| 3.110 answer | ID | XOR | packet size | Head / Data1 | Data2 | Data3 | Data4 | Data5 | Data6 |
|--------------------------------------|-----------|-----------|-------------|--------------|-----------|----------|-----------|-------|-------|
| Vehicle address in use [new!!!]: | 010 00000 | xxxx xxxx | 0000 0100 | 100 00 ccc | 00 AAAAAA | AAAAAAAA | device ID | | |
| Vehicle address in use : [old!!!] | 001 00000 | xxxx xxxx | 100 00 ccc | | | | | | |

Vehicle still in use. Answer to vehicle announce. If this command is received the interface must send a vehicle configuration command when the vehilce is unknown. (see also 2.030)

packet size = 4 (7) - Header = 40h

ccc = info (000 = max count of active vehicles reached , 001 = vehicle address unknown - 010 = vehilce address in use , 011 = max space of storeable area in central station reached , 100 = future use...)

| 3.120 answer | ID | XOR | packet size | Head / Data1 | Data2 | Data3 | Data4 | Data5 | Data6 |
|-------------------|-----------|-----------|-------------|--------------|----------|-----------|-------|-------|-------|
| Vehilce log out : | 011 00000 | xxxx xxxx | 0000 0011 | 00 AAAAAA | AAAAAAAA | device ID | | | |

Answer to a vehilce log out command

packet size = 3 (6) - Header = 60h

A13 .. A0 = vehicle address (0..10239)

| 3.130 answer | ID | XOR | packet size | Head / Data1 | Data2 | Data3 | Data4 | Data5 | Data6 |
|-----------------------------------|-----------|-----------|-------------|--------------|-----------|-------|-------|-------|-------|
| Decoder Programming feedback : | 100 00000 | xxxx xxxx | 0000 0010 | 100 EEE 00 | device ID | | | | |

Answer to a programming command 'Register-programming or CV-programming'

packet size = 2 (5) - Header = 80h

EEE = feedback information (000 = no/false feedback from decoder , 001 = programming track overload , 010 = external voltage on programming track , 100 = programming sucess)

| 3.131 answer | ID | XOR | packet size | Head / Data1 | Data2 | Data3 | Data4 | Data5 | Data6 |
|--------------------|-----------|-----------|-------------|--------------|-----------|-----------|-----------|-------|-------|
| CV-read feedback : | 100 00000 | xxxx xxxx | 0000 0100 | 100 EEEAA | AAAA AAAA | dddd dddd | device ID | | |

Answer to a programming command 'CV-read' with result

packet size = 4 (7) - Header = 80h

EEE = feedback information (000 = no/false feedback from decoder , 001 = programming track overload , 100 = reading success) - A = address of CV - d = readback value of CV.

| 3.132 answer * | ID | XOR | packet size | Head / Data1 | Data2 | Data3 | Data4 | Data5 | Data6 |
|--------------------|-----------|-----------|-------------|--------------|-----------|-----------|-----------|-----------|-----------|
| Vehilce readback : | 100 00000 | xxxx xxxx | ???? ???? | 100 EEEAA | AAAA AAAA | ????????? | ????????? | ????????? | ????????? |

Answer for reading a vehilce configuration.

packet size = ?? - Header = 80h

Not yet defined.

| 3.140 Befehl | ID | XOR | packet size | Head / Data1 | Data2 | Data3 | Data4 | Data5 | Data6 |
|-----------------------------|-----------|-----------|-------------|--------------|-------|-------|-------|-------|-------|
| XOR error in transmission : | 001 00000 | xxxx xxxx | 0000 0001 | 1111 1111 | | | | | |

Answer to a generally command if the XOR-check is incorrect. The same command is repeated by the device in the next loop.

packet size = 1 (4) – Header = 20h

| 3.150/60/70 Befehl | ID | XOR | packet size | Head / Data1 | Data2 | Data3 | Data4 | Data5 | Data6 |
|-----------------------|-----------|-----------|-------------|--------------|-----------|-----------|-----------|-----------|-----------|
| reserved for future : | 101 00000 | xxxx xxxx | ???? ???? | ???? ???? | ???? ???? | ???? ???? | ???? ???? | ???? ???? | ???? ???? |
| reserved for future : | 110 00000 | xxxx xxxx | ???? ???? | ???? ???? | ???? ???? | ???? ???? | ???? ???? | ???? ???? | ???? ???? |
| reserved for future : | 111 00000 | xxxx xxxx | ???? ???? | ???? ???? | ???? ???? | ???? ???? | ???? ???? | ???? ???? | ???? ???? |

Answer for additional data – packetlength up to 255 byte possible, f.e. ascii strings etc.

packet size = ? (?) - Header = A0h, C0h, E0h

4. appendix

4.0 timing

- packettime f.e. 5 byte command = 880µsec.
- min. delaytime between command and direkt answer = 0 msec.
- Max. delaytime between command and direct answer = 2 msec.
-

4.1 command table

| Nr. | Befehl | Header | Xor | Data1 | Data2 | Data3 | Data4 | Data5 | Data6 | Data7 | Ver. | S. |
|-------|---------------------------|------------|-----------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------|----|
| 2.010 | Drive command : | 011 00001 | xxxx xxxx | T0aa aaaa | aaaa aaaa | rggg gggg | | | | | 1.0 | 3 |
| 2.020 | Function command : | 011 00 010 | xxxx xxxx | T0AA AAAA | AAAA AAAA | L0ws ssss | | | | | 1.0 | 3 |
| 2.030 | Vehicle announcement : | 011 00 100 | xxxx xxxx | T0AA AAAA | AAAA AAAA | kk0k 0000 | | | | | 1.0 | 3 |
| 2.040 | Vehicle configuration : | 100 00 101 | xxxx xxxx | T0AA AAAA | AAAA AAAA | kk00 kkkk | tttt tttt | | | | 1.0 | 3 |
| 2.050 | Delete vehicle : | 010 00 101 | xxxx xxxx | 00AA AAAA | AAAA AAAA | | | | | | 1.0 | 3 |
| 2.100 | NMRA command (3..6 Byte): | LLL 01 000 | xxxx xxxx | NMRA <byte1> | NMRA <byte2> | NMRA <byte3> | NMRA <byte4> | NMRA <byte5> | NMRA <byte6> | | 1.3 | 4 |
| | NMRA command (>6 Byte): | 111 01 000 | xxxx xxxx | packet size | NMRA <byte1> | NMRA <byte2> | NMRA <byte3> | NMRA <byte4> | NMRA <byte5> | NMRA <byten> | 1.3 | 4 |
| 2.110 | Address-reader : | 100 01 001 | xxxx xxxx | 0sss ssss | 00aa aaaa | aaaa aaaa | rggg gggg | | | | 1.0 | 4 |
| 2.120 | Turnout control : | 010 01 010 | xxxx xxxx | 00ss ssss | ssss SSzr | | | | | | 1.0 | 4 |
| 2.130 | Feedbackdata : | 010 01 011 | xxxx xxxx | 00ss ssss | ssss ss0r | | | | | | 1.0 | 4 |
| 2.200 | Reset emmergency stop : | 000 10 000 | xxxx xxxx | | | | | | | | 1.0 | 5 |
| 2.210 | Set emmergency stop : | 000 10 001 | xxxx xxxx | | | | | | | | 1.0 | 5 |
| 2.220 | Set NMRA-Resetpakets : | 000 10 010 | xxxx xxxx | | | | | | | | 1.0 | 5 |
| 2.230 | Automatik : vehilce: | 110 10 011 | xxxx xxxx | K0 ssssss (1) | ssss ss0r (1) | 00 AA AAAA | AAAA AAAA | TA00 RRRR | tttt tttt | | 1.2 | 5 |
| | Automatik : turnout: | 110 10 011 | xxxx xxxx | K0 ssssss (1) | ssss ss0r (1) | 00ss ssss | ssss ssZr | TA00 0000 | tttt tttt | | 1.2 | 5 |
| | Automatik : veh. / reader | 110 10 011 | xxxx xxxx | K0 aaaaaa | 0000 0000 | 00 AA AAAA | AAAA AAAA | TA rr RRRR | tttt tttt | | 1.2 | 5 |
| | Auto. : turnout / reader | 110 10 011 | xxxx xxxx | K0 aaaaaa | ssss ssZr | 00 AA AAAA | AAAA AAAA | TA rr 0000 | tttt tttt | | 1.2 | 5 |
| 2.300 | Programming register : | 010 10 100 | xxxx xxxx | 0000 0aaa | dddd dddd | | | | | | 1.0 | 6 |
| 2.310 | Programming CV value : | 011 10 101 | xxxx xxxx | 0000 00aa | aaaa aaaa | dddd dddd | | | | | 1.0 | 6 |
| 2.320 | Programming POM : | 101 10 101 | xxxx xxxx | 0000 00aa | aaaa aaaa | dddd dddd | 00AA AAAA | AAAA AAAA | | | 1.0 | 6 |

| Nr. | Befehl | Header | Xor | Data1 | Data2 | Data3 | Data4 | Data5 | Data6 | Data7 | Ver. | S. |
|-------|------------------------------|------------|-----------|-----------|-----------|-----------|-----------|--------|-------|-------|------|----|
| 2.330 | Read back CV value: | 010 10 110 | xxxx xxxx | 0000 00aa | aaaa aaaa | | | | | | 1.0 | 6 |
| 2.340 | Read vehilce data : * | 000 10 110 | xxxx xxxx | | | | | | | | --- | 67 |
| 2.400 | Data storing of vehicles : * | 000 11 101 | xxxx xxxx | 0000 ?000 | 0000 0000 | 0000 0000 | 0000 0000 | | | | --- | 7 |
| 2.410 | Interface announcement : | 101 11000 | xxxx xxxx | ssss ssss | ssss ssss | ssss ssss | ID-high | ID-low | | | 1.2 | 7 |

4.2 info, direkt answers

| Nr. | Funktion | Ruf | Xor | Data1 | Data2 | Data3 | Data4 | Data5 | Data6 | Data7 | Data8 | D9 | Ver. | S. |
|-------|--------------------------------|-----------|-----------|------------|--------------|-----------|-----------|-----------|-----------|----------------------------|---------------------------|-----|------|----|
| 3.000 | system status : | 000 00000 | xxxx xxxx | 0000 0001 | 100 EUSnn | | | | | | | | 1.2 | 8 |
| 3.010 | Update message : | 000 00000 | xxxx xxxx | 0000 0011 | 100 01000 | 00 ttttt | device ID | | | | | | 1.2 | 8 |
| 3.020 | Message send : | 000 00000 | xxxx xxxx | 0000 0001 | 101 mmmmm | | | | | | | | 1.2 | 8 |
| 3.030 | ext. system status : | 000 00000 | xxxx xxxx | 0000 0101 | 110 0 bbbb | iiii iii | 00 zzzzzz | vvvv vvvv | 00YYYYYY | | | | 1.2 | 8 |
| 3.100 | Vehicle address not in use : | 010 00000 | xxxx xxxx | 0000 1000 | 00 AAAAAA | AAAAA | Lk00 kkkk | tttt tttt | rggg gggg | ffff ffff _{16..9} | ffff ffff _{8..1} | ID | 1.2 | 9 |
| 3.110 | Vehicle address in use : | 010 00000 | xxxx xxxx | 0000 0100 | 100 00 ccc | 00 AAAAAA | AAAAA | device ID | | | | | 1.2 | 9 |
| | [old] : | 001 00000 | xxxx xxxx | 100 00 ccc | | | | | | | | | 1.0 | 9 |
| 3.120 | Vehilce log out : | 011 00000 | xxxx xxxx | 0000 0011 | 00 AAAAAA | AAAAA | device ID | | | | | | 1.2 | 9 |
| 3.130 | Decoder Programming feedback : | 100 00000 | xxxx xxxx | 0000 0010 | 100 EEE 00 | device ID | | | | | | | 1.2 | 9 |
| 3.131 | CV-read feedback : | 100 00000 | xxxx xxxx | 0000 0100 | 100 EEEAA | AAAA AAAA | dddd dddd | device ID | | | | | 1.2 | 9 |
| 3.132 | Vehilce readback : | 100 00000 | xxxx xxxx | ???? ???? | 100 EEEAA | AAAA AAAA | ???????? | ???????? | ???????? | ???????? | | | 1.2 | 10 |
| 3.140 | XOR error in transmission : | 001 00000 | xxxx xxxx | 0000 0001 | 1111 1111 | | | | | | | | 1.2 | 10 |
| 3.150 | reserved for future : | 101 00000 | xxxx xxxx | ???? ???? | ???? ???? | ???? ???? | ???? ???? | ???? ???? | ???? ???? | ???? ???? | ???? ???? | ... | 1.2 | 10 |
| 3.160 | reserved for future : | 110 00000 | xxxx xxxx | ???? ???? | ???? ???? | ???? ???? | ???? ???? | ???? ???? | ???? ???? | ???? ???? | ???? ???? | ... | 1.2 | 10 |
| 3.170 | reserved for future : | 111 00000 | xxxx xxxx | ???? ???? | ???? ???? | ???? ???? | ???? ???? | ???? ???? | ???? ???? | ???? ???? | ???? ???? | ... | 1.2 | 10 |

- future use

4.3 **notes**

(1) .. sending to interface not really meaningful, but usefull to switch f.e. virtual contacts ;-)

4.4 **revision history**

| date | version | filename | addons / bugfixing | minimum required firmware in command station |
|----------|----------|------------------------------------|-----------------------------------------------------------------|-------------------------------------------------|
| 06/10/13 | V1.2beta | DiMAX-Interface-V12beta 061013.pdf | - added the nmra packet command '2.100' [Page 4] | DiMAX1200Z_23_061016. DiMAX |
| 06/10/31 | V1.2beta | DiMAX-Interface-V12beta 061031.pdf | - add description to command '2.030 delete vehilce' [Page 3] | DiMAX1200Z_23_061102. DiMAX |
| 06/12/12 | V1.2 | DiMAX-Interface-V12_061212.pdf | - add manufacturer-ID to interface konfiguration [Page 7] | DiMAX1200Z_23.DiMAX |

beta release

errors and omissions excepted. subject to change without notice.