Description of the access through the JBUS®/MODBUS® link for load transfer modules and IT-SWITCH

UPS/NTA GB/MTCJBUS.H

12/14/07

FOREWORD

We thank you for the trust you have in our Load Transfer Module (LTM).

Our equipment complies with the standard EN 50081-1 and EN 50081-2 referring to electromagnetic compatibility.

SAFETY REQUIREMENTS

Using conditions:

Do read carefully these instructions before proceeding to the LTM commissioning. For a better use of the LTM, it is recommended to:

- maintain the ambient temperature between 0°C and 35°C
- maintain the humidity rate below 90 % (condensation-free).

Precautions the user should take:

WARNING:

It is absolutely necessary to earth the LTM before connecting upstream and downstream cables.

Dangerous voltages remain present, even if the load transfer module has been switched off ; supply voltage is indeed still present at the input of the static switches.

Do follow scrupulously the procedures when switching the LTM on or off. Whatever the repairs, they must be exclusively executed by authorised staff, having previously been trained.

This equipment meets the requirements of the Community directives applied to this product. Hence it is labelled as follows:

CE

This equipment is designed to a restricted distribution in compliance with the conditions defined by the standard EN 50091-2. As a consequence, restrictions to the installation or complementary steps may be needed to prevent potential electromagnetic interference.

CONTENTS

JBUS® : Industrial communication protocol. APRIL registered brand.

1. GENERAL DEFINITION

The Load Transfer Module is fitted with an external interface enabling to connect a link RS 422 or RS 485 (through the MODBUS®/JBUS® protocol). Addresses are based on a 16-bit coding (h symbol).

MODBUS®/JBUS® is an industrial protocol which links a MASTER unit to one or several SLAVE units. The master is the only one that can question the various slaves. They can only answer according to an established protocol (See §3).

2. DEVICE INTERFACE

2.1. Features

- Link support :	RS-485 RS-422 Both link supports are galvanically insulated from the chassis : 500 $V_{DC/1min}$
- Transmission Protocol :	MODBUS®/JBUS ®, RTU-type.
- Baud speed :	1200, 2400, 4800, 9600 bauds - can be set via software.
- character format :	8 bits, with or without parity, even or odd parity: can be set via software.
- 1 or 2 stop bit.	
- Cable length :	1000 m max.

2.2. Connecting the MODBUS/JBUS® link to I.T.SWITCHES from 16 to 40A

Note :
For I.T. SWITCHES (with PCB MT300 bearing the code E964396 index ≥ B), the configuration RS485 or RS422 is automatic. The only action to be carried out is the line-end adaptation as per § "b" or "c" below.

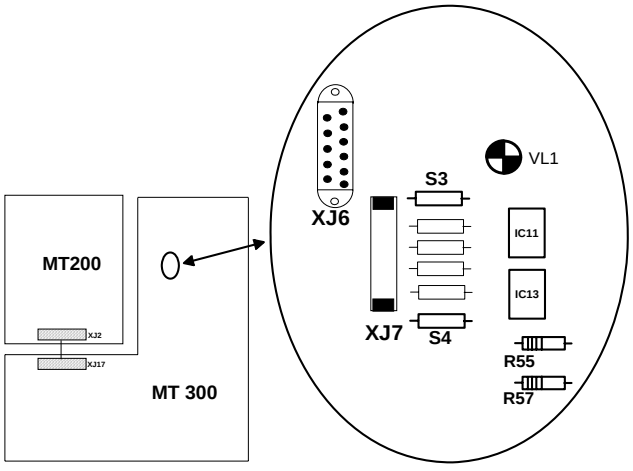
Two configurations are to be achieved :
- the configuration as a 2-wire link (installed by default) or 4-wire link, (See diagram below),
- the line impedance adaptation.

a. Configuration as RS-485 or RS422

The configuration is achieved on PCB MT300.

Configuration as RS485 (2-wire) :
- R57 is available while R55 is not.

Configuration as RS422 (4-wire) :
- R55 is available while R57 is not.



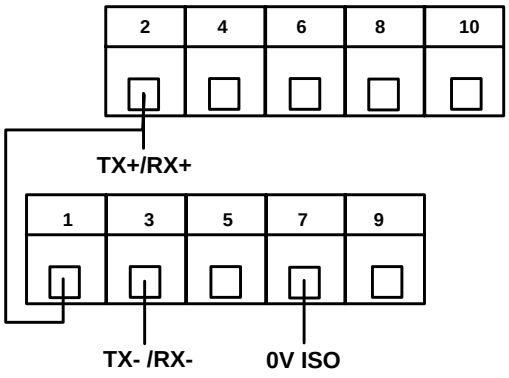
b. Cabling terminal X32 for a 2-wire link (RS485) :

Terminal 2 : TX+ / RX+

Terminal 3 : TX- / RX-

Terminal 7 : 0V Isolated

Strap terminals 1 and 2 if the LTM is at the end of the line

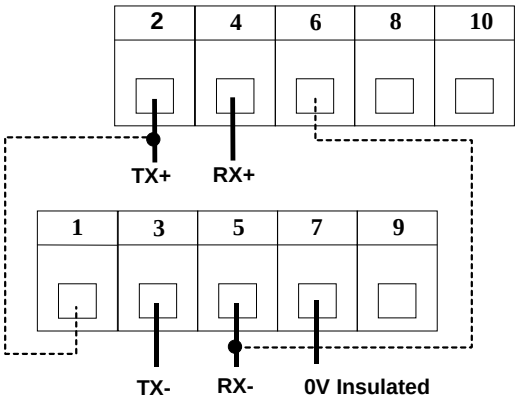


Terminal X32

c. Cabling terminal X32 for a 4-wire link (RS422) :

Terminal 2 : TX+
Terminal 3 : TX-
Terminal 4 : RX+
Terminal 5 : RX-
Terminal 7 : 0V Isolated.

Strap terminals 1 and 2 as well as 5 and 6 if the LTM is at the end of the line.



Terminal X32

2.3. Connecting the MODBUS/JBUS® link to Power LTMs

Note :
For power LTMs (with PCB MT300 bearing the code E962576 index ≥ M), the configuration RS485 or RS422 is automatic. The only action to be carried out is the line-end adaptation as per § "b" or "c" below.

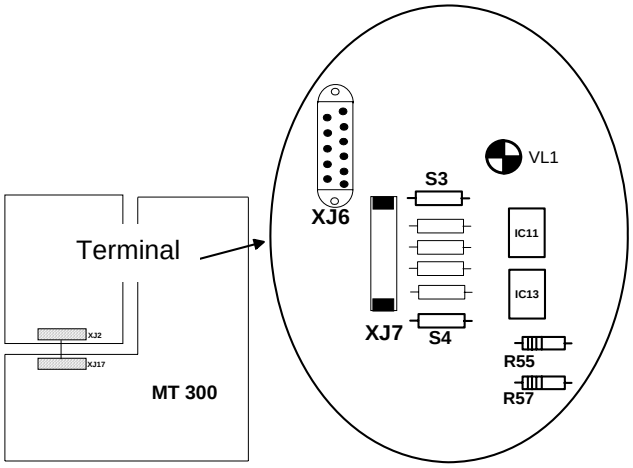
Two configurations are to be achieved :
- the configuration as a 2-wire link (installed by default) or 4-wire link, (See diagram below),
- the line impedance adaptation.

a. Configuration as RS-485 or RS422

The configuration is achieved on PCB MT300.

Configuration as 2-wire link (RS485) :
- R57 is available while R55 is not.

Configuration as 4-wire link (RS422) :
- R55 is available while R57 is not.



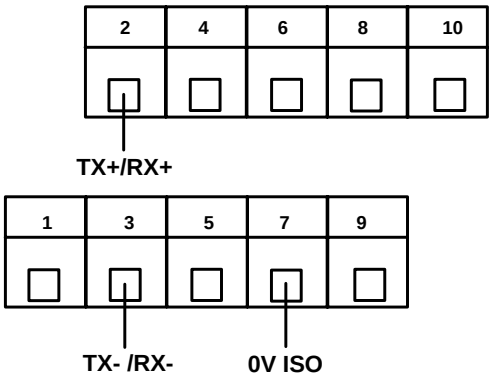
b. Cabling terminal X32 for a 2-wire link (RS485) :

Terminal 2 : TX+ / RX+

Terminal 3 : TX- / RX-

Terminal 7 : 0V Isolated.

strap S4 is to be suppressed on PCB MT300 if the LTM is not at the end of the line.

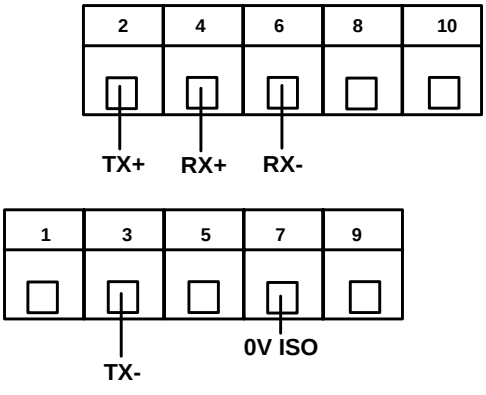


Terminal X32

c. Cabling terminal X32 for a 4-wire link (RS422) :

Terminal 2 : TX+
Terminal 3 : TX-
Terminal 4 : RX+
Terminal 5 : RX-
Terminal 7 : 0V Isolated.

Straps S3 and S4 are to be suppressed on PCB MT300 if the LTM is not at the end of the line.



Terminal X32

3. SOFTWARE INTERFACE

3.1. Common part

Parameters for serial connection (slave N°, baudrate…) are to be set during the installation step. These configurations can be directly achieved on the control panel if the LTM is equipped with the advanced version. If the LTM has the basic control panel, they are to be performed by a Service technician or the local dealer in possession of the appropriate software.
For the *IT-Switch*, the configurations must be carried out by the local dealer by means of the Commissioning-Soft.

One to 32 slaves can be available on the keyboard-display of the UPS.

The different MODJBUS® / JBUS® functions available are as follows :

- F1: bit reading (this function is subject to a specific use which does not comply with the MODJBUS® / JBUS protocol).

Here is a particular use of the function number 1 (bit reading)

Sequence when receiving a question:

octet :	1	1	2	2	2
	NES	1	ADR	n° bit	CRC

where :

NES is the slave number
ADR is the 16 bit address in which the bit is located
N° bit is the number of the needed bit (from 1 to 16)
CRC: CRC16 over 16 bits.

Sequence when sending back the answer:

octet :	1	1	1	1	1	2
	NES	1	2	status	0	CRC

where :

NES is the slave number
status is the status of the needed bit (0 or 1)
CRC: CRC16 over 16 bits.

- F3: reading of one or several consecutive words

- F6: writing of one word

- F16: writing of several words.

3.2. Maps organisation

INFORMATION MAP	Start Address	Word length	Type
Binary information	0000h	16	Reading
Measurements	0010h	32	Reading
Clock	0060h	4	Reading + writing
Command	0040h	1 word per command	Writing

- Each map must be read separately
- Each word can be read separately in the same map.

3.3. Information maps for the jbus output

TOR
UPS status, alarms, faults and enables correspond to a 16-bit coding at the assigned address. These information are organised bit after bit as described here after.

D15	...	D8	D7	...	D0

0000h : status of source 1

D0: Load on source 1
D1: SC 1 closed
D2: Load on detour 1
D3: Reserved
D4: Source 1 out of tolerances
D5: Source 1 absent
D6: Q41 closed
D7: Not used
D8: Not used
D9: Not used
D10: Not used
D11: Not used
D12: Not used
D13: Not used
D14: Not used
D15: Not used

0001h : status of source 2

D0: Load on source 2
D1: SC 2 closed
D2: Load on detour 2
D3: Reserved
D4: Source 2 out of tolerances
D5: Source 2 absent
D6: Q42 closed
D7: Not used
D8: Not used
D9: Not used
D10: Not used
D11: Not used
D12: Not used
D13: Not used
D14: Not used
D15: Not used

0002h : Output status

D0:	Priority Source 1	D8:	Output out of tolerances
D1:	Q30 closed	D9:	Output absent
D2:	Load on priority source	D10:	Not used
D3:	Load on non priority source	D11:	Not used
D4:	Priority SC closed	D12:	Not used
D5:	Non priority SC closed	D13:	Not used
D6:	Load not supplied	D14:	Not used
D7:	Sources synchronised	D15:	Not used

0003h : General status

D0:	Transfer in progress	D8:	Not used
D1:	Not used	D9:	Not used
D2:	Not used	D10:	Not used
D3:	Not used	D11:	Reserved
D4:	Not used	D12:	Reserved
D5:	Not used	D13:	Remote mode
D6:	Not used	D14:	Reserved
D7:	Not used	D15:	Reserved

0004h : Alarms

D0:	Imminent Stop	D8:	SC2 alarm
D1:	Icc Detection	D9:	Electronic alarm
D2:	Transfer locked	D10:	Not used
D3:	Transfer impossible	D11:	Not used
D4:	Return impossible	D12:	Not used
D5:	Detour alarm (Q52 and Q30 closed)	D13:	Not used
D6:	Overload	D14:	Not used
D7:	SC1 alarm	D15:	General alarm

0005h : Faults 1

D0:	preventive temperature SC1	D8:	Reserved
D1:	Temperature SC1	D9:	Output voltage sensor
D2:	Reserved	D10:	Electronic temperature
D3:	Driver supply SC1	D11:	Not used
D4:	Ventilation SC1 (if option provided)	D12:	Not used
D5:	Reserved	D13:	Standard supply
D6:	Phase rotation source 1	D14:	Input 1 supply
D7:	Critical overload SC1	D15:	Input 2 supply

0006h : Faults 2

D0:	Preventive temperature SC2	D8:	Reserved
D1:	Temperature SC2	D9:	Not used
D2:	Reserved	D10:	Not used
D3:	Driver supply SC2	D11:	Not used
D4:	Ventilation SC2 (if option provided)	D12:	Not used
D5:	Reserved	D13:	Optional supply (if option provided)
D6:	Phase rotation source 2	D14:	Supply MT610 (if option provided)
D7:	Critical overload SC2	D15:	Reserved

0007h : Enabling

D0:	Reserved	D8:	Remote / local mode
D1:	Reserved	D9:	Not used
D2:	Reserved	D10:	Not used
D3:	Reserved	D11:	Not used
D4:	Reserved	D12:	Not used
D5:	Reserved	D13:	Not used
D6:	Reserved	D14:	Not used
D7:	Reserved	D15:	Not used

0008h : Auxiliary inputs

D0:	normal auxiliary input 1	D8:	extension auxiliary input 1
D1:	normal auxiliary input 2	D9:	extension auxiliary input 2
D2:	normal auxiliary input 3	D10:	extension auxiliary input 3
D3:	normal auxiliary input 4	D11:	extension auxiliary input 4
D4:	normal auxiliary input 5	D12:	extension auxiliary input 5
D5:	normal auxiliary input 6	D13:	extension auxiliary input 6
D6:	normal auxiliary input 7	D14:	extension auxiliary input 7
D7:	normal auxiliary input 8	D15:	extension auxiliary input 8

0009h to 000Fh : Not used

MEASUREMENTS

0010h	Phase to phase voltage source 1 U13	Volts	
0011h	Phase to phase voltage source 1 U21	Volts	
0012h	Phase to phase voltage source 1 U32	Volts	
0013h	Frequency source 1	Hz x 100	example : 4993 = 49,93Hy
0014h	Output phase voltage V1	Volts	
0015h	Output phase voltage V2	Volts	
0016h	Output phase voltage V3	Volts	
0017h	Load rate	%	example : 51 = 51%
0018h	Crest factor	x10	example : 14 = 1,4
0019h	Output frequency	Hz x 100	example : 4993 = 49,93Hz
001Ah	Reserved		
001Bh	Reserved		
001Ch	Reserved		
001Dh	Reserved		
001Eh	Reserved		
001Fh	Reserved		
0020h	Phase to phase voltage source 2 U13	Volts	
0021h	Phase to phase voltage source 2 U21	Volts	
0022h	Phase to phase voltage source 2 U32	Volts	
0023h	Frequency source 2	Hz x 100	example : 4993 = 49,93Hz
0024h	Output current phase 1	Amperes	
0025h	Output current phase 2	Amperes	
0026h	Output current phase 3	Amperes	
0027h	Phase-shift source 1 and source 2	µ second	
0028h	Electronic temperature	°C	
0029h	Output power phase L1	kVA	
002Ah	Output power phase L2	kVA	
002Bh	Output power phase L3	kVA	
002Ch	Reserved		
002Dh	Reserved		
002Eh	Reserved		
002Fh	Reserved		

0030h to **003Fh** : Not used

COMMANDS

0040h : Closing priority CS[1]
0041h **:** Closing non priority CS[1]
0042h : Closing SC1
0043h : Closing SC2
0044h : Load stop
0045h : Alarms reset
0046h : Transfer locked
0047h **:** Priority Source 1[1]
0048h **:** Priority Source 2[1]

NOTA : where the value is not equal to 0, the writing at the address activates the commands

3.4. Time reading / writing

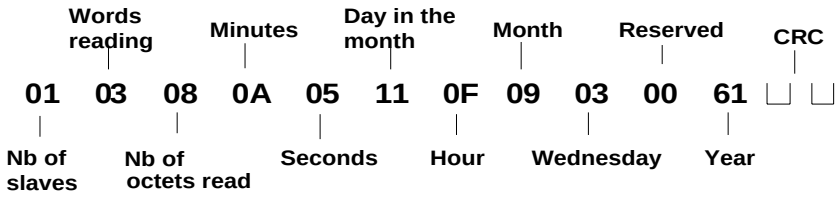
	MSB	LSB
0060h	Minutes 0-59	Seconds 0-59
0061h	Days 1-31	Hours 0-23
0062h	Month 1-12	weekday 1 = Monday ; 7 = Sunday
0063h	Reserved	Year 1900

Examples :

1. Sequence for time reading

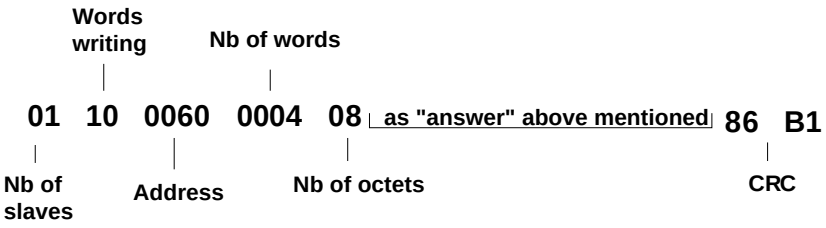
01	03	0060	0004	4417
Nr of slaves	words reading	address	Nr of words	CRC

Answer from LTM



[1] Available on MTCs – software interface referenced E501555.X or superior

2. Sequence for time setting



Answer from LTM