# 01<sup>™</sup> SuperModified – Testing with RS485 <> USB

## 1. Preinstalled cables

The Supermodified controller comes with several wires soldered. By default the power and RS485 cables are soldered. I2C and legacy RC servo interface cables can also be soldered upon request. These are represented in the schematic below. Please note that the pre-soldered cables always have the illustrated colors.



01<sup>™</sup> SuperModified

Miniature Controller for DC Motors

"The robotic rebirth of the hobby servo"



VCC SCK GND TISO IFA ISO IFC GND GND

RS485-A / UART Tx RS485-B / UART Rx

> Testing with RS485<>USB

- 2. Prerequisites Windows XP or later.
  - FTDI VCP driver installed. This is the driver for the USB<>485 converter and it can be downloaded at: <u>http://www.ftdichip.com/Drivers/VCP.htm</u>
  - Supermodified Commander installed. This is the stand alone application that communicates to the controllers. It can be downloaded at: <a href="http://01mechatronics.com/sites/default/files/docs/Setup%20SMS%20v1.9.64-5000.zip">http://01mechatronics.com/sites/default/files/docs/Setup%20SMS%20v1.9.64-5000.zip</a>
- **3. Connections** In total 4 connections from the Supermodified are needed for operation via RS485 and 5 connections for operation via UART.
- 3.1. RS485 The connections needed for RS485 operation are illustrated below:



#### 3.2. UART

The connections needed for UART operation are illustrated below:

**Important Note:** Because UART signals are referenced to ground it is necessary that there is a common ground between the RS485<>USB and the  $01^{TM}$  Supermodified controller. This can also be done by connecting the power ground to the USB<>RS485 converter.



#### 4. Testing with Supermodified Commander

After installing the drivers and making the necessary connections and before launching the 01<sup>TM</sup> Supermodified commander, it is recommended to check at which COM port the USB<>485 converter resides. This can be seen at Control Panel -> Device Manager in any version of windows.



In this example the serial port is COM1.

Supermodified Commander v1.9.64-4000 COM Port Settings START SET PID GAIN P COM1 - 57600 - CONNECT HALT SET PID GAIN I SET PID GAIN D STO SET ANTI WIND UP default 57600 GET PID GAIN P SET PROFILE ACCELERATION SET PROFILE CONSTANT VELOCITY Motor Selection GET PID GAIN I SET CURRENT LIMIT GET PID GAIN D SCAN BUS FOR MOTORS SET DURATION FOR CURRENT LIMIT GET ANTI WIND U MOVE WITH VELOCITY Host Id 01 Motor Id selection GET PROFILE ACCELERATION MOVE TO ABSOLUTE POSITION GET PROFILE CONSTANT VELOCITY MOVE TO RELATIVE POSITION Manual Hex Commands GET CURRENT LIMIT PROFILED MOVE WITH VELOCITY PROFILED MOVE TO ABSOLUTE POSITION / Up to repeat commands GET CURRENT LIMIT DURATION PROFILED MOVE TO RELATIVE POSITION GET DIGITAL IO CONFIGURATION SET VELOCITY SETPOINT GET LOCAL ACCEPTANCE MASK er response grabbed SET ABSOLUTE POSITION SETPOINT GET DIGITAL INPUTS SET RELATIVE POSITION SETPOINT GET ANALOG INPUTS SET PROFILED VELOCITY SETPOINT GET POSITION SET PROFILED ABSOLUTE POSITION SETPOINT SET PROFILED RELATIVE POSITION SETPOINT GET ABSOLUTE POSITION CONFIGURE DIGITAL IOS Broadcast Commands GET VELOCITY SET DIGITAL OUTPUTS BROADCAST DO MOVE GET CURRENT SET NODE ID BROADCAST GLOBAL STAR RESET ERRORS SET LOCAL ACCEPTANCE MASK BROADCAST GLOBAL HALT GET ERROR REACTION SET BAUD RATE UART BROADCAST GLOBAL STOP RESET INCREMENTAL POSITION SET ERROR REACTION

Now it is time to launch the  $01^{TM}$  Supermodified Commander. Upon launch this is what you should see:

• The first thing to do is select the COM port that the USB<>485 converter is connected to. Just select the appropriate COM port from the combo box:

COM1	▼ 57600 ▼	CONNECT
COM1 COM2 COM3		default 57600
COM4 COM5 COM6	ction	
COM7 COM8 COM9 COM10 COM11	CAN BUS FO	R MOTORS
	Motor Id	selection
COM12 COM13	x Command	is
COM13 COM14 COM15 COM16	repeat command	s)
COM17 COM18	response grabbe	d

• Next hit the connect button. This is what you should see:

COM Port Settings	
Connection: COM1 at 57600 default: 57600	
Motor Selection	
SCAN BUS FOR MOTORS	
	GI
Host Id UI Motor Id selection	GET PR
	GET PROF
Manual Hex Commands	GE
(Down / Up to repeat commands)	GET CUR
	GET DIGI
Last controller response grabbed	GET LOC
	GE
	GE
	GET A
Broadcast Commands	
BROADCAST DO MOVE	
BROADCAST GLOBAL START	I
BROADCAST GLOBAL HALT	GET
	RESET IN

 After successful connection to the COM port scan the bus for 01<sup>™</sup> Supermodified controllers. Just hit the SCAN BUS FOR MOTORS button. The progress bar for bus querying appears.

System Scanner		
	29%	-

After the bus scan is complete the Motor Id selection combo box must contain the only node found on the bus, ie ID #4, which is the default setting for any new  $01^{TM}$  Supermodified controller.

COM Port Settings	START	SET PID GAIN P
COM1 - 57600 - DISCONNECT	HALT	SET PID GAIN I
Constanting:	STOP	SET PID GAIN D
COM1 at 57600 default: 57600		SET ANTI WIND UP
	GET PID GAIN P	SET PROFILE ACCELERATION
Motor Selection	GET PID GAIN I	SET PROFILE CONSTANT VELOCITY
SCAN BUS FOR MOTORS	GET PID GAIN D	SET DURATION FOR CURRENT LIMIT
	GET ANTI WIND UP	MOVE WITH VELOCITY
Host Id 01 Motor Id selection 04	GET PROFILE ACCELERATION	MOVE TO ABSOLUTE POSITION
U4I	GET PROFILE CONSTANT VELOCITY	MOVE TO RELATIVE POSITION
Manual Hex Commands	GET CURRENT LIMIT	PROFILED MOVE WITH VELOCITY
(Down / Up to repeat commands)	GET CURRENT LIMIT DURATION	PROFILED MOVE TO ABSOLUTE POSITION
	GET DIGITAL IO CONFIGURATION	PROFILED MOVE TO RELATIVE POSITION
Last controller response grabbed	GET LOCAL ACCEPTANCE MASK	SET VELOCITY SETPOINT
	GET DIGITAL INPUTS	SET ABSOLUTE POSITION SETPOINT
	GET ANALOG INPUTS	SET RELATIVE POSITION SETPOINT
	GET POSITION	SET PROFILED ABSOLUTE POSITION SETPOINT
	GET ABSOLUTE POSITION	SET PROFILED RELATIVE POSITION SETPOINT
Broadcast Commands	GET VELOCITY	CONFIGURE DIGITAL IOS
BROADCAST DO MOVE	GET CURRENT	SET DIGITAL OUTPUTS
BROADCAST GLOBAL START	RESET ERRORS	SET NODE ID
		SET LOCAL ACCEPTANCE MASK
BROADCAST GLOBAL HALT	GET ERROR REACTION	SET BAUD RATE UART
onnecting to port COM1 with speed 57600 onnecting to port COM1 with speed 57600 success		

Now it is time to try out some of the available commands. Before that, go ahead
and check that the controller is currently not applying any force on the motor. Try to
move the shaft of the motor and notice that it rotates freely. Now press the START
button and notice at the bottom of the screen:



This is the console window and it has many useful information about communication warnings or errors etc. Now check the motor shaft again. You will notice that the controller is holding the shaft in position.

• Go ahead and test another command. For example an absolute position move. Just hit the MOVE TO ABSOLUTE POSITION text. An input window appears:

# 01<sup>™</sup> SuperModified

📲 Data Comm	ander 📃	X
	MOVE TO ABSOLUTE POSITION	
· · · ·	[	
	[-9223372036854775808, 9223372036854775807]	

The base unit for the 01<sup>™</sup> Supermodified controller is the encoder tick. The MagEnc utilizes an absolute encoder that has 32768 ticks per revolution. So in order to instruct the controller to do a full turn you can enter 32768 and hit enter. The motor performs a full turn.

• All commands utilize the encoder tick as a base unit. Thus velocities are in ticks/sec and accelerations in ticks/sec<sup>2</sup>. You can now try any other command.

5. Warnings and errors

Try the STOP command and after that try any MOVE command. The motor does not move at all and at the console this message appears:

		_
if is error count command = 1		ь.
byte count = 1 (01)		
byte count data 0 is 20 (14)		
ERROR RESPOND RESULT (with the following different error codes and names)		
20 (int) - 14 (hex):		
"INVALID COMMAND FOR MOTOR STATE"		
CRC = 239 (EF)		
slave command responded with success without a single retry !!!		
		h
		1
1		
	P	

The Supermodified has responded with an error code. You can see what exactly this means in the error code reference section of the Supermodified datasheet:

0x14	Invalid command for motor state	DO NOTHING	<u>Description</u> : The received command is invalid for the given motor state. ie the $01^{\text{TM}}$ SuperModified controller is instructed to move the motor with a specific velocity prior to receiving a Start command (initialization and PID activation). The command is not executed. An error response is
	motor state		a specific velocity prior to receiving a Start command (initialization and PID activation). The command is not executed. An error response is issued immediately.
			commands.

If you try to execute any command after that it will fail with the same error code. This is because the Supermodified controller needs to be explicitly instructed to erase the error. There are many good reasons for this and some of them are related to safety.

So if you want to continue using the controller you must issue a RESET ERRORS command.

There are many more things you can do with the Supermodified commander, the most important being calibrating PID and adjusting configuration settings etc. These are covered in the Supermodified Configuration Guide.

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