JBC

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PROGRAMMERS GUIDE

Communication Protocol

For Preheaters

Communication Protocol

This communication protocol was developed to use JBC devices in automated soldering processes. It allows communication between preheaters and a robot (PC or PLC).

The protocol is divided into the following 3 layers:
- **PHL:** Physical Layer
- **DLL:** Data Link Layer
- **APL:** Application Layer (depends on preheater model)

Physical Layer (PHL)

To connect the robot to the JBC station it is used a micro of communications from the manufacturer Freescale, specifically the K60.

It is must be previously configured on your computer, and once connected it must not allow changing 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 5000 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:
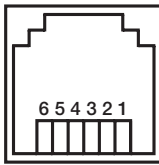
Female RJ12 Connector

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.

The serial connection does not need to maintain the connection, i.e., the connected robot can set a speed or length and not send any order more. The equipment remains with the last configured status awaiting new orders.

Possible Configurations:

Transmission Speed	
Number	Description
00	1200 bps
01	2400 bps
02	4800 bps
03	9600 bps
04	19200 bps
05	38400 bps
06	57600 bps
07	115200 bps
08	230400 bps
09	250000 bps
0A	460800 bps
0B	500000 bps

Parity
Even
Odd
None

Stop Bits
1 bit
2 bits

Data Link Layer (DLL)

The frame format is the following, in which the data field may or may not depending on the type of frame.

Start	Control Header*	Control Command	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

Operation Header Field		Data Field
R (Read)		Is not used
W (Write)		Used
A (Acknowlegement)	Response to Reading Comands	Used
	Response to Writing Comands	Is not used
N (Negative Acknowlegement)		Used

**In case of Negative Acknowledgement, the Data Field contains one of the following Error Values:

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 command not accepted)
00006	JBC device model error (device unknown)
00009	Undefined (error not defined)

Frame Fields

|	
Start	Start of transmission. Corresponds to the character STX of ASCII code (0x02).
Control Header	Four Codes are used (see table from previous page).
Control Command	Select the command which should be used (see pages 10-18).
Data	Shown in five digits. First tens of thousand is sent and thereafter successively until the last unit. Example: in order to send "12345" it is first sent "1", and finally "5". If it is a negative number, the minus sign is at the tens of thousands digit, shown as an ASCII code "-". Example: In order to send "-50", the data that will be sent is "-0050". If the number has less than five digits, then zeros will be placed before. Example: in order to send "375" the data that will be sent is "00375".
Stop	End of transmission. Corresponds to the ASCII code character ETX (0x03).
Check	This is an error check field. The value is obtained by calculating the logic function XOR for the whole frame, excluding the BCC.

Connection Description

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.

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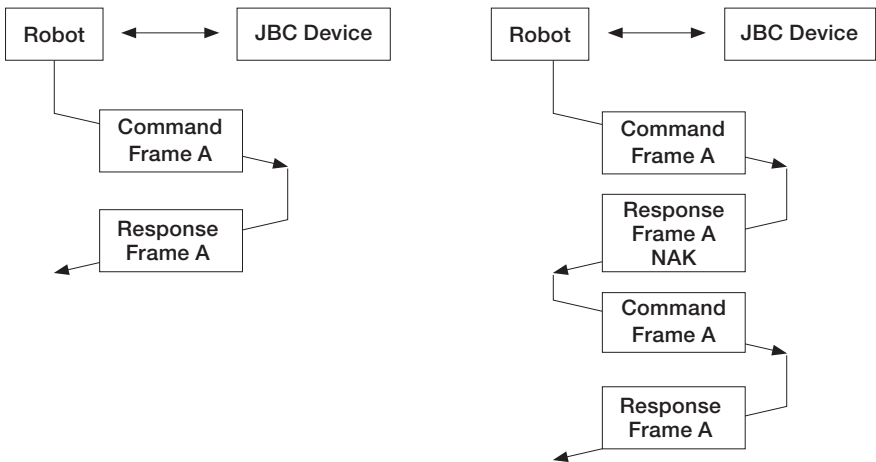
The number of repetitions followed by erroneous frames is determined by the Robot. The JBC equipment does not expects an ACK from the information the Robot sends. If the Robot receives a frame with errors, it cannot ask this to be resent, so that it only can repeat everything once again.

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 °C.
• The power is given as in thousands of the theoretical maximum power station [‰] without decimals.

A list of other kinds of data follows:

Other types of data are detailed below:
When the equipment is connected to a robot, the station doesn't pay attention to the console push button of the preheater neither to the pedal, so the robot decides when to start or stop.

Ports:

Number	Description
1	Port 1
2	Port 2 (not available)
3	Port 3 (not available)
4	Port 4 (not available)

Tool Errors:

Number	Description
00000	OK
00001	Selected temperature not reached
00002	Error: low preheater intensity
00003	TC1 not connected
00004	TC2 not connected
00005	TC3 not connected
00006	TC4 not connected

Station Errors:

Number	Description
00000	OK
00001	---
00002	---
00003	Memory
00004	Mains frequency
00005	Station model

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 (modified value out of limit)
00004	Control error (control code not accepted)
00005	Control Mode (must control the equimpent, robot mode)
00006	Incorrect sequence (on reprogramming)
00007	Flash write error (boot cannot write on flash)
00008	Active control mode (two connections cannot coexist in control mode)
00009	Not valid hardware (trying to reprogram with an incorrect hardware version: not a program for that UC)
00010	Internal error. This happens when consulting some intern values that are not available or when trying to change a station parameter without without the UC being detected. Unexpected error.
00032	Undefined (error not defined)

TC Warnings:

Number	Description
00000	OK
00001	TC limit exceeded (stops working cycle)
00002	TC out of range (only informs)
00003	TC out of its place (stops working cycle)
00004	TC limit exceeded (only informs)

List of Stations:

Type	Description
PHSE	• Infrared preheater • Maximum temperature: 405 ºC • Minimum temperature: TOFF • A port for PC communication (USB-B) • A port for JT communication (RJ-45) • A port for Robot communication (RJ-12)
PHBE	• Convection preheater • Maximum temperature: 405 ºC • Minimum temperature: TOFF • A port for PC communication (USB-B) • A port for JT communication (RJ-45) • A port for Robot communication (RJ-12)

Commands - Tools

Code	Description	Details
R-PWM	Read - Work Mode (Power / Temperature)	To read the working mode. The equipment answers with a "APWM" as the control field. The data field will contain the requested information.
W-PWM	Write - Work Mode (Power / Temperature)	To save the working mode. The equipment answers with an "APWM" as the control field. • 00000: Power mode • 00001: Temperature mode
R-PST	Read - Preheater State (Stop / Start)	To read the station state. The equipment answers with a "APST" as the control field. The data field will contain the requested information. The station state can be: • 00000: Heater Off • 00001: Heater On
W-PST	Write - Preheater State (Stop / Start)	To save the station state. The equipment answers with a "APST" as the control field.

Code	Description	Details
R-CMx	Read - TC Configuration Mode + channel	To read the TC configuration mode. The 'x' must be replaced with the number of TC channel in ASCII, e.g. "RCM0" for thermocouple 1. The equipment answers with a "ACMx" as the control field, e.g. "ACM0". The data field will contain the requested information. The TC configuration modes can be: • 00000: Regulation mode • 00001: Protection-warning mode • 00002: Protection-error mode The Regulation mode, the station adjusts the delivered power in order to not exceed the selected limit. The Protection-Warning mode, the station warns in the case the limit is exceeded. The Protection-Error mode, the station stops in the case the limit is exceeded and it pops up an error.
W-CMx	Write - TC Configuration Mode + channel	To save the TC configuration mode. The 'x' must be replaced with the number of TC channel in ASCII, e.g. "WCM0" for thermocouple 1.
R-SST	Read - Selected Time to Stop	To read the selected Time to Stop. The equipment answers with a "ASST" as the control field. The data field, will contain the requested information. The "Time to Stop" data is sent in **seconds**.
W-SST	Write - Selected Time to Stop	To save the selected Time to Stop. The equipment answers with a "ASST" as the control field. The "Time to Stop" data is sent in seconds.

Code	Description	Details
R-STx	Read - Selected Temperature + channel	To read the selected temperature per each TC channel. The 'x' must be replaced with the number of TC channel in ASCII, e.g. "RST0" for thermocouple 1. The equipment answers with a "ASTx" as the control field, e.g. "AST0". The data field will contain the requested information.
W-STx	Write - Selected Temperature + channel	To save the selected temperature per each channel. The 'x' must be replaced with the number of TC channel in ASCII, e.g. "WST0" for thermocouple 1. The equipment answers with a "ASTx" as the control field, e.g. "AST0"
R-SPW	Read - Selected Power	To read the selected power. The equipment answers with a "ASPW" as the control field. The data field will contain the requested information.
W-SPW	Write - Selected Power	To save the selected power. The equipment answers with a "ASPW" as the control field. The data field will contain the requested information.
R-DPW	Read - Delivered Power	To read the delivered power. The equipment answers with a "ADPW" as the control field. The data field will contain the requested information.
R-TER	Read - Tool Error	To read tool error. The equipment answers with a "ATER" as the control field. The data field will contain the requested information.

Code	Description	Details
R-WAx	Read - Warning + channel	To read warnings per each TC channel. The 'x' must be replaced with the number of TC channel in ASCII, e.g. "RWA0" for thermocouple 1. The equipment answers with a "AWAx" as the control field. The data field will contain the requested information.
R-ACZ	Read - Active Zones	To read the activated zones. The equipment answers with a "AACZ" as the control field. The data field will contain the requested information. • 00000: Only zone A • 00001: Only zone B • 00002: Both zones A and B
W-ACZ	Write - Active Zones	To save the activated zones. The equipment answers with a "AACZ" as the control field. The data field will contain the requested information.
R-MTx	Read - Measured Temperature + channel	To read each current TC channel temperature. The 'x' must be replaced with the number of TC channel in ASCII, for example "RMT0" for thermocouple 1. The equipment answers with a "AMTx" as the control field. The data field will contain the requested information.

Commands - Station

Code	Description	Details
R-MAT	Read - Maximum Selected Temperature	To read the working mode. The equipment answers with a "APWM" as the control field. The data field will contain the requested information.
W-MAT	Write - Maximum Selected Temperature	To save the working mode. The equipment answers with an "APWM" as the control field. • 00000: Power mode • 00001: Temperature mode
R-MIT	Read - Minimum Selected Temperature	To read the station state. The equipment answers with a "APST" as the control field. The data field will contain the requested information. The station state can be: • 00000: Heater off • 00001: Heater on
W-MIT	Write - Minimum Selected Temperature	To save the station state. The equipment answers with a "APST" as the control field.
R-MAP	Read - Maximum Selected Power	To save the station state. The equipment answers with a "APST" as the control field.
W-MAP	Write - Maximum Selected Power	To save the station state. The equipment answers with a "APST" as the control field.

Code	Description	Details
R-MIP	Read - Minimum Selected Power	To read the minimum power. The equipment answers with a "AMIP" as the control field. The data field will contain the requested information.
W-MIP	Write - Minimum Selected Power	To save the minimum power. The equipment answers with a "AMIP" as the control field. The data field will contain the requested information.
R-SER	Read - Station Error	To read station error. The equipment answers with a "ASER" as the control field. The data field will contain the requested information.
W-RST	Write - Parameter Reset	To do a reset of the parameters. The equipment answers with a "ARST" as the control field. If RST is performed, Robot Mode sets to default so it switches off.
R-SMN	Read - Station Model Name	To read the station model name. The equipment answers with an "ASMN" as the control field. The data file will contain the requested information.

Commands - Counters

Code	Description	Details
R-ONT	Read - Total Switched On Minutes	To read the total ON minutes. The equipment answers with an "AONT" as the control field. The data field will contain the requested information.
R-WRT	Read - Total Working Minutes	To read the total working minutes. The equipment answers with an "AWRT" as the control field. The data field will contain the requested information.
R-WCT	Read - Total Work Cycles	To read the total working cycles. The equipment answers with an "AWCT" as the control field. The data field will contain the requested information.
R-ONP	Read - Partial Switched On Minutes	To read the partial ON minutes. The equipment answers with an "AONP" as the control field. The data field will contain the requested information.
R-WRP	Read - Partial Working Minutes	To read the partial working minutes. The equipment answers with an "AWRP" as the control field. The data field will contain the requested information.
R-WCP	Read - Partial Work Cycles	To read the partial working cycles. The equipment answers with an "AWCP" as the control field. The data field will contain the requested information.

Notes

Notes

Notes

This product should not be thrown in the garbage.
In accordance with the European directive 2012/19/EU, electronic equipment at the end of its life must be collected and returned to an authorized recycling facility.

More information available on our website

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