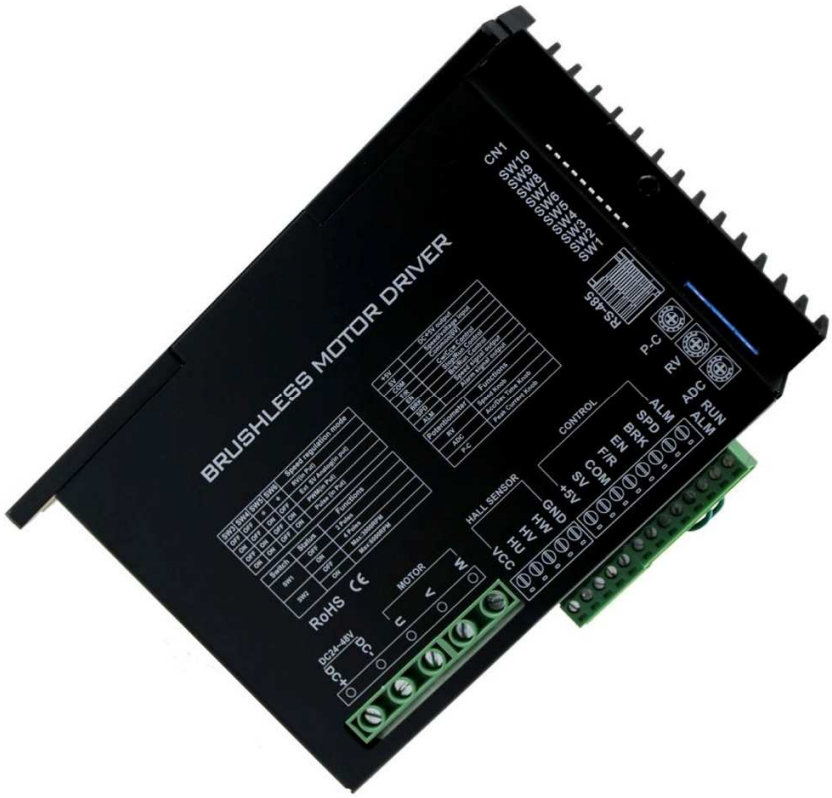
BLDC Motor Driver

24-48V DC, 750W with RTU Modbus

RMCS – 6611



Operating Manual v1.0

Contents

Introduction – Salient Features

Rhino Motion Controls RMCS-6611 with RTU Modbus is a high performance BLDC servo drive (20-48 VDC 750 W) designed for optimized operation of any BLDC Servo motors with hall sensor feedback.

- ARM based high speed controller design
- Alarm output on error
- High power 750W 24-48V Brushless DC Motor Drive
- Can be controlled by PLC, PC Software, Microcontroller, SBC or any other device which can communicate with RTU Modbus.
- Its also possible to operate without any controller using Onboard or external potentiometer, PWM, Pulse etc.
- In Analog Speed Control mode Current, Speed and Acceleration can be set by using 3 potentiometers available on drive. Current setting range is 4A - 30A.
- In Analog Speed Control mode direction can be changed by connecting F/R pin to COM pin of drive.
- Over current, over voltage, under voltage protection.
- In this drive torque output and speed is stable at high speed.
- Up to 15 slaves is available through switch setting, upto 15 motors can be controlled using a single modbus line.
- When the power is turned on, the drive can start running motor automatically if enable is connected.


BRUSHLESS MOTOR DRIVER
CN1
SW10
SW9
SW8
SW7
SW6
SW5
SW4
SW3
SW2
SW1
RS485
RoHS
DC24~48V
DC+
DC-
MOTOR
U
V
W
HALL SENSOR
VCC
HU
HV
HW
GND
CONTROL
+5V
SV
COM
F/R
EN
BRK
SPD
ALM
P-C
RV
ADC
RUN
ALM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DC-
DC+

Technical specifications and Pin description

Parameters	Minimum value	Typical value	Maximum	Unit
Voltage	20	36	60	V
Current	4	30	60	A
Logic input current	10	20	50	mA
Hall power supply	-	5	-	VDC
Speed control	150	3000	5 00 00	Rpm

Digital control signal port :

Name	Description
DC+/DC-	DC voltage input (DC24V~DC48V)
U, V, W	Motor phase line
Hu, Hv, Hw	Hall signal line
VCC	Hall Power Supply + (5VDC)
GND	Hall Power Supply - (GND)
+5V	External potentiometer power supply
SV	External speed regulation. Dangling when using internal speed control.
COM	Public port (low level)
F/R	Direction, floating or high level is forward rotation, low level reversal
EN	The high level control signal enables the end stop, the low -level operation
BRK	Brake, low level for normal operation, high level shutdown
SPEED	Speed signal output
ALARM	Alarm signal output

Switch Settings:

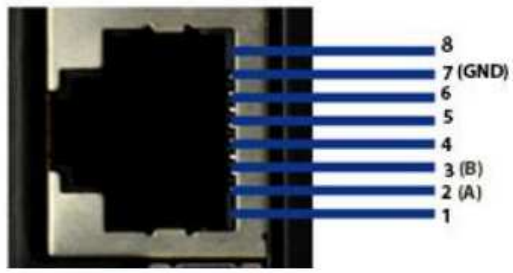
Switch	Status	Function
SW1	OFF	2 Pole Motor
SW1	ON	4 Pole Motor
SW2	OFF	Max Speed : 3000 RPM
SW2	ON	Max Speed : 5000 RPM

SW3	SW4	SW5	SW6	Speed Mode
OFF	OFF	*	*	RV - Onboard Potentiometer Input
ON	OFF	ON	OFF	External Potentiometer Input
OFF	ON	OFF	ON	PWM (INPUT)
ON	ON	OFF	ON	PULSE (INPUT)

SW10	SW9	SW8	SW7	Slave ID
OFF	OFF	OFF	ON	1
OFF	OFF	ON	OFF	2
OFF	OFF	ON	ON	3
OFF	ON	OFF	OFF	4
OFF	ON	OFF	ON	5
OFF	ON	ON	OFF	6
OFF	ON	ON	ON	7
ON	OFF	OFF	OFF	8
ON	OFF	OFF	ON	9
ON	OFF	ON	OFF	10
ON	OFF	ON	ON	11
ON	ON	OFF	OFF	12
ON	ON	OFF	ON	13
ON	ON	ON	OFF	14
ON	ON	ON	ON	15

Connection to PC and other Modbus devices

There is an eight pin RJ45 port on side of drive which can be used to connect to Modbus lines. Pin outs as below



An USB to 485 or Serial to 485 converter is required to connect to computer.

Modbus is connected with 9600bps baudrate, 8 bits, no parity and 1 stop byte (9600,8,N,1) in RTU protocol.

Modbus Registers

Register	Function	Data (Decimal)	Details
182	Enable RS-485 Control	1	Runs motor according to Modbus commands
	Disable RS-485 Control	2 (Default on startup)	Runs motor according to SW3,SW4,SW5,SW6 and other inputs on drive
102	Control motor motion		
	Stop/Disable Motor	0	Enable motor in CW
	Enable motor in forward direction	1	Enable motor in analog Control mode
	Enable motor in reverse direction	2	Disable motor in analog Control mode
	Brake Motor	3	Disable motor in CW
86	Set Motor Speed*	0 to 6000 (0 Default on startup)	Set Motor Speed in RPM
95	Speed Feedback*	0 to 6000 (Read Only)	Actual motor speed in RPM
198	Current Feedback*	0 to 600 (Read Only)	Actual Current in A * 10 If reading is 105 current is 10.5A
200	Voltage Feedback*	0 to 600 (Read Only)	Actual Voltage in V * 10 If reading is 245 voltage is 24.5V

*** Real time feedback data is available on modbus even in non-modbus control modes when motor is controlled through analog voltage, potentiometer, pwm or pulse.**

Operation

By default drive start in non-Modbus control mode. The motor runs according to SW3, SW4, SW5, SW6 and inputs given to drive. It can also be controlled through PC, PLC, Microcontrollers like arduino or Single board computers like Raspberry Pi.

To control drive through PC a full featured software is available, also any other software - ready or custom made which can communicate on Modbus RTUcan be used to control these drives. A USB to RS-485 converter is required which will generate a virtual COM port on PC.

- PC with GUI software for Rhino 6611 drive or any generic Modbus RTU software (Like Modbus Poll)
  - GUI software http://robokits.co.in/downloads/Rhino%20BLDC%206611%20Setup.exe
  - Modbus Poll demo version - https://www.modbustools.com/download.html

Software Installation

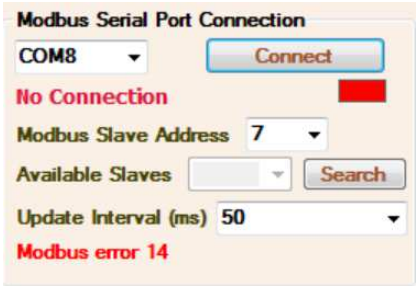
Software is available here. http://robokits.co.in/downloads/Rhino%20BLDC%206611%20Setup.exe

Download and run setup in a Windows based PC. There are no options to configure for installation.

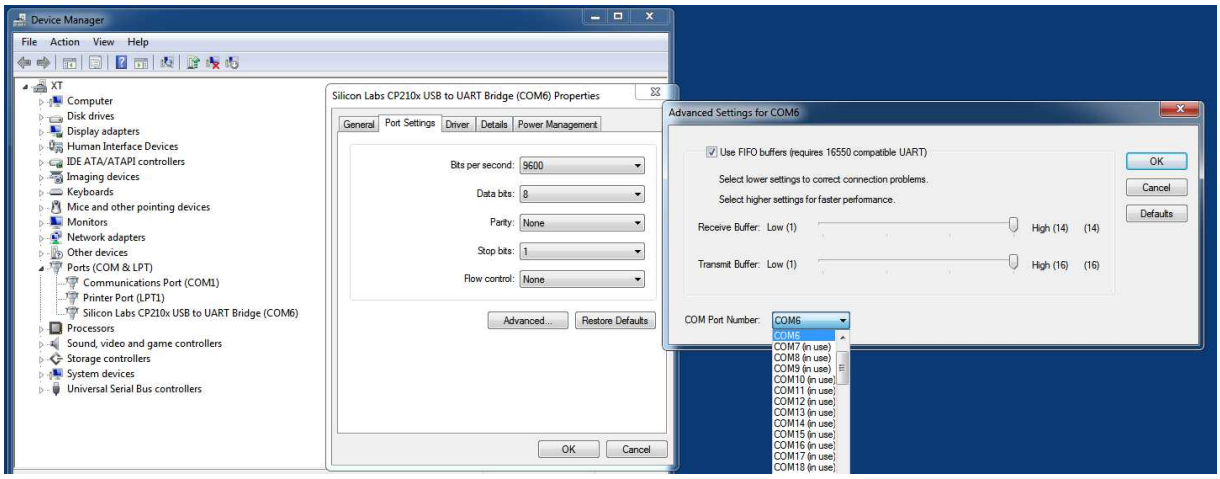
DRIVE QUICKSTART & TEST WITH PC SOFTWARE

COM port Selection

Select COM Port for USB-UART , then click on "Connect" button.

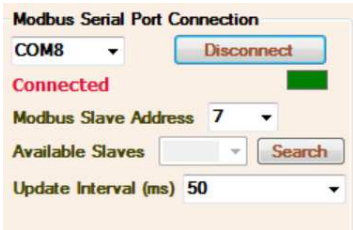


You may look in 'Devices and Printers' or 'Device Manager' for specific serial port of your device. The software supports serial ports up to COM32 only. If your device's port number is higher you can change it in - Device Manager > Ports (COM & LPT) > Double click on device name > Port Settings > Advanced > COM Port number



Once your drive is connected to COM Port and it shows "Connected" message.

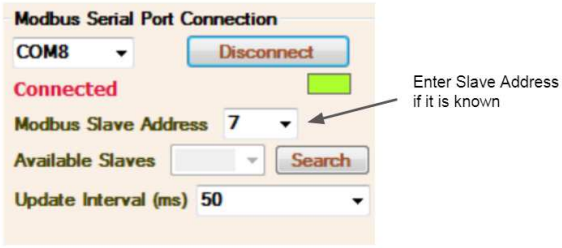
When the drive communicates with software You can see a blinking Green indication.



Selection Of Modbus Slave Address

There are two ways to select Modbus Slave address.

1. If Slave address is already known, it can be directly selected from drop box.



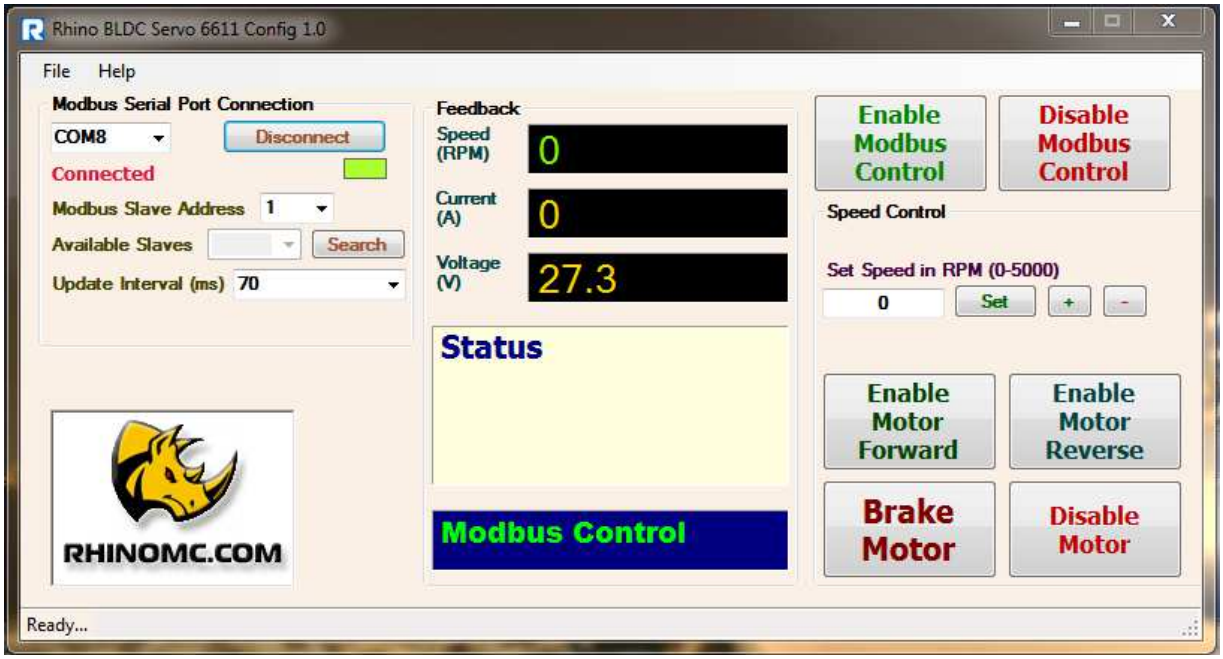
2. If slave address is not known or multiple drives with multiple addresses are connected on serial bus, click search button. This will search for all slave ids from 1 to 15. If any response is received from slave id it will give indication in status bar and list the drive in 'Available Slaves' drop down box.

To search slave address click on "Search". Once all the connected devices are found click on "Stop Search". Select any of detected slave address in Modbus Slave Address drop down box and drive will start communicating to software.

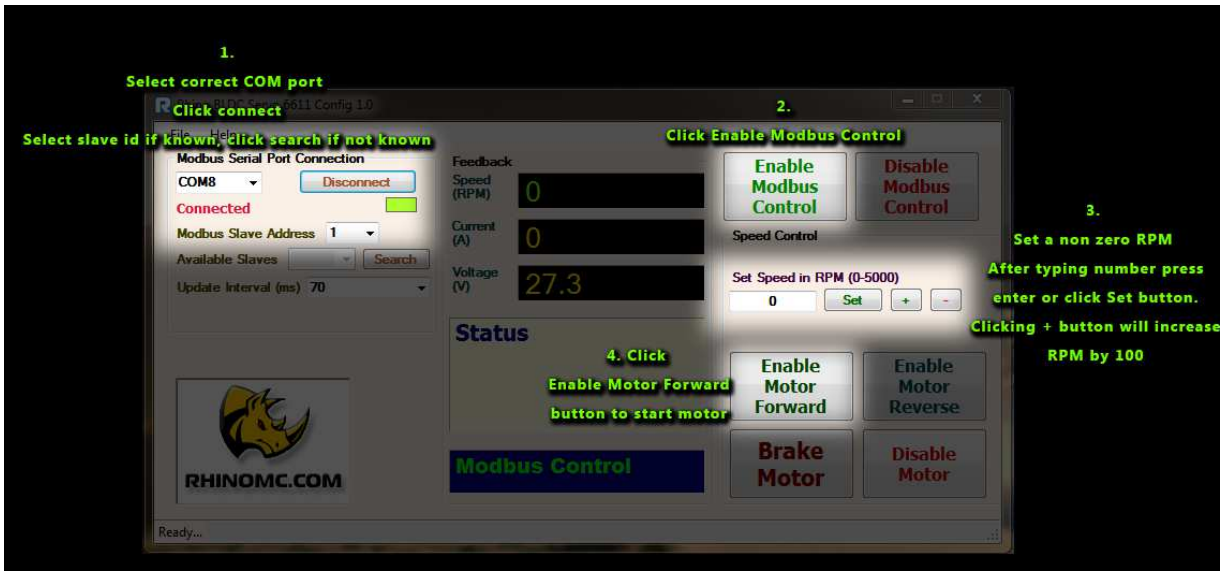
Make sure that there are no multiple drives with same slave address are connected on serial bus.

Drive operation using GUI software

On successful connection to drive the software will look like this.



To start motor running follow steps as below.

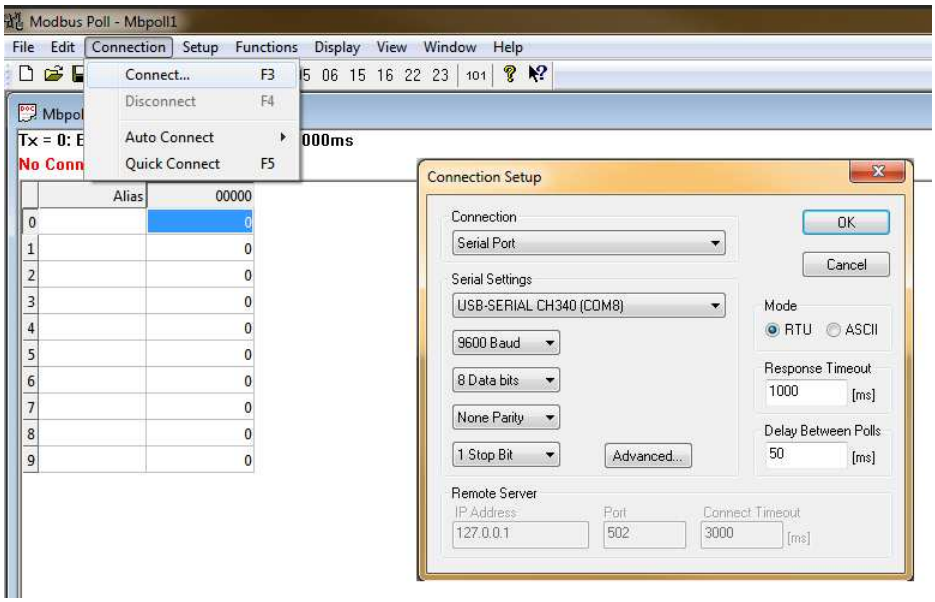


- Feedback section will show actual real time speed, current and voltage.
- It will also show motor status and whether motor is controlled by modbus or not.
- Speed can be typed into the text box, pressing enter or clicking set button will change speed.
- Clicking + button will increase speed by 100 RPM, clicking - will decrease by 100 RPM
- Pressing Enable Motor Reverse button will change the direction.
- Clicking Disable Motor button will stop motor with decceleration.
- Clicking Brake Motor button will stop motor immediately.

Drive operation using other generic modbus software

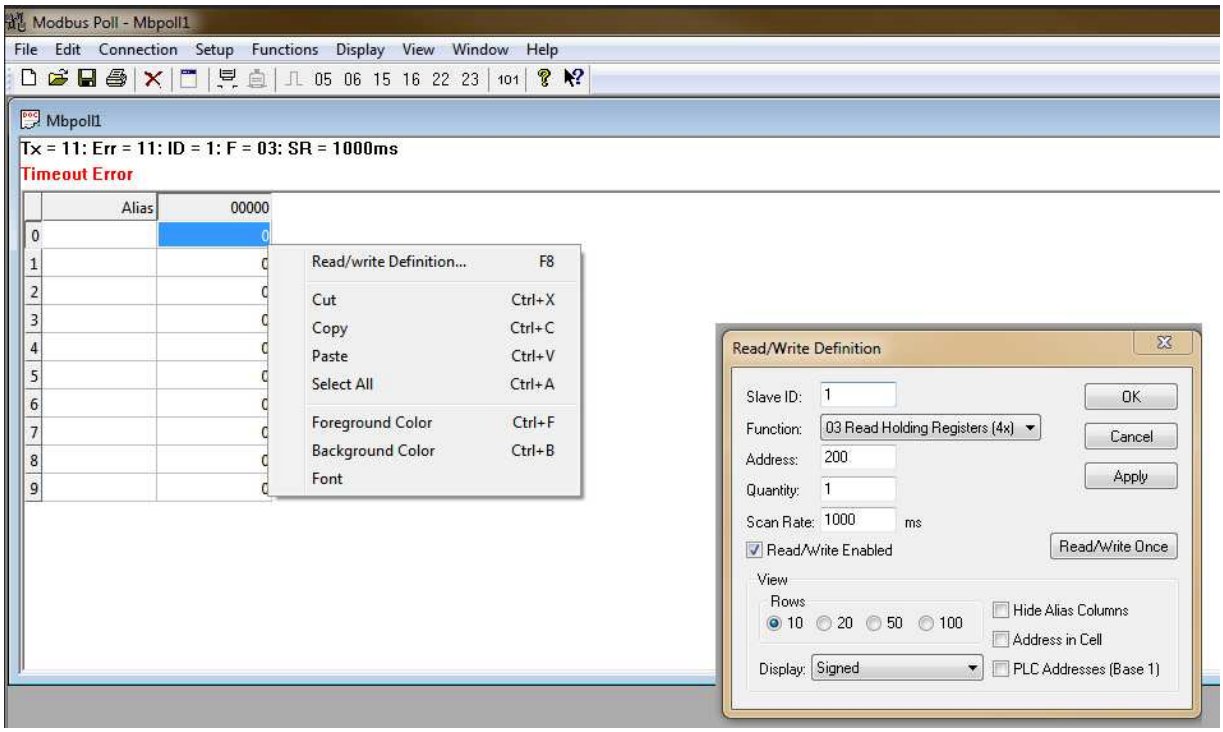
Any software communicating on RTU modbus protocol can work with this drive. For example Modbus Poll is a free to try demo software which can be used to test functionality of drive.

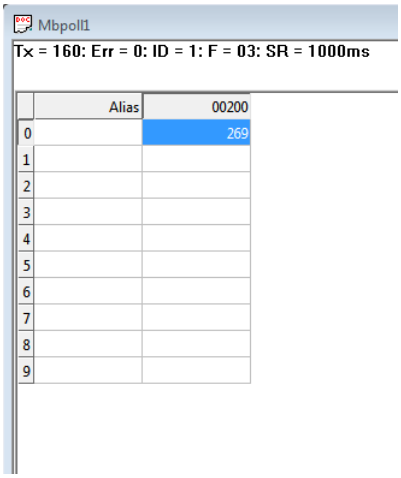
Connect to COM port with 485 converter connected at 9600, 8, N, 1 with RTU protocol



After connecting right click on cell and go to Read/write Definition...

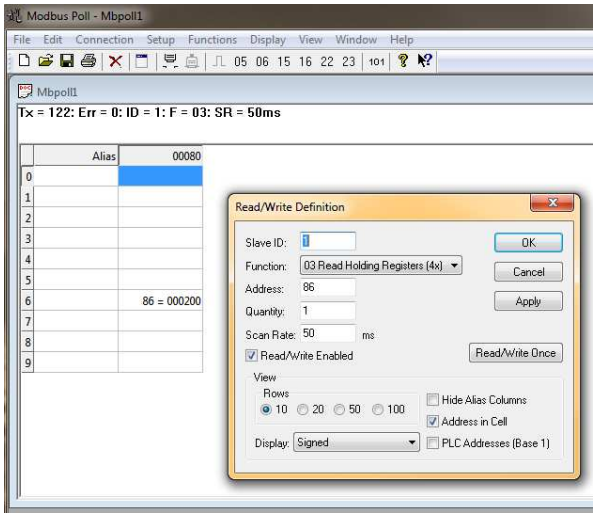
Select your drive's slave id, function 03 and address according to table above. In this example selecting address 200 will show voltage.



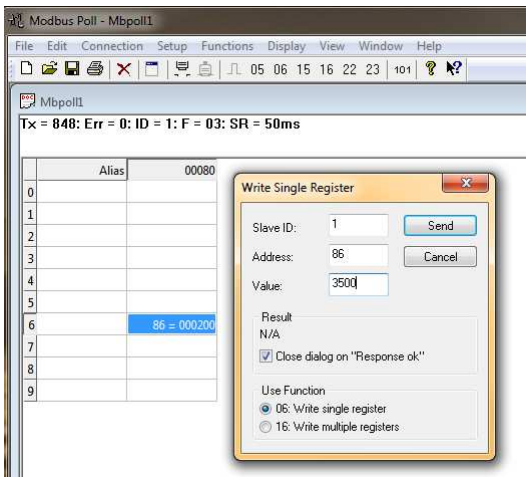


Dividing this value by 10 will give voltage in volts. In this case its 26.9V.

To write value to register first read a writable register. In this case its address 86 for set speed.



Double clicking on value will open write dialog. Enter any value from 0 to 6000 to set speed and click send.



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