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CONTROLLER user manual	Author:	DD

SUMMARY

This document is the user and installation manual of the 4EVAC Controller, the head unit of the 4EVAC Impact voice evacuation system.

REVISION AND APPROVAL

Rev.	Date	Nature of Changes	Approved By
01	05-06-2019	Original draft	DD
02	10-03-2020	Updated CAL button, GPO rating, # of zones, net ports, max. output power, # of DCA amplifiers, # of messages	DD
03	08-06-2020	Corrections	TvdH
04	11-06-2020	Minor corrections	DD

Table of Contents

Thank you for choosing 4EVAC as your Voice Evacuation System solution.

4EVAC Impact is a 19" rack format, EN54-16 certified Voice Evacuation System, dedicated to medium to large installations. The Impact system is capable of both standalone and network operation, for a wide selection of peripheral devices and remote extensions. 4EVAC Impact is certified in accordance with EN54-16 and EN54-4, which are harmonized standards under the Construction Products Regulation, mandatory in the European Union.

The 4EVAC Impact system is fully compatible with the Compact 500 Voice Evacuation System. This means that both systems can be connected to one network, running the same protocol in peer-to-peer architecture, operating within the same space of voice evacuation zones, sharing the same audio messages, BGM broadcasts, microphone consoles, I/O extensions and cabling infrastructure.

1. General information

4EVAC Controller is the head unit of the 19" rack mounted Impact Voice Evacuation System. The Controller covers complete EN54-16 certified functionality, as well as a variety of features essential to Public Address applications.

4EVAC Controller incorporates 16 monitored contact inputs; 8 GPO, 4 relay outputs, 2 analogue audio inputs and 2 outputs. In addition, local network interfaces for max. 16 local peripheral devices (e.g. mic consoles) and 2 global network ports for interconnecting multiple systems in a redundant ring topology are included.

The Controller is designed to work with 4EVAC DCA2.500 power amplifiers over a 4EVAC proprietary AMP LINK protocol. The Controller can also be easily integrated with any third-party PA/VA power amplifier.

2. Front indicators
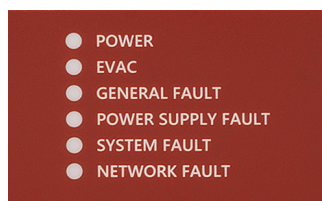
2.1. POWER

Indicates if the Controller is being powered and if the system is properly booted.

OFF	Not powered
GREEN continuous	This device is powered and operational.
GREEN blinking	This device is booting after power up / reset.

2.2. EVAC

Indicates that the system is in the Voice Alarm state, where at least one zone in the system is occupied by an emergency audio signal, i.e. a pre-recorded EVAC MESSAGE or LIVE EVAC, when a fireman mic is being used.

OFF	EVAC status is inactive (quiescent mode)
RED continuous	EVAC status is active

2.3. GENERAL FAULT

Indicates that the system is in the FAULT state (general fault indicator), where at least one device in the system is reporting a fault.

OFF	System is healthy
YELLOW continuous	Local fault is detected (failure of Impact controller or local AMP LINK amplifiers)
YELLOW blinking	Remote fault is detected (this Impact controller and amplifiers are healthy and another device in the network is reporting fault state)

2.4. POWER SUPPLY FAULT

Indicates a power supply fault of the local Impact system, where at least one of following faults is reported

OFF	Power supply OK
YELLOW blinking	Battery-related fault: o Loss of battery o Loss of charger o Battery resistance too high o Temperature fault
YELLOW continuous	Mains fault

2.5. SYSTEM FAULT

Indicates a system fault of the Impact Controller, where:

- a CPU or program execution is stopped or malfunctioning,

- there is a corruption of storage memory containing config settings and audio files (SD card).

Where the system fault is caused by a CPU or memory fault, the Controller remains in its "safe state", where critical functions (including audio transmission, reaction on control inputs, etc.) are stopped until the fault is resolved.

OFF	Firmware and settings OK
YELLOW continuous	CPU / program fault

YELLOW blinking	o SD card fault
	o Config file not compatible
	o Wrong ID setting

2.6. NETWORK FAULT

Indicates when any device or link in the network is missing.

OFF	Network OK
YELLOW continuous	At least one device from the network is missing.
YELLOW blinking slow	Global ring is broken (any place in the ring)

3. Front buttons
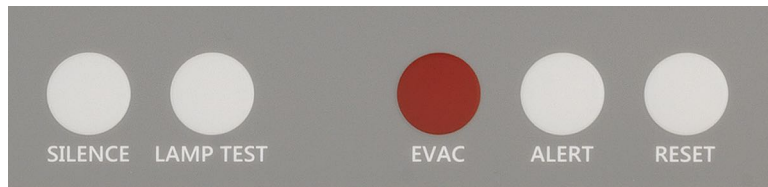
3.1. SILENCE

Press to mute the sound of the buzzer in the entire system.

3.2. LAMP TEST

Press to verify visual (LEDs) and audible indications (buzzer) of the front panel of the local Controller and local amplifiers (connected to AMP LINK of local Controller).

3.3. EVAC

Press to trigger the EVAC message in all zones in the entire system.

3.4. ALERT

Press to trigger the ALERT message in all zones in the entire system.

3.5. RESET

Press to reboot the system. In a network system this will reboot the entire network.

ℹ **NOTE: Applying RESET will re-initiate AMP LINK and re-assign addresses and settings of amplifiers connected to the AMP LINK, according to the configuration settings of the Controller. Addressing of the amplifiers follows the order of the AMP LINK physical connection (see chapter "AMP LINK").**

4. Back panel

Analog audio inputs AMP LINK Local network ports CAL button (not used) Reset button 24V DC input (parallel connectors)
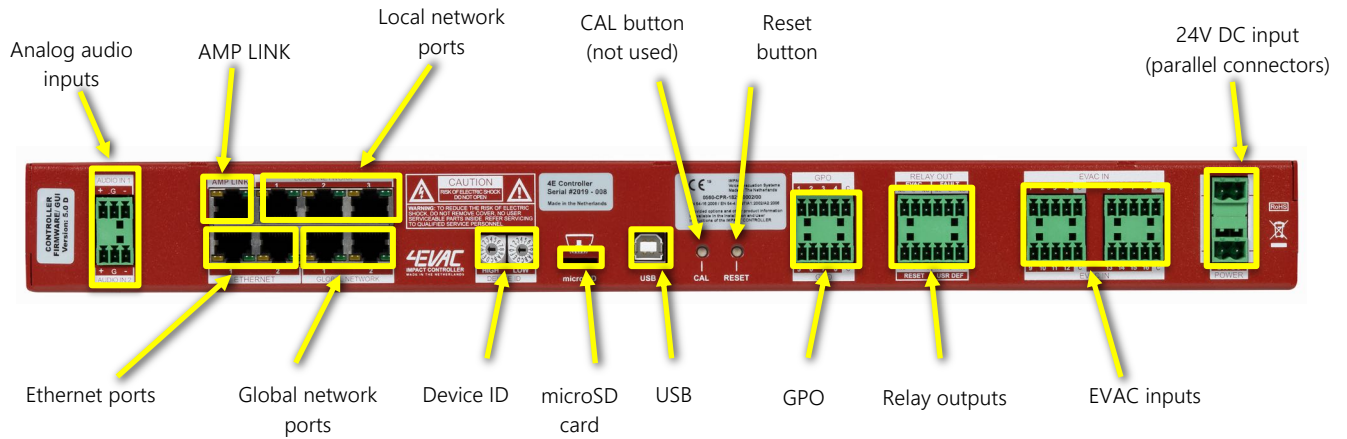
Ethernet ports Global network ports Device ID microSD card USB GPO Relay outputs EVAC inputs

4.1. Analog audio inputs

In the left section the Controller provides 2 independent analogue audio inputs dedicated for BGM broadcast.

2 x mono, balanced, line level (0dbU / 0.775Vrms), 15kΩ input impedance.

Connect your auxiliary audio source for background music or low priority external paging microphone here.

AUDIO input

P
GND
N

+
shield
-

to external audio source
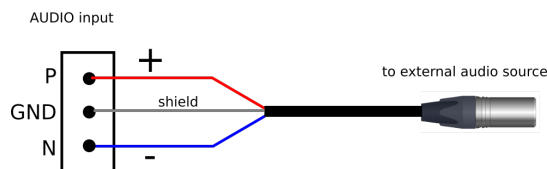
4.2. AMP LINK

The AMP LINK (RED vertical cat5 cable) is the secured bus connecting the Impact Controller to up to 16 x DCA2.500 amplifiers. Based on RS485, this internal system bus provides:

- 2 balanced audio channels across the entire AMP LINK chain, monitored;
- Control and diagnostics data interface.

In order to work properly, the AMP LINK must be set up in the configuration settings ("Amplifier" tab).

Amplifiers connected to the AMP-LINK are addressed and initiated by the Controller at each system reboot.

NOTE: Reboot the system (Controller front panel RESET) after each modification applied to any amplifier on the AMP-LINK, including:

- replacing / adding / removing a DCA2.500 amplifier (along with new configuration settings);
- changing DIP-switch settings on DCA2.500 back panel;
- replacing the battery;

The AMP-LINK is monitored but not redundant. Therefore, in order to maintain EN54 – IP30 compliance, the AMP-LINK cable must not be exposed to external field influences and remain fully protected and closed entirely inside the cabinet of the Impact system.

Amplifiers connected to the AMP-LINK are addressed (numbered) in the same order as they are physically connected to the controller via an AMP-LINK cable. In the configuration and diagnostic software information "Amplifier 1" is the first unit on the bus (i.e. the closest and connected directly to the controller), "Amplifier 2" is the second unit in the chain, etc.
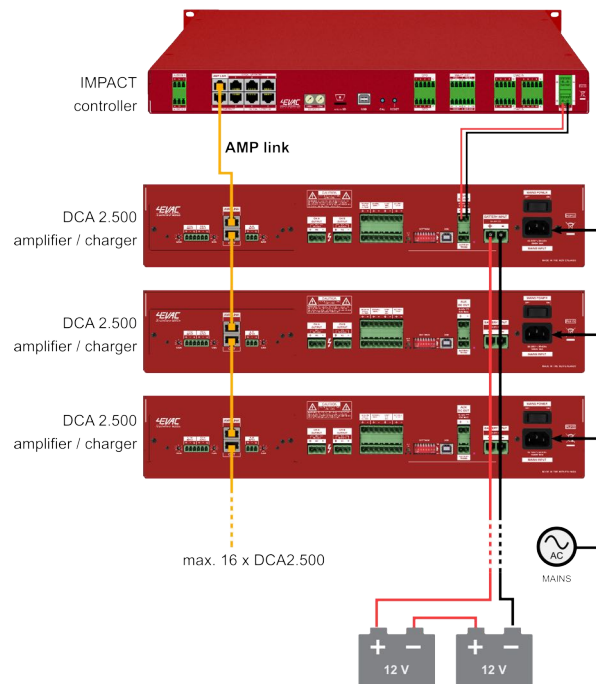
AMP-LINK audio + data bus

4.3. Local network

The L-Net daisy-chain topology is dedicated to peripheral devices of the Controller, such as zone-expander modules or remote microphone stations. The L-Net is used to expand functionality of the Impact system to remote locations via a powered data bus. Every L-Net port is powered with 24V DC and power over L-Net is always enabled.

The L-Net capacity of a single Compact 500 unit is limited to the following figures:

- Maximum 8 devices per port,
- Maximum 16 devices per Controller.
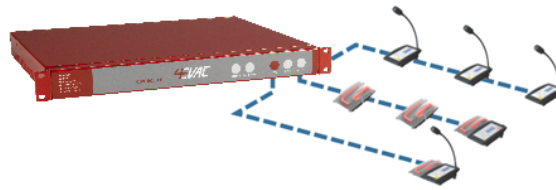
L-Net daisy chain topology

The L-Net port delivers power to remote devices. The maximum power capacity of each L-Net port is 500mA (protected with a, slow type, automatic fuse). L-Net devices of different types have different average power consumption, which may vary from 30mA up to 180mA. This implies limitations in terms of the maximum number of devices powered over the L-Net.

NOTE: Consider power consumption of L-Net powered devices!

In the table below, you can see an example of power consumption over the L-Net. This example showcases the usage of a single type of L-Net device (4E-FMTC microphone console with 180mA current consumption @24V), where the units are distributed equally over the L-Net cable.

No. of devices on single L-Net bus	Maximum total L-Net cable length			Method of Power	Total current draw @24V
	AWG26 (13.4ohms / 100m)	AWG24 (8.42ohms / 100m)	AWG22 (5.24ohms / 100m)		
1	250m	250m	250m	From L-NET	180mA
2	186m	250m	250m	From L-NET	360mA
3	107m	170m	250m	Power injector	540mA
4	71m	113m	182m	Power injector	720mA
5	53m	85m	136m	Power injector	900mA

For more information about installation and powering of remote network devices, please see the network device installation manual and 4EVAC Battery Calculator.

Note: Power injectors are available and can be found on our pricelist from May 2020.

4.4. Global network

G-Net is a redundant network ring where multiple Controllers may be connected into one system. It is used to reliably synchronize data between all connected devices and for multi-channel live audio transmission with very low latency. G-Net works as a redundant double ring between Controllers, which keeps the global system intact in case of single link failure.

To create a redundant G-Net ring between multiple Controllers, connect both G-Net ports between every unit in the network, so that you create a closed ring.

Power over G-Net (active by default) is dedicated to supply devices connected to the G-net port, such as fiber transceivers (FSC).

4.5. Ethernet (option)

Interface to built-in dual port Ethernet switch (future expansion port for IP connectivity).

4.6. Device ID

The Controller is equipped with a rotary switch that determines the Device ID (or device address) in the network. Make sure that the Device ID set on the rotary switch complies with the ID defined in the configuration settings for this device.

Wrong ID setting will trigger a system fault because of a configuration error.

4.7. Micro SD card

The Controller is supplied with a pre-installed micro SD memory card. The memory card contains a complete system configuration file, including audio messages.

The configuration file is prepared in the 4EVAC Manager – a Windows GUI application. More information about creating configuration settings can be found in the 4EVAC Manager User Manual.

The memory card is under constant surveillance, as well as its contents. When the memory card is removed, damaged or its contents are corrupted, the Controller will report a system fault. During a system fault, caused by a memory error, it enters a safe state where the system stops all functions and requires a reboot. This state can be reset only by a manual device reset.

4.8. CAL button

Firmware version 5.2 and up: This button is not in use (AMP LINK is set up during system reboot, based on configuration settings)

Firmware version below 5.2: Press this button in order to calibrate the AMP LINK bus. Once calibrated, the DCA2.500 amplifiers on the AMP LINK will communicate with the controller, exchanging information about the power supply and amplifier status.

4.9. RESET button

Press to trigger a hard reset of the Controller (different from the RESET button on the front panel – soft reset). This button will trigger a hardware reset of the local Controller only.

4.10.   GPO

8 x general purpose output (open collector) with common ground.

GPOs are programmable in the configuration settings. The GPO can be linked to any system events to follow system events and various zone states.

NOTE: Each output can accept max. 110mA and max. 24V open circuit voltage.

4.11. Relay outputs

The Controller features 4 potential-free relay outputs to external devices. Each output has individual 3 pins:

- normally open,
- normally closed,
- common.

4.11.1. EVAC

Activated (closed) during EVAC mode, where at least one zone of the voice evacuation system is transmitting an automatic EVAC message or LIVE EVAC signal from a fireman microphone.

4.11.2. FAULT

Activated (closed) while the fault status is reported by the voice evacuation system. Also activated when the Controller is not powered.

4.11.3. RESET

Activated (closed) immediately after a manual reboot of the system is triggered on the front panel. The active pulse length of the reset signal is configurable from 0 (disabled) to 5000ms in the configuration settings.

4.11.4. USR DEF

This relay output is not in use.

4.12. EVAC inputs

There are 16 monitored inputs dedicated to triggering signals for evacuation, silence and reset instructions from an external fire detection system, as well as any other events, including commercial activities.

Each of these inputs has 1 triggering pin, with a common ground level for all inputs. EVAC inputs have built-in DC monitoring which requires two resistors of 4.7kΩ + 10kΩ in order to detect input active/inactive states as well as short and open faults. The EOL resistors must be located directly at the triggering output inside of the external device (i.e. fire detection system) to provide reliable surveillance of the entire link.

EVAC / SILENCE / RESET input   external switch / relay

4.7kΩ

10kΩ
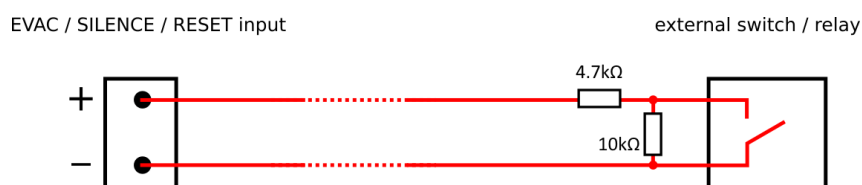
EVAC inputs must receive an activation signal of at least 100ms in order to trigger events. Pulses shorter than 100ms will be ignored.

5. Connections and recommended cable types

	How many	Connector type	Signal type	Additional information	Recommended cable (minimum)	Max. length
Analog audio in	2	pluggable screw terminal block 3.5 mm	Analog balanced mono audio, 0dBu	n/a	Balanced shielded microphone cable, typ. 2 x 0.25mm^2	100m
EVAC in	16		Pull-down input with fault detection (open/short)	EOL resistors 10kΩ + 4.7kΩ in series	Depends on length, typ. N x 0.75~1.5mm2 (N – number of individual triggering signals from / to fire detection system)	1000m
EVAC / FAULT/ RESET out	3		Potential-free relay output	n/a		1000m
GPI	8		Pull-down input	n/a		1000m
GPO	8		Open collector output max. 24V max. 110mA	n/a	Depends on length, typ. N x 0.75~1.5mm2 (N – number of individual triggering signals to external devices)	1000m
AMP LINK port	1	RJ-45	Line level analogue audio + RS485 data		UTP CAT5e	10m
G-Net port	2		Full duplex RS-422	Redundant ring with power delivery	FTP CAT5e crossover	250m (between devices)
L-Net port	3			Daisy chain with power delivery		Power limitations apply
DC Power in	1	Pluggable screw terminal block 5.08mm	24~30V DC	n/a	2 x 1.5mm^2	10m

6. Technical specifications

Standalone system (single controller)	
Number of zones	max. 96 local zones
Maximum total output power	16000 W
Dedicated power amplifiers	DCA2.500 2 x 500 W, max. 32 x 500W (max. 16 x DCA2.500)
Standby power amplifiers	500W per backup channel (configurable from 0 to 16 backup channels)
Loudspeaker line monitoring	
SW6	20kHz AC monitoring with EOL module, short/open/impedance deviation
LOOPDRIVE	loop DC monitoring with short-circuit isolators, short/open/earth leakage, EN54-17 certified
Voice messages	
Storage	max. 22 audio files x 5 minute each, micro-SD card with content monitoring
Message player	Max. 2 simultaneous local message playback, priority control
Controls and indications	
General controls / indications	Lamp test button, silence button, power, evac, general fault LED indicators
Fault indications	Power supply, system fault, network
Evac manual control	EVAC message, ALERT message, SILENCE, RESET
Power supply	PSE integrated within DCA2.500 (EN 54-4 certified)
DC supply input	24 – 30V DC (from DCA2.500)
Power consumption	140 mA @24V DC
Inputs	
2 x BGM	2 x balanced analogue audio mono input, 0dBu, input impedance 15kΩ
16x EVAC in	monitored analogue inputs, 4.7kΩ +10kΩ EOL resistors
Outputs	
EVAC out, FAULT out, RESET out	Potential-free relay output (configurable NO/NC) max. 1A
GPO	8 x Open collector output (configurable NO/NC) max. 24V / 110mA
Amplifiers (on AMP-LINK bus)	
Type DCA2.500	Class D, transformer-less, direct output
PSE	integrated power supply equipment, EN54-4 certified
DC output	2A auxiliary purpose DC output
Charger	4A charger output, max. 100Ah (>80% in 24h according to EN54-4)
Protection	over load shutdown, over temperature shutdown
Backup amplifiers	auto backup at end stage failure, auto restore
Efficiency	96% @ rated power (DC-powered)
Output voltage	max. 100V RMS
Rated power	500W per channel
Bandwidth	50 Hz – 20 kHz
SNR	>80 dB
THD + N	<0.1% @ rated power
Audio	
Frequency response	
Local BGM	50 Hz – 20 kHz (AMP-LINK) uncompressed
Messages, network streaming	100 Hz – 12 kHz (G-NET) compressed
Analog input- output latency	< 10 ms (stand-alone system)
Network audio stream format	24 kHz sampling, ADPCM compressed
Message file input format	16 bit WAV, max. 5 minutes
DSP features	HP/LP filter, multipoint parametric EQ, input / output level
No. of output audio channels (AMP-LINK)	2

Mechanical	
Dimensions (HxWxD)	4.4 x 44 x 34 cm (1U)
Weight	4 kg
Housing material	Steel
IP rating	IP 30
Mounting	19" rack mounting
Operating conditions	
Temperature (Ambient)	-5 ~ 40°C
Max. Temperature (Device)	65°C
Relative humidity	max. 90% (non condensing)
Storage temperature	-40 ~ 70°C

Network system	
Max. number of devices in the network	254
Max. number of zones	254
Max. number of loudspeaker lines	1434
Max. total system output power	119.5 kW
Number of simultaneous network audio channels	2
Network audio transmission latency	0.3 ms per device
Local network	
Architecture	Master-slave, up to 16 slave devices per Controller
Connection	3 x L-Net port, RJ-45, powered daisy chain, digital audio & control data
Cabling	X-over FTP CAT5e (or higher)
Current consumption	max. 500 mA per L-Net port
Max. length of local link (node-to-node)	
default	250 m
with twisted-pair extenders	500 m
with MM fiber extenders	2500 m
Global network	
Architecture	Peer-to-peer, up to 254 Controllers
Connection	2 x G-Net port, RJ-45, powered redundant ring, digital audio & control data
Cabling	X-over FTP CAT5e (or higher) / multimode optical fiber
Current consumption	max. 500 mA per port, reserved only for network extenders
Max. distance between devices	
default	250 m
with twisted-pair extender	500 m
with MM fiber extenders	2500 m

All information provided in this document is subject to change without notice. 4EVAC may also make improvements and/or changes in the products described in this information at any time without notice.

4EVAC

M A D E   I N   T H E   N E T H E R L A N D S

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