

Instras Motor Interface Module (MiM)

PC Communication Protocol Description

Purpose of this document

Purpose of this document is to describe the Instras MiM device firmware communication.

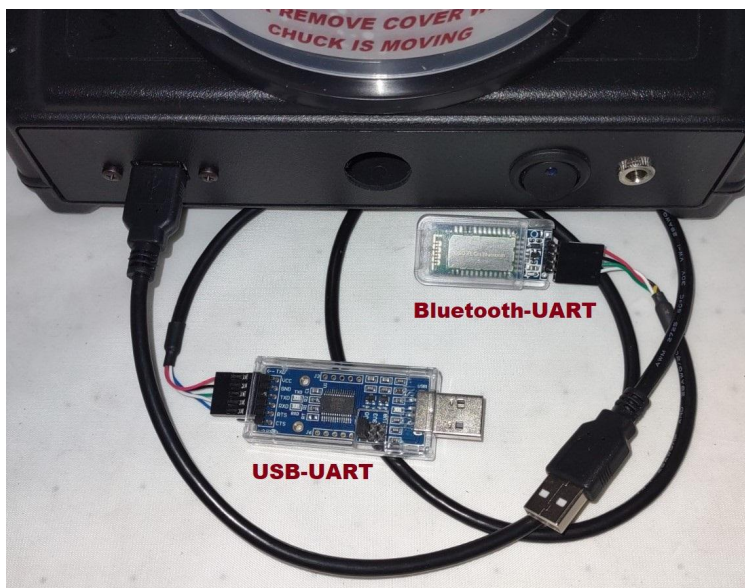
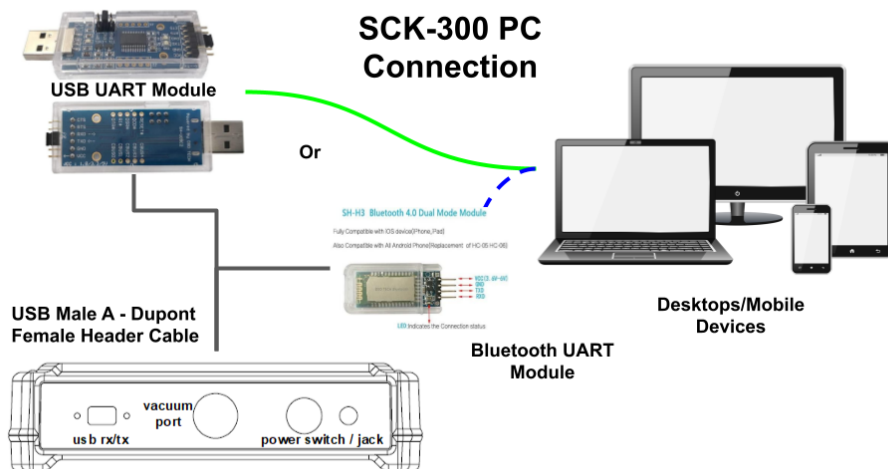
Device description and working principles

The Motor Interface Module (MiM) used in the SCK-300/SCK-300P/SCK-300S (versions 2) spin coater units can be connected to any device that supports either a USB-COM (UART) protocol converter or has the COM/RS232 interface. The device supports 3.3V logic level signals, thus it can not be connected directly to a regular RS232 communication port. To use it with a regular RS232 port, a voltage level converter must be used. The pins for connecting the data cable are shown in the following image.

Beware – TX shows the pin through which it TRANSMITS the data, and RX – RECEIVES. In most of the cases it is necessary to connect the TX of one device with the RX of the other and vice versa.

Instras MiM supports UART communication with 19200 baud rate, 8 data bits, 1 stop bit, RTS/CTS flow control and no parity bits. All commands and responses sent to or from the MiM are in text (ASCII) format. Every command and response ends with a new line (10 in ASCII table) and carriage return (13 in ASCII table) symbols.

The MiM device can receive commands from and send responses to any external device with the appropriate UART adapter and control software. This allows setting and getting the current RPM of the spin coater motor, as well as controlling the stepper motor based SCK-300S.



Commands to Connect and Control SCK-300[P] (*version 2*) Spin Coater units.

1. Send Commands to Initialize the SCK-300 unit. These must be sent every time the SCK is powered on since they are not stored on MiM board.
 - 1.1. Send command to set the Start PWM: **“SetStartPWM,0”**. This is used to make sure the motor spins if the speed is set at rpms below 1000 rpms initially.
 - 1.2. Send command to set the motor profile slope: **“SetSlope,960”**. This is the slope from the motor profile x100 to turn it into an integer. For the SCK-300 use a value of 740 instead.
 - 1.3. Send command to set the motor profile intercept: **“SetIntercept,500”**. This is the intercept from the motor profile. For the SCK-300 use a value of 200 instead.
 - 1.4. Lastly, send command to turn on the spin coater motor: **“BLDCon”**
2. Send commands to set the desired speed in RPMs and measure the actual RPM value
 - 2.1. Send command to set speed to 1500 rpms: **“SetRPM,1500”**. The speed can be changed while the motor is already spinning.
 - 2.2. Send command to get current speed: **“GetRPM”**. This command is usually ran in a loop to continuously monitor speed.
 - 2.3. Send command to stop the motor: **“SetRPM,0”**.
3. Send command to turn off motor: **“BLDCoff”**

Commands to Connect and Control SCK-300S (*version 2*) Spin Coater units.

1. Send Commands to Initialize the SCK-300S unit.
 - 1.1. Send command to turn on the Stepper Driver: **“STEPon”**.
 - 1.2. Send command to place the stepper motor in sleep mode: **“SleepOn”**. This prevents power being sent to the stepper motor until it's ready to spin.
2. Send commands to set the desired speed in RPMs
 - 2.1. Implement a function to convert the desired RPM to frequency value to send to the MiM board ([see sample code](#)).
 - 2.2. Send command to get the motor out of sleep mode: **“SleepOff”**. This sends power to the stepper motor.
 - 2.3. Send command to set the desired frequency (i.e rpm speed): **“SetFreq,nnnn”**. The speed can be changed while the motor is already spinning.
 - 2.4. Send command to spin the motor in clockwise direction: **“MoveUp,10000000”**. This will start the stepper motor spinning. You should note that unlike the regular SCK-300 motor, stepper motors can't be arbitrarily set to spin at any speed. The speed needs to be slowly increased, otherwise the motor might not spin at all.
 - 2.5. Send command to get the current frequency: **“GetFreq”**. This command is used

in conjunction with a function to convert the frequency to RPM usually and ran in a loop to continuously monitor speed.

- 2.6. Send command to stop the motor: **“SleepOn”**.
3. Send command to turn off stepper driver: **“STEPoff”**

A full list of supported commands can be found at the GitHub Gist below.

<https://gist.github.com/ns96/ef95fd06573a871adfa1c4bed21eef43>

Connecting SCK-300 Using TTL-USB Adapter

Using the [DSD TECH SH-U09C2 USB to TTL Adapter](#), or similar, the connectivity is as above. Set the TTL level to 5V and use a [USB Male to Female Dupont Header Cable](#) to connect to the USB port of the SCK-300 unit. The [Termite](#) program can be used for testing purposes.

Connecting SCK-300 Using TTL Bluetooth Adapter Module

It is also possible to use a [TTL Bluetooth Adapter](#) to make wireless connections from bluetooth enabled devices (phones, tablets, laptops etc). The [correct baud rate](#) of this device first needs to be set to 19,200 before it can be used. A [USB Male to Female Dupont Header Cable](#) to connect to the USB port of the SCK-300 unit is also needed.

Sample Java Code

Sample Java code and additional details for communicating with the MiM/SCK-300 units can be found at the GitHub link below.

<https://github.com/ns96/SCKTalk>