3el 8x32, 5x64 Analog Multiplexer

Programming Manual

Features:

- Communication over Ethernet
- TCP/UDP server
- Configurable IP address
- Human readable commands and messages
- Grouped output control
- Contacts self-test mode
- Macro configurator software
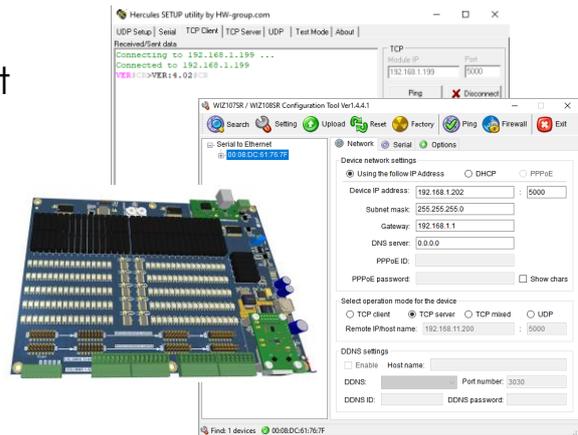
Preparing the software tools   :

The Ethernet connection is implemented using a WIZnet W7100A module. The related datasheets can be downloaded from the following links:

https://www.WIZnet.io/product-item/w7100a/
https://www.WIZnet.io/product-item/wiz107sr/

The most important software tool is the **WIZ107SR/WIZ108SR Configuration Tool Ver 1.4.4.1** which is used for scan, configure TCPIP/UDP settings and can be downloaded from the following link:

https://www.WIZnet.io/wp-content/uploads/WIZnethome /S2E%20Module/WIZ107_108SR/Utility/WIZ107_108_config_tool.zip

You also can check for future updates on the manufacturer webpages for the WIZ107SR module.

Setting up the Ethernet interface:

The **WIZ107SR/WIZ108SR Configuration Tool Ver 1.4.4.1** should be used to configure the AMUX's TCPIP/UDP settings. Three main steps are required to follow:

1. Search for the AMUX on the network (for this the AMUX has to be powered and connected to the network). This can be performed with the "Search" button on the GUI. Once search is done, the AMUX's MAC address should appear in the list on the left of the GUI. Note that in rare cases for computers

connected to more than one network in the same time, this search might not work on all networks but rather the primary one only. In that case we recommend to configure the unit on the primary network and then switch it to the network where it will be used.
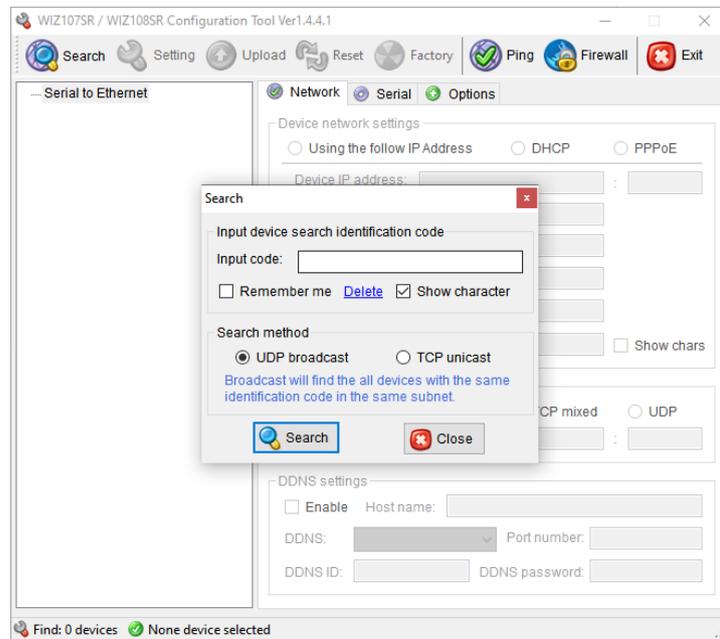
2. Configure the TCP/IP settings, assign fixed or DHCP controlled IP address, set the Port number to 5000, then specify the subnet mask and gateway IP and let the operation mode at TCP server. Save settings by pressing the **Setting** button.
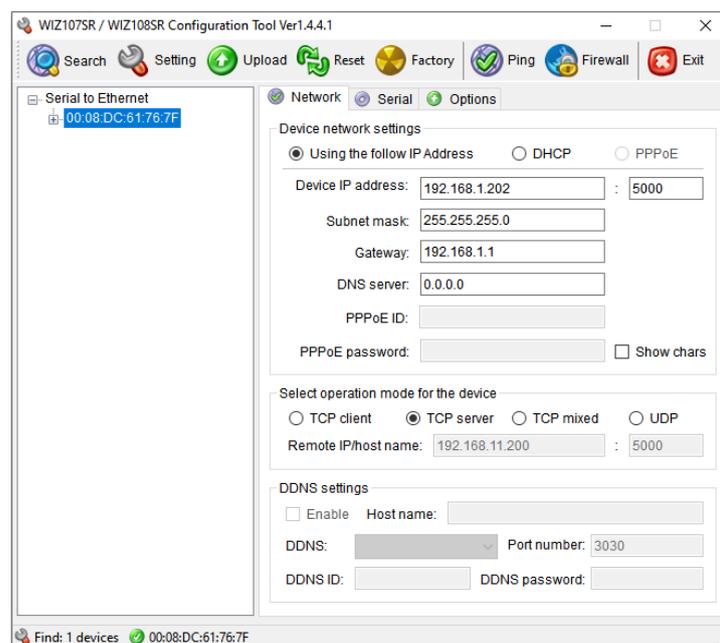
3. Finally configure the serial settings for the W7100A module setting the Baud Rate to 115200, Data Bit length to 8, Parity to NONE, Stop Bit to 1 and Flow Control to NONE. Save settings by pressing the **Setting** button
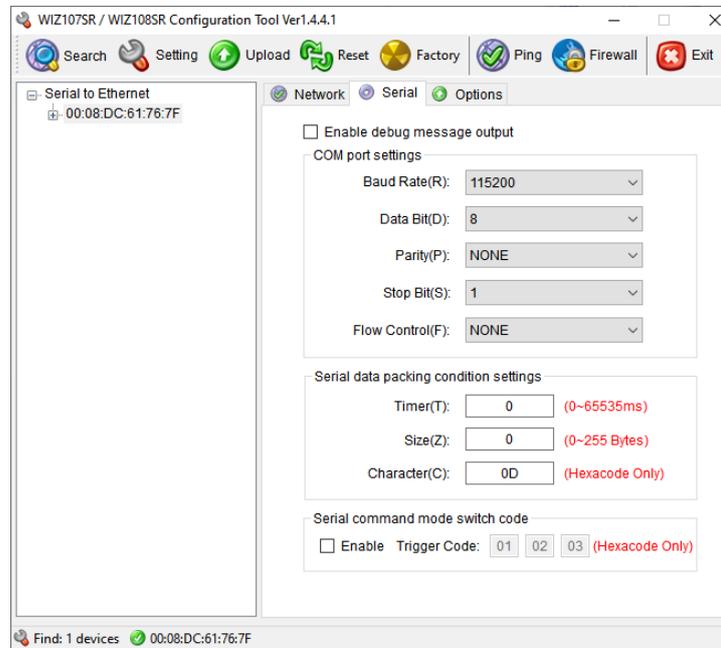
From this moment is possible to connect to the AMUX with any TCPIP tool (or UDP depending on the settings). You can use for example the Hercules tool for this purpose (but any other TCP console, like Putty will do):

https://www.hw-group.com/software/hercules-setup-utility

AMUX Protocol

The protocol is human readable, uses ASCII coded characters and each message ends with a Carriage Return (CR) character.

Every valid response starts with "**>**" character or if intermediary lines are present with "**#**" character (any number of intermediary lines can be, and the last line always has to start with "**>**"). If an error occurs or invalid command was entered the protocol returns "**!**" character.

   AMUX has board address and column address selector and the same address has to be used for messages (like **@rcVER** is **@00VER** for the image below):

   For connection, please use the configured IP address and Port number. After connecting to the AMUX over TCP/IP and sending the basic **@00VER** command followed by a Carriage Return character (**@00VER**<CR>) a valid response should be get from the AMUX containing the firmware version:

Command	Description		
@rcVER<CR> r - board row address c - board column address	Get firmware and AMUX version		
Example:	Send	@00VER<CR>	
	Receive	#00MUX8x32 v6.3 CUST [2] >@00VER	
Note:	CUST=Macros enabled GEN=Macros disabled [n] 1=5x64, 2=8x32 v5+, 3=8x32 v1.0		
@rcSWITCHsrrrccc<CR> r - board row address c - board column address s - state (0 off / 1 on) rrr – row (001-008) in single mode (001-080) when scaled (MUX8x32) ccc - column (001-032) in single mode (001-320) when scaled (MUX8x32) rrr - row (001-005) in single mode (001-050) when scaled (MUX5x64) ccc - column (001-064) in single mode (001-640) when scaled (MUX5x64)	Change relay state (cache only)		
Example:	Send	@00SWITCH1001001<CR>	
	Receive	>@00SWITCH1001001	
Note:	One or more SWITCH commands always have to be followed by UPDATE to have the real relays switched!		
@rcUPDATE<CR> r - board row address c - board column address	Apply relay state (set previously with SWITCH)		
Example:	Send	@00UPDATE<CR>	
	Receive	>@00UPDATE	

3el 8x32, 5x64 Analog Multiplexer

Programming Manual

Command	Description
@rcISWITCHsrrrccc\<CR>	
r - board row address c - board column address s - state (0 off / 1 on) rrr - row (001-008) in single mode (001-080) when scaled (MUX8x32) ccc - column (001-032) in single mode (001-320) when scaled (MUX8x32) rrr - row (001-005) in single mode (001-050) when scaled (MUX5x64) ccc - column (001-064) in single mode (001-640) when scaled (MUX5x64)	Change relay state (instant switch on the real relays)

Example:	Send	@00ISWITCH1001001\<CR>
	Receive	>@00ISWITCH1001001

Note:	ISWITCH does not needs UPDATE, it switches the real relays instantly.

Command	Description
@rcRESET\<CR> r - board row address c - board column address	Clear all relay state to open

Example:	Send	@00RESET\<CR>
	Receive	>@00RESET

Command	Description
@rcALLs\<CR> r - board row address c - board column address s - state (0/1)	Set all relay states to on/off

Example:	Send	@00ALL0\<CR>
	Receive	>@00ALL0

Important:	Setting all columns with all rows is dangerous if anything is connected to rows and columns!

Command	Description
@rcDIAGsrrrcccR\<CR> r - board row address c - board column address s - state (0 off / 1 on)	Switch diagnose and range relays

Command	Description	
rrr - row (001-008) in single mode (001-080) when scaled (MUX8x32) ccc - column (001-032) in single mode (001-320) when scaled (MUX8x32) rrr - row (001-005) in single mode (001-050) when scaled (MUX5x64) ccc - column (001-064) in single mode (001-640) when scaled (MUX5x64) R - range (3=100mA)		
Example:	Send	@00DIAG10010013<CR>
	Receive	>@00DIAG1001001
Important:	Do not run diagnose with electronic equipment connected to rows or columns!	
@rcMEASURE<CR> r - board row address c - board column address	Measure voltage on diagnose	
Example:	Send	@00MEASURE<CR>
	Receive	#00mV115 >@00MEASURE
@rcTESTRELAYS<CR> r - board row address c - board column address	Diagnose all relays (close->measure->open->measure)	
Example:	Send	@00TESTRELAYS<CR>
	Receive	#00FAIL-Row3-Col18 >@00TESTRELAYS
Important:	Do not run diagnose with electronic equipment connected to rows or columns!	
@rcTESTRELAYV<CR> r - board row address c - board column address	Diagnose all relays with voltage (close->measure->open->measure)	
Example:	Send	@00TESTRELAYS<CR>
	Receive	#00DIAGCODE12999Row3-

Command	Description
	Col18 RX:>@00TESTRELAYV
Note:	DIAGCODE format: DIAGCODExvvvvRowR-ColC x = 1 - connected relay voltage too high (closed relay resistance too high) x = 2 - disconnected relay voltage too low (open relay resistance too low) x = 3 - both tests failed vvv - measured voltage (mV) row - row col - column
Important:	Do not run diagnose with electronic equipment connected to rows or columns!
@rcFINDSHORTS<CR> r - board row address c - board column address	Detect short circuits between columns (Diagnosis will use Row 8 for MUX8x32, Row 5 for MUX5x64)

Example:	Send	@00FINDSHORTS<CR>
	Receive	#00SC:Col04-Col11 >@00FINDSHORTS

Important:	Do not run diagnose with electronic equipment connected to rows or columns!
@rcPING<CR> r - board row address c - board column address	Ping

Example:	Send	@00PING<CR>
	Receive	>@00PING

Custom command set (MACRO)

@rcCMDEXECN[name]<CR>	Execute a macro with a given name	
r - board row address c - board column address [name] - name of the macro to be run		
Example:	Send	@00CMDEXECNMacro<CR>
	Receive	>@00CMDEXECNMacro
@rcCMDEXECI[index]<CR>	Execute a macro with a given index	
r - board row address c - board column address [index] - index of the macro to be run		
Example:	Send	@00CMDEXECI11<CR>
	Receive	>@00CMDEXECI11

Custom command set (MACRO tree) can be edited with software provided by 3EL:

https://www.3el.ro/fordownload/WindowsMux.zip

Download the zip, unpack it anywhere and start MUX3El.exe from there.

The software will start with a login. Be sure nothing is connected to the AMUX (does not permits multiple connections):
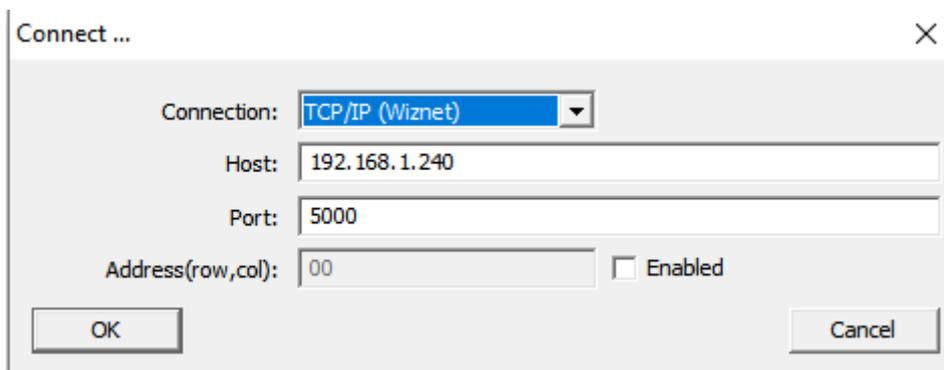
After a successful connection the screen should look like this for 8x32 AMUX:
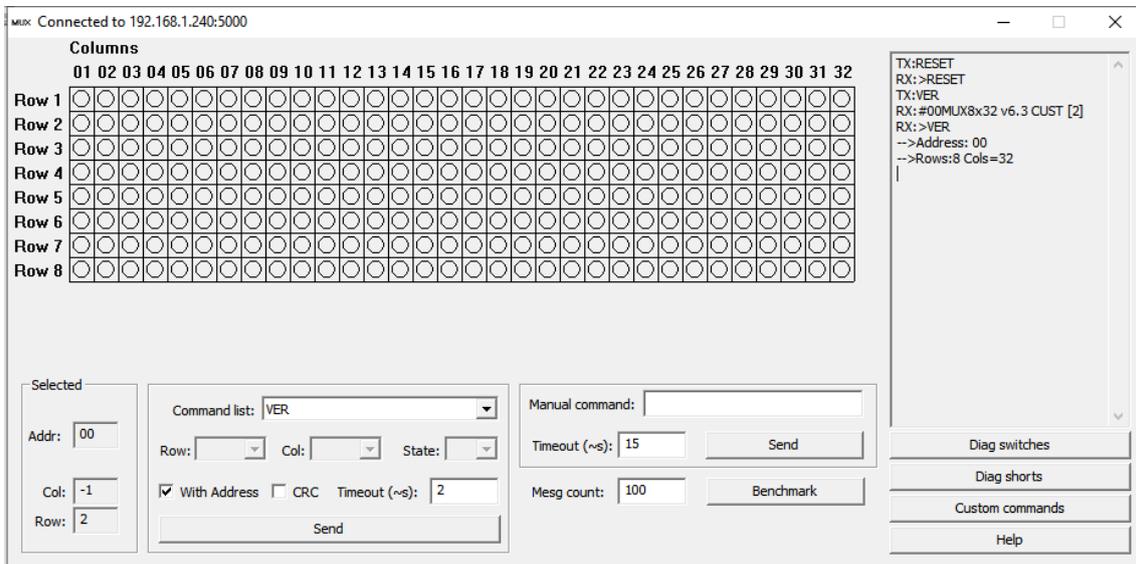
And like this for 5x64 AMUX:
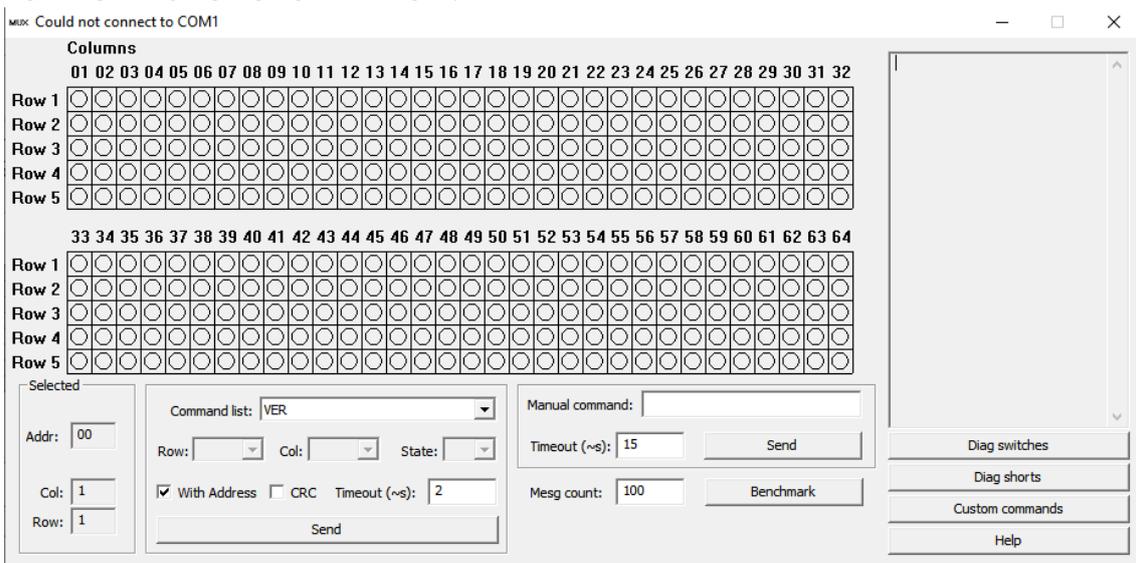
The rows and columns are detected automatically from the response to the VER command.

You can run diagnosis from this user interface ("Diag switches", "Diag shorts"). It is important to not run any kind of diagnosis with electrical equipment connected to the rows and columns!

The result should look like this when there are any errors:

A turned-ON switch is marked with a black dot in green square, a defective switch is marked with a white dot in red square, a short circuit detected in between two columns turns in a red dot in green square (the switch itself is healthy but an external short circuit happened).

Editing the custom command set (MACRO list) can be done with pressing the "Custom commands" button which should show a new dialog what will read out the macro list from the AMUX if available:

"Customer name" holds the name of the whole macro list.

"Set count" is the number of the macros in the configuration (maximum of 100).

"Write count" is the counter for macro zone flash write. The flash in the AMUX controller is guaranteed to support 20000 writes so don't go over that.

"Version" is the format version of the macro list.

"Databytes" shows the currently used bytes by macro list and in this case the maximum is 3067 bytes.

The tree on the left is the visual representation of the current MACRO list.

"Add new set of commands" is for adding a new MACRO:
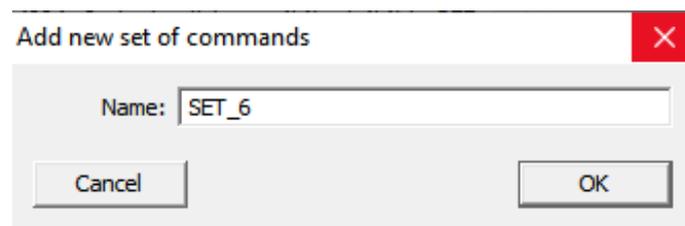
"Add new command" is adding a new command for the currently selected macro. Possible commands are:

- Switch (more switches can be executed at once with Update):
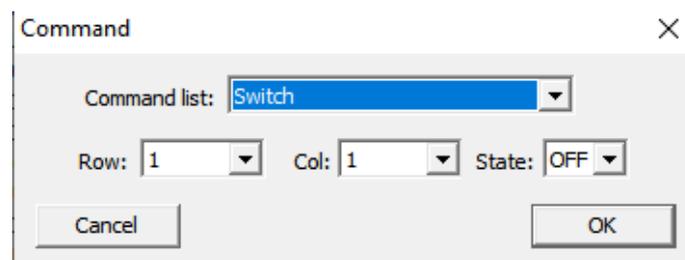
- Instant switch (relay switch executed instantly):
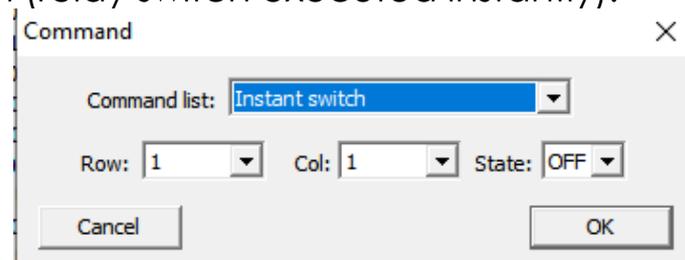
- Delay (millisecond). Note that the AMUX will execute this delay during the execution of the MACRO (which will block the

communication too until it is executed). Thus it is not recommended to use big delays, it is intended for shorter delays (maximum is 2000msec).
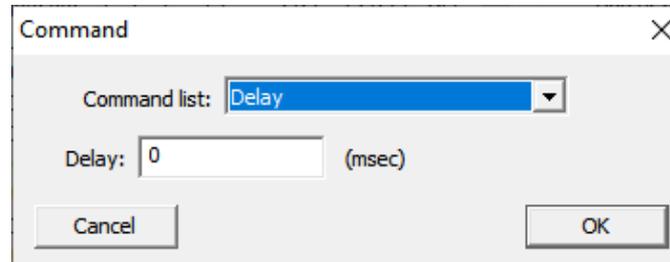
- Update (to update relay state after a set of switches):
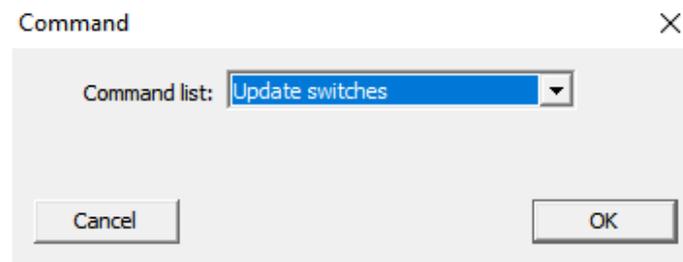
"Edit selected element" is for editing any element selected in the macro tree.

"Execute selected set (by name)" and "Execute selected set (by index)" will execute the selected MACRO. These two buttons are only active when a macro is selected and it is not when a command is selected.
NOTE: if you are editing a macro tree, executing a macro is possible only after it is uploaded in the AMUX!

"Drag and Drop" is working in the macro tree so users can move a command between macros.

"Download from multiplexer" will download the macro tree from the connected AMUX.

"Upload to multiplexer" will upload the current macro tree to the connected AMUX.

"Force reloading in multiplexer" will reload the macro list from the one saved in the connected AMUX.

"Save to file" will save the current macro tree to a csv file.

"Load from file" will load the macro tree from a csv file.
NOTE: to activate the loaded macro tree in the connected AMUX after "Load from file", "Upload to multiplexer" is needed.