

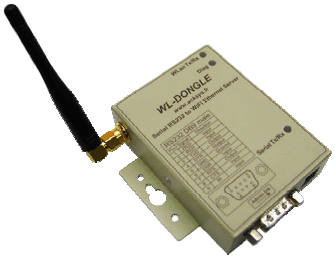


MULTIPOINT FIRMWARE USER GUIDE

FOR ETHERNET AND WI-FI PORT SERVERS

TABLE OF CONTENTS

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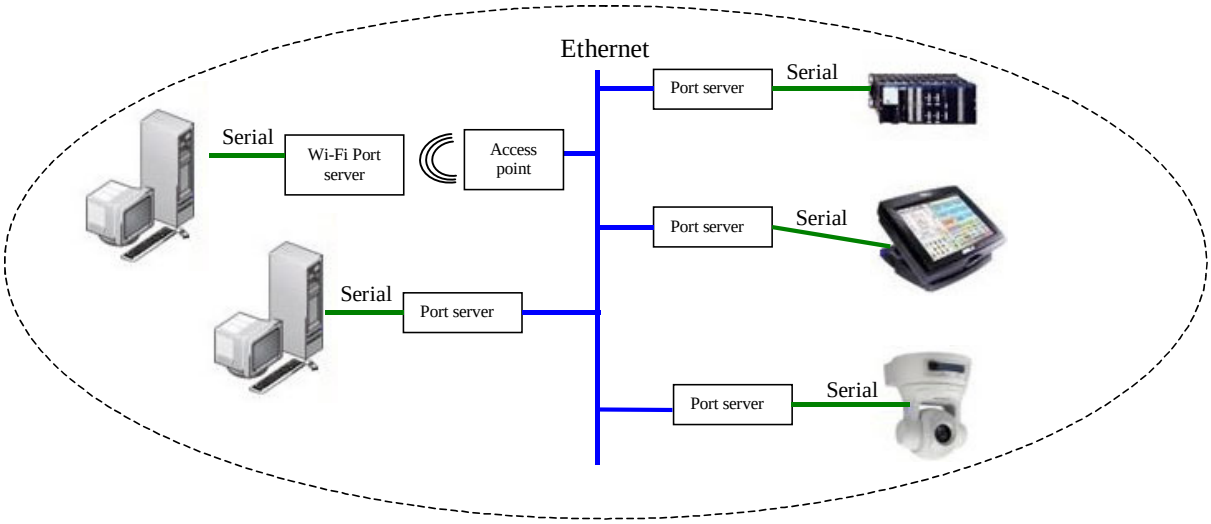
I. WHEN TO USE THE MULTIPOINT FIRMWARE ?

- ✓ Network tunnel between several serial buses or single devices
- ✓ Separate multipoint groups on the network
- ✓ Optional hardware and software flow control
- ✓ Master/slaves mode
- ✓ Multimaster ability
- ✓ Slaves can be isolated from each other to simulate 4 wires serial bus
- ✓ Local and remote administration via CLI (Command Line Interface)
- ✓ Connectionless UDP/IP transfers

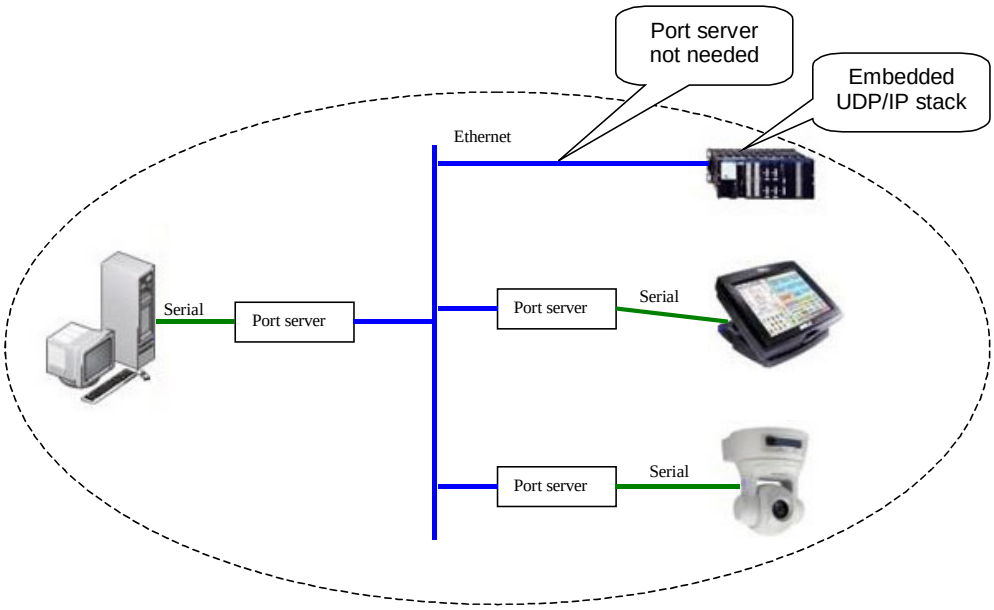
The MULTIPOINT firmware simulates an RS422 / RS485 bus with the network.

With the MULTIPOINT firmware you can set up a group of port servers or WI-FI port server that will work together to simulate interconnected asynchronous serial ports.



Data sent by one port server will be delivered to all other port server in the group, or to a designated destination, thus giving a feeling of a dedicated link.

Also, TCP/IP-aware computers can communicate with the group without the intermediary port server. The application software can use standard UDP sockets to send and receive messages:



Note in the above picture that the computer on the top right is directly connected to the net.

II. MAIN CAPABILITIES

II.1 Serial-to-network data exchange

The MULTIPOINT firmware handles data exchange between a serial RS232 / RS422 / RS485 link and a network.

Data received on the serial interface is packetized following user-selectable rules, then sent to the network interface.

Data received on the network interface is placed into the serial interface buffer and sent one character at a time, respecting flow control and line turnaround protocols if needed.

II.2 UDP network protocol

In order to be as transparent as possible, the network interface uses connectionless UDP transfers, avoiding connection establishment constraints on the link.

With such protocol, data can be lost, corrupted, inverted or duplicated (the last two cases may occur in rare cases involving several network routers).

II.3 Unicast and broadcast network communication

Network data packets sent by the MULTIPOINT firmware can be broadcast to the LAN or can be addressed to a specific receiver (unicast).

Broadcast operation shall be used when data sent by one device must be received by all participating devices. For example, a polling master device communicating with many slaves must broadcast data requests.

Unicast operation shall be used when the data sent by one device must be received by only one other device. For example, a slave device answering its master can unicast its data (it can also broadcast its data if such use does not disturb other slave devices).

II.4 Serial line interface

Data is exchanged through the serial interface at speeds up to the maximum baud rate supported by the port server device. It can optionally be subject to flow control, either hardware (RTS/CTS) or software (XON-XOFF). DSR, DCD and RING input signals are always ignored.

II.5 Virtual buses

By setting a specific UDP port into the MULTIPOINT firmware, one can set up groups of devices on the same LAN, wherein the groups are isolated from each other and simulate as many separate multidrop RS485 buses.

II.6 Programming interface

Using raw UDP data, the MULTIPOINT firmware can communicate directly with network-aware applications.

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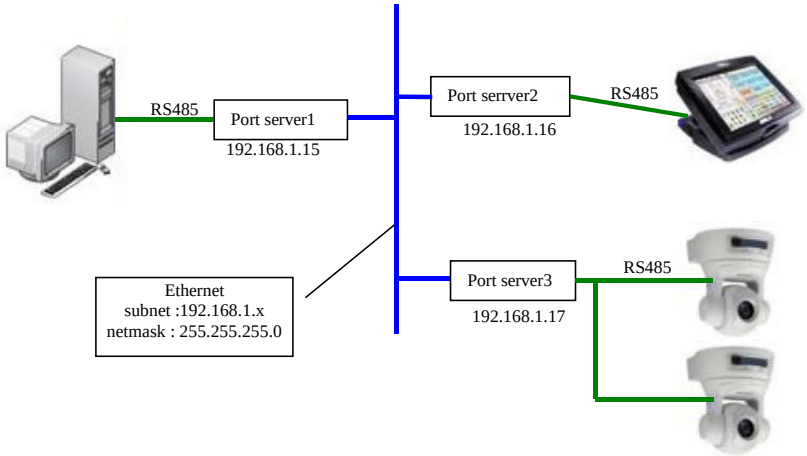
III. APPLICATIONS NOTES

III.1 Replacement for a multidrop RS485 bus



1) Ask the network administrator for available IP addresses on the LAN, and for the NETMASK information.
2) Assign IP addresses to the three port servers.
3) Use the administration system to set up each port server in turn.

Device to set up	Setup commands

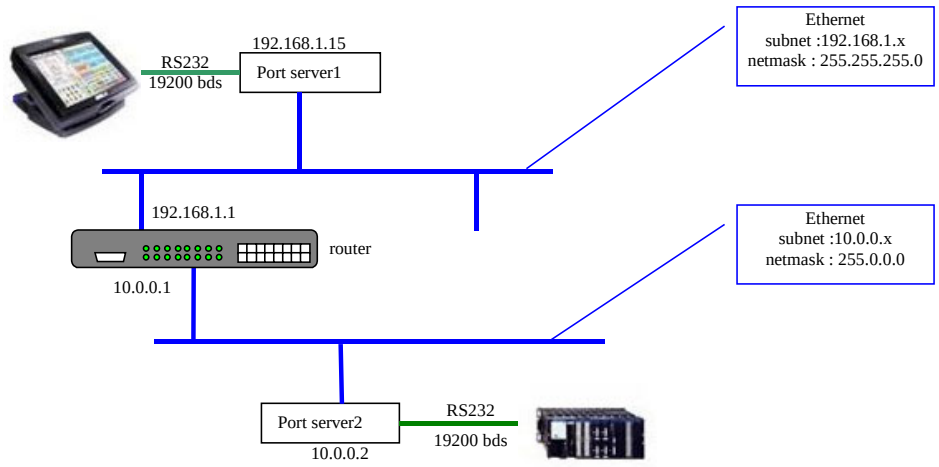
port server1	`set default`
	(this implies RS232 at 9600 bauds, 8 bits, no parity, 1 stop, UDP port 2300, netmask 255.255.255.0 and a broadcast remote address)
	`set net ip 192.168.1.15`
	`set serial interface rs485 noecho`

port server2	`set default`
	`set net ip 192.168.1.16`
	`set serial interface rs485 noecho`
	`set serial remoteip 192.168.1.15`
	(Setting the remote in this case is optional, but reduces network usage)

port server3	`set default`
	`set net ip 192.168.1.17`
	`set serial interface rs485 noecho`
	`set serial remoteip 192.168.1.15`
	(Setting the remote in this case is optional, but reduces network usage)

III.2 Replacement for a point-to-point RS232 link

This advanced example involves the crossing of an IP router.



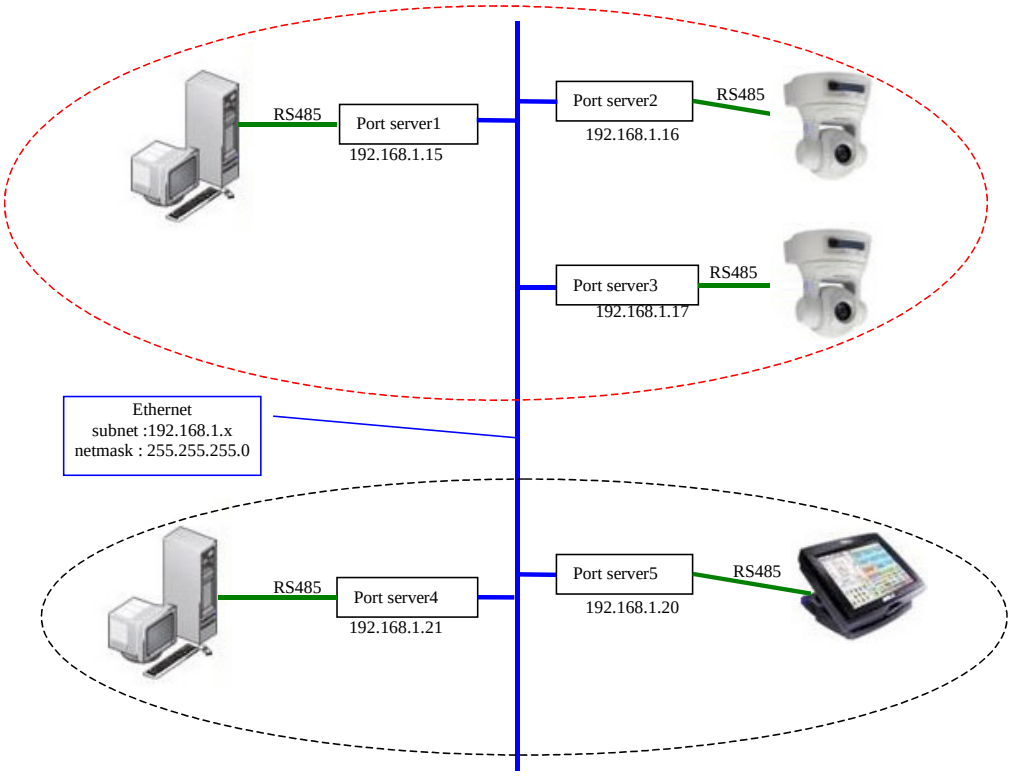
1) Ask the network administrator for available IP addresses on the LAN, NETMASK information and possibly gateway addresses.
2) Assign IP addresses to the two port servers.
3) Use the administration system to set up each port server in turn.

Device to set up	Setup commands

port server1	`set default`
	(this implies RS232 at 9600 bauds, 8 bits, no parity, 1 stop, UDP port 2300, netmask 255.255.255.0 and a broadcast remote address)
	`set net ip 192.168.1.15`
	`set net gateway 192.168.1.1`
	`set serial remoteip 10.0.0.2`
	`set serial baudrate 19200`

port server2	`set default`
	`set net ip 10.0.0.2`
	`set net gateway 10.0.0.1`
	`set net mask 255.0.0.0`
	`set serial remoteip 192.168.1.15`
	`set serial baudrate 19200`

III.3 Replacement for two separate multidrop RS485 buses



Ask the network administrator for available IP addresses on the LAN, and for the NETMASK information.

1) Assign IP addresses to the five port servers.
2) Use the administration system to set up each port server in turn.

Device to set up	Setup commands

port server1	`set default`
	(this implies RS232 at 9600 bauds, 8 bits, no parity, 1 stop, UDP port 2300, netmask 255.255.255.0 and a broadcast remote address)
	`set serial interface rs485 noecho`
	`set net ip 192.168.1.15`

port server2	`set default`
	`set serial interface rs485 noecho`
	`set net ip 192.168.1.16`
	`set serial remoteip 192.168.1.15`

port server3	`set default`
	`set serial interface rs485 noecho`
	`set net ip 192.168.1.17`
	`set serial remoteip 192.168.1.15`

port server4	`set default`
	`set serial interface rs485 noecho`
	`set net ip 192.168.1.21`
	`set serial port 2301`

port server5	`set default`
	`set serial interface rs485 noecho`
	`set net ip 192.168.1.20`
	`set serial port 2301`
	`set serial remoteip 192.168.1.21`

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IV. TROUBLESHOOTING

IV.1 No communication

The complete absence of communication is usually caused by:

- The sender not having data to send. Check serial data and flow control.
- The sender address not having the same subnet address than the receiver's. Check that you can "ping" both the sender and the receiver from another computer on the LAN. Check the netmasks.
- The sender not being on the same LAN as the receiver. If this is on purpose, check the sender's gateway address, and check that the router lets broadcast packets through.
- The sender not having the same UDP port (not being in the same group) than the receiver. Check both UDP ports.
- The sender not sending to the receiver's address or broadcast address. Check this.

IV.2 Data loss

Data can possibly be lost at several points during the transfer:

- If serial data fill the serial receive buffer before data can be transmitted

  ⇒ Use inbound flow control, or change the packetisation rules, use bigger packets at higher loads

- If UDP packets cannot go on the net, or if they are lost by network routers, because of a heavy network load

  ⇒ Use retransmission in your serial device, use a dedicated network, use switches instead of hubs, use bigger packets at higher loads

  Note: UDP makes no attempt to retransmit lost data, nor does the MULTIPOINT firmware.

- If an incoming UDP packet cannot be transferred to the serial transmit buffer because it already holds too much data

  ⇒ Remove outbound flow control, speed down the data sender.

IV.3 Split data frames, packetization rules

In some cases, data is sent by a device as frames separated by an idle delay. If the receiving device is sensitive to interframe delays, it is necessary to insure that each data frame is transmitted into its own UDP packet. Then it is time to check the "sendtrigger" port server parameter.

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V. COMMANDS REFERENCE LIST

Displaying the configuration parameters is allowed if the **showperm** parameter is set to « allow ». If it is set to « deny », the configuration parameters can only be displayed by the administrator after logging in.

Some parameters can only be displayed for your information but cannot be changed.

Conventions used in these tables:

- **bold text** must be typed as is.
- *italicized text* denotes a parameter which must be replaced by the proper value.
- ***italicized bold text*** denotes warnings or limitations.

Tables:

SETTING OR DISPLAYING THE GENERAL PARAMETERS

Command			Default value	Notes	Description
login	*username*				start the administrator identification sequence. Ask password.
set	**default**				restore factory defaults, except the MAC address, the save count, the current firmware and the next firmware to run.
save					save the current configuration to the permanent configuration memory which is used after reboot and remains when the device is powered off.
reset					close the administration session and reboot the device, to ignore parameters changed but not saved, or to reload saved parameters. The following parameters do not need a reset to take effect: location, showperm, netconfigperm, serial interface.
show	**version**				display firmware name and version
quit					close administration session (TELNET only).
set **show**	**login** **login**	*username*	root		change/display administrator username. 8 bytes max. Upper and lower cases.
set **show**	**password** **password**	*password*	root		change/display administrator password. 8 bytes max. Upper and lower cases.
set **show**	**location** **location**	*location*	“Unknown location”		change/display *location* description of the device server. 30 bytes max. Upper and lower cases.
set **show**	**showperm** **showperm**	*perm*	allow		change/display the right to display configuration information without entering the administrator password. *perm* : one of **allow / deny**
set **show**	**netconfigperm** **netconfigperm**	*perm*	allow		change/display the right to use the administration system from the network. *perm* : one of allow / deny
set **show**	**upgradeperm** **upgradeperm**	*perm*	allow		change/display the right to upgrade the firmware. *perm* : one of **allow / deny** If this flag is set to “**allow**”, upgrade is allowed. (through serial port or Wifi interface) else upgrade is not allowed. ***These commands are not available for devices providing several firmwares simultaneously.***
set	**net password**	*password*	empty	note 9	change exploitation password. (see detailed documentation)

The following commands are available only in devices which provide several firmwares simultaneously.

set **show**	**prog enable** **prog enable**	*Seg*	MULTIPOINT firmware located in seg / 3	execute after next reset the current firmware located in segment *seg*. Display this firmware.
show	**prog list**			display information about all 6 firmwares.
show	**prog info**	*seg*		display information about firmware located in segment *seg*, in computer readable format.
show	**prog data**	*seg*		display information about firmware located in segment *seg*, in computer readable format.

SETTING OR DISPLAYING THE NETWORK PARAMETERS

Command			Default value	Notes	Description
show	**net ethernet**		device serial number		display Ethernet MAC address. 6 hex digits separated by columns.
set **show**	**net dhcp** **net dhcp**	*state*	off		turn **on** /**off** or display the DHCP client use. When dhcp is on, the manually specified IP address is not used.
set	**net dhcp clientid**	*ident*	empty (MAC address sent as string)		replace the standard client ID (MAC address as a string) by the custom string *ident*. 15 bytes max, upper and lower cases allowed.
set	**net dhcp clientid**				delete the custom client ID and use the standard client ID.
show	**net dhcp clientid**				display value enforced on DHCP option 61, if any.
set **show**	**net dhcp hname** **net dhcp hname**	*hostname*	empty (not sent)		provide the DHCP server with the supplementary Host Name option, with value *hostname*. 19 bytes max, no spaces allowed, upper and lower cases allowed. Value assigned to DHCP option 12, if any.
set **show**	**net ip** **net ip**	*aaa.bbb.ccc.ddd*	192.168.1.253		change/display IP address in dotted decimal notation.
set **show**	**net mask** **net mask**	*aaa.bbb.ccc.ddd*	255.255.255.0		change/display local subnet mask.
set **show**	**net gateway** **net gateway**	*aaa.bbb.ccc.ddd*	0.0.0.0		change/display the gateway IP address.
set **show**	**net metric** **net metric**	*mmm*	10		change/display the number of gateway hops. mmm is **1** to **255.**
show	**net config port**		23		administration port.

SETTING OR DISPLAYING THE NETWORK WIRELESS PARAMETERS

All commands of the "network wireless parameters" section are only valid for wifi port servers.

Command			Default value	Notes	Description
set **show**	**net ssid** **net ssid**	*ssid*	acksys		change/display the SSID of the device. SSID is a case sensitive characters string (32 characters max). Empty character string is not allowed.
set **show**	**net mode** **net mode**	*mode*	infra		configure/display the WIFI mode. One of **ad-hoc** or **infra**. **ad-hoc :** configure the device in AD-HOC mode . **Infra :** configure the device in infrastructure mode.
set **show**	**net channel** **net channel**	*channel*	6		In ad-hoc mode, configures the radio channel used for communication with the other device. *channel* is in the range **0** to **13**. In infrastructure mode this parameter is ignored.
set	**net wepkey**	*keynum key*	no default value		define up to 4 WEP keys. *keynum* is the key number. Range **1** to **4**. *key* is the hexadecimal key value. 10 digits (64 bits key) or 26 digits (128 bits key). ***The last 6 digits are generated by the firmware*** Example : set 64 bits WEP key : set net wepkey 1 1F2564AE12 set 128 bits WEP key : set net wepkey 1 123654875ADFEC236542541A26 ***Note : to enter a 128 bits WEP key, you must before enable 128 bits key mode. See command "set net usekey 1 128" below.***
set	**net wepkey**	*keynum* **0**			delete wepkey *keynum*
show	**net wepkey**				display all 4 WEP keys (the last 6 digits are displayed as zeroes).
set **show**	**net usekey** **net usekey**	*[keynum] [128]*			define the WEP key to use. If the *keynum* parameter is left empty, device won't use any WEP key, else device uses WEP key *keynum*. Example: Activate 64 bits WEP key set net usekey 1 Activate 128 bits WEP key set net usekey 1 128 Disable WEP key using set net usekey
set	**net auth**	*mode*	open		set the authentication mode. *mode* is one of **open**, **share** ***open*** : the device is authenticated by its MAC address. ***share*** : the device is authenticated by its WEP Key. ***This command is not valid for WL-COMETH I.***

Command			Default value	Notes	Description
set	**net unencrypted**	*mode*	accept		configure if the device accept or ignore the unencrypted WIFI packet. mode is one of **ignore** or **accept** **ignore** : The device ignores all WIFI packet unencrypted **accept** : The device accepts all WIFI packet unencrypted ***This command is not valid for WL-COMETH I*.**
set	**net txrate**	*txrate*	automatic		set the WIFI transmit rate. *txrate* is one of **1**, **2**, **5.5**, **11**, **automatic.** **1**, **2**, **5.5** or **11:** device will always use the given transmit rate. **automatic:** device will automatically choose the appropriate transmit rate.
show	**net wlan**				display WIFI parameters : channel, txrate, authentification mode, RF signal quality. ***Authentification mode is not displaying for WL COMETH I*.** ***"WLg" products also display available access points around.***

SETTING OR DISPLAYING THE SERIAL PARAMETERS

Command			Default value	Notes	Description
set **show**	**serial port** **serial port**	*nnnn*	2300		Change/display the TCP port used for data transfer. *nnnn* is **1** to **65534** ***except 23***
set **show**	**serial remoteip** **serial remoteip**	*ip [remoteport]*	255.255.255.255		*ip*: destination IP address for incoming serial data. Must be reacheable either directly (same LAN) or through a router (check the gateway parameter). Use 255.255.255.255 to broadcast the data on the LAN. *remoteport*: (parameter available on versions 1.4 and up) the UDP port where the data will be sent in the device bearing address *ip*. If the *remoteport* is **not given** or is **zero**, the remote port will be the same as the local port (see command "set serial port"). The changes take effect immediately, but in a future release this may require a reset.
set **show**	**serial interface** **serial interface**	*mode [option]*	rs232		*mode* : one of **rs232/rs422/4wires/rs485/2wires** *option* : **master** or **slave** for rs422 / 4wires mode, **noecho** or **echo** for rs485 / 2wires mode • On some products, only "rs232" is meaningful. Other choices will result in communication errors. See the serial port specifications of the appropriate port server user manual. • Keywords "**rs422**" and "**4wires**" are synonyms. Their meaning is identical. • Keywords "**rs485**" and "**2wires**" are synonyms. Their meaning is identical. **rs232** : setting for rs232 serial interface equipment **rs422 master** or **4wires master** : setting for master equipment in multidrop, configuration or for both equipments in point to point configuration **rs422 slave** or **4wires slave** : setting for slave in multidrop configuration. **rs485 noecho** or **2wires noecho** : setting for all devices in multidrop or point to point. **rs485 echo** or **2wires echo** : setting for all equipments in multidrop or point to point configuration. In this mode, transmitted characters on RS485 line are echoed on Lan line.
set **show**	**serial dtr** **serial dtr**	*mode*	high		DTR management**.** *mode* is one of **high/low.** **High** and **low** mean the signal is permanently set in this state.
set **show**	**serial rts** **serial rts**	*mode*	high		RTS management**.** *mode* is one of **modem/high/low/flow.** **Modem** means the signal is used as if a modem was connected to the port (DTR ➔ the device is on line, RTS ➔ the device wants to send data). **Flow** means the signal is used for input flow control. **High** and **low** mean the signal is permanently set in this state.
set **show**	**serial dsr** **serial dsr**	*mode*	ignore		DSR management. *mode* : always **ignore** *mode* : always **ignore**.
set **show**	**serial cts** **serial cts**	*mode*	ignore		CTS management. *mode* is one of **ignore / flow** **flow** means the signal is used for output flow control. **ignore** means that the signal is locally ignored.
set **show**	**serial dcd** **serial dcd**	*mode*	ignore		DCD management**.** *mode* : always **ignore** *mode* : always **ignore**.
set **show**	**serial ring** **serial ring**	*mode*	ignore		RING management **:** *mode* : always **ignore**

Command			Default value	Notes	Description
set **show**	**serial baudrate** **serial baurate**	*speed*	9600		*speed* : any baud rate from **229** bauds to **230400** bauds (from **10** bauds on Ethernet products)
set **show**	**serial format** **serial format**	*nbits parity nstops*	8 n 1		*nbits* is **7** or **8** bits, *parity* is one of **e, o, n, m, s** (meaning even, odd, none, mark or space), *nstops* is **1** or **2** stop bits.
set **show**	**serial xonxoff** **serial xonxoff**	*mode*	ignore		software flow control : *mode* is one of **use** / **ignore**. Mixed (i.e. software and hardware) flow control can be set.
set	**sendtrigger charcount**	*count*	off (0)	notes 5,6	number of chars required in the buffer before emission to the client application. Allowed values range from **0** to **255**. When this parameter is not **0**, data received on the asynchronous serial port will not be sent to the client application until there are at least *count* characters in the buffer. Set this parameter to **0** to disable it.
set	**sendtrigger framedelay**	*delay*	off (0)	notes 5, 6, 7	delay between char reception and emission to the client application. Allowed values range from **0** to **255**.The *delay* can be specified in milliseconds by appending a '**m**' to the figure, or in character duration by appending a '**c**' to the figure. '**m**' is the default if no unit is specified. When this parameter is not **0**, data received on the asynchronous serial port will not be resent to the client application until the specified delay has elapsed, after which, all data received in the meantime will be sent. Set this parameter to **0** to disable it.
set	**sendtrigger idledelay**	*delay*	2 ms	notes 5, 6, 7	delay between last char reception and emission to the client application. Allowed values range from **0** to **255**.The *delay* can be specified in milliseconds by appending a '**m**' to the figure, or in character duration by appending a '**c**' to the figure. '**m**' is the default. When this parameter is not **0**, data received on the asynchronous serial port will not be resent to the client application until the specified delay has elapsed since the last character was received, after which, all data received will be sent. Setting this parameter to 0, we disable it. Set this parameter to **0** to disable it.
show	**sendtrigger**		send when timeout after 1st char = 2ms or buffer full	notes 5, 6, 7	display the condition used to put the data received on the asynchronous serial port, in the queue for transmission to the client application.
set **show**	**serial interframe** **serial interframe**	*delay*	0		*delay* is a duration in milliseconds. (available in version 1.6 and up; not supported in the "Cometh Admin web" software). When successive UDP frames are received from the network, they are sent back-to-back to the serial port if *delay* is set to **0**. Otherwise there is a garanteed minimum idle time of *delay* milliseconds inserted between two frames sent to the serial port. If the Ethernet traffic is low, the idle time is between *delay* and *delay*+1. This feature can be combined with a "sendtrigger idledelay" on the receiving side to implement a low-throughput UDP proxy over a serial link.

SETTING OR DISPLAYING PARAMETERS FOR THE "WLG" RANGE OF DEVICES

Command			Default value	Notes	Description
set	**wlan**				Run the wizard asking for the WiFi parameters
show	**wlan**				Display the WiFi parameters.
set	**wlan** *{options….}*				Change specific WiFi parameters (you can specify one or more of the following parameters) :
		state	on		*state*=**on** or **off** .Turns radio card on or off
		topology	adhoc		*topology*= one of **infra** or **adhoc**
		ssid *string*	acksys		change the ssid of the device. *string* is a case sensitive characters string.
		band	bg		change the radio protocol: *band*= one of **bonly gonly bg ah** (standard 802.11 protocols)
		superag	sagoff		*superag*= one of **sagoff sagon sagdyn sagstatic** Super AG mode is an atheros card feature.
		region	eu		*region*= one of **il us hk ca au fr eu jp sg kr** (standardized code of the world region).
		chan *channels*	auto		List of channels checked for access points. Available values depend on the region and the band. **auto** allows to scan all the channels allowed in the region.
		antennas	diversity		*antennas*= one of **diversity main aux** If your product has only one antenna, choose diversity or main. If your product has 2 antennas you can choose diversity to use both antennas or specify which antenna you want to use (main or aux).
		tx rate	best		you can enforce a specific standard bit rate. "**best**" selects the best rate available for the given band and reception quality.
		tx power	high		you can change the radio output power *tx power* = one of **high medium low**
		roaming	0 (off)		set the reception level under the bridge will search another access point. The reception level can be specified in units of dBm with negative values, or in percentage with positive values. example: `set wlan infra ssid myssid ah low` This command will be change to infrastructure mode with ssid "myssid" and radio protocol 802.11a/h and a low transmit power.

Command			Default value	Notes	Description
set	**wkey**				Run the wizard asking for the WiFi security parameters
show	**wkey**				Display the WiFi security parameters.
set	**wkey** *{option}*				Change specific WiFi security parameters (you can specify one or more of the following parameters) :
		method	off		*method*= **off** (no security or WEP key), **personal** (uses WPA protocol with a pre-shared key) or **enterprise** (not implemented)
		protocol	wpa		*protocol***= wpa** or **wpa2**
		cipher	tkip		*cipher***= tkip** or **aes**. Usually TKIP is used together with WPA and AES is used together with WPA2.
		password *str*	unspecified		change the pre-shared key to *str.*
ping	*ip-adress*				Sends ICMP ECHO-REQUEST four times to the specified destination. The answer (or timeout indication) will be displayed a few seconds after the prompt.
stat					Displays various indications for technical support purpose.
rxfifo	*state*		on		reserved for factory tests. DO NOT CHANGE.

NOTES

(1) This group of commands allows to retrieve or set globally the ACKSYS device server configuration.

(2) **Security note:** sensitive data, like login and password information, are conveyed in clear text by the following commands. You must take any step to protect these data from disclosure. As a basic protective step, the commands themselves can only be used by a logged-in operator.

(3) **Usage note:** Some data conveyed by these commands should be kept unique to a device. This applies especially to the IP and MAC addresses in the 'common' parameters. You should either avoid to change this unique data or to restore them after using the 'set' commands.

(4) **Usage note:** Some parameters take effect immediately, as specified elsewhere. Beware that the parameters you change do not affect the device at the moment you set them. For example, if you change the DHCP Client Id, this will take effect at the next lease expiration (which could happen soon).

(5) Use this group of commands to improve buffering of outgoing network data.

(6) **Usage note:** For the purpose of these commands, "send to the client application" means that the data is queued for transmission as soon as possible. The reception at the client side may be delayed by network contention, client not acknowledging data fast enough, packet lost, etc.

(7) **Usage note:** When a delay is specified as a number of characters duration, it is converted at run-time into a count of milliseconds (based on the character size and baud rate), and rounded up to the next millisecond.

(8) **Character strings** can be naked or quoted. If naked, they start at the first non-space character, they finish at end of line, and can include any "authorized character". If quoted, they start at the first character after the opening double quote, they finish either at end of line or at the first encountered double quote, and can include any "authorized character" except the double quote itself. The authorized characters are: **A** to **Z**, **a** to **z**, **0** to **9**, ***** ,**?**, **"**, **-**, **underscore**, **.**, **:**, **space**.