JBC

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Robot Communication Protocol for JTSE

Programmer's Guide

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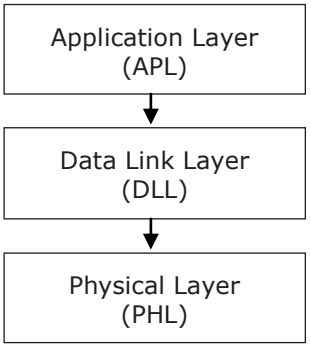
Content

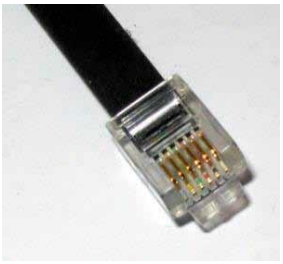
1 PROTOCOL STATION – ROBOT

To connect the JBC stations to a PC, the following communication protocol is developed, which is divided in 3 levels or layers:

- Application Layer (depends on station model)
- Data Link Layer
- Physical Layer



2 PHYSICAL LAYER (PHL)



It must be previously configured on your computer, and once connected it must not allow to change parameters from the equipment unless the connection is aborted. In addition it cannot allow new connections. To enter it is needed the express request of the user by entering to station settings and activating the robot mode, which is Control mode's type in this case.

Physically it is type RS-232 with RJ12 connector (RJ-11, only 4 pins are used) and configuration: speed from 1200 to 500000 bps; 8 bits of data; even parity, odd parity or no parity; and 1 or 2 bits of stop (e.g. 19200-8E1). See the following pin distribution:

Pin	Description
1	NC
2	GND
3	Tx
4	Rx
5	GND
6	NC

The equipment configuration is DCE type and the robot configuration is DTE type, so that the connection cable can be direct. Anyway, you can reverse the connection type by turning the connection of one of the ends of the RJ-12 cable.

To enter it is needed the express request of the user by entering to station settings and activating the robot mode, which is Control mode's type in this case.

This type of connection does not need to maintain the connection, i.e., the connected robot can set a temperature and not send any order more. The equipment remains with the last configured status awaiting new orders.

2.1 Possible configurations

Speed of transmission:

1200 bps
2400 bps
4800 bps
9600 bps
19200 bps
38400 bps
57600 bps
115200 bps
230400 bps
250000 bps
460800 bps
500000 bps

Parity:

Even
Odd
None

Stop Bits:

1 bit
2 bits

3 DATA LINK LAYER (DLL)

The frame format is the following, in which the field data may or may not depending on the type of frame. Furthermore the address fields may or may not appear depending on if has been activated sending / receiving with address:

- **With no address**

Start	Control header	Control code	Data	Stop	Check
1 byte	1 byte	3 bytes	0 or 5 bytes	1 byte	1 byte
STX	'R', 'W', 'A', 'N'	"code"	"-9999" to "99999"	ETX	BCC

- **With address**

Start	Source address	Target address	Control header	Control code	Data	Stop	Check
1 byte	2 bytes	2 bytes	1 byte	3 bytes	0 or 5 bytes	1 byte	1 byte
STX	"00" to "99"	"00" to "99"	'R', 'W', 'A', 'N'	"code"	"-9999" to "99999"	ETX	BCC

Everything is sent in ASCII code.
The Data field can be either visible or not. When visible, it is shown in five digits/characters.

Depending on the Control Header field, the following occurs:

- R: If an order for reading is sent, the data field is not shown.
- W: If an order for writing is sent, the data field appears.
- A: If an answer to a reading order is sent, the data field appears. If it is an answer to a written order the data field does not appear.
- N: If an answer of non-conformity is sent, the data field appears indicating the type of error.

3.1 Description of frame fields

- **Start**: This corresponds to the character STX of ASCII code (0x02). Start of transmission.
- **Source address**: Information's source address , the address range is from "00" to "99".
- **Target address**: Information's destination address, the address range is from "00" to "99".

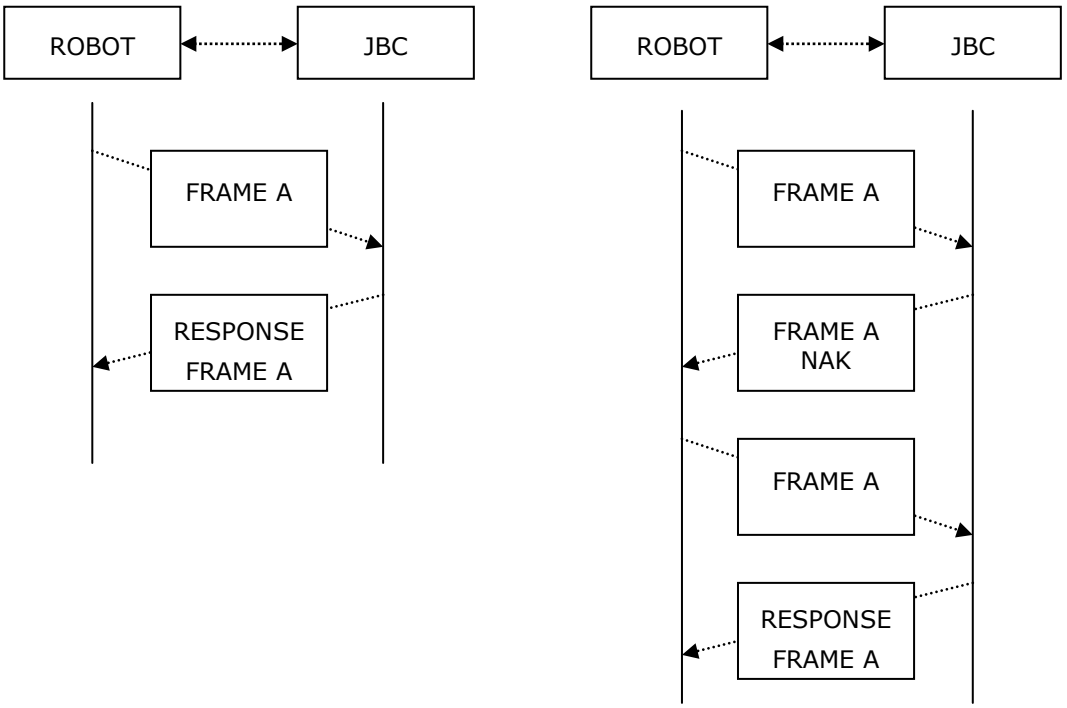
- **Control**: This describes the frame function
  - Control header:
    - R: Reading code (read)
    - W: writing code (write)
    - A: Correct frame code (ACK = acknowledgement)
    - N: incorrect frame code (NAK = negative acknowledgement)
  - Control code: This describes the frame function.
- **Data**: Data sent is in ASCII code. This is shown in five digits. First tens of thousands are sent and successively to the last in units i.e. in order to send 12345, you first send `1´, and finally `5´. If the number contains a negative sign, this will be shown as an ASCII character `-´ and placed at tens of thousands position, so that the lowest number that can be transmitted is -0050. If the number has less than five digits, e.g. 375, then zeros will be placed before it like "00375".
- **Stop**: This corresponds to the character ETX of ASCII code (0x03). End of transmission.
- **Check**: This is obtained by calculating the logic function XOR for the whole frame excluding the BCC. This is an error check.

3.2 Description of connection

Connection is selected from the station by activating the Robot mode. The equipment will only respond to instructions from the RS232 connection. This type of connection does not have an initial connection stage or a time-out to control the connection. It can only be activated and deactivated from the station.

3.3 Description of frame reception

Every frame that the robot sends to JBC equipment is evaluated at "data layer link (DLL)". To know if the received frame is correct or not if: it starts with STX + finishes with ETX + correct BCC + correct length. Once you have checked this is correct, the information is sent to application level (APL) and this will answer with a frame according to what is requested. Or else it is the layer link which answers with a frame of the type NACK.



The number of repetitions followed by erroneous frames is determined by the Robot. The JBC equipment does not expects an ACK from the information the Robot sends. If the Robot receives a frame with errors, it cannot ask this to be resent, so that it only can repeat everything once again.

4 Application Layer (APL)

The application layer offers several services through order-answer type. The communication always begins in the ROBOT and the UC destination responds with a frame answer.

The data is always in ASCII five digit bytes.

- Temperatures are always shown in ºC.
- The power is given as in thousands of the theoretical maximum power station [‰] without decimals.

4.1 List of tools

Number	Description
00000	No tool
00001	JT
00002	TE

4.2 List of ports

Number	Description
00001	Port 1

4.3 List of tool errors

Number	Description
00000	OK. No error
00001	Air pump malfunction
00002	Insufficient Air flow. Check for air leaks or obturation in heater
00003	Heater malfunction. Replace heater
00004	Thermocouple needed
00005	Set temp not reached
00006	Short-circuit. Replace heater
00007	Incorrect tool resistance
00008	Incorrect heater
00009	No tool
00010	Checking tool

4.4 List of station errors

Number	Description
00000	OK
00001	Stop by overload (TRAFO) (no used)
00002	Temperature sensor (no used)
00003	Memory
00004	Mains frequency
00005	Station model
00006	Not connected MCU Tools

4.5 List of communication errors

Number	Description
00001	BCC error (frame error when doing the sum check)
00002	Format error (format is not correct, i.e. incorrect size)
00003	Out of range (modifying value out of limit)
00004	Control error (control code not accepted)
00005	Control mode (you must control the equipment, mode robot)
00006	Station model error (station unknown)
99999	Undefined (error not defined)

4.6 List of tool status

The unit digit indicates the status of the tool.

Number	Description
XXXX0	Tool OFF
XXXX1	Tool ON (Heater ON, Air pump ON)

The tens digit indicates the cooling status.

Number	Description
XXX0X	Cooling OFF
XXX1X	Cooling ON (Heater OFF, Air pump ON)

The hundreds digit indicates the suction status.

Number	Description
XX0XX	Suction OFF
XX1XX	Suction ON

4.7 List of work modes

Number	Description
00000	Manual mode (Profiles OFF)
00001	Profile mode (Profiles ON)

4.8 List of commands

Code	Description
RST1	Read select air temperature + port 1
WST1	Write select air temperature + port 1
RSF1	Read select air flow + port 1
WSF1	Write select air flow + port 1
RSE1	Read select external temperature + port 1
WSE1	Write select external temperature + port 1
RAT1	Read air temperature + port 1
RET1	Read external temperature + port 1
RWM1	Read work mode + port 1
WWM1	Write work mode + port 1
RPP1	Read port power + port 1
RPE1	Read port error + port 1
RPS1	Read port status + port 1
WPS1	Write port status + port 1
RCT1	Read connect tool + port 1
RA1y	Read adjust temp + port 1 + tool
WA1y	Write adjust temp + port 1 + tool
RSMN	Read station model name
RMAT	Read maximum air temperature
WMAT	Write maximum air temperature
RMIT	Read minimum air temperature
WMIT	Write minimum air temperature
RMAF	Read maximum air flow
WMAF	Write maximum air flow
RMIF	Read minimum air flow
WMIF	Write minimum air flow
RMAE	Read maximum external temperature
WMAE	Write maximum external temperature
RMIE	Read minimum external temperature
WMIE	Write minimum external temperature
RSER	Read station error
WRST	Write reset station settings
WRSP	Write reset station parameters (Factory Default)
ROH1	Read counter on hours + port 1
RWH1	Read counter work hours + port 1
RTC1	Read counter tool cycles + port 1
RSC1	Read counter suction cycles + port 1

4.9 Frames descriptions

4.9.1 Read select air temperature (RSTx)

To read the selected air temperature, you need to replace the 'x' with the number of the destination port in ASCII, for example, "RST1". The equipment answers with an "ASTx" as the control field, as in the example "AST1".

The data field will contain the requested information.

Table 4.2 lists the number of available ports.

4.9.2 Write select air temperature (WSTx)

To modify the selected air temperature, the 'x' should be replaced with the destination port in ASCII, for example "WST1". Equipment answers with an "ASTx" as the control field, in the example "AST1".

4.9.3 Read select air flow (RSFx)

To read the selected air flow, you need to replace the 'x' with the number of the destination port in ASCII, for example, "RSF1". The equipment answers with an "ASFx" as the control field, as in the example "ASF1".

The data field will contain the requested information.

Table 4.2 lists the number of available ports.

4.9.4 Write select air flow (WSFx)

To modify the selected air flow, the 'x' should be replaced with the destination port in ASCII, for example "WSF1". Equipment answers with an "ASFx" as the control field, in the example "ASF1".

4.9.5 Read select external temperature (RSEx)

To read the selected external temperature, you need to replace the 'x' with the number of the destination port in ASCII, for example, "RSE1". The equipment answers with an "ASEx" as the control field, as in the example "ASE1".

The data field will contain the requested information.

Table 4.2 lists the number of available ports.

4.9.6 Write select external temperature (WSEx)

To modify the selected air flow, the 'x' should be replaced with the destination port in ASCII, for example "WSE1". Equipment answers with an "ASEx" as the control field, in the example "ASE1".

4.9.7 Read air temperature (RATx)

To read the real air temperature from tool thermocouple, the 'x' must be replaced with the number of the destination port in ACCII, for example, "RAT1". The equipment answers with an "AATx" as the control field, as in the example "AAT1". Data field will contain the requested information.

4.9.8 Read external temperature (RETx)

To read the real temperature from external thermocouple, the 'x' must be replaced with the number of the destination port in ACCII, for example, "RET1". The equipment answers with an "AETx" as the control field, as in the example "AET1". Data field will contain the requested information.

4.9.9 Read work mode (RWMx)

To read the selected work mode, you need to replace the 'x' with the number of the destination port in ASCII, for example, "RWM1". The equipment answers with an "AWMx" as the control field, as in the example "AWM1".

The data field will contain the requested information.

Table 4.2 lists the number of available ports.

Table 4.7 lists the work modes available.

4.9.10 Write work mode (WWMx)

To modify the selected work mode, the 'x' should be replaced with the destination port in ASCII, for example "WWM1". Equipment answers with an "AWMx" as the control field, in the example "AWM1".

Table 4.7 lists the work modes available.

4.9.11 Read port power (RPPx)

To read the power supplied to the tool, the 'x' must be replaced with the number of destination port in ASCII, for example "RPP1". The equipment answers with an "APPx" as the control field, in the example "APP1". Data field will contain the requested information.

4.9.12 Read port error (RPEx)

To read the port error, the 'x' must be replaced with the number of the destination port in ASCII, for example "RPE1". Equipment answers with an "APEx" as the control field, in the example "APE1". Field data will contain the requested information. (See 4.3 List of tool errors).

4.9.13 Read port status (RPSx)

To read the port status, the 'x' must be replaced with the number of the destination port in ASCII, for example "RPS1". The equipment answers with an "APSx" as the control field, in

the example "APS1". Control field will contain the requested information. (See 4.6 List of tool status).

4.9.14 Write port status (WPSx)

To modify the port status, the 'x' must be replaced with the number of the destination port in ASCII, for example "WPS1". The data field will contain the value you need to modify. (See 4.6 List of tool status).

4.9.15 Read connect tool (RCTx)

To read the connected tool, the 'x' must be replaced with the number of the destination port in ASCII, for example "RCT1". The equipment answers with an "ACTx" as the control field, as in the example "ACT1". The data field will contain the requested information. (See 4.1 List of tools).

4.9.16 Read adjust temp (RAxy)

To read the tool adjustment temperature, the 'x' must be replaced with the destination port in ASCII, and 'y' with the specific tool. For example "RA11", port 1 and tool 1 (JT). The equipment answers with an "AAxy" as the control field, in the example "AA11". The data field will contain the requested information.

4.9.17 Write adjust temp (WAxy)

To modify the adjustment of the temperature, the 'x' must be replaced with the number of destination port in ASCII, and 'y' with the specific tool. For example "WA11", port 1 and tool 1 (JT). The equipment answers with an "AAxy" as the control field, in the example "AA11".

4.9.18 Read station model (RSMN)

To read the station model name.

The PC answers with the ASCII code associated to each character that makes up the station model, together with blanks to complete the five-character data field. Blank spaces will occupy the most significant bytes of the data field, as shown in the example: " JTSE". The equipment answers with an "ASMN" as the control field. The data file will contain the requested information.

4.9.19 Read maximum air temperature (RMAT)

To read the maximum working air temperature of the station. The equipment answers with an "AMAT" as the control field. The data file will contain the requested information.

4.9.20 Write maximum air temperature (WMAT)

This modifies the maximum working air temperature of the station. The equipment answers with an "AMAT" as the control field.

4.9.21 Read minimum air temperature (RMIT)

To read the minimum working air temperature of the station. The equipment answers with an "AMIT" as the control field. The data field will contain the requested information.

4.9.22 Write minimum air temperature (WMIT)

It modifies the minimum working air temperature of the station. The equipment answers with an "AMIT" as the control field.

4.9.23 Read maximum air flow (RMAF)

To read the maximum working air flow of the station. The equipment answers with an "AMAF" as the control field. The data file will contain the requested information.

4.9.24 Write maximum air flow (WMAF)

This modifies the maximum working air flow of the station. The equipment answers with an "AMAF" as the control field.

4.9.25 Read minimum air flow (RMIF)

To read the minimum working air flow of the station. The equipment answers with an "AMIF" as the control field. The data field will contain the requested information.

4.9.26 Write minimum air flow (WMIF)

It modifies the minimum working air flow of the station. The equipment answers with an "AMIF" as the control field.

4.9.27 Read maximum external temperature (RMAE)

To read the maximum working external temperature of the station. The equipment answers with an "AMAE" as the control field. The data file will contain the requested information.

4.9.28 Write maximum external temperature (WMAE)

This modifies the maximum working external temperature of the station. The equipment answers with an "AMAE" as the control field.

4.9.29 Read minimum external temperature (RMIE)

To read the minimum working external temperature of the station. The equipment answers with an "AMIE" as the control field. The data field will contain the requested information.

4.9.30 Write minimum external temperature (WMIE)

It modifies the minimum working external temperature of the station. The equipment answers with an "AMIE" as the control field.

4.9.31 Read station error (RSER)

To read the station error. The equipment answers with an "ASER" as the control field. The data field will contain the requested information. (See 4.4 List of station errors).

4.9.32 Write reset station parameters (WRSP)

To reset the station parameters at factory values. The equipment answers with an "ARSP" as the control field.

4.9.33 Read counter plugged hours (ROHx)

To read the connected-hours counter, the 'x' must be replaced with the number of destination port in ASCII of the request, for example "ROH1". The equipment answers with an "AOHx" as the control field, in the example, "AOH1". The data field will contain the requested information.

4.9.34 Read counter work hours (RWHx)

To read the work-hours counter, the 'x' must be replaced with the number of destination port in ASCII of the request, for example "RWH1". The equipment answers with an "AWHx" as the control field, in the example, "AWH1". The data field will contain the requested information.

4.9.35 Read counter tool cycles (RTCx)

To read the tool work-cycles counter, the 'x' must be replaced with the number of destination port in ASCII of the request, for example "RTC1". The equipment answers with an "ATCx" as the control field, in the example, "ATC1". The data field will contain the requested information.

4.9.36 Read counter suction cycles (RSCx)

To read the suction-cycles counter, the 'x' must be replaced with the number of destination port in ASCII of the request, for example "RSC1". The equipment answers with an "ASCx" as the control field, in the example, "ASC1". The data field will contain the requested information.

Notes:

Notes:

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