Operating instruction manual

SDMO

Controller

TELYS2 - JBUS

16/07/2014 33530003901_0_1

1. Introduction

This document shows how to use the RS485 link present on TELYS2. It is broken down into 3 parts:

1. Presentation of the RS485 link and the JBUS protocol;
2. List of information available on TELYS2;
3. Examples of use of the TELYS2 RS485 link.

2. Definitions

- bit: This is the smallest basic unit for representing information. It can have 0 or 1 as value;
- byte: = 8 bits;
- word: = 2 bytes = 16 bits;
- long: = 2 words = 4 bytes = 32 bits;
- bauds: transmission speed: bits/sec.

A byte is a sequence of 8 bits, it is written as follows: 1001 0001, where each bit takes the value 0 or 1. For each byte this gives 255 different combinations. A word is a sequence of 16 bits, i.e. 65535 possible values.

When values or addresses are expressed in hexadecimal, they are always preceded by the symbol "0x" in this document. Values that are not preceded by any symbol are expressed in decimal.

3. RS485 link and Jbus protocol

This means of communication available on TELYS2 consists of 2 main parts:

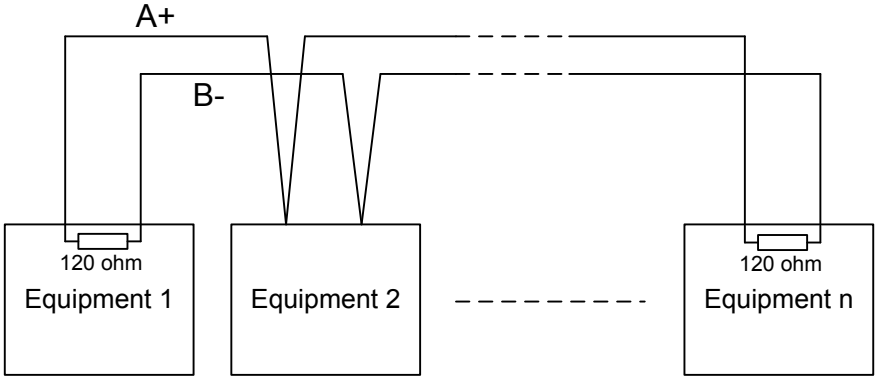
1. Hardware: Data is exchanged in the form of 0s and 1s. This hardware part defines how a 0 and a 1 are represented. It is the RS485 link that carries out this operation.
2. Software: The organization of 0s and 1s received enables to know what message a machine wants to send to another. This "organization" is known as protocol. In this particular case, it consists of the JBUS protocol.

3.1. RS485 link

The RS485 link is the physical medium for communication.
This is a differential link. It consists of 2 active wires (A+ and B-) and a shielding.

This is a serial multipoint type link. It connects several devices to one another. The maximum distance from the bus is 1200 metres.
The RS485 bus requires a line impedance of 120 ohms STP (Shielded Twisted Pair) and a resistance of 120 ohms / 1/2 watt at each of its ends. These resistances are commonly known as "end of line resistances".

The diagram below shows the architecture of an RS485 link.



The software parameters of an RS485 link are as follows:

- Communication speed, expressed in bauds: 9600 by default on TELYS2;
- Number of data bits: 8 by default on TELYS2;
- Number of stop bits: 1 by default on TELYS2;
- Type of parity check: No check by default on TELYS2.

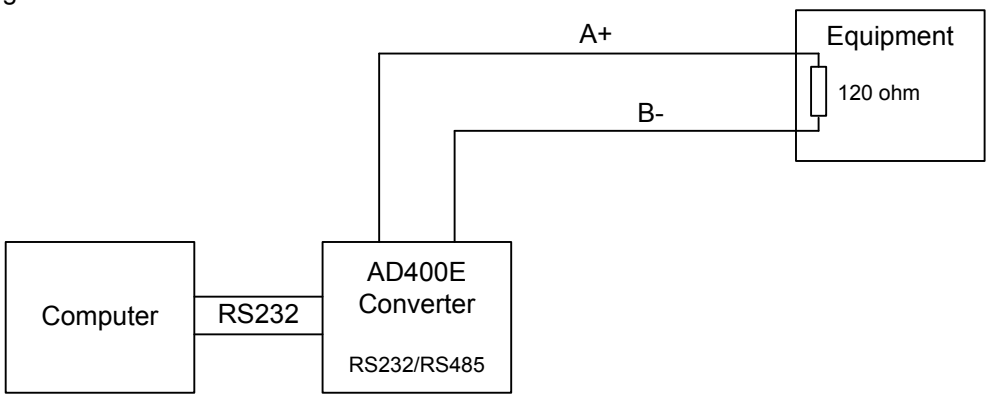
3.2. Connecting a PC to the RS485 network

This section explains how to connect a PC to the RS485 network. To carry out this operation, you need to know whether the PC that will be used for the connection has a serial port.

3.2.1 PC equipped with a serial port

The serial port of the PC includes an RS232 link. This link is not compatible with RS485. To communicate with TELYS2, it is necessary to use an RS232 / RS485 converter.
SDMO offers the AD400E converter to carry out this function.

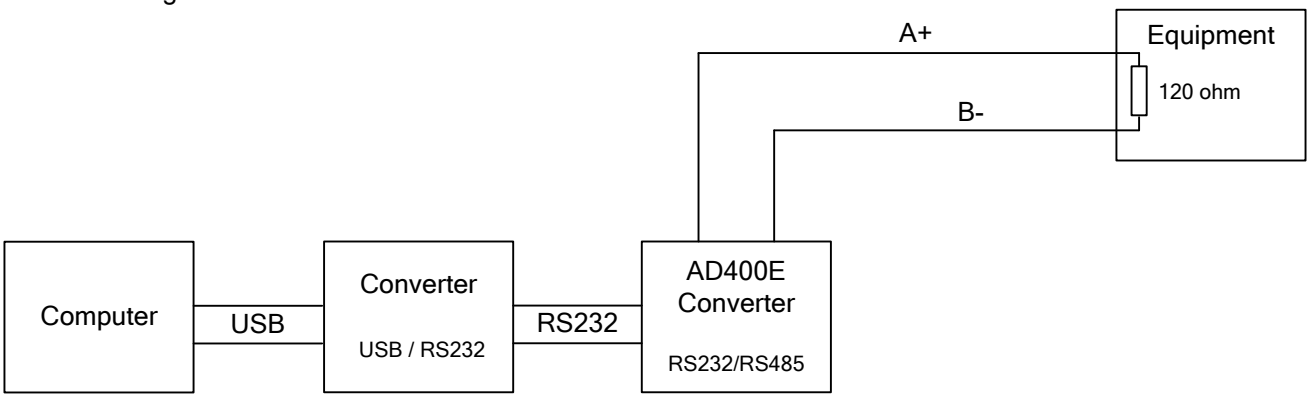
The connection diagram is as follows:



3.2.2 PC not equipped with a serial port

The solution recommended by SDMO to connect a PC not equipped with a serial port to the RS485 network is the use of a USB / RS232 converter and the use of the AD400E RS232 / RS485 converter.

The connection diagram is as follows:



3.3. The JBUS protocol

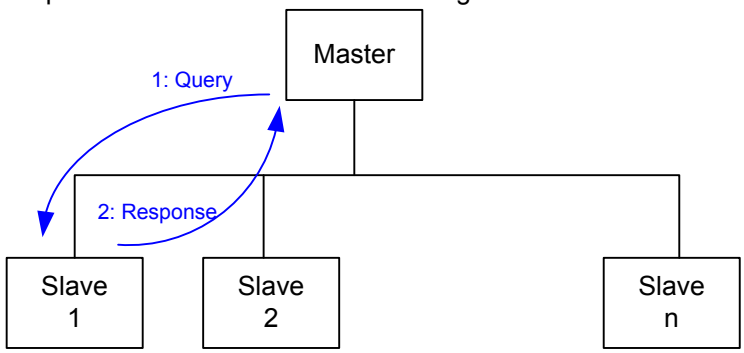
3.3.1 General presentation

A protocol is a way of organising data that is exchanged on a physical medium (e.g.: RS485, RS232, etc.).
For example: start address, then the information and at the end a check for the correct transmission of information.

The JBUS protocol (manufactured by April) or ModBus (manufactured by Modicon) is very widely used in the field of industrial communication and particularly on controllers. These two protocols are compatible, their common features are the following:

- There is one master and several slaves;
- Each slave has a separate address;
- The master always takes the initiative of communicating;
- The structure of frames exchanged is identical for both these protocols;
- The read, write operations between devices can be carried out by means of these protocols. These operations are known as "functions".

Following is the schematic representation of the master/slave organisation.



3.3.2 Difference between the JBUS/ModBus protocols

There are two important differences between the JBus protocol and the ModBus protocol:

a) The addressing of slaves: ModBus starts counting from 1 whereas JBUS starts from 0:

Slave	ModBus	JBus
First slave	1	0
Second slave	2	1
Third slave	3	2
…	…	…

b) Processing capacity:

Slave	ModBus	JBus
Number of slaves	255	247
Read n bits (function 1)	2000	1920
Read n words (function 3)	125	120
Write n bits (function 15)	1968	1920
Write n words (function 16)	123	120

The actual processing capacity depends on the master and slaves present on the bus.

3.3.3 JBUS exchanges

The exchanges are of the half-duplex type (first transmission then reception). No slave can send a message without a prior request from the master. The dialogue between slaves is not possible.

The sequence of a dialogue is as follows:
1. The master polls a slave then waits for its response, for reading as well as for writing;
2. The slave responds to the master.

TELYS2 acts only as a slave. It transmits data on the bus only if it is polled by the master to do it.
The communication mode selected is the RTU mode (Remote Terminal Unit).

3.3.4 JBUS functions and frames

There are approximately 20 JBUS functions. The following functions are implemented in TELYS2:
- Reading of N words: Function 3;
- Writing of 1 word: Function 6.

All frames end with a CRC (Cyclic Redundancy Check). This a mathematical calculation to verify that the frame received is complete. This calculation is generally included in the programmes using the JBUS/ModBus protocol.
All frames and data contained are expressed in hexadecimal.

3.3.4.1. Function 3: Reading of words

The frame sent by the master to request the value of several words is as follows:

Read request frame	Data	Address of the slave	Function	Start address	Number of words to be read	CRC
	Size	1 byte	1 byte	2 bytes	2 bytes	2 bytes

Note: The value of the function is equal to 3 in this particular case (reading)

The response returned by the slave is as follows:

Response frame	Data	Address of the slave	Function	Number of bytes sent	Values of the N words read	CRC
	Size	1 byte	1 byte	1 byte	N* 2 bytes	2 bytes

Note: The value of the function is equal to 3 in this particular case
Note: The length of this frame can change: It depends on the number (N) of bytes read.

In the event of an error in the frame, the slave returns:

Error frame	Data	Address of the slave	Error code	Exception code	CRC
	Size	1 byte	1 byte	1 byte	2 bytes

Note: The error code is equal to 83 in our case

The table below describes the meaning of the exception codes:

Exception code	**Meaning**
1	Incorrect function code
2	Incorrect address
3	Invalid data
4 or 5 or 6	Processing error

For additional information on this function, refer to the examples in section 5.1 " Reading of information ".

3.3.4.2. Function 6: writing a word

The frame returned by the master to change the value of a word is as follows:

Write request frame	Data	Address of the slave	Function	Address of the word	Value to be written in this word	CRC
	Size	1 byte	1 byte	2 bytes	2 bytes	2 bytes

Note: The value of the function is equal to 3 in this particular case (writing)

The response returned by the slave is as follows:

Response frame	Data	Address of the slave	Function	Address of the word	Value of this word	CRC
	Size	1 byte	1 byte	2 bytes	2 bytes	2 bytes

Note: The value of the function is equal to 6 in this particular case
Note: If everything is OK, the 2 values are identical

In the event of an error in the frame, the slave returns:

Error frame	Data	Address of the slave	Error code	Exception code	CRC
	Size	1 byte	1 byte	1 byte	2 bytes

Note: The error code is equal to 86 in this particular case

The table below describes the meaning of the exception codes:

Exception code	**Meaning**
1	Incorrect function code
2	Incorrect address
3	Invalid data
4 or 5 or 6	Processing error

For further information on this function, refer to the examples in section 5.2 "Writing".

4. Information available on TELYS2 through the RS485 link

This section presents all the information available on the RS485 link. The data is categorized by address.

4.1. States, alarms and faults

4.1.1 States of the generating set

States of the generating set				
Information on the frame				
	Access: Read	Note: It is essential to query the 2 words in the same frame. A bit by bit analysis of the value received must be carried out		
Query data				
	TELYS2 Address: 5 (by default)	JBUS Function: 3	JBUS Address: ▪ Hexadecimal: 0x100 ▪ Decimal: 256	Data length: 2 words (4 bytes)

Data of the response to be analyzed		
Address of the word read	***Position of the bit in the frame received***	***Meaning***
0x101 (257)	0	Request for automatic no load start-up in progress
	1	Request for automatic start-up under load in progress
	2	Request for manual no load start-up in progress
	3	Request for manual start-up under load in progress
	4	Stop request in progress
	5	Delayed stop request in progress
	6	Generating set stopped
	7	Generating set started
	8	Generating set stabilised
	9	Generating set under load
	10	Generating set ready to supply
	11	Command/control power-on in progress
	12	Safety inhibition activated
	13	Automatic operation with start-up on external start-up command
	14	Automatic operation with start-up on time range
	15	Automatic operation with start-up on test
0x100 (256)	16	Auto/Manu reversed 1: Automatic mode / 0: manual mode
	17	Test type: 0 : no load test / 1: under load test
	18	Start-up carried out on time range
	19	Standby generating set pre-alarm: GES
	20	External start-up command
	21	General alarm (0: deactivated/ 1: activated)
	22	General fault (0: deactivated / 1: activated)
	23	General fault with delayed shut-down (0: deactivated / 1: activated)
	24	Automatic operation ready to start
	25	Automatic operation in start-up sequence
	26	Generating set automatic operation active
	27	Automatic operation in shut-down sequence
	28	Sound alarm state
	29	Configuration of the controller in progress
	30	Configuration fault
	31	*Not used*

4.1.2 Generating set alarms

Generating set alarms (1/2)				
Information on the frame				
	Access: Read	Note: It is essential to query the 2 words in the same frame A bit by bit analysis of the value received must be carried out		
Query data				
	TELYS2 Address: 5 (by default)	JBUS Function: 3	JBUS Address: ▪ Hexadecimal: 0x102 ▪ Decimal: 258	Data length: 2 words (4 bytes)
Data of the response to be analyzed				

Address of the word read	***Position of the bit in the frame received***	***Meaning***
0x103 (259)	0	Generic alarm activated, see input configuration, section 4.3
	1	Holding tank alarm
	2	Fuel pump circuit breaker alarm 1
	3	Fuel pump circuit breaker alarm 2
	4	High fuel level alarm
	5	Very high fuel level alarm
	6	Low fuel level in daily tank alarm
	7	Oil pressure alarm
	8	Oil Pressure transmitter alarm
	9	Oil temperature alarm
	10	Oil temperature transmitter alarm
	11	Low oil level alarm
	12	HT water temperature alarm
	13	LT water temperature alarm
	14	Water temperature transmitter alarm
	15	Water preheating insufficient alarm
0x102 (258)	16	Low water level alarm
	17	Air cooler low water level alarm
	18	Charging alternator alarm
	19	General engine alarm
	20	Overload alarm
	21	Short-circuit overload alarm
	22	Active power return alarm
	23	Reactive power return alarm
	24	Min alternator voltage alarm
	25	Max alternator voltage alarm
	26	Min alternator frequency alarm
	27	Max alternator frequency alarm
	28	Min battery voltage alarm
	29	Max battery voltage alarm
	30	Phase rotation problem alarm
	31	Current transformer connection alarm

Generating set alarms (2/2)

Information on the frame

Access: Read	Note: It is essential to query the 2 words in the same frame A bit by bit analysis of the value received must be carried out

Query data

TELYS2 Address: 5 (by default)	JBUS Function: 3	JBUS Address: ▪ Hexadecimal: 0x104 ▪ Decimal: 260	Data length: 2 words (4 bytes)

Data of the response to be analyzed

Address of the word read	***Position of the bit in the frame received***	***Meaning***
0x105 (261)	0	*Not used*
	1	External start-up command alarm
	2	Emergency stop alarm
	3	External emergency stop alarm
	4	Permanent isolation controller triggering alarm
	5	*Not used*
	6	Alarm EJP J-1 (France only)
	7	Failure to start alarm
	8	Overspeed alarm
	9	Underspeed alarm
	10	CAN 1 bus alarm
	11	Engine CAN bus alarm
	12	*Not used*
	13	Differential relay triggering alarm
	14	*Not used*
	15	*Not used*
0x104 (260)	16	*Not used*
	17	*Not used*
	18	*Not used*
	19	*Not used*
	20	*Not used*
	21	*Not used*
	22	*Not used*
	23	*Not used*
	24	*Not used*
	25	*Not used*
	26	*Not used*
	27	*Not used*
	28	*Not used*
	29	*Not used*
	30	*Not used*
	31	*Not used*

4.1.3 Generating set faults

Generating set faults (1/2)				
Information on the frame				
	Access: Read	Note: It is essential to query the 2 words in the same frame A bit by bit analysis of the value received must be carried out		
Query data				
	TELYS2 Address: 5 (by default)	JBUS Function: 3	JBUS Address: ▪ Hexadecimal: 0x106 ▪ Decimal: 262	Data length: 2 words (4 bytes)
Data of the response to be analyzed				

Address of the word read	***Position of the bit in the frame received***	***Meaning***
0x107 (263)	0	Generic fault activated, see input configuration, section 4.3
	1	Holding tank fault
	2	Fuel pump circuit breaker fault 1
	3	Fuel pump circuit breaker fault 2
	4	High fuel level fault
	5	Very high fuel level fault
	6	Low fuel level in daily tank fault
	7	Oil pressure fault
	8	Oil pressure transmitter fault
	9	Oil temperature fault
	10	Oil temperature transmitter fault
	11	Low oil level fault
	12	HT water temperature fault
	13	LT water temperature fault
	14	Water temperature transmitter fault
	15	Water preheating insufficient fault
0x106 (262)	16	Low water level fault
	17	Air cooler low water level fault
	18	Charging alternator fault
	19	General engine fault
	20	Overload fault
	21	Short-circuit overload fault
	22	Active power return fault
	23	Reactive power return fault
	24	Min alternator voltage fault
	25	Max alternator voltage fault
	26	Min alternator frequency fault
	27	Max alternator frequency fault
	28	Min battery voltage fault
	29	Max battery voltage fault
	30	Phase rotation problem fault
	31	Current transformer connection fault

Generating set faults (2/2)

Information on the frame

Access: Read	Note: It is essential to query the 2 words in the same frame A bit by bit analysis of the value received must be carried out

Query data

TELYS2 Address: 5 (by default)	JBUS Function: 3	JBUS Address: ▪ Hexadecimal: 0x108 ▪ Decimal: 264	Data length: 2 words (4 bytes)

Data of the response to be analyzed

Address of the word read	***Position of the bit in the frame received***	***Meaning***
0x109 (265)	0	*Not used*
	1	External start-up command fault
	2	Emergency stop fault
	3	External emergency stop fault
	4	Permanent isolation controller triggering fault
	5	*Not used*
	6	Fault EJP J-1 (France only)
	7	Non-starting fault
	8	Overspeed fault
	9	Underspeed fault
	10	CAN 1 bus fault
	11	Engine CAN bus fault
	12	*Not used*
	13	Differential relay triggering fault
	14	*Not used*
	15	*Not used*
0x108 (264)	16	*Not used*
	17	*Not used*
	18	*Not used*
	19	*Not used*
	20	*Not used*
	21	*Not used*
	22	*Not used*
	23	*Not used*
	24	*Not used*
	25	*Not used*
	26	*Not used*
	27	*Not used*
	28	*Not used*
	29	*Not used*
	30	*Not used*
	31	*Not used*

4.1.4 Alarms and faults assigned to logic inputs

The state of the following alarms and faults must be consulted directly on the inputs of section 4.3.1 " Logic inputs of TELYS2 ".
To do this, refer to the allocation of inputs of the TELYS2 and associated input/output modules.

Alarms	Faults
Oil preheating insufficient alarm	Water preheating insufficient fault
Engine oil level high alarm	Oil preheating insufficient fault
Tank fuel level low alarm	Engine oil level high fault
Fuel level very low alarm	Low fuel level in daily tank fault
Alternator overload or short-circuit alarm	Tank fuel level low alarm
Normal contactor open alarm	High fuel level fault
Standby contactor open alarm	Fuel level very low fault
Differential triggering alarm	Normal contactor open fault
Differential relay connection alarm	Standby contactor open fault
Permanent isolation controller connection alarm	Differential triggering fault
Battery charger alarm	Differential relay connection fault
Air cooler circuit breaker alarm	Permanent isolation controller connection fault
Mains water flow alarm	Battery charger fault
Fire detection alarm	Air cooler circuit breaker fault
Oil leak alarm	Mains water flow fault
Fuel tank leak alarm	Fire detection fault
Air cooler compartment door open alarm	Oil leak fault
MCPS door open alarm	Fuel tank leak fault
Main circuit breaker open alarm	Air cooler compartment door open fault
Min starter battery voltage alarm	MCPS door open fault
Starter battery charger alarm	Main circuit breaker open fault
MX coil circuit breaker alarm	Min starter battery voltage fault
Butterfly valve alarm	Starter battery charger fault
Starter air pressure alarm	MX coil circuit breaker fault
Thermomagnetic relay alarm	Butterfly valve fault
Cylinder head temperature alarm	Starter air pressure fault
Calorstat inlet coolant temperature alarm	Thermomagnetic relay fault
Water circulation insufficient alarm	Cylinder head temperature fault
Bearing temperature alarm	Calorstat inlet coolant temperature fault
Stator temperature alarm	Water circulation insufficient fault
Phase rotation alarm	Bearing temperature fault
Current transformer connection alarm	Stator temperature fault
EJP J-1 alarm	

4.2. Electrical and mechanical measurements

Electrical and mechanical measurements				
Information on these indications				
	Access: Read	Note: The length of the data to be read must be correctly taken into account. The values returned are signed: They can be negative and positive.		
Query data				
	TELYS2 Address: 5 (by default)	JBUS Function: 3	JBUS Address: Depending on indication (see below)	Data length: Depending on indication (see below)

Available indications				
JBUS Address		Available data	Data length (bytes)	Units
Hexa decimal	Decimal			
0x200	512	Oil pressure	2	in 1/10 BAR
0x201	513	Oil temperature	2	in °C
0x202	514	HT water temperature	2	in °C
0x203	515	LT water temperature	2	in °C
0x204	516	Fuel level	2	in tank %
0x205	517	Battery ammeter	2	in A
0x206	518	Battery voltage	2	in 1/10V
0x207	519	I1	4	in 1/100 A
0x209	521	I2	4	in 1/100 A
0x20B	523	I3	4	in 1/100 A
0x20D	525	In	4	in 1/100 A
0x20F	527	U12	4	in 1/10 V
0x211	529	U23	4	in 1/10 V
0x213	531	U31	4	in 1/10 V
0x215	533	V1	4	in 1/10 V
0x217	535	V2	4	in 1/10 V
0x219	537	V3	4	in 1/10 V
0x21B	539	Alternator voltage frequency	2	in 1/100 Hz
0x21C	540	Engine speed	2	in rpm
0x21D	541	P	4	in 1/10 W
0x21F	543	Q	4	in 1/10 VAR
0x221	545	S	4	in 1/10 VA
0x223	547	Power factor	1	in 100 * cos
0x224	548	Inductive or capacitive power factor	1	0: Inductive/1: Capacitive
0x225	549	Partial hour meter	4	in s
0x227	551	Total hour meter	4	in s
0x229	553	Partial active energy meter	4	in kWh
0x22B	555	Total active energy meter	4	in kWh
0x22D	557	Partial reactive energy meter	4	in kVarh
0x22F	559	Total reactive energy meter	4	in kVarh

4.3. Logic inputs and outputs

4.3.1 Logic inputs of TELYS2

Logic inputs of TELYS2				
Information on the frame				
	Access: Read	Note: It is essential to query the 2 words in the same frame A bit by bit analysis of the value received must be carried out It is necessary to know the allocation of inputs of the TELYS2 (configuration/wiring diagram)		
Query data				
	TELYS2 Address: 5 (by default)	JBUS Function: 3	JBUS Address: ▪ Hexadecimal: 0x300 ▪ Decimal: 768	Data length: 2 words (4 bytes)

Data of the response to be analyzed			
	Address of the word read	***Position of the bit in the frame received***	***Meaning***
	0x301 (769)	0	ELH 01: External start-up command
		1	ELH 02: *depending on configuration*
		2	ELH 03: *depending on configuration*
		3	ELH 04: *depending on configuration*
		4	ELH 05: *depending on configuration*
		5	ELH 06: *depending on configuration*
		6	ELH 07: *depending on configuration*
		7	ELH 08: *depending on configuration*
		8	ELH 09: *depending on configuration*
		9	ELH 10: *depending on configuration*
		10	ELH 11: *depending on configuration*
		11	ELH 12: *depending on configuration*
		12	ELH 13: *depending on configuration*
		13	ELH 14: *depending on configuration*
		14	ELH 15: *depending on configuration*
		15	ELH 16: Emergency stop
	0x300 (768)	16	ELH 17: External emergency stop
		17	*Not used*
		18	*Not used*
		19	*Not used*
		20	*Not used*
		21	*Not used*
		22	*Not used*
		23	*Not used*
		24	*Not used*
		25	*Not used*
		26	*Not used*
		27	*Not used*
		28	*Not used*
		29	*Not used*
		30	*Not used*
		31	*Not used*

4.3.2 TELYS2 logic outputs

TELYS2 logic outputs				
Information on the frame				
	Access: Read	Note: It is essential to query the 2 words in the same frame A bit by bit analysis of the value received must be carried out It is necessary to know the allocation of outputs of the TELYS2 (configuration/wiring diagram)		
Query data				
	TELYS2 Address: 5 (by default)	JBUS Function: 3	JBUS Address: ▪ Hexadecimal: 0x302 ▪ Decimal: 770	Data length: 2 words (4 bytes)

Data of the response to be analyzed

Address of the word read	***Position of the bit in the frame received***	***Meaning***
0x303 (771)	0	SLH 01: *depending on configuration*
	1	SLH 02: *depending on configuration*
	2	SLH 03: *depending on configuration*
	3	SLH 04: *depending on configuration*
	4	SLH 05: *depending on configuration*
	5	SLH 06: *depending on configuration*
	6	SLH 07: *depending on configuration*
	7	SLH 08: *depending on configuration*
	8	SLH 09: Starter 1 control
	9	SLH 10: *depending on configuration*
	10	SLH 11: *depending on configuration*
	11	*Not used*
	12	*Not used*
	13	*Not used*
	14	*Not used*
	15	*Not used*
0x302 (770)	16	*Not used*
	17	*Not used*
	18	*Not used*
	19	*Not used*
	20	*Not used*
	21	*Not used*
	22	*Not used*
	23	*Not used*
	24	*Not used*
	25	*Not used*
	26	*Not used*
	27	*Not used*
	28	*Not used*
	29	*Not used*
	30	*Not used*
	31	*Not used*

4.3.3 Logic inputs/outputs Input/output modules 1 and 2

Logic inputs/outputs Input/output modules 1 and 2				
Information on the frame				
	Access: Read	Note: It is essential to query the 2 words in the same frame A bit by bit analysis of the value received must be carried out It is necessary to know the allocation of input/output modules (configuration/wiring diagram)		
Query data				
	TELYS2 Address: 5 (by default)	JBUS Function: 3	JBUS Address: ▪ Hexadecimal: 0x304 ▪ Decimal: 772	Data length: 2 words (4 bytes)

Data of the response to be analyzed

Address of the word read	***Position of the bit in the frame received***	***Meaning***
0x305 (773)	0	Input 1 of the input/output module number 1
	1	Input 2 of the input/output module number 1
	2	Input 3 of the input/output module number 1
	3	Input 4 of the input/output module number 1
	4	Output 1 of the input/output module number 1
	5	Output 2 of the input/output module number 1
	6	Output 3 of the input/output module number 1
	7	Output 4 of the input/output module number 1
	8	Output 5 of the input/output module number 1
	9	Output 6 of the input/output module number 1
	10	*Not used*
	11	*Not used*
	12	*Not used*
	13	*Not used*
	14	*Not used*
	15	*Not used*
0x304 (772)	16	Input 1 of the input/output module number 2
	17	Input 2 of the input/output module number 2
	18	Input 3 of the input/output module number 2
	19	Input 4 of the input/output module number 2
	20	Output 1 of the input/output module number 2
	21	Output 2 of the input/output module number 2
	22	Output 3 of the input/output module number 2
	23	Output 4 of the input/output module number 2
	24	Output 5 of the input/output module number 2
	25	Output 6 of the input/output module number 2
	26	*Not used*
	27	*Not used*
	28	*Not used*
	29	*Not used*
	30	*Not used*
	31	*Not used*

4.3.4 Logic inputs/outputs Input/output modules 3 and 4

Logic inputs/outputs Input/output modules 3 and 4				
Information on the frame				
	Access: Read	Note: It is essential to query the 2 words in the same frame A bit by bit analysis of the value received must be carried out It is necessary to know the allocation of input/output modules (configuration/wiring diagram)		
Query data				
	TELYS2 Address: 5 (by default)	JBUS Function: 3	JBUS Address: ▪ Hexadecimal: 0x306 ▪ Decimal: 774	Data length: 2 words (4 bytes)

Data of the response to be analyzed

Address of the word read	***Position of the bit in the frame received***	***Meaning***
0x307 (775)	0	Input 1 of the input/output module number 3
	1	Input 2 of the input/output module number 3
	2	Input 3 of the input/output module number 3
	3	Input 4 of the input/output module number 3
	4	Output 1 of the input/output module number 3
	5	Output 2 of the input/output module number 3
	6	Output 3 of the input/output module number 3
	7	Output 4 of the input/output module number 3
	8	Output 5 of the input/output module number 3
	9	Output 6 of the input/output module number 3
	10	*Not used*
	11	*Not used*
	12	*Not used*
	13	*Not used*
	14	*Not used*
	15	*Not used*
0x306 (774)	16	Input 1 of the input/output module number 4
	17	Input 2 of the input/output module number 4
	18	Input 3 of the input/output module number 4
	19	Input 4 of the input/output module number 4
	20	Output 1 of the input/output module number 4
	21	Output 2 of the input/output module number 4
	22	Output 3 of the input/output module number 4
	23	Output 4 of the input/output module number 4
	24	Output 5 of the input/output module number 4
	25	Output 6 of the input/output module number 4
	26	*Not used*
	27	*Not used*
	28	*Not used*
	29	*Not used*
	30	*Not used*
	31	*Not used*

4.3.5 Logic inputs/outputs Input/output module 5

Logic inputs/outputs Input/output module 5				
Information on the frame				
	Access: Read	Note: It is essential to query only one word (and not 2 as for the previous cases A bit by bit analysis of the value received must be carried out It is necessary to know the allocation of input/output modules (configuration/wiring diagram)		
Query data				
	TELYS2 Address: 5 (by default)	JBUS Function: 3	JBUS Address: ▪ Hexadecimal: 0x308 ▪ Decimal: 776	Data length: 1 word (2 bytes)

Data of the response to be analyzed

Address of the word read	***Position of the bit in the frame received***	***Meaning***
0x308 (776)	0	Input 1 of the input/output module number 5
	1	Input 2 of the input/output module number 5
	2	Input 3 of the input/output module number 5
	3	Input 4 of the input/output module number 5
	4	Output 1 of the input/output module number 5
	5	Output 2 of the input/output module number 5
	6	Output 3 of the input/output module number 5
	7	Output 4 of the input/output module number 5
	8	Output 5 of the input/output module number 5
	9	Output 6 of the input/output module number 5
	10	*Not used*
	11	*Not used*
	12	*Not used*
	13	*Not used*
	14	*Not used*
	15	*Not used*

4.4. Commands
4.4.1 Generating set commands

<table>
<tr><th colspan="5">Generating set commands</th></tr>
<tr><td colspan="5">Information on these indications</td></tr>
<tr><td></td><td colspan="2">Access: Write</td><td colspan="2">Note:</td></tr>
<tr><td colspan="5">Query data</td></tr>
<tr><td></td><td>TELYS2 Address:
5 (by default)</td><td>JBUS Function:
6</td><td>JBUS Address:
Depending on indication (see below)</td><td>Data length:
Depending on indication (see below)</td></tr>
<tr><td colspan="5">Available indications</td></tr>
<tr><td>JBUS Address</td><td colspan="3">Value expressed in decimal to be entered to give a command to the generating set</td><td>Data length (bytes)</td></tr>
<tr><td>0x450
(1104)</td><td colspan="3">00 (0x00): No load start-up command
01 (0x01): Stop command
02 (0x02): Request for closing the generating set output
03 (0x03): Request for opening the generating set output
04 (0x04): Command for switching to automatic mode
05 (0x05): Command for switching to manual mode
06 (0x06): Sound alarm reset
07 (0x07): Faults reset
08 (0x08): No load test command(+ indicate the duration in minutes at the address 0x451)
09 (0x09): Test under load command (+ indicate the duration in minutes at the address 0x451)
10 (0x0A): Partial hour meter reset
11 (0x0B): Partial active energy meter reset
12 (0x0C): Partial reactive energy meter reset</td><td>2</td></tr>
<tr><td>0x451
(1005)</td><td colspan="3">Additional information when the command is equal to 8 or 9</td><td>2</td></tr>
</table>

4.5. Time ranges/Programmes

Time ranges					
Information on these indications					
	Access: read and write	Note:			
Query data					
	TELYS2 Address: 5 (by default)	JBUS Function: 3 / 6	JBUS Address: Depending on indication (see below)	Data length: Depending on indication (see below)	
Available indications					
JBUS Address		Available data		Data length (bytes)	Units
Hexa decimal	Decimal				
Time Range / Programme 1					
0x901	2305	Year	of the start-up date	2	
0x902	2306	Month		2	
0x903	2307	Day		2	
0x904	*2308*	*Not used*		*2*	
0x905	2309	Hour		2	H
0x906	2310	Minute		2	Min
0x907	*2311*	*Not used*		*2*	
0x908	2312	Year	of the stop date	2	
0x909	2313	Month		2	
0x90A	2314	Day		2	
0x90B	*2315*	*Not used*		*2*	
0x90C	2316	Hour		2	H
0x90D	2317	Minute		2	Min
0x90E	*2318*	*Not used*		*2*	
0x90F	2319	Periodicity		2	0: None 1: Once 2: Daily 3: Weekly 4: Monthly 5: Annual
0x910	2320	Without load / With load		2	0: without load 1: with load
Time Range / Programme 2					
0x911	2321	Year	of the start-up date	2	
0x912	2322	Month		2	
0x913	2323	Day		2	
0x914	*2324*	*Not used*		*2*	
0x915	2325	Hour		2	H
0x916	2326	Minute		2	Min
0x917	*2327*	*Not used*		*2*	
0x918	2328	Year	of the stop date	2	
0x919	2329	Month		2	
0x91A	2330	Day		2	
0x91B	*2331*	*Not used*		*2*	
0x91C	2332	Hour		2	H
0x91D	2333	Minute		2	Min
0x91E	*2334*	*Not used*		*2*	
0x91F	2335	Periodicity		2	Same as address 0x90F
0x920	2336	Without load / With load		2	Same as address 0x910

Time Range / Programme 3					
0x921	2337	Year		2	
0x922	2338	Month		2	
0x923	2339	Day		2	
0x924	*2340*	*Not used*	of the start-up date	*2*	
0x925	2341	Hour		2	H
0x926	2342	Minute		2	Min
0x927	*2343*	*Not used*		*2*	
0x928	2344	Year		2	
0x929	2345	Month		2	
0x92A	2346	Day		2	
0x92B	*2347*	*Not used*	of the stop date	*2*	
0x92C	2348	Hour		2	H
0x92D	2349	Minute		2	Min
0x92E	*2350*	*Not used*		*2*	
0x92F	2351	Periodicity		2	0: None 1: Once 2: Daily 3: Weekly 4: Monthly 5: Annual
0x930	2352	Without load / With load		2	0: without load 1: with load
Time Range / Programme 4					
0x931	2353	Year		2	
0x932	2354	Month		2	
0x933	2355	Day		2	
0x934	*2356*	*Not used*	of the start-up date	*2*	
0x935	2357	Hour		2	H
0x936	2358	Minute		2	Min
0x937	*2359*	*Not used*		*2*	
0x938	2360	Year		2	
0x939	2361	Month		2	
0x93A	2362	Day		2	
0x93B	*2363*	*Not used*	of the stop date	*2*	
0x93C	2364	Hour		2	H
0x93D	2365	Minute		2	Min
0x93E	*2366*	*Not used*		*2*	
0x93F	2367	Periodicity		2	Same as address 0x92F
0x940	2368	No load / Under load		2	Same as address 0x930
Time Range / Programme 5					
0x941	2369	Year		2	
0x942	2370	Month		2	
0x943	2371	Day		2	
0x944	*2372*	*Not used*	of the start-up date	*2*	
0x945	2373	Hour		2	
0x946	2374	Minute		2	
0x947	*2375*	*Not used*		*2*	
0x948	2376	Year		2	
0x949	2377	Month		2	
0x94A	2378	Day		2	
0x94B	*2379*	*Not used*	of the stop date	*2*	
0x94C	2380	Hour		2	H
0x94D	2381	Minute		2	Min
0x94E	*2382*	*Not used*		*2*	
0x94F	2383	Periodicity		2	Same as address 0x92F
0x950	2384	No load / Under load		2	Same as address 0x930

Time Range / Programme 6					
0x951	2385	Year		2	
0x952	2386	Month		2	
0x953	2387	Day		2	
0x954	*2388*	*Not used*	of the start-up date	*2*	
0x955	2389	Hour		2	H
0x956	2390	Minute		2	Min
0x957	*2391*	*Not used*		*2*	
0x958	2392	Year		2	
0x959	2393	Month		2	
0x95A	2394	Day		2	
0x95B	*2395*	*Not used*	of the stop date	*2*	
0x95C	2396	Hour		2	H
0x95D	2397	Minute		2	Min
0x95E	*2398*	*Not used*		*2*	
0x95F	2399	Periodicity		2	0: None 1: Once 2: Daily 3: Weekly 4: Monthly 5: Annual
0x960	2400	No load / Under load		2	0: without load 1: with load
Time Range / Programme 7					
0x961	2401	Year		2	
0x962	2402	Month		2	
0x963	2403	Day		2	
0x964	*2404*	*Not used*	of the start-up date	*2*	
0x965	2405	Hour		2	H
0x966	2406	Minute		2	Min
0x967	*2407*	*Not used*		*2*	
0x968	2408	Year		2	
0x969	2409	Month		2	
0x96A	2410	Day		2	
0x96B	*2411*	*Not used*	of the stop date	*2*	
0x96C	2412	Hour		2	H
0x96D	2413	Minute		2	Min
0x96E	*2414*	*Not used*		*2*	
0x96F	2415	Periodicity		2	Same as address 0x95F
0x970	2416	No load / Under load		2	Same as address 0x960
Time Range / Programme 8					
0x971	2417	Year		2	
0x972	2418	Month		2	
0x973	2419	Day		2	
0x974	*2420*	*Not used*	of the start-up date	*2*	
0x975	2421	Hour		2	H
0x976	2422	Minute		2	Min
0x977	*2423*	*Not used*		*2*	
0x978	2424	Year		2	
0x979	2425	Month		2	
0x97A	2426	Day		2	
0x97B	*2427*	*Not used*	of the stop date	*2*	
0x97C	2428	Hour		2	H
0x97D	2429	Minute		2	Min
0x97E	*2430*	*Not used*		*2*	
0x97F	2431	Periodicity		2	Same as address 0x95F
0x980	2432	No load / Under load		2	Same as address 0x960

4.6. Date and time

Date and time				
Information on these indications				
	Access: read and write	Note:		
Query data				
	TELYS2 Address: 5 (by default)	JBUS Function: 3 / 6	JBUS Address: Depending on indication (see below)	Data length: Depending on indication (see below)

Available indications				
JBUS Address		Available data	Data length (bytes)	Units
Hexa decimal	Decimal			
0xA00	2560	Year	2	
0xA01	2561	Month	2	
0xA02	2562	Day	2	
0xA03	2563	Hour	2	H
0xA04	2564	Minute	2	Min
0xA05	2565	Second	2	sec

4.7. Versions

Versions				
Information on these indications				
	Access: Read	Note:		
Query data				
	TELYS2 Address: 5 (by default)	JBUS Function: 3	JBUS Address: Depending on indication (see below)	Data length: Depending on indication (see below)

Available indications				
JBUS Address		Available data	Data length (bytes)	Units
Hexa decimal	Decimal			
0xB00	2816	Version Packsoft reference – Major revision	1	
0xB01	2817	Version Packsoft reference – Minor revision	1	
0xB02	2818	Version PackConf- major revision	1	
0xB03	2819	Version PackConf – minor revision	1	
0xB04	2820	Version PackConf – revision index	1	
0xB05	2821	Version PackSoft – Major revision	1	
0xB06	2822	Version PackSoft – minor revision	1	
0xB07	2823	Version PackSoft – revision index	1	
0xB08	2824	Electronic board Serial number	20	
0xB1C	2844	SDMO serial number (Genset)	20	

5. Examples of use of the TELYS2 RS485 link

This section presents examples of use of the RS485/JBus communication of TELYS2.

5.1. Reading of information

5.1.1 Reading the battery voltage

The information relating to the battery voltage can be found in section 4.2 "
Electrical and mechanical measurements".
The following are the characteristics to be retained:

- JBUS function: 3 ;
- Address to be queried: 0x206 (518 in decimal);
- Length of data to be queried: 2 bytes, i.e. 1 word;
- The battery voltage unit is tenth of a Volt.

The TELYS2 address must be verified in the menu 253 of TELYS2. By default, this value is 5.
These characteristics enable to create the request frame:

	Data	Address of the slave	Function	Start address	Number of words to be read	CRC
Request frame	Size	1 byte	1 byte	2 bytes	2 bytes	2 bytes
	Content	05 (Menu 253)	03	0206	0001	6437 (to be calculated)

The TELYS2 returns the following frame (for example):

	Data	Address of the slave	Function	Number of bytes sent	Values of the N words read	CRC
Response frame	Size	1 byte	1 byte	1 byte	N* 2 bytes	2 bytes
	Value	05	03	02	0071	89A0

The information to be verified is the following:

- Address of the slave identical to the one in the request frame;
- Function identical to the one in the request frame;
- Number of bytes returned = Number of words to be read * 2.

After these checks, the battery voltage is read in the following manner:

- Conversion of the hexadecimal value and decimal value. Can be done using the calculator on a computer.
  0071 in hexadecimal is equivalent to 113 in decimal, i.e. a battery voltage of 11.3V.

The other information in section 4.2”
Electrical and mechanical measurements“ must be read in the same manner. Make sure to respect the length of each data.

5.1.2 Reading the state of the generating set

The information relating to the state of the generating set may be found in section 4.1.1 “States of the generating set”
The following are the characteristics to be retained:

- JBUS function: 3 ;
- Address to be queried: 0x100 (256 in decimal);
- Length of data to be queried: 4 bytes, i.e. 2 words;
- It is necessary to carry out a bit by bit analysis of the value received.

The TELYS2 address must be verified in the menu 253 of TELYS2. By default, this value is 5.
These characteristics enable to create the request frame:

Request frame	Data	Address of the slave	Function	Start address	Number of words to be read	CRC
	Size	1 byte	1 byte	2 bytes	2 bytes	2 bytes
	Content	**05** (Menu 253)	**03**	**0100**	**0002**	**C473** (to be calculated)

The TELYS2 returns the following frame (for example):

Response frame	Data	Address of the slave	Function	Number of bytes sent	First word read	Second word read	CRC
	Size	1 byte	1 byte	1 byte	2 bytes	2 bytes	2 bytes
	Value	**05**	**03**	**04**	**0840**	**0050**	**BC7B**

The information to be verified is the following:

- Address of the slave identical to the one in the request frame;
- Function identical to the one in the request frame;
- Number of bytes returned = Number of words to be read * 2.

After these checks, the state of the generating set is read in the following manner:

- Conversion of the hexadecimal value and binary value. Can be done using the calculator on a computer.

	First word read																Second word read															
Hexadecimal value	0x0840																0x0050															
Bit number	**31**	**30**	**29**	**28**	**27**	**26**	**25**	**24**	**23**	**22**	**21**	**20**	**19**	**18**	**17**	**16**	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Value	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0

After comparison with the table of section 4.1.1 “States of the generating set”, reading this data enables to obtain the following information:

- Bit 4 (=1): A shut-down request of the generating set is in progress;
- Bit 6 (=1): The generating set is shut down;
- Bit 16 (=0): The generating set is in manual mode;
- Bit 22 (=1): The general fault is activated;
- Bit 27 (=1): The automatic operation is in shut-down sequence.

The procedure is identical for all response frames where there is a bit by bit analysis to be carried out.

5.1.3 Reading the fault states

The information relating to the state of faults of the generating set may be found in section 4.1.3 “Generating set faults". For this example, the faults of the second list are taken into account.
The procedure is identical to the previous example.

The following are the characteristics to be retained:
- JBUS function: 3 ;
- Address to be queried: 0x108 (264 in decimal);
- Length of data to be queried: 4 bytes, i.e. 2 words;
- It is necessary to carry out a bit by bit analysis of the value received.

The TELYS2 address must be verified in the menu 253 of TELYS2. By default, this value is 5.
These characteristics enable to create the request frame:

	Data	Address of the slave	Function	Start address	Number of words to be read	CRC
Request frame	Size	1 byte	1 byte	2 bytes	2 bytes	2 bytes
	Content	**05** (Menu 253)	**03**	**0108**	**0002**	**45B1** (to be calculated)

The TELYS2 returns the following frame (for example):

	Data	Address of the slave	Function	Number of bytes sent	First word read	Second word read	CRC
Response frame	Size	1 byte	1 byte	1 byte	2 bytes	2 bytes	2 bytes
	Value	**05**	**03**	**04**	**0000**	**0084**	**BF90**

The information to be verified is the following:
- Address of the slave identical to the one in the request frame;
- Function identical to the one in the request frame;
- Number of bytes returned = Number of words to be read * 2.

After these checks, the state of the generating set is read in the following manner:

- Conversion of the hexadecimal value and binary value. Can be done using the calculator on a computer.

	First word read																Second word read															
Hexadecimal value	0x0000																0x0084															
Bit number	**31**	**30**	**29**	**28**	**27**	**26**	**25**	**24**	**23**	**22**	**21**	**20**	**19**	**18**	**17**	**16**	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Value	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0

After comparison with the table of section 4.1.3 "Generating set faults", reading this data enables to obtain the following information:
Bit 2 (=1): Emergency stop fault
Bit 7 (=1): Non-starting fault

5.1.4 Reading of the state of TELYS2 inputs

The information relating to the state of TELYS2 inputs may be found in section 4.3.1 “Logic inputs of TELYS2".
The procedure is identical to the previous example.

The following are the characteristics to be retained:
- JBUS function: 3 ;
- Address to be queried: 0x300 (768 in decimal);
- Length of data to be queried: 4 bytes, i.e. 2 words;
- It is necessary to carry out a bit by bit analysis of the value received.

The TELYS2 address must be verified in the menu 253 of TELYS2. By default, this value is 5.
These characteristics enable to create the request frame:

	Data	Address of the slave	Function	Start address	Number of words to be read	CRC
Request frame	Size	1 byte	1 byte	2 bytes	2 bytes	2 bytes
	Content	**05** (Menu 253)	**03**	**0300**	**0002**	**C5CB** (to be calculated)

The TELYS2 returns the following frame (for example):

	Data	Address of the slave	Function	Number of bytes sent	First word read	Second word read	CRC
Response frame	Size	1 byte	1 byte	1 byte	2 bytes	2 bytes	2 bytes
	Value	**05**	**03**	**04**	**0000**	**8000**	**DE33**

The information to be verified is the following:
- Address of the slave identical to the one in the request frame;
- Function identical to the one in the request frame;
- Number of bytes returned = Number of words to be read * 2.

After these checks, the state of the generating set is read in the following manner:

- Conversion of the hexadecimal value and binary value. Can be done using the calculator on a computer.

	First word read																Second word read															
Hexadecimal value	0x0000																0x8000															
Bit number	**31**	**30**	**29**	**28**	**27**	**26**	**25**	**24**	**23**	**22**	**21**	**20**	**19**	**18**	**17**	**16**	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Value	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

After comparison with the table of section 4.3.1 “Logic inputs of TELYS2", reading this data enables to obtain the following information:
Bit 15 (=1): The ELH17 input is activated: This is the emergency stop present on TELYS2.

5.1.5 Reading of input states of input/output modules of the TELYS2

The information relating to the input/output states of input/output modules can be found in section 4.3.3 “ Logic inputs/outputs Input/output modules 1 and 2".
The procedure is identical to the previous example.

The following are the characteristics to be retained:
- JBUS function: 3 ;
- Address to be queried: 0x304 (772 in decimal);
- Length of data to be queried: 4 bytes, i.e. 2 words;
- It is necessary to carry out a bit by bit analysis of the value received.

The TELYS2 address must be verified in the menu 253 of TELYS2. By default, this value is 5.
These characteristics enable to create the request frame:

Request frame	Data	Address of the slave	Function	Start address	Number of words to be read	CRC
	Size	1 byte	1 byte	2 bytes	2 bytes	2 bytes
	Content	**05** (Menu 253)	**03**	**0304**	**0002**	**840A** (to be calculated)

The TELYS2 returns the following frame (for example):

Response frame	Data	Address of the slave	Function	Number of bytes sent	First word read	Second word read	CRC
	Size	1 byte	1 byte	1 byte	2 bytes	2 bytes	2 bytes
	Value	**05**	**03**	**04**	**0005**	**0007**	**EE30**

The information to be verified is the following:
- Address of the slave identical to the one in the request frame;
- Function identical to the one in the request frame;
- Number of bytes returned = Number of words to be read * 2.

After these checks, the state of the generating set is read in the following manner:

- Conversion of the hexadecimal value and binary value. Can be done using the calculator on a computer.

	First word read																Second word read															
Hexadecimal value	0x0005																0x0007															
Bit number	**31**	**30**	**29**	**28**	**27**	**26**	**25**	**24**	**23**	**22**	**21**	**20**	**19**	**18**	**17**	**16**	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Value	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1

After comparison with the table of section 4.3.3 “Logic inputs/outputs Input/output modules 1 and 2", reading this data enables to obtain the following information:

Bit 0 (=1): Input 1 of the input/output module number 1 activated;
Bit 1 (=1): Input 2 of the input/output module number 1;
Bit 2 (=1): Input 3 of the input/output module number 1;
Bit 16 (=1): Input 1 of the input/output module number 2.

5.1.6 Reading of measurements of TELYS2

The information relating to the measurements made by the TELYS2 can be found in section 4.2 "Electrical and mechanical measurements". The value measured in this example is the active power measurement.

The following are the characteristics to be retained:
- JBUS function: 3 ;
- Address to be queried: 0x21D (541 in decimal);
- Length of data to be queried: 4 bytes, i.e. 2 words;
- The unit of the value received is 1/10 W.

The TELYS2 address must be verified in the menu 253 of TELYS2. By default, this value is 5.
These characteristics enable to create the request frame:

	Data	Address of the slave	Function	Start address	Number of words to be read	CRC
Request frame	Size	1 byte	1 byte	2 bytes	2 bytes	2 bytes
	Content	**05** (Menu 253)	**03**	**021D**	**0002**	**5431** (to be calculated)

The TELYS2 returns the following frame (for example):

	Data	Address of the slave	Function	Number of bytes sent	First word read	Second word read	CRC
Response frame	Size	1 byte	1 byte	1 byte	2 bytes	2 bytes	2 bytes
	Value	**05**	**03**	**04**	**05DB**	**FFFF**	**CEB4**

The information to be verified is the following:
- Address of the slave identical to the one in the request frame;
- Function identical to the one in the request frame;
- Number of bytes returned = Number of words to be read * 2.

To decode the value read, the following method must be followed:

A. Converting hexadecimal values into binary values

Warning, the first word read and the second word read must be reversed.

	Second word read																First word read															
Hexadecimal value	0xFFFF																0x05DB															
Bit number	**31**	**30**	**29**	**28**	**27**	**26**	**25**	**24**	**23**	**22**	**21**	**20**	**19**	**18**	**17**	**16**	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Value	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	1	0	1	1	1	0	1	1	0	1	1

B. Case 1: the first bit on the left is equal to 0

1. Conversion of binary into decimal

Using a calculator, for example. The value must be associated with the unit indicated: 1/10 W

C. Case 2: The first bit on the left is equal to 1 / Use of the method known as "two's complement".

The first bit on the left is equal to 1, which means that the value is negative.

1. Reverse the value of each of the bits

Bit number	**31**	**30**	**29**	**28**	**27**	**26**	**25**	**24**	**23**	**22**	**21**	**20**	**19**	**18**	**17**	**16**	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Before	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	1	0	1	1	1	0	1	1	0	1	1
After reversal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	1	0	0	0	1	0	0	1	0	0

2. Add 1 to the value found

Bit number	**31**	**30**	**29**	**28**	**27**	**26**	**25**	**24**	**23**	**22**	**21**	**20**	**19**	**18**	**17**	**16**	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Before	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	1	0	0	0	1	0	0	1	0	0
After addition	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	1	0	0	0	1	0	0	1	0	1

3. Conversion of binary into decimal

The conversion gives the value 64037.

In this case 2 where the first bit on the left had the value 1, the '-' sign must be added in front of the decoded value, i.e. -640374.

The value must be associated with the unit indicated: 1/10 W, i.e. finally, -64037.4 W.

5.2. Writing information

5.2.1 Sending commands to the generating set

The information relating to the sending of commands to the TELYS2 can be found in section 4.4.1 “Generating set commands”.
The command sent here is the faults reset command.

The following are the characteristics to be retained:
- JBUS function: 6 ;
- Address to be polled: 0x450 (1104 in decimal);
- Length of data to be written: 2 bytes, i.e. 1 word

The TELYS2 address must be verified in the menu 253 of TELYS2. By default, this value is 5.
These characteristics enable to create the request frame:

Write request frame	Data	Address of the slave	Function	Address of the word	Value to be written in this word	CRC
	Size	1 byte	1 byte	2 bytes	2 bytes	2 bytes
	Content	**05** (Menu 253)	**06**	**0450**	**0007**	**C8AD** (to be calculated)

The TELYS2 returns the following frame (for example):

Response frame	Data	Address of the slave	Function	Address of the word	Value of this word	CRC
	Size	1 byte	1 byte	2 bytes	2 bytes	2 bytes
	Content	**05**	**06**	**0450**	**0007**	**C8AD**

The information to be verified is the following:
- Address of the slave identical to the one in the request frame;
- Function identical to the one in the request frame;
- Number of bytes returned = Number of words to be read * 2;
- Identical value for the address boxes and value of the word.