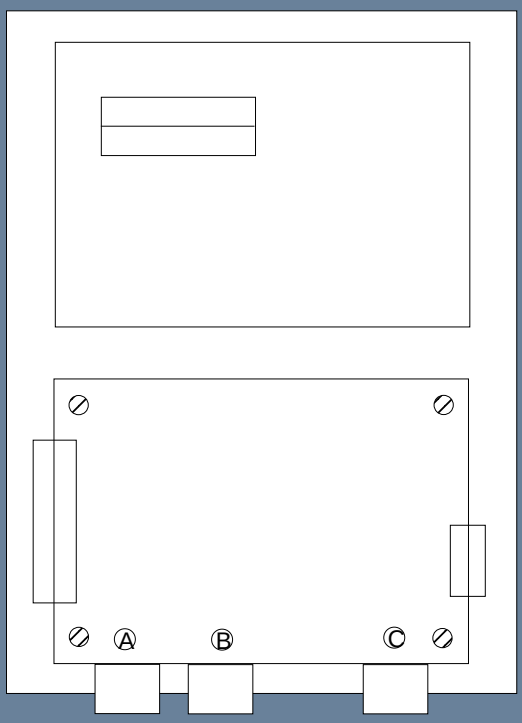


RECTIVAR® 4

Three phase digital variable speed controllers for DC motors

Interface extension option board VW1-RZD101

user's manual

Telemecanique
GROUPE SCHNEIDER

Contents

Designed as an option for the RECTIVAR 4 series 74/84 digital variable speed controllers, the interface extension option board enables processing within the speed controller, of the following complementary functions :

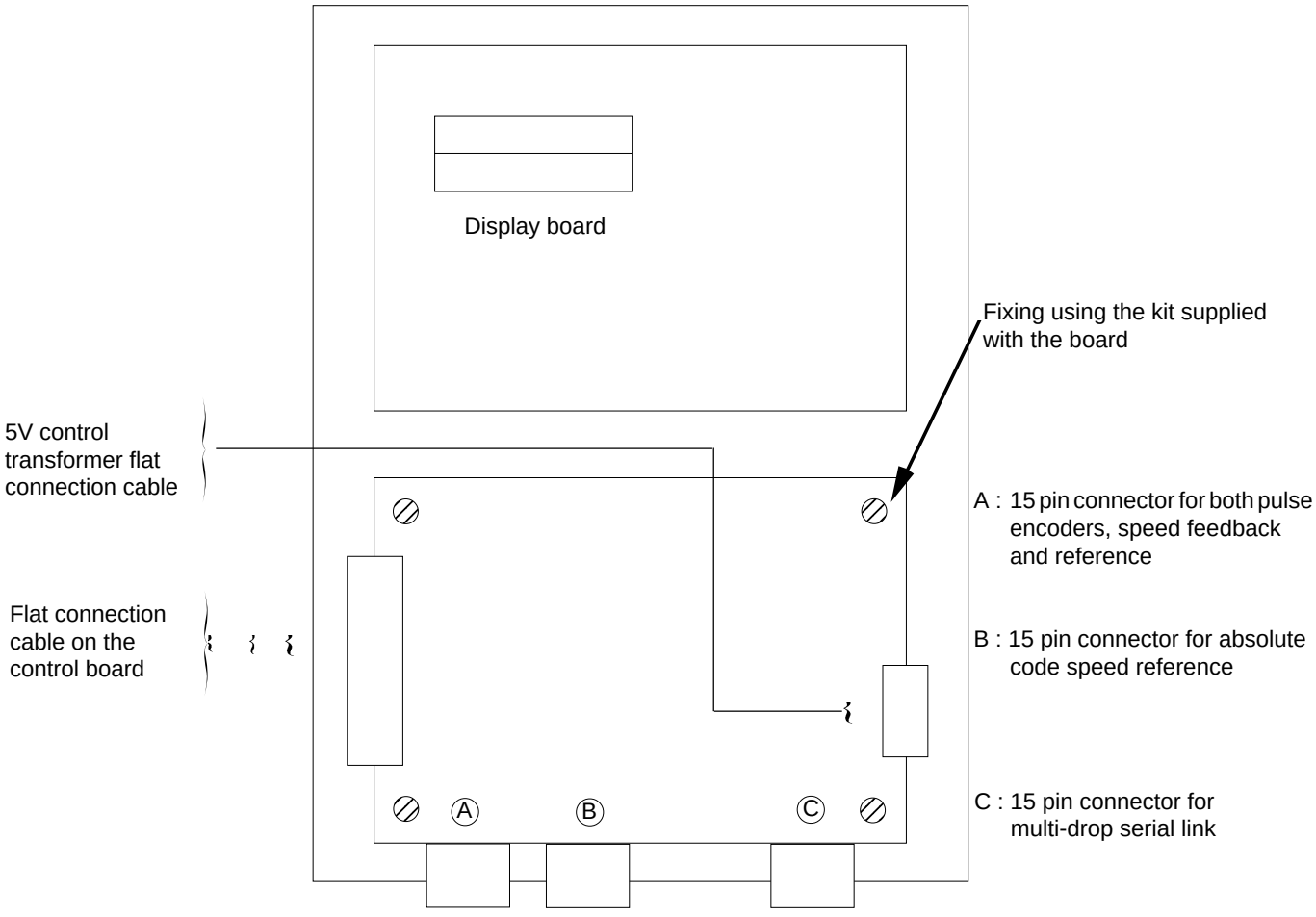
- RS485, UNITELWAY or MODBUS multi-drop serial link
- digital speed regulation, via additional inputs :
  - pulse encoder speed feedback
  - pulse encoder speed reference
  - speed reference in absolute binary code.

This option can be combined with certain special application cartridges (see corresponding user's manuals). It assumes the use of the software RTV 74/84, version 2, or any later version.
If the board is installed with a previous software, it is ignored.

Mounting

The board, supplied separately, should be mounted and connected with the speed controller switched off, in the control rack under the display board.

Connect the option board's flat cable to the control board's J4 connector. Connect the supply cable from the control transformer, already provided in the control enclosure, to the option board connector. If this is not done, the connection fault for this cable will be displayed as initial fault "+5V. Option".



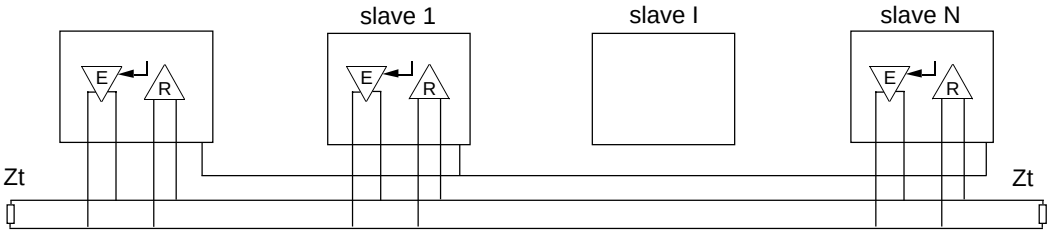
Connectors A - B - C are electrically protected against incorrect fitting.
This manual is provided as an addition to the user's manual n° 42085, which should be referred to separately.

Multi-drop serial link

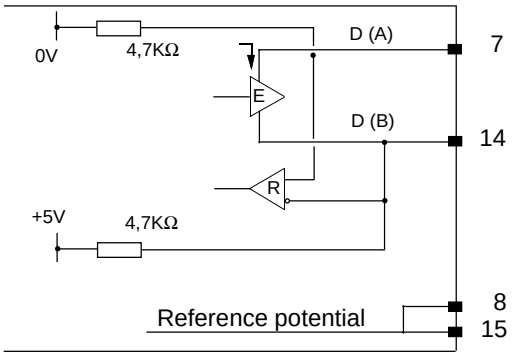
The option board's C connector enables connection of an RS485 serial link which in turn, enables operation with the protocols UNI-TELWAY or MODBUS® according to the configuration given below. This cannot be combined with the speed controller's standard point to point serial link. Communication with RECTIVAR 74/84 speed controllers is carried out via objects, bits or special words described in the user's manual for RECTIVAR 74/84, which should be referred to for this definition. The description of the protocols is given on the following pages.

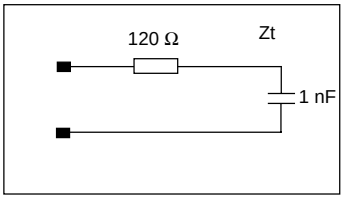
RS485 - Reminders

- differential transmission mode,
- direct connection using 2 screened and twisted pairs
- a terminal device is required at the each end of each line (line end adaptation)
- number of stations : 28 maximum
- line length : up to 1 km
- tap-junction connection : possible up to 20 m maximum.



The reference potential for each interface **must** be connected in order to avoid common mode voltages which can be high.





Line termination recommended at both ends (for example via TSXSC61 enclosure)

Addressing

The UNI-TELWAY standard C connector (sub D 15 pin female) carries :

Pin	Signal	Description
1	ENA	
2	N1	Station address binary weight 2
3	N3	Station address binary weight 8
4	PAR	Station address parity
5	COM	Station address common
6		
7	D (A)	RS485 line
8	OVL	RS485 reference potential
9	N0	Station address binary weight 1
10	N2	Station address binary weight 4
11	N4	Station address binary weight 16
12	$\overline{\text{UTW}}$	
13	+5VL	Console supply
14	D (B)	RS485 line
15	OVL	RS485 reference potential

The RECTIVAR speed controller's address is written in configuration (see later). The standardised terminals N0, N1, N2, N3, N4, PAR and COM are not used by the RTV 74/84.

The TSXSCA60 line continuity module and TSXSCA61 line end module or TSXSCA62 subscriber module microcontact address codings are not used.

The TSXSCA60 terminal ensures line continuity (and enables the coding of the address on microcontact for devices without address programming : LT8, ATV5 ...).

Terminal TSXCS61 should only be used at line end : it includes the end of line adaptation (and enables the coding of the address on microcontact for devices without address programming : LT8, ATV5 ...)

Connection to UNI-TELWAY bus

The RS485 isolated line must be adapted at both ends. Physical connection to the UNI-TELWAY bus can be carried out in two ways, which can be used in combination : daisy chain and tap junction connection.

Various accessories are available to facilitate connection of the system to the bus :

- *TSXSCA60* : daisy chain connection module, for mounting directly onto connector C.
- *TSXSCA61* : as above, with, in addition, assurance of line end adaptation.
- *TSXSCA62* : subscriber connector for 2 systems including end of line adaptation when the connector is at the end.
- *TSXCSE015* : standard cable (L = 1,5m) fitted with 2 connectors. To be used between connector C and subscriber connector TSXSCA62.

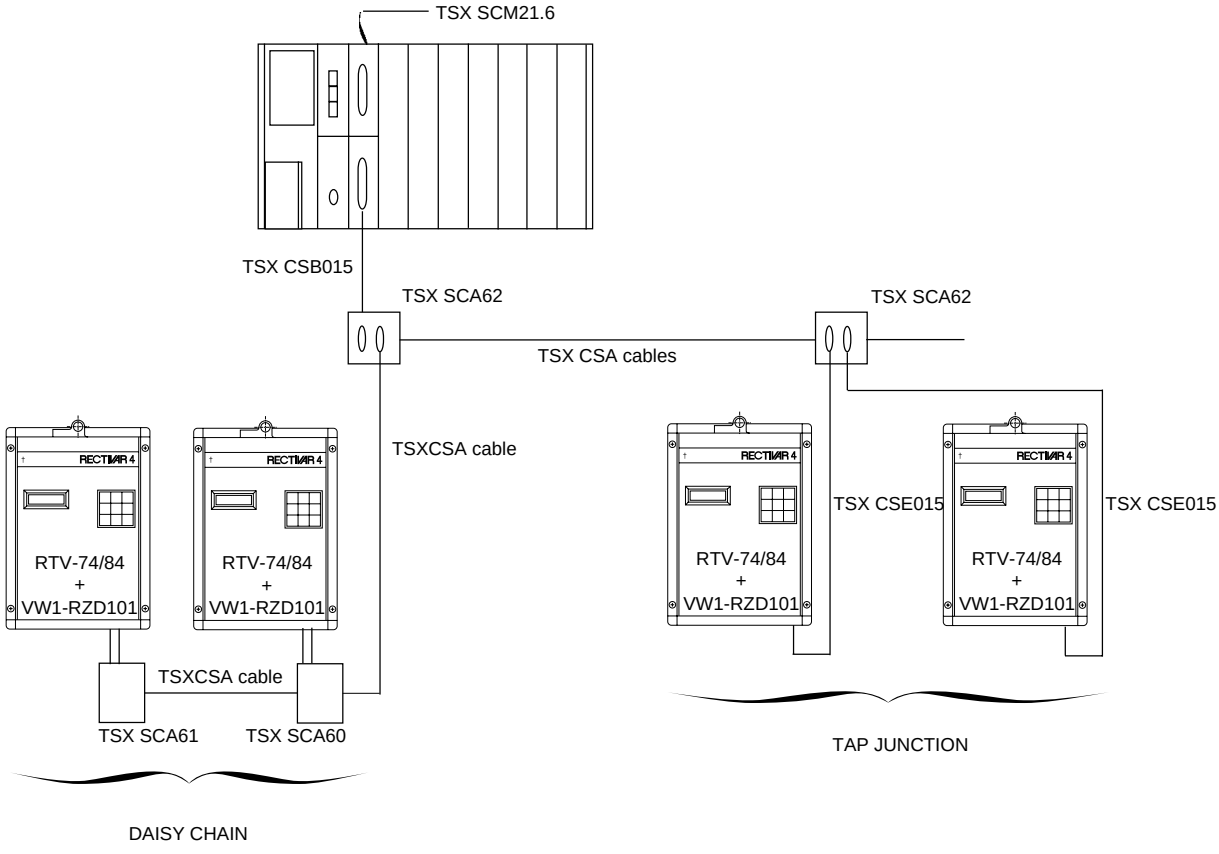
The bus comprises a screened cable with a double pair of twisted conductors. It is available in three lengths :

- TSXCSA100 : length 100 m
- TSXSCA200 : length 200 m
- TSCSCA500 : length 500 m

For more details about these connection accessories, please refer to "UNI-TELWAY REFERENCE MANUAL".
The address of the Rectivar can only be configured by the keypad and not via the cable.

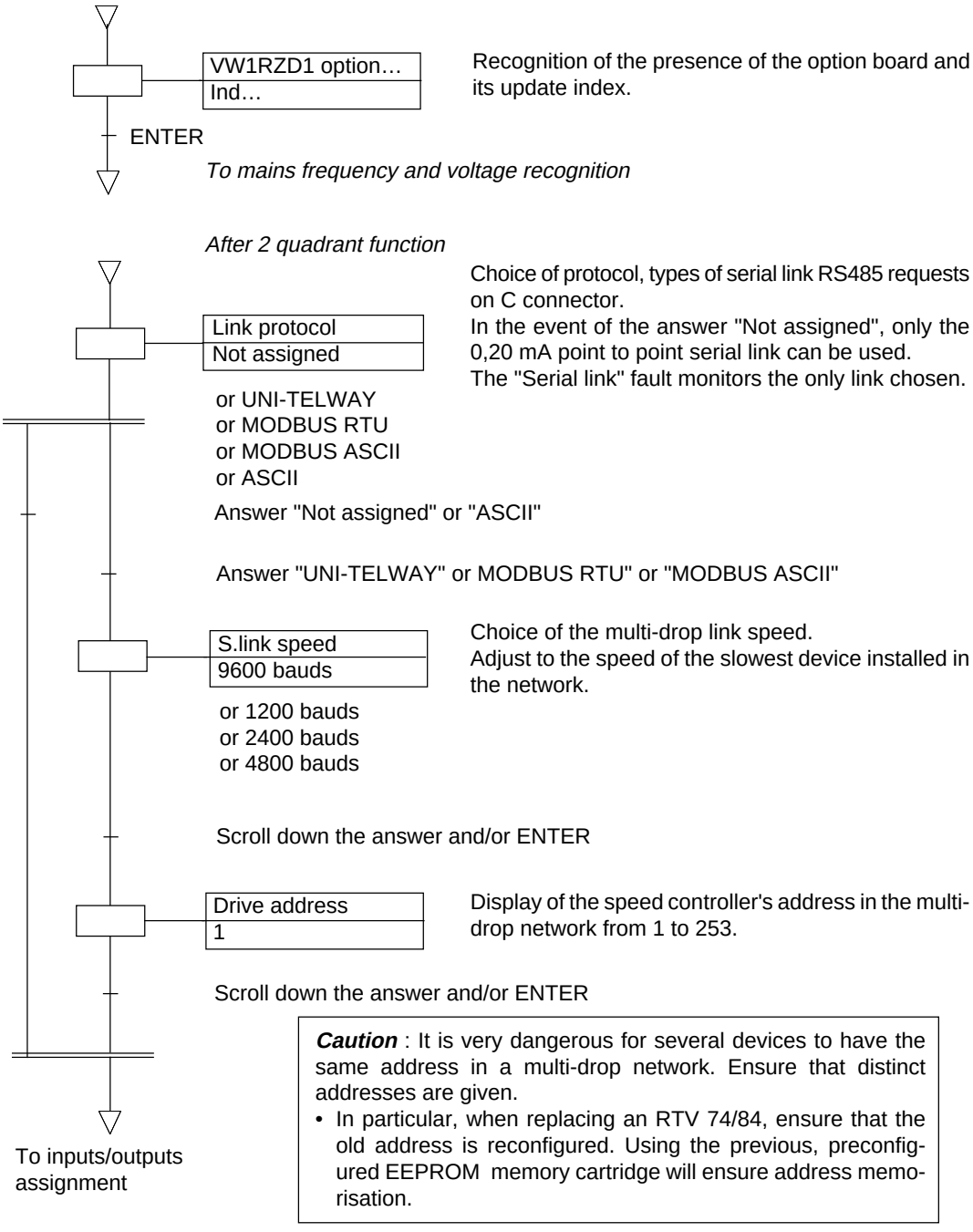
Examples

With series 7 programmable controller.



Configuration extension

The presence of the VW1RZD101 board causes the additional parameters to be displayed in the speed controller's basic configuration, after automatic recognition of the speed controller rating.
The indications given in the boxes below correspond to factory standards.



Caution : It is very dangerous for several devices to have the same address in a multi-drop network. Ensure that distinct addresses are given.

- In particular, when replacing an RTV 74/84, ensure that the old address is reconfigured. Using the previous, preconfigured EEPROM memory cartridge will ensure address memorisation.

Protocols

Protocols UNI-TELWAY and MODBUS RTU or ASCII ar described in the following pages.
Point to point ASCII protocol, is described in user's manual n° 42085.
Word formats are fixed (not adjustable) according to the protocol selected :
- UNI-TELWAY or MODBUS RTU (or ASCII)
1 start bit, 8 data bits, 1 parity bit : Odd, 1 stop bit
- MODBUS ASCII
1 start bit, 7 data bits, 1 parity bit : Odd, 1 stop bit.

UNI-TELWAY protocol

Structure of the data

The adjustment, command, control and supervision of the electronic power or protection products, is carried out via the data (or objects), peculiar to each product.

This comprises essentially :

- BITS known as Bi (i = bit number) which enables the logic commands to be carried out.
- WORDS (of 16 bits) described as Wi (i = word number) which will be used to memorise either complete numerical values (- 32768 to + 32767) or 16 independent logic states (these words are called registers).
  See addresses described in the user's manual for the RECTIVAR 74/84 (42085).

Access to the data

The UNI-TELWAY application protocol defines standard requests, enabling the reading or writing of this data. General use requests are also available to the user for setting up, diagnostic, and communication test functions.

Some data is accessible in write as well as read : these are the bits and words corresponding to adjustments, references and commands. This data is used by the product.

However, data developed by the system are only accessible in read (signalling, fault data…). Writing of this data is meaningless and is refused.

UNI-TE request	code (hexa)
Identification	H"0F"
Protocol version	H"60"
Status	H"61"
Mirror	H"FB"
Error counter reading	H"A2"
Counter reset	H"A4"

UNI-TE request	code (hexa)
Bit read	H"00"
Bit write	H"10"
Word read	H"04
Word write	H"14"
Object read	H"36"
Object write	H"37"

The table above specifies the requests accepted by the RECTIVAR RTV 74/84 speed controller. Details of the coding is given in the UNI-TELWAY reference manual.

Object read and write requests :

These requests enable access to several words within the limits specified above. The coding of these requests can be carried out by specifying :

Question code (TXTi,C) = H'36' (read) ou H"37" (write) 60 words
Category = 0...7
Segment = H'68' (internal word)
Object type = H'06' for byte (8 bits) or
H'07' for word (16 bits)
Object address = H'xxx'
Etc.

Answers to the requests

Identification request
Response code = H'3F'
Product type = H'15'
Subtype = H'4A' (series 74) or H'54' (series 84)
Product version = H'XX' RECTIVAR software version
ASCII* chain = product symbol (e.g. : RTV84D32)
*The first byte corresponds to the length of the chain.

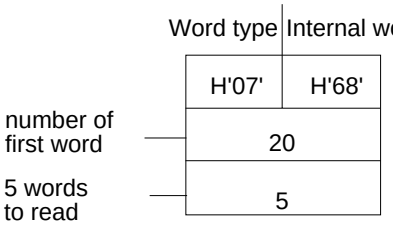
Status request
Response code = H'61'
Current state = H'XX'
bit 0 : internal fault
bit 1 : correctable fault
bit 2 : non correctable fault
bit 3 : not significant
bit 4 : not significant
bit 5 : not significant
bit 6 : speed controller ready
bit 7 : speed controller in LOCAL control
State mask = H'C7' gives the significant bits of the current state

Programming examples

For a TSX7 with use of text block, READING of words W20 to W24 of the RTV 74/84

1 - Using an word object type = H'07'

Text block on transmission
TxTI,C = H'0736 (category + request)
TxTi,L = 6
+ transmission table



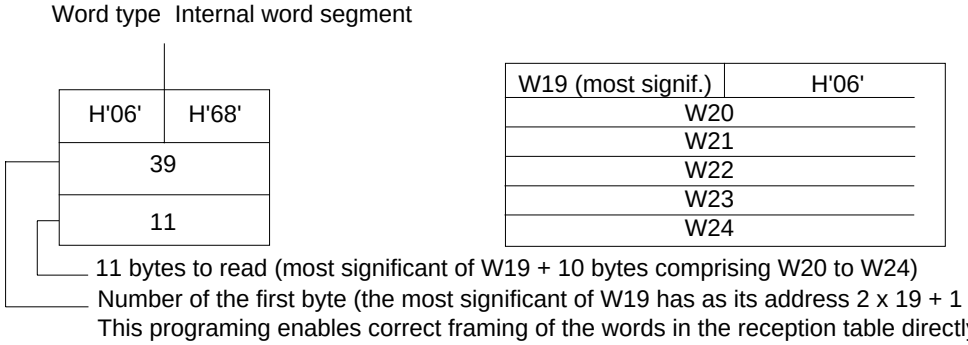
Text block on reception
TxTi,V = H'66' (report)
TxTi,S = 11 (11 bytes received)
+ reception table

W20 (least signif.)	H'07
W21 (least signif.)	W20 (most signif.)
W22 (least signif.)	W21 (most signif.)
W23 (least signif.)	W22 (most signif.)
W24 (least signif.)	W23 (most signif.)
	W24 (most signif.)

The data received in the reception table is shifted by one byte. The application programme has to carry out a correction (by successive shifts, for example), before using the data.

2 - Using an object type byte = H'06'

Text block on transmission
TxTi,C = H'0736 (category + request)
TxTi,L = 6
+ transmission table



Text block on reception
TXTi,V = H'66' (report)
TXTi,S = 12 (12 bytes received)
+ reception table

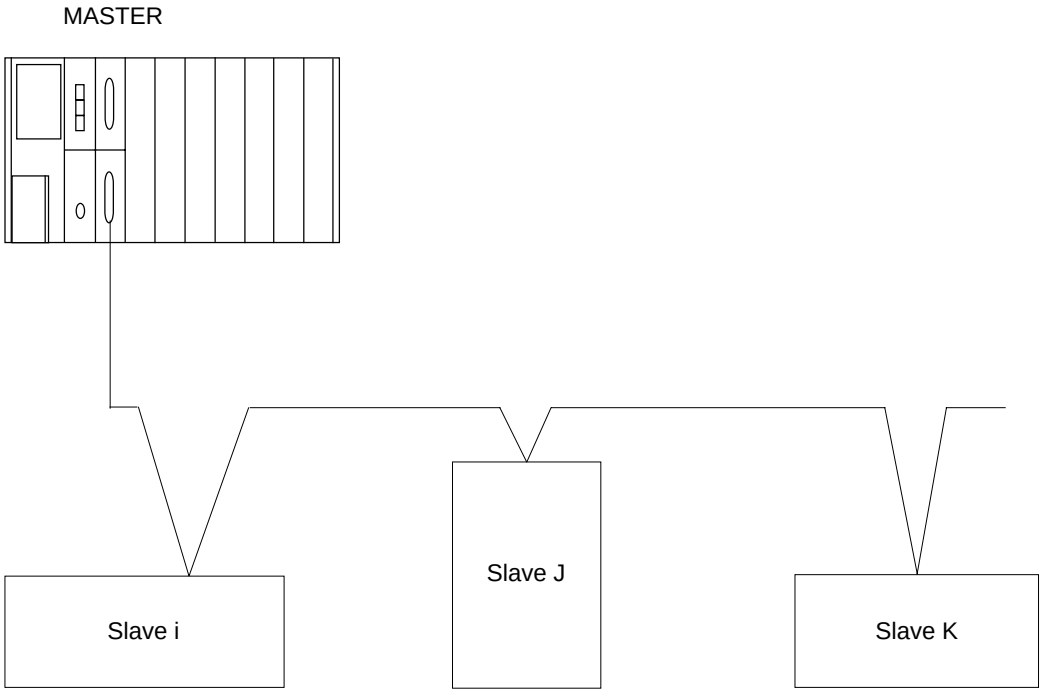
This programing enables correct framing of the words in the reception table directly.

MODBUS® protocol

Principle

MODBUS® protocol is a dialogue protocol which creates a hierarchical structure (one master and several slaves).
MODBUS® protocol enables, via the master, the interrogation of several intelligent slaves.
A multi-drop link connects together the master and slaves. Two types of dialogue are possible between master and slaves :
- the master talks to one slave and waits for its answer
- the master talks to all the slaves without waiting for an answer (principle of general distribution).

The master controls the exchanges, and only the master takes the initiative. The master repeats the question, in the event of an incorrect exchange, and announces the slave as absent if no response is received within a certain time limit. Only one device can be in the process of transmitting on the line at any one time. No slave can send a message itself without first having been invited to do so.



Note : no lateral communication (that is, from slave to slave), can be carried out directly.
The master's application software must have been designed to cover this :
interrogate a slave and send the data received to another slave.

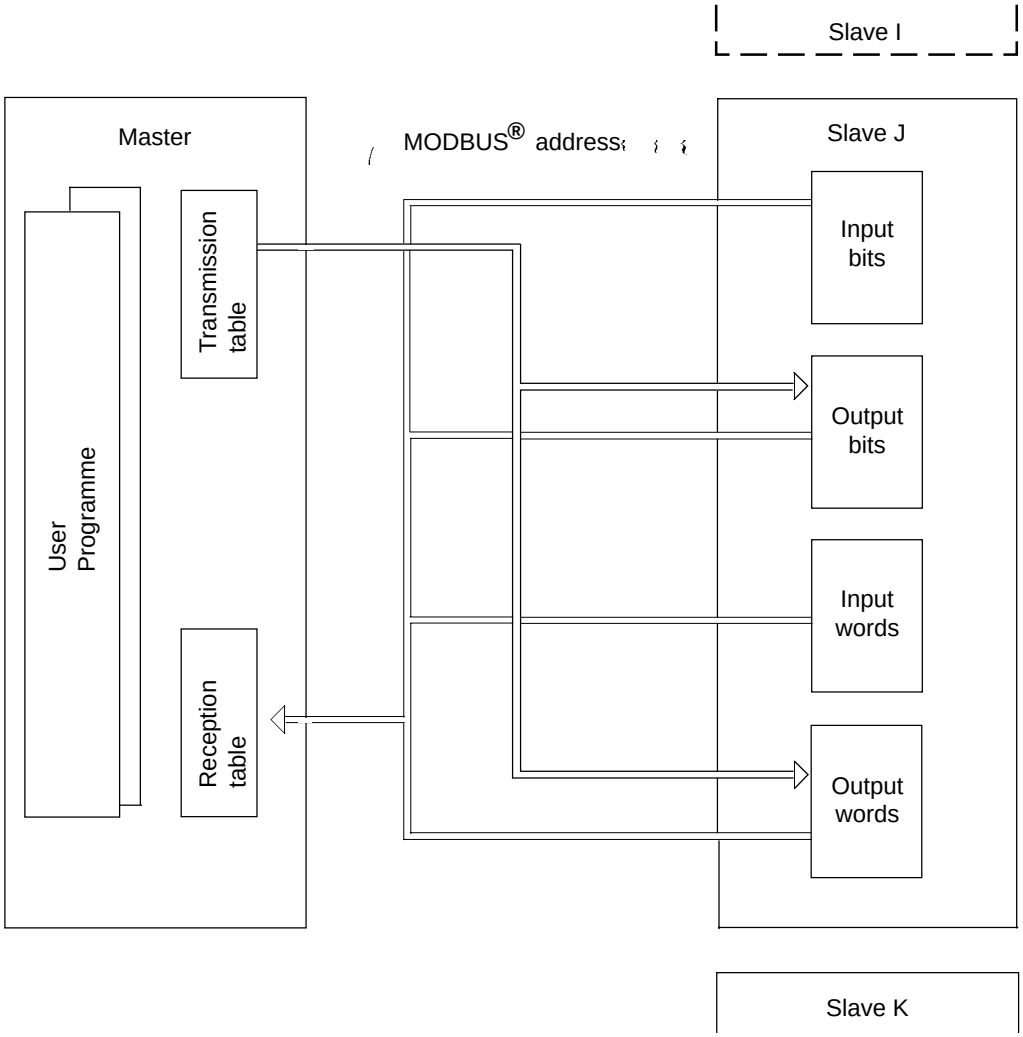
MODBUS® protocol

Accessible data

MODBUS® protocol enables the exchange of data (bits and words) between master and slave and assures the control of these exchanges.

As a result, within each slave, areas of bits are defined which will either be read or written by the master.

An input object can be read, only.
An output object can be read or written.



The exchanges

The master, or the supervisor, takes the initiative in exchanges. The master addresses a slave by supplying it with four types of data:

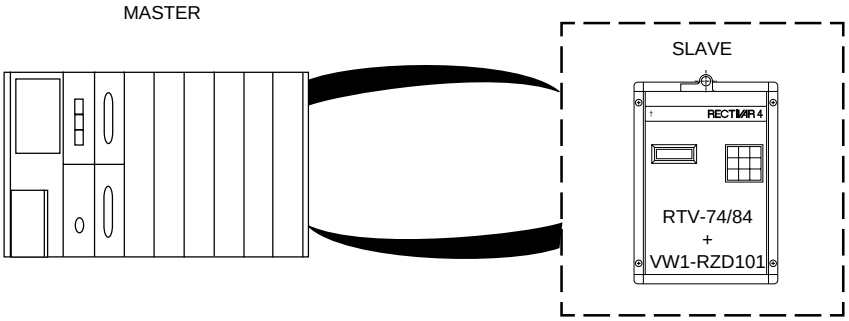
- the slave's address
- the function required from the slave
- data zone (varies depending on the request)
- exchange control.

The link master waits for the slave's answer before transmitting the next message. In this way, any conflict on the link can be avoided. This authorises operation in half duplex.

MODBUS® protocol

Control and supervision

Any control of exchanges between two devices communicating by asynchronous serial link includes, obviously, exception answers when exchange faults occur. Various incoherent messages can arrive at a slave. In this case, the latter tells the master that it has not understood, and the master takes the decision whether or not to repeat the exchange.



The master has access to a certain amount of data retained and controlled by the slave,. The master accesses this data via special function codes (diagnostic, events counter reading...).

MODBUS® functions

Among the MODBUS® functions can be distinguished :

- the main functions, enabling data exchange
- the additional functions for exchange diagnostic.

From the master's point of view, the definition of the "read", "write" functions are as follows :

Code	***Nature of the functions***	***D***	***RTV 74/84***
01	Reading of N output bits		1 maximum
02	Reading of N input bits		1 maximum
03	Reading of N output words		60 maximum
04	Reading of N input words		60 maximum
05	Writing of an output bit	D	yes
06	Writing of an output word	D	yes
08	Diagnostic (see details)		yes
11	Reading of events counter		yes
16	Writing of N output words	D	60 maximum

The functions noted as "D" can be used in general distribution. The message transmitted by the master must, therefore, specify a slave number = 0.
There is never an answer message in return.

MODBUS® protocol

Details of the functions

Code 01 : *Reading of N output bits*
This function enables the reading of output bits (which can be written and read in the slave by the master).

Code 02 : *Reading of N input bits*
Identical to the above, except that the bits are input bits (which the master can only read)

Code 03 : *Reading of N output words*
This function enables the reading of output words (which can be written and read in the slave by the master)

Code 04 : *Reading of N input words*
Identical to the above, except that the words are input words (which the master can only read)

Code 05 : *Writing of an output bit*
Enables an output bit to be positioned at 0 or 1 (only accessible in write mode)

Code 06 : *Writing of an output word*
Enables the writing of a 16 bit output word (only accessible in write mode)

The diagnostic function code 08 is always accompanied by a subcode :

Code 08/00 : *Echo*
This function requires the slave being interrogated to send back to the master, the complete-message sent by the master.

Code 08/01 : *Reinitialisation of the channel*
This function enables reinitialisation of a slave's communication and, in particular, enables its being made to quit "listen only" mode.

Code 08/03 : *ASCII delimiter change*
In ASCII mode, the messages are delimited by line feed characters (LF = H'0A).This function enables the character to be changed.

Code 08/04 : *Change to LOM mode*
This function enables a slave to be forced to change to listen only mode (LOM).
In this mode, the slave does not process the messages sent to it and never transmits an answer, other than to reinitialise a channel.

Code 08/0A : *Counter reset*
This function carries out the reset to zero of all the counters monitoring a slave's exchanges.

Code 08/0B : *Number of messages seen on the line*
This function enables reading on a 16 bit counter (increased from 0 to FFFF) which calculates the total number of messages seen on the line and processed by the slave.

Code 08/0C : *Number of messages received after a checksum error* (reading of a 16 bit counter)

Code 08/0D : *Number of exception answers*
Reading of a 16 bit counter calculating the total number of exception messages transmitted by a slave to the master (following an incorrect data link).

Code 08/0E : *Number of messages addressed to the slave*
Reading of a 16 bit counter calculating the total number of messages, whatever their nature.

Code 11 : *Events counter reading*
This function enables two 16 bit words to be read :
- a status (always zero)
- a counter which increases on each reception of a correct message (form and contents) sent to the slave, except for exception answers.

Code 16 : *Writing of N output words*
This function enables the master to write output words in the slave (words which can either be written or read).

MODBUS® protocol

MODBUS® frames

Two transmission modes can be used, one of them only being used in a system.

RTU mode
The frame defined for the MODBUS® protocol includes neither message heading bytes, nor end of message bytes. Its definition is as follows :

Address	Request	Data	CRC16

The data are transmitted in binary code.
CRC16 : cyclical redundancy check parameter

ASCII mode
The data link is complete and is defined as follows :

Heading	Address	Request	Data	LRC	End of "CRLF"

- heading = ":" (H'3A),
- the data is in ASCII code : each byte is divided into two nibbles and each nibble is coded with an ASCII character (O to F),
- LRC : longitudinal redundancy check parameter
- end = "CR" "LF" (H'OD and H'OA).

Details of the frames (RTU mode)

Reading of N bits : function 1 or 2

Question

Slave n°	1 or 2	N° of 1st bit PF | Pf	Nbr of bits PF | Pf	CRC16
1 byte	1 byte	2 bytes	2 bytes	2 bytes

PF = Most significant
Pf = Least signifigant

Answer

Slave n°	1 or 2	Nbr of bytes read	Value	.....	Value	CRC 16
1 byte	1 byte	1 byte				2 bytes

Example : reading of bit B3 of slave 2

Question	02	01	0003	0001	CRC16
Answer	02	01	01		CRC16

00 if B3 = 0
01 if B3 = 1

MODBUS® protocol

Details of the frames (RTU mode)

Reading of N words : function 3 or 4

Question

Slave n°	3 or 4	n° of 1st word PF Pf	Nbr of words PF Pf	CRC16
1 byte	1 byte	2 bytes	2 bytes	2 bytes

Answer

Slave n°	3 or 4	Nbr of bytes read	Value of 1st word PF Pf	.....	Value of last word PF Pf	CRC16
1 byte	1 byte	1 byte	2 bytes		2 bytes	2 bytes

Example : Reading of words W20 to W24 of slave 6

Question

06	04	0E	05	CR16

Answer

06	04	0A	xxxx	.....	xxxx	CR16

Value of W20 — Value of W24

Writing of an output bit : function 5

Question

Slave n°	5	Bit n° PF Pf	Value of bit	CRC16
1 byte	1 byte	2 bytes	2 bytes	2 bytes

Answer

Slave n°	5	Bit n° PF Pf	Value of bit	CRC16
1 byte	1 byte	2 bytes	2 bytes	2 bytes

the field "value of bit" has two possible values, excluding any other value :
- bit at 0 = 0000
- bit at 1 = FF00

Example : writing of value 1 in bit B3 of slave 2

Question

02	05	03	FF00	CR16

Answer

02	05	03	FF00	CR16

MODBUS® protocol

Writing of an output word : function 6

Question

Slave n°	6	Word n° PF | Pf	Word value PF | Pf	CRC16
1 byte	1 byte	2 bytes	2 bytes	2 bytes

Answer

Slave n°	6	Word n° PF | Pf	Word value PF | Pf	CRC16
1 byte	1 byte	2 bytes	2 bytes	2 bytes

Example : writing of value 3A15 in word W12 of slave 5

Question and answer

05	06	OC	3A15	CRC16

Diagnostic : function 8

Question / Answer

Slave n°	8	subcode	data	CRC16
1 byte	1 byte	2 bytes	2 bytes	2 bytes

Subcode	Question data	Answer data	Function carried out
00	XY	XY	Echo
01	00	00	Reinitialisation
03	X0	X0	X = new delimiter
04	00	no reply	Change to LOM
0A	00	00	Reset counters to 0
0B	00	XY	XY = value included
0C	00	XY	" " " "
0D	00	XY	" " " "
0E	00	XY	" " " "

Reading of events counter : function 11

Question

Slave n°	0B	CRC16
1 byte	1 byte	2 bytes

Answer

Slave n°	0B	00 00	Counter value PF | Pf	CRC16
1 byte	1 byte	2 bytes	2 bytes	2 bytes

Writing of N output words : function 16

Question PF = Most significant Pf = Least significant

Slave n°	10	N° of 1st word PF	Pf	Nbr of words PF	Pf	Byte Nbr	Value of 1st word PF	Pf	etc	CRC16
1 byte	1 byte	2 bytes		2 bytes		1 byte	2 bytes			2 bytes

Answer

Slave n°	10	N° 1st word PF	Pf	Nbr of words PF	Pf	CRC16
1 byte	1 byte	2 bytes		2 bytes		2 bytes

Example : writing of values 1, 2 in words W16, W17 of slave 11

Question	0B	10	0010	0002	04	0001	0002	CRC16
Answer	0B	10	0010	0002	CRC16			

Exception answers

An exception answer is sent back by the slave when it cannot carry out the request it has received.

Formation of an exception answer

Slave n°	Answer code	Error code	CRC16
1 byte	1 byte	1 byte	2 bytes

Answer code : question function code + H'80 (the highest ranking bit is set to 1).

Error code : 1 = the function requested is not recognised by the slave.
2 = the numbers (addresses) of the bits and the words given when the request was made are not present in the slave.
3 = the values of the bits and the words given when the request was made are not permitted in the slave.
4 = the slave has started to carry out the request, but cannot continue to process it completely.

Calculation of CRC16

The CRC16 is calculated from all the message bytes, using the following method :

Initialise the CRC (16 bit register) at H'FFFF

From the 1st to the last byte of the message, calculate :
CRC X0R < byte> ⩤ CRC
Carry out 8 times
Shift the CRC one bit to the right
If the output bit = 1, calculate CRC X0R H'A001 ⩤ CRC
End of process.

End of process

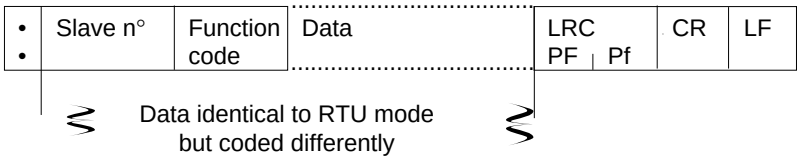
The CRC obtained will be transmitted least significant first, most signifcant next.

X0R means exclusive OR.

MODBUS® protocol

ASCII mode

In this mode, the MODBUS® frame has the following structure :



Delimiters : ":" = H'3A', CR = H'0D', LF = H'0A'

Data : the data field is analogue with the RTU frames, but coded in ASCII character. Each byte is divided into 2 nibbles and each of them is encoded in its ASCII equivalent.

Example : the byte containing the number of slave 06 will be coded by the 2 ASCII characters "0" and "6", that is by H'30' et H'36'.

LRC : the module 256 hexadecimal sum of the data link contents (without delimiters) before ASCII coding, 2's complement.
The byte thus obtained is then coded in 2 ASCII characters, as previously.

Presentation

The basic RTV 74/84 is programmed to carry out the cascade of the speed and current regulation loops with an accuracy which relies on the analogue speed signal conversion resolution.
As a reminder, these conversions are at ± 2000 points with a time of 13,3 ms at 50 Hz at the reference inputs and 10 ms at 50 Hz on the speed feedback : tachogenerator or armature current. These inputs are also filtered with a time constant of about 100 ms.
The interface extension board enables speed reference and feedback signal resolution to be increased in such a way as to optimise the RTV 74/84 microprocessor calculation capacity which is ± 32 000 points at the speed regulator inputs.

To do this, the board enables connection of the two speed frequency signals to the A connector, and the parallel link connection of a binary signal to the B connector.

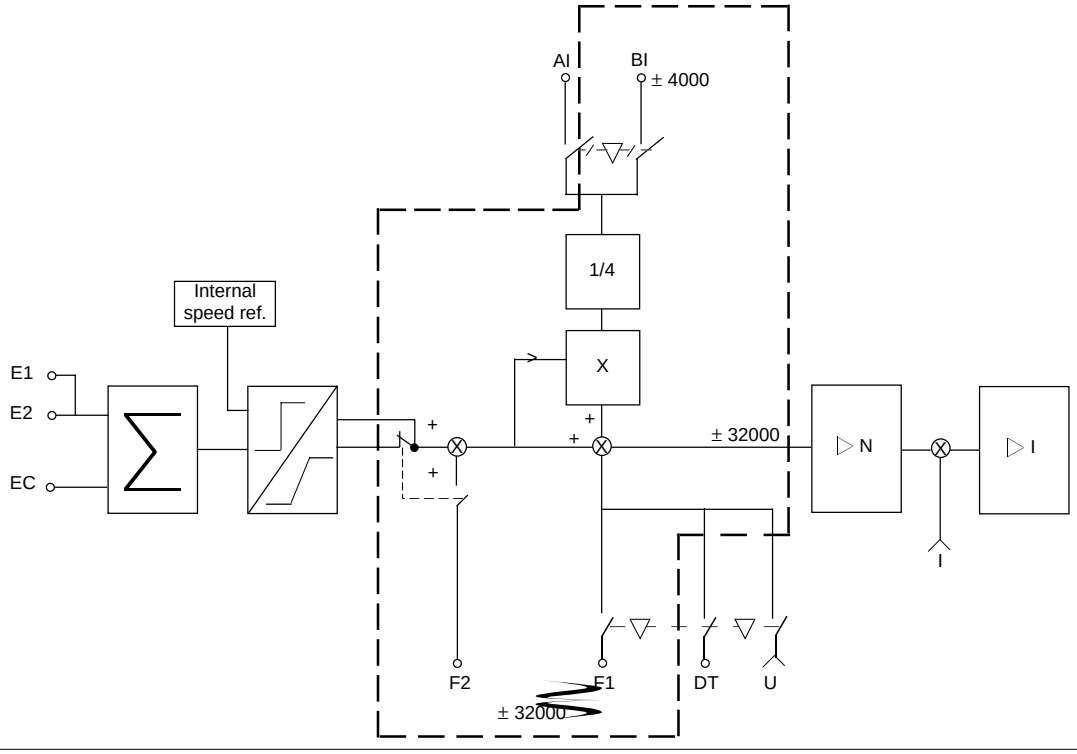
- The two speed frequency signals have a static conversion of 28 800 points for 100 kHz, that is, 32 600 points less ~ 10 % for a calculation and overspeed capacity reserve. These conversions are taken into account at 50 Hz every 10 ms without filtering (every 8,5 ms at 60 Hz).

  - The F1 signal (see page 20) serves as a configurable speed feedback, instead of a tachogenerator or an armature voltage reading : in particular, it is an incremental encoder, mounted on the shaft of the driven motor.
  - The F2 signal (see page 21) serves as an independent speed reference for the internal ramp, replacing the ramp output : it is a frequency generator, or an incremental encoder mounted on a pilot motor.

- The BI binary signal is in pure 12 bit binary plus sign, that is ± 4000 points (page 22).

The latter can be a series of programmable controller logic outputs, or an absolute encoder driven by a master controller or encoding wheel.
This digital input is considered as an additional input to the speed amplifier, independent from the ramp but proportional to its output after a division by 4. The ± 4000 points of the BI input are therefore homogeneous to ± 8000 points at the F2 input, or 2,5V at the E1 input at full scale.

Block diagram extension

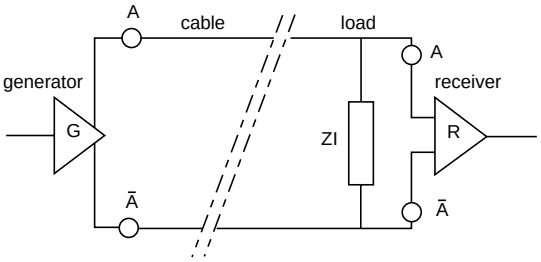


Frequency generators

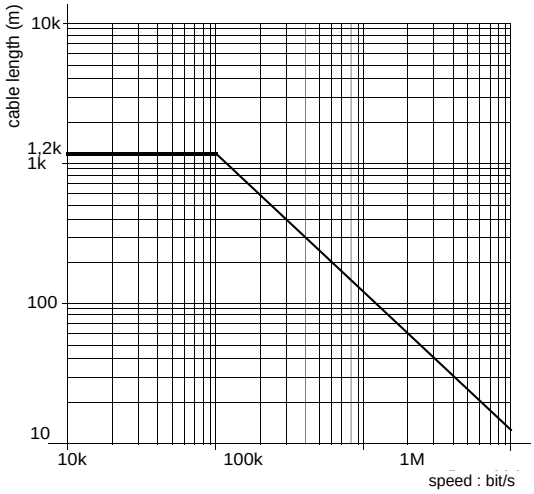
The Ⓐ connector on the option board enables connection of the two frequency generators, for example, double channel incremental encoders.
The characteristics of inputs F1 and F2 are :
- maximum frequency : 100 kHz (above this there is a danger of data loss). Selection of a maximum frequency between 80kHz and 100 kHz is recommended, in other words, the 60th of the sum of the maximum speed configuration (of the motor) multiplied by the number of pulses per encoder revolution,i.e. between 80000 and 100000 Hz.

Example : with maximum speed configured at 3000 rpm, the number of impulses per revolution of the driven motor will be between
80 000 x 60 / 3000 = 1600 and 100 000 x 60 / 3000 = 2000

A lower resolution causes a loss in proportion to the accuracy of the conversion.
- minimum frequency : 4 Hz for significant capture at low speed
- impulse signal voltage level : according to RS422,
- signal form : according to RS422,
- signal nature : A. B. $\overline{A}$. $\overline{B}$ (0 signal unnecessary),
- reminder of standard RS422A.
  - Operation in differential mode.
- Transmission signal A. $\overline{A}$: ≤ 6V output voltage
  ZI = 100 to 150Ω.
  Cable termination resistance to be added by user.
- Transmission signal B. $\overline{B}$: Identical.



- Speed 100 kbits/second maximum with :
  minimum load impedance = 100Ω,
  maximum cable length = 1200m.



- Due to the internal multiplication by 4 check that times between increasing and decreasing signals are equal (cycle ratio ≠ 1).
If not, there is a risk to loose data at frequence near 100kHz

Speed feedback : F1

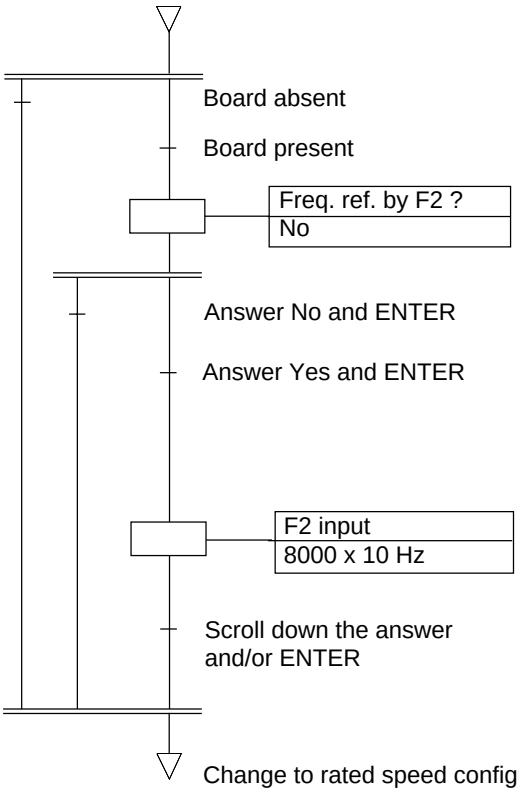
- 5V supply available (including supply for BI input) : 350 mA for the RECTIVAR. Above this capacity, fit a supply external to the RECTIVAR.
- Encoders external connection by 1,5 mm² minimal cross section by screened pairs.

The RECTIVAR's configuration procedure offers the exclusive choice of speed feedback :
"Armature voltage"- "Tachogenerator" - "Pulse encoder", the latter choice is only avalable if the board in question has been detected as having been installed in the RECTIVAR. If this selection is made, the resolution of the encoder in pulses per motor revolution must be configured and causes the scaling up of the digital frequency conversion.
The pulse counting direction (with internal multiplication by 4) determines the speed feedback signal.
It should be noted that the "Reverse speed feedback function" enables the direction of the signal capture to be reversed, without modifying the wiring.

Frequency generator

F2 speed reference

Once it has been detected that the interface extension board has been connected inside the RECTIVAR, the configuration continues after the Speed feedback reversal as follows :



No or Yes decision whether to use F2 as a direct speed amplifier reference.
This assignment disconnects the internal ramp, except for the Internal speed ref. function, where appropriate. In addition to this, the AI input can no longer be assigned for anything other than Arm. I ext. lim. or Not assigned.
However, the use of the BI input can be combined with input F2.

Indication of the maximum frequency supplied by the generator. This value will be converted to 28800 points homogeneous with the analogue reference's 10 volts.
Adjustment limit : from1000 x 10 Hz to 9999 x 10Hz
by default : 8000 x 10 Hz (80 kHZ)

For the taking into account of the F2 input, even when used alone, a FORWARD or REVERSE logic signal is necessary. Reverse inverts F2's signal.
The Low speed, Faster/Slower, Reference detector, and Rounded Ramp functions are not configurable in Yes if F2 is assigned to the reference above.

Connection of the frequency generators to the A connector (sub D15 pin female, male connector provided).

Pins	Signals	Description
1	NC	Not used
2	AN +	Signal A from F1
3	BN +	" B from F1
4	AN -	" $\overline{A}$ from F1
5	GND	0V
6	+ 5V	5V supply
7	NC	Not used
8	BN -	Signal $\overline{B}$ from F1
9	AR +	Signal A from F2
10	BR +	" B from F2
11	AR -	" $\overline{A}$ from F2
12	BR -	" $\overline{B}$ from F2
13	NC	Not used
14	NC	
15	NC	

AN, BN = F1 AR, BR = F2

Warning :
The complementary signals must be connected by the same chielded pair.
Example:
AN + with AN -
BN + with BN -

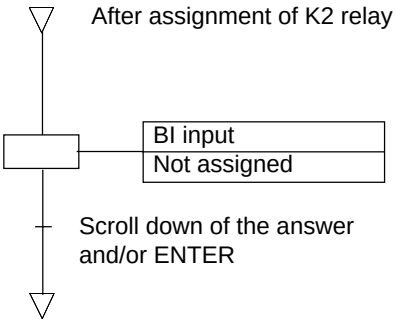
Use a screened twisted pair cable without any electrical breaks in the screen :
- Controller side : screen connected to earth pin of SUB-D connector.
- Encoder side : leave unconnected.

Cable dimensions :
1,5 mm^2 minimum for the connection between enclosure and encoder.
0,4 mm^2 maximum for cabling the interior of the enclosure with SUB-D connector (length as short as possible).

Binary reference input

BI input

The B connector on the option board enables connection of a 13 bit binary signal, an absolute encoder, for example, in parallel links.
If the board is detected in the RECTIVAR, the configuration of the special assignments of the inputs/outputs is as follows :



Assignment of the BI input function to :
- Summing reference on the speed amplifier (see function at AI).
- Not assigned.

• The Add ref. sp. ampli. function cannot be assigned to BI and AI at the same time. If it is selected for BI, it will no longer appear in the AI assignment menu

• The Add ref. sp. ampli. function at BI is not locked by the serial link's analogue line mode. It can, therefore, be combined with the E1, E2, Ec and AI analogue reference inputs, or with frequency F2 in local mode and with writing of analogue command words in serial link line mode, except word W28 which cannot be written if BI is assigned to this function.

BI input characteristics

- 5V TTL signal
- Command by 0V signal, i.e. external common : to speed controller 0V
- Consummation per input bit : 15 mA i.e. 195 mA for 13 bits
- 5V supply available (including supply for inputs F1, F2) : 350 mA via the RECTIVAR. Above this capacity, fit a supply external to the RECTIVAR.

Input connected to B connector (sub D 15 pin female, male connector provided).

Pins	Signals	Description
1	D0	2^0 : 1
2	D1	2^1 : 2
3	D2	2^2 : 4
4	D3	2^3 : 8
5	GND	0V
6	+ 5V	5V supply
7	D4	2^4 : 16
8	D5	2^5 : 32
9	D6	2^6 : 64
10	D7	2^7 : 128
11	D8	2^8 : 256
12	D9	2^9 : 512
13	D10	2^{10} : 1024
14	D11	2^{11} : 2048
15	D12	Sign

Use a screened twisted pair wires. The screen must be connected at the earth connection of the SubD connector on the controller side. The other end must remain unconnected.

Dialogue extension by serial link

- The read - write words, W0 to W29, are not modified, either in their functions, or their unit value definitions.
  W27 can be switched using F2 in line mode, its resolution being ± 32000 points.

- Additional read words are used, involving :
  - W48 : F1 speed feedback
  - W49 : F2 speed reference

  } resolution ± 32000 points (28800 = Max speed).
  - W51 : BI binary input, resolution ± 4000 points.

- The configuration, where necessary, of the BI input can be read on the bits W59,4 to W59,7 (CBI) with decimal values identical to the similar assignments of the AI input (bits W59,0 to W59,3).

- The configuration of the F2 input can be read on bits W60,C to W60,F with decimal values :
  1 : not assigned
  2 : Dir. ref. sp. ampli

Some option cartridges can increase the number of codes. A test at a value which is not zero can comprise a presence check via the serial link of the interface extension option board.

Telemecanique encoders

According to the need, the encoders with following references can be used:

- XCC HE7 A40	1000 pulses/rotation,	diameter 58,	axle ø6
- XCC HF6 B55	2500 pulses/rotation,	diameter 58,	axle ø10
- XCC HF7 B50	2000 pulses/rotation,	diameter 58,	axle ø10
- XCC HH7 B55	2500 pulses/rotation, + 0,10V output	diameter 100,	axle ø10

See relevant catalogue.