



NV10P

MULTIFUNCTION VOLTAGE AND FREQUENCY PROTECTION RELAY

MANUAL



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This document applies to NV10P devices with firmware release 3.50 and following.

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1 INTRODUCTION

Scope and liability



This document describes the functions, the technical data of NV10P devices; instructions for mounting, setting and commissioning are included. All the protective functions included in the NV10P version (27, 59, 59N, 810, 81U, 81R) are exposed; they are valid for the same protective functions included in the Basic versions NV10B (27, 59, 59N).

This manual has been checked out, however, deviations from the description cannot be completely ruled out, so that no liability in a legal sense for correctness and completeness of the information or from any damage that might result from its use is formally disclaimed.

The information given in this document is reviewed regularly; any corrections and integration will be included in subsequent editions that are identified by the date of revision.

We appreciate any suggestions for improvement.

We reserve the right to make technical improvements without notice.

Applicability

This manual is valid for NV10P devices with firmware release 3.50 and following.

Conformity

The product complies with the CEE directives:

- EMC Council Directives: 2014/30/EC
- Low voltage Directives: 2014/35/EC



Technical support

Contact: Service tecnico THYTRONIC www.thytronic.it

Copyright

All right reserved; It is forbidden to copy, modify or store material (document and sw) protected by copyright without Thytronic consent.

Warranty

Thytronic warrants devices against defects in materials and workmanship under normal use for a period of ONE (1) YEAR from the date of retail purchase by the original end-user purchaser ("Warranty Period").

Safety recommendations

The warning contained in this document are all-important for safety; special attention must be paid to the following symbols:



DANGER

Death, severe personal injury or substantial property damage will result if proper precautions are not taken



WARNING

Death, severe personal injury or substantial property damage can result if proper precautions are not taken.



CAUTION

Minor personal injury or property damage can result if proper precautions are not taken

Installation and commissioning must be carried out by qualified person; Thytronic assumes no responsibility for damages caused from improper use that does not comply all warning and caution in this manual.

In particular the following requirements must be met:

- Remove power before opening it.
- Verify the voltage absence by means suitable instrumentation on relay connections; attention must be paid to all circuits supplied by external sources (binary input, CT, etc...)
- Care must be taken when handling metal parts (front panel, connectors).



CAUTION

Settings must be established on the basis of a coordination study.

Numerical values inside examples have educational purpose only; they don't be used, in no way, for actual applications.

Insulation tests

After insulation tests, hazardous voltages (capacitor charges,...) may be arise; it is advisable to gradually reduce the test voltage avoiding to erase it abruptly.

Product identification

Each device is equipped with:

- Identification label installed on the front side with following informations: code number, phase and residual nominal currents, auxiliary voltage range and CE mark:
- Test label with following informations: data, serial number and test operator signature.

Environment

The NV10 device must be employed according to the environment conditions shown (see technical data).

In case of different environment conditions, appropriate provisions must be provided (conditioning system, humidity control, etc...).

If contaminants are present (dust, corrosive substances, etc...), filters must be provided.

Graphical conventions

The CEI/IEC and ANSI symbols is employed where possible:

e.g.: 27= ANSI code concerning the undervoltage element.

Following text formats are used:

The ThyVisor⁽¹⁾ menu:

Undervoltage - 27

The parameter description (measures, thresholds, operate time,...) and related value:

U > element
Definite time
U > def

The display messages (MMI) are shown as:

NV10

Notes are highlighted with cursive letters inside colored bar

Note: Useful description note

Glossary/definitions

27	Undervoltage ANSI code
59	Overvoltage ANSI code
59N	Residual voltage ANSI code
81O	Overfrequency ANSI code
81U	Underfrequency ANSI code
81R	Frequency rate of change ANSI code
BF	B reaker F ailure
74VT	VT monitoring
74TCS	Trip Circuit Supervision
DFR	Digital Fault Recorder (Oscillography)
SER	Sequential Event Recorder
SFR	Sequential Fault Recorder
ANSI	American National Standard Institute
IEEE	Institute of Electrical and Electronics Engineers
IEC	International Electrotechnical Commission
CENELEC	Comité Européen de Normalisation Electrotechnique
52 o CB (Circuit Breaker)	Circuit Breaker
52a	Auxiliary contact in the breaker that is in the same position as the breaker. It can be assigned to a binary input to locate the CB position (Breaker failure and/or CB diagnostic functions). (52a open = CB open)
52b	Auxiliary contact in the breaker that is in the opposite position as the breaker (52b open = CB closed)
K1...K6...K10	Output relays
Pulse	Output relay with pulse operation
tTR	Output relay minimum pulse width
Latched	Output relay with latched operation (manual reset) Output relay with latched operation (automatic reset)
No-latched	Output relay with no-latched operation (automatic reset)
CT	Current Transformer
P1	IEC nomenclature for primary polarity mark of CTs (as an alternative to a ANSI dot)
P2	IEC nomenclature for primary polarity mark of CTs (as an alternative to a ANSI no-dot)
S1	IEC nomenclature for secondary polarity mark of CTs (as an alternative to a ANSI dot)
S2	IEC nomenclature for secondary polarity mark of CTs (as an alternative to a ANSI no-dot)

Note 1 The graphic interface and the operation of the ThyVisor software are described in the relative chapters

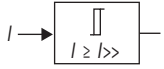


Self test	to a ANSI no-dot) Diagnostic
Start	Leave an initial condition or reset condition (Pickup)
Trip	Operation (with operate time)
Operating time	Duration of time interval between the instant when the characteristic quantity in reset condition is changed, under specified conditions, and the instant when the relay operates
Dropout ratio	The ratio of a reset value to an operate value in well-specified conditions. The dropout ratio may be lower or greater than 1 according as an over or under element is considered
Reset time	Duration of the time interval between the instant when the characteristic quantity in operate condition is changed, under specified conditions, and the instant when the relay operates. The stated reset time is related to a step variation of characteristic quantity in operate condition to the reset condition.
Overshoot time	The critical impulse time for a relay which is in its reset condition, is the longest duration a specified change in the input energizing quantity(ies) (characteristic quantity), which will cause the relay to change to operate condition, can be applied without the relay switches. The overshoot time is the difference from the operate time and the critical impulse time. The declared values for the overshoot time are applicable with the lower setting value of the operation time.
MMI (Man Machine Interface)	Operator front panel
ThyVisor	Setting and monitoring software
Log file	A text file that lists actions that have occurred (ThyVisor).
J2SE	Java Platform Standard Edition
Subnet Mask	(Ethernet nomenclature)
Sw	Software
Fw	Firmware
Upgrade	Firmware upgrade
XML	eXtensible Markup Language

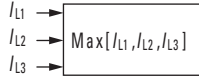
Symbols



Threshold setting (e.g. pickup $I_{>>}$).
The value is available for reading and is adjustable by means ThyVisor + MMI.



Limit block ($I \geq I_{>>}$ threshold).



Computation block (Max phase current)



Curve type (definite/inverse time)



Logic internal signal (output); may be a logical state (e.g. $I_{>>}$ Start) or a numerical value
It is available for reading (ThyVisor + communication interface)



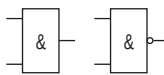
Logic external signal (input); may be a command coming from a binary input or a sw command
It is available for reading (ThyVisor + communication interface)



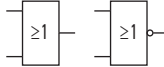
Internal signal (e.g. Breaker Failure output state concerning to the 2nd threshold of the 50 element)
It is not available for reading (missing arrow)



Switch



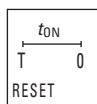
AND and NAND logic gates



OR and NOR logic gates



EXOR logic gate



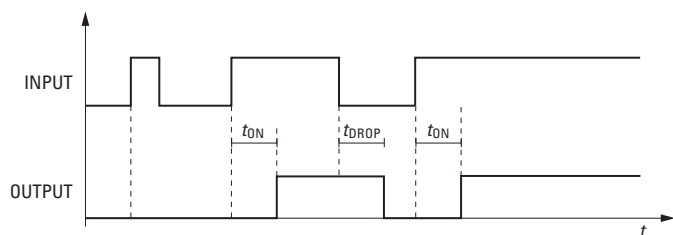
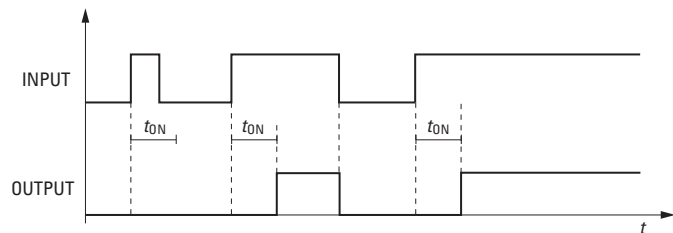
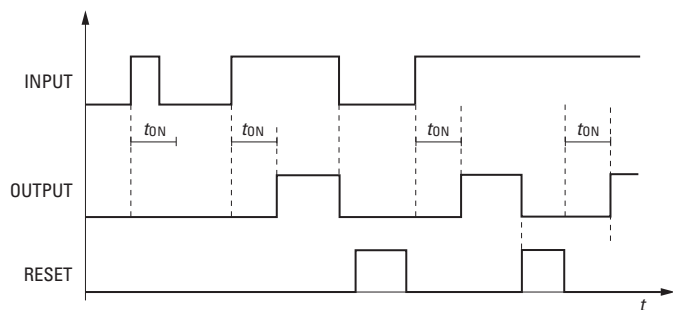
ON delay timer with reset (t_{ON} delay)

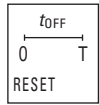


ON delay timer without reset (t_{ON} delay)

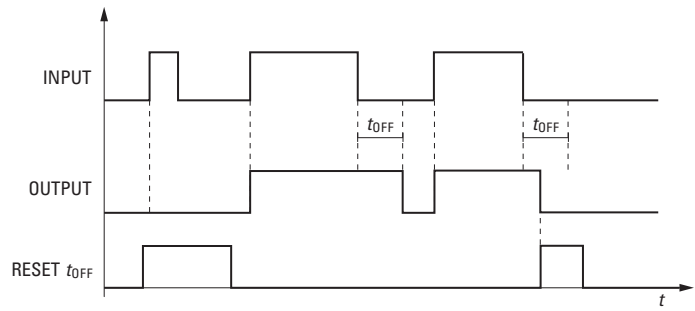


OFF delay timer (dropout) without reset (t_{DROP} delay)

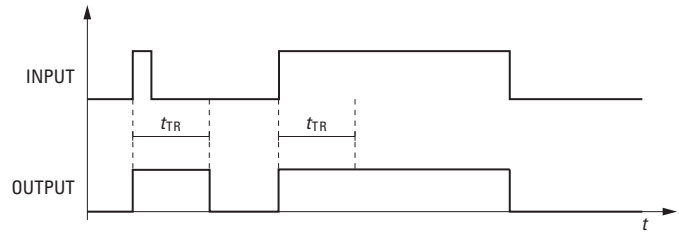




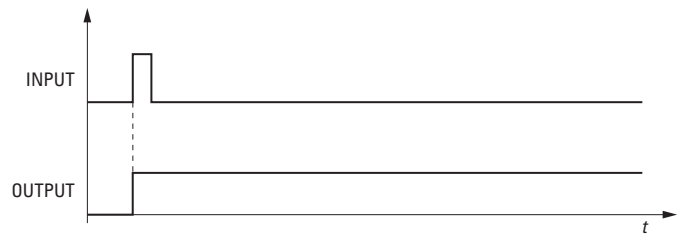
OFF delay timer (dropout) with reset (t_{OFF} delay)



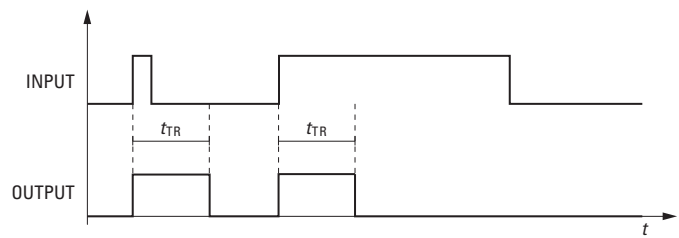
Minimum pulse width operation for output relays (t_{TR})



Latched operating mode for output relays and LEDs



Pulse operating mode for output relays



2 GENERAL

Preface

The relay type NV10P can be typically used in HV, MV and LV distribution systems, on transformers or for electrical machines.

It can be used for system decoupling, load shedding and loss of main (islanding) protection.

In addition to the main protection element, the breaker failure (BF), Trip Circuit Supervision (TCS) and programmable logic (PLC) are also provided are also provided.

— Input circuits for inductive VTs TV or direct connection

Following input circuits are available:

- Three voltages (line-to-line) with nominal voltages programmable in the range 50...130 V ($U_R=100V$) or 200...520 V ($U_R = 400V$) and one residual voltage input with nominal voltage programmable in the range 50...130 V ($U_{ER}=100V$).

— Input circuits for electronic Sensor

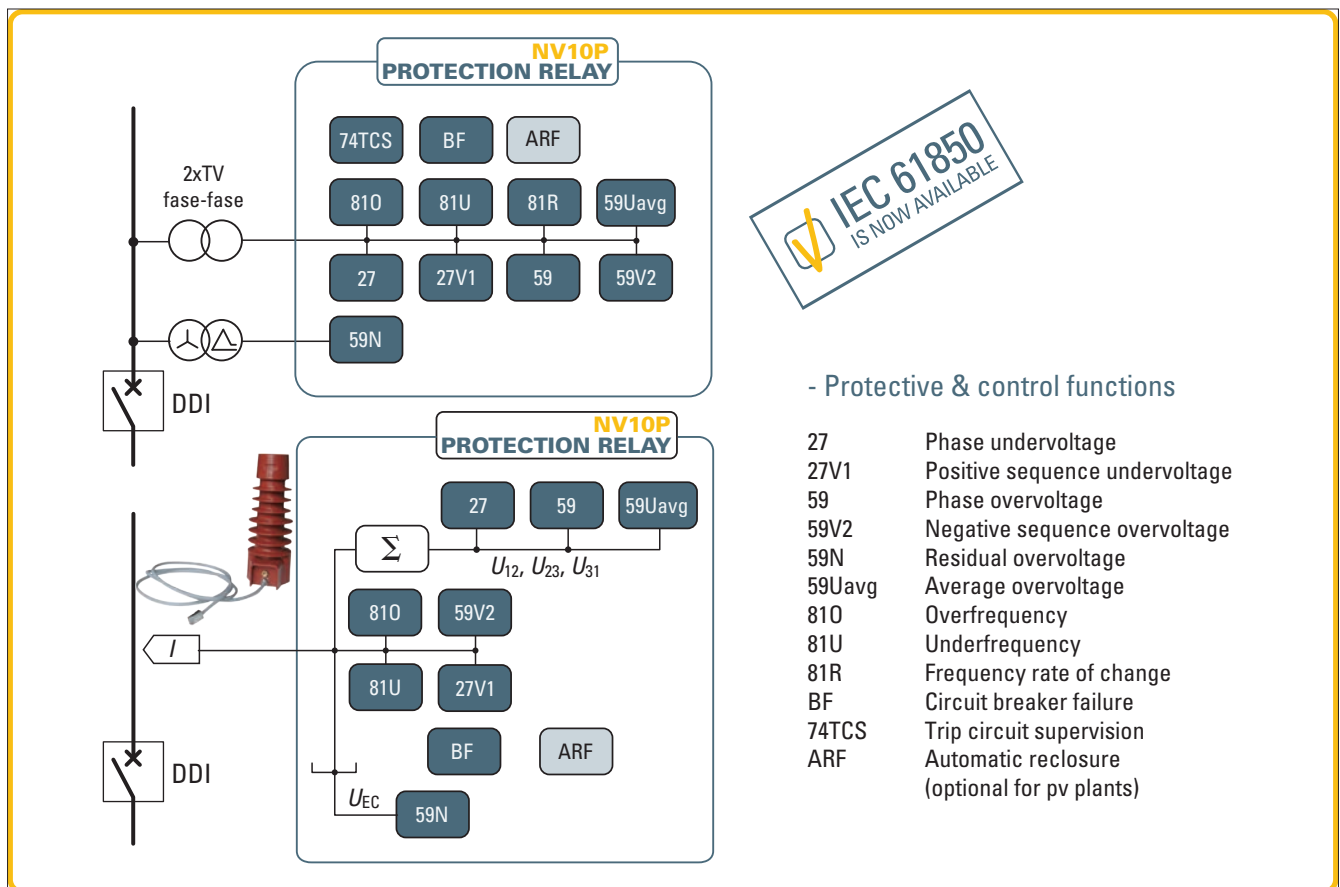
Following input circuits are available:

- Three voltages (line-to-ground) with 20/ $\sqrt{3}$ kV nominal voltage); the residual voltage is calculated from phase voltages.

Setting, programming and reading operations must be effected by means of Personal Computer with ThyVisor software or by means of remote communication interface (RS485 bus, Ethernet network and USB); all operations must be performed through MMI if enabled.

According to the hardware configurations, the NV10P protection relay can be shipped in various case styles depending on the required mounting options:

- Flush.
 - Projecting mounting.
 - Rack.
 - With separate operator panel.
- Other options are:
- Auxiliary power supply operating range.
 - Communication protocols.



- Protective & control functions

27	Phase undervoltage
27V1	Positive sequence undervoltage
59	Phase overvoltage
59V2	Negative sequence overvoltage
59N	Residual overvoltage
59Uavg	Average overvoltage
810	Overfrequency
81U	Underfrequency
81R	Frequency rate of change
BF	Circuit breaker failure
74TCS	Trip circuit supervision
ARF	Automatic reclosure (optional for pv plants)

Main features

- Metallic case.
- Backlight LCD 4x16 Display.
- Eight LEDs that may be joined with matrix criteria to many and various functions.
- RESET key to clear LED indications and latched output relays.
- Two free settable binary inputs.
- Independently settable for start, trip, self-test and control six output relay (K1...K6) Each output relay may be set with normally energized or normally de-energized operating mode and manual or automatic reset (latched/no-latched).
- Rear Ethernet communication port, with MODBUS TCP/IP® or IEC61850 protocol, with RJ45 (copper wires) or FX (optical fiber) connection.
- Rear RS485 port, with ModBus protocol.
- USB front serial port (local communication for ThyVisor).
- Real time clock with super capacitor.

The most significant constructive features are:

- Galvanically insulated input and output circuits (communication and binary circuits included).
- Optimum filtering of input signals through combined use of analog and digital filters.
- Traditional electromechanical-type final output contacts with continuous monitoring of control coil continuity.
- Auxiliary supply comprising a switching-type voltage stabilizing circuit having a very wide working range and a very small power dissipation
- Nominal frequency: 50 or 60 Hz.

The most significant operating features are:

- Programming of operating modes and parameters by means of the front keys and alphanumeric display, with a programming procedure based on carrying out guided selections and on explicit and immediate signalling of the operations being performed, so that such procedure can be carried out without coding tables or mnemonic informations.
- The feature modification operations do not interrupt the normal functions of the relay.
- Impossibility of programming unacceptable parameter values, thanks to the automatic limitation of top and bottom scale values for the relative setting ranges.
- Currents are sampled 24 times per period and measured in the effective value (RMS) of the fundamental component using the DFT (Discrete Fourier Transform) algorithm and digital filters.
- The fault recorder (SFR) runs continuously capturing in circular mode the last twenty events upon trigger of binary input/output and/or element pickup (start-trip).
- The event recorder (SER) runs continuously capturing in circular mode the last three hundred events upon trigger of binary input/output.
- Digital fault recorder (DFR) in COMTRADE format (oscillography).

Photo



3 TECHNICAL DATA

3.1 GENERAL

Product standard for measuring relays

Reference standards

IEC 60255-1 **Part 1: Common requirements**

Mechanical data

Mounting:	
• Flush.	
• Projecting.	
• Rack.	
• Separated operator panel.	
External dimensions (Flush mounting)	177 x 107 x 235 (high x width x depth)
Terminals	screw connection
Mass (Flush mounting)	2.0 kg
Reference standards	EN 60529, EN 60529/A1
<i>Degrees of protection provided by enclosures (IP Code)</i>	
• Front	IP52
• Terminals	IP20

Insulation

<i>Reference standards</i>	EN 60255-5, IEC 60255-27
High voltage test (50 Hz - 60 s)	
• Auxiliary power supply	2 kV
• Input circuits	2 kV
• Output circuits	2 kV
• Output circuits (between open contacts)	1 kV
• Communication circuits	500 V
Impulse voltage withstand test (1.2/50 µs):	
• Auxiliary power supply	5 kV (Common mode) - 2kV (Differential mode)
• Input circuits	5 kV
• Output circuits	5 kV
• Output circuits (between open contacts)	1 kV
Insulation resistance	>100 MΩ

Voltage dip and interruption

<i>Reference standards</i>	EN 61000-4-29, IEC 60255-22-11
Voltage dips, short interruptions and voltage variations on dc input power port immunity tests	
• Interruption (UT=40%)	100 ms
• Interruption (UT=0%)	50 ms
• Voltage variations (UT=80...120%)	10 s

EMC tests for interference immunity

<i>Reference standards</i>	IEC 60255-26, EN 60255-26
Product standard for measuring relays	
Generic standards immunity for industrial environments	EN 61000-6-2
• Electromagnetic compatibility requirements for measuring relays and protection equipment	
Apparati di automazione e controllo per centrali e stazioni elettriche	
• Compatibilità elettromagnetica - Immunità	ENEL REMC 02
• Normativa di compatibilità elettromeccanica per apparati e sistemi	ENEL REMC 01
<i>Reference standards</i>	EN 60255-22-1 IEC 60255-22-1 EN 61000-4-12 EN 61000-4-12
Damped oscillatory wave	
• 0.1 MHz and 1 MHz common mode	2.5 kV
• 0.1 MHz and 1 MHz differential mode	1.0 kV
• Ring wave common mode	2.0 kV
• Ring wave differential mode	1.0 kV
<i>Reference standards</i>	EN 60255-22-2 IEC 60255-22-2 EN 61000-4-2 IEC 61000-4-2
Electrostatic discharge	
• Contact discharge	6 kV
• Air discharge	8 kV
<i>Reference standards</i>	EN 60255-22-3 IEC 60255-22-3 EN 61000-4-3 IEC 61000-4-3
Radiated radio-frequency fields	
• 80...1000 MHz AM 80%	10 V/m

	• 900 MHz Pulse modulated	10 V/m
	<i>Reference standards</i>	EN 60255-22-4 IEC 60255-22-4 EN 61000-4-4 IEC 61000-4-4
	Fast transient burst (5/50 ns)	
	• Auxiliary power supply • Input circuits	2 kV 4 kV
	<i>Reference standards</i>	EN 60255-22-5 IEC 60255-22-5 EN 61000-4-5 IEC 61000-4-5
	High energy pulse	
	• U_{aux} (line-to-ground 10 ohm, 9 μF) • U_{aux} (line-to-line 0 ohm, 18 μF) • I/O ports (line-to-ground 40 ohm, 0.5 μF) • I/O ports (line-to-line 40 ohm, 0.5 μF)	2 kV 1 kV 2 kV 1 kV
	<i>Reference standards</i>	EN 60255-22-6 IEC 60255-22-6 EN 61000-4-6 IEC 61000-4-6
	Conducted radio-frequency fields	
	• 0.15...80 MHz AM 80% 1kHz	10 V
	<i>Reference standards</i>	EN 60255-22-7 IEC 60255-22-7 EN 61000-4-16 IEC 61000-4-16
	Power frequency immunity tests	
	• Dc voltage • 50 Hz continuously • 50 Hz 1 s • 0.015...150 kHz	30 V 30 V 300 V 30 V
	<i>Reference standards</i>	EN 61000-4-8 IEC 61000-4-8
	Magnetic field 50 Hz	
	• 50 Hz continuously • 50 Hz 1 s	100 A/m 1 kA/m
	<i>Reference standards</i>	EN 61000-4-10 IEC 61000-4-10
	Damped oscillatory magnetic field	
	• Damped oscillatory wave 0.1 MHz • Damped oscillatory wave 1 MHz	30 A/m 30 A/m
Emission	<i>Reference standards</i>	EN 60255-25 IEC 60255-25 EN 61000-6-4 IEC 61000-6-4 EN 55011 CISPR 11
	Electromagnetic emission tests	
	• Conducted emission auxiliary power supply 0.15...0.5 MHz • Conducted emission auxiliary power supply 0.5...30 MHz • Radiated emission 30...230 MHz • Radiated emission 230...1000 MHz	79 dB μ V 73 dB μ V 40 dB μ V/m 47 dB μ V/m
Mechanical tests	<i>Reference standards</i>	EN 60255-21-1 EN 60255-21-2 RMEC01
	Vibration, shock, bump and seismic tests on measuring relays and protection equipment	
	• EN 60255-21-1 Vibration tests (sinusoidal) • EN 60255-21-2 Shock and bump test	Class 1 Class 1
Climatic tests	<i>Reference standards</i>	IEC 60068-x ENEL R CLI 01 CEI 50
	Environmental testing	
	Ambient temperature	-25...+70 °C
	Storage temperature	-40...+85 °C
	Relative humidity	10...95 %
Safety	Atmospheric pressure	70...110 kPa
	<i>Reference standards</i>	IEC 60255-27
	Safety requirements for electrical equipment for measurement, control and laboratory use	
	Pollution degree	3
	Reference voltage	250 V
Certifications	Overvoltage category	III
	<i>Reference standards</i>	
	Product standard for measuring relays	EN 50263
	CE Conformity	
	• EMC Directive • Low Voltage Directive	2014/30/EC 2014/35/CE
	Type tests	IEC 60255-1

3.2 INPUT CIRCUITS

Auxiliary power supply U_{aux}

Voltage	
Nominal value (range)	24...48 V~/ or 115...230 V~/110...220 V-
Operative range (each one of the above nominal values)	19...60 V~/ - 85...265 V~/75...300 V-
<i>Inrush current (max)</i>	
• 24 V-	6 A, 5 ms
• 48 V-	14 A, 5 ms
• 110 V-	20 A, 1 ms
• 230 V~	50 A, 1 ms
Frequency (for alternate voltage supply)	45...66 Hz
Max distortion factor (for alternating voltage supply)	15%
<i>Max alternating component (for dc voltage supply):</i>	
• Full wave rectified sine wave	100 %
• Sine wave	80 %
<i>Power consumption:</i>	
• Maximum (energized relays, Ethernet TX)	10 W (20 VA)
• Maximum (energized relays, Ethernet FX)	15 W (25 VA)

Voltage input circuits

Relay phase to phase nominal voltage $U_n^{(1)}$	50...130 V ($U_R = 100$ V) 200...520 V ($U_R = 400$ V)
Relay phase nominal voltage $E_n = U_n / \sqrt{3}$	-
Permanent overload	1.3 U_n
Thermal overload (1 s)	2 U_n
Rated consumption (for any phase)	≤ 0.5 VA

Residual voltage input circuit

Relay residual nominal voltage U_{En}	50...130 V
Permanent overload	1.3 U_{En}
Thermal overload (1 s)	2 U_{En}
Rated consumption	≤ 0.5 VA

Binary input circuits

Quantity	2
Type	optocoupler
Operative range	24...265 V~/ -
Min activation voltage U_{DIGmin}	18 V
Max consumption, energized I_{DIG}	3 mA

3.3 OUTPUT CIRCUITS

Relays

Quantity	6
Type of contacts K1, K2	changeover (SPDT, type C)
Type of contacts K3, K4, K5	make (SPST-NO, type A)
Type of contacts K6	break (SPST-NC, type B)
Nominal current	8 A
Nominal voltage/max switching voltage	250 V~/400 V~
<i>Breaking capacity:</i>	
• Direct current (L/R = 40 ms)	50 W
• Alternating current ($\lambda = 0,4$)	1250 VA
Make	1000 W/VA
Short duration current (0,5 s)	30 A
Minimum switching load	300 mW (5 V/ 5 mA)
Life:	
• Mechanical	10^6 operations
• Electrical	10^5 operations

3.4 MMI

Display	LCD alphanumeric 16x4
LEDs	
Quantity	8
• ON/fail (green)	1
• Start (yellow)	1
• Trip (red)	1
• Freely allocatable (red)	5
Keyboard	8 keys

Note 1 $U_R = 100$ V or $U_R = 400$ V version must be selected at ordering



3.5 COMMUNICATION INTERFACES

Local portConnection
ProtocolUSB Type B
Modbus RTU®**Remote ports**

RS485

- Connection
- Baud rate
- Protocol

screw terminals
1200...57600 bps
ModBus®RTU
IEC 60870-5-103
DNP3

Ethernet 100BaseT

- Connection

- Baud rate
- Protocol

Optical fiber 1300 nm, ST
100 Base TX, RJ45
100 Mbps
ModBus®TCP/IP,
IEC 61850 - Level A

3.6 GENERAL SETTINGS FOR INDUCTIVE VTs VERSIONS

Relay nominal frequency (f_n)	50, 60 Hz
Relay nominal voltage (U_n)	50...130 V ^[1] (step 1 V) 200...520 V ^[2] (step 1 V)
Relay residual nominal voltage (U_{En})	50...130 V (step 1 V)
Calculated relay residual nominal voltage (U_{ECn})	$U_{ECn} = \sqrt{3} U_n$
Line VT primary nominal voltage (U_{np})	50 V...500 kV 50...499 V (step 1 V) 500...4990 V (step 10 V) 5000...49900 V (step 100 V) 50000...500000 V (step 1000 V)
Residual primary nominal voltage (phase-to-phase) $\cdot \sqrt{3}$ (U_{Enp})	50 V...500 kV 50...499 V (step 1 V) 500...4990 V (step 10 V) 5000...49900 V (step 100 V) 50000...500000 V (step 1000 V)

3.6.1 GENERAL SETTINGS FOR SENSOR VERSIONS

Relay nominal frequency (f_n)	50, 60 Hz
Relay nominal voltage (U_n)	50...130 V ^[2] (step 1 V)
Relay residual nominal voltage (E_n)	$E_n = U_n / \sqrt{3}$
Calculated relay residual nominal voltage (U_{ECn})	$U_{ECn} = \sqrt{3} U_n = 3 E_n$
Line VT primary nominal voltage (U_{np})	50 V...500 kV 50...499 V (step 1 V) 500...4990 V (step 10 V) 5000...49900 V (step 100 V) 50000...500000 V (step 1000 V)

3.7 PROTECTIVE FUNCTIONS

Thermal protection with Pt100 probes - 26^[3]

ThAL1...8 Alarm:

Alarm threshold 26 PT1...PT8 ($Th_{AL1...8}$)	0...200 °C
Operating time ThAL1...8 ($t_{ThAL1...8}$)	0...100 s

Th>1...8 Trip:

Trip threshold 26 PT1...PT8 ($Th_{>1...8}$)	0...200 °C
Operating time ThAL1...8 ($t_{Th>1...8}$)	0...100 s

Undervoltage - 27 for inductive VTs versions

Common configuration:

27 Operating logic (<i>Logic27</i>)	AND/OR
---------------------------------------	--------

U< Element

<i>U< Curve type ($U_{<Curve}$)</i>	DEFINITE/INVERSE ^[4]
<i>Definite time</i>	
27 First threshold definite time ($U_{<def}$)	0.05...1.10 U_n (step 0.01 U_n)
$U_{<def}$ Operating time ($t_{U<def}$)	0.07...100.0 s 0.07...9.99 s (step 0.01 s) 10.0...100.0 s (step 0.1 s)
<i>Inverse time</i>	
27 First threshold inverse time ($U_{<inv}$)	0.05...1.10 U_n (step 0.01 U_n)
$U_{<inv}$ Operating time ($t_{U<inv}$)	0.10...100.0 s 0.10...9.99 s (step 0.01 s) 10.0...100.0 s (step 0.1 s)

Element U<<

<i>Definite time</i>	
27 Second threshold definite time ($U_{<<def}$)	0.05...1.10 U_n (step 0.01 U_n)
$U_{<<def}$ Operating time ($t_{U<<def}$)	0.07...100.0 s 0.07...9.99 s (step 0.01 s) 10.0...100.0 s (step 0.1 s)

Note 1 The setting ranges of the relay nominal voltage U_n are dependent on the version (to be selected on purchase), with reference voltages U_R 100 V or 400 V.

Note 2 When the rated voltage of the electricity network divided by $\sqrt{3}$ corresponds to the value of rated primary voltage of the sensors (20000 / $\sqrt{3}$), then the nominal voltage of the relay must be adjusted to $U_n = 100$ V (default setting).

Note 3 The 26 element is available when the MPT module is connect on Thybus and enabled

Note 4 The mathematical formula for INVERSE curve is: $t = (0.75 \cdot t_{U<inv}) / [1 - (U/U_{<inv})]$
 t = operating time (in seconds)
 $t_{U<inv}$ = operating time setting (in seconds)
 U = input voltage
 $U_{<inv}$ = threshold setting

Pickup time	≤ 0.04 s
Dropout ratio	1.03...1.05
Dropout time	≤ 0.04 s
Overshoot time	0.03 s
Pickup accuracy	$\pm 1\% \pm 1\% U_n/E_n$
Operate time accuracy	5% or ± 10 ms

Undervoltage - 27 for electronic sensor versions

Common configuration:

	Voltage measurement type for 27 (U_{type27})	U_{ph-ph}/U_{ph-n}
	27 Operating logic ($Logic27$)	AND/OR
$U<$ Element		
	$U<$ Curve type ($U_{<Curve}$)	DEFINITE/INVERSE ^[1]
Definite time		
	27 First threshold definite time ($U_{<def}$)	0.05...1.10 U_n/E_n (step 0.01 U_n/E_n)
	$U_{<def}$ Operating time ($t_{U<def}$)	0.07...100.0 s 0.07...9.99 s (step 0.01 s) 10.0...100.0 s (step 0.1 s)
Inverse time		
	27 First threshold inverse time ($U_{<inv}$)	0.05...1.10 U_n/E_n (step 0.01 U_n/E_n)
	$U_{<inv}$ Operating time ($t_{U<inv}$)	0.10...100.0 s 0.10...9.99 s (step 0.01 s) 10.0...100.0 s (step 0.1 s)
Element $U<<$		
Definite time		
	27 Second threshold definite time ($U_{<<def}$)	0.05...1.10 U_n/E_n (step 0.01 U_n/E_n)
	$U_{<<def}$ Operating time ($t_{U<<def}$)	0.07...100.0 s 0.07...9.99 s (step 0.01 s) 10.0...100.0 s (step 0.1 s)
	Pickup time	≤ 0.04 s
	Dropout ratio	1.03...1.05
	Dropout time	≤ 0.04 s
	Overshoot time	0.03 s
	Pickup accuracy	$\pm 1\% \pm 1\% U_n/E_n$
	Operate time accuracy	5% or ± 10 ms

Positive sequence undervoltage - 27V1 for inductive VTs versions

$U_1<$ Element

Definite time		
	27V1 First threshold definite time ($U_{1<def}$)	0.05...1.10 U_n (step 0.01 U_n)
	$U_{1<def}$ Operating time ($t_{U_1<def}$)	0.07...100.0 s 0.07...9.99 s (step 0.01 s) 10.0...100.0 s (step 0.1 s)
	Pickup time	≤ 0.04 s
	Dropout ratio	1.03...1.05
	Dropout time	≤ 0.04 s
	Overshoot time	0.03 s
	Pickup accuracy	$\pm 1\% \pm 1\% U_n$
	Operate time accuracy	5% or ± 10 ms

Positive sequence undervoltage - 27V1 for electronic sensor versions

$U_1<$ Element

Definite time		
	27V1 First threshold definite time ($U_{1<def}$)	0.05...1.10 E_n (step 0.01 E_n)
	$U_{1<def}$ Operating time ($t_{U_1<def}$)	0.07...100.0 s 0.07...9.99 s (step 0.01 s) 10.0...100.0 s (step 0.1 s)
	Pickup time	≤ 0.04 s
	Dropout ratio	1.03...1.05
	Dropout time	≤ 0.04 s
	Overshoot time	0.03 s
	Pickup accuracy	$\pm 1\% \pm 1\% E_n$
	Operate time accuracy	5% or ± 10 ms

Note 1 The mathematical formula for INVERSE curve is: $t = (0.75 \cdot t_{U<inv}) / [1 - (U/U_{<inv})]$
 t = operating time (in seconds)
 $t_{U<inv}$ = operating time setting (in seconds)
 U = input voltage
 $U_{<inv}$ = threshold setting

Overvoltage - 59 for inductive VTs versions

Common configuration:

<i>U> Element</i>	59 Operating logic (<i>Logic59</i>)	AND/OR
	<i>U> Curve type (<i>U>Curve</i>)</i>	DEFINITE/INVERSE ^[1]
<i>Definite time</i>	59 First threshold definite time (<i>U>def</i>)	0.50...1.50 U_n (step 0.01 U_n)
	<i>U>def Operating time (<i>t_{U>def}</i>)</i>	0.03...100.0 s
		0.03...9.99 s (step 0.01 s)
		10.0...100.0 s (step 0.1 s)
<i>Inverse time</i>	59 First threshold inverse time (<i>U>inv</i>)	0.50...1.50 U_n (step 0.01 U_n)
	<i>U>inv Operating time (<i>t_{U>inv}</i>)</i>	0.10...100.0 s
		0.10...9.99 s (step 0.01 s)
		10.0...100.0 s (step 0.1 s)
<i>U>> Element</i>	<i>Definite time</i>	
	59 Second threshold definite time (<i>U>>def</i>)	0.50...1.50 U_n (step 0.01 U_n)
	<i>U>>def Operating time (<i>t_{U>>def}</i>)</i>	0.03...100.0 s
		0.03...9.99 s (step 0.01 s)
		10.0...100.0 s (step 0.1 s)
	Pickup time	≤ 0.04 s
	Dropout ratio	0.95...0.98
	Dropout time	≤ 0.04 s
	Overshoot time	0.03 s
	Pickup accuracy	$\pm 1\% \pm 1\% U_n/E_n$
	Operate time accuracy	5% or ± 10 ms

Overvoltage - 59 for electronic sensor versions

Common configuration:

	Voltage measurement type for 59 (<i>Utype59</i>)	U_{ph-ph}/U_{ph-n}
<i>U> Element</i>	59 Operating logic (<i>Logic59</i>)	AND/OR
	<i>U> Curve type (<i>U>Curve</i>)</i>	DEFINITE/INVERSE ^[2]
<i>Definite time</i>	59 First threshold definite time (<i>U>def</i>)	0.50...1.50 U_n/E_n (step 0.01 U_n/E_n)
	<i>U>def Operating time (<i>t_{U>def}</i>)</i>	0.03...100.0 s
		0.03...9.99 s (step 0.01 s)
		10.0...100.0 s (step 0.1 s)
<i>Inverse time</i>	59 First threshold inverse time (<i>U>inv</i>)	0.50...1.50 U_n/E_n (step 0.01 U_n/E_n)
	<i>U>inv Operating time (<i>t_{U>inv}</i>)</i>	0.10...100.0 s
		0.10...9.99 s (step 0.01 s)
		10.0...100.0 s (step 0.1 s)
<i>U>> Element</i>	<i>Definite time</i>	
	59 Second threshold definite time (<i>U>>def</i>)	0.50...1.50 U_n/E_n (step 0.01 U_n/E_n)
	<i>U>>def Operating time (<i>t_{U>>def}</i>)</i>	0.03...100.0 s
		0.03...9.99 s (step 0.01 s)
		10.0...100.0 s (step 0.1 s)
	Pickup time	≤ 0.04 s
	Dropout ratio	0.95...0.98
	Dropout time	≤ 0.04 s
	Overshoot time	0.03 s
	Pickup accuracy	$\pm 1\% \pm 1\% U_n/E_n$
	Operate time accuracy	5% or ± 10 ms

Note 1 The mathematical formula for INVERSE curve is: $t = (0.5 \cdot t_{U>inv}) / [(U/U_{>inv}) - 1]$
 t = operating time (in seconds)
 $t_{U>inv}$ = operating time setting (in seconds)
 U = input voltage
 $U_{>inv}$ = threshold setting

Note 2 The mathematical formula for INVERSE curve is: $t = (0.5 \cdot t_{U>inv}) / [(U/U_{>inv}) - 1]$
 t = operating time (in seconds)
 $t_{U>inv}$ = operating time setting (in seconds)
 U = input voltage
 $U_{>inv}$ = threshold setting

Ten minutes overvoltage - 59Uavg^[1] for inductive VTs versions

Common configuration:

<i>Uavg> Element</i>	Operating logic (<i>Logic59Uavg</i>)	AND/OR
<i>Definite time</i>		
	First threshold definite time ($U_{avg>def}$)	0.50...1.50 U_n (step 0.01 U_n)
	Time delay ($t_{Uavg>def}$)	0...1000 s (step 1 s)
	Pickup time	according to the reference conditions ^[2]
	Pickup accuracy	$\pm 1\% \pm 1\% U_n$
	Time delay accuracy ^[3]	5% ± 3 s

Ten minutes overvoltage - 59Uavg^[1] for electronic sensor versions

Common configuration:

<i>Uavg> Element</i>	Voltage measurement type (<i>Utype59Uavg</i>) Operating logic (<i>Logic59Uavg</i>)	U_{ph-ph}/U_{ph-n} AND/OR
<i>Definite time</i>		
	First threshold definite time ($U_{avg>def}$)	0.50...1.50 U_n (step 0.01 U_n/E_n)
	Time delay ($t_{Uavg>def}$)	0...1000 s (step 1 s)
	Pickup time	according to the reference conditions ^[2]
	Pickup accuracy	$\pm 1\% \pm 1\% U_n/E_n$
	Time delay accuracy ^[3]	5% ± 3 s

Residual overvoltage - 59N for inductive VTs versions

Common configuration:

<i>U_E> Element</i>	Residual voltage measurement type for 59N - direct/calculated ($3V_{oType59N}$) U_E/U_{EC} Operation from 74VT external ($74VText59N$)	OFF/Block
<i>U_E> Curve type (<i>U_E>Curve</i>)</i>		
	DEFINITE/INVERSE ^[4]	
<i>U_E> Reset time delay (<i>t_{UE>RES}</i>)</i>		
	0.00...100.0 s	
	0.00...9.99 s (step 0.01 s)	
	10.0...100.0 s (step 0.1 s)	
<i>Definite time</i>		
	59N First threshold definite time ($U_{E>def}$)	0.01...0.70 U_{En} (step 0.01 U_{En})
	$U_{E>def}$ Operating time ($t_{UE>def}$)	0.07...100.0 s
		0.07...9.99 s (step 0.01 s)
		10.0...100.0 s (step 0.1 s)
<i>Inverse time</i>		
	59N First threshold inverse time ($U_{E>inv}$)	0.01...0.50 U_{En} (step 0.01 U_{En})
	$U_{E>inv}$ Operating time ($t_{UE>inv}$)	0.10...100.0 s
		0.10...9.99 s (step 0.01 s)
		10.0...100.0 s (step 0.1 s)
<i>Element U_E>></i>		
	$U_{E>>}$ Reset time delay ($t_{UE>>RES}$)	0.00...100.0 s
		0.00...9.99 s (step 0.01 s)
		10.0...100.0 s (step 0.1 s)
<i>Definite time</i>		
	59N Second threshold definite time ($U_{E>>def}$)	0.01...0.70 U_{En} (step 0.01 U_{En})
	$U_{E>>def}$ Operating time ($t_{UE>>def}$)	0.07...100.0 s
		0.07...9.99 s (step 0.01 s)
		10.0...100.0 s (step 0.1 s)
	$U_{E>>}$ Reduced Operating time ($t_{cUE>>def}$)	0.07...10.00 s (step 0.01 s)
	$t_{cUE>>}$ Activation time ($t_{atcUE>>}$)	1...60 s (step 1 s)
	Pickup time	≤ 0.04 s
	Dropout ratio	0.95...0.98
	Dropout time	≤ 0.04 s
	Overshoot time	0.03 s
	Pickup accuracy	$\pm 1\% \pm 1\% U_{En}$
	Operate time accuracy	5% or ± 10 ms

Note 1 The function is based on the measurement of the mean of the three phase voltages of 10 minutes with update every three seconds

Note 2 The pickup time depends on the initial and final value of the input voltage; e.g. with a setting of threshold equal to 1.10 U_n :
- with initial value 0 and final value 1.1 $U_{avg>def}$ ($1.1 \times 1.1 = 1.21 U_n$) the pickup time is 498 s
- with initial value 0.9 $U_{avg>def}$ ($0.9 \times 1.1 = 0.99 U_n$) and final value 1.1 $U_{avg>def}$ ($1.1 \times 1.1 = 1.21 U_n$) the pickup time is 285 s

Note 3 Since the aggregate value is updated every 3 s, times are only meaningful in multiples of 3 s

Note 4 The mathematical formula for INVERSE curve is $t = (0.5 \cdot t_{UE>inv}) / [(U_E/U_{E>inv}) - 1]$
 t = operating time (in seconds)
 $t_{UE>inv}$ = operating time setting (in seconds)
 U_E = residual input voltage (direct or calculated)
 $U_{E>inv}$ = threshold setting

Residual overvoltage - 59N for electronic sensor versions

Common configuration:

$U_E >$ Element	Residual voltage measurement type for 59N - ($3V_{OType59N}$)	U_{EC} OFF/Block
	Operation from 74VT external ($74V_{Text59N}$)	
	$U >$ Curve type ($U >_{Curve}$)	DEFINITE/INVERSE ^[1]
	$U_E >$ Reset time delay ($t_{UE > RES}$)	0.00...100.0 s 0.00...9.99 s (step 0.01 s) 10.0...100.0 s (step 0.1 s)
Definite time	59N First threshold definite time ($U_E >_{def}$)	0.01...0.70 U_{En} (step 0.01 U_{En})
	$U_E >_{def}$ Operating time ($t_{UE >_{def}}$)	0.07...100.0 s 0.07...9.99 s (step 0.01 s) 10.0...100.0 s (step 0.1 s)
Inverse time	59N First threshold inverse time ($U_E >_{inv}$)	0.01...0.50 U_{En} (step 0.01 U_{En})
	$U_E >_{inv}$ Operating time ($t_{UE >_{inv}}$)	0.10...100.0 s 0.10...9.99 s (step 0.01 s) 10.0...100.0 s (step 0.1 s)
Element $U_E >>$	$U_E >>$ Reset time delay ($t_{UE >> RES}$)	0.00...100.0 s 0.00...9.99 s (step 0.01 s) 10.0...100.0 s (step 0.1 s)
	Definite time	
	59N Second threshold definite time ($U_E >>_{def}$)	0.01...0.70 U_{En} (step 0.01 U_{En})
	$U_E >>_{def}$ Operating time ($t_{UE >>_{def}}$)	0.07...100.0 s 0.07...9.99 s (step 0.01 s) 10.0...100.0 s (step 0.1 s)
	$U_E >>$ Reduced Operating time ($t_{cUE >>_{def}}$)	0.07...10.00 s (step 0.01 s)
	$t_{cUE >>}$ Activation time ($t_{atcUE >>}$)	1...60 s (step 1 s)
	Pickup time	≤ 0.04 s
	Dropout ratio	0.95...0.98
	Dropout time	≤ 0.04 s
	Overshoot time	0.03 s
	Pickup accuracy	$\pm 1\% \pm 1\% U_{En}$
	Operate time accuracy	5% or ± 10 ms

Negative sequence overvoltage - 59V2 for inductive VTs versions

$U_2 >$ Element

Definite time	• 59V2 First threshold definite time ($U_2 >_{def}$)	0.01...0.50 U_n (step 0.01 U_n)
	• $U_2 >_{def}$ Operating time ($t_{U2 >_{def}}$)	0.07...100.0 s 0.07...9.99 s (step 0.01 s) 10.0...100.0 s (step 0.1 s)
	Pickup time	≤ 0.04 s
	Dropout ratio	0.95...0.98
	Dropout time	≤ 0.04 s
	Overshoot time	0.03 s
	Pickup accuracy	$\pm 1\% \pm 1\% U_n$
	Operate time accuracy	5% or ± 10 ms

Negative sequence overvoltage - 59V2 for electronic sensor versions

$U_2 >$ Element

Definite time	• 59V2 First threshold definite time ($U_2 >_{def}$)	0.01...0.50 U_n (step 0.01 U_n)
	• $U_2 >_{def}$ Operating time ($t_{U2 >_{def}}$)	0.07...100.0 s 0.07...9.99 s (step 0.01 s) 10.0...100.0 s (step 0.1 s)
	Pickup time	≤ 0.04 s
	Dropout ratio	0.95...0.98
	Dropout time	≤ 0.04 s
	Overshoot time	0.03 s
	Pickup accuracy	$\pm 1\% \pm 1\% E_n$
	Operate time accuracy	5% or ± 10 ms

Note 1 The mathematical formula for INVERSE curve is $t = (0.5 \cdot t_{UE >_{inv}}) / [(U_E / U_E >_{inv}) - 1]$
 t = operating time (in seconds)
 $t_{UE >_{inv}}$ = operating time setting (in seconds)
 U_E = residual input voltage (calculated), $U_E >_{inv}$ = threshold setting

Underfrequency (81U)

$f_{<}$ Element

Definite time

81U First threshold definite time ($f_{<def}$)	0.800...1.000 f_n (step 0.001 f_n)
$f_{<def}$ Operating time ($t_{f_{<def}}$)	0.05...100.0 s
	0.05...9.99 s (step 0.01 s)
	10.0...100.0 s (step 0.1 s)

Voltage control

• $f_{<}$ Control enable ($f_{<}&$)	ON/OFF
• $f_{<}$ Controlled by $U_{E>>}$ start ($f_{<}&U_{E>>}$)	ON/OFF
• $f_{<}$ Controlled by digital input ($f_{<}&DIGIN$)	ON/OFF
• $f_{<}$ Controlled by $U_{1<}$ start ($f_{<}&27V1$)	ON/OFF
• $f_{<}$ Controlled by $U_{2>}$ start ($f_{<}&59V2$)	ON/OFF
• $f_{<}$ Controlled by $U_{<}$ start ($f_{<}&U_{<}$)	ON/OFF
• $f_{<}$ Controlled by 61850 network no link ($f_{<}&rete61850-K0$)	ON/OFF
• $f_{<}&$ Reset time delay ($f_{<}&res$)	0.00...200.0 s
	0.00...9.99 s (step 0.01 s)
	10.0...200.0 s (step 0.1 s)

$f_{<<}$ Element

Definite time

81U Second threshold definite time ($f_{<<def}$)	0.800...1.000 f_n (step 0.001 f_n)
$f_{<<def}$ Operating time ($t_{f_{<<def}}$)	0.05...100.0 s
	0.05...9.99 s (step 0.01 s)
	10.0...100.0 s (step 0.1 s)
$f_{<<}$ Reduced Operating time ($t_{cf_{<<def}}$)	0.07...10.00 s (step 0.01 s)
$t_{cf_{<<}}$ Activation time ($t_{atcf_{<<}}$)	1...60 s (step 1 s)

$f_{<<<}$ Element

Definite time

81U Third threshold definite time ($f_{<<<def}$)	0.800...1.000 f_n (step 0.001 f_n)
$f_{<<<def}$ Operating time ($t_{f_{<<<def}}$)	0.05...100.0 s
	0.05...9.99 s (step 0.01 s)
	10.0...100.0 s (step 0.1 s)

$f_{<<<<}$ Element

Definite time

81U Fourth threshold definite time ($f_{<<<<def}$)	0.800...1.000 f_n (step 0.001 f_n)
$f_{<<<<def}$ Operating time ($t_{f_{<<<<def}}$)	0.05...100.0 s
	0.05...9.99 s (step 0.01 s)
	10.0...100.0 s (step 0.1 s)

Pickup time	≤ 0.03 s
Dropout ratio	≤ 1.002
Dropout time	≤ 0.04 s
Overshoot time	0.04 s
Pickup accuracy	± 20 mHz
Operate time accuracy	$1.5\% \pm 10$ ms ^[1]

Overfrequency (81O)

$f_{>}$ Element

Definite time

81O First threshold definite time ($f_{>def}$)	1.000...1.200 f_n (step 0.001 f_n)
$f_{>def}$ Operating time ($t_{f_{>def}}$)	0.05...100.00 s
	0.05...9.99 s (step 0.01 s)
	10.0...100.0 s (step 0.1 s)

Voltage control

• $f_{>}$ Control enable ($f_{>}&$)	ON/OFF
• $f_{>}$ Controlled by $U_{E>>}$ start ($f_{>}&U_{E>>}$)	ON/OFF
• $f_{>}$ Controlled by digital input ($f_{>}&DIGIN$)	ON/OFF
• $f_{>}$ Controlled by $U_{1<}$ start ($f_{>}&27V1$)	ON/OFF
• $f_{>}$ Controlled by $U_{2>}$ start ($f_{>}&59V2$)	ON/OFF
• $f_{>}$ Controlled by $U_{<}$ start ($f_{>}&U_{<}$)	ON/OFF
• $f_{>}$ Controlled by 61850 network no link ($f_{>}&rete61850-K0$)	ON/OFF
• $f_{>}&$ Reset time delay ($f_{>}&res$)	0.00...200.0 s
	0.00...9.99 s (step 0.01 s)
	10.0...200.0 s (step 0.1 s)

$f_{>>}$ Element

Definite time

81O Second threshold definite time ($f_{>>def}$)	1.000...1.200 f_n (step 0.001 f_n)
$f_{>>def}$ Operating time ($t_{f_{>>def}}$)	0.05...100.00 s
	0.05...9.99 s (step 0.01 s)
	10.0...100.0 s (step 0.1 s)

Note 1: $1.5\% \pm 15$ ms with operate time setting = 0.05 s

$f_{>>}$ Reduced Operating time ($t_{cf}>>_{def}$)	0.07...10.00 s (step 0.01 s)
$t_{cf}>>$ Activation time ($t_{atcf}>>$)	1...60 s (step 1 s)
Pickup time	≤ 0.03 s
Dropout ratio	≥ 0.998
Dropout time	≤ 0.04 s
Overshoot time	0.04 s
Pickup accuracy	± 20 mHz
Operate time accuracy	$1.5\% \pm 10$ ms ^[1]

Frequency rate of change (81R)

$df>$ Element

$df>$ Operating mode ($Mode-df>$)	Module/Positive/Negative
Definite time	
81R First threshold definite time ($df>_{def}$)	0.1...10.0 Hz/s (step 0.1 Hz/s)
$df>_{def}$ Operating time ($tdf>_{def}$)	0.00...100.0 s
	0.00...0.99 s (step 0.01 s)
	10.0...100.0 s (step 0.1 s)

$df>>$ Element

$df>>$ Operating mode ($Mode-df>>$)	Module/Positive/Negative
Definite time	
81R Second threshold definite time ($df>>_{def}$)	0.1...10.0 Hz/s (step 0.1 Hz/s)
$df>>_{def}$ Operating time ($tdf>>_{def}$)	0.00...100.0 s
	0.00...0.99 s (step 0.01 s)
	10.0...100.0 s (step 0.1 s)

$df>>>$ Element

$df>>>$ Operating mode ($Mode-df>>>$)	Module/Positive/Negative
Definite time	
81R Third threshold definite time ($df>>>_{def}$)	0.1...10.0 Hz/s (step 0.1 Hz/s)
$df>>>_{def}$ Operating time ($tdf>>>_{def}$)	0.00...100.0 s
	0.00...0.99 s (step 0.01 s)
	10.0...100.0 s (step 0.1 s)

$df>>>>$ Element

$df>>>>$ Operating mode ($Mode-df>>>>$)	Module/Positive/Negative
Definite time	
81R Fourth threshold definite time ($df>>>>_{def}$)	0.1...10.0 Hz/s (step 0.1 Hz/s)
$df>>>>_{def}$ Operating time ($tdf>>>>_{def}$)	0.00...100.0 s
	0.00...0.99 s (step 0.01 s)
	10.0...100.0 s (step 0.1 s)
Pickup time	≤ 0.3 s with setting df : 0.1...0.9 Hz/s
	≤ 0.2 s with setting df : 1.0...4.9 Hz/s
	≤ 0.1 s with setting df : 4.9...10.0 Hz/s
Dropout time	≤ 0.05 s
Reference values	rest 0 df
	trip 1.5 df
Pickup accuracy	± 20 mHz/s with setting df : 0.1...0.9 Hz/s
	± 50 mHz/s with setting df : 1.0...4.9 Hz/s
	± 200 mHz/s with setting df : 4.9...10.0 Hz/s
Operate time accuracy	$3\% \pm 20$ ms

Breaker failure - BF

BF Time delay (t_{BF})	0.06...10.00 s (step 0.01 s)
Dropout ratio	0.95...0.98
Dropout time	≤ 0.05 s
Operate time accuracy	5% or ± 10 ms

Note 1: $1.5\% \pm 15$ ms with operate time setting = 0.05 s

3.8 CONTROL AND MONITORING

Frequency tracking

Locking range ^[1]	20...63 Hz
Rate (instantaneous change)	5 Hz/s
Minimum voltage	0.015 E_n

Trip Circuit Supervision - 74TCS

<i>Operate time:</i>	
• One binary input supervision	40 s
• Two binary inputs supervision	2 s
<i>Reset time delay:</i>	
• One binary input supervision	6 s
• Two binary inputs supervision	0.6 s

Circuit Breaker supervision

Circuit breaker diagnostic

Number of CB trips threshold (N.Open)	0...10000 (step 1)
Circuit Breaker maximum allowed opening time ($t_{break>}$)	0.05...1.00 s (step 0.01 s)

Oscillography (DFR)^[2]

<i>Format</i>	COMTRADE
<i>Recording mode</i>	circular
<i>Sampling rate</i>	24 samples / cycle
<i>Trigger setup:</i>	
• Pre-trigger time	0.05...1.00 s (step 0.01 s)
• Post-trigger time	0.05...60.00 s (step 0.05 s)
<i>Set sample channels:</i>	$U_{L1}, U_{L2}, U_{L3}, U_E$
<i>Set analog channels:</i>	
Analog 1...Analog 12	$f, U_{L1}, U_{L2}, U_{L3}, U_E, U_{EC}, U_1, U_2, df/dt$ $T1...T8^{[3]}$
<i>Set digital channels:</i>	
Digital 1...Digital 12	K1... K6, K7...K10, IN1, IN2, IN3...IN42 ^[4]

PLC (Programmable Logic Controller)^[5]

<i>Reference standard</i>	IEC 61131-3
<i>Language^[6]</i>	IL (Instruction List)
<i>Inputs:</i>	
Binary inputs	IN1, IN2 on board IN8...IN10 with MRI module IN11...IN26 with one MID16 module IN27...IN42 with two MID16 modules
Delayed binary inputs ^[7]	IN1, IN2 on board IN8...IN10 with MRI module IN11...IN26 with one MID16 module IN27...IN42 with two MID16 modules
<i>Outputs:</i>	
Start (all elements)	Start U<, Start U<<,...etc
Trip (all elements)	Trip U<, Trip U<<,...etc
Measures	UL1, UL2,...ecc
Temperature	Pt100
Relays	K11...K6 on board K7...K10 with MRI module
LEDs	START, TRIP, L1...L6 on board L7...L10 with MRI module
Current converter	DAC

Note 1 If the measured frequency is out of the locking range, the system lock on to the rated frequency (50 or 60 Hz)

Note 2 For the DFR function a licence is required; call Thytronic for purchasing.

Note 3 The measures of temperature are available only when the MPT module on Thybus is enabled (eight Pt100 inputs)

Note 4 Output relay K7...K10 and binary input IN3...IN42 states are available only when the concerning I/O circuits are implemented (MRI and MID16 modules on Thybus)

Note 5 For the PLC function a licence is required; call Thytronic for purchasing.

Note 6 With ThyVisor V3.4.3 release and compiler IEC 61131-3 V1.2.7 only the IL language is implemented (Instruction List); other languages, according with IEC 61131 standard (ST (Structured Text)), LD (Ladder Diagram), FBD (Function Block Diagram), SFC (Sequential Functional Chart), will be available soon

Note 7 The input state is acquired downstream the tON and tOFF timers

3.9 METERING

More data are available inside Section 5 - MEASURES, LOGIC STATES AND COUNTERS

Accuracy (type tests)

MEASURE	Reference values	Accuracy	Reference values	Accuracy
Phase voltage	$0.1 U_n$	0.2%	$1 U_n$	0.03%
Measured residual voltage	$0.01 U_{En}$	0.02%	$0.1 U_{En}$	0.02%
Calculated residual voltage	$0.01 U_{ECn}$	0.5%	$0.1 U_{ECn}$	0.3%
Frequency	$0.02 U_n$	3 mHz	$1 U_n$	2 mHz
Positive/Negative sequence voltage	$0.01 U_n$	4%	$0.15 U_n$	0.3%
Pickup and operate time	1.5 x setting for first element	$5\% \pm 10 \text{ ms}$	2.5 x setting for other elements	$5\% \pm 10 \text{ ms}$

Measures

Direct

Frequency of three voltage inputs ($f_{UL1}, f_{UL12}, f_{UL13}$)
RMS value of fundamental component of the input voltages (U_{L1}, U_{L2}, U_{L3})
RMS value of fundamental component of the residual voltage (U_E)

Calculated

- Calculated phase-to-phase voltages (U_{12}, U_{23}, U_{31})
- Calculated residual current (U_{EC})
- Maximum voltage between $U_{L1}-U_{L2}-U_{L3}$ (U_{Lmax})
- Average voltage between $U_{L1}-U_{L2}-U_{L3}$ (U_L)
- Positive sequence voltage (U_1)
- Negative sequence voltage (U_2)
- Third harmonic of residual voltage (U_{E-3rd})
- Frequency rate of change (df/dt)

Medie:

- Ten minutes (refresh 3 s) average voltage between U_{12}, U_{23}, U_{31} ($U_{L1avg}, U_{L2avg}, U_{L3avg}$)
- Max voltage between $U_{L1avg}, U_{L2avg}, U_{L3avg}$ ($U_{Lavgmax}$)

PT100^[1]

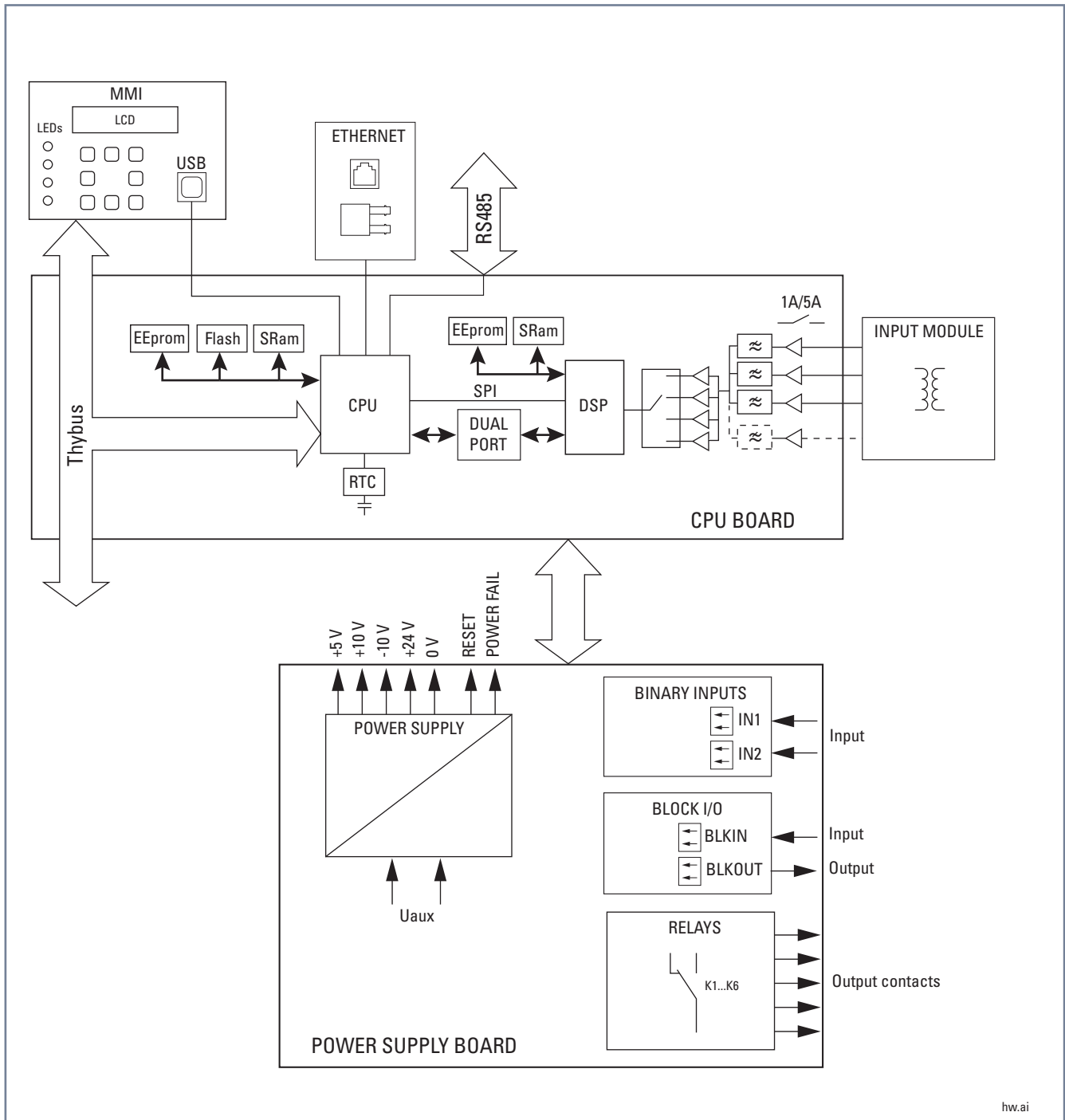
Temperature PT1 (T_1)
Temperature PT2 (T_2)
Temperature PT3 (T_3)
Temperature PT4 (T_4)
Temperature PT5 (T_5)
Temperature PT6 (T_6)
Temperature PT7 (T_7)
Temperature PT8 (T_8)

Note 1 The measures of temperature are available only when the MPT module on Thybus is enabled (eight Pt100 inputs)

4 FUNCTION CHARACTERISTICS

4.1 HARDWARE DESCRIPTION

The following figure illustrates the basic structure of the relay.



Printed boards hold the circuit components arranged according to a modular allocation of the main functions.

Power supply board

All the components necessary for conversion and stabilization functions are present. Two versions are envisaged suited to the input ranges 24...48 V and 115...230 V. The circuit provides stabilized voltages of +10 V and -10 V, required for the analogue measurement, +24V for relays and +5 V for supplying the digital circuits. The circuit board additionally comprises:

- Two binary input circuits, with photo-couplers which provide for galvanic separation.
- Six output relays (K1...K6).

CPU board

Analog processing

This circuit board contains all the circuits necessary for performing the analogue and digital processing of the signals.

The following are envisaged:

- Anti aliasing filter circuits,
- Amplifier circuits for conditioning the input signals,
- Reference voltage adjustment circuits for the measurement A/D converter.

The Pro-n relays use a DSP processor operating at 40 MHz; it performs all the processing on the analogue signals and furthermore coordinates management of the TX-RX signals to the CPU.

The input currents are sampled at a frequency of 24 samples per period by means of a dual conversion system which allows the attainment of information pertaining to polarity and amplitude with high resolution. The measurement criterion allows precise measurement of even those signals having a unidirectional component, such as transient currents with overlapping exponential, which typically appear during faults.

The circuit board also houses the output relays with the corresponding command and control circuits, communication circuits, buttons, LCD display, LEDs and the key switch.

CPU

A 32 bit CPU is provided.

The following are envisaged:

- Real Time Clock circuits with oscillator and super capacitor,
- USB communication port,
- RS485 communication port,
- Thybus communication circuits for external modules and MMI board,
- Network communication circuits (optional Ethernet).

Memories:

- SRam: high speed static memory, used for data and cache,
- Flash memory: used for fw storage and upgrade,
- EEprom memory: used for calibration data storage,
- Dual port Ram for data transfer between CPU and DSP.

Input board

- Three VTs committed for phase voltages acquisition,
- One VT committed for residual voltage acquisition.

MMI (keyboard, LED and display)

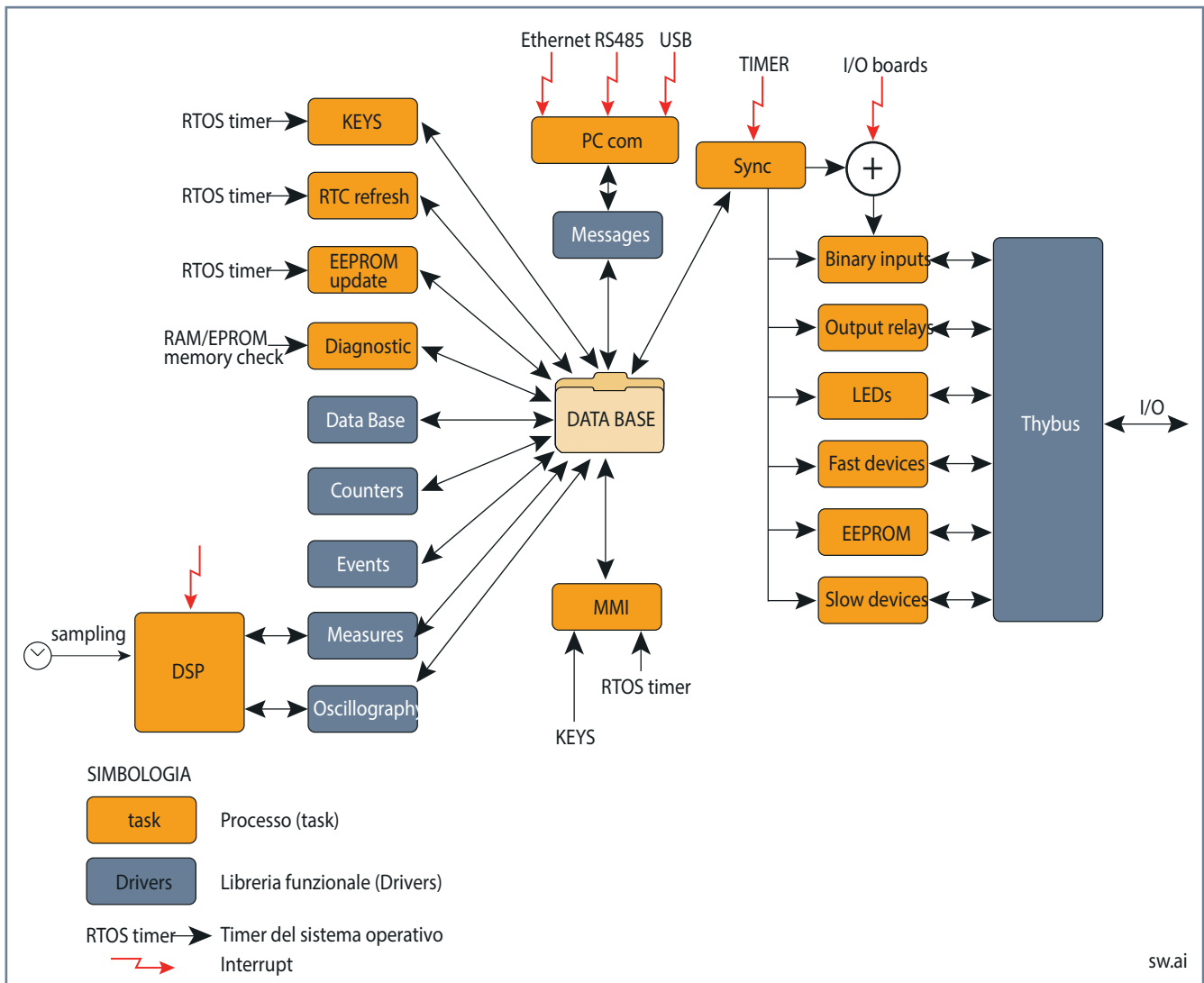
The MMI module (Man Machine Interface) includes:

- An eight keys 8 keyboard,
- a backlight LCD display,
- Eight signalling LEDs,

The removable plug allows separation of the MMI module for free access to the CPU board when DIP-switch setting is required.

4.2 SOFTWARE DESCRIPTION

The program which handles operation of the Pro-N relays is made up of three fundamental elements shown in the following block diagram.



Base software

Single modules are application independent with modular and scalable structure. The system can be assimilated to the PC BIOS (Basic Input-Output System); three main function are provided:

- Start-up test execution;
- RAM loading of the operating system;
- Provide a suitable interface to access the relay hardware.

Real-time operating system

An embedded operative system is employed suitable for real-time applications (RTOS). A multithread preemptive structure is able to manage several task with multiple priority levels. The kernel represents the nucleus of the system: it includes the processing functions closest to the electronic circuits. In addition, the kernel manages a service communication protocol known as Basic Protocol (BP).

Task

The task (process e thread) are the base components.

Example are:

- Keyboard management
- RTC (Real Time Clock) updating
- RAM/EEPROM updating
- Diagnostic
- Input acquisition
- Output relay management
- MMI
- I/O updating
- DSP data processing

DSP Firmware

By means of Discrete Fourier Transform calculation, based on 24 samples/period, information is deduced in relation to the amplitude and phase of all the current measurements; these are constantly updated and at the disposal of all the protection and control application algorithms.

Drivers

Inside the driver library, all the specialized module for protection and control function are provided. They are the link from kernel and application layer. Examples are:

- Data base management
- PC messages management
- TCP/IP messages management
- Basic Protocol management
- Counter management
- Event and fault management
- Measuring management
- Oscillography management

Application Software

The software acts the specialization of the base system; all protective and control elements are inside it.

The main modules are:

- Diagnostic function for application layer,
- Input management (binary inputs),
- Protective functions,
- Event recording,
- Output management (LEDs and relays)

Each element (Kernel, Drivers and Application) may, in turn, be split into modules:

Base protocol (kernel)

The module known as the Basic Protocol (BP) manages the service communication between the kernel and the other modules through the communication buses with the following services:

- Data and information exchange,
- Calibration,
- Upgrade fw DSP,
- Upgrade application sw

Communication (drivers)

The ModBus TCP/IP protocol, with ethernet interface, the ModBus RTU, IEC 60870-5-103 and DNP3 protocol over RS485 interface and the ModBus RTU USB for ThyVisor are provided.

MMI (drivers)

The drivers deal with the menu management (MMi and/or communication messages).

Data Base

The data base is split into three main sections:

- RAM for volatile data,
- REE and PAR for non volatile data.

Self test (Application)

The main hw and sw function are permanently verified in background; no additional delay are introduced.

In particular the following function are tested:

- Reference voltages;
- Output relays;
- Sw flow with execution time monitoring;
- REE and PAR data congruence.

Development tools (Builder)

For the development of the project, a CASE instrument has been developed, responsible for the optimized production of software code for the management of collaboration, the database and the MMI data and the Xml files used for communication. The automatic code generation criteria ensures the quality of the result in terms of the reusability, verifiability and maintainability of the software life cycle.

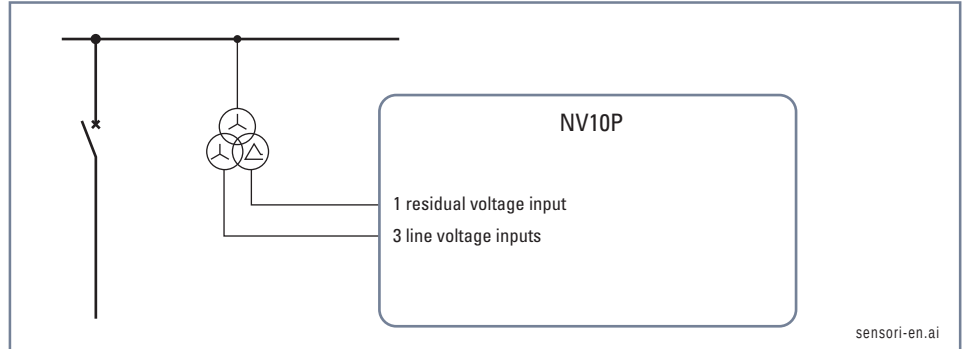
4.3 I/O DESCRIPTION

Metering inputs

VTs versions

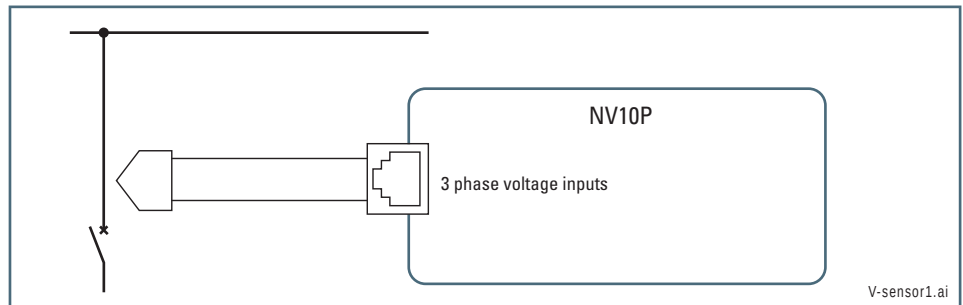
The following inputs are provided:

- Three phase voltage inputs with programmable nominal voltages within range 50...130 V ($U_R=100$ V) or 200...520 V ($U_R=400$ V) to be select on order. The nominal voltages is user adjustable inside a wide setting range, so the relays can be employed on plants with TV different secondary voltages (50...130 V for versions with $U_R=100$ V and 200...520 V for versions with $U_R=400$ V). The version with $U_R=400$ V allows a direct measure without interposing VTs for low voltage applications (200...520 V nominal voltage).
- One residual voltage input, with programmable nominal voltage within range 50...130 V ($U_{ER}=100$ V);



Electronic sensor versions

Three voltmetric inputs are provided; the phase voltages U_{L1} , U_{L2} , U_{L3} are measured, and the phase-to-phase voltages U_{12} , U_{23} , U_{31} and the residual voltage U_{EC} are calculated.



Signal processing

Various processing levels are involved:

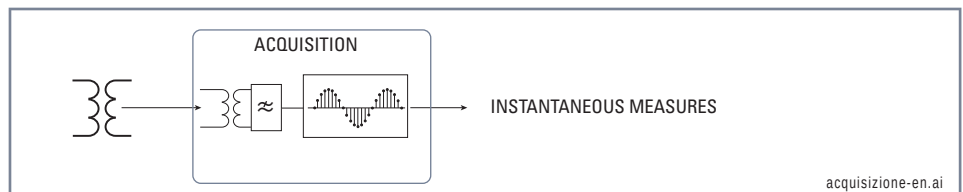
- Acquisition (base level).
- Direct measures of physical channels (first level).
- Calculated measures (second level).
- Derived (third level).

The measures concerning a level are based on data worked out in the previous level.

For each level the required resources concerning the priority for tasks (conditioning circuits, DSP and CPU) are on hand.

ACQUISITION (base level)

The input signals are sampled 24 times per period:



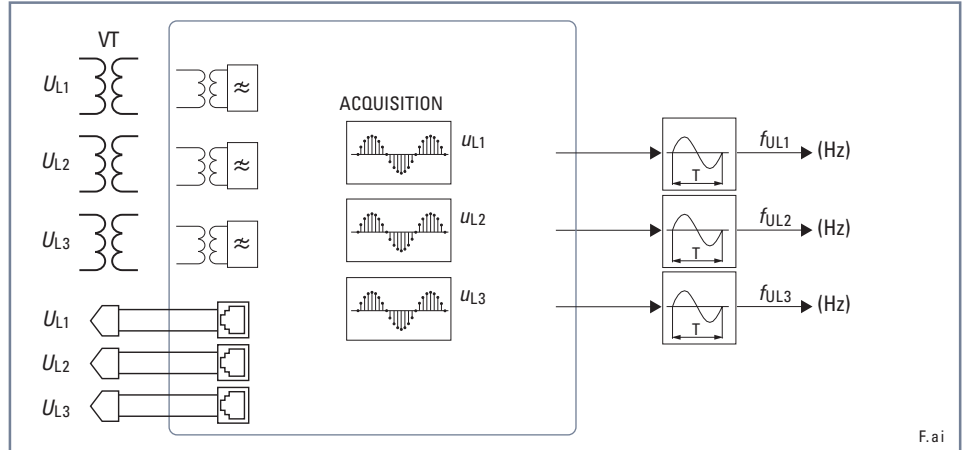
- $u_{L1}...u_{L3}$ Input voltage instantaneous values
- u_E Residual voltage instantaneous value

From the sampled quantities, several measures are computed for protection, monitoring and metering purposes.

- Direct
- Calculated

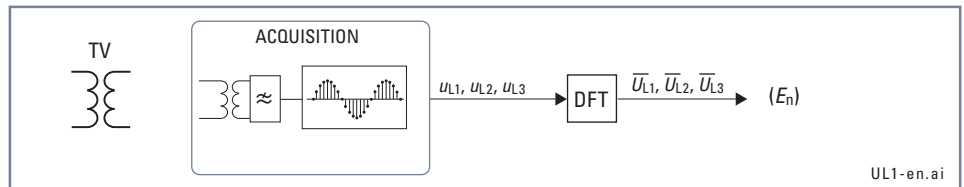
Direct

- Frequency. The measure of period is taken from voltage inputs.

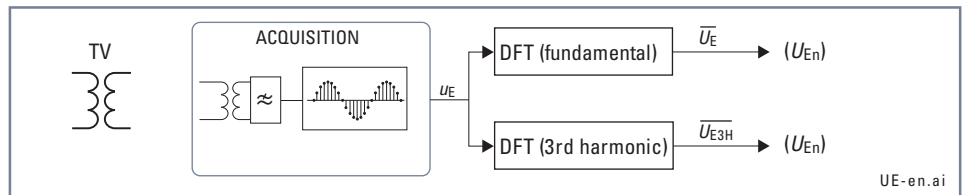


Samples are processed by means DFT (Discrete Fourier Transform) algorithm and the phase and amplitude of fundamental are computed:

- Input voltages U_{L1} , U_{L2} , U_{L3}



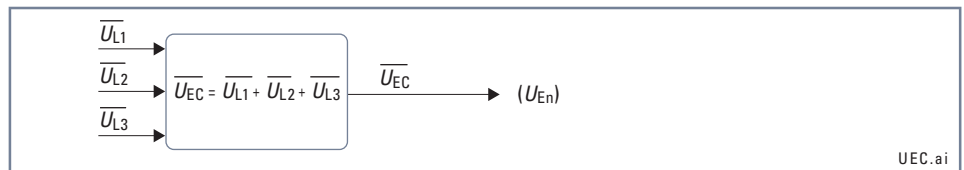
- Residual voltage U_E



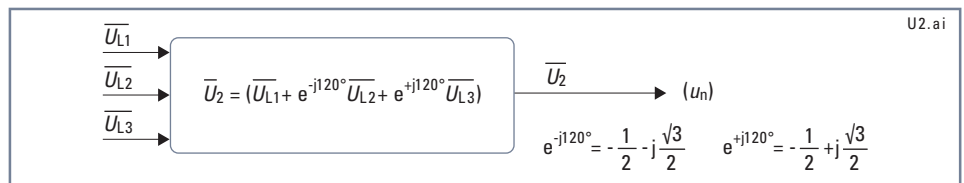
Calculated

By means vector addition of direct measures the following are calculated (RMS value of fundamental components):

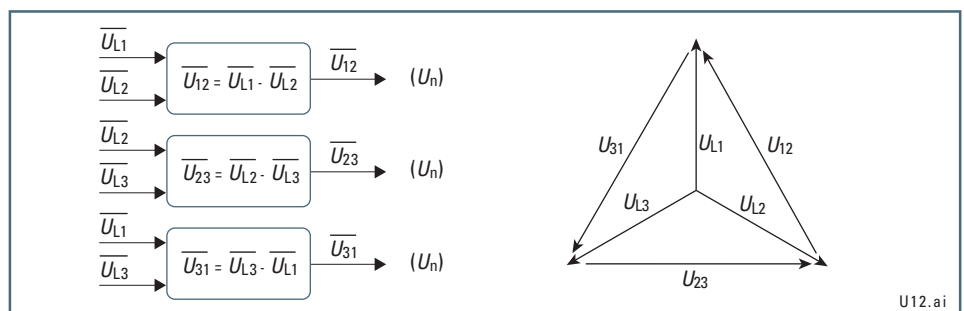
- Calculated residual voltage U_{EC}



- Negative sequence voltage: U_2



- Fundamental components of phase-to-phase voltages: U_{12} , U_{23} , U_{31} ^[1]



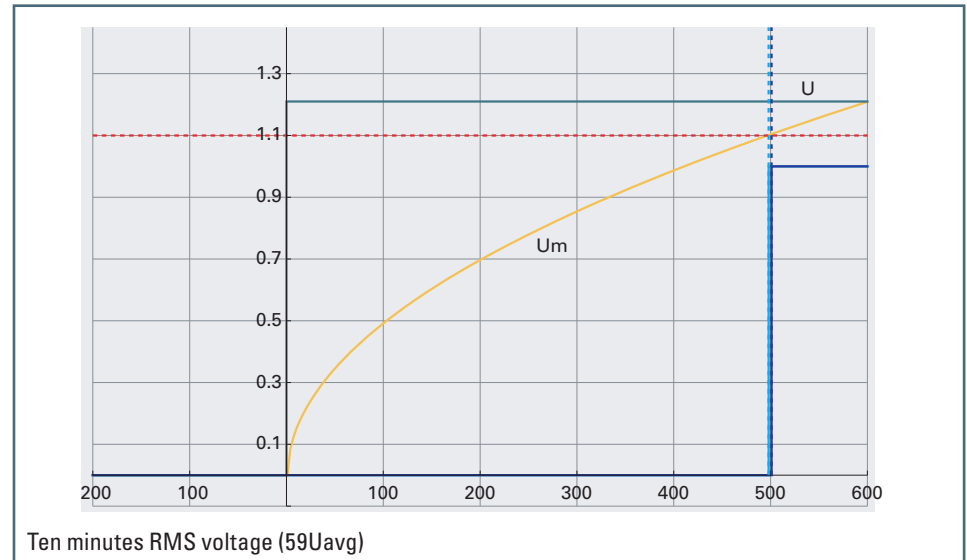
Ten minutes RMS voltage

From the values of phase voltages U_{L1} , U_{L2} , U_{L3} (versions with electronic sensors) or U_{12} , U_{23} , U_{31} (versions with inductive VTs), the RMS voltage is calculated by aggregating 10 minutes of:

- The RMS voltages are acquired every 0.2 seconds;
- Separately for each phase, the acquired values are aggregated to 10 minutes (600 s) performing the square root of the arithmetic mean of the last 600/0, 2 = 3000 values squared. The aggregation of 10 minutes is updated every 3 s.

$$U_m = \sqrt{\frac{1}{3000} \sum_{i=1}^{3000} (U_i)^2}$$

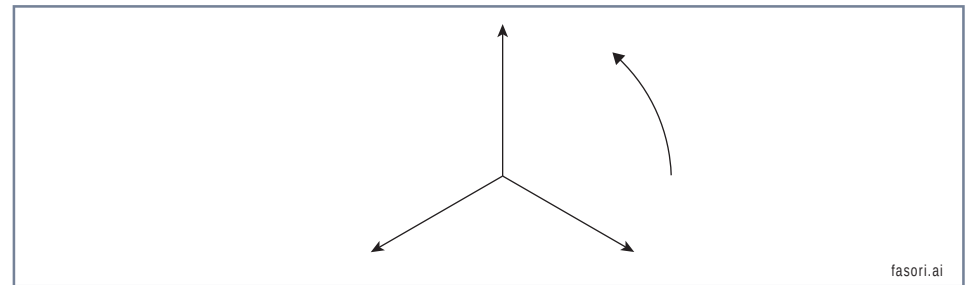
In response to a step change of the input voltage U (with voltage initially already stabilized), the voltage U_m has a transitional trend with square-law as shown in the following figure.



Conventions

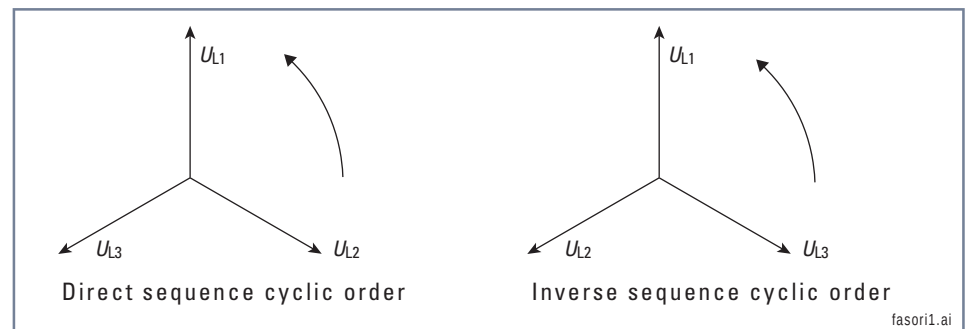
Phase rotation direction

The conventional rotation direction for the voltage phasors is counter-clockwise.



Cyclic phase sequence order

For three phase rotating voltages, a direct cyclic sequence is defined when the three phases are L1, L2, L3 ordered, while an inverse cyclic sequence is defined when the three phases are L1, L3, L2 ordered.



Use of measured values

Usage of measured values for protection, control and monitoring.

	$f_{UL1}, f_{UL2}, f_{UL3}$	U_{L1}, U_{L2}, U_{L3}	U_{L1}, U_{L2}, U_{L3}	U_{L1}, U_{L2}, U_{L3}	U_{L2}, U_{23}, U_{31}	U_E	U_E	U_1	U_2	U_{EC}	Temperature	Binary input I_{N1}, I_{N2}	Output Relay K1...K6	Start LED L1...L5	Trip LED L1...L5	Logic block (Block1)	Breaker failure (BF)
PROTECTION																	
Thermal Pt100 probes (26)											■		■	■	■		
Undervoltage - 27			■	■									■	■	■	■	■
Positive sequence undervoltage (27V1)								■									
Overvoltage - 59			■	■									■	■	■	■	■
Negative sequence overvoltage (59V2)									■								
Residual overvoltage - 59N							■			■			■	■	■	■	■
Average voltage (59Uavg)																	
Underfrequency - 81U	■												■	■	■	■	■
Overfrequency - 81O	■												■	■	■	■	■
Frequency rate of change - 81R	■												■	■	■	■	■
Breaker failure - BF	■											■	■	■	■		
CONTROL & MONITORING																	
Trip Circuit Supervision (TCS)												■					
Logic block (Block1)												■					
Frequency tracking (IF)	■												■	■	■		
Self																	
Automatic reclosure (ARF)												■	■	■	■	■	
EVENT RECORDING (SER)																	
Event 0												■	■	■	■		
Event 1												■	■	■	■		
Event 2												■	■	■	■		
Event ...												■	■	■	■		
Event 299												■	■	■	■		
FAULT RECORDING (SFR)																	
Fault 0	■	■	■			■			■		■	■	■				
Fault 1	■	■	■			■			■		■	■	■				
Fault 2	■	■	■			■			■		■	■	■				
Fault ...	■	■	■			■			■		■	■	■				
Fault 19	■	■	■			■			■		■	■	■				
DIGITAL FAULT RECORDER (OSCILLOGRAPHY)																	
Record 1	■	■	■		■												
Record 2	■	■	■		■												
Record 3	■	■	■		■												
Record ...	■	■	■		■												

Binary inputs

Two binary inputs are available.

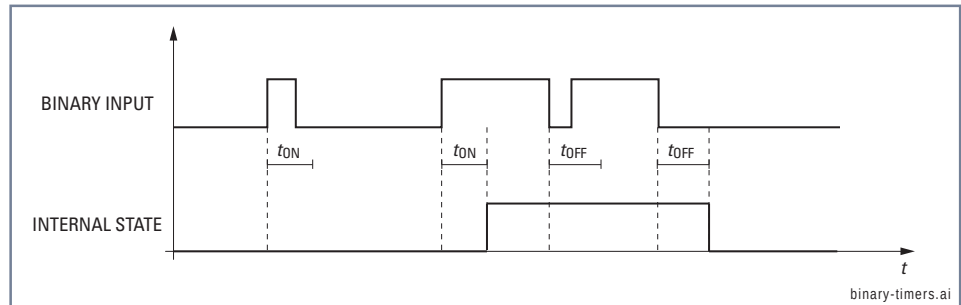
The dry inputs must be powered with an external voltage, (usually the auxiliary power supply).

The connections are shown in the schematic diagrams.

The following settings can be used to configure each input:

- Logic Active-ON (activated when powered), or Active-OFF (activated when power is turned off).
- ON Timer (OFF-to-ON time delay) and OFF Timer (ON-to-OFF time delay).
- Binary input allocation.

Adjustable debounce timer allows any transient to decay avoiding false activation of the input; the positive transition is acquired if the input is permanently high for a time interval longer than the t_{ON} setting delay; similarly for the negative transitions, the negative transition is acquired if the input is permanently high for a time interval longer than the t_{OFF} setting delay.



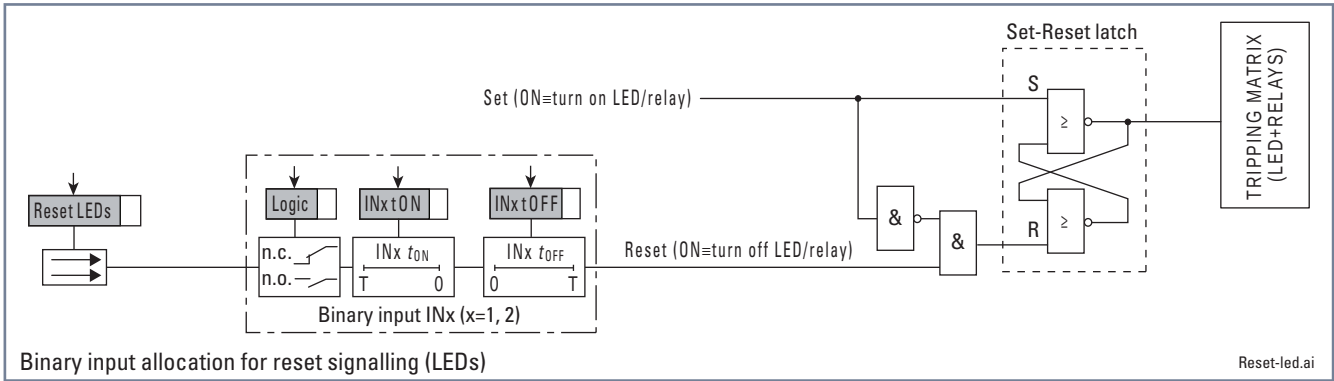
In the above shown diagram, INTERNAL STATE represents the logical state of the binary input used in the following processing.

Each binary input may be matched to one of the following default functions.

FUNCTIONS	Binary inputs	
	IN1	IN2
Reset LEDs	■	■
Set profile (switching setting A and B)	■	■
Fault trigger (fault recording)	■	■
Block1 (logic block)	■	■
TCS1 (Trip Circuit Supervision)	■	■
TCS2 (Trip Circuit Supervision)	■	■
Trip ProtExt (trip from external protection relays)	■	■
Reset counters	■	■
Reset CB Monitor (clear CB monitoring data)	■	■
52a (CB auxiliary contact)	■	■
52b (CB auxiliary contact)	■	■
Open CB	■	■
Close CB	■	■
Remote trip	■	■
74VT ext. (74VT from external protection relays)	■	■
f<-f> Control	■	■
UE>>	■	■
27V1	■	■
59V2	■	■
U<	■	■

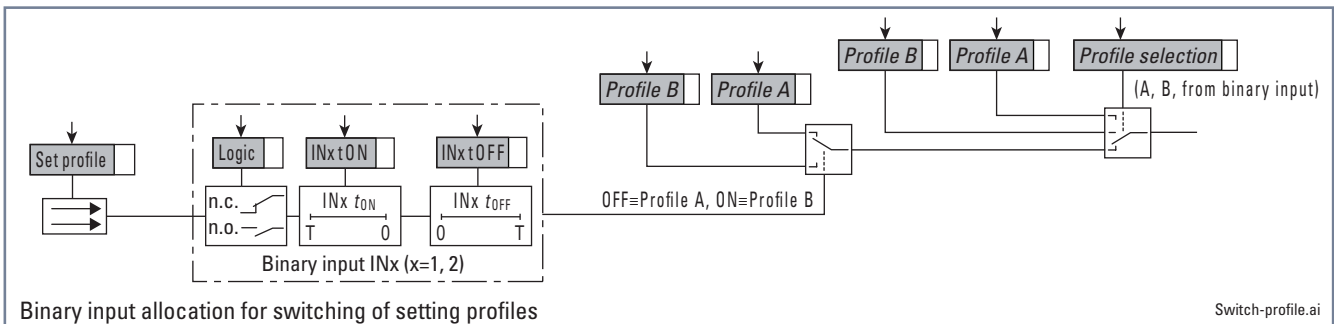
Reset LEDs

If the element tripped have gone back to rest condition, the latched LEDs and/or relays may be cleared.



Set profile

Inside PRO-N devices, two independent setting profiles (A and B) are available. Whereas different settings are required, they are made in the setting profiles and stored in the non volatile memory of relay. Applicable setting profile is activated usually via a binary input; when the programmed input is activated, the profile B becomes operative as a replacement for the default profile A.^[1]

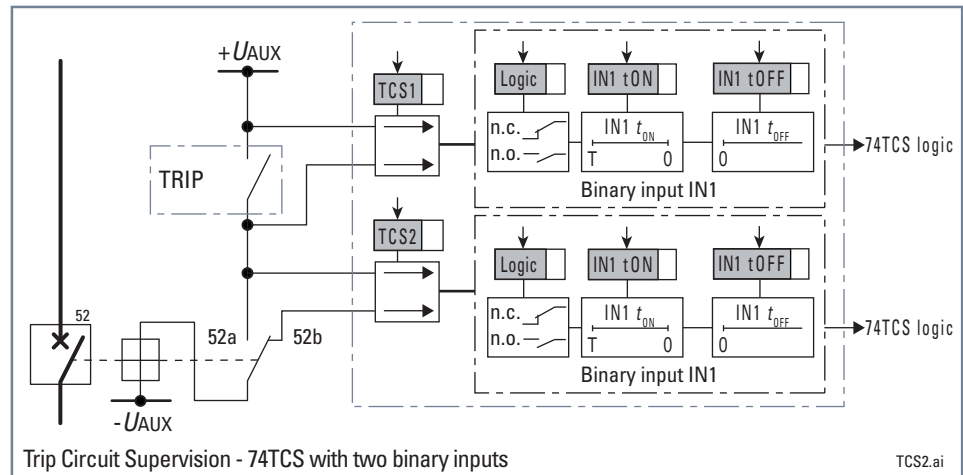


TCS1 and TCS2

Trip Circuit Supervision.

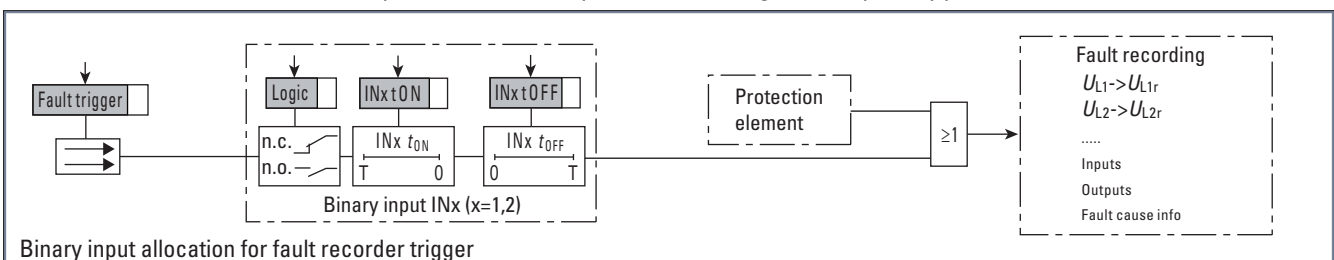
Supervision with one or two binary input can be performed.

The exhaustive treatment of the TCS function is described in the concerning paragraph.



Fault trigger

When the programmed input is activated, a trigger is issued for fault record SFR). Data storing takes place with the same procedure resulting from a trip of any protective elements.

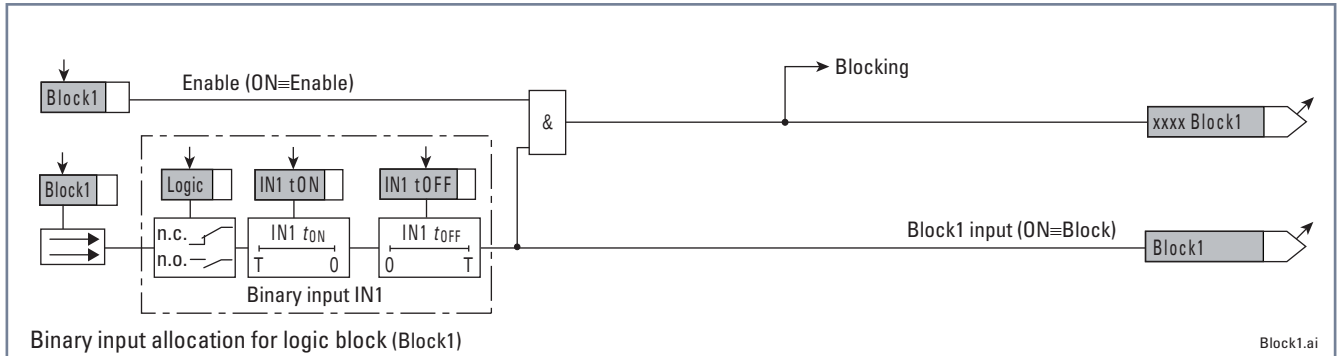


Note 1 To enable the profile switching the "Input-selected" parameter must be set inside the "Profile selection" submenu.
If multiple setting groups are not required, Group A is the default selection

Block1

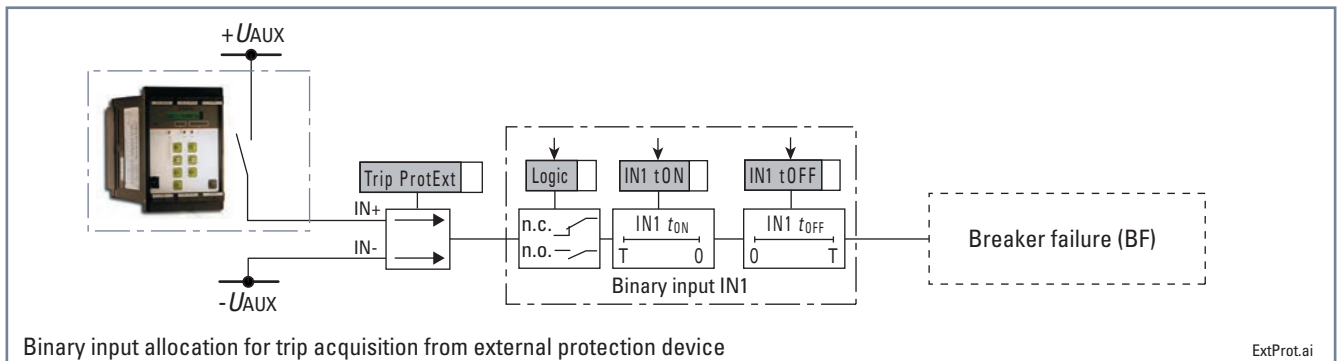
A change in status of a binary input effects a block for a length of time equal to the activation of the input[1]; the element pickup that wish be blocked must be enabled (the *Block1* parameter must be set to *ON* in the concerning menu).^[2]

The application of the IN1 binary input for the acquisition of the Block1 (logic block) coming from external signal is shown in the following figure.



Trip ProtExt

The binary input detects a trip coming from an external protective relay: the information is available for the breaker failure function (BF).



Reset counters

A change in status of a binary input effects a reset of all start/trip partial counters.^[3]

Reset CB Monitor

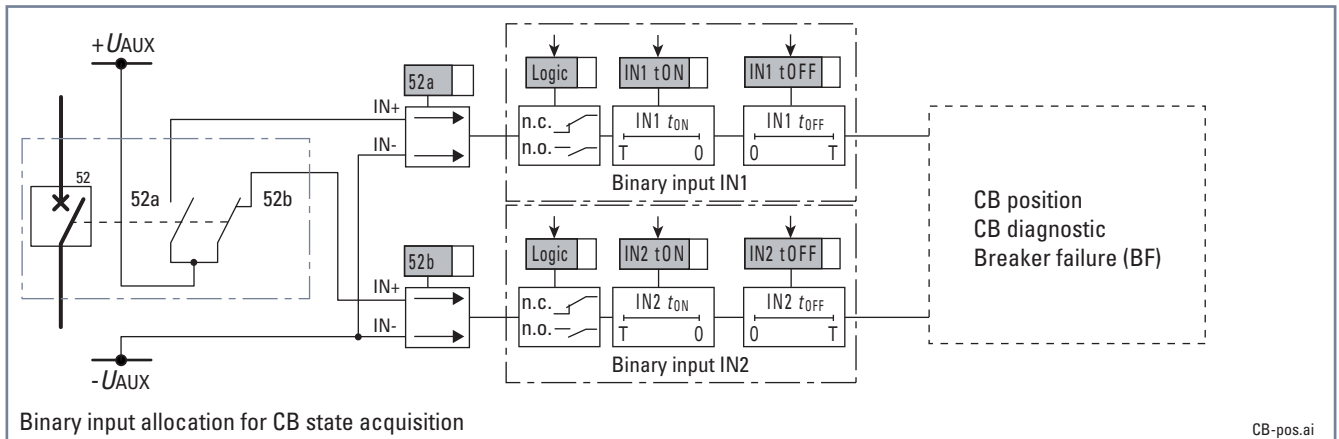
A change in status of a binary input effects a reset of all counters concerning the circuit breaker diagnostic:

- CB Open counter

52a-52b

The CB position can be acquired by means of binary inputs connected to the auxiliary contacts: the information is used in the following functions:

- CB position (open-closed)
- CB diagnostic (N. of operations, trip time)
- Breaker Failure (BF).



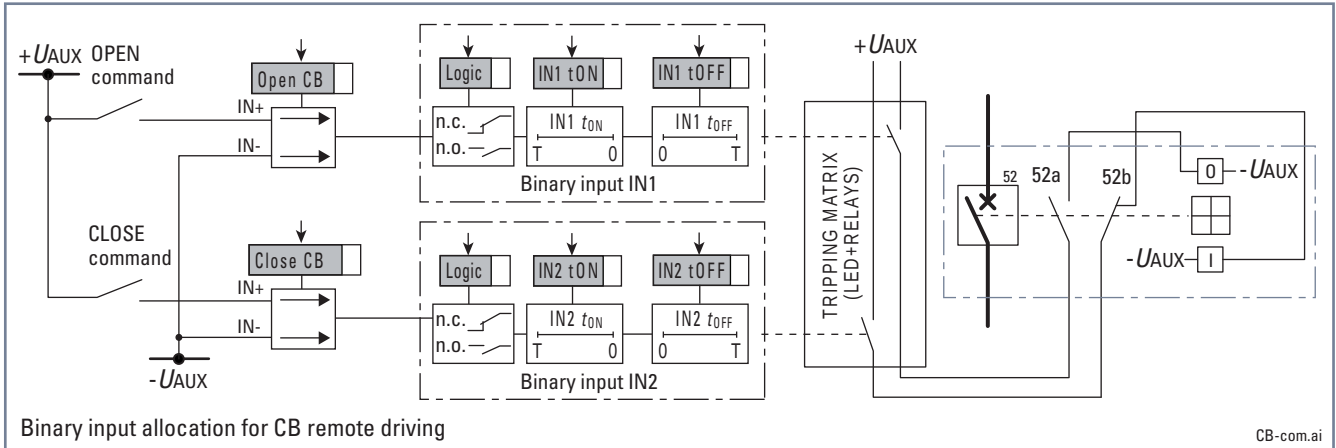
Note 1 The Block1 (logic block) keeps block of the protection for the whole time when the input is active.

Note 2 The activation of one binary input produces indiscriminately a block of all protective elements programmed for being blocked from Block1

Note 3 The reset of the total counters is practicable by means ThyVisor command with Session Level 1 (available with password)

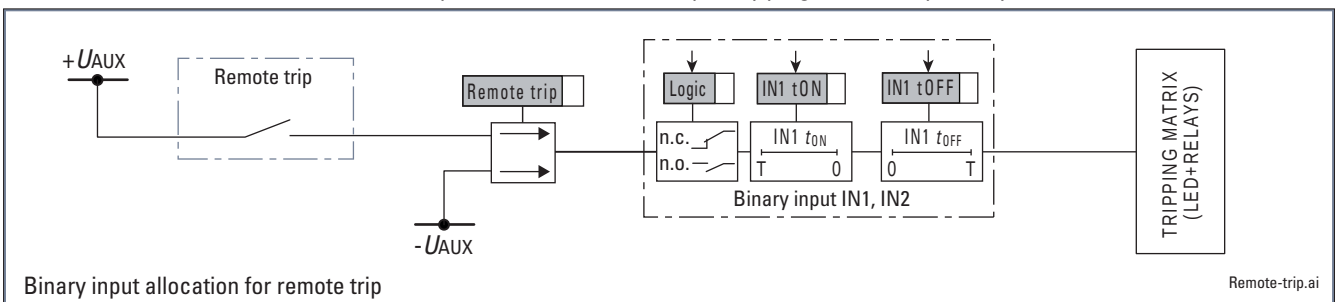
Open CB/Close CB

The external acquisition of remote commands allows to drive CB remotely.



Remote trip

The input activation drives an expressly programmed output relay..

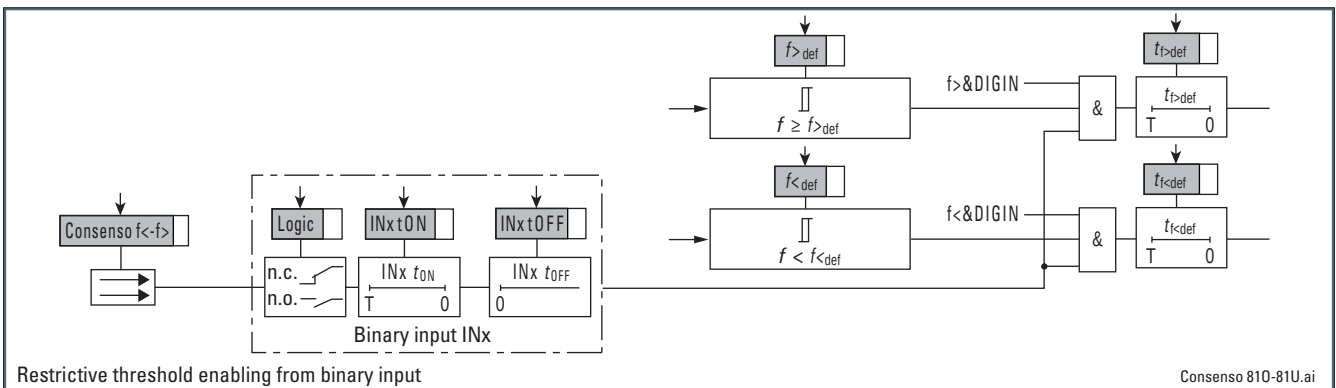


74TV ext

The external acquisition of 74TV allows to block or to change the operating mode of protective elements where the residual voltage is employed; the information is available for residual voltage protective elements (59N protections) that may operate inadvertently when an event cause a loss of one or more voltages.

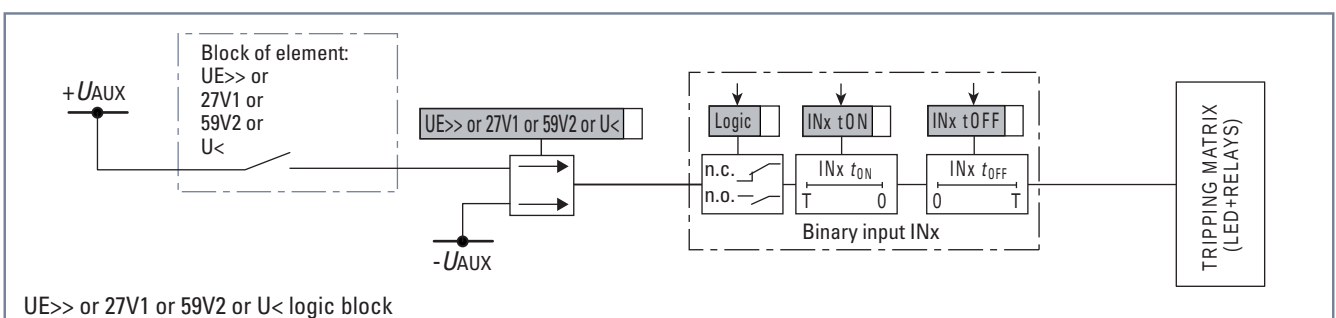
$f < f >$ Control

While the second threshold of each frequency protection is always active, the first threshold is activated / deactivated, respectively, in the absence / presence of the signal integrity of the communication network (from digital input set with inverted logic function and Consent $f < f >$ or by communication interface with IEC 61850 protocol).



$UE >>$, 27V1, 59V2, $U <$

When the programmed input is activated, a block of the concerning element is set.



Output relays

Six output relays are available (K1...K6):^[1]

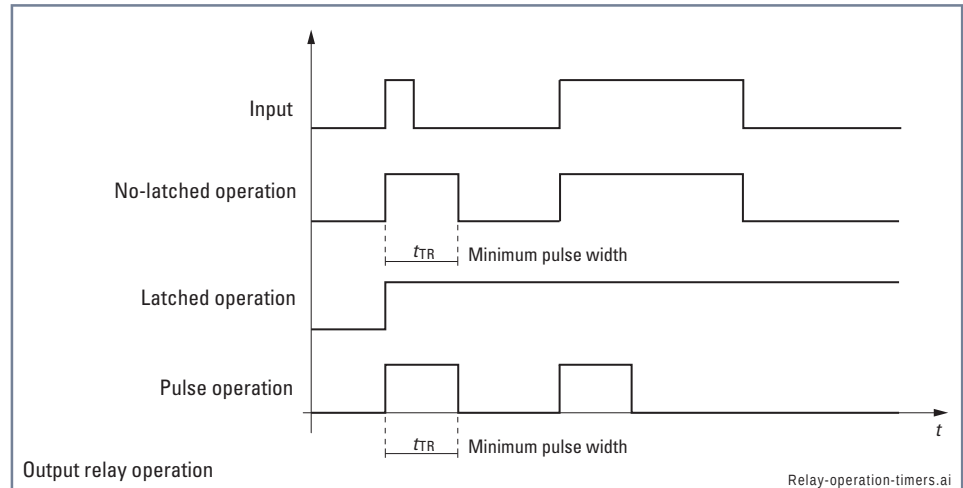
- K1 and K2 have two changeover contacts (SPDT, type C).
- K3, K4 and K5 have one make contact (SPST-NO, type A).^[2]
- K6 has one break contact (SPST-NC, type B).^[3]

Each output relay may be programmed with following operating mode:

- *Operation MODE* (No latched, Pulse, Latched).
- *Logic* (Energized/De-energized).

To each output relay a programmable timer is matched (*Minimum pulse width* parameter).

All parameters are available inside the **SetRelays** menu.



Any change to the settings can be affected at any time, also with the relay on duty, separately for each relay.

Notes:

- When de-energized operating mode is set, the relay remains in rest condition if no trip command is in progress.
- When energized operating mode is set, the relay remains in operating condition if no trip command is in progress and the auxiliary supply is powered on.
- When no-latched operating mode is set (*Operation MODE No latched*), the output relay reset at the end of the trip condition. To each output relay a programmable timer is matched (minimum pulse width operation).
- When latched operating mode is set (*Operation MODE Latched*), the output relay doesn't reset at the end of the trip condition; it stays ON until a reset command is issued (RESET key, ThyVisor or communication command).
- When pulse operating mode is set (*Operation MODE Pulse*), the output relay reset after a *t_{TR}* programmable delay regardless of the trip condition.
- It is advisable to make sure that the output contact technical data are suitable for load (Nominal current, breaking capacity, make current, switching voltage,...).

Matching every output relay to any protective element is freely programmable inside the *Setpoints* submenus according a tripping matrix structure.^{[4][5]}

Note 1 Schematic diagram are shown inside APPENDIX B1.

Note 2 K3 and K4 have a common terminal (A10)

Note 3 K5 and K6 have a common terminal (A13)

Note 4 Matching of the output relay to the protective and control functions can be defined so that any collision from other function is avoided. All output relay are unassigned in the default setting.

Note 5 Self test relay: it is advisable to plan the following settings:

- Energized operating mode,
- No-latched ,

in order that it stays ON for normal conditions and the other way round it goes OFF if any fault is detected and/or the auxiliary supply turns OFF.

FUNCTION	RELAYS					
	K1	K2	K3	K4	K5	K6
Self-test relay	■	■	■	■	■	■
U< Start relays (U< ST-K)	■	■	■	■	■	■
U< Trip relays (U< TR-K)	■	■	■	■	■	■
U<< Start relays (U<< ST-K)	■	■	■	■	■	■
U<< Trip relays (U<< TR-K)	■	■	■	■	■	■
27V1 Start relays (U1<ST-K)	■	■	■	■	■	■
27V1 Trip relays (U1< TR-K)	■	■	■	■	■	■
U> Start relays (U> ST-K)	■	■	■	■	■	■
U> Trip relays (U> TR-K)	■	■	■	■	■	■
U>> Start relays (U>> ST-K)	■	■	■	■	■	■
U>> Trip relays (U>>TR-K)	■	■	■	■	■	■
59Uavg Start relays (Uavg> ST-K)	■	■	■	■	■	■
59Uavg Trip relays (Uavg> TR-K)	■	■	■	■	■	■
UE> Start relays (UE> ST-K)	■	■	■	■	■	■
UE> Trip relays (UE> TR-K)	■	■	■	■	■	■
UE>> Start relays (UE>> ST-K)	■	■	■	■	■	■
UE>> Trip relays (UE>>TR-K)	■	■	■	■	■	■
59UV2 Start relays (U2> ST-K)	■	■	■	■	■	■
59UV2 Trip relays (U2> TR-K)	■	■	■	■	■	■
f> Start relays (f>ST-K)	■	■	■	■	■	■
f> Trip relays (f>TR-K)	■	■	■	■	■	■
f>> Start relays (f>>ST-K)	■	■	■	■	■	■
f>> Trip relays (f>>TR-K)	■	■	■	■	■	■
f< Trip relays (f<ST-K)	■	■	■	■	■	■
f< Trip relays (f<TR-K)	■	■	■	■	■	■
f<< Start relays (f<<ST-K)	■	■	■	■	■	■
f<< Trip relays (f<<TR-K)	■	■	■	■	■	■
f<<< Start relays (f<<<ST-K)	■	■	■	■	■	■
f<<< Trip relays (f<<<TR-K)	■	■	■	■	■	■
f<<<< Start relays (f<<<<ST-K)	■	■	■	■	■	■
f<<<< Trip relays (f<<<<TR-K)	■	■	■	■	■	■
df> Start relays (df>ST-K)	■	■	■	■	■	■
df> Trip relays (df>TR-K)	■	■	■	■	■	■
df>> Start relays (df>>ST-K)	■	■	■	■	■	■
df>> Trip relays (df>>TR-K)	■	■	■	■	■	■
df>>> Start relays (df>>>ST-K)	■	■	■	■	■	■
df>>> Trip relays (df>>>TR-K)	■	■	■	■	■	■
df>>>> Start relays (df>>>>ST-K)	■	■	■	■	■	■
df>>>> Trip relays (df>>>>TR-K)	■	■	■	■	■	■
74TCS Start relays (74TCS-ST-K)	■	■	■	■	■	■
74TCS Trip relays (74TCS-TR-K)	■	■	■	■	■	■
BF Start relays (BF-ST-K)	■	■	■	■	■	■
BF Trip relays (BF-TR-K)	■	■	■	■	■	■
Number of CB trips diagnostic relays (N.Open-K)	■	■	■	■	■	■
Circuit breaker opening time diagnostic relays (tbreak-K)	■	■	■	■	■	■
Open CB command relays (CBopen-K)	■	■	■	■	■	■
Close CB command relays (CBclose-K)	■	■	■	■	■	■
Remote tripping relays (RemTrip-K)	■	■	■	■	■	■

LED indicators

Eight LEDs are available.

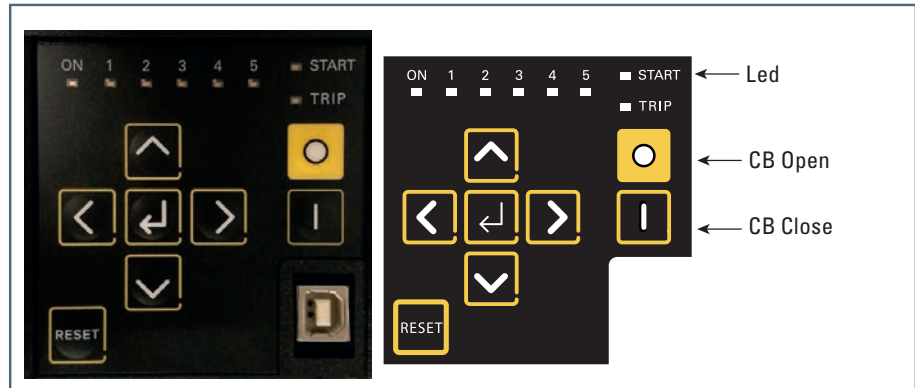
- One green LED "ON": if turned on it means that the device is properly working, if flashing the internal self-test function has detected an anomaly.
- One yellow LED "START" tagged for START of one or more protective elements.^[1]
- One red LED "TRIP" tagged for TRIP of one or more protective elements.^[1]
- Five red LEDs "1...5" for highlight the activation of one or more user defined function.

Each output relay may be programmed with following operating mode:

- No-latched: the LED reset at the end of the trip condition.
- Latched: the LED doesn't reset at the end of the trip condition; it stays ON until a manual reset command is issued (RESET key, ThyVisor or communication command).

Any change to the settings can be affected at any time, also with the relay on duty, separately for each LED

Programming and/or configuration changes can be carried out at any time, separately for each LED by setting the parameters inside the **SetLed** menu.



Free allocation of each LED may be set according to the matrix structure shown in the following page.^[2]

Note 1 The START and the TRIP LED are user assignable to any function; other than starting and tripping information can be assigned to them too, just the same for L1...L5

Note 2 All LEDs are unassigned in the default setting.

FUNCTIONS	START	TRIP	LED				
			1	2	3	4	5
U< Start LEDs (U< ST-L)	■	■	■	■	■	■	■
U< Trip LEDs (U< TR-L)	■	■	■	■	■	■	■
U<< Start LEDs (U<< ST-L)	■	■	■	■	■	■	■
U<< Trip LEDs (U<< TR-L)	■	■	■	■	■	■	■
27V1 Start LEDs (U1<ST-L)	■	■	■	■	■	■	■
27V1 Trip LEDs (U1<TR-L)	■	■	■	■	■	■	■
U> Start LEDs (U> ST-L)	■	■	■	■	■	■	■
U> Trip LEDs (U> TR-L)	■	■	■	■	■	■	■
U>> Start LEDs (U>> ST-L)	■	■	■	■	■	■	■
U>> Trip LEDs (U>>TR-L)	■	■	■	■	■	■	■
59Uavg Start LEDs (Uavg> ST-L)	■	■	■	■	■	■	■
59Uavg Trip LEDs (Uavg> TR-L)	■	■	■	■	■	■	■
UE> Start LEDs (UE> ST-L)	■	■	■	■	■	■	■
UE> Trip LEDs (UE> TR-L)	■	■	■	■	■	■	■
UE>> Start LEDs (UE>> ST-L)	■	■	■	■	■	■	■
UE>> Trip LEDs (UE>>TR-L)	■	■	■	■	■	■	■
59V2 Start LEDs (U2> ST-L)	■	■	■	■	■	■	■
I59V2 Trip LEDs (U2> TR-L)	■	■	■	■	■	■	■
f> Start LEDs (f>ST-L)	■	■	■	■	■	■	■
f> Trip LEDs (f>TR-L)	■	■	■	■	■	■	■
f>> Start LEDs (f>>ST-L)	■	■	■	■	■	■	■
f>> Trip LEDs (f>>TR-L)	■	■	■	■	■	■	■
f< Start LEDs (f<ST-L)	■	■	■	■	■	■	■
f< Trip LEDs (f<TR-L)	■	■	■	■	■	■	■
f<< Start LEDs (f<<ST-L)	■	■	■	■	■	■	■
f<< Trip LEDs (f<<TR-L)	■	■	■	■	■	■	■
f<<< Start LEDs (f<<<ST-L)	■	■	■	■	■	■	■
f<<< Trip LEDs (f<<<TR-L)	■	■	■	■	■	■	■
f<<<< Start LEDs (f<<<<ST-L)	■	■	■	■	■	■	■
f<<<< Trip LEDs (f<<<<TR-L)	■	■	■	■	■	■	■
df> Start LEDs (df>ST-L)	■	■	■	■	■	■	■
df> Trip LEDs (df>TR-L)	■	■	■	■	■	■	■
df>> Start LEDs (df>>ST-L)	■	■	■	■	■	■	■
df>> Trip LEDs (df>>TR-L)	■	■	■	■	■	■	■
df>>> Start LEDs (df>>>ST-L)	■	■	■	■	■	■	■
df>>> Trip LEDs (df>>>TR-L)	■	■	■	■	■	■	■
df>>>> Start LEDs (df>>>>ST-L)	■	■	■	■	■	■	■
df>>>> Trip LEDs (df>>>>TR-L)	■	■	■	■	■	■	■
74TCS Start LEDs (74TCS-ST-L)	■	■	■	■	■	■	■
74TCS Trip LEDs (74TCS-TR-L)	■	■	■	■	■	■	■
BF Start LEDs (BF-ST-L)	■	■	■	■	■	■	■
BF Trip LEDs (BF-TR-L)	■	■	■	■	■	■	■
Number of CB trips diagnostic LEDs (N.Open-L)	■	■	■	■	■	■	■
Circuit breaker opening time diagnostic LEDs (tbreak-L)	■	■	■	■	■	■	■
Open CB command LEDs (CBopen-L)	■	■	■	■	■	■	■
Close CB command LEDs (CBclose-L)	■	■	■	■	■	■	■
Remote tripping LEDs (RemTrip-L)	■	■	■	■	■	■	■

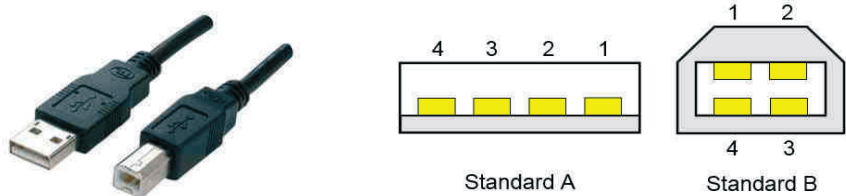
Communication interfaces

Several communication ports are provided:

- USB port on the front side of the NV10 device for local communication (ThyVisor).
- RS485 port on the rear side of the NV10 device for bus communication.
- Ethernet port on the rear side of the NV10 device for bus communication.

USB

to connect the local port USB can be used the L10042 cable (USB type B - Type A)



The serial port is the simplest access for setting by means the ThyVisor software.

RS485

Several protocol are implemented^[1]:

- ModBus RTU. Modbus is a serial communications protocol. It is a de facto standard communications protocol in industry, and is now the most commonly available means of connecting industrial electronic devices also inside electric utilities and substation.
- IEC 60870-5. The IEC 60870-5 suite of protocol is used for communications from master station to substation, as well within the substation; the IEC 60870-5-103 (Protection equipment) is available together the Modbus protocol on some version of Pro-n devices (code NVxx#xxxxC x).

Ethernet

It is provided (optionally) a communication board useful for Ethernet communication with ModBus TCP/IP protocol.^[2]

Modbus/TCP basically embeds a Modbus frame into a TCP frame in a simple manner. This is a connection-oriented transaction which means every query expects a response.

This query/response technique fits well with the master/slave nature of ModBus, adding to the deterministic advantage that Switched Ethernet offers industrial users.

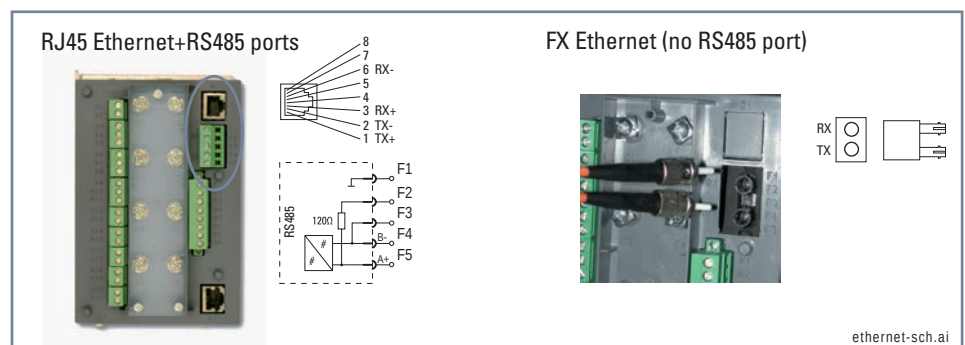
In the same way as the RS485 base Modbus, every device is identified by a personal address and the communication goes in "client-server" mode with answering request from the recipient.

The protective relay can be directly connect to the Ethernet network (no gateway, protocol converter are needed).

Two port can be implemented:

- 100BASE-TX with RJ45 connector (copper).
- 100BASE-FX with FX connector (optical fiber)^[2]

For both modules no hw preset are required.



Two LEDs are on board (RJ45):

- LINK - (green): The LED lights up if the connection is active.
- TX - (yellow): The LED lights up when data transmission is active.

Note 1 The RS485 port is not implemented on the Pro-N devices endowed with Ethernet FX port

Note 2 Information about the ModBus map may be find inside the "Remote programming manual"

4.4 PROTECTIVE ELEMENTS

Rated values

Inside the Base menu the following parameters may be set:

- Relay reference name.
- Relay nominal voltages (phase and residual), to which the regulation are related.
- Primary nominal values, employed for measures relative to primary values.
- Measurements reading mode.

Information for settings:

- **Relay reference name.**

Alphanumeric mnemonic string (max 16 characters) useful for identification of protected plant.

- **Relay nominal frequency f_n**

This nominal value must be set same as the frequency of the grid.

Example: grid frequency $f_n = 50$ Hz

Relay nominal frequency $f_n = 50$ Hz

Inductive VTs versions

- **Relay nominal voltage U_n**

Two reference voltage are available: $U_R = 100$ V and $U_R = 400$ V

The U_n relay nominal voltage must be set to the value of relay input voltages at grid nominal voltage.

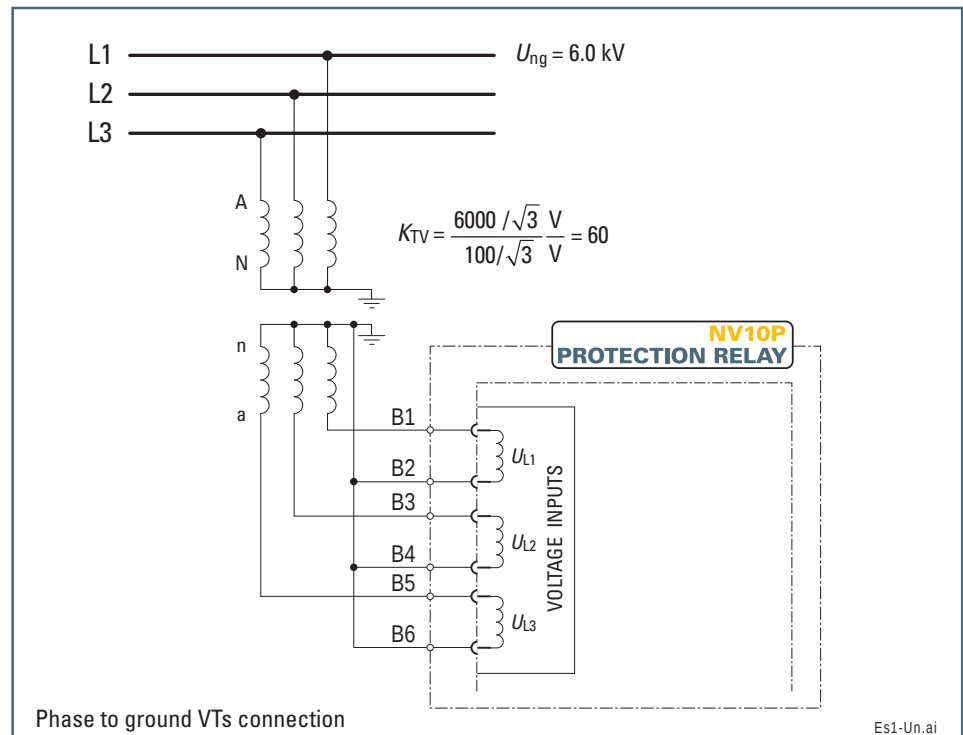
The U_n value must calculated as:

$$U_n = \frac{\text{Grid nominal voltage } U_{ng} \text{ where the VTs are included [V]}}{\text{Voltage transformer ratio } K_{TV}}$$

If VTs with primary nominal voltage is equal to the grid voltage divided by $\sqrt{3}$, the following streamlined calculus may be used:

$$U_n = \text{VTs secondary nominal voltage [V]} \times \sqrt{3}$$

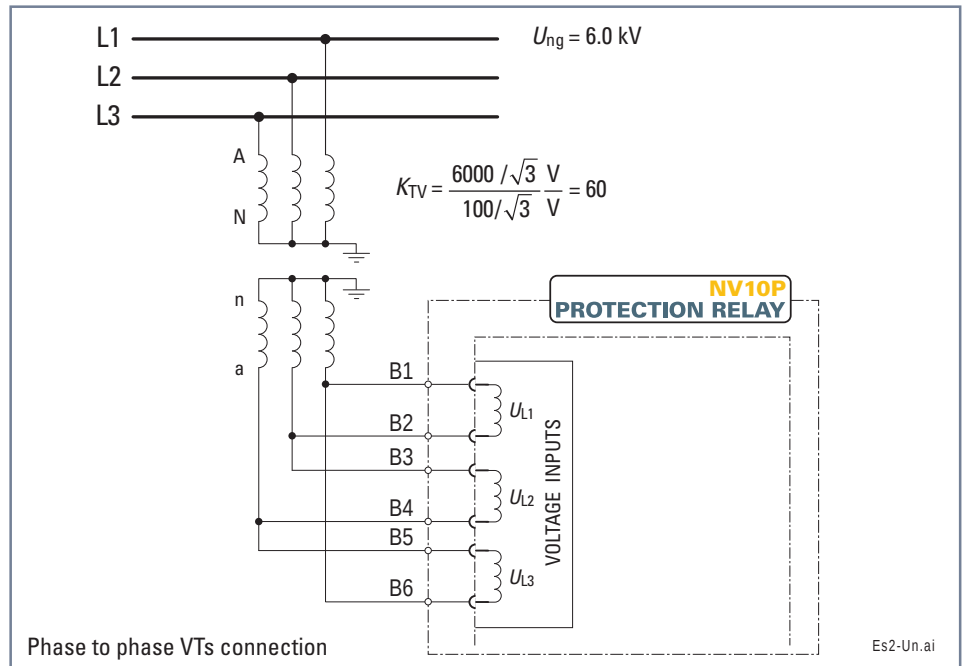
Example 1



The relay nominal voltage may be set to:

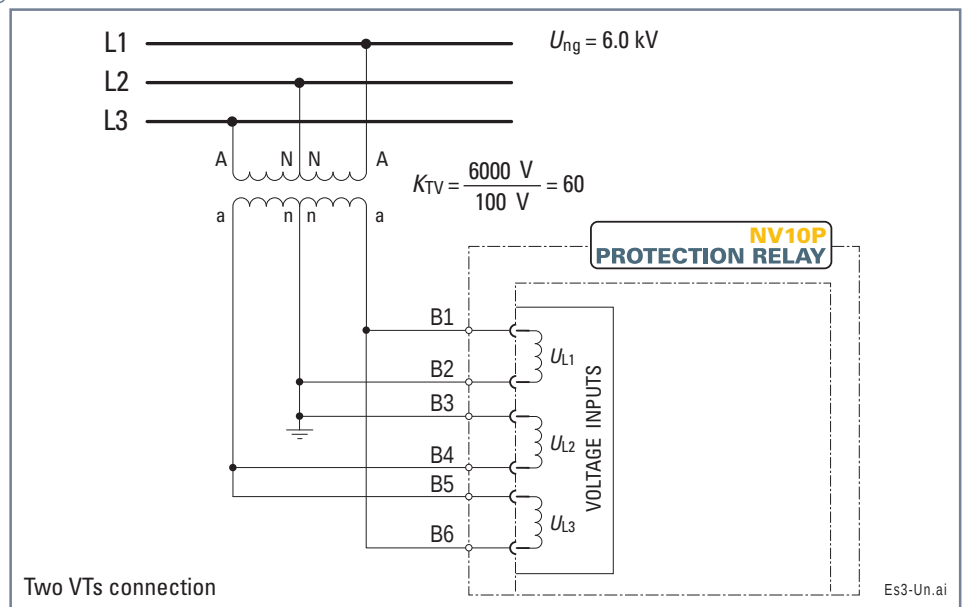
$$U_n = U_{ng} / \sqrt{3} \cdot K_{TV} = 6000 / \sqrt{3} \cdot 60 = 100 / \sqrt{3} = 58 \text{ V}$$

Example 2



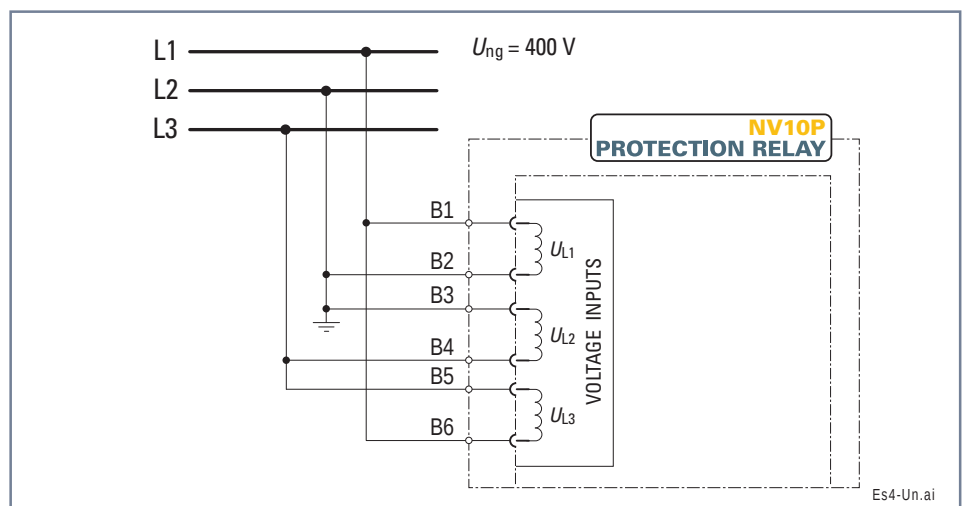
The relay nominal voltage may be set to: $U_n = U_{ng} / K_{TV} = 6000 / 60 = 100 \text{ V}$

Example 3



The relay nominal voltage may be set to: $U_n = U_{ng} / K_{TV} = 6000 / 60 = 100 \text{ V}$

Example 4



The relay nominal voltage may be set to: $U_n = U_{ng} = 400 \text{ V}$

- Relay residual nominal voltage U_{En}

Three instances are expected:

- A) residual voltage acquired with open delta VT.
- B) residual voltage measure by means VT connected from star-point and earth.
- C) residual voltage measure by vector calculus.

Case A

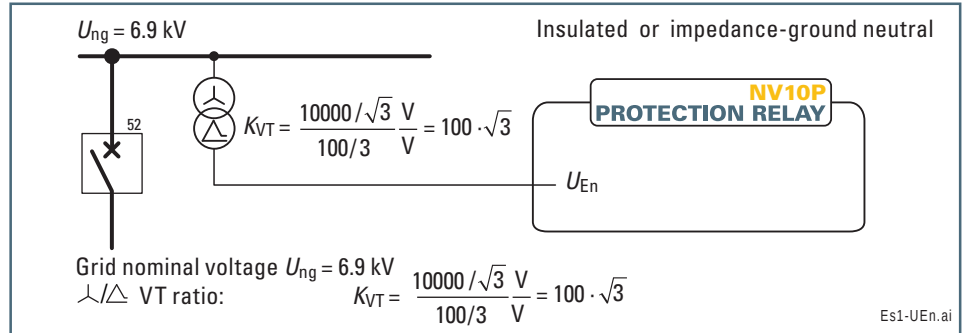
The residual nominal voltage U_{En} may be estimated by means of the following general formula (effective for insulated neutral or impedance-ground connected grids):

$$U_{En} = \frac{\text{Grid nominal voltage } U_{ng} \text{ where the VTs [V] } \times \sqrt{3}}{\text{VT ratio } K_{VT} \text{ } \Delta/\Delta}$$

If open delta VT with primary nominal voltage balances to the grid voltage divided by $\sqrt{3}$, the following streamlined calculus may be used:

$U_{En} = 3 \cdot \text{VT open delta secondary nominal voltage [V]}$ for insulated or impedance-ground neutral grids.

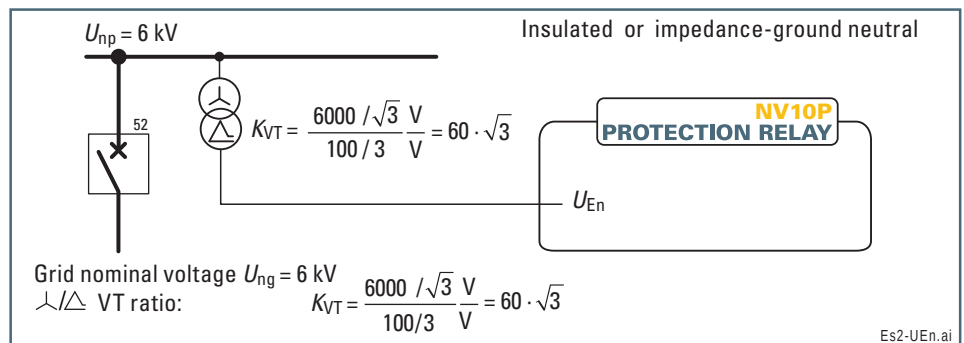
Example A1



The relay residual nominal voltage U_{En} must be estimated by means of the following general formula:

$$U_{En} = \sqrt{3} \cdot U_{ng} / K_{VT} = \sqrt{3} \cdot 6900 / (\sqrt{3} \cdot 100) = 69 \text{ V}$$

Example A2



The relay residual nominal voltage U_{En} must be indifferently estimated by means of the following general formula:

$$U_{En} = \sqrt{3} \cdot U_{ng} / K_{VT} = \sqrt{3} \cdot 6000 / (\sqrt{3} \cdot 60) = 100 \text{ V}$$

or by means the following:

$$U_{En} = 3 \cdot U_{hs} = 3 \cdot 100 / 3 = 100 \text{ V}$$

Case B

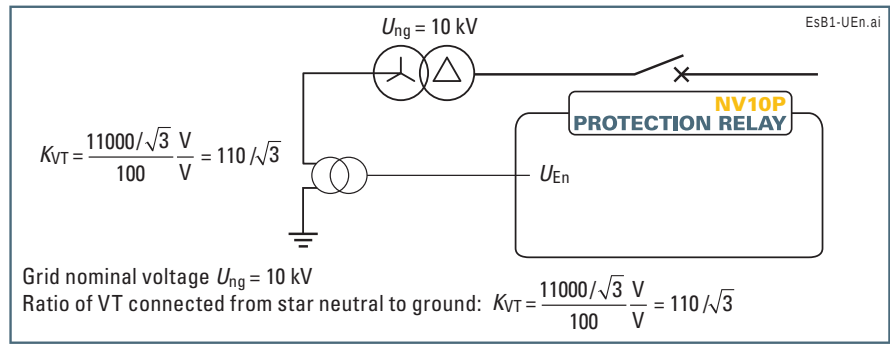
The relay residual nominal voltage U_{En} must be estimated by means of the following general formula:

$$U_{En} = \frac{\text{Grid nominal voltage } U_{ng} \text{ where the VTs are included [V]} / \sqrt{3}}{\text{Voltage transformer ratio } K_{TV}}$$

If a VT with primary nominal voltage equal to the grid voltage divided by $\sqrt{3}$ is connected from star neutral to ground, the following streamlined calculus may be used:

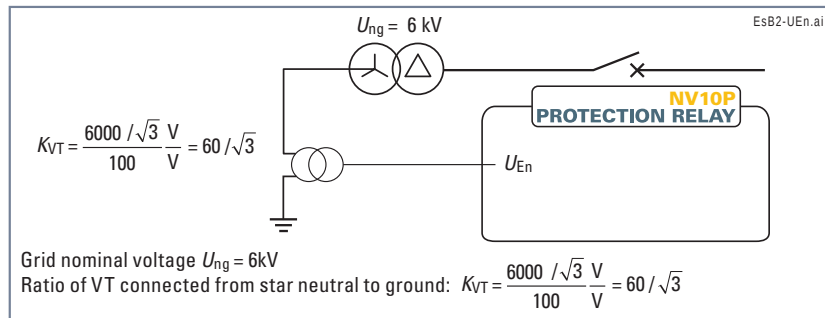
$$U_{En} = \text{VT secondary nominal voltage [V]}$$

Example B1



The relay residual nominal voltage U_{En} may be estimated by means of the following general formula:
 $U_{En} = (U_{ng} / \sqrt{3}) / K_{VT} = (10000 / \sqrt{3}) / (110 / \sqrt{3}) = 91 \text{ V}$

Example B2

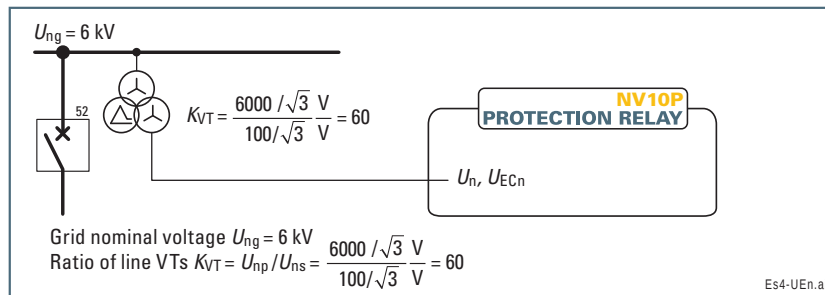


The relay residual nominal voltage U_{En} may be estimated by means of the following general formula:
 $U_{En} = (U_{ng} / \sqrt{3}) / K_{VT} = (6000 / \sqrt{3}) / (60 / \sqrt{3}) = 100 \text{ V}$

Case C

The relay residual calculated nominal voltage U_{ECn} is estimated automatically by means of the formula: $U_{ECn} = \sqrt{3} \cdot U_n$

Example C1



According with the example 2 where $U_{En} = 100 \text{ V}$ the relay residual calculated nominal voltage U_{ECn} is calculated inside the relay as: $U_{ECn} = U_n \cdot \sqrt{3} = 100 \cdot \sqrt{3} = 173 \text{ V}$

• VTs Phase primary voltage U_{np} (phase-to-phase)

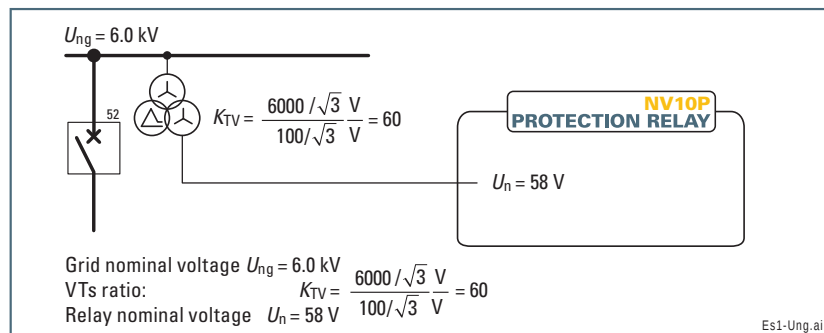
This parameter affects the measure of the input voltages when the primary measurement reading mode is selected.

If the formerly indications concerning the relay nominal voltage U_n are complied (Phase to ground and phase-to-phase VTS connection diagrams), then the U_{np} setting must be adjusted to:

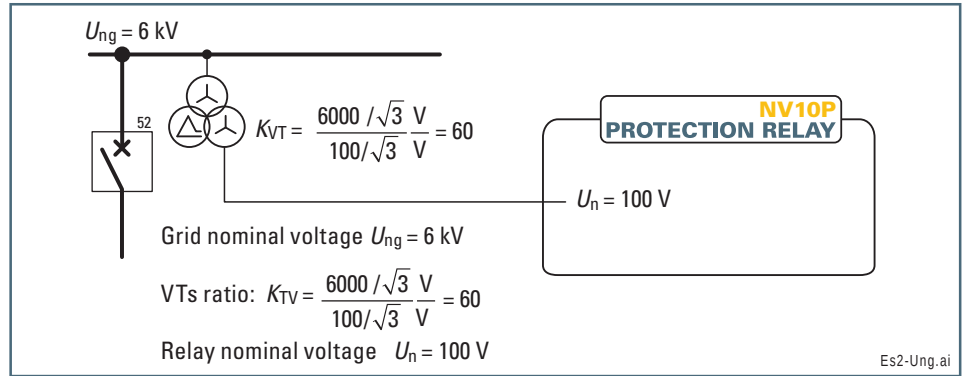
$U_{np} = \text{grid nominal voltage [V]}$.

Example 1

The U_{np} setting must be adjusted to: $U_{np} = U_{ng} = 6.0 \text{ kV}$

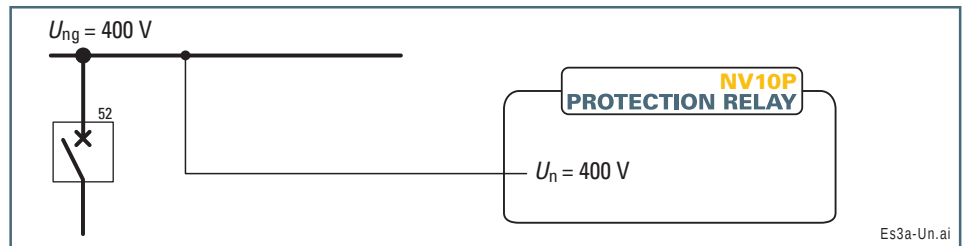


Example 2



The U_{np} setting must be adjusted to: $U_{np} = U_{ng} = 6 \text{ kV}$

Example 3



The U_{np} setting must be adjusted to: $U_{np} = U_{ng} = 400 \text{ V}$

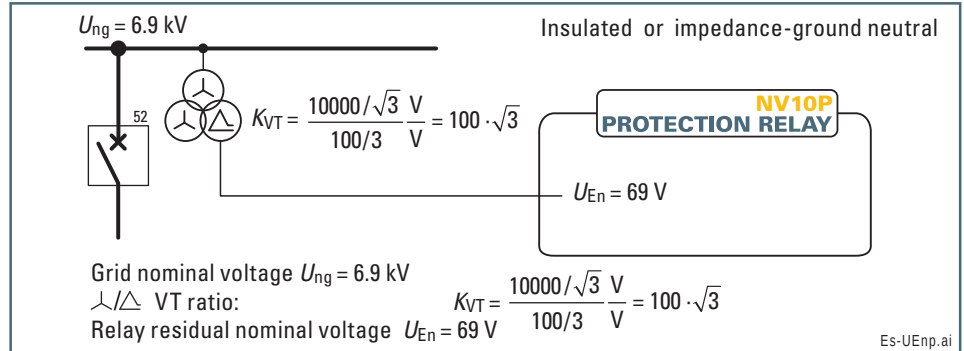
• **Residual primary voltage U_{Enp}**

This parameter affects the measure of the direct residual voltage when the primary measurement reading mode is selected.

If the formerly indications concerning the relay nominal residual voltage U_{En} are complied, then the U_{Enp} setting must be adjusted to (effective for insulated neutral or impedance-ground connected grids):

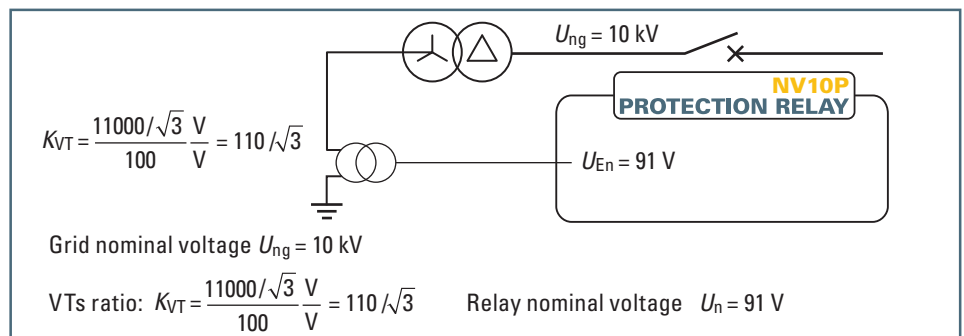
$U_{Enp} = \sqrt{3} \cdot \text{grid nominal voltage [V]}$.

Example 1



The U_{Enp} setting must be adjusted to: $U_{Enp} = \sqrt{3} \cdot U_{ng} = \sqrt{3} \cdot 6900 \text{ V} = 11900 \text{ V}$

Example 2



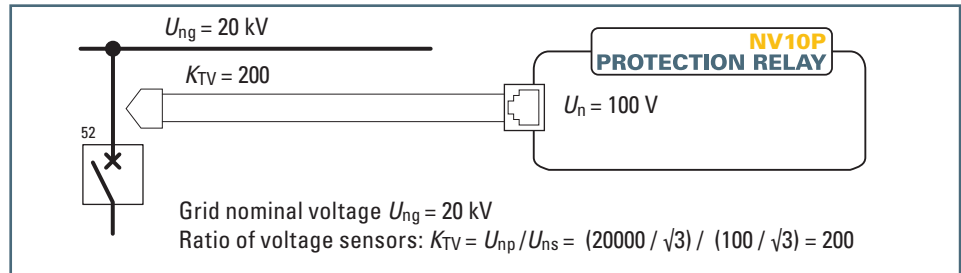
The U_{Enp} setting must be adjusted to: $U_{Enp} = \sqrt{3} \cdot U_{ng} = \sqrt{3} \cdot 10000 \text{ V} = 17300 \text{ V}$

Electronic sensor versions

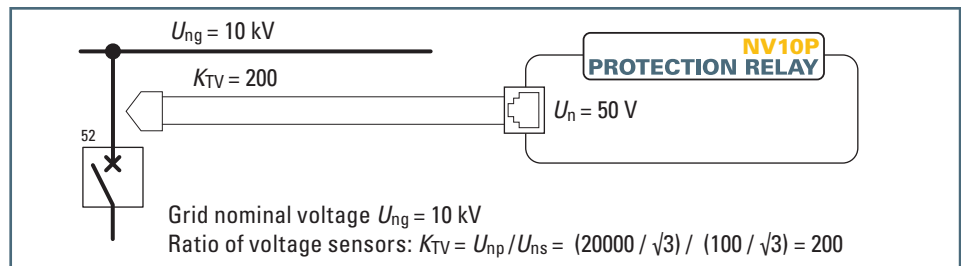
• **Relay nominal voltage U_n**

The voltage sensor is considered equivalent to a VT with $(20000 / \sqrt{3}) / (100 / \sqrt{3})$ voltage transformation ratio.

When the grid rated voltage divided by $\sqrt{3}$ corresponds to the sensors rated primary voltage ($20000 / \sqrt{3}$), the relay rated voltage $U_n^{[1]}$ should be set to $U_n = 100$ V (default setting).



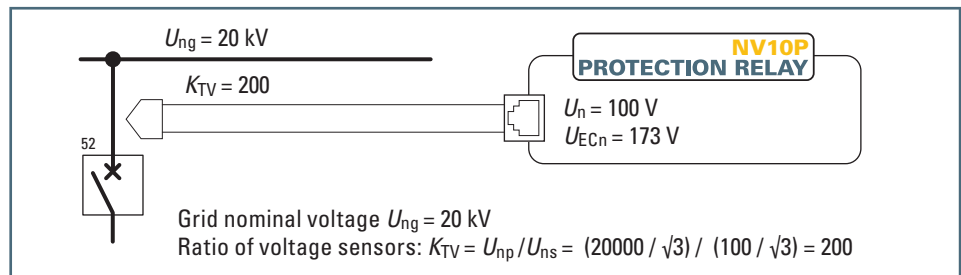
When the grid rated voltage divided by $\sqrt{3}$ is different from the value of rated primary voltage of the sensors ($20000 / \sqrt{3}$) the relay rated voltage U_n is calculated by the following general formula: $U_n = U_{ng} / K_{TV}$ in the example given below, which corresponds to $U_n = 10\,000 / 200 = 50$ V.



• Relay residual nominal voltage U_{En}

The rated residual voltage of the relay U_{ECn} is automatically calculated by the relay: $U_{ECn} = \sqrt{3} \cdot U_n$

Example



As per the above example $U_n = 100$ V. The relay will automatically calculate:

$$U_{ECn} = U_n \cdot \sqrt{3} = 100 \cdot \sqrt{3} = 173 \text{ V}$$

If the threshold required is expressed in primary Volts the setting is calculated by the following general formula: $U_{E>>def} = \text{threshold} / (U_{ng} / \sqrt{3})$; e.g. $U_{ng} = 20\,000$ and threshold $59N = 577$ V (primary): $U_{E>>def} = 577 / (20\,000 / \sqrt{3}) = 0.05 U_{ECn}$

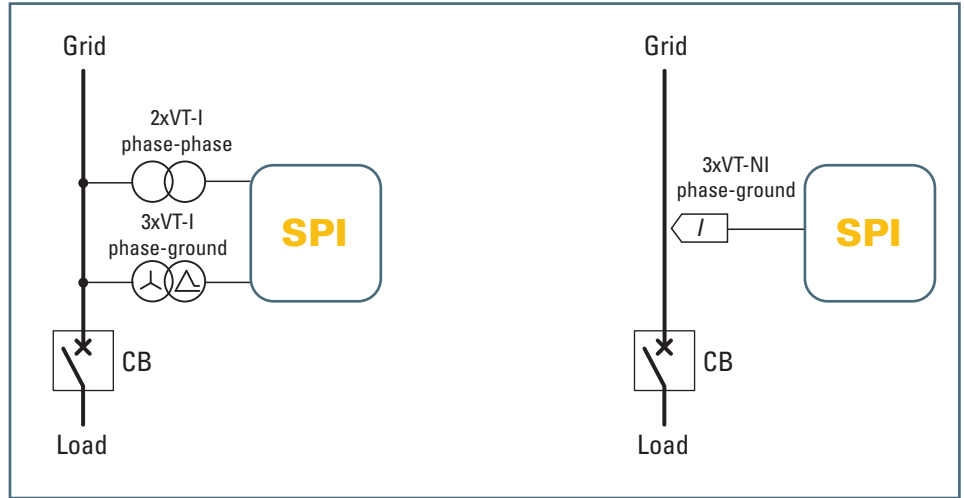
• Measurement reading mode

Measures may be displayed according the following operating modes:

- With *RELATIVE* setting all measures are related to the nominal value,
- With *PRIMARY* setting all measures are related to the primary value.

— Application notes concerning to the Vts positioning

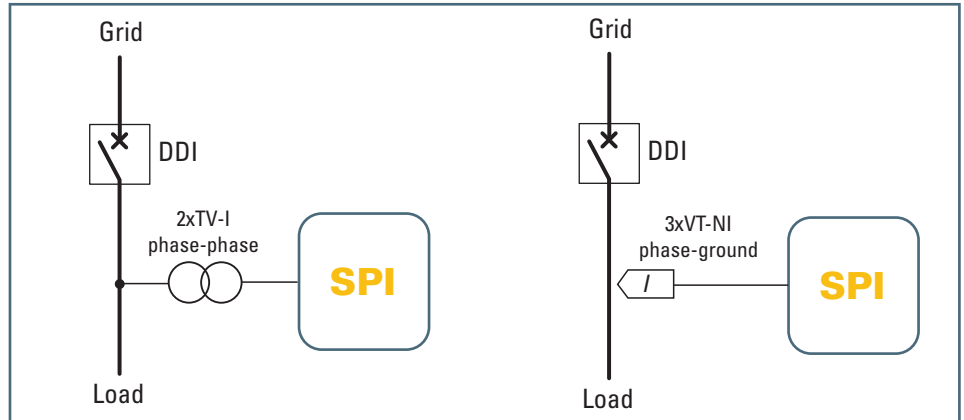
- Both transducers residual as well as voltage and frequency VTs are normally to be installed upstream of the CB.



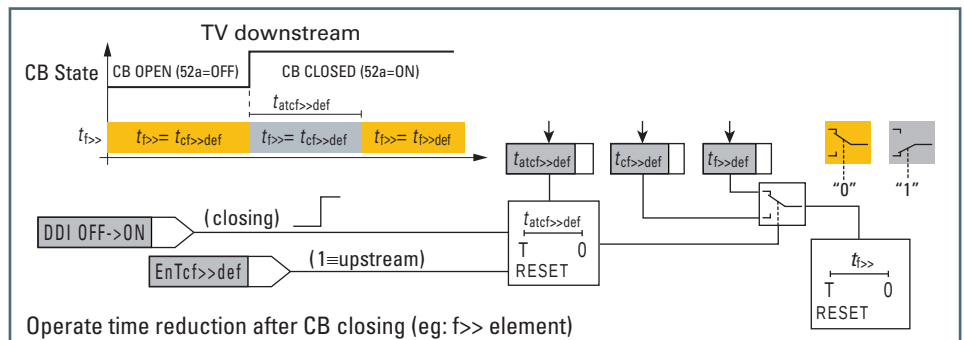
VOLTAGE AND FREQUENCY VTs POSITIONING

Only for static generators, it is permissible to install it downstream of the CB but:

- exclusion of protective elements must be provided when CB is open (to avoid that the CB closing is forbidden) and
- when the CB closes (after removal of the exclusion), the SPI should automatically set the operate time of the $f_{>>}$, $f_{<<}$, $UE_{>>}$ thresholds to a reduced time (while maintaining the response time of the remaining thresholds) for a time of at least 30 s after the closing of the CB.



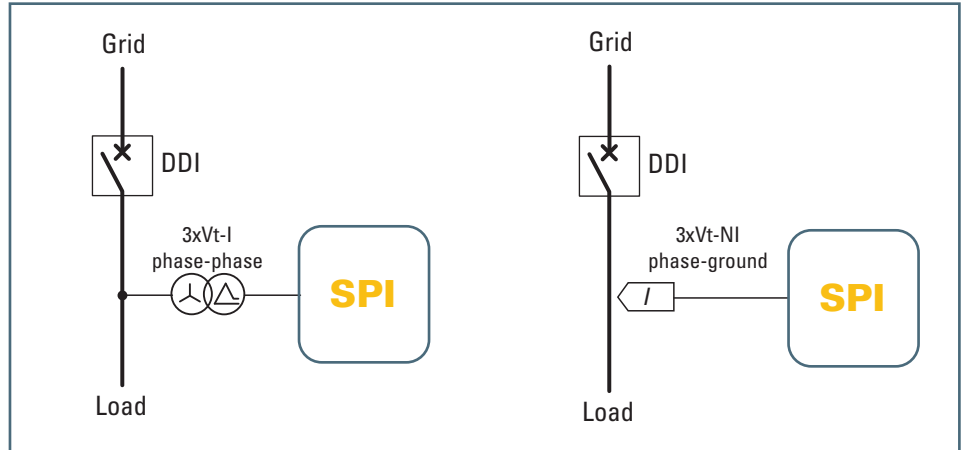
- The element disabling when the circuit breaker is open can be selected by setting ON the $xxdisbyCB_OPEN$ parameters inside the **Set \ Profile A(or B) \ yy \ Setpoints**, menu where **xx** is the element that you want to disable (eg: $f_{>}$) and **yy** is the corresponding function (eg: **Over-frequency-810**).
- When the CB closes, the operate time of the $f_{>>}$, $<< f$, $UE_{>>}$ elements is automatically adjusted to a reduced value $tc_{xx}>>def$ for an adjustable time $t_{atc_{xx}}>>def$. The reduction of the operate time for the second threshold can be selected by setting the $EnTc_{xx}>>def$ parameter inside the **Set \ Profile A(or B) \ yy \ xx>> Element \ Setpoints** menu, while the timers are adjustable inside the **Set \ Profile A(or B) \ yy \ xx>> Element \ Definite time** menu.



RESIDUAL VOLTAGE V_{Ts} POSITIONING

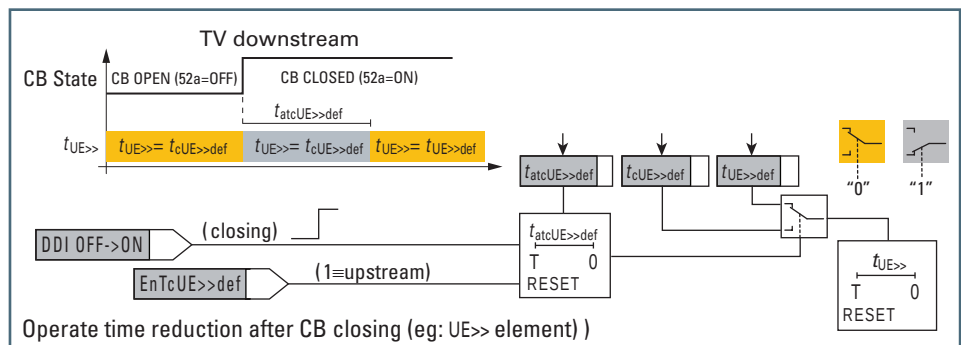
Installation downstream of the DDI is admitted but, to avoid that at reclosing of the DDI a possible single-phase fault to ground is fed until trip of 59N protection (25 s), the two following alternatives are possible:

- only for static generators, the generator must wait for a time of at least 30 s before connecting to the grid;
- for all generators (with the exception of synchronous generators) that the SPI, on the closing command of the DDI, automatically set the operate time $off>>$, $f<<$, $UE>>$ thresholds to 0.20 s for a time of at least 30 s after the closing of the DDI.



A) The element disabling when the circuit breaker is open can be selected by setting *ON* the $xxdisbyCB_OPEN$ parameters inside the **Set\Profile A(or B)\yy\Setpoints**, menu where **xx** is the element that you want to disable (eg: $f>$) and **yy** is the corresponding function (eg: **Residual overvoltage-59N**).

B) When the CB closes, the operate time of the $f>>$, $<<f$, $UE>>$ elements is automatically adjusted to a reduced value $tcxx>>def$ for an adjustable time $tatcxx>>def$. The reduction of the operate time for the second threshold can be selected by setting the $EnTcxx>>def$ parameter inside the **Set\Profile A(or B)\yy\xx>>Element\Setpoints** menu, while the timers are adjustable inside the **Set\Profile A(or B)\yy\xx>>Element\Definite time** menu.



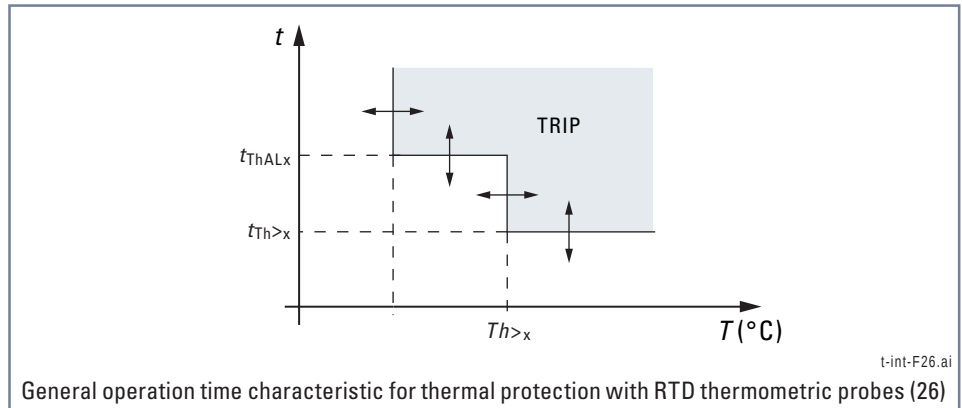
Thermal protection with RTD thermometric probes - 26

Preface

The measure of temperature is acquired by means of Pt100 (RTD Resistive Temperature sensing Devices) probed, connected to the MPT module.^[1]

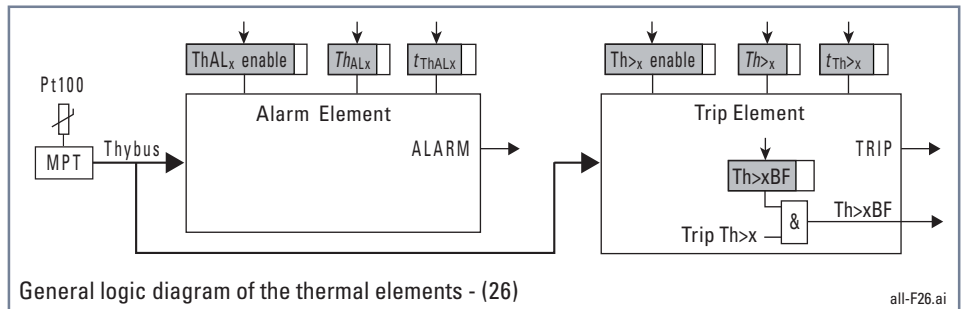
A direct thermal protection element with eight PT100 thermometric probes (RTD Resistive Thermal Device) provides protection against premature ageing or breakdown of the insulating materials through overheating.

Thermal protection using thermometric probes offers greater reliability than Thermal overload-based indirect protection, since it is not influenced by inaccuracies in the time constant for the thermal model of the machinery and by variations in the surrounding temperature.



For each thermometric probe an alarm (Th_{ALx} , where $x=1...8$ points one of the eight probes) and one trip adjustable threshold is provided ($Th_{>x}$), with adjustable operating time (t_{ThALx} and $t_{Th>x}$); if the measured temperature overcomes the threshold, the relative alarm and/or trip is issued when the timer expires.

The adjustments are operable in °C.



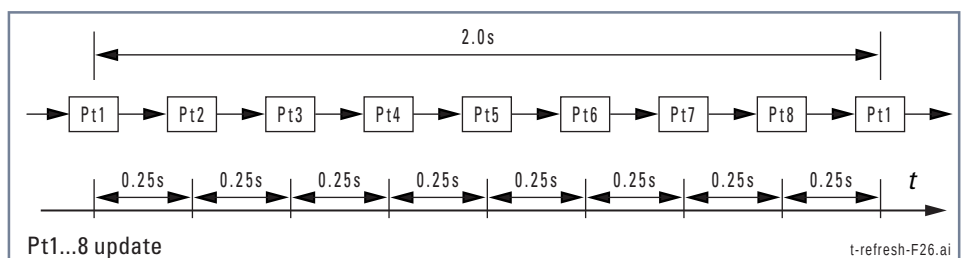
The probes should be placed in strategic points around the machinery susceptible to the greatest overheating, such as for example:

- near the generator stator windings, near the step-up transformer windings and/or in the oil, with the aim of detecting overheating produced by the overload currents,
- near the generator bearings, with the aim of detecting localised overheating due to worn or non-lubricated bearings.

The Pt100 probes detect the temperature in the range -50 °C...+250 °C (at 0 °C its resistance is 100 ohm); an alarm indicates any interruption or short-circuiting of the probe or related connections to the MPT module; the information is available inside the **Read \ PT100** menu:

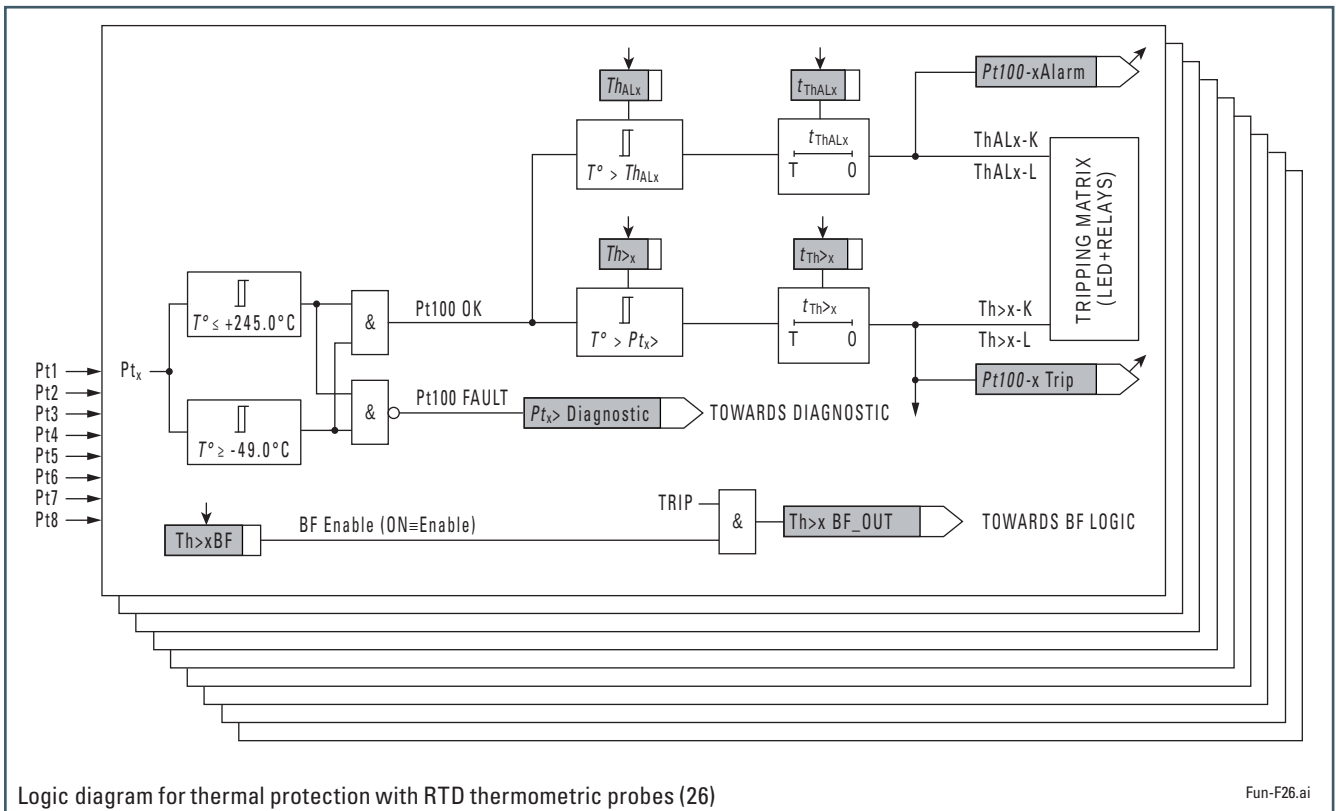
- **Ptx probe ON** to point a measure inside the range
 - **Ptx probe LOW** to point a measure lower the range (short circuit of probe and/or wires)
 - **Ptx probe HIGH** to point a measure higher the range (breaking of probe and/or wires).
- Self reset is performed when faults are cleared.

The measure of each probe is updated at 2 s time intervals.



All alarm and/or trip elements can be enabled or disabled by setting *ON* or *OFF* the *ThALx Enable* e *Th>x Enable* parameters inside the **Set\Profile A(or B)\Thermal protection with RTD thermometric probes - 26\PTx Probe\ThALx Alarm (ThALx Trip)** where $x = 1...8$.

Each trip threshold ($Th>x$) may be associated with the breaker failure (BF) function by setting *ON* the *Th>xBF* parameters inside the **Set\Profile A(or B)\Thermal protection with RTD thermometric probes - 26\PTx Probe\ThALx Trip** where $x = 1...8$.^[1]



Undervoltage - 27

Preface

Two operation thresholds, independently adjustable with adjustable delay.
 The first one may be programmed with definite or inverse time, while the second threshold operates with definite time characteristic.
 Each threshold may be separately enabled or disabled.
 The first threshold trip may be inhibited by start of the second threshold.

Operation and settings

The fundamental frequency of the input voltages (U_{L1} , U_{L2} , U_{L3}) are employed.
 Each of three voltages compared with the setting values ($U_{<}$, $U_{<<}$). The start and trip logic may be selected **OR** or **AND**.
 With **OR** selection, a start is issued when at least one of the three voltages goes down the adjustable threshold (START); with **AND** selection, a start is issued when all the three voltages go down the adjustable threshold.
 After expiry of the associated operate time ($t_{U<}$, $t_{U<<}$) a trip command is issued; if instead the voltages exceed the threshold, the element is restored.
 The first threshold ($U_{<}$) may be programmed with definite or inverse time according the following characteristic curve:

$$t = 0.75 t_{U<inv} / [1 - (U/U_{<inv})]$$

Where:

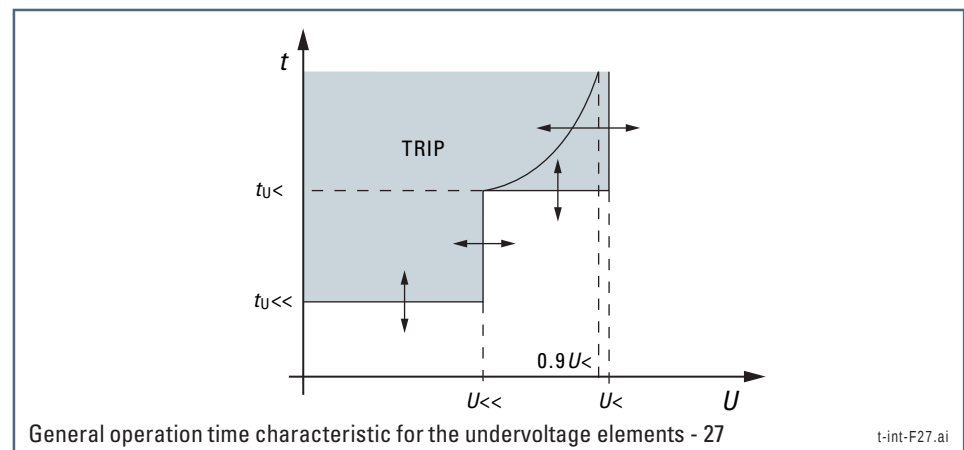
t :	operate time
$U_{<inv}$:	threshold setting
$t_{U<inv}$:	operate time setting

For the inverse time characteristic, following data applies:

- The operate time setting is referred to an input voltage equal to 1/4 of the pickup value.
- Asymptotic reference value (minimum pickup value): $0.9 U_{<}$
- Minimum operate time: 0.1 s
- Range where the equation is valid: $0 \leq U/U_{<inv} \leq 0.9$

The first undervoltage element can be programmed with definite or inverse time characteristic by setting the $U_{<}Curve$ parameter (**DEFINITE**, **INVERSE**) available inside the **Set \ Profile A(or B) \ Undervoltage-27 \ U< Element \ Setpoints** menu.

Each element can be enabled or disabled by setting **ON** or **OFF** the $U_{<} Enable$ parameter inside the **Set \ Profile A(or B) \ Undervoltage-27 \ U< Element \ Setpoints** menu and/or the **State** parameter inside the **Set \ Profile A(or B) \ Undervoltage-27 \ U<< Element \ Definite time**.



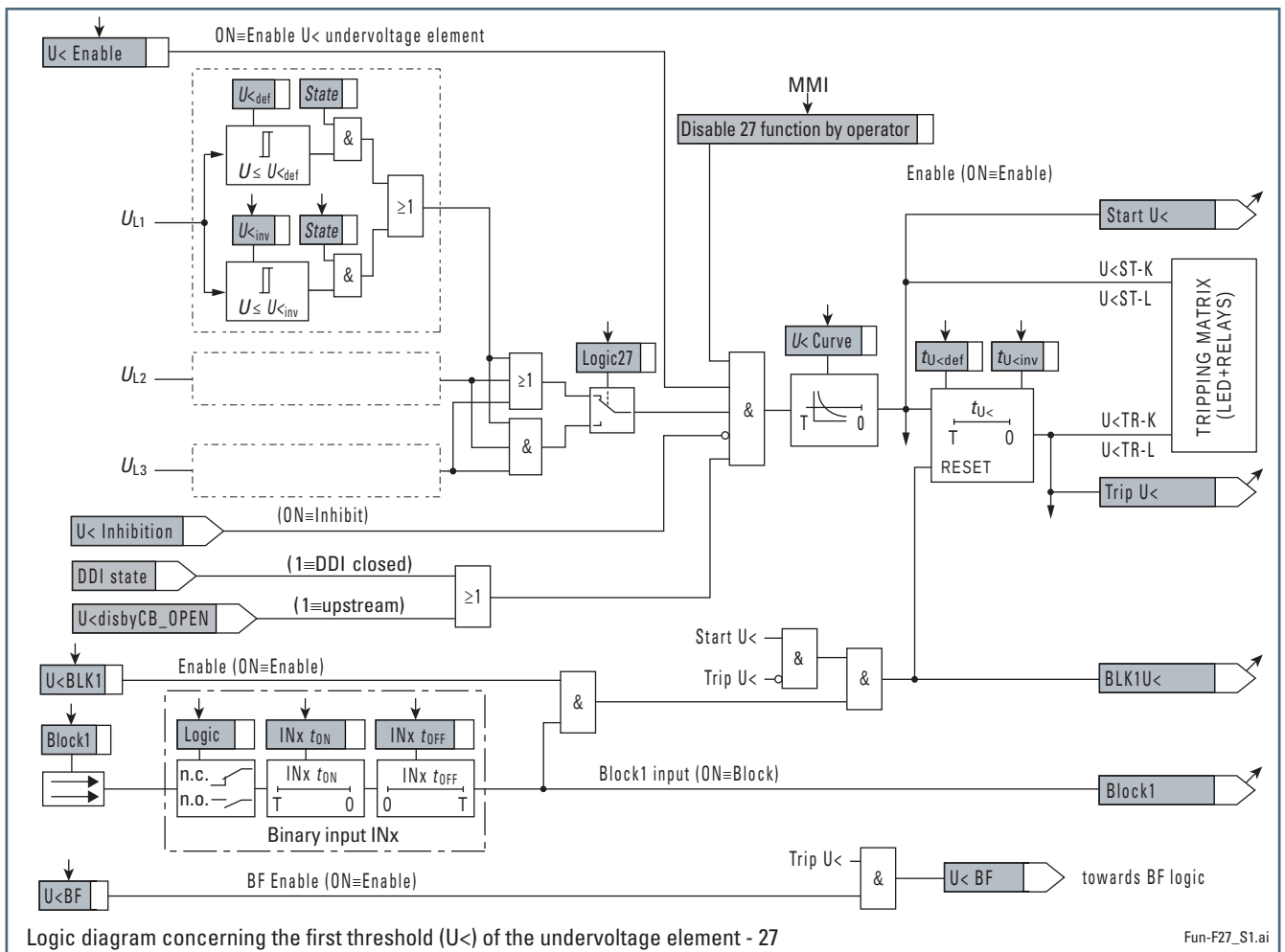
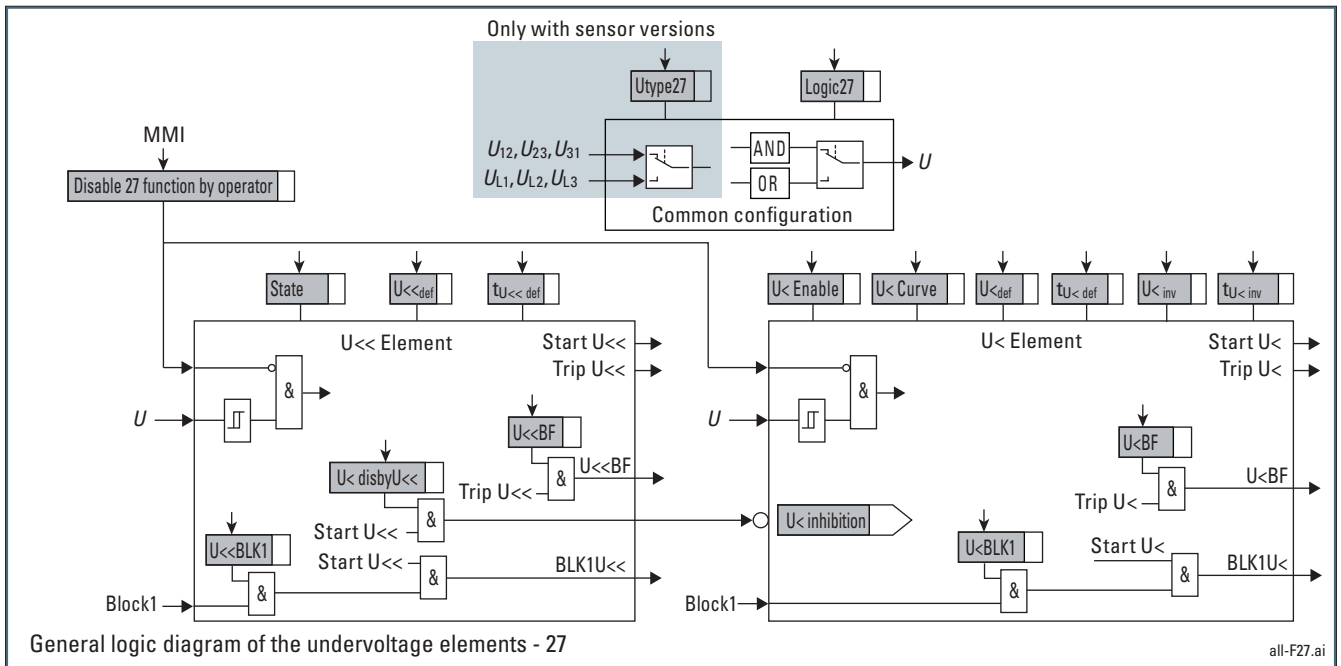
The operating logic (**AND** or **OR**) is adjustable inside the **Set \ Profile A(or B) \ Undervoltage-27 \ Common configuration** menu by means the **Logic27** parameter; the allowed settings are **OR** (at least one voltage lower than threshold) or **And** (all three voltage must be lower than threshold).

The first threshold trip ($U_{<}$) may be inhibited by start of the second threshold ($U_{<<}$) by setting **ON** the $U_{<} Disabling by U_{<<}$ start ($U_{<}disbyU_{<<}$) parameter available inside the **Set \ Profile A(or B) \ Undervoltage-27 \ U<< Element \ Setpoints** menu.

User can disable both 27 protection thresholds from the keyboard. During this command, the trip output relay ($U_{<}$ and / or $U_{<<}$ thresholds) are forced to reset state, the message "27 Disabled" is displayed and all LEDs blink until the end of the command.

The elements can be disabled in the case of connection of the measuring inputs (TV or TV-I-NI) downstream of the Device Interface when the DI is open.

The threshold disabling is selected by setting **ON** the $U_{<}disbyCB_OPEN$, $U_{<<}disbyCB_OPEN$ parameters, inside the **Set \ Profile A(or B) \ Undervoltage-27 \ U< Element (U<< Element) \ Setpoints** menu.

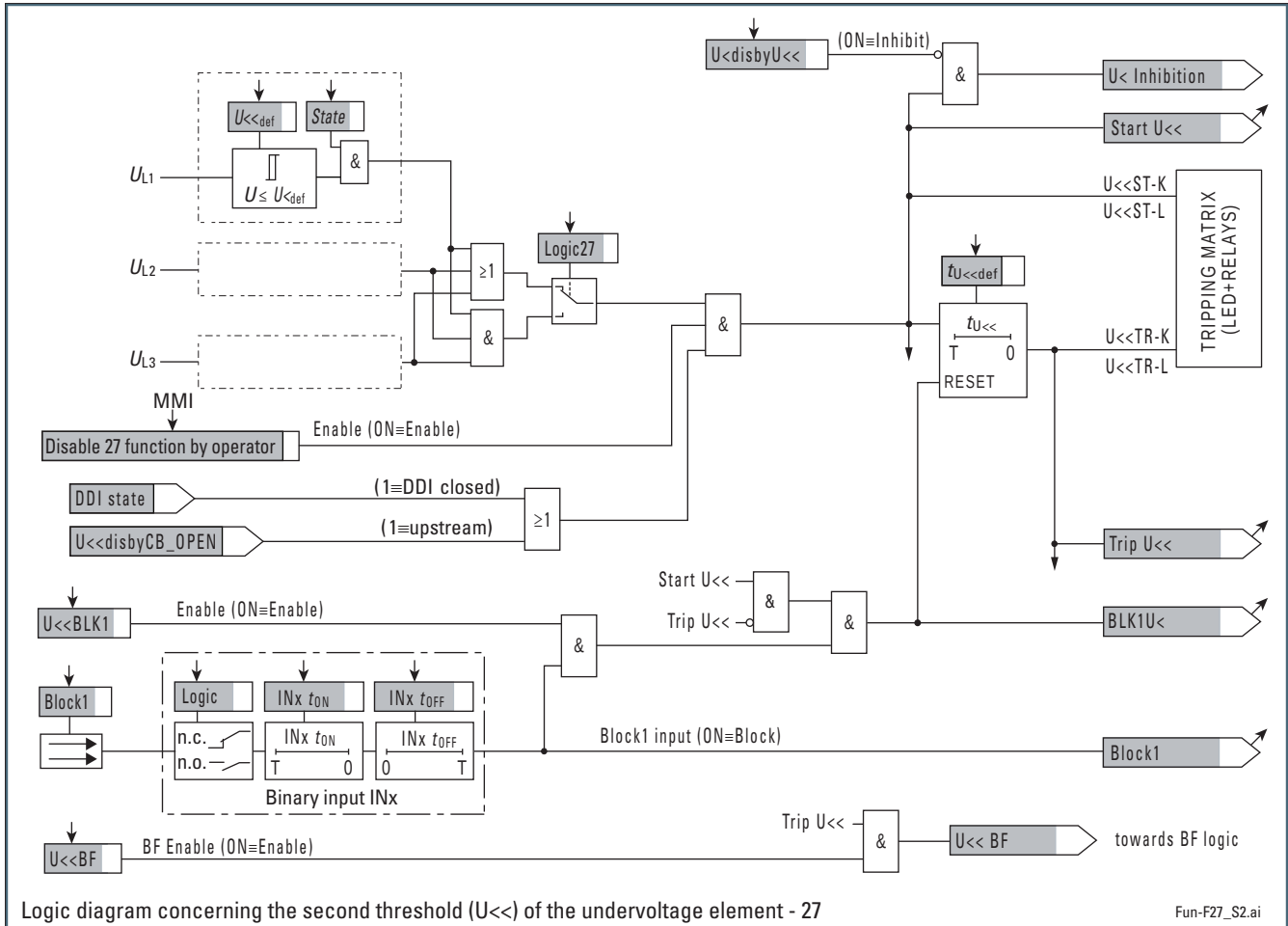


Breaker failure (BF)

All undervoltage elements can produce the Breaker Failure output if the $U < BF$ and $U < < BF$ parameters are set to *ON*. The parameters are available inside the **Set \ Profile A(or B) \ Undervoltage - 27 \ U < Element (U < < Element) \ Setpoints** menus.^[1]

All the named parameters can be set separately for **Profile A** and **Profile B** (**Set \ Profile A(or B) \ Undervoltage - 27 \ U < Element (U < < Element) \ Setpoints** menus).

For every of the two thresholds the logic block can be set.



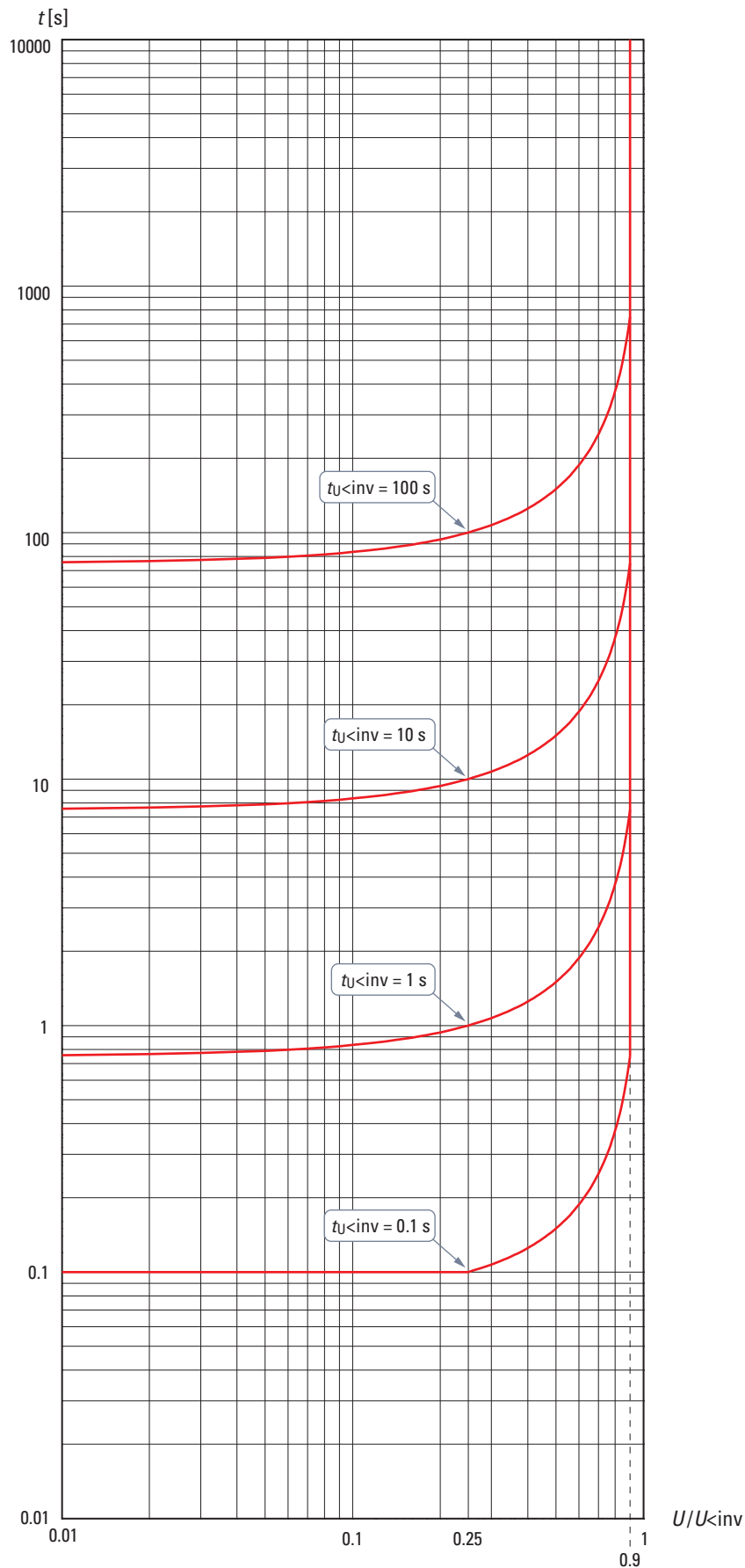
Logical block (Block1)

If the $U < BLK1$ and/or $U < < BLK1$ enabling parameters are set to *ON* and a binary input is designed for logical block (Block1), the protection is blocked off whenever the given input is active.

The trip timer is held in reset condition, so the operate time counting starts when the input block goes down.^[2] The enabling parameters are available inside the **Set \ Profile A(or B) \ Undervoltage - 27 \ U < Element (U < < Element) \ Setpoints** menus, while the *Block1* function must be assigned to the selected binary input inside the **Set \ Inputs \ Binary input IN1(x)** menus (IN1 or INx matching).

Note 1 The common settings concerning the Breaker failure protection are adjustable inside the **Breaker Failure - BF** menu.

Note 2 The exhaustive treatment of the logical block (Block 1) function may be found in the "Logic Block" paragraph inside **CONTROL AND MONITORING** section.



$$t = t_{U<inv} \cdot \left[\frac{0.75}{1 - (U/U_{<inv})} \right]$$

Note: match of operating and setting time takes place when $U/U_{<inv} = 0.25$

Positive sequence undervoltage - 27V1

Preface

The protection has an adjustable threshold and definite time characteristic.

Enabling or disabling is provided by means ThyVisor, the element can be temporarily blocked by keyboard command.

Operation and settings

The positive sequence voltage is calculated as:

$U_1 = (U_{L1} + e^{+j120^\circ} \cdot U_{L2} + e^{-j120^\circ} \cdot U_{L3}) / 3$ where U_{L1} , U_{L2} and U_{L3} are the phase-ground for versions with inputs from electronic sensors, or

$U_1 = (U_{12} + e^{+j120^\circ} \cdot U_{23} + e^{-j120^\circ} \cdot U_{31}) / 3$ where U_{12} , U_{23} e U_{31} are the voltages for versions with inputs from inductive VTs phase-to-phase, or by direct measurement of line voltages and with $e^{+j120^\circ} = -1/2 - j\sqrt{3}/2$, $e^{-j120^\circ} = -1/2 + j\sqrt{3}/2$.

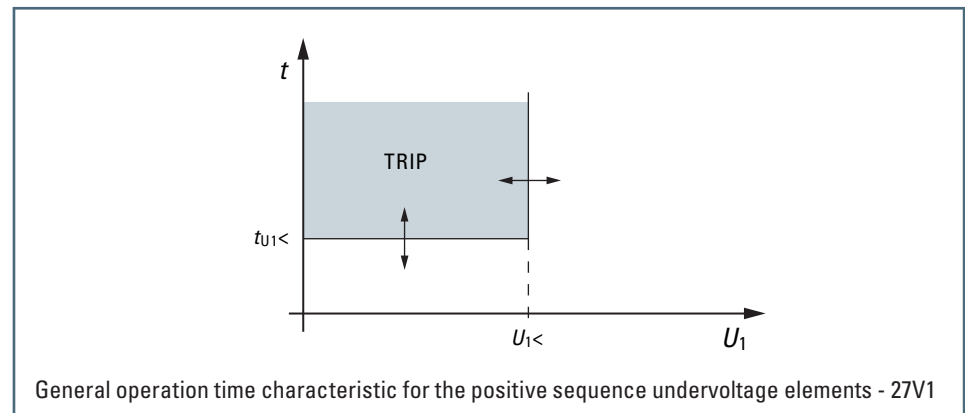
For versions with voltage inputs from phase to earth measurement, the thresholds are expressed in pu E_n , for versions with phase-to-phase inputs from inductive VTs or direct measurement, the thresholds are expressed in pu U_n .

The voltage of the positive sequence is compared with the threshold ($U_1 <_{def}$).

A start is issued when the positive sequence voltage goes below adjustable threshold (START).

After expiry of the associated operate time ($t_{U1<}$) a trip command is issued; if instead the voltages exceed the threshold, the element is restored.

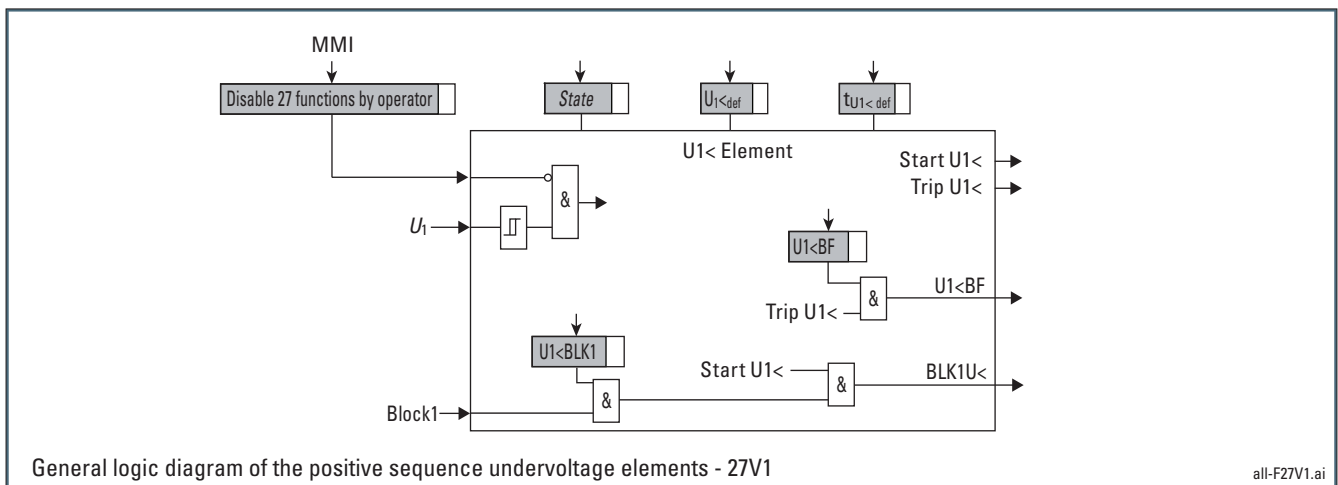
The element can be enabled or disabled by setting **ON** or **OFF** the **State** parameter inside the **Set \ Profile A(or B) \ Positive sequence undervoltage-27V1 \ U1< Element \ Definite time** menu.



The user can disable the 27V1 protection by means of a keyboard command (DISABLE 27 FUNCTION BY OPERATOR). During this command, the output trip relays (manual or automatic reset, normally energized or de-energized) are forced to idle state, the "Disable 27-27V1" message is displayed "and all the LEDs flash until the end of the command.

The element can be disabled in the case of connection of the measuring inputs (TV or TV-I-NI) downstream of the Device Interface when the DI is open.

The threshold disabling is selected by setting **ON** the $U_1 <_{disbyCB_OPEN}$ parameter, inside the **Set \ Profile A(or B) \ Positive sequence undervoltage-27V1 \ U1< Element \ Setpoints** menu.



Breaker failure (BF)

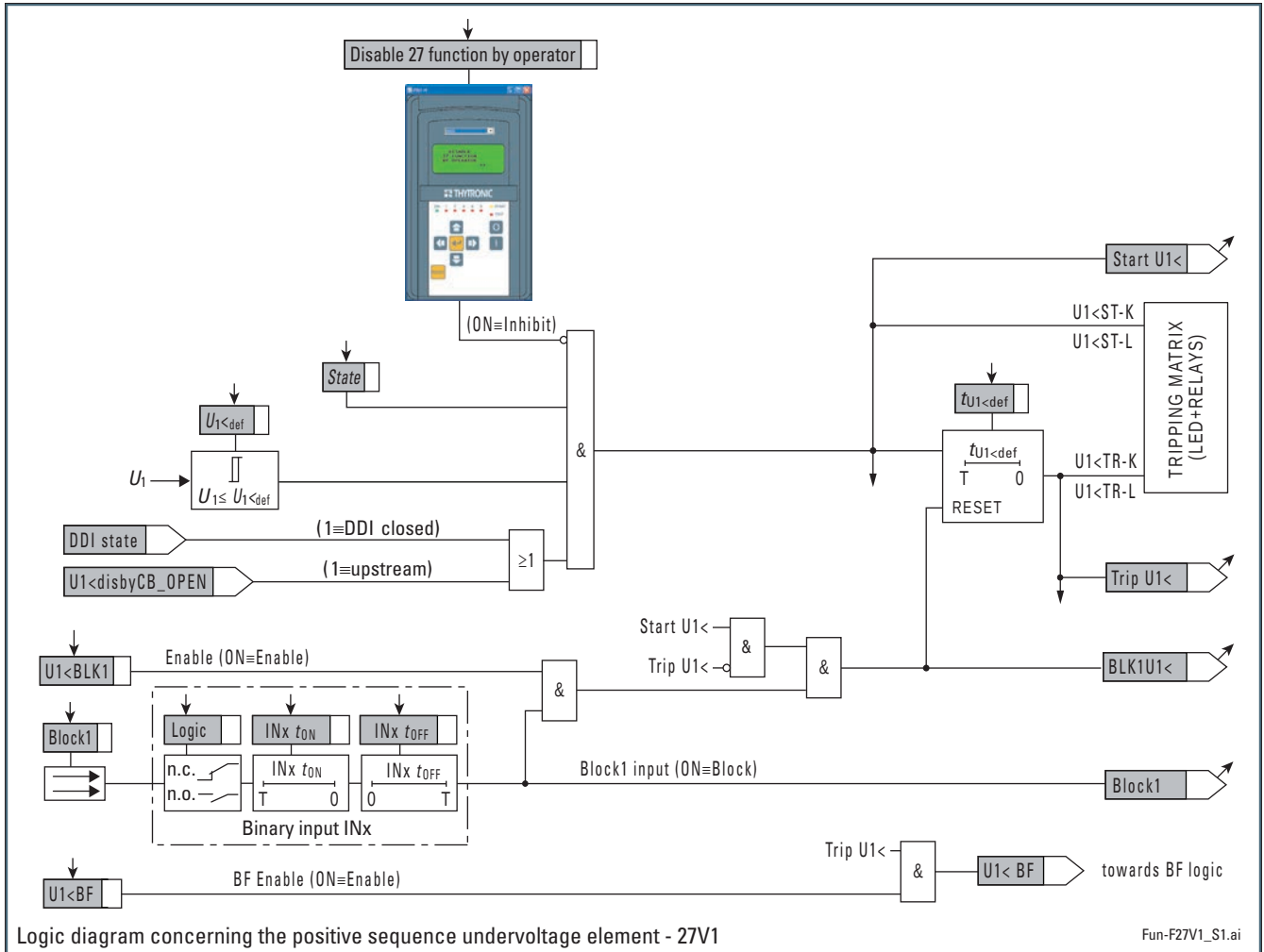
The undervoltage element can produce the Breaker Failure output if the $U_1 < BF$ parameter is set to **ON**. The parameter is available inside the **Set \ Profile A(or B) \ Positive sequence undervoltage - 27V1 \ U1< Element \ Setpoints** menu.^[1]

Note 1 The common settings concerning the Breaker failure protection are adjustable inside the Breaker Failure - BF menu.

Logical block (Block1)

If the $U1 < BLK1$ enabling parameter is set to *ON* and a binary input is designed for logical block (Block1), the protection is blocked off whenever the given input is active.

The trip timer is held in reset condition, so the operate time counting starts when the input block goes down.^[1] The enabling parameter is available inside the **Set \ Profile A(or B) \ Positive sequence undervoltage - 27V1 \ U1 < Element \ Setpoints** menus, while the *Block1* function must be assigned to the selected binary input inside the **Set \ Inputs \ Binary input IN1(x)** menus (IN1 or INx matching). All the named parameters can be set separately for **Profile A** and **Profile B**.



Note 1 The exhaustive treatment of the logical block (Block 1) function may be found in the "Logic Block" paragraph inside CONTROL AND MONITORING section.

Overvoltage - 59

Preface

Two operation thresholds, independently adjustable with adjustable delay .
 The first one may be programmed with definite or inverse time, while the second threshold operates with definite time characteristic.
 Each threshold may be separately enabled or disabled.
 The first threshold trip may be inhibited by start of the second threshold.

Operation and settings

The fundamental frequency of input voltages are utilized.
 Each of three voltages is compared with the setting values ($U>$, $U>>$).
 The start and trip logic may be selected *OR* or *AND*; with *OR* selection, a start is issued when at least one of the three voltages overcomes the adjustable threshold (START); after expiry of the associated operate time ($t_{U>}$, $t_{U>>}$) a trip command is issued; if instead the voltages drop below the threshold, the element is restored.
 With *AND* selection, a start is issued when all the three voltages overcomes the adjustable threshold; after expiry of the associated operate time ($t_{U>}$, $t_{U>>}$) a trip command is issued; if instead the voltage drops below the threshold, the element is restored.

The first threshold ($U>$) may be programmed with definite or inverse time according the following characteristic curve:

$$t = 0.5 t_{U>inv} / [(U/U_{>inv}) - 1]$$

Where:

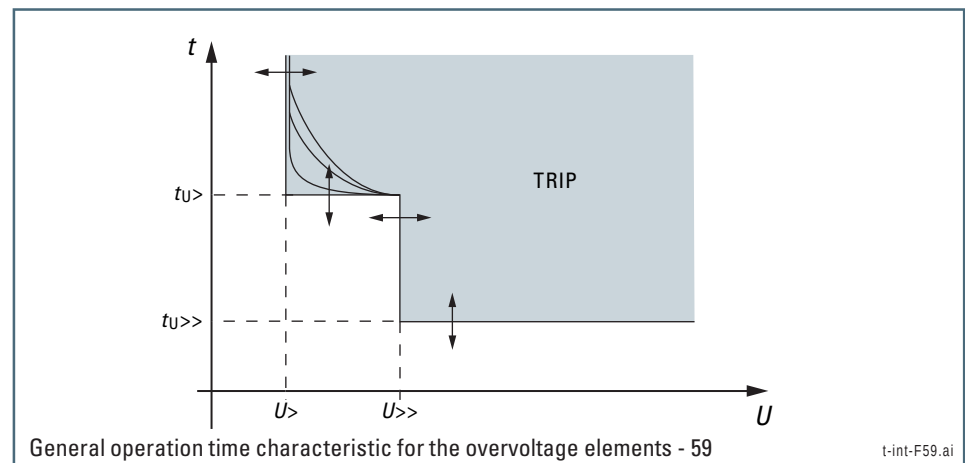
t : operate time
 $U_{>inv}$: threshold setting
 $t_{U>inv}$: operate time setting

For the inverse time characteristic, following data applies:

- The operate time setting is referred to an input voltage equal to 1.5 of the pickup value.
- Asymptotic reference value (minimum pickup value): $1.1 U_{>inv}$
- Minimum operate time: 0.1 s
- Range where the equation is valid: $1.1 \leq U/U_{>inv} \leq 4$
- If $U_{>inv}$ pickup $\geq 0.5 U_n$, the upper limit is $2 U_n$.

The first overvoltage element can be programmed with definite or inverse time characteristic by setting the $U>Curve$ parameter (*DEFINITE*, *INVERSE*) available inside the **Set\Profile A(or B)\Overvoltage-59\U> Element\Setpoints** menu.

Each element can be enabled or disabled by setting *ON* or *OFF* the $U> Enable$ parameter inside the **Set\Profile A(or B)\Overvoltage-59\U> Element\Setpoints** menu and/or the *State* parameter inside the **Set\Profile A(or B)\Overvoltage-59\U>> Element\Definite time**.

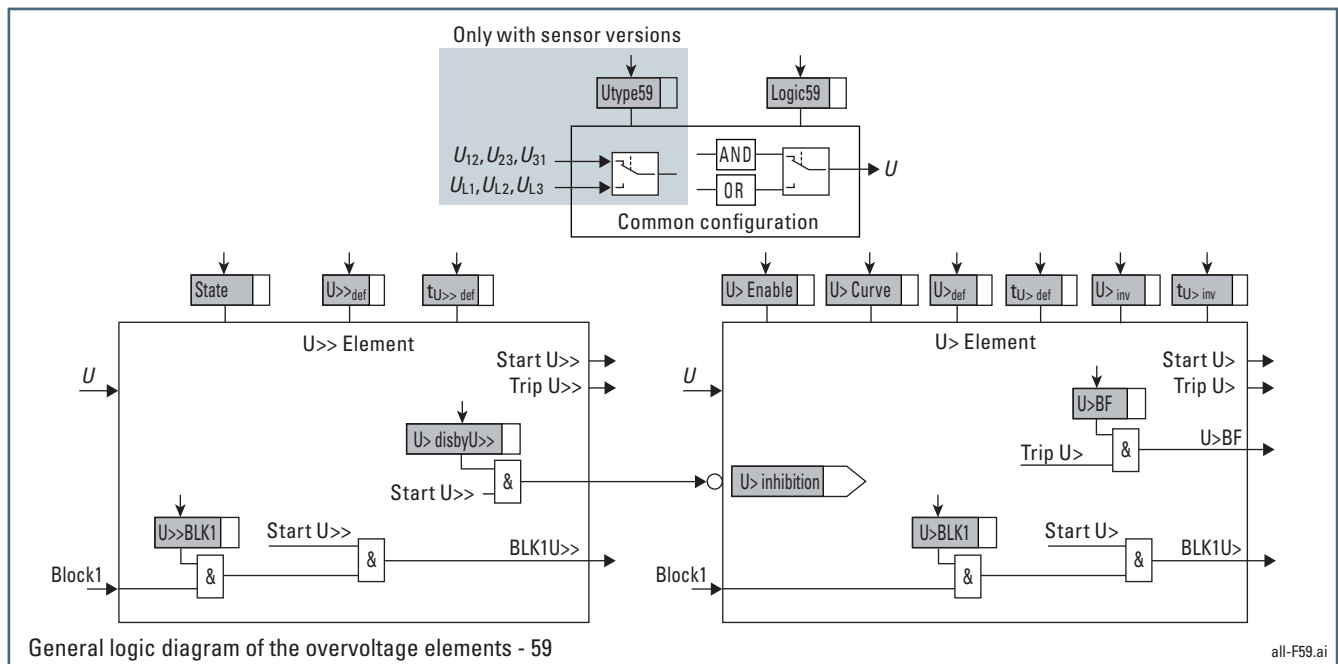


The operating logic (AND or OR) is adjustable inside the **Set\Profile A(or B)\Overvoltage-59\Common configuration** menu by means the *Logic59* parameter; the allowed settings are *OR* (at least one voltage larger than threshold) or *And* (all three voltage must be larger than threshold).

The first threshold trip ($U>$) may be inhibited by start of the second threshold ($U>>$) by setting *ON* the $U>$ Disabling by $U>>$ start ($U>disbyU>>$) parameter available inside the **Set\Profile A(or B)\Overvoltage-59\U>> Element\Setpoints** menu.

The elements can be disabled in the case of connection of the measuring inputs (TV or TV-I-NI) downstream of the Device Interface when the DI is open.

The threshold disabling is selected by setting *ON* the $U>disbyCB_OPEN$, $U>>disbyCB_OPEN$ parameters, inside the **Set\Profile A(or B)\Overvoltage-59\U> Element (U>> Element)\Setpoints** menu.

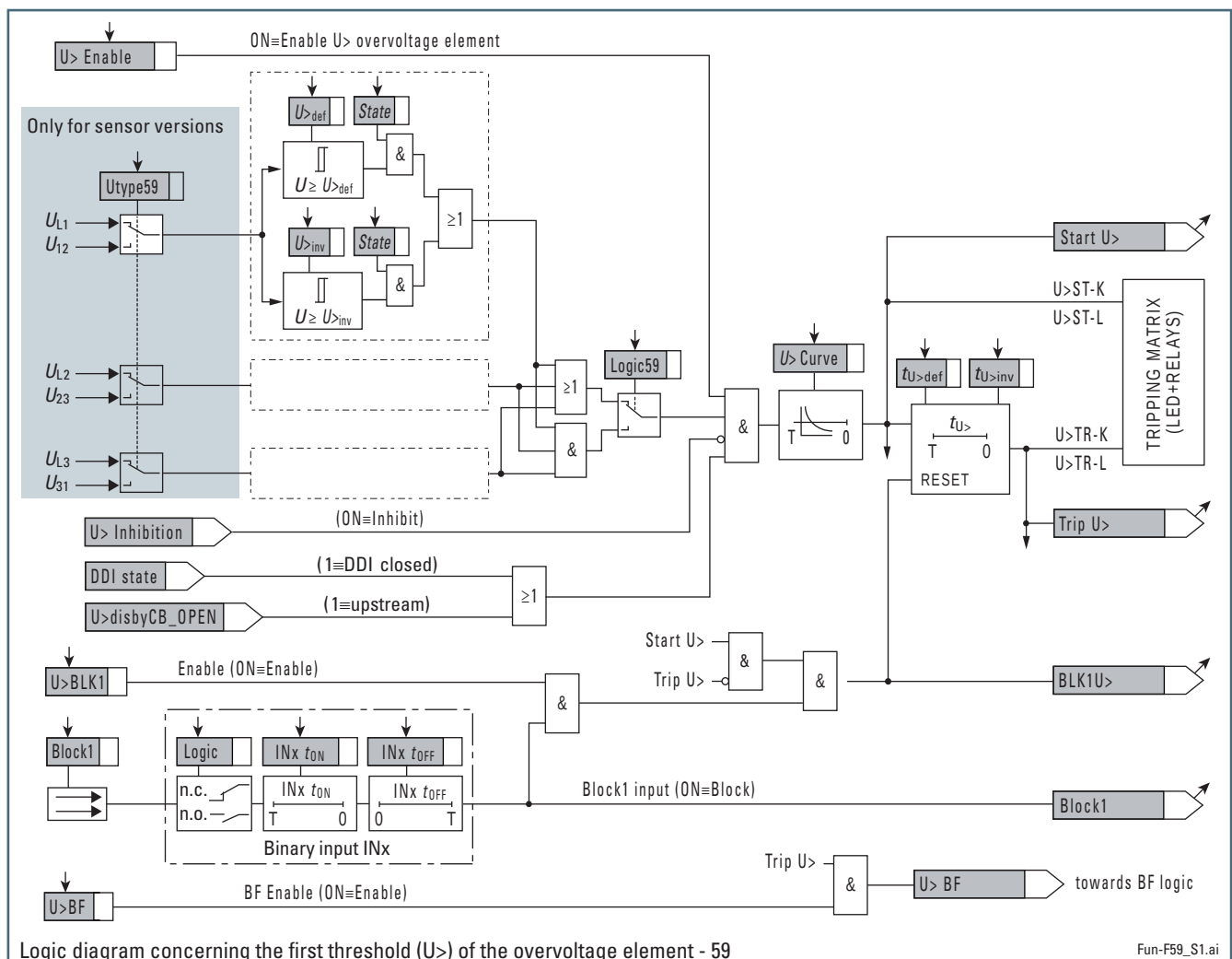


Breaker failure (BF)

Both overvoltage elements can produce the Breaker Failure output if the $U> BF$ and $U>>BF$ parameters are set to ON.

The parameters are available inside the **Set \ Profile A(or B) \ Overvoltage - 59 \ U> Element (U>> Element) \ Setpoints** menus.^[1]

All the parameters can be set separately for **Profile A** and **Profile B** (**Set \ Profile A(or B) \ Overvoltage - 59 \ U> Element (U>> Element) \ Setpoints** menus).

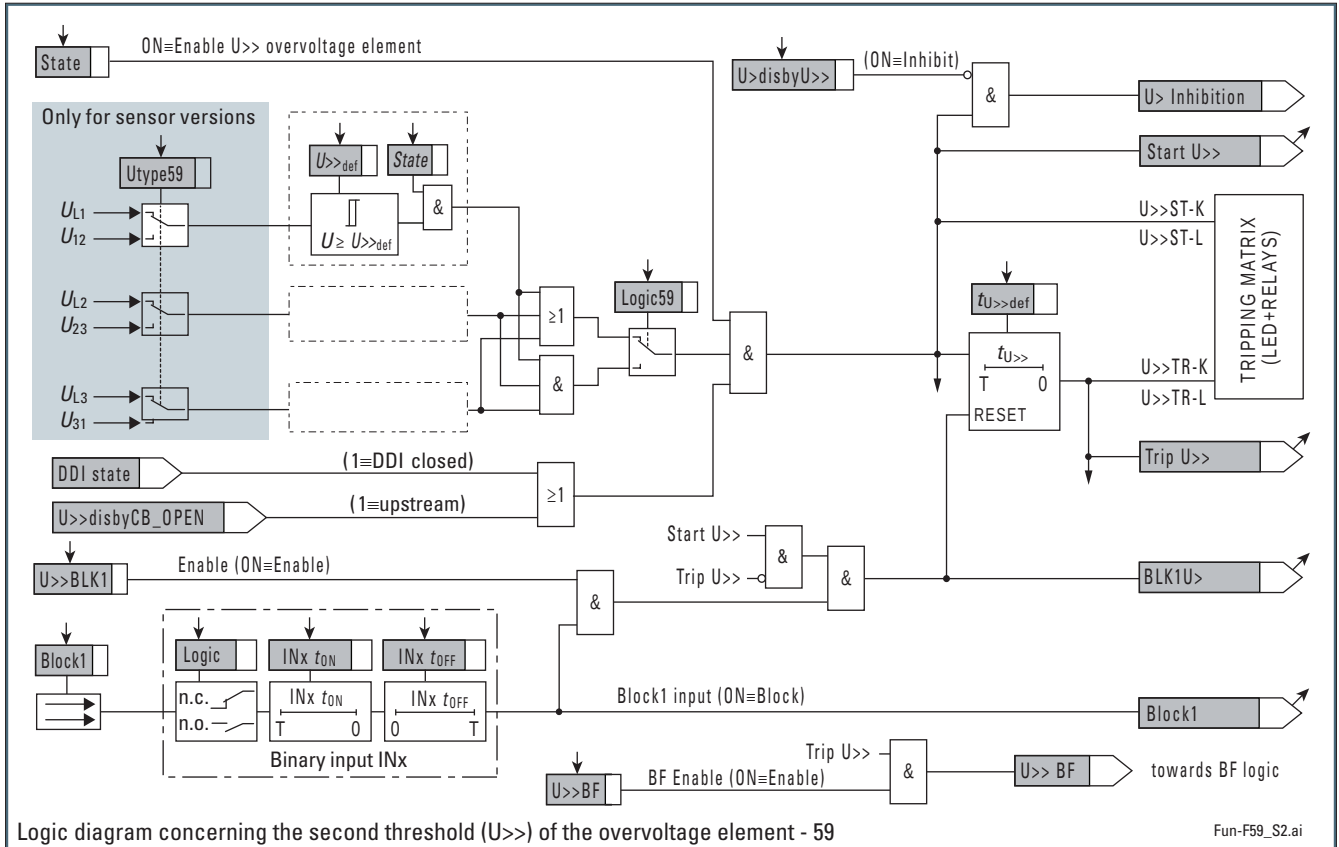


Note 1 The common settings concerning the Breaker failure protection are adjustable inside the **Breaker Failure - BF** menu.

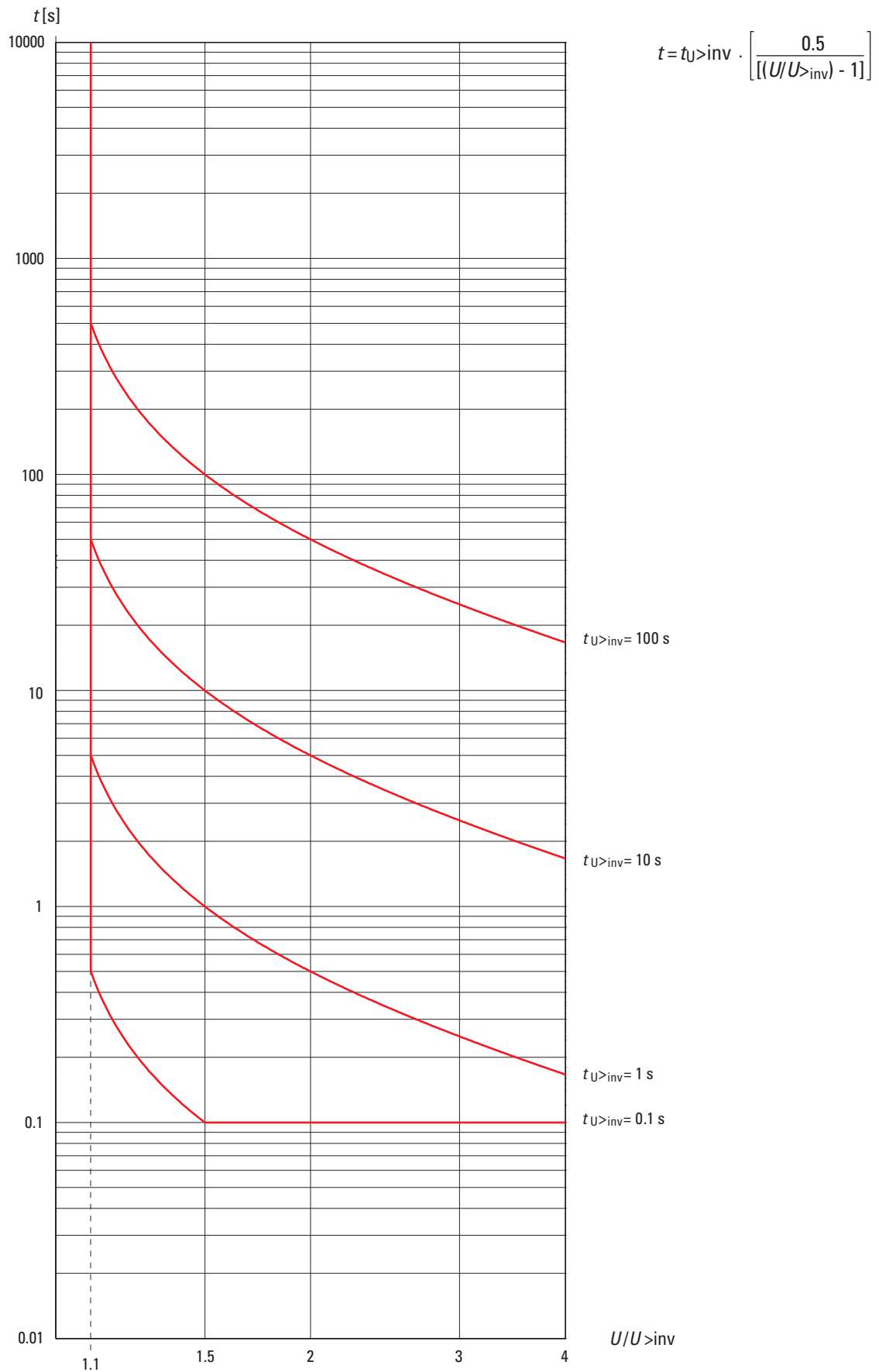
For every of the two thresholds the logic block can be set.

Logical block (Block1)

If the $U > BLK1$ and/or $U >> BLK1$ enabling parameters are set to *ON* and a binary input is designed for logical block (Block1), the protection is blocked off whenever the given input is active. The trip timer is held in reset condition, so the operate time counting starts when the input block goes down.^[1] The enabling parameters are available inside the **Set \ Profile A(or B) \ Overvoltage - 59 \ U > Element (U >> Element) \ Setpoints** menus, while the *Block1* function must be assigned to the selected binary input inside the **Set \ Inputs \ Binary input IN1(x)** menus (IN1 or INx matching).



Note 1 The exhaustive treatment of the logical block (Block 1) function may be found in the "Logic Block" paragraph inside CONTROL AND MONITORING section.



Note: match of operating and setting time takes place when $U/U>_{inv} = 1.5$

Average overvoltage (59avg)

Preface

The protection has an adjustable threshold and definite time characteristic.

Enabling or disabling is provided by means ThyVisor.

For inputs from sensors versions, the type of measurement of line voltages and phase voltages may be select.

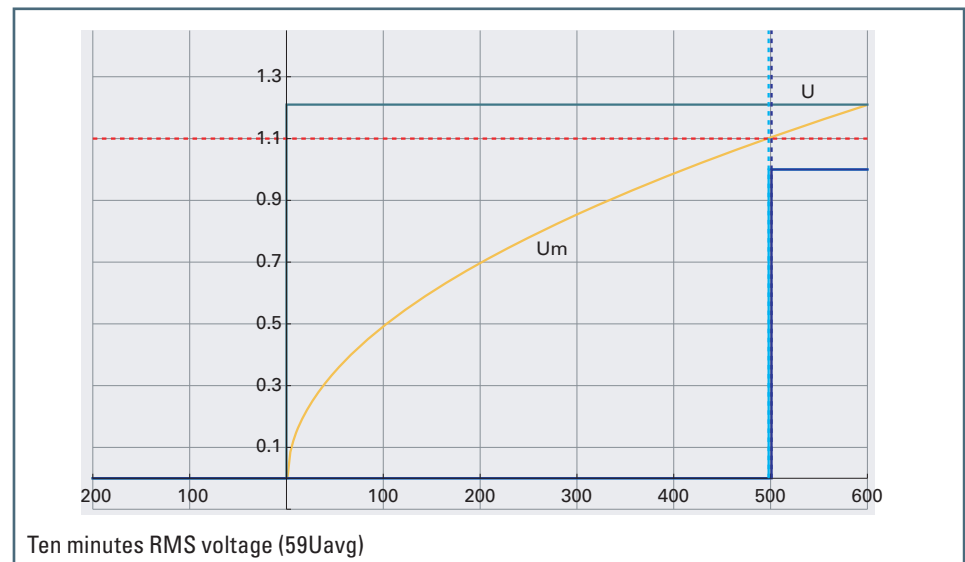
Operation and settings

The fundamental component of the three input voltages is measured and the arithmetic mean of the values of U_{L1} , U_{L2} , U_{L3} phase voltages (versions with inputs from sensors) or U_{12} , U_{23} , U_{31} phase-to-phase voltages (versions with inputs from inductive VTs) is calculated on the values acquired every 0.2 seconds in a time interval of ten minutes with updates every three seconds on a sliding window of 10 minutes (200 values) as indicated below:

- The RMS voltages are acquired every 0.2 seconds;
- Separately for each phase, the acquired values are aggregated to 10 minutes (600 s) performing the square root of the arithmetic mean of the last $600/0,2 = 3000$ values squared. The aggregation of 10 minutes is updated every 3 s.

$$U_m = \sqrt{\frac{1}{3000} \sum_{i=1}^{3000} (U_i)^2}$$

In response to a step change of the input voltage U (with voltage initially already stabilized), the voltage U_m has a transitional trend with square-law as shown in the following figure.

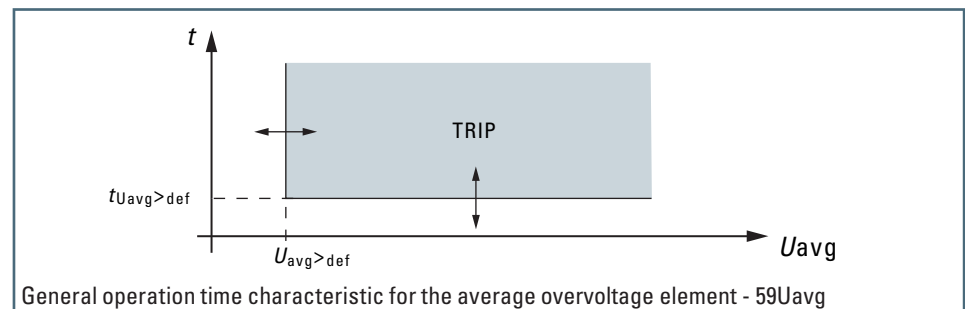


The pickup time depends on reference conditions^[1]

Each of three voltages is compared with the setting values.

The start and trip logic may be selected **OR** or **AND**; with **OR** selection, a start is issued when at least one of the three voltages overcomes the adjustable threshold (START); after expiry of the associated operate time a trip command is issued; if instead the average voltages drops below the threshold, the element it is restored.

With **AND** selection, a start is issued when all the three average voltages overcomes the adjustable threshold; after expiry of the associated operate time a trip command is issued; if instead the average voltages drops below the threshold, the element it is restored.



The operating logic (AND or OR) is adjustable inside the **Set \ Profile A(or B) \ Average overvoltage-59Uavg \ Common configuration** menu by means the *Logic59Uavg* parameter; the allowed settings are **OR** (at least one voltage larger than threshold) or **And** (all three voltage must be larger than threshold).

Note 1 The pickup time depends on the initial and final value of the input voltage; e.g. with a setting of threshold equal to 1.10 Un:

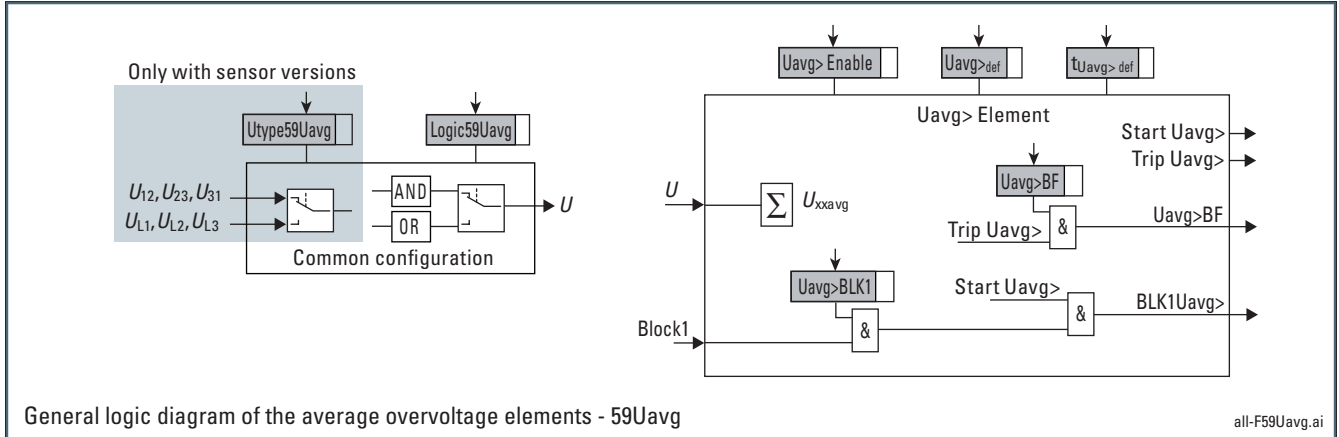
- with initial value 0 and final value 1.1 Uavg > def (1.1x1.1 = 1.21 Un) the pickup time is 498 s

- with initial value 0.9 Uavg > def (0.9x1.1 = 0.99 Un) and final value 1.1 Uavg > def (1.1x1.1 = 1.21 Un) the pickup time is 285 s

With inputs from sensors versions, the type of measurement of line-to-line voltages and phase voltages may be select: the *Utype59Uavg* parameter in the **Set \ Profile A(or B) \ Average overvoltage-59Uavg \ Common configurations** menu may be set. The possible settings are *Uph-ph* (voltages) or *Uph-n* (phase voltages).

The element can be disabled in the case of connection of the measuring inputs (TV or TV-I-NI) downstream of the Device Interface when the DI is open.

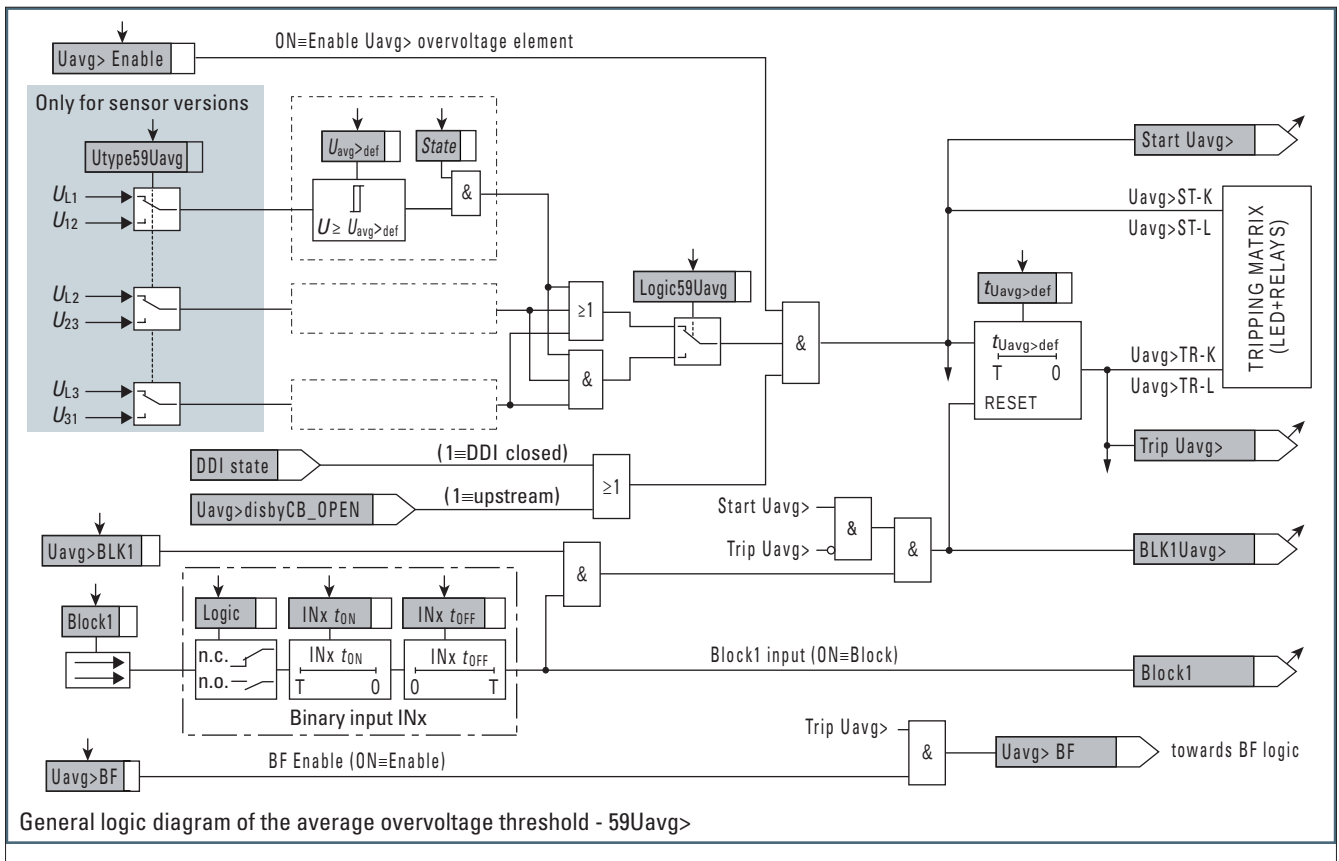
The threshold disabling is selected by setting **ON** the *Uavg>disbyCB_OPEN* parameter, inside the **Set \ Profile A(or B) \ Average overvoltage-59Uavg \ Uavg> Element \ Setpoints** menu.



Breaker failure (BF)

The average overvoltage element can produce the Breaker Failure output if the *Uavg> BF* parameter is set to **ON**.

The parameter is available inside the **Set \ Profile A(or B) \ Average overvoltage - 59Uavg \ Uavg> Element \ Setpoints** menus.



Logical block (Block1)

If the *Uavg>BLK1* enabling parameter is set to **ON** and a binary input is designed for logical block (Block1), the protection is blocked off whenever the given input is active.

The trip timer is held in reset condition, so the operate time counting starts when the input block goes down. The enabling parameters are available inside the **Set \ Profile A(or B) \ Average overvoltage - 59Uavg \ Uavg> Element \ Setpoints** menus, while the *Block1* function must be assigned to the selected binary input inside the **Set \ Inputs \ Binary input IN1(x)** menus (IN1 or INx matching).

All the parameters can be set separately for **Profile A** and **Profile B**.

Residual overvoltage - 59N

Preface

Two operation thresholds, independently adjustable ($U_{E>}$, $U_{E>>}$) with adjustable delay ($t_{UE>}$, $t_{UE>>}$). The fundamental component of the residual voltage is computed, therefore the element is insensitive to the third harmonic components.

The first threshold ($U_{E>}$) can be programmed with definite or inverse time, while the second threshold operates with definite time characteristic.

Each threshold may be separately enabled or disabled.

The first threshold trip ($U_{E>}$) may be inhibited by start of the second threshold ($U_{E>>}$).

Operation and settings

With VTs input version two measuring criteria of the residual voltage are provided:

- Direct
- Calculated.

while for versions with inputs from sensors the residual voltage is always calculated.

For direct measure the fundamental component of the residual voltage input is used (U_E), whereas, for calculated measure (U_{EC}) the residual voltage comes from a vector sum of three phase voltage phasors.

$$U_{EC} = |\vec{U}_{L1} + \vec{U}_{L2} + \vec{U}_{L3}|$$

The residual voltage (U_E or U_{EC}) is compared with the setting values ($U_{E>}$, $U_{E>>}$); a start is issued when the residual voltage overcomes the adjustable threshold (START); after expiry of the associated operate time ($t_{UE>}$, $t_{UE>>}$) a trip command is issued; if instead the voltage drops below the threshold, the element is restored.

The first threshold ($U_{E>}$) may be programmed with definite or inverse time according the following characteristic curve:

$$t = 0.5 t_{UE>inv} / [(U_E / U_{E>inv}) - 1] \text{ or}$$

$$t = 0.5 t_{UE>inv} / [(U_{EC} / U_{E>inv}) - 1]$$

Where:

U_E :	measured residual voltage
U_{EC} :	calculated residual voltage
t :	operate time
$U_{E>inv}$:	pickup value
$t_{UE>inv}$:	operate time setting

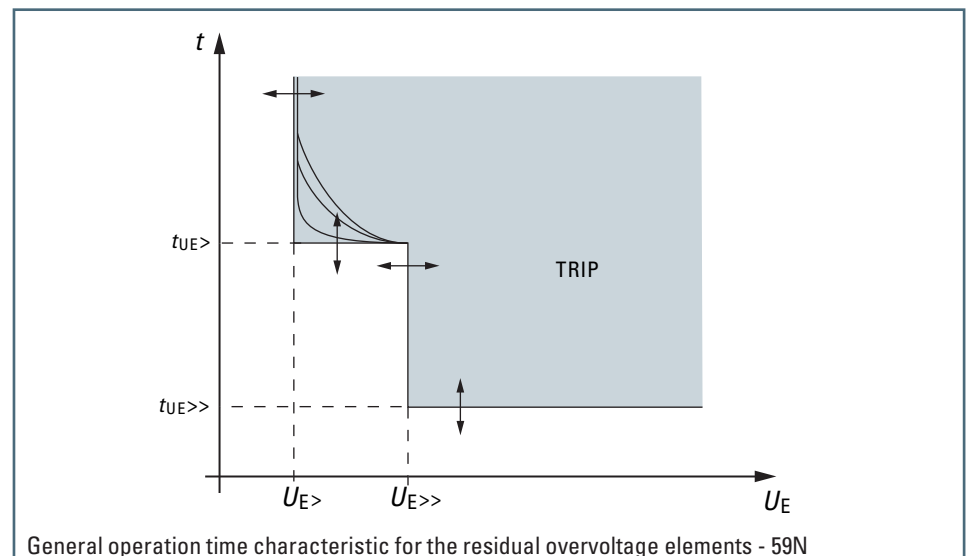
For the inverse time characteristic, following data applies:

- The operate time setting is referred to an input voltage equal to 1.5 of the pickup value.
- Asymptotic reference value (minimum pickup value): $1.1 U_{E>inv}$
- Minimum operate time: 0.1 s
- Range where the equation is valid: $1.1 \leq U_E / U_{E>inv}$ ($U_{EC} / U_{E>inv}$) ≤ 4
- If $U_{E>inv}$ pickup $\geq 0.5 U_{En}$, the upper limit is $2 U_{En}$.

The first residual overvoltage element can be programmed with definite or inverse time characteristic by setting the $UE>$ Curve parameter (*DEFINITE*, *INVERSE*) available inside the **Set\Profile A(or B)\Residual overvoltage-59N\UE> Element\Setpoints** menu.

For definite time characteristic the upper limit is $2 U_{En}$.

Each element can be enabled or disabled by setting *ON* or *OFF* the $UE>$ Enable parameter inside the **Set\Profile A(or B)\Residual overvoltage-59N\UE> Element\Setpoints** menu and/or the *State* parameter inside the **Set\Profile A(or B)\Residual overvoltage-59N\UE>> Element\Definite time**.



Selection of the measuring criteria of the residual voltage (direct measure or calculated measure) is available inside the **Set\Profile A(or B)\Residual overvoltage-59N\Common configuration** menu; The *3Votype59N* parameter may be select as *UE* (direct measure) or *UEC* (calculated measure).

With UE setting (direct voltage measurement), the thresholds are in p.u. U_{En} , with UEC setting (calculated voltage measurement), the thresholds are in p.u. U_{ECn} .

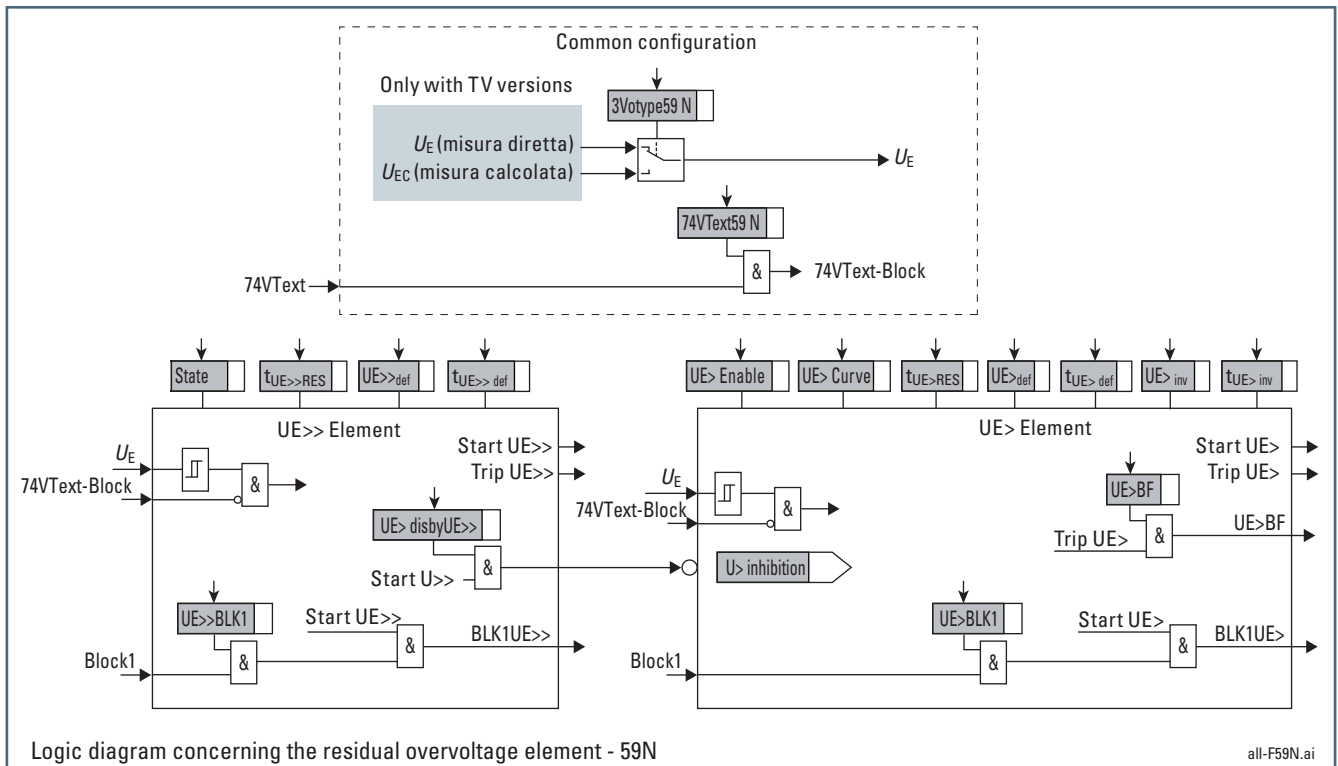
For both measuring criteria, a block of the $UE>$ and $UE>>$ threshold may be select when the 74VT function is active (external by binary input). The blocking enabling parameter 74VText59N is available inside the **Set \ Profile A(or B) \ Residual overvoltage-59N \ Common configuration** menu.^[1]

The first threshold trip ($UE>$) may be inhibited by start of the second threshold ($UE>>$) by setting **ON** the $UE>$ Disabling by $UE>>$ start ($UE>disbyUE>>$) parameter available inside the **Set \ Profile A(or B) \ Residual overvoltage-59N \ $UE>>$ Element \ Setpoints** menu.

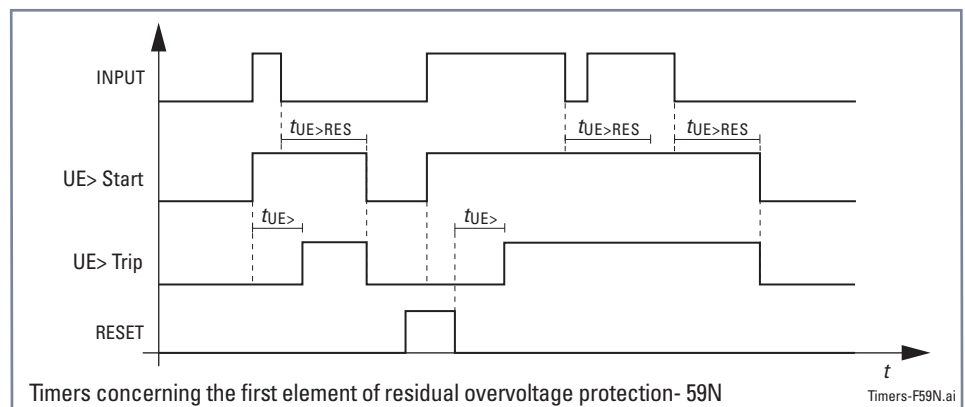
The elements can be disabled in the case of connection of the measuring inputs (TV or TV-I-NI) downstream of the Device Interface when the DI is open.

The threshold disabling is selected by setting **ON** the $UE>disbyCB_OPEN$, $UE>>disbyCB_OPEN$ parameters, inside the **Set \ Profile A(or B) \ Residual overvoltage-59N \ $UE>$ Element ($UE>>$ Element) \ Setpoints** menu.

When the CB closes, the operate time of the $UE>>$ element is automatically adjusted to a reduced value $t_{cUE>>def}$ for an adjustable time $t_{atcUE>>def}$. The reduction of the operate time for the second threshold can be selected by setting the $EnT_{cUE>>def}$ parameter inside the **Set \ Profile A(or B) \ Residual overvoltage-59N \ $UE>>$ Element \ Setpoints** menu, while the timers are adjustable inside the **Set \ Profile A(or B) \ Residual overvoltage-59N \ $UE>>$ Element \ Definite time** menu.



An adjustable reset time delay is provided for every threshold $t_{UE>RES}$, $t_{UE>>RES}$.



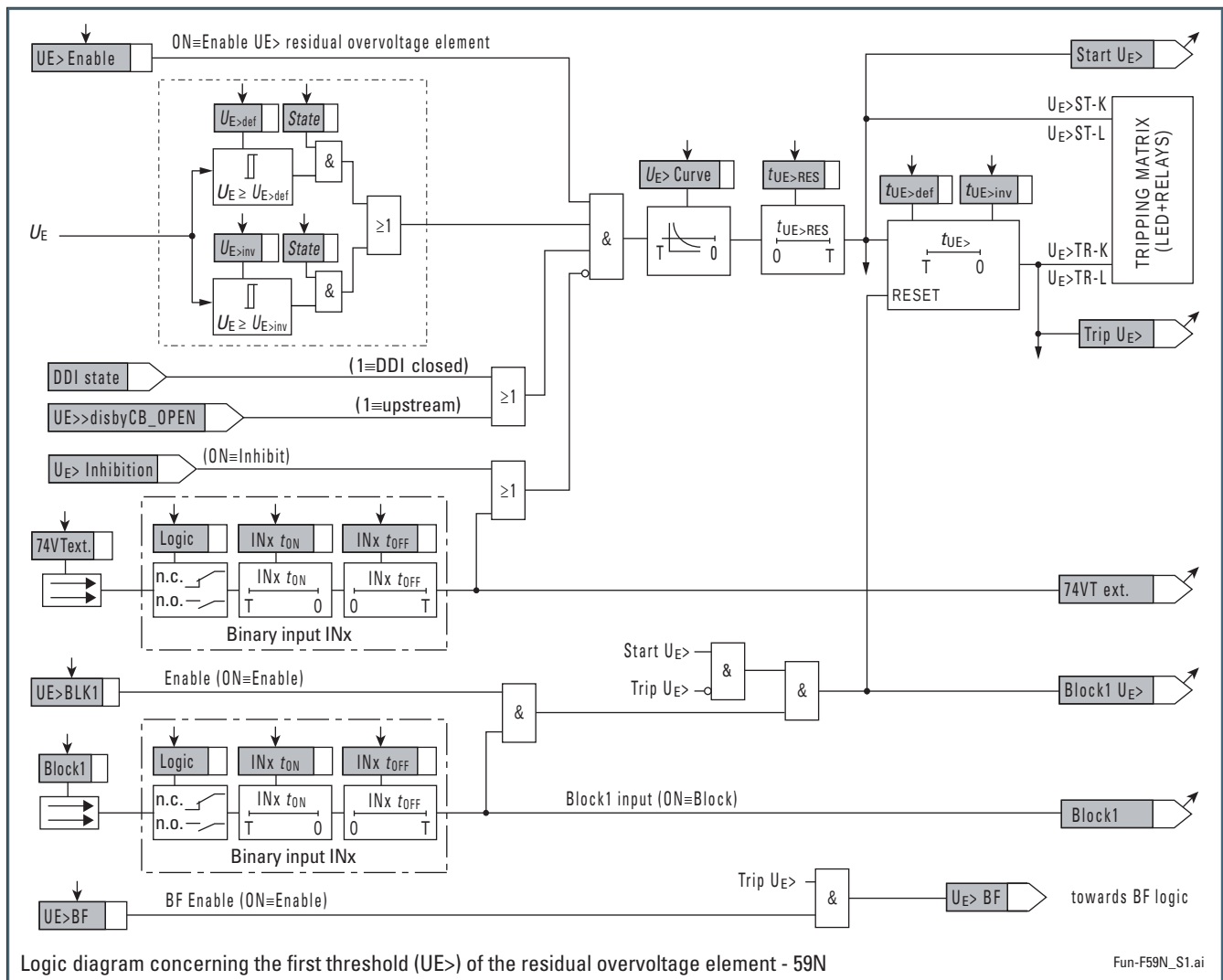
Breaker failure (BF)

Both residual overvoltage elements ($UE>$, $UE>>$) can produce the Breaker Failure output if the $UE>BF$ and $UE>>BF$ parameters are set to **ON**.

The parameters are available inside the **Set \ Profile A(or B) \ Residual overvoltage - 59N \ $UE>$ Element ($UE>>$ Element) \ Setpoints** menus.^[2]

Note 1 The operating time must be adjusted to a greater value than the 74VT activation time (internal or binary input)

Note 2 The common settings concerning the Breaker failure protection are adjustable inside the **Breaker Failure - BF** menu.



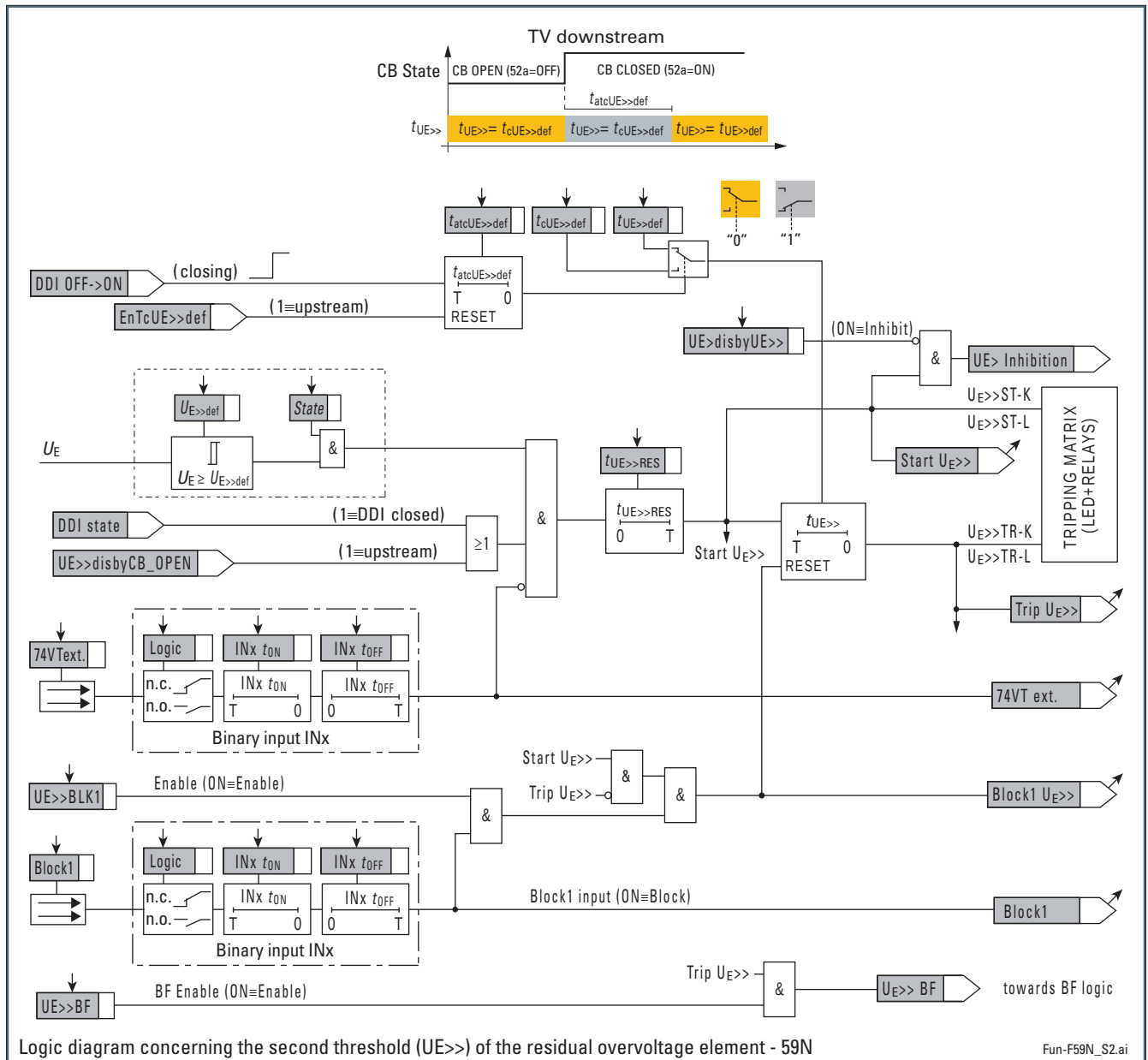
For every of the two thresholds the logic block can be set.

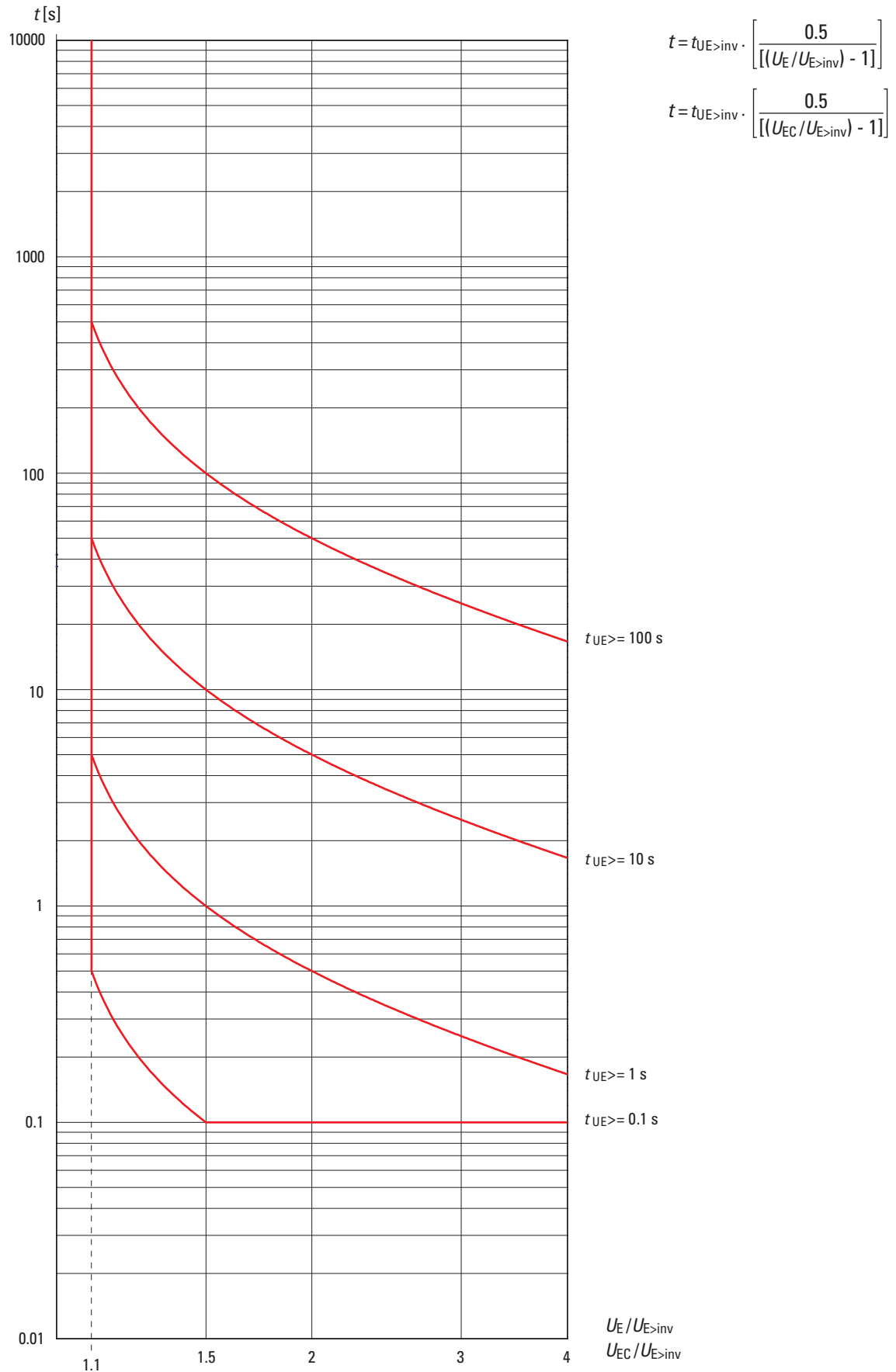
Logical block (Block1)

If the **UE>BLK1** and/or **UE>>BLK1** enabling parameters are set to **ON** and a binary input is designed for logical block (Block1), the protection is blocked off whenever the given input is active. The trip timer is held in reset condition, so the operate time counting starts when the input block goes down.^[1] The enabling parameters are available inside the **Set\Profile A(or B)\Residual overvoltage - 59N\UE> Element (UE>> Element)\Setpoints** menus, while the **Block1** function must be assigned to the selected binary input inside the **Set\Inputs\Binary input IN1(2)** menus (IN1 or IN2 matching).

All the named parameters can be set separately for **Profile A** and **Profile B**).

Note 1 The exhaustive treatment of the logical block (Block 1) function may be found in the "Logic Block" paragraph inside CONTROL AND MONITORING section.





Note: match of operating and setting time takes place when $U_E/U_{E>inv} = 1.5$ or $U_{EC}/U_{E>inv} = 1.5$

Inverse time operating characteristic concerning the first threshold (UE>) of the residual overvoltage element - 59N

F_59N-Char.ai

Negative sequence overvoltage - 59V2

Preface

The protection has an adjustable threshold and definite time characteristic. Enabling or disabling is provided by means ThyVisor.

Operation and settings

The negative sequence voltage is calculated as:

$U_2 = (U_{L1} + e^{-j120^\circ} \cdot U_{L2} + e^{+j120^\circ} \cdot U_{L3}) / 3$ where U_{L1} , U_{L2} and U_{L3} are the phase-ground for versions with inputs from electronic sensors, or

$U_2 = (U_{12} + e^{-j120^\circ} \cdot U_{23} + e^{+j120^\circ} \cdot U_{31}) / 3$ where U_{12} , U_{23} e U_{31} are the voltages for versions with inputs from inductive VTs phase-to-phase, or by direct measurement of line voltages and with $e^{-j120^\circ} = -1/2 - j\sqrt{3}/2$, $e^{+j120^\circ} = -1/2 + j\sqrt{3}/2$.

For versions with voltage inputs from phase to earth measurement, the thresholds are expressed in pu E_n , for versions with phase-to-phase inputs from inductive VTs or direct measurement, the thresholds are expressed in pu U_n .

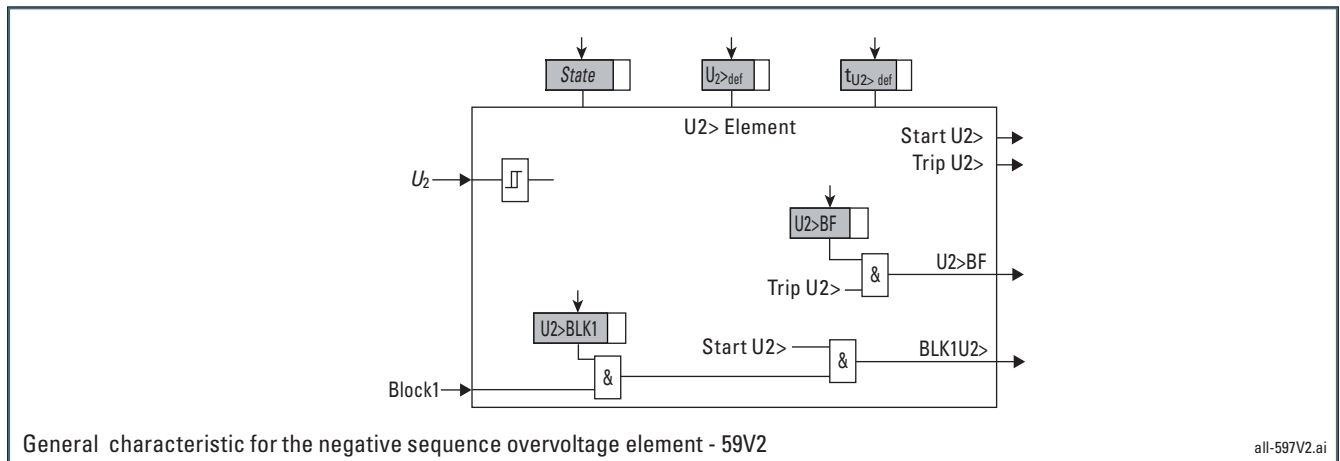
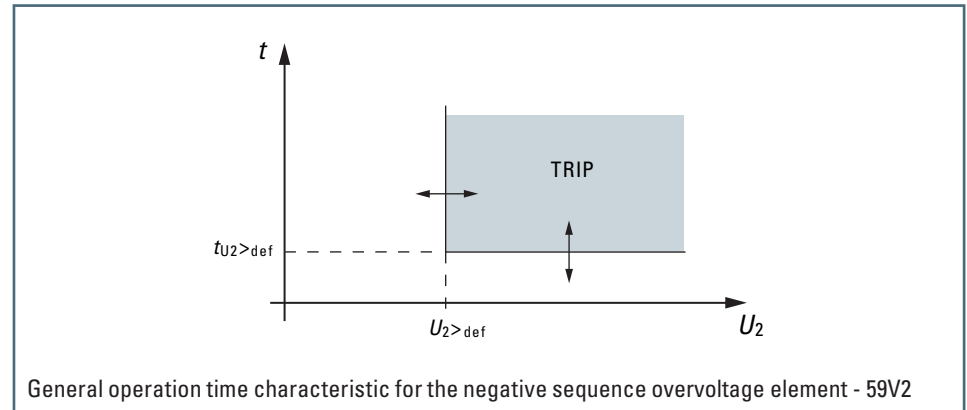
The negative sequence voltage is compared with the threshold ($U_{2>def}$).

A start is issued when the negative sequence voltage overcomes the adjustable threshold (START). After expiry of the associated operate time ($t_{U2>}$) a trip command is issued; if instead the voltage drops below the threshold, the element is restored.

The element can be enabled or disabled by setting **ON** or **OFF** the *State* parameter inside the **Set \ Profile A(or B) \ Negative sequence overvoltage-59V2 \ U2> Element \ Definite time** menu.

The element can be disabled in the case of connection of the measuring inputs (TV or TV-I-NI) downstream of the Device Interface when the DI is open.

The threshold disabling is selected by setting **ON** the $U2>disbyCB_OPEN$ parameter, inside the **Set \ Profile A(or B) \ Negative sequence overvoltage-59V2 \ U2> Element \ Setpoints** menu.



all-59V2.ai

Breaker failure (BF)

The negative sequence overvoltage element can produce the Breaker Failure output if the $U2>BF$ parameter is set to **ON**.

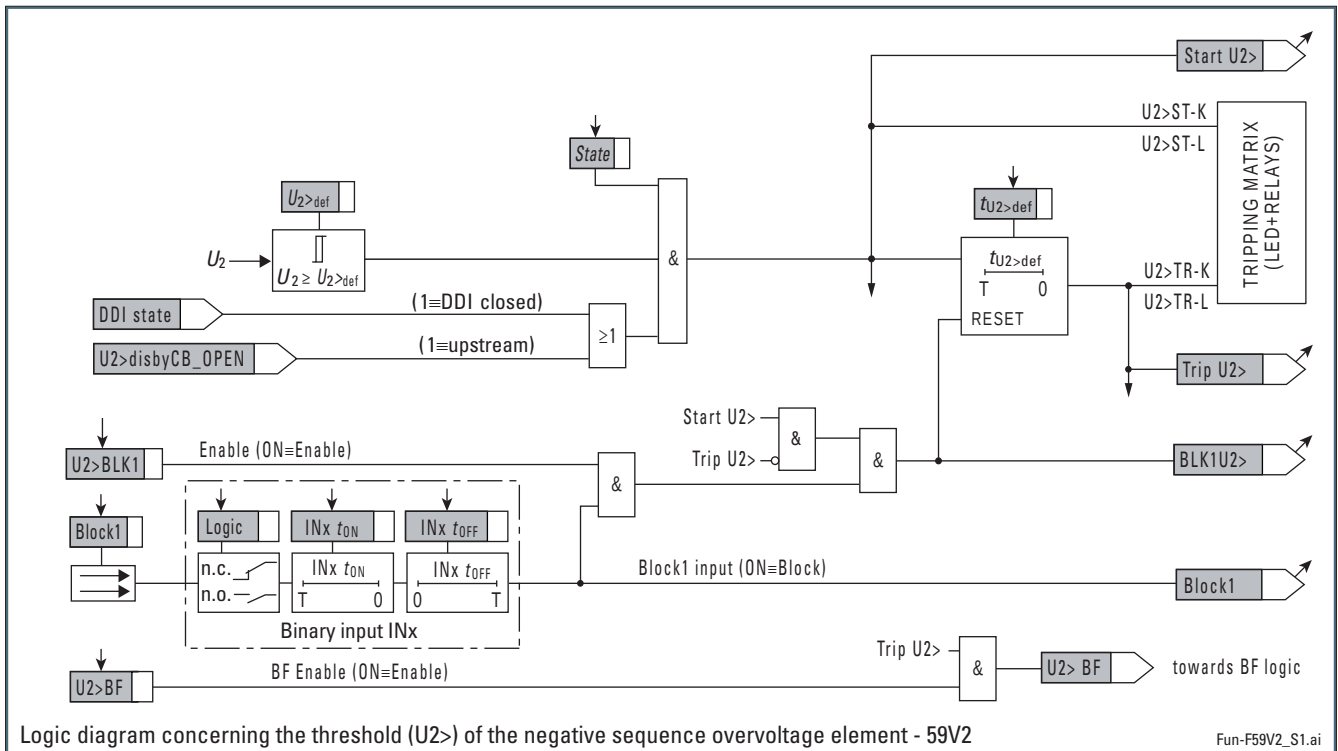
The parameter is available inside the **Set \ Profile A(or B) \ Negative sequence overvoltage - 59V2 \ U2> Element \ Setpoints** menu.^[1]

All the parameters can be set separately for **Profile A** and **Profile B**.

Logical block (Block1)

Note 1 The common settings concerning the Breaker failure protection are adjustable inside the **Breaker Failure - BF** menu.

If the $U2>BLK1$ enabling parameter is set to *ON* and a binary input is designed for logical block (Block1), the protection is blocked off whenever the given input is active.
The trip timer is held in reset condition, so the operate time counting starts when the input block goes down.^[1] The enabling parameter is available inside the **Set \ Profile A(or B) \ Negative sequence overvoltage - 59V2 \ U2> Element \ Setpoints** menu, while the *Block1* function must be assigned to the selected binary input inside the **Set \ Inputs \ Binary input IN1(x)** menus (IN1 or INx matching).



Fun-F59V2_S1.ai

Note 1 The exhaustive treatment of the logical block (Block 1) function may be found in the "Logic Block" paragraph inside CONTROL AND MONITORING section.

Overfrequency - 810

Preface

Two operation thresholds, independently adjustable ($f>$, $f>>$) with adjustable delay ($t_{f>}$, $t_{f>>}$) are provided.

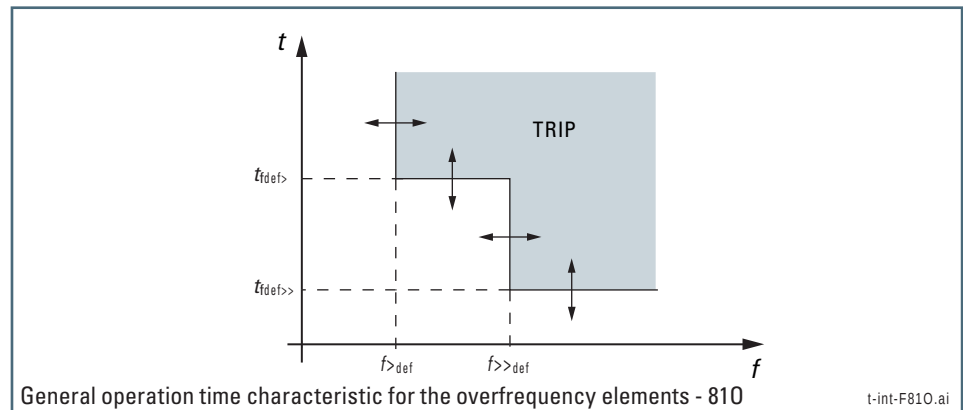
Each threshold may be separately enabled or disabled.

The first threshold trip ($f>$) may be inhibited by start of the second threshold ($f>>$).

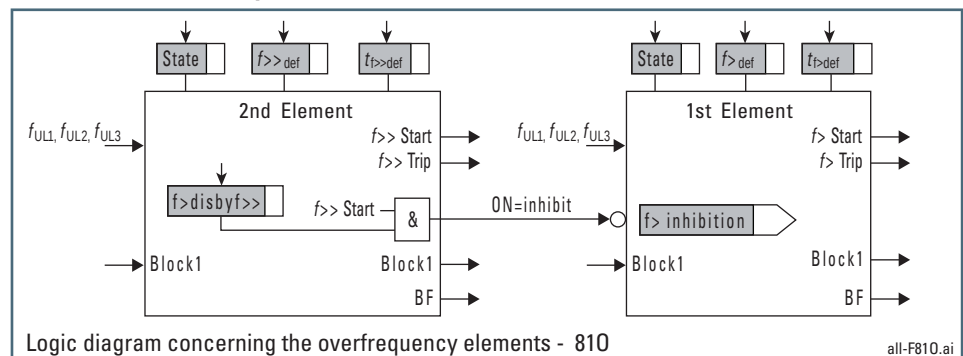
Operation and settings

The frequency, acquired from U_{L1} , U_{L2} , U_{L3} input voltages^[1] is compared with the setting values ($f>$, $f>>$); a start is issued when the frequency overcomes the adjustable threshold (START); after expiry of the associated operate time ($t_{f>}$, $t_{f>>}$) a trip command is issued; if instead the frequency drops below the threshold, the element is restored.

When the frequency value is out of the lock range, it is fixed to the upper or lower limit (20 Hz or 90 Hz). Both elements operate with definite time characteristic.

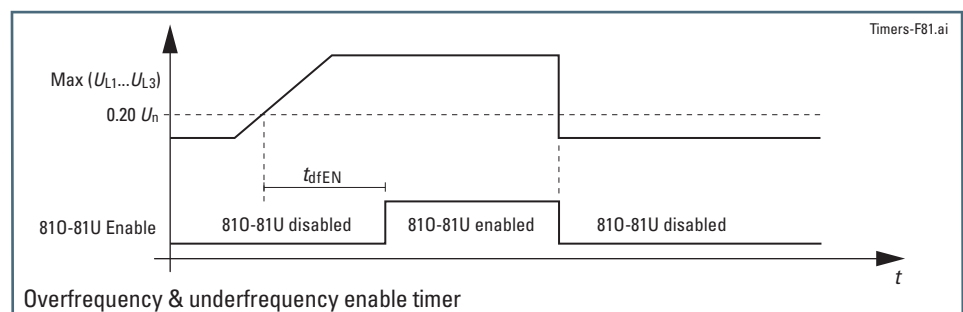


Each element can be enabled or disabled by setting **ON** or **OFF** the **State** parameter inside the **Set \ Profile A(or B) \ Overfrequency-810 \ f> Element (or f>> Element \ Definite time** menu.



The overfrequency protection is enabled only when the maximum of the input voltages $U_{LMAX} = \max(U_{L1}, U_{L2}, U_{L3})$ overcomes $0.2 U_n$ for a t_{fEN} adjustable time.

Setting of the t_{fEN} value is available inside the **Set \ Base** menu with "level 1" session.



The first threshold trip ($f>$) may be inhibited by start of the second threshold ($f>>$) by setting **ON** the $f>$ Disabling by $f>>$ start ($f>disbyf>>$) parameter available inside the **Set \ Profile A(or B) \ Overfrequency-810 \ f>> Element \ Setpoints** menu.

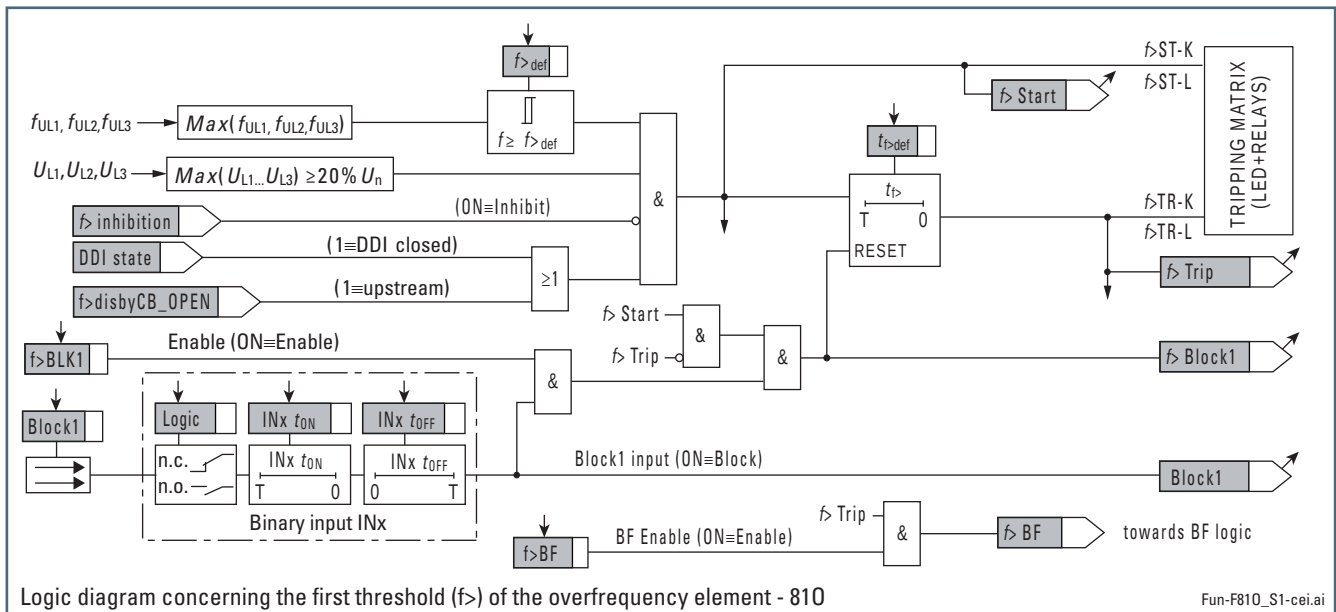
The elements can be disabled in the case of connection of the measuring inputs (TV or TV-I-NI) downstream of the Device Interface when the DI is open. The threshold disabling is selected by setting **ON** the $f>disbyCB_OPEN$, $f>>disbyCB_OPEN$ parameters, inside the **Set \ Profile A(or B) \ Overfrequency-810 \ Setpoints** menu.

When the CB closes, the operate time of the $f>>$ element is automatically adjusted to a reduced val-

Note 1 For sensors inputs versions the frequency is measured on the phase voltages (U_{L1} , U_{L2} , U_{L3}), while for versions with inductive VTs inputs the frequency is measured on-phase-to-phase voltages (U_{12} , U_{23} , U_{31}).
On the diagrams U_{L1} , U_{L2} , U_{L3} are the input phase voltages or phase-to-phase according to the corresponding versions

ue $t_{cf} > \text{def}$ for an adjustable time $t_{atcf} > \text{def}$. The reduction of the operate time for the second threshold can be selected by setting the $EnTcf > \text{def}$ parameter inside the **Set \ Profile A(or B) \ Overfrequency-810 \ f > Element \ Setpoints** menu, while the timers are adjustable inside the **Set \ Profile A(or B) \ Overfrequency-810 \ f > Element \ Definite time** menu.

Breaker failure (BF)



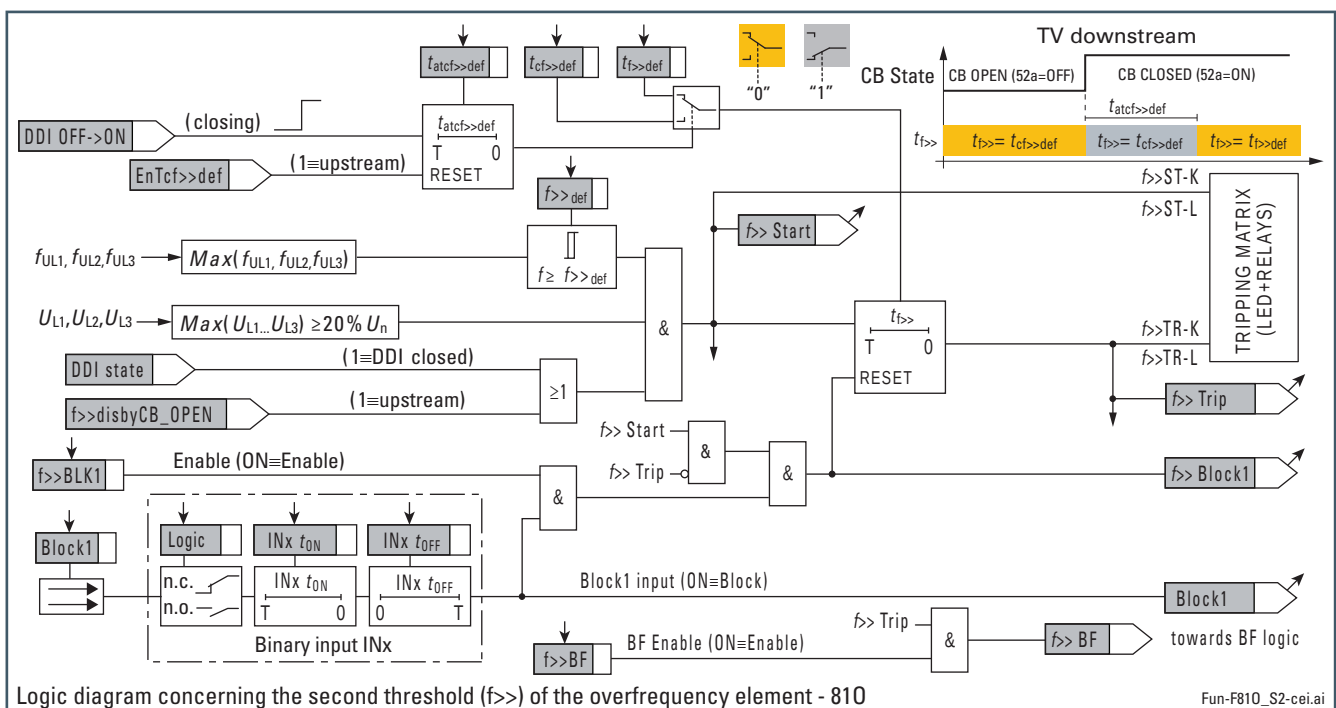
Both overfrequency elements ($f >$, $f >>$) can produce the Breaker Failure output if the $f > BF$ and $f >> BF$ parameters are set to ON.

The parameters are available inside the **Set \ Profile A(or B) \ Overfrequency - 810 \ f > Element (f >) \ Element) \ Setpoints** menus.^[1]

Logical block (Block1)

If the $f > BLK1$ and/or $f >> BLK1$ enabling parameters are set to ON and a binary input is designed for logical block (Block1), the protection is blocked off whenever the given input is active.

The trip timer is held in reset condition, so the operate time counting starts when the input block goes down.^[2] The enabling parameters are available inside the **Set \ Profile A(or B) \ Overfrequency - 810 \ f > Element (f >> Element) \ Setpoints** menus, while the *Block1* function must be assigned to the selected binary input inside the **Set \ Inputs \ Binary input IN1(x2)** menus (IN1 or INx matching).



Note 1 The common settings concerning the Breaker failure protection are adjustable inside the **Breaker Failure - BF** menu.

Note 2 The exhaustive treatment of the logical block (*Block 1*) function may be found in the "Logic Block" paragraph inside **CONTROL AND MONITORING** section.

Underfrequency - 81U

Preface

Four operation thresholds, independently adjustable with adjustable delay are provided. Each threshold may be separately enabled or disabled.

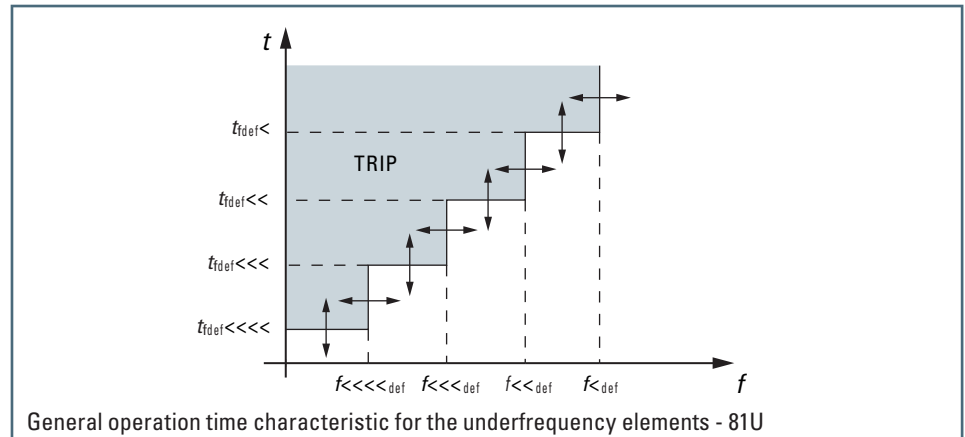
Operation and settings

The frequency, acquired from U_{L1} , U_{L2} , U_{L3} input voltages^[1] is compared with the setting thresholds; a start is issued when the frequency goes down the adjustable threshold (START); after expiry of the associated operate time a trip command is issued; if instead the frequency goes over the threshold, the element is restored.

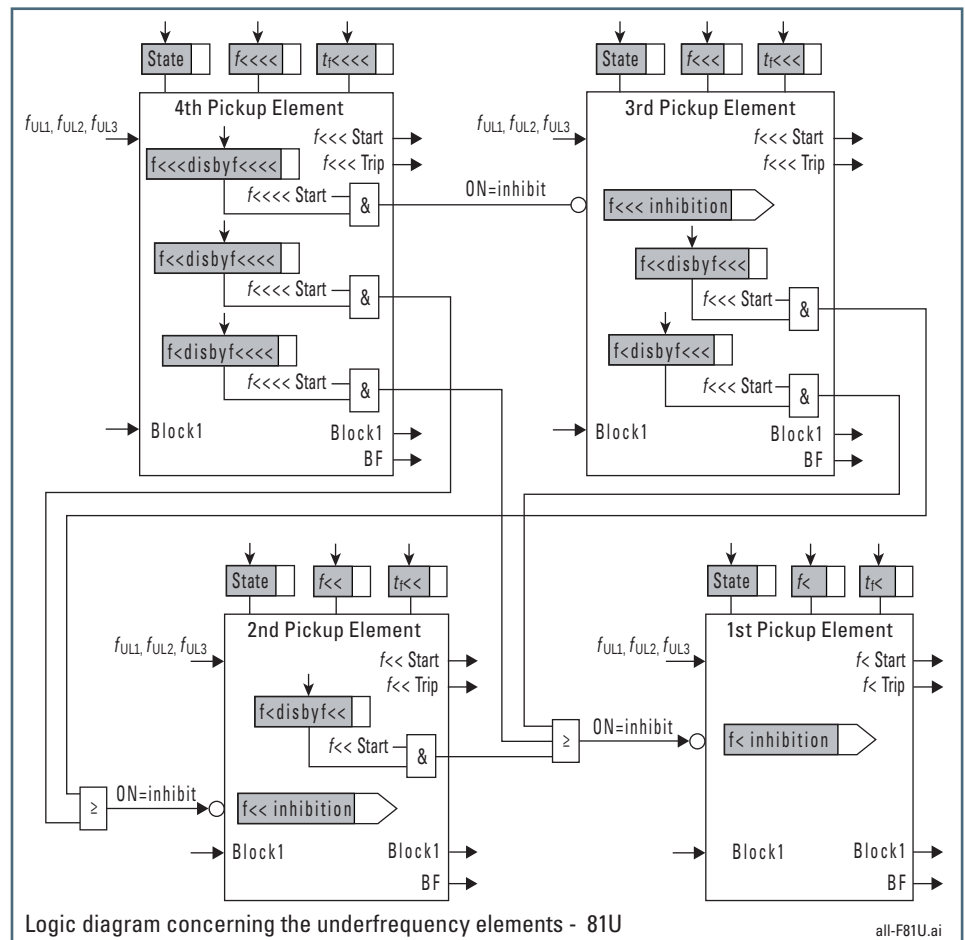
All elements operate with definite time characteristic.

When the frequency value is out of the lock range, it is fixed to the upper or lower limit (20 Hz or 90 Hz).

All elements operate with definite time characteristic.



Each element can be enabled or disabled by setting **ON** or **OFF** the **State** parameter inside the **Set\ Profile A(or B)\ Underfrequency-81U\ f< Element** (**f<< Element**, **f<<< Element**)\ **Definite time** menu.

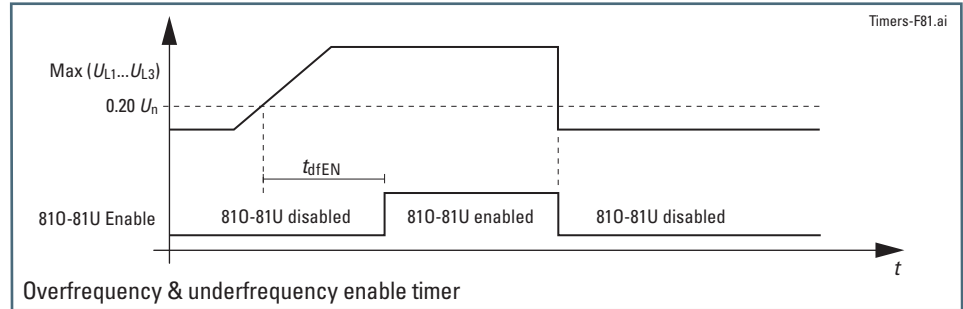


The underfrequency protection is enabled only when the maximum of the input voltages

Note 1 For sensors inputs versions the frequency is measured on the phase voltages (U_{L1} , U_{L2} , U_{L3}), while for versions with inductive VTs inputs the frequency is measured on phase-to-phase voltages (U_{12} , U_{23} , U_{31}).

On the diagrams U_{L1} , U_{L2} , U_{L3} are the input phase voltages or phase-to-phase according to the corresponding versions

$U_{LMAX} = \max(U_{L1}, U_{L2}, U_{L3})$ overcomes $0.2 U_n$ for a t_{fEN} adjustable time.
Setting of the t_{fEN} value is available inside the **Set \ Base** menu with "level 1" session.



The trip of $f<$ element may be inhibited by the start of the second, third and/or fourth element ($f<<$, $f<<<$, $f<<<<$) by setting **ON** the Disable $f<$ by start $f<<$, Disable $f<$ by start $f<<<$, Disable $f<$ by start $f<<<<$ ($f<disbyf<<$, $f<disbyf<<<$, $f<disbyf<<<<$) parameters available inside the **Set \ Profile A(or B) \ Underfrequency-81U \ f< Element (f<< Element, f<<< Element) \ Setpoints** menus.

Similarly the trip of the:

- $f<<$ element may be inhibited by start of the third and/or fourth element ($f<<<$ and/or $f<<<<$) by setting **ON** the Disable $f<<$ by start $f<<<$, start $f<<<<$ ($f<<disbyf<<<$, $f<<disbyf<<<<$) parameter available inside the **Set \ Profile A(or B) \ Underfrequency-81U \ f<< Element, (f<<< Element) \ Setpoints** menus.
- $f<<<$ element may be inhibited by start of the fourth element ($f<<<<$) by setting **ON** the Disable $f<<<$ by start $f<<<<$ ($f<<<disbyf<<<<$) parameter available inside the **Set \ Profile A(or B) \ Underfrequency-81U \ f<<< Element \ Setpoints** menu.

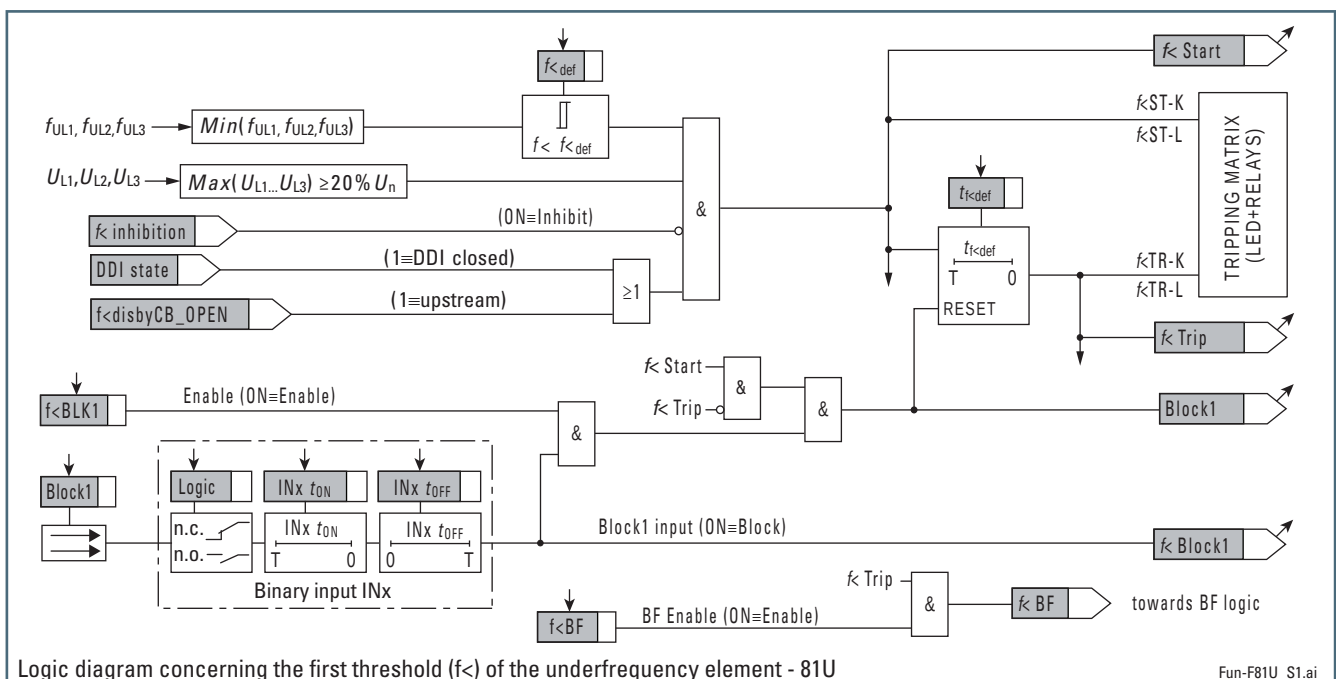
The elements can be disabled in the case of connection of the measuring inputs (TV or TV-I-NI) downstream of the Device Interface when the DI is open. The threshold disabling is selected by setting **ON** the $f<disbyCB_OPEN$, $f<<disbyCB_OPEN$, $f<<<disbyCB_OPEN$, $f<<<<disbyCB_OPEN$ parameters, inside the **Set \ Profile A(or B) \ Underfrequency-81U \ Setpoints** menu.

When the CB closes, the operate time of the $f<$ element is automatically adjusted to a reduced value $t_{cf}<def$ for an adjustable time $t_{atcf}<def$. The reduction of the operate time for the second threshold can be selected by setting the $EnTcf<def$ parameter inside the **Set \ Profile A(or B) \ Underfrequency-81U \ f< Element \ Setpoints** menu, while the timers are adjustable inside the **Set \ Profile A(or B) \ Underfrequency-81U \ f< Element \ Definite time** menu

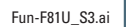
Logical block (Block1)

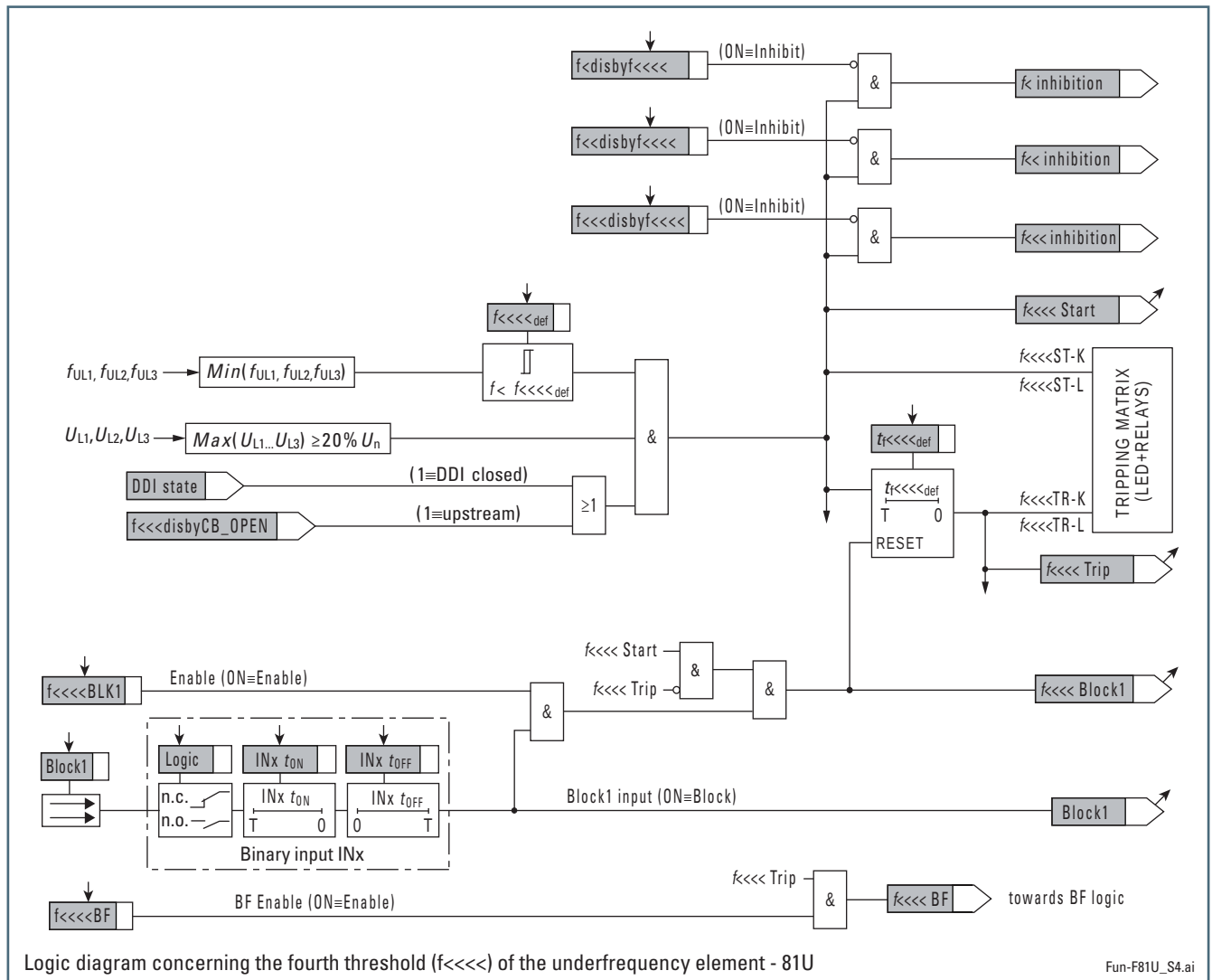
If the $f<BLK1$, $f<<BLK1$, $f<<<BLK1$ and/or $f<<<<BLK1$ enabling parameters are set to **ON** and a binary input is designed for logical block (Block1), the protection is blocked off whenever the given input is active.

The trip timer is held in reset condition, so the operate time counting starts when the input block goes down.^[1] The enabling parameters are available inside the **Set \ Profile A(or B) \ Underfrequency - 81U \ f< Element (f< Element, f<< Element, f<<< Element) \ Setpoints** menus, while the **Block1** function must be assigned to the selected binary input inside the **Set \ Inputs \ Binary input IN1(x)** menus (IN1 or INx matching).



Note 1 The exhaustive treatment of the logical block (Block 1) function may be found in the "Logic Block" paragraph inside CONTROL AND MONITORING section.





Application notes about over-under frequency elements - 81U and 81O

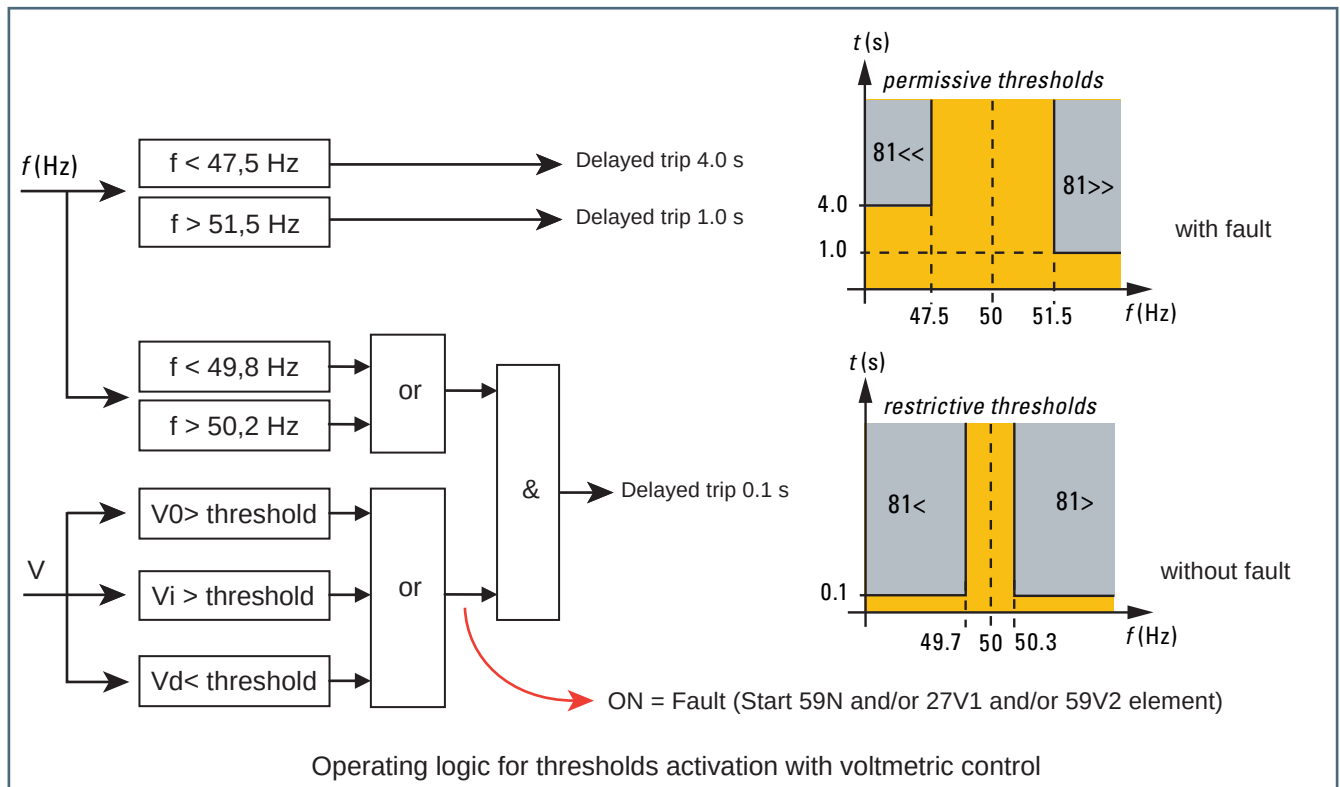
To ensure compliance with CEI 0-16 Italian standard the voltage enabling function is provided through which the first threshold can be enable / disable, respectively, in the absence / presence of the signal integrity of the communication network Distributor (digital input set with inverse logic and $f < -f >$ Control function or communication interface protocol IEC 61850).

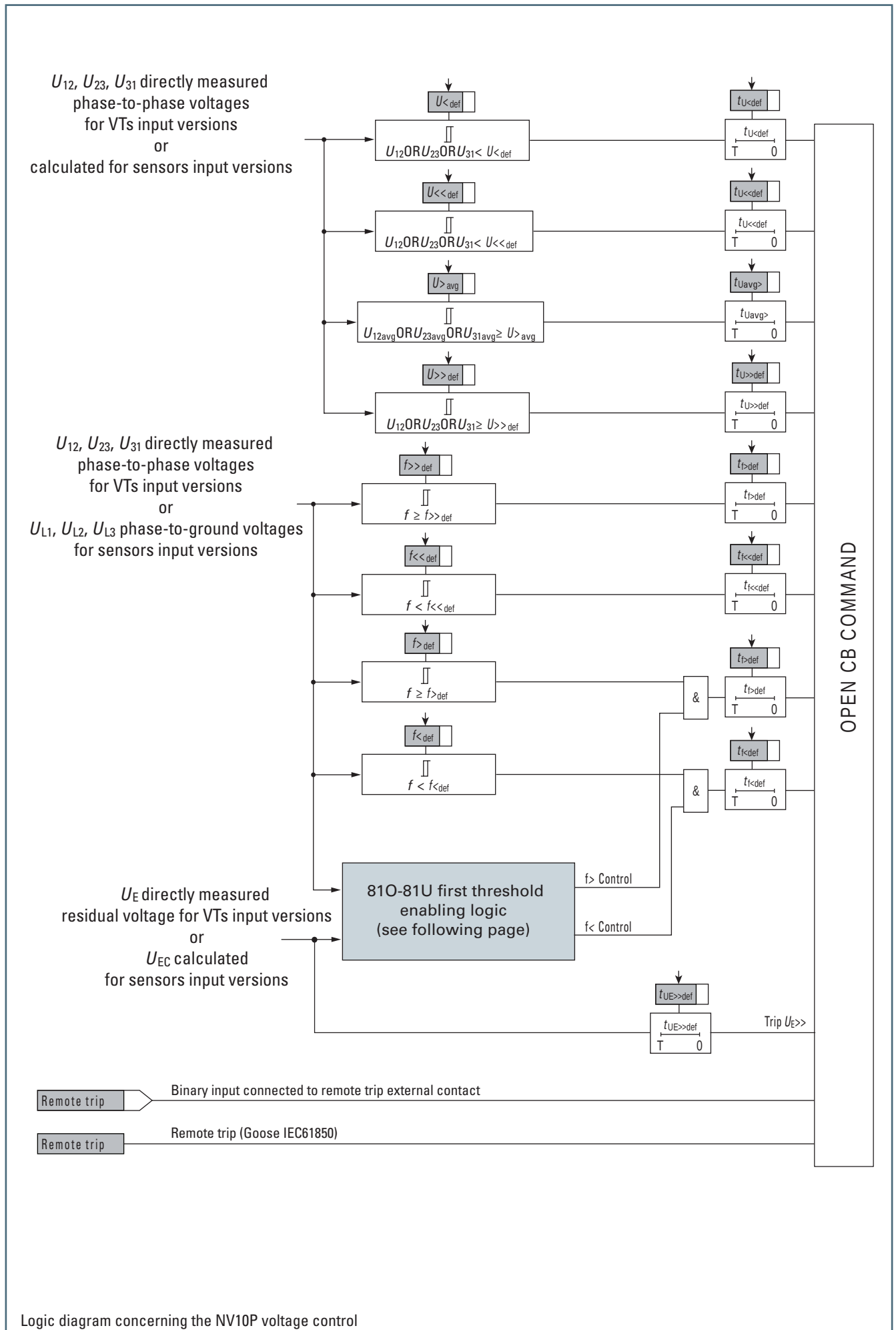
For the trip of the first threshold of each element can be enabled by one or more of the following consensus:

- start of residual current second threshold (59N internal element by programming ON the $f < \&UE>>, f > \&UE>>$ parameter)
- start of residual voltage second threshold (59N external element) acquired by means of binary input programmed as $f < -f >$ Control (setting ON the $f < \&DIGIN, f > \&DIGIN$ parameter)
- loss of communication network acquired by means of binary input programmed as $f < -f >$ Control with inverse logic (setting ON the $f < \&DIGIN, f > \&DIGIN$ parameter)
- start of positive sequence undervoltage threshold (27V1 programming ON the $f < \&27V1, f > \&27V1$ parameter)
- start of negative sequence overvoltage threshold (59V2 programming ON the 59V2 (programming ON the $f < \&59V2, f > \&59V2$ parameter)
- start of first threshold of the undervoltage element (27 programming ON the $f < \&U<, f > \&U<$ parameter)
- loss of communication network from Goose IEC 61850 message programming ON the $f < \&rete61850-KO, f > \&rete61850-KO$ parameter.

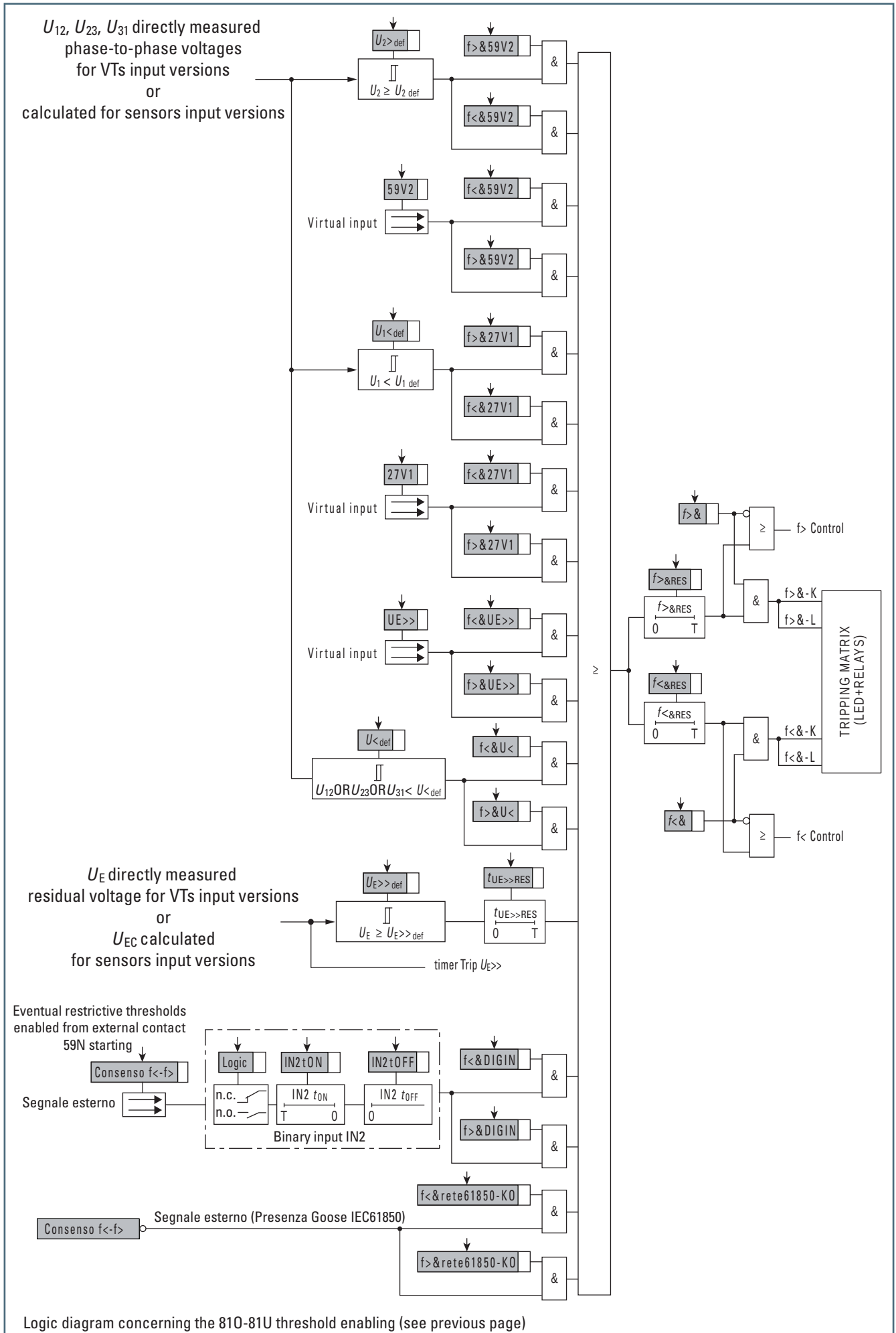
The parameters listed above are available in the menus inside the menu

Set \ Profile A(or B) \ Underfrequency - 81U \ f < element \ Voltage control for parameters concerning to the underfrequency element (81U) and within the **Set \ Profile A(or B) \ Overfrequency - 81O \ f > element \ Voltage control** menu for parameters concerning to the overfrequency element (81O).





Logic diagram concerning the NV10P voltage control



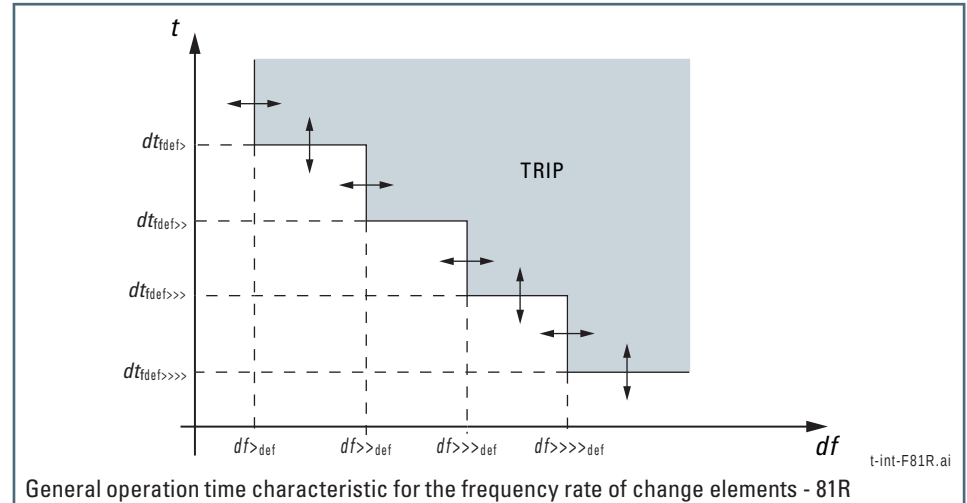
Frequency rate of change - 81R

Preface

Fast trips may be issued when positive/negative or any (module) changes in frequency are detected. The 81R element is faster than underfrequency and overfrequency protections. Four operation thresholds, independently adjustable with adjustable delay are provided. Each threshold may be separately enabled or disabled.

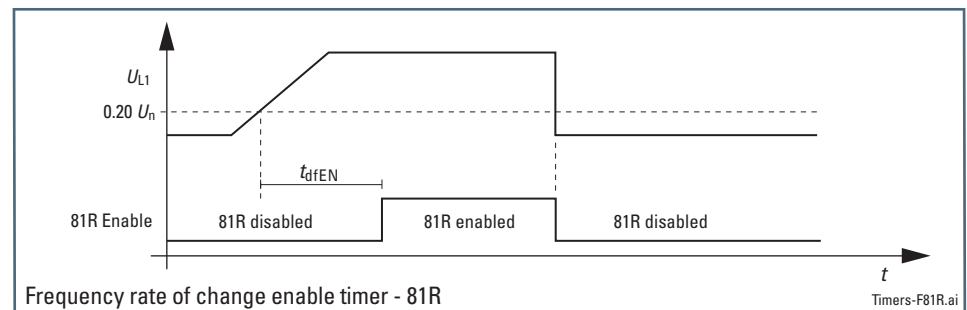
Operation and settings

The frequency rate of change, acquired from $U_{L1}^{[1]}$ input voltage, is compared with the setting values ($df>$, $df>>$, $df>>>$, $df>>>>$); a start is issued when the frequency overcomes the adjustable threshold (START); after expiry of the associated operate time ($t_{df>}$, $t_{df>>}$, $t_{df>>>}$, $t_{df>>>>}$) a trip command is issued; if instead the frequency rate of change drops below the threshold, the element is restored. When the frequency value is out of the lock range, it is fixed to the upper or lower limit (20 Hz or 90 Hz). All elements operate with definite time characteristic.



The frequency rate of change protection is enabled only when the maximum of the U_{L1} input voltage overcomes $0.2 U_n$ for a t_{dfEN} adjustable time.

Setting of the t_{dfEN} value is available inside the **Set \ Base** menu with "level 1" session.



Each element can be enabled or disabled by setting **ON** or **OFF** the *State* parameter inside the **Set \ Profile A(or B) \ Frequency rate of change-81R \ df> Element (df>> Element, df>>> Element, df>>>> Element) \ Definite time** menu.

For every threshold the positive/negative or module of frequency change can be selected (typically for speedup/slowdown or any speed change of the generator; the *df* operating mode can be set (*Mode-df>*, *Mode-df>>*, *Mode-df>>>*, *Mode-df>>>>*) inside the **Set \ Profile A(or B) \ Frequency rate of change-81R \ df> Element (df>> Element, df>>> Element, df>>>> Element) \ Setpoints** menu.

The trip of *df>* element may be inhibited by the start of the second, third and/or fourth element (*df>>*, *df>>>*, *df>>>>*) by setting **ON** the *Disable df>* by start *df>>*, *Disable df>>* by start *df>>>*, *Disable df>>>* by start *df>>>>* (*df>disbydf>>*, *df>disbydf>>>*, *df>disbydf>>>>*) parameters available inside the **Set \ Profile A(or B) \ Frequency rate of change-81R \ df>> Element (df>>> Element, df>>>> Element) \ Setpoints** menus.

Similarly the trip of the:

- *df>>* element may be inhibited by start of the third and/or fourth element (*df>>>* and/or *df>>>>*) by setting **ON** the *Disable df>>* by start *df>>>*, start *df>>>>* (*df>>disbydf>>>*, *df>>disbydf>>>>*) parameter available inside the **Set \ Profile A(or B) \ Frequency rate of change-81R \ df>>> Element, (df>>>> Element) \ Setpoints** menus.

- *df>>>* element may be inhibited by start of the fourth element (*df>>>>*) by setting **ON** the *Disable*

Note 1 For sensors inputs versions the frequency is measured on the phase voltage U_{L1} , while for versions with inductive VTs inputs the frequency is measured on-phase-to-phase voltage U_{12}
On the diagrams U_{L1} , U_{L2} , U_{L3} are the input phase voltages or phase-to-phase according to the corresponding versions

df>>> by start df>>>> (df>>>>disbydf>>>>) parameter available inside the **Set\Profile A(or B)\Frequency rate of change-81R\df>>>> Element\Setpoints** menu.

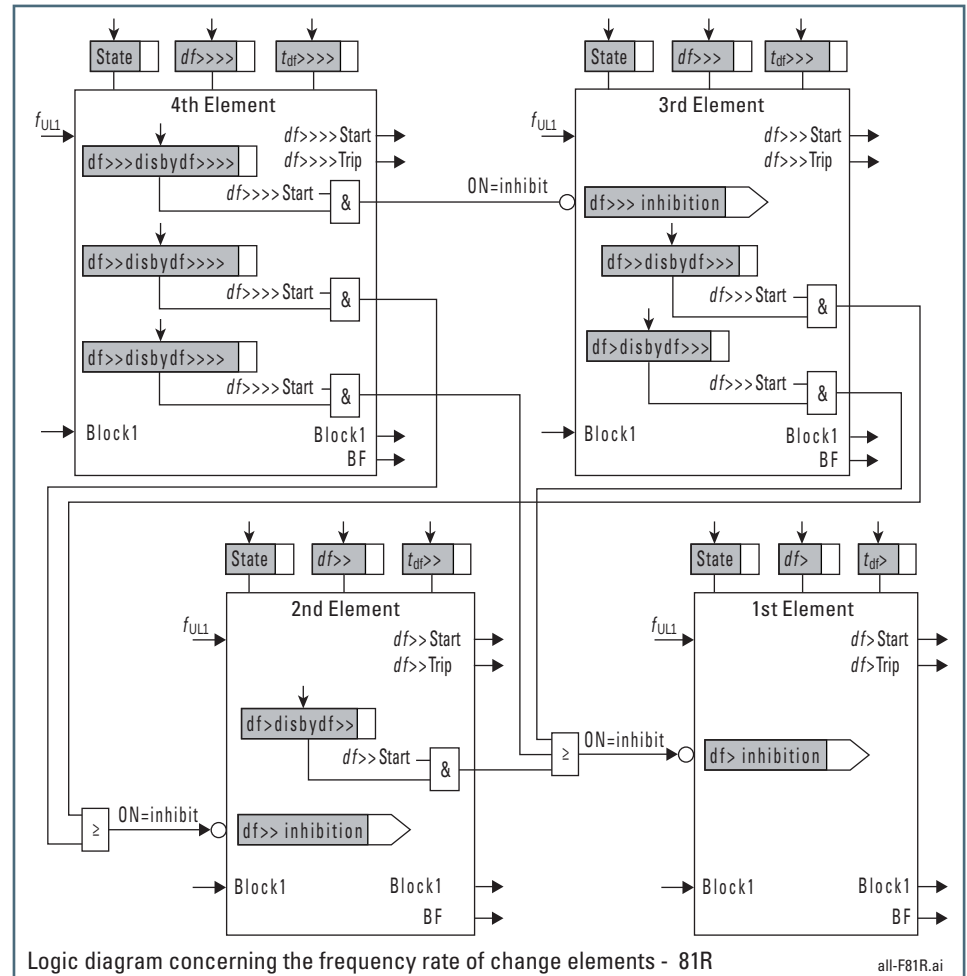
The elements can be disabled in the case of connection of the measuring inputs (TV or TV-I-NI) downstream of the Device Interface when the DI is open. The threshold disabling is selected by setting **ON** the df>disbyCB_OPEN, df>>disbyCB_OPEN, df>>>disbyCB_OPEN, df>>>>disbyCB_OPEN parameters, inside the **Set\Profile A(or B)\Frequency rate of change-81R\df> Element (df>> Element, df>>> Element, df>>>> Element)\Setpoints** menu.

For every of the four thresholds the logic block can be set.

Logical block (Block1)

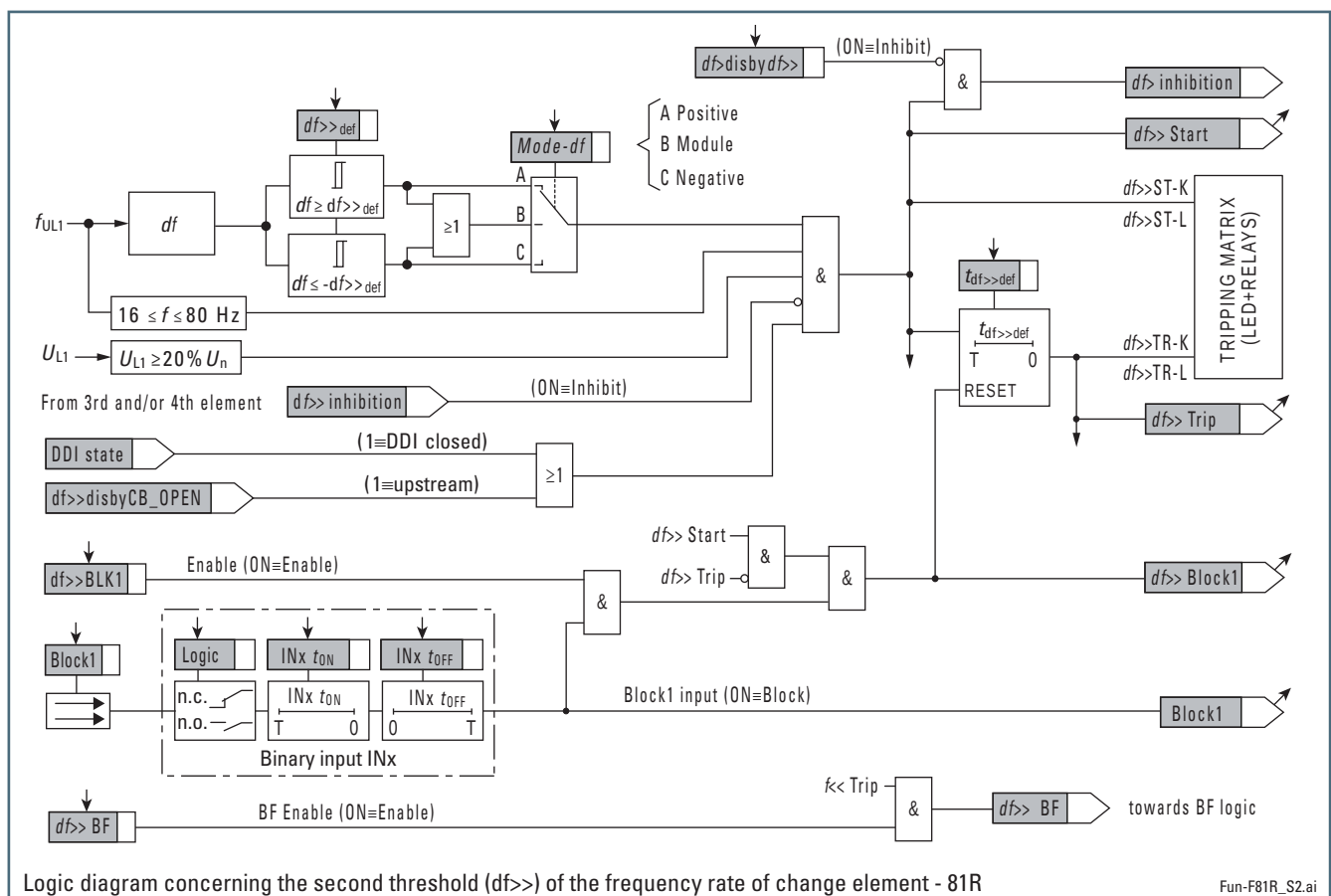
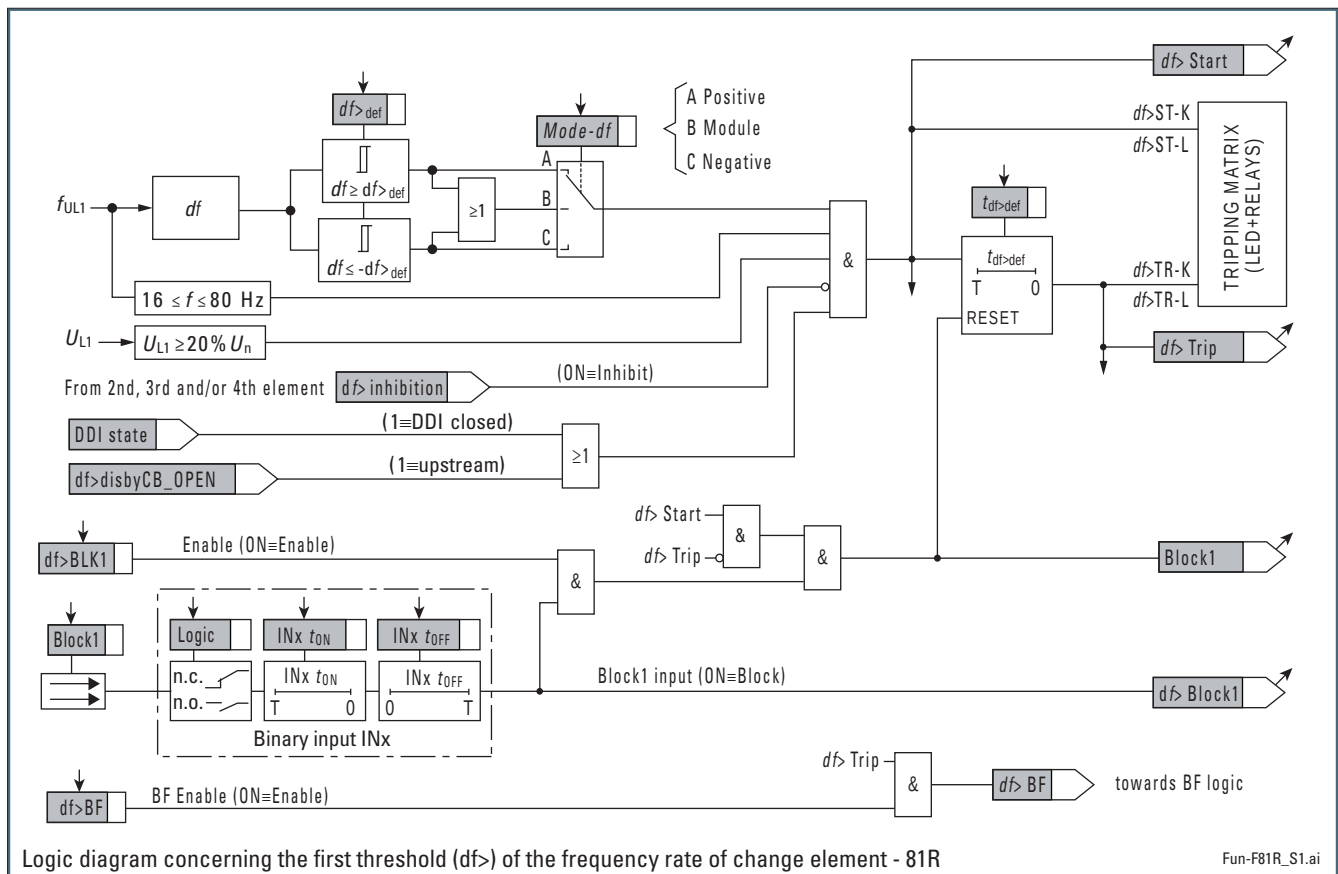
If the df>BLK1, df>>BLK1, df>>>BLK1 and/or df>>>>BLK1 enabling parameters are set to **ON** and a binary input is designed for logical block (Block1), the protection is blocked off whenever the given input is active.

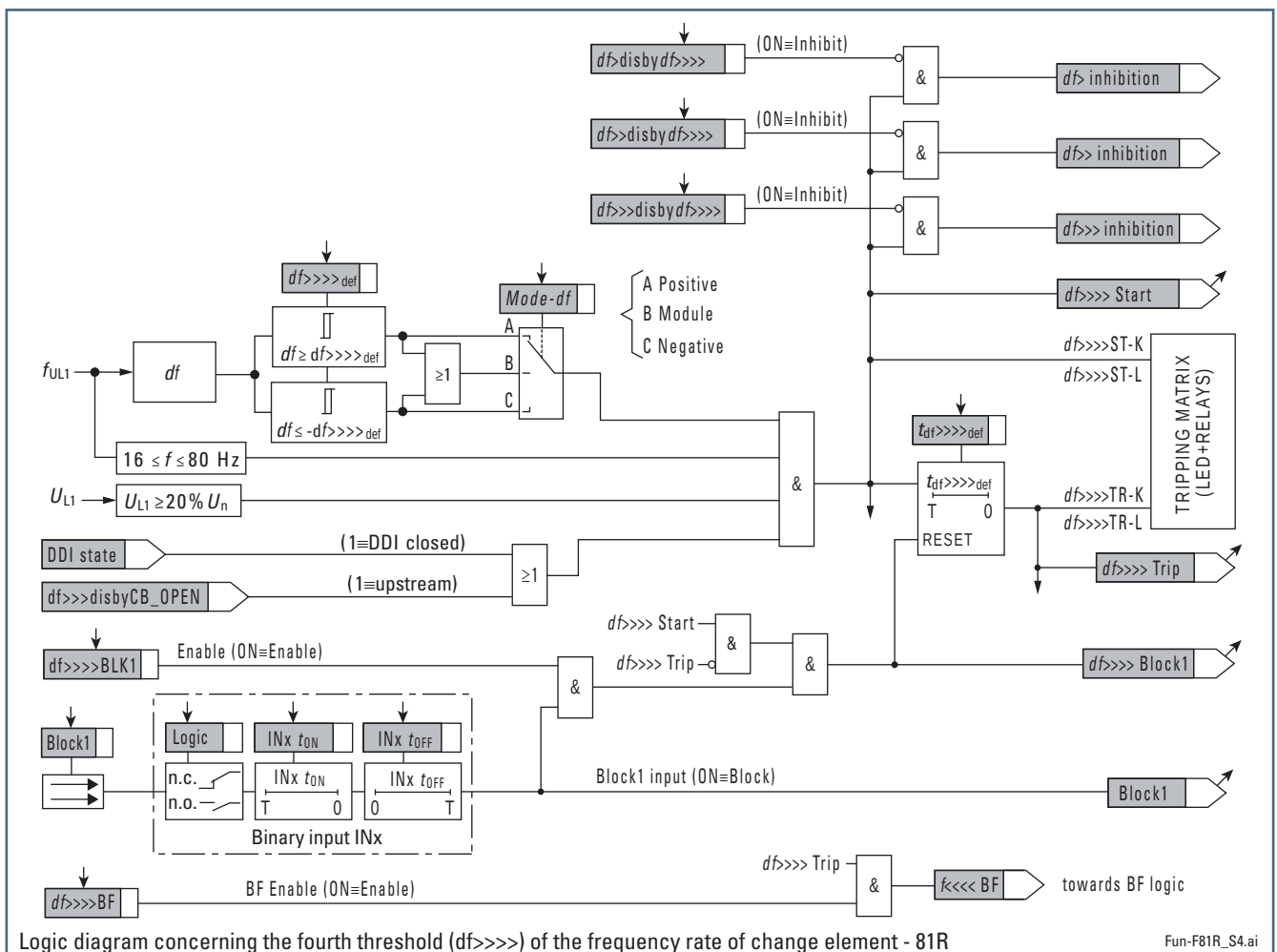
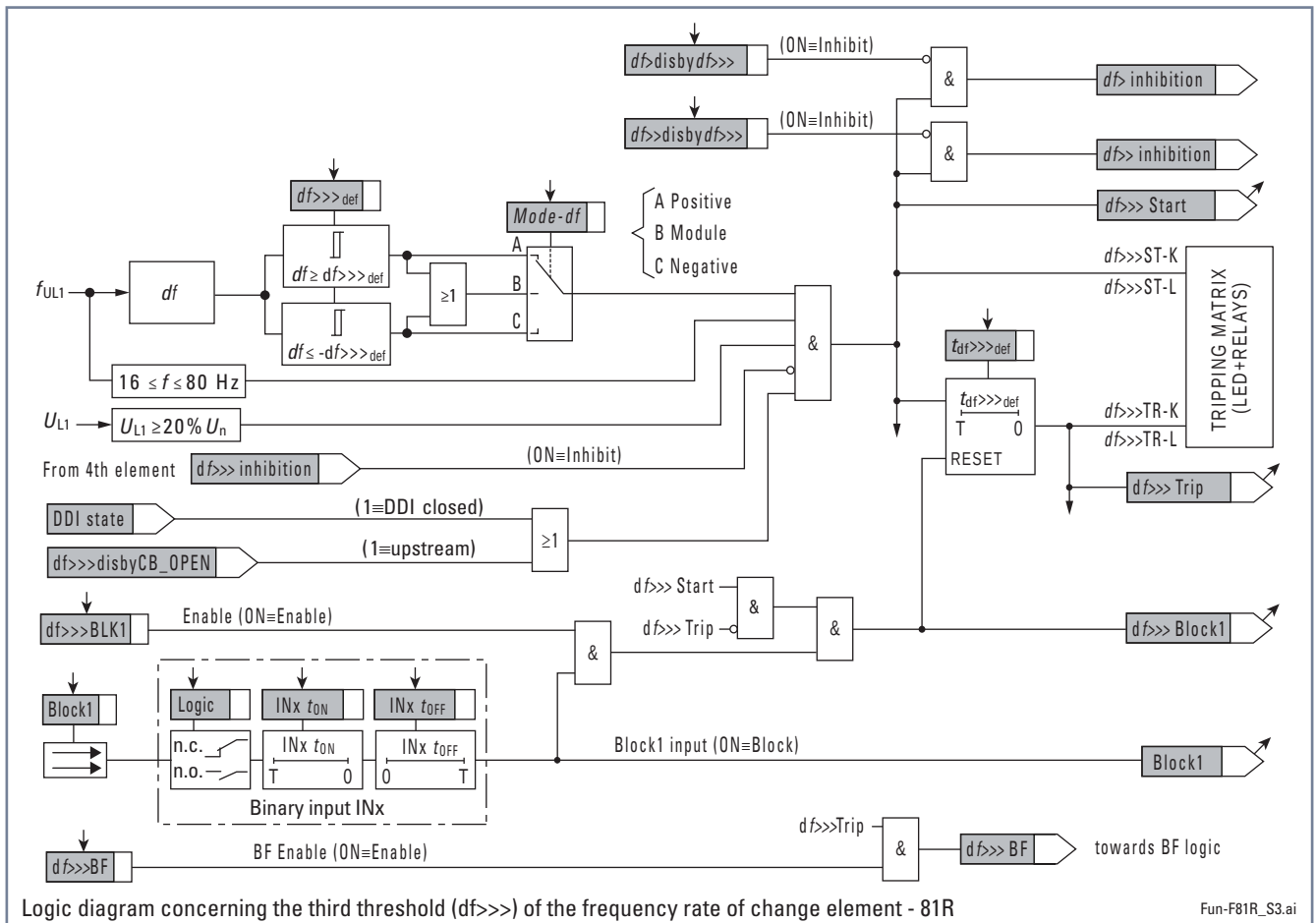
The trip timer is held in reset condition, so the operate time counting starts when the input block goes down.^[1] The enabling parameters are available inside the **Set\Profile A(or B)\Frequency rate of change-81R\df> Element (df>> Element, df>>> Element, df>>>> Element)\Setpoints** menus, while the **Block1** function must be assigned to the selected binary input inside the **Set\Inputs\Binary input IN1(x)** menus (IN1 or INx matching).



All the parameters can be set separately for **Profile A** and **Profile B**.

Note 1 The exhaustive treatment of the logical block (Block 1) function may be found in the "Logic Block" paragraph inside CONTROL AND MONITORING section.





Breaker failure - BF

Preface

When the protection issues a trip command but, because an anomaly, the circuit breaker cannot open, the breaker failure protection issues a back-up trip command to trip adjacent circuit breakers. The breaker failure function may be started by internal protective function (if associated with BF) or by external protections.

Operation and settings

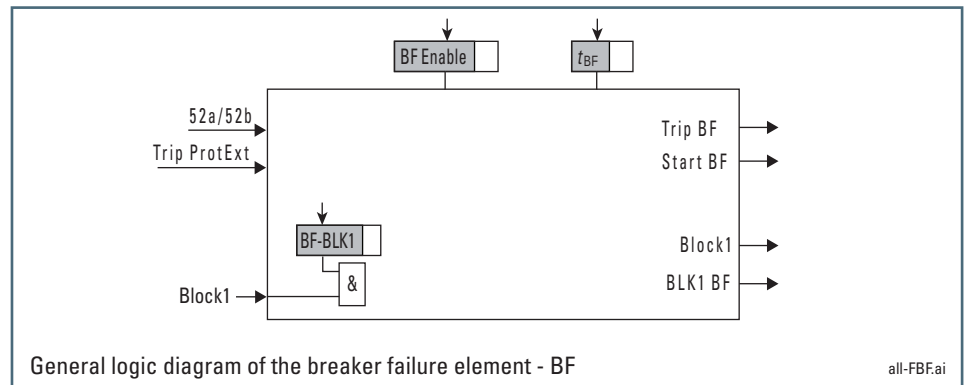
The starting of the timer occurs if both the following conditions are filled:

- 1) Start and trip of internal protective elements (trip of elements matched with BF protection) or, trip of external protections acquired by means binary input or, if enabled, the remote trip command.
- 2) The CB is closed (the CB state may be acquired by means one^[1] or two binary inputs connected to the auxiliary contacts 52a and 52b).

If both conditions are held along the set operate time t_{BF} , the BF element trips at deadline, vice versa the timer is cleared and the function is restored.

To the purpose to restore the BF element as quickly as possible, with start of the same protection (see A condition), additionally to the trip of some internal protections, their starts are required (start reset is faster than trip reset).

The element may be enabled or disabled by setting **ON** the *BF Enable* parameter available inside the **Set \ Profile A(or B) \ Breaker failure-BF** menu.



If two binary inputs are designed for acquire the 52a and 52b auxiliary contacts^[2], the control of the CB position is enabled.

The *52a* and *52b* function must be assigned to the selected binary inputs inside **Set \ Inputs \ Binary input IN1(x)** menus (IN1 or INx matching).

To enable the breaker failure protection to operate with trips coming from external protections, one binary input must be designed to acquire the relative contacts. The *TripProtExt* function must be assigned to the selected binary input inside the **Set \ Inputs \ Binary input IN1(x)** menus (IN1 or IN... matching).

The t_{BF} parameter, available inside the **Set \ Profile A(or B) \ Breaker failure-BF** menu, may be adjusted separately for **Profile A** and **Profile B**.

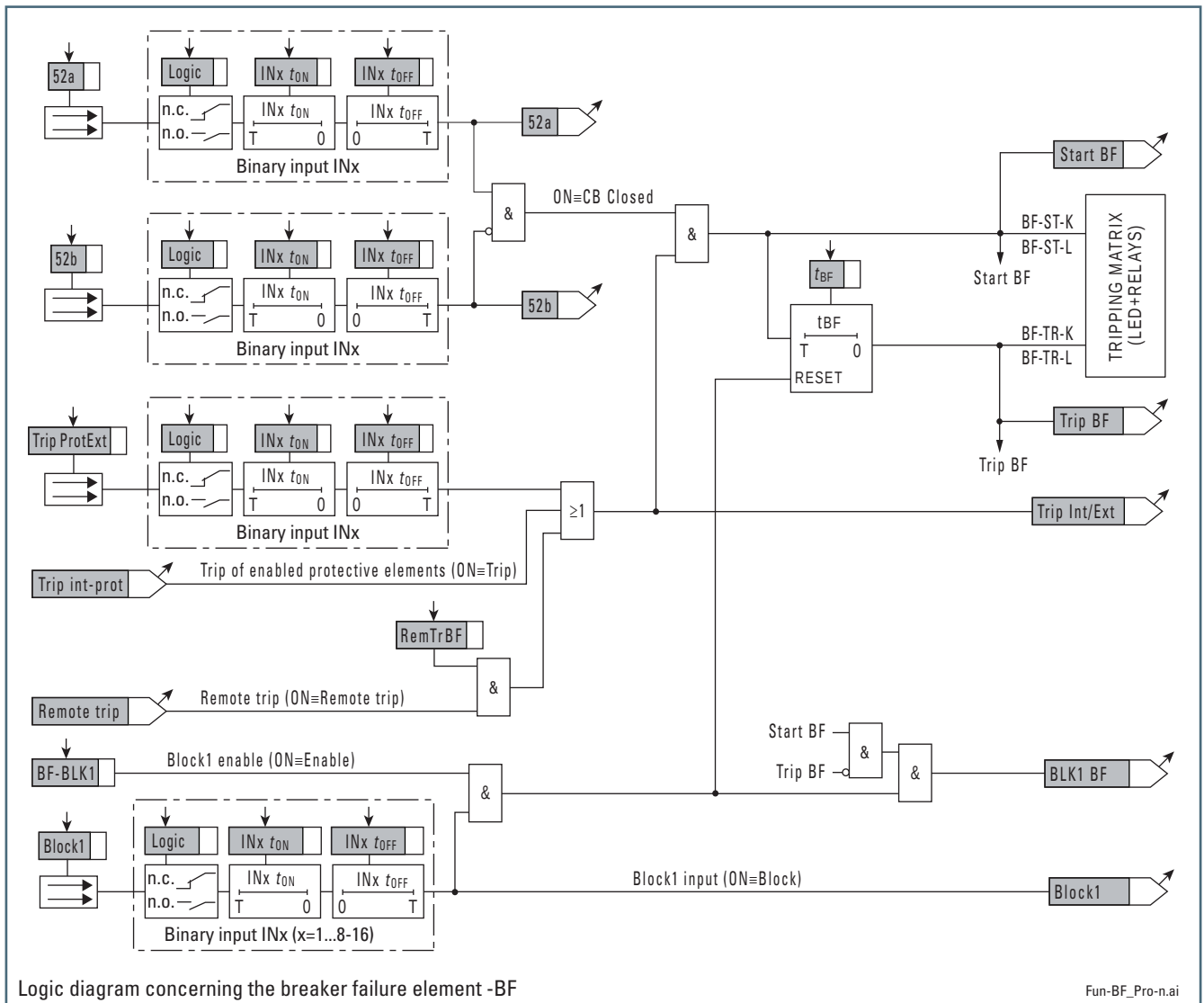
Logical block (Block1)

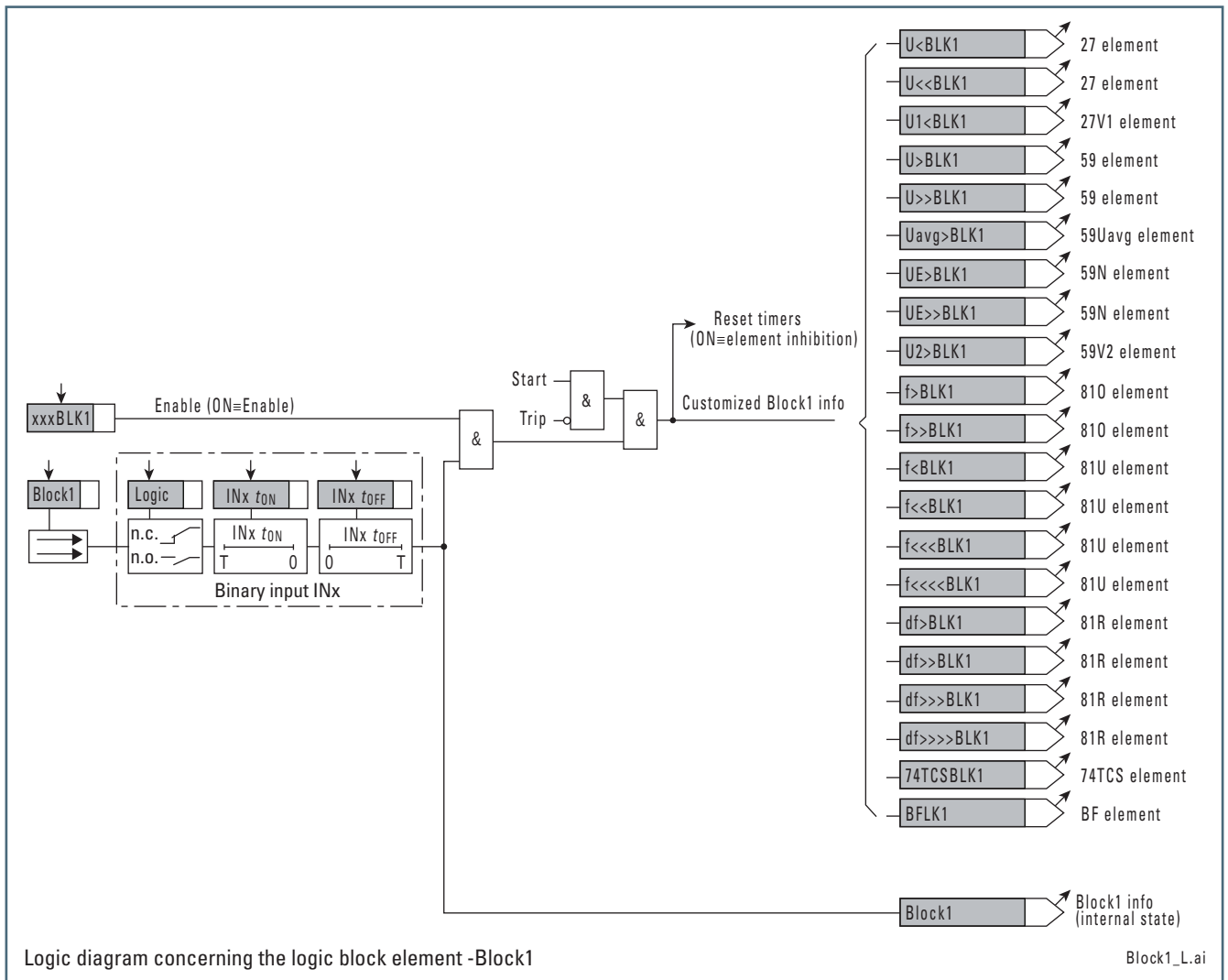
If the *BF-BLK1* parameter (BF logical block) is set to **ON**, and a binary input is designed for logical block (Block1), the breaker failure protection is blocked off whenever the given input is active. The trip timer is held in reset condition, so the operate time counting starts when the input block goes down.^[3] The enabling parameter is available inside the **Set \ Profile A(or B) \ Breaker failure-BF** menu, while the *Block1* function must be assigned to the selected binary input inside the **Set \ Inputs \ Binary input IN1(x)** menus (IN1 or INx matching).

Note 1 Both auxiliary contact state 52a and 52b must be acquired (two binary inputs are required) with Fw version previous to 1.60; with later versions, giving up an inconsistency occurs, one logical input for the acquisition of a contact (52nd or 52b) may suffice

Note 2 Both auxiliary contact state 52a and 52b must be acquired (two binary inputs are required) with Fw version previous to 1.60; with later versions, giving up an inconsistency occurs, one logical input for the acquisition of a contact (52nd or 52b) may suffice

Note 3 The exhaustive treatment of the logic block (Block 1) function may be found in the "Logic Block" paragraph inside CONTROL AND MONITORING section





Virtual I/O with Ethernet messages

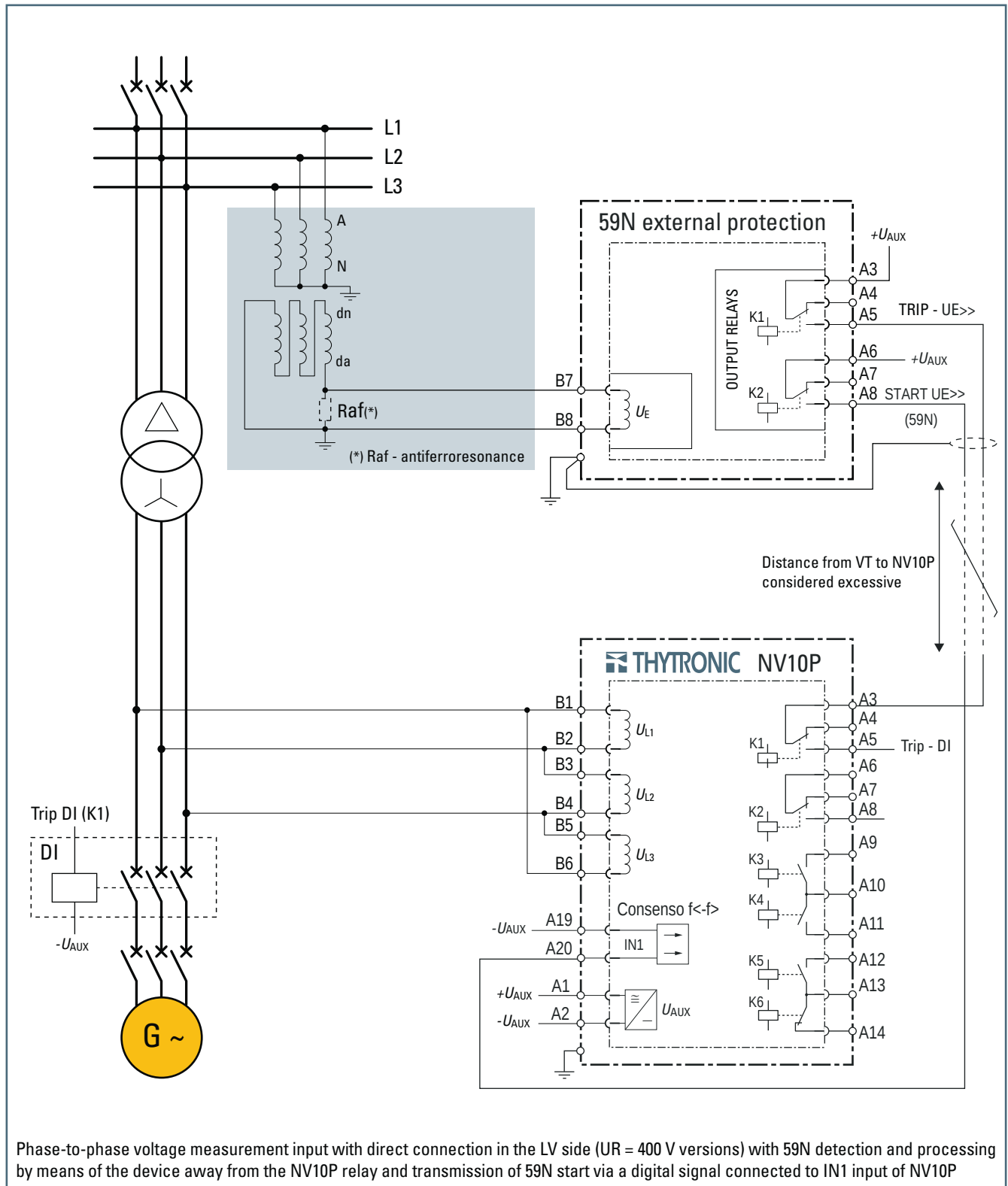
Eight outputs (Virtual Output - VOUT1 ... 8) and ten virtual inputs (Virtual Inputs - VIN1 ... VIN10) may be defined using RPC or IEC 61850 communication protocols over Ethernet network.

Over Pro-N relay the virtual I / O can be usefully employed for:

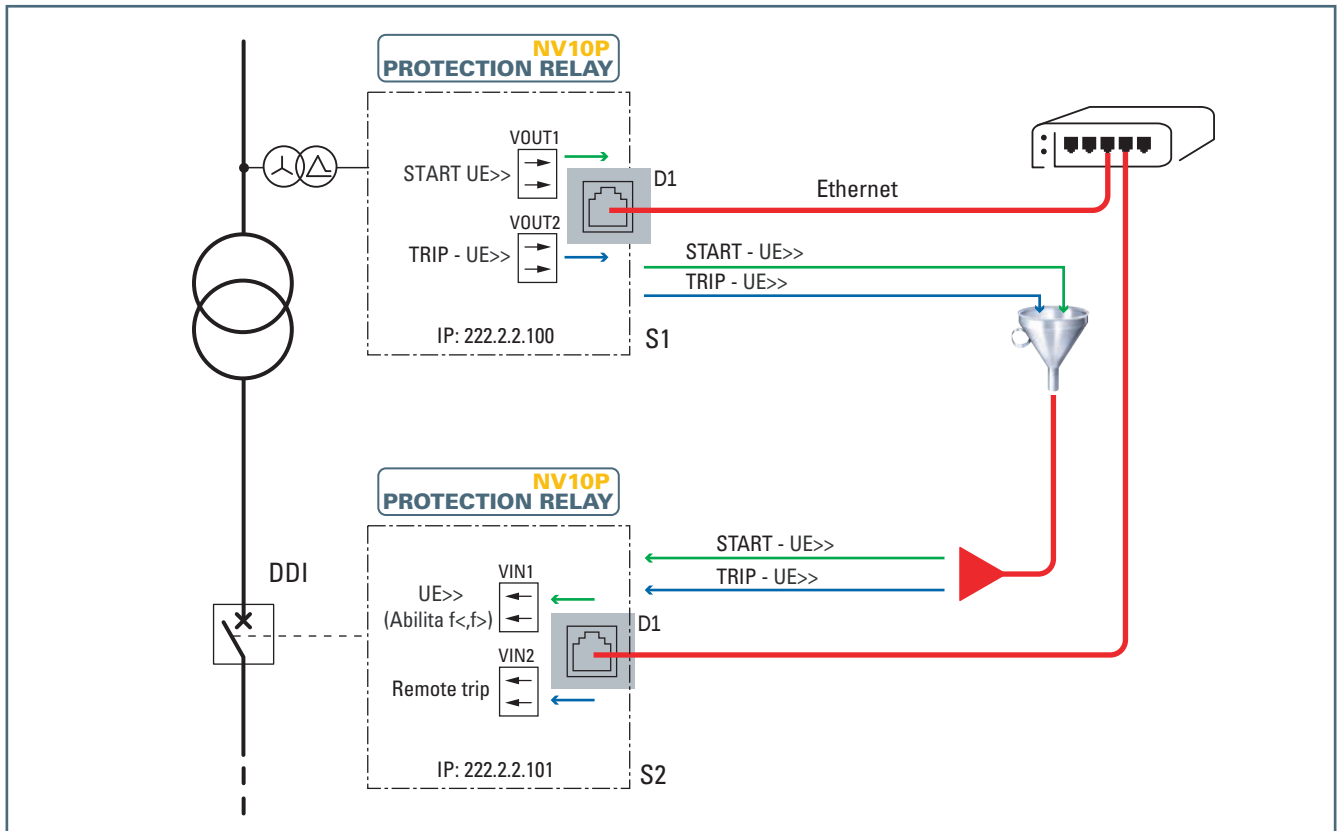
- 1) Transmit information between protections installed in significant distance where the traditional connections are critical in terms of reliability. One application is proposed in which the measurement of residual voltage, not being available on the interface relay (high distance from NV10P relay and VTs installed in MV), is transmitted as start and trip signals by another relay (S1) to the interface relay (S2).
- 2) Making OR logic for opening control of multiple DDI (simultaneous control of all DDI operated by each SPI) in cases of multiple interface protections (Smart Grids).

Example 1

The diagram shows a solution that uses relays, logic inputs and connections pilot wires to transmit 59N start and trip information to the interface relay (S2) from a relay (S1) installed in MV.



Alternatively to the method where relays, logic inputs and connections pilot wires are employed to transmit the information of 59N start and trip between the relays S1 and S2, the diagram below shows the solution that utilizes the I / O virtual circuitry by means of messages on Ethernet network..

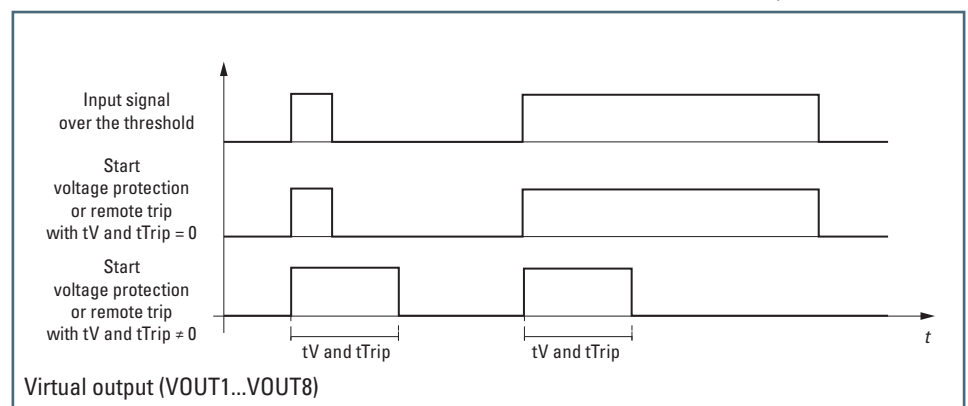


S1 outputs

Two outputs are programmed as:

- VOUT1, used in the example as start signal of the second threshold of 59N protection of S1 (Start UE>>) in order to activate the first threshold of minimum and maximum frequency (restrictive thresholds) of the S2 protection
- VOUT2, used in Example as trip signal of the second threshold of 59N protection of S1 (Trip UE>>) in order to control the opening of the interface device by means of remote tripping of the S2 protection.

The outputs are activated by the input signal (UE >> start and / or remote trip) and stay active (also in case of drop of the input signal) for the duration of an adjustable time (t_V and t_{Trip}).



S2 inputs

For each of the eight virtual inputs one function may be associated that can be activated by the selected input; in the example the enable of the first threshold of under and over frequency is programmed when an earth fault in MT arises (UE>> start active on the S1 protection) at the input virtual VIN1 and remote trip connected to the VIN2 virtual input of the S2 protection relay.

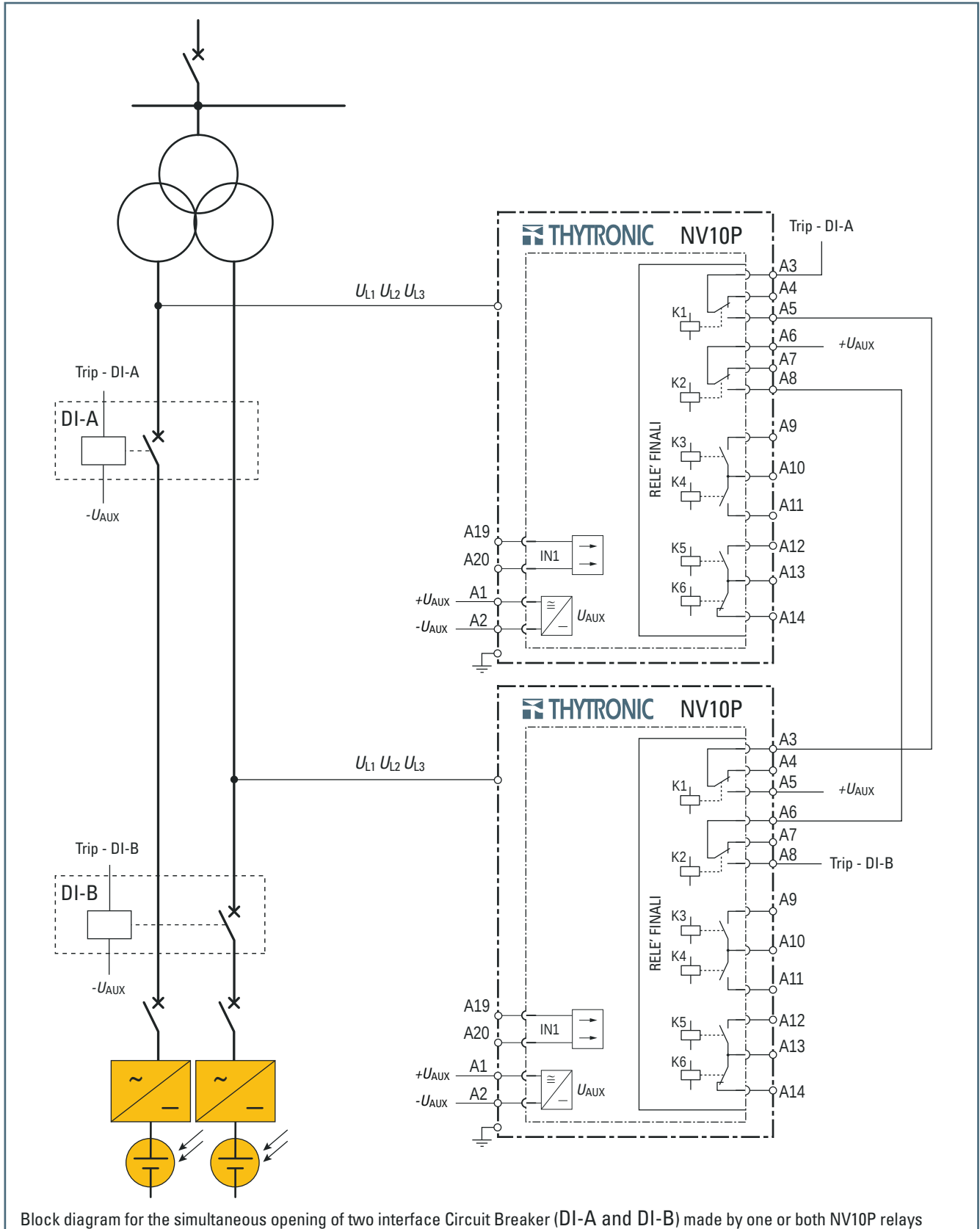
Links (virtual pilot wires)

After defining the input and output circuits the virtual links must be created. A unique IP address for each relay must be assigned

Example 2

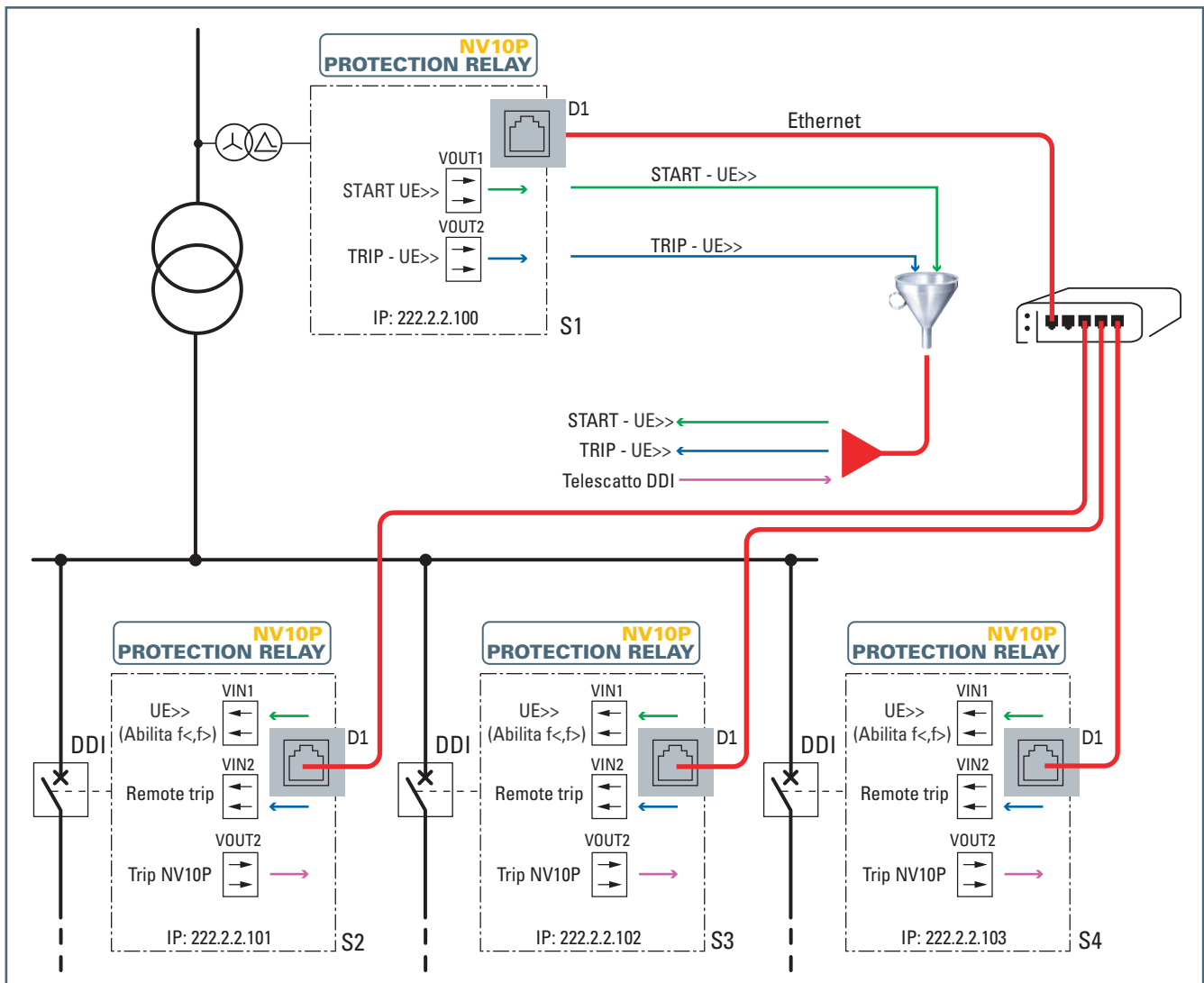
The diagram shows the traditional solution that uses relays, logic inputs and pilot wires connections to realize the logical OR for the opening command of two DDI (simultaneous control of both DDI operated by each interface relay).

The logical OR is realized driving each circuit breaker by the series connection of two output relays (a relay for each CB); can easily understand the added complication for implementation of the logic when further protection interfaces are mounted, (in addition the need to implement the logic concerning the measurement of residual voltage, as described in Example 1, must be considered).



Block diagram for the simultaneous opening of two interface Circuit Breaker (DI-A and DI-B) made by one or both NV10P relays

The diagram shows an example that uses the virtual I / O circuits where the S1 relay transmits the information relating to the 59N function to relay S2, S3 and S4 and simultaneously the OR logic for the command of the interface devices is achieved.



S1 outputs

The VOUT1 and VOUT2 outputs must be programmed as in Example 1 to transmit information about to the 59N protection, processed by the S1 relay to relay S2, S3 and S4 where the measure of residual voltage is missing:

- Start, used as a start signal of the second threshold of 59N protection (S1) in order to activate the first threshold of under and over frequency (81U and 81O) of the protections S2, S3 and S4.
- Trip, used in Example as trip signal of the second threshold of 59N protection (S1) in order to control the opening of the interface device by means of remote tripping of protections S2, S3 and S4

S2, S3 e S4 inputs

The enable of the first threshold of under and over frequency (81U and 81O) is set to the occurrence of an earth fault (start UE >> active on S1 protection) on the VIN1 virtual input and the remote trip on the VIN2 virtual input protection on S2, S3 and S4 relays that drive the circuit breaker interface.

S2, S3 and S4 outputs

The output VOUT2 must be set to carry out the logical OR for the opening command of all the circuit breaker interfaces (simultaneous control of all the CBs function from each NV10P):

- Trip, used in the example as a trip signal of the protection functions of S1 in order to control the opening of the interface device by means of remote tripping of protections S2, S3 and S4

Links (virtual pilot wires)

After defining the input and output circuits the virtual links must be created.

A unique IP address for each relay must be assigned.

To transmit information to a group of devices the *Multicast* communication mode is available.

Remote tripping

Preface

Some output relays may be programmed for remote trip function resulting from a command coming from a binary input.

If a binary input is designed for remote trip acquisition, an output relay allocated to the same function is triggered when the input (IN1 and/or IN2) is active.

Operation and settings

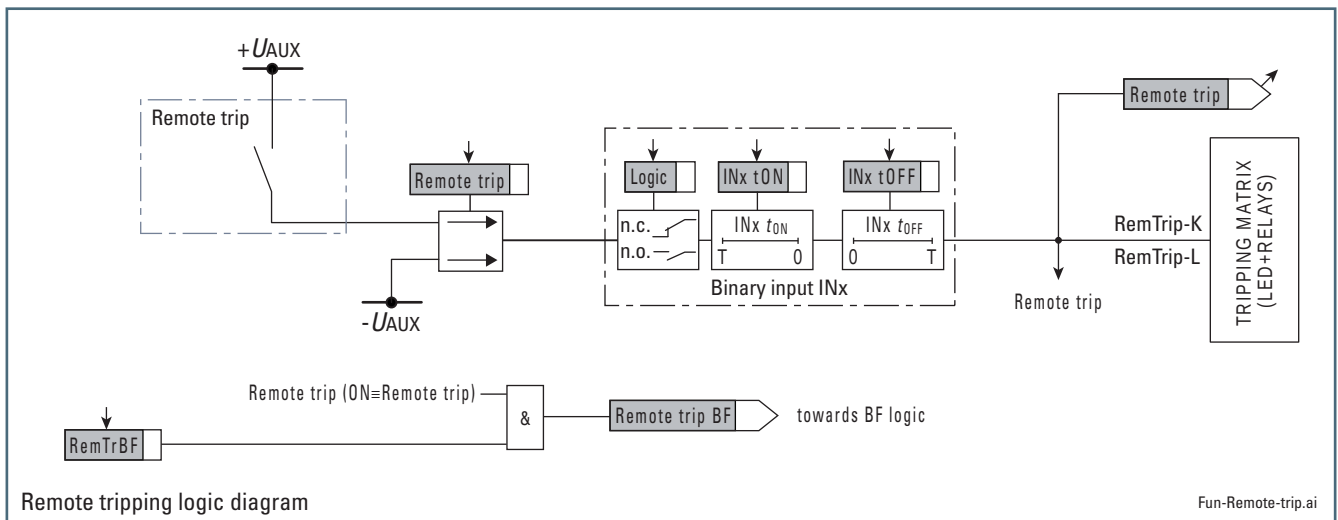
The *Remote trip* matching must be assigned to the selected binary inputs inside the **Set \ Inputs \ Binary input1** or **Set \ Inputs \ Binary inputx** menus.

When a binary input is programmed for remote trip acquisition, the *IN1 tON*, *IN2 tON*, *IN1 tOFF* and *IN2 tOFF* time delays must be reset to zero; the *Logic* parameters (*ON/OFF*) must be programmed in the same way of the related circuit connected with-it.

The *RemTrip-K* matching must be assigned to the selected output relays inside the **Set \ Remote tripping** submenu; the same for addressing the LED indicators (*RemTrip-L*).

When output relays are programmed for remote tripping, the t_{TR} time delays must reset to zero; the operation mode must be set with self reset (*No-latched* inside **Set \ Relays** submenu) and the *Logic* parameters (*Energized/De-energized*) must be programmed in the same way of the related binary input connected with-it.

All the parameters are common for A and B Profiles.



Frequency tracking

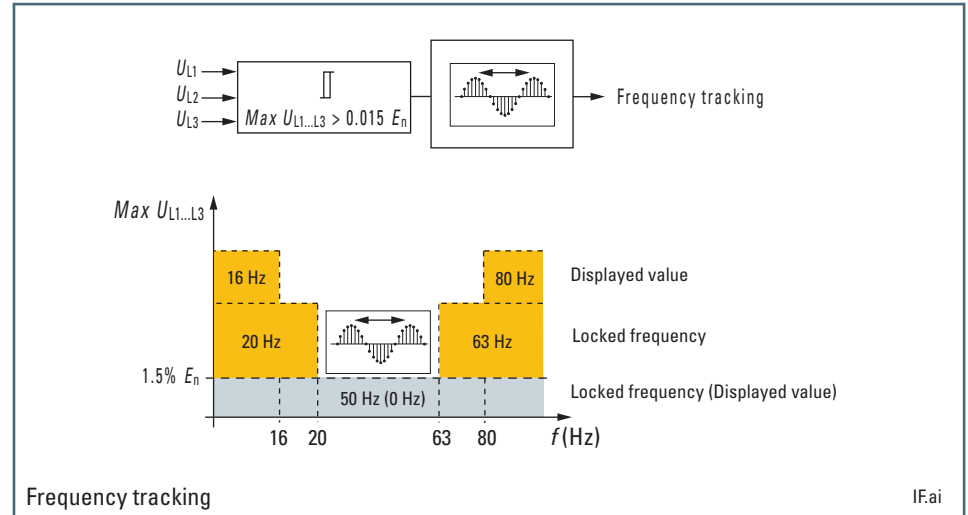
Within the frequency range 20...63 Hz a frequency tracking algorithm adjusts the currents sampling frequency, so as to keep the number of samples in any given period constant.

With 24 samples for periods the sampling rate is adjusted from 480 Hz with $f = 20$ Hz to 1.512 kHz with $f = 63$ Hz.

For a frequency step change the tracking response time is 5 Hz/s for NV10P.

The frequency measure is based on the largest voltage input.^[1]

- If the larger input voltage is lower than 1.5 % E_n the sampling frequency is fixed to f_n (50 or 60 Hz).
- If the measured frequency is outside the locking range, the sampling frequency is fixed to the lower or upper value (20 or 63 Hz).



All protective elements are always operative; accuracy is guaranteed inside locked frequency band.

Note 1 For inputs from sensors versions the frequency is measured on the phase voltages (U_{L1} , U_{L2} , U_{L3}), while for versions with inputs from inductive VTs the frequency is measured on line-to-line voltages (U_{12} , U_{23} , U_{31}).

Inside the diagrams U_{L1} , U_{L2} , U_{L3} are the input phase-to neutral or phase-to-phase voltages according to the corresponding versions

Trip circuit supervision - 74TCS

Preface

The trip circuit can be monitored to signal possible anomalies that would lead to the missing opening of circuit breaker when trip and/or operator command are issued.

Circuit interruption as well as missing of auxiliary voltage and/or coil faults are detected.

Supervision with one or two binary inputs can be selected; depending on association of binary inputs, the corresponding logic is automatically selected.

For this purpose the *TCS1* and *TCS2* (if two binary input are used) matching must be assigned to the selected binary inputs inside the **Set \ Inputs \ Binary input IN1** and **Set \ Inputs \ Binary input INx** menus.

When a binary input is programmed for the TCS function, the *IN1 tON*, *INx tON*, *IN1 tOFF* and *INx tOFF* time delays must be reset to zero and the *Logic* parameter must be set to *Active-ON* inside the **Set \ Inputs \ Binary input IN1** and **Set \ Inputs \ Binary input INx** menus.

Operation and settings

The 74TCS element may be enabled or disabled; to enable it, the *74TCS Enable* parameter must be set to *ON* inside the **Set \ Profile A(B) \ Trip circuit supervision-74TCS** submenu.

A logic block can be set from one binary input.^[1]

If the *74TCS-BLK1* parameter is set to *ON*, and a binary input is designed for logical block (Block1), the TCS supervision function is blocked off whenever the given input is active. The trip timer is held in reset condition, so the operate time counting starts when the input block goes down. The *74TCS-BLK1* parameter is available inside the **Set \ Profile A(B) \ Trip circuit supervision-74TCS** submenu.

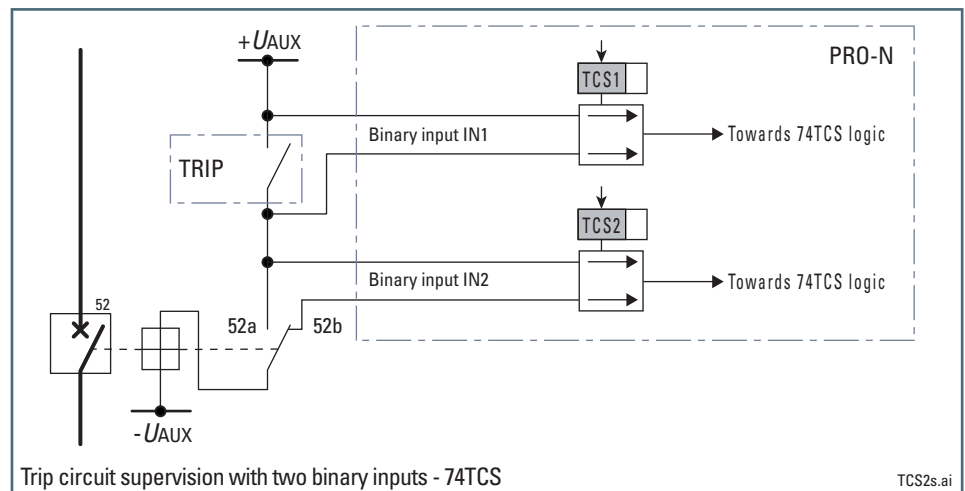
All the parameters can be set separately for **Profile A** and **Profile B**.

Two inputs supervision

With two binary input all malfunctions are detected (inclusive of mechanics faults).

The binary inputs are connected to the trip and to the 52b contacts.

The CB auxiliary voltage must be 36 V at least (twice the minimum threshold for every binary input).



The faulty condition is detected occurs if both the following conditions are filled:

- A) The TRIP contact is closed (external protection relay tripped);
- B) The circuit breaker is closed (52a closed and 52b open).

Because such conditions can arise with healthy circuit too (e.g. a trip command is issued by the protection relay but the CB opening time is still in progress), to avoid untimely operations the previous condition are checked every 80 ms and the output is issued after a 2 s delay; outputs are reset to zero if at least the A or B condition become false after 0.6 s delay.^[2]

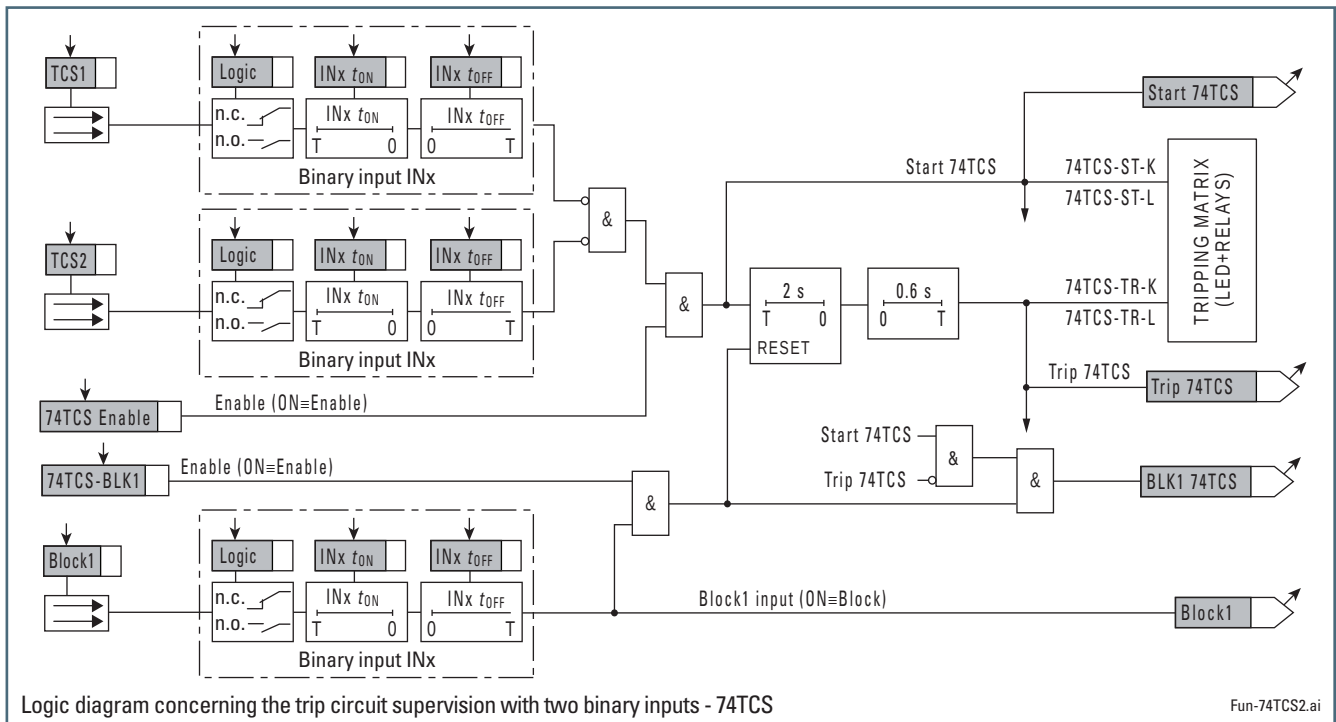
Note 1 Since two binary inputs are just used (TCS1 and TCS2), an external I/O module is required for the logic block function. The exhaustive treatment of the logic block (Block 1) function may be found in the "Logic Block" paragraph inside CONTROL AND MONITORING section

Note 2 Following assumption are considered for the framework:

Logic: ON,

Timers *tON* and *tOFF*: reset to zero

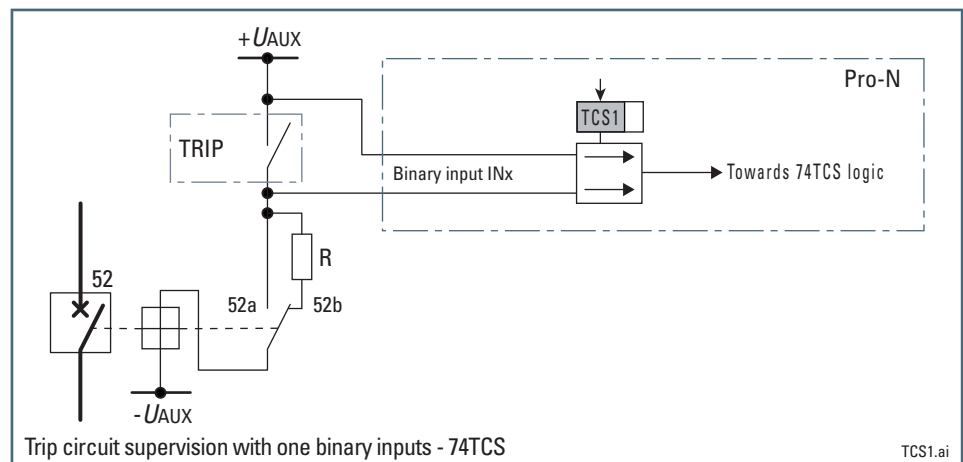
TRIP contact of the protection: DE-energized, No latched



One input supervision

By means of the right sizing of a resistor, the trip circuit supervision may be performed even with lower control voltage (e.g. when the control voltage is less than 36 V required for driving of two binary inputs, typically $U_{AUX} = 24V$).

The binary input is connected to the trip and an external resistor must be connected the 52b auxiliary contact.

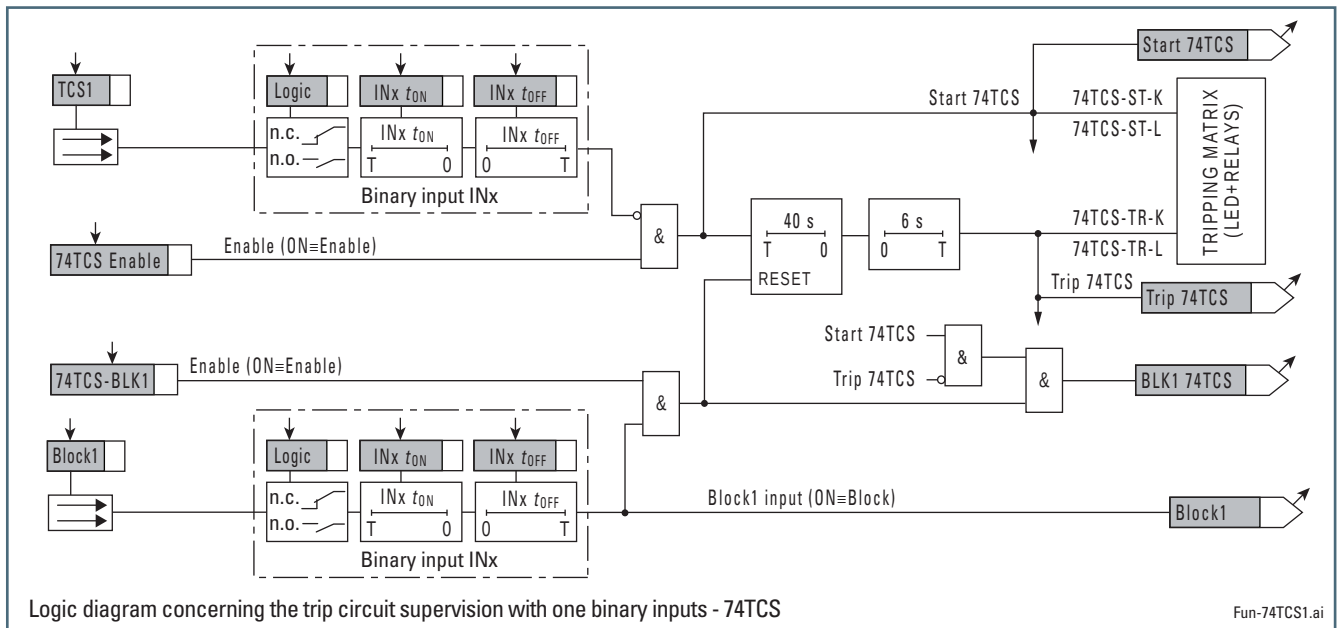


The fault condition of the trip circuit is detected by binary input power down.

With healthy circuit and TRIP contact closed, the binary input is feed across the 52a path (CB closed) or across the resistor R and 52b path (CB open).

When the TRIP contact turns ON, the binary input becomes short-circuited; to avoid untimely operations the previous condition are checked every 80 ms and the output is issued after a 40 s delay in order to allow the fault clearing and the consequent reset of the TRIP protection.

Outputs are reset to zero after 6 s from the TRIP contact open.^[1]



How to calculate resistance

Both the following conditions must be filled:

- 1) The circuit breaker coil must no be powered when the CB is open and an open command is issued;
- 2) The binary input is energized when the trip contact open.

1) If the circuit breaker is just open an unnecessary excitation must be avoided; the most critical event arises when the TRIP contact is closed (e.g. manual or test command), so with minimal series resistance. To avoid an unwanted excitation the series resistance must be higher than a minimum value defined as:

$$R_{\min} = R_{TC} \cdot (U_{AUX} - U_{TCmin}) / U_{TCmin}$$

where:

U_{TCmin} : minimum coil excitation voltage
 U_{AUX} : auxiliary voltage
 R_{TC} : coil resistance

2) To energize the binary input circuit when the TRIP contact and CB open, the series resistance must be lowerer than a maximum value defined as:

$$R_{\max} = [(U_{AUX} - U_{DIGmin}) / I_{DIG}] - R_{TC}$$

where:

U_{DIGmin} : minimum binary input excitation voltage (18 V)
 U_{AUX} : auxiliary voltage
 R_{TC} : coil resistance
 I_{DIG} : binary input excitation current (0.003 A)

To satisfy the above requirements, the R value must be chosen between the $R_{\min}$ and $R_{\max}$ values; typically the normalized value nearest the arithmetic mean:

$$R = (R_{\min} + R_{\max}) / 2$$

The power dissipated by the R resistor is:

$$P_R = R \cdot I^2 = R \cdot [U_{AUX} / (R + R_{TC})]^2$$

Example

$U_{AUX} = 110 \text{ Vcc}$ (auxiliary voltage)
 $P_{TC} = 50 \text{ W}$ (coil power)
 $R_{TC} = U_{AUX}^2 / P_{TC} = 242 \Omega$ (coil resistance)
 $U_{TCmin} = 77 \text{ V}$ (minimum coil excitation voltage = 70% U_{AUX})
 $U_{DIGmin} = 18 \text{ V}$ (minimum binary input excitation voltage)
 $I_{DIG} = 0.003 \text{ A}$ (binary input excitation current)

$$R_{\min} = R_{TC} \cdot (U_{AUX} - U_{TCmin}) / U_{TCmin} = 242 \cdot (110 - 77) / 77 = 103.7 \Omega$$

$$R_{\max} = [(U_{AUX} - U_{DIGmin}) / I_{DIG}] - R_{TC} = [(110 - 18) / 0.003] - 242 = 30425 \Omega$$

$$R = (R_{\min} + R_{\max}) / 2 = (103.7 + 30425) / 2 = 15264 \Omega \sim 15 \text{ k} \Omega$$

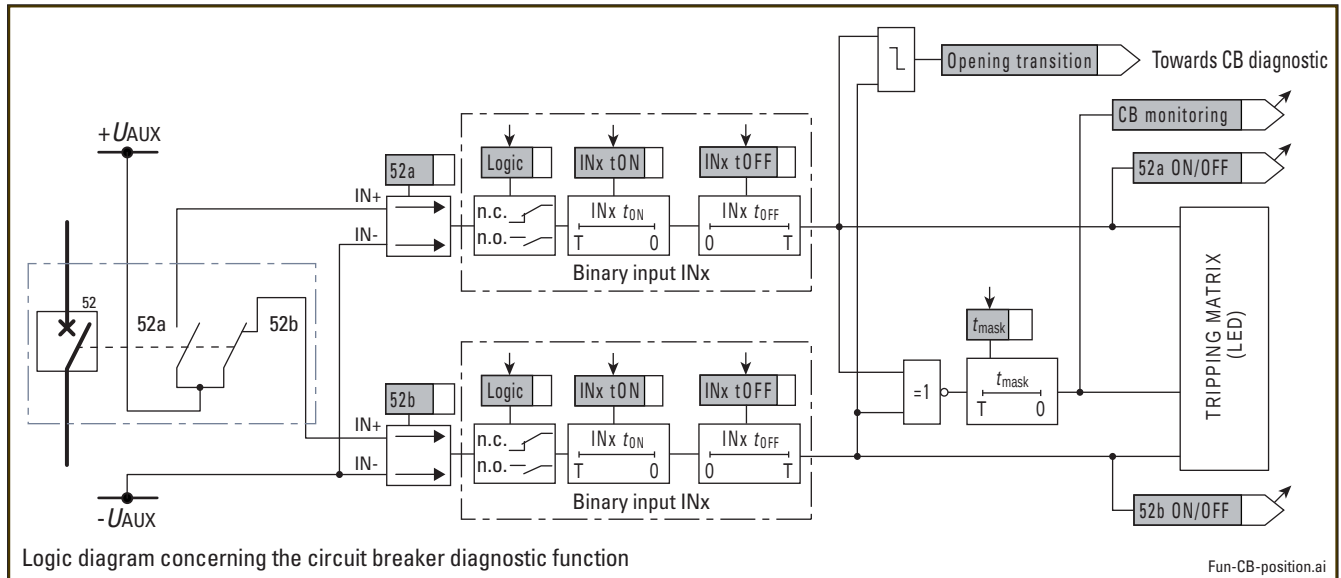
$$P_R \text{ (Power dissipated by the R resistor)} = U_{AUX}^2 / R = 110^2 / 15000 = 0.8 \text{ W}$$

Circuit breaker supervision

Preface

Several diagnostic metering and monitoring function are available:

- By means 52a and 52b auxiliary contacts, the CB position is acquired. Depending on such information the Open and/or Close commands can be safely issued by user.
- An adjustable threshold can be set for a wear estimate of the breaker contacts; the current values (ΣI or ΣI^2) are summed and compared to a user-adjustable threshold. When the threshold or the number of operations is exceeded the relay can activate an output relay. The function helps to adjust maintenance planning.
- By means 52a and 52b auxiliary contacts, the opening time is calculated and compared to a user-adjustable threshold. If the threshold is exceeded the relay can activate an output relay.



Operation and settings

According to the conventional contact position

- 52a is the auxiliary contact that is in the same position as the circuit breaker, (52a open = CB open),
- 52b is the auxiliary contact that is in the opposite position as the circuit breaker, (52a open = CB closed).

To acquire the CB position, the 52a and 52b function must be set inside the **SetInputs\Binary input 1** and **SetInputs\Binary input 2** menus. The **IN1 tON**, **IN2 tON**, **IN1 tOFF** and **IN2 tOFF** time delays must be reset to zero and the **Logic** parameter must be set to **Active-ON** inside the **SetInputs\Binary input IN1** and **SetInputs\Binary input IN2** menus.

CIRCUIT BREAKER COMMANDS

Two output relays can be set to command CB opening and closing; the **CBopen-K** and **CBclose-K** function must be set inside the **SetCircuit breaker supervision\LEDs-relays allocation** menu; the CB position can be visualized by means two LEDs (**CBopen-L** and **CBclosed-L** parameters).

All the parameters are common for **Profile A** and **Profile B**.

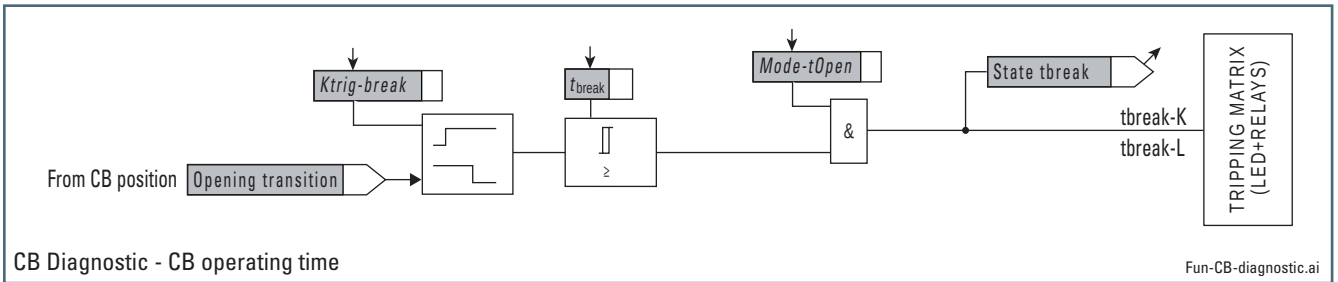
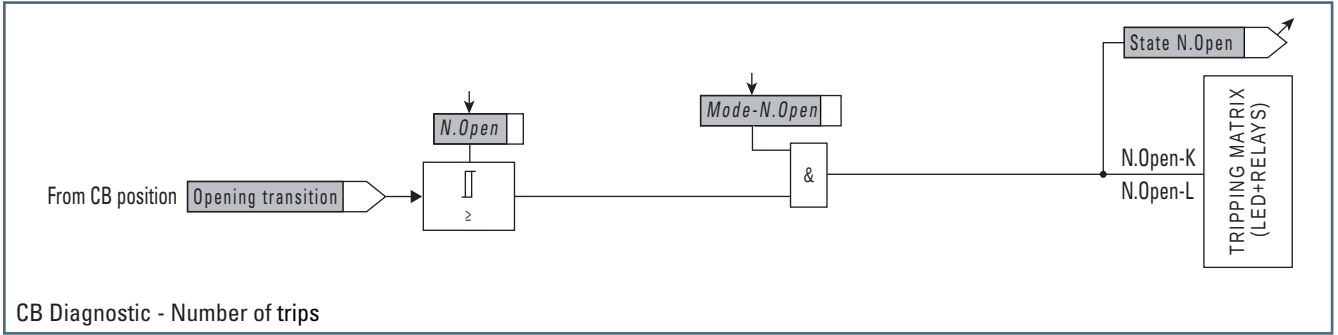
CIRCUIT BREAKER DIAGNOSTIC

Four different criteria can be select.

- 1) Number of CB trip mode (**ModeN.Open ON**). When the number of operations (**N.Open**) is exceeded, an output relay and/or LED can be activated.
- 2) Cumulative CB currents mode (**ModeSumI ON**). When the per-phase value exceeds the threshold, an output relay and/or LED can be activated.
- 3) Cumulative CB I^2t mode (**ModeSumI²t ON**). The tripping energy I^2t is calculated on the base of current measure at the time of the open command on the base of the circuit breaker opening time provided for I^2t calculation (**tbreak**). When the per-phase value exceeds the threshold, an output relay and/or LED can be activated.
- 4) CB operating time mode (**Mode-tOpen ON**). The time interval between the trip command and the CB open acquisition is calculated on the base of a programmable relay (**Ktrig-break**). When the time interval (**tbreak**) is exceeded, an output relay and/or LED can be activated.

The four criteria can be contemporaneously or separately set.

All the named parameters are available inside the **SetCircuit Breaker supervision\CB Diagnostic** menu.



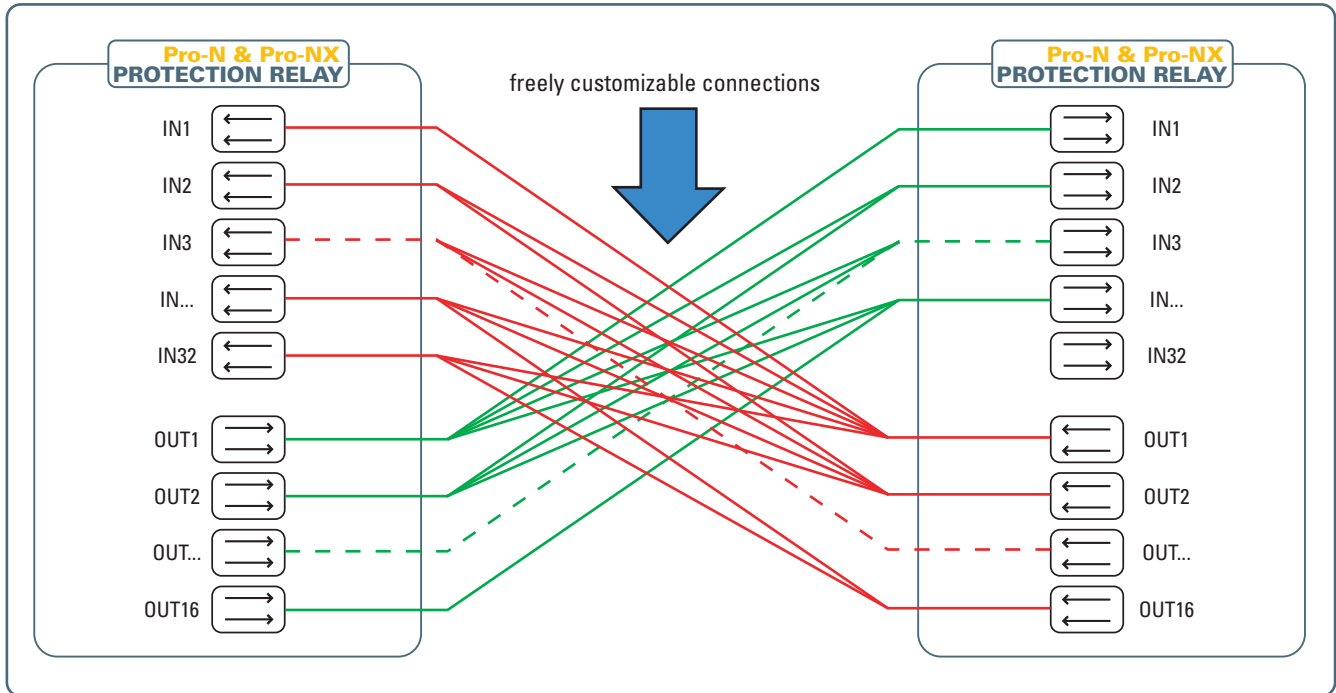
Virtual I/O

Preface

By ThyVisor and ThyVisor software tools the type of operation and links between outputs (Virtual Output - VOUT1 ... 16) and virtual inputs (Virtual Inputs - VIN1 ... VIN32) may be defined using RPC or IEC 61850 communication protocols over Ethernet network.

The system allows:^[1]

- Availability of sixteen inputs and thirty-two outputs independently programmable by the user
- Simplify wiring using one channel as the Ethernet
- Eliminate the need to install communication devices and / or external conversion
- Significantly reduce costs
- Dynamically change from sw connections and associated functions.



Applications

With Pro-N and Pro-XX relay the virtual I / O can be usefully employed for:

- Transmit information between protections installed in significant distance where the traditional connections are critical in terms of reliability.
- Making OR logic for opening control of multiple DDI (simultaneous control of all DDI operated by each SPI) in cases of multiple interface protections (Smart Grids)
- Achieve accelerated logic discrimination in which some protection elements can be blocked by the activation of the downstream protection start; this allows to reduce the clearing time that, in time logic systems require trip time significantly long in correspondence of the power source.
- Circuit breaker commands
- Selection of setting profiles
- Remote trip
- Include I / O in the programmable logic (PLC)
- etc. ..

Virtual Outputs:

The t_V , t_{F-IPh} and t_{F-IE} timers start when the virtual output goes ON; the virtual output are disabled (OFF) when the timers expire; if the t_V , t_{F-IPh} and t_{F-IE} timers are cleared the virtual output follows the associated signal state (Start, Trip, Digital IN).

The setting ranges are:

Start reset time for voltage elements (t_V)	0.00...30.00 s (step 0.01 s)
Start reset time for phase current elements (t_{F-IPh})	0.00...30.00 s (step 0.01 s)
Start reset time for ground current elements (t_{F-IE})	0.00...30.00 s (step 0.01 s)
Trip reset time (t_{Trip})	0.00...30.00 s (step 0.01 s)

All settings are available inside the **Set \ Virtual Outputs \ Settings** menu.

Virtual Inputs:

LinkLoss timer 3.0...60.0 s (step 0.1 s)

If the Virtual input is set for Remote Trip, in case of outage of the communication network, when the count expires the remote trip is issued.

The setting is available inside the **Set \ Virtual Inputs \ Settings** menu.

Each virtual input can be associated with one of the following functions:

FUNZIONI	Ingressi virtuali								
	VIN1 Function (A)	VIN1 Funct. (B)	VIN1 -K	VINx Funct.(A)	VINx Funct.(B)	VINx -K	VIN32 Function (A)	VIN32 Funct. (B)	VIN32 -K
Reset LEDs	■			■			■		
Set profile (switching setting A and B)	■			■			■		
Fault trigger (fault recording)	■			■			■		
Block1 (logic block)	■			■			■		
TCS1 (Trip Circuit Supervision)	■			■			■		
TCS2 (Trip Circuit Supervision)	■			■			■		
Trip ProtExt	■			■			■		
Reset counters	■			■			■		
Reset CB Monitor	■			■			■		
52a (CB auxiliary contact)	■			■			■		
52b (CB auxiliary contact)	■			■			■		
Open CB	■			■			■		
Close CB	■			■			■		
Remote trip	■			■			■		
74VT ext.	■			■			■		
f<-f> Control	■			■			■		
UE>>	■			■			■		
27V1	■			■			■		
59V2	■			■			■		
U<	■			■			■		
K1			■			■			■
K2			■			■			■
K3			■			■			■
K4			■			■			■
K5			■			■			■
K6			■			■			■
K7			■			■			■
K8			■			■			■
K9			■			■			■
K10			■			■			■

Each virtual output can be associated with one of the following functions:

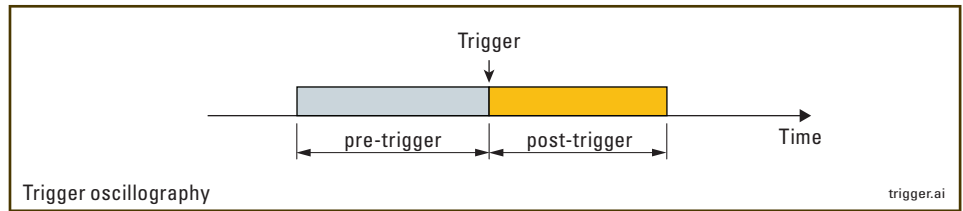
FUNCTIONS	Uscita virtuale VOUT1				Uscite virtuali VOUT2...16			
	Start	Trip	Input Mask1	Input Mask2	Start	Trip	Input Mask1	Input Mask2
UE>>	■				■			
27V1	■				■			
59V2	■				■			
U<	■				■			
TEST_START	■				■			
U<TR		■				■		
U<<TR		■				■		
U>TR		■				■		
U>>TR		■				■		
UE>TR		■				■		
UE>>TR		■				■		
Th1>TR (Pt100 probe)		■				■		
Th2>TR		■				■		
Th3>TR		■				■		
Th4>TR		■				■		
Th5>TR		■				■		
Th6>TR		■				■		
Th7>TR		■				■		
Th8>TR		■				■		
74TCS-TR		■				■		
BF-TR		■				■		
TEST_TRIP		■				■		
U1<-TR		■				■		
Uavg>-TR		■				■		
U2>-TR		■				■		
f>TR		■				■		
f>>TR		■				■		
f<TR		■				■		
f<<TR		■				■		
f<<<TR		■				■		
f<<<<TR		■				■		
df>TR		■				■		
df>>TR		■				■		
df>>>TR		■				■		
df>>>>TR		■				■		
IN1			■				■	
IN2			■				■	
IN3			■				■	
IN4			■				■	
IN5			■				■	
IN6			■				■	
IN7			■				■	
IN8			■				■	
IN9			■				■	
IN10			■				■	
IN11			■				■	
IN12			■				■	
IN13			■				■	
IN14			■				■	
IN15...IN32			■				■	
IN33				■				■
IN34				■				■
IN35				■				■
IN36				■				■
IN37				■				■
IN38				■				■
IN39				■				■
IN40				■				■
IN41				■				■
IN42				■				■

Oscillography

Trigger Setup

Following parameters, available inside the **Set \ Oscillography \ Trigger Setup** menu, are user-programmable:

- *Pre-trigger time* and *Post-trigger time*.



- *Element pickup trigger*; the information recording starts when a state transition on any protective element occurs if the parameter is set to *ON*.
- *Trigger from outputs*; the information recording starts when a state transition on the selected output relay occurs if the parameter is set (K1...K6).
- *Binary input trigger*; the information recording starts when a state transition on the selected binary input occurs if the parameter is set to *ON*.
- *Trigger from inputs*; the information recording starts when a state transition on the selected binary input occurs if the parameter is set (IN1...INx).
- *80% Buffer alarm*; when the 80% of the buffer space is reached an alarm may be issued if the parameter is set to *ON*.

Set sampled channels

The desired sampled quantities may be select inside the **Set \ Oscillography \ Set sampled channels** menu (u_{L1} , u_{L2} , u_{L3} , u_E).

Set analog channels

The desired sampled quantities may be select inside the **Set \ Oscillography \ Set analog channels** menu.

Everyone of twelve analog channel may be associated to one of the selected measures (f_{UL1} , f_{UL2} , f_{UL3} , u_{L1} , u_{L2} , u_{L3} , u_{I2} , u_{I23} , u_{I31} , u_E , u_{EC} , u_I , u_2 , df/dt , $T1...T8^{[1]}$).

Set digital channels

The desired digital quantities may be select inside the **Set \ Oscillography \ Set digital channels** menu. Everyone of twelve digital channel may be associated to one of the selected I/O signal (K1... K6, K7... K10, IN1, IN2, IN3...IN42^[2]).

Note 1 The 26 menu is available when the MPT module is enabled

Nota 2 The output relay K7...K10 and binary input IN3...IN42 states is meaningful when the I/O circuits are present (MRI and MID16 modules)

5 MEASURES, LOGIC STATES AND COUNTERS

Measures

Direct

- Frequency $(f_{UL1}, f_{UL12}, f_{UL13})$
- Phase voltages RMS value of fundamental component (U_{L1}, U_{L2}, U_{L3})
- Residual voltage RMS value of fundamental component (U_E)

Calculated

- Phase-to-phase voltages^[1] $(U_{12}-U_{23}-U_{31})$
- Maximum voltage between $U_{L1}-U_{L2}-U_{L3}$ (U_{Lmax})
- Average voltage between $U_{L1}-U_{L2}-U_{L3}$ (U_L)
- Calculated residual voltage (U_{EC})
- Positive sequence voltage (U_1)
- Negative sequence voltage (U_2)
- Third harmonic of residual voltage (U_{E-3rd})
- Frequency rate of change (df/dt)

Averages

- Phase average voltages $(U_{L1avg}, U_{L2avg}, U_{L3avg})$
- Phase-to-phase average voltages $(U_{12avg}, U_{23avg}, U_{31avg})$
- Maximum voltage between $U_{L1avg}, U_{L2avg}, U_{L3avg}$ $(U_{Lavgmax})$
- Maximum voltage between $U_{12avg}, U_{23avg}, U_{31avg}$ (U_{avgmax})

Protection

For each protection threshold, the following data are available:

- Start *ON/OFF*
- Trip *ON/OFF*
- Logic block (Block1) *ON/OFF*

Delayed inputs

The binary input states, acquired downstream the delay timers are available:

- IN1 *ON/OFF*
- IN2 *ON/OFF*

Internal states

The state of the functions assigned to binary inputs are available (**ReadInternal states**):

- Reset LEDs *ON/OFF*
- Profile selection *ON/OFF*
- Fault trigger *ON/OFF*
- Block1 *ON/OFF*
- Tcs1 *ON/OFF*
- Tcs2 *ON/OFF*
- Trip External protections *ON/OFF*
- Reset partial counters *ON/OFF*
- Reset CB monitoring data *ON/OFF*
- 52a *ON/OFF*
- 52b *ON/OFF*
- Open CB *ON/OFF*
- Close CB *ON/OFF*
- Thermal image presetting *ON/OFF*
- Remote trip *ON/OFF*
- 74VT ext. *ON/OFF*
- f<-f> Control *ON/OFF*

Relays

For every output relay, the output operating state and diagnostic are available (**ReadRelays** menu):

- K1 State *ON/OFF*
- K1 Diagnostic *OK/NOT OK*
- K2 State *ON/OFF*
- K2 Diagnostic *OK/NOT OK*
- *ON/OFF*
- K6 State *ON/OFF*
- K6 Diagnostic *OK/NOT OK*

Counters

For every element two set of counters are available (Partial counters and Total counters); the partial counters can be cleared by the user level, while the Total counter reset can be achieved with password (Session Level 1).

Every partial counter is reset to zero when ten thousand count is passed.

All partial counters can be cleared by means a single command; for this purpose the Reset partial counters command must be issued (**Commands \ Reset** submenu).

- 27 - Counters
- 27V1 - Counters
- 59 - Counters
- 59V2 - Counters
- 59Uavg - Counters
- 59N - Counters
- 810 - Counters
- 81U - Counters
- 81R - Counters
- 74TCS - Counters
- CB - Counters
- BF - Counters

Partial counters

- xx Start partial counter (xx = I>, I>>,....) 0...9999
- xx Trip partial counter (xx = I>, I>>,....) 0...9999
- xx Block1 partial counter (xx = I>, I>>,....) 0...9999
- xx Block2 partial counter (xx = I>, I>>,....) 0...9999

Total counters

- xx Start total counter (xx = I>, I>>,....) 0...9999
- xx Trip total counter (xx = I>, I>>,....) 0...9999
- xx Block1 total counter (xx = I>, I>>,....) 0...9999
- xx Block2 total counter (xx = I>, I>>,....) 0...9999

Self test

Proper management (programming and remote monitoring) of the self-diagnosis function ensures the fast detection of most of the protection system failures and significantly reduces the need for periodic testing.

Following anomalies (MINOR) are not relevant (the protective elements continue to work):

- Oscillography run-time OK/NOT OK
- Data Bus minor OK/NOT OK
- Protection I/O assigned run-time minor OK/NOT OK
- PLC I/O not-matching run-time minor OK/NOT OK

Lower level diagnostic (MINOR) can be output or ignored; for this purpose the *MINOR Fail alarm* parameter can be set *ON* or *OFF* inside the **Set \ Self test relay** submenu.

All remaining anomalies **disables all protective functions**^[1]

- Protection and controls ON SERVICE/OUT OF SERVICE
- System diagnostic OK/NOT OK
- Device diagnostic OK/NOT OK
- Program diagnostic OK/NOT OK
- Data-base boot OK/NOT OK
- Data-base runtime OK/NOT OK
- DSP boot OK/NOT OK
- DSP run-time OK/NOT OK
- Memory boot OK/NOT OK
- Memory run-time OK/NOT OK
- Data Bus heavy OK/NOT OK
- PLC boot OK/NOT OK
- PLC run-time OK/NOT OK
- Protection I/O assigned verify startup OK/NOT OK
- Protection I/O assigned verify run-time major OK/NOT OK
- Total protection I/O assigned not-matching 0
- PLC I/O assigned not-matching OK/NOT OK
- PLC I/O assigned not-matching run-time major OK/NOT OK
- Total PLC I/O assigned not-matching 0
- MMI module Boot OK/NOT OK
- MMI module Run-time OK/NOT OK
- MRI module Boot OK/NOT OK
- MRI module Run-time OK/NOT OK
- MID16-1 module Boot OK/NOT OK
- MID16-1 module Run-time OK/NOT OK
- MID16-2 module Boot OK/NOT OK
- MID16-2 module Run-time OK/NOT OK
- PT100 module Boot OK/NOT OK
- PT100 module Run-time OK/NOT OK
- Current loop module Boot OK/NOT OK
- Current loop Run-time OK/NOT OK

The diagnostic alarms can be allocated to an output relay; the *Self-test relay* parameter (K1...K6) is available inside the **Set \ Self-test Relay** submenu.

When a higher level anomaly is recognized **all protective functions are disabled** and the output relays switch in no-trip state:

- rest state if the output relay are set in *De-energized* mode (contacts as shown in the diagrams)
- active state if the output relay are set in *Energized* mode (opposite to what is shown in the diagrams).

Note 1 The relays are being switched in rest position (ON if set with Energized logic - OFF if set with De-energized logic)

The connections of the trip and diagnostic relays must be performed according to the application: when the output relay must be normally energized and the circuit breaker must be open in case of failure of the protection system, the self-test function must be enabled and assigned to the normally energized relay selected for tripping.

Fault recording - SFR

Recording is triggered by one or more causes (up to 8 simultaneous):

- Activation (OFF-ON transition) of any relay programmed for trip of protection or control element
- External trigger (binary input programmed as *Fault trigger*)

Twenty events are recorded into a circular FIFO (First In, First Out) buffer.^{[1][2]}

Following information are stored in every record:

- Fault counter^[3]
- Date and time
- Fault cause (element trip)
- Input phase voltages U_{L1r} , U_{L2r} , U_{L3r}
- Input phase-to-phase voltages U_{12r} , U_{23r} , U_{31r}
- Phase average voltages U_{L1avgr} , U_{L2avgr} , U_{L3avgr}
- Phase-to-phase average voltages U_{12avgr} , U_{23avgr} , U_{31avgr}
- Measured residual voltage U_{Er}
- Calculated residual voltage U_{ECr}
- Positive sequence voltage U_{1r}
- Negative sequence voltage U_{2r}
- Frequency f_{UL1r} , f_{UL2r} , f_{UL3r}
- Frequency rate of change df
- Inputs IN1-IN2-...
- Outputs K1-K6
- Fault cause info (eg. faulted phase)

Event recording - SER

Recording is triggered by one or more causes:

- Start and/or trip of any enabled protection or control element
- Binary input activation (OFF-ON or ON-OFF transition)
- Power-on or power-down (Auxiliary power supply)
- Setting change.

Three hundred events are recorded into a circular FIFO (First In, First Out) buffer.^{[2][4]}

Following information are stored in every record:

- Event counter^[5]
- Date and time
- Event cause (binary input/element trip/setting change)

Oscillography - DFR

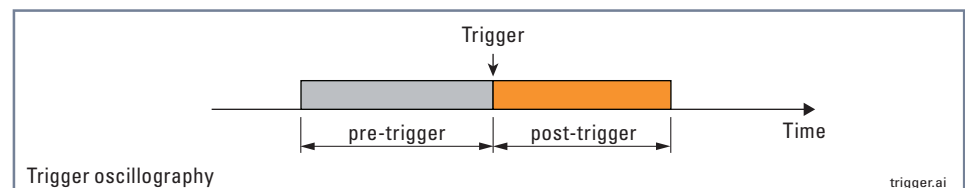
Upon programmable trigger, the fault records are recorded in COMTRADE format; the sampled measures (24 sample per cycle) are stored in a circular shift memory buffer.

The fault record are self-triggered; they are stored in sequential order up the allocated memory is used up after which the oldest memory is overwritten.

An operating procedure example for the digital fault recording is illustrated inside the ThyVisor section.

Following parameters are user-programmable:

- Pre-trigger and post-trigger time
- Selected sampled quantities.
- Analog channels (1...12) allocation.
- Digital channels (1...12) allocation (output relay and/or binary inputs).
- Trigger setup; the information storage starts when a state transition on the selected signal occurs. (protective element start and/or trip, output relay and/or binary input switching).
- Alarm: when the 80% of the buffer space is reached an alarm may be issued. The system being of linear type, the records are back-to-back recorded to the end of available memory; the alarm output is a warning in order that the user may download the data FLASH^[6] to clear memory for new records.



Note 1 Fault 0 is the newest fault, while the Fault 19 is the oldest fault

Note 2 Data are stored in non volatile memory; they are held in spite of power down

Note 3 Counter is updated at any new record; it may be cleared by means ThyVisor

Note 4 Event 0 is the newest event, while the Event 299 is the oldest event

Note 5 Counter is updated at any new record; it may be cleared by means ThyVisor

Note 3 Data are stored into non volatile memory FLASH, they are preserved also when power goes down

Following parameters are user-programmable:

Sample channels

- Instantaneous value for input voltages u_{L1} , u_{L2} , u_{L3}
- Instantaneous value for residual voltage u_E

Analog channels

- Frequency f_{UL1} , f_{UL12} , f_{UL13}
- Fundamental component for input phase voltages U_{L1} , U_{L2} , U_{L3}
- Fundamental component for input phase-to-phase voltages U_{12} , U_{23} , U_{31}
- Fundamental component for measured residual voltage U_E
- Fundamental component for calculated residual voltage U_{EC}
- Fundamental component for positive sequence voltage U_1
- Fundamental component for negative sequence voltage U_2
- Frequency rate of change df/dt

Digital channels

- Binary inputs
- Output relays

COMTRADE

Records are recorded in COMTRADE format; (Common Format for Transient Data); This is a standard for the data exchange for various types of tests or simulation datas, etc, for power system applications.

The measurements are recorded in ASCII or BINARY format. COMTRADE files always come by pairs:

- The ".CFG"-file describing the configuration: number of analog and digital channels, sampling rate, scale factors, etc.
- The ".DAT"-file containing the data

The COMTRADE is part of IEC 60255-24 standard.

The recording can be analyzed by mean of ThyVisor sw or any other standard compliant viewer.

The record quantity (max 400 records) is depending on settings of following parameters:

- Pre-trigger and post-trigger times
- Number of allocated channels.

By means of the following formula the record quantity may be evaluated:

$$N = \text{int} \left[\frac{12000}{(34 + 20 v_i + 4 v_{RMS} + n_B) \cdot (t_{pre} + t_{post})} \cdot \frac{50 \text{ (Hz)}}{f \text{ (Hz)}} \right]$$

where:

N : record quantity

v_i : sampled measures

v_{RMS} : analog measures (RMS)

n_B : logic variables

t_{pre} : pre-trigger time interval

t_{post} : post-trigger time interval

f : frequency

Example 1

With the following setting:

- Pre-trigger: 0.25 s
- Post-trigger: 0.25 s
- Sampled measures: u_{L1} , u_{L2} , u_{L3} , u_E
- Analog measures: U_{L1} , U_{L2} , U_{L3} , U_E
- Logic variables: K1, K2, K3, K4, K5, K6, IN1, IN2

180 record can be stored if $f = 50 \text{ Hz}$

Example 2

With following setting:

- Pre-trigger: 0.25 s
- Post-trigger: 02.5 s
- Sampled data: u_{L1} , u_{L2} , u_{L3} , u_E
- Analog measures: U_{L1} , U_{L2} , U_{L3} , U_E
- Digital channels: K1, K2, K3, K4, K5, K6, IN1, IN2

up to 150 records can be stored if $f = 60 \text{ Hz}$

6 INSTALLATION

6.1 PACKAGING

Packaging consists of a polystyrene foam packaging guaranteeing adequate protection for transport and storage under normal environmental conditions.

The Pro_N protection relays must be stored within the required temperature limits; the relative humidity should not cause condensation or formation of frost.

It is recommended that the devices are stored in their packaging; in the case of long storage, especially in extreme climatic conditions.

It is recommended that the packaging not be disposed of into the environment, but kept in case the relay should be moved at some later time.

6.2 MOUNTING

The Pro_N protection relays are housed inside metal cases suitable for various kinds of assembly:

- Flush mounting
- Projecting mounting
- With separate operator panel
- 19 " Rack.

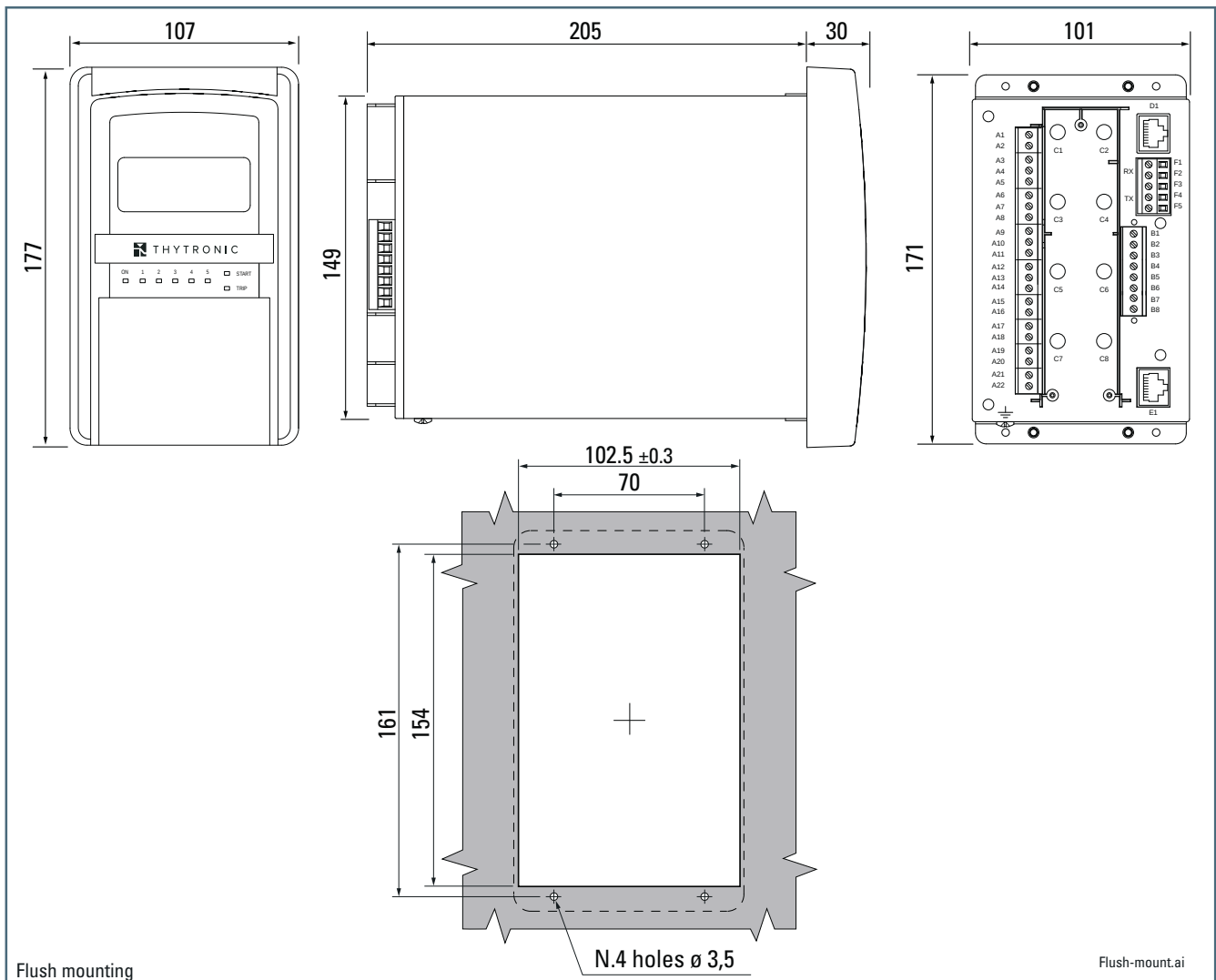
Removability is ensured to facilitate maintenance operations so that the electronic module can be replaced; this provides minimum downtime and maximum protection availability.

Flush mounting

The fixed case, fitted with special fastening brackets, is mounted on the front of electric control board, previously drilled as indicated in the drawing.

In case of side-by-side mounting of several relays the minimum drilling distance is determined by the front dimensions indicated in the overall dimensions drawing, increased by 3 mm, to ensure an adequate tolerance and gasket space between adjacent relays.

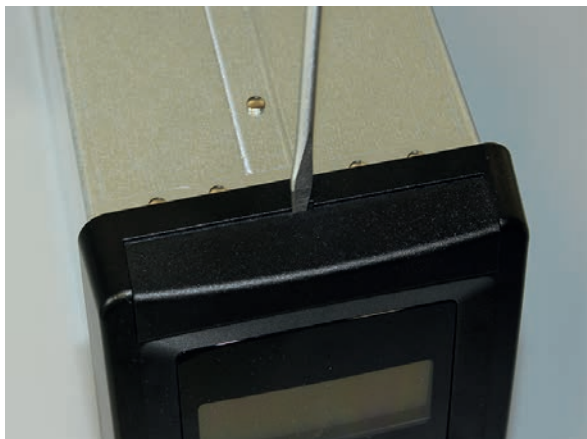
The depth dimension, as indicated in the drawing, must be increased by as much as needed to allow room for the wiring.



NOTE

Separation of fixed and removable parts is NOT required

- Remove the upper tile and open the little door to access the fastening screws.

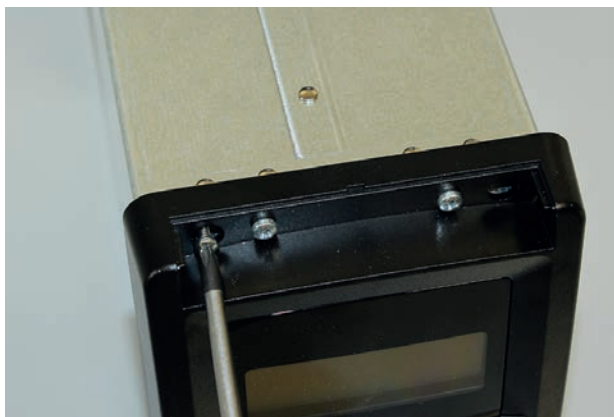


Removing tile to access the fastening screws



Remove-tile.ai

- The fixed case is fastened by means of four screws onto the panel as indicated in the drawing.



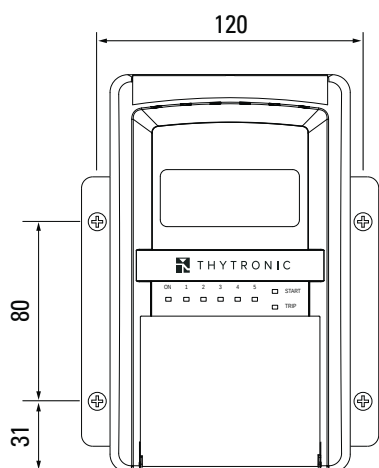
Four screws



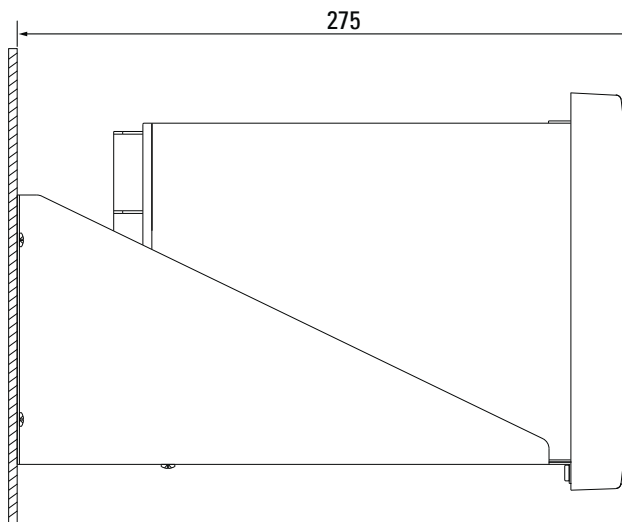
Flush-mount1.ai

Projecting mounting

- Remove the ground screw and open the little door to access the fastening screws.
In case of side-by-side mounting of several relays, the minimum fixing distance is determined by the dimensions of the mounting plate indicated in the overall dimensions drawing, increased horizontally and vertically by as much as needed to allow room for the wiring and to ensure an adequate tolerance between the apparatus.



Projecting mounting

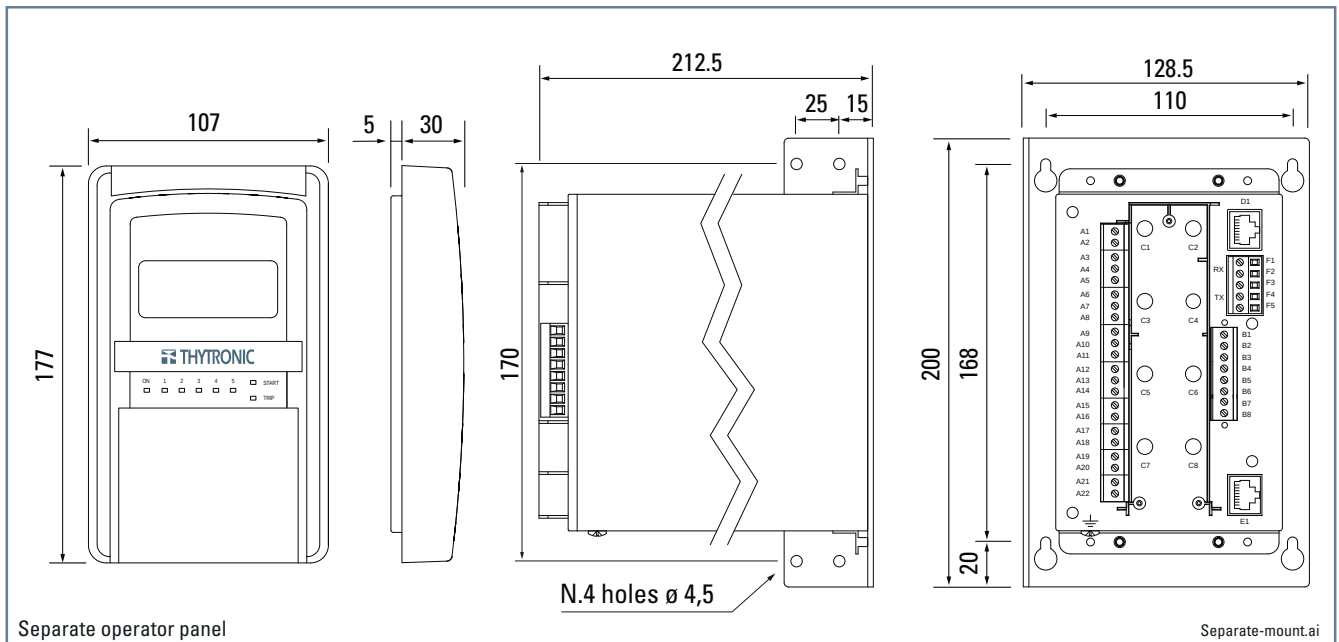


Projecting.ai

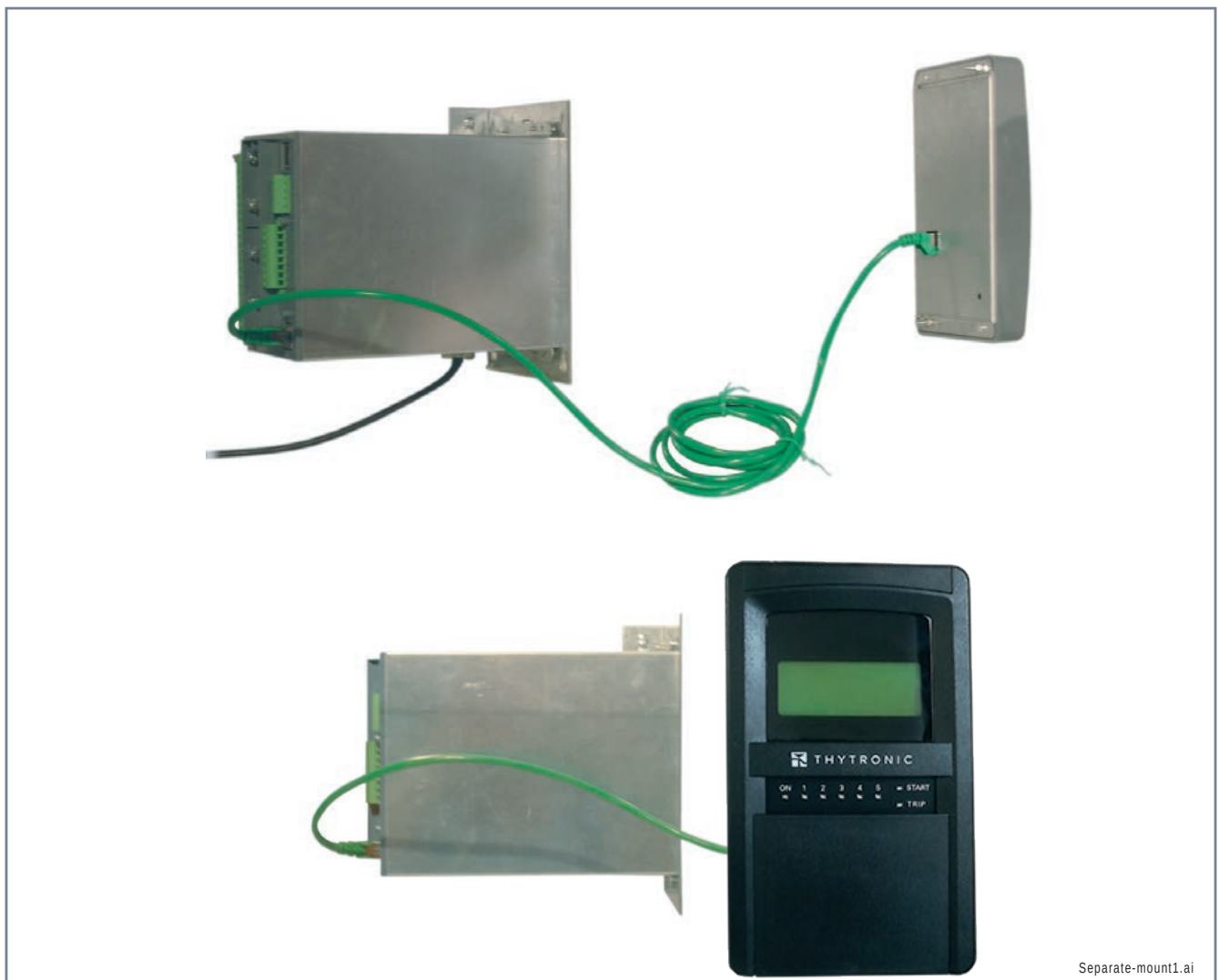
Separate operator panel

The solution with projecting assembly and a separate operator panel is particularly suitable for limited in depth installations.

Cutout dimension and mounting steps concerning the separate operator panel are the same for the flushing mounting (see previous pages).

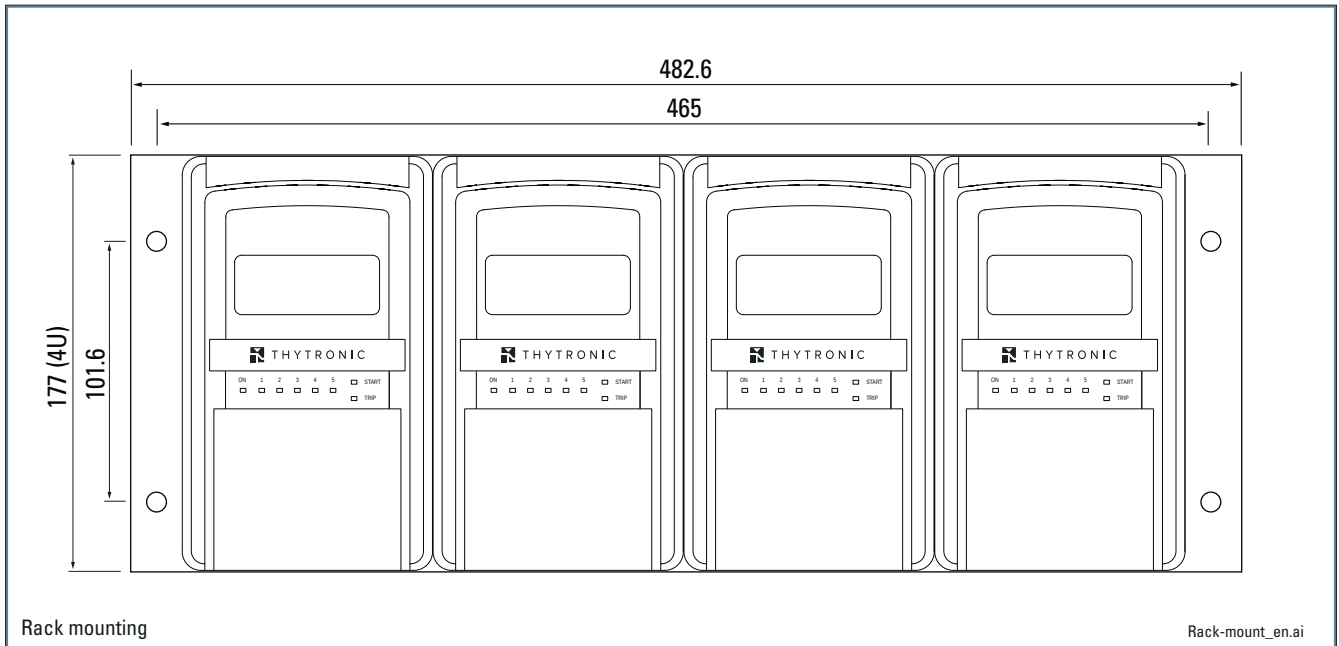


A standard direct shielded cable with RJ45 connectors must be used for connections.



Rack mounting

For mounting inside a standardized 19-inch system (EIA 310-D, IEC 60297 and DIN 41494 SC48D), the MAR adapter is required (frame available on request).



To allow opening of the keyboard door a one unit space must be provided when several rack are overlapping mounted.

6.3 ELECTRICAL CONNECTIONS

Electrical connections should be made by referring to the connection diagram; in cases where certain of the circuits (communication, block, or others) are not used, the relevant connections must remain open.

Examples of connection diagrams are reported on Appendix to this manual.



CAUTION

Devices must be installed by qualified personnel only.
No liability is accepted from Thytronic due to improper use.

A protective ground connection is required, which must be connected to the suitable screw with a separate lead of at least 2.5 mm².

Screw terminals are available for the connections, the use of terminals is recommended.

For the A1...A22 connections, screw terminals with following characteristics are available:

- Nominal cross section: 0.14...2.5 mm² (AWG 26...16) for single conductor
da 0.14 a 0.75 mm² for two conductors with same cross section
- Tightening torque: 0.5-0.6 Nm
- Stripping length: 8 mm

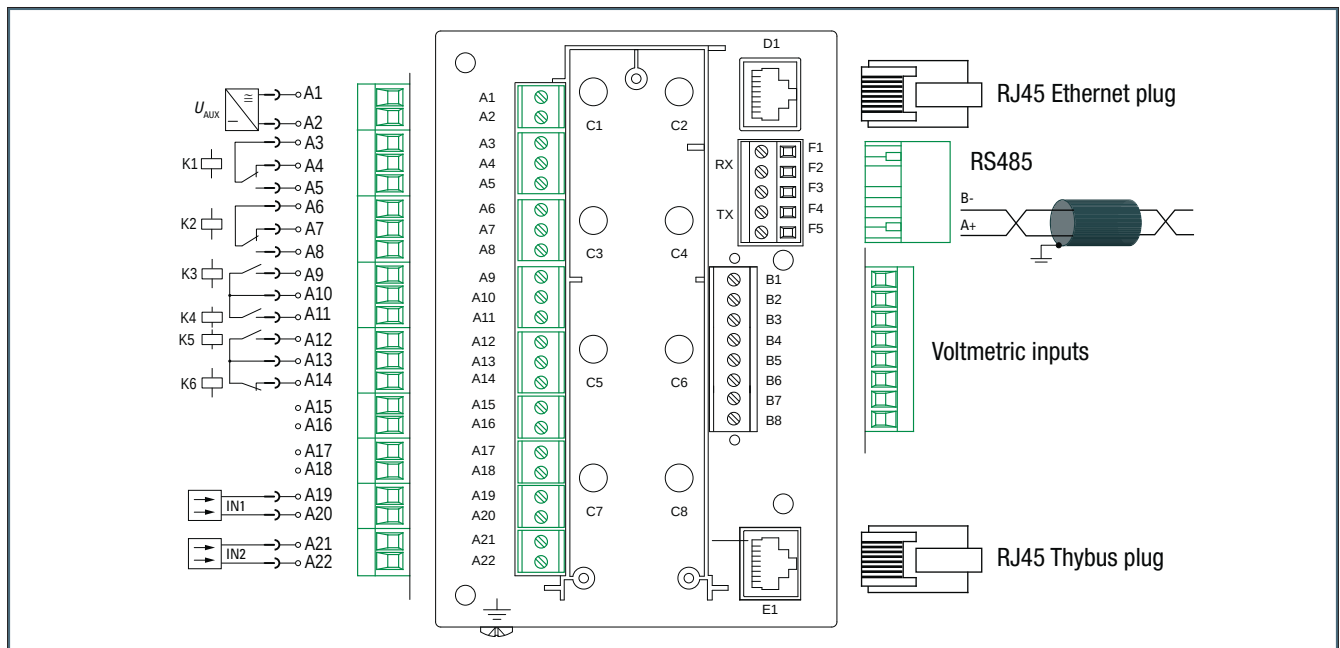
For the B1...B8 connections, screw terminals with following characteristics are available:

- Nominal cross section: da 0.2 a 2.5 mm² (AWG 24...12) for single conductor
da 0.2 a 1.5 mm² for two conductors with same cross section
- Tightening torque: 0.5-0.6 Nm
- Stripping length: 7 mm

For the F1...F5 (RS485) connections, screw terminals with following characteristics are available:

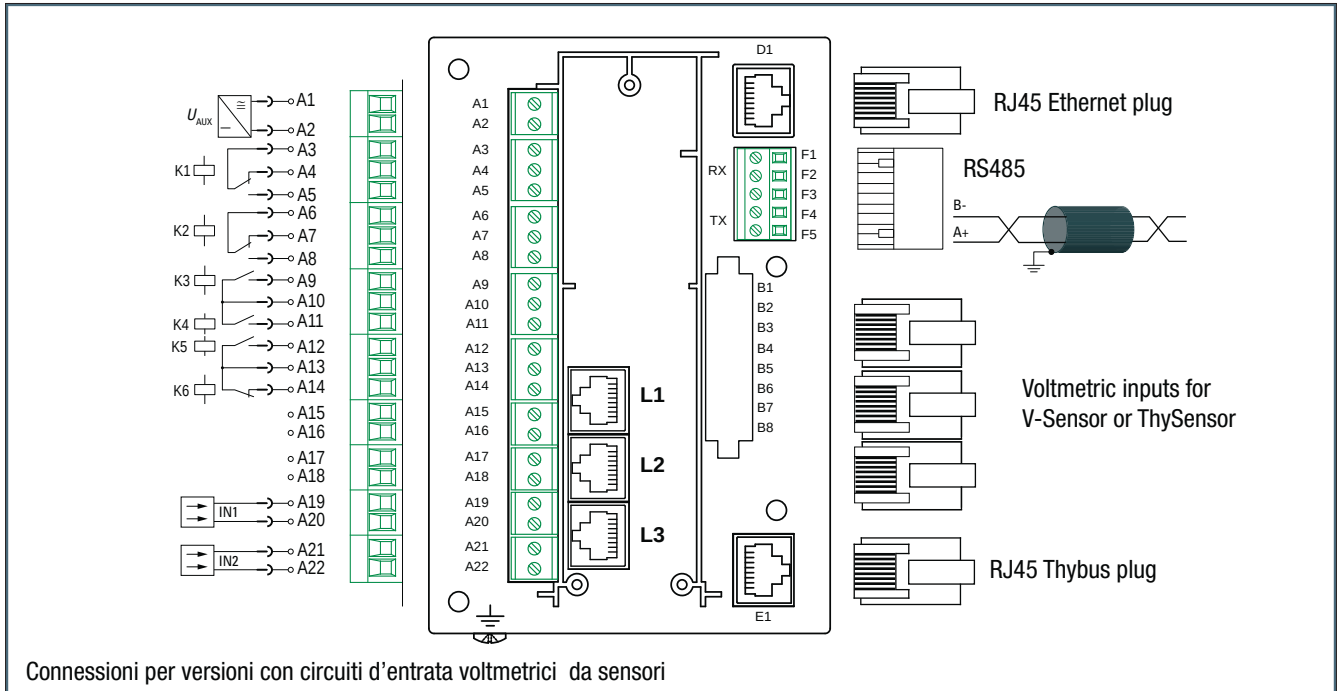
- Nominal cross section: da 0.2 a 2.5 mm² (AWG 24...12) for single conductor
da 0.2 a 1.5 mm² for two conductors with same cross section
- Tightening torque: 0.5-0.6 Nm
- Stripping length: 10 mm.

*Inductive VTs
or direct connection*

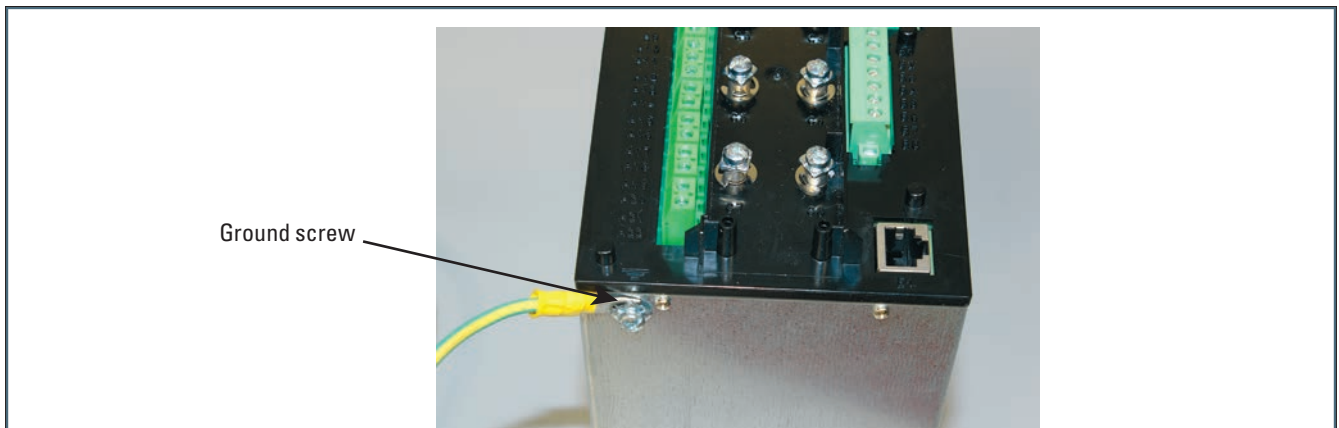


Electronic sensor inputs

Links to the voltage inputs are made via wired RJ45 plugs..

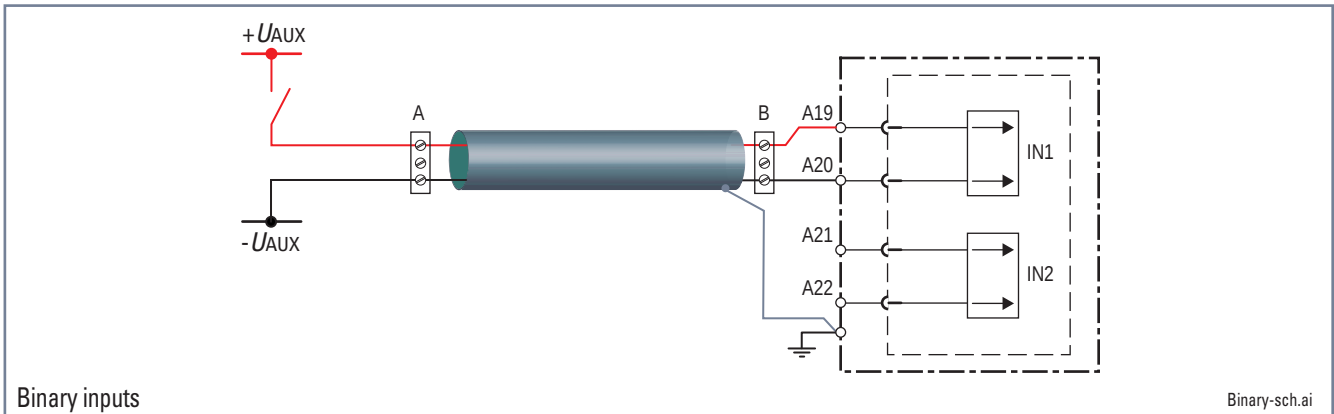


A protective ground connection is required, which must be connected to the suitable screw with a separate lead of at least 2.5 mm².



Binary inputs

The dry input circuits, despite being galvanically isolated, must preferably be supplied with the same auxiliary voltage of the control panel.
The inputs are polarity free with wide voltage range.



The optoisolated inputs are immune to transitory interferences, however the following recommendation must be considered in high disturbed environments:

- Position input wiring away from high energy sources.
- Set a debounce timer (tON and/or tOFF) to allow the transient to decay.
- Use shielded cables with ground connection on only one end (preferably at the relay side).

Output relays

Six output relays are available.

It is advisable to verify that the technical characteristic of the contacts be suitable for the applied load (about current, nominal voltage, make and break current , etc..).

Output relay K1 and K2 have one change over contacts (SPDT, type C).

Output relay K3 and K4 have one make contact (SPST-NO, type A) and a common reference (A10 terminal).

Output relay K5 and K6 have one make contact (SPST-NO, type A for K5), one break contact (SPST-NC, type B for K6) and a common reference (A13 terminal).

All contacts are shown in de-energized state for standard reference.



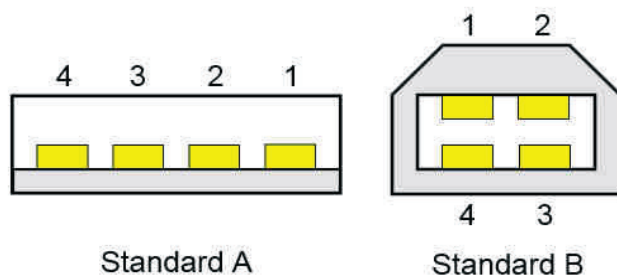
CAUTION

It is advisable to verify that the technical characteristic of the contacts be suitable for the applied load (about current, nominal voltage, make and break current , etc..).

For all diagrams the output contacts are shown in de-energized state for standard reference.

USB port

The link from PC and NV10 USB port must be established by the cable L10042 (USB Type B - Type A)



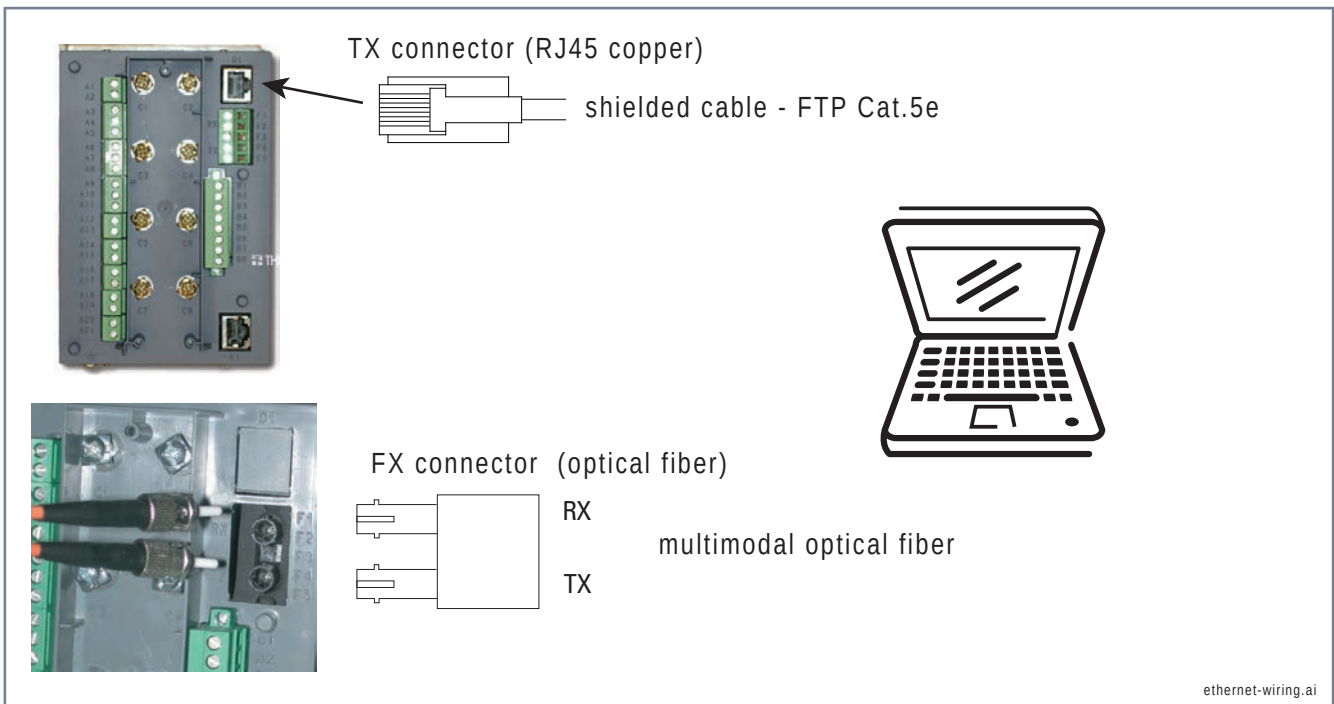
After installation, the same communication port must be selected to define the ThyVisor parameters (typically COM4, COM5,...).

Ethernet port

One RJ45 (copper) or FX (optics fiber) port may be provided.

Connections to the TX (RJ45) port must be made with shielded cable FTP Cat.5e category or higher.

For testing a PC may be directly connect to the Ethernet port (D1) on the rear side.
With TX interface a cross cable must be employed, while an Ethernet-optical fiber converter, suitable for 100 Mb data rate must be employed if an FX port is implemented.



The link must be enabled by means ThyVisor sw and USB connection:

- Set the IP address (*Host IP address e IP net mask*) in order that the NA10 and PC parameters are matched; the parameters are inside the **Communication \ Ethernet** submenu.
- Set to *OFF* the *Autonegotiation* parameter of NA10 device (*Autonegotiation* parameter inside **Communication \ Ethernet** submenu).

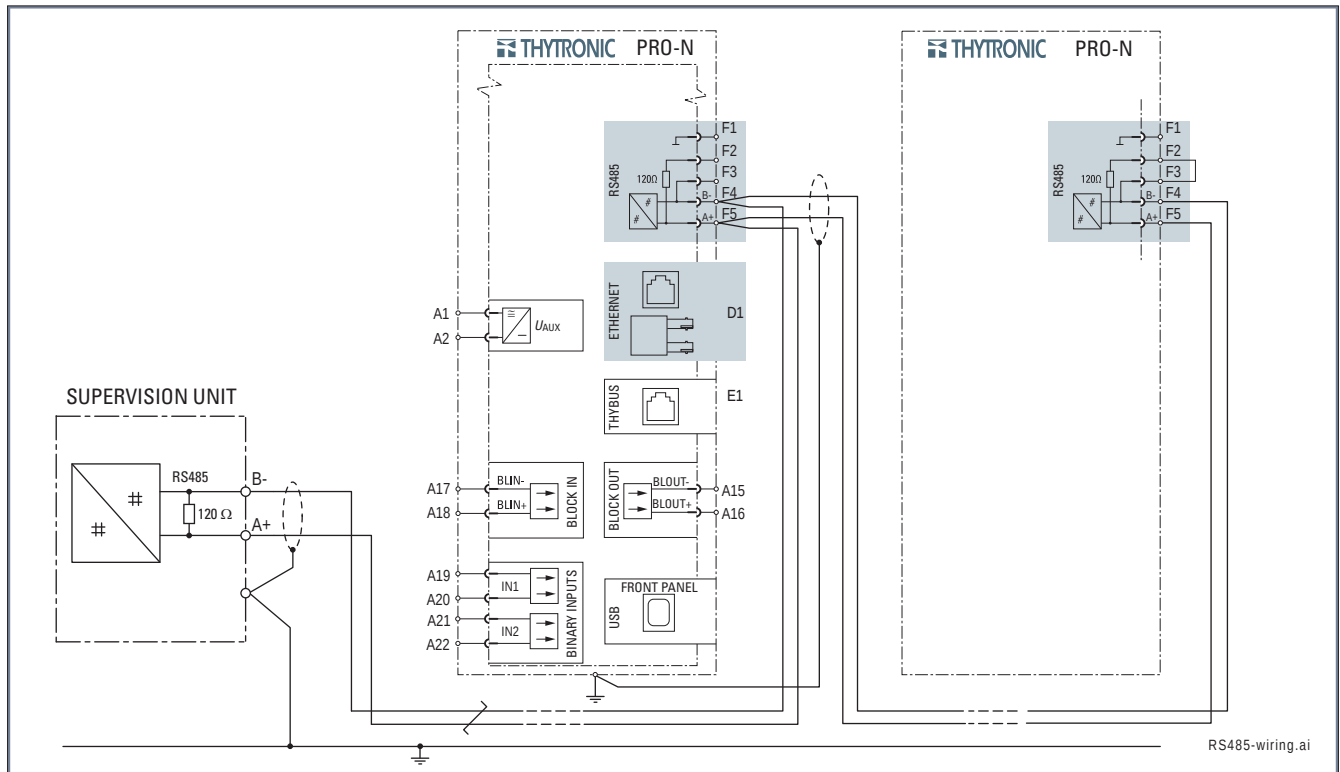
For security reasons, a change of the Ethernet communication parameters become active only after an hw reset.

RS485 port

RS485 communication circuit connections must be made using screened twisted pair cable observing the polarities; screening must only be connected to the end terminating at the RS485 interface

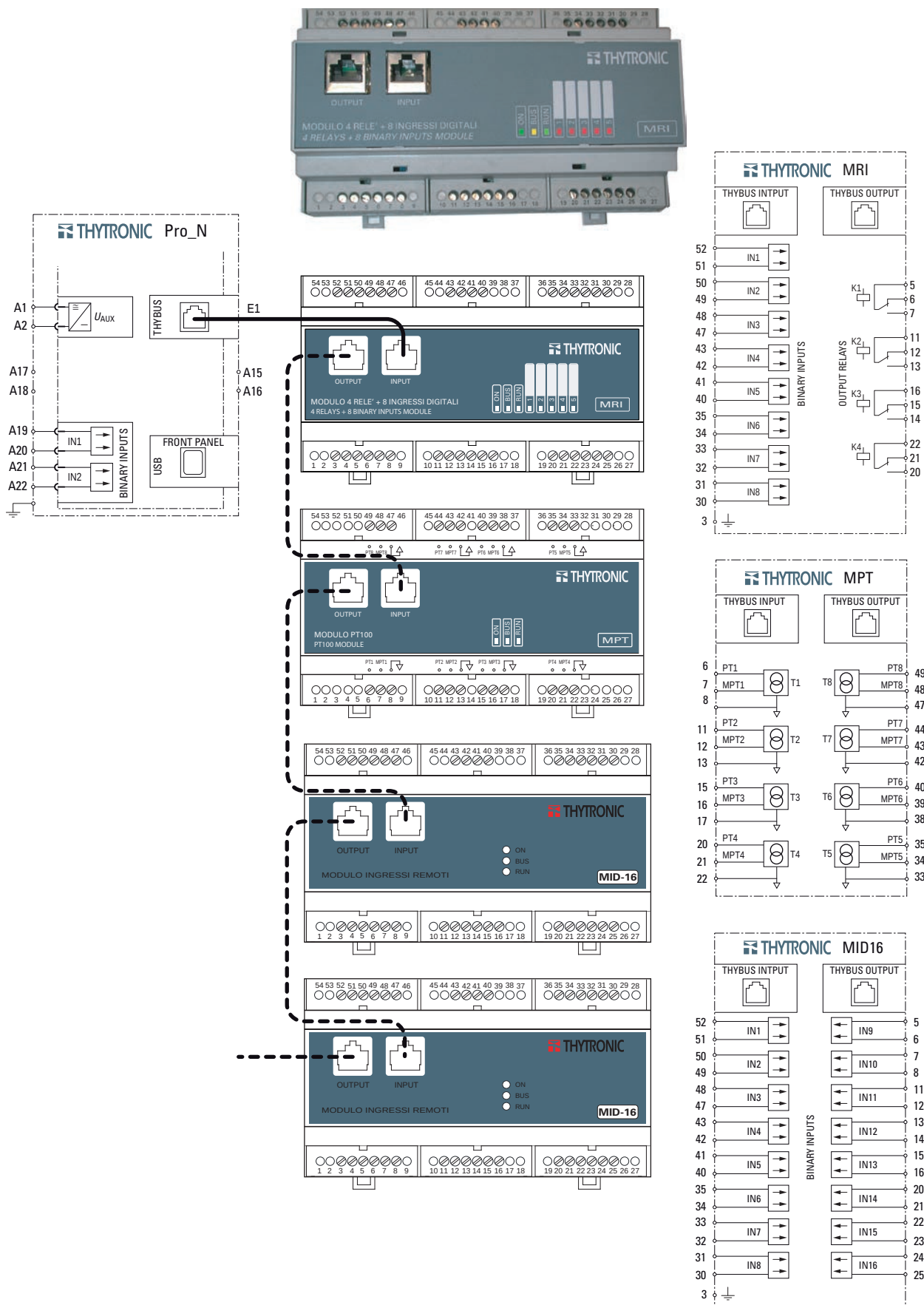
circuit pertaining to the monitoring unit.

It is recommended to terminate the line at the extremities of the same; this must be performed on the RS485 line control unit and on the NV10 device placed at the furthest point connecting the specially provided resistor; termination can be made by means a jumper between the F2-F3 terminals. Termination resistors allow adjusting the impedance of the line, reducing the influence of the inductive components of the same, which might compromise good communication.



Thybus port

In order to extend I/O capability, the Pro_N relays can be customized through external auxiliary modules; moreover 4...20 mA converter and temperature measuring modules are provided. The modules do not need external auxiliary supply. It is fed directly by Thybus port. The Thybus link must be carried out by means category 5 shielded cable with RJ45 connectors.



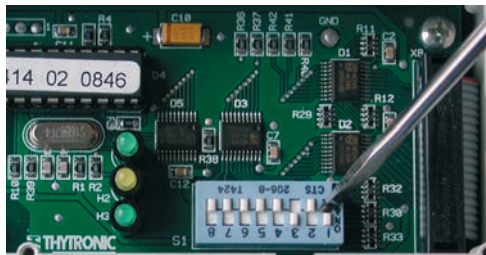
The maximum length of the Pro-N device - module link is:

- 2 m for MRI module (max one module)
- 20 m for MMOS-4 module (max one MMI module)
- 30 m for MID16 and MPT modules
- 30 m for MPT module (max one Pt100 module)
- 30 m for MCI module (max one current converter module)

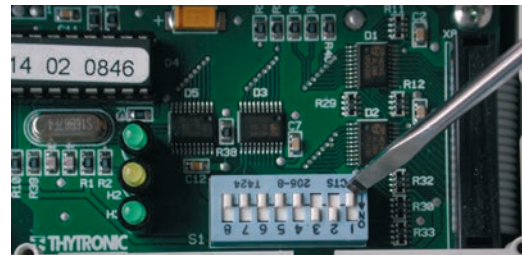
For upgrading, that may be operated at any time with in service devices too, the following operations must be performed:

- Turn OFF power supply
- Connect the auxiliary modules to the Thybus port in daisy chain mode following the INPUT-OUTPUT sequence.^[1]

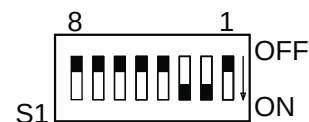
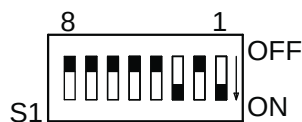
If two MID16 (binary inputs) are installed, the hardware address must be set to avoid communication collisions on the Thybus; for this purpose the default address must be changed on one module, by means of dip-switch on the top circuit board (front plate must be removed).



default address



modified address (2nd MID16 module)



MID16 hardware address setting

DIP-MID16.ai

- Turn on power
- Go on to the sw setting (see SETTING section of instruction manual).

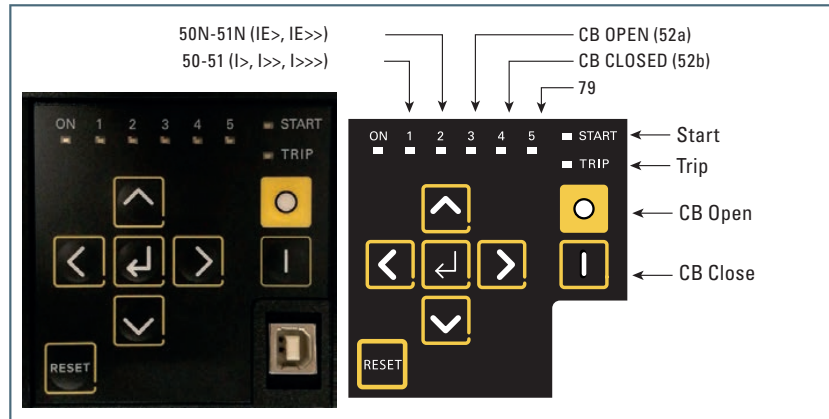
Note 1 The insertion order is free.

One MRI module, two MID16 modules, one MPT module, one MCI module and one MMI module (separate operator panel) can be connect at the same time to the Thybus port (maximum expansion).

6.4 LED ALLOCATION

Following indicator LEDs are available on the front panel:

- LED ON (green): if no diagnostic anomalies are detected, the green LED is turned ON while any fault is highlighted by flashing.
- LEDs 1...5 (red) are freely assignable from the user to any protective and/or control functions.
- LED START (yellow) committed for start information of any protective functions.
- LED TRIP (red) committed for trip information of any protective functions.



6.5 FINAL OPERATIONS

Before energizing the electric board, it is advisable to check that:

- The auxiliary voltage in the panel falls within the operative range of Pro_N relays.
- The relay rated voltage (100 V or 400 V) corresponds to the Pro_N input voltages.
- All wirings are correct.
- All screws are tightly screwed.

7 PROGRAMMING AND SETTINGS

All relay programming and adjustment operations may be performed through MMI (keyboard and display) or using a Personal Computer with the aid of the ThyVisor software.



WARNING

For safety reasons, a change of the following parameters become active only after an hw reset:

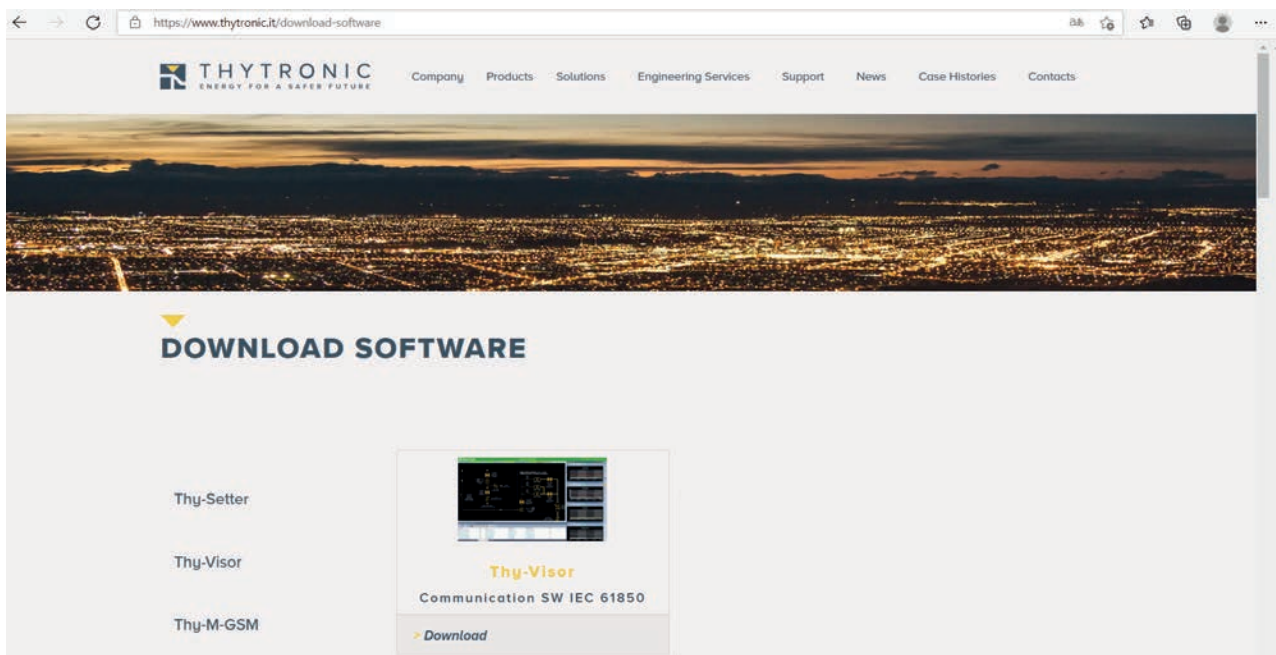
- Relay nominal frequency (f_n)
- The changes become operational after the relay is turned off and on again.

7.1 SW ThyVisor

The ThyVisor sw is a “browser” of data (setting, measure, etc..); it implements an engine that is afford to rebuild the menu set up and the relationships to data concerning all Thytronic protective relays by means of XML files.

ThyVisor installation

The latest release of ThyVisor can be downloaded free of charge from the www.thytronic.it site (Products - Software).^[1]



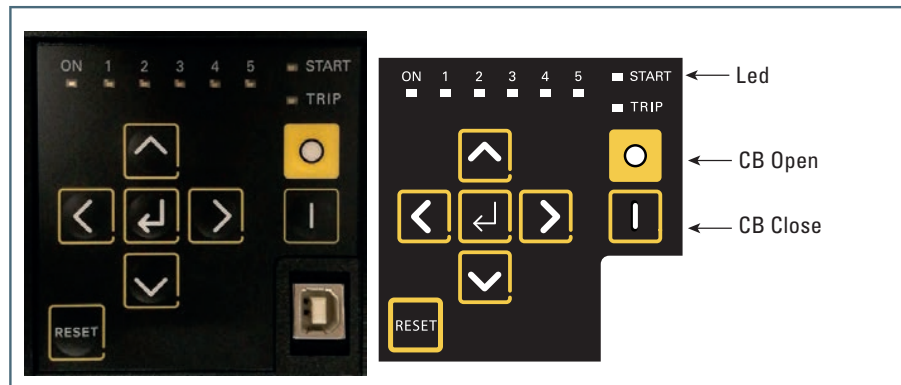
ThyVisor use

Please refer to ThyVisor user manual for detailed instructions.
The document is available on www.thytronic.it (Product / Software / ThyVisor - Download area).

Note 1 Starting from the 3.5.9 release it is necessary to download and install not only the application setup but the Template setup also. In case off updating download and install only the new release.

7.2 MMI (Man Machine Interface)

On the front panel there are eight buttons which allow the user to perform all the settings, reading and modification operations.^[1]



The adjustment of the settings and the operation mode of the output relays must be performed while the unit is electrically powered; the alphanumeric display shows the necessary information with reference to the operations performed through the keyboard. One minute after the keyboard is not more in use, the display backlight switches automatically to OFF. All preset values are permanently stored in the nonvolatile memory.

The buttons take the following operations:

- **Up** (Up) move the cursor upwards to the preceding menu options
- **Down** (Down) move the cursor downwards to the subsequent menu options
- **Left** (Left) move the cursor upwards to the preceding menu options
- **Right** (Right) move the cursor downwards to the subsequent menu options
- **Enter** (Enter) access to the selected menu with the option of modifying any given parameter
- **Reset** (Reset) abort the current changes and/or accessing the previous menu
- **Circle** (Circuit breaker Open command)
- **Bar** (Circuit breaker Close command)

At power-up, the display shows the text:

"THYTRONIC

PRO-NA10-xxx-x serial number

date and time: (01/01/2000 00:00"

The ON green Led points out the auxiliary power supply voltage (permanent lighted) and possible faults (blink lighted).

The display backlight is automatically activated when any key switch is set.

By means of the **Up** or **Down** buttons, it is possible to cyclically browse through the menu options:

READ, SET, COMMUNICATION, TEST

Having identified the sub-menu of interest, it is possible to gain access by using the **Right** button and then analogously, run through the relevant options by using the **Up** or **Down** buttons.

The full menu tree and some examples are showed in the following pages (numerical values and settings are pointed out as examples and does not agree with real situations).

Reading variables (READ)

All data (measure, settings, parameters, etc...) may be displayed:

```
"SERIAL NUMBER    >>"
"INFO             >>"
"MEASURES         >>"
"ACTIVE PROFILE   >>"
"PROTECTIONS      >>"
"PLC              >>"
"CIRCUIT BREAKER SUPERVISION >>"
"DELAYED INPUTS   >>"
"INTERNAL STATES  >>"
"RELAYS           >>"
"PARTIAL COUNTERS >>"
"TOTAL COUNTERS   >>"
"SELF-TEST        >>"
"PILOT WIRE DIAGNOSTIC >>"
"SELECTIVE BLOCK BLOCK2 >>"
"FAULT RECORDING  >>"
"EVENTS RECORDING >>"
```

Setting modifying (SET)

Note 1 Setting changes are enabled when the La mEnabling setting by MMI parameter is set

All changes in the setting parameters are carried out through MMI only if the Enable setting by MMI parameter is ON. (ENABLE SETTING BY MMI submenu inside the SET menu).

To effect a change, having identified the parameter intended for change, the following procedure must be performed:

- Select the parameter going through the menus by means the **Up**, **Down** and **Right** keys.
- Press the **Enter** button for a few seconds; the modification in progress status is highlighted by flashing of the START and TRIP LEDs and by appearance of the pointer on the bottom.
- Move the cursor over the parameter intended for change using the **Enter** button,
- Change the parameter by means the **Up** (increment) or **Down** (decrement) buttons,
- Press the **Enter** button to move the cursor over the last parameter in the display,
- Press the **Enter** button once again; the cursor and the LED TRIP turn off (the LED START keeps flashing),
- Press the **Enter** button for a few seconds; new message appears: "Confirm settings?"
- Answer to the message ENTER: YES to confirm changes or RESET: NO to abort.

The end of the START LED blinking points out the end of procedure; the changes become right now active.

The abort command may be used to abandon changes (prior to use of the ENTER: YES); the same effect is achieved by removing the auxiliary power supply to the relay.

As example, to set the operating mode of the K1 output relay as ENERGIZED, LATCHED, the following procedure must be issued:

- By means **Down** button select the Set menu "SET >>",
 - Press the **Right** button to enter; the following submenu title is displayed: "BASE >>"
 - Scroll menus by means **Down** button

"INPUTS	>>"
"RELAYS	>>"
"LEDS	>>"
"SELF-TEST RELAY	>>"
"MMI	>>"
"PROFILE SELECTION	>>"
"PROFILE A	>>"
"PROFILE B	>>"
"PLC	>>"
"CIRCUIT BREAKER SUPERVISION 52	>>"
"CT SUPERVISION 74CT	>>"
"REMOTE TRIPPING	>>"
"PILOT WIRE DIAGNOSTIC	>>"
"DEMAND MEASURES	>>"
 - Select the Set menu "RELAYS >>", the "K1 relay Setpoints >>" message is displayed,
 - Press the **Right** button to enter; the following messages are displayed:

"Logic DE-ENERGIZED Mode NO LATCHED"
 - Press the **Enter** button for a few seconds; the modification in progress status is highlighted by the both START and TRIP flashing.
 - Move the cursor over the parameter intended for change using the **Enter** button, (in our case on the message "Logic DE-ENERGIZED",
 - Change the parameters by means the **Up** (increment) or **Down** (decrement) buttons, "Logic EN-ERGIZED",
 - Press the **Enter** button to move the cursor over the last parameter in the display, "Mode NO LATCHED",
 - Change the parameters by means the **Up** (increment) or **Down** (decrement) buttons, "Mode LATCHED",
 - Press the **Enter** button once again; the cursor and the LED TRIP turn off (the LED START keeps flashing),
 - Press the **Enter** button for a few seconds; new message appears: "Confirm settings?"
 - Answer to the message ENTER: YES to confirm changes or RESET: NO to abort.
- The end of the LED blinking points out the end of procedure.

TEST

The operational tests with command of the selected output relays may be activated.

By means of **Up** or **Down** buttons it is possible to browse the main menu till the "TEST" message; to enter you must press the **Right** button.^[1]

The display message "Test state: OFF" shows the test state (OFF or test in progress).

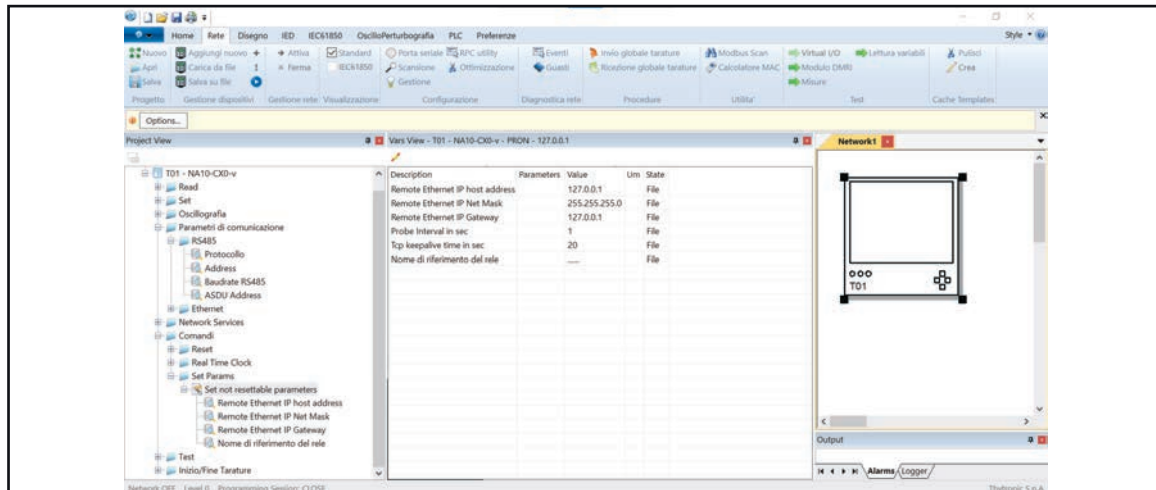
- Test K2
- Test K3
- Test K4
- Test K5
- Test K6

As example, to start the test of K1, the following procedure must be issued:

- Select the Start test menu "Start test >>".
- Press the **Right** button to start; the test in progress status is highlighted by activation of all LEDs,
- Come back by pressing the **Left** button and select the relay to be tested by means the **Up** or **Down** buttons until the message "Test K1 >>" is displayed.
- Press the **Right** button to start the test.
- To terminate the test, it is necessary to select the "Stop test >>" message and press the **Right** button to end the test. In any case the test will be automatically terminated after a delay of one minute.

COMMUNICATION

Inside the **COMMUNICATION** menu it is possible to read/modify the setting data of the RS485 Protocol and Ethernet parameters.



By means of **Up** or **Down** buttons it is possible to browse the main menu till the "RS485 Protocol >>" or "Ethernet parameters >>" message; to enter you must press the **Right** button.

As example, to select the address 12 for the ModBus protocol, the following procedure must be issued:

- Select the Communication menu "COMMUNICATION >>".
 - By means **Down** button select the "RS485 Protocol >>".
 - Press the **Right** button to enter; the following message is displayed:
"Protocol MODBUS"
"Address 1"
"9600 baud"
 - Start the procedure to effect a change explained in the Setting modifying (SET) paragraph:
 - Press the **Enter** button for a few seconds; the modification in progress status is highlighted by the both START and TRIP flashing.
 - Move the cursor over the parameter intended for change using the **Enter** button, (in the example on the 1 address),
 - Change the parameters by means the **Up** (increment) button (up to 12 address),
 - Press the **Enter** button to move the cursor over the last parameter in the display,
 - Press the **Enter** button once again; the cursor and the LED TRIP turn off (the LED START keeps flashing),
 - Press the **Enter** button for a few seconds; new message appears: "Confirm settings?"
 - Answer to the message ENTER: YES to confirm changes or RESET: NO to abort.
- The end of the LED blinking points out the end of procedure.

Note 1 Instantly all the relays are switched in rest state, including relays programmed as "normally energized"

Circuit breaker commands

By means of the **Open command** and **Close command** keys, the circuit breaker commands may be issued.

The committed output relays must be enabled inside the **Circuit Breaker supervision \ LEDs-relays allocation** menu.

Enable / block changes via keyboard - Password

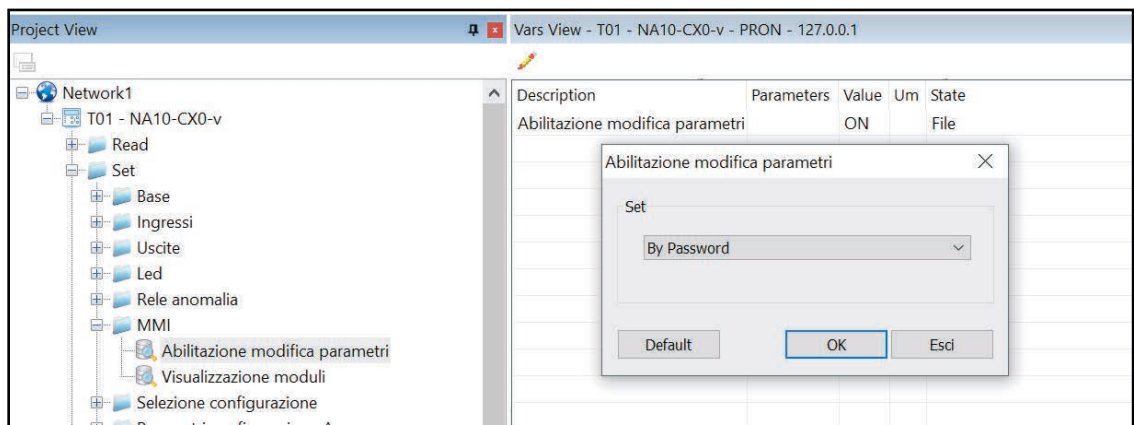
All parameters (measurements and settings) are available for reading from the operator panel (MMI), while the setting changes are enabled or disabled depending on possible operation modes:

- Enable without password (factory setting)
- Enable with password
- Disabled

The choice of operation modes is possible only through ThyVisor operating at the session level 1:

- Connect the PC serial port to the relay socket on the RJ10 front panel
- Run the ThyVisor sw (the latest version latest version available on the site is recommended).
- Select the *Preference - Session* menu; when you start the session level is set to 0 as shown in the bottom of the window
- Select the level 1. Prompted for a password (the default *level1*) to move to level 1. Confirm twice with "OK". (Level 1, as shown in the bottom of the window).
- Open the communication session by executing the menu command *Communication - Open*. Verify that inside the modality box *Serial* and *Automatic* are selected
- ThyVisor will search automatically the relay from the template, regardless of what is selected in the *device family*.
- Inside the Serial Configuration panel select the COM port (eg COM1, COM4 etc), give the *Start* command and wait for the opening of the new window
- Save the file. Choose the location to save the file and give the *Save* command. The configuration data of the relay are transferred to the PC (the progress bar is displayed from 0 ... 100%). A folder on a yellow background with the name of the file is highlighted on the left side of the windows. The serial connection is operative, at the bottom of the screen the word *ON-LINE* is highlighted in green field.

- Select the **Set \ MMI** folder (MMI stands for Man-Machine-Interface = keyboard). On the right side of the window (first row) select *Parameter setting enable*; with a "click" on the column value 3 options are available:
 - *OFF* = keyboard enabled only for reading
 - *By password* = keyboard enabled for reading and setting by means of password
 - *ON* = keyboard enabled for reading and setting without password



To modify any parameter the calibration session must be open by means of *Start setting* command from the menu or directly by clicking on F4 key. the opening of the session setting is highlighted by its *Programming state:Open* on yellow field on the bottom bar. To save the monifiche it is necessary to send the command from the menu "IED / close" or directly by clicking on F5 key.

Operation with Password

If the *By password* mode is selected a new menu *password* is inserted at the top of the display menu.

- Press the **Right** key the: `password not ok >>` message is displayed and any changes of parameters is disabled
- Press the **Right** key; you can enter the password page `enter password` where you are prompted to enter the 4 characters password (the default password is 0000)
- Press the **Enter** button for a few seconds; the modification in progress status is highlighted by flashing of the START and TRIP LEDs and by appearance of the pointer on the bottom
- Change the parameters by means the **Up** (increment) or **Down** (decrement) buttons, using the **Left** and **Right** keys to move to the previous or next character

- Press the **Enter** button; the cursor and the LED TRIP turn off (the LED START keeps flashing),
- Press the **Enter** button for a few seconds; new message appears: `Confirm settings?`
- Answer to the message `ENTER: YES` to confirm changes or `RESET: NO` to abort.
- The message: `password ok >>` is displayed
- To exit from password menu use **Left** or **Up** keys: if you press the **Right** button you go back in the password menu and the password must be entered. The parameter changes are enabled from the keyboard. After any confirming with (Enter) or abandoning the change (reset button) the password must be entered again.
- The possibility of modifying the parameters from the keyboard is automatically disabled after about 3 minutes elapsed without pressing any button. If you do not want to wait three minutes of waiting, it must go back to the password menu and come out without input any data (**Left** and **Right** until the the message `password not ok >>` is displayed.

Changing the password

Changing the password is possible only after entering the correct password (`password ok >>` message); press the **Down** key, a new menu is displayed `change password` that you access with the **Right** key. Inside this menu the password can be changed.

- Press the **Enter** button for a few seconds; the modification in progress status is highlighted by flashing of the START and TRIP LEDs and by appearance of the pointer on the bottom
- Change the parameters by means the **Up** (increment) or **Down** (decrement) buttons, using the **Left** and **Right** keys to move to the previous or next character
- Press the **Enter** button; the cursor and the LED TRIP turn off (the LED START keeps flashing),
- Press the **Enter** button for a few seconds; new message appears: `Confirm settings?`
- Answer to the message `ENTER: YES` to confirm changes or `RESET: NO` to abort.

Lost password

If password is lost the data base of the device must be restored, proceed with the following steps:

- Activate the session level 1
- Send `Set default settings` command available inside the **Command \ Default settings** menu.



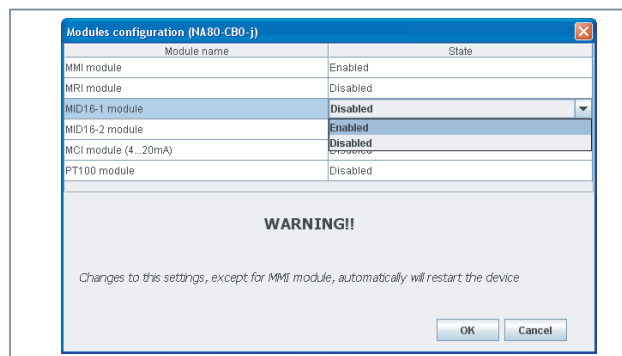
WARNING

The command `Set default settings` restores the factory settings, all user- defined adjustments are cleared. Be carefully to enter the correct parameter !
The device serial number should be set to avoid IP address conflicts for devices connected to the Ethernet network.

Following the `Set default settings` command the password is reset to `0000`.

7.3 MODULES MANAGEMENT

After installation, the modules must be enabled (working with level 1 session level). The Thybus modules may be set inside the *Procedure* menu (or by means a click on the  icon). Following up any module configuration an automatic reset is issued and the I/O devices are included inside the device menu. ^[1] When two MID16 modules are enabled, the hardware address must be set; the dip-switch layout is showed inside the **INSTALLATION** section.



Note 1 Binary inputs and output names (ThyVisor):

Binary inputs for devices with two inputs onboard

IN1, IN2 on board
IN3...IN10 with MRI module
IN11...IN26 with one MID16 module
IN27...IN42 with two MID16 modules

Binary inputs for devices with five inputs onboard

IN1...IN5 on board
IN6...IN13 with MRI module
IN14...IN29 with one MID16 module
IN30...IN45 with two MID16 modules

Output relays

K1...K6 on board

LEDs:

K7...K10 with MRI module
ON, START, TRIP, L1...L5 on board
L6...L10 with MRI module



7.4 MAINTENANCE

The Pro-N relays do not require any particular maintenance; all circuits use high quality static components, the subassembly products undergo dynamic checks on their functioning before the final assembling of the complete equipment. The dedicated circuits and the firmware for the self-test function continuously check the relay operation; the continuously operating auto-zeroing function dynamically corrects the measuring errors due to offset, heat dependent drifts, aging of components, etc. The processor is equipped with a watch-dog circuit which restores the correct operation of the firmware in case of fault.

If the following criteria are properly implemented:

- comprehensive functional tests at commissioning,
- absence of significant modification on the protection system,
- activation and permanent remote control of self-test alarms through supervision,
- control of self-test undetectable failures (comparing of measures with the external instruments, auxiliary voltage control, etc ..)
- analysis of the stored information (faults and events, and oscillographic records),

periodic checks can be avoided. In the absence of some of the criteria listed above, it is advisable to perform periodic checks every five years.

7.5 REPAIR

No repair of possible faults by the client is foreseen; if following to any irregularity of operation, the above tests confirm the presence of a fault, it will be necessary to send the relay to the factory for the repair and the consequent settings and checks.

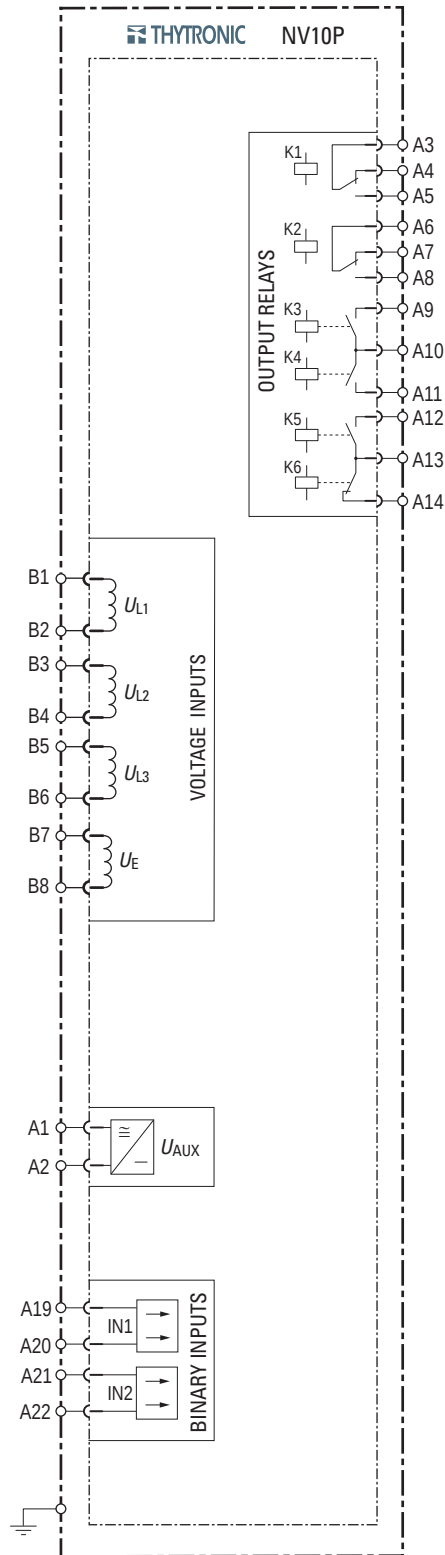
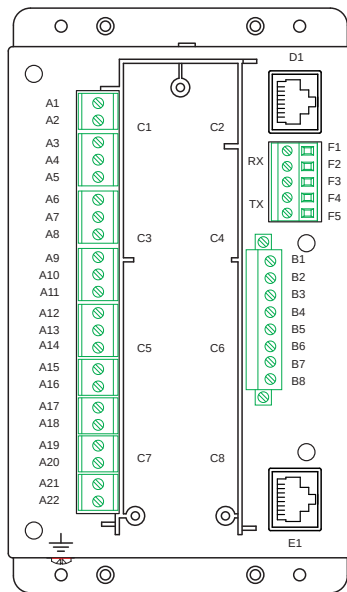
7.6 PACKAGING

The Pro-N devices must be stored within the required temperature limits; the relative humidity should not cause condensation or formation of frost.

It is recommended that the devices are stored in their packaging; in the case of long storage, especially in extreme climatic conditions, it is recommended that the device is supplied with power for some hours before the commissioning, in order to bring the circuits to the rating conditions and to stabilize the operation of the components.

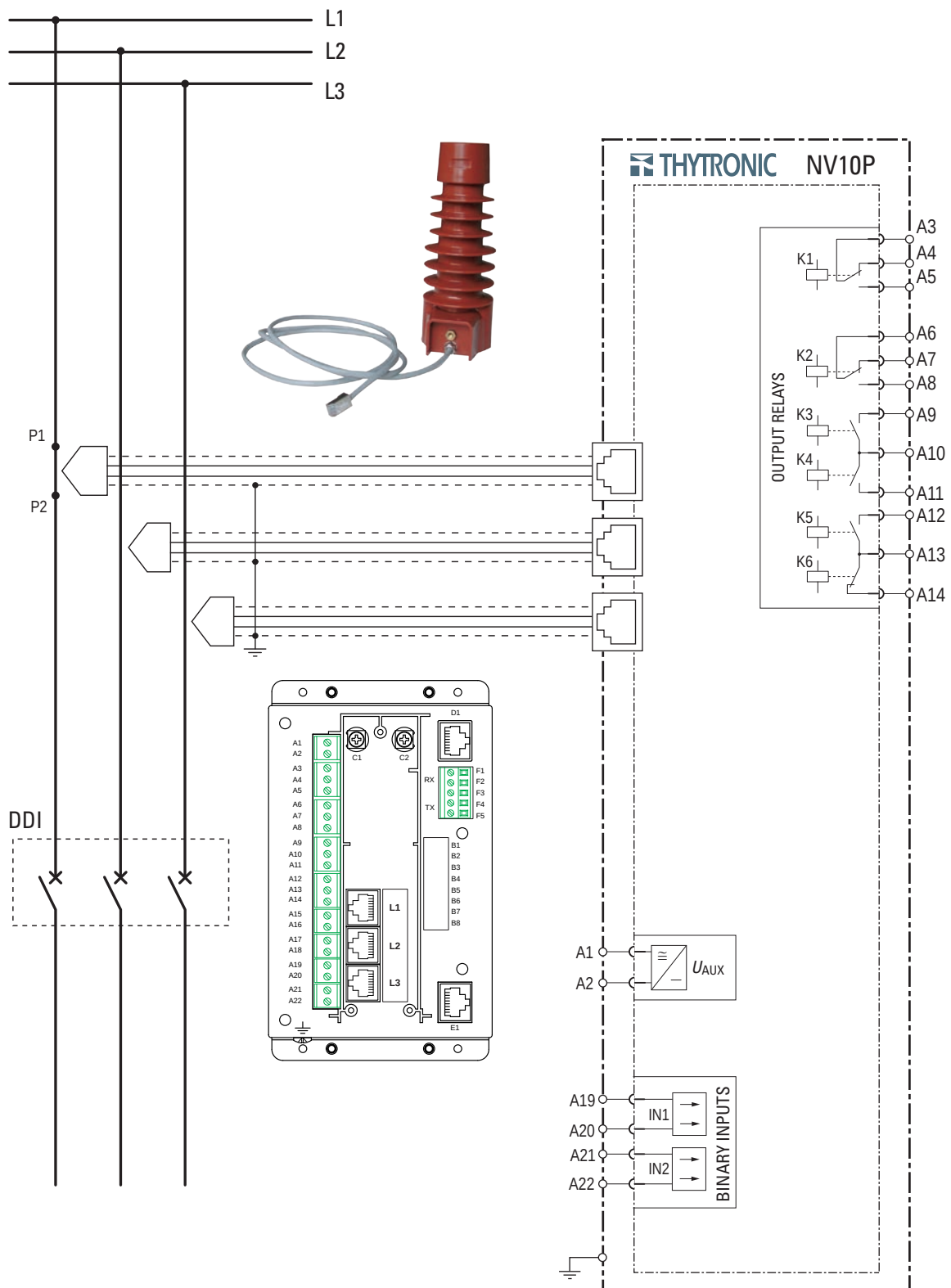
8 APPENDIX

8.1 APPENDIX A1 - I/O Diagram



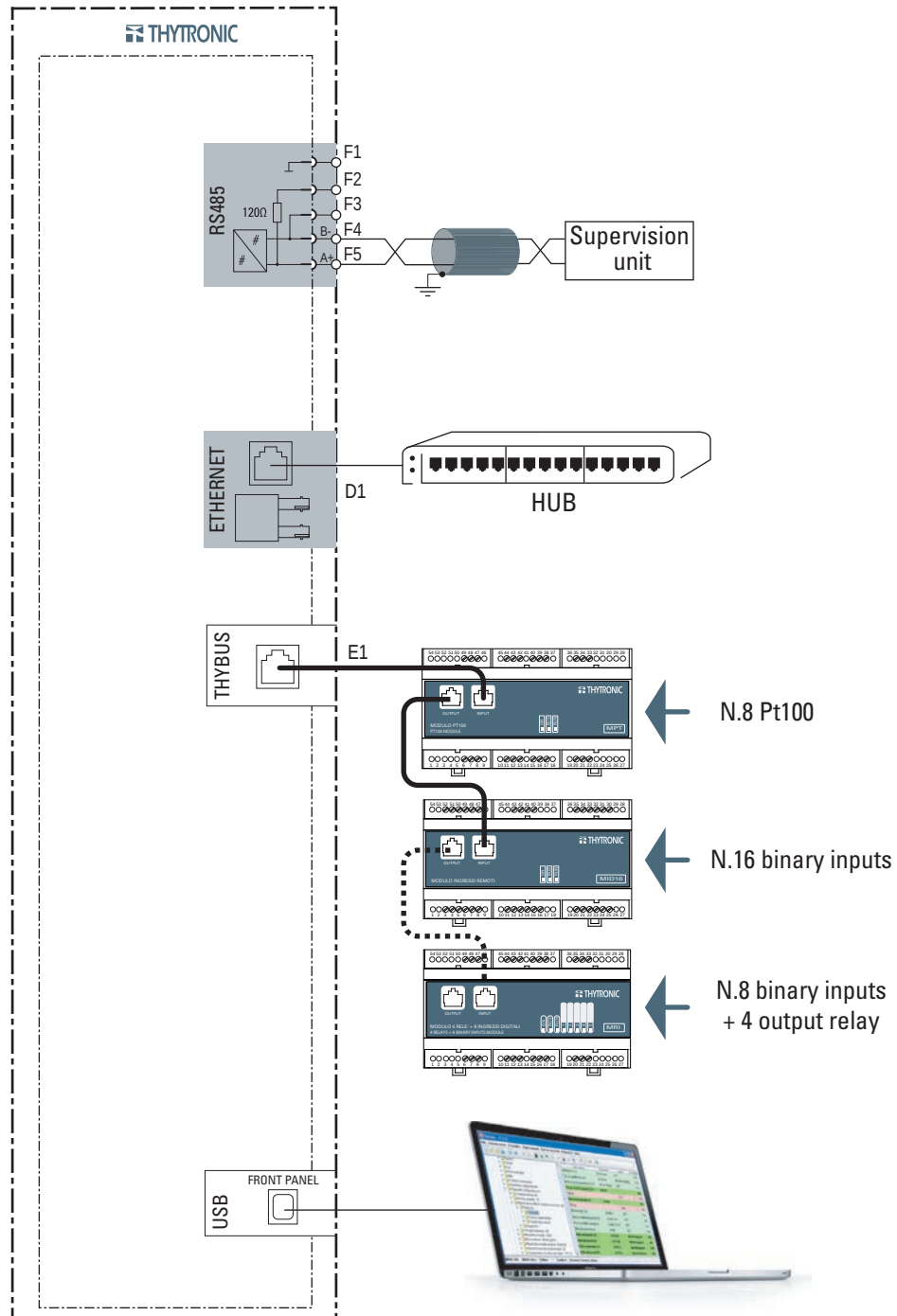
Measurement of input voltages by means of inductive VTs

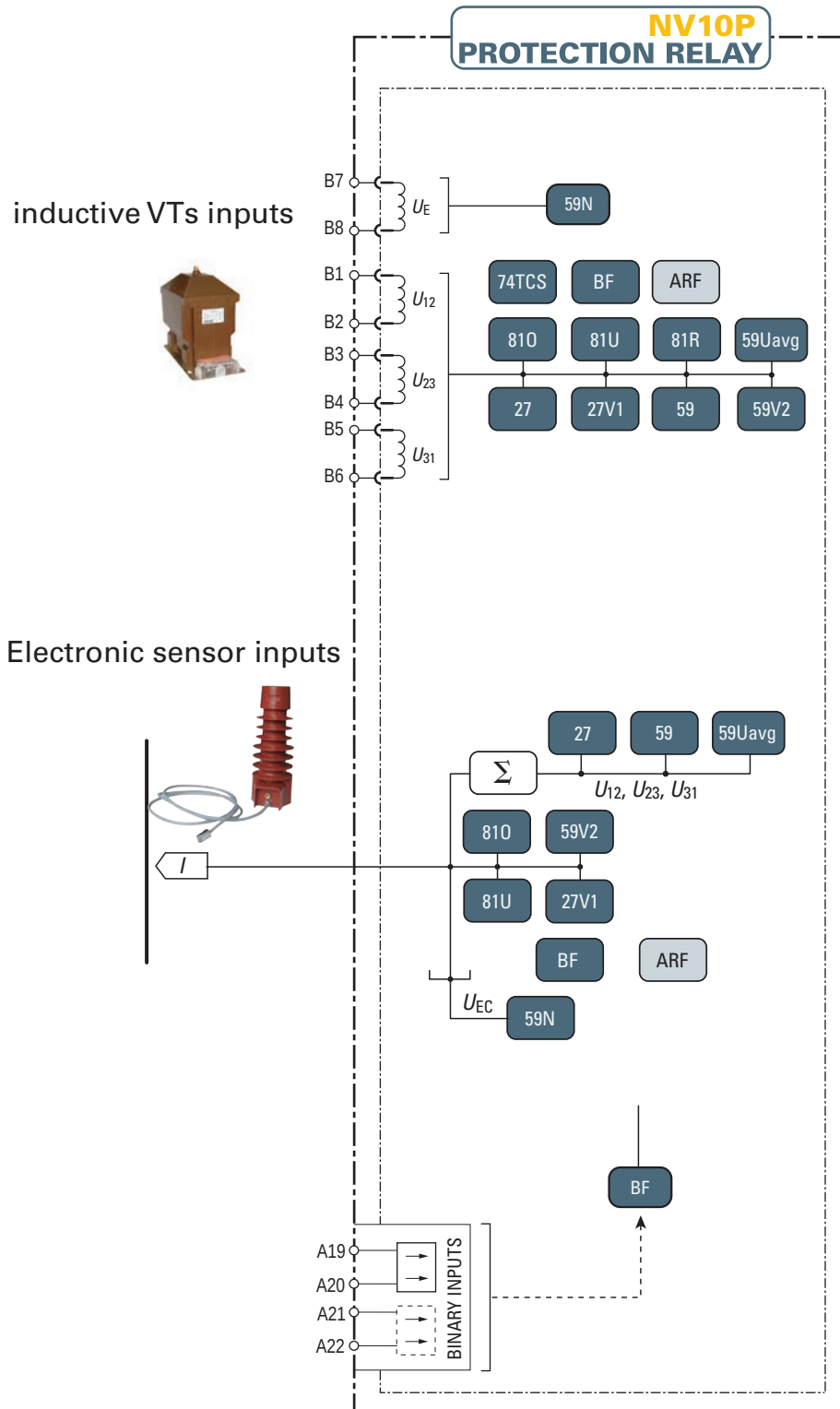
NV10P-I-0.ai



Misura delle tensioni d'entrata mediante sensori

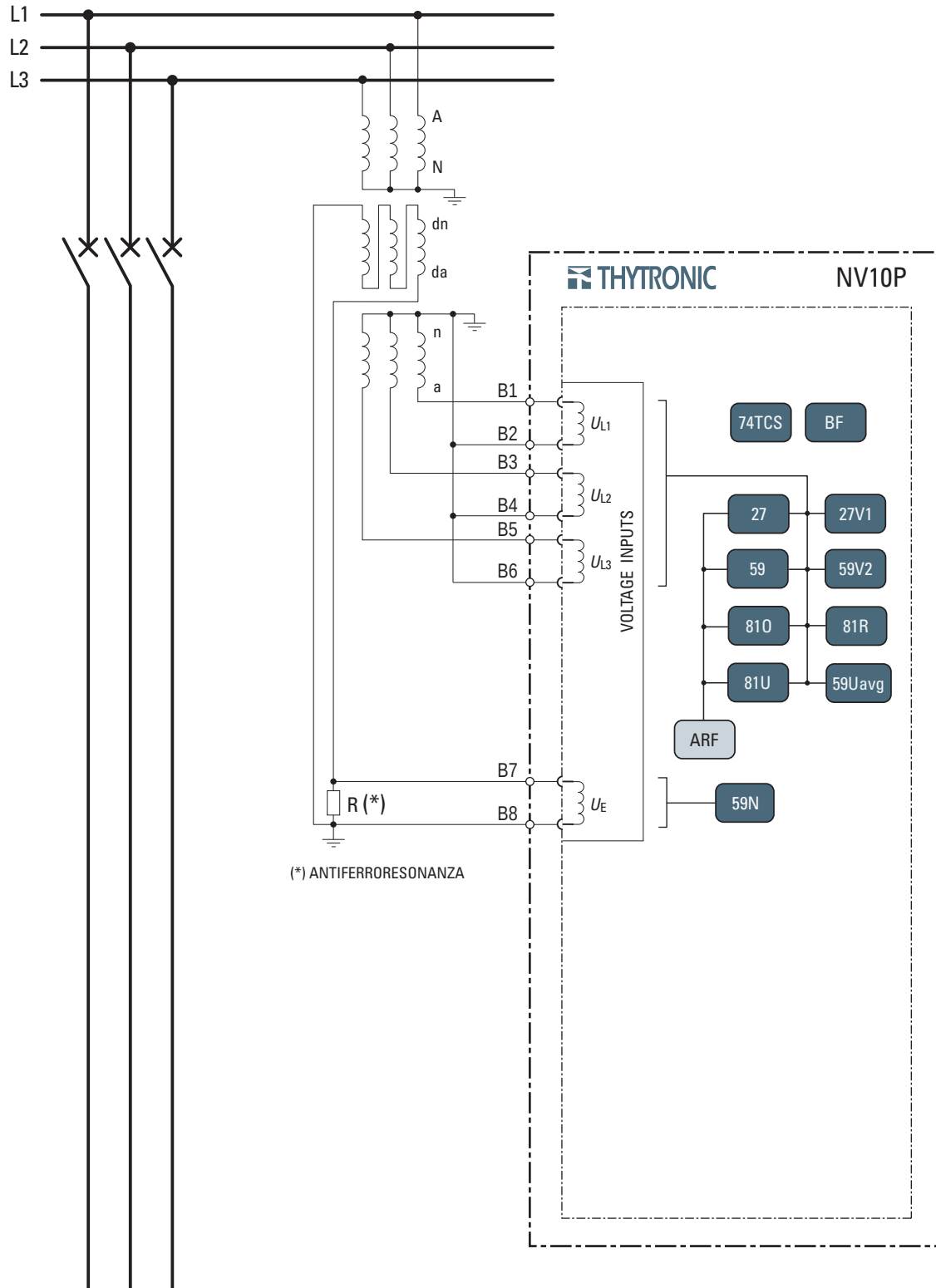
8.2 APPENDIX A2 - Interfaces





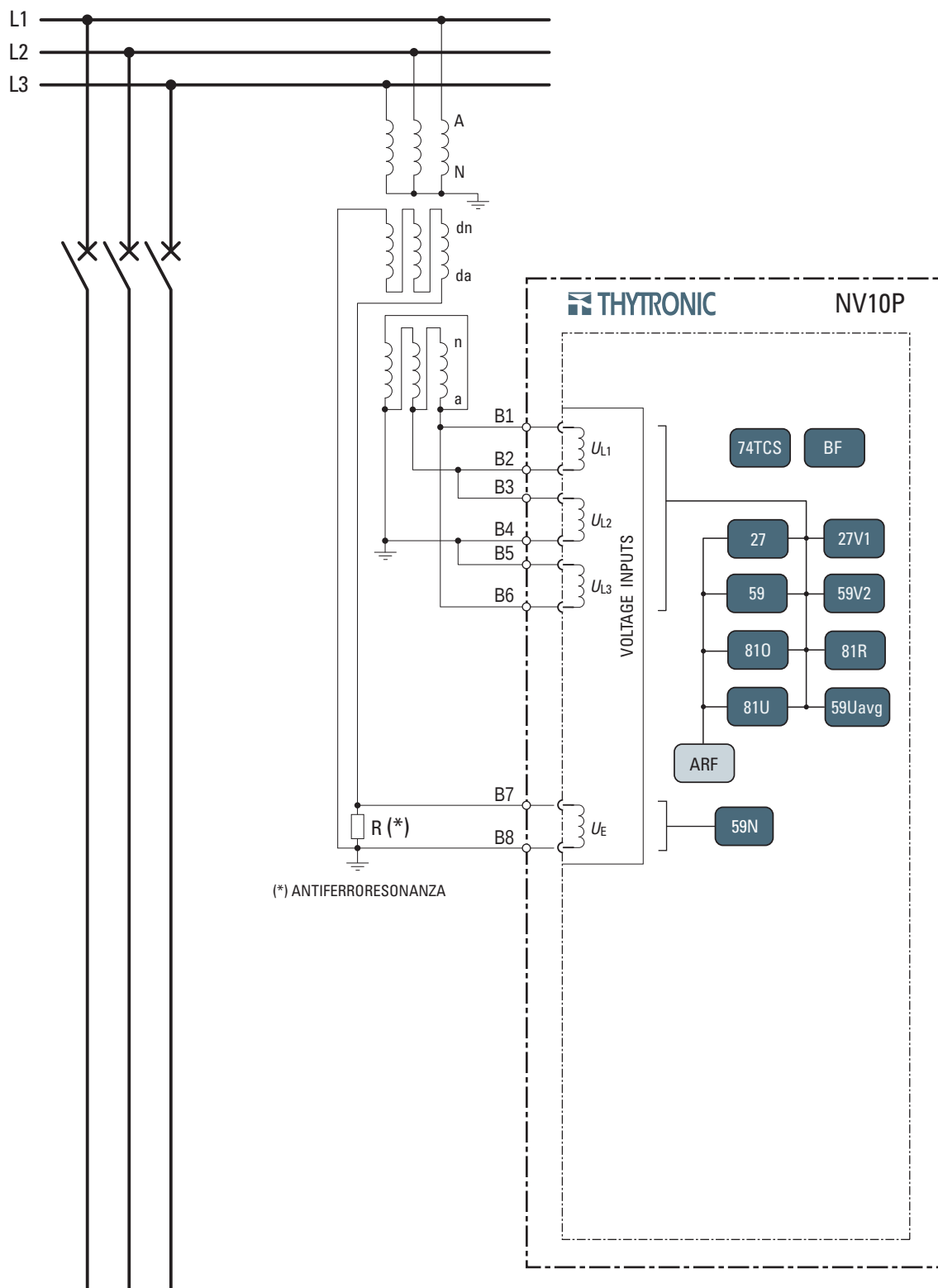
8.4 APPENDIX A4 - Connection diagrams

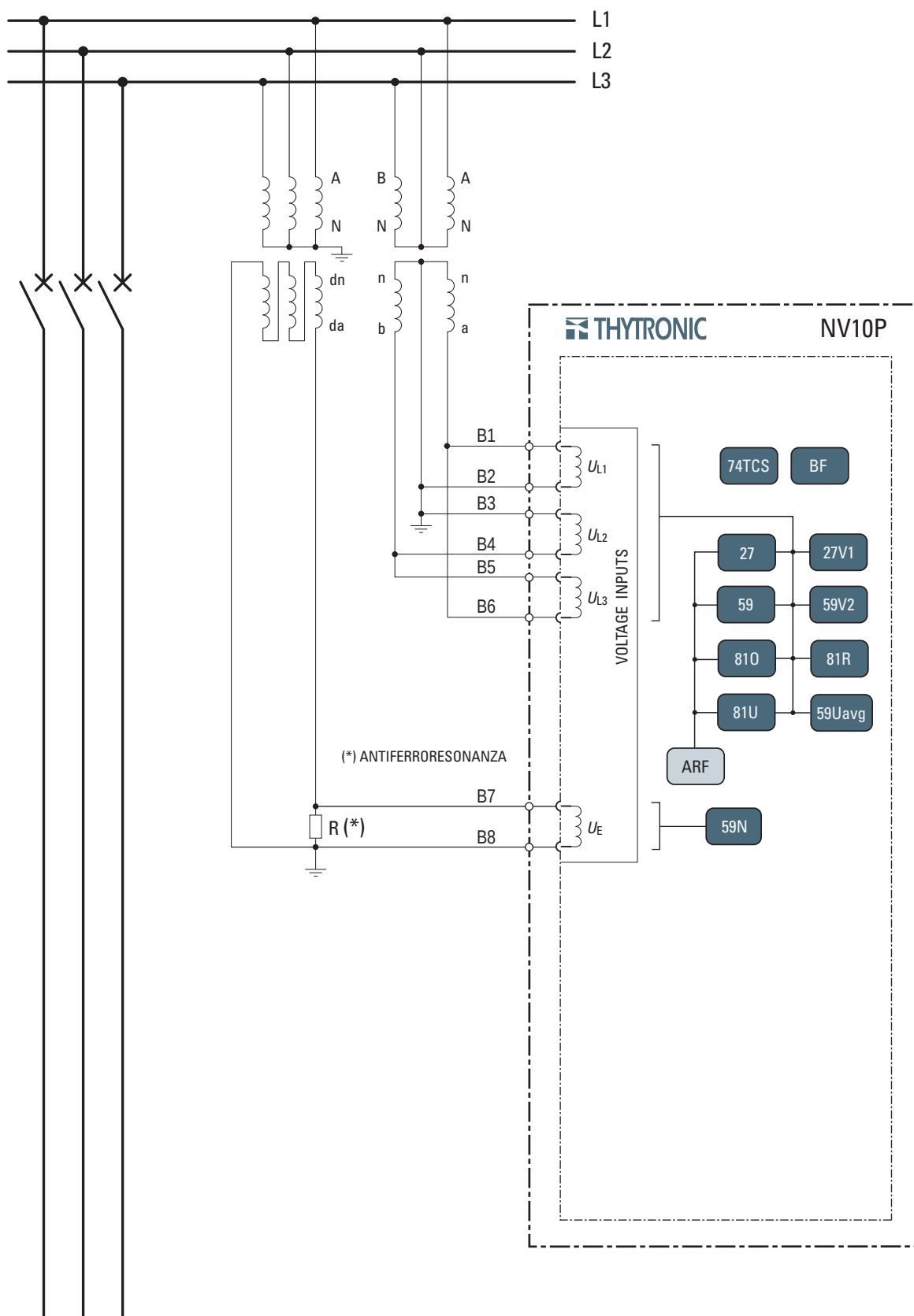
*Note: Some typical connection diagram are shown.
All diagram must be considered just as example; they cannot be comprehensive for real applications.
For all diagrams the output contacts are shown in de-energized state for standard reference.*



Voltage inputs - phase-to-earth VTs star connections

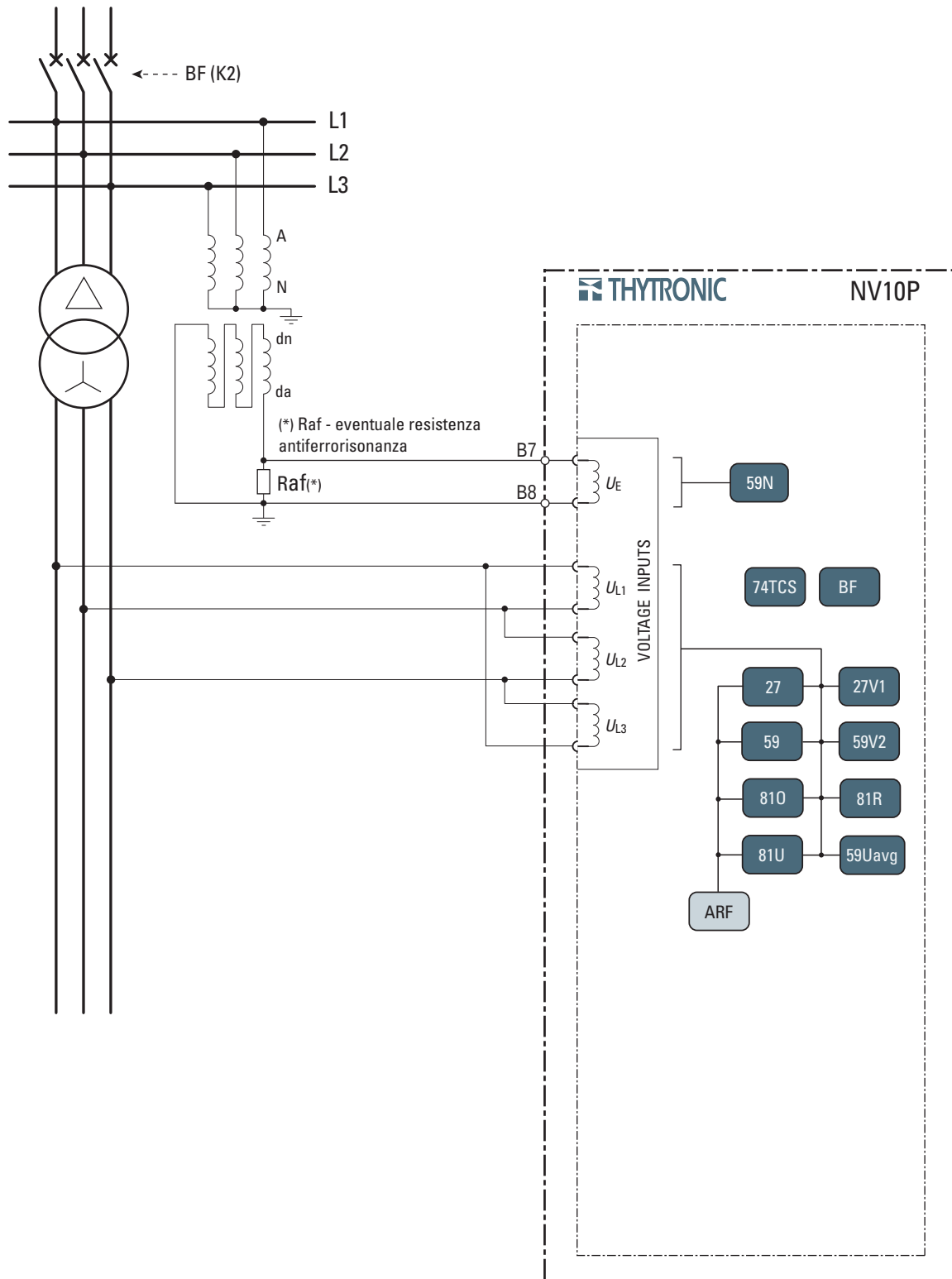
NV10P-sch2.ai





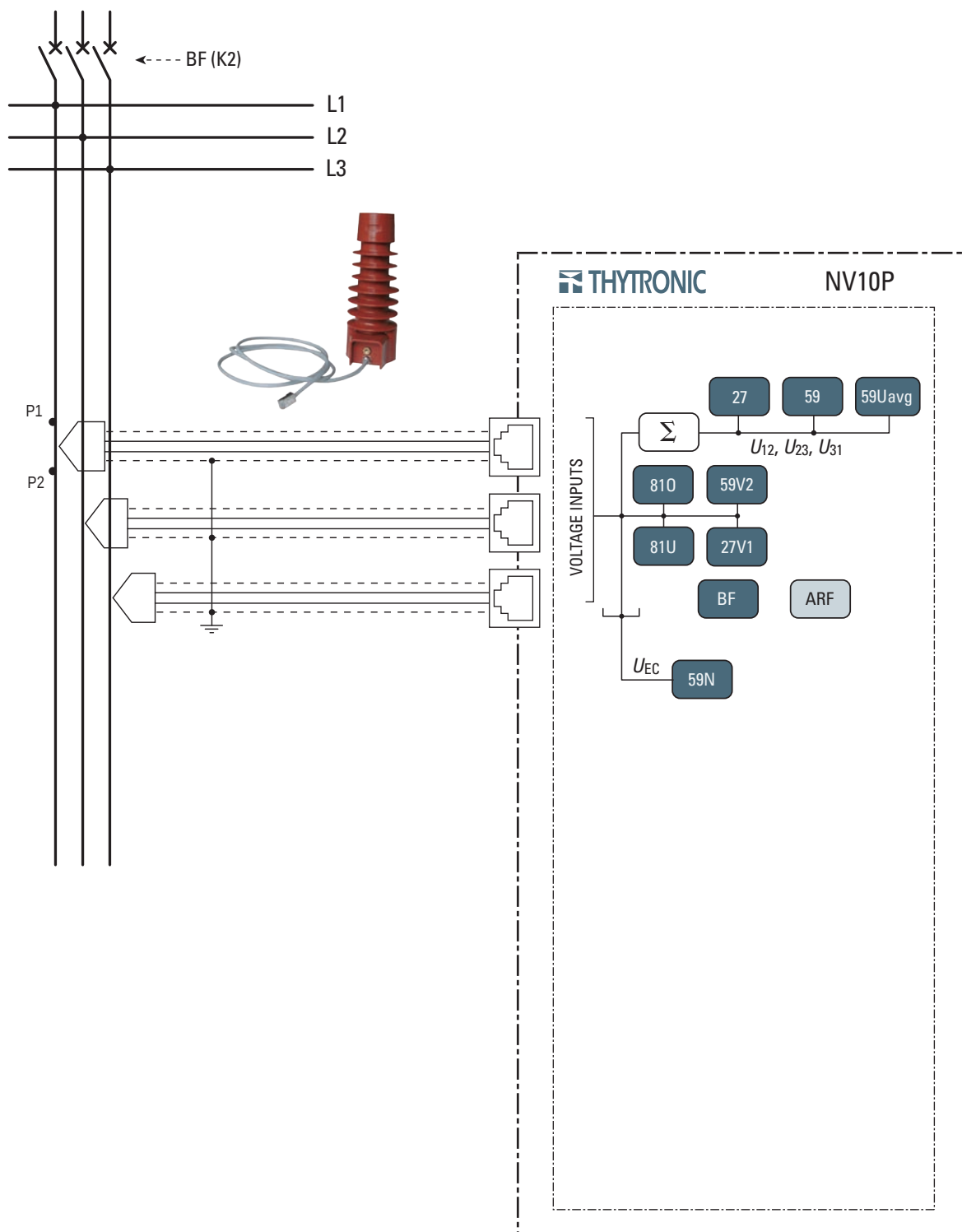
Voltage inputs - "V" connections VTs

NV10P-sch7.ai



Voltage inputs - direct connection to a low voltage network with phase to phase measure ($U_R = 400$ V versions)
Residual voltage by means of open delta VTs

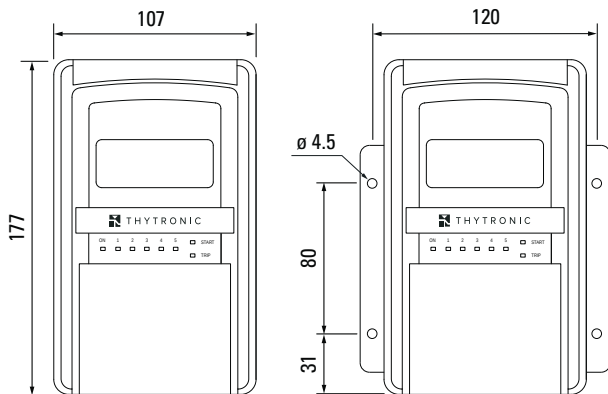
NV10P-sch5.ai



Phase-ground voltage measurement by means of V-Sensor

8.5 APPENDIX B1 - NV10P Dimensions

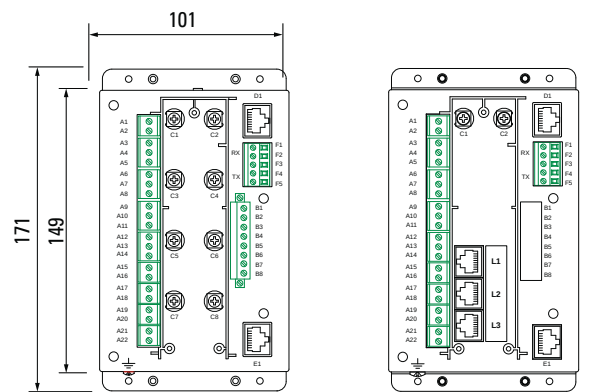
FRONT VIEWS



FLUSH MOUNTING

PROJECTING MOUNTING

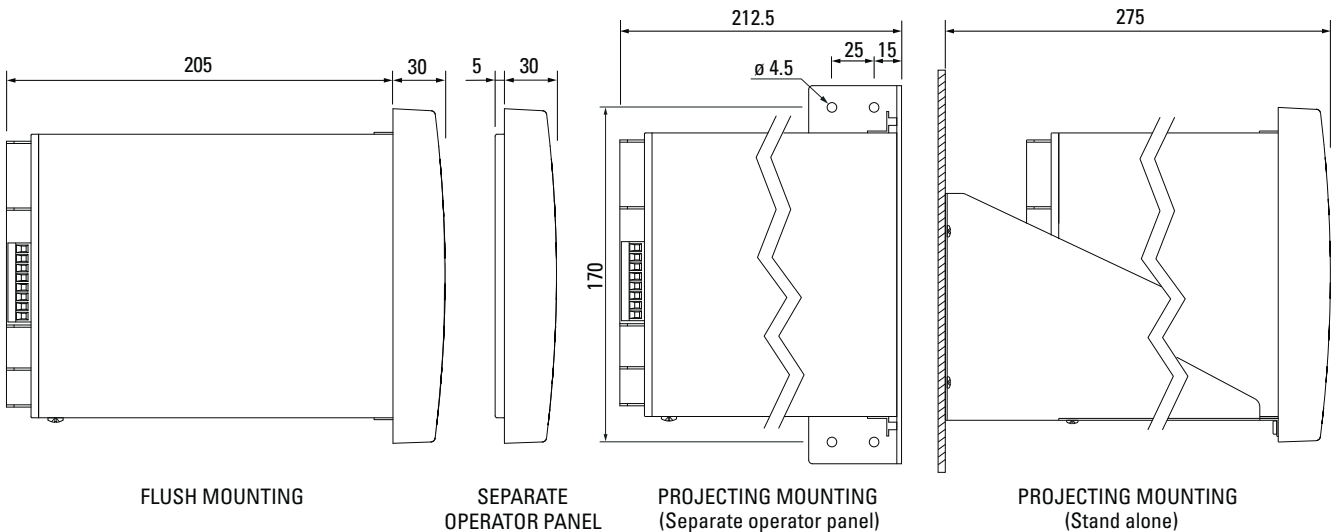
REAR VIEWS



FLUSH MOUNTING
(Inductive VTs inputs)

FLUSH MOUNTING
(Electronic sensor inputs)

SIDE VIEWS



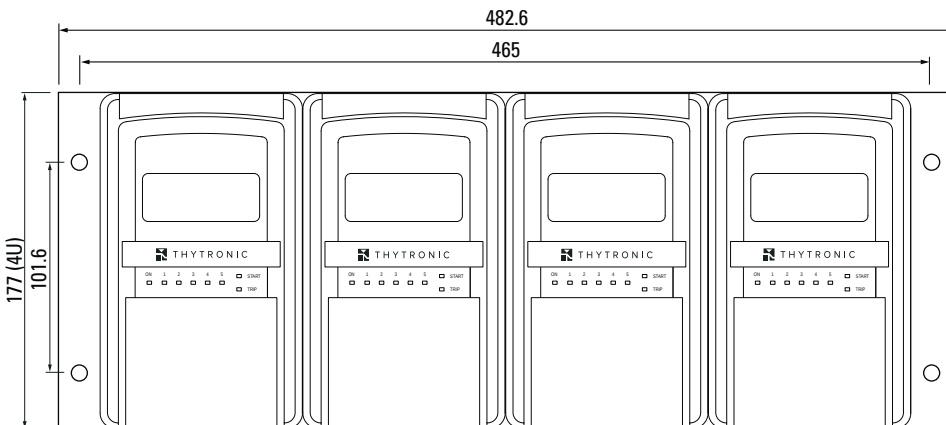
FLUSH MOUNTING

SEPARATE
OPERATOR PANEL

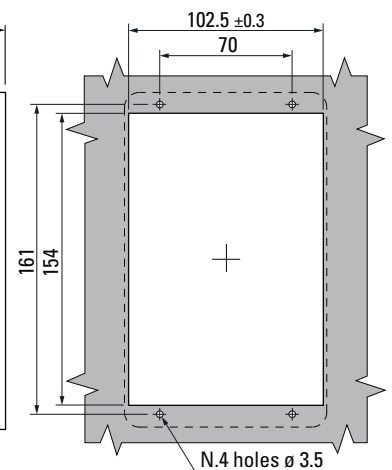
PROJECTING MOUNTING
(Separate operator panel)

PROJECTING MOUNTING
(Stand alone)

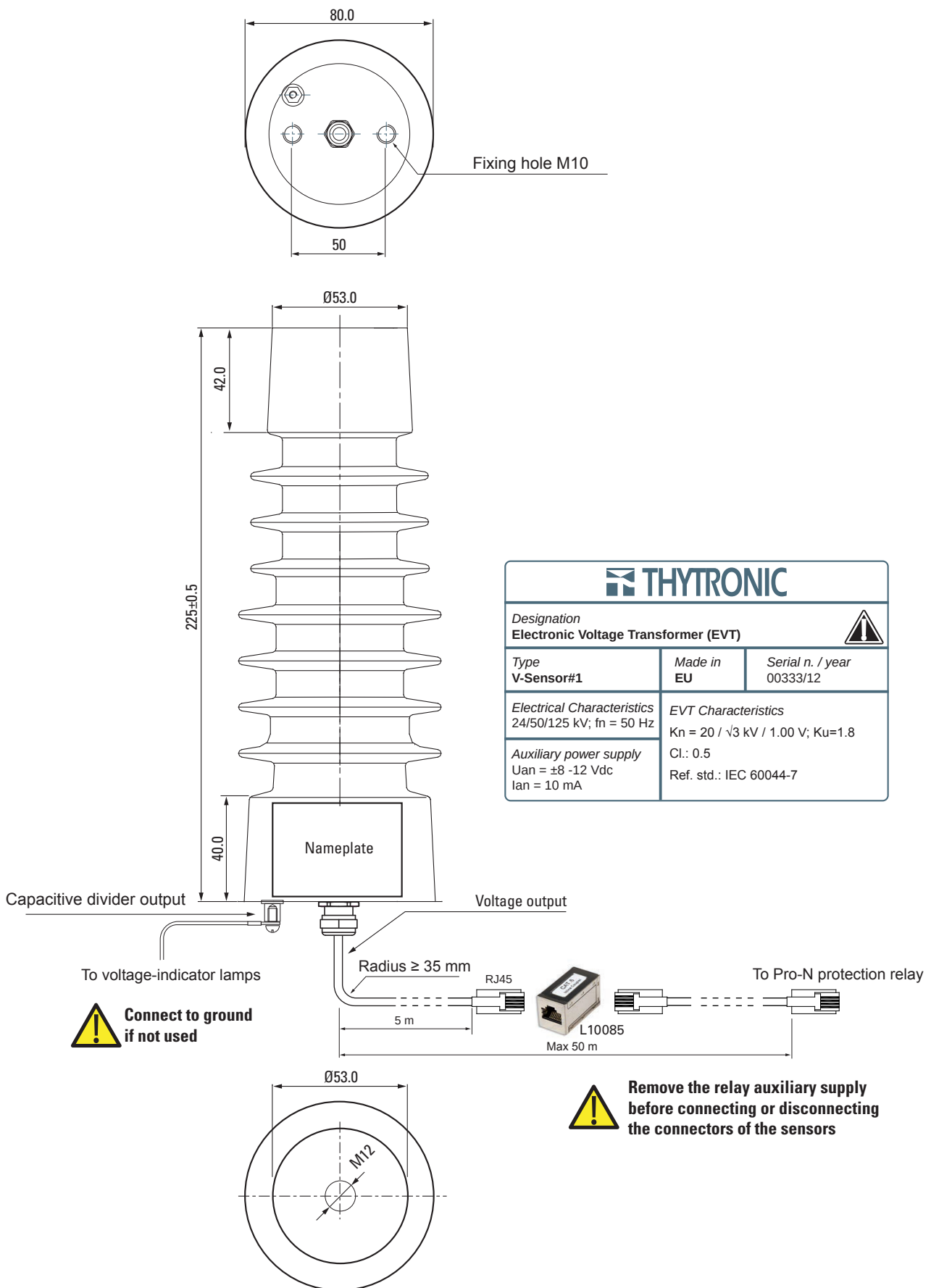
RACK MOUNTING



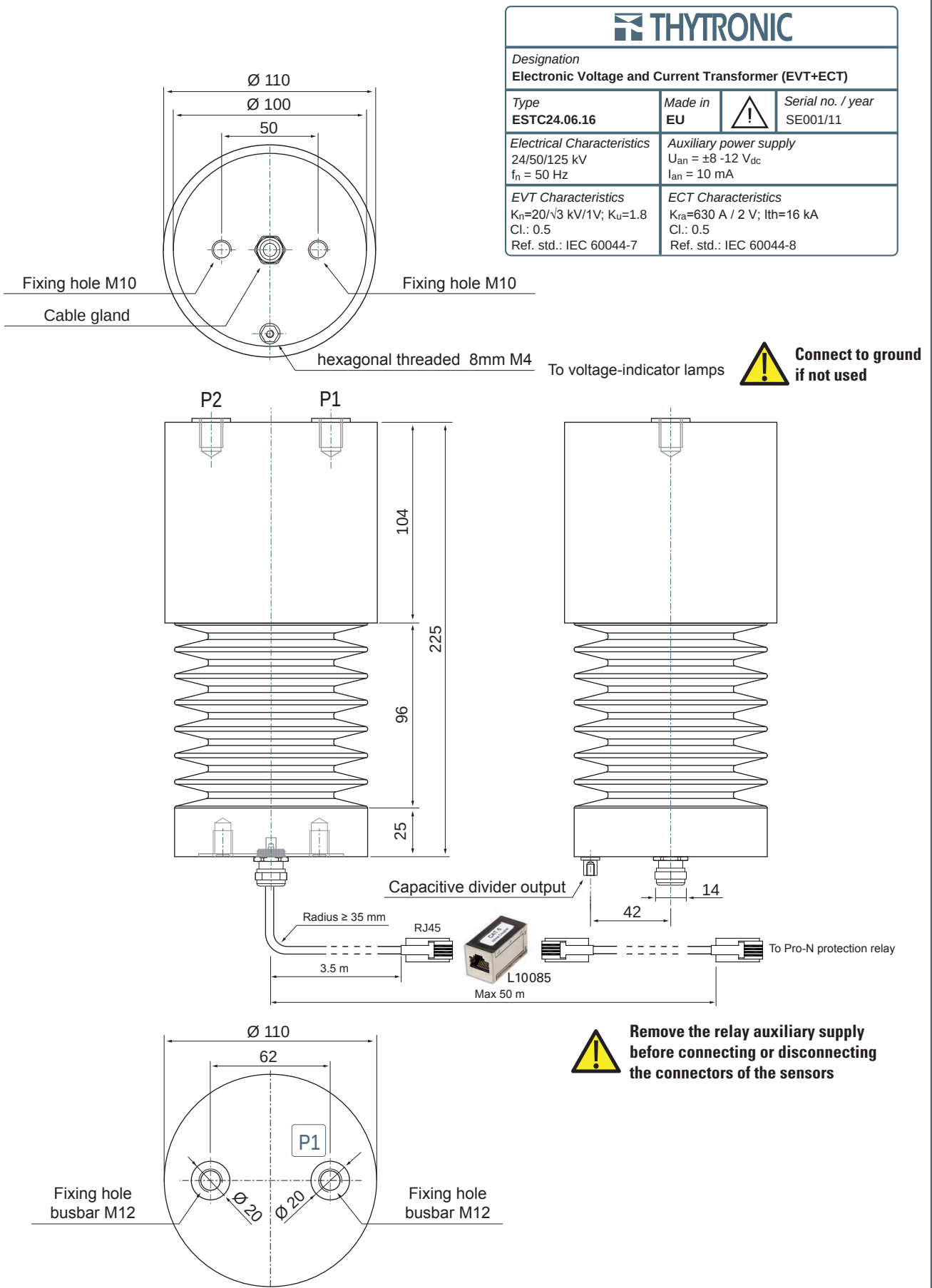
FLUSH MOUNTING CUTOUT



8.6 APPENDIX B2 - V-Sensor Dimensions



8.7 APPENDIX B3 - ThySensor Dimensions



8.8 APPENDIX C - Setting table

Notes: - The 26 element, the output relay and LEDs K7...K10, L6...L10 and the binary input IN3...IN42 settings are available only when the concerning I/O circuits are implemented (MPT, MRI and MID16 modules on Thybus)

Description	Parameter	Unit	Setting range
Set			
Base			
Relay reference name			
Relay nominal frequency - fn		Hz	50 ... 60 step = 10
Relay nominal voltage - Un		V	50 ... 130 step = 1 200 ... 520 step = 1
Relay residual nominal voltage (direct measurement) - UEn		V	50 ... 130 step = 1
Relay residual nominal voltage (calculated measurement) - UECN = 1.73 * Un			
Line VT primary nominal voltage - Unp		V	50 ... 499 step = 1 500 ... 4990 step = 10 5000 ... 49900 step = 100 50000 ... 500000 step = 1000
Residual primary nominal voltage (phase to phase) * 1.73 - UEnp		V	50 ... 499 step = 1 500 ... 4990 step = 10 5000 ... 49900 step = 100 50000 ... 500000 step = 1000
Measurements reading mode			RELATIVE PRIMARY
Language			English Turkish Russian Espanol
Inputs			
Binary input IN1			
IN1			
Logic			Active-ON Active-OFF
IN1 tON			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN1 tOFF			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN1 matching (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
IN1 matching (B)			none
Binary input IN2			
IN2			
Logic			Active-ON Active-OFF
IN2 tON			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN2 tOFF			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN2 matching (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
IN2 matching (B)			none
Binary input IN3			
IN3			
Logic			Active-ON Active-OFF

IN3 tON			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN3 tOFF			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN3 matching (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
IN3 matching (B)			none
Binary input IN4			
IN4			
Logic			Active-ON Active-OFF
IN4 tON			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN4 tOFF			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN4 matching (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
IN4 matching (B)			none
Binary input IN5			
IN5			
Logic			Active-ON Active-OFF
IN5 tON			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN5 tOFF			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN5 matching (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
IN5 matching (B)			none
Binary input IN6			
IN6			
Logic			Active-ON Active-OFF
IN6 tON			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN6 tOFF			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN6 matching (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
IN6 matching (B)			none
Binary input IN7			

IN7			
Logic			Active-ON Active-OFF
IN7 tON			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN7 tOFF			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN7 matching (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
IN7 matching (B)			none
Binary input IN8			
IN8			
Logic			Active-ON Active-OFF
IN8 tON			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN8 tOFF			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN8 matching (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
IN8 matching (B)			none
Binary input IN9			
IN9			
Logic			Active-ON Active-OFF
IN9 tON			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN9 tOFF			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN9 matching (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
IN9 matching (B)			none
Binary input IN10			
IN10			
Logic			Active-ON Active-OFF
IN10 tON			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN10 tOFF			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN10 matching (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<

IN10 matching (B)			none
Binary input IN11			
IN11			
Logic			Active-ON Active-OFF
IN11 tON			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN11 tOFF			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN11 matching (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
IN11 matching (B)			none
Binary input IN12			
IN12			
Logic			Active-ON Active-OFF
IN12 tON			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN12 tOFF			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN12 matching (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
IN12 matching (B)			none
Binary input IN13			
IN13			
Logic			Active-ON Active-OFF
IN13 tON			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN13 tOFF			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN13 matching (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
IN13 matching (B)			none
Binary input IN14			
IN14			
Logic			Active-ON Active-OFF
IN14 tON			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN14 tOFF			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1

IN14 matching (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
IN14 matching (B)			none
Binary input IN15			
IN15			
Logic			Active-ON Active-OFF
IN15 tON			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN15 tOFF			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN15 matching (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
IN15 matching (B)			none
Binary input IN16			
IN16			
Logic			Active-ON Active-OFF
IN16 tON			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN16 tOFF			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN16 matching (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
IN16 matching (B)			none
Binary input IN17			
IN17			
Logic			Active-ON Active-OFF
IN17 tON			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN17 tOFF			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN17 matching (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
IN17 matching (B)			none
Binary input IN18			
IN18			
Logic			Active-ON Active-OFF
IN18 tON			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN18 tOFF			

Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN18 matching (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
IN18 matching (B)			none
Binary input IN19			
IN19			
Logic			Active-ON Active-OFF
IN19 tON			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN19 tOFF			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN19 matching (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
IN19 matching (B)			none
Binary input IN20			
IN20			
Logic			Active-ON Active-OFF
IN20 tON			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN20 tOFF			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN20 matching (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
IN20 matching (B)			none
Binary input IN21			
IN21			
Logic			Active-ON Active-OFF
IN21 tON			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN21 tOFF			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN21 matching (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
IN21 matching (B)			none
Binary input IN22			
IN22			
Logic			Active-ON Active-OFF
IN22 tON			

Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN22 tOFF			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN22 matching (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
IN22 matching (B)			none
Binary input IN23			
IN23			
Logic			Active-ON Active-OFF
IN23 tON			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN23 tOFF			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN23 matching (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
IN23 matching (B)			none
Binary input IN24			
IN24			
Logic			Active-ON Active-OFF
IN24 tON			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN24 tOFF			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN24 matching (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
IN24 matching (B)			none
Binary input IN25			
IN25			
Logic			Active-ON Active-OFF
IN25 tON			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN25 tOFF			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN25 matching (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
IN25 matching (B)			none
Binary input IN26			
IN26			

Logic			Active-ON Active-OFF
IN26 tON			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN26 tOFF			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN26 matching (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
IN26 matching (B)			none
Binary input IN27			
IN27			
Logic			Active-ON Active-OFF
IN27 tON			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN27 tOFF			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN27 matching (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
IN27 matching (B)			none
Binary input IN28			
IN28			
Logic			Active-ON Active-OFF
IN28 tON			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN28 tOFF			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN28 matching (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
IN28 matching (B)			none
Binary input IN29			
IN29			
Logic			Active-ON Active-OFF
IN29 tON			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN29 tOFF			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN29 matching (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
IN29 matching (B)			none

Binary input IN30			
IN30			
Logic			Active-ON Active-OFF
IN30 tON			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN30 tOFF			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN30 matching (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
IN30 matching (B)			none
Binary input IN31			
IN31			
Logic			Active-ON Active-OFF
IN31 tON			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN31 tOFF			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN31 matching (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
IN31 matching (B)			none
Binary input IN32			
IN32			
Logic			Active-ON Active-OFF
IN32 tON			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN32 tOFF			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN32 matching (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
IN32 matching (B)			none
Binary input IN33			
IN33			
Logic			Active-ON Active-OFF
IN33 tON			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN33 tOFF			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1

IN33 matching (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
IN33 matching (B)			none
Binary input IN34			
IN34			
Logic			Active-ON Active-OFF
IN34 tON			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN34 tOFF			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN34 matching (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
IN34 matching (B)			none
Binary input IN35			
IN35			
Logic			Active-ON Active-OFF
IN35 tON			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN35 tOFF			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN35 matching (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
IN35 matching (B)			none
Binary input IN36			
IN36			
Logic			Active-ON Active-OFF
IN36 tON			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN36 tOFF			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN36 matching (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
IN36 matching (B)			none
Binary input IN37			
IN37			
Logic			Active-ON Active-OFF
IN37 tON			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN37 tOFF			

Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN37 matching (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
IN37 matching (B)			none
Binary input IN38			
IN38			
Logic			Active-ON Active-OFF
IN38 tON			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN38 tOFF			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN38 matching (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
IN38 matching (B)			none
Binary input IN39			
IN39			
Logic			Active-ON Active-OFF
IN39 tON			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN39 tOFF			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN39 matching (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
IN39 matching (B)			none
Binary input IN40			
IN40			
Logic			Active-ON Active-OFF
IN40 tON			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN40 tOFF			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN40 matching (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
IN40 matching (B)			none
Binary input IN41			
IN41			
Logic			Active-ON Active-OFF
IN41 tON			

Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN41 tOFF			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN41 matching (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
IN41 matching (B)			none
Binary input IN42			
IN42			
Logic			Active-ON Active-OFF
IN42 tON			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN42 tOFF			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
IN42 matching (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
IN42 matching (B)			none
Relays			
K1			
Logic			De-energized Energized
Operation MODE			No-latched Pulse Latched
Minimum pulse width		ms	0 ... 500 step = 5
K2			
Logic			De-energized Energized
Operation MODE			No-latched Pulse Latched
Minimum pulse width		ms	0 ... 500 step = 5
K3			
Logic			De-energized Energized
Operation MODE			No-latched Pulse Latched
Minimum pulse width		ms	0 ... 500 step = 5
K4			
Logic			De-energized Energized
Operation MODE			No-latched Pulse Latched
Minimum pulse width		ms	0 ... 500 step = 5
K5			
Logic			De-energized Energized
Operation MODE			No-latched Pulse Latched
Minimum pulse width		ms	0 ... 500 step = 5
K6			
Logic			De-energized Energized
Operation MODE			No-latched Pulse Latched
Minimum pulse width		ms	0 ... 500 step = 5
K7			
Logic			De-energized Energized
Operation MODE			No-latched Pulse Latched
Minimum pulse width		ms	0 ... 500 step = 5

K8			
Logic			De-energized Energized
Operation MODE			No-latched Pulse Latched
Minimum pulse width		ms	0 ... 500 step = 5
K9			
Logic			De-energized Energized
Operation MODE			No-latched Pulse Latched
Minimum pulse width		ms	0 ... 500 step = 5
K10			
Logic			De-energized Energized
Operation MODE			No-latched Pulse Latched
Minimum pulse width		ms	0 ... 500 step = 5
LEDs			
START			
Type			No-latched Latched
TRIP			
Type			No-latched Latched
L1			
Type			No-latched Latched
L2			
Type			No-latched Latched
L3			
Type			No-latched Latched
L4			
Type			No-latched Latched
L5			
Type			No-latched Latched
L6			
Type			No-latched Latched
L7			
Type			No-latched Latched
L8			
Type			No-latched Latched
L9			
Type			No-latched Latched
L10			
Type			No-latched Latched
Analog outputs			
Current loop 1			
Loop 1 Measure assigned	Loop1-Mis		Frequency UL1 UL2 UL3 UL1avg UL2avg UL3avg UE UL UEC U1 U2 PLC None
Loop 1 Output range	Loop1-Range		0-5 mA 0-20 mA 4-20 mA
Loop 1 Output type	Loop1-Type		Unipolar Bipolar
Loop 1 Nominal multiplier	Loop1-M		0.01 ... 100.00 step = 0.01
Loop 1 Terminals polarity	Loop1-Polarity		Normal Reverse
Current loop 2			
Loop 2 Measure assigned	Loop2-Mis		Frequency UL1 UL2 UL3 UL1avg UL2avg UL3avg UE UL UEC U1 U2 PLC None
Loop 2 Output range	Loop2-Range		0-5 mA 0-20 mA 4-20 mA
Loop 2 Output type	Loop2-Type		Unipolar Bipolar
Loop 2 Nominal multiplier	Loop2-M		0.01 ... 100.00 step = 0.01
Loop 2 Terminals polarity	Loop2-Polarity		Normal Reverse
Current loop 3			

Loop 3 Measure assigned	Loop3-Mis		Frequency UL1 UL2 UL3 UL1avg UL2avg UL3avg UE UL UEC U1 U2 PLC None
Loop 3 Output range	Loop3-Range		0-5 mA 0-20 mA 4-20 mA
Loop 3 Output type	Loop3-Type		Unipolar Bipolar
Loop 3 Nominal multiplier	Loop3-M		0.01 ... 100.00 step = 0.01
Loop 3 Terminals polarity	Loop3-Polarity		Normal Reverse
Current loop 4			
Loop 4 Measure assigned	Loop4-Mis		Frequency UL1 UL2 UL3 UL1avg UL2avg UL3avg UE UL UEC U1 U2 PLC None
Loop 4 Output range	Loop4-Range		0-5 mA 0-20 mA 4-20 mA
Loop 4 Output type	Loop4-Type		Unipolar Bipolar
Loop 4 Nominal multiplier	Loop4-M		0.01 ... 100.00 step = 0.01
Loop 4 Terminals polarity	Loop4-Polarity		Normal Reverse
Self-test Relay			
MINOR Fail alarm			NO YES
Self-test relay			K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
MMI			
Modules data visualization			Assigned modules All modules
Profile selection			
Active profile			A B By INPUT
Profile A			
Thermal protection with RTD thermometric probes - 26			
PT1 Probe			
ThAL1 Alarm			
ThAL1 Enable	ThAL1 Enable		OFF ON
26 PT1 Alarm threshold	ThAL1	^C	0 ... 200 step = 1
ThAL1 Operating time			
Value		s	0 ... 100 step = 1
ThAL1 Alarm relays	ThAL1-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
ThAL1 Alarm LEDs	ThAL1-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Th>1 Trip			
Th>1 Enable	Th>1 Enable		OFF ON
26 PT1 Trip threshold	Th>1	^C	0 ... 200 step = 1
Th>1 Operating time			
Value		s	0 ... 100 step = 1
Th>1 Breaker failure	Th>1BF		OFF ON
Th>1 Trip relays	Th>1-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
Th>1 Trip LEDs	Th>1-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
PT2 Probe			
ThAL2 Alarm			
ThAL2 Enable	ThAL2 Enable		OFF ON
26 PT2 Alarm threshold	ThAL2	^C	0 ... 200 step = 1
ThAL2 Operating time			
Value		s	0 ... 100 step = 1
ThAL2 Alarm relays	ThAL2-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
ThAL2 Alarm LEDs	ThAL2-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Th>2 Trip			
Th>2 Enable	Th>2 Enable		OFF ON
26 PT2 Trip threshold	Th>2	^C	0 ... 200 step = 1
Th>2 Operating time			

Value		s	0 ... 100 step = 1
Th>2 Breaker failure	Th>2BF		OFF ON
Th>2 Trip relays	Th>2-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
Th>2 Trip LEDs	Th>2-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
PT3 Probe			
ThAL3 Alarm			
ThAL3 Enable	ThAL3 Enable		OFF ON
26 PT3 Alarm threshold	ThAL3	^C	0 ... 200 step = 1
ThAL3 Operating time			
Value		s	0 ... 100 step = 1
ThAL3 Alarm relays	ThAL3-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
ThAL3 Alarm LEDs	ThAL3-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Th>3 Trip			
Th>3 Enable	Th>3 Enable		OFF ON
26 PT3 Trip threshold	Th>3	^C	0 ... 200 step = 1
Th>3 Operating time			
Value		s	0 ... 100 step = 1
Th>3 Breaker failure	Th>3BF		OFF ON
Th>3 Trip relays	Th>3-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
Th>3 Trip LEDs	Th>3-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
PT4 Probe			
ThAL4 Alarm			
ThAL4 Enable	ThAL4 Enable		OFF ON
26 PT4 Alarm threshold	ThAL4	^C	0 ... 200 step = 1
ThAL4 Operating time			
Value		s	0 ... 100 step = 1
ThAL4 Alarm relays	ThAL4-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
ThAL4 Alarm LEDs	ThAL4-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Th>4 Trip			
Th>4 Enable	Th>4 Enable		OFF ON
26 PT4 Trip threshold	Th>4	^C	0 ... 200 step = 1
Th>4 Operating time			
Value		s	0 ... 100 step = 1
Th>4 Breaker failure	Th>4BF		OFF ON
Th>4 Trip relays	Th>4-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
Th>4 Trip LEDs	Th>4-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
PT5 Probe			
ThAL5 Alarm			
ThAL5 Enable	ThAL5 Enable		OFF ON
26 PT5 Alarm threshold	ThAL5	^C	0 ... 200 step = 1
ThAL5 Operating time			
Value		s	0 ... 100 step = 1
ThAL5 Alarm relays	ThAL5-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
ThAL5 Alarm LEDs	ThAL5-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Th>5 Trip			
Th>5 Enable	Th>5 Enable		OFF ON
26 PT5 Trip threshold	Th>5	^C	0 ... 200 step = 1

Th>5 Operating time			
Value		s	0 ... 100 step = 1
Th>5 Breaker failure	Th>5BF		OFF ON
Th>5 Trip relays	Th>5-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
Th>5 Trip LEDs	Th>5-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
PT6 Probe			
ThAL6 Alarm			
ThAL6 Enable	ThAL6 Enable		OFF ON
26 PT6 Alarm threshold	ThAL6	^C	0 ... 200 step = 1
ThAL6 Operating time			
Value		s	0 ... 100 step = 1
ThAL6 Alarm relays	ThAL6-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
ThAL6 Alarm LEDs	ThAL6-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Th>6 Trip			
Th>6 Enable	Th>6 Enable		OFF ON
26 PT6 Trip threshold	Th>6	^C	0 ... 200 step = 1
Th>6 Operating time			
Value		s	0 ... 100 step = 1
Th>6 Breaker failure	Th>6BF		OFF ON
Th>6 Trip relays	Th>6-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
Th>6 Trip LEDs	Th>6-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
PT7 Probe			
ThAL7 Alarm			
ThAL7 Enable	ThAL7 Enable		OFF ON
26 PT7 Alarm threshold	ThAL7	^C	0 ... 200 step = 1
ThAL7 Operating time			
Value		s	0 ... 100 step = 1
ThAL7 Alarm relays	ThAL7-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
ThAL7 Alarm LEDs	ThAL7-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Th>7 Trip			
Th>7 Enable	Th>7 Enable		OFF ON
26 PT7 Trip threshold	Th>7	^C	0 ... 200 step = 1
Th>7 Operating time			
Value		s	0 ... 100 step = 1
Th>7 Breaker failure	Th>7BF		OFF ON
Th>7 Trip relays	Th>7-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
Th>7 Trip LEDs	Th>7-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
PT8 Probe			
ThAL8 Alarm			
ThAL8 Enable	ThAL8 Enable		OFF ON
26 PT8 Alarm threshold	ThAL8	^C	0 ... 200 step = 1
ThAL8 Operating time			
Value		s	0 ... 100 step = 1
ThAL8 Alarm relays	ThAL8-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
ThAL8 Alarm LEDs	ThAL8-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Th>8 Trip			
Th>8 Enable	Th>8 Enable		OFF ON

26 PT8 Trip threshold	Th>8	^C	0 ... 200 step = 1
Th>8 Operating time			
Value		s	0 ... 100 step = 1
Th>8 Breaker failure	Th>8BF		OFF ON
Th>8 Trip relays	Th>8-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
Th>8 Trip LEDs	Th>8-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Diagnostic			
PT100 probe diagnostic relays	PT100Diag-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
PT100 probe diagnostic LEDs	PT100Diag-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Undervoltage - 27			
Common configuration			
27 Operating logic	Logic27		OR AND
U< Element			
Setpoints			
U< Enable	U< Enable		OFF ON
U< Curve type	U<Curve		INVERSE DEFINITE
U< Logical block	U<BLK1		OFF ON
U< Breaker failure	U<BF		OFF ON
U< Disabling by CB_OPEN	U<disbyCB_OPEN		OFF ON
U< Start relays	U<ST-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
U< Trip relays	U<TR-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
U< Start LEDs	U<ST-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
U< Trip LEDs	U<TR-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Definite time			
27 First threshold definite time			
State			OFF ON
Pickup value		Un	0.05 ... 1.10 step = 0.01
U<def Operating time			
Value		s	0.03 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
Inverse time			
27 First threshold inverse time			
State			OFF ON
Pickup value		Un	0.05 ... 1.10 step = 0.01
U<inv Operating time	tU<inv	s	0.10 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
U<< Element			
Setpoints			
U<< Logical block	U<<BLK1		OFF ON
U<< Breaker failure	U<<BF		OFF ON
U< Disabling by U<< start	U<disbyU<<		OFF ON
U<< Disabling by CB_OPEN	U<<disbyCB_OPEN		OFF ON
U<< Start relays	U<<ST-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
U<< Trip relays	U<<TR-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
U<< Start LEDs	U<<ST-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
U<< Trip LEDs	U<<TR-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Definite time			

27 Second threshold definite time			
State			OFF ON
Pickup value		Un	0.05 ... 1.10 step = 0.01
U<<def Operating time			
Value		s	0.03 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
Positive sequence undervoltage - 27V1			
U1< Element			
Setpoints			
U1< Logical block	U1<BLK1		OFF ON
U1< Breaker failure	U1<BF		OFF ON
U1< Disabling by CB_OPEN	U1<disbyCB_OPEN		OFF ON
U1< Start relays	U1<ST-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
U1< Trip relays	U1<TR-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
U1< Start LEDs	U1<ST-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
U1< Trip LEDs	U1<TR-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Definite time			
27V1 First threshold definite time			
State			OFF ON
Pickup value		Un	0.05 ... 1.10 step = 0.01
U1<def Operating time			
Value		s	0.07 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
Overvoltage - 59			
Common configuration			
59 Operating logic	Logic59		OR AND
U> Element			
Setpoints			
U> Enable	U> Enable		OFF ON
U> Curve type	U>Curve		INVERSE DEFINITE
U> Logical block	U>BLK1		OFF ON
U> Breaker failure	U>BF		OFF ON
U> Disabling by CB_OPEN	U>disbyCB_OPEN		OFF ON
U> Start relays	U>ST-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
U> Trip relays	U>TR-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
U> Start LEDs	U>ST-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
U> Trip LEDs	U>TR-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Definite time			
59 First threshold definite time			
State			OFF ON
Pickup value		Un	0.50 ... 1.50 step = 0.01
U>def Operating time			
Value		s	0.03 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
Inverse time			
59 First threshold inverse time			
State			OFF ON
Pickup value		Un	0.50 ... 1.50 step = 0.01

U>inv Operating time	tU>inv	s	0.10 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
U>> Element			
Setpoints			
U>> Logical block	U>>BLK1		OFF ON
U>> Breaker failure	U>>BF		OFF ON
U> Disabling by U>> start	U>disbyU>>		OFF ON
U>> Disabling by CB_OPEN	U>>disbyCB_OPEN		OFF ON
U>> Start relays	U>>ST-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
U>> Trip relays	U>>TR-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
U>> Start LEDs	U>>ST-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
U>> Trip LEDs	U>>TR-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Definite time			
59 Second threshold definite time			
State			OFF ON
Pickup value		Un	0.50 ... 1.50 step = 0.01
U>>def Operating time			
Value		s	0.03 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
Average overvoltage - 59Uavg			
Common configuration			
59Uavg Operating logic	Logic59Uavg		OR AND
Uavg> Element			
Setpoints			
Uavg> Enable	Uavg> Enable		OFF ON
Uavg> Logical block	Uavg>BLK1		OFF ON
Uavg> Breaker failure	Uavg>BF		OFF ON
Uavg> Disabling by CB_OPEN	Uavg>disbyCB_OPEN		OFF ON
Uavg> Start relays	Uavg>ST-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
Uavg> Trip relays	Uavg>TR-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
Uavg> Start LEDs	Uavg>ST-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Uavg> Trip LEDs	Uavg>TR-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Definite time			
59Uavg First threshold definite time			
State			OFF ON
Pickup value		Un	0.50 ... 1.50 step = 0.01
Uavg>def Delay time			
Value		s	0 ... 1000 step = 1
Residual overvoltage - 59N			
Common configuration			
Residual voltage measurement type for 59N - direct/calculated	3VoType59N		UE UEC
59N Operation from 74VT external	74VText59N		OFF Block
UE> Element			
Setpoints			
UE> Enable	UE> Enable		OFF ON
UE> Curve type	UE>Curve		INVERSE DEFINITE
UE> Reset time delay			

Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
UE> Logical block	UE>BLK1		OFF ON
UE> Breaker failure	UE>BF		OFF ON
UE> Disabling by CB_OPEN	UE>disbyCB_OPEN		OFF ON
UE> Start relays	UE>ST-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
UE> Trip relays	UE>TR-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
UE> Start LEDs	UE>ST-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
UE> Trip LEDs	UE>TR-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Definite time			
59N First threshold definite time			
State			OFF ON
Pickup value		UEn	0.01 ... 0.70 step = 0.01
UE>def Operating time			
Value		s	0.07 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
Inverse time			
59N First threshold inverse time			
State			OFF ON
Pickup value		UEn	0.01 ... 0.50 step = 0.01
UE>inv Operating time	tUE>inv	s	0.10 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
UE>> Element			
Setpoints			
UE>> Reset time delay			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
UE>> Logical block	UE>>BLK1		OFF ON
UE>> Enable	UE>>BF		OFF ON
UE> Disabling by UE>> start	UE>disbyUE>>		OFF ON
UE>> Disabling by CB_OPEN	UE>>disbyCB_OPEN		OFF ON
UE>> Start relays	UE>>ST-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
UE>> Trip relays	UE>>TR-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
UE>> Start LEDs	UE>>ST-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
UE>> Trip LEDs	UE>>TR-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Definite time			
59N Second threshold definite time			
State			OFF ON
Pickup value		UEn	0.01 ... 0.70 step = 0.01
UE>>def Operating time			
Value		s	0.07 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
UE>>def Enable shrink time	EnTc UE>>def		OFF ON
UE>> Shrink time	tcUE>>def	s	0.07 ... 10.00 step = 0.01
tcUE>>def Activation time			
Value		s	1 ... 60 step = 1
Negative sequence overvoltage - 59V2			
U2> Element			
Setpoints			

U2> Logical block	U2>BLK1		OFF ON
U2> Breaker failure	U2>BF		OFF ON
U2> Disabling by CB_OPEN	U2>disbyCB_OPEN		OFF ON
U2> Start relays	U2>ST-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
U2> Trip relays	U2>TR-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
U2> Start LEDs	U2>ST-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
U2> Trip LEDs	U2>TR-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Definite time			
59V2 First threshold definite time			
State			OFF ON
Pickup value		Un	0.01 ... 0.50 step = 0.01
U2>def Operating time			
Value		s	0.07 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
Overfrequency - 810			
f> Element			
Setpoints			
f> Logical block	f>BLK1		OFF ON
f> Breaker failure	f>BF		OFF ON
f> Disabling by CB_OPEN	f>disbyCB_OPEN		OFF ON
f> Start relays	f>ST-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
f> Trip relays	f>TR-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
f> Start LEDs	f>ST-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
f> Trip LEDs	f>TR-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Definite time			
810 First threshold definite time			
State			OFF ON
Pickup value		fn	1.000 ... 1.200 step = 0.001
f>def Operating time			
Value		s	0.05 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
Voltage control			
f> Control enable	f>&		OFF ON
f> Controlled by UE>>	f>&UE>>		OFF ON
f> Controlled by digital input	f>&DIGIN		OFF ON
f> Controlled by 27V1	f>&27V1		OFF ON
f> Controlled by 59V2	f>&59V2		OFF ON
f> Controlled by U<	f>&U<		OFF ON
f> Controlled by 61850 network no link	f>&re-te61850-KO		OFF ON
f>& Reset time delay			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 200.0 step = 0.1
f> Control relays	f>&-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
f> Control LEDs	f>&-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
f>> Element			
Setpoints			
f>> Logical block	f>>BLK1		OFF ON

f>> Breaker failure	f>>BF		OFF ON
f> Disabling by f>> start	f>disbyf>>		OFF ON
f>> Disabling by CB_OPEN	f>>disbyCB_OPEN		OFF ON
f>> Start relays	f>>ST-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
f>> Trip relays	f>>TR-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
f>> Start LEDs	f>>ST-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
f>> Trip LEDs	f>>TR-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Definite time			
810 Second threshold definite time			
State			OFF ON
Pickup value		fn	1.000 ... 1.200 step = 0.001
f>>def Operating time			
Value		s	0.05 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
f>>def Enable shrink time	EnTc f>>def		OFF ON
f>> Shrink time	tcf>>def	s	0.07 ... 10.00 step = 0.01
tcf>>def Activation time			
Value		s	1 ... 60 step = 1
Underfrequency - 81U			
f< Element			
Setpoints			
f< Logical block	f<BLK1		OFF ON
f< Breaker failure	f<BF		OFF ON
f< Disabling by CB_OPEN	f<disbyCB_OPEN		OFF ON
f< Start relays	f<ST-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
f< Trip relays	f<TR-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
f< Start LEDs	f<ST-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
f< Trip LEDs	f<TR-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Definite time			
81U First threshold definite time			
State			OFF ON
Pickup value		fn	0.800 ... 1.000 step = 0.001
f<def Operating time			
Value		s	0.05 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
Voltage control			
f< Control enable	f<&		OFF ON
f< Controlled by UE>>	f<&UE>>		OFF ON
f< Controlled by digital input	f<&DIGIN		OFF ON
f< Controlled by 27V1	f<&27V1		OFF ON
f< Controlled by 59V2	f<&59V2		OFF ON
f< Controlled by U<	f<&U<		OFF ON
f< Controlled by 61850 network no link	f<&re-te61850-KO		OFF ON
f<& Reset time delay			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 200.0 step = 0.1
f< Control relays	f<&-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10

f< Control LEDs	f<&-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
f<< Element			
Setpoints			
f<< Logical block	f<<BLK1		OFF ON
f<< Breaker failure	f<<BF		OFF ON
f< Disabling by f<< start	f<disbyf<<		OFF ON
f<< Disabling by CB_OPEN	f<<disbyCB_OPEN		OFF ON
f<< Start relays	f<<ST-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
f<< Trip relays	f<<TR-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
f<< Start LEDs	f<<ST-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
f<< Trip LEDs	f<<TR-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Definite time			
81U Second threshold definite time			
State			OFF ON
Pickup value		fn	0.800 ... 1.000 step = 0.001
f<<def Operating time			
Value		s	0.05 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
f<<def Enable shrink time	EnTc f<<def		OFF ON
f<< Shrink time	tcf<<def	s	0.07 ... 10.00 step = 0.01
tcf<<def Activation time			
Value		s	1 ... 60 step = 1
f<<< Element			
Setpoints			
f<<< Logical block	f<<<BLK1		OFF ON
f<<< Breaker failure	f<<<BF		OFF ON
f< Disabling by f<<< start	f<disbyf<<<		OFF ON
f<< Disabling by f<<< start	f<<disbyf<<<		OFF ON
f<<< Disabling by CB_OPEN	f<<<disbyCB_OPEN		OFF ON
f<<< Start relays	f<<<ST-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
f<<< Trip relays	f<<<TR-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
f<<< Start LEDs	f<<<ST-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
f<<< Trip LEDs	f<<<TR-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Definite time			
81U Third threshold definite time			
State			OFF ON
Pickup value		fn	0.800 ... 1.000 step = 0.001
f<<<def Operating time			
Value		s	0.05 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
f<<<< Element			
Setpoints			
f<<<< Logical block	f<<<<BLK1		OFF ON
f<<<< Breaker failure	f<<<<BF		OFF ON
f< Disabling by f<<<< start	f<disbyf<<<<		OFF ON
f<< Disabling by f<<<< start	f<<disbyf<<<<		OFF ON
f<<< Disabling by f<<<< start	f<<<disbyf<<<<		OFF ON

f<<<< Disabling by CB_OPEN	f<<<<disbyCB_OPEN		OFF ON
f<<<< Start relays	f<<<<ST-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
f<<<< Trip relays	f<<<<TR-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
f<<<< Start LEDs	f<<<<ST-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
f<<<< Trip LEDs	f<<<<TR-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Definite time			
81U Fourth threshold definite time			
State			OFF ON
Pickup value		fn	0.800 ... 1.000 step = 0.001
f<<<<def Operating time			
Value		s	0.05 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
Frequency rate of change - 81R			
df> Element			
Setpoints			
df> Operating mode	Mode-df>		Module Positive Negative
df> Logical block	df>BLK1		OFF ON
df> Breaker failure	df>BF		OFF ON
df> Disabling by CB_OPEN	df>disbyCB_OPEN		OFF ON
df> Start relays	df>ST-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
df> Trip relays	df>TR-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
df> Start LEDs	df>ST-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
df> Trip LEDs	df>TR-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Definite time			
81R First threshold definite time			
State			OFF ON
Pickup value		Hz/s	0.1 ... 10.0 step = 0.1
df>def Operating time			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
df>> Element			
Setpoints			
df>> Operating mode	Mode-df>>		Module Positive Negative
df>> Logical block	df>>BLK1		OFF ON
df>> Breaker failure	df>>BF		OFF ON
df> Disabling by df>> start	df>disbydf>>		OFF ON
df>> Disabling by CB_OPEN	df>>disbyCB_OPEN		OFF ON
df>> Start relays	df>>ST-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
df>> Trip relays	df>>TR-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
df>> Start LEDs	df>>ST-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
df>> Trip LEDs	df>>TR-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Definite time			
81R Second threshold definite time			
State			OFF ON
Pickup value		Hz/s	0.1 ... 10.0 step = 0.1
df>>def Operating time			

Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
df>>> Element			
Setpoints			
df>>> Operating mode	Mode-df>>>		Module Positive Negative
df>>> Logical block	df>>>BLK1		OFF ON
df>>> Breaker failure	df>>>BF		OFF ON
df> Disabling by df>>> start	df>disbydf>>>		OFF ON
df>> Disabling by df>>> start	df>>disbydf>>>		OFF ON
df>>> Disabling by CB_OPEN	df>>>disbyCB_OPEN		OFF ON
df>>> Start relays	df>>>ST-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
df>>> Trip relays	df>>>TR-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
df>>> Start LEDs	df>>>ST-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
df>>> Trip LEDs	df>>>TR-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Definite time			
81R Third threshold definite time			
State			OFF ON
Pickup value		Hz/s	0.1 ... 10.0 step = 0.1
df>>>def Operating time			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
df>>>> Element			
Setpoints			
df>>>> Operating mode	Mode-df>>>>		Module Positive Negative
df>>>> Logical block	df>>>>BLK1		OFF ON
df>>>> Breaker failure	df>>>>BF		OFF ON
df> Disabling by df>>>> start	df>disbydf>>>>		OFF ON
df>> Disabling by df>>>> start	df>>disbydf>>>>		OFF ON
df>>> Disabling by df>>>> start	df>>>disbydf>>>>		OFF ON
df>>>> Disabling by CB_OPEN	df>>>>disbyCB_OPEN		OFF ON
df>>>> Start relays	df>>>>ST-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
df>>>> Trip relays	df>>>>TR-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
df>>>> Start LEDs	df>>>>ST-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
df>>>> Trip LEDs	df>>>>TR-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Definite time			
81R Fourth threshold definite time			
State			OFF ON
Pickup value		Hz/s	0.1 ... 10.0 step = 0.1
df>>>>def Operating time			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
Trip circuit supervision - 74TCS			
74TCS Enable	74TCS Enable		OFF ON
74TCS Logical block	74TCS-BLK1		OFF ON
74TCS Start relays	74TCS-ST-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
74TCS Trip relays	74TCS-TR-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10

74TCS Start LEDs	74TCS-ST-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
74TCS Trip LEDs	74TCS-TR-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Breaker failure - BF			
BF Enable	BF Enable		OFF ON
BF Time delay			
Value		s	0.06 ... 10.00 step = 0.01
BF Logical block	BF-BLK1		OFF ON
BF Start relays	BF-ST-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
BF Trip relays	BF-TR-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
BF Start LEDs	BF-ST-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
BF Trip LEDs	BF-TR-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Profile B			
Thermal protection with RTD thermometric probes - 26			
PT1 Probe			
ThAL1 Alarm			
ThAL1 Enable	ThAL1 Enable		OFF ON
26 PT1 Alarm threshold	ThAL1	°C	0 ... 200 step = 1
ThAL1 Operating time			
Value		s	0 ... 100 step = 1
ThAL1 Alarm relays	ThAL1-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
ThAL1 Alarm LEDs	ThAL1-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Th>1 Trip			
Th>1 Enable	Th>1 Enable		OFF ON
26 PT1 Trip threshold	Th>1	°C	0 ... 200 step = 1
Th>1 Operating time			
Value		s	0 ... 100 step = 1
Th>1 Breaker failure	Th>1BF		OFF ON
Th>1 Trip relays	Th>1-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
Th>1 Trip LEDs	Th>1-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
PT2 Probe			
ThAL2 Alarm			
ThAL2 Enable	ThAL2 Enable		OFF ON
26 PT2 Alarm threshold	ThAL2	°C	0 ... 200 step = 1
ThAL2 Operating time			
Value		s	0 ... 100 step = 1
ThAL2 Alarm relays	ThAL2-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
ThAL2 Alarm LEDs	ThAL2-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Th>2 Trip			
Th>2 Enable	Th>2 Enable		OFF ON
26 PT2 Trip threshold	Th>2	°C	0 ... 200 step = 1
Th>2 Operating time			
Value		s	0 ... 100 step = 1
Th>2 Breaker failure	Th>2BF		OFF ON
Th>2 Trip relays	Th>2-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
Th>2 Trip LEDs	Th>2-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
PT3 Probe			

ThAL3 Alarm			
ThAL3 Enable	ThAL3 Enable		OFF ON
26 PT3 Alarm threshold	ThAL3	^C	0 ... 200 step = 1
ThAL3 Operating time			
Value		s	0 ... 100 step = 1
ThAL3 Alarm relays	ThAL3-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
ThAL3 Alarm LEDs	ThAL3-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Th>3 Trip			
Th>3 Enable	Th>3 Enable		OFF ON
26 PT3 Trip threshold	Th>3	^C	0 ... 200 step = 1
Th>3 Operating time			
Value		s	0 ... 100 step = 1
Th>3 Breaker failure	Th>3BF		OFF ON
Th>3 Trip relays	Th>3-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
Th>3 Trip LEDs	Th>3-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
PT4 Probe			
ThAL4 Alarm			
ThAL4 Enable	ThAL4 Enable		OFF ON
26 PT4 Alarm threshold	ThAL4	^C	0 ... 200 step = 1
ThAL4 Operating time			
Value		s	0 ... 100 step = 1
ThAL4 Alarm relays	ThAL4-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
ThAL4 Alarm LEDs	ThAL4-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Th>4 Trip			
Th>4 Enable	Th>4 Enable		OFF ON
26 PT4 Trip threshold	Th>4	^C	0 ... 200 step = 1
Th>4 Operating time			
Value		s	0 ... 100 step = 1
Th>4 Breaker failure	Th>4BF		OFF ON
Th>4 Trip relays	Th>4-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
Th>4 Trip LEDs	Th>4-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
PT5 Probe			
ThAL5 Alarm			
ThAL5 Enable	ThAL5 Enable		OFF ON
26 PT5 Alarm threshold	ThAL5	^C	0 ... 200 step = 1
ThAL5 Operating time			
Value		s	0 ... 100 step = 1
ThAL5 Alarm relays	ThAL5-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
ThAL5 Alarm LEDs	ThAL5-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Th>5 Trip			
Th>5 Enable	Th>5 Enable		OFF ON
26 PT5 Trip threshold	Th>5	^C	0 ... 200 step = 1
Th>5 Operating time			
Value		s	0 ... 100 step = 1
Th>5 Breaker failure	Th>5BF		OFF ON
Th>5 Trip relays	Th>5-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
Th>5 Trip LEDs	Th>5-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10

PT6 Probe			
ThAL6 Alarm			
ThAL6 Enable	ThAL6 Enable		OFF ON
26 PT6 Alarm threshold	ThAL6	^C	0 ... 200 step = 1
ThAL6 Operating time			
Value		s	0 ... 100 step = 1
ThAL6 Alarm relays	ThAL6-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
ThAL6 Alarm LEDs	ThAL6-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Th>6 Trip			
Th>6 Enable	Th>6 Enable		OFF ON
26 PT6 Trip threshold	Th>6	^C	0 ... 200 step = 1
Th>6 Operating time			
Value		s	0 ... 100 step = 1
Th>6 Breaker failure	Th>6BF		OFF ON
Th>6 Trip relays	Th>6-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
Th>6 Trip LEDs	Th>6-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
PT7 Probe			
ThAL7 Alarm			
ThAL7 Enable	ThAL7 Enable		OFF ON
26 PT7 Alarm threshold	ThAL7	^C	0 ... 200 step = 1
ThAL7 Operating time			
Value		s	0 ... 100 step = 1
ThAL7 Alarm relays	ThAL7-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
ThAL7 Alarm LEDs	ThAL7-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Th>7 Trip			
Th>7 Enable	Th>7 Enable		OFF ON
26 PT7 Trip threshold	Th>7	^C	0 ... 200 step = 1
Th>7 Operating time			
Value		s	0 ... 100 step = 1
Th>7 Breaker failure	Th>7BF		OFF ON
Th>7 Trip relays	Th>7-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
Th>7 Trip LEDs	Th>7-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
PT8 Probe			
ThAL8 Alarm			
ThAL8 Enable	ThAL8 Enable		OFF ON
26 PT8 Alarm threshold	ThAL8	^C	0 ... 200 step = 1
ThAL8 Operating time			
Value		s	0 ... 100 step = 1
ThAL8 Alarm relays	ThAL8-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
ThAL8 Alarm LEDs	ThAL8-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Th>8 Trip			
Th>8 Enable	Th>8 Enable		OFF ON
26 PT8 Trip threshold	Th>8	^C	0 ... 200 step = 1
Th>8 Operating time			
Value		s	0 ... 100 step = 1
Th>8 Breaker failure	Th>8BF		OFF ON
Th>8 Trip relays	Th>8-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10

Th>8 Trip LEDs	Th>8-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Diagnostic			
PT100 probe diagnostic relays	PT100Diag-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
PT100 probe diagnostic LEDs	PT100Diag-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Undervoltage - 27			
Common configuration			
27 Operating logic	Logic27		OR AND
U< Element			
Setpoints			
U< Enable	U< Enable		OFF ON
U< Curve type	U<Curve		INVERSE DEFINITE
U< Logical block	U<BLK1		OFF ON
U< Breaker failure	U<BF		OFF ON
U< Disabling by CB_OPEN	U<disbyCB_OPEN		OFF ON
U< Start relays	U<ST-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
U< Trip relays	U<TR-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
U< Start LEDs	U<ST-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
U< Trip LEDs	U<TR-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Definite time			
27 First threshold definite time			
State			OFF ON
Pickup value		Un	0.05 ... 1.10 step = 0.01
U<def Operating time			
Value		s	0.03 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
Inverse time			
27 First threshold inverse time			
State			OFF ON
Pickup value		Un	0.05 ... 1.10 step = 0.01
U<inv Operating time	tU<inv	s	0.10 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
U<< Element			
Setpoints			
U<< Logical block	U<<BLK1		OFF ON
U<< Breaker failure	U<<BF		OFF ON
U< Disabling by U<< start	U<disbyU<<		OFF ON
U<< Disabling by CB_OPEN	U<<disbyCB_OPEN		OFF ON
U<< Start relays	U<<ST-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
U<< Trip relays	U<<TR-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
U<< Start LEDs	U<<ST-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
U<< Trip LEDs	U<<TR-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Definite time			
27 Second threshold definite time			
State			OFF ON
Pickup value		Un	0.05 ... 1.10 step = 0.01
U<<def Operating time			

Value		s	0.03 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
Positive sequence undervoltage - 27V1			
U1< Element			
Setpoints			
U1< Logical block	U1<BLK1		OFF ON
U1< Breaker failure	U1<BF		OFF ON
U1< Disabling by CB_OPEN	U1<disbyCB_OPEN		OFF ON
U1< Start relays	U1<ST-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
U1< Trip relays	U1<TR-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
U1< Start LEDs	U1<ST-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
U1< Trip LEDs	U1<TR-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Definite time			
27V1 First threshold definite time			
State			OFF ON
Pickup value		Un	0.05 ... 1.10 step = 0.01
U1<def Operating time			
Value		s	0.07 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
Overvoltage - 59			
Common configuration			
59 Operating logic	Logic59		OR AND
U> Element			
Setpoints			
U> Enable	U> Enable		OFF ON
U> Curve type	U>Curve		INVERSE DEFINITE
U> Logical block	U>BLK1		OFF ON
U> Breaker failure	U>BF		OFF ON
U> Disabling by CB_OPEN	U>disbyCB_OPEN		OFF ON
U> Start relays	U>ST-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
U> Trip relays	U>TR-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
U> Start LEDs	U>ST-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
U> Trip LEDs	U>TR-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Definite time			
59 First threshold definite time			
State			OFF ON
Pickup value		Un	0.50 ... 1.50 step = 0.01
U>def Operating time			
Value		s	0.03 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
Inverse time			
59 First threshold inverse time			
State			OFF ON
Pickup value		Un	0.50 ... 1.50 step = 0.01
U>inv Operating time	tU>inv	s	0.10 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
U>> Element			
Setpoints			
U>> Logical block	U>>BLK1		OFF ON

U>> Breaker failure	U>>BF		OFF ON
U> Disabling by U>> start	U>disbyU>>		OFF ON
U>> Disabling by CB_OPEN	U>>disbyCB_OPEN		OFF ON
U>> Start relays	U>>ST-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
U>> Trip relays	U>>TR-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
U>> Start LEDs	U>>ST-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
U>> Trip LEDs	U>>TR-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Definite time			
59 Second threshold definite time			
State			OFF ON
Pickup value		Un	0.50 ... 1.50 step = 0.01
U>>def Operating time			
Value		s	0.03 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
Average overvoltage - 59Uavg			
Common configuration			
59Uavg Operating logic	Logic59Uavg		OR AND
Uavg> Element			
Setpoints			
Uavg> Enable	Uavg> Enable		OFF ON
Uavg> Logical block	Uavg>BLK1		OFF ON
Uavg> Breaker failure	Uavg>BF		OFF ON
Uavg> Disabling by CB_OPEN	Uavg>disbyCB_OPEN		OFF ON
Uavg> Start relays	Uavg>ST-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
Uavg> Trip relays	Uavg>TR-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
Uavg> Start LEDs	Uavg>ST-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Uavg> Trip LEDs	Uavg>TR-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Definite time			
59Uavg First threshold definite time			
State			OFF ON
Pickup value		Un	0.50 ... 1.50 step = 0.01
Uavg>def Delay time			
Value		s	0 ... 1000 step = 1
Residual overvoltage - 59N			
Common configuration			
Residual voltage measurement type for 59N - direct/ calculated	3VoType59N		UE UEC
59N Operation from 74VT external	74VText59N		OFF Block
UE> Element			
Setpoints			
UE> Enable	UE> Enable		OFF ON
UE> Curve type	UE>Curve		INVERSE DEFINITE
UE> Reset time delay			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
UE> Logical block	UE>BLK1		OFF ON
UE> Breaker failure	UE>BF		OFF ON
UE> Disabling by CB_OPEN	UE>disbyCB_OPEN		OFF ON

UE> Start relays	UE>ST-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
UE> Trip relays	UE>TR-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
UE> Start LEDs	UE>ST-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
UE> Trip LEDs	UE>TR-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Definite time			
59N First threshold definite time			
State			OFF ON
Pickup value		UEn	0.01 ... 0.70 step = 0.01
UE>def Operating time			
Value		s	0.07 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
Inverse time			
59N First threshold inverse time			
State			OFF ON
Pickup value		UEn	0.01 ... 0.50 step = 0.01
UE>inv Operating time	tUE>inv	s	0.10 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
UE>> Element			
Setpoints			
UE>> Reset time delay			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
UE>> Logical block	UE>>BLK1		OFF ON
UE>> Enable	UE>>BF		OFF ON
UE>> Disabling by CB_OPEN	UE>>disbyCB_OPEN		OFF ON
UE> Disabling by UE>> start	UE>disbyUE>>		OFF ON
UE>> Start relays	UE>>ST-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
UE>> Trip relays	UE>>TR-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
UE>> Start LEDs	UE>>ST-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
UE>> Trip LEDs	UE>>TR-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Definite time			
59N Second threshold definite time			
State			OFF ON
Pickup value		UEn	0.01 ... 0.70 step = 0.01
UE>>def Operating time			
Value		s	0.07 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
UE>>def Enable shrink time	EnTc UE>>def		OFF ON
UE>> Shrink time	tcUE>>def	s	0.07 ... 10.00 step = 0.01
tcUE>>def Activation time			
Value		s	1 ... 60 step = 1
Negative sequence overvoltage - 59V2			
U2> Element			
Setpoints			
U2> Logical block	U2>BLK1		OFF ON
U2> Breaker failure	U2>BF		OFF ON
U2> Disabling by CB_OPEN	U2>disbyCB_OPEN		OFF ON
U2> Start relays	U2>ST-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
U2> Trip relays	U2>TR-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10

U2> Start LEDs	U2>ST-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
U2> Trip LEDs	U2>TR-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Definite time			
59V2 First threshold definite time			
State			OFF ON
Pickup value		Un	0.01 ... 0.50 step = 0.01
U2>def Operating time			
Value		s	0.07 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
Overfrequency - 810			
f> Element			
Setpoints			
f> Logical block	f>BLK1		OFF ON
f> Breaker failure	f>BF		OFF ON
f> Disabling by CB_OPEN	f>disbyCB_OPEN		OFF ON
f> Start relays	f>ST-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
f> Trip relays	f>TR-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
f> Start LEDs	f>ST-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
f> Trip LEDs	f>TR-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Definite time			
810 First threshold definite time			
State			OFF ON
Pickup value		fn	1.000 ... 1.200 step = 0.001
f>def Operating time			
Value		s	0.05 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
Voltage control			
f> Control enable	f>&		OFF ON
f> Controlled by UE>>	f>&UE>>		OFF ON
f> Controlled by digital input	f>&DIGIN		OFF ON
f> Controlled by 27V1	f>&27V1		OFF ON
f> Controlled by 59V2	f>&59V2		OFF ON
f> Controlled by U<	f>&U<		OFF ON
f> Controlled by 61850 network no link	f>&re-te61850-KO		OFF ON
f>& Reset time delay			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 200.0 step = 0.1
f> Control relays	f>&-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
f> Control LEDs	f>&-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
f>> Element			
Setpoints			
f>> Logical block	f>>BLK1		OFF ON
f>> Breaker failure	f>>BF		OFF ON
f> Disabling by f>> start	f>disbyf>>		OFF ON
f>> Disabling by CB_OPEN	f>>disbyCB_OPEN		OFF ON
f>> Start relays	f>>ST-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
f>> Trip relays	f>>TR-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10

f>> Start LEDs	f>>ST-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
f>> Trip LEDs	f>>TR-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Definite time			
810 Second threshold definite time			
State			OFF ON
Pickup value		fn	1.000 ... 1.200 step = 0.001
f>>def Operating time			
Value		s	0.05 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
f>>def Enable shrink time	EnTc f>>def		OFF ON
f>> Shrink time	tcf>>def	s	0.07 ... 10.00 step = 0.01
tcf>>def Activation time			
Value		s	1 ... 60 step = 1
Underfrequency - 81U			
f< Element			
Setpoints			
f< Logical block	f<BLK1		OFF ON
f< Breaker failure	f<BF		OFF ON
f< Disabling by CB_OPEN	f<disbyCB_OPEN		OFF ON
f< Start relays	f<ST-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
f< Trip relays	f<TR-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
f< Start LEDs	f<ST-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
f< Trip LEDs	f<TR-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Definite time			
81U First threshold definite time			
State			OFF ON
Pickup value		fn	0.800 ... 1.000 step = 0.001
f<def Operating time			
Value		s	0.05 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
Voltage control			
f< Control enable	f<&		OFF ON
f< Controlled by UE>>	f<&UE>>		OFF ON
f< Controlled by digital input	f<&DIGIN		OFF ON
f< Controlled by 27V1	f<&27V1		OFF ON
f< Controlled by 59V2	f<&59V2		OFF ON
f< Controlled by U<	f<&U<		OFF ON
f< Controlled by 61850 network no link	f<&re-te61850-KO		OFF ON
f<& Reset time delay			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 200.0 step = 0.1
f< Control relays	f<&-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
f< Control LEDs	f<&-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
f<< Element			
Setpoints			
f<< Logical block	f<<BLK1		OFF ON
f<< Breaker failure	f<<BF		OFF ON
f< Disabling by f<< start	f<disbyf<<		OFF ON

f<< Disabling by CB_OPEN	f<<disbyCB_OPEN		OFF ON
f<< Start relays	f<<ST-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
f<< Trip relays	f<<TR-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
f<< Start LEDs	f<<ST-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
f<< Trip LEDs	f<<TR-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Definite time			
81U Second threshold definite time			
State			OFF ON
Pickup value		fn	0.800 ... 1.000 step = 0.001
f<<def Operating time			
Value		s	0.05 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
f<<def Enable shrink time	EnTc f<<def		OFF ON
f<< Shrink time	tcf<<def	s	0.07 ... 10.00 step = 0.01
tcf<<def Activation time			
Value		s	1 ... 60 step = 1
f<<< Element			
Setpoints			
f<<< Logical block	f<<<BLK1		OFF ON
f<<< Breaker failure	f<<<BF		OFF ON
f< Disabling by f<<< start	f<disbyf<<<		OFF ON
f<< Disabling by f<<< start	f<<disbyf<<<		OFF ON
f<<< Disabling by CB_OPEN	f<<<disbyCB_OPEN		OFF ON
f<<< Start relays	f<<<ST-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
f<<< Trip relays	f<<<TR-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
f<<< Start LEDs	f<<<ST-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
f<<< Trip LEDs	f<<<TR-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Definite time			
81U Third threshold definite time			
State			OFF ON
Pickup value		fn	0.800 ... 1.000 step = 0.001
f<<<def Operating time			
Value		s	0.05 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
f<<<< Element			
Setpoints			
f<<<< Logical block	f<<<<BLK1		OFF ON
f<<<< Breaker failure	f<<<<BF		OFF ON
f< Disabling by f<<<< start	f<disbyf<<<<		OFF ON
f<< Disabling by f<<<< start	f<<disbyf<<<<		OFF ON
f<<< Disabling by f<<<< start	f<<<disbyf<<<<		OFF ON
f<<<< Disabling by CB_OPEN	f<<<<disbyCB_OPEN		OFF ON
f<<<< Start relays	f<<<<ST-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
f<<<< Trip relays	f<<<<TR-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
f<<<< Start LEDs	f<<<<ST-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10

f<<<< Trip LEDs	f<<<<TR-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Definite time			
81U Fourth threshold definite time			
State			OFF ON
Pickup value		fn	0.800 ... 1.000 step = 0.001
f<<<<def Operating time			
Value		s	0.05 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
Frequency rate of change - 81R			
df> Element			
Setpoints			
df> Operating mode	Mode-df>		Module Positive Negative
df> Logical block	df>BLK1		OFF ON
df> Breaker failure	df>BF		OFF ON
df> Disabling by CB_OPEN	df>disbyCB_OPEN		OFF ON
df> Start relays	df>ST-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
df> Trip relays	df>TR-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
df> Start LEDs	df>ST-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
df> Trip LEDs	df>TR-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Definite time			
81R First threshold definite time			
State			OFF ON
Pickup value		Hz/s	0.1 ... 10.0 step = 0.1
df>def Operating time			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
df>> Element			
Setpoints			
df>> Operating mode	Mode-df>>		Module Positive Negative
df>> Logical block	df>>BLK1		OFF ON
df>> Breaker failure	df>>BF		OFF ON
df> Disabling by df>> start	df>disbydf>>		OFF ON
df>> Disabling by CB_OPEN	df>>disbyCB_OPEN		OFF ON
df>> Start relays	df>>ST-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
df>> Trip relays	df>>TR-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
df>> Start LEDs	df>>ST-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
df>> Trip LEDs	df>>TR-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Definite time			
81R Second threshold definite time			
State			OFF ON
Pickup value		Hz/s	0.1 ... 10.0 step = 0.1
df>>def Operating time			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
df>>> Element			
Setpoints			
df>>> Operating mode	Mode-df>>>		Module Positive Negative
df>>> Logical block	df>>>BLK1		OFF ON

df>>> Breaker failure	df>>>BF		OFF ON
df> Disabling by df>>> start	df>disbydf>>>		OFF ON
df>> Disabling by df>>> start	df>>disbydf>>>		OFF ON
df>>> Disabling by CB_OPEN	df>>>disbyCB_OPEN		OFF ON
df>>> Start relays	df>>>ST-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
df>>> Trip relays	df>>>TR-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
df>>> Start LEDs	df>>>ST-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
df>>> Trip LEDs	df>>>TR-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Definite time			
81R Third threshold definite time			
State			OFF ON
Pickup value		Hz/s	0.1 ... 10.0 step = 0.1
df>>>def Operating time			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
df>>>> Element			
Setpoints			
df>>>> Operating mode	Mode-df>>>>		Module Positive Negative
df>>>> Logical block	df>>>>BLK1		OFF ON
df>>>> Breaker failure	df>>>>BF		OFF ON
df> Disabling by df>>>> start	df>disbydf>>>>		OFF ON
df>> Disabling by df>>>> start	df>>disbydf>>>>		OFF ON
df>>> Disabling by df>>>> start	df>>>disby-df>>>>		OFF ON
df>>>> Disabling by CB_OPEN	df>>>>disbyCB_OPEN		OFF ON
df>>>> Start relays	df>>>>ST-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
df>>>> Trip relays	df>>>>TR-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
df>>>> Start LEDs	df>>>>ST-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
df>>>> Trip LEDs	df>>>>TR-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Definite time			
81R Fourth threshold definite time			
State			OFF ON
Pickup value		Hz/s	0.1 ... 10.0 step = 0.1
df>>>>def Operating time			
Value		s	0.00 ... 9.99 step = 0.01 10.0 ... 100.0 step = 0.1
Trip circuit supervision - 74TCS			
74TCS Enable	74TCS Enable		OFF ON
74TCS Logical block	74TCS-BLK1		OFF ON
74TCS Start relays	74TCS-ST-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
74TCS Trip relays	74TCS-TR-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
74TCS Start LEDs	74TCS-ST-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
74TCS Trip LEDs	74TCS-TR-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Breaker failure - BF			
BF Enable	BF Enable		OFF ON
BF Time delay			

Value		s	0.06 ... 10.00 step = 0.01
BF Logical block	BF-BLK1		OFF ON
BF Start relays	BF-ST-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
BF Trip relays	BF-TR-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
BF Start LEDs	BF-ST-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
BF Trip LEDs	BF-TR-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
PLC			
Setpoints			
Enable	PLC Enable		OFF ON
Relays	PLC-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
LEDs	PLC-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Switches			
Switch 1			0 1
Switch 2			0 1
Switch 3			0 1
Switch 4			0 1
Switch 5			0 1
Switch 6			0 1
Switch 7			0 1
Switch 8			0 1
Switch 9			0 1
Switch 10			0 1
Switch 11			0 1
Switch 12			0 1
Switch 13			0 1 2
Switch 14			0 1 2
Switch 15			0 1 2
Switch 16			0 1 2
Switch 17			0 1 2
Switch 18			0 1 2
Switch 19			0 1 2
Switch 20			0 1 2
Switch 21			0 1 2 3
Switch 22			0 1 2 3
Switch 23			0 1 2 3
Switch 24			0 1 2 3
Switch 25			0 1 2 3 4 5 6 7 8 9
Switch 26			0 1 2 3 4 5 6 7 8 9
Switch 27			0 1 2 3 4 5 6 7 8 9
Switch 28			0 1 2 3 4 5 6 7 8 9
Switch 29			0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99

Switch 30			0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99
Switch 31			0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99
Switch 32			0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99
Timers			
Timer 1		s	0.00 ... 0.99 step = 0.01 1.0 ... 60.0 step = 0.1
Timer 2		s	0.00 ... 0.99 step = 0.01 1.0 ... 60.0 step = 0.1
Timer 3		s	0.00 ... 0.99 step = 0.01 1.0 ... 60.0 step = 0.1
Timer 4		s	0.00 ... 0.99 step = 0.01 1.0 ... 60.0 step = 0.1
Timer 5		s	0.00 ... 0.99 step = 0.01 1.0 ... 60.0 step = 0.1
Timer 6		s	0.00 ... 0.99 step = 0.01 1.0 ... 60.0 step = 0.1
Timer 7		s	0.00 ... 0.99 step = 0.01 1.0 ... 60.0 step = 0.1
Timer 8		s	0.00 ... 0.99 step = 0.01 1.0 ... 60.0 step = 0.1
Timer 9		s	0.0 ... 59.9 step = 0.1 60 ... 299 step = 1 300 ... 3600 step = 10
Timer 10		s	0.0 ... 59.9 step = 0.1 60 ... 299 step = 1 300 ... 3600 step = 10
Timer 11		s	0.0 ... 59.9 step = 0.1 60 ... 299 step = 1 300 ... 3600 step = 10
Timer 12		s	0.0 ... 59.9 step = 0.1 60 ... 299 step = 1 300 ... 3600 step = 10
Timer 13		s	0.0 ... 59.9 step = 0.1 60 ... 299 step = 1 300 ... 3600 step = 10

Timer 14		s	0.0 ... 59.9 step = 0.1 60 ... 299 step = 1 300 ... 3600 step = 10
Timer 15		s	0.0 ... 59.9 step = 0.1 60 ... 299 step = 1 300 ... 3600 step = 10
Timer 16		s	0.0 ... 59.9 step = 0.1 60 ... 299 step = 1 300 ... 3600 step = 10
Timer 17		s	0 ... 59 step = 1 60 ... 3540 step = 60 3600 ... 86400 step = 600
Timer 18		s	0 ... 59 step = 1 60 ... 3540 step = 60 3600 ... 86400 step = 600
Timer 19		s	0 ... 59 step = 1 60 ... 3540 step = 60 3600 ... 86400 step = 600
Timer 20		s	0 ... 59 step = 1 60 ... 3540 step = 60 3600 ... 86400 step = 600
Timer 21		s	0 ... 59 step = 1 60 ... 3540 step = 60 3600 ... 86400 step = 600
Timer 22		s	0 ... 59 step = 1 60 ... 3540 step = 60 3600 ... 86400 step = 600
Timer 23		s	0 ... 59 step = 1 60 ... 3540 step = 60 3600 ... 86400 step = 600
Timer 24		s	0 ... 59 step = 1 60 ... 3540 step = 60 3600 ... 86400 step = 600
ARF - 1			
Enable			OFF ON
Selection			Aux1 Aux2
Up frequency limit		Hz	50.00 ... 60.00 step = 0.05
Low frequency limit		Hz	40.00 ... 50.00 step = 0.05
Up frequency band limit		Hz	50.00 ... 60.00 step = 0.05
Low frequency band limit		Hz	40.00 ... 50.00 step = 0.05
Timer		s	0 ... 59 step = 1 60 ... 1000 step = 10
ARF - 2			
Enable			OFF ON
Selection			Aux1 Aux2
Up frequency limit		Hz	50.00 ... 60.00 step = 0.05
Low frequency limit		Hz	40.00 ... 50.00 step = 0.05
Up frequency band limit		Hz	50.00 ... 60.00 step = 0.05
Low frequency band limit		Hz	40.00 ... 50.00 step = 0.05
Timer		s	0 ... 59 step = 1 60 ... 1000 step = 10
Circuit Breaker supervision			
LEDs-relays allocation			
Open CB command relays	CBopen-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
Close CB command relays	CBclose-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10

CB Closed LEDs	CBclose-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
CB Open LEDs	CBopen-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
CB State diagnostic relays	CBdiag-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
CB Diagnostic			
Number of CB trips mode	ModeN.Open		OFF ON
Number of CB trips threshold	N.Open		0 ... 10000 step = 1
CB operating time mode	Mode-tOpen		OFF ON
Trigger relay for CB opening time trigger measurement	Ktrig-break		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
Circuit breaker maximum allowed opening time			
Value		s	0.05 ... 1.00 step = 0.01
Number of CB trips diagnostic relays	N.Open-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
Circuit breaker opening time diagnostic relays	tbreak-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
Number of CB trips diagnostic LEDs	N.Open-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Circuit breaker opening time diagnostic LEDs	tbreak-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
Remote tripping			
Remote tripping breaker failure	RemTrBF		OFF ON
Remote tripping relays	RemTrip-K		K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
Remote tripping LEDs	RemTrip-L		START TRIP L1 L2 L3 L4 L5 L6 L7 L8 L9 L10
TimeZone			
Time Zone			(UTC+0) - Greenwich Dublin Edinburgh Lisbon London (UTC+1) - Amsterdam Berlin Bern Rome Stockholm Vienna (UTC+2) - Athens Bucharest Cairo Istanbul (UTC+3) - Addis Abeba Baghdad Moscow Nairobi S.Petersburg (UTC+4) - Baku Dubai Mauritius Samara Tbilisi (UTC+5) - Karachi Maldives Tashkent Yekaterinburg (UTC+6) - Almaty Dhaka Omsk (UTC-1) - Azores CapoVerde (UTC-2) - Mid Atlantic (UTC-3) - Brasilia BuenosAires Georgetown Greenland (UTC-4) - AtlanticTime LaPaz Manuas Santiago (UTC-5) - EasternTime (US Canada) Indiana (UTC-6) - CentralTime (US Canada) CentralAmerica
Daylight saving time			Disable Europe Russia Jordan Syria Egypt
Virtual Outputs - VOUT			
Settings			
Start dropout time for voltage protections	tV	s	0.00 ... 30.00 step = 0.01
Trip reset	tTrip	s	0.00 ... 30.00 step = 0.01
VOUT1			
Type			Start Trip Plc Input
Start			UE>> 27V1 59V2 U< TEST_START
Trip			U<TR U<<TR U>TR U>>TR UE>TR UE>>TR Th1>TR Th2>TR Th3>TR Th4>TR Th5>TR Th6>TR Th7>TR Th8>TR 74TCS-TR BF-TR TEST_TRIP U1<TR Uavg>TR U2>TR f>TR f>>TR f<TR f<<TR f<<<TR f<<<<TR df>TR df>>TR df>>>TR df>>>>TR
Input Mask1			IN1 IN2 IN3 IN4 IN5 IN6 IN7 IN8 IN9 IN10 IN11 IN12 IN13 IN14 IN15 IN16 IN17 IN18 IN19 IN20 IN21 IN22 IN23 IN24 IN25 IN26 IN27 IN28 IN29 IN30 IN31 IN32

Input Mask2			IN33 IN34 IN35 IN36 IN37 IN38 IN39 IN40 IN41 IN42
VOUT2			
Type			Start Trip Plc Input
Start			UE>> 27V1 59V2 U< TEST_START
Trip			U<TR U<<TR U>TR U>>TR UE>TR UE>>TR Th1>TR Th2>TR Th3>TR Th4>TR Th5>TR Th6>TR Th7>TR Th8>TR 74TCS-TR BF-TR TEST_TRIP U1<TR Uavg>TR U2>TR f>TR f>>TR f<TR f<<TR f<<<TR f<<<<TR df>TR df>>TR df>>>TR df>>>>TR
Input Mask1			IN1 IN2 IN3 IN4 IN5 IN6 IN7 IN8 IN9 IN10 IN11 IN12 IN13 IN14 IN15 IN16 IN17 IN18 IN19 IN20 IN21 IN22 IN23 IN24 IN25 IN26 IN27 IN28 IN29 IN30 IN31 IN32
Input Mask2			IN33 IN34 IN35 IN36 IN37 IN38 IN39 IN40 IN41 IN42
VOUT3			
Type			Start Trip Plc Input
Start			UE>> 27V1 59V2 U< TEST_START
Trip			U<TR U<<TR U>TR U>>TR UE>TR UE>>TR Th1>TR Th2>TR Th3>TR Th4>TR Th5>TR Th6>TR Th7>TR Th8>TR 74TCS-TR BF-TR TEST_TRIP U1<TR Uavg>TR U2>TR f>TR f>>TR f<TR f<<TR f<<<TR f<<<<TR df>TR df>>TR df>>>TR df>>>>TR
Input Mask1			IN1 IN2 IN3 IN4 IN5 IN6 IN7 IN8 IN9 IN10 IN11 IN12 IN13 IN14 IN15 IN16 IN17 IN18 IN19 IN20 IN21 IN22 IN23 IN24 IN25 IN26 IN27 IN28 IN29 IN30 IN31 IN32
Input Mask2			IN33 IN34 IN35 IN36 IN37 IN38 IN39 IN40 IN41 IN42
VOUT4			
Type			Start Trip Plc Input
Start			UE>> 27V1 59V2 U< TEST_START
Trip			U<TR U<<TR U>TR U>>TR UE>TR UE>>TR Th1>TR Th2>TR Th3>TR Th4>TR Th5>TR Th6>TR Th7>TR Th8>TR 74TCS-TR BF-TR TEST_TRIP U1<TR Uavg>TR U2>TR f>TR f>>TR f<TR f<<TR f<<<TR f<<<<TR df>TR df>>TR df>>>TR df>>>>TR
Input Mask1			IN1 IN2 IN3 IN4 IN5 IN6 IN7 IN8 IN9 IN10 IN11 IN12 IN13 IN14 IN15 IN16 IN17 IN18 IN19 IN20 IN21 IN22 IN23 IN24 IN25 IN26 IN27 IN28 IN29 IN30 IN31 IN32
Input Mask2			IN33 IN34 IN35 IN36 IN37 IN38 IN39 IN40 IN41 IN42
VOUT5			
Type			Start Trip Plc Input
Start			UE>> 27V1 59V2 U< TEST_START
Trip			U<TR U<<TR U>TR U>>TR UE>TR UE>>TR Th1>TR Th2>TR Th3>TR Th4>TR Th5>TR Th6>TR Th7>TR Th8>TR 74TCS-TR BF-TR TEST_TRIP U1<TR Uavg>TR U2>TR f>TR f>>TR f<TR f<<TR f<<<TR f<<<<TR df>TR df>>TR df>>>TR df>>>>TR

Input Mask1			IN1 IN2 IN3 IN4 IN5 IN6 IN7 IN8 IN9 IN10 IN11 IN12 IN13 IN14 IN15 IN16 IN17 IN18 IN19 IN20 IN21 IN22 IN23 IN24 IN25 IN26 IN27 IN28 IN29 IN30 IN31 IN32
Input Mask2			IN33 IN34 IN35 IN36 IN37 IN38 IN39 IN40 IN41 IN42
VOUT6			
Type			Start Trip Plc Input
Start			UE>> 27V1 59V2 U< TEST_START
Trip			U<TR U<<TR U>TR U>>TR UE>TR UE>>TR Th1>TR Th2>TR Th3>TR Th4>TR Th5>TR Th6>TR Th7>TR Th8>TR 74TCS- TR BF-TR TEST_TRIP U1<TR Uavg>TR U2>TR f>TR f>>TR f<TR f<<TR f<<<TR f<<<<TR df>TR df>>TR df>>>TR df>>>>TR
Input Mask1			IN1 IN2 IN3 IN4 IN5 IN6 IN7 IN8 IN9 IN10 IN11 IN12 IN13 IN14 IN15 IN16 IN17 IN18 IN19 IN20 IN21 IN22 IN23 IN24 IN25 IN26 IN27 IN28 IN29 IN30 IN31 IN32
Input Mask2			IN33 IN34 IN35 IN36 IN37 IN38 IN39 IN40 IN41 IN42
VOUT7			
Type			Start Trip Plc Input
Start			UE>> 27V1 59V2 U< TEST_START
Trip			U<TR U<<TR U>TR U>>TR UE>TR UE>>TR Th1>TR Th2>TR Th3>TR Th4>TR Th5>TR Th6>TR Th7>TR Th8>TR 74TCS- TR BF-TR TEST_TRIP U1<TR Uavg>TR U2>TR f>TR f>>TR f<TR f<<TR f<<<TR f<<<<TR df>TR df>>TR df>>>TR df>>>>TR
Input Mask1			IN1 IN2 IN3 IN4 IN5 IN6 IN7 IN8 IN9 IN10 IN11 IN12 IN13 IN14 IN15 IN16 IN17 IN18 IN19 IN20 IN21 IN22 IN23 IN24 IN25 IN26 IN27 IN28 IN29 IN30 IN31 IN32
Input Mask2			IN33 IN34 IN35 IN36 IN37 IN38 IN39 IN40 IN41 IN42
VOUT8			
Type			Start Trip Plc Input
Start			UE>> 27V1 59V2 U< TEST_START
Trip			U<TR U<<TR U>TR U>>TR UE>TR UE>>TR Th1>TR Th2>TR Th3>TR Th4>TR Th5>TR Th6>TR Th7>TR Th8>TR 74TCS- TR BF-TR TEST_TRIP U1<TR Uavg>TR U2>TR f>TR f>>TR f<TR f<<TR f<<<TR f<<<<TR df>TR df>>TR df>>>TR df>>>>TR
Input Mask1			IN1 IN2 IN3 IN4 IN5 IN6 IN7 IN8 IN9 IN10 IN11 IN12 IN13 IN14 IN15 IN16 IN17 IN18 IN19 IN20 IN21 IN22 IN23 IN24 IN25 IN26 IN27 IN28 IN29 IN30 IN31 IN32
Input Mask2			IN33 IN34 IN35 IN36 IN37 IN38 IN39 IN40 IN41 IN42
VOUT9			
Type			Start Trip Plc Input
Start			UE>> 27V1 59V2 U< TEST_START

Trip			U<TR U<<TR U>TR U>>TR UE>TR UE>>TR Th1>TR Th2>TR Th3>TR Th4>TR Th5>TR Th6>TR Th7>TR Th8>TR 74TCS-TR BF-TR TEST_TRIP U1<TR Uavg>TR U2>TR f>TR f>>TR f<TR f<<TR f<<<TR f<<<<TR df>TR df>>TR df>>>TR df>>>>TR
Input Mask1			IN1 IN2 IN3 IN4 IN5 IN6 IN7 IN8 IN9 IN10 IN11 IN12 IN13 IN14 IN15 IN16 IN17 IN18 IN19 IN20 IN21 IN22 IN23 IN24 IN25 IN26 IN27 IN28 IN29 IN30 IN31 IN32
Input Mask2			IN33 IN34 IN35 IN36 IN37 IN38 IN39 IN40 IN41 IN42
VOUT10			
Type			Start Trip Plc Input
Start			UE>> 27V1 59V2 U< TEST_START
Trip			U<TR U<<TR U>TR U>>TR UE>TR UE>>TR Th1>TR Th2>TR Th3>TR Th4>TR Th5>TR Th6>TR Th7>TR Th8>TR 74TCS-TR BF-TR TEST_TRIP U1<TR Uavg>TR U2>TR f>TR f>>TR f<TR f<<TR f<<<TR f<<<<TR df>TR df>>TR df>>>TR df>>>>TR
Input Mask1			IN1 IN2 IN3 IN4 IN5 IN6 IN7 IN8 IN9 IN10 IN11 IN12 IN13 IN14 IN15 IN16 IN17 IN18 IN19 IN20 IN21 IN22 IN23 IN24 IN25 IN26 IN27 IN28 IN29 IN30 IN31 IN32
Input Mask2			IN33 IN34 IN35 IN36 IN37 IN38 IN39 IN40 IN41 IN42
VOUT11			
Type			Start Trip Plc Input
Start			UE>> 27V1 59V2 U< TEST_START
Trip			U<TR U<<TR U>TR U>>TR UE>TR UE>>TR Th1>TR Th2>TR Th3>TR Th4>TR Th5>TR Th6>TR Th7>TR Th8>TR 74TCS-TR BF-TR TEST_TRIP U1<TR Uavg>TR U2>TR f>TR f>>TR f<TR f<<TR f<<<TR f<<<<TR df>TR df>>TR df>>>TR df>>>>TR
Input Mask1			IN1 IN2 IN3 IN4 IN5 IN6 IN7 IN8 IN9 IN10 IN11 IN12 IN13 IN14 IN15 IN16 IN17 IN18 IN19 IN20 IN21 IN22 IN23 IN24 IN25 IN26 IN27 IN28 IN29 IN30 IN31 IN32
Input Mask2			IN33 IN34 IN35 IN36 IN37 IN38 IN39 IN40 IN41 IN42
VOUT12			
Type			Start Trip Plc Input
Start			UE>> 27V1 59V2 U< TEST_START
Trip			U<TR U<<TR U>TR U>>TR UE>TR UE>>TR Th1>TR Th2>TR Th3>TR Th4>TR Th5>TR Th6>TR Th7>TR Th8>TR 74TCS-TR BF-TR TEST_TRIP U1<TR Uavg>TR U2>TR f>TR f>>TR f<TR f<<TR f<<<TR f<<<<TR df>TR df>>TR df>>>TR df>>>>TR
Input Mask1			IN1 IN2 IN3 IN4 IN5 IN6 IN7 IN8 IN9 IN10 IN11 IN12 IN13 IN14 IN15 IN16 IN17 IN18 IN19 IN20 IN21 IN22 IN23 IN24 IN25 IN26 IN27 IN28 IN29 IN30 IN31 IN32

Input Mask2			IN33 IN34 IN35 IN36 IN37 IN38 IN39 IN40 IN41 IN42
VOUT13			
Type			Start Trip Plc Input
Start			UE>> 27V1 59V2 U< TEST_START
Trip			U<TR U<<TR U>TR U>>TR UE>TR UE>>TR Th1>TR Th2>TR Th3>TR Th4>TR Th5>TR Th6>TR Th7>TR Th8>TR 74TCS-TR BF-TR TEST_TRIP U1<TR Uavg>TR U2>TR f>TR f>>TR f<TR f<<TR f<<<TR f<<<<TR df>TR df>>TR df>>>TR df>>>>TR
Input Mask1			IN1 IN2 IN3 IN4 IN5 IN6 IN7 IN8 IN9 IN10 IN11 IN12 IN13 IN14 IN15 IN16 IN17 IN18 IN19 IN20 IN21 IN22 IN23 IN24 IN25 IN26 IN27 IN28 IN29 IN30 IN31 IN32
Input Mask2			IN33 IN34 IN35 IN36 IN37 IN38 IN39 IN40 IN41 IN42
VOUT14			
Type			Start Trip Plc Input
Start			UE>> 27V1 59V2 U< TEST_START
Trip			U<TR U<<TR U>TR U>>TR UE>TR UE>>TR Th1>TR Th2>TR Th3>TR Th4>TR Th5>TR Th6>TR Th7>TR Th8>TR 74TCS-TR BF-TR TEST_TRIP U1<TR Uavg>TR U2>TR f>TR f>>TR f<TR f<<TR f<<<TR f<<<<TR df>TR df>>TR df>>>TR df>>>>TR
Input Mask1			IN1 IN2 IN3 IN4 IN5 IN6 IN7 IN8 IN9 IN10 IN11 IN12 IN13 IN14 IN15 IN16 IN17 IN18 IN19 IN20 IN21 IN22 IN23 IN24 IN25 IN26 IN27 IN28 IN29 IN30 IN31 IN32
Input Mask2			IN33 IN34 IN35 IN36 IN37 IN38 IN39 IN40 IN41 IN42
VOUT15			
Type			Start Trip Plc Input
Start			UE>> 27V1 59V2 U< TEST_START
Trip			U<TR U<<TR U>TR U>>TR UE>TR UE>>TR Th1>TR Th2>TR Th3>TR Th4>TR Th5>TR Th6>TR Th7>TR Th8>TR 74TCS-TR BF-TR TEST_TRIP U1<TR Uavg>TR U2>TR f>TR f>>TR f<TR f<<TR f<<<TR f<<<<TR df>TR df>>TR df>>>TR df>>>>TR
Input Mask1			IN1 IN2 IN3 IN4 IN5 IN6 IN7 IN8 IN9 IN10 IN11 IN12 IN13 IN14 IN15 IN16 IN17 IN18 IN19 IN20 IN21 IN22 IN23 IN24 IN25 IN26 IN27 IN28 IN29 IN30 IN31 IN32
Input Mask2			IN33 IN34 IN35 IN36 IN37 IN38 IN39 IN40 IN41 IN42
VOUT16			
Type			Start Trip Plc Input
Start			UE>> 27V1 59V2 U< TEST_START
Trip			U<TR U<<TR U>TR U>>TR UE>TR UE>>TR Th1>TR Th2>TR Th3>TR Th4>TR Th5>TR Th6>TR Th7>TR Th8>TR 74TCS-TR BF-TR TEST_TRIP U1<TR Uavg>TR U2>TR f>TR f>>TR f<TR f<<TR f<<<TR f<<<<TR df>TR df>>TR df>>>TR df>>>>TR

Input Mask1			IN1 IN2 IN3 IN4 IN5 IN6 IN7 IN8 IN9 IN10 IN11 IN12 IN13 IN14 IN15 IN16 IN17 IN18 IN19 IN20 IN21 IN22 IN23 IN24 IN25 IN26 IN27 IN28 IN29 IN30 IN31 IN32
Input Mask2			IN33 IN34 IN35 IN36 IN37 IN38 IN39 IN40 IN41 IN42
Virtual Inputs - VIN			
Settings			
Profile			
Enable Switch settings profile			OFF ON
Settings Profile			Profile A Profile B
Input Vin (link)			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
LinkLoss			
Enable link loss			OFF ON
Input Vin (link)			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
LinkLoss Timer			
Value		s	3.0 ... 60.0 step = 0.1
VIN			
VIN1-Function (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
VIN1-Function (B)			none
VIN1-K			K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
VIN2-Function (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
VIN2-Function (B)			none
VIN2-K			K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
VIN3-Function (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
VIN3-Function (B)			none
VIN3-K			K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
VIN4-Function (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
VIN4-Function (B)			none
VIN4-K			K1 K2 K3 K4 K5 K6 K7 K8 K9 K10

VIN5-Function (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
VIN5-Function (B)			none
VIN5-K			K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
VIN6-Function (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
VIN6-Function (B)			none
VIN6-K			K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
VIN7-Function (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
VIN7-Function (B)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
VIN7-K			K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
VIN8-Function (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
VIN8-Function (B)			none
VIN8-K			K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
VIN9-Function (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
VIN9-Function (B)			none
VIN9-K			K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
VIN10-Function (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
VIN10-Function (B)			none
VIN10-K			K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
VIN11-Function (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
VIN11-Function (B)			none
VIN11-K			K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
VIN12-Function (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
VIN12-Function (B)			none

VIN12-K			K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
VIN13-Function (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
VIN13-Function (B)			none
VIN13-K			K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
VIN14-Function (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
VIN14-Function (B)			none
VIN14-K			K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
VIN15-Function (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
VIN15-Function (B)			none
VIN15-K			K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
VIN16-Function (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
VIN16-Function (B)			none
VIN16-K			K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
VIN17-Function (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
VIN17-Function (B)			none
VIN17-K			K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
VIN18-Function (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
VIN18-Function (B)			none
VIN18-K			K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
VIN19-Function (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
VIN19-Function (B)			none
VIN19-K			K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
VIN20-Function (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
VIN20-Function (B)			none
VIN20-K			K1 K2 K3 K4 K5 K6 K7 K8 K9 K10

VIN21-Function (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
VIN21-Function (B)			none
VIN21-K			K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
VIN22-Function (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
VIN22-Function (B)			none
VIN22-K			K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
VIN23-Function (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
VIN23-Function (B)			none
VIN23-K			K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
VIN24-Function (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
VIN24-Function (B)			none
VIN24-K			K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
VIN25-Function (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
VIN25-Function (B)			none
VIN25-K			K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
VIN26-Function (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
VIN26-Function (B)			none
VIN26-K			K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
VIN27-Function (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
VIN27-Function (B)			none
VIN27-K			K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
VIN28-Function (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
VIN28-Function (B)			none
VIN28-K			K1 K2 K3 K4 K5 K6 K7 K8 K9 K10

VIN29-Function (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
VIN29-Function (B)			none
VIN29-K			K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
VIN30-Function (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
VIN30-Function (B)			none
VIN30-K			K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
VIN31-Function (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
VIN31-Function (B)			none
VIN31-K			K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
VIN32-Function (A)			Reset LEDs Set profile Fault trigger Block1 TCS1 TCS2 Trip ProtExt Reset counters Reset CB Monitor 52a 52b Open CB Close CB Remote trip 74VT ext. f<-f> Control UE>> 27V1 59V2 U<
VIN32-Function (B)			none
VIN32-K			K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
Comtrade			
Enable			OFF ON
Enable Compression			OFF ON
Remove files if Enabled=OFF			OFF ON
Oscillography			
Readings			
State			Initialization Upload from serial flash Reset Wait Store to serial flash Start recording Acquire Trigger Stopped Fail Off
Serial flash state			OFF Upload from serial flash Store to serial flash Reset serial flash
Serial flash overrun			OFF ON
Records			0 ... 0 step = 0
Buffer storage		%	0 ... 0 step = 0
Trigger Setup			
Pre-trigger time		s	0.05 ... 1.00 step = 0.01
Post-trigger time		s	0.05 ... 60.00 step = 0.05
Element pickup trigger			ON OFF
Trigger from outputs			K1 K2 K3 K4 K5 K6 K7 K8 K9 K10
Binary input trigger			ON OFF
Trigger from inputs IN1-IN32			IN1 IN2 IN3 IN4 IN5 IN6 IN7 IN8 IN9 IN10 IN11 IN12 IN13 IN14 IN15 IN16 IN17 IN18 IN19 IN20 IN21 IN22 IN23 IN24 IN25 IN26 IN27 IN28 IN29 IN30 IN31 IN32
Trigger from inputs IN33-IN42			IN33 IN34 IN35 IN36 IN37 IN38 IN39 IN40 IN41 IN42
80% Buffer alarm			OFF ON

Set sample channels			
uL1			On Off
uL2			On Off
uL3			On Off
uE			On Off
Set analog channels			
Analog 1			fUL1 fUL2 fUL3 UL1 UL2 UL3 UE UEC U1 U2 df/dt T1 T2 T3 T4 T5 T6 T7 T8 Off
Analog 2			fUL1 fUL2 fUL3 UL1 UL2 UL3 UE UEC U1 U2 df/dt T1 T2 T3 T4 T5 T6 T7 T8 Off
Analog 3			fUL1 fUL2 fUL3 UL1 UL2 UL3 UE UEC U1 U2 df/dt T1 T2 T3 T4 T5 T6 T7 T8 Off
Analog 4			fUL1 fUL2 fUL3 UL1 UL2 UL3 UE UEC U1 U2 df/dt T1 T2 T3 T4 T5 T6 T7 T8 Off
Analog 5			fUL1 fUL2 fUL3 UL1 UL2 UL3 UE UEC U1 U2 df/dt T1 T2 T3 T4 T5 T6 T7 T8 Off
Analog 6			fUL1 fUL2 fUL3 UL1 UL2 UL3 UE UEC U1 U2 df/dt T1 T2 T3 T4 T5 T6 T7 T8 Off
Analog 7			fUL1 fUL2 fUL3 UL1 UL2 UL3 UE UEC U1 U2 df/dt T1 T2 T3 T4 T5 T6 T7 T8 Off
Analog 8			fUL1 fUL2 fUL3 UL1 UL2 UL3 UE UEC U1 U2 df/dt T1 T2 T3 T4 T5 T6 T7 T8 Off
Analog 9			fUL1 fUL2 fUL3 UL1 UL2 UL3 UE UEC U1 U2 df/dt T1 T2 T3 T4 T5 T6 T7 T8 Off
Analog 10			fUL1 fUL2 fUL3 UL1 UL2 UL3 UE UEC U1 U2 df/dt T1 T2 T3 T4 T5 T6 T7 T8 Off
Analog 11			fUL1 fUL2 fUL3 UL1 UL2 UL3 UE UEC U1 U2 df/dt T1 T2 T3 T4 T5 T6 T7 T8 Off
Analog 12			fUL1 fUL2 fUL3 UL1 UL2 UL3 UE UEC U1 U2 df/dt T1 T2 T3 T4 T5 T6 T7 T8 Off
Set digital channels			
Binary 1			K1 K2 K3 K4 K5 K6 K7 K8 K9 K10 IN1 IN2 IN3 IN4 IN5 IN6 IN7 IN8 IN9 IN10 IN11 IN12 IN13 IN14 IN15 IN16 IN17 IN18 IN19 IN20 IN21 IN22 IN23 IN24 IN25 IN26 IN27 IN28 IN29 IN30 IN31 IN32 IN33 IN34 IN35 IN36 IN37 IN38 IN39 IN40 IN41 IN42 Off
Binary 2			K1 K2 K3 K4 K5 K6 K7 K8 K9 K10 IN1 IN2 IN3 IN4 IN5 IN6 IN7 IN8 IN9 IN10 IN11 IN12 IN13 IN14 IN15 IN16 IN17 IN18 IN19 IN20 IN21 IN22 IN23 IN24 IN25 IN26 IN27 IN28 IN29 IN30 IN31 IN32 IN33 IN34 IN35 IN36 IN37 IN38 IN39 IN40 IN41 IN42 Off

Binary 1

Binary 12			K1 K2 K3 K4 K5 K6 K7 K8 K9 K10 IN1 IN2 IN3 IN4 IN5 IN6 IN7 IN8 IN9 IN10 IN11 IN12 IN13 IN14 IN15 IN16 IN17 IN18 IN19 IN20 IN21 IN22 IN23 IN24 IN25 IN26 IN27 IN28 IN29 IN30 IN31 IN32 IN33 IN34 IN35 IN36 IN37 IN38 IN39 IN40 IN41 IN42 Off
Communication			
RS485			
Protocol			MODBUS IEC60870-5-103
Address			1 ... 254 step = 1
Baudrate RS485			1200 baud 2400 baud 4800 baud 9600 baud 19200 baud 38400 baud 57600 baud
Ethernet			
IP host address			
IP net mask			
IP gateway			
Autonegotiation			OFF ON
Network Services			
NTP			
General			
Enable			OFF ON
Type			Local Network Internet User
NTP synchronization LED			None START TRIP L1 L2 L3 L4 L5
Internet Type			
NTP Server			Zurich(Europe) Berlin(Europe) Italy(Europe) Fukuoka1(Japan) Fukuoka2(Japan) Pushchi- no(Russia) Lagos(Nigeria) South Africa
User Type			
NTP Server address			
Network management			
Enable			OFF ON
Type			Multicast Broadcast
Multicast address			
Broadcast address			
Rx port			0 ... 20000 step = 1
Tx port			0 ... 20000 step = 1
TimeToLive(Multicast)			0 ... 20 step = 1
RPC			
TCP			
Server			
Enable			OFF ON
Led client(s) connected			None START TRIP L1 L2 L3 L4 L5
CONN1			
VOUT/IN PAIR			
Pair_1 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_1 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE

Pair_2 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_2 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_3 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_3 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_4 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_4 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_5 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_5 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_6 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_6 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_7 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_7 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE

Pair_8 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_8 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_9 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_9 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_10 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_10 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_11 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_11 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_12 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_12 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_13 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_13 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE

Pair_14 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_14 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_15 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_15 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_16 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_16 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Enable			OFF ON
Address			
LEDs			None START TRIP L1 L2 L3 L4 L5
CONN2			
VOUT/IN PAIR			
Pair_1 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_1 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_2 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_2 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_3 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE

Pair_3 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_4 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_4 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_5 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_5 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_6 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_6 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_7 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_7 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_8 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_8 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_9 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE

Pair_9 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_10 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_10 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_11 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_11 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_12 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_12 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_13 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_13 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_14 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_14 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_15 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE

Pair_15 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_16 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_16 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Enable			OFF ON
Address			
LEDs			None START TRIP L1 L2 L3 L4 L5
CONN3			
VOUT/IN PAIR			
Pair_1 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_1 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_2 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_2 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_3 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_3 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_4 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_4 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE

Pair_5 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_5 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_6 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_6 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_7 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_7 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_8 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_8 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_9 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_9 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_10 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_10 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE

Pair_11 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_11 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_12 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_12 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_13 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_13 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_14 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_14 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_15 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_15 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_16 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_16 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Enable			OFF ON
Address			

LEDs			None START TRIP L1 L2 L3 L4 L5
CONN4			
VOUT/IN PAIR			
Pair_1 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_1 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_2 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_2 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_3 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_3 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_4 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_4 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_5 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_5 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_6 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE

Pair_6 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_7 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_7 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_8 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_8 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_9 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_9 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_10 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_10 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_11 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_11 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_12 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE

Pair_12 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_13 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_13 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_14 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_14 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_15 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_15 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_16 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_16 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Enable			OFF ON
Address			
LEDs			None START TRIP L1 L2 L3 L4 L5
CONN5			
VOUT/IN PAIR			
Pair_1 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_1 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE

Pair_2 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_2 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_3 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_3 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_4 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_4 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_5 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_5 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_6 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_6 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_7 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_7 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE



Pair_8 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_8 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_9 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_9 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_10 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_10 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_11 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_11 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_12 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_12 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_13 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_13 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE

Pair_14 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_14 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_15 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_15 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_16 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_16 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Enable			OFF ON
Address			
LEDs			None START TRIP L1 L2 L3 L4 L5
CONN6			
VOUT/IN PAIR			
Pair_1 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_1 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_2 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_2 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_3 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE

Pair_3 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_4 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_4 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_5 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_5 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_6 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_6 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_7 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_7 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_8 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_8 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_9 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE

Pair_9 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_10 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_10 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_11 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_11 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_12 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_12 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_13 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_13 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_14 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_14 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_15 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE

Pair_15 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_16 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_16 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Enable			OFF ON
Address			
LEDs			None START TRIP L1 L2 L3 L4 L5
CONN7			
VOUT/IN PAIR			
Pair_1 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_1 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_2 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_2 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_3 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_3 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_4 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_4 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE

Pair_5 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_5 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_6 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_6 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_7 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_7 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_8 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_8 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_9 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_9 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_10 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_10 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE

Pair_11 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_11 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_12 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_12 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_13 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_13 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_14 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_14 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_15 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_15 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_16 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_16 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Enable			OFF ON
Address			

LEDs			None START TRIP L1 L2 L3 L4 L5
CONN8			
VOUT/IN PAIR			
Pair_1 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_1 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_2 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_2 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_3 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_3 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_4 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_4 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_5 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_5 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_6 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE

Pair_6 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_7 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_7 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_8 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_8 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_9 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_9 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_10 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_10 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_11 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_11 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_12 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE

Pair_12 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_13 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_13 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_14 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_14 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_15 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_15 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_16 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_16 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Enable			OFF ON
Address			
LEDs			None START TRIP L1 L2 L3 L4 L5
Multicast			
Server			
DEVICES ID			
Device 1			0 ... 999999 step = 1
Device 2			0 ... 999999 step = 1
Device 3			0 ... 999999 step = 1
Device 4			0 ... 999999 step = 1
Device 5			0 ... 999999 step = 1
Device 6			0 ... 999999 step = 1
Device 7			0 ... 999999 step = 1

Device 8			0 ... 999999 step = 1
Device 9			0 ... 999999 step = 1
Device 10			0 ... 999999 step = 1
Device 11			0 ... 999999 step = 1
Device 12			0 ... 999999 step = 1
Device 13			0 ... 999999 step = 1
Device 14			0 ... 999999 step = 1
Device 15			0 ... 999999 step = 1
Device 16			0 ... 999999 step = 1
Device 17			0 ... 999999 step = 1
Device 18			0 ... 999999 step = 1
Device 19			0 ... 999999 step = 1
Device 20			0 ... 999999 step = 1
Enable			OFF ON
Led client(s) connected			None START TRIP L1 L2 L3 L4 L5
Address			
Enable list Devices			OFF ON
CONN1			
VOUT/IN PAIR			
Pair_1 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_1 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_2 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_2 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_3 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_3 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_4 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE

Pair_4 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_5 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_5 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_6 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_6 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_7 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_7 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_8 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_8 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_9 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_9 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_10 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE

Pair_10 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_11 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_11 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_12 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_12 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_13 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_13 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_14 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_14 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_15 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_15 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_16 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE

Pair_16 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Enable			OFF ON
Address			
LEDs			None START TRIP L1 L2 L3 L4 L5
CONN2			
VOUT/IN PAIR			
Pair_1 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_1 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_2 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_2 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_3 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_3 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_4 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_4 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_5 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_5 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE

Pair_6 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_6 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_7 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_7 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_8 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_8 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_9 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_9 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_10 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_10 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_11 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_11 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE

Pair_12 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_12 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_13 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_13 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_14 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_14 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_15 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_15 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_16 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_16 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Enable			OFF ON
Address			
LEDs			None START TRIP L1 L2 L3 L4 L5
CONN3			
VOUT/IN PAIR			
Pair_1 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE

Pair_1 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_2 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_2 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_3 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_3 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_4 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_4 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_5 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_5 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_6 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_6 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_7 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE

Pair_7 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_8 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_8 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_9 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_9 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_10 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_10 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_11 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_11 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_12 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_12 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_13 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE

Pair_13 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_14 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_14 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_15 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_15 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_16 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_16 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Enable			OFF ON
Address			
LEDs			None START TRIP L1 L2 L3 L4 L5
CONN4			
VOUT/IN PAIR			
Pair_1 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_1 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_2 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_2 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE

Pair_3 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_3 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_4 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_4 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_5 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_5 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_6 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_6 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_7 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_7 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_8 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_8 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE

Pair_9 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_9 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_10 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_10 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_11 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_11 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_12 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_12 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_13 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_13 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_14 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_14 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE

Pair_15 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_15 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_16 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_16 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Enable			OFF ON
Address			
LEDs			None START TRIP L1 L2 L3 L4 L5
CONN5			
VOUT/IN PAIR			
Pair_1 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_1 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_2 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_2 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_3 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_3 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_4 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE

Pair_4 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_5 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_5 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_6 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_6 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_7 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_7 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_8 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_8 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_9 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_9 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_10 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE

Pair_10 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_11 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_11 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_12 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_12 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_13 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_13 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_14 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_14 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_15 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_15 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_16 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE

Pair_16 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Enable			OFF ON
Address			
LEDs			None START TRIP L1 L2 L3 L4 L5
CONN6			
VOUT/IN PAIR			
Pair_1 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_1 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_2 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_2 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_3 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_3 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_4 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_4 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_5 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_5 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE

Pair_6 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_6 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_7 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_7 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_8 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_8 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_9 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_9 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_10 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_10 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_11 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_11 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE

Pair_12 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_12 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_13 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_13 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_14 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_14 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_15 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_15 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_16 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_16 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Enable			OFF ON
Address			
LEDs			None START TRIP L1 L2 L3 L4 L5
CONN7			
VOUT/IN PAIR			
Pair_1 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE

Pair_1 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_2 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_2 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_3 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_3 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_4 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_4 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_5 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_5 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_6 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_6 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_7 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE

Pair_7 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_8 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_8 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_9 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_9 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_10 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_10 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_11 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_11 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_12 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_12 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_13 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE

Pair_13 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_14 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_14 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_15 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_15 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_16 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_16 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Enable			OFF ON
Address			
LEDs			None START TRIP L1 L2 L3 L4 L5
CONN8			
VOUT/IN PAIR			
Pair_1 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_1 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_2 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_2 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE

Pair_3 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_3 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_4 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_4 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_5 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_5 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_6 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_6 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_7 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_7 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_8 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_8 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE

Pair_9 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_9 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_10 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_10 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_11 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_11 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_12 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_12 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_13 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_13 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_14 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_14 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE



Pair_15 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_15 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Pair_16 Local Vout			VOUT1 VOUT2 VOUT3 VOUT4 VOUT5 VOUT6 VOUT7 VOUT8 VOUT9 VOUT10 VOUT11 VOUT12 VOUT13 VOUT14 VOUT15 VOUT16 NONE
Pair_16 Remote Vin			VIN1 VIN2 VIN3 VIN4 VIN5 VIN6 VIN7 VIN8 VIN9 VIN10 VIN11 VIN12 VIN13 VIN14 VIN15 VIN16 VIN17 VIN18 VIN19 VIN20 VIN21 VIN22 VIN23 VIN24 VIN25 VIN26 VIN27 VIN28 VIN29 VIN30 VIN31 VIN32 NONE
Enable			OFF ON
Address			
LEDs			None START TRIP L1 L2 L3 L4 L5
Test			
Signal Simulator			
TEST state			OFF ON

8.9 APPENDIX D- EC Declaration of conformity

Manufacturer:	THYTRONIC S.p.A.
Address:	Piazza Mistral 7 - 20139 MILANO

The undersigned manufacturer herewith declares that the product

Protection relay - type NV10P

is in conformity with the provisions of the following EC directives (including all applicable amendments) when installed in accordance with the installation instructions:

Reference n°	Title
2014/35/EC 2014/30/EC	Low Voltage Directive EMC Directive

Reference of standards and/or technical specifications applied for this declaration of conformity or parts thereof:

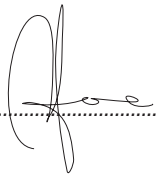
- harmonized standards:

Reference n°	Issue	Title
EN 61010-1	2010	Safety requirements for electrical equipment for measurement, control and laboratory use
EN 50263	2000	Electromagnetic compatibility (EMC) Product standard for measuring relays and protection equipments
EN 61000-6-4	2007-2011	Electromagnetic compatibility (EMC) Emission standard for industrial environments
EN 61000-6-2	2005	Electromagnetic compatibility (EMC) Immunity standard for industrial environments

- other standards and/or technical specifications:

Reference n°	Issue	Title
EN 60255-1	2011	Electrical relays Part 6: General requirements for measuring relays and protection equipment

Year of CE marking: 2006

Signature.....


Name
Title
Date

FIORE Mattia
Managing director
12-2006



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