ZEG-ENERGETYKA

SC-64

Substation Annunciator Panel

POWER SYSTEM PROTECTION
EQUIPMENT

TABLE OF CONTENT

1. MANUFACTURER COMMENTS

1.1. General safety rules

WARNING!
During normal operation of the device, some of its parts are under hazardous voltage. Inappropriate or improper use of the device can pose a danger to persons serving, also leads to damage of the device.

1.2. List of applied standards

The device described in this manual has been designed and manufactured for industrial purposes. In the process of development and production, compliance with the standards has been assumed, the fulfillment of which ensures the implementation of the assumed principles and safety measures, provided that the user complies with the installation and startup and operating instructions.
This device complies with the essential requirements of the Low Voltage Directive (2014/35/UE) and the Electromagnetic Compatibility Directive (2014/30 / EU), in compliance with the following standards:

- **PN-EN 60664-1:2011** Insulation coordination for equipment within low-voltage systems - Part 1: Principles, requirements and tests
- **PN-EN 61010-1:2011** Safety requirements for electrical equipment for measurement, control, and laboratory use -- Part 1: General requirements
- **PN-EN 60255-26:2014-01** Measuring relays and protection equipment -- Part 26: Electromagnetic compatibility requirements
- **PN-EN 61000-6-2:2008** Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments
- **PN-EN 61000-6-4:2008/A12:2012** Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments

Related standards:

- **PN-EN 61000-4-2:2011** Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test
- **PN-EN 61000-4-4:2013-05** Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test
- **PN-EN 61000-4-5:2014-10** Electromagnetic compatibility (EMC) -- Part 4-5: Testing and measurement techniques -- Surge immunity test
- **PN-EN 61000-4-11:2007** Electromagnetic compatibility (EMC) - Part 4-11: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests
- PN-EN 60255-22-5:2014-1 Measuring relays and protection equipment -- Part 26: Electromagnetic compatibility requirements

- PN-EN 60255-22-2:2014-1 Measuring relays and protection equipment -- Part 26: Electromagnetic compatibility requirements
- PN-EN 60255-22-4:2014-01 Measuring relays and protection equipment -- Part 26: Electromagnetic compatibility requirements
- PN-IEC 255-11:1994 Electrical relays - Part 11: Interruptions to and alternating component (ripple) in d.c. auxiliary energizing quantity of measuring relays

1.3. Storage and transport

The devices are packed in individual packages to protect them from damage during transport and storage. Equipment should be stored in transport packs, indoors, free of vibration and direct atmospheric, dry, airy, free from harmful vapors and gases. Ambient air temperature should not be below -20 ° C and above + 70 ° C and relative humidity should not exceed 80%.

1.4. Place of installation

The equipment should work in areas free of water, dust and gases and explosive, flammable and chemically active gases where the mechanical exposure is moderate. Installation height should not exceed 2000 m above sea level at an ambient temperature of -5 ° C to + 40 ° C and relative humidity not exceeding 80%.
The device terminal marked with the PE symbol should be connected to ground potential. It is recommended to use stranded wire of cross section min. 2,5 mm2 and insulation strength min. 500 V with a length of no more than 3 m.

1.5. Device documentation

The set comes with:

- User manual
- Test protocol
- Warranty Card

1.6. Disposal

The device has been manufactured mostly from materials that can be recycled or disposed of without endangering the environment. A recalled device may be recaptured for re-processing, provided that its condition corresponds to normal wear and tear. All components that are not regenerated will be removed in an environmentally friendly manner. The device should be disposed of in accordance with local law or passed on to an electronic waste disposal company.

1.7. Warranty and service

The warranty period is 24 months from the date of sale, unless a longer period agreed in the contract or the sales contract.
The warranty covers free of charge removal of defects revealed during use, under the conditions specified in the warranty card.

ZEG-ENERGETYKA SP. Z O.O. gives a guarantee subject to the following conditions:

- the installation and operation of the device should be in accordance with that manual
- the seal on the device's housing must not be affected
- no corrections or changes can be made to the warranty card

The warranty does not cover:

- defects caused in result of inappropriate transport or storage conditions
- defects caused in result of inappropriate installation or operation of the device
- defects caused in result of tampering within the unit, structural modifications, alterations and repairs carried out without the consent of the manufacturer

BUYER TIPS:

- Proper and trouble-free operation of the device requires proper transport, storage, mounting and commissioning, as well as proper operation, maintenance and service.
- The equipment must be handled by properly trained and qualified personnel
- When complaining, please state the reason for the complaint (symptoms related to malfunction) and factory serial number
- After receiving of the complaint confirmation, send the complaint device with the warranty card to the manufacturer's address
- The warranty period is extended by the time of successful complaint filling

1.8. How to order

The order should specify the full name of the device and all the necessary parameters:

- type and version of the device
- supply voltage level

Example of order:

- Substation Annunciator unit SC-64
- supply voltage: Upn = 220 V DC

1.9. Manufacturer's data

ZEG-ENERGETYKA Sp. z o.o. Oddział Tychy
ul. Fabryczna 2
43-100 Tychy
Poland
tel: +48 32 775 07 80
tel/fax: +48 32 775 07 83
NIP: 6381805949
REGON: 242933572
VAT ID-No.: PL6381805949
ING Bank Śląski SA: 72 1050 1344 1000 0090 9570 7718
e-mail: biuro@zeg-energetyka.pl
www.zeg-energetyka.pl

2. TECHNICAL DESCRIPTION

2.1. Application

The SC-64 annunciator is dedicated for optical visualisation of information fed to its binary inputs as binary signals. Especially indicated signals could be protection operation and trip signals essential for quick assessment of the situation by service departments. The device cooperates with acoustic substation signalling system and is equipped with event recorder. Recorded content can be transferred to SCADA system by fiber optic communication port, RS-485 or by Ethernet network. Cooperation with SCADA system is possible by following communication protocols: ZEG or IEC 60870-5-103, and optional: MODBUS, DNP3 or IEC61850.
Depending on supply voltage level, the signalling unit is manufactured in following variants:

- SC-64, Upn=230V AC/DC
- SC-64, Upn=110V AC/DC
- SC-64, Upn=24V AC/DC

2.2. Main features

Main features of SC-64 are:

- 64 optical signalling points (binary inputs, LED diodes)
- 16 relay outputs for picking-up and multiplication of signals purposes
- watchdog contact for lack of supply voltage or supply module failure signalling purposes
- binary input for remote quitting of visual or acoustic signalisation purposes
- flush mount

2.3. Construction

Central signalling unit SC-64 is enclosure in standard rack of 19”/4U/163 dimensions. Each cassette is equipped with 64 RGD LED diodes for disturbance signalling (Fig. 1). Input signals can be grouped up to 15 signals per group and light suitable LED diode. Thanks to possibility of signals grouping, any LED diode can be light by any input. The device can be expanded up to 256 signals. The SC-64 device can be equipped with relays in order to multiply output signals. Multiplicated signals can also be grouped up to 15 signals per group. The devices consists of two independent main parts:

- front panel (with RGB LED diodes)
- logical unit (in 4U cassette, with input/output modules, supply module, communication module)

The design allows to separated mounting of panel and logical unit. The device can be mounted in any place, while front panel is usually located in easy access and visible place ex. at cabinet frame. The front panel (Fig. 1) includes six function buttons F1-F6. The buttons purpose is to test proper signalling of alarms i.e.: Trip, failure, Al1, Al2, PAC, fire, break-in. “Alarm ON/OFF” button allows to block acoustic signals. “Alarm C” button allows to quit acoustic signals.

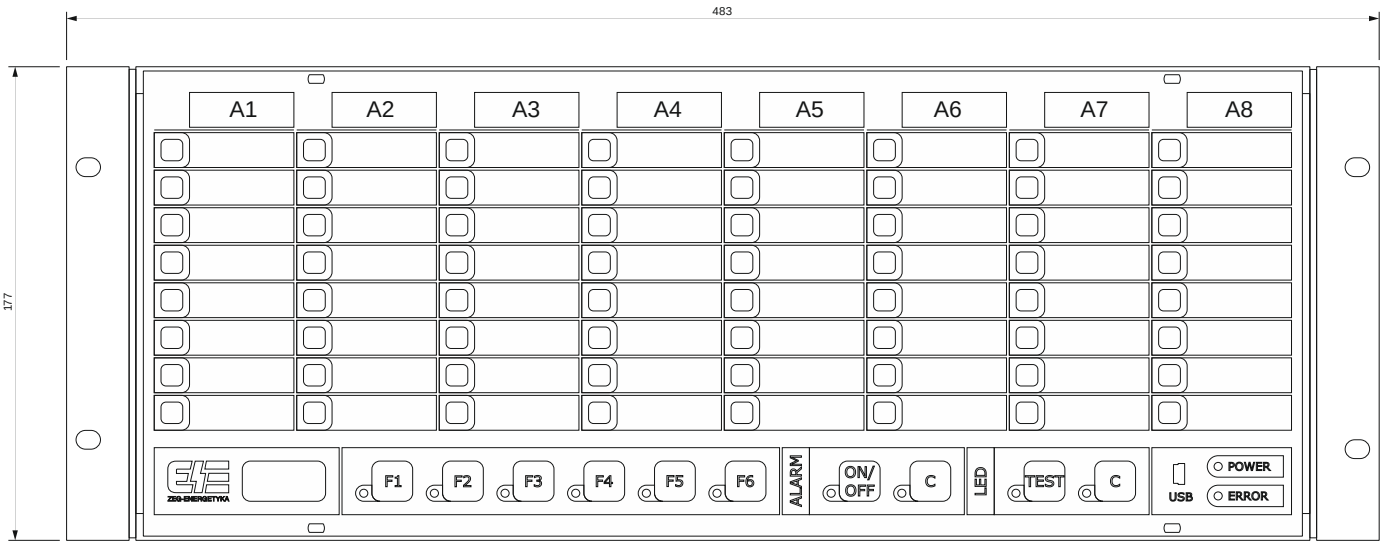


Fig. 1. SC-64 substation annunciator, front panel layout

The front panel (Fig. 1) is equipped with 64 light LED RGB diodes whose indicates the disturbance. The diodes are grouped in 8 columns. Next to each diode, description area of large dimensions (13x38 mm) is located.
Six buttons F1-F6 located on the front panel are used to test the alarms i.e.: TRIP, Fail, AL1, AL2, FIRE, Break-in.
ON/OFF button allows to lock the acoustic signals, while the C button is used for acknowledgement of the signals.
Buttons located in “LED” area allows to test the LED diodes (TEST) and acknowledge of visual signalling.
The USB socket under the last column allows to connect the device with PC computer and configure it by the SmiS software.
POWER diode indicates the operation of the device while ERROR diode indicate the improper operation (failure) of the device.

Description of addresses of particular I/O modules:

- E1 – cassette 4U no. 1 (E2 – no. 2 etc.)
- Z1 – supply module
- G1 – 8 outputs module. Separated contacts to connect with 4 acoustics channels
- R1 – 8 outputs module. Separated contacts to connect acoustic channels with radio
- S1 – 8 input module. Inputs for quitting and test purposes (220 V DC)
- Y1 – 8 separated outputs module. For multiplication of any signal purpose
- H1 – communication hub
- A1 – 8 input modules. For feeding the unit with substation signals purposes

The logical unit (fig. 2 and 3) can be equipped with up to 21 modules whose could be the input, output or communication modules. RJ-45 socket lockated in power supply module (E1Z1) allows to connect the device with other units (see point 4.3)

In standard option, the SC-64 signalling unit (Fig. 2) is equipped with:

- 8 input modules of 8 signals per each (marked as E1A1 …. E1A8)
- 2 output modules of 8 signals per each (marked as E1G1, E1R1)
- 1 supply module, providing 2 independent 12 V voltage sources (marked as E1Z1)
- 1 module for test purposes (marked as E1S1)
- 1 communication hub (marked as E1H1)

Example of extended option is signalling unit SC-64 (Fig. 3) with multiplying relays:

- 8 output modules with 8 multiplying relays per each (marked as E1Y1 …. E1Y8)

On the figure 3 the side view of the device is presented. The device consist of two main parts:

- The front panel (left)
- The logical unit (right)

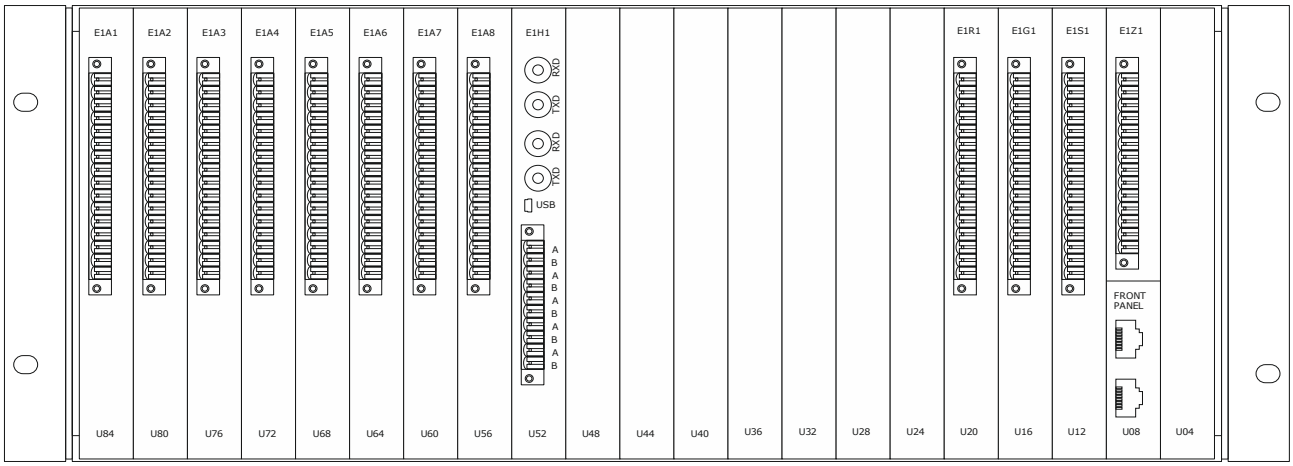


Fig. 2. SC-64 annunciator, terminals arrangement – standard version

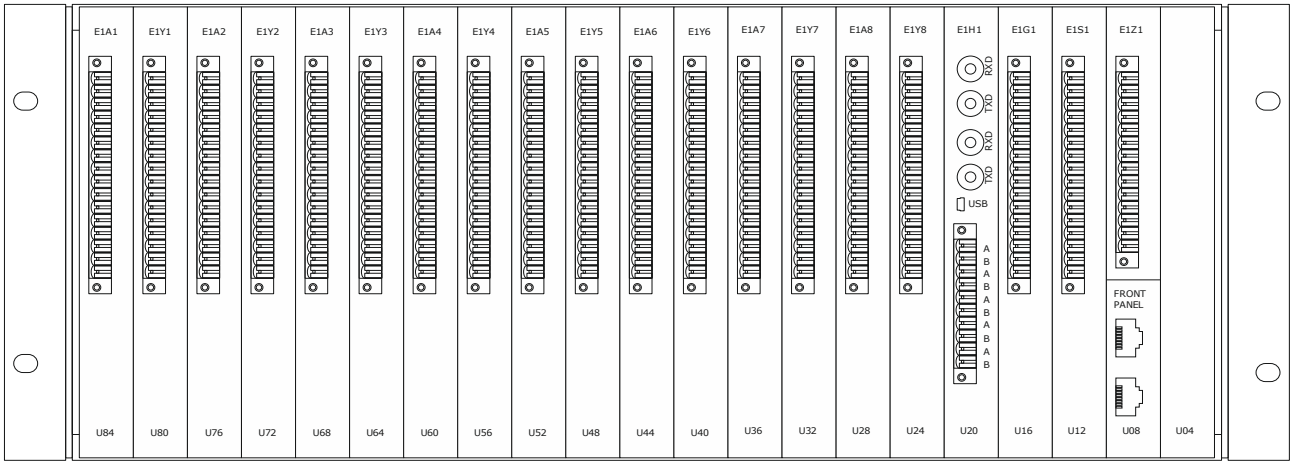


Fig. 3. SC-64 annunciator, terminals arrangement – version with multiplying relays

Figure 4 presents the side view of the device. The device consist of two parts:

- front panel
- logical unit

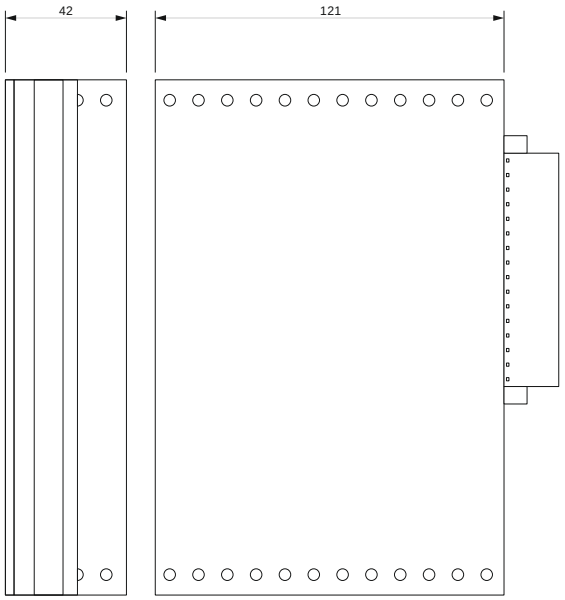


Fig. 4. SC-64 annunciator, side view (left – front panel, right – logical unit)

A1 module sends multiplied signals to Y1 module (A2 to Y2 etc.)

- E1Z1 – control inputs (test mode purposes and interlocks)
- E1A1 – Relay outputs to control acoustic signal
- E1R1 – Relay outputs to control radio signal

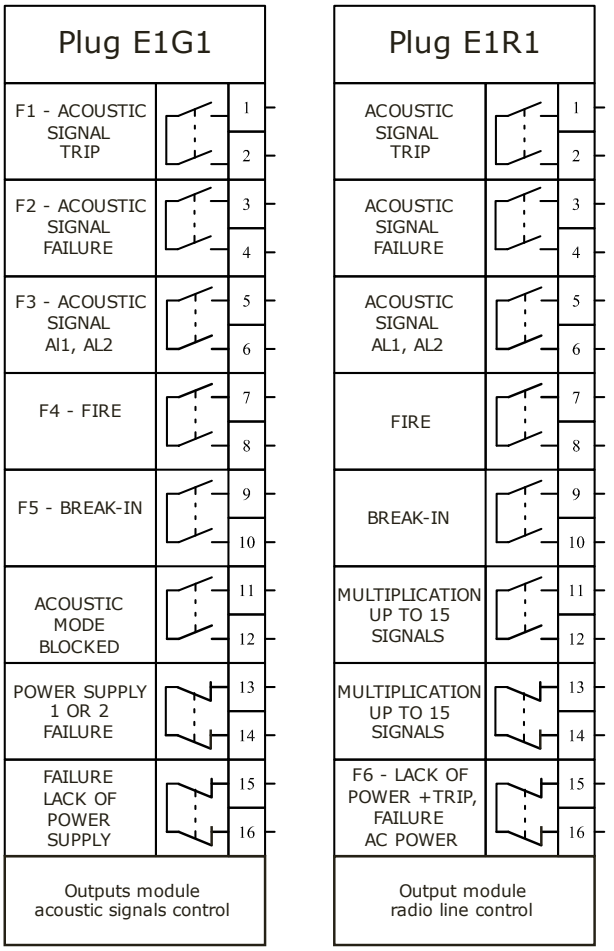


Fig. 5. Terminals arrangement of modules in cassette E1

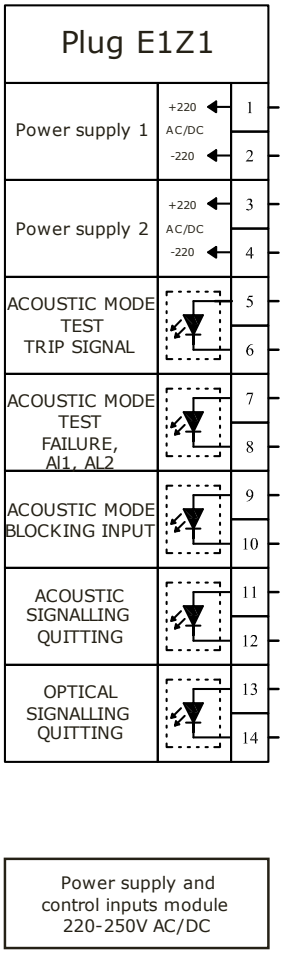


Fig. 6. Terminals arrangment of supply module

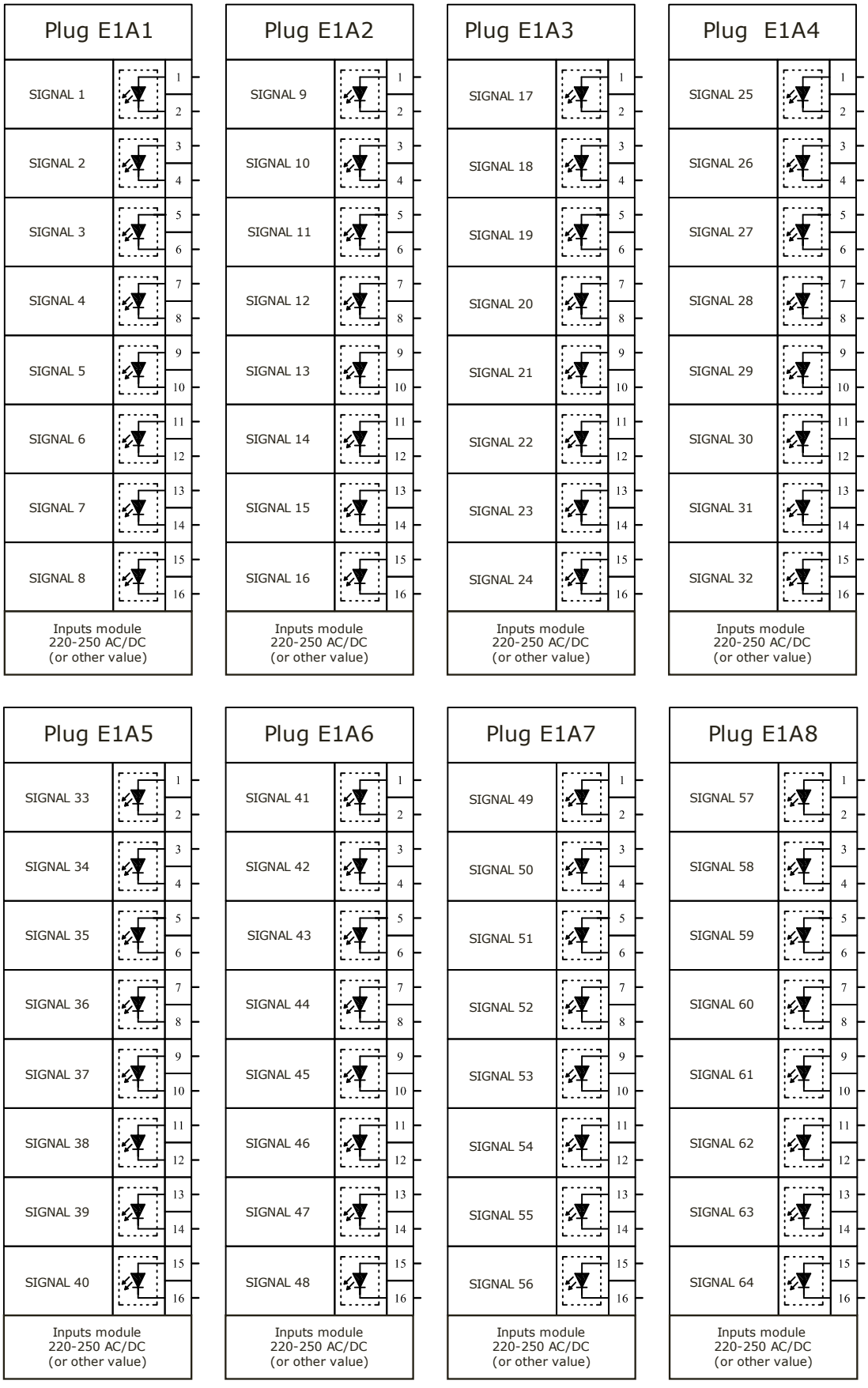


Fig. 7. E1A1 – E1A8 – Inputs modules – terminals arrangement

CAUTION – Polarization of inputs is restricted: 1 – plus potential, 2 – minus potential

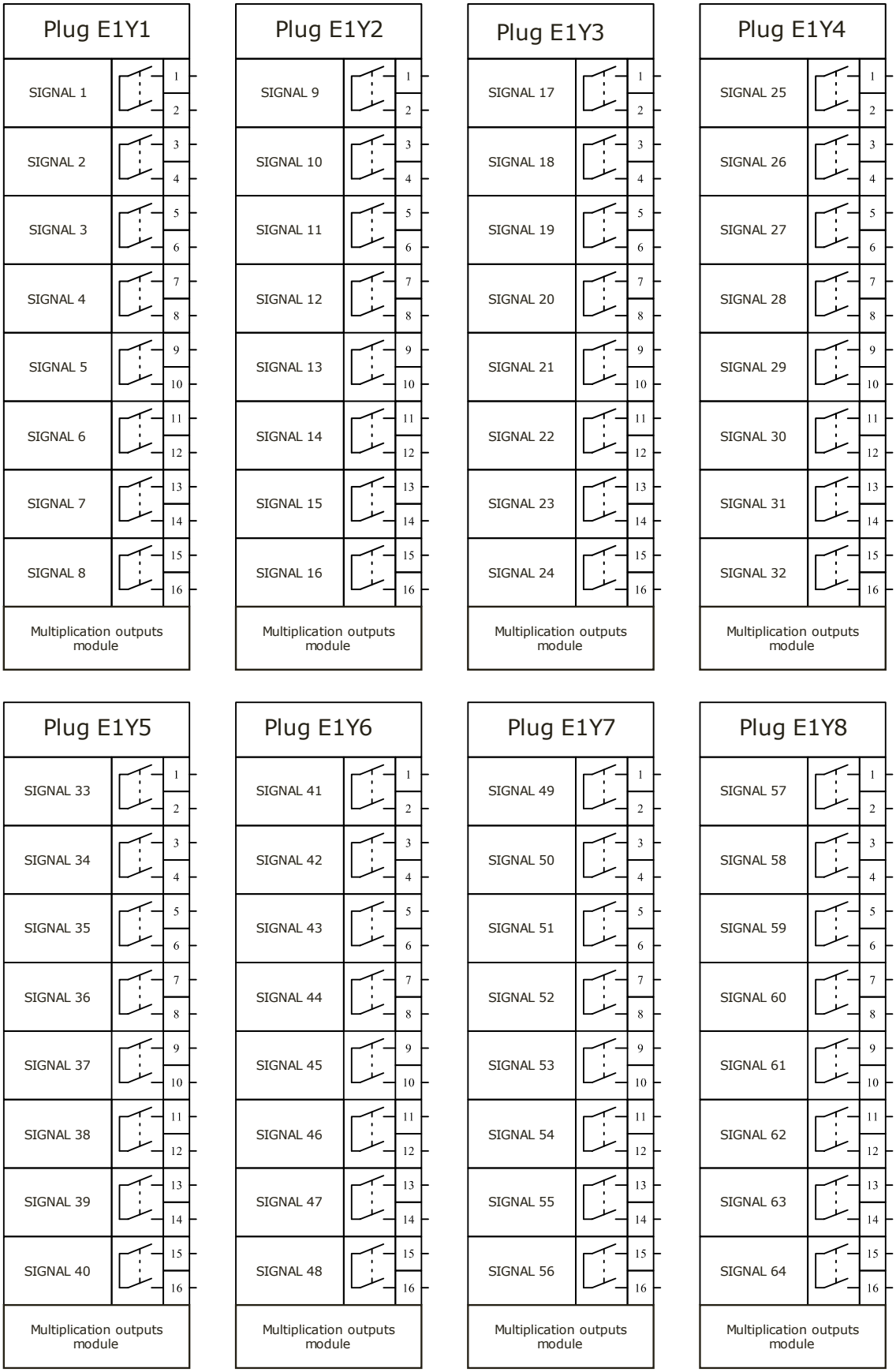


Fig. 8. E1Y1 – E1Y8 – Multiplication outputs modules

3. TECHNICAL DATA

Supply module	Supply voltage	Uz = 2 × 110V/240V, DC/AC (on request)	
	Permissible range of voltage fluctuation	±15%	
	Burden in supply voltage	AC	≤ 30VA
		DC	≤ 30W
	Burden in control inputs	AC	≤ 25VA
		DC	≤ 25W
	Permissible supply voltage dip	tp = 50ms	
Signal inputs	Number of inputs (per one cassette)	64 to 128	
	Number of cassettes	1 to 4	
	Insulation	Optical	
	Input voltage (of signal inputs)	Uw = 220V DC / 230V AC (or any different on request)	
	Threshold	0,7 x Uw for DC 0,5 x Uw for AC (on request)	
	Burden in signal inputs	0,3W / input	
	Range of settable time delay	5 ms to 25 s for DC 20 ms to 25 s for AC Default setting: 100ms	
	Time resolution	1 ms	
Control inputs	Number of inputs	8	
	Insulation	Optical	
	Input voltage	Uws = 220V DC	
	Threshold	Uws × 0,7	
	Burden in control inputs	0,3W / input	
Multiplication outputs	Number multiplication contacts	64 to 128	
	Breaking capacity	3A at 250 V AC 0,2A at 250 V DC; L/R=40ms	
	Maximum contact carry	4 A	
Acoustic outputs	Number of contacts	16	
	Breaking capacity	3A at 250 V AC 0,2A at 250 V DC; L/R=40ms	
	Maximum contact carry	4 A	
Communication	Number of communication channels	8	

	Port 1	Fiber optic ST / IEC 870-5-103
	Port 2	Fiber optic ST / ZEG protocol
	Port 1/3/4/5/6	RS485
	Port 7 – front panel	USB / ZEG protocol
	Port 8 – terminals side	USB / ZEG protocol
Insulation	Insulation strenght	2kV, 50Hz, 1 min
	Nominal voltage	250V
	Overvoltage	II
	Ingress protection degree	IP 40
Operating condition	Ambient temperature	268 ÷ 313K (-5 ÷ +40 ^{o}C)
	Relative humidity	< 80%
General data	Dimensions (width x height x depth)	483 mm × 177 mm × 163 mm
	Weight	5,5 kg

4. FUNCTIONALITY

4.1. Principle of operation

The SC-64 substation annunciator is freely programmable device, which indicates occurrence of substation signal by optical indicators. Received signals can be grouped and individually assigned to optical indicators, relay outputs or quitting inputs. Inputs are energized by control voltage. Input pick-up can be programmable delayed with delay time up to 25 seconds. Disturbance optical signalling is realized by blinking light of frequency 2 Hz. Quitting of the optical signals is possible only after quitting of acoustic signals. Sustained signal of disturbance, after blinking mode quitting, is further signalled by continuous light. If quitted disturbance is vanished, the optical indicator blanks. Every acoustic channel (TRIP, Failure, Al1, Al2) can be picked-up by any of disturbance input. Every disturbance input is supported by interlock circuit against excess of data coming from damaged channel.
Additional feature is possibility of signalling of disappearing signal. Disappeared signal picks-up the blinking light of frequency 0,5 Hz and can be assigned to “failure” contact. Blinking signals both “slow” and “fast” are quitted by “C” button. If disturbance signals are multiplied, multiplying relays contacts are closed at the moment when disturbance became an event, i.e. after set time delay.

4.2. Block diagram of device operation manner

Block diagram presenting the operation manner of the device is shown on figure 5 (page 17)

4.3 Device configuration

Block diagram presenting the connection of front panels and logical units of the device is shown on figure 10 (page 19). Fig. 10a presents the logical unit mechanically and electrically connected to front panel by 32 pins connector which ensures reliable connection. At Fig. 10b the connection by RJ45 wire is shown. In this case, the front panel and logical unit are mount separately. Fig 10c presents the possibility of connection two front panels with one logical unit by RJ45 wire. This arrangement allows to present the same group of signals in two different places. Fig. 10d shows connection of four logical units with four front panels.

4.4 Inputs

For every input, the voltage type must defined – DC or AC.
Every input can be picked-up by rising edge or falling edge of energising voltage (configured by software). Time-delay is settable (up to 25 sec) in order to adjust filtering against disturbances or fulfil object time dependences. Each pick-up signal can be assigned to independently to one of 16 channels whose activates the acoustic signalisation – 4 channels of TRIP, fail, AL1, AL2 signals. The parameters of the manner of visual indication depends on inputs configuration too. Possible manners are blinking mode (fast/slow) and reaction to quitting signal (if applied). For 220V DC voltage the threshold of pick-up and drop-out lays between 140 and 185 V (approx.. 0,6 – 0,8 Un)

4.5 Signalling diodes

Each signalling purposes diode can be picked up by any of group of 15 signals whose are selected from any signal accessible in the device. Grouping of signals allows to pick-up any LED diode by any input. Connecting of few devices together allows to upgrade the signalisation up to 512 signals. the configuration software allows to choose the colour of diode. Available colours are red, blue, pink, green, yellow, light-blue, white.

4.6 Acoustic signals

Acoustic signals can be performed by four programmable Substation Acoustic Alarms of type **ASS**. Acoustic Alarms **ASS** can be ordered separately. **Substation Acoustic Alarms are not standard equipment of the SC-64 unit**. Acoustic panel is performed to be mounted in cabinet. Three acoustic signals are designed to work under 220V DC and one under 230 V AC. Every acoustic signal has LED diode for indication of acoustic signal operation mode. LED diodes are located at front of the device beside test buttons F1-F6.

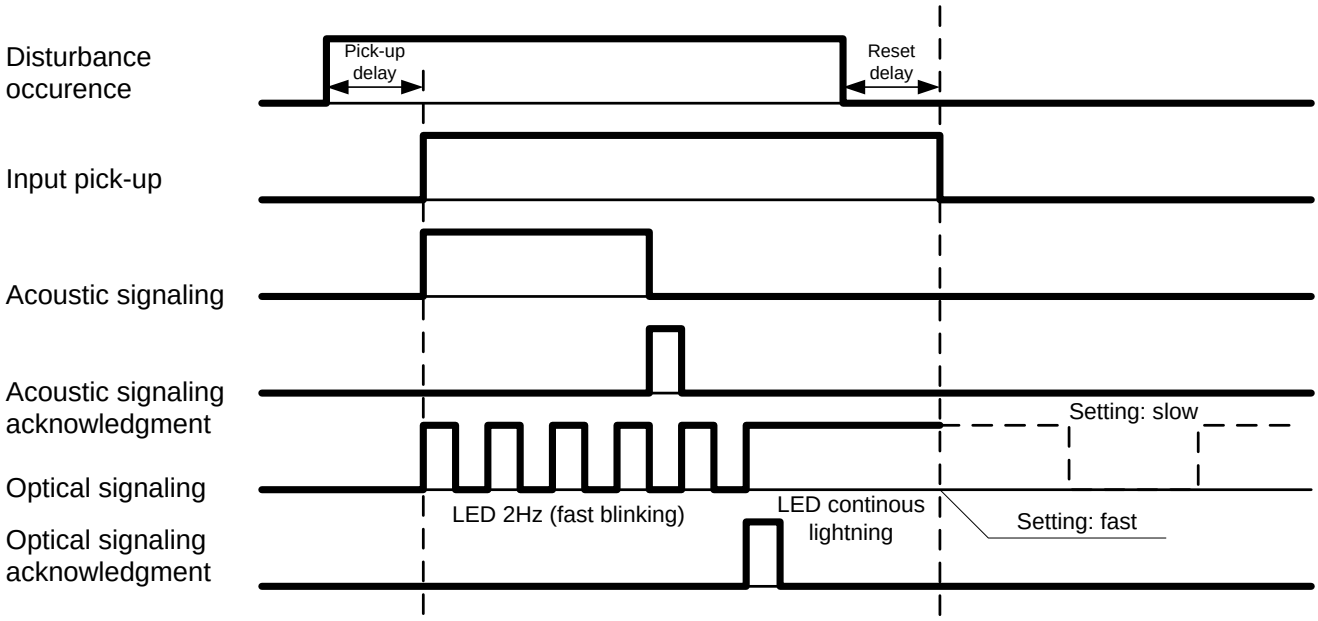
4.7 Multiplying relays

SC-64 annunciator panel can be equipped with relays in order to multiply the input signals. Each relay can be picked-up by any of group of 15 signals whose are selected from any signal accessible in the device. Each relay can be used to connect any of acoustic signal taken from one of 16 channels – 4 channels of TRIP, FAIL, AL1, AL2 signals. Configuration of multiplication of signals is described in configuration software documentation.

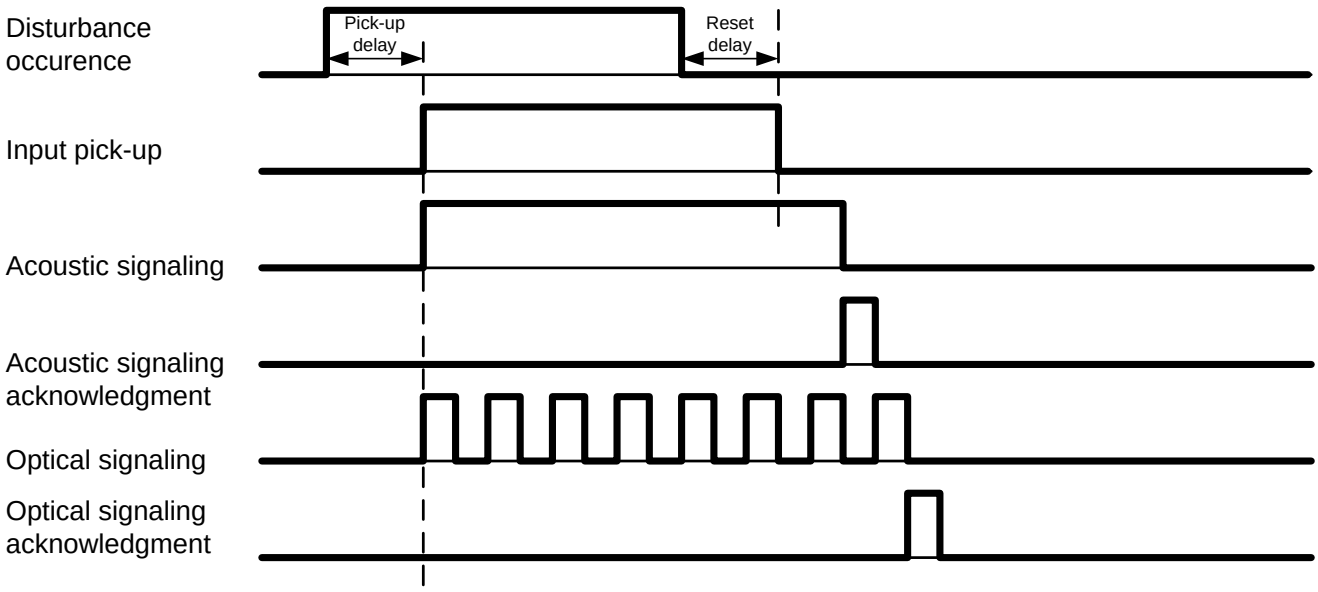
4.8 Optical signaling

Optical signaling is fulfiled by the blinking light of frequency 2 Hz. In order to quitt the optical signaling, the acoustic signal must be priorly quitted.
If the picking signal is still active, after quitting, the blinking mode of signaling turns in to the contineous lightning. As the picking signal drops, the signaling blanks.
Other operation mode are available in input channels configuration panel (slow-blinking mode). By this signaling manner, the signaling is sensitive to input signal drop. Drop of signal on input, starts the slow-blinking mode of signaling diode (0,5 Hz) and can also pick-up the Fail signal.
Blinking signals of both types, slow and fast as well, are quitted by the “C” button.
If the SC-64 unit is equipped with multiplying modules, the multiplying relays closes their contacts at the moment when pick-up has been recognized i.e. after the time-delay set by the user.
Each input is protected against excessive number of events receive whos could come from a broken relay. It operates on the basis of counting the number of events in particular time period. The maximum number of events cannot be higher than 3 events per second and 6 events per 10 sec. If the number of events exceeds one of that criteria, the input is blocked until incoming events cease.

Figures below show the time dependancies of disturbance and the order of ackwonledgment (quitting)
Long-term disturbance (still sustained while acknowledgment)



Short-term disturbance (vanished before acknowledgment)



The parameter “fast”/”slow” determinates if after vanishing of disturbance, the signaling is completely off or is shown by slow blinking.

4.9 Event recorder

Event recorder, records the events with time resolution of 1 ms. The events are kept in non-volatile memory. The events are saved according to first-in-first-out rule. The device records up to 26210 events (memory can be extended up to 52420 events). The recorder registers all input signals as well as signals refered to device failure. The communication is carried out by E1H1 communication module.

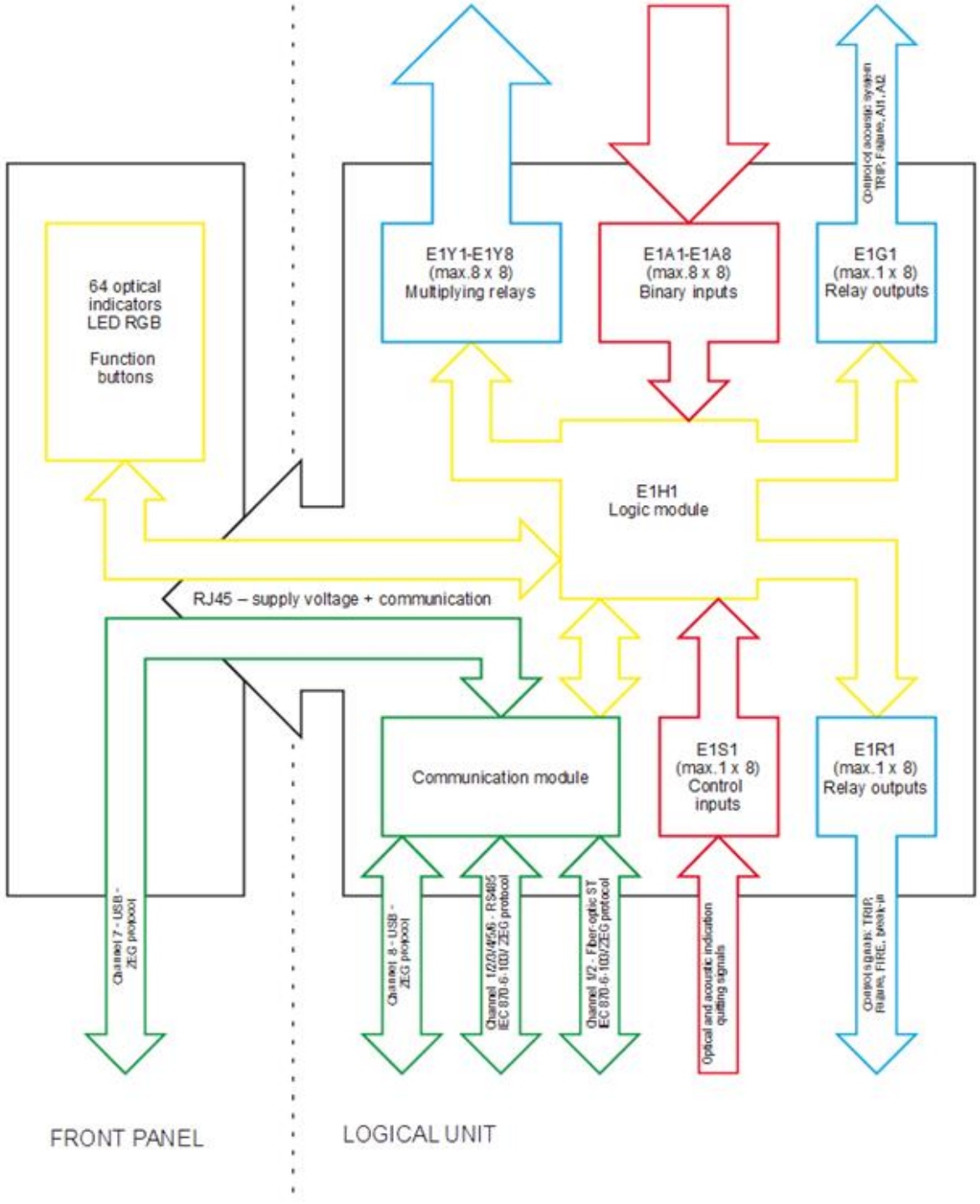


Fig. 9. Block diagram presenting device principle of operation

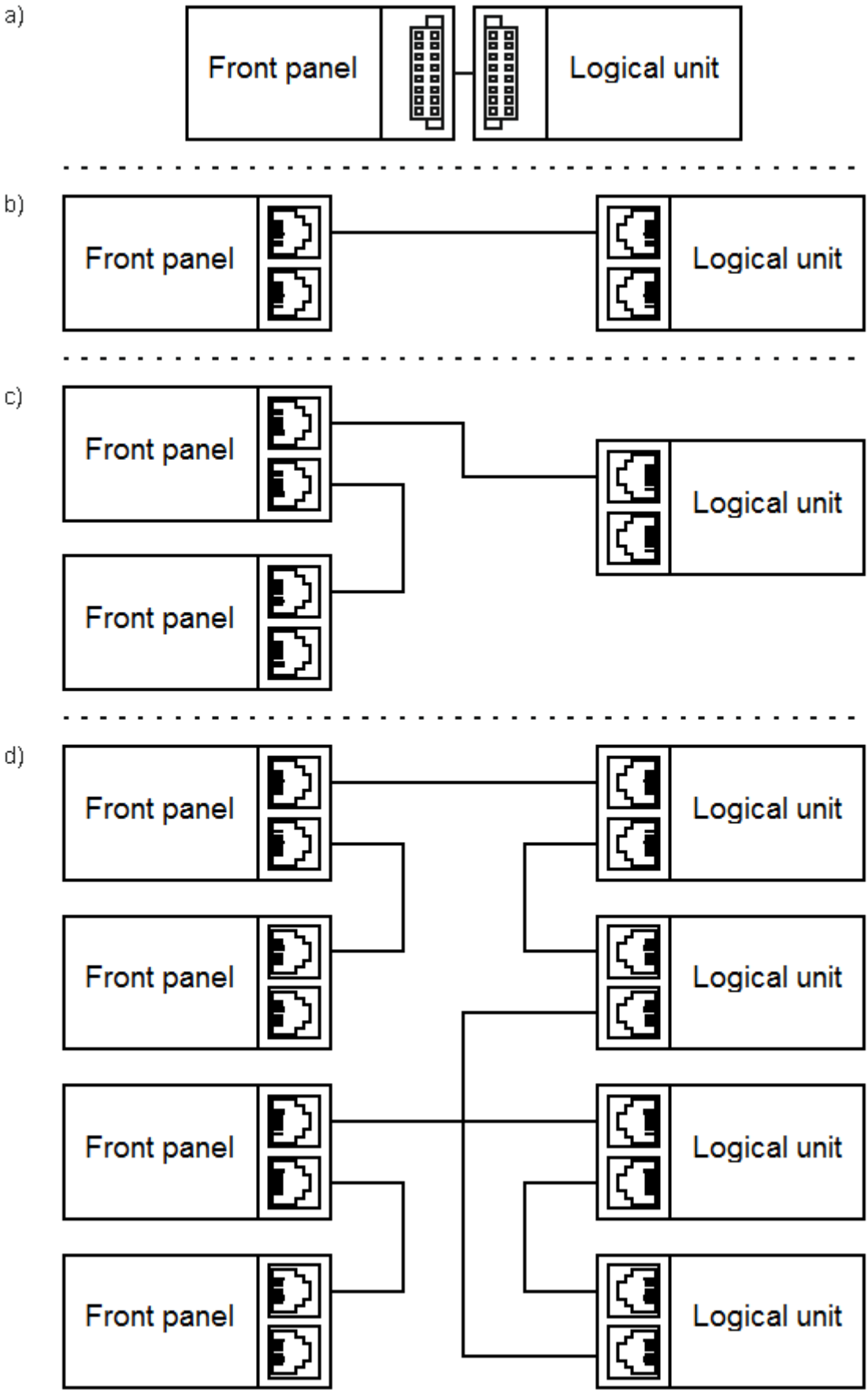


Fig. 10. Block diagram of possible manners of connection front panels with logical unit

5. INSTALLATION AND COMMISIONING

5.1. Storage and preparation the SC-64 annunciator for operation

SC-64 substation annunciator is delivered to the user in packages to ensure protection against external influences that could cause damage. Therefore, do not unpack them for storage. Transport packages should be transported and reloaded with care, avoiding shocks and maintaining the position specified on their packaging. Storage is possible in indoors, dry (relative humidity <80%), free of corrosive vapors at -20 ºC to +70 ºC.
In order to mount the signalling unit in cabinet doors, the mounting holes has to be made (Fig. 11).

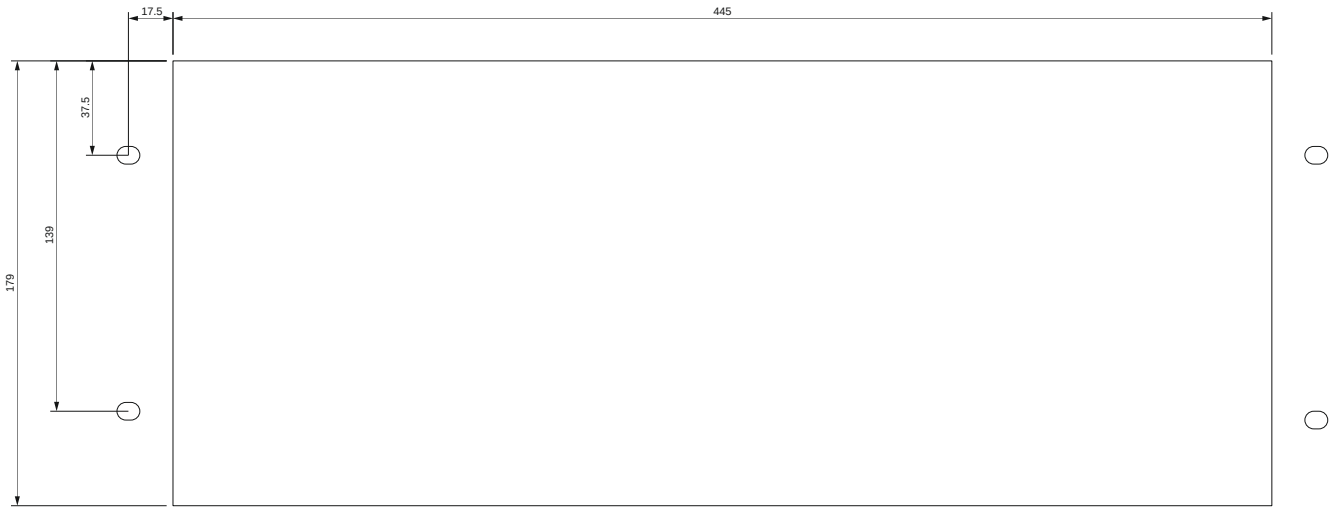


Fig. 1. Mounting holes dimensions

5.2. Operation and maintaince

During routine tests of signalling unit, its proper work must be checked using the function buttons F1-F6 (picking-up of acoustic signals) and the button “LED test”. Routine tests should be carried out at least once a year.

6. SMIS 2 SOFTWARE

The SC-64 annunciator panel is provided with free software enabling its, configuration, registers reading and visualisation of particular device’s modules. The software can be downloaded from manufacturer’s web site under following address:
www.zeg-energetyka.pl/en/product/smis/

NOTICES

NOTICES

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