2G-6S.1.16.F

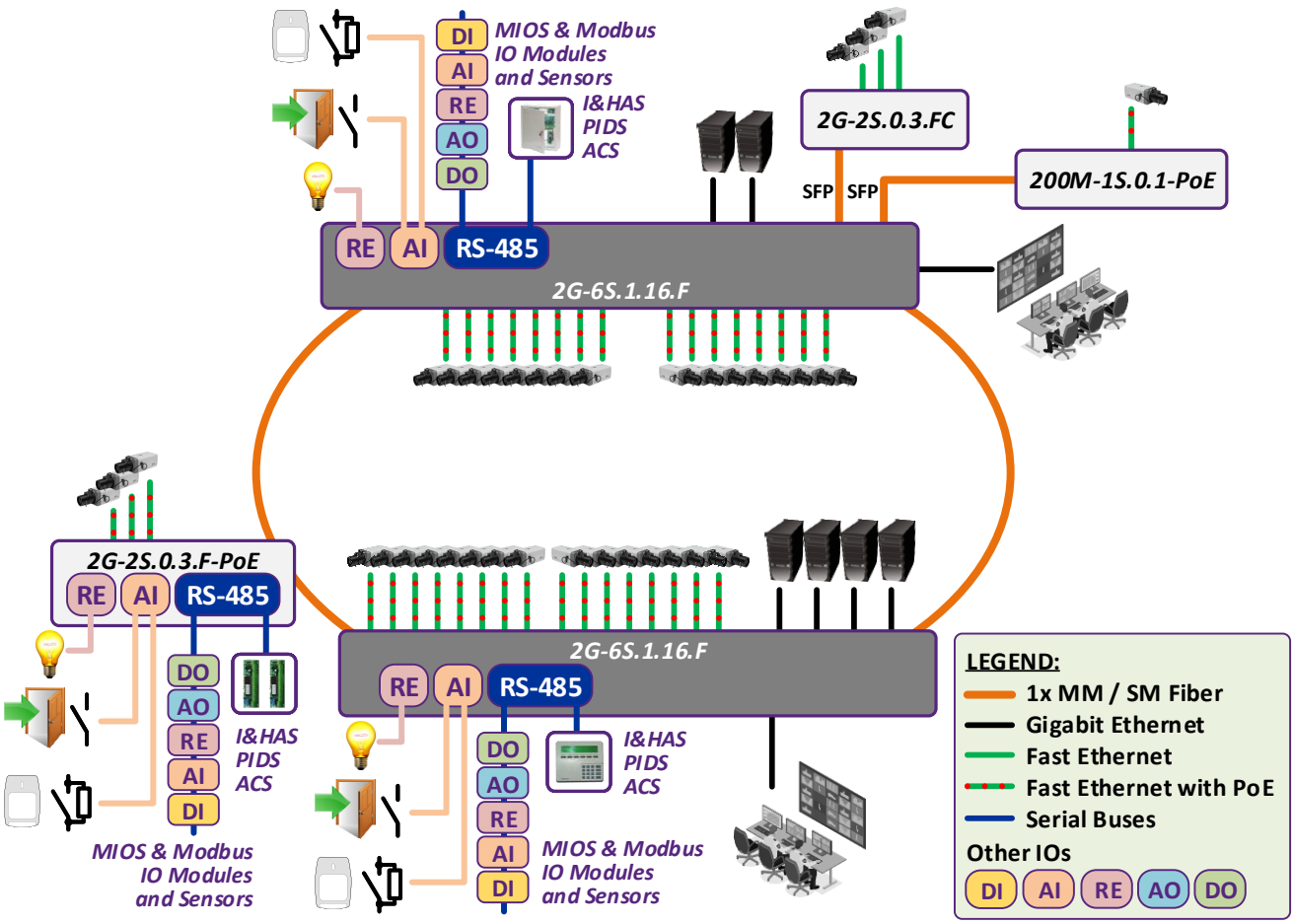
19" / 1U Design

- 4x COMBO Ports (SFP/RJ45)
- 2x SFP Ports Supporting 100/1000BASE-X (1)
- 1x Gigabit Ethernet Port
- 16x Fast Ethernet Ports with PoE
- Serial Bus 1x RS485 / Modbus
- 2x Digital/Alarm Inputs
- 1x Programmable Relay Output
- 3x Independent Supply Inputs
- External Supply with Power 280W(2)
- Redundant Topology LAN-RING, RSTP
- Event Management, Supporting: HTTP/ONVIF Client, E-mail, IP Watchdogs, ETH Events, TCP, Modbus, DIO, Balanced Loops...
- Support of Visualization Software
- Encrypted Management over LAN/Local USB
- VLAN, QoS, SNMP, SMTP, SNTP, IGMP, RSTP(-M), LLDP, 802.1X
- Fine Overvoltage Protections on All Ports
- Maximum Start Time 15s
- Operating Range –30°C to +60°C
- Passive Cooling

PRODUCT NAME	CODE	SUPPLY
2G-6S.1.16.F-UNIT/1U	1-860-426	230VAC
(1) SFP Module 1000BASE-BX-U and 1000BASE-BX-D Included		
(2) 1pc Included		

Typical Connection of LAN-RING System

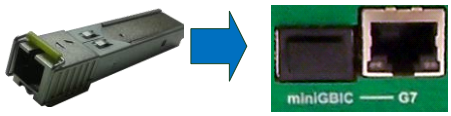
Versatility



4x COMBO port SFP/RJ45

compatibility

Switch 2G-6S.1.16.F is equipped with four universal COMBO ports (combination of SFP slot and GE port). Into SFP slot, it is possible to insert SFP modules METEL or other manufacturers' supporting 100/1000BASE-X standard. If no SFP module is inserted into the slot the adjacent gigabit port, supporting 10BASE-T, 100BASE-Tx, 1000BASE-T standards, functions Auto negotiation and MDI/MDI-X, is automatically activated.



2x SFP port

compatibility

Switches are equipped with two SFP slots 1000BASE-X (2 SFP modules 1000BASE-BX are included in the accessory.

1x Gigabit Ethernet port

compatibility

Gigabit Ethernet port support standards 10BASE-T, 100BASE-Tx, 1000BASE-T, function Auto negotiation and MDI/MDI-X.

16x port Fast Ethernet with PoE

compatibility

Fast Ethernet ports support standards 10BASE-T, 100BASE-Tx, function Auto negotiation and MDI/MDI-X. The ports are protected with overvoltage protections 30A. All Fast Ethernet ports are compatible with PoE Standards IEEE 802.3af. They can supply the terminal device over UTP/FTP cable with the ouput power of up to 15.4W.

1x RS485 / MODBUS port

versatility

The switches are equipped with one RS485 bus which can be configured into the following modes:

TCP server – for direct interconnect. with the app. on the controlling server (PIDS sensors, t/H sensors...).

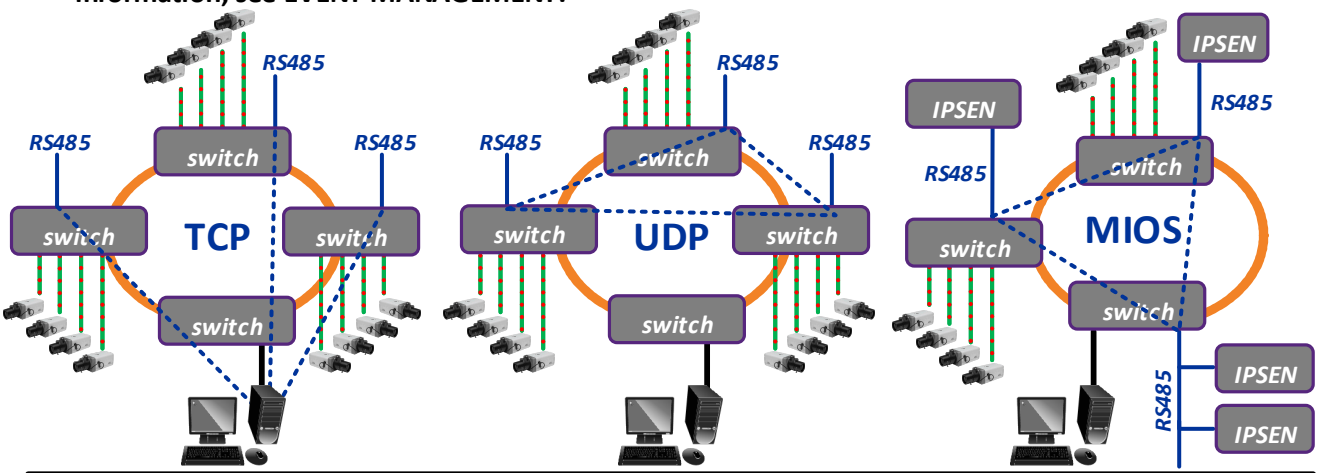
UDP mode – for interconnection of 2 and more devices with the requirement of extremely low latency. UDP mode is suitable especially for interconnection of I&HAS alarm systems (in accordance with EN50131-1 with I&HAS Dominus, Galaxy, ASSET, SPC*).

* Version F – connection over miniLAN-485 and FE ports, Version G - direct connection to RS485 ports.

EXP-C IO mode – for connection of up to 15pcs of I/O units EXP-C or 5pcs of I/O units EXP-C16.

MIOS IO mode – for connection of up to 15pcs of I/O units IPSEN-D6(D16), concentrators IPSEN-BL8-I and IPSEN-BL8O, temperature, humidity, flood sensors and other MIOS modules.

🕮 **The switches can be configured by the MODBUS RTU / TCP Master or Slave devices. For more information, see EVENT MANAGEMENT.**



2x Digital/Alarm Inputs

versatility

Switches are equipped with digital/alarm inputs (more info in the EVENT MANAGEMENT section).

1x Programmable Relay Output

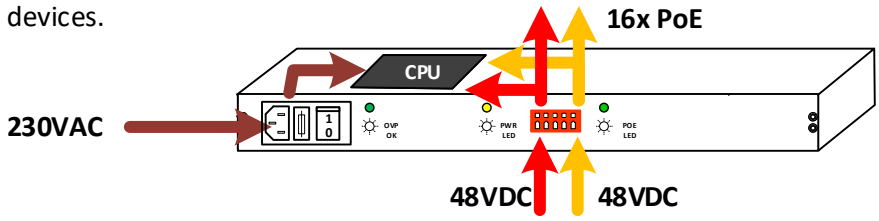
versatility

Switches are equipped with a programmable relay with a change-over contact (more info in the EVENT MANAGEMENT section).

3 independent supply inputs

safety

Switch without PoE – from the input of 230V/50Hz is powered switch without PoE for the external devices.
Switch with PoE – from the two independent inputs 48 - 57VDC is powered switch with PoE for the external devices.



Technical Parameters

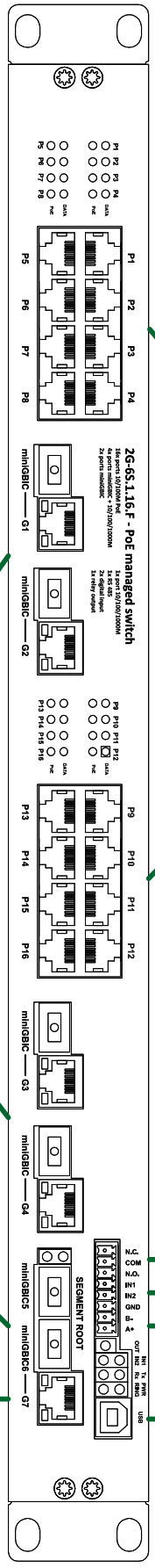
compatibility

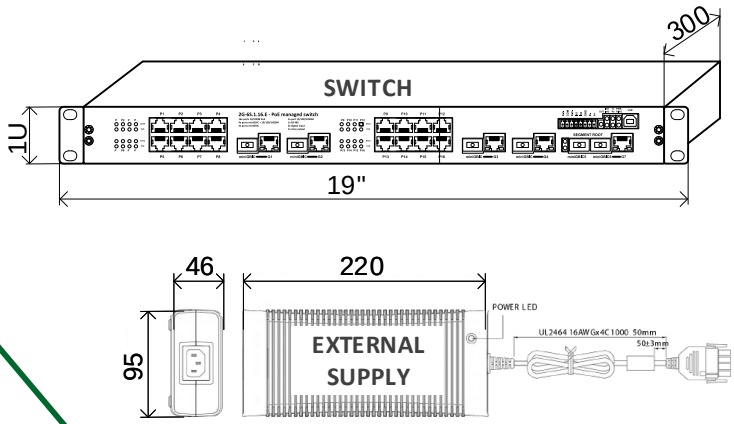
	Parameter	Value	Unit	Note
COMBO Ports	Count	4		
	SFP slot(1) - Supported Formats	100/1000 BASE-LX, BASE-BX		Compatible with MSA
	RJ45(1)	10/100/1000 BASE-T		
SFP Slots	Count	2		2x SFP Included in Package
	SFP slot(1) - Supported Formats	100/1000 BASE-LX, BASE-BX		Compatible with MSA
Gigabit Ethernet	Count	1		
	Supported Formats	GE UTP ports: 10BaseT, 100BaseTx, 1000BaseTx		
Fast Ethernet	Count	16		PoE max. 15.4W na port
	Supported Formats	FE UTP ports: 10BaseT, 100BaseTx		
	Overvoltage Protection	30	A	8/20µs
Switching	Priority	IEEE 802.1Q		
	VLANs	4094		
	IGMP Groups	256		
	Size of MAC tabule	8	K	
	Size of Packet Buffer	1	Mbit	
Management	Application	SIMULand		Windows Application
RS485	Count	1		
	Speed	Max. 57,6	kbps	
	Overvoltage Protection	30	A	8/20µs
Digital Inputs	Count	2		
	Mode	Digital - NC / NO		
		Analog 0 - 30kΩ for Balanced Loops		
Relay Output	Type of contact	1x Change-over		
	Max. Load	62.5VA (30W) / 1A / 60V		Resistive Load
Supply without PoE	Voltage	180-260	VAC	45-55Hz
	Power Consumption	Max. 20	W	
	Overvoltage Protection	1500	W	10/1000µs
Power Supply with PoE	2 independent inputs for the external power supply (one power supply 48VDC / 280W is included in the package)			
	Voltage	48-57	VDC	
	Power Consumption	Max. 280	W	
Environment	Operational Range	–30...+60	°C	Temperature of Environment
	Storage Range	–40...+70	°C	
	Humidity	Max. 95	%	Non-condensing
Mechanical	Weight	4,16	kg	
	Dimensions	19" x 1U x 300mm		
	Cooling	Passive		
Certification		CE, TUV		
The producer retains the right to change any technical parameters without previous written or published notification.				
(1) It is not possible to use both interfaces at the same time.				

Front view and Dimensions of 2G-6S.1.16.F

universality

LED INDICATION
PWR - supply 230VAC
lights = OK
LINK/ACT - port activity
lights are green = port is active
RING ERR - error status ring
lights are red = fault
RING - status indication ring
see. description protocol LAN-RING
PoE - state of PoE supply
PoE off = LED not lights
PoE Discovery Disable = blinks are green
PoE OK = lights are green, PoE supply is activate
Fault PoE = lights are red, fault is on the PoE devices (short-circuit, overload, ...)
IN1,2 - states digital inputs
lights green = input is closed
OUT - states relay output
lights green = output is closed
RS485
Tx blinks red = transmit data
Rx blinks green = receive data





P1 – P16:
Fast ethernet ports 10/100Mbps incl. support of PoE acc. to IEEE 802.3af.
Ports are protected with overvoltage protection 30A (8/20µs).

miniGBIC – Gx:
COMBO PORTS with:
- SFP slots for insertion of miniGBIC SFP modules (100/1000 BASE-X),
- RJ45 ports 10/100/1000Mbps.
RJ45 ports are equipped with overvoltage protection 30A (8/20µs).

OUT:
Relay with change-over contact. Output is protected with resetable current protection.

IN1, IN2:
Programmable digital/alarm inputs for connection of contact switches, tampers, PIR sensors,...
Inputs are protected with an overvoltage protection 30A (8/20µs).

SLOTS miniGBIC
Compatibility with 100/1000BASE-X

BUS:
RS485
1 serial buses RS485
Overvoltage protection 30A (8/20µs).

GIGABIT LAN PORT
10/100/1000Mbps
Overvoltage protection 30A (8/20µs)

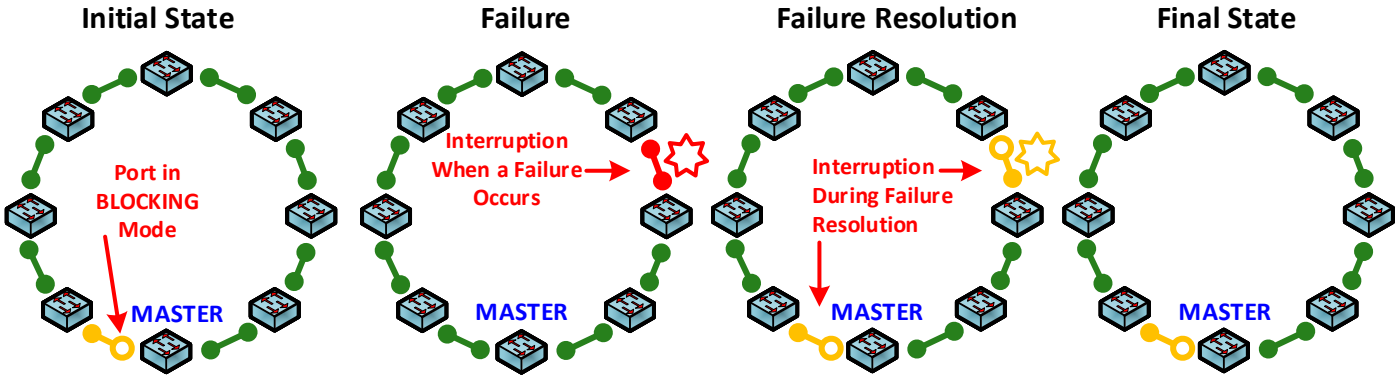
USB:
port for local USB management from application SIMULand.

REVISION
201308 – Start production
201312 – Add additional supply 48VDC
201402 – Exchange CPU module, change marking E->F
201405 – Support RS485 MIOS BUS
201608 – Change datasheet structure
201906 – Added protocol 802.1X

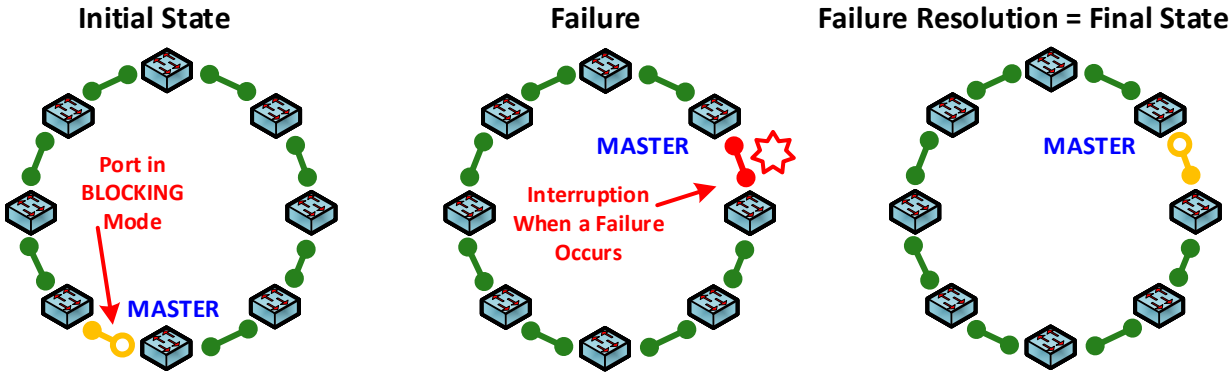
Core Advantages of LAN-RING System

RING Topology

One of the fundamental elements of the security system LAN-RING is fast data forwarding to a back-up line. Since 2008, this function has been performed by LAN-RING.v1 protocol with a switchover time of 30ms from the failure. Each ring in the system has a unique ID and one switch with the MASTER function (controls the ring). The higher port of the MASTER switch is normally set to a BLOCKING mode, hence preventing a loop. A port in BLOCKING mode receives only LAN-RING frames and blocks the other data (back-up line). If a failure occurs, the state of the blocked port changes to FORWARDING and starts to transmit all data.



During the failure creation and resolution, there are 2 short interruptions in the route. The second interruption provides the switchover from the back-up line back to the MASTER switch. Since, the end of 2014, a new innovative version of LAN-RING.v2 is available. The switch which has the MASTER function which controls the ring. In the case of a failure the MASTER function moves to the switch next to the failure. From the origin of the problem to the time of its removal, only one interruption occurs of up to maximum of 30ms.



🕮 **The switchover time to the back-up line is for LAN-RING protocols slightly dependent on the number of switches connected in the ring. With each switch connected to the ring, the reconfiguration time increases by only about 6µs!**

The table below shows an example of switchover times measured during testing at Prague's University ČVUT and in METEL's laboratory.

FAILURE	RSTP	RSTP-M	LAN-RING.v2	UNIT
Failure on an Active Line (5 Switches in a Ring)				
Outage	avg. 84	avg. 30	< 30	ms
Recovery	avg. 197	avg. 30	0	ms
Failure on an Active Line (10 Switches in a Ring)				
Outage	avg. 794	avg. 40	< 30	ms
Recovery	avg. 6	avg. 3	0	ms
Failure on an Active Line (30 Switches in a Ring)				
Outage	-	avg. 110	< 30	ms
Recovery	-	avg. 166	0	ms

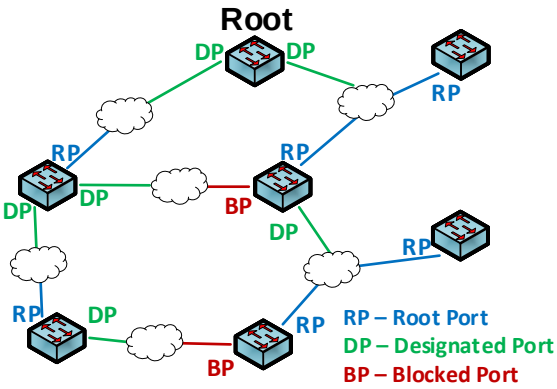
Core Advantages of LAN-RING System

RSTP vs. RSTP-M

RSTP-M complies with the requirements of security and automation systems to ensure a fast back-up route in the case of a failure and at the same time:

- ❖ fully compatible with RSTP acc. to IEEE 802.1D-2004
- ❖ supports MESH topology
- ❖ reduces reconfiguration time to a minimum
- ❖ removes some flaws of RSTP

See examples "Failure of a line" and "Loss of a ROOT switch".

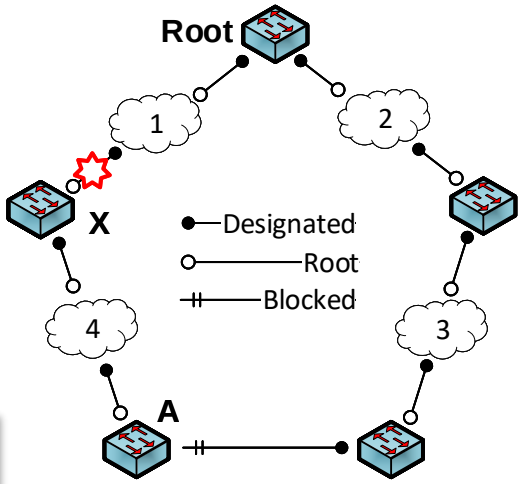


Failure of a Line

When the first failure occurs, the nearest switch (X) propagates information about route loss to the active side of the ring. If this information is received by any other switch knowing the alternative route (Switch A), it is its task to put it into operation.

RSTP: Switch A, after the reception of the information about the failure, is waiting for a periodically sent frame BPDU (by default every 2s) from the alternative route so that it can verify the activity of this back-up line. Only then can it unblock the alternative route.

RSTP-M: Switch A assumes that the alternative route is active and therefore unblocks the route immediately.



Example of Measured Values:

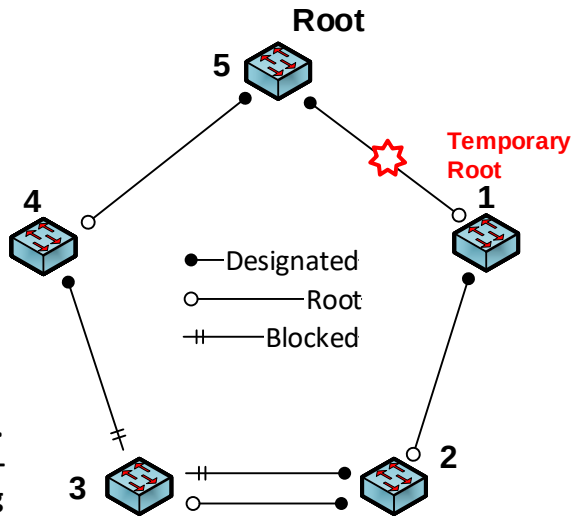
	10 RSTP-M SWITCHES			30 RSTP-M SWITCHES		
	MIN	AVG	MAX	MIN	AVG	MAX
Back-up Unblocking [ms]	< 1	40	45	109	110	116
Topology Recovery [ms]	< 1	3	3	1	166	600

Loss of a ROOT Switch

If switch 1 loses connectivity with ROOT switch (5), it declares itself as a ROOT switch (1) and propagates this information further to the active side. Switch 3 after reception of BPDU initiates a search for an alternative route to switch 5.

RSTP: As an alternative route can be considered a back-up line between switches 2-3 and this will result in the blocking of the so far functioning connection and opening of an alternative connection. This change does not benefit anyone; it only causes undesired data loss. Route 3-4 is thus unblocked later.

RSTP-M: Protocol actively monitors the state of its direct neighbors. Based on this information, switch 3 evaluates changes of route 2-3 as purposeless and there is no switchover. By contrast, it immediately reacts by the unblocking of route 3-4.



🕮 The resolution of these failures is mutually influencing. Some RSTP implementations have a well handled loss-of-a-ROOT-switch problem but lose because of that on handling of the line failure. RSTP-M limits the delays of both of the above mentioned problems and other failures to a minimum.

🕮 In security systems, we recommend using ring topology and LAN-RING protocol ensuring reconfiguration speed. That is its main advantage versus the RSTP. In systems with more complex topology, RSTP-M can be a suitable solution. It does not guarantee reconfiguration time but, in comparison with general RSTP protocol, it reduces the reconfiguration times to a minimum. Non-guaranteed network reconfiguration time can cause longer outages (tens of second and up to minutes) of the connection of VMS.

Core Advantages of LAN-RING System

The LAN-RING industrial switch software includes the Event Management tool set in the Extension menu. The user can set up to 64 automatic actions. The event management switch is also able to communicate directly with the PLC IPLOG where the control program written in the FBD, LD, ST or IL language described in IEC 61131-3 is running. Event management has the potential to significantly increase the value of your system and customize the system to the customer's requirements.

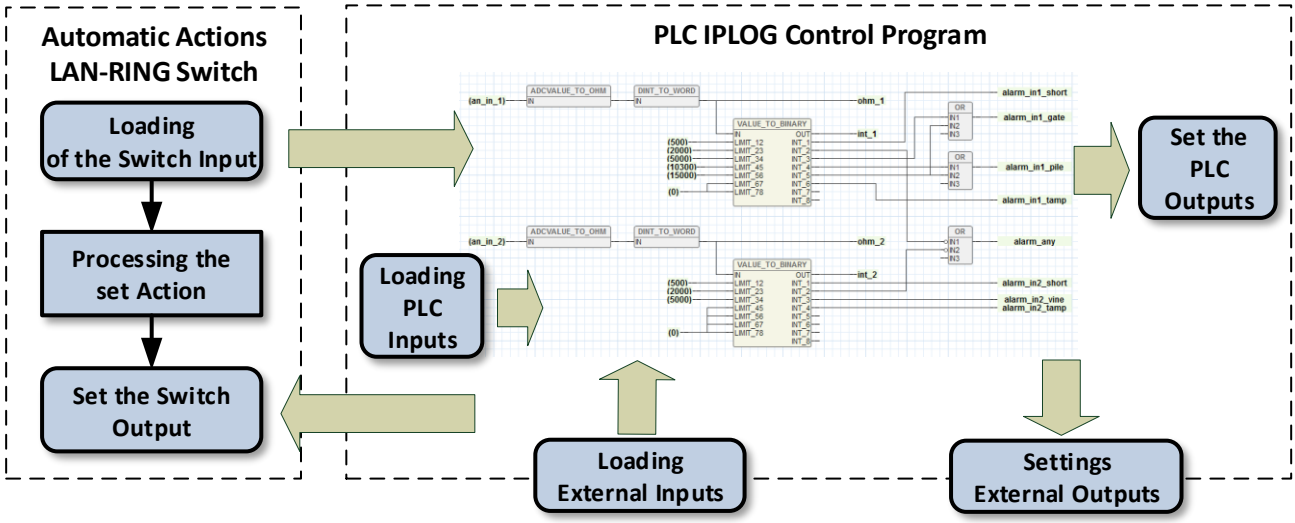
Examples of Automatic Actions

Available Inputs and Outputs

A unique set of tools in the EXTENSION menu of LAN-RING switches and monitoring units IPLOG allow you to set a whole range of automated actions independent of external software. The table below provides an overview of supported inputs and outputs that can be used to set automatic actions.

NAME	TYPES	DESCRIPTION
MODBUS RTU/TCP	INPUTS and OUTPUTS (DI, AI, BI, RE, AO, DO, BO)	Up to 16 IO Modules and Sensors on RS485 Bus
LOCAL IO	INPUTS and OUTPUTS (BI, DI, RE)	Local Inputs and Outputs LAN-RING Switches
ETHERNET EVENTS	INPUTS and OUTPUTS	Protocol for Transmission of Statuses Over LAN
SNMPv2/v3	INPUTS and OUTPUTS	Protocol for Transmission of Statuses Over LAN
TCP EVENTS	INPUTS	Receives TCP Messages From Cameras etc.
RESTART POE	OUTPUTS	Restarts PoE with IP Watchdog
EMAIL	OUTPUTS	Sends E-mails
ONVIF	OUTPUTS	Controls Cameras
HTTP	OUTPUTS	Sends HTTP Commands to CAM, NVR, PLC...
IP WATCHDOGS	INPUTS	Monitors IP devices
OPTICAL RINGS	INPUTS	Monitors Optical RINGs States
FE / GE / FO PORTS	INPUTS and OUTPUTS	Monitors Port States, Port Control

Connection to a PLC IPLOG



Core Advantages of LAN-RING System

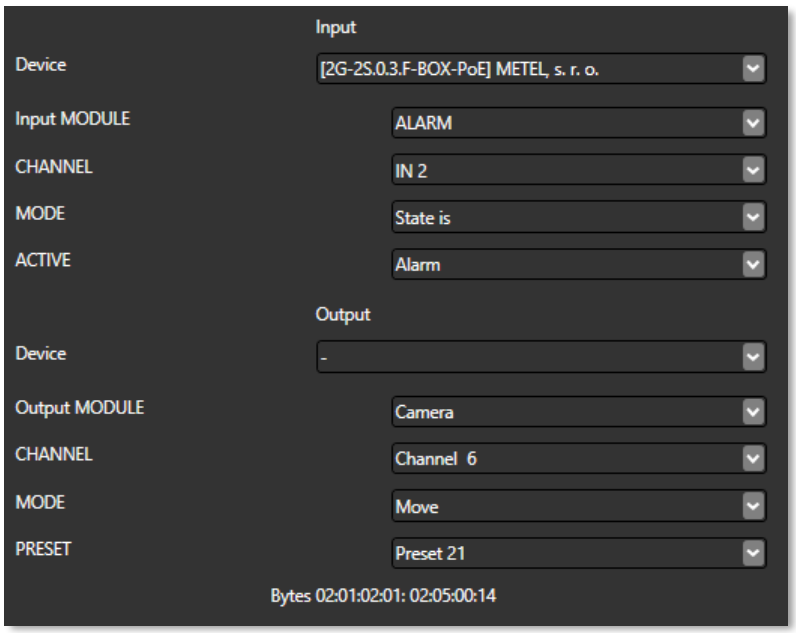
HTTP and ONVIF Commands for Camera Control

Switches and IPLOGs units support controlling 8, 16 or 32 cameras or other IP devices via HTTP and ONVIF Profile S protocols. HTTP tool in devices can use GET and PUT methods with a length of command of up to 128B. The advantage of direct control from switches or IPLOGs units is a high speed response in milliseconds, compared to hundreds of ms when controlling cameras from servers.

Typical application:

- **A camera turns automatically to a door in case of door tamper opening, PIR sensor motion detection etc.**
- **Switch / IPLOG automatically switches on the camera to DAY/NIGHT mode based on an external light sensor.**

Event Example: In the Case of an ALARM Status in IN2, Camera no. 6 will be Turned to Preset no. 21



Advanced IP Watchdogs

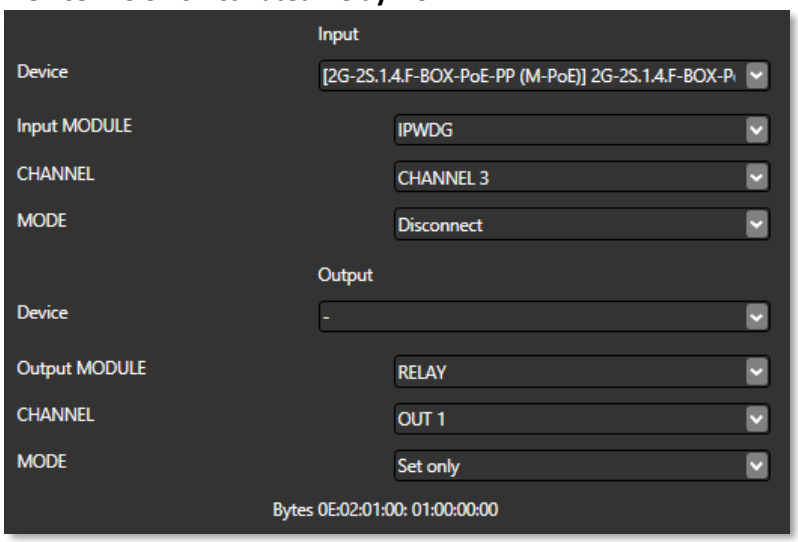
LAN-RING switches and IPLOG PLC support advanced IP Watchdogs that not only monitor the availability of IP devices but are also capable of performing a wide range of automatic actions in the case of a problem being detected. ARP protocol is used for the monitoring of IP devices availability and thus allowing their use for devices with blocked ICMP protocol (pings). There are the following possibilities for switches and PLCs:

- 8 IP Watchdogs in small switches
- 16 IP Watchdogs in 19" switches
- 32 IP Watchdogs in IPLOG units.

IP Watchdog Can:

- **Sends E-mails / SNMP Traps**
- **Controls Local / Remote Relays**
- **Sends HTTP / ONVIF Commands**
- **Turns on / Turns off Ethernet Ports**

Event Example: In the Case of a Detected Disconnected Device No.3 is Activated Relay No.1



Monitoring of Optical Rings and Ethernet Ports

For maximum safety, we recommend constantly monitoring the status of all optical rings. In the event of the first disruption of the optical ring the data is redirected to a backup route and the system continues to function. However, there can occur a second fault, after which, part of the system will be non-functioning. Event Management includes a variety of tools for early detection of faults. Moreover, it is able to monitor and control the (on / off) status of any ethernet or optical port.

Core Advantages of LAN-RING System

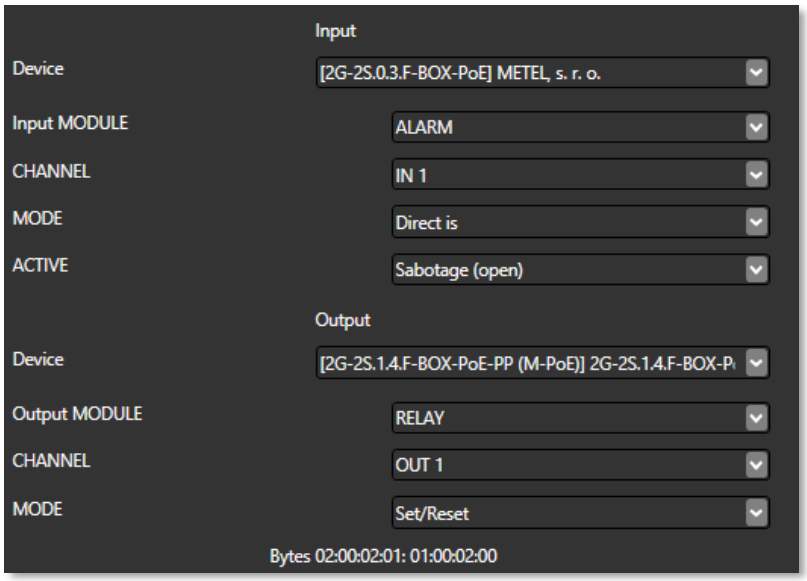
ETHernet events

A completely new concept of Event Manager allows you to set events across devices. Just select the input device, its input and in the same menu as well an output device and its output.

🕮 **Output can be:**

- ❖ digital or analog output on METEL devices available in the network
- ❖ digital or analog output on Modbus devices available in the network.

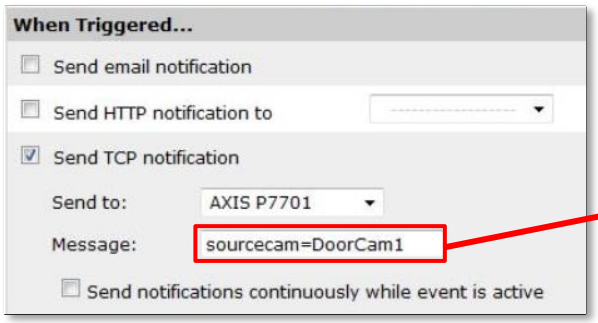
Event example: in case of SABOTAGE status in IN1, is activated remote relay No.1



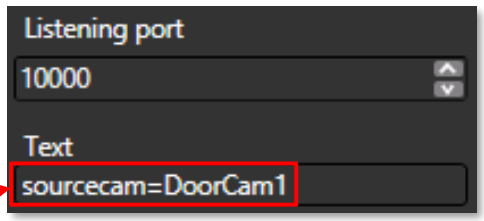
TCP Events

Modern IP cameras can in the case of motion detection or loud noises send TCP events that can serve as another input of Event management METEL.

Menu of IP Camera AXIS



TCP Menu in SIMULand.v4



E-mails

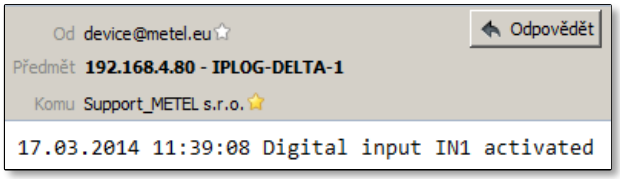
Firmware of LAN-RING switches and PLCs IPLOG support the sending of e-mails over a SMTP server. There are two ways of sending e-mails:

A) During generation of each allowed trap an e-mail is sent to one address marked as **„Logger“**. The message contains the time, trap OID, value and index. This function is called SMTP Logger and can be used e.g. for logging of SNMP traps in the form of e-mails. They are usually not in comparison with SNMP ports, blocked by firewalls.

B) E-mail sending can be set also as an automatic action in menu **„EVENTS“**. An e-mail can be sent to up to 5 addresses. The sending of each piece of information is set separately for each address. Each person thus receives only the e-mails intended for them and is not bothered with redundant information.

Example of Sending OID

Example of E-mail Sending on Activation of IN1



Core Advantages of LAN-RING System

Digital Inputs and Relay outputs

Digital inputs and outputs enable transmission of two-state information in modes:

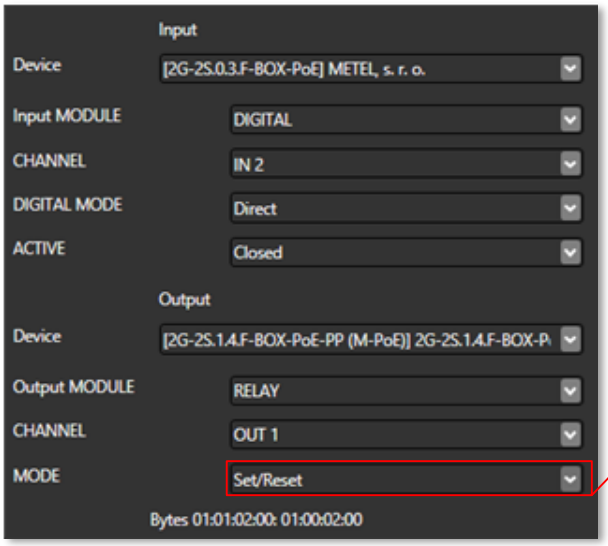
CLOSE – if input is switched (closed), a defined event will be performed. Typical usage – START button that activates a pulse at the relay output for the opening of a gate.

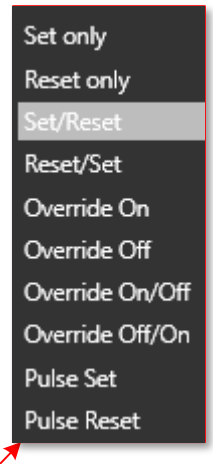
OPEN – if input is disconnected (open), a predefined automatic action will be performed. Typ. usage – setting of OPEN mode for a door contact. When the door opens, the device sends HTTP/ONVIF command for turning the camera to a PRESET, displaying text, etc.

CHANGE – status information is sent in the event of any changes in input.

DIRECT – input status is periodically copied to a set output. This mode is usually used to transmit an input status directly to a relay output(s). Digital input status can be transmitted to local output(s) or using ETH option to output(s) of a remote device.

Event example

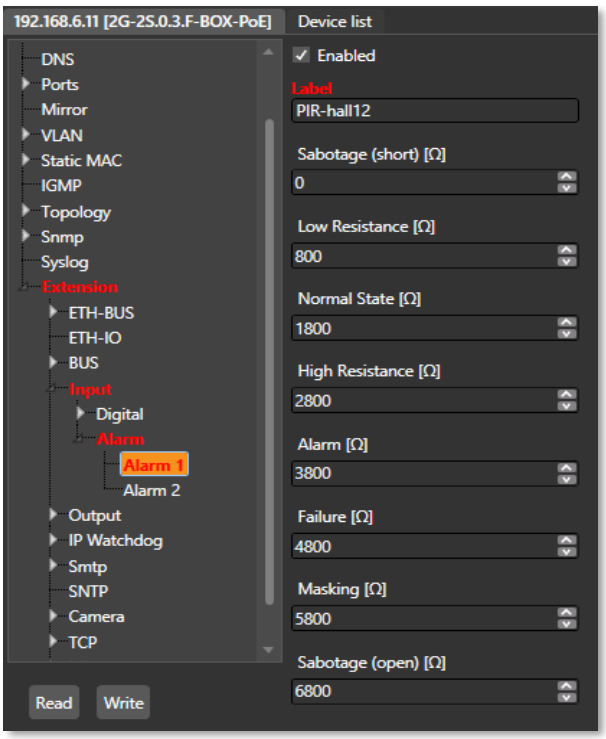




Output modes:

- ❖ activates the selected output,
- ❖ deactivates the selected output,
- ❖ copies the state of input to output,
- ❖ the same as above with negation,
- ❖ turn ON output regardless of other inputs,
- ❖ turn OFF output regardless of other inputs,
- ❖ rewrites output regardless of other inputs,
- ❖ the same as above with negation,
- ❖ activates the output for a set interval,
- ❖ the same as above with negation.

Example of setting a balanced loop



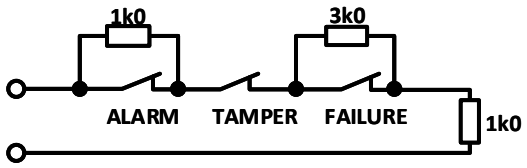
🕮 **Red text in the menu mean that the settings are not saved to the device.**

Balanced Alarm Loops

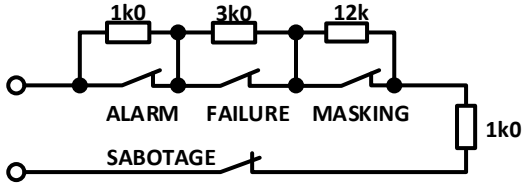
Digital inputs of switches and IPLOG monitoring units can be switched to ALARM mode supporting balanced loops used in alarm systems. It is basically the analog inputs with a variable resistance of connected alarm loops in the range of 0 ....30kΩ. The method of loop balancing and the resistance corresponding to separate statuses can be easily set in the application SIMULand.

Examples:

Double balanced zone with failure signaling



Double balanced zone with failure and masking signaling



Core Advantages of LAN-RING System

Industrial switches LAN-RING and PLCs IPLOG offer a variety of operating modes for serial buses interfaces. In the switches are primarily found RS485 buses, which can be configured to a wide range of operating modes.

LAN-RING - Overview of Supported Modes RS485

		BUS 2							
		RS485	MIOS	EXP-C	Dominus	Galaxy	Peridect	SPC*	RS422	NOTE
BUS 1	RS485	✓	×	×	✓	✓	✓	✓	×	MODBUS ASCII/RTU, I&HAS Asset
	MIOS	✓	×	×	✓	✓	✓	✓	×	IO Modules METEL
	EXP-C	✓	×	×	✓	✓	✓	✓	×	IO Modules METEL
	DOMINUS	✓	×	×	✓	×	✓	×	×	I&HAS Abbas
	GALAXY	✓	×	×	×	×	✓	×	×	I&HAS Honeywell
	PERIDECT	✓	×	×	✓	✓	✓	✓	×	PIDS Sieza
	SPC*	✓	×	×	×	×	✓	✓	×	I&HAS Vanderbilt
	RS422	×	×	×	×	×	×	×	✓	MODBUS
	* Available from CPU Module Version G.									

🕮 **When transmitting data from alarm systems designed in accordance with EN 50131-1 the following rules apply:**

- ❖ **All frames are identified with VLAN headers in accordance with IEEE 802.1Q.**
- ❖ **All connected systems have a defined bandwidth (protection from DDoS attacks).**
- ❖ **Alarm system data have the QoS bits set for the highest priority.**
- ❖ **The activity on all ports in the transmission system should be monitored via SNMP protocol.**

IPLOG - Supported Serial Interfaces

PLCs IPLOG have been developed with focus on the versatility of the whole solution. This also applies to IF modules with serial interfaces. IPLOG has 2 slots for the IF module, one on the MOTHERBOARD and the other on the IO board.

PRODUCT NAMES	AVAILABLE INTERFACES	TYPICAL APPLICATIONS
IF-01(G)	2x RS485	MODBUS IO Modules and Sensors, Remote Reading of the Electric Energy, Water, Heat
IF-02(G)	2x RS232 (Tx, Rx)	Bar Code Readers, Alarm Panels, Weight Scales, Measuring Devices, MODBUS IO Modules
IF-04G	DALI RS485	Lighting Controls MODBUS IO Modules and Sensors, Remote Reading of the Electric Energy, Water, Heat
IF-05	2x DI RS485	PIR Sensors, Tampers, Buttons, Limit Switches MODBUS IO Modules and Sensors, Remote Reading of the Electric Energy, Water, Heat
IF-06	AUDIO: LINE IN/OUT	Two-way Intercom, Audio over LAN Automatic Playback of Audio Messages from Memory
IF-07G	1-Wire RS485	iButton Reader or 1-Wire t/RH, Pressure Sensors MODBUS IO Modules and Sensors, Remote Reading of the Electric Energy, Water, Heat
IF-08G	Profibus	PROFIBUS Sensors for Temperature, Humidity and Speed in Automation Systems
IF-09	M-BUS RS485	Remote Reading of the Electric Energy, Water, Gas and Heat Consumption by M-BUS MODBUS IO Modules and Sensors, Remote Reading of the Electric Energy, Water, Heat
IF-11	Wiegand 2x DI	Wiegand Readers, Wiegand Controllers PIR Sensors, Tampers, Buttons, Limit Switches
IF-12	4x DI 24V	Tampers, Buttons, Limit Switches
IF-13(G)	RS232 (Tx, Rx, CTS, RTS)	Bar Code Readers, Alarm Panels, Weight Scales, Measuring Devices, MODBUS IO Modules
IF-14G	4x DI	PIR Sensors, Tampers, Buttons, Limit Switches
IF-15(G)	4x OC	LED Signaling
IF-16	LoRa	IoT, sensors, ...

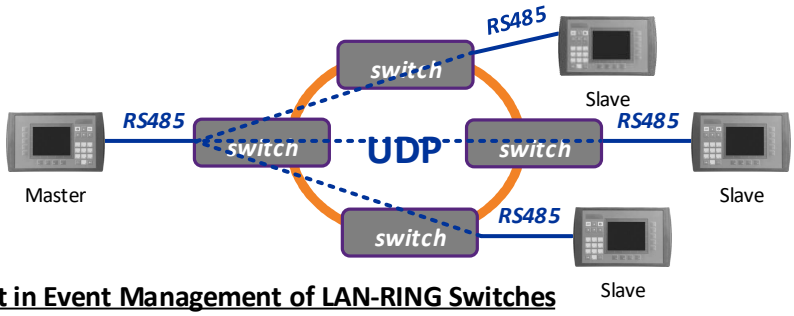
Core Advantages of LAN-RING System

MODBUS RTU / TCP - Support in LAN-RING and IPLOG Devices

Modbus is a serial communication protocol that was established in 1979. Since then, it has been widely used in industrial automation. LAN-RING switches and control units PLC IPLOG supports this standard. The use of Modbus in industrial switches LAN-RING can be following:

PARAMETERS MODBUS RTU	PLC IPLOG-GAMA	SWITCH LAN-RING F, G
Bitrate	115.2 / 19.2 kbps	57.6/19.2 kbps
Bus Lenght	Max. 100 / 1.200 m	Max. 100 / 1.200 m
Slaves on Bus	Max. 30	Max. 16
R / W Cycle	> 10 ms	> 100 ms

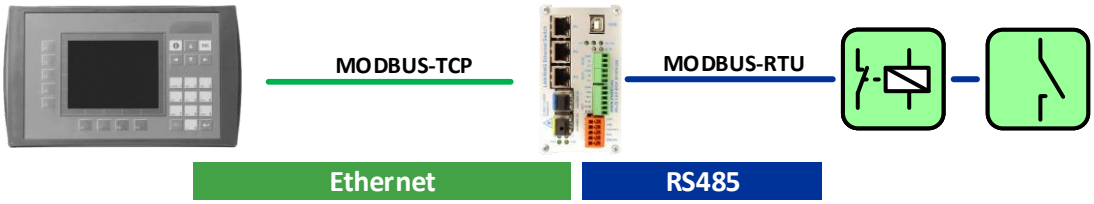
Transparent transmission of Modbus data between RS485 ports



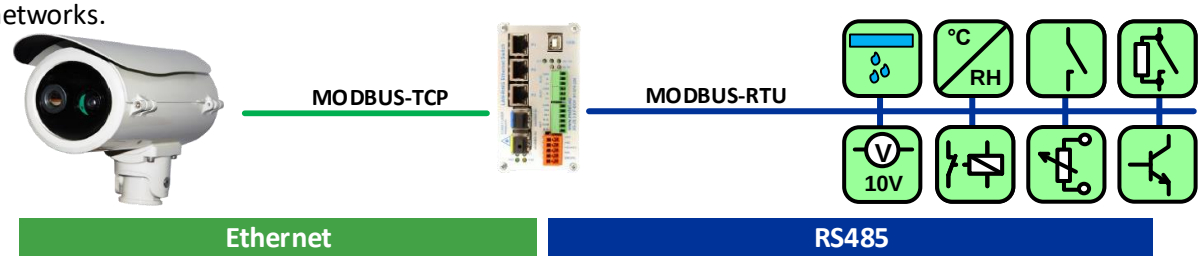
Modbus Support in Event Management of LAN-RING Switches

From June 2016, new firmwares were made available which extend the Event management and supports Modbus RTU and TCP. Typical applications are for example:

❖ **SLAVE Mode** - PLC control via MODBUS protocol outputs of LAN-RING switch / monitoring its inputs.



❖ **MASTER Mode** - Event management of LAN-RING switches communicate via MODBUS RTU or MODBUS TCP protocol with IO modules and sensors which are connected to the RS485 bus or are available on LAN networks.



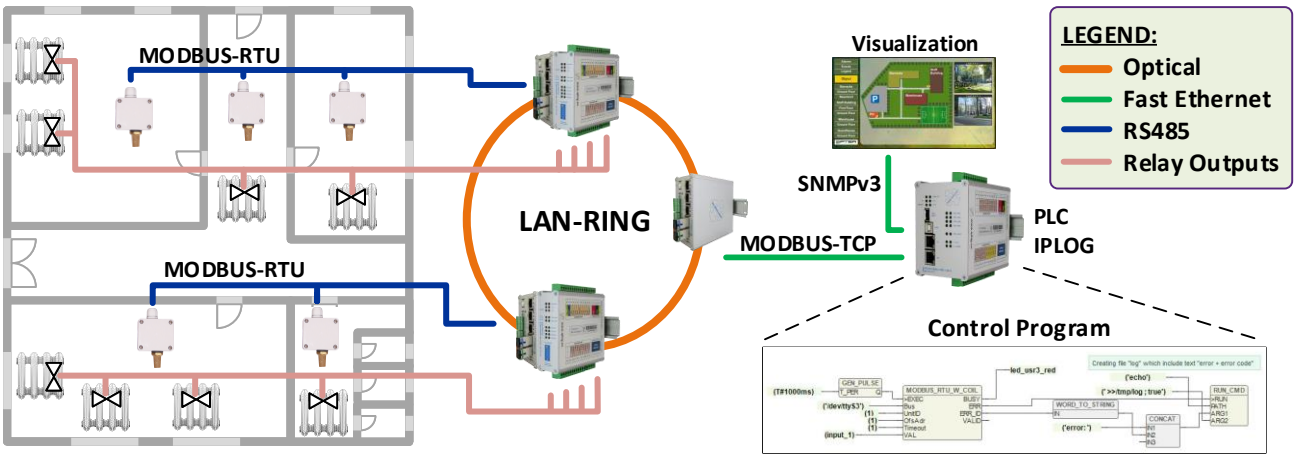
Complex MODBUS solution for data collection, control and visualization of objects

We offer a comprehensive MODBUS solution that covers a wide range of requirements such as:

❖ Data collection from MODBUS sensors connected to RS485 bus switches or PLCs.

❖ Data processing in a PLC by a control program written in FBD, LD, ST or IL languages IEC 61131-3.

❖ Visualization of the system in IFTER-EQU software or in other software using SNMP or MODBUS.



Core Advantages of LAN-RING System

Secure Network Infrastructure Sharing

Communication between configuration software SIMULand and the devices are encrypted with an AES algorithm and protected against unauthorized changes in transmitted data by hash algorithm SHA1. The switches thus comply with EN 62676-1-2 secure communication requirements.

If the switches are used for transmission of alarm systems data and are subject to EN50131-1, different VLAN [2] and QoS [1] must be used for separate services. We recommend assigning the highest QoS to the I&HAS system and the 2nd highest to the management, according to the list below:

- QoS 7 – I&HAS
- QoS 6 – Network Management
- QoS 5 – MIOS / Modbus Events
- QoS 4 – IP CCTV
- QoS 1 – Common Company LAN

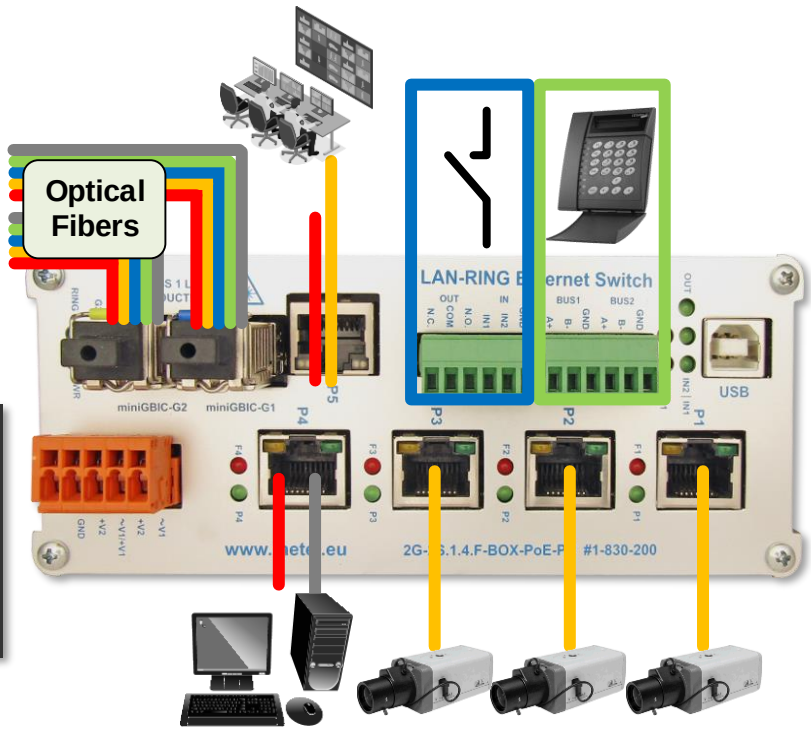
Management Configuration Menu

[1] Priority: 7

[2] VLAN ID: 1

[3]

	Remote IP address	Enabled
ote access IP table 1	192.168.101.16	✓
ote access IP table 2	192.168.101.17	✓
ote access IP table 3	192.168.101.18	✓
ote access IP table 4	192.168.101.19	✓
ote access IP table 5	255.255.255.0	



Remote access to switch management can be restricted based on the source of IP addresses [3] or banned completely by filling in zero IP address (0.0.0.0) [3]. Nevertheless, it is always accessible via USB port for local configuration (password protected) or RESET to default settings.

🕮 **Default setting from FW56: VLAN Enabled, Management VLAN = 1/PRIO=7**

Compliance of 2G-2S.0.2.F, 2G-2S.0.3.F, 2G-2S.3.0.F and 2G-2S.1.4.F switches are in accordance with EN 50131-1 has been verified by trials in the independent test laboratory Testalarm, to security levels 1 to 4. In applications where LAN-RING systems are used as transmission routes for I&HAS systems the following rules must be adhered to.

Support of VLAN, QoS, SNMP, SMTP, SNTP, IGMP, 802.1X

IEEE 802.1Q	VLAN, QoS	IGMP	Internet Group Management Protocol
IEEE 802.3	10BaseT	LLDP	Link Layer Discovery Protocol
IEEE 802.3u	100BaseT(X) / 100Base FX	RSTP	Rapid Spanning Tree Protocol
IEEE 802.3ab	1000Base(X)	SMTP	Simple Mail Transfer Protocol
IEEE 802.3af	PoE max. 15.4W	SNMP	Simple Network Management Protocol
IEEE 802.3at	PoE max. 25.5W	SNTP	Simple Network Time Protocol
IEEE 802.3bt	PoE max. 100W	IEEE 802.1X	Port Access Control

Overvoltage Protections

All ports are protected against overvoltage. As a result, the Mean Time Between Failures (MTBF) on the devices is higher, helping to minimize maintenance costs.

Port	Protection
Fast Ethernet	1000 A (8/20µs)
Gigabit Ethernet (COMBO)	30 A (8/20µs)
Supply	1500 W (10/1000µs)

Core Advantages of LAN-RING System

Support of Monitoring and Visualization Software

Switches support a wide range of monitoring and visualization software. For communication with these software platforms is for security reasons used solely communication encrypted with SNMP (.v3) and methods:

SNMP SET – device setting via SNMP protocol. Typical example: setting of relay and any configuration of fast/gigabit Ethernet ports or serial buses RS485.

SNMP GET – sending of status information based on a request from the control system. This form is used for transmission of typically non-critical operational information. SNMP manager periodically queries SNMP agents. The con is the fact that the information transmission can be delayed by a few seconds.

SNMP TRAP – the device spontaneously sends status information to the control system. SNMP TRAP is frequently used for transmission of critical statuses. Its advantage resides, in comparison with SNMP get, in immediate reaction.

🕮 **For integration to other programs MIB files are available for download at www.metel.eu.**

Monitoring of Network Infrastructure

To monitor network devices METEL we recommend using ZABBIX software (tested) or any other software with support of SNMP.v3/v2c.

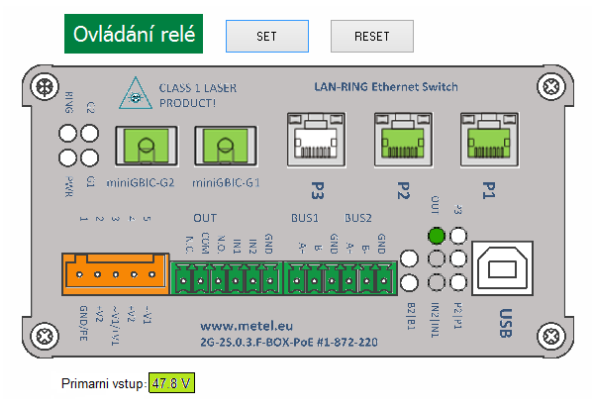
Visualization of Network Infrastructure

To monitor and visualize network infrastructure comprising of switches METEL or other manufacturers we recommend IFTER EQU software. It is an information system for visualization, integration and management of security systems, building automation systems and their control from the monitoring centers. IFTER EQU has built-in support of:

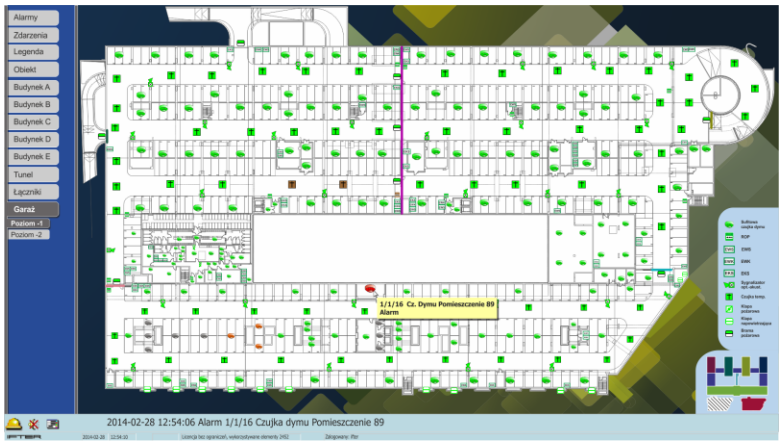
- ❖ access control systems
- ❖ CCTV systems
- ❖ alarm systems
- ❖ fire alarm systems
- ❖ building automation systems

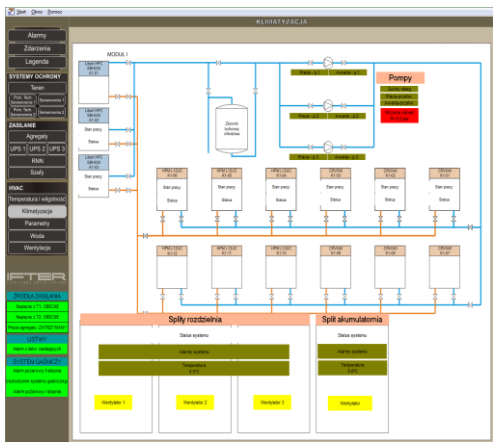
The software allows specifying the reaction of one system to an event occurred in another. One of its main advantages is the native support of standards SNMP, MODBUS, BACKNET, OPC without having to create special drivers. IFTER EQU uses client-server architecture. Client workstations are connected to a central database to store process data. Flexible client-server architecture thus allows system management from anywhere in the LAN/WAN.

Example of switch details in IFTER EQU



Example of graphical panels in IFTER EQU



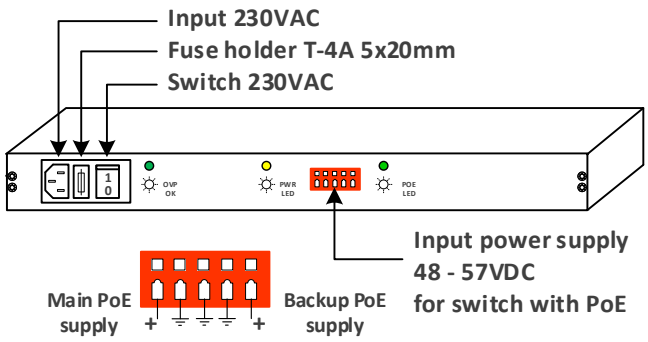


2G-6S.1.16.F

Industrial PoE Managed Switches

1. **Mounting**
   Mount the switch to 19´´ rack RACK/3U or flat surface.

2. **Connect supply**
   Connect power supply. The supply is indicated by LED PWR. **When using a PoE power is required to connect an external 48 - 57 VDC power supply.**
   Note: Power supply 230VAC provides full functionality of switches without PoE power. External power supply 48 - 57VDC is ensured full functionality of the switch, including PoE. Switches are equipped with two redundant inputs 48 - 57 VDC. The inputs 230VAC and 48 - 57 VDC can be used simultaneously.



3. **Insert optical module**
   Any SFP module complying with MSA requirements (agreement of SFP modules manufacturers) can be inserted into the SFP slot. For modules with duplex transmission over one fiber (wavelength multiplex) we must ensure that the optical modules are connected correctly to each other. That means that for example for WDM modules METEL can interconnect W4 with W5. We can't interconnect W4 with W4 or W5 with W5.
   Note:
   For the correct functioning of the LAN-RING.v1 and .v2 systems it is essential to maintain the proper connection of the GBIC modules. Module W4 must be connected to a pair of lower slot designation and module W5 to higher slot.

Table shows how to insert SFP modules for the correct functioning of the LAN-RING.v1 and v2.

Slot name	Mark SFP modules	Wavelength
miniGBIC-G1	BX-100/1000-20-W4-L	Tx: 1310nm, Rx: 1550nm
miniGBIC-G2	BX-100/1000-20-W5-L	Tx: 1550nm, Rx: 1310nm
miniGBIC-G3	BX-100/1000-20-W4-L	Tx: 1310nm, Rx: 1550nm
miniGBIC-G4	BX-100/1000-20-W5-L	Tx: 1550nm, Rx: 1310nm
miniGBIC-G5	BX-100/1000-20-W4-L	Tx: 1310nm, Rx: 1550nm
miniGBIC-G6	BX-100/1000-20-W5-L	Tx: 1550nm, Rx: 1310nm

In the picture below you can find the maximum draw through each port. In accordance with standard EN 62676-1-2 we recommend the system be designed with a 25% reserve.