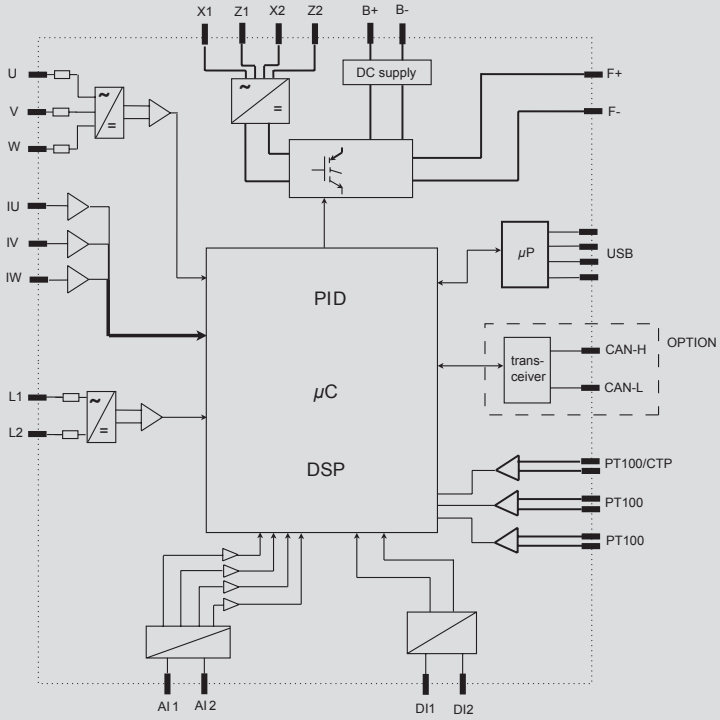


CAN D500 SERIES

LS proprietary protocol / J1939 D500

AVRs

Installation and maintenance

LEROY-SOMER™

Nidec

All for dreams

CAN D500 SERIES - LS proprietary protocol / J1939 D500 AVRs

This manual concerns the alternator AVR which you have just purchased.
We wish to draw your attention to the contents of this maintenance manual.

SAFETY MEASURES

Before using your machine for the first time, it is important to read the whole of this installation and maintenance manual.

All necessary operations and interventions on this machine must be performed by a qualified technician.

Our technical support service will be pleased to provide any additional information you may require.

The various operations described in this manual are accompanied by recommendations or symbols to alert the user to potential risks of accidents. It is vital that you understand and take notice of the following warning symbols.

WARNING

Warning symbol for an operation capable of damaging or destroying the machine or surrounding equipment.

Warning symbol for general danger to personnel.

Warning symbol for electrical danger to personnel.

All servicing or repair operations performed on the AVR should be undertaken by personnel trained in the commissioning, servicing and maintenance of electrical and mechanical components.

When the generator is driven at a frequency below 28 Hz for more than 30 seconds with an analogue AVR, its AC power supply must be disconnected.

WARNING
This AVR can be incorporated in a EC-marked machine.
This manual is to be given to the end user.

CAN D500 SERIES - LS proprietary protocol / J1939 D500 AVRs

CAN D500 SERIES - LS proprietary protocol / J1939 D500 AVRs

Content

CAN D500 SERIES - LS proprietary protocol / J1939 D500 AVRs

1 - GENERALITIES

The purpose of this document is to define the specification of CAN LS proprietary and the J1939 for the D500 series.

2 - SPECIFICATION FOR THE CAN LS PROPRIETARY PROTOCOL.

2.1 - Hard CAN

CAN functionality according to CAN specification V2.0 B active

A programmable data transfer rate.

Baud rate	Maximum length	Data transfer rate parameter 12.06
1M	30 m	0
500 K	100 m	1
250 K	250 m	2
125 K	500 m	3
100 K	700 m	4
50 K	1000 m	5

Programmable Extended 29-bit identifiers.

DLC = 6 6 byte data Message object Data Length Code (Read and Write Mode)

DLC = 8 8 byte data Message object Data Length Code (only Read Mode)

2.2 - Protocol

2 modes are defined:

- The most simple is the only Read Mode .In that case, only four programmable parameters can be read from the D500.The identifier and the data transfer rate are also programmable.

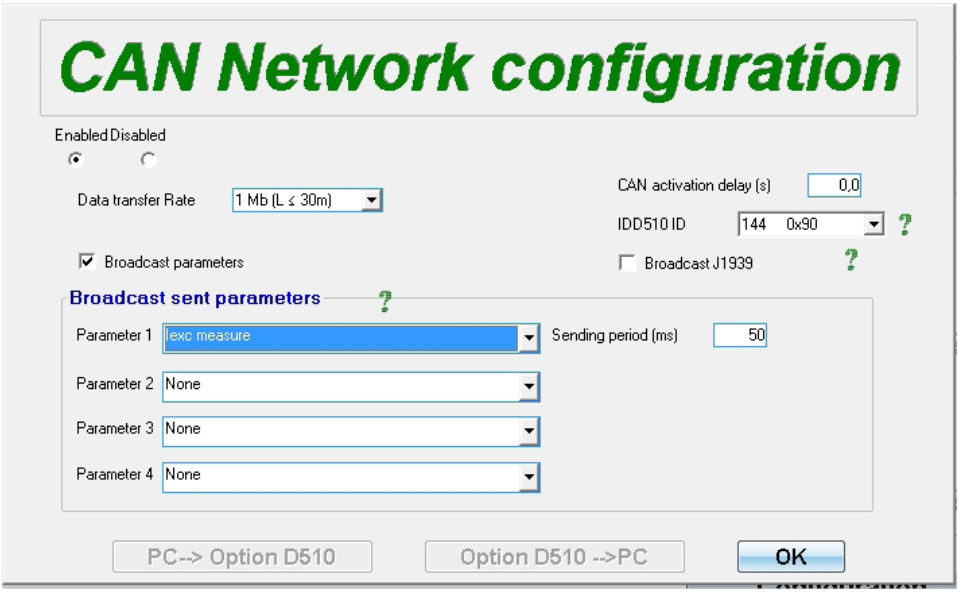
- The message with these four parameters is sent according to a time defined by the sending time parameter.

The other one is the Read and Write Mode, and all parameters from D500 can be read and written.

2.2.1 - Read Only Mode

With a PC and EasyReg, the final customer is able to select the four parameters to be read, the identifier and the data transfer rate as given by the example below.

CAN D500 SERIES - LS proprietary protocol / J1939 D500 AVRs



DLC = 8 8 byte data Message object Data Length Code (Only Read Mode).

Parameter	Designation	Minimum	Maximum	Type	Factory setting
12.05	Identifier1	0	32000	RW	0 x 321
12.06	data transfer rate	0	8	RW	5
12.07	Sending time	50 ms	10000 ms	RW	100
12.08	Parameter 1	0	2151	RW	535
12.09	Parameter 2	0	2151	RW	501
12.10	Parameter 3	0	2151	RW	587
12.11	Parameter 4	0	2151	RW	492
12.45	Source address	0	255	RW	144 (0 x 90)

For example, to select the excitation current (5.87) in parameter 1, the parameter 1's value has to be 587.

5 is the Menu number.

87 is the Parameter number.

It is necessary to set up the parameter 12.06 data transfer rate to the desired value.

And then the power must be switched off to allow the parameter 12.06 data transfer rate to be taken into account by the D510.

The identifier value for LS only read mode is = 0xCFF2000 +m1245_Source_adress

The default setting for the source address is (hex 0x90)

The default value for the identifier value for LS only read mode is 0xCFF2090

2.2.2 - Read and Write Mode

- All parameters from D500 can be read and written.

- The CAN identifier and the data transfer rate are programmable.

Identifier LS Write = 0xCFF0F00 + m1245_Source_adress ⟶ default value = 0xCFF0F90

Identifier LS Write Answer = 0XcFF1000+m1245_Source_adress ⟶ default value = 0XcFF1090

Identifier LS Read = 0xCFF0E00 +m1245_Source_adress ⟶ default value = 0xCFF0E90

Identifier LS Read Answer = 0XcFF1100 +m1245_Source_adress ⟶ default value = 0XcFF1190

- The specific protocol LS is encapsulated inside the CAN frame.

At the specific protocol LS level, the customer is the master and the D500 the slave.

The parameters of the D500 database are accessible from a Menu number and a Parameter number.

- Frames for the specific LS protocol

The customer sends commands:

Write :

Question Customer ⟶ D500

WRITE-QUESTION (header_WR, Parameter number, Menu number, value)

Answer D500 ⟶ Customer

WRITE-ANSWER (header_WR +ok, Parameter number, Menu number, value)

Or

WRITE_ANSWER (header_WR +Nok, Parameter number, Menu number, memory value)

Read :

Question Customer ⟶ D500

READ_QUESTION (header_RD, Parameter number, Menu number, value)

Answer D500 ⟶ Customer

READ_ANSWER (header_RD, Parameter number, Menu number, value)

CAN D500 SERIES - LS proprietary protocol / J1939 D500 AVRs

Master Customer: Management of a time out.

Read frame:

1B

Header: 0001.1011	Parameter number	Menu number	0xFF	0xFF	All other bytes «exclusive or»	Read UPN Master message

18

Header: 0001.1000	Parameter number	Menu number	Parameter value (low)	Parameter value (high)	All other bytes «exclusive or»	Read UPN Slave Answer ok

19

Header: 0001.1001	Parameter number	Menu number	Parameter value (low)	Parameter value (high)	All other bytes «exclusive or»	Read UPN Slave Answer n ok

Response: Header.0 = UPN inexistent

Write Frame:

1A

Header: 0001.1010	Parameter number	Menu number	Parameter value (low)	Parameter value (high)	All other bytes «exclusive or»	Write UPN Master message

18

Header: 0001.1000	Parameter number	Menu number	Parameter value (low)	Parameter value (high)	All other bytes «exclusive or»	Write UPN Slave answer ok

19

Header: 0001.1000	Parameter number	Menu number	Parameter value (low)	Parameter value (high)	All other bytes «exclusive or»	Write UPN Slave answer ok

Response: Header.0 = UPN inexistent

- Header + OK, Header + NOT functionality of the protocol.

When the customer wants to write a parameter :

If the parameter exits and its value is accessible then the header for the answer is 0x18

Otherwise the header of the answer changes to indicate a problem.

Header.0 =1 then parameter does not exist or is not accessible for the writing.

When the customer wants to read a parameter:

If the parameter exits then the header for the answer is 0x18

Otherwise the header of the answer changes to indicate a problem.

Header.0 =1 then parameter does not exist

2.2.3 - Frames examples

With the PC and Easyreg, it is possible to set up 3 different CAN Identifier.

Only read mode

Identifier LS only read mode = 0xCFF0000+ (m1205_identifier1*256) +m1245_Source_adress

Write mode

Question

Frame coming from customer to D500 ⟶

Identifier LS Write = 0xCFF0000+ (m1220_identifier2*256) +m1245_Source_adress

Answer

Frame coming from D500 to Customer ⟶

Identifier LS Write Answer =0xCFF00090+ (m1240_ Identifier4*256) +m1245_Source_adress;

Read mode

Question

Frame coming from customer to D500 ⟶

Identifier LS Read = 0xCFF0000 + (m1221_identifier3*256) + m1245_Source_adress

Answer

Frame coming from D500 to Customer ⟶

Identifier LS Read Answer = 0xCFF0090 + (m1241_ Identifier5*256) + m1245_Source_adress

12.07	Sending time	200
12.08	Parameter 1	535 Alternator Voltage
12.09	Parameter 2	539 I u alternator
12.10	Parameter 3	570 I v alternator
12.11	Parameter 4	571 I w alternator

Read Only mode

The cyclic frame of the D500 will be as follow.

Alternator voltage = 4100 = 0x1004 high value = 0x10, low value = 0x4 parameter1

Alternator current u = 2500 = 0x9c4 high value = 0x9, low value = 0xc4 parameter2

Alternator current v = 2510 = 0x9ce high value = 0x9, low value = 0xce parameter3

Alternator current w = 2520 = 0x9d8 high value = 0x9, low value = 0xd8 parameter4

CAN-ID	BYTE0	BYTE1	BYTE2	BYTE3	BYTE4	BYTE5	BYTE6	BYTE7
Identifier1	param1(low)	param1(high)	param2(low)	param2(high)	param3(low)	param3(high)	param4(low)	param4(high)
Id1	0x4	0x10	0xc4	0x9	0xce	0x9	0xd8	0x9

The D500 will now start to transmit following CAN telegrams every 200ms DLC=8 so 8 BYTES are transmitted

Id1=Identifier LS only read mode

Read and write mode

Example : Customer Write 5.12 Voltage set point with 390.0V

Parameter number =12=0xc

Menu number =5=0x5

Value=390*10=3900=0xf3c high value=0xf low value=0x3c

Customer transmits following CAN telegram DLC=6 so 6 BYTES are transmitted

CAN-ID	BYTE0	BYTE1	BYTE2	BYTE3	BYTE4	BYTE5
Identifier LS Write	0x1a	0xc	0x5	0x3c	0xf	XOR

D500 replies with following CAN telegram

CAN-ID	BYTE0	BYTE1	BYTE2	BYTE3	BYTE4	BYTE5
Identifier LS Write Answer	0x18	0xc	0x5	0x3c	0xf	XOR

Example : Customer read 5.12 Voltage set point (reading value is 390.0V)

Customer transmits following CAN telegram DLC=6 so 6 BYTES are transmitted

CAN-ID	BYTE0	BYTE1	BYTE2	BYTE3	BYTE4	BYTE5
Identifier LS Read	0x1b	0xc	0x5	0xff	0xff	XOR

D500 replies with following CAN telegram

CAN-ID	BYTE0	BYTE1	BYTE2	BYTE3	BYTE4	BYTE5
Identifier LS Read Answer	0x18	0xc	0x5	0x3c	0xf	XOR

2.3 - List of parameters

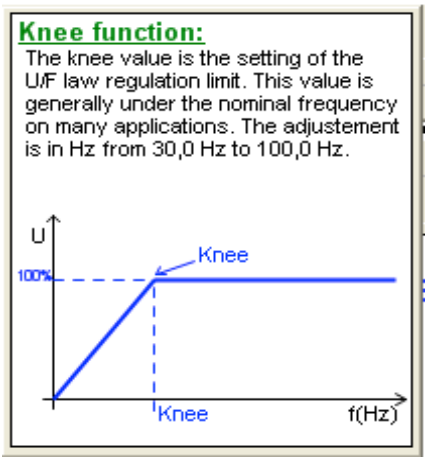
2.3.1 - Reference Voltage – LAM – Soft Start.

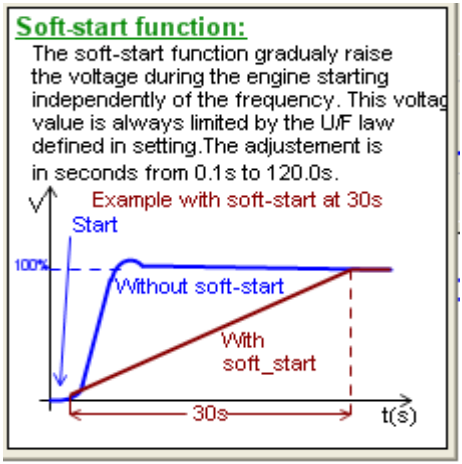
Parameter	Designation	Minimum	Maximum	Type	Factory setting
5.03	knee LAM	37 Hz	100 ,0 Hz	RW	48 Hz
5.05	adjustable LAM	70% of reference Voltage	100% of reference voltage	RW	100% of reference voltage
5.06	U/F variable slope	1,0	3,0	RW	1.0
5.12	Voltage set point	90,0V	530,0 V	RW	400,0V
5.14	Adjustable Voltage	-30.0%	+30.0%	RW	0
5.16	Voltage Reference 2	90,0 V	530,0 V	R	
5.17	Reactive drop compensation	0.0%	+10,0%	RW	0.0%
5.20	soft Start Acceleration	0,1 s	120,0 s	RW	1.0s
5.21	Soft voltage recovery	0,1 s / 10HZ	30,0 s / 10HZ	RW	0,1 s / 10HZ
5.23	Voltage reference after Ramp	0,0 V	530,0 V	R	
5.41	Voltage line drop compensation	0,0%	10,0%	RW	0,0%
5.28	PID Scale factor	1	100	RW	100
5.89	PID RMS Enable	0	1	RW	0

RW Read Write

R Read only

Please note, if a ratio is used for the return alternator voltage, the set point reference voltage 5.12 must take into account this ratio.

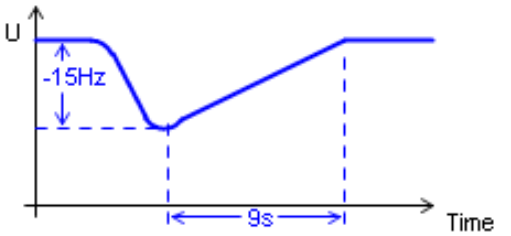


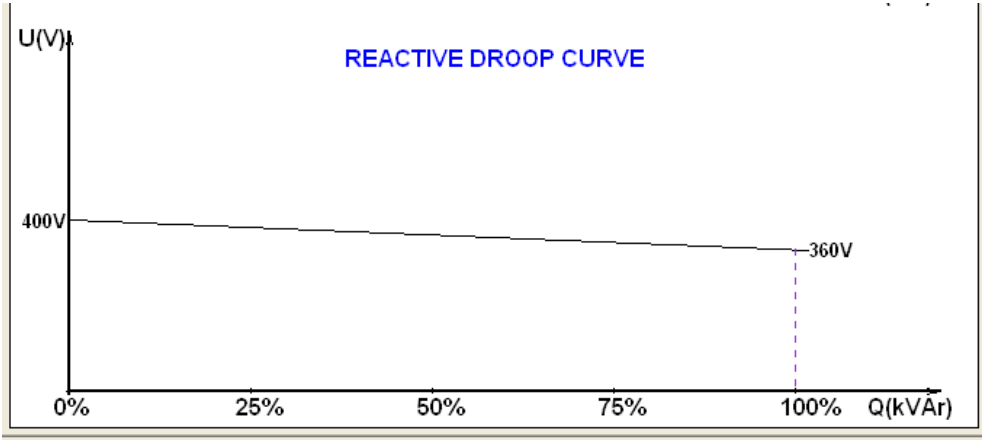


Knee point and soft start principles

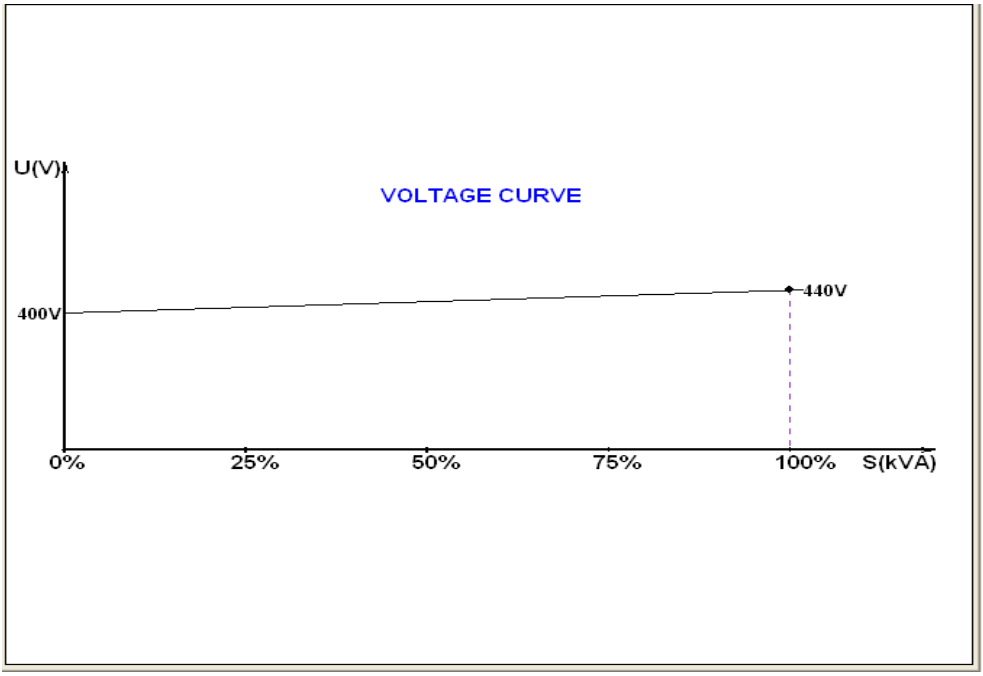
Soft voltage recovery function:

During load impacts, this function helps the genset to return to its rated speed faster due to a gradual increase in voltage.
For example if the speed dip of 15 Hz and the setting is 6 s/10Hz the time to return to the rated voltage will be of 9s.
The adjustement is in s/10Hz from 0,1 s/10Hz to 30,0 s/10Hz.





Example for [5.17] reactive drop compensation set to 10% and a reference voltage at 400V



Example for [5.41] Voltage line drop compensation set to 10% and a reference voltage at 400V

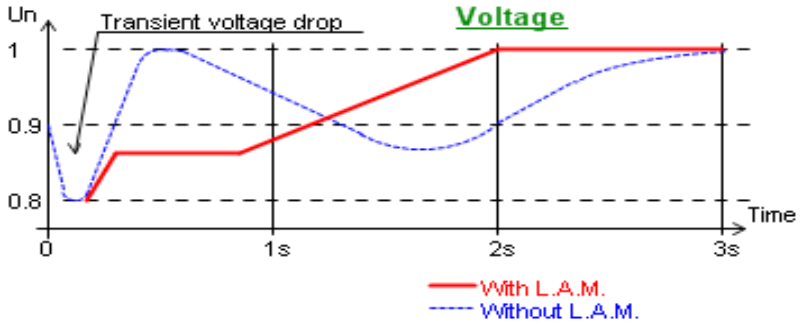
NOTA: The user can refer to the D500 series manual (ref : 4243) for more information about these functions

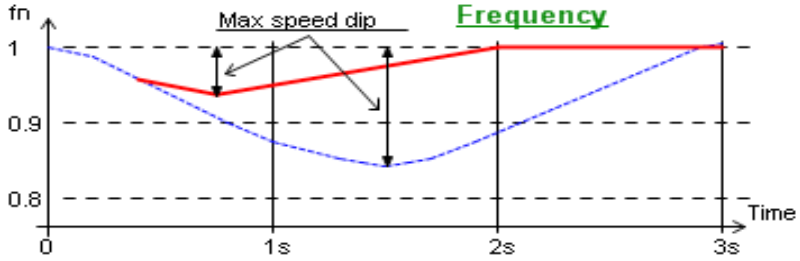
2.3.2 - Measured values

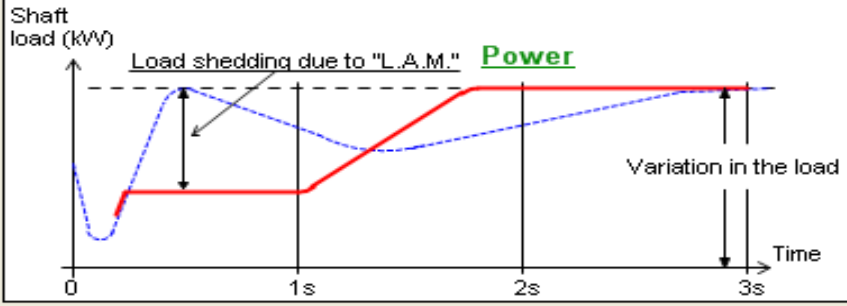
Parameters	Désignation	Minimum	Maximum	Type
5.01	Alternator Frequency	10,0 Hz	100,0 Hz	R
5.80	Alternator Voltage	0,0 V	530,0 V	R
5.39	I u alternator	0 A	5000 A	R
5.70	I v alternator	0 A	5000 A	R
5.71	I w alternator	0 A	5000 A	R
5.08	Grid input Frequency	10,0 Hz	100,0Hz	R
5.82	Grid input Voltage	50,0 V	530,0 V	R

L.A.M (Load Acceptance Module):

On load impact, the engine speed rotation decrease. When it reach the preset frequency knee, the "L.A.M." function will drop the voltage by the preset value in % and concequently, it reduces the active load needed from the engine. The frequency drop will be also reduced.
As soon as the AVR detects a rise of the engine speed, it activates the "soft recovery voltage" function to reach preset U/F law. This function is designed to reduce speed variation during a load impact or increase the load impact capability for the same variation speed.







2.3.3 - Power Factor

Parameters	Designation	Minimum	Maximum	Type	Factory setting
4.01	Power factor set point	0	1.00	RW	0
4.09	Forward / Reverse Power factor	0	1	RW	0
4.28	Current transformer phase correction	0.00	15.00 degrees	RW	0.00
5.45	measured value of Power factor	0.000	1.000	R	
5.46	measured value of Sign of Power factor	0	1	R	

2.3.4 - KVAR

Parameters	Designation	Minimum	Maximum	Type	Factory setting
4.05	reactive power Reference	-100 %	+100 %	RW	0
4.07	measured value of reactive power	-32000 KVAR	+32000 KVAR	R	
4.15	measured value of apparent Power	-32000 KVA	+32000 KVA	R	
4.16	measured value of Active Power	-32000 KW	+32000 KW	R	
5.42	I Nominal alternator	0 A	5000 A	RW	0 A
4.91	V Nominal alternator	0	1000,0V	RW	400,0V

Please note, if a ratio is used for the return alternator voltage, the nominal voltage alternator 4.91 must take into account this ratio.

Similarly, the reactive power measured 4.07 by the D500 is calculated with the voltage received by the D500. So to find the real measure, it is necessary to multiply 4.07 by the inverse ratio.

2.3.5 - Reference Iexc.

Parameters	Designation	Minimum	Maximum	Type	Factory setting
5.33	Iexc Reference	0,0A	20 ,0A	RW	0,0A
5.34	measured value of Excitation current	0.0 A	20 .0A	R	

2.3.6 - Operating mode

Parameters	Designation	Minimum	Maximum	Type	Factory setting
5.30	PF/KVAR or Voltage Select	0	1	RW	0
4.08	Regulation Cos or KVAR Select	0	1	RW	0
5.13	U=u	0	1	RW	1
5.49	Manual Mode	0	1	RW	0

2.3.7 - Fault and outputs assignments

Parameters	Designation	Minimum	Maximum	Type
10.01	No trip	0	1	R
10.06	short circuit Alarm	0	1	R
10.07	Loss of voltage sensing Alarm	0	1	R
10.23	under excitation Alarm	0	1	R
10.26	over excitation on level Alarm	0	1	R
10.27	over excitation on curve Alarm	0	1	R
10.42	overvoltage Alarm	0	1	R
10.52	Over temperature PT100_1 Alarm	0	1	R
10.54	Over temperature PTC Alarm	0	1	R
10.62	Over temperature PT100_2 Alarm	0	1	R
10.72	Over temperature PT100_3 Alarm	0	1	R
10.83	Stator overcurrent limitation Active	0	1	R

Parameters	Designation	Minimum	Maximum	Type
10.36	trip state	0	32000	R
Bit0	0	10.01 No trip		
Bit1	1	10.06 short circuit Alarm		
Bit2	2	10.07 Loss of voltage sensing Alarm		
Bit3	3	10.23 under excitation Alarm		
Bit4	4	10.26 over excitation on level Alarm		
Bit5	5	10.27 over excitation on curve Alarm		
Bit6	6	10.42 overvoltage Alarm		
Bit7	7	10.52 Over temperature PT100_1 Alarm		
Bit8	8	10.54 Over temperature PTC Alarm		
Bit9	9	10.62 Over temperature PT100_2 Alarm		
Bit10	10	10.72 Over temperature PT100_3 Alarm		
Bit11	11	10.72 Over stator current		
Bit12	12	10.72 Over stator current U		
Bit13	13	10.72 Over stator current V		
Bit14	14	10.72 Over stator current W		
Bit15	15	10.72 imbalance stator current		

Parameters	Designation	Minimum	Maximum	Type
10.38	trip state	0	32000	R
Bit0	0	10.15 open diode		
Bit1	1	10.16 short circuit diode		
Bit2	2	unused		
Bit3	3	unused		
Bit4	4	unused		
Bit5	5	unused		
Bit6	6	unused		
Bit7	7	unused		
Bit8	8	unused		
Bit9	9	unused		
Bit10	10	unused		
Bit11	11	unused		
Bit12	12	unused		
Bit13	13	unused		
Bit14	14	unused		
Bit15	15	unused		

2.3.8 - Trip Enable

Parameters	Designation	Minimum	Maximum	Type	Factory setting
10.03	Voltage loss detection Enable	0	1	RW	1
10.20	Excitation current protection Enable	0	1	RW	1
10.40	Overvoltage protection Enable	0	1	RW	1

2.3.9 - PT100

Parameters	Designation	Minimum	Maximum	Type	Factory setting
10.51	PT100_1 temperature threshold	50	200 degrees Celsius	RW	160
10.61	PT100_2 temperature threshold	50	200 degrees Celsius	RW	160
10.71	PT100_3 temperature threshold	50	200 degrees Celsius	RW	160
10.50	PT100_1 temperature	0	250 degrees Celsius	R	
10.60	PT100_2 temperature	0	250 degrees Celsius	R	
10.70	PT100_3 temperature	0	250 degrees Celsius	R	

2.3.10 - Diodes trip parameters

Parameters	Designation	Minimum	Maximum	Type	Factory setting
10.13	Enable diode fault	0	1	RW	0
10.14	Enable shut down diodes	0	1	RW	1
10.15	Open diode trip	0	1	R	
10.16	Short circuit diode trip	0	1	R	

2.3.11 - Serial number parameters

2.3.11.1 - The D510 C firmware version number

The D510C firmware is available in the parameter 5.99

2.3.11.2 - Serial number of the product

The serial number is available in these following parameters.

Parameter	Designation	Minimum	Maximum	Type	Factory setting
19.50	D500 type	0	32000	R	
19.51	Serial number 1	0	32000	R	
19.52	Serial number 2	0	32000	R	
19.53	Serial letter	0	32000	R	

19.50 D500 Type

0	D510 REVA
1	D510 C REVA
2	D515 REVA
3	D515 C REVA

NOTA: The current revision is REVB

19.53 letter or number

Decimal value of ASCCI code

CAN D500 SERIES - LS proprietary protocol / J1939 D500 AVRs

Serial number example:

19.51		**19.53**	**19.52**
Year	week	Letter or number	Number of incrementation
207	46	L	02539

NOTA: 207 above must be read as 2007

Examples:

« D510_REVA_S/N : 20746L02539 »

« D515CREVA_S/N : 20746L02539 »

3 - J1939 D500

The J1939 for the D510 is done according to the SAE J1939 standards. The SAE J1939-75 document defines the OSI Application layer data parameters (SPNs) and messages (PGNs) for information predominantly associated with monitoring and control generators and driven equipment in electric power generation and industrial applications.

3.1 - Broadcast

3.1.1 - PGN 65030 (0X00FEO6) Generator Average Basic AC Quantities -GAAC

Transmission repetition rate	100ms
Priority	3
Extended data page	0
Data page	0

Identifier 29 bits			Data							
Priority EDP DP	PGN	SA	SPN 2440		SPN 2444		SPN 2436		SPN 2448	
C	FE06									

SPN 2440 Generator Average Line-Line AC rms Voltage:

Resolution: 1V/bit, 0 Offset

Data range: 0 to 64255 V

Type: measured

SPN 2444 Generator Average Line-Neutral AC rms Voltage:

Resolution: 1V/bit, 0 Offset

Data range: 0 to 64255 V

Type: measured

SPN 2436 Generator Average AC Frequency:

Resolution: 1/128 Hz/bit, 0 offset

Data range: 0 to 501.992 1875 Hz

Type: measured

SPN 2448 Generator Average AC rms current:

Resolution: 1A/bit, 0 Offset

Data range: 0 to 64255 A

Type: measured

Voltage: Line to Line AC rms Voltage SPN 2440 Average

Current AC rms current SPN 2448 Average

PGN 65030 = 0XFE06 priority 3

Example:

Voltage=400V =0x190

Current=50A =0x32

SA=parameter 12.45=0x90 (parameter 12.45 is the source address of the D500)

Identifier 29 bits			Data							
Priority R DP	PGN	SA	SPN 2440						SPN 2448	
C	FE06	90	90	01	FF	FF	FF	FF	32	00

0XC=01100 P=011 =3 priority R=0 DP=0

3.1.2 - PGN 64934 (0X00FDA6) Voltage Regulator Excitation status –VREP

Transmission repetition rate	100ms
Priority	3
Extended data page	0
Data page	0

Identifier 29 bits			Data				
Priority EDP DP	PGN	SA	SPN 3380		SPN 3381		SPN 3382
C	FDA6		FF	FF			FF

SPN 3380 Generator Excitation Field Voltage:

Not used

SPN 3381 Generator Excitation Field Current:

Resolution: 0.05 A/bit, 0 offset

Data range: 0 to 3212.75 A

Type: measured

SPN 3382 Generator Output Voltage Bias percentage

Not used

3.1.3 - PGN 65028 (0X00FEO4) Generator Total AC Reactive Power - GTACR

Transmission repetition rate	100ms
Priority	3
Extended data page	0
Data page	0

Identifier 29 bits			Data							
Priority EDP DP	PGN	SA	SPN 2456				SPN 2464		SPN 2518	
C	FE04									

SPN 2456 Generator Total Reactive Power:

Resolution: 1Var /bit, -2000 000 000 Offset

Data range: -2000 000 000 to 2 211 081 215 Var

Type: measured

SPN 2464 Generator Overall Power Factor:

Resolution: 1/16384 per bit, -1 Offset

Data range: -1.00000 to 2.921 814

Type: measured

SPN 2518 Generator Overall Power factor lagging:

Resolution: 4 states/ 2 bit, 0 offset

Data range: 0 to 3

00 : leading

01 : lagging

10 : errors

11 : not available

Type: measured

3.1.4 - PGN 65029 (0X00FEO5) Generator Total Power - GTACP

Transmission repetition rate	100ms
Priority	3
Extended data page	0
Data page	0

Identifier 29 bits			Data							
Priority EDP DP	PGN	SA	SPN 2452				SPN 2460			
C	FE05									

SPN 2452 Generator Total Real Power:

Resolution: 1W /bit, -2000 000 000 Offset

Data range: -2000 000 000 to 2 211 081 215 W

Type : measured

SPN 2460 Generator Total Apparent Power:

Resolution: 1VA / bit, -2000000000 offset

Data range: -2000 000 000 to 2 211 081 215 VA

Type : measured

3.1.5 - PGN 65281 (0X00FF01) Proprietary PT100 Temperature +TRIP +ALARM

Transmission repetition rate	100ms
Priority	3
Extended data page	0
Data page	0

Identifier 29 bits			Data						
Priority EDP DP	PGN	SA	PT100_1		PT100_2		PT100_3		TRIP+ALARM
C	FF01								

PT100_1 Temperature:

Resolution: 1 degree /bit, 0 offset

Data range: 0 to 250 degree Celsius

Type: measured

PT100_2 Temperature:

Resolution: 1 degree /bit, 0 offset

Data range: 0 to 250 degree Celsius

Type: measured

PT100_3 Temperature:

Resolution: 1 degree /bit, 0 offset

Data range: 0 to 250 degree Celsius

Type: measured

TRIP + ALARM + STATE:

Resolution: 65535 states /16bit, 0 offset

Data range: 0 to 65535

Type: measured

10.35 LED STATE

16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
							BlinkIEXC	Power on	HZ	Volt	iexc	Fault	manu	PFKVAR	U=U

Nota: Every trip can be broadcasted with this PGN

3.1.6 - PGN 65027 (0X00FEO3) Generator Phase A Basic AC Quantities -GPAAC

Transmission repetition rate	100ms
Priority	3
Extended data page	0
Data page	0

Identifier 29 bits			Data							
Priority EDP DP	PGN	SA	SPN 2441		SPN 2445		SPN 2437		SPN 2449	
C	FE03									

SPN 2441 Generator Phase AB Line-Line AC RMS Voltage:

Resolution: 1V/bit, 0 Offset

Data range: 0 to 64255 V

Type: measured

SPN 2445 Generator Phase A Line Neutral AC RMS Voltage:

Resolution: 1V/bit, 0 Offset

Data range: 0 to 64255 V

Type: measured

SPN 2437 Generator Phase A AC Frequency:

Resolution: 1/128 Hz/bit, 0 offset

Data range: 0 to 501.992 1875 Hz

Type: measured

SPN 2449 Generator Phase A AC RMS current:

Resolution: 1A/bit, 0 Offset

Data range: 0 to 64255 A

Type measured

Example :

Voltage line line ⟶ SPN 2441 Generator Phase AB Line-Line AC RMS Voltage

Current ⟶ SPN 2449 Generator Phase A AC RMS current

Voltage line neutral ⟶ SPN 2445 Generator Phase A Line Neutral AC RMS Voltage

Frequency phase A ⟶ SPN 2437 Generator Phase A AC Frequency:

PGN 65030 = 0XFE06 priority 3

Voltage=400V =0x190

Current=50A =0x32

Voltage line neutral=400V / Racine (3) =231V =0XE7

Frequency phase A=50.0 Hz ==> (50.0 *128) /10=6400 =0x1900

SA=parameter 12.45=0x90 (parameter 12.45 is the source address of the D500)

Identifier 29 bits			Data							
Priority R DP	PGN	SA	SPN 2441		SPN 2445		SPN 2437		SPN 2449	
C	FE03	90	90	01	E7	00	19	00	32	00

0XC=01100 P=011 =3 priority R=0 DP=0

3.1.7 - PGN 65024 (0X00FEO0) Generator Phase B Basic AC Quantities -GPBAC

Transmission repetition rate	100ms
Priority	3
Extended data page	0
Data page	0

Identifier 29 bits			Data							
Priority EDP DP	PGN	SA	SPN 2442		SPN 2446		SPN 2438		SPN 2450	
C	FE00									

SPN 2442 Generator Phase BC Line-Line AC RMS Voltage:

Resolution: 1V/bit, 0 Offset

Data range: 0 to 64255 V

Type: measured

SPN 2446 Generator Phase B Line Neutral AC RMS Voltage:

Resolution: 1V/bit, 0 Offset

Data range: 0 to 64255 V

Type: measured

SPN 2438 Generator Phase B AC Frequency:

Resolution: 1/128 Hz/bit, 0 offset

Data range: 0 to 501.992 1875 Hz

Type: measured

SPN 2450 Generator Phase B AC RMS current:

Resolution: 1A/bit, 0 Offset

Data range: 0 to 64255 A

Type: measured

3.1.8 - PGN 65021 (0X00FDFD) Generator Phase C Basic AC Quantities -GPCAC

Transmission repetition rate	100ms
Priority	3
Extended data page	0
Data page	0

Identifier 29 bits			Data							
Priority EDP DP	PGN	SA	SPN 2443		SPN 2447		SPN 2439		SPN 2451	
C	FDFD									

SPN 2443 Generator Phase CA Line-Line AC RMS Voltage:

Resolution: 1V/bit, 0 Offset

Data range: 0 to 64255 V

Type: measured

SPN 2447 Generator Phase C Line Neutral AC RMS Voltage:

Resolution: 1V/bit, 0 Offset

Data range: 0 to 64255 V

Type: measured

SPN 2439 Generator Phase C AC Frequency:

Resolution: 1/128 Hz/bit, 0 offset

Data range: 0 to 501.992 1875 Hz

Type: measured

SPN 2451 Generator Phase C AC RMS current:

Resolution: 1A/bit, 0 Offset

Data range: 0 to 64255 A

Type: measured

3.2 - Commands and requests

3.2.1 - PGN 65284 (0X00FF04) Requested Generator Average AC Quantities –RGAAC LS PROPRIETARY

Transmission repetition rate 100ms

Priority 3

Extended data page 0

Data page 0

Identifier 29 bits			Data							
Priority EDP DP	PGN	SA	SPN 3386 LS							
C	FF04									

SPN 3386 LS Requested Generator Average Line-Line AC RMS Voltage:

Resolution: 1 /128/bit, 0 offset

Data range: 0 to 32899071 V

Type: Status

3.2.2 - PGN 65285 (0X00FF05) Requested Generator Total AC Reactive Power – RGTACRP LS PROPRIETARY

Transmission repetition rate 100ms

Priority 3

Extended data page 0

Data page 0

Identifier 29 bits			Data								
Priority EDP DP	PGN	SA	SPN 3383 LS				SPN 3384 LS		SPN 3385 LS		
C	FF05										FF

SPN 3383 LS Requested Generator Total AC Reactive Power:

Resolution: 1 VA / bit, -2000 000 000 VA offset

Data range: -2 000 000 000 to +2 211 081 215 VA

Type : Status

SPN 3384 LS Requested Generator Overall Power Factor:

Resolution: 1 /16384 per bit, -1 offset

Data range: -1.00000 to +2.291 814

Type: Status

SPN 3385 LS Requested Generator Overall Power Factor lagging:
00 leading
01 lagging
10 reserved
11 don't care
Resolution: 4 states /2 bit, 0 offset
Data range: 0 to 3
Type: Status

BYTE7

SPN 3385 LS							
1	2	3	4	5	6	7	8
		1	1	1	1	1	1

3.2.3 - PGN 65286 (0X00FF06) Voltage Regulator Operating mode - VROM LS PROPRIETARY

Transmission repetition rate	1s
Priority	7
Extended data page	0
Data page	0

Identifier 29 bits			Data							
Priority EDP DP	PGN	SA								
1C	FF06		BYTE1	BYTE2	FF	FF	FF	FF	FF	FF

BYTE1

SPN 3375 LS			SPN3376 LS			SPN3377 LS	
1	2	3	4	5	6	7	8

BYTE2

SPN 3378 LS		SPN3379 LS		F			
1	2	3	4	5	6	7	8

SPN 3375 LS Voltage regulator load Compensation mode
Not used

SPN 3376 LS Voltage regulator Var/Power Factor Operating mode

000 Var / Power Factor regulation disabled

001 Power Factor regulation enabled

010 Var regulation enabled

011 Reserved

100 Reserved

101 Reserved

110 Reserved

111 don't care

Resolution: 8 states/ 3bit, 0 offset

Data range: 0 to 7

Type: status

SPN 3377 LS Voltage regulator under frequency Compensation Enabled

Not used

SPN 3378 LS Voltage regulator soft start state

00 Soft start is inactive

01 Soft start is active

10 Reserved

11 don't care

Resolution: 4 states/ 2bit, 0 offset

Data range: 0 to 3

Type: status

SPN 3379 LS Voltage regulator enabled

00 No regulating voltage –unit disabled

01 regulating voltage

10 Reserved

11 don't care

Resolution: 4 states/ 2bit, 0 offset

Data range: 0 to 3

Type: status

3.2.4 - PGN 65282 (0X00FF02) Proprietary Command Reset Trip D500

Transmission repetition rate 100ms

Priority 3

Extended data page 0

Data page 0

Identifier 29 bits			Data						
Priority EDP DP	PGN	SA							RESET TRIP
C	FF02		FF	FF	FF	FF	FF	FF	

BYTE8

8	7	6	5	4	3	2	1

Byte8.1 1 ⟶ Reset Trip 0 ⟶ OFF

Byte8.2 1 ⟶ reinit soft start

3.2.5 - Request PGN 59904 0XEA00
Not USED

Request PGN PGN= 59904 EA00 Priority 6 6=110 11000=0x18

Priority 6

Extended data page 0

Data page 0

Identifier 29 bits			Data		
Priority R DP	On Request	SA	PGN REQUESTED		
18	EA00				

The D500 has to give an answer with the PGN requested as defined in the broadcast mode but only one time

Example:

Request PGN 61468 (0X00F01C)

Identifier 29 bits			Data		
Priority R DP	On Request	SA	PGN REQUESTED		
18	EA00		1C	F0	00

3.3 - Active Diagnostic Troubles Codes DM1

The diagnostic messages for the D510 are done according to the Active Diagnostic Troubles Codes DM1 specified in the SAE J1939-73 (Application layer Diagnostic)

The DM1 message is sent every 1 second.

The associated PGN is PGN 65226 (0X00FECA) Active Diagnostic Troubles Codes DM1 priority 6

Byte 1

Bits 8-7 Malfunction Indicator Lamp Status

Bits 6-5 Red Stop Lamp Status

Bits 4-3 Amber Warning Lamp Status

Bits 2-1 Protect Lamp Status

Byte 2 Not used

Bits 8-7 Flash Malfunction Indicator Lamp Status

Bits 6-5 Flash Red Stop Lamp Status

Bits 4-3 Flash Amber Warning Lamp Status

Bits 2-1 Flash Protect Lamp Status

Byte 3

Bits 8-1 SPN, 8 least significant bits of SPN (most significant at bit 8)

Byte 4

Bits 8-1 SPN, second byte of SPN (most significant at bit 8)

Byte 5

Bits 8-6 SPN, 3 most significant bits (most significant at bit 8)

Bits 5-1 FMI, (most significant at bit 5)

Byte 6

Bits 8 SPN Conversion method

Bits 7-1 Occurrence count

The DM1 message is only applied to the following SPN:

SPN 2440 Generator Average Line-Line AC rms Voltage

SPN 2448 Generator Average AC rms current

SPN 3381 Generator Excitation Field Current

3.3.1 - No trip DM1 or only one trip

No trip

Identifier 29 bits			Data							
Priority R DP	DM1	SA	Red lamp	Unused	SPN		SPN +FMI	CM+OC		
18	FECA		00	FF	00	00	00	00	FF	FF
			Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8

One trip DM1

Identifier 29 bits			Data							
Priority R DP	DM1	SA	Red lamp	Unused	SPN		SPN +FMI	CM+OC		
18	FECA			FF					FF	FF
			Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8

Example:
SPN 2440 Generator Average Line-Line AC rms Voltage: Under voltage

Byte 1
Bits 8-7 Malfunction Indicator Lamp Status 00 Lamp MIL off
Bits 6-5 Red Stop Lamp Status 01 Lamp red on
Bits 4-3 Amber Warning Lamp Status 00 Lamp Amber Warning off
Bits 2-1 Protect Lamp Status 00 Lamp Protect Status off
Byte1 =0x 10 red lamp

Byte 2 Not used
Byte 2 = 0xFF
SPN 2440 =0X988

Byte 3 SPN
Byte3 = 0x88

Byte 4 SPN
Byte4 = 0x09

Byte 5 SPN +FMI
Bits 8-6 SPN, 3 most significant bits (most significant at bit 8) 000
Bits 5-1 FMI, (most significant at bit 5) 4 voltage under level
Byte5 = 0x04

Byte 6
Bits 8 SPN Conversion method 0 version 4 recommended
Bits 7-1 Occurrence count 1
Byte6 = 0x01

Identifier 29 bits			Data							
Priority R DP	DM1	SA	Red lamp	Unused	SPN		SPN +FMI	CM+OC		
18	FECA		10	FF	88	09	04	01	FF	FF
			Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8

3.3.2 - DM1 more than one trip + transport protocol + BAM

In that case it is necessary to send several packets, and to use the Transport Protocol Connection Management (TP.CM) defined in the SAE J1939 -21.

This type of message is used to initiate and close connections and also to control flow.

The associated PGN is PGN 60416 (0X00EC00) Transport Protocol connection management TP.CM priority 7.

The Broadcast Announce Message (BAM) is used to inform all the nodes of the network that a large message is about to be broadcast. It defines the parameter group and the number of bytes to be sent. After TP.CM_BAM is sent, the Data Transfer Messages are sent and they contain the packetized broadcast data.

Identifier 29 bits			Data							
Priority R DP	BAM	SA		Nbr of bytes		Nbr of packets		DM1		
1C	EC00		20				FF	CA	FE	00
			Byte 1	Byte 2	Byte3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8

Byte 1
Control Byte 32 BAM 0x20

Byte 2 -3
total message size, number of bytes
a = lamp status
b = SPN
c = SPN+FMI
d = CM and OC
a 2 bytes
bcd 4 bytes
Message is as follow abcdbcdbcd…
2 trips ⟶ 2bytes +2*4bytes =10 bytes
Byte2=0x0A
Byte3=0x00
3 trips ⟶ 2bytes +3*4bytes =14 bytes
Byte2=0x0E
Byte3=0x00

Byte 4
total number of packets
2 Trips
10 bytes/7=1.42 ==> 2 packets
3 Trips
14 bytes/7=2 ==> 2 packets

Byte 5
reserved FF
Byte 6 -7-8 Parameter Group number of the packeted message, DM1 (FECA) in that case
According to SAE J1939-21, the TP.DT message is also used. The TP.DT message is an individual packet of a multipacket message transfer. For example if a large message had to be divided into 5 packets in order to be communicated, then there would be 5 TP.DT messages.
The associated PGN is PGN 60160 (0X00EB00) Transport Protocol Data Transfer TP.DT priority 7
Byte 1 Sequence Number
Byte 2-8 Packetized Data

Identifier 29 bits			Data							
Priority R DP	TP.DT	SA	First packet	Red lamp	Unused	SPN1		SPN1 + FMI	Count	SPN2
1C	EB00		01		FF					
			Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8

2 Trips

Identifier 29 bits			Data							
Priority R DP	TP.DT	SA	Second packet	SPN 2	SPN 2 +FMI	Count	Unused	Unused	Unused	Unused
18	EB00		02				FF	FF	FF	FF
			Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8

3 Trips

Identifier 29 bits			Data							
Priority R DP	TP.DT	SA	Second packet	SPN 2	SPN 2 +FMI	Count	SPN3	SPN3	SPN3+FMI	Count
18	EB00		02							
			Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8

Trips Example n°1 :
The D500 sends two trips:
SPN 2440 Generator Average Line-Line AC rms Voltage: Under voltage
SPN 2448 Generator Average AC rms current Over current
SA=parameter 12.45=0x90 (parameter 12.45 is the source address of the D500)
For each trip the counter is only 1.

CAN D500 SERIES - LS proprietary protocol / J1939 D500 AVRs

Message # 1

Priority R DP	BAM	SA		Nbr of bytes		Nbr of packets		DM1		
1C	EC00	90	20	0A	00	02	FF	CA	FE	00
			Byte 1	Byte 2	Byte3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8

Message # 2

Identifier 29 bits			Data							
Priority R DP	TP.DT	SA	First packet	Red lamp	Unused	SPN1		SPN1 +FMI	Count	SPN2
1C	EB00	90	01	10	FF	88	09	04	01	90
			Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8

Message # 3

Identifier 29 bits			Data							
Priority R DP	TP.DT	SA	Second packet	SPN 2	SPN 2 +FMI	Count	Unused	Unused	Unused	Unused
18	EB00	90	02	09	06	01	FF	FF	FF	FF
			Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8

Message # 2

Byte 2

Bits 8-7 Malfunction Indicator Lamp Status	00 Lamp MIL off
Bits 6-5 Red Stop Lamp Status	01 Lamp red on
Bits 4-3 Amber Warning Lamp Status	00 Lamp Amber Warning off
Bits 2-1 Protect Lamp Status	00 Lamp Protect Status off

Byte2 =0x 10 red lamp

Byte 3 Not used
Byte3 = 0xFF
SPN1 2440 = 0X988

Byte 4 SPN
Byte4 = 0x88
Byte 5 SPN
Byte5 = 0x09

Byte 6 SPN +FMI

Bits 8-6 SPN, 3 most significant bits (most significant at bit 8)	000
Bits 5-1 FMI, (most significant at bit 5)	4 voltage under level

Byte6 =0x04

Byte 7
Bits 8 SPN Conversion method 0 version 4 recommended
Bits 7-1 Occurrence count 1
Byte7 =0x01
SPN2 2448 =0X990

Byte 8 SPN
Byte8 =0x90

Message # 3

Byte 2 SPN
Byte5 =0x09

Byte 3 SPN +FMI
Bits 8-6 SPN, 3 most significant bits (most significant at bit 8) 000
Bits 5-1 FMI, (most significant at bit 5 6 Over current
Byte3 =0x06

Byte 4
Bits 8 SPN Conversion method 0 version 4 recommended
Bits 7-1 Occurrence count 1
Byte4 =0x01

Trips Example n°2 :
SPN 2440 Generator Average Line-Line AC rms Voltage: Under voltage
SPN 2448 Generator Average AC rms current Over current
SPN 3381 Generator Excitation Field Current: Over current
SA=parameter 12.45=0x90 (parameter 12.45 is the source address of the D500)

Message # 1

Priority R DP	BAM	SA		Nbr of bytes		Nbr of packets		DM1		
1C	EC00	90	20	0E	00	02	FF	CA	FE	00
			Byte 1	Byte 2	Byte3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8

Message # 2

Identifier 29 bits			Data							
Priority R DP	TP.DT	SA	First packet	Red lamp	Unused	SPN1		SPN1 +FMI	Count	SPN2
1C	EB00	90	01	10	FF	88	09	04	01	90
			Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8

CAN D500 SERIES - LS proprietary protocol / J1939 D500 AVRs

Message # 3

Identifier 29 bits			Data							
Priority R DP	TP.DT	SA	Second packet	SPN 2	SPN 2 +FMI	Count	SPN3	SPN3	SPN3+FMI	Count
18	EB00	90	02	09	06	01	35	0D	06	01
			Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8

Message # 1
Number of bytes= 14=0xE

Message # 2 idem as previous

Message # 3
SPN2 3381 =0XD35
Byte 5 SPN
Byte 5 = 0x35
Byte 6 SPN
Byte 6 = 0x0D
Byte 7 SPN +FMI
Bits 8-6 SPN, 3 most significant bits (most significant at bit 8) 000
Bits 5-1 FMI, (most significant at bit 5) 6 Over current
Byte7 =0x06
Byte 8
Bits 8 SPN Conversion method 0 version 4 recommended
Bits 7-1 Occurrence count 1
Byte8 =0x01

4 - COMMENTS

4.1 - Undefined Parameters in J1939

4.1.1 - Grey Area

Grey area for specific LS parameters undefined in J1939

PDU2	
FF	1
	2

PGN Grey AREA FFXX

For example:

Broadcast mode ⟶ PGN 65281 (0X00FF01) Proprietary PT100 Temperature +TRIP +ALARM

Command and request ⟶ PGN 65282 (0X00FF02) Proprietary Command Reset Trip D500

4.1.2 - Specific CAN protocol

The proprietary LS CAN protocol is used to access any parameters inside of the D500.

The identifiers of the LS protocol frames are in the grey area in order to be compliant with J1939 standards

Identifier LS broadcast = 0xCFF0090+ (m1205_identifier1*256)

Identifier LS Write = 0xCFF0090+ (m1220_identifier2*256)

Identifier LS Write Answer =0xCFF0090+ (m1240_can_test1*256);

Identifier LS Read = 0xCFF0090+ (m1221_identifier3*256)

Identifier LS Read Answer = 0xCFF0090+ (m1241_can_test2*256)

4.2 - General comments

No support for address claiming. No name

Disposal and recycling instructions

We are committed limiting the environmental impact of our activity. We continuously monitor our production processes, material sourcing and products design to improve recyclability and minimise our environmental footprint.

These instructions are for information purposes only. It is the user's responsibility to comply with local legislation regarding product disposal and recycling.

Waste & hazardous materials

The following components and materials require special treatment and must be separated from the alternator before the recycling process:

- electronic materials found in the terminal box, including the automatic voltage regulator (198), current transformers (176), interference suppression module (199) and other semi-conductors.

- diode bridge (343) and surge suppressor (347), found on the alternator rotor.

- major plastic components, such as the terminal box structure on some products. These components are usually marked with information concerning the type of plastic.

Service & Support

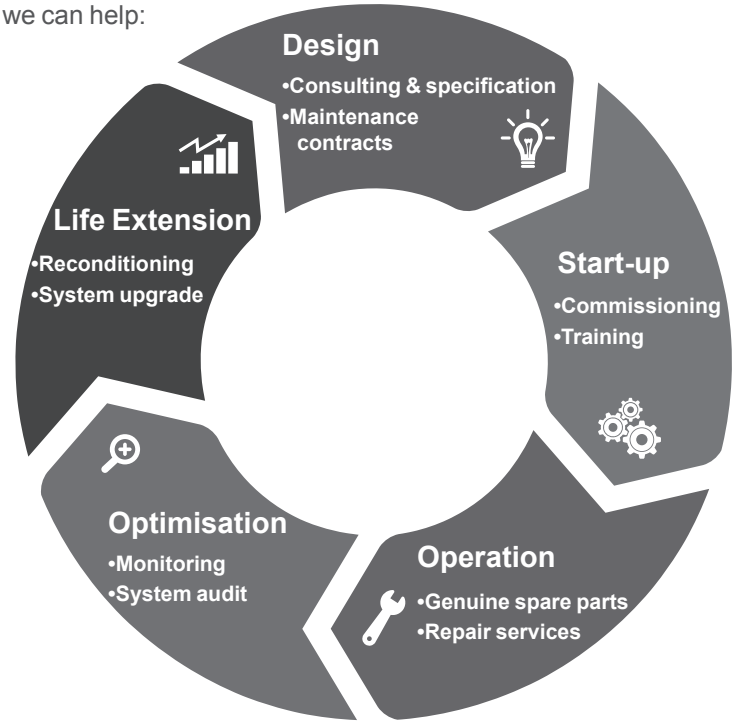
Our worldwide service network of over 80 facilities is at your service.

This local presence is our guarantee for fast and efficient repair, support and maintenance services.

Trust your alternator maintenance and support to electric power generation experts. Our field personnel are 100% qualified and fully trained to operate in all environments and on all machine types.

We have a deep understanding of alternator operation, providing the best value service to optimise your cost of ownership.

Where we can help:



Contact us:
Americas: +1 (507) 625 4011
Europe & Rest of the world: +33 238 609 908
Asia Pacific: +65 6250 8488
China: +86 591 88373036
India: +91 806 726 4867
Middle East: +971 4 811 8483

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