TCP-CLIENT FIRMWARE USER'S GUIDE

FOR ETHERNET AND WI-FI PORT SERVERS

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TCP CLIENT FIRMWARE USER GUIDE

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I. INTRODUCTION

The TCP CLIENT firmware may be used with any product of the ACKSYS port servers range.

It allows any computer or device equipped with an asynchronous serial interface, to connect to a remote computer or device over a TCP/IP network.

On its own or on behalf of the serial device, the port server can initiate a raw TCP connection with a selected network server. Then an application program on the network server can exchange data to and from the port server serial port (thus with the device connected to this port).

Serial port control signals, though not transmitted over the network, can be used locally on the port server to drive certain functions: automatic connections, flow control.

The TCP CLIENT firmware functions as a **network client**. This means that it provides no service to the network: instead, it volunteers to connect to a network server as soon as proper local conditions allow (serial device ready for example).

Administration.
Even while TCP CLIENT is connected to a network server, TELNET can be used to access the port server administration interface.

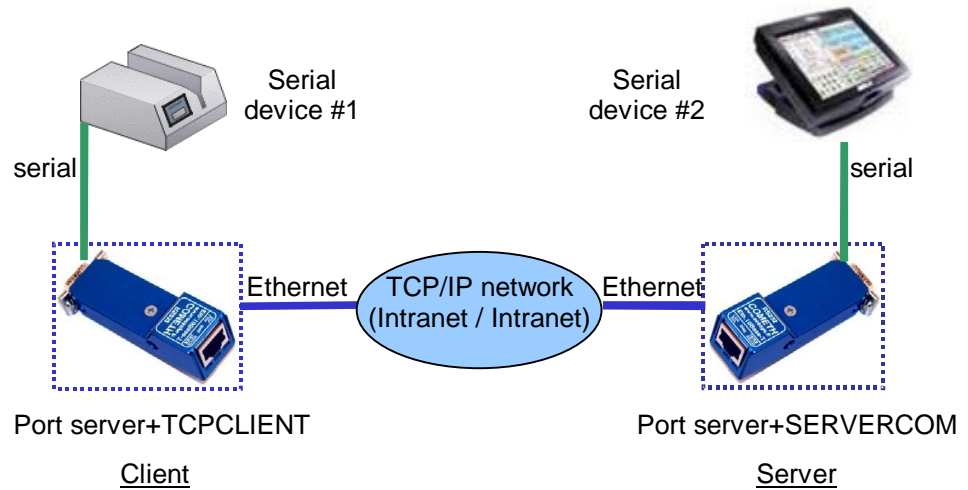**Example 1: connection to an application program.**
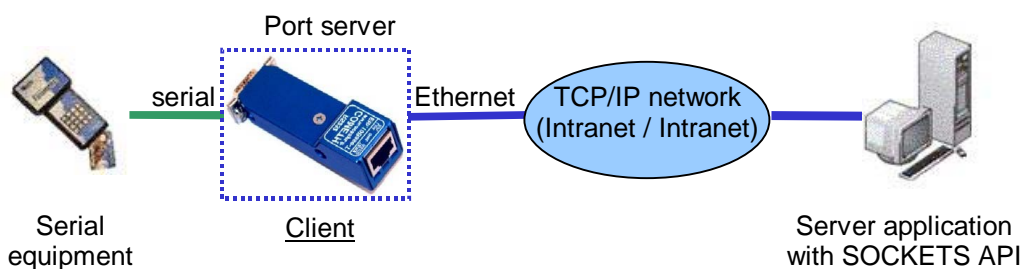
When the serial equipment is powered on, the port server calls the server application which can then exchange data with the equipment. When the serial equipment is powered off, the port server closes the connection to the application.

The application only knows about connected equipments, thus allowing dynamic adds and removes.
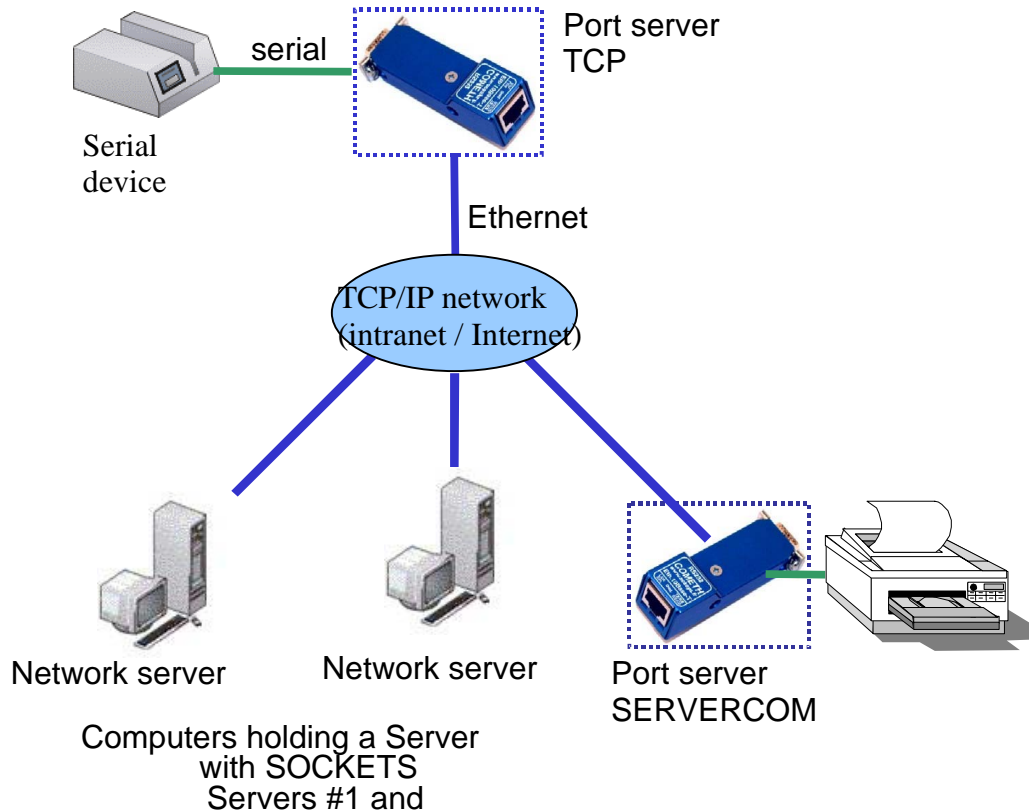
II.   WHEN TO USE THE TCP CLIENT FIRMWARE ?

In order to identify the cases where TCP CLIENT can be used, it is important to know that the TCP CLIENT firmware has the following properties:

- It uses TCP communications on the network side, forbidding undetected data loss at the expense of slower communications.

- It conveys no protocol information in the data exchanged between the remote application software and the device connected to the port server.

- It can handle serial communications up to 230400 bauds.

- It can drive and monitor serial control signals, locally only (not from/to the remote).

The TCP CLIENT firmware can be used to solve the following needs:

- Application software using a TCP SOCKET to exchange data with a remote serial device, when the number of such devices is changes in the time.

- Application software using a TCP SOCKET to exchange data with a remote serial device, when the application has scarce resources to allocate (only active TCP CLIENTS require TCP resources in the server).

- Two-ways tunnelling raw data between a SERVERCOM port server and a TCP-CLIENT port server.

- Tunnelling MODBUS frames (or other asynchronous protocols) in point-to-point configurations.

- Connection of a remote serial console to a multiuser computer system.

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III. USING THE TCP CLIENT FIRMWARE

III.1 Theory of operation

The network configuration, including IP address, netmask, gateway (router) address, DHCP, and so on, is described in the port server user manual.

To establish a TCP connection, the port server must be given the server IP address. The firmware lets you set up an array of up to eight servers (see command "**set net server**") with indices ranging from 0 to 7. Servers at lower indices in this arraye take precedence over servers at higher indices.

Upon reset, the first connection is launched on the valid server IP address whose index is the lowest in the array. Server IP addresses set to 0.0.0.0 are considered unused.

Three events can trigger connection requests to the TCP server:

- **"set serial opencon permanent"**: Permanent connection.
  As soon as the port server is powered on, it tries to connect to a server.

- **"set serial opencon dsr"**: connection driven by the DSR signal.
  A connection call takes place when the DSR control signal is in high state.When the DSR control signal drops, the port server closes the connection with the server. Then, when the DSR rises again, the connection request is targetted to the same server. No more than four reconnections per minute can take place due to a DSR drop.
  The special case **"set serial opencon dsri"** will forcefully resets the TCP connection instead of closing smoothly when the DSR drops, thus making the DTR drop immediately if configured to "modem" mode.

- **"set serial opencon data"**: connection once-per-dataframe:
  This mode is available on the Ethernet ports servers only.
  A connection call takes place when data is received on the serial port. When the configured send condition is met (command "*set sendtrigger*"), the accumulated serial frame is sent to the server and the connection is immediately closed. No data can be received from the TCP server in this mode. If the call times out, the data frame is lost. If another data frame arrives before the call is acknowledged, only the last frame received is sent, previous frame(s) will be lost. The call will not time out while it is delayed due to low resources in the port server. No more than four reconnections per minute can take place.

In all cases, if connection with the server is closed or lost, a new connection request is immediately launched on the next server. When the array of servers is exhausted it is looked up from the beginning once again.

In order to avoid loading the network with connection requests, a time out can be set with the following commands:
- **"set net TimeEstCon"** which limits the waiting time when a server does not answer immediately;
- **"set net TimePollServ"** which restrains permanent polling of the defined servers, should they all reject the connection request. This defines a polling interval for the group of servers.

III.2   Configuration

The factory default firmware is not TCP CLIENT. You must first activate the required firmware. Please refer to the port server user manual for information about how to do this.

The port server comes with defaults settings for the TCP CLIENT firmware. These settings can be reinstated with the "**set default**" command. Important settings are:

- **sendtrigger**: by default the port server sends incoming serial data onto the network when some idle time elapse after the last character received. You can set alternate conditions. See the detailed documentation of this command.
- **flow control**: by default the port server uses no local flow control. Often you will want to change this. See the detailed documentation of the "set serial" commands.

➤ Let's say that you connect the port server to a device that sends a continuous data flow at 1200 bauds. The default sendtrigger works, but since there is never an idle time in the serial flow, data is sent to the remote server only when a full packet is built, which is every 4.2 seconds using large 512 bytes chunks. While this keeps the network bandwidth use low, you might want the server to receive faster in smaller chunks. A better sendtrigger in this case is:

set sendtrigger charcount 10c

which sends evey 10 bytes, i.e. every 80ms at 1200 bauds. Do not forget also in this case:

set serial baudrate 1200

➤ Let's say that you connect the port server to a device which honors the XON/XOFF protocol. Then you can set it in the port server:

set serial xonxoff use

➤ Let's say that you connect the port server to a device which honors the RTS/CTS protocol. Then you can set it in the port server:

set serial rts flow
set serial cts flow

III.3   Led indicator

The diagnostic LED (red LED) blinks five times per second to indicate that connection with a server TCP is not established.

III.4   Using the SOCKET interface

Application software can use the SOCKET interface to communicate with a port server running the TCP CLIENT firmware. This involves setting up a TCP socket, and using it to listen for incoming connections. Usually server-side application sofware should activate keepalives.

IV.   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:

- general parameters
- network parameters
- wireless parameters
- serial parameters
- parameters available only for the "WLg" products range
- notes

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.***

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

set	**prog enable**	*seg*	TCPCLIENT	execute after next reset the current firmware located in segment *seg*.
show	**prog enable**		firmware located in seg /5	Display this firmware.
show	**prog list**			display information about all 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**		Factory defined		display Ethernet 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 enforced on DHCP option 61 (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 default client ID.
show	**net dhcp clientid**				display custom client ID
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*	64 ("WLg") 10 (others)		change/display the number of gateway hops. mmm is **1** to **255**
set	**net keepalive**	*n t1 t2*	3/3/1 ("WLg") Off (others)		*n* defines the number of probes to send before closing the connection. *t1* defines the time in seconds before sending the first probe since the connection is inactive (the "activation delay" mentioned earlier). *t2* defines the time in seconds between each probes (the "interval delay mentioned earlier). *n* ranges from **1** to **255**. *t1* and *t2* range from **1** to **65535**. This command also resets the "**segtmo**" parameter to (t1 + t2 x n).
show	**net keepalive**				display keepalive parameters as "n probes, t1/t2 sec"; else "keepalive off".
set	**net keepalive**	**0 0 0**			disables use of the keep-alive feature.
set **show**	**net segtmo** **net segtmo**	*delay*	4 ("WLg") Off (0) (others)		*delay* defines the number of seconds the firmware will wait for acknowledgement of send data, after which it will consider that the network has failed and will abort the TCP connection. *delay* ranges from **0** (off) to **65535**. Setting "**keepalive**" changes "**segtmo**". display segtmo parameter value.
show	**net config port**		23		administration port

Command			Default value	Notes	Description
set	**net server**	*ArrayIndex IPaddress Port*			*arrayIndex*: index of the server in the servers array, **0** to **7**. The servers table is processed in increasing index numbers. *IPaddress* : IP address of TCP server in dotted decimal notation. *Port* : TCP data port of TCP server. Port is **1** to **65535**. Example : Set the TCP server at IP address 192.168.1.1, which runs an application listening to TCP port 3000, so that it is the first server called after a device power on: root> **set net server 0 192.168.1.1 3000**
set	**net server**	*ArayIndex* **0.0.0.0**			Delete the TCP server in *ArrayIndex*
set show	**net timeestcon net timeestcon**	*duration*	300 tenths of sec.		*duration* is the time allowed to establish a connection with a server. At end of duration, if connection is not established, a connection request is issued to the next server. *duration* is **1** to **65535** in tenths of second. *duration* is **0** to disable the timer.
set show	**net timepollserv net timepollserv**	*duration*	300 tenths of sec.	note 9	This timer avoids to poll permanently all servers in the array, if they all refuse the connection. This timer is launched at the connection attempt on the first server in the array. When the array is exhausted, it will not be looked up again until duration has expired. *Duration* is **1** to **65535** in tenths of second. Duration is **0** to disable the timer.

SETTING OR DISPLAYING THE NETWORK WIRELESS PARAMETERS
All commands of the "network wireless parameters" section are only valid for wireless device servers.

Command			Default value	Notes	Description
set **show**	**net ssid** **net ssid**	*ssid*	acsys		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*	Ad-hoc ("WLg") Infra (others)		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 **show**	**net wepkey** **net wepkey**	*keynum* **0**			delete wepkey *keynum* 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*	Ignore (WLg-range) Accept (other products)		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 avaible access points around.

SETTING OR DISPLAYING THE SERIAL PARAMETERS

Command			Default value	Notes	Description
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 opencon serial opencon	*mode*	permanent		TCP connection request event *mode* : one of **permanent / dsr / dsri / data** **permanent** : connection requests take place as soon as there is no active connection (see also timeouts effect) **dsr** : connection/disconnection requests take place whenever DSR rises/falls. **dsri** : same as "**dsr**" but the DSR fall forcefully resets the connection with immediate effect. **data** : (available on Ethernet ports servers with TCP-Client v2.6 only) connection is established only for the time necessary to send a data frame, delimited by the send trigger.
set show	serial dtr serial dtr	*mode*	high		DTR management**.** *mode* is one of **modem/high/low.** **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). **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 **high/low/flow.** **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 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* is one of **ignore** *mode* : always **ignore**.
set show	serial ring serial ring	*mode*	ignore		RING management **:** *mode* : always **ignore**
set show	serial baudrate serial baudrate	*speed*	9600		*speed* : any baud rate from **10** bauds to **230400** bauds (up to 1'000'000 on RS422/RS485 "WLg" products)

Command			Default value	Notes	Description
set	**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. (*nbits*=**6** bits is also supported on the "WLg" range)
show	**serial format**				
set	**serial xonxoff**	*mode*	ignore		software flow control :
show	**serial xonxoff**				*mode* is one of **use** or **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*	3 ms ("WLg" products) 2 char times (others)	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 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 since the last character was received, after which, all data received will be sent. 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.

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 <u>authorized characters</u> are: **A** to **Z**, **a** to **z**, **0** to **9**, *****, **?**, **"**, **–**, **underscore**, **.**, **:**, **space** .

(9) TimePollServ parameter example with 3 servers initialized