

# **JBC**

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## **COMMUNICATION PROTOCOL**



### **SFR**

Solder Feeder for Robot

# SFR Communication Protocol

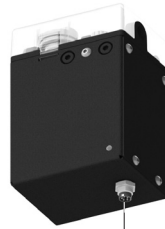
This communication protocol was developed to use JBC devices, such as the Solder Feeder (SFR), in automated soldering processes. It allows communication between the SFR and a robot (PC or PLC).

The protocol is divided into the following 3 layers:

- **PHL:** Physical Layer
- **DLL:** Data Link Layer
- **APL:** Application Layer (depends on device model)

## Physical Layer (PHL)

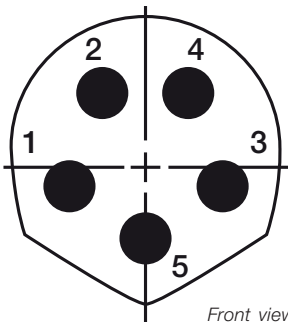
- SFR-A and SFR-B can be connected by a five-pin communications cable. (Ref. 0020261).
- Serial communication type is RS-232, configured as 19200 bps, eight (8) data bits, no (N) parity bit and one (1) stop bit (19200-8N1).
- The Communication Connector provides “switch” input and power supply.
- Power communication input requires 24Vdc, 1.5A, while the switch input can be pulled to 0V or 24V to activate the feeding process.
- See the following pin distribution:



Communications Connector SFR-A



Communications Connector SFR-B



Front view Solder Feeder Connector

Communications Connector		
Pin	Color	Description
1	Brown	Power Supply input: 24Vdc (±5%). 1,5A current required.
2	White	Serial input: RS232 RX
3	Blue	Common reference: GND for RS232, power supply and switch input
4	Black	Switch input: 0V or 24V to start feeding. Leave it open to stop
5	Grey	Serial output: RS232 TX

- Switch input is intended for no serial connection mode but relay or transistor digital output. Digital output from the PLC to the switch input can be PNP or NPN style, as well as a relay contact.

## Data Link Layer (DLL)

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

### Frame without address

Start	Operation Header*	Operation Code	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

### Frame with address (factory default)

Start	Source Address	Target Address	Operation Header*	Operation 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', '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 (Acknowledgement)	Response to Reading Comands	Used
	Response to Writing Comands	Is not used
N (Negative Acknowledgement)		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

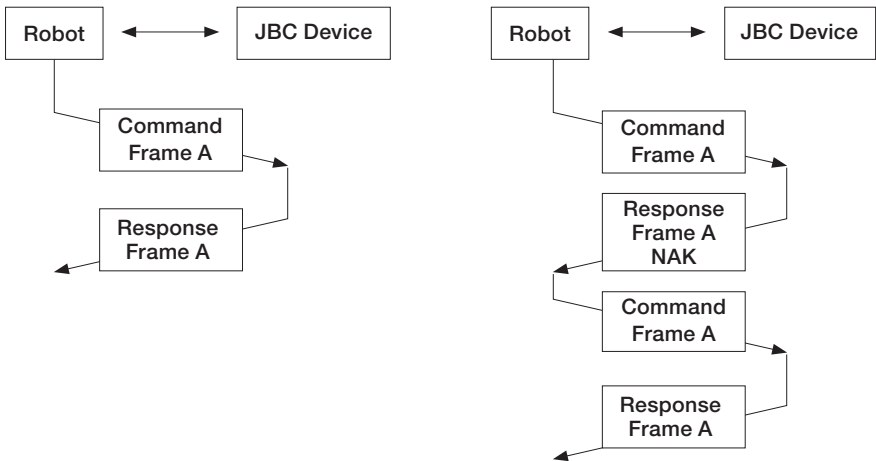
<b>Start</b>	Start of transmission. Corresponds to the character STX of ASCII code (0x02).
<b>Source Address</b>	The Source Address range is from "00" to "99". The factory setting for Robot Address is "00".
<b>Target Address</b>	The Target Address range is from "00" to "99". Factory settings for JBC devices are as follows: <ul style="list-style-type: none"> <li>· Soldering Stations Address is "01"</li> <li>· Solder Feeder Address is "10"</li> <li>· Fume Extractor Address is "20"</li> </ul>
<b>Operation Header</b>	Four Codes are allowed (see page 3).
<b>Operation Code</b>	Select the command which should be used (see table from page 7).
<b>Data</b>	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".
<b>Stop</b>	End of transmission. Corresponds to the ASCII code character ETX (0x03).
<b>Check</b>	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 an 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 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)

## Commands

(Operation Header + Operation Code)

Code	Description	Details
<b>W-MOD</b>	Write - Feeding Mode	<p>Two Feeding Modes are available: "Continuous" and "Discontinuous" Mode.</p> <p>The Data Field contains "00001" for Continuous Mode or "00002" for Discontinuous Mode.</p> <p>Continuous Mode means: The SFR starts to feed as soon as a Start Feeding Command (SFD) is received and stops when a Stop Feeding Command (SSD) is received.</p> <p>Discontinuous Mode means: The SFR feeds a finite amount of tin when it receives a Start Feeding Command (SFD).</p> <p>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.</p> <p>Factory settings: The JBC device is set with Continuous Mode.</p>
<b>R-MOD</b>	Read - Feeding Mode	<p>The current Feeding Mode will be responded.</p> <p>The JBC device responds with an "A-MOD" and the Data Field contains "00001" for Continuous Mode or "00002" for Discontinuous Mode</p>
<b>W-SFD</b>	Write - Start Feeding	<p>The JBC device starts tin feeding.</p> <p>The Data Field contains "00001" if the direction of feeding is forward or "00000" if the direction is backward.</p> <p>For Continuous Mode: The feeding process will last until a Stop Feeding Signal (SSD) is sent to the JBC device.</p> <p>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).</p> <p>The JBC device responds with an "A-SFD" and the Data Field contains the same value as the command.</p>

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

Code	Description	Details
<b>W-THI</b>	Write - Wire Thickness	<p>Sets the wire thickness.</p> <p>Data field values are: 0 - Diameter &lt;= 0.8mm  1 - Diameter &gt; 0.8 and &lt;= 1.2mm  2 - Diameter &gt; 1.2mm</p> <p>The equipment answers with an "ATHI" as the control field and the data field contains the same value as the original command</p>
<b>R-THI</b>	Read - Wire Thickness	<p>Returns the current wire thickness.</p> <p>The equipment answers with and "ATHI" and the data fields contains the thickness, as defined in WTHI. Example, "00002" means more than 1.2mm of diameter.</p>
<b>W-TES</b>	Write - Tool Enable Status	<p>Enables or disables the switch input port.</p> <p>The Data Field contains "00001" to enable or "00000" to disable the input port.</p> <p>The JBC device responds with "A-TES".</p> <p>Factory default: The switch input signal is set to enabled "00001".</p>
<b>R-TES</b>	Read - Tool Enable Status	<p>To get the switch input status.</p> <p>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.</p>
<b>R-ECV</b>	Read - Error Code Value	<p>To get the Error Code.</p> <p>The JBC device responds with "A-ECV" and Data Field contains the last Error Code.</p>
<b>W-ECV</b>	Write - Reset Error Code Value	<p>Resets the last Error Code.</p> <p>The JBC device responds with "A-ECV" and the Data Field contains "00001".</p>



<b>Code</b>	<b>Description</b>	<b>Details</b>
<b>R-CPT</b>	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.
<b>R-CPP</b>	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.
<b>W-CPP</b>	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".
<b>R-CFT</b>	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.
<b>R-CFP</b>	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.
<b>W-CFP</b>	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".
<b>R-CTT</b>	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.

Code	Description	Details
<b>R-CTP</b>	Read - Counter Tin Feeding Partial Length	<p>To get the tin feeding length of the Partial Counter.</p> <p>The JBC device responds with “A-CTP” and the Data Field will contain the requested information expressed in meters.</p>
<b>W-CTP</b>	Write - Reset Counter Tin Feeding Partial	<p>To command the tin feeding length reset of the Partial Counter.</p> <p>The JBC device responds with an “RCTP” and the Data Field contains “00000”.</p>
<b>W-SLD</b>	Write Start Loading	<p>Forces the JBC device to start tin feeding, ignoring any carrying error. This command is useful for manual tin loading.</p> <p>The Data Field contains “00001” to start loading or “00000” to end loading.</p> <p>The JBC device responds with an “A-SLD” and the Data Field contains the same value as the original command.</p>
<b>W-NVS</b>	Write Non-Volatile Setting	<p>Forces the JBC device to write the present mode, speed, and length settings, made until now, in the non-volatile station memory.</p> <p>These values will then be used at the next start. The Data Field contains “00000”.</p> <p>The JBC device responds with “A-NVS” and the Data Field contains the same value as the original command.</p>
<b>W-SAD</b>	Write - New Source Address	<p>Forces the JBC device to write a new Source Address by filling the Data Field with a value between “00000” and “00099”.</p> <p>If the Data Field contains “00000”, the JBC device assumes that the protocol is changed to “with-no-address” mode.</p>

Code	Description	Details
<b>W-RSP</b>	Write - Reset Source Parameters (factory settings)	<p>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:</p> <ul style="list-style-type: none"> <li>- Address Mode: activated</li> <li>- Source Address: from "00" to "99"</li> <li>- Solder Feeder Address: "10"</li> <li>- Physical layer: baud rate 19200-8-N-1</li> <li>- The Data Field contains "00000"</li> </ul> <p>The JBC Device will be restarted automatically.</p>
<b>R-FDS</b>	Read - Feeding Status	<p>The tin feeding status will be responded.</p> <p>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.</p>
<b>R-SMN</b>	Read Station Model Name	<p>The device model name will be responded.</p> <p>The JBC device responds with "A-SMN" and the Data Field will contain the requested information.</p>
<b>R-FDL</b>	Read - fed length	<p>The feed length will be responded.</p> <p>For Continuous Mode: The Data Field will contain the tenths of millimeters fed since the last W-SFD command.</p> <p>For Discontinuous Mode: The Data Field will contain the current tenths of millimeters fed of the total length defined with the W-LEN command.</p>

## Factory Settings

Communication configuration: 19200 - 8N1

With Addresses: Target Address: 10

Source Address: 00

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

Wire Thickness: Default 0 for diameter  $\leq$  0.8mm

## Examples Communication Frames for SFR

**Frame with addresses** - Wire Length Command

Source: 00; Target :10; Command: W-LEN; SFR Length 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 Length Command

Command: W-LEN; SFR Length 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







**JBC**

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