TRANSNET

CAPITAL PROGRAM

SPECIFICATION

TELEMETER REAR UNIT GPRS TRACKING

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CONTENT PAGE

1. Purpose

TFR want to track and trace rear EoT units to improve management and maintenance of the units.

2.Sending data detail. (RU to server)

Description	Pos	Compress data	Database data	Database field name
Header	1	1 byte STX = $02		None
Message Type	2	1 byte Message identifire $04	None	None
Rear IDI	3-5	3 byte integer. 5 Digit numeric number. Max = 16777216	5 characters "00000" to "99999"	RearIDI
Front IDI	6-8	3 byte integer. 5 digit numeric number Max = 16777216	5 characters "00000" to "99999"	FrontIDI
Date time	9-12	4 bytes integer.	Timestamp '2008-07-07 01:01:01','yyyy-mm-dd hh24:mi:ss' "2008-07-04 23:34:07"	DateTime (Previous PCDateTime)
Latitude	13-15	3 bytes 1/30000 of a degree originated at south pole.	8 characters "-25.2345"	Latitude
Longitude	16-18	3 bytes 1/30000 of a degree originated at international date line.	7 characters "28.3466"	Longitude
Speed	19,20	2 bytes decimal KM/hour. Conversion of 18.3 knots to DM/Hour will be used.	3 characters "000" to "999"	Speed
Rear volts	21	1 byte indicating rear battery volts in decimal voltage	4 characters "00.0" to "25.5"	RearVolts
Front volts	22	1 byte indicating front battery volts in decimal voltage	4 characters "00.0" to "25.5"	FrontVolts
Status	23	1 byte status indicating the following by setting the bits. • Bit 0: Braketype 1=Air brake 0=Vacuum brakes • Bit 1: Charging 1= On charge 0= No charge • Bit 2:RearBrake 1= Activated 0 =Not activated • Bit 3: Air generator 1= Fitted 0= Not fitted • Bit 4: 0 = Spare • Bit 5: 0 = Spare • Bit 6: Flasher 0=Off 1=On • Bit 7: TelemeterMode 0=Run 1=Slp	3 characters "000" to " 255" 1="Air" 0= "Vac" On charge="Yes" No charge="No" Activated ="Yes" Not activated="No" Fitted="Yes" Not Fitted="No" '???' – 3 spare chars '???' – 3 spare chars '???' – 3 spare chars 'On'=On 'Off'=Off 'Act'-Running, 'Slp'=Sleep	BrakeType Charging EBArear Aircharger Status4 Status5 Status6 Flash RUMode
Failure mode	24	1 byte status indicating the following by bits.	3 characters "000" to " 255"	

		• Bit 0: Coms fail 1= Fail 0 = No failure • Bit 1: Air charger fail 1= Fail 0 = No failure • Bit 2: Emergency braking 1=Emergency active 0=Not activated • Bit 3: 0 = Drag wheel Detection • Bit 4: 0 = Spare • Bit 5: 0 = Spare • Bit 6: 0 = Spare • Bit 7: 0 = Spare	Fail ="Yes" No failure="No" 3 characters Fail ="Yes" No failure="No" Activated="Yes" Not activated="No" 3 characters Activated='Yes' Not activated='No' '???' – 3 spare chars '???' – 3 spare chars '???' – 3 spare chars '???' – 3 spare chars	ComsFail AirChFail EmBrake DWD FailMode4 FailMode5 FailMode6 FailMode7
Pressure / Vacuum Value	25,26	2 bytes integer value representing KPA	3 characters Airbrake = "000" to "999" Vacuum="-00" to "-99"	BrakeValue No sign for Air brakes and – for Vacuum brakes.
Alarm Count	27	1 byte integer value	3 characters "000" to " 255" Detail to be determined. Possible use as 8 Hardware failure bits.	AlarmCount
Last Service Info	28-31	4 bytes. Date and time transmitted as seconds elapsed since midnight 1 March 2004.	Timestamp '2008-07-07 01:01:01','yyyy-mm-dd hh24:mi:ss' "2008-07-04 23:34:07"	MTCEDate
Fault code-1	32-36	5 bytes	4 Alpha characters "ABCD"	FCode1
Fault code-2	37-41	5 bytes	4 Alpha characters "ABCF"	FCode2
Fault code-3	42-46	5 bytes	4 Alpha characters "ADFG"	Fcode3
Handling	47	1 byte integer value. Representing level of movement due to ruff handling. (need accelerometer) Bits 0-7 = max movement in any direction. Send 00h if not available.	3 characters "000" to "255"	Handling (Previous Railfault)
VSWR	48	1 byte (0h-FFh)	4 characters '0.00' to '2.55'	VSWR
RSSI	49	1 byte (0h-FFh)	4 characters '-000' to '-255'	RSSI
Not send by RU		Not send by RU	15 character database field '10.254.30.59'	SourceIP
Altitude	50,51	2 byte integer value.	5 characters. "00000" to "65535" meters	Altitude
Packet Count	52	1 byte integer value. Start at 1 and increment with each packet send until role over from 255.	3 characters "000" to "255"	PacketCount

CRC	53,54	2 bytes CCIT 16 Bit (Polynomial 10001000000100001) exclude the header and terminator bytes.		None
End of transmission	55	1 byte EOT = $04		

This packet had a fix length of 55 bytes.

3. Acknowledgement for IP port

$09 : Acknowledgement from RU for IP/Port setup (RU to Server)

Field Number	Description	Position in string	Field Width	Compressed Data
1	Start Header	1	1 Byte	STX = $02
2	Status	2	1 Byte	Message type = **$09**
3	Rear ID	3,4,5	3 Bytes	Integer. 5 Digit numeric number. Max=16777216. In reality 99999.
4	CRC	6,7	2 Bytes	CCIT 16 bit (Polynomial 10001000000100001) excluding the header and terminator bytes.
5	End of Transmission	8	1 byte	EOT = $04

This packet had a fix length of 8 bytes

4. Acknowledgement for APN connection

$0A : Acknowledgement from RU for APN Connection server setup (RU to server)

Field Number	Description	Position in string	Field Width	Compressed Data
1	Start Header	1	1 Byte	STX = $02
2	Status	2	1 Byte	Message type = **$0A**
3	Rear ID	3,4,5	3 Bytes	Integer. 5 Digit numeric number. Max=16777216. In reality 99999.
4	CRC	6,7	2 Bytes	CCIT 16 bit (Polynomial 10001000000100001) excluding the header and terminator bytes.
5	End of Transmission	8	1 byte	EOT = $04

This packet had a fix length of 8 bytes

5. Acknowledgement from database. (Server to RU)

The following packet will be send from the Database to rear unit after receiving a packet.

Field Number	Description	Position in string	Field Width	Compress data
1	Start header	1	1 Byte	STX = $02
2	Status	2	1 Byte	ACK = $06
3	Rear IDI	3,4,5	3 Byte	3 byte integer. 5 Digit numeric number. Max = 16777216
4	Packet Count	6	1 Byte	1 byte integer value of packet to ACK.
5	CRC	7,8	2 Byte	2 bytes CCIT 16 Bit (Polynomial 10001000000100001) exclude the header and terminator bytes.
6	End of transmission	9	1 Byte	1 byte EOT = $04

This packet had a fix length of 9 bytes

Example: 02h,06h,023A3Dh,0Dh,A3B5h,04h (Send 02h>04h)

Note-1: The rear unit will re-send the data packet if no acknowledgement is received within 60 seconds.

Note-2: The Rear unit will use this acknowledgement as one method to determine if the GPRS

is disconnected or not and to reset the modem to restart a new connection.
Note-3: Store 10 packets and send when GPRS are available.

6. Calling a field unit. (Server to RU)

The following packet will request a full data packet from the RU.

Field Number	Description	Position in string	Field Width	Compress data
1	Start header	1	1 Byte	1 byte STX = $02
2	Status	2	1 Byte	Enquiry ENQ = $05
3	Rear IDI	3,4,5	3 Byte	3 byte integer. 5 Digit numeric number. Max = 16777216
4	CRC	6,7	2 Byte	2 bytes CCIT 16 Bit (Polynomial 10001000000100001) exclude the header and terminator bytes.
5	End of transmission	8	1 Byte	1 byte EOT = $04

This packet had a fix length of 8 bytes

Example: 02h,05h,035F73h,12A4h,04h (Send 02h>04h)

7. Setting Server IP address and port

$07 : Setting Server IP Address and Port on Rear unit (Server to client)

Field Number	Description	Position in string	Field Width	Compressed Data
1	Start Header	1	1 Byte	STX = $02
2	Status	2	1 Byte	Message type = **$07**
3	Rear ID	3,4,5	3 Bytes	Integer. 5 Digit numeric number. Max=16777216. In reality 99999.
4	Server IP Address	6-21	15 Characters	Fix width string for example '010.107.002.011'
5	Server GPRS port	22-25	4 Characters	Fix width string for example '9760' for Inteletrack Telemeters and '9770' for EMS Telemeters.
6	CRC	26,27	2 Bytes	CCIT 16 bit (Polynomial 10001000000100001) excluding the header and terminator bytes.
7	End of Transmission	28	1 byte	EOT = $04

This packet had a fix length of 28 bytes.

8. : Setting server/network APN connection Address

$08 : Setting server/network APN connection Address (Server to client)

Field Number	Description	Position in string	Field Width	Compressed Data
1	Start Header	1	1 Byte	STX = $02
2	Status	2	1 Byte	Message type = $08
3	Rear ID	3,4,5	3 Bytes	Integer. 5 Digit numeric number. Max=16777216. In reality 99999.
4	Address Length	6	1 Byte	Length of text string to follow For example 0x0D,(10 decimal) for 'iatstfr.co.za'
5	Server APN connection name	7-37	1 to 30 Characters long	Address string for example 'iatstfr.co.za'
6	Address Length	38	1 Byte	Length of text string to follow For example 0x12, (18 decimal) for 'its.spoornet.co.za'

7	Server APN connection name	39-69	1 to 30 Characters long	Adres string for example 'its.spoornet.co.za'
6	CRC	70,71	2 Bytes	CCIT 16 bit (Polynomial 1000100000010000l) excluding the header and terminator bytes.
7	End of Transmission	72	1 byte	EOT = $04

NB : This packet had a variable length from 11 (no Apn info) up to 72 bytes long(for 2x30character Apn addresses).

9. Reporting triggers

The following triggers must be implemented and software settable in the rear unit.

Triggers	Programmable settings
30 minutes when Stationary on train and sensing brake pressure > 200 or vac > -25	Settable 1-60 minutes
10 minutes when Stationary and sensing no brake pressure or vacuum.	Settable 1-60 minutes
30 minutes or 25km which ever elapsed first when train are moving and sensing brake pressure > 400 or vacuum > -51.	Settable 1-60 minutes & 1 – 50km
Immediate when EBA is applied	fixed
Immediately when a failure mode is detected.	fixed
Immediately when the brake alarm is activated and not restored within 5 min on a moving EoT.	fixed
Immediately when charger is connected	fixed
Immediately when disconnect from charger.	fixed
Immediately send data when the train completion fails on a moving train.	*fixed*

10. Date and time conversion.

Data and Time System

Following on from the conversion of spatial co-ordinates to an integer based system, time from the GPS is also converted to an integer based system that can be represented in 4 bytes.

The unit of time is 1 second – equivalent to the resolution of the GPS receiver.

0h00 on 1st March 2004 is chosen as the time datum. (Beginning of the last leap year)

Time is transmitted as GMT (Greenwich Mean Time) – no time zone offset is applied.

As calculated on 8 Dec 2008

year2004:=31+30+31+30+31+31+30+31+30+31; (From 1 March)
year2005:=365;
year2006:=365;
year2007:=365;
year2008:=31+29+31+30+31+30+31+31+30+31+30+7;

seconds:=(year2004+year2005+year2006+year2007+year2008)*24*60*60+
(hour*60*60) + (min *60) + sec;

Sample time:
8 Dec 2008 21:46:04 > 150673564 sec S.A time
8 Dec 2008 21:47:55 > 150673675 sec S.A time
8 Dec 2008 21:52:32 > 150673954 sec S.A time

Subtract 7200 sec to get GMT

11. Longitude and Latitude conversion.

Longitude and Latitude Co-ordinate System

The spatial co-ordinate system that is used is long integer based –
data transmission is minimised (send 3 bytes instead of 9 bytes per ordinate value)
Can use integer arithmetic.

Latitude and Longitude co-ordinates are transformed into long integers (high byte not used) using a right hand Cartesian co-ordinate system. with origin at the South Pole and the International Date Line.

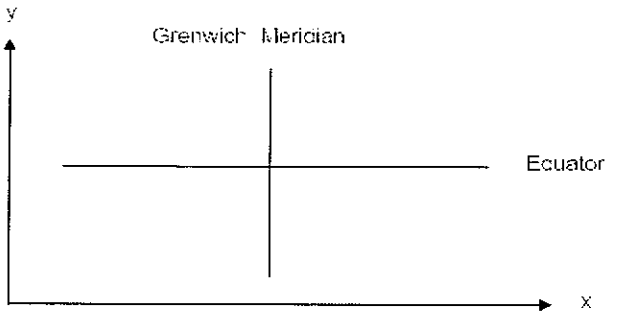
Sample: S25.76285 E28.15339

Longitude:=round(longitude_degrees*30000+5400000);
6244601 =(28.15339*30000+5400000)
6244601 = 5F48F9h

Converting back to Longitude
Longitude_degrees:=(longitude-5400000)/30000;
28.1534:=(6244601-5400000)/30000;

Latitude:=round(2700000-latitude_degrees*30000);
1927114 :=round(2700000-25.76285*30000);
1927114 = 1D67CAh

Converting back to Latitude
Latitude_degrees:= (latetude-2700000)/30000;
-25.7629:=(1927114-2700000)/30000;



The maximum resolution obtainable from a GPS receiver is 4 decimals of a degree of Longitude or Latitude - translates to about 15 metres on the ground.

One second of arc is equivalent to 30 metres on the ground - so the resolution of a GPS receiver is approximately one half second of arc.

The co-ordinate system therefore has to have a resolution of better than 1 / 7200 of a degree of arc, not change sign and be represented in less than 3 bytes for any location on earth.

Choosing a unit of measure equal to 1 / 30 000 of a degree accomplishes this requirement. One degree equals 30 000 units and 360 degrees equals 10 800 000 units – comfortably accommodated in 3 bytes

Using this co-ordinate system -

South Pole	y = 0	
North Pole	y = 5 400 000	Hex - 5265C0 uses 3 bytes
Equator	y = 2 700 000	
Greenwich	x = 5 400 000	
International Date Line	x = 0 or 10 800 000	Hex - A4CB80 uses 3 bytes

Are in fact only using 3 bytes per ordinate – can use the high byte for an additional variable.

Any other location on the earth can be represented by a (x,y) pair whos values will always be positive, irrespective of hemisphere. Precision of a GPS receiver is preserved.

12. Speed conversion

Speed

The maximum speed that a train is likely to attain (in decimeters per km) is easily represented as an unsigned integer (65535) using two bytes.

A conversion factor of 18.3 to convert Knots to Dm hour will be used.

Speed::=round(speed_knots*10);
770:=round(77.0*10);
0302h

Kmhour:=round((knots/10)*18.3);
141:=round((770/10)*18.3);

OR send km/h as one byte. (0-255 km/h) Example: 55km/h = 0037h 1st byte = 00h

13. Power up of rear units.

The rear unit VHF RF portion must be switched on/off by the on off PB. The main processor, GPS, GPRS must stay on to continue the tracking function. These electronics must only switched off when the Battery reached the low voltage disconnect level.

14. Database structure

```
SQL> describe eotdata;
 Name                                      Null?    Type
 ----------------------------------------- -------- ------------
 REARIDI                                   NOT NULL VARCHAR2(5)
 FRONTIDI                                  NOT NULL VARCHAR2(5)
 PCDATETIME                                NOT NULL TIMESTAMP(0)
 LATITUDE                                  NOT NULL VARCHAR2(8)
 LONGITUDE                                 NOT NULL VARCHAR2(7)
 SPEED                                     NOT NULL VARCHAR2(3)
 REARVOLTS                                 NOT NULL VARCHAR2(4)
 FRONTVOLTS                                NOT NULL VARCHAR2(4)
 BRAKETYPE                                 NOT NULL VARCHAR2(3)
 CHARGING                                  NOT NULL VARCHAR2(3)
 EBAREAR                                   NOT NULL VARCHAR2(3)
 STATUS4                                   NOT NULL VARCHAR2(3)
 FLASH                                     NOT NULL VARCHAR2(3)
 RUNSHD                                    NOT NULL VARCHAR2(3)
 RUMODE                                    NOT NULL VARCHAR2(3)
 COMSFAIL                                  NOT NULL VARCHAR2(3)
 AIRCHFAIL                                 NOT NULL VARCHAR2(3)
 EMBRAKE                                   NOT NULL VARCHAR2(3)
 DWD                                       NOT NULL VARCHAR2(3)
 FAILMODE4                                 NOT NULL VARCHAR2(3)
 FAILMODE5                                 NOT NULL VARCHAR2(3)
 FAILMODE6                                 NOT NULL VARCHAR2(3)
 FAILMODE7                                 NOT NULL VARCHAR2(3)
 BRAKEVALUE                                NOT NULL VARCHAR2(4)
 ALARMCOUNT                                NOT NULL VARCHAR2(3)
 AIRCHARGER                                NOT NULL VARCHAR2(3)
 MTCEDATE                                  NOT NULL TIMESTAMP(0)
 FCODE1                                    NOT NULL VARCHAR2(5)
 FCODE2                                    NOT NULL VARCHAR2(5)
 FCODE3                                    NOT NULL VARCHAR2(5)
 RAILFAULTS                                NOT NULL VARCHAR2(3)
 VSWR                                      NOT NULL VARCHAR2(4)
 RSSI                                      NOT NULL VARCHAR2(4)
 SOURCEIP                                  NOT NULL VARCHAR2(15)
 ALTITUDE                                  NOT NULL VARCHAR2(5)
 PACKET                                    NOT NULL VARCHAR2(3)

SQL>
```

```
INSERT INTO EOTDATA(RearIDI,FrontIDI,PCDateTime,Latitude,Longitude,Speed,RearVolts,Frontvolts,BrakeType,
        Charging,EBArear,Status4,Flash,Runshd,RUMode,ComsFail,AirCHFail,EMBrake,DWD,Failmode4,
                Failmode5,failmode6,Failmode7,BrakeValue,AlarmCount,AirCharger,
            MTCEDate,Fcode1,Fcode2,Fcode3,RailFaults,VSWR,RSSI,SourceIP,Altitude,Packet)
    VALUES('09999','54321',to_timestamp('2010-04-29 10:01:01','yyyy-mm-dd hh24:mi:ss'),'-25.2345','28.5660','155',
        '12.8','12.5','AIR','No ','No ','000','000','000','slp','NO ','NO ','NO ','YES','000','000','000','000',' 450','128','No ',
        to_timestamp('2008-07-04 23:34:07','yyyy-mm-dd hh24:mi:ss'),'ABCD','EFGH','JKLM','123','1.25','-
095','127.017.012.123','02450','007');
```

15. Sample data

Select TO_CHAR(pcdatetime,'YYYY-MM-DD hh24:mi:ss'),Latitude,Longitude,rearidi,frontidi,Speed,RearVolts,Frontvolts,BrakeType,
Charging,EBArear,Status4,Flash,Runshd,RUMode,ComsFail,AirCHFail,EMBrake,DWD,Failmode4,
Failmode5,failmode6,Failmode7,BrakeValue,AlarmCount,AirCharger,
TO_CHAR(mtcedate,'YYYY-MM-DD hh24:mi:ss'),Fcode1,Fcode2,Fcode3,RailFaults,VSWR,RSSI,SourceIP,Altitude,Packet from EOTData
where TO_CHAR(pcdatetime,'YYYY-MM-DD') >= '2009-10-16' and rearidi = '09701' order by pcdatetime desc
Future data field are fill with "???"

TO_CHAR(PCDATETIME,'YYYY-MM-DD	LATITUDE	LONGITUDE	REARIDI	FRONTIDI	SPEED	REARVOLTS	FRONTVOLTS	BRAKETYPE	CHARGING	EBAREAR	STATUS4	FLASH	RUNSHD	RUMODE	COMSFAIL	AIRCHFAIL	EMBRAKE	DWD	FAIL
2010-01-29 06:52:51	-29.8238	30.9805	09701	00000	006	12.4	00.0	Air	No	No	???	Off	Run	Slp	No	No	No	No	???
2010-01-29 06:20:57	-29.8062	30.9565	09701	00000	000	12.4	00.0	Air	No	No	???	Off	Run	Slp	No	No	No	No	???
2010-01-29 05:49:09	-29.8062	30.9566	09701	00000	000	12.4	00.0	Air	No	No	???	Off	Run	Slp	No	No	No	No	???
2010-01-29 05:17:14	-29.8062	30.9565	09701	00000	000	12.4	00.0	Air	No	No	???	Off	Run	Slp	No	No	No	No	???
2010-01-29 04:45:21	-29.8062	30.9564	09701	00000	000	12.4	00.0	Air	No	No	???	Off	Run	Slp	No	No	No	No	???
2010-01-29 04:13:30	-29.8062	30.9566	09701	00000	000	12.4	00.0	Air	No	No	???	Off	Run	Slp	No	No	No	No	???
2010-01-29 03:41:31	-29.8062	30.9565	09701	00000	000	12.4	00.0	Air	No	No	???	Off	Run	Slp	No	No	No	No	???
2010-01-29 03:41:24	-29.8062	30.9565	09701	00000	000	12.4	00.0	Air	No	No	???	Off	Run	Slp	No	No	No	No	???
2010-01-29 03:41:22	-29.8062	30.9565	09701	00000	000	12.4	00.0	Air	No	No	???	Off	Run	Slp	No	No	No	No	???
2010-01-29 03:08:27	-29.8062	30.9566	09701	00000	000	12.4	00.0	Air	No	No	???	Off	Run	Slp	No	No	No	No	???
2010-01-29 02:36:26	-29.8062	30.9566	09701	00000	000	12.5	00.0	Air	No	No	???	Off	Run	Slp	No	No	No	No	???
2010-01-29 02:04:27	-29.8062	30.9566	09701	00000	000	12.5	00.0	Air	No	No	???	Off	Run	Slp	No	No	No	No	???
2010-01-29 01:32:34	-29.8062	30.9566	09701	00000	000	12.5	00.0	Air	No	No	???	Off	Run	Slp	No	No	No	No	???
2010-01-29 01:00:47	-29.8062	30.9565	09701	00000	000	12.5	00.0	Air	No	No	???	Off	Run	Slp	No	No	No	No	???

DWD	FAILMODE4	FAILMODE5	FAILMODE6	FAILMODE7	BRAKEVALUE	ALARMCOUNT	AIRCHARGER	TO_CHAR(MTCEDATE,'YYYY-MM-DDHH	FCODE1	FCODE2	FCODE3	RAILFAULTS	VSWR	RSSI	SOURCEIP	ALTITUDE	PACKET
No	???	???	???	???	000	000	No	2009-10-28 14:29:19	RNNNN	RNNNN	RNNNN	000	0.00	-000	010.254.029.163	00123	211
No	???	???	???	???	000	000	No	2009-10-28 14:29:19	RNNNN	RNNNN	RNNNN	000	0.00	-000	010.254.029.163	00023	210
No	???	???	???	???	000	000	No	2009-10-28 14:29:19	RNNNN	RNNNN	RNNNN	000	0.00	-000	010.254.029.163	00035	209
No	???	???	???	???	000	000	No	2009-10-28 14:29:19	RNNNN	RNNNN	RNNNN	000	0.00	-000	010.254.029.163	00038	208
No	???	???	???	???	000	000	No	2009-10-28 14:29:19	RNNNN	RNNNN	RNNNN	000	0.00	-000	010.254.029.163	00037	207
No	???	???	???	???	000	000	No	2009-10-28 14:29:19	RNNNN	RNNNN	RNNNN	000	0.00	-000	010.254.029.163	00027	206
No	???	???	???	???	000	000	No	2009-10-28 14:29:19	RNNNN	RNNNN	RNNNN	000	0.00	-000	010.254.029.163	00026	205
No	???	???	???	???	000	000	No	2009-10-28 14:29:19	RNNNN	RNNNN	RNNNN	000	0.00	-000	010.254.029.163	00028	204
No	???	???	???	???	000	000	No	2009-10-28 14:29:19	RNNNN	RNNNN	RNNNN	000	0.00	-000	010.254.029.163	00034	203
No	???	???	???	???	000	000	No	2009-10-28 14:29:19	RNNNN	RNNNN	RNNNN	000	0.00	-000	010.254.029.163	00034	202
No	???	???	???	???	000	000	No	2009-10-28 14:29:19	RNNNN	RNNNN	RNNNN	000	0.00	-000	010.254.029.163	00040	201
No	???	???	???	???	000	000	No	2009-10-28 14:29:19	RNNNN	RNNNN	RNNNN	000	0.00	-000	010.254.029.163	00037	200

16. Data format.

All data field data will be send MSB firs and LSB last.
Example: Rear IDI = 014DAFh (85423)
01 = send 1st
4D = send 2nd
AF = send 3rd

The data are send as one long string starting from 02h...04h. Each field is send MSB first and LSB last.

17. CRC info

```
Here is an example specification for
a popular form of the CRC-16 algorithm.

   Name   : "CRC-16"
   Width  : 16
   Poly   : 1021h      (     1000000100001)
   Init   : FFFFh
   RefIn  : True
   RefOut : True
   XorOut : 0000h
   Check  : BB3Dh
```

18. Server software

The server software must support the following.

a) Calling a pre selected field unit.
b) Change the connection IP on a selected field unit.
c) Change the port on a selected field unit.
d) Change the two APN's on a selected field unit.
e) User friendly.
f) Supporting at least 1000 rear units simultaneous connections.
g) The rear units of a specific supplier will only be used to connect to his specific server software.
h) The REAR unit must revert back to the original settings if no connection can be made within 3 tries of changing items-b,c,d.

End of specification