JBC

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PROGRAMMERS GUIDE

Communication Protocol

For SF Solder Feeder

Communication Protocol

This communication protocol was developed to use JBC devices, such as the Automatic Solder Feeder (SF), in automated soldering processes. It allows communication between the SF 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 station model)

Physical Layer (PHL)

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

It 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.

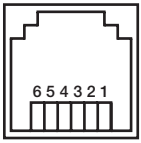
Physically it is type RS-232 with RJ12 connector (RJ-11, only 4 pins are used) and configuration: speed from 1200 to 500000 bps; 8 bits of data; even parity, odd parity or no parity; and 1 or 2 bits of stop (e.g. 19200-8E1).

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 other order. The equipment remains with the last configured status awaiting new orders.

Robot Station Connector



Female RJ12 Connector

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

Data Link Layer (DLL)

The frame format is shown in the tables below. By factory settings, communications are made with addresses. They can be disable using W-SAD commad. Depending on the command used, the Data Field* is not necessary.

With no address

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´, À´, `N´	“code”	“-9999” to “99999”	ETX	BCC

With address (factory default)

Start	Source Address	Target Address	Control Header*	Control Command	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´, À´, `N´	“code”	“-9999” to “99999”	ETX	BCC

**Operation Header options:*

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

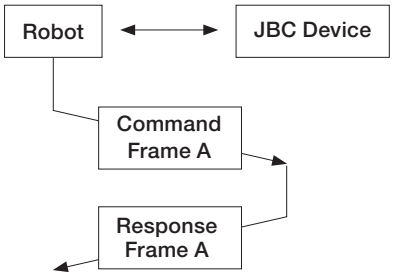
Start	Start of transmission. Corresponds to the character STX of ASCII code (0x02).
Source Address	The Source Address range is from “00” to “99”. The factory setting for Robot Address is “00”.
Target Address	The Target Address range is from “00” to “99”. Factory settings for JBC devices are as follows: · Soldering Stations Address is “01” · Solder Feeder Address is “10” · Fume Extractor Address is “20”
Control Header	Four Codes are used (see table from page 4).
Control Command	Select the command to be used (see pages 10-14).
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 character “-”. Example: In order to send “-50”, the data 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 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.

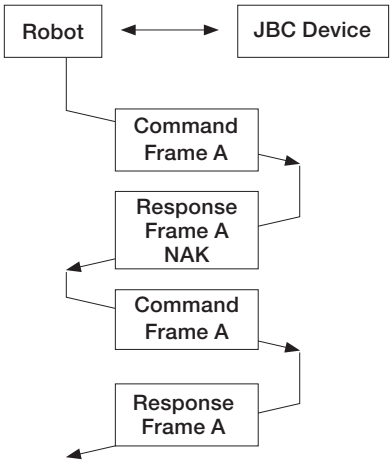
Frame Reception

The Robot sends a Command Frame to the JBC device. This information is send to the Application Layer (APL). The Command Frame obtained from the robot is correct if it has the correct length and **“starts with STX + finishes with ETX + correct BCC”.**

The JBC device will send a Response Frame. In the case of a Response Frame with errors, the Robot determines the number of consecutive Command Frames that will send to the JBC device. If the Robot receives a Response Frame with errors, it cannot be resend by the JBC device.

The JBC device does not expect ACK/NAK from the Robot.





Application Layer (APL)

The robot starts the communication with a Command Frame and the JBC device sends a Response Frame. For a detailed functional description, see the table with the command overview starting on page 10.

- Temperature is always shown in ºC.
- The power is given in thousands of the theorical maximum JBC Device power [%] without decimals.

Tools:

Number	Description
0	Without tool
1	T210
2	T245/T470
2	TR245/TR470
3	PA120/AM120
4	HT420/AT420
5	DS360
6	DR560
7	NT115
8	NP115/AN115
9	TRA245/TRA470

Ports:

Number	Description
1	Port 1
2	Port 2
3	Port 3
4	Port 4

Station Errors:

Number	Description
00000	OK
00001	Stop due by overload (TRAFO)
00002	Temperature sensor error
00003	Memory
00004	Mains frequency
00005	JBC device model
00006	Not connected MCU tools
00007	Warning overload (TRAFO)

Port Errors:

Number	Description
00000	OK
00001	Short-circuit
00002	Short-circuit non-recoverable, JBC Device should be restarted
00003	Open circuit
00004	No tool
00005	No tool accepted
00006	Tool detection
00007	Stop due by maximum powers (not implemented)
00008	Stop due by overload (MOS)
00009	Warning overload (MOS)

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	Robot Control Mode Error (in JBC Device Menu is “off” for “Robot Mode” selected)
00006	Station model error (station unknown)
99999	Undefined (error not defined)

Tool Operating Status:
(Standard Processes)

Number	Description
00000	Working
00001	Stand, it still has not gone into sleep mode (delay)
00002	Sleep*
00003	Hibernation*

**Not selectable with W-PSx commands.*

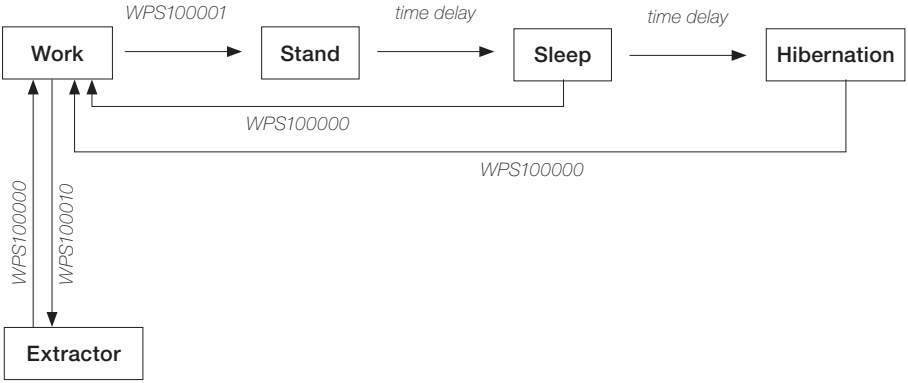
Tool Operating Status:
(Automated Processes)

Number	Description
00000	Working
00010	Cooling

Suction Status

Number	Description
00000	Desoldering OFF
00100	Desoldering ON

The following diagram shows the soldering stations work flow:



Commands

Code	Description	Details
W-MOD	Write - Feeding Mode	Two Feeding Modes are available: “Continuous” and “Discontinuous” Mode. The Data Field contains “00001” for Continuous Mode or “00002” for Discontinuous Mode. Continuous Mode means: The SF starts to feed as soon as a Start Feeding Command (SFD) is received and stops when a Stop Feeding Command (SSD) is received. Discontinuous Mode means: The SF feeds a finite amount of tin when it receives a Start Feeding Command (SFD). This tin amount is set by Write Length Command (LEN). The JBC device responds with an “A-MOD” and the Data Field contains the same value as the command. Factory settings: The JBC device is set with Continuous Mode.
R-MOD	Read - Port Status + port	The current Feeding Mode will be responded. The JBC device responds with an “A-MOD” and the Data Field contains “00001” for Continuous Mode or “00002” for Discontinuous Mode.
W-SFD	Write - Start Feeding	The JBC device starts tin feeding. The Data Field contains “00001” if the direction of feeding is forward or “00000” if the direction is backward. For Continuous Mode: The feeding process will last until a Stop Feeding Signal (SSD) is sent to the JBC device. For Discontinuous Mode: The feeding process is automatically stopped when the specified length (mm) has been supplied. The length is determined previously with the command Write Length (LEN). The JBC device responds with an “A-SFD” and the Data Field contains the same value as the command.

Code	Description	Details
W-SSD	Write - Stop Feeding	The JBC device stops tin feeding. Only for Continuous Mode: The Data Field contains “00000”. The JBC device response with an “A-SSD” and the Data Field contains the same value as the command.
W-LEN	Write - Feeding Length	Sets the tin length to be fed. Only available in Discontinuous Mode. The length measuring starts, when the Start Feeding Command (SFD) is received. The Data Field contains the length to be fed, expressed in tenths of millimetres. Example, “00005” means 0.5 mm. The JBC device response with “A-LEN” and the Data Field contains the same value as the send command.
R-LEN	Read - Feeding Length	The current tin feeding length will be responded. The length measuring starts, when the Start Feeding Command (SFD) is received. The JBC device response with “A-LEN” and the Data Field contains the length to be fed, expressed in tenths of millimetres. For example: “00005” means 0.5mm
W-SPD	Write - Feeding Speed	Sets the tin feeding speed for Continuous and Discontinuous Feeding Mode. The Data Field contains the feeding speed expressed in tenths of millimetres per second. Example: “00010” means 1mm/s. The JBC device response with “A-SPD” and the Data Field contains the same value as the original command.
R-SPD	Read - Feeding Speed	The current tin feeding speed will be responded. The JBC device responds with “A-SPD” and the Data Field contains the feeding speed, expressed in tenths of millimetres per second. For Example: “00010” means 1mm/s.

Code	Description	Details
W-TES	Write - Tool Enable Status	Enables or disables the switch input port. The Data Field contains “00001” to enable or “00000” to disable the input port. The JBC device responds with “A-TES”. Factory default: The switch input signal is set to enabled “00001”.
R-TES	Read - Tool Enable Status	To get the switch input status. The JBC device responds with “A-TES” and the Data Field contains “00001” if the switch port is enabled or “00000” if it is disabled.
R-ECV	Read - Error Code Value	To get the Error Code. The JBC device responds with “A-ECV” and Data Field contains the last Error Code.
W-ECV	Write - Reset Error Code Value	Resets the last Error Code. The JBC device responds with “A-ECV” and the Data Field contains “00001”.
R-CPT	Read - Counter Plugged Total Hours	To get the plugged hours of the Total Counter. The JBC device responds with “A-CPT” and the Data Field will contain the requested information.
R-CPP	Read - Counter Plugged Partial Hours	To get the plugged hours of the Partial Counter. The JBC device responds with “A-CPP” and the Data Field will contain the requested information.
W-CPP	Write - Reset Counter Plugged Partial Hours	To resets the plugged hours of the Partial Counter. The JBC device responds with “A-CPP” and the Data Field contains “00000”.

Code	Description	Details
R-CFT	Read - Counter Feeding Total Hours	To get the feeding hours of the Total Counter. The JBC device responds with “A-CFT” and the Data Field will contain the requested information.
R-CFP	Read - Counter Feeding Partial Hours	To get the feeding hours of the Partial Counter. The JBC device responds with “A-CFP” and the Data Field will contain the requested information.
W-CFP	Write - Reset Counter Feeding Partial Hours	To command the tin feeding hours reset of the Partial Counter. The JBC device responds with “A-CFP” and the Data Field contains “00000”.
R-CTT	Read - Counter Tin Feeding Total Length	To get the tin feeding length of the Total Counter. The JBC device responds with “A-CTT” and the Data Field will contain the requested information expressed in meters.
R-CTP	Read - Counter Tin Feeding Partial Length	To get the tin feeding length of the Partial Counter. The JBC device responds with “A-CTP” and the Data Field will contain the requested information expressed in meters.
W-CTP	Write - Reset Counter Tin Feeding Partial	To command the tin feeding length reset of the Partial Counter. The JBC device responds with an “RCTP” and the Data Field contains “00000”.
W-SLD	Write Start Loading	Forces the JBC device to start tin feeding, ignoring any carrying error. This command is useful for manual tin loading. The Data Field contains “00001” to start loading or “00000” to end loading. The JBC device responds with an “A-SLD” and the Data Field contains the same value as the original command.

Code	Description	Details
W-NVS	Write Non-Volatile Setting	Forces the JBC device to write the present mode, speed, and length settings, made until now, in the non-volatile station memory. These values will then be used at the next start. The Data Field contains “00000”. The JBC device responds with “A-NVS” and the Data Field contains the same value as the original command.
W-SAD	Write - New Source Address	Forces the JBC device to write a new Source Address by filling the Data Field with a value between “00000” and “00099”. If the Data Field contains “00000”, the JBC device assumes that the protocol is changed to “with-no-address” mode.
W-RSP	Write - Reset Source Parameters (factory settings)	Forces the JBC device to restore the factory settings. The settings depend on every JBC device and model. In terms of protocol, common settings are: - Address Mode: activated - Source Address: from “00” to “99” - Solder Feeder Address: “10” - Physical layer: baud rate 19200-8-N-1 - The Data Field contains “00000” The JBC Device will be restarted automatically.
R-FDS	Read - feeding status	The tin feeding status will be responsed. The JBC device responds with “A-FDS” and the Data Field will contain “00001” if the device is feeding or “00000” if the device is idle.
R-SMN	Read station model name	The device model name will be responsed. The JBC device responds with “A-SMN” and the Data Field will contain the requested information.

Code	Description	Details
R-FDL	Read - fed length	The feed length will be responsed. For Continuous Mode: The Data Field will contain the tenths of millimeters fed since the last W-SFD command. For Discontinuous Mode: The Data Field will contain the current tenths of millimeters fed of the total length defined with the W-LEN command.

Examples Communication Frames for SF

Frame with addresses - Wire Lenght Command
Source: 00; Target :10; Command: W-LEN; SF Lenght Setting: 20 mm.

Codification	Start	Source Address	Target Address	Operation Header	Operation Code	Data	Stop	Check
ASCII	STX	00	10	W	LEN	00200	ETX	0x22
HEX	02	3030	3130	57	4C454E	3030323030	03	22

Sending code: 0230303130574C454E30303230300322

Frame without addresses - Wire Lenght Command
Command: W-LEN; SF Lenght Setting: 20 mm.

Codification	Start	Operation Header	Operation Code	Data	Stop	Check
ASCII	STX	W	LEN	00200	ETX	0x23
HEX	02	57	4C454E	3030323030	03	23

Sending code: 02574C454E30303230300323

Factory Settings

Communication configuration: 19200 - 8N1
With no addressing

Feeding Settings: Continuous Mode and speed 10mm/s
(changing to Discontinuous Mode: speed 10mm/s and lenght 20mm)

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.

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