

ESCG

802.11 a/b/g

WLAN-Client Adapter and Bridge

Manual



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System Overview

The ESCG is intended to connect devices with ethernet or serial interfaces to a Wireless Local Area Network (WLAN) corresponding to the 802.11 a/b/g standard.

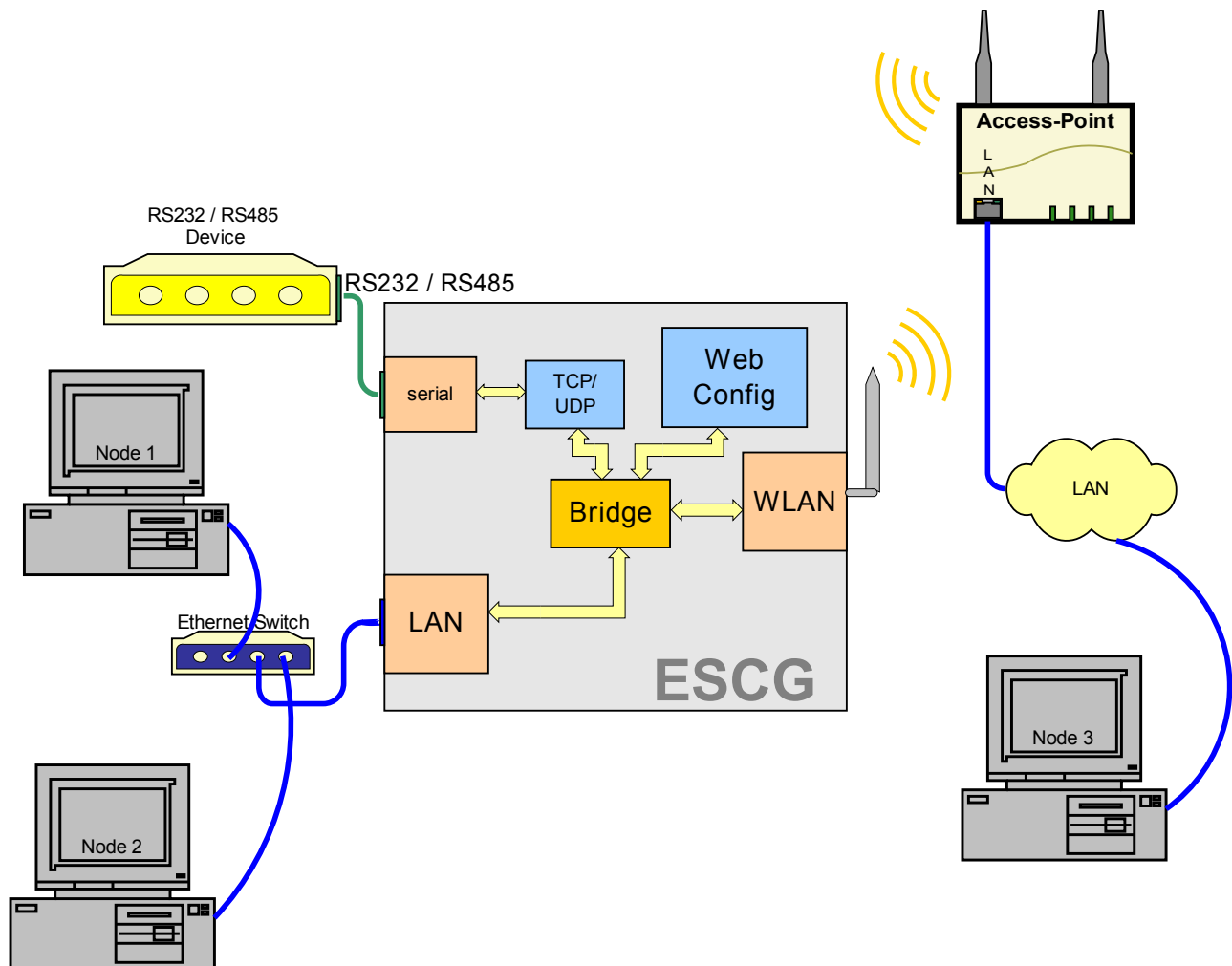


Illustration 1: System overview

The ESCG can receive and transmit data via a Ethernet LAN port and can transfer this data via a WLAN Interface to a matching WLAN access point that is connected to a stationary LAN.

The ESCG can also receive and transmit data via a serial port. This data can be exchanged via a TCP- or UDP-Socket with other devices by using the LAN or WLAN interfaces of the ESCG.

The ESCG needs many parameters to handle all the different interfaces. The ESCG supports a Web interface to configure all these parameters. In addition a further interface is available to locate, configure, update and to monitor the ESCG. This interface is used by the ESCG-Config-Program.

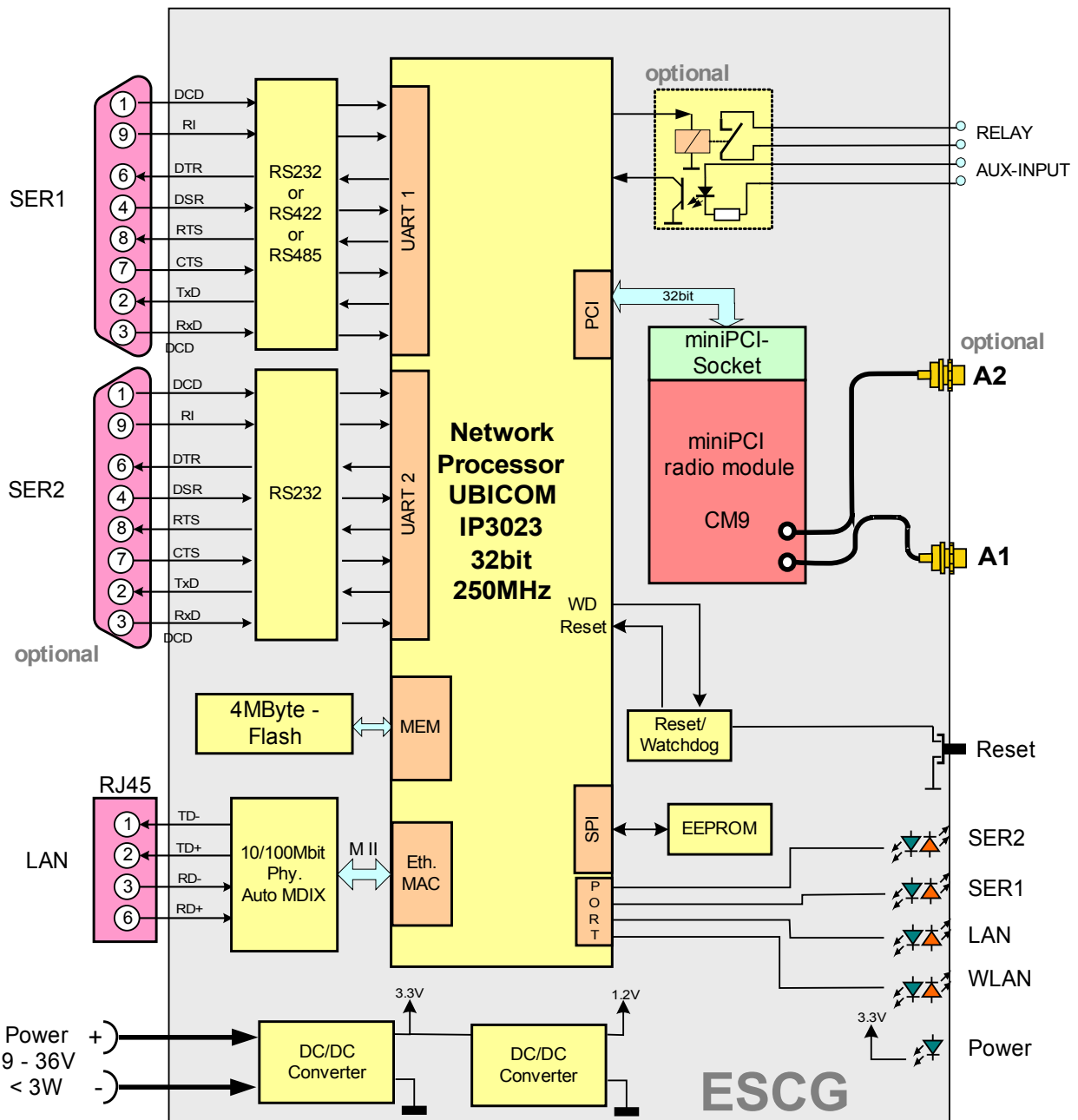


Illustration 2: Block schematic

Connections to the ESCG

The core of the ESCG is a 32bit network processor that controls all functions.

The interfaces are:

- 1) Mini-PCI-Socket
- 2) Ethernet-Interface 10/100 MBit + auto MDI (auto crossover function)
- 3) 1 or 2 serial interfaces with 6 status lines each
- 4) optional: Relay contact and AUX input with optocouple

The Ethernet port has a RJ45 plug. Because of the auto MDI functionality the ESCG can be attached to a HUB or the LAN port of a computer with standard patch cables. The ESCG recognizes the cable polarity and automatically connects the right signal lines.

The serial port is a 9 pin female D-SUB connector. The pinout makes it possible to connect to a computer COM port with a 1 to 1 serial cable. The exact pinout is shown in Illustration 3 below.

In the standard version the power supply should be 8 – 30VDC / 3W. At 12VDC the input current is typically 250mA.

Back and front view:

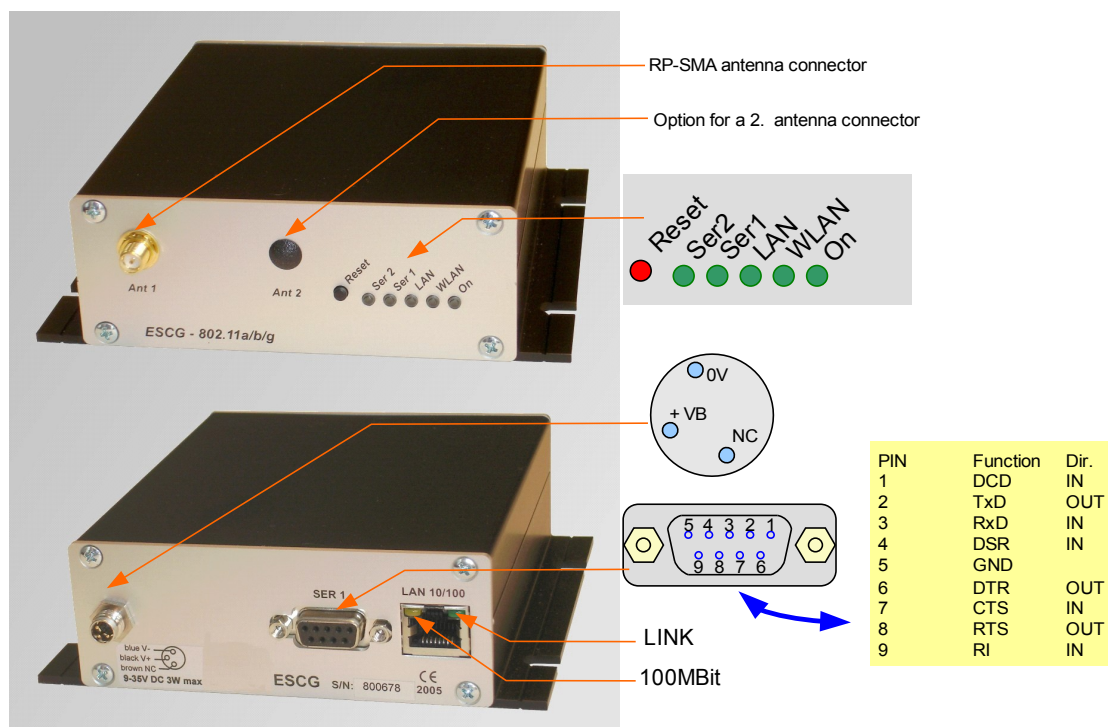


Illustration 3: Connections and LED's

LED	Function
On	Green always on when power is on
WLAN	Red blinking searching for RF-connection (scanning) Steady green found a suitable Access-Point and established a connection Green blinking 802.1x Authentication is in process Green + red blinking RF activity (receive or transmit)
LAN	Off no link is recognized Green link is established with another LAN device. Green + red blinking activity on the LAN interface
Ser1 (2)	Off interface is inactive or not connected to the other (W)LAN-.communication side Green connected to other serial device. Green + red blinking activity on the serial interface (receive or transmit)

Technical features

Processor	Type	32bit network processor 250MHz clock
	Memory	256KByte program (internal) 64KByte data (internal) 4MByte flash (external) 4MByte SDRAM (external, optional)
Interface	Ethernet	10/100 Mbps fast Ethernet auto MDI/MDIX
	Serial 1	RS232 with control lines RTS, CTS, DSR, DTR,DCD (input), RI (input) (optional as RS485, RS422)
	Serial 2	Same as serial 1 but only RS232
	Mini-PCI	Socket for RF cards with Atheros chipsets (AR5112, AR5113, AR5414)
	Relay (optional)	Relay contact can be operated over LAN or WLAN Connection with circular M8-4pin connector with screw locking
	AUX input (optional)	Isolated input with optocouple
LEDs	LEDs	- Power (green) - WLAN (green, red) - LAN (green, red) - SER1 (green, red) - SER2 (green, red)
Power supply	Connector	Standard: DC jack (2.1mm pin / 5.5mm hole) optional: Circular M8-3pin connector with screw locking
	Power consumption	< 2.5W (typ.) < 3W (max.)
	Voltage range	Standard: 8-30V non isolated optional: 18-72V or 9-36V isolated
Temperature range		operating 0 - 70°C (32 - 158°F) storage -20 - 80°C (-4 - 176°F)
Dimensions	Board	120x100x20mm
	Case	standard: 125x105x40mm
	Weight	approx. 500g

WLAN - Interface

WLAN	Encryption	64, 128bit WEP, TKIP, AES
	Security	802.11i WPA + WPA2 (Wifi Protected Access) (PSK/TKIP/AES) 802.1x (EAP-(T)TLS, EAP-PEAP), LEAP
	Data rates	802.11b 11, 5.5, 2 & 1 MBit/Sec. 802.11g 54, 48, 36, 24, 18, 12, 9, 6 MBit/Sec. 802.11a 54, 48, 36, 24, 18, 12, 9, 6 MBit/Sec.
	Frequencies	ISM band: 2.400 MHz to 2.483 MHz U-NII band: 5.150 MHz to 5.350 MHz (ETSI, RegTP indoor) 5.470 MHz to 5.725 MHz (ETSI, RegTP outdoor)
	Channels	802.11b/g: ETSI: 1-13, (3 non overlapping) 802.11a: ETSI: 19 non overlapping (5.150-5.350 & 5.470-5.725 MHz)
	Power output	802.11b/g: 18dBm peak 802.11a: 18 or 17dBm

First Time Setup

To set up the ESCG it has to be connected with a patch cable to the Ethernet interface of a computer. Because of the auto MDI/MDIX capability, you can use a straight or crossover patch cable.

After applying power, the green “Link LED” on the RJ45 connector shines when a link is detected. The yellow “100 MBit LED” indicates whether the connection is capable of 100 MBit.

The “LAN” LED on the front panel shines green when a connection has been established via the Ethernet. The “WLAN” LED on the front panel will be blinking red because usually no suitable WLAN is recognized.

The ESCG-Config Program

To do the „first time setup“ the ESCG has to be connected via the LAN-Interface to the computer (PC) that runs the ESCG-Config-Program.

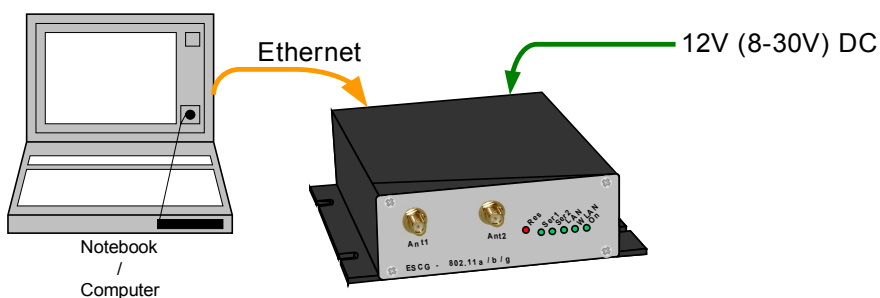


Illustration 4: arrangement to configure the ESCG

You have to observe:

- The connected PC should have an fixed IP address. (no DHCP)
- The LAN-Interface at the PC must be detected as connected. Check the parameter of the LAN-Interface with the „ipconfig“-command.
- If the LAN-Interface of the PC is correctly recognized then press the „refresh“-button of the ESCG-config-program.
- An active firewall could prevent the communication to the ESCG.

After the start the ESCG-Config-Program ascertained all network interfaces that are active at the PC. After that the ESCG-Config-Program sends broadcast UDP requests to all these interfaces. The registered answers of the ESCG devices are shown in a list.

No.	Name	SN	Vers.	IP-Address	ESCG-MAC	SSID	AP Mac / Name	Signal	Bitrate	Key	Ch.	LAN
1	WL...	809123	2.18a	192.168.170.106	00:0b:6b:86:9e:ff	WLC2106	AP_250	30	54MBit	EAP-TLS	64	UP
2	ESCG	800295	2.18a	192.168.170.109	00:0b:6b:37:4f:0a	WLC2106	AP_250	52	54MBit	EAP-PEAP	64	DOWN

IP: 192.168.170.163

Illustration 5: ESCG-config screenshot

All located ESCG-Devices are shown in a list with there station names, firmware versions and addresses.
The WLAN connection is also shown with a signal quality value.
The value can be interpreted as follows:

Signal $\geq 40 \rightarrow$ connection very good

Signal $\geq 30 \rightarrow$ connection good

Signal $\geq 20 \rightarrow$ connection is ok, but the ESCG starts to search for better AP's.

Signal $< 20 \rightarrow$ connection restricted, the bit rates will be lowered.

Reset to factory default

The factory default settings can be restored by pressing the reset button located on the front panel for a longer period. After about 5 seconds the LEDs "SER1" and "SER2" starts blinking red and green alternately. By keeping the button depressed the factory default values are restored. After finishing all LEDs except the "ON" LED are turned off. Now the reset button can be released.

main factory default values:

SSID =	"ESCG_WLAN"
WEP =	OFF
WPA =	OFF
MODE=	802.11b/g

IP =	192.168.170.100
Netmask =	255.255.255.0
Gateway =	192.168.170.1

SER1+2 :	off
802.1x user:	„admin“
802.1x password:	„password“

Parameter setting via WEB interface

Information page

General informations regarding firmware versions and status reports are shown on this page.

The screenshot shows the 'Information and Status' page of the ESCG web interface. The page has a teal header with 'ESCG' and '802.11a/b/g WLAN-Bridge + Serial Client Adapter'. A left sidebar contains navigation links: Information, APs, Wireless, Security, Admin, Advanced, Serial Port 1, Serial Port 2, Relay, AUX-Input, and Ping Test. The main content area is divided into sections: Bridge Information, WLAN - Info, IP - Info, Ethernet - Info, Serial Interfaces, Input / Output, and WGB Mode Information. Blue arrows point from various data fields to callout boxes on the right, explaining the information. A callout at the bottom left points to the 'Client 1' and 'Client 2' entries in the WGB Mode section.

Information and Status
NOTE: You may need to reload this page to see the current settings.

Bridge Information
Serial Number: 809123
Bridge Name: WLCTest
MAC Address: 000B6B869EFF
Firmware-Version: ESCG 2.18a
Device-Uptime: 0Days 00h 00m 35s

WLAN - Info
SSID: WLC2106
MAC-Addr. of AP: 0019A90ED1DF
Current transmit rate: 36 Mbit/s
Current channel: 64 (5GHz)
SNR: 35dB
Security: WPA EAP-TLS
Certificates: Root: cacert.der

IP - Info
Device IP: 192.168.170.106 (Static)
Gateway IP: 192.168.170.249
Subnet Mask: 255.255.255.0

Ethernet - Info
Link state: Up
Link speed: 100 Mbit/s full duplex
Connection type: straight through

Serial Interfaces
Serial Port 1: not connected | Mode = TCP-Server
Serial Port 2: not connected | Mode = TCP-Server

Input / Output
Board-Relay: UDP listen on Port 9000 (Status = OFF)
Input-Line: switch Board-Relay ON

WGB Mode Information
Client 1: IP 192.168.170.130 MAC:00E000156CD1
Client 2: IP 192.168.170.132 MAC:0018F8953156

Annotations:

- ESCG serial number
- Device name
- MAC address of internal RF card
- Firmware version
- Run time since switching on or last reset respectively.
- Network name (SSID)
- WLAN Connection AP MAC-Addr Transmission Rate used channel SNR Signal to Noise Ratio
- Used encryption: none, WEP, WPA, EAP-xxx
- If encryption = EAP-xxx the stored certificates are shown here.
- Current ESCP IP address - static - DHCP = assigned by DHCP server
- Status LAN-Interface: Link state: „Up“ = connected „Down“ = no connection Link speed: - 100MBit full (half) duplex - 10MBit full (half) duplex Connection type: - straight through - crossed
- Setting and state of serial interfaces and AUX input / relay output if available.
- The connected clients at the LAN port of the ESCG are shown in this list.

Illustration 6: Information page

On the left hand side are links to different setup and information pages.

- Information the page above(Illustration 6)
- APs a table with all access points currently seen by the ESCG (Illustration 7).
- Wireless WLAN interface setup (SSID, mode, frequencies etc.) (Illustration 8)
- Security Encryption setup (WPA, WEP) (Illustration 9)
- Admin
 - reboot ESCG
 - reset all parameters to default.

- firmware updates
- configure IP-address, subnet mask, gateway IP
- configure setup options
- enter username and password (Illustration 12)
- serial Port 1 setup of serial port 1 (Illustration 19)
- serial Port 2 setup of serial port 2
- Relay internal relay setup. (Illustration 20)
- AUX-input optocouple input setup. (Illustration 21)
- Ping Test settings for a special mode to test the WLAN connection.

Access point page

Information on all access points currently available to the ESCG.

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802.11a/b/g WLAN-Bridge + Serial Client Adapter

Access Points
This is a list of available access points.

MAC address	SSID	Name	Ch	Mode	Encr	RSSI	Time	Last Seen
0A0B6B33E78D	ESCG_WLAN	L-54A/G 1	11g	NONE	45dB	30 sec	0 sec	
001349F4465C	DSLWLANModem200	- ??? - 6	11g	WPA	3dB	0 sec	31 sec	
0019A90ED1D0	WLC2106	AP_250 11	11g	WPA	45dB	0 sec	31 sec	
0003C9A3D5F8	physioTherme	- ??? - 11	11g	WEP	29dB	0 sec	31 sec	
001D19E7022A	Arcoor-E70204	- ??? - 9	11g	WPA	15dB	0 sec	31 sec	
0012BFACCAAF	Shou_Zhong-extern	- ??? - 2	11g	WPA	36dB	0 sec	0 sec	
00036DF2E13C	WLAN-01	- ??? - 10	11b	WEP	6dB	0 sec	30 sec	
0019A90EE680	WLC2106	AP_252 1	11g	WPA	49dB	0 sec	0 sec	
0019A90EE681	WLC2106_WEP128	AP_252 1	11g	WEP	49dB	0 sec	0 sec	
001F3F56D9CA	FRITZ!Box Fon WLAN 7113	- ??? - 1	11g	WPA	3dB	0 sec	0 sec	
020B6B33E78D	- Not available -	L-54A/G 1	11g	WEP	46dB	0 sec	0 sec	

Annotations:

- SSID**, Service Set Identifier. This is the name of the access point and the connected open network. If the name is red, the ESCG is currently connected to it. Not available means the SSID is hidden (closed network)
- Access point name. If not available: „???”
- Access points channel number
- Access point mode
11b = 11MBit
11g = 54MBit
- Connection time: this shows how long the ESCG is or has been connected to that AP
- RSSI, Received Signal Strength Indication. Indicates the signal strength for the reception from this access point
< 10 very poor
10 - 20 poor
20 - 40 good
>40 very good
- Used encryption:
NONE
WPA
WEP
- Access point MAC address

Illustration 7: Access point page

Wireless page

Configuring the WLAN interface

The screenshot shows the 'Basic Wireless' configuration page for the ESCG 802.11a/b/g WLAN-Bridge + Serial Client Adapter. The page includes a sidebar with navigation links: Information, APs, Wireless, Security, Admin, Advanced, Serial Port 1, Serial Port 2, Relay, AUX-Input, and Ping Test. The main configuration area contains the following settings:

- Wireless On/Off:** Radio buttons for ON (selected) and OFF.
- Wireless Mode:** Radio buttons for Infrastructure (selected) and Ad-hoc.
- Wireless Network Name (SSID):** Text field containing 'ESCG_WLAN'.
- Transmission rate (Mbits/s):** Dropdown menu set to 'Best (automatic)'.
- Transmitter Power (dBm):** Radio buttons for 1, 3, 5, 10, 15, and max. (selected).
- 802.11 Mode:** Dropdown menu set to 'Mixed 802.11g and 802.11b'.
- AP Density:** Dropdown menu set to 'low'.
- Super mode:** Dropdown menu set to 'Disabled'.
- Country:** Dropdown menu set to 'Germany'.
- Antenna Mode:** Radio buttons for Diversity (selected) and Single.
- 802.11a Frequency Bands:** Dropdown menu set to 'Band 1+2+3'.
- Channel:** Dropdown menu set to '2.412 GHz - CH 1'.

Annotations on the right side of the page explain the function of each setting:

- Switch the WLAN radio on or off:** Points to the Wireless On/Off radio buttons.
- Wireless mode:** Infrastructure = Connect to AP; Ad hoc = peer to peer connection. Points to the Wireless Mode radio buttons.
- SSID, Service Set Identifier:** Name of the WLAN network. This name must be the same as the access points SSID. Points to the Wireless Network Name (SSID) text field.
- Transmission rate:** Best = automatic depending on signal strength. If useful, you can select a fixed bitrate. Points to the Transmission rate (Mbits/s) dropdown menu.
- Transmit power:** Points to the Transmitter Power (dBm) radio buttons.
- 802.11 mode:** 802.11b = 2.4GHz 11MBit; 802.11g = 2.4GHz 54MBit; 802.11b/g = 2.4GHz 11 + 54MBit; 802.11a = 5GHz 54MBit. Points to the 802.11 Mode dropdown menu.
- AP Density:** influences the roaming behaviour. Points to the AP Density dropdown menu.
- Country:** Select the country in which the ESCG is used. This determines the number of available channels. Points to the Country dropdown menu.
- Antenna mode:** single = when one antenna is used; diversity = when two antennas are used. With two antennas the radio can select the antenna that delivers the best signal. Points to the Antenna Mode radio buttons.
- 802.11a Frequency Bands:** possible channel restriction for the 5GHz (802.11a) operation. Points to the 802.11a Frequency Bands dropdown menu.
- Channel:** This channel has to be selected in ad hoc mode only. Points to the Channel dropdown menu.

Illustration 8: Wireless page

I

By clicking the “Save” button all changes on this page are stored. Use “Cancel” to undo any changes. After clicking “Save” the program prompts the user to make a reboot. This should be done after all necessary changes on all pages have been made.

Security page

Setting up the security options.

If the user selects the 802.1x authentication the PSK or the WEP-Keys don't have to be defined because the ESCG and the Radius-Server will determine these parameters automatically.

ESCG
802.11a/b/g WLAN-Bridge + Serial Client Adapter

Security and Encryption Settings
On this page you can set the 802.11a/g security and encryption options. Any new settings will not take effect until the bridge is rebooted.

Save Cancel

802.1x configuration
Enable 802.1x to require stations to use Authentication over EAP.

802.1x Authentication ☐

EAP Mode **EAP-PEAP**
Select the 802.1x Method.

802.1x user **admin**

802.1x password **admin@123456**

WPA configuration
Enable WPA Authenticator to require stations to use high grade encryption and authentication.

WPA Enable ☐

WPA Mode **WPA**
Select the WPA Mode.

Cipher Type **TKIP**
Select the cipher type.

PSK
Enter a text pass phrase between 8 and 63 characters.

WEP configuration
WEP is the wireless encryption standard. To use it you must enter the same key(s) into the bridge and the access point. For 64 bit keys you must enter 10 hex digits into each key box. For 128 bit keys you must enter 26 hex digits into each key box. A hex digit is either a number from 0 to 9 or a letter from A to F. If you leave a key box blank then this means a key of all zeros.

Enable WEP ☒
Check this box to enable WEP. For the most secure use of WEP, also set authentication type to "Shared Key" when WEP is enabled.

Default WEP key to use **WEP Key 1**
Select the key to be used as the default key. Data transmissions are always encrypted using the default key. The other keys can only be used to decrypt received data.

Authentication **Open**
Select the type of authentication used when connecting to an access point. 'Open' is used if anyone can connect to the AP. 'Shared key' is used if both devices must know the encryption key.

WEP key lengths **128 bit (26 hex digits)**
Select the WEP key size. This length applies to all keys.

WEP key 1 **AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA**

WEP key 2

WEP key 3

WEP key 4

Annotations:

- Enable authentication with radius server
- Select authentication method 1
EAP-PEAP
EAP-TLS
EAP-TTLS
LEAP (CISCO spec.)
- Username and Password
- Enable WPA and select WPA mode
WPA = encryption with RC4
WPA2 = encryption conforming to AES
- Select cipher type
- PSK = Pre Shared Key for authentication with access point
- Default WEP key for data transmission
- Authentication type for registration with an access point
- WEP key length
64 bit or 128 bit
- Enter keys as hex digits
10 digits for 64 bit WEP
26 digits for 128 bit WEP
- There must be at least one key that is defined as default WEP key

Illustration 9: Security page

Admin page

Setting up administration rights and configure basic features, update firmware

The screenshot shows the ESCG Administration page with various configuration sections. Annotations with arrows point to specific elements:

- Reboot ESCG**: Points to the 'Reboot' button in the 'Device Control' section.
- Restore ESCG configuration to default values**: Points to the 'Reset Configuration' button in the 'Device Control' section.
- Select firmware file**: Points to the 'Durchsuchen...' button in the 'Firmware Upgrade' section.
- Upload firmware to ESCG**: Points to the 'Upload' button in the 'Firmware Upgrade' section.
- Device name**: Points to the 'Device name' input field, which contains 'ESCG'. A note explains: 'This is a name to identify the ESCG by external configuration and IP address lookup programs, i.e. the locator program. This is not the SSID'.
- IP address**: Points to the 'IP Address Mode' radio buttons. A note explains: 'By selecting "DHCP" the ESCG is assigned the IP address from a DHCP server on the network. By selecting "Static" the IP address is fixed. In this case the network mask has to be defined and possibly the default gateway.'
- Enable more configuration options**: Points to the 'Telnet-Config' checkbox. A note explains: 'Telnet-Config: Configuration option via an telnet server socket (TCP-Port 23). Is Interface is compatible to the ESC-Config-Programm of the older 11MBit-ESC device'. It also points to the 'disable wireless config' checkbox with a note: 'disable wireless config: for security reasons it is possible to prevent the configuration via WLAN.'
- Option to block the bridging function of the ESCG**: Points to the 'disable Bridge' checkbox. A note explains: 'This could be useful when the ESCG only works as a serial client adapter. The configuration via LAN-Interface is not blocked with this option.'
- Enter user name and password to protect the ESCG from unauthorized access**: Points to the 'User name' and 'Administrator password' input fields. A note explains: 'This is the user name that you must type when logging in to these web pages.' and 'This is the password that you must type when logging in to these web pages. You must enter the same password into both boxes, for confirmation'.

Illustration 10: Administration page

Advanced page

The advanced page offers more detailed options to define the behavior of the ESCG in the WLAN environment.

Cloning

The cloning parameter defines the MAC address of the ESCG's radio. Usually the ESCG leaves the MAC address at the manufacturers value. All devices which are connected to the ESCG's ethernet port use this MAC address for communication via WLAN.

The ESCG keeps a table where the original MAC address of the connected device is linked to its IP address.

If a data package arrives at the ESCG on the ethernet port, the ESCG first checks if there is an entry in its table with the source MAC address of this device. If the answer is no, this MAC address is added to the table.

Next it checks if there is an entry for the target MAC address.

If the answer is yes it means that the receiver of this data packet is located on the wired side of the ESCG and therefore there is no need to send it over the wireless radio.

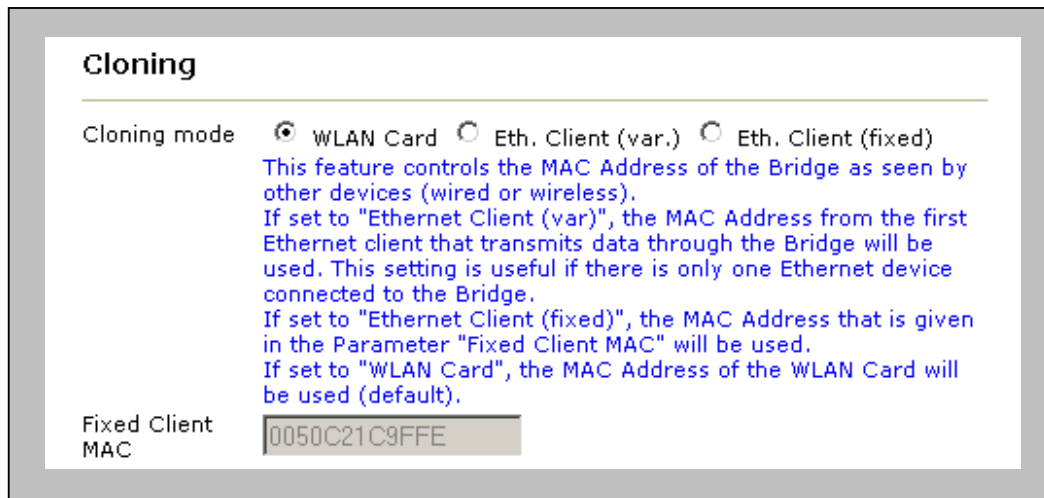
If the answer is no, the source MAC address is replaced by the radio's MAC address and the data package is sent over the radio to the WLAN

If the ESCG receives a data package from the WLAN, it first extracts the target IP address. Next it looks up the corresponding MAC address in its table. This MAC address is placed in the data package which is then sent over the ethernet port to the connected devices.

With this method several devices can be connected to the ESCG.

This procedure only works in LAN's / WLAN's that use the IP protocol. If other protocols are used, the ESCG can be forced to transfer the MAC address of the first data packet that arrives on the ethernet port to the radio. This method is called cloning. It ensures that all data packages intended for the connected device are received by the ESCG. The ESCG can forward the data to the ethernet port without any further processing. This method allows only one device to be connected to the ESCG ethernet port. This strategy is activated by selection the option "Eth. Client (var)".

With the option "Eth. Client (fixed)" the user can defined a MAC address that the ESCG will use for the WLAN Connection.



The screenshot shows a web interface titled "Cloning". It contains three radio buttons for "Cloning mode": "WLAN Card" (selected), "Eth. Client (var.)", and "Eth. Client (fixed)". Below these is a detailed explanation of the feature: "This feature controls the MAC Address of the Bridge as seen by other devices (wired or wireless). If set to 'Ethernet Client (var)', the MAC Address from the first Ethernet client that transmits data through the Bridge will be used. This setting is useful if there is only one Ethernet device connected to the Bridge. If set to 'Ethernet Client (fixed)', the MAC Address that is given in the Parameter 'Fixed Client MAC' will be used. If set to 'WLAN Card', the MAC Address of the WLAN Card will be used (default).". At the bottom, there is a label "Fixed Client MAC" next to a text input field containing the value "0050C21C9FFE".

Illustration 11: Cloning section

Advanced bridging

Because some WLAN-Systems (especially centralized solutions like wireless LAN controller) don't accept that 2 different devices with different IP addresses are working with the same MAC-Address, it is possible to hide the IP-Address of the ESCG to the WLAN side.

To reach the ESCG from the WLAN side you have to define the IP address of the client that is connected to the LAN port of the ESCG.

If the connected client also operates a webserver on TCP port 80 an alternative webserver port for the ESCG can be defined. To reach the webside of the ESCG with the configuration shown in (Illustration 12) you have to input the address "192.168.170.130:8033" to the webbrowser.

Advanced bridging

hide device IP to WLAN

☒

This option is only usefull if the device is used as a ethernet client bridge. If this option is active, the IP address of the device will not appear to the WLAN side. This is usefull for WLAN system (AP's) with activated ARP caching. Read the manual for more information.

Ethernet Client IP

192.168.170.130

IP Address of the Client connected to the LAN-Port. Set to "0.0.0.0" if unknown or variable

Alternative webservice port

8033

Alternative webservice port for the web interface via WLAN
http://ClientIP:AlternativePort

Illustration 12: Configuration example

WGB-Mode (Workgroup Bridge)

The WGB-Mode works exclusively in environments with CISCO access points and (or) CISCO Wireless LAN controller (WLC). If the ESCG works in systems with CISCO WLC's it is strongly recommended to configure the ESCG to work in WGB-Mode.

CISCO had implemented this special mode for client adapters. In this mode the clients which are connected to the LAN port of the ESCG are separately declared as WGB – clients to the wireless controller. The clients are communicating with there own MAC addresses via WLAN.

The top screenshot shows the 'Clients' table with the following data:

Client MAC Addr	AP Name	WLAN Profile	Protocol	Status	Auth	Port	WGB
00:90:4b:dd:53:a9	AP_252	WLC2106	802.11g	Associated	Yes	1	Yes
00:e0:00:15:6c:d1	AP_252	WLC2106	802.11b	Associated	Yes	1	No

The bottom screenshot shows the 'WGB Wired Clients' table with the following data:

Client MAC Addr	AP Name	WLAN Profile	Protocol	Status	Auth	Port
00:e0:00:15:6c:d1	AP_252	WLC2106	802.11b	Associated	Yes	1

Arrows indicate that the entry with MAC address 00:e0:00:15:6c:d1 is linked between the 'Clients' table and the 'WGB Wired Clients' table.

Illustration 13: Screenshots of the client table from a CISCO WLC 2106

The configuration of the WGB-mode can be completed by the definition of the IP addresses of the clients which are connected to the LAN Port. This is recommended for clients that don't communicate constantly. With a defined client entry in the WGB section, the ESCG can ping this client after startup. If the client answers the device can login the client to the wireless controller. A non defined client can only be announced to the wireless controller when the first ethernet data has been received to the ESCG.

Workgroup bridging

Workgroup Bridge Mode

☒

Client IP1

192.168.170.130

Client IP2

0.0.0.0

Client IP3

0.0.0.0

Client IP4

0.0.0.0

Client IP5

0.0.0.0

Check this box to enable the Workgroup Bridge (WGB) Mode. This is only useful in CISCO environments. It is recommended to define the IP-Addresses of the clients that will be connected to the LAN-Port. This should be done for clients that are working in a passive mode (servers).

Illustration 14: Configuration example

Roaming

Roaming is the term for automatically changing to another access point when the ESCG recognizes a decreasing RF signal level when leaving the covered area of the current access point and a better level with another AP is available.

For this purpose the ESCG keeps a table with a list of access points from which it is receiving signals (beacons).

To receive these beacons the ESCG has to tune to the different channels and listen for incoming signals for a certain amount of time. This hampers the regular data traffic which the ESCG has to process. Therefore this procedure is handled in different ways depending on the current signal level.

To make this procedure even more effective, the user can restrict the channels where the ESCG is allowed to look for beacons of other access points.

Roaming

Channels for Roaming

Set the channels which the infrastructure system (AP's) use. So the device can optimize the roaming. Input the channel numbers seperated with ','

Illustration 15: Roaming channels

Ethernet Port

Check this option to enable manual settings for the ethernet port.

Ethernet Port

Manual Config

☒

Bitrate

☐ 10 Mbit/s
☒ 100 Mbit/s

Duplex Selection

☐ half duplex
☒ full duplex

LAN Cable Type

☒ straight through
☐ crossed

Check this box to enable manual settings for the ethernet port.

Illustration 16: Manual settings for the ethernet port

DHCP-Relay-Agent

Check this option to enable the DHCP-Relay-Agent of the ESCG. This is useful if the connected clients at the ethernet port of the ESCG are using DHCP. This option is not active in WGB-Mode.

Serial interface setup

The ESCG can have one or two serial interfaces, depending on the options. Each interface is configured on its own WEB page.

Network configuration

There are different modes available for the use of the serial interfaces:

1) **TCP/IP server mode:**

In this mode the ESCG opens a socket in a “listen mode”, which means that it is waiting on a certain port (local port) for a connection. The ESCG only holds one connection at a time. In this mode only the port number has to be specified.

2) **TCP/IP client mode:**

In this mode the ESCG actively opens a TCP connection on the specified port of another network node. This node can be another ESCG or a computer which is waiting for a connection on the specified port. In this mode the port number and the IP address of the connected device have to be specified.

3) **UDP/IP mode:**

In this mode the ESCG is waiting for data on the “local port” which are sent with UDP/IP. The received data are then sent to the “remote port” of the remote IP address. The UDP should be used in circumstances where the communication between the devices is frequently interrupted. It should be considered though that the UDP protocol does not guarantee the correct transfer of data.

4) **Printerserver mode:**

In this mode the ESCG starts a TCP/IP socket in server mode which is waiting for a connection on port 515. The ESCG is then able to execute print jobs corresponding to RFC1179. If you want to enable a printer with this method under Windows, it has to be set up like the following example:

Example:

Windows setup for a printer connected over LPR

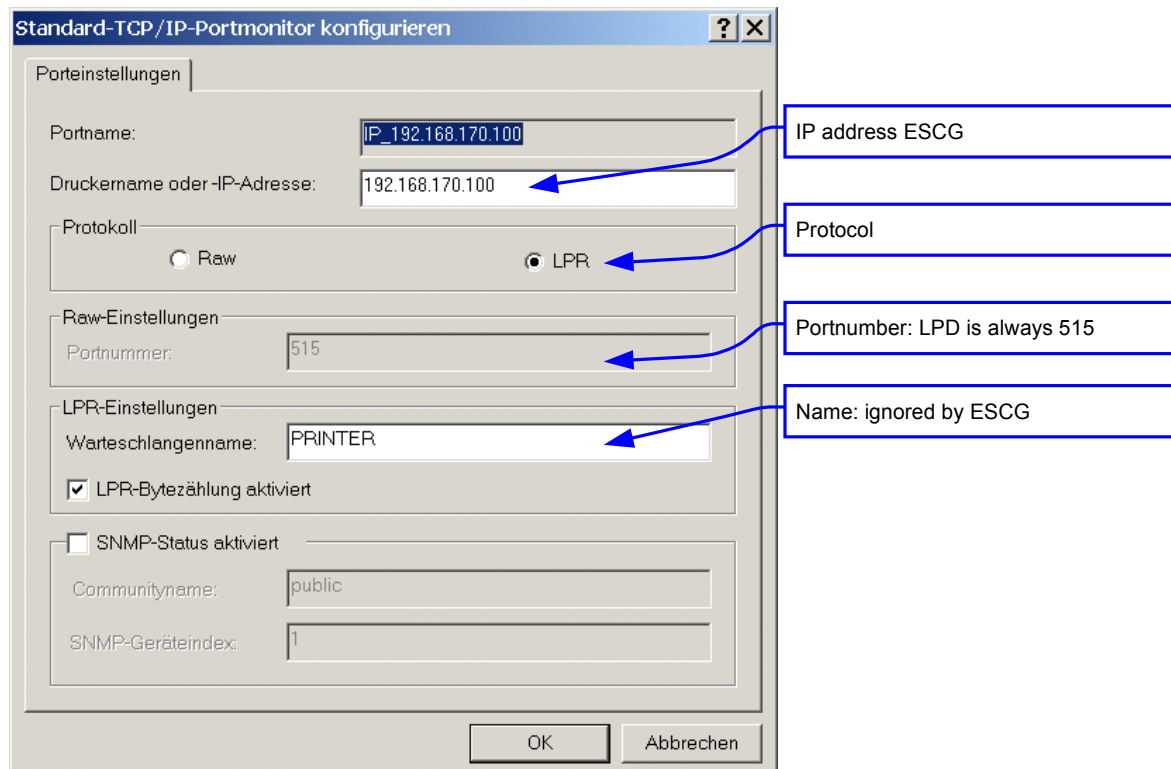


Illustration 17: Windows TCP/IP port monitor

5) **COM server mode:**

In this mode the ESCG provides virtual COM ports under Windows. For this purpose a software tool from the company Wiesemann & Theis (www.wut.de) has to be installed. The tool is named “COM Umlenkung”.

This tool enables the ESCG to connect to serial devices over LAN/WLAN. After installation of the software enter the ESCG IP address and port number.
Please take notice of the license regulations of Wiesemann & Theis to use this tool.

Comment to the multicast settings

In the Multicast-Mode serial busmembers who are communicating with RS485 interfaces can be connected via the (W)LAN. Depending which task the serial device takes it is possible to configure different modes:

1. Slave
2. Master
3. Multimaster

As a slave the ESCG receives data on the configured multicast address and sends this data to the serial interface. Data that is received from the serial line is sent to the given unicast IP address.

As a master the ESCG receives data from the unicast IP address and transmits data to the multicast IP address.

In multimaster mode all transfers are done via the multicast IP address.

sample application:

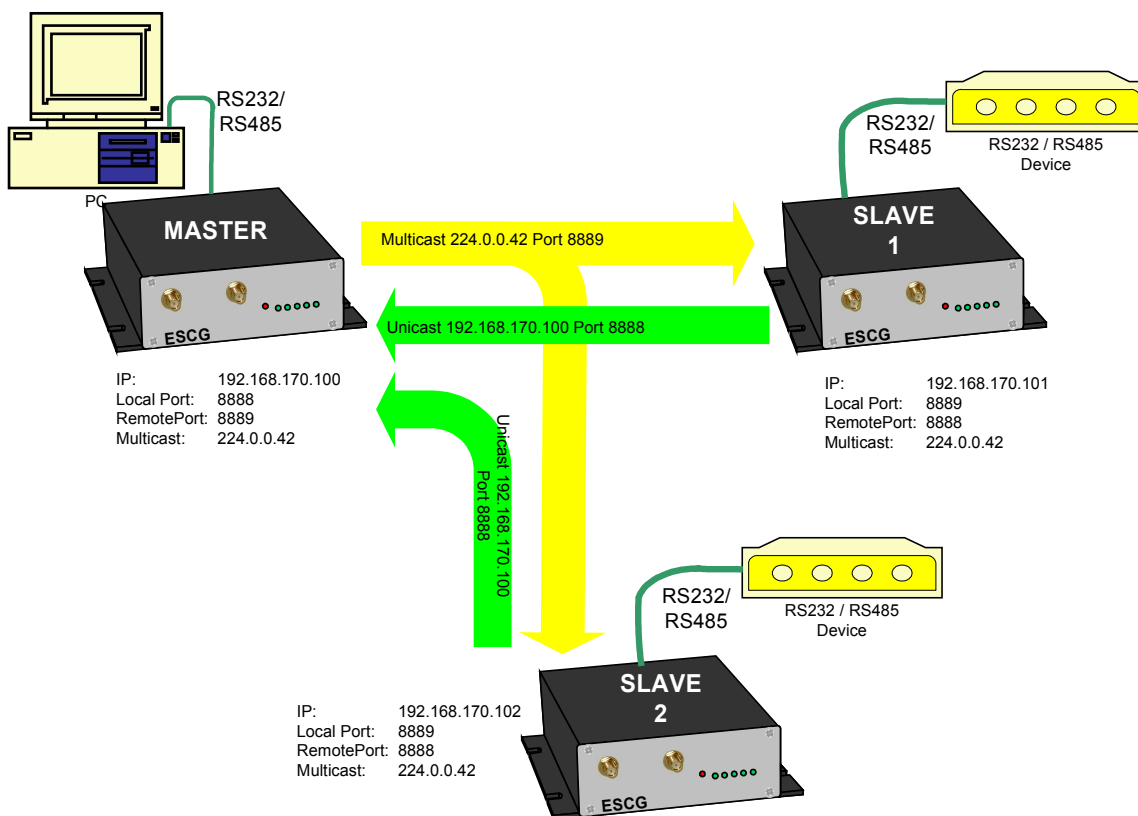


Illustration 18: Multicast-mode

“Keep alive“ settings

A TCP/IP connection remains open after being established until one of the communicating devices closes the connection. If the physical connection between the ESCG and the other device is interrupted without closing the TCP/IP connection, there is a possibility that the ESCG is not able to reconnect. The TCP/IP socket can be programmed to send an empty data package to the communication partner in regular intervals (keep alive period). If the communication partner supports this mode, it sends a corresponding answer. This answer is proof that the connection is still intact. If there is no answer for a number of times (keep alive probes), the TCP/IP connection is closed and the ESCG starts the TCP/IP socket again.

“Send trigger” configuration

The data received by the ESCG are first temporarily stored. There are different criteria when the stored data will be sent over the LAN/WLAN.

- 1) **Byte trigger:** The user defines a number of Bytes. After reaching that number, the stored data are sent.
- 2) **Timeout:** After receiving a character a timer with the programmed value is started. Each received character restarts the timer. Once the timer has elapsed the stored data are sent.
- 3) **Delimiter:** The user defines a certain character. When this character is received, the stored data are sent.

The parameter “**receive fifo size**” defines the quantity of bytes that can be stored in a ringbuffer before the data is sent to the (W)LAN interface. If you use the ESCG in an application that receives permanently data via the serial interface the “receive fifo size” has to be set to a value between 1024 and 2048 bytes. Because the ESCG needs all the available RAM memory in a situation of authentication with 802.1x (PEAP, TLS) this value is set to a value of 256Bytes by default to save memory space.

Handshake mode

This defines how the communication partners are signalling their ability to send and receive data. With the status lines RTS and DTR the ESCG reports that it is ready to receive. The status lines CTS and DSR are inputs where the communication partner reports its readiness to receive. The signals DCD and RI can be forwarded to the ESCGs LAN/WLAN communication partner.

The ESCG be controlled remote or local to handle the data flow.

The following modes are available to the user:

- 1) **no handshake:** The CTS/DSR signals are not utilized. CTS/RTS are set to active when the serial interface is connected over the LAN/WLAN.
- 2) **XON / XOFF :** The ESCG sends and receives the control characters XON = 0x11 and XOFF = 0x13. The ESCG sends a XOFF to his serial communication partner when the memory buffer is almost full and a XON when it is almost empty.
- 3) **RTS/CTS:** The ESCG signals that it is ready to receive over the RTS line and recognizes the CTS signal to determine if its serial partner is ready to receive.
- 4) **DTR/DSR:** The ESCG signals that it is ready to receive over the DTR line and recognizes the DSR signal to determine if its serial partner is ready to receive.
- 5) **Remote:** In this mode the ESCG transmits the state of the status lines CTS, DSR, RI and DCD to its LAN/WLAN communication partner. This happens over a different socket (port). This makes it necessary for the user to enter more specifications.
The state of the status lines are described by strings of letters.
A capital letter means the signal is active, a small letter means inactive.
'D' = DSR active 'd' = DSR inactive
'R' = CTS active 'r' = CTS inactive
'C' = DCD active 'c' = DCD inactive
'I' = DSR active 'i' = DSR inactive

The ESCG interprets the received data as follows:

'D' -> set DTR to active 'd' = set DTR to inactive
'R' -> set RTS to active 'r' = set RTS to inactive
'C' or 'c' and 'I' or 'i' are ignored.

- 6) **3964R:** This is a special protocol which is commonly used for communication with SPS (programmable control systems). This protocol uses special characters and events to signal when it is ready to transmit and receive. Descriptions of this protocol are available in literature.

ESCG

802.11a/b/g WLAN-Bridge + Serial Client Adapter

Information

APs

Wireless

Security

Admin

Advanced

Serial Port 1

Serial Port 2

Relay

AUX-Input

Serial Client on Port 1

On this page you can configure the serial client on port 1. Any new settings will not take effect until the bridge is rebooted.

SaveCancel

Port active

☒

Check this box to enable this serial port.

Port 1 baudrate and format

Baudrate

9600

Baudrate for this serial Port

Paritybit

none

Select the parity bit.

Databits

8

Select the number of databits

Stopbits

1

Select the number of stopbits.

Port 1 network configuration

Port mode

UDP/IP

Select the port mode.

Server IP

192.168.170.242

Server IP in client mode

Local port

8888

Local port number

Remote port

8888

Remote port number

Port 1 multicast configuration

Multicast mode

no multicast

no multicast = send + receive unicast
Save = receive multicast, send unicast
Master = receive unicast, send multicast
Multimaster = receive multicast, send multicast

Multicast IP address

224.0.0.42

Port 1 keep alive parameter

keep alive period

0

Time between two "TCP keep alives" in seconds.

keep alive probes

0

Amount of "keep alive probes" - failure till the TCP connection is closed.

Port 1 send trigger configuration

Byte trigger

128

Number of bytes in the receive buffer to trigger the network sendroutine.

Character timeout

10

Timeout in milliseconds between 2 characters to trigger the sendroutine.

Frame end delimiter

This is a single HEX value. When the delimiter byte is received the receivebuffer will be send.

Receive FIFO size

256

Receive FIFO size in bytes. The receive FIFO stores the bytes before they are send to the network (WLAN or LAN) interface. Because of the limited memory space of this device you should take the lowest possible value.

Port 1 handshake mode

XON/XOFF, RTS/CTS or DTR/DSR are local handshake modes. In 'transparent mode' the status of the handshake input signals (DSR+CTS) will be send to the remote side via an extra port. 3964R means that the serial port handles this protocol for sending and receiving data

Handshake protocol

no Handshake

Select the method of doing the handshake.

Local port

8880

Local port number for handshake.

Remote port

8880

Remote port number for handshake.

Illustration 19: Serial interface setup

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Internal Relay

The ESCG can be ordered with an internal relay. This provides the user with a contact which can be opened or closed over the network or with the optional AUX input.

The screenshot shows the 'Onboard-Relay control' page of the ESCG 802.11a/b/g WLAN-Adapter. The page title is 'Onboard-Relay control' and the subtitle is 'On this page you can configure the relay output of the ESCG.' There are 'Save' and 'Cancel' buttons at the top right. The left sidebar contains a navigation menu with links: 'Information', 'APs', 'Wireless', 'Security', 'Admin', 'Advanced', 'Serial Port 1', 'Serial Port 2', 'Relay', and 'AUX-Input'. The main content area is titled 'Relay - OUTPUT configuration' and contains the following fields and options:

- Mode:** Radio buttons for 'not active', 'UDP', 'TCP (Server)' (selected), and 'internal'. A callout box explains: 'Relay control mode: - not active - UDP = UDP/IP socket on "Local Port" - TCP = TCP/IP server socket on "Local Port" - internal = controlled by AUX input'.
- Relay restore:** A checked checkbox. A callout box explains: 'If the current state of the relay contact has to be restored after a software reboot, check this box.' Below it, text says: 'Check this box to restore the Relay-Status after a Reboot.'
- Relay ON:** An unchecked checkbox. A callout box explains: 'If the relay has to be switched on automatically after power up or hardware reboot, check this box.' Below it, text says: 'Check this box to define that the relay is on after power up or hardware reset.'
- Local Port:** A text input field containing '9000'. A callout box explains: 'Portnumber for the IP-Connection (UDP or TCP).' and 'Portnumber for UDP + TCP mode options.'
- ON Phrase:** A text input field containing 'ON'. A callout box explains: 'Character string to switch relay on. If the string is empty, any character sent to the above port will switch the relay on.'
- OFF Phrase:** A text input field containing 'OFF'. A callout box explains: 'Character string to switch relay off. If the string is empty, the relay will be switched off by the timer.'
- Timeout (sec):** A text input field containing '10'. A callout box explains: 'Time in seconds after which the relay is switched off. "0" stands for infinite.'

Additional explanatory text for the 'ON Phrase' field: 'The data which is received on the defined port is checked for this phrase to switch the relay-output ON. When the phrase is empty any data to that port switches the output to ON.'

Additional explanatory text for the 'OFF Phrase' field: 'The data which is received on the defined Port is checked for this phrase to switch the relay-output OFF. When the phrase is empty the relay-output is switched off by the timer.'

Additional explanatory text for the 'Timeout' field: 'Define the time in seconds when the relay-output returns automatically from the ON-state to OFF.'

Illustration 20 Relay settings

AUX input

The optional AUX input is connected to the processor via optocouple. It can be configured that its state is signaled over the network or that it actuates the internal relay.

ESCG

802.11a/b/g WLAN-Adapter

modas

www.modas.de

Auxiliary input configuration

On this page you can configure the aux. input of the ESCG.

Save Cancel

Information

Wireless

Security

Admin

Advanced

Serial Port 1

Serial Port 2

Relay

AUX-Input

AUX - INPUT configuration

Mode

☐ not active
☒ UDP
☐ Relay ON
☐ Relay OFF
☐ toggle

Select 'UDP' to send datagrams when the status of the aux.-input changes. Select 'Relay ON' to switch the relay ON. Select 'Relay OFF' to switch the relay OFF. Select 'toggle' to toggle the relay between ON and OFF

Remote Port

9000

Remote-Port for the UDP-Datagram.

Remote IP

192.168.170.10

IP-Address of the station where to send the datagram

ON Text

ON

This string will be send when the aux.-input changes to the ON-State

OFF Text

OFF

This string will be send when the aux.-input changes to the OFF-State

Sample Rate (sec)

10

Define the interval in seconds the inputstatus ist sampled. For every sample a datagram is send to the defined remote-IP.

Mode:

- not active

- UDP = sends ist state over UDP socket

- Relay ON = switch relay on with active signal

- Relay OFF = switch relays off with acive signal

- toggle = toggles relais with each signal.

IP-address and port of the device the signal states are sent to via UDP/IP

Character string which is sent when signal is active.

Character string which is sent when signal is inactive.

The above strings are sent to the remote IP whenever the signal state is changing. A "Sample rate" (in seconds) can be defined for sending the current state of the AUX input in intervals without changing the signal state.

Illustration 21 AUX input settings

Connector for relay and AUX-input

If the ESCG comes with the relay option an additional connector is mounted on the back panel.

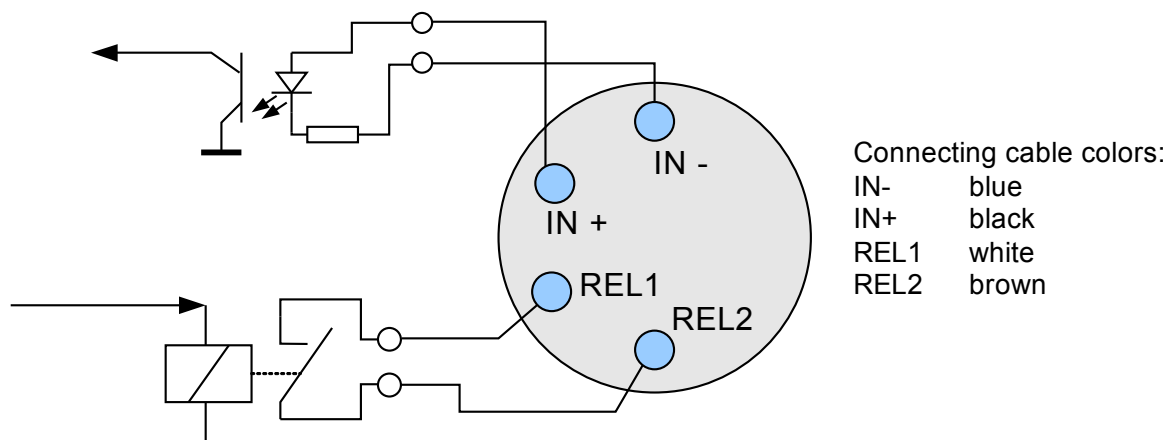


Illustration 22 Pin assignment for relay + input connector

Power supply connector

Optional the ESCG can be equipped with a circular M8- 3pin connector. The connection is as follows:

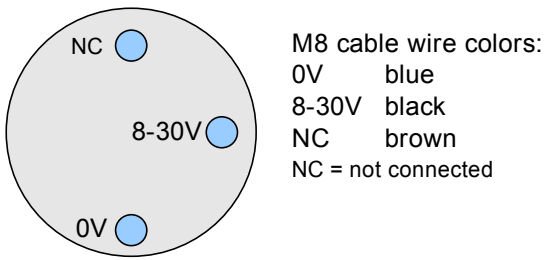


Illustration 23 Power supply connector

The following illustration shows the mounted connectors for relay and power supply at the rear panel.



Illustration 24 Rear panel with relay and power connector