VOLTAGE AND FREQUENCY RELAY

VAMP 11V

Technical Manual

(V11V/EN M v1.0)

(January 2016)

Schneider Electric

Note: The technical manual for this device gives instructions for its installation, commissioning, and operation. However, the manual cannot cover all conceivable circumstances or include detailed information on all topics. In the event of any questions or specific problems arising, do not take any action without proper authorization. Contact the appropriate Schneider Electric Energy technical sales office and request the necessary information.

Any agreements, commitments, and legal relationships and any obligations on the part of Schneider Electric Energy including settlements of warranties, result solely from the applicable purchase contract, which is not affected by the contents of the technical manual.

This device MUST NOT be modified. If any modification is made without the express permission of Schneider Electric Energy, it will invalidate the warranty, and may render the product unsafe.

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SAFETY SECTION

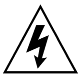
CONTENTS

STANDARD SAFETY STATEMENTS AND EXTERNAL LABEL INFORMATION FOR SCHNEIDER ELECTRIC ENERGY EQUIPMENT

1. INTRODUCTION

This Safety Section and the relevant equipment documentation provide full information on safe handling, commissioning and testing of this equipment. This Safety Section also includes reference to typical equipment label markings.

The technical data in this Safety Section is typical only, see the technical data section of the relevant equipment documentation for data specific to a particular item of equipment.



Before carrying out any work on the equipment the user should be familiar with the contents of this Safety Section and the ratings on the equipment's rating label.

Reference should be made to the external connection diagram before the equipment is installed, commissioned or serviced.

Language specific, self-adhesive User Interface labels are provided in a bag for some equipment.

2. HEALTH AND SAFETY

The information in the Safety Section of the equipment documentation is intended to ensure that equipment is properly installed and handled in order to maintain it in a safe condition.

It is assumed that everyone who will be involved with the equipment is familiar with the contents of this Safety Section, or the Safety Guide (SFTY/4L M).

When electrical equipment is in operation, dangerous voltages are present in certain parts of the equipment. Failure to observe warning notices, incorrect use, or improper use may endanger personnel and equipment and also cause personal injury or physical damage.

Before working in the terminal strip area, the equipment must be isolated.

Proper and safe operation of the equipment depends on appropriate shipping and handling, proper storage, installation and commissioning, and on careful operation, maintenance and servicing. For this reason only qualified personnel may work on or operate the equipment.

Qualified personnel are individuals who:

- Are familiar with the installation, commissioning, and operation of the equipment and of the system to which it is being connected;
- Are able to safely perform switching operations in accordance with accepted safety engineering practices and are authorized to energize and de-energize equipment and to isolate, ground, and label it;
- Are trained in the care and use of safety apparatus in accordance with safety engineering practices;
- Are trained in emergency procedures (first aid).

The equipment documentation gives instructions for its installation, commissioning, and operation. However, the manuals cannot cover all conceivable circumstances or include detailed information on all topics. In the event of any questions or specific problems arising, do not take any action without proper authorization. Contact the appropriate Schneider Electric Energy technical sales office and request the necessary information.

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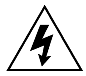
3. SYMBOLS AND LABELS ON THE EQUIPMENT

For safety reasons the following symbols which may be used on the equipment or referred to in the equipment documentation, should be understood before it is installed or commissioned.

3.1 Symbols

Caution: refer to equipment documentation



Caution: risk of electric shock

Protective Conductor (*Earth) terminal

Functional/Protective Conductor (*Earth) terminal

Note: This symbol may also be used for a Protective Conductor (Earth) Terminal if that terminal is part of a terminal block or sub-assembly e.g. power supply.

*NOTE: THE TERM EARTH USED THROUGHOUT THIS TECHNICAL MANUAL IS THE DIRECT EQUIVALENT OF THE NORTH AMERICAN TERM GROUND.

3.2 Labels

See Safety Guide (SFTY/4L M) for typical equipment labeling information.

4. INSTALLING, COMMISSIONING AND SERVICING

Equipment connections

Personnel undertaking installation, commissioning or servicing work on this equipment should be aware of the correct working procedures to ensure safety.

The equipment documentation should be consulted before installing, commissioning, or servicing the equipment.

Terminals exposed during installation, commissioning and maintenance may present a hazardous voltage unless the equipment is electrically isolated.

Any disassembly of the equipment may expose parts at hazardous voltage, also electronic parts may be damaged if suitable electrostatic voltage discharge (ESD) precautions are not taken.

If there is unlocked access to the rear of the equipment, care should be taken by all personnel to avoid electric shock or energy hazards.

Voltage connections should be made using insulated crimp terminations to ensure that terminal block insulation requirements are maintained for safety.

Watchdog (self-monitoring) contacts are provided in numerical relays to indicate the health of the device. Schneider Electric Energy strongly recommends that these contacts are hardwired into the substation's automation system, for alarm purposes.

To ensure that wires are correctly terminated the correct crimp terminal and tool for the wire size should be used.

The equipment must be connected in accordance with the appropriate connection diagram.

Protection Class I Equipment

- Before energizing the equipment it must be earthed using the protective conductor terminal, if provided, or the appropriate termination of the supply plug in the case of plug connected equipment.

- The protective conductor (earth) connection must not be removed since the protection against electric shock provided by the equipment would be lost.
- When the protective (earth) conductor terminal (PCT) is also used to terminate cable screens, etc., it is essential that the integrity of the protective (earth) conductor be checked after the addition or removal of such functional earth connections. For M4 stud PCTs the integrity of the protective (earth) connections should be ensured by use of a locknut or similar.

The recommended minimum protective conductor (earth) wire size is 2.5 mm^2 (3.3 mm^2 for North America) unless otherwise stated in the technical data section of the equipment documentation, or otherwise required by local or country wiring regulations.

The protective conductor (earth) connection must be low-inductance and as short as possible.

All connections to the equipment must have a defined potential. Connections that are pre-wired, but not used, should preferably be grounded when binary inputs and output relays are isolated. When binary inputs and output relays are connected to common potential, the pre-wired but unused connections should be connected to the common potential of the grouped connections.

Before energizing the equipment, the following should be checked:

- Voltage rating/polarity (rating label/equipment documentation);
- VT circuit rating (rating label) and integrity of connections;
- Protective fuse rating;
- Integrity of the protective conductor (earth) connection (where applicable);
- Voltage rating of external wiring, applicable to the application.

Accidental touching of exposed terminals

If working in an area of restricted space, such as a cubicle, where there is a risk of electric shock due to accidental touching of terminals which do not comply with IP20 rating, then a suitable protective barrier should be provided.

Equipment use

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Removal of the equipment front panel/cover

Removal of the equipment front panel/cover may expose hazardous live parts, which must not be touched until the electrical power is removed.

UL and CSA listed or recognized equipment

To maintain UL and CSA approvals the equipment should be installed using UL and/or CSA listed or recognized parts of the following type: connection cables, protective fuses/fuse holders or circuit breakers, insulation crimp terminals, and replacement internal battery, as specified in the equipment documentation.

Equipment operating conditions

The equipment should be operated within the specified electrical and environmental limits.

External resistors, including voltage dependent resistors (VDRs)

Where external resistors, including voltage dependent resistors (VDRs), are fitted to the equipment, these may present a risk of electric shock or burns, if touched.

Battery replacement

Where internal batteries are fitted they should be replaced with the recommended type and be installed with the correct polarity to avoid possible damage to the equipment, buildings and persons.

Insulation and dielectric strength testing

Insulation testing may leave capacitors charged up to a hazardous voltage. At the end of each part of the test, the voltage should be gradually reduced to zero, to discharge capacitors, before the test leads are disconnected.

Insertion of modules and pcb cards

Modules and PCB cards must not be inserted into or withdrawn from the equipment whilst it is energized, since this may result in damage.

Insertion and withdrawal of extender cards

Extender cards are available for some equipment. If an extender card is used, this should not be inserted or withdrawn from the equipment whilst it is energized. This is to avoid possible shock or damage hazards. Hazardous live voltages may be accessible on the extender card.

External test blocks and test plugs

Great care should be taken when using external test blocks and test plugs such as the MMLG, MMLB and MiCOM P990 types, hazardous voltages may be accessible when using these.

Fiber-optic communication

Where fiber-optic communication devices are fitted, these should not be viewed directly. Optical power meters should be used to determine the operation or signal level of the device.

Cleaning

The equipment may be cleaned using a lint free cloth dampened with clean water, when no connections are energized. Contact fingers of test plugs are normally protected by petroleum jelly, which should not be removed.

Maintenance and installation

For safety reason, no work must be carried out on the VAMP until all power sources to the unit have been disconnected

5. DE-COMMISSIONING AND DISPOSAL

De-commissioning

The supply input (auxiliary) for the equipment may include capacitors across the supply or to earth. To avoid electric shock or energy hazards, after completely isolating the supplies to the equipment (both poles of any dc supply), the capacitors should be safely discharged via the external terminals prior to de-commissioning.

Disposal

It is recommended that incineration and disposal to water courses is avoided. The equipment should be disposed of in a safe manner. Batteries should be removed from any equipment before its disposal, taking precautions to avoid short circuits. Particular regulations within the country of operation, may apply to the disposal of the equipment.

6. TECHNICAL SPECIFICATIONS FOR SAFETY

6.1 Protective fuse rating

Where UL Listing of the equipment is not required the recommended fuse type is a high rupture capacity (HRC) type with a maximum current rating of 16 Amps and a minimum DC rating of 250 Vdc, for example the Red Spot NIT or TIA type.

To maintain UL and CUL Listing of the equipment for North America a UL Listed fuse shall be used. The UL Listed type shall be a Class J time delay fuse, with a maximum current rating of 15 A and a minimum DC rating of 250 Vdc, for example type AJT15.

The protective fuse should be located as close to the unit as possible.

6.2 Protective class

IEC 60255-27: 2013	Class I (unless otherwise specified in the equipment documentation).

6.3 Installation category

IEC 60255-27: 2013	Installation category III (Overvoltage Category III).
EN 60255-27: 2014	Distribution level, fixed installation.
	Equipment in this category is qualification tested at 5kV peak, 1.2/50µs, 500Ω, 0.5J, between all supply circuits and earth and also between independent circuits.

6.4 Environment

The equipment is intended for indoor installation and use only. If it is required for use in an outdoor environment then it must be housed in a specific cabinet which will enable it to meet the requirements of IEC 60529 with the classification of degree of protection IP54 (dust and splashing water protected).

Pollution Degree - Pollution Degree 2 Compliance is demonstrated by reference to safety
Altitude - Operation up to 2000m standards.

IEC 60255-27:2013

EN 60255-27: 2014

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INTRODUCTION

Date:	**1st December 2015**
Software Version:	**1A**
Connection Diagrams:	**10V11V01**

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FIGURES

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1. VAMP documentation structure

The manual provides a functional and technical description of the VAMP protection relay and a comprehensive set of instructions for the relay's use and application.

The section contents are summarized below:

V11V/EN IT Introduction

A guide to the VAMP range of relays and the documentation structure. Also a general functional overview of the relay and brief application summary are given.

V11V/EN TD Technical Data

Technical data including setting ranges, accuracy limits, recommended operating conditions, ratings and performance data. Compliance with norms and international standards is quoted where appropriate.

V11V/EN GS Getting Started

A guide to the different user interfaces of the protection relay describing how to start using it. This section provides detailed information regarding the communication interfaces of the relay, including a detailed description of how to access the settings database stored within the relay.

V11V/EN ST Settings

List of all relay settings, including ranges, step sizes and defaults, together with a brief explanation of each setting.

V11V/EN OP Operation

A comprehensive and detailed functional description of all protection and non-protection functions.

V11V/EN AP Application Notes

This section includes a description of common power system applications of the relay, calculation of suitable settings, some typical worked examples, and how to apply the settings to the relay.

V11V/EN MR Measurements and Recording

Detailed description of the relays recording and measurements functions.

V11V/EN CM Commissioning

Instructions on how to commission the relay, comprising checks on the calibration and functionality of the relay.

V11V/EN MT Maintenance

A general maintenance policy for the relay is outlined.

V11V/EN TS Troubleshooting

Advice on how to recognize failure modes and the recommended course of action. Includes guidance on whom at Schneider Electric Energy to contact for advice.

V11V/EN SG Symbols and Glossary

List of common technical abbreviations found within the product documentation.

V11V/EN IN Installation

Recommendations on unpacking, handling, inspection and storage of the relay. A guide to the mechanical and electrical installation of the relay is provided, incorporating earthing recommendations. All external wiring connections to the relay are indicated.

V11V/EN CM Communication Database

This section provides an overview regarding the SCADA/DCS communication interfaces of the relay.

V11V/EN VH Firmware and Service Manual Version History

History of all hardware and software releases for the product.

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2. INTRODUCTION TO VAMP

VAMP is a comprehensive solution capable of meeting all electricity supply requirements. It comprises a range of components, systems and services from Schneider Electric Energy.

Central to the VAMP concept is flexibility.

VAMP provides the ability to define an application solution and, through extensive communication capabilities, integrate it with your power supply control system.

VAMP products include extensive facilities for recording information on the state and behavior of the power system using disturbance and fault records. They can also provide measurements of the system at regular intervals for a control center enabling remote monitoring and control to take place.

For up-to-date information on any VAMP product, visit our website:

www.schneider-electric.com

3. PRODUCT SCOPE

VAMP 11V is cost-effective over/under voltage and frequency protection relay for essential protection functions. It is high-quality, easy to install and easy to set up (even manually by using front panel HMI).
Thanks of very small case dimensions can be applied as replacement of all old technology protection relays or installed in the modern low dimension MV or LV switchgear panels, events and relay settings can be downloaded to a local PC (selected Models).

Settings for the protection elements are entered using the front panel keyboard and can be checked on the local display or using the MiCOM S1 Studio setting software (selected Models). MiCOM S1 Studio must be at least 5.1.0 software version or higher. In case of having older version of MiCOM S1 Studio than 5.1.0, please install the newest tool from Schneider Electric Web Page.

3.1 Key for the manual

The V11V relays are available in several hardware versions offering different numbers of outputs, inputs, communication ports etc. called “Models” (Model: A, N, L).

Please refer to the commercial publication for further information on the product features and application arrangements.

3.2 Functional overview

The V11V relay offers a wide variety of protection functions.
The protection features are summarized below:

PROTECTION FUNCTIONS OVERVIEW		Function available
27/27S	Three undervoltage stages are provided with AND/OR logic. The first (U<) and the second stage (U<<) may be set to Inverse Definite Minimum Time (IDMT) or Definite Time (DT); the third stage (U<<<) may be set to DT only.	All models
59	Three overvoltage stages are provided with AND/OR logic. The first (U>) and the second stage (U>>) may be set to Inverse Definite Minimum Time (IDMT) or Definite Time (DT); the third stage (U>>>) may be set to DT only.	All models
59N	Three earth fault stages operates from a measured or calculated (from phase voltage) earth fault voltage value. The first earth fault stage has time-delayed characteristics which are selectable between inverse definite minimum time (IDMT) and definite time (DT). The second and third stages have a definite time characteristic only.	All models Model L does not have dedicated analog input
47	Two negative sequence overvoltage stages are provided as overvoltage protection with independent time-delay characteristics. These characteristics are selectable between inverse definite minimum time (IDMT) and definite time (DT) for first stage, second stage can operate only with DT characteristic.	N, A
27D	The positive sequence undervoltage element included in the V11V relays provides two stage non-directional undervoltage protection with independent time-delay characteristics. These characteristics are selectable between inverse definite minimum time (IDMT) and definite time (DT) for first stage. Second stage can operate only with DT characteristic.	A
81U/81O	The frequency element included in the V11V relay provides six stages of non-directional overfrequency or underfrequency protection with independent time-delay characteristics. These characteristics are only definite time (DT) characteristic.	A
	USB port (in models: A with powering feature)	N,A
	Rear communication port (RS485)	L(optional), N,A

PROTECTION FUNCTIONS OVERVIEW		Function available
	CB Control via a rear communication port (RS485) or dedicated binary input	NA
	Binary inputs	L(0), N(2), A(6)
	Output contacts (Watchdog included)	L(4), N(6), A(8)
	3 timers (AUX)	N, A
	Comprehensive disturbance recording (waveform capture)	A
	Time synchronization via binary input	A
	Circuit breaker status & condition monitoring	A

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The V11V also offers the following relay management functions in addition to the functions listed above.

- Up to 20 Fault Records, 5 Alarm Records, 200 Events (if ports are available) (when the available space is exhausted, the oldest record is automatically overwritten by the new one)
- Readout of actual settings available via the USB port or rear communication port (RS485) (if ports are available)
- 2 alternative setting groups
- 3 phase voltage input
- Earth fault voltage input (model N, A)
- CB Control via the front panel menu
- Counters
- Programmable allocation of binary inputs and outputs
- Multi-level password protection

Application overview

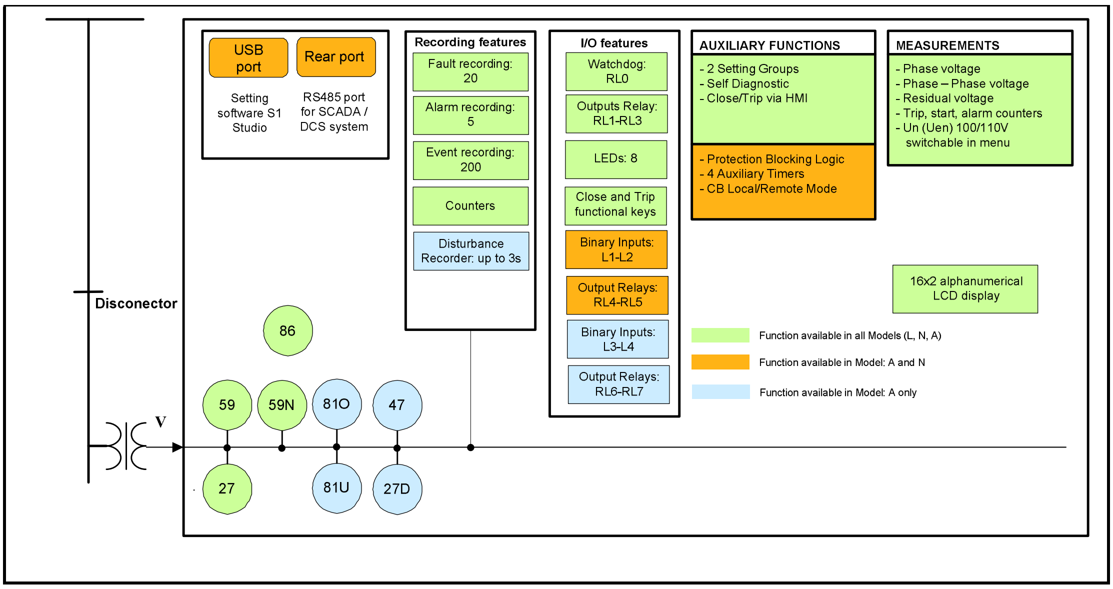

Figure 1: Functional diagram of the V11V

3.3 Ordering options Information (Required with Order)

Cortec number

Cortec type: V11V		1		N		N		N		N	N	1	1	

Voltage Protection Relay.
Three Voltage Inputs (Ph or Ph-Ph)
Flush mounting case, 2x16 LCD display and 8 LEDs,
Close and Trip keys on the front panel

Model

Model L (3 voltages, No Binary Inputs, 4 Binary Outputs)	L
Model N (4 voltages, 2 Binary Inputs, 6 Binary Outputs)	N
Model A (4 voltages, 6 Binary Inputs, 8 Binary Outputs, Over/Under frequency protection, Back-lit LCD display, RTC back-up capacitor)	A

Earth Voltage input

Model L: without	0
Model N, A: Uon = 57 - 130Vac	1

Voltage inputs (Ph or Ph-Ph)

Un= 57 - 130Vac	1
Un= 220 - 480Vac	2

Vx Auxiliary Voltage Supply

Model N, A: 24 - 60 Vac/dc	1
Model L: 24-240Vac/dc, **Model N, A:** 90 - 240 Vac/dc;	2

Communication port / protocol

Model L: Without	0
Model N, A,: USB port and RS485 with settable switching between Modbus and IEC103 via HMI	1

Language

Language: English/ German/ French/ Spanish/ Russian/ Turkish/ Polish	1

Accessories

Without	N

3.4 Catalogue numbers for international distribution center ordering

Model	Catalogue no.	Voltage inputs' range	Aux. power supply	Cortec code
Model L	**REL10070**	Un = 57-130 Vac	Vx = 24 - 240 Vac/250 Vdc	V11VL10N1N2N0NN11N
Model L	**REL10071**	Un = 220 - 480 Vac	Vx = 24 - 240 Vac/250 Vdc	V11VL10N2N2N0NN11N
Model N	**REL10090**	Un = 57-130 Vac	Vx = 24 - 60 Vac/dc	V11VN11N1N1N1NN11N
Model N	**REL10091**	Un = 220 - 480 Vac	Vx = 24 - 60 Vac/dc	V11VN11N2N1N1NN11N
Model N	**REL10092**	Un = 57-130 Vac	Vx = 90 - 240 Vac/250 Vdc	V11VN11N1N2N1NN11N
Model N	**REL10093**	Un = 220 - 480 Vac	Vx = 90 - 240 Vac/250 Vdc	V11VN11N2N2N1NN11N
Model A	**REL10080**	Un = 57-130 Vac	Vx = 24 - 60 Vac/dc	V11VA11N1N1N1NN11N
Model A	**REL10081**	Un = 220 - 480 Vac	Vx = 24 - 60 Vac/dc	V11VA11N2N1N1NN11N
Model A	**REL10082**	Un = 57-130 Vac	Vx = 90 - 240 Vac/250 Vdc	V11VA11N1N2N1NN11N
Model A	**REL10083**	Un = 220 - 480 Vac	Vx = 90 - 240 Vac/250 Vdc	V11VA11N2N2N1NN11N
	REL10030	Adapter for V11 standard flush mounting case to allow mounting on the wall		
	REL10031	Front cover with sealing for V11 standard case preventing from unauthorised access		

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TECHNICAL DATA

Date:	**1st December 2015**
Software Version:	**1A**
Connection Diagrams:	**10V11V01**

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CONTENT

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1. Mechanical specification

1.1 Case

Design	Flush mounting case
Weight	approx. 0.65 kg

1.2 Terminals

AC Voltage Input Terminals

Threaded M3 screw-type plug-in terminals, with wire protection for conductor cross-section

(i) 0.2 - 6 mm^2 single-core

(ii) 0.2 - 4 mm^2 finely stranded

General Input/Output Terminals

For power supply, binary and contact inputs, output contacts and COM for rear communications.

Threaded M3 screw-type plug-in terminals, with wire protection for conductor cross-section

(i) 0.2 - 4 mm^2 single-core

(ii) 0.2 - 2.5 mm^2 finely stranded

Local communication

USB port

Cable Type: USB 2.0

Connectors:

PC: type A male

V11V: type mini B 5-pin male

USB Cable: minimum 1P*28AWG/2C*24AWG, max : 2m

Rear Communications Port

EIA(RS)485 signal levels, two wire

Connections located on general purpose block, M3 screw

For screened twisted pair cable, distance to be bridged: multi-endpoint link: max. 100 m

Isolation to SELV level.

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2. RATINGS

2.1 Power Supply

Nominal auxiliary voltage Vx (ordering options)	24V – 60V dc/ac (50Hz/60Hz) (A and N) 90V – 240V dc/ac (50Hz/60 Hz) (A and N) 24V – 240V dc/ac (50Hz/60 Hz) (L only)
Operating range	19V – 72V dc, 19V – 66V ac (A and N) 72V - 300V dc, 72V -265V ac (A and N) 19V – 300V dc, 19V – 265V ac (L only)
Tolerable AC ripple	Up to 12% for a dc supply, per IEC 60255-11: 2008

Nominal Burden Auxiliary Power Supply Vx

Note: (i) Initial position: no output, no LED energized.

(ii) Active position: all outputs and LEDs energized.

For ac Vx voltage max. approx:

Vx range	Vx	S	
	V	VA	
		Initial position	Active position
24V – 60V ac	24	3.5	7.5
	60	4.5	8.0
90V – 240V ac (L, N: 24V -240V ac)	110	6.0	10.0
	230	10.0	14.5
	240	10.2	15.0

For dc Vx voltage max. approx:

Vx range	S	
	W	
	Initial position	Active position
24V – 60V dc	2.5	5.0
90V – 240V dc (L, N: 24V-240V dc)	2.5	4.5

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Auxiliary Power Supply Voltage Interruption	EN 60255-26:2013	Interruption of the ac/dc auxiliary supply without de-energizing (T_{OFF}).

Vx	*T_{OFF}	
	ac	dc
24 V	20 ms	20 ms
48 V	50 ms	30 ms
60 V	90 ms	50 ms
90 V	200 ms	100 ms
110 V	300 ms	150 ms
220 V	1,2 s	600 ms
230 V	1,3 s	700 ms
240 V	1,4 s	750 ms
250 V	1,5 s	800 ms

*4 energized output relays

2.2 Frequency (Voltage Inputs)

Nominal frequency	50 or 60 Hz (selectable in V11V menu)
Operating range	(40 ÷ 60) Hz or (50 ÷ 70) Hz

2.3 Voltage Inputs

Phase voltage inputs:

Nominal voltage (Un)	(57 ÷ 130) V_{ph-ph}ac eff or (220 ÷ 480) V_{ph-ph}ac eff (dependent on CORTEC number)
Operating range	(5 ÷ 200) V_{ph-ph}ac eff or (20 ÷ 720) V_{ph-ph}ac eff
Nominal Burden at Un	< 0.22 VA at (57 ÷ 130) Vac; < 0.3 VA at (220 ÷ 480) Vac;
Thermal withstand	10 s @ 300/1300 V_{ph-ph}ac eff continuous: 200/720 V_{ph-ph}ac eff
Connection	Refer to section 12 of V11V Installation chapter (V11V/EN IN)

Earth voltage inputs:

Nominal voltage Uon	(57 ÷ 130) Vac
Operating range	(5 ÷ 135) Vac
Nominal burden at Uon	< 0.43 VA
Thermal withstand	10 s @ 200 Vac continuous: 135 Vac
Connection	Refer to section 12 of V11V Installation chapter (V11V/EN IN)

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2.4 Binary Inputs

Binary inputs type: Optically isolated inputs

	Filtering time approx.	Binary Inputs				
		Nominal Voltage range	Voltage operating range	Minimum polarisation voltage (Logic 1) approx.	Maximum polarisation current approx.	Maximum continuous withstand
1	40 ms	24 – 60 Vac/dc	19.2 – 66 Vac/dc	16 Vdc 18 Vac	12 mA (66V)	110 Vdc 78 Vac
2	40 ms	90 – 240 Vac/dc	72 – 264 Vac/dc	66 Vac/dc	2.5 mA (264V)	300 Vdc 264 Vac

Binary input energy consumption	
Logic input burden for Vx ordering code 0	R input = approx. 6kOhm
Logic input burden for Vx ordering code 1	R input = approx. 109kOhm
Logic input recognition time	As filtering time + 2 ms

2.5 Output Relay Characteristics

Contact ratings	
Contact relay	Dry contact, Ag Ni
Carry capability	5 A continuous
Rated Voltage	250 Vac
Breaking characteristics for RL1, RL2, RL3 and WD	
Short-duration capacity	25 A for 3 s
Making capacity	150 A for 30 ms
AC breaking capacity	1250 VA resistive (cos ϕ = unity) 1250 VA inductive (cos ϕ = 0.7)
DC breaking capacity	250 Vdc; 50 W resistive 25 W inductive (L/R = 40 ms)
Operation time	<10ms
Durability	
Loaded contact	10 000 operations minimum
Unloaded contact	100 000 operations minimum
Breaking characteristics for RL4, RL5, RL6, RL7	
Short-duration capacity	25 A for 3 s
Making capacity	150 A for 30 ms
AC breaking capacity	1250 VA resistive (cos ϕ = unity) 1250 VA inductive (cos ϕ = 0.7)
DC breaking capacity	250 Vdc; 50 W resistive 25 W inductive (L/R = 40 ms)
Operation time	<10ms
Durability	
Loaded contact	10 000 operations minimum
Unloaded contact	100 000 operations minimum

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3. INSULATION

Insulation resistance	EN 60255-27: 2014	> 100 MΩ at 500 Vdc (Using only electronic/brushless insulation tester).
High Voltage (Dielectric) Withstand		2 kV RMS AC, 1 minute: Between all case terminals connected together and the case earth. Between all terminals of independent circuits with terminals on each independent circuit connected together (USB port excluded).
Impulse Voltage Withstand Test		Front time: 1.2 µs, Time to half-value: 50 µs, Peak value: 5 kV Source Characteristics: 500 Ohm, 0.5 J. Common and differential mode: power supply, terminal block (excluding RS485), binary inputs, relays
Creepage Distances and Clearances		Pollution degree 2, Overvoltage category III, Impulse test voltage 5 kV.

4. EMC TESTS

1 MHz Burst High Frequency Disturbance Test	**EN 60255 - 26: 2013** EN61000-4-18: 2010 Level 3	Common-mode test voltage: 2.5 kV, Differential test voltage: 1.0 kV, Test duration: 2 s, Source impedance: 200 Ω
Immunity to Electrostatic Discharge	EN61000-4-2: 2009 Level 3	8 kV discharge in air to all communication ports. 6 kV point contact discharge to any part of the front of the product.
Electrical Fast Transient or Burst Requirements	EN61000-4-4: 2012 Level 3	Amplitude: 2 kV, Burst frequency 5 kHz (Class III)
Surge Immunity Test	EN61000-4-5: 2014 Level 3	Time to half-value: 1.2/50 µs, Amplitude: 2 kV between all groups and case earth, Amplitude: 1 kV between terminals of each group
Immunity to Radiated Electromagnetic Energy	EN61000-4-3: 2010	Test field strength, frequency band: - 80 MHz to 1000 MHz: 10 V/m, - 1.4 GHz to 2.7 GHz: 10 V/m Test using AM: 1 kHz / 80% sinus Spot frequencies: 80MHz, 160MHz, 380MHz, 450MHz, 900MHz, 1850MHz, 2150MHz 80 % AM, 1kHz, 100% (duty cycle)
Radiated Immunity from Digital Radio Telephones		10 V/m, 900 MHz 100% AM, 200 Hz/50% square wave
Immunity to Conducted Disturbances Induced by Radio Frequency Fields	EN61000-4-6: 2014	Disturbing test voltage: 10 V, 150 kHz to 80 MHz, 80% AM, 1 kHz Spot frequencies: 27 MHz, 68 MHz
Power Frequency Magnetic Field Immunity	EN61000-4-8: 2010 Level 4	50Hz, 30 A/m - 1 minute for each position 50Hz, 300 A/m - 3 seconds for each position
Network frequency (50Hz) electromagnetic fields immunity test		50Hz, 1000A/m – 1 seconds for each position
Pulse magnetic fields immunity test	EN61000-4-9: 2010 Level 5	6,4/16 µs magnetic pulse 1000A/m. Applied to enclosure.
Conducted Emissions	EN55022: 2011 (CISPR 22) Class A	0.15 MHz - 0.5 MHz, 79 dBµV (quasi peak) 66 dBµV (average); 0.5 MHz - 30 MHz, 73 dBµV (quasi peak) 60 dBµV (average)
Radiated Emissions	EN55022: 2011 (CISPR 11) Class A	30 MHz - 230 MHz, 40 dBµV/m at 10 m measurement distance; 230 MHz - 1 GHz, 47 dBµV/m at 10 m measurement distance 1 - 2 GHz, 76 dBµV/m at 3 m measurement distance

TD

AC and DC voltage dips	**EN 60255 - 26: 2013** EN61000-4-29: 2000 EN61000-4-11: 2004	0%xU_T residual voltage, 10ms, 20ms, 50ms, 100ms, 200ms, 500ms (ac/dc) 40%xU_T residual voltage, 200ms (50Hz), 200 ms(60Hz) 200ms (dc) 70%xU_T residual voltage, 500ms (50Hz), 500 ms(60Hz) 500ms (dc)
AC and DC voltage interruptions	EN61000-4-29: 2000 EN61000-4-11: 2004	0%xU_T residual voltage, 5s (50Hz), 5s (60Hz) 5s (dc)
AC component in DC (ripple)	EN61000-4-17: 2009	15% of rated DC value 100 Hz and 120 Hz / 600 s
Gradual shut-down/start –up (for DC power supply)	EN61000-4-29: 2000	Shut-down ramp 60s power off 5min start-up ramp 60s

5. ENVIRONMENT

Ambient Temperature Range	EN 60255-1: 2010 EN60068-2-2 Bd: 2007 EN60068-2-1 Ad: 2007	Operating temperature range: -20°C to +60°C (–4°F to +140°F), Storage and transit: –25°C to +70°C (–13°F to +158°F).
Ambient Humidity Range	EN 60068-2-78: Cab: 2013	56 days at 93% relative humidity and +40°C.
	EN 60068-2-30: Db: 2005	Damp heat cyclic, six (12 + 12) hour cycles, 93% RH, +25 to +55°C
Vibration Test	EN 60255-21-1: 1995	Response Class 1 Endurance Class 1
Shock and Bump	EN 60255-21-2: 1995	Shock response Class 1 Shock withstand Class 1 Bump Class 1
Seismic	EN 60255-21-3:1995	Class 2
Enclosure Protection	EN 60529: 2000	IP 40 Protection for relay housing IP 20 Protection for terminals. IP 54 Protection (front panel) against dust and dripping water for flash mounted case.

TD

6. EU Directive

6.1 EMC Compliance

2014/30/EU

Compliance with the European Commission's EMC Directive.

Product Specific Standards were used to establish conformity:

- EN 60255-26: 2013
- EN 60255-1: 2010

6.2 Product Safety

2014/35/EU

Compliance with the European Commission's Low Voltage Directive. Compliance is demonstrated by reference to generic safety standards:

- EN60255-27:2014

7. DEVIATIONS OF THE PROTECTION ELEMENTS

Glossary

U_1, U_2, U_3: measured value of AC Voltage Inputs U1, U2, U3

U_{max} : max (U_1, U_2, U_3)

Vs : setting value for V>, V>>, V>>>, V<, V<<, V<<<

V1s : setting value for V1<, V1<<

V2s : setting value for V2>, V2>>

fs : setting value for f1, f2, f3, f4, f5, f6

Ves : setting value for VN>, VN>>, VN>>>

DT : Definite time

IDMT : Inverse definite minimum time

TD

Reference voltage (Un):

Un = 57V – 130V

Un = 220V – 480V

<table>
<tr><th colspan="4">PROTECTION FUNCTIONS TIME DETAILS</th></tr>
<tr><td></td><td>Element</td><td>Retardation time[1]</td><td>Drop off time</td></tr>
<tr><td>Voltage protection</td><td>V>, V>>, V>>>, V<, V<<, V<<<</td><td rowspan="3">≤ 50ms</td><td rowspan="3">≤ 50ms</td></tr>
<tr><td>Residual voltage protection</td><td>VN>, VN>>, VN>>></td></tr>
<tr><td>Positive sequence undervoltage protection
Negative sequence overvoltage protection</td><td>V1<, V1<<
V2>, V2>></td></tr>
<tr><td>Frequency protection</td><td>f1, f2, f3, f4, f5, f6</td><td>≤ 50ms</td><td>≤ 80ms</td></tr>
</table>

1 - Retardation time – see V11V/EN SG chapter.

TD

Functions	Range	Operate (Deviation)	Reset (Deviation)	Time deviation
Undervoltage protection (V<, V<<, V<<<)	(5÷200)V (20÷720)V	DT: Vs (±2%Vs ±0.2V) Vs (±2%Vs ±2V) IDMT: 0.9Vs (±2%Vs)	DT: ((settable) 1.00÷1.20) Vs (±3%) IDMT: 0.95Vs (±2%Vs)	DT[1]: ±(2% + 60 ms) IDMT[2]: ±(4% + 40 ms)
Overvoltage protection (V>, V>>, V>>>)	(5÷200)V (20÷720)V	DT: Vs (±2%Vs ±0.2V) Vs (±2%Vs ±2V) IDMT: 1.1Vs (±2%Vs)	DT: ((settable) 0.80÷1.00) Vs (±3%) IDMT: 1.05Vs (±2%Vs)	DT[1]: ±(2% + 60 ms) IDMT[2]: ±(4% + 40 ms)
Residual voltage protection (VN>, VN>>, VN>>>)	(0.5÷130)V Direct measurement	DT: Ves (±2%Ves ±0.2V) IDMT: 1.1Ves (±2%Ves)	DT: 0.95Vs (±2%) IDMT: 1.05Ves (±2%Ves)	DT[1]: ±(2% + 60 ms) IDMT[2]: ±(4% + 40 ms)
Residual voltage protection (VN>, VN>>, VN>>>)	(0.5÷130)V Calculated for Un (5÷200)V (20÷720)V	DT: Ves (±3%U_{max} ±0.5V) Ves (±3%U_{max} ±4V) IDMT: 1.1Ves (±3%U_{max})	DT: 0.95Ves (±3%) IDMT: 1.05Ves (±3%U_{max})	DT[1]: ±(3% + 60 ms) IDMT[2]: ±(7% + 60 ms)
Positive sequence undervoltage protection (V1<, V1<<)	(5÷200)V (20÷720)V	DT: V1s (±3%U_{max} ±0.5V) V1s (±3%U_{max} ±2V) IDMT: 0.9V1s (±3%U_{max})	DT: 1.05V1s (±3%) IDMT: 0.95V1s (±3%U_{max})	DT[1]: ±(2% + 60 ms) IDMT[2]: ±(4% + 40 ms)
Negative sequence overvoltage protection (V2>, V2>>)	(5÷200)V (20÷720)V	DT: V2s (±3%U_{max} ±0.5V) V2s (±3%U_{max} ±2V) IDMT: 1.1V2s (±3%U_{max})	DT: 0.95V2s (±3%) IDMT: 1.05V2s (±3%U_{max})	DT[1]: ±(2% + 60 ms) IDMT[2]: ±(4% + 40 ms)
Under/Over frequency	(40-70)Hz U≥ 0.5Un 0.1Un<U<0.5Un	fs (±10mHz) fs (±50mHz)	Fs+50mHz/-50mHz (±10mHz) (±50mHz)	±(2% + 25 ms)

1. During investigation of operation time - injection value must be 2 times greater than setting value.
2. According to standard IEC 60255-151. For UK Rectifier (Rect) characteristic: ±(12% + 40 ms).

8. Deviations of Automation Functions Timers

Automation Function Timers	
CB monitoring timers	Greater of ± 2% or ± 30ms
Auxiliary timers tAUX1, tAUX2, tAUX3, tAUX4, tVTS	Greater of 2% or (+35ms…+55ms)

TD

9. DEVIATIONS OF MEASUREMENTS

Measurement	Range	Deviation
Voltage / Residual voltage	(57 ÷ 130) Vac (220 ÷ 480) Vac	± (2% of rdg + 2 digits)[1]
Frequency	(40 ÷ 60) Hz (50 ÷ 70) Hz	±10 mHz

1. rdg: reading (the read-in value)
digit: the smallest value that can be displayed

10. PROTECTION SETTING RANGES

Note: (L, N, A) – available in Model L, N and A

10.1 [27] Phase Undervoltage Protection (L, N, A)

– Phase to Phase or Phase to neutral Voltage Fundamental

10.1.1 Protection Setting Ranges

[27] Undervoltage	Setting Range		
	Min.	Max.	Step
V< ?	Disabled, OR Trip, OR Alarm, AND Trip, AND Alarm, OR Trip/52a, OR Alarm/52a, AND Trip/52a, AND Alarm/52a		
V<	5 V for range (57-130)V 20 V for range (220-480)V	130 V 480 V	0.1 V 0.5 V
Delay type	DT or IDMT (IEC_SI, IEC_VI, IEC_EI, IEC_LTI, UK_STI, C02_P20, US_ C08, IEEE_MI, IEEE_VI, IEEE_EI, RXIDG, BPN EDF, RI, RECT, C02_P40 curve)		
tV<	0.02 s	200 s	0.01 s
V< TMS	0.02	1.50	0.01
V< TD	0.02	100	0.01
V< Reset Delay Type	DT or IDMT (refer to Operation chapter)		
DMT V< tReset	0.00 s	600 s	0.01 s
K (RI)	0.1	10	0.1
V<< ?	Disabled, OR Trip, OR Alarm, AND Trip, AND Alarm, OR Trip/52a, OR Alarm/52a, AND Trip/52a, AND Alarm/52a		
V<<	5 V for range (57-130)V 20 V for range (220-480)V	130 V 480 V	0.2 V 0.5 V
Delay type	DT or IDMT (IEC_SI, IEC_VI, IEC_EI, IEC_LTI, UK_STI, C02_P20, US_ C08, IEEE_MI, IEEE_VI, IEEE_EI, RXIDG, BPN EDF, RI, RECT, C02_P40 curve)		
tV<<	0.02 s	200 s	0.01 s
V<< TMS	0.02	1.50	0.01
V<< TD	0.02	100	0.01
V<< Reset Delay Type	DT or IDMT (refer to Operation chapter)		
DMT V<< tReset	0.00 s	600 s	0.01 s
K (RI)	0.1	10	0.1
V<<< ?	Disabled, OR Trip, OR Alarm, AND Trip, AND Alarm, OR Trip/52a, OR Alarm/52a, AND Trip/52a, AND Alarm/52a		
V<<<	5 V for range (57-130)V 20 V for range (220-480)V	130 V 480 V	0.2 V 0.5 V
tV<<<	0.02 s	200 s	0.01 s

10.2 [59] Phase Overvoltage Protection (L, N, A)

– Phase to Phase or Phase to neutral Voltage Fundamental

10.2.1 Protection Setting Ranges

[59] Overvoltage	Setting Range		
	Min.	Max.	Step
V> ?	Disabled, OR Trip, OR Alarm, AND Trip, AND Alarm, OR Trip/52a, OR Alarm/52a, AND Trip/52a, AND Alarm/52a		
V>	5 V for range (57-130)V 20 V for range (220-480)V	200 V 720 V	0.1 V 0.5 V
Delay type	DT or IDMT (IEC_SI, IEC_VI, IEC_EI, IEC_LTI, UK_STI, C02_P20, US_ C08, IEEE_MI, IEEE_VI, IEEE_EI, RXIDG, BPN EDF, RI, RECT, C02_P40 curve)		
tV>	0.02 s	200 s	0.01 s
V> TMS	0.02	1.50	0.01
V> TD	0.02	100	0.01
V> Reset Delay Type	DT or IDMT (refer to Operation chapter)		
DMT V> tReset	0.00 s	600 s	0.01 s
K (RI)	0.1	10	0.1
V>> ?	Disabled, OR Trip, OR Alarm, AND Trip, AND Alarm, OR Trip/52a, OR Alarm/52a, AND Trip/52a, AND Alarm/52a		
V> >	5 V for range (57-130)V 20 V for range (220-480)V	200 V 720 V	0.1 V 0.5 V
Delay type	DT or IDMT (IEC_SI, IEC_VI, IEC_EI, IEC_LTI, UK_STI, C02_P20, US_ C08, IEEE_MI, IEEE_VI, IEEE_EI, RXIDG, BPN EDF, RI, RECT, C02_P40 curve)		
tV> >	0.02 s	200 s	0.01 s
V>> TMS	0.02	1.50	0.01
V>> TD	0.02	100	0.01
V>> Reset Delay Type	DT or IDMT (refer to Operation chapter)		
DMT V>> tReset	0.00 s	600 s	0.01 s
K (RI)	0.1	10	0.1
V>>> ?	Disabled, OR Trip, OR Alarm, AND Trip, AND Alarm, OR Trip/52a, OR Alarm/52a, AND Trip/52a, AND Alarm/52a		
V>>>	5 V for range (57-130)V 20 V for range (220-480)V	200 V 720 V	0.1 V 0.5 V
tV>>>	0.02 s	200 s	0.01 s

10.3 [59N] Residual Overvoltage Protection (L, N, A)

– Earth fault voltage	Fundamental
– Earth fault voltage ranges	See following table
– Ua+Ub+Uc	Derived voltage

10.3.1 Protection Setting Ranges

[59] Overvoltage	Setting Range		
	Min.	Max.	Step
VN> ?	Disabled, Trip (measured), Alarm (measured), Trip (Ua+Ub+Uc), Alarm (Ua+Ub+Uc)		
VN>	0.5 V	130 V	0.1 V
Delay type	DT or IDMT (IEC_SI, IEC_VI, IEC_EI, IEC_LTI, UK_STI, C02_P20, US_ C08, IEEE_MI, IEEE_VI, IEEE_EI, RXIDG, BPN EDF, RI, RECT, C02_P40 curve)		
tVN>	0.02 s	200 s	0.01 s
VN> TMS	0.02	1.50	0.01
VN> TD	0.02	100	0.01
VN> Reset Delay Type	DT or IDMT (refer to Operation chapter)		
DMT VN> tReset	0.00 s	600 s	0.1 s
K (RI)	0.1	10	0.1
VN>> ?	Disabled, Trip (measured), Alarm (measured), Trip (Ua+Ub+Uc), Alarm (Ua+Ub+Uc)		
VN>>	0.5 V	130 V	0.1 V
tVN>>	0.02 s	200 s	0.01 s
VN>>> ?	Disabled, Trip (measured), Alarm (measured), Trip (Ua+Ub+Uc), Alarm (Ua+Ub+Uc)		
VN>>>	0.5 V	130 V	0.1 V
tVN>>>	0.02 s	200 s	0.01 s

10.4 [47] Negative Sequence Overvoltage Protection (N, A)

– Phase Voltage: Fundamental

10.4.1 Protection Setting Ranges

[47] Negative Sequence OV	Setting Range		
	Min.	Max.	Step
V2> ?	Disabled, Trip, Alarm, Trip/52a, Alarm/52a		
V2>	5 V for range (57-130)V 20 V for range (220-480)V	200 V 720 V	0.1 V 0.5 V
Delay type	DT or IDMT (IEC_SI, IEC_VI, IEC_EI, IEC_LTI, UK_STI, C02_P20, US_ C08, IEEE_MI, IEEE_VI, IEEE_EI, RXIDG, BPN EDF, RI, RECT, C02_P40 curve)		
tV2>	0.02 s	200 s	0.01 s
V2> TMS	0.02	1.50	0.01
V2> TD	0.02	100	0.01
V2> Reset Delay Type	DT or IDMT (refer to Operation chapter)		
DMT U2> tReset	0.00 s	600 s	0.01 s
K (RI)	0.1	10	0.1
V2>> ?	Disabled, Trip, Alarm, Trip/52a, Alarm/52a		
V2>>	5 V for range (57-130)V 20 V for range (220-480)V	200 V 720 V	0.1 V 0.5 V
tV2>>	0.02 s	200 s	0.01 s

10.5 [27D] Positive Sequence Undervoltage Protection (A)

– Phase to Phase or Phase to neutral Voltage : Fundamental

10.5.1 Protection Setting Ranges

[27D] Positive Sequence UV	Setting Range		
	Min.	Max.	Step
V1< ?	Disabled, Trip, Alarm, Trip/52a, Alarm/52a		
V1<	5 V for range (57-130)V 20 V for range (220-480)V	130 V 480 V	0.1 V 0.5 V
Delay type	DT or IDMT (IEC_SI, IEC_VI, IEC_EI, IEC_LTI, UK_STI, C02_P20, US_ C08, IEEE_MI, IEEE_VI, IEEE_EI, RXIDG, BPN EDF, RI, RECT, C02_P40 curve)		
tV1<	0.02 s	200 s	0.01 s
V1< TMS	0.02	1.50	0.01
V1< TD	0.02	100	0.01
V1< Reset Delay Type	DT or IDMT (refer to Operation chapter)		
DMT V1< tReset	0.00 s	600 s	0.01 s
K (RI)	0.1	10	0.1
V1<<?	Disabled, Trip, Alarm, Trip/52a, Alarm/52a		
V1<<	5 V for range (57-130)V 20 V for range (220-480)V	130 V 480 V	0.1 V 0.5 V
tV1<<	0.02 s	200 s	0.01 s

10.6 [81U/81O] Under/Over Frequency Protection (A)

10.6.1 Protection Setting Ranges

[81U/O] Frequency	Setting ranges		
	Min.	Max.	Step
f1?	Disabled, f> Trip, f> Alarm, f< Trip, f< Alarm		
f1	fn-10 Hz	fn+10 Hz	0.01 Hz
tf1	0.1 s	600.00 s	0.01 s
f2?	Disabled, f> Trip, f> Alarm, f< Trip, f< Alarm		
f2	fn-10 Hz	fn+10 Hz	0.01 Hz
tf2	0.1 s	600.00 s	0.01 s
f3?	Disabled, f> Trip, f> Alarm, f< Trip, f< Alarm		
f3	fn-10 Hz	fn+10 Hz	0.01 Hz
tf3	0.1s	600.00 s	0.01 s
f4?	Disabled, f> Trip, f> Alarm, f< Trip, f< Alarm		
f4	fn-10 Hz	fn+10 Hz	0.01 Hz
tf4	0.1 s	600.00 s	0.01 s
f5?	Disabled, f> Trip, f> Alarm, f< Trip, f< Alarm		
f5	fn-10 Hz	fn+10 Hz	0.01 Hz
tf5	0.1 s	600.00 s	0.01 s
f6?	Disabled, f> Trip, f> Alarm, f< Trip, f< Alarm		
f6	fn-10 Hz	fn+10 Hz	0.01 Hz
tf6	0.1 s	600.00 s	0.01 s

Where fn is nominal frequency.

11. AUTOMATION CONTROL FUNCTIONS

Note: (L, N, A) – available in Model L, N and A

11.1 Trip Commands

The following protection elements may be set to *'Disabled', 'Trip'* or *'Alarm', for each option with state control of the connector and possibility of work from fault in 3 phases (AND) or for fault in any one phase (OR)*: tV>, tV>>, tV>>>, tV<, tV<<, tV<<<, tV1<(A), tV1<<(A), tV2>(N, A), tV2>>(N, A).

The following protection elements may be set to *'Disabled', 'Trip'* or *'Alarm', for each option with possibility of work from measured value or calculated* : tVN>, tVN>>, tVN>>>.

TD

The following protection elements may be set to *'Disabled', 'Trip'* or *'Alarm, for each option under or over type*: tf1(A), tf2(A), tf3(A), tf4(A), tf5(A), tf6(A).

The following protection elements may be set to *'Disabled', 'Trip'* or *'Alarm*: tAUX1, tAUX2, tAUX3.

11.2 Blocking Logic (N, A)

In V11V, we have tree ways to block protections: by input, VTS or state control of connector.

The following time-delayed stages may be blocked by input:

– tV>, tV>>, tV>>>, tV<, tV<<, tV<<<, tV1<(A), tV1<<(A), tV2>, tV2>>, tVN>, tVN>>, tVN>>>, tf1(A), tf2(A), tf3(A), tf4(A), tf5(A), tf6(A).

The following stages may be blocked by VTS:

– V>, V>>, V>>>, V<, V<<, V<<<, V1<(A), V1<<(A), V2>, V2>>, VN>, VN>>, VN>>>, f1(A), f2(A), f3(A), f4(A), f5(A), f6(A).

The following stages may be blocked by state control of connector:

– VTS, V>, V>>, V>>>, V<, V<<, V<<<, V1<(A), V1<<(A), V2>, V2>>, VN>, VN>>, VN>>>.

11.3 Output Relays

Assignable functions: Protection Trip, Protection Trip (pulse), Trip CB Order, Close CB Order, Alarm, Start V>, Start V>>, Start V>>>, Start V<, Start V<<, Start V<<<, Start V1<(A), Start V1<<(A), Start V2>(N, A), Start V2>>(N, A), Start VN>, Start VN>>, Start VN>>>, Start f1(A), Start f2(A), Start f3(A), Start f4(A), Start f5(A), Start f6(A), AUX1, AUX2, AUX3, AUX4, AUX5, tV>, tV>>, tV>>>, tV<, tV<<, tV<<<, tV1<(A), tV1<<(A), tV2>(N, A), tV2>>(N, A), tVN>, tVN>>, tVN>>>, tf1(A), tf2(A), tf3(A), tf4(A), tf5(A), tf6(A), tAUX1, tAUX2, tAUX3, CB Alarm, tCB Faulty ext., Setting Group 1, tVTS, tfout.

11.4 Latch of the auxiliary Output Relays

All output relays (WD not included) can be latched.

11.5 Reverse Output Relay Logic

All logic of the output relays can be reversed.

Note: Reverse logic means that if a function assigned to outputs is disabled the contact is closed. If the function is enabled the contact is opened.

11.6 Inputs (N, A)

11.6.1 Input Assignation

A single function or multiple automation functions can be assigned to 2(N) or 6(A) logic inputs:

None, Maintenance Mode, Reset Latched Signaling, Reset Latched Outputs, Blocking tV>, Blocking tV>>, Blocking tV>>>, Blocking tV<, Blocking tV<<, Blocking tV<<<, Blocking tV1<(A), Blocking tV1<<(A), Blocking tV2>, Blocking tV2>>, Blocking tVN>, Blocking tVN>>, Blocking tVN>>>, Blocking tf1(A), Blocking tf2(A), Blocking tf3(A), Blocking tf4(A), Blocking tf5(A), Blocking tf6(A), AUX1, AUX2, AUX3, AUX4, AUX5, CB Status 52a, CB Status 52b, CB FLT External Signalling, Setting Group 2, Manual Close, Manual Trip, VTS, Start Disturber Recorder, Local CTRL Mode, Time Synchronization.

11.6.2 Reverse Input Logic

The logic of the inputs can be reversed: Input L1 and L2 (N) or L1 to L6 (A)

Note: Reverse logic means that if an input is energized, the function assigned to this input is disabled. If the input is not energized, the function is enabled.

11.7 LEDs

Assignable functions: Alarm, Start V>, Start V>>, Start V>>>, Start V<, Start V<<, Start V<<<, Start V1<(A), Start V1<<(A), Start V2>(N, A), Start V2>>(N, A), Start VN>, Start VN>>, Start VN>>>, Start f1(A), Start f2(A), Start f3(A), Start f4(A), Start f5(A), Start f6(A), AUX1, AUX2, AUX3, AUX4, AUX5, tV>, tV>>, tV>>>, tV<, tV<<, tV<<<, tV1<(A), tV1<<(A), tV2>(N, A), tV2>>(N, A), tVN>, tVN>>, tVN>>>, tf1(A), tf2(A), tf3(A), tf4(A), tf5(A), tf6(A), tAUX1, tAUX2, tAUX3, Local CTRL mode, CB Alarm, Maintenance, tCB Faulty External Signalling, Setting Group 2, tVTS, tfout.

11.8 Latch of the LED’s

All LED’s can be latched.

11.9 Auxiliary Timers (N, A)

Auxiliary timers G1/G2	Setting range		
	Min.	Max.	Step
Aux1 ?	Disabled , Trip, Alarm		
Time-delay tAux1	0	600 s	10 ms
Aux2 ?	Disabled , Trip, Alarm		
Time-delay tAux2	0	600 s	10 ms
Aux3?	Disabled , Trip, Alarm		
Time-delay tAux3	0	600 s	10 ms

TD

11.10 Circuit Breaker (L, N, A)

11.10.1 CB Time Setting Ranges

CB Control Time	Model	Setting range		
		Min.	Max.	Step
tOpen Pulse min	All models	0.1 s	10 s	0.01 s
tClose Pulse	All models	0.1 s	10 s	0.01 s
Time-delay for Close	A	0.0 s	200 s	0.01 s

TD

11.10.2 Time-delay for Faulty CB External Signal (A)

CB Faulty External Monitoring	Setting range		
	Min.	Max.	Step
tCB FLT ext	1 s	200 s	1 s

11.10.3 Remote Control Mode (A)

Remote Control Mode	Setting range
Remote CTRL Mode	Remote only Remote + Local

11.10.4 Circuit Breaker Control and Monitoring Setting Ranges (A)

CB Supervision	Setting range		
	Min.	Max.	Step
CB Time Supervision?	Yes or No		
CB Open time	0.01 s	10 s	0.01 s
CB Close time	0.01 s	10 s	0.01 s

12. RECORDING FUNCTIONS

12.1 Event Records

(not available in model L)

Capacity	200 events
Time-tag	1 millisecond
Triggers	Any selected protection alarm and threshold Logic input change of state Setting changes Self test events

12.2 Fault Records

Capacity	20 faults
Time-tag	1 millisecond
Triggers	Any selected protection which trip CB
Data	Fault date Protection thresholds Setting Group AC inputs measurements (RMS) Fault measurements

TD

12.3 Disturbance Records (A)

12.3.1 Triggers, Data, Setting Ranges

Disturbance Records	Total record: up to 4s, but not more than 5 records			
Triggers	Any selected protection alarm and threshold, logic input, remote command			
Data	AC input channels 16 sample per cycle digital input and output states			
	Default value	**Setting range**		
		Min.	**Max.**	**Step**
Pre-fault Time	0.1	0.1	2	0.01
Post-fault Time	0.1	0.1	1	0.01
Max record time	1.5	0.10	4	0.01
Disturb record Trig	on Inst	on Trip or on Inst.		
Trigger	Protection selected for tripping, Logic input (Start Distur.R.)			

13. COMMUNICATION (Model N, A)

Type Port	Physical Link	Connectors	Data Rate	Comms. mode	Protocol
RS485	Screened twisted pair	Screws or snap-on	4.8 or 9.6 or 19.2 or 38.4 or 57.6 or 115.2 kbits/s (default:19.2 kbit/s)	Data Bit: 8 Stop bit: 1/ 2 Parity: None/Odd/Even Adress: 1 to 247 for Modbus Adress: 1 to 254 for IEC60870-5-103	Modbus RTU, IEC60870-5-103 (selectable in menu)
USB	USB2.0	PC: type A male V11V: type mini B male	115.2 kbits/s (fixed)	Data Bit:8 Stop bit: 1 Parity: None Adress: 1	Modbus RTU

TD

14. CURVES

14.1 General

Although the curves tend towards infinite when the voltage approaches Vs (general threshold), the minimum guaranteed value of the operating voltage for all the curves with the inverse time characteristic is 1.1 Vs (with a tolerance of ± 0.05 Vs).

14.1.1 Inverse Time Curves

Some stage of protection functions can be selected (refer to settings options) with an inverse definite minimum time (IDMT) characteristic. The time-delay is calculated using a mathematical formula.

In all, there are fifteen IDMT characteristics available.

The mathematical formula applicable to the first ten curves is:

$$t = TMS \times \left(\frac{k}{\left(\frac{G}{Gs}\right)^{\alpha} - P} + c \right)$$

Where:

t Operation time

k, c, α, P Constant (see table)

G Value of measured voltage

Gs Value of the programmed threshold (pick-up value)

TMS Time multiplier setting (for IEC: TMS; IEEE: TD)

Type of curve (according to IEC60255-151 std definition)	Standard	k	c	α	P
IEC Standard inverse (SI)	IEC/A	0.14	0	0.02	1
IEC Very inverse (VI)	IEC/B	13.5	0	1	1
IEC Extremely inverse (EI)	IEC/C	80	0	2	1
Long time inverse (LTI)	IEC	120	0	1	1
FR Short time inverse (STI)	FR	0.05	0	0.04	1
US Short time inverse	C02 P20	0.02394	0.01694	0.02	1
US Short time inverse	C02 P40	0.16758	0.11858	0.02	1
Long time inverse	C08	5.848	0.1654	2	1
IEEE Moderately Inverse	IEEE	0.0515	0.114	0.02	1
IEEE Very inverse	IEEE	19.61	0.491	2	1
IEEE Extremely inverse	IEEE	28.2	0.1217	2	1
UK Rectifier protection	RECT	45900	0	5.6	1
BNP (EDF)	EDF	1000	0.655	2	1
RI		-4.2373	0	-1	1.43644

Note: For RI curve the equation is valid for the range: $1.1 \le V/Vs \le 20$

RXIDG Curves

The first earth thresholds can be selected with dedicated RXIDG curves.

The curves available follow the formula:

t = 5.8 – 1.35 * Un (1/ (k * Vs/V))

Where:

t = tripping time

k = coefficient (from 0.3 to 1, by steps of 0.01)

Vs = value of the programmed threshold (Pick-up value)

V = value of measured voltage

14.1.2 Reset Timer

Some stage of protection functions are provided with a timer hold facility: "tReset".

The value that is set for this reset timer corresponds to the minimum time during which the voltage value needs to be lower than 95% of the phase (or earth) threshold before the corresponding phase (or earth) time-delay is reset.

Note: There is an exception to this rule when the protection triggers. In fact, in that case, the time-delays are immediately reset.

The value of the Reset Timer depends on the type of timer associated with the pick-up of the first phase (or earth) stage.

Type of timer	Reset Timer	
	DMT Reset characteristic	IDMT characteristic
DMT, Rectifier, LTI, STI, Rectifier, BNP EDF, RXIDG	Settable from 0 to 600 ms	Not available. If IDMT is selected: reset timer is set to 0s (see table below: K=0)
IDMT IEC or RI	Settable from 0 to 600 ms	Based on RTMS value (refer to Operation chapter)
IDMT IEEE or CO	Settable from 0 to 600 ms	Based on RTD value (refer to Operation chapter)

Reset timer:

The first phase, earth and negative sequence overvoltage stages are provided with a timer hold facility: "t Reset".

It may be set to a definite time value or to an inverse definite minimum time characteristic (IEC/IEEE/ANSI curves only). This may be useful in certain applications, for example when grading with upstream electromechanical overcurrent relays that have inherent reset time-delays.

The second and third earth fault stages have only a definite time reset.

A possible situation where the reset timer may be used is to reduce fault clearance times where intermittent faults occur.

An example may occur in a cable with plastic insulation. In this application it is possible that the fault energy melts the cable insulation, which then reseals after clearance, thereby eliminating the cause for the fault. This process repeats itself to give a succession of fault current pulses,

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each of increasing duration with reducing intervals between the pulses, until the fault becomes permanent.

When the reset time of the overvoltage relay is set to its minimum, the relay will be repeatedly reset and will not be able to trip until the fault becomes permanent. By using the reset timer hold function the relay will integrate the fault current pulses, thereby reducing the fault clearance time.

The mathematical formula applicable to the five curves is:

$$t = RT \times \left(\frac{\mathrm{tr}}{1 - \left(\frac{G}{Gs} \right)^{\mathrm{p}}} \right)$$

Where:

t Reset time

tr, p Constant (see table)

G Value of the measured voltage

Gs Value of the programmed threshold (pick-up value)

RT Reset time multiplier (RTMS for IEC or RTD for IEEE/US) setting between 0.025 and 1.5.

Type of curve	Standard	tr	p
US Short time inverse	C02_P40	2.261	2
US Short time inverse	C02_P20	2.261	2
Long time inverse	C08	5.95	2
IEEE Moderately inverse (MI)	IEEE	4.9	2
IEEE Very inverse (VI)	IEEE	21.6	2
IEEE Extremely Inverse (EI)	IEEE	29.1	2
IEC Standard Inverse Time (SI)	IEC/A	12.1	2
IEC Very Inverse Time (VI)	IEC/B	43.2	2
IEC Extremely Inverse Time (EI)	IEC/C	80	2
IEC Long Time Inverse (LTI)	IEC	0	2
FR Short Time Inverse (STI)	FR	0	2
UK Rectifier (Rect)	UK	0	2
BNP EDF	BNP EDF	0	2
RXIDG	RXIDG	0	0
RI	RI	0	2

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GETTING STARTED

Date:	**1st December 2015**
Software Version:	**1A**
Connection Diagrams:	**10V11V01**

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CONTENTS

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FIGURES

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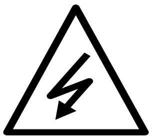
BEFORE CARRYING OUT ANY WORK ON THE EQUIPMENT, THE USER SHOULD BE FAMILIAR WITH THE CONTENTS OF THE SAFETY GUIDE SFTY/4L M/E11 OR LATER ISSUE, OR THE SAFETY AND TECHNICAL DATA SECTION OF THE TECHNICAL MANUAL AND ALSO THE RATINGS ON THE EQUIPMENT RATING LABEL.



For safety reasons, no work must be carried out on the V11V until all power sources to the unit have been disconnected.

1. RELAY POWER UP

Follow the following instructions carefully in order to correctly power up the relay.

1.1 System Connections

Check the wiring scheme of your installation.

Check that the output relay contacts are included in your trip circuit.

1.2 Auxiliary Power Supply Connections

Connect a DC or AC (according to nominal supply rating V_{AUX}) voltage power supply.

Positive V_{AUX} to terminal A1
Negative V_{AUX} to terminal A2

Turn on the auxiliary power supply and set to approximately the rated voltage as shown on the relay's front panel.

The display should show:

1.00 kV	1.00 kV
1.00 kV	1.00 kVe

Displays:
- first line: phases A and B voltages,
- second line: phase C voltage and earth voltage,

taking into account the phase VT ratio (CONFIGURATION/VT RATIO submenu).

The **LEDs** should be configured as follows:

– The green LED "Healthy" (watchdog) is illuminated.

The configuration of the remaining LEDs depends on the relay's history before powering (if the LEDs are configured as latching their state is stored in memory, therefore after repowering they are illuminated again until they are manually reset).

1.3 Powering up from the USB port is available in model A only (not available in model N, model L no USB on the front panel)

Only some of the relay's electronic circuits, for the HMI and RS485 communications, are supplied from the USB port.

Note: Since the I/O boards are not supplied from the USB port the inputs' status is set to default value.
Additionally, output contacts are not operational therefore it is impossible to execute any commands.

2. USER INTERFACES AND MENU STRUCTURE

The settings and functions of the VAMP protection relay can be accessed both from the front panel keypad and LCD, and via the front and rear communication ports. Information on each of these methods is given in this section to describe how to start using the relay.

Note:

"(**NA**)" means that function is available in model N and A only.

"(**A**)" means that function is available in model A, etc.

2.1 Introduction to the relay

2.1.1 Front panel

The front panel of the relay is shown in Figure 1.

The front panel of the relay includes:

– a 16-character by 2-line alphanumeric liquid crystal display (LCD),

– a 9-key keypad comprising 4 arrow keys (, , ,), an HMI key, a clear key ( ), a read key ( ), a trip command key ( ) and a close command key ( ).

– 8 LEDs,

– a USB port for local communications,

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2.1.2 Special symbols on the LCD display

The following special symbols may appear on the LCD display:

- It is possible to move up by pressing this key,
- It is possible to move left by pressing this key,
- It is possible to move down by pressing this key,
- It is possible to move right by pressing this key,
- The last menu cell in the column. If the key is pressed here the cursor will reach the first cell in the column,
- It is possible to edit the displayed values,

<0.1 40> - Setting range: from 0.1 to 40,

0.01 - Setting value step: 0.01,

- On the last line: Setting group 1 is displayed.
  In the upper-right corner: Setting group 1 is active,
- On the last line: Setting group 2 is displayed,
  In the upper-right corner: Setting group 2 is active,
- Edition of values on the display password-protected,
- Edition of setting value is possible (the level correct password has been entered),

A - An alarm is still active (the cause of alarm is highlighted).

2.1.3 Indications

Note: "(**NA**)" means that function is available in model N and A only.

Fixed Function LEDS:

Healthy – Powering of microprocessor and no hardware problems detected (green LED)

Trip – Any trip caused by protection criteria

And 6 programmable LEDS for the following functions (OR logic):

Alarm –	Alarm signal
U> –	Start of the first overvoltage stage
U>> –	Start of the second overvoltage stage
U>>> –	Start of the third overvoltage stage
U< –	Start of the first undervoltage stage
U<< –	Start of the second undervoltage stage
U<<< –	Start of the third undervoltage stage
U1< –	Start of the first positive sequence undervoltage stage (**A**)
U1<< –	Start of the second positive sequence undervoltage stage (**A**)
U2> –	Start of the first stage negative sequence overvoltage stage (**NA**)
U2>> –	Start of the second stage negative sequence overvoltage stage (**NA**)
UN> –	Start of the first earth fault overvoltage stage
UN>> –	Start of the second earth fault overvoltage stage
UN>>> –	Start of the third earth fault overvoltage stage
Start f1 –	Start of the first frequency stage (**A**)
Start f2 –	Start of the second frequency stage (**A**)
Start f3 –	Start of the third frequency stage (**A**)
Start f4 –	Start of the fourth frequency stage (**A**)
Start f5 –	Start of the fifth frequency stage (**A**)
Start f6 –	Start of the sixth frequency stage (**A**)
AUX1 –	Trigger of AUX1 (via a binary input) (**A**)
AUX2 –	Trigger of AUX2 (via a binary input) (**A**)
AUX3 –	Trigger of AUX3 (via a binary input) (**A**)
tU> –	Trip of the first overvoltage stage
tU>> –	Trip of the second overvoltage stage
tU>>> –	Trip of the third overvoltage stage
tU< –	Trip of the first undervoltage stage
tU<< –	Trip of the second undervoltage stage
tU<<< –	Trip of the third undervoltage stage
tU1< –	Trip of the first positive sequence undervoltage stage (**A**)
tU1<< –	Trip of the second positive sequence undervoltage stage (**A**)
tU2> –	Trip of the first stage negative sequence overvoltage stage (**NA**)
tU2>> –	Trip of the second stage negative sequence overvoltage stage (**NA**)
tUN> –	Trip of the first earth fault overvoltage stage
tUN>> –	Trip of the second earth fault overvoltage stage

tUN>>> – Trip of the third earth fault overvoltage stage

tf1 – Trip of the first frequency stage (**A**)

tf2 – Trip of the second frequency stage (**A**)

tf3 – Trip of the third frequency stage (**A**)

tf4 – Trip of the fourth frequency stage (**A**)

tf5 – Trip of the fifth frequency stage (**A**)

tf6 – Trip of the sixth frequency stage (**A**)

tAUX1 – Trigger of AUX1 timer (via a binary input) (**NA**)

tAUX2 – Trigger of AUX2 timer (via a binary input) (**NA**)

tAUX3 – Trigger of AUX3 timer (via a binary input) (**A**)

Local CTRL Mode – Local Control Mode (**NA**)

CB Alarm – Circuit Breaker condition alarm signal (CB Open NB, Sum Amps(n), CB Open Time and CB Close Time) (**A**)

Maintenance Mode – Maintenance Mode (outputs are disconnected from all functions) (**A**)

tCB FLT Ext.Sign. – An input mapped to this function detects CB problems that may influence control possibilities (for example spring problem, insufficient pressure, etc.). Signaling is active during a settable time (*GLOBAL SETTINGS/CIRCUIT BREAKER/tCB FLT ext*) (**A**)

Setting Group n – Setting Group n active (n= 1, 2)

tVTS – Trigger of VT supervision (**A**)

fout – frequency is out of range (**A**)

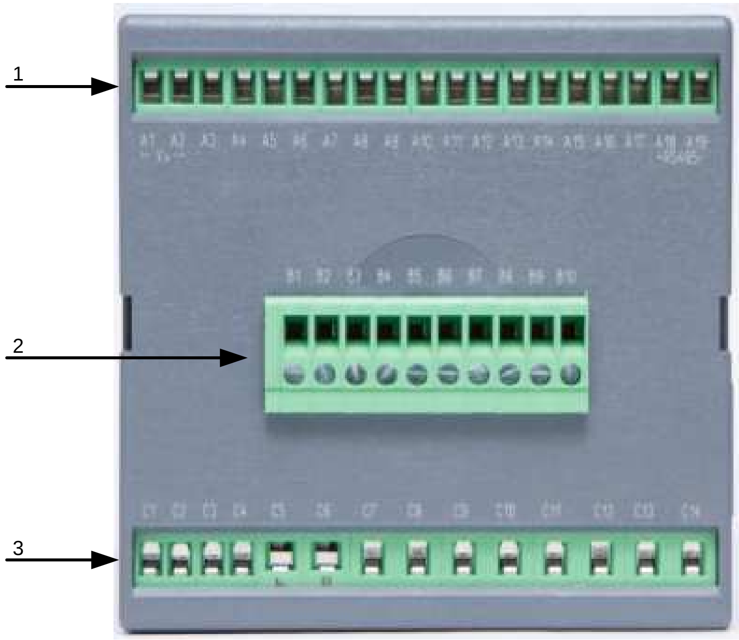
Every LED can be configured to be latched or self-resetting (***SETTING GROUP 1/ LEDS CONFIGURATION G1/ Latched LEDs***).

If a LED is configured as latching, the manner in which it will be reset is selectable:

- Resetting of LEDs via manual reset (***GLOBAL SETTINGS/LOC/Signaling Reset 0: Manual only***)
- Resetting of LEDs via any protection start (set for CB tripping) or via manual reset (***GLOBAL SETTINGS/LOC/Signaling Reset 1: Start protect.)***
- Resetting of LEDs via manual close command (RS485, HMI or Input) or via manual reset (***GLOBAL SETTINGS/LOC/LEDs Reset 2: Close Command)***

1 – Red "Trip" LED: Protection trip
2 – Yellow "Alarm" LED: Alarm signaling
3,4, 5, 6, 7 – Red programmable LED
8 – Green "Healthy" LED: Watchdog
9 – 16-character by 2-line alphanumeric liquid crystal display (LCD)
10 – Clear key
11 – Read key
12 – 4 arrow keys, an enter key
14 – CB Close key
15 – CB Open Key
16 – USB port for local connection

Figure 1: V11V Front Panel



1 – Terminal block A: Auxiliary voltage Vaux, contact outputs (WD,RL1-RL3) and binary inputs (L1, L2) and RS485
2 – Contact outputs (**A**): RL6, RL7 and binary inputs (**A**): L3, L4, L5, L6
3 – Terminal block C: voltage analogue inputs (phases and earth), (**NA**) output contacts: RL4, RL5
Refer to Installation chapter V11V/EN IN.

Figure 2: Rear View of the V11V

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2.2 Relay connection and power-up

The relay can be powered from the following sources:

- Auxiliary voltage Vaux (terminals A1-A2)
- USB port (only some electronic boards: to ensure HMI, USB and/or RS485 communications)

Note:

1. USB is not available in model L
2. USB not supply electronic of V11V in model N. The auxiliary voltage have to present on A1-A2 terminals

2.2.1 Auxiliary Supply Voltage (Vaux) connection

Before applying the auxiliary supply voltage to the relay, check that the rated nominal ac or dc voltage is appropriate for the application and that it will be connected to the correct terminals (A1&A2). The relay's serial number, voltage rating, and power rating information can be viewed on the upper side of the case. The ac or dc supply voltage must be within the corresponding nominal range of the device, as indicated in the table below, for the appropriate nominal rating of the equipment:

Model	Nominal ranges of auxiliary voltage Vaux	Operative dc range	Operative ac range
L	24 – 240 Vdc/Vac	19 to 300 Vdc	19 to 265 Vac
N	24 – 60 Vdc/Vac 90 – 240 Vdc/Vac	19 to 72 Vdc 72 to 300 Vdc	19 to 66 Vac 72 to 265 Vac
A	24 – 60 Vdc/Vac 90 – 240 Vdc/Vac	19 to 72 Vdc 72 to 300 Vdc	19 to 66 Vac 72 to 265 Vac

Once the ratings have been verified for the application, connect the equipment to an external power source capable of delivering the requirements specified on the label, to perform the relay familiarization procedures. Please refer to the wiring diagrams in the Installation section for complete installation details, ensuring that the correct polarities are observed in the case of dc supply.

Note: The label specifies the auxiliary voltage for the V11V supply input and binary inputs (dependent on ordering options).

2.2.2 Voltage inputs

The measuring voltage inputs of the V11V should be connected to the secondary wires of the power system VTs as shown in the connection diagrams in section 8 of V11V Installation chapter V11V/EN IN.

The parameters of the VTs that can be connected to the V11V’s voltage input terminals are detailed in section 3 of chapter V11V/EN AP - Applications.

2.2.3 Earthing

V11V have no the Protective (Earth) Conductor Terminal (because of the plastic case)

2.2.4 Output contacts

Depends on the model the V11V has:

- Model L: 3 output contacts + WD(RL0)

- Model N: 5 output contacts + WD(RL0)

- Model A: 7 output contacts + WD(RL0)

V11V is delivered with the following default factory settings for the outputs:

- Output RL0/WD (N/O: A3-A5, N/C: A4-A5) -watchdog is not configurable
- Output RL1 (N/O: A6-A8, N/C: A7-A8) is not configured
- Output RL2 (N/O: A9-A11, N/C: A10-A11) is not configured
- Output RL3 (N/O: A12-A13) is not configured
- Output RL4 (**NA**) (N/O: C1-C2) is not configured
- Output RL5 (**NA**) (N/O: C3-C4) is not configured
- Output RL6 (**A**) (N/O: B1-B2) is not configured
- Output RL7 (**A**) (N/O: B3-B4) is not configured

To modify the outputs configuration, refer to section 2.2 of chapter V11V/EN ST - Settings.

The output connection diagram is shown in section 8 of chapter V11V/EN IN - Installation.

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2.2.5 Binary inputs

Depends on the model the V11V has:

- Model L: no binary inputs

- Model N: 2 binary inputs

- Model A: 6 binary inputs

Binary inputs:

- Input L1 (**NA**): A14-A16 terminals (terminal block A)
- Input L2 (**NA**): A15-A16 terminals (terminal block A)
- Input L3 (**A**): B5-B7 terminals (terminal block B)
- Input L4 (**A**): B6-B7 terminals (terminal block B)
- Input L5 (**A**): B8-B10 terminals (terminal block B)
- Input L6 (**A**): B9-B10 terminals (terminal block B)

There operation range is the same as auxiliary voltage supply (A1-A2 terminals) see chapter 2.2.1 (ordering option).

To modify the inputs' configuration, refer to section 1.2.3 of chapter V11V/EN ST - Settings.

The input connection diagram is shown in section 8 of chapter V11V/EN IN - Installation.

2.3 Introduction to the user interfaces and setting options

The relay has a USB user interface for use with MiCOM S1 STUDIO 5.1.0 (or higher) software.

With this interface it is possible to download the setting values, latest fault, alarm and event records (**NA**) as well as disturbance records (**A**) and fully configure the V11V.

Note: After connection to the USB port the ***Healthy*** LED is lit. If the LED is not lit refer to chapter V11V/EN TS - Troubleshooting.

The USB port integrates electronic boards only to allow communications with the V11V via the HMI/RS485/USB interfaces.

2.4 Changing parameters via the front panel user interface (HMI)

Changing of all parameters is password-protected.

After restart or powering up, the V11V is in ***Protection Mode***. This means that all settings are the same as in the relay's operation system and are available on the front panel user interface.

To change any parameters, it is necessary to switch the V11V to the ***SETTING CHANGE MODE***.

The ***SETTING CHANGE MODE***, for entered password level which changes setting parameters, is indicated by the sequential flashing of the programmable LEDs (from 4 up to 8 LEDs) on the front panel.

Until it is switched back from the ***SETTING CHANGE MODE*** to the ***PROTECTION MODE***, or restarted by disconnecting then reconnecting the power supply, the V11V uses the setting parameters that were active before the ***SETTING CHANGE MODE*** was entered (previous settings).

Press the **OK** navigation key, after changing a chosen parameter (confirmation of change). The new value is saved in FRAM memory but the V11V still uses the setting value that was active before the ***SETTING CHANGE MODE*** was entered (previous settings). The new value will be available in the operation system only after the firmware has been reset. When the firmware is reset, all the settings are loaded into the V11V system.

When switching from the ***SETTING CHANGE MODE*** to the ***PROTECTION MODE***, *a* warm reset is applied.

The V11V therefore applies the new parameters to the relay's operation system.

Afterwards, the settings available on the front panel and those used by the operation system are consistent.

Note: While the LEDs (LED’s 3 - 7) are start flashing subsequently (***SETTING CHANGE MODE*** *by entering* ***Administrator*** *or* ***Protection setting*** password) there can be a mismatch between the settings displayed on the front panel and those used by the operating system.

When “***Control only***” rights password is entered then all LED’s (LED’s 3 - 7) start flashing in the same time. ***Administrator*** *or* ***Protection setting*** password. Additionally all changes are executed and recorded immediately (no need warm reset of firmware). Because this level is not signaled so after 5 minutes V11V switches back automatically from the ***SETTING CHANGE MODE*** to the ***PROTECTION MODE***.

The password protection of the relay comprises three levels:

– Administrator (***Without limits***)

– Protection setting (***Protection only***)

– Control only (***Test control***) – this level is used for tests and/or control execution only (no changing of setting parameters) so signaling of ***SETTING CHANGE MODE*** differs from above. On this password level there is no the sequential flashing of the programmable LEDs (from 3 up to 7 LEDs) but flashing in the same time. On the control windows is the special sign: which informs that control is allowed.

Administrator rights: all the menu settings may be changed (violet color on Fig.9-25).

Protection setting rights: it is possible to change settings in the ***PROTECTION*** column; ***CTRL Default Windows (CB status CTRL, L/R status CTRL)*** and ***COMMISSIONING/ Maintenance Mode*** windows are also possible (green color on Fig.9-25).

Control rights: ***CTRL Default Windows (CB status CTRL, L/R status CTRL)*** and ***COMMISSIONING/Maintenance Mode*** windows from the front panel only (yellow color on Fig.9-25).

For each level the password consists of 4 digits (0 to 9)

NOTE: The default password is 0000 for every password protection level.

It is recommended to change default password from 0000 to unique value for every password level.

If the first password is different, this means that the *Administrator* password has been changed.

The *Protection setting* password is still 0000. Therefore, to protect settings against unauthorized access it is necessary to change the *Protection setting* password by first entering 0000 then a new value.

The Control password is still 0000. Therefore, if it is necessary to change it, first enter 0000 then the new value (*Control* right) of the password.

Notes: 1. If the *Protection setting* rights have not been changed, or if it has been set to the default value (0000), it is possible to change all the settings in the ***PROTECTION*** column, reset the counters and control the CB without entering a password, simply by pressing the **OK** navigation key. This makes it possible to change a chosen parameter by automatically switching the V11V to the ***SETTING CHANGE MODE*** (the programmable LEDs are flashing).
This means that even after changing only one parameter it is necessary to switch the V11V back to ***PROTECTION MODE*** in order to activate the new settings (warm restart).

2. If the *Control* rights password has not been changed or if it has been set to the default value (0000) it is possible to control the CB in menu without password protection.

2.4.1 *SETTING CHANGE MODE*

The ***SETTING CHANGE MODE*** should be used to change settings.

Using the ***SETTING CHANGE MODE*** ensures that all changed parameters will be applied simultaneously so as to avoid any problems caused by possible setting inconsistencies.

The ***SETTING CHANGE MODE*** makes it possible to change settings while the relay is active without any risk (the V11V continues to use the previous settings).

After exiting the ***SETTING CHANGE MODE*** a warm reset of firmware is applied so that all the protection counters are reset.

Note: Latched LEDs and outputs are not reset (stored values are not cleared during a V11V reset)

To switch the V11V to the ***SETTING CHANGE MODE*** navigate to the ***SETTING CHANGE MODE*** main header (see Figure 9), then press the ▽ key:

```
Edit settings?
Enter PSWD
```

Press the **OK** navigation key.

```
Edit settings?
Enter PSWD 0000
```

The 0 digit furthest to the right is flashing.

Enter the password:

1. If the digit is flashing, change the digit to the required value by pressing the ▽ key or the △ key.
2. Change the flashing digit by pressing the ◁ key or ▷ key.
3. Continue as above to set the whole password (4 digits)

4. If the correct password is set, press the OK navigation key

The LCD displays 'OK' during approximately 1 second, then the new ***SETTING CHANGE*** cell is displayed:

If the password entered is for:

- *Administrator* rights:

```
Setting change:
 Without limits
```

To indicate that the V11V is in ***SETTING CHANGE MODE*** on the level: ***"Without limits"*** the programmable LEDs are flashing

- *Protection* settings:

```
Setting change:
 Protection only
```

To indicate that the V11V is in ***SETTING CHANGE MODE*** on the level: ***"Protection only"*** the programmable LEDs are flashing

- *Control* only:

```
Setting change:
 Test control
```

There is no any indication that this level is entered. ***SETTING CHANGE MODE*** is active by 5 minutes only.

The screen displays the scope of the current modification rights..

At this time it is possible to start changing the setting parameters.

Note: The parallel pressing: and key it makes jump from any place to:

```
Edit settings?
 Enter PSWD
```

the menu cell in which the password can be entered (hot key).

If all settings are changed, it is necessary to return to ***PROTECTION MODE*** to apply a warm reset.

Press the and keys simultaneously to jump to the following cell:

```
Edit settings?
Exit:press ENTER
```

Press the OK navigation key to apply a warm reset and display the following cell:

```
Setting change:
       Protected
```

The programmable LEDs do not flash sequentially. The V11V is in ***PROTECTION MODE***

Note: In ***SETTING CHANGE MODE*** all functions use the previously stored settings (before the ***SETTING CHANGE MODE*** was entered).

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Changing of a single setting parameter

Go to the required setting cell (see section 2.5.8).

Press the HMI OK key.

```
Edit settings?
Enter PSWD 000
```

Using the , , , keys, enter the password.

Press OK navigation key to confirm the password and switch to ***SETTING CHANGE MODE***.

Press OK navigation key to enter the chosen setting parameter.

Using the , , , keys, set the required value.

Confirm the change by pressing the OK navigation key.

Switch from ***SETTING CHANGE MODE*** to ***PROTECTION MODE***.

For example, press the and keys simultaneously to display the following cell:

```
Edit settings?
Exit:press ENTER
```

Press the OK navigation key to switch from ***SETTING CHANGE MODE*** to ***PROTECTION MODE***.

The following cell should be displayed:

```
Setting change:
       Protected
```

The above cell confirms that settings are password-protected, and that the V11V is in ***PROTECTION MODE***.

Additionally the programmable LEDs do not flash sequentially.

Changing the password

To change the password, first enter the existing password to obtain the appropriate password protection rights.

Press the key to display the following cell:

```
Change Password
```

Press *the* OK navigation key, to display:

```
Change Password
            0000
```

Using the , , , keys, enter the new password.

Press OK navigation key to confirm the new password and jump to the cell displaying information on protection rights

For example:

```
Setting change:
 Without limits
```

To exit the ***SETTING CHANGE MODE*** (apply a warm reset) press the and keys simultaneously to display the following cell:

```
Edit settings?
Exit:press ENTER
```

Press the **OK** navigation key to confirm switching from ***SETTING CHANGE MODE*** to ***PROTECTION MODE***.

The following cell should be displayed:

```
Setting change:
       Protected
```

The above cell confirms that the settings are password-protected and that the V11V is in ***PROTECTION MODE***. Additionally the programmable LEDs do not flash sequentially.

GS

2.5 V11V Menu description

2.5.1 Headers

The main headers are shown in Figure 3.

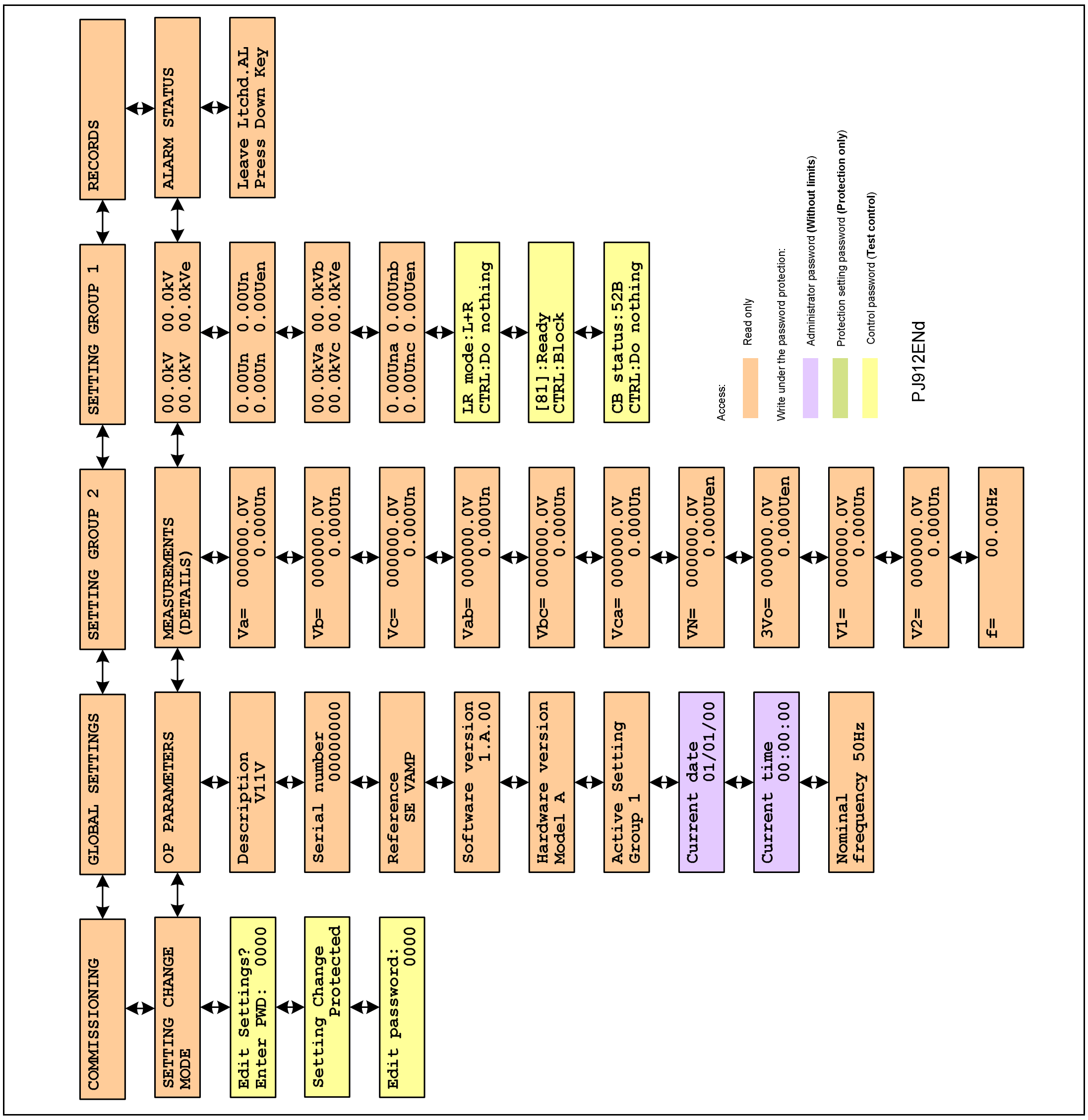

Figure 3: Column headers

2.5.2 *ALARM STATUS* column

ALARM STATUS (see Figure 4) information is available if the cause of alarm has been triggered. Therefore, if after pressing the [V] key the new cell is displayed, it means that no alarms have been detected.

Depending on the V11V configuration an alarm signal is self-resetting (no cause of alarm – no alarm signal; ***GLOBAL SETTINGS/LOC/Alarm Display 0: Self-reset***) or manually resettable (alarm signal latched; ***GLOBAL SETTINGS/LOC/Alarm Display 1: Latching***).

Default setting: ***0: Self-Reset***. This means that if an alarm signal has disappeared no information is available in the ***ALARM STATUS*** column.

If set to ***Latching***, this means that if an alarm signal has disappeared information is still available in the ***ALARM STATUS*** column until it is reset in the ***ALARM STATUS/ Alarm Reset*** window.

Alarm information is always available in the event recorder. However, the programmable LEDs can be used to store causes of alarm if required.

Figure 4 shows all causes of alarms (if alarms have been enabled in the main configuration column of the protection function).

2.5.3 *RECORDS* column

Twenty fault records are available in the V11V.

Changing a record in the menu is possible in the ***Record Number*** menu cell, by pressing the **OK** navigation key then the △ or ▽ key. Once the required record is selected, press the HMI **OK** key to confirm the change. If the *Control* rights password has been set to the default value (0000), this operation does not require entering a password; otherwise it is necessary to enter the *Control* rights password.

Records in the ***Fault Recorder*** can be reset using the MiCOM S1 Studio communication software or via the RS485 link.

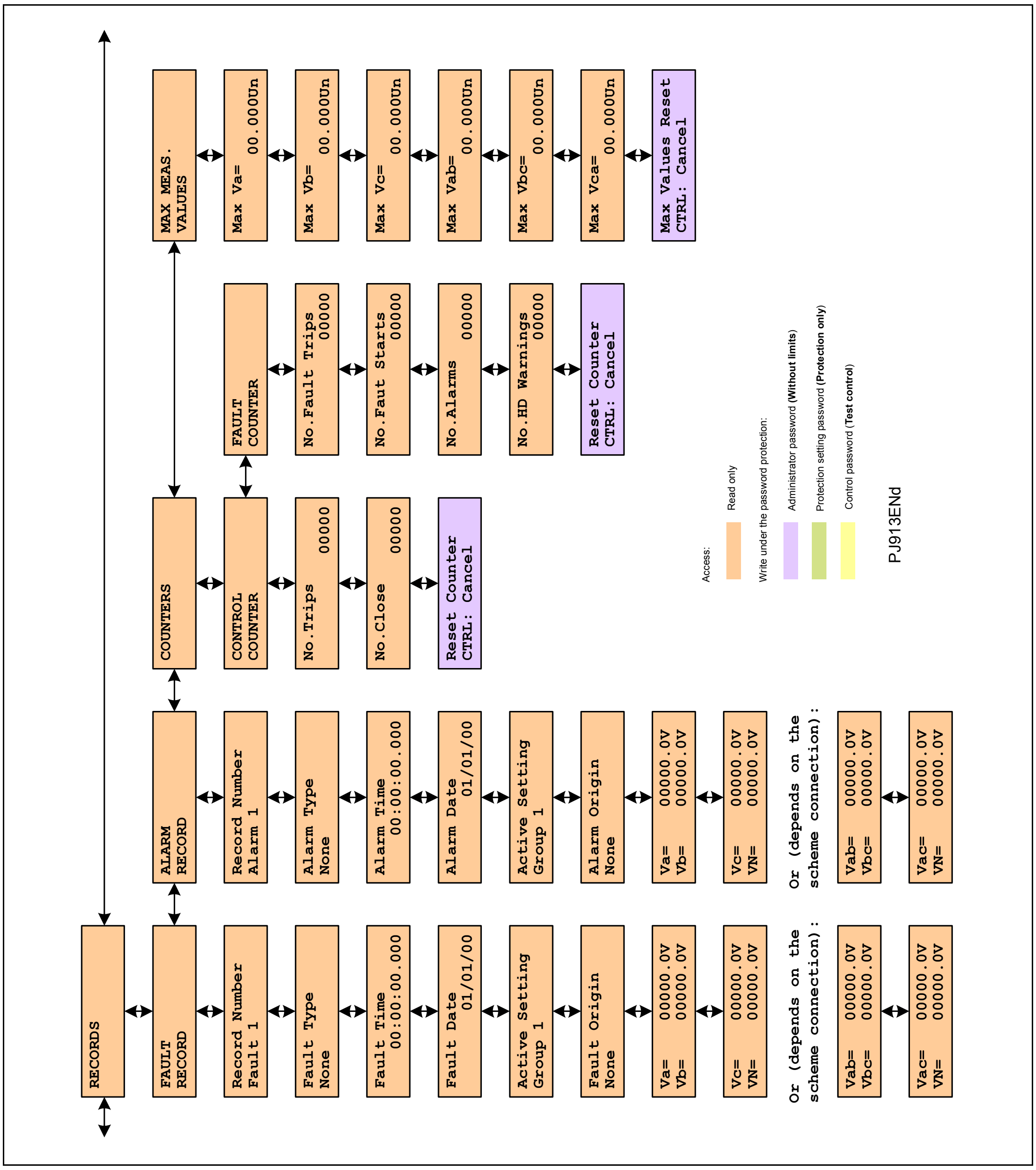

Figure 4: RECORDS column

Counters can be reset in the ***Counter Reset*** cell of the menu, by pressing the **OK** key then the △ or ▽ key. Once the required record is selected, press the **OK** key to confirm the change. This operation requires entering a ***Administrator*** password (***Without limits***).

In addition, counters can be reset using the MiCOM S1 Studio communication software or via the RS485 link.

2.5.4 *SETTING GROUP* columns

The V11V has two setting groups. The relay is delivered with one setting group active only (factory default setting).

If two setting groups are to be used, the second setting group must be activated in the menu cell:

GLOBAL SETTINGS/SETTING GROUP SELECT/Setting Group Select*:*

Nb of Groups 0: One Group

by changing its setting from ***0: One Group*** to ***1: Two Groups***

Each setting group includes:

- Protection settings
- Output relay configuration
- Binary input configuration
- Programmable LED configuration

Switching between setting groups is possible via:

- Configured binary inputs
- Menu (**GLOBAL SETTINGS/SETTING GROUP SELECT/Setting Group Select** cell)
- MiCOM S1 Studio setting software
- Remotely via RS485

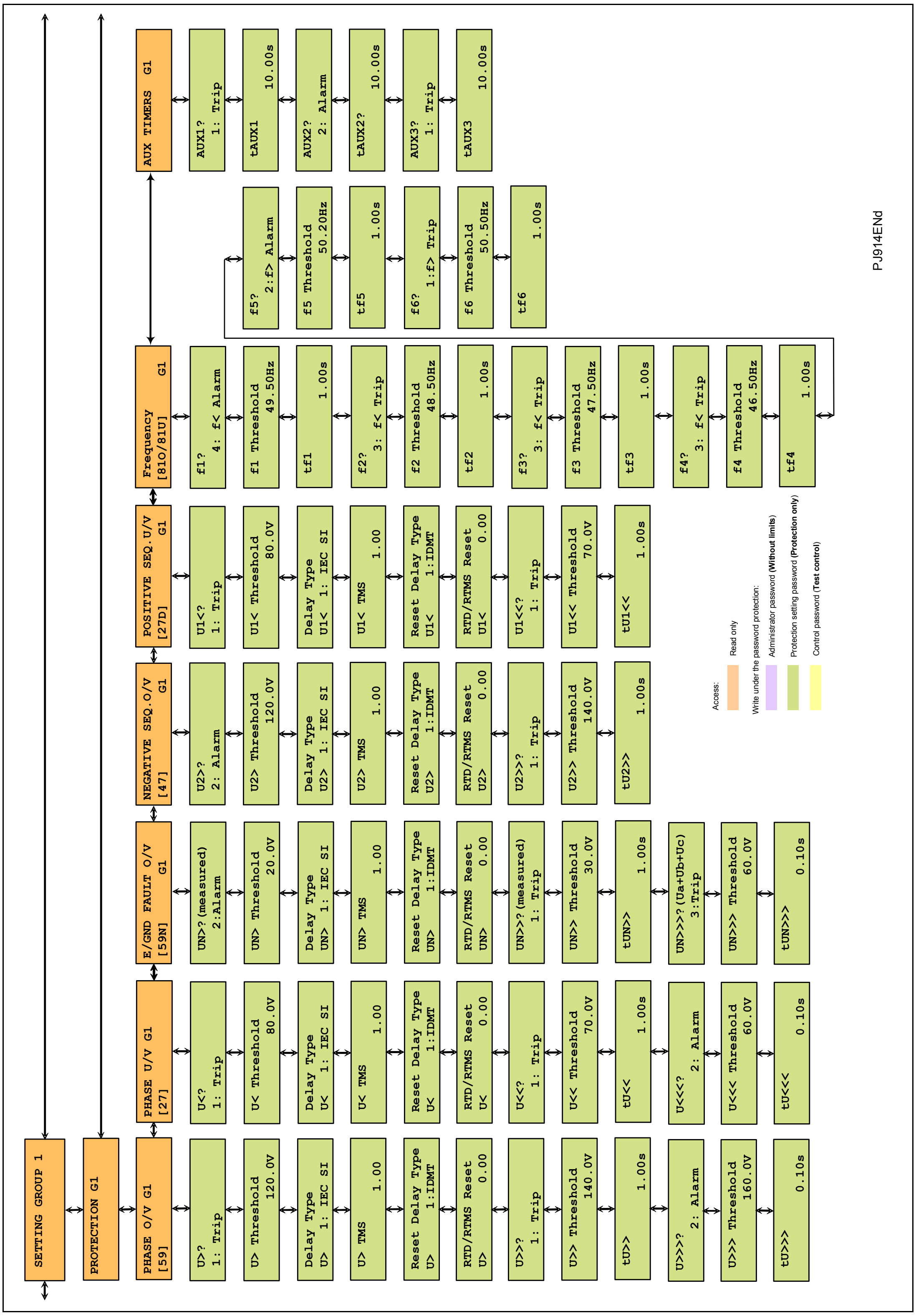

Figure 5: SETTING GROUP 1 columns

Information about the active setting group is available in menu: **OP PARAMETERS/ Active Set Group** cell.

Information about the active setting group can be displayed via the programmable LEDs by configuring them to that function and via a special symbol on the LCD display.

Notes: 1. If setting groups are to be switched using a binary input (**NA**), this binary input must be configured to setting group switch both in Setting Group 1 and Setting Group 2.

2. It is possible to copy all the parameters from Setting Group 1 to Setting Group 2 or vice versa (**GLOBAL SETTINGS/SETTING GROUP SELECT/Copy Settings** cell). It will then only be necessary to change the parameters' values.

2.5.5 *GLOBAL SETTINGS* column

Global Settings include all general settings, such as:

- Localization (***LOC***),
- Setting Group operation (***SETTING GROUP SELECT***),
- Voltage transformer parameters (***VT RATIO***),
- Time settings related to Circuit Breaker control or monitoring (***CIRCUIT BREAKER***),
- Voltage transformer supervision (***VT SUPERVISION***),
- Advanced settings for the froquency protection elements ([81] ***ADVANCED SETTINGS*****),**
- Advanced settings for the voltage protection elements (***VOLTAGE ADVANCED CONFIGURATION*****)**,
- RS485 communication parameters (***COMMUNICATION***) (**NA**),
- Disturbance recorder parameters (***DISTURBANCE RECORDER***) (**A**),

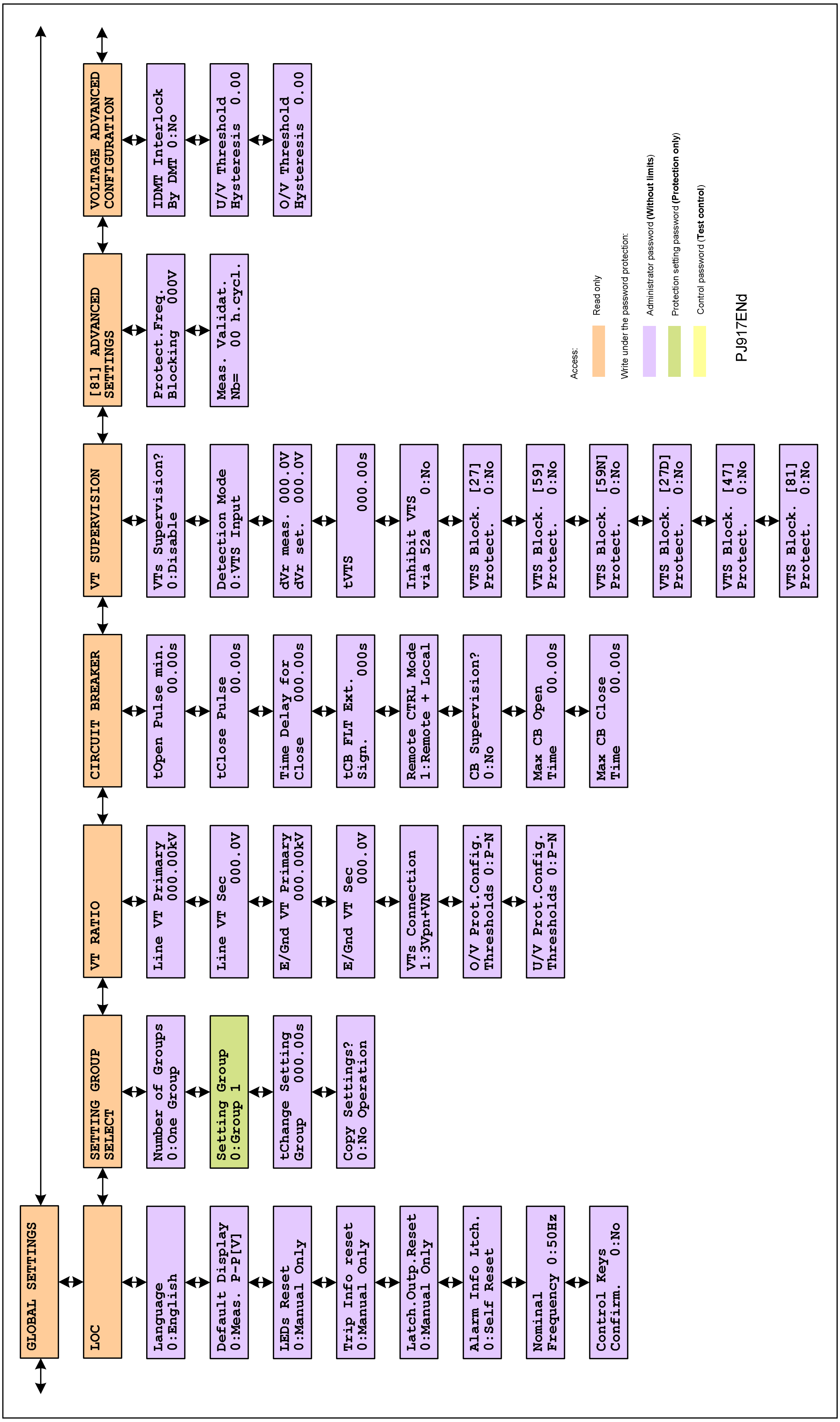

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Figure 6: GLOBAL SETTINGS column

It is possible to Copy all parameters from Setting Group 1 to Setting Group 2 and inversely in the ***Copy settings*** cell by pressing the OK navigation key. Choose the required operation by pressing the △ or ▽ key (***Copy G1 → G2*** or **Copy G2 → G1**). Confirm the change by pressing the OK navigation key.

Note: The setting group change's time-delay, from Setting Group 1 to Setting Group 2 (***t Change Setting*** cell), applies to changes effected via a binary input only (**NA**).

2.5.6 *COMMISSIONING* column

The settings available in the the *COMMISSIONING* column are:

– ***Opto I/P status*** – which binary inputs are active (logic status) (**NA**),

– ***Relay O/P status*** – which binary outputs are active (physical status),

– ***Maintenance mode*** – allows the user to check the operation of the protection functions without actually sending any external command (tripping or signaling) (**A**),

– ***Test Pattern*** – allows the user to set outputs contacts for tests (**A**),

– ***Contact Test Time*** – defines the output's pulse length during the tests (**A**),

– ***Test outputs*** – if set to **1:** ***apply test***, pressing the OK navigation key will execute the test of the outputs (**A**),

– ***Functional Test*** – allows the user to set the protection criteria to be tested (**A**),

– ***Functional Test End*** – defines the end of the functional test: ***CB opened*** or ***Time*** (**A**),

– ***Functional Test Time*** – defines the pulse length during the functional test (**A**),

– ***Functional Test*** – if set to ***Apply Test*** pressing the OK navigation key will execute the functional test (**A**).

It is possible to set following ***Maintenance mode*** options (**A**):

- "***No***" - ***Maintenance mode*** is disabled. All window cells below are hidden (***Maintenance mode*** is the latest cell in ***COMMISIONING*** column)
- "***Yes,outp.trips***" - ***Maintenance mode*** is enabled. In this mode all test cells in ***COMMISIONING*** column are available (see Fig.7 below). During tests outputs are energized.
- "***Yes,outp.block***" - ***Maintenance mode*** is enabled and all test cells in ***COMMISIONING*** column are available (see Fig.7 below). In this mode, the high state of output functions are ignored (control of outputs are blocked).

This operation requires entering a ***Control*** rights password (***Test control***).

It is possible to set additional programmable LED for Maintenance Mode.

Note: The Maintenance Mode is active up to 10 minutes only. After this time V11V automatically sets - ***Maintenance mode:*** "***No***". It protects user against leaving the V11V in this mode after tests.

GS

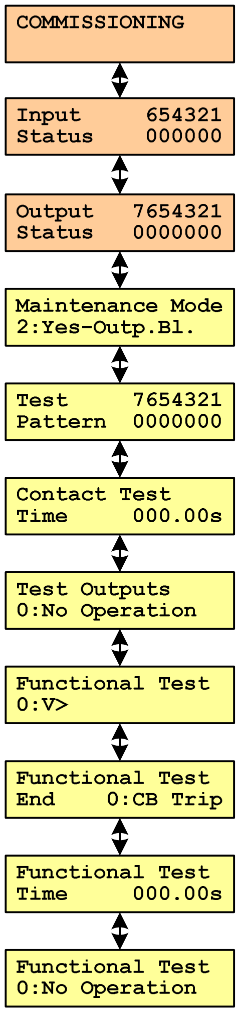


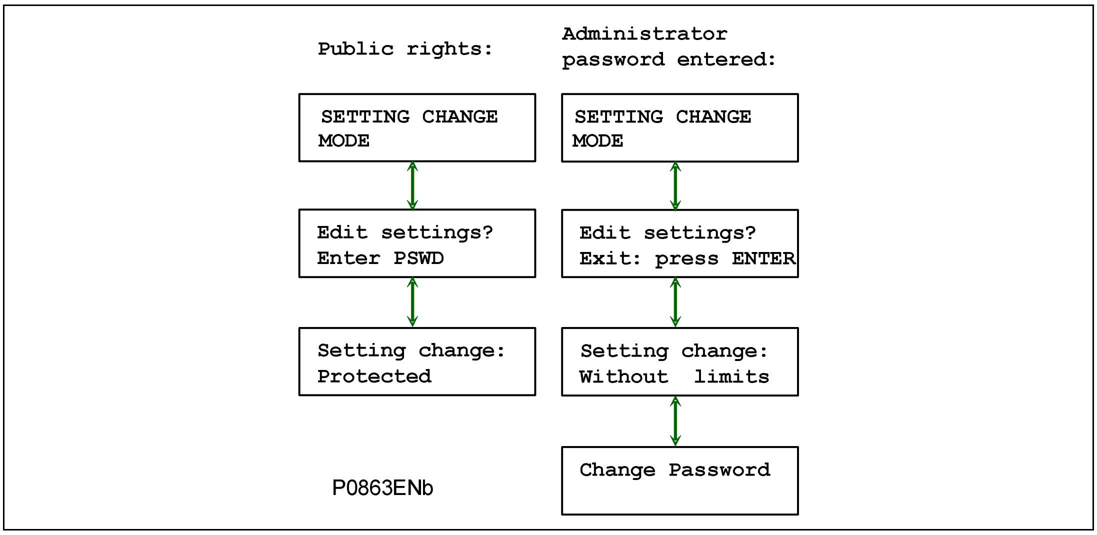
Figure 7: COMMISSIONING column

2.5.7 *SETTING CHANGE MODE* column

The ***SETTING CHANGE MODE*** column is used to:

- Allow changing of all parameters in the menu (***SETTING CHANGE MODE).***
- Set a new password or change the existing password (Change Password)

GS



GS

Figure 8: SETTING CHANGE MODE column

2.5.8 Menu Map

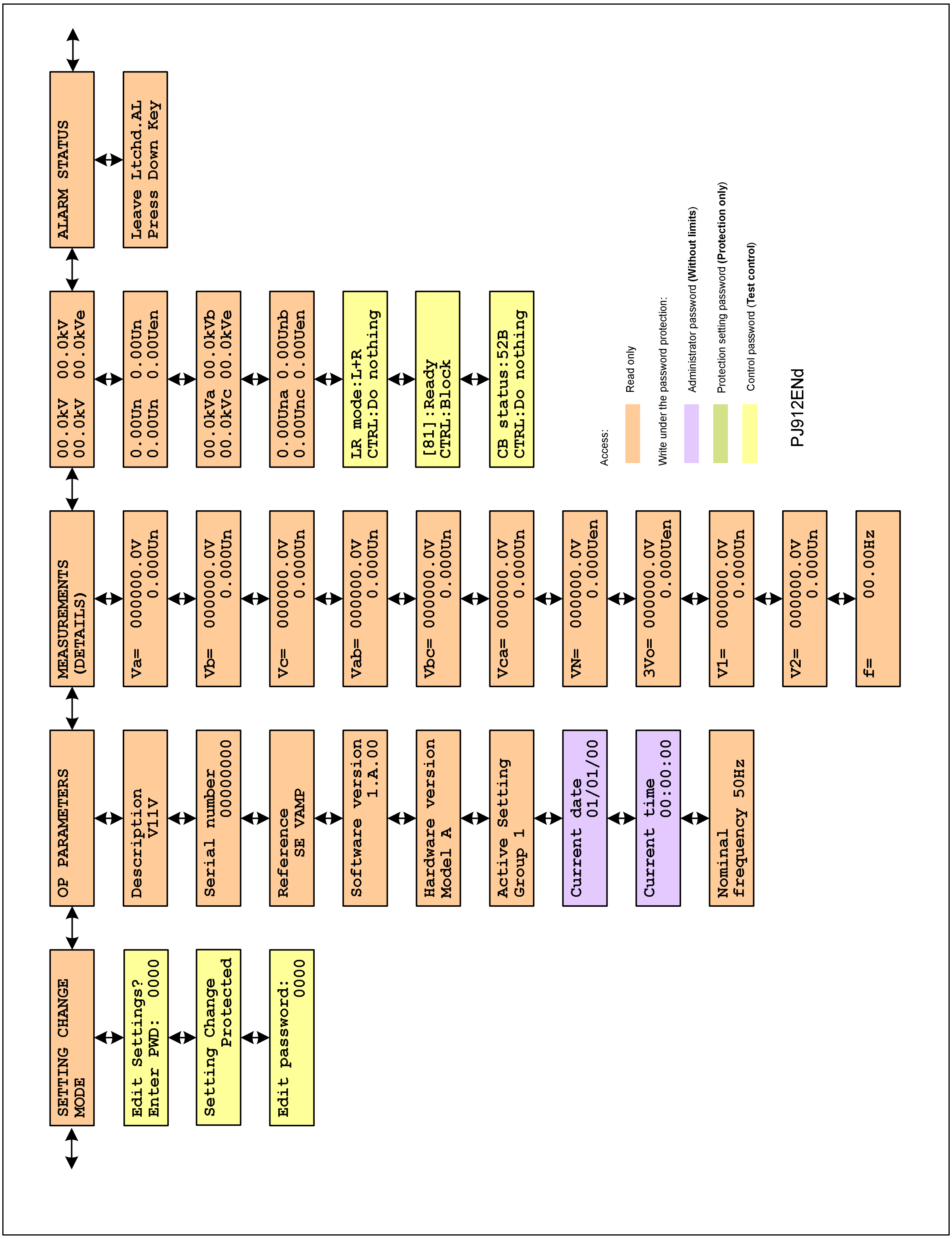


Figure 9: V11V Model A Menu Map part 1 (Firmware 1A)

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GS

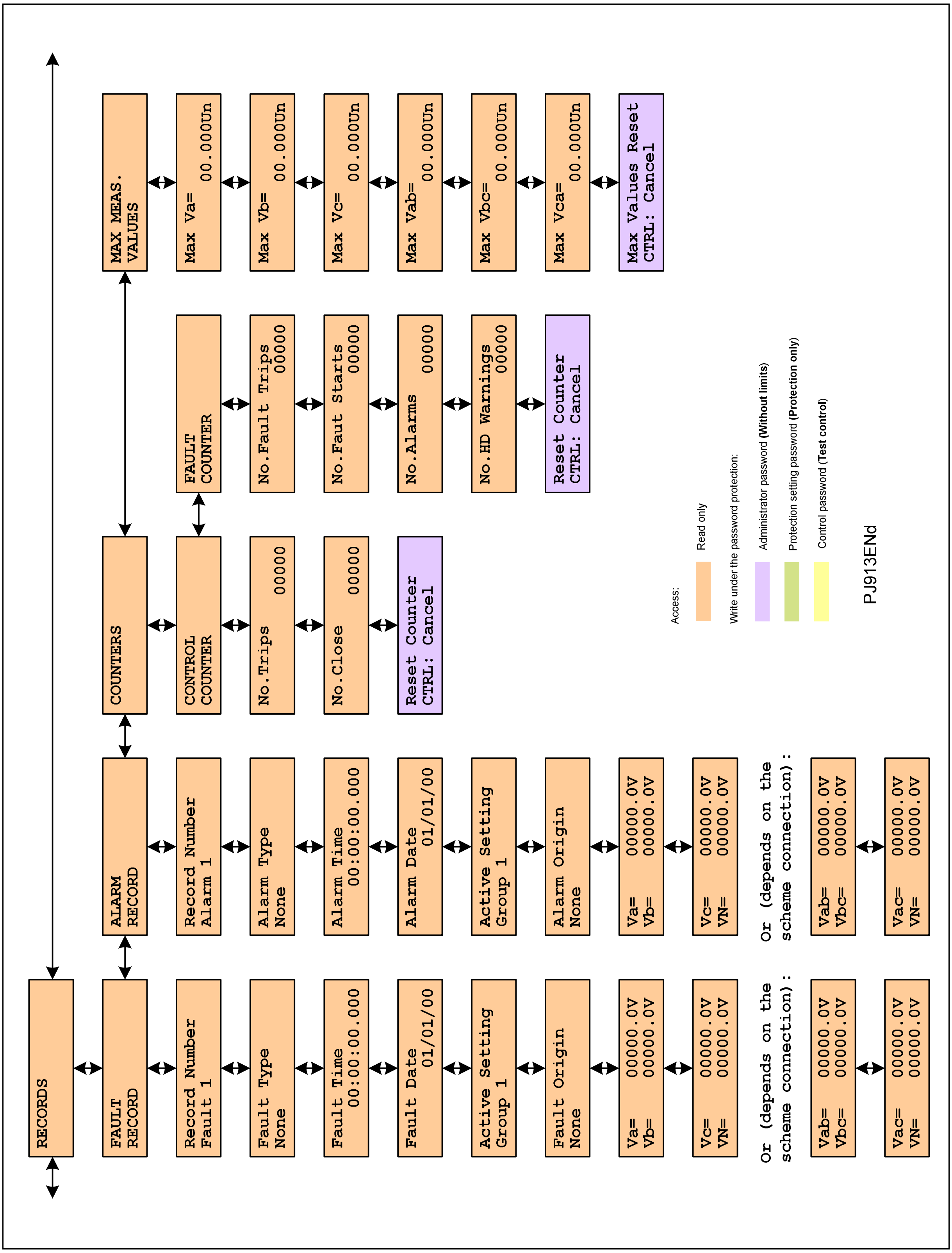

Figure 10: V11V Model A Menu Map part 2 (Firmware 1A)

GS

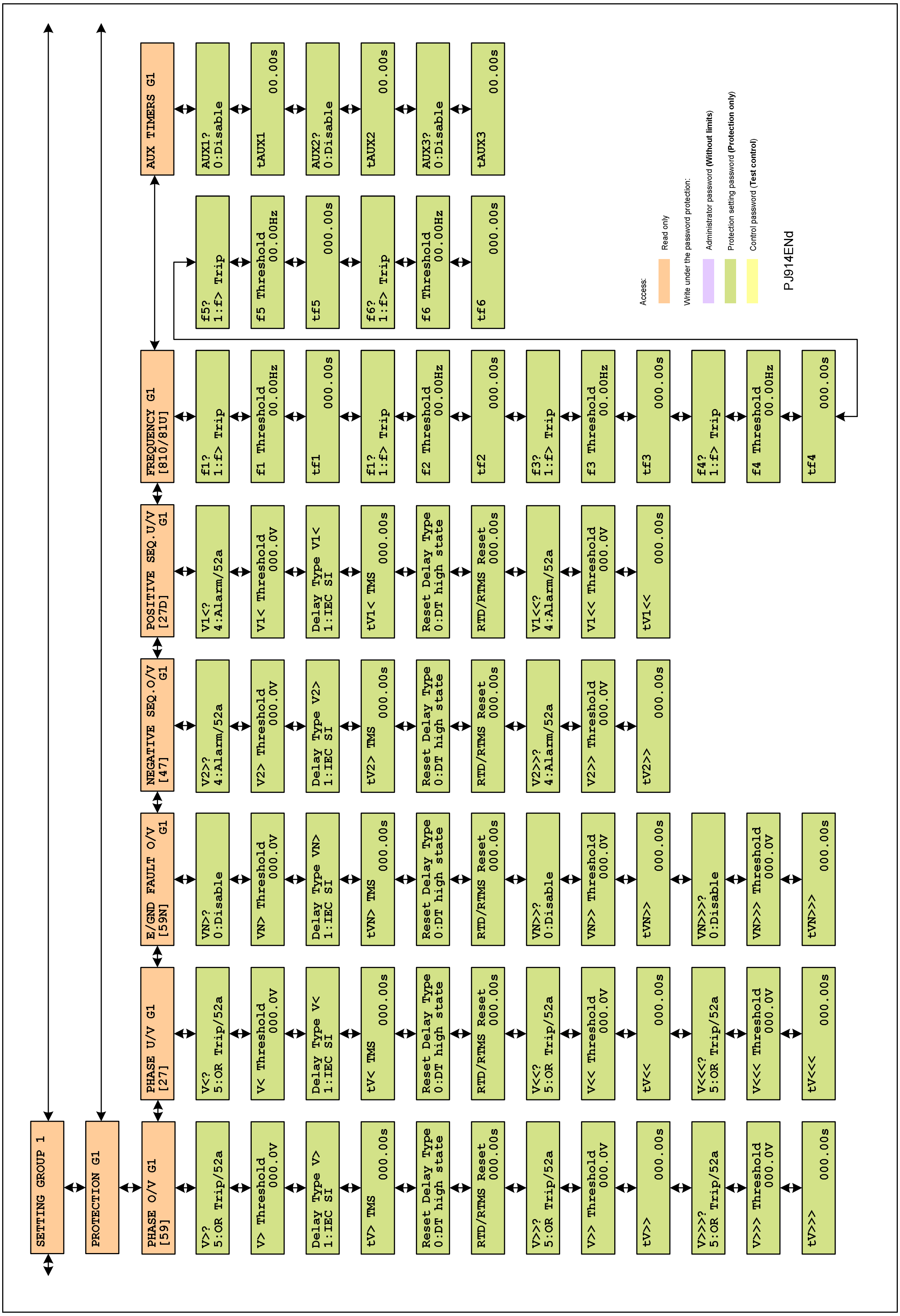

Figure 11: V11V Model A Menu Map part 3 (Firmware 1A)

GS

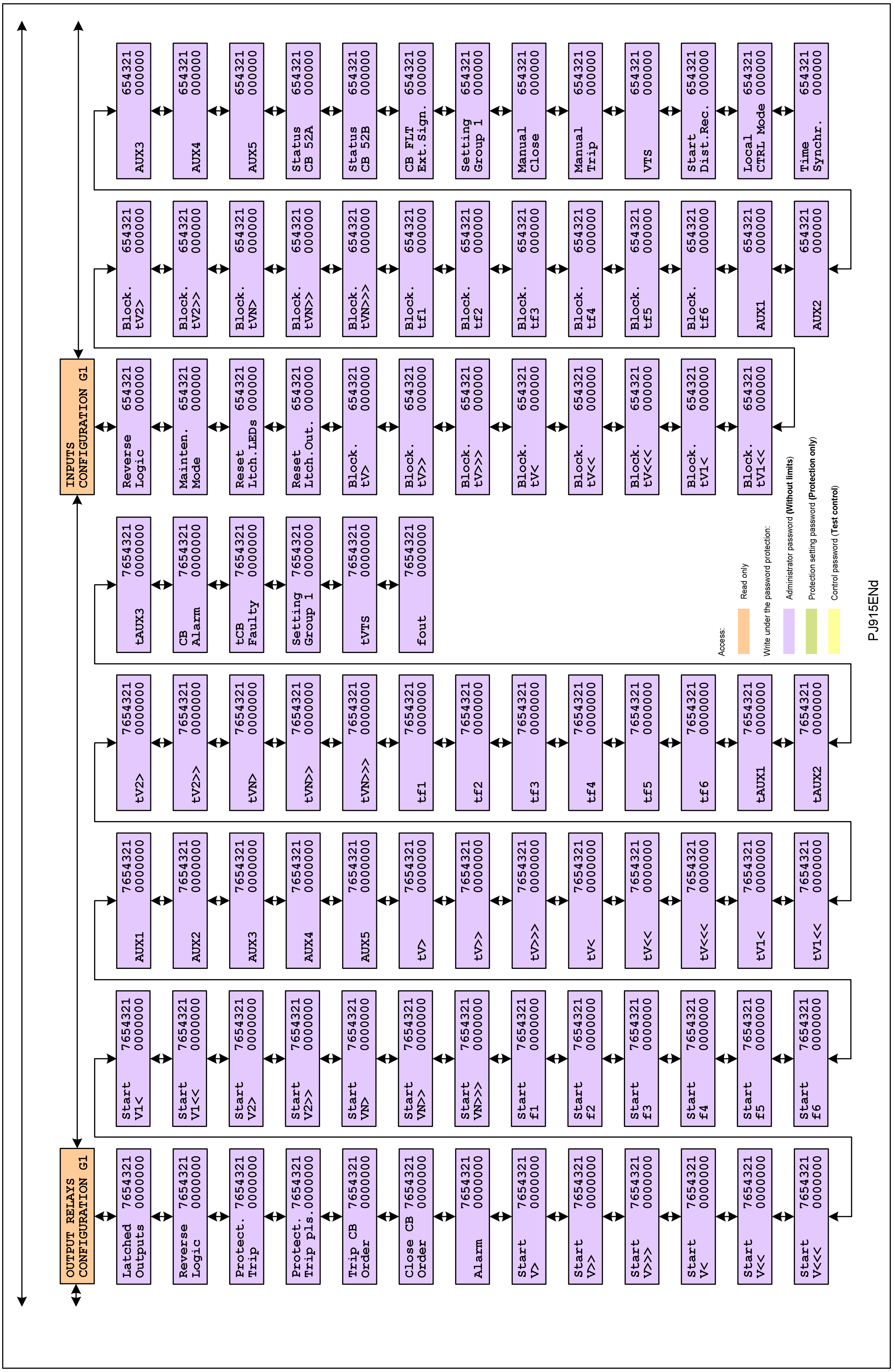

Figure 12: V11V Model A Menu Map part 4 (Firmware 1A)

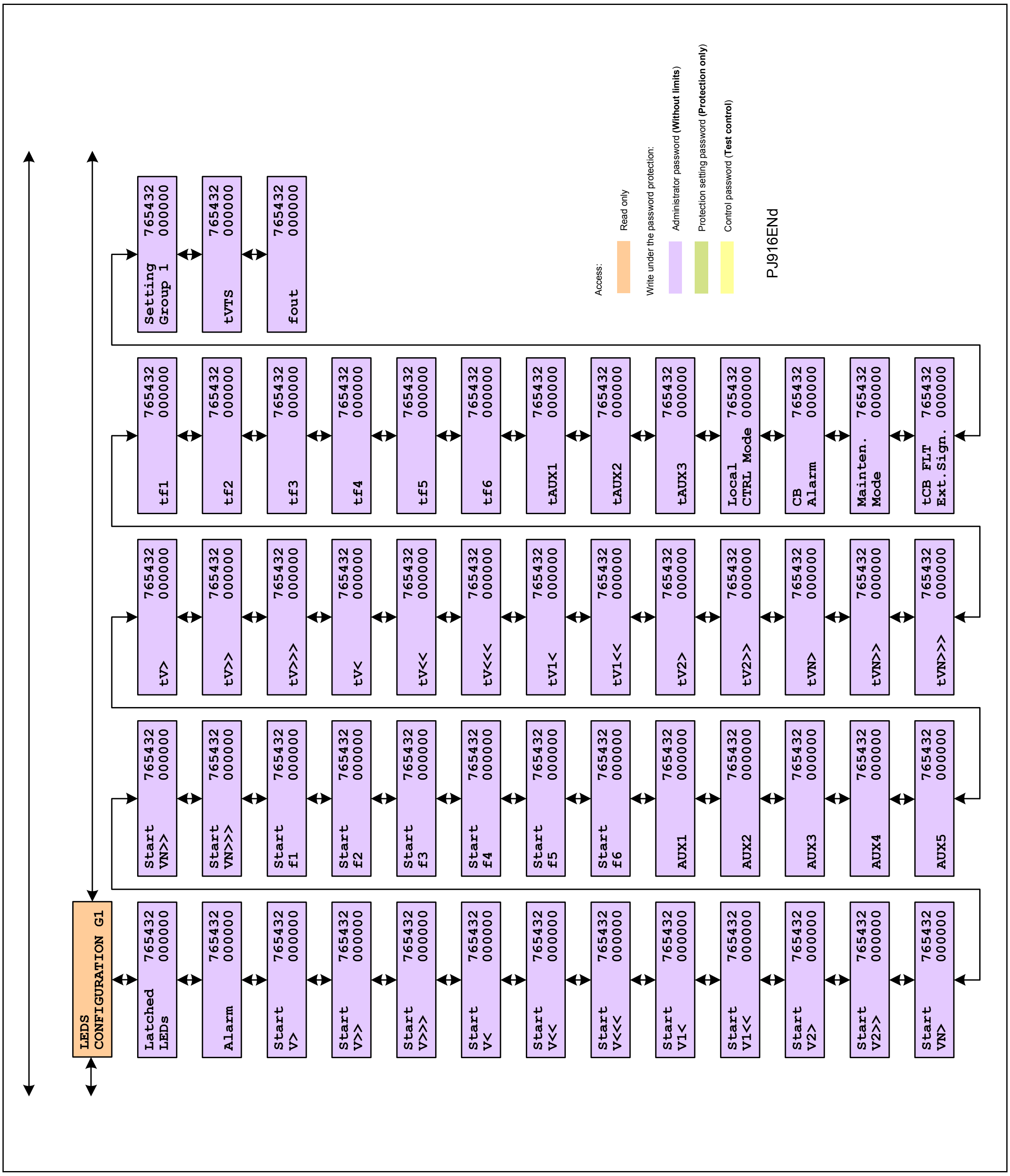

Figure 13: V11V Model A Menu Map part 5 (Firmware 1A)

GS

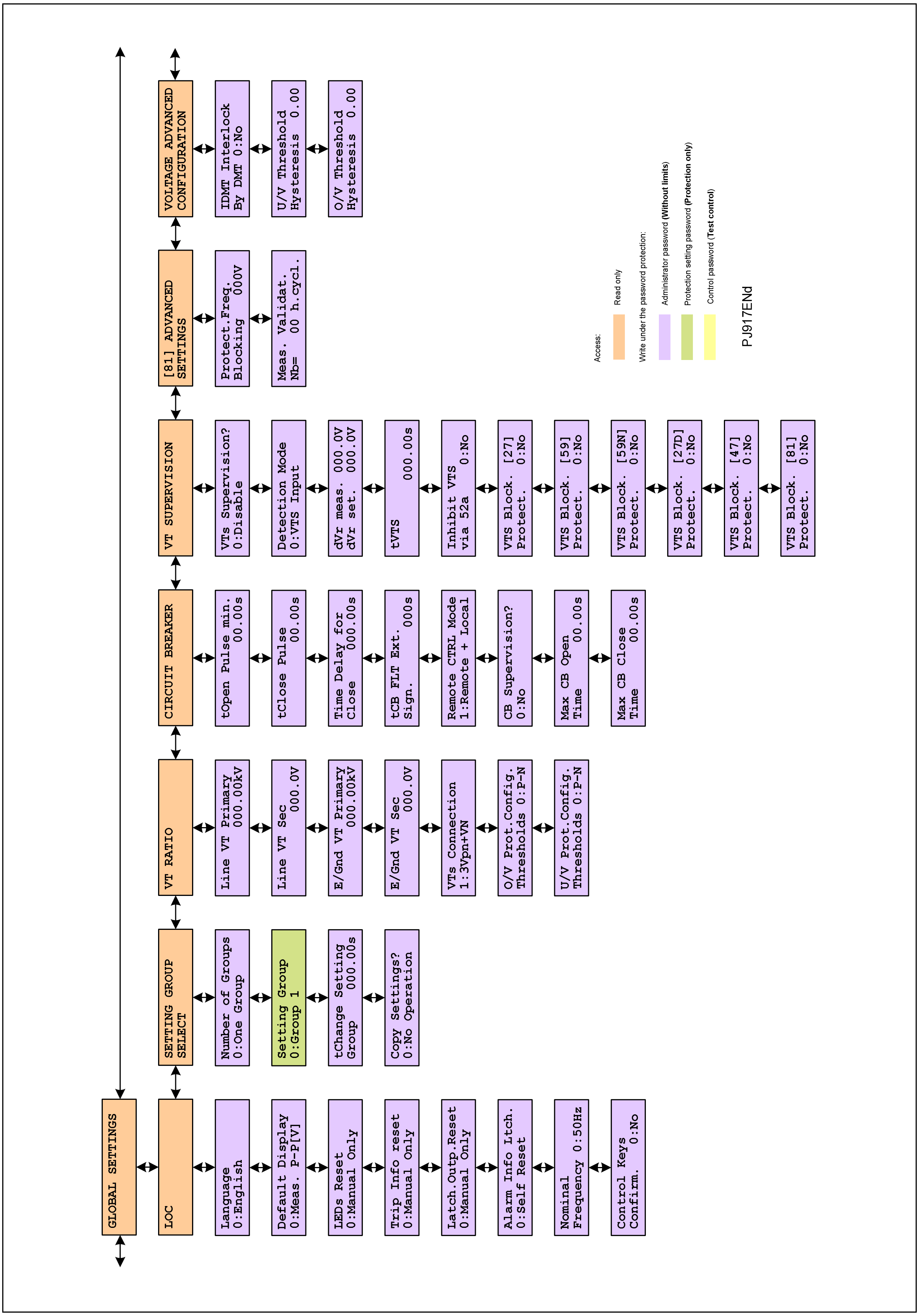

Figure 14: V11V Model A Menu Map part 6 (Firmware 1A)

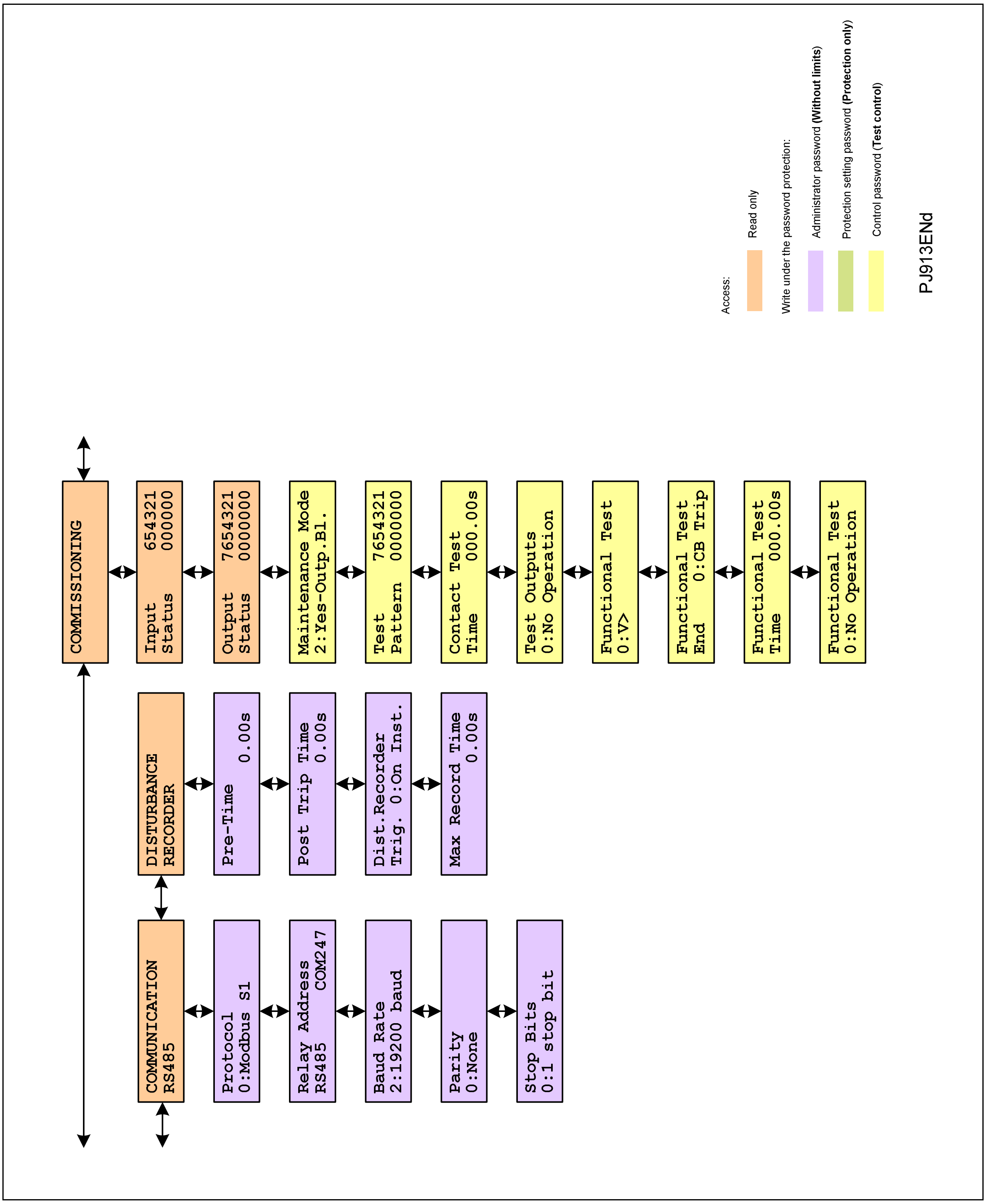

Figure 15: V11V Model A Menu Map part 7 (Firmware 1A)

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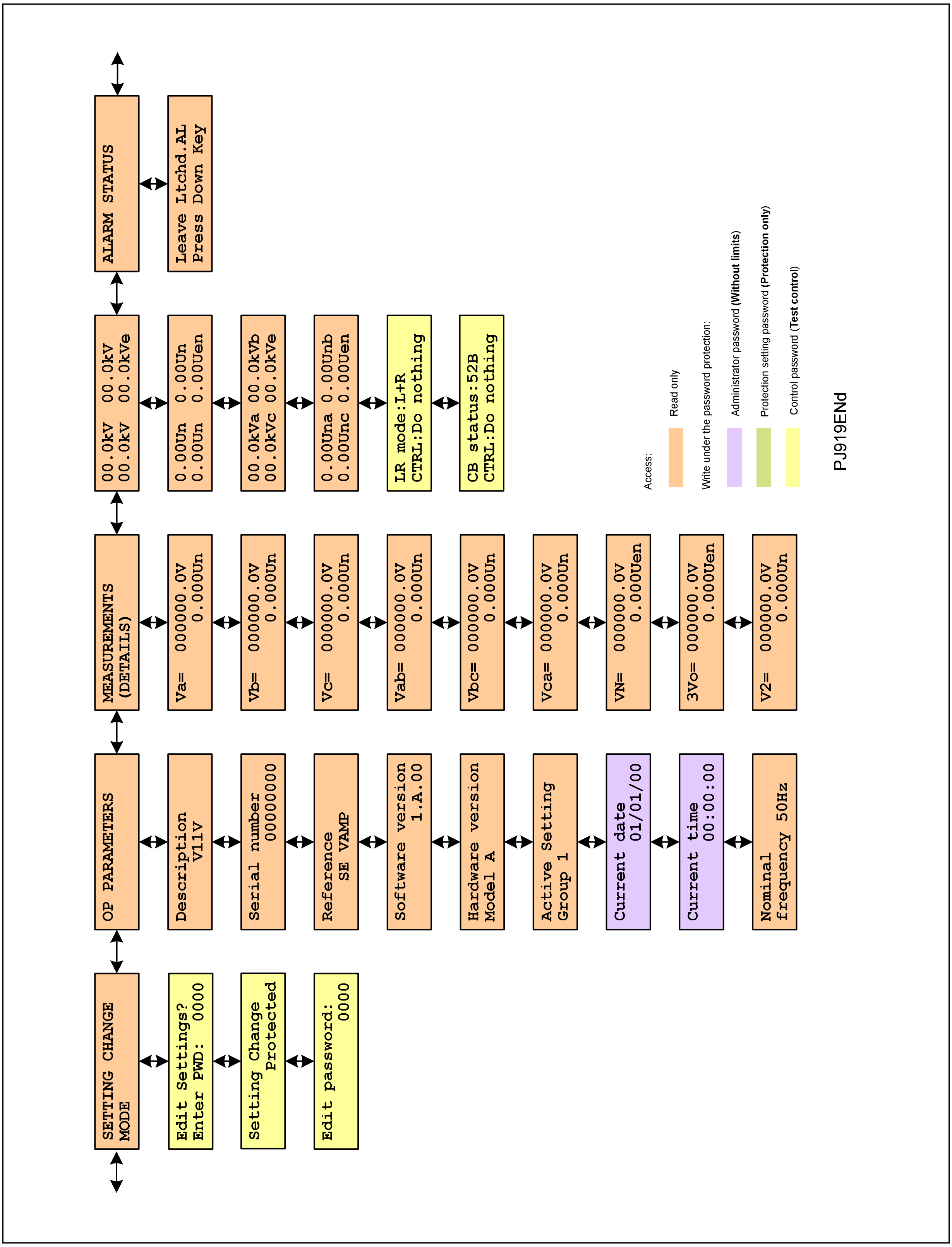

Figure 16: V11V Model N Menu Map part 1 (Firmware 1A)

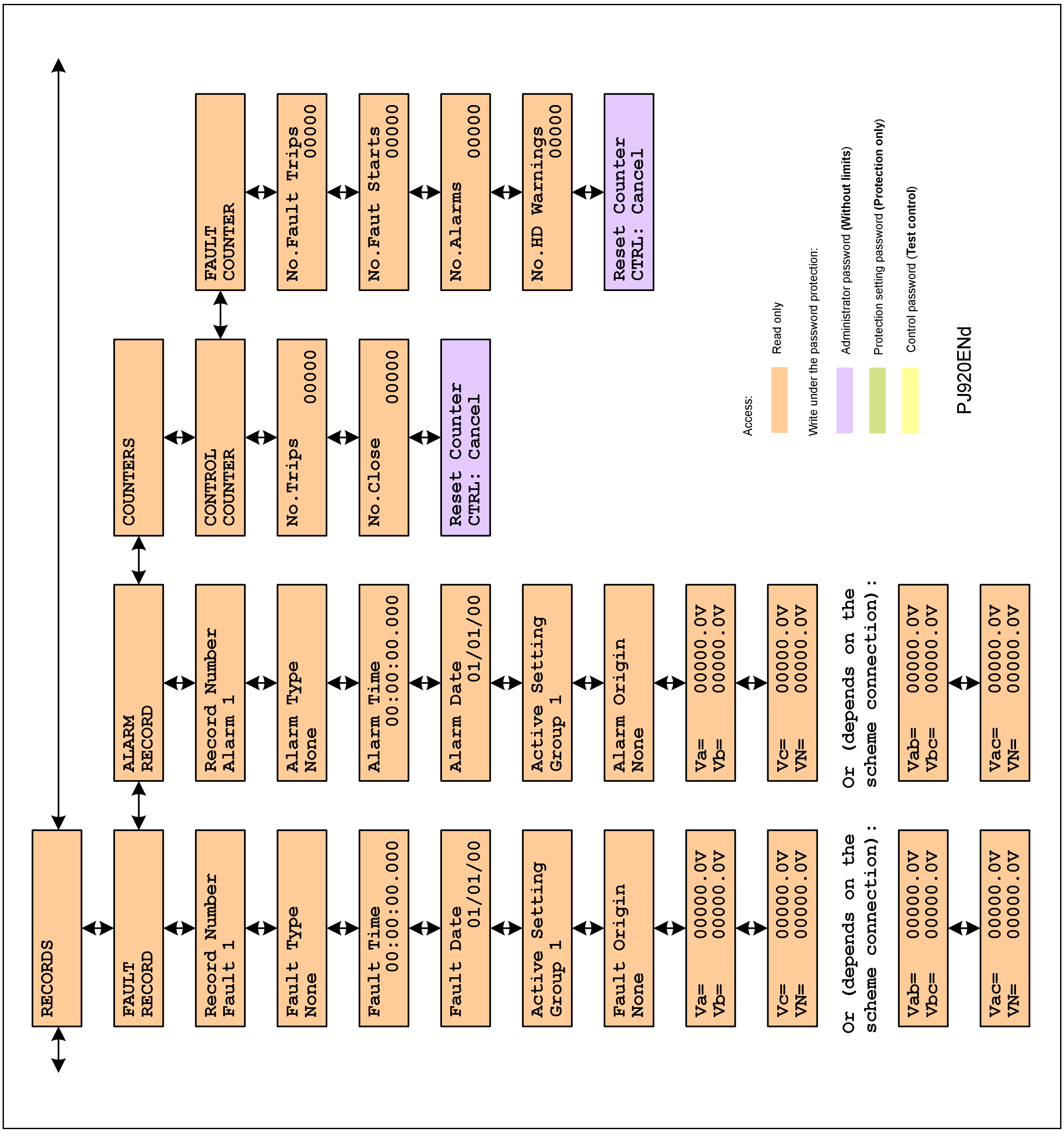

Figure 17: V11V Model N Menu Map part 2 (Firmware 1A)

GS

GS

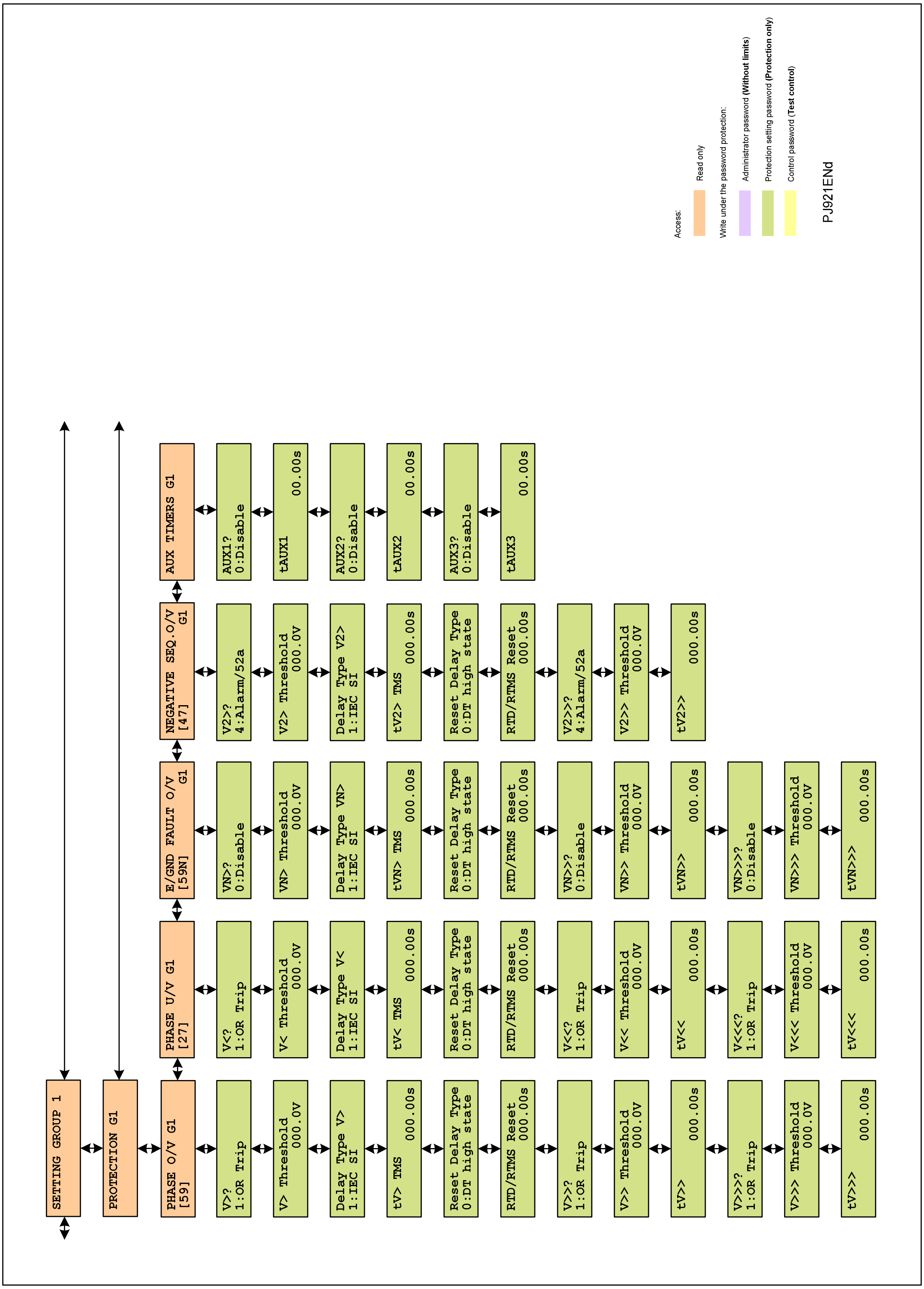

Figure 18: V11V Model N Menu Map part 3 (Firmware 1A)

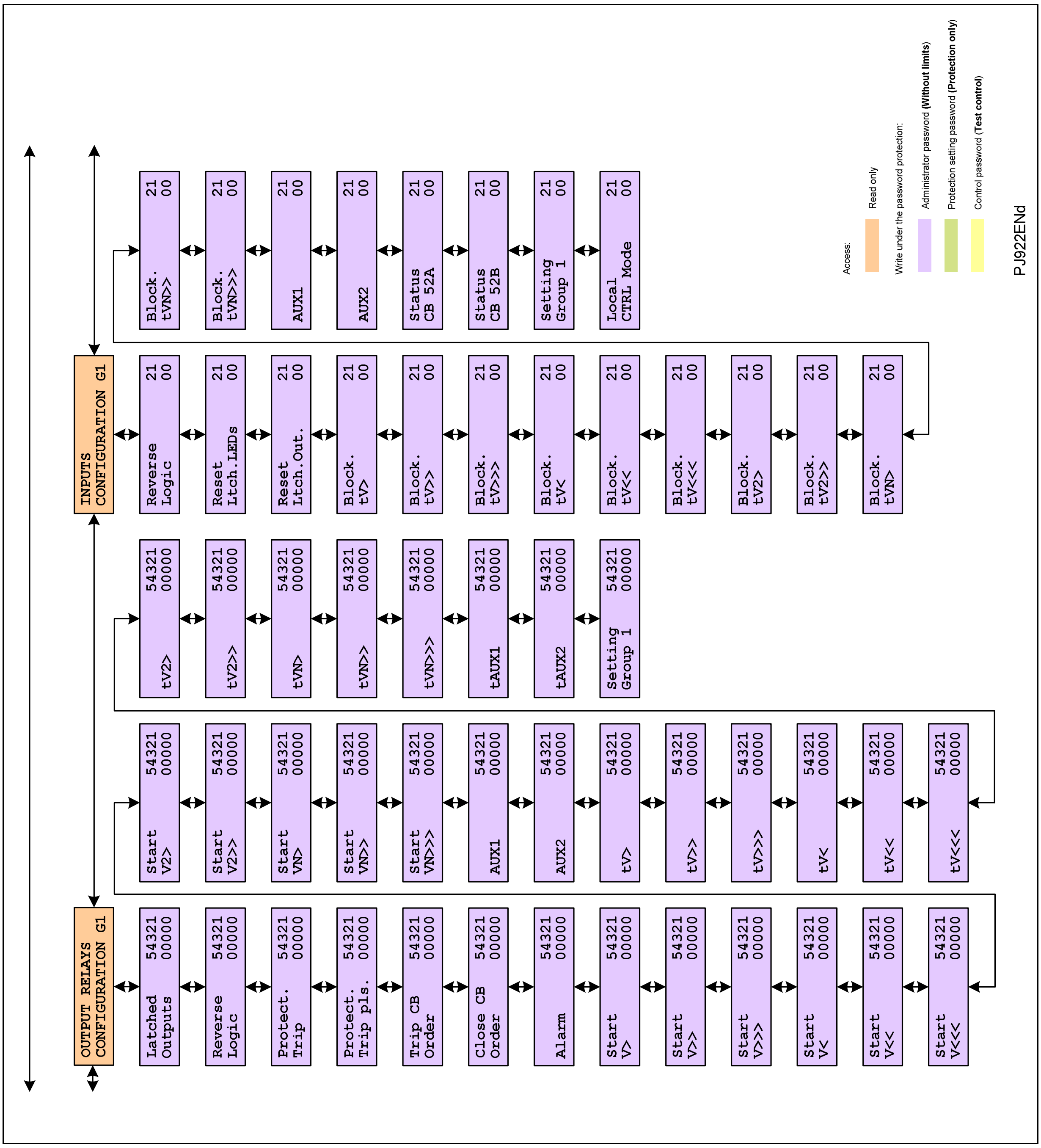

Figure 19: V11V Model N Menu Map part 4 (Firmware 1A)

GS

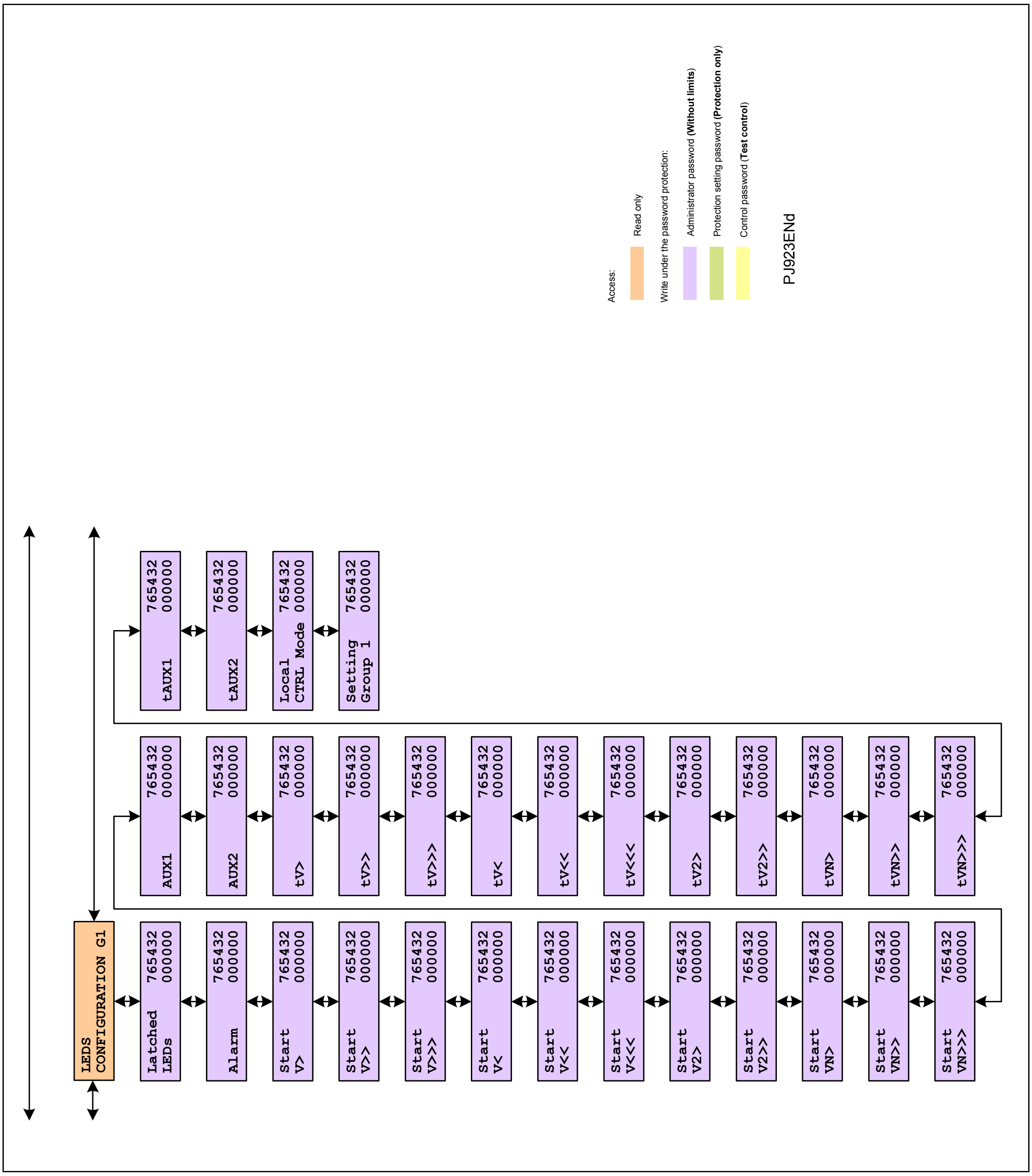

Figure 20: V11V Model N Menu Map part 5 (Firmware 1A)

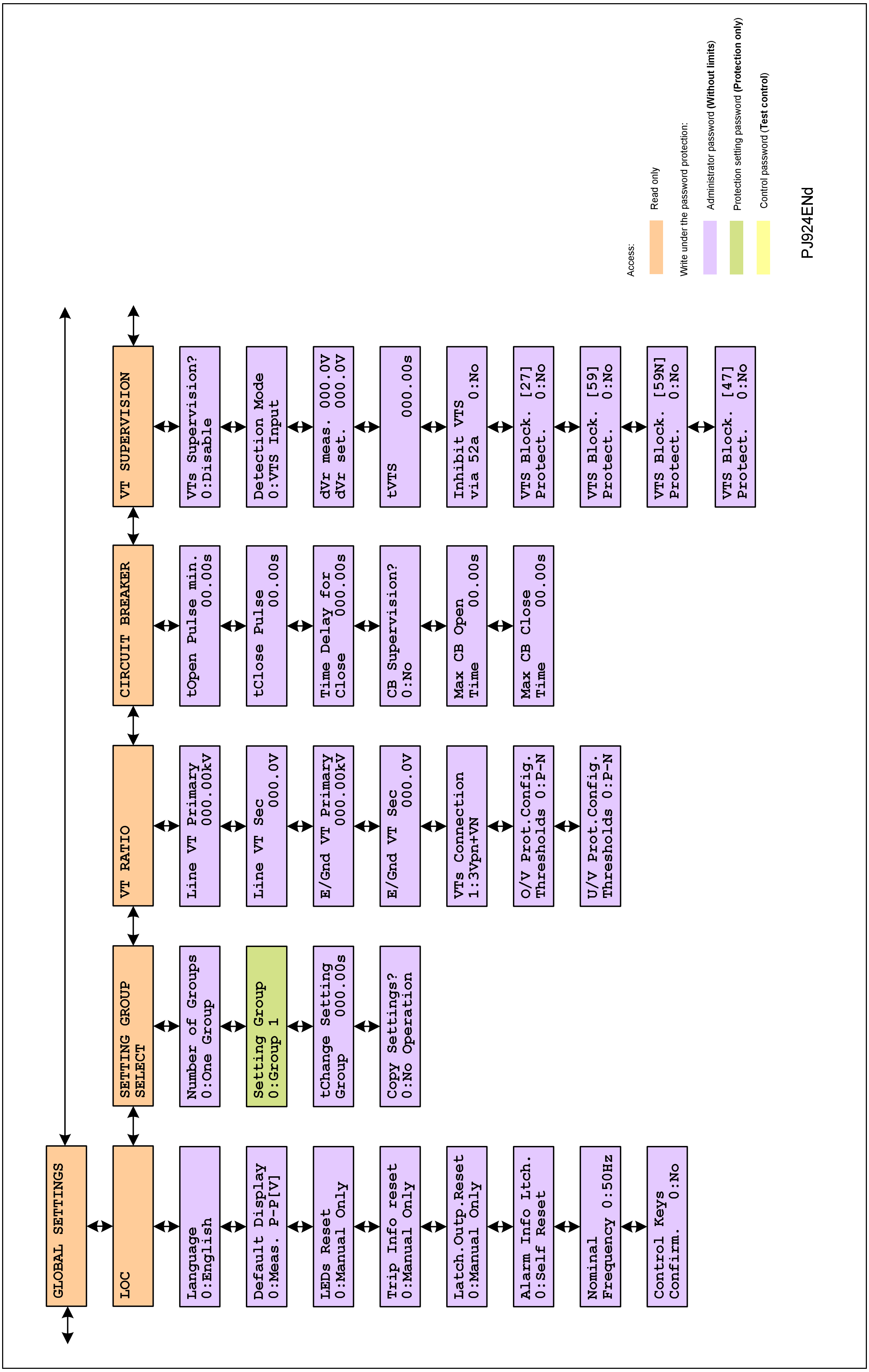
GLOBAL SETTINGS
LOC
Language 0:English
Default Display 0:Meas. P-P[V]
LEDs Reset 0:Manual Only
Trip Info reset 0:Manual Only
Latch.Outp.Reset 0:Manual Only
Alarm Info Ltch. 0:Self Reset
Nominal Frequency 0:50Hz
Control Keys Confirm. 0:No
SETTING GROUP SELECT
Number of Groups 0:One Group
Setting Group 0:Group 1
tChange Setting Group 000.00s
Copy Settings? 0:No Operation
VT RATIO
Line VT Primary 000.00kV
Line VT Sec 000.0V
E/Gnd VT Primary 000.00kV
E/Gnd VT Sec 000.0V
VTs Connection 1:3Vpn+VN
O/V Prot.Config. Thresholds 0:P-N
U/V Prot.Config. Thresholds 0:P-N
CIRCUIT BREAKER
tOpen Pulse min. 00.00s
tClose Pulse 00.00s
Time Delay for Close 000.00s
CB Supervision? 0:No
Max CB Open Time 00.00s
Max CB Close Time 00.00s
VT SUPERVISION
VTs Supervision? 0:Disable
Detection Mode 0:VTS Input
dVr meas. 000.0V dVr set. 000.0V
tVTS 000.00s
Inhibit VTS via 52a 0:No
VTS Block. [27] Protect. 0:No
VTS Block. [59] Protect. 0:No
VTS Block. [59N] Protect. 0:No
VTS Block. [47] Protect. 0:No
Access:
Read only
Write under the password protection:
Administrator password (Without limits)
Protection setting password (Protection only)
Control password (Test control)
PJ924ENd

Figure 21: V11V Model N Menu Map part 6 (Firmware 1A)

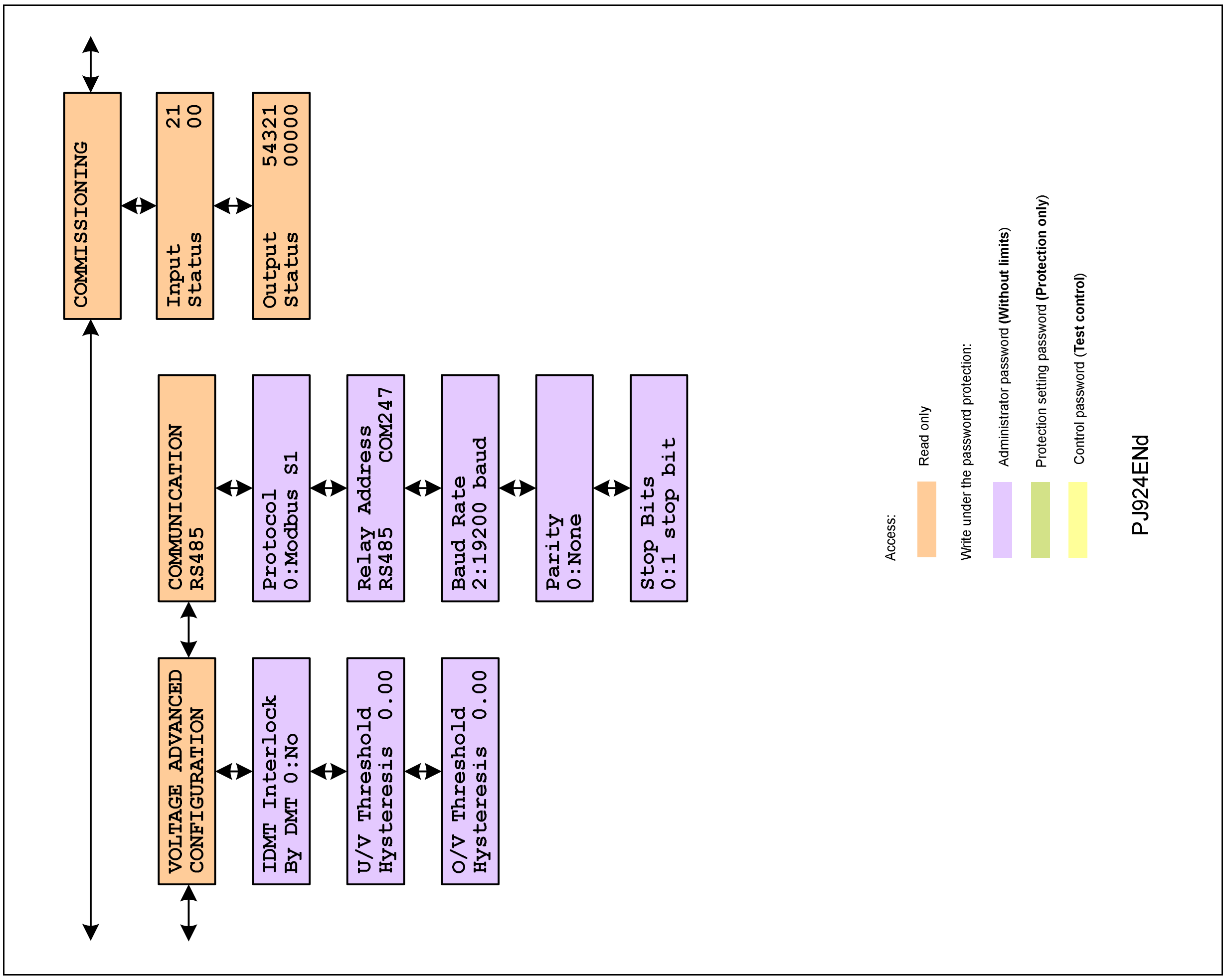

Figure 22: V11V Model N Menu Map part 7 (Firmware 1A)

GS

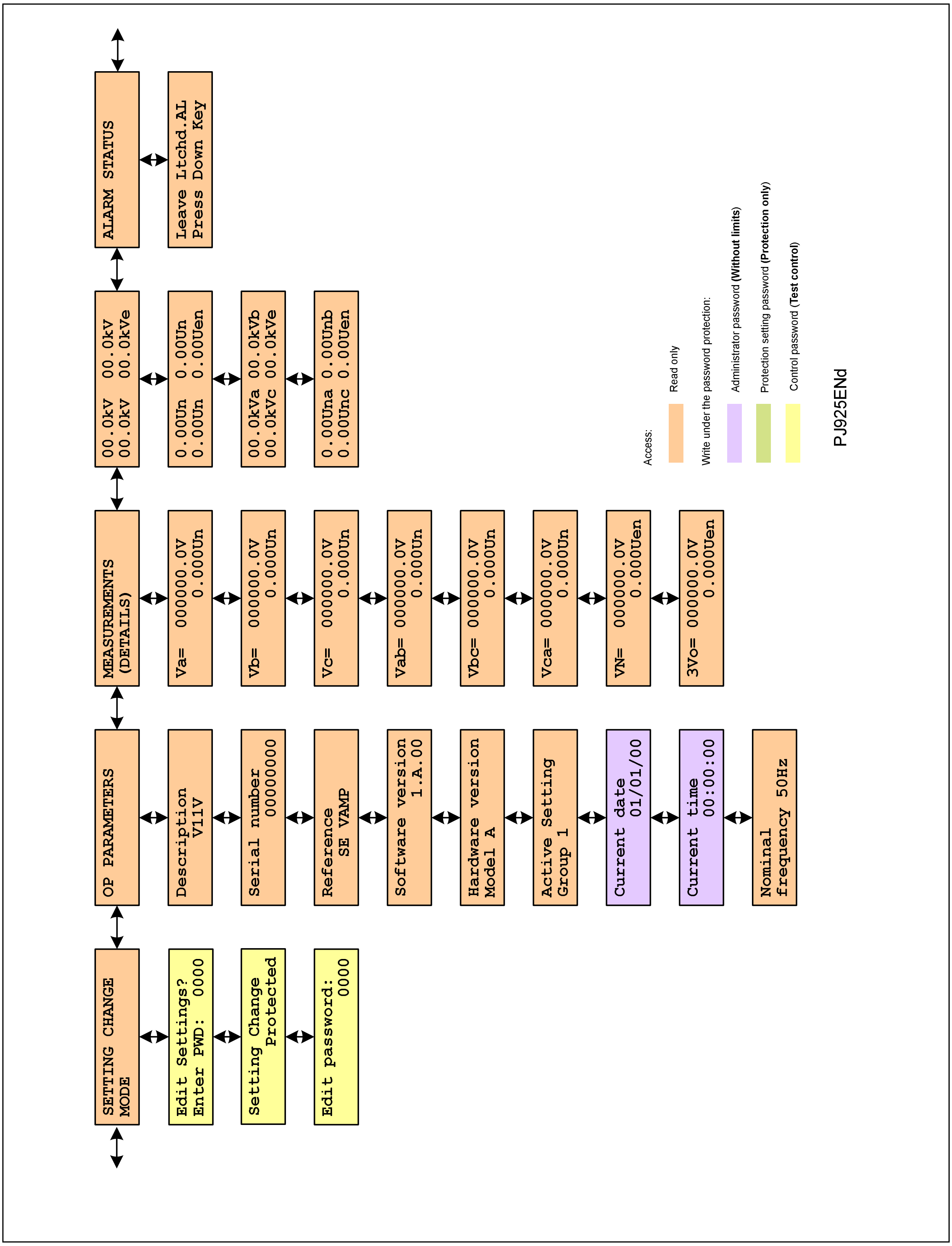

Figure 23: V11V Model L Menu Map part 1 (Firmware 1A)

GS

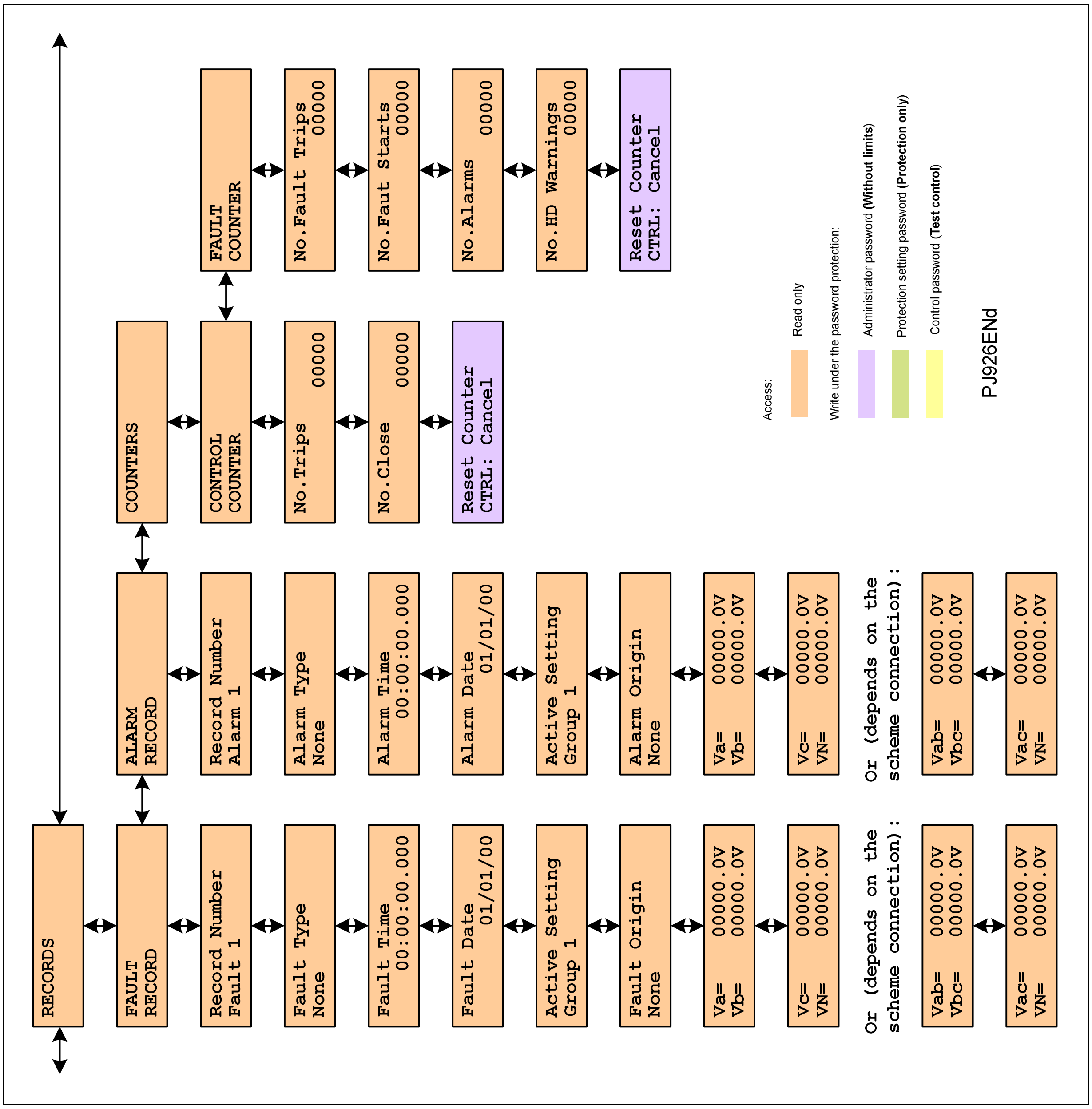

Figure 24: V11V Model L Menu Map part 2 (Firmware 1A)

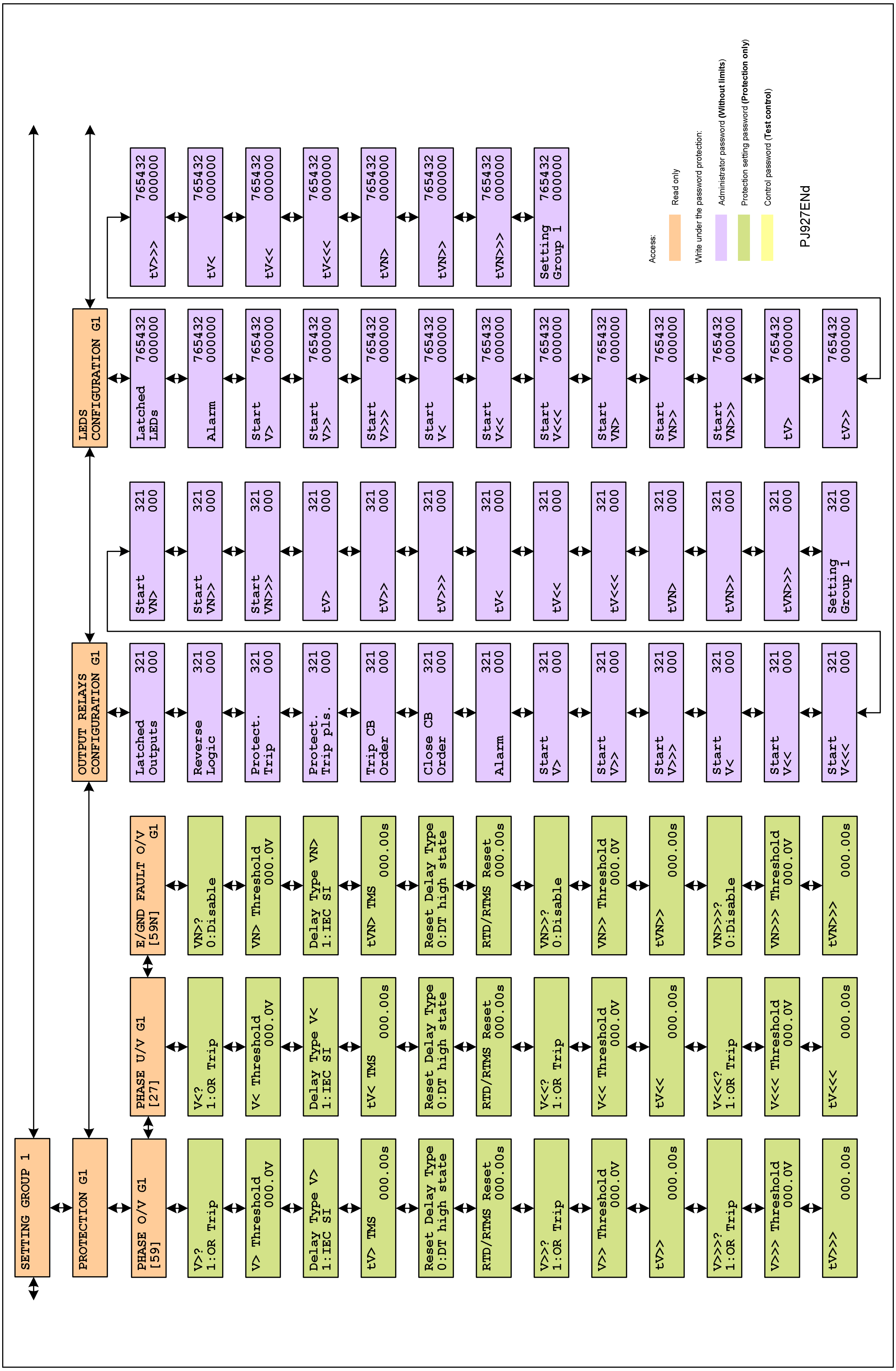

Figure 24: V11V Model L Menu Map part 3 (Firmware 1A)

GS

GS

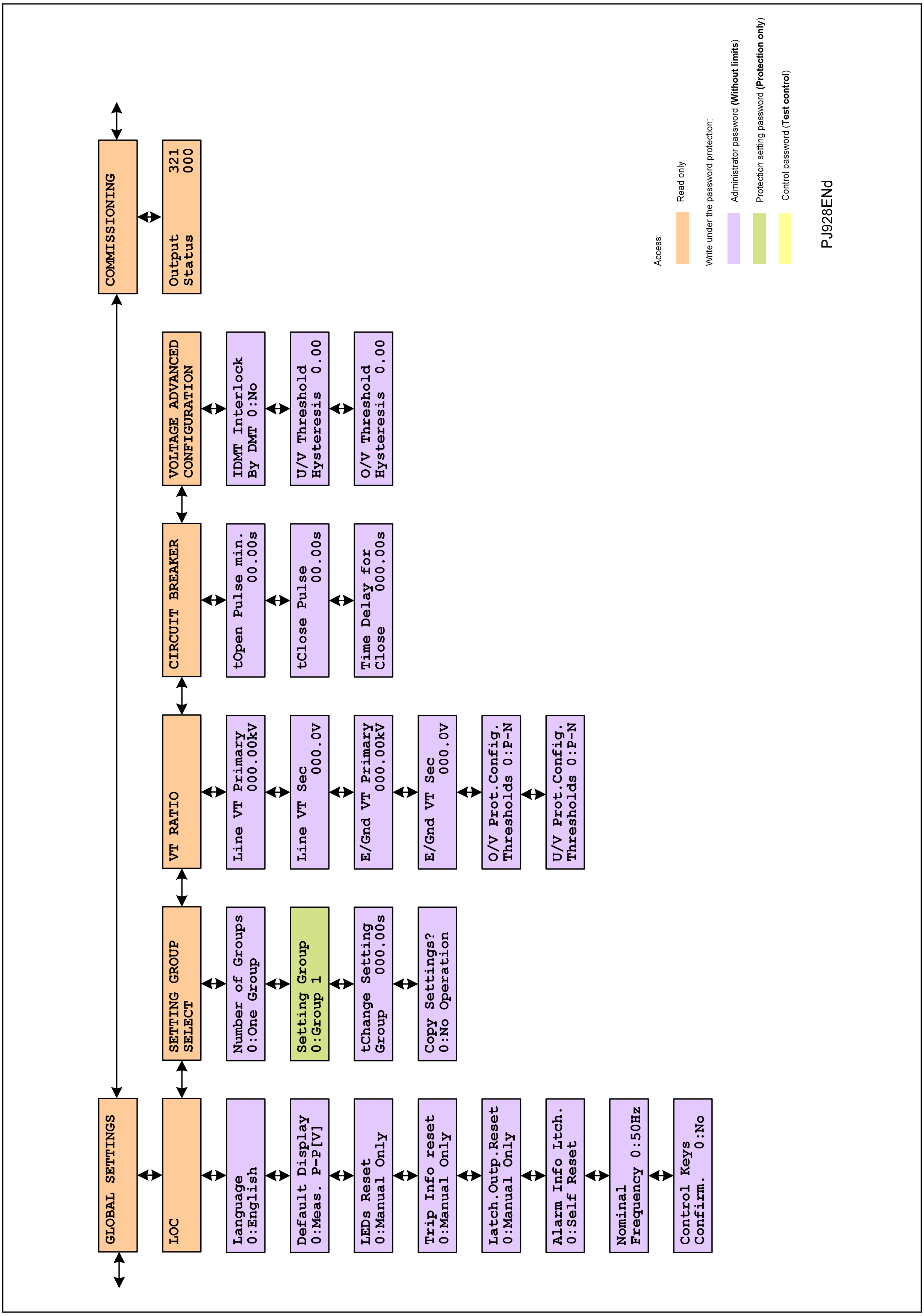

Figure 25: V11V Model L Menu Map part 4 (Firmware 1A)

3. LOCAL CONNECTION VAMP 11V TO A PC

3.1 Configuration

Figure 26: Connection relay to the PC

Local connection between a PC and the relay is made through a USB cable.

Before connection cable to USB socket it is necessary discharge static electricity from the body by touching a metal grounded object (such as an unpainted metal surface) to prevent against ESD damage.

Communications can be established between a PC and a device fitted with a USB port.

The MiCOM S1 STUDIO 5.1.0 (or higher) software has a built-in USB driver and virtual COM software.

3.2 USB Driver and virtual COM software installation

Note: The MiCOM S1 STUDIO 5.1.0 (or higher) software includes all drivers therefore no action is needed.

3.2.1 Remote connection

The Figure 27 shows the recommended way to connect an RS485 cable to the relay in order to build a local network.

3.3 Products plugged into the same panel

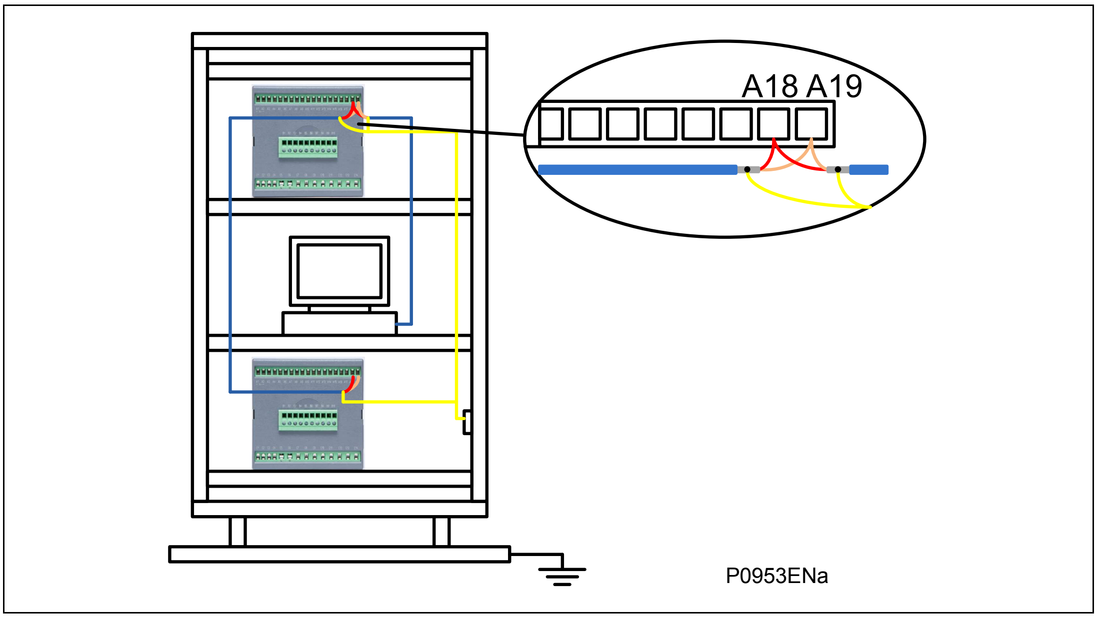

Figure 27: Connection between relays in local network

3.4 MiCOM S1 Studio relay communications basics

MiCOM S1 Studio 5.1.0 (or higher) are the universal VAMP 11x and MiCOM IED Support Software packages which provide users with a direct and convenient access to all data stored in any VAMP 11x using the USB front communication port.

MiCOM S1 Studio 5.1.0 provide full access to:

– VAMP 11x/MiCOM Px10 relays

– Px20, Px20, Px30, Px40 relays

– MiCOM Mx20 measurements units

The following sections give the main procedures to connect to and to use MiCOM S1 Studio 5.1.0.

Before starting, check that the USB serial cable is properly connected to the USB port on the front panel of the relay. Please follow the instructions given in section 3.1 in order to ensure proper connection between the PC and the relay before attempting to communicate with the relay.

This section is intended as a quick start guide to using MiCOM S1 Studio 5.1.0, and assumes that you have a copy of MiCOM S1 Studio 5.1.0 installed on your PC. Please refer to the MiCOM S1 Studio User Manual for more detailed information.

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3.5 MiCOM S1 Studio 5.1.0

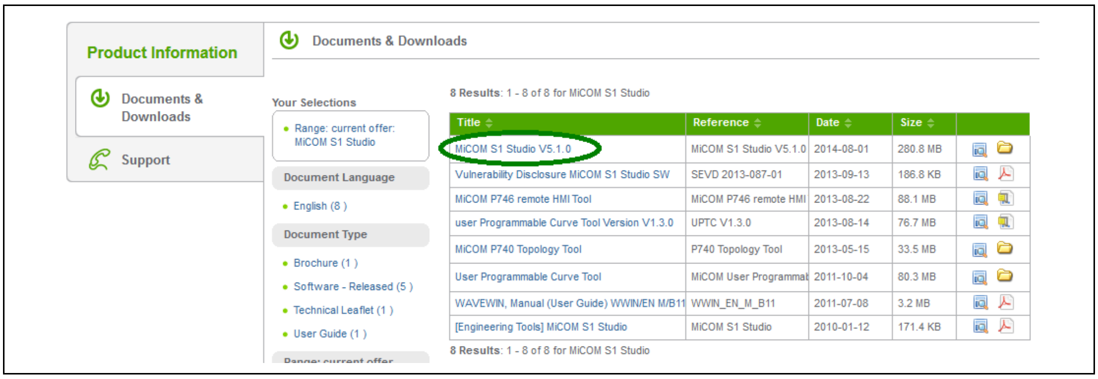
3.5.1 MiCOM S1 Studio downloading

The MiCOM S1 Studio can be downloaded from WEB site: www.schneider-electric.com.

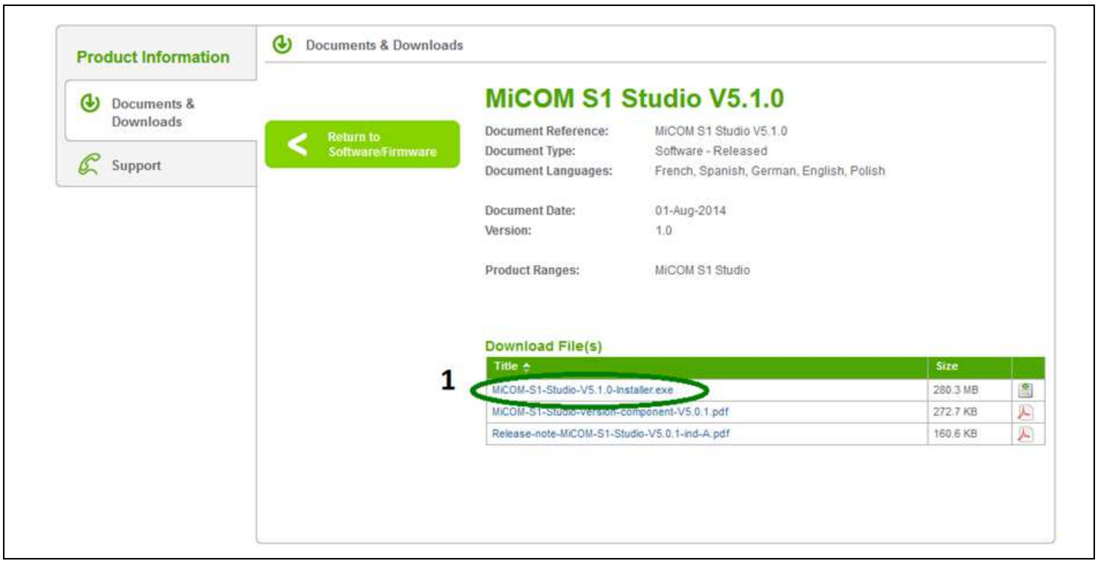
In the search field enter “Studio” (1)

During typing an advice will appear as above (type slowly), so select "MiCOM S1 Studio - IED Support Software” (2)

The new window will appear (see below). Click on “MiCOM S1 Studio 5.1.0” (1)”

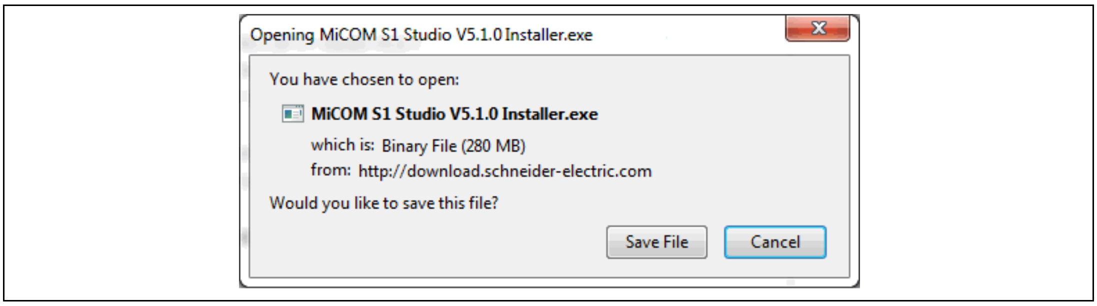


The new window will appear (see below). Click on MiCOM S1 Studio Installer 5.1.0 (1)



Note: in case of any problems with finding windows as above, it is possible to go directly to window below by typing in internet browser: “MiCOM-S1-Studio 5.1.0 Installer.exe”.

The new window will appear (see below). Click “Save file”, than run exe file for starting of installation.


Opening MiCOM S1 Studio V5.1.0 Installer.exe
You have chosen to open:
MiCOM S1 Studio V5.1.0 Installer.exe
which is: Binary File (280 MB)
from: http://download.schneider-electric.com
Would you like to save this file?
Save File
Cancel

GS

3.5.2 Data Model Management

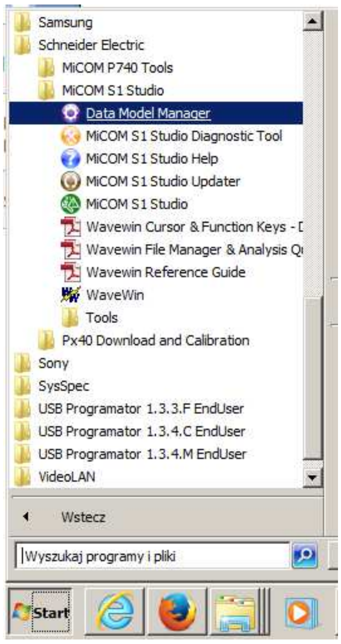
The settings and parameters of the protection relay can be extracted from the relay or loaded using the Data Model manager. The Data Model Manager can load any model from a local file, a external disks/drives or an Internet server (if connected).

The Data Model Manager is used to add and remove data models, as well as to export and import data model files.

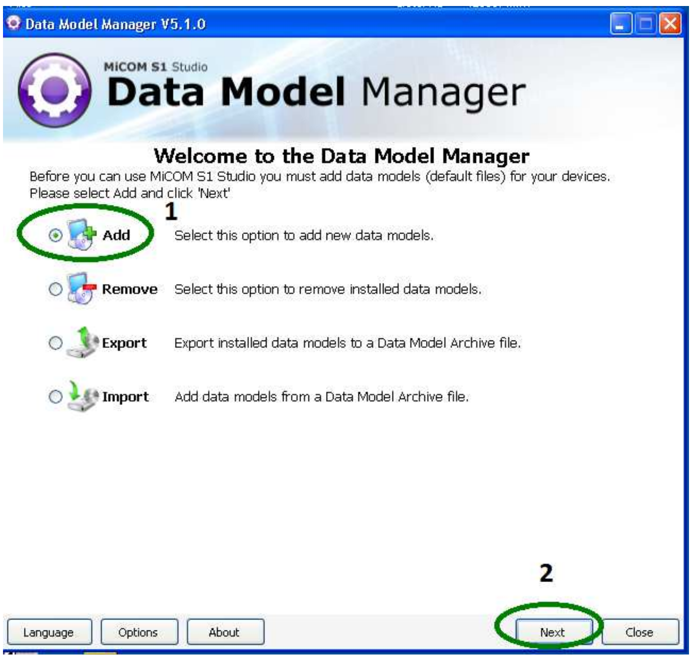
It is necessary to close MiCOM S1 Studio prior to launching the Data Model Manager.

To open the Data Model Manager, click on the icon: 

. Select "All programs" then "Schneider Electric" and than "MiCOM S1 Studio".



The following window is displayed:



Select the ***Add*** option to add the new data model then click on ***Next***.

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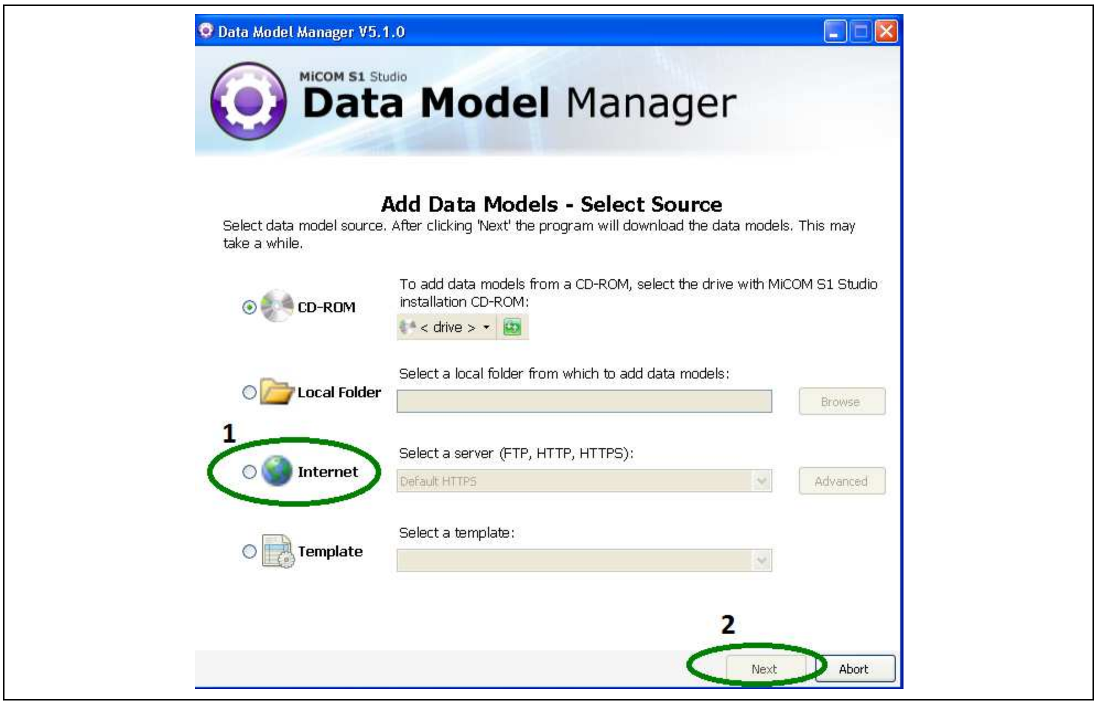
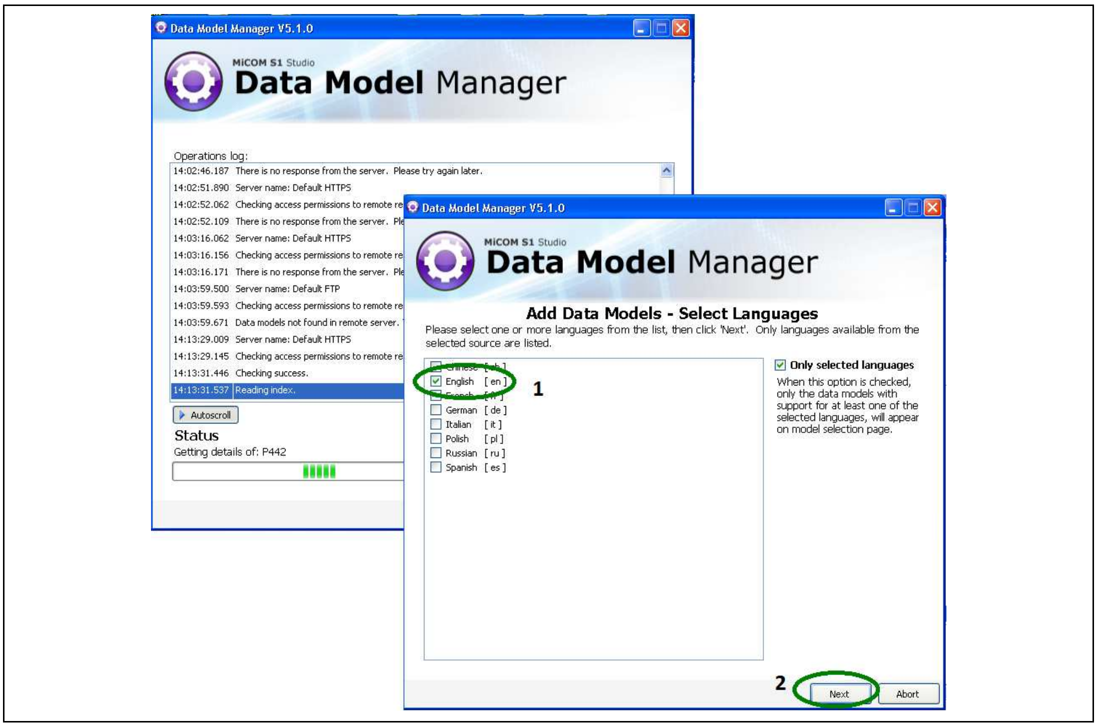
The next window is used to select the data model's source (external drives, local folder or Schneider Electric FTP server). Select the data model's source then click on ***Next***.

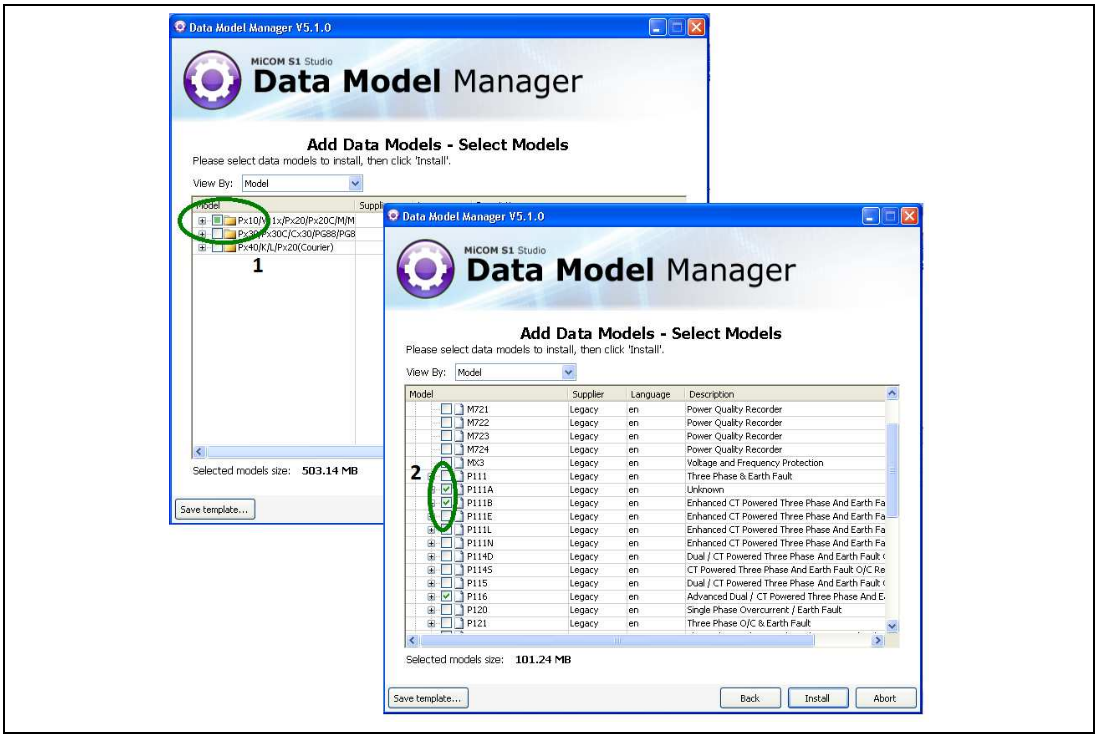


Note: The procedure below assumes connection to Schneider Electric FTP server.

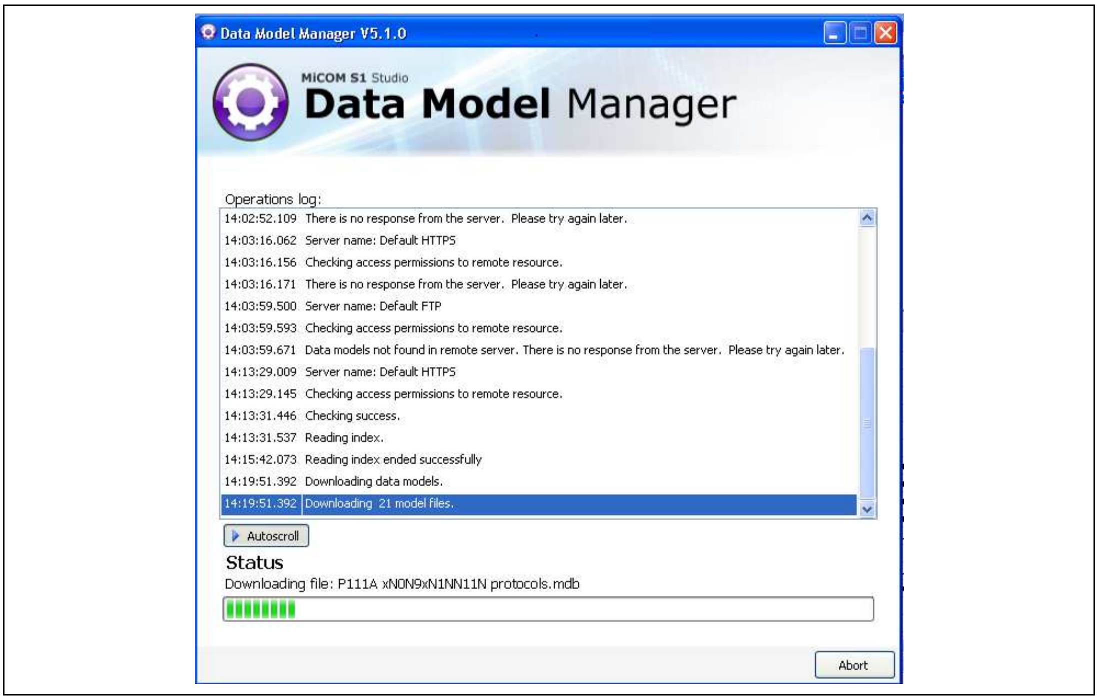
The Data Model Manager loads the data models details then automatically displays the language selection panel. Select the menu language then click on ***Next***.



The data models panel is displayed. Select the data model relevant to your product (for instance, to download V11V data models, expand the ***V11x/Px10/Px20/Px20C/M/Modulex*** sub-menu (click on **+** then select the data model relevant to your product). Once the data models are selected, the Data Model Manager window displays the file size of the download.



Click on ***Install***. The data model files are downloaded and updated in your system.



Once installation is complete, close the Data Model Manager. The downloaded Data Model will be used by MiCOM S1 Studio when a system file is opened or created. For more information on how to open this default setting file, refer to sub-chapter 3.5.99.

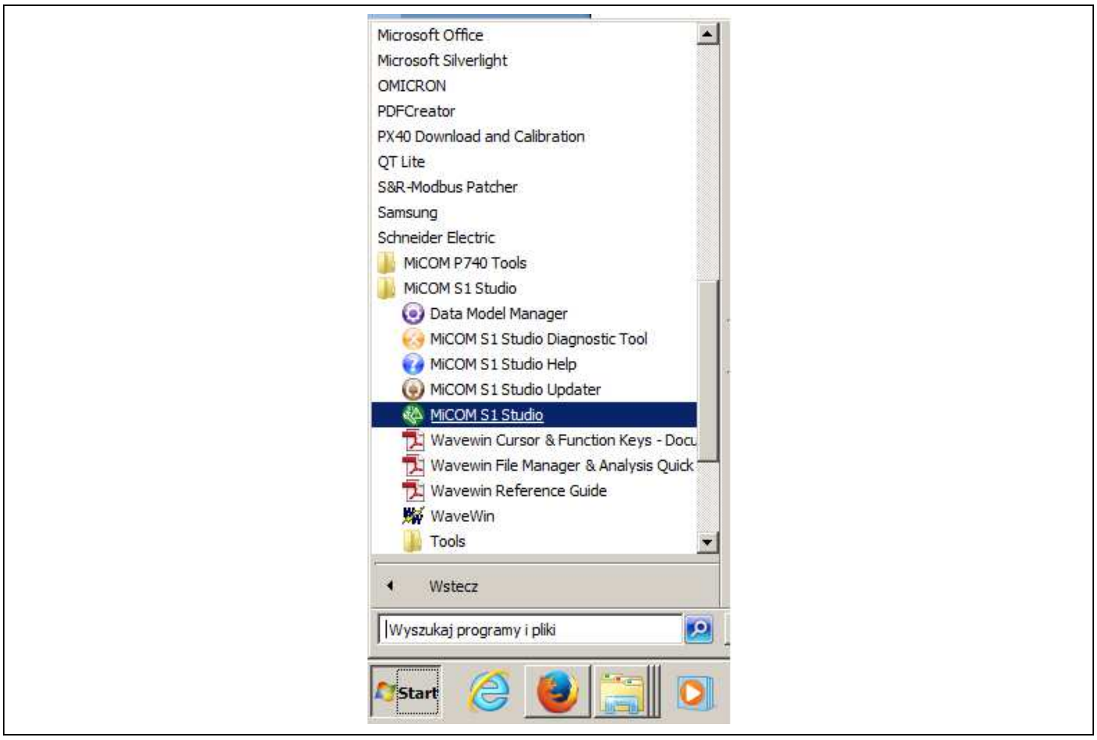
3.5.3 "Quick Connection" to the relay using MiCOM S1 Studio

To start MiCOM S1 Studio, click on the icon: 

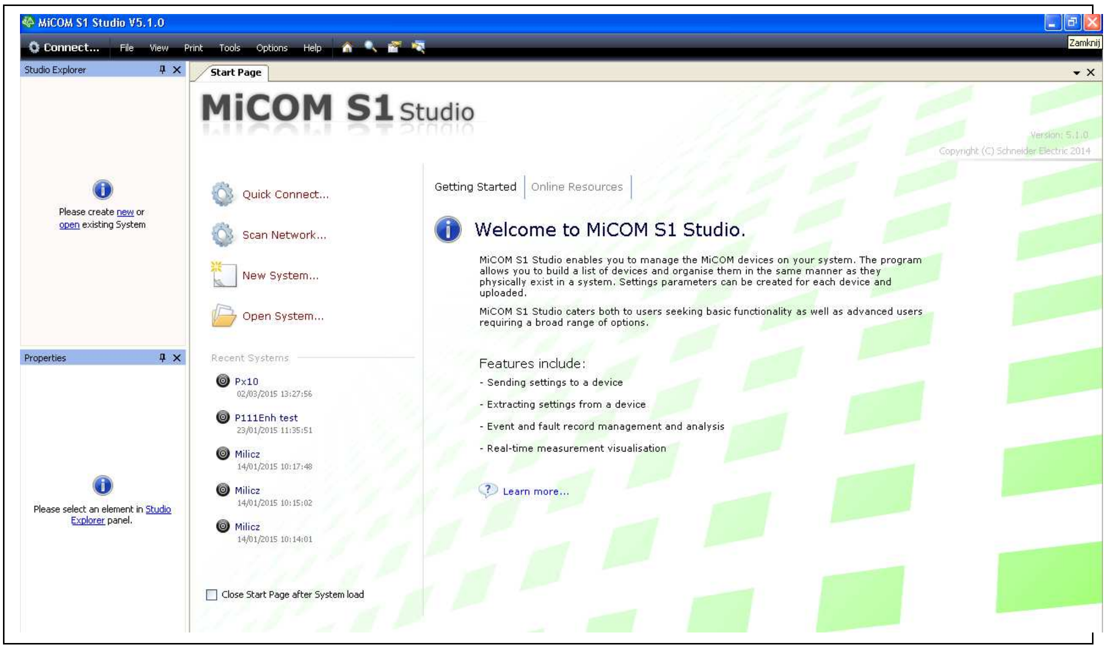
In the ***Programs*** menu, select Schneider Electric then ***MiCOM S1 Studio***.

GS

GS

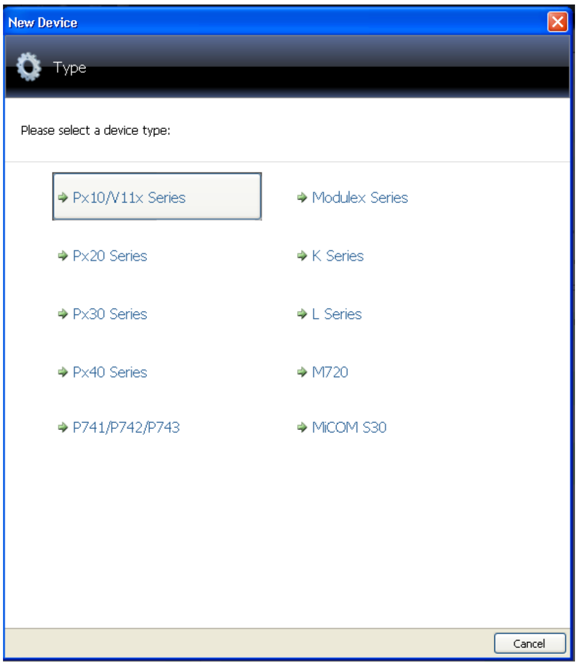


The MiCOM S1 Studio launcher screen is displayed:

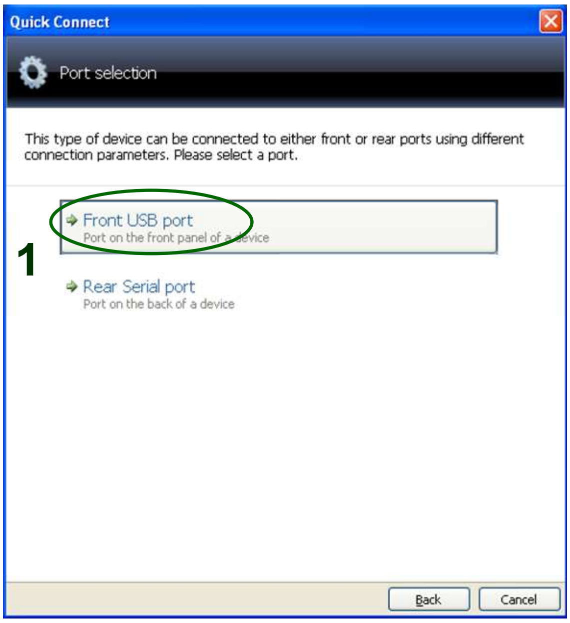


– Click on the Quick Connect button at the top left of the application's window.

– Select ***Px10/V11x Series*** from the presented options:



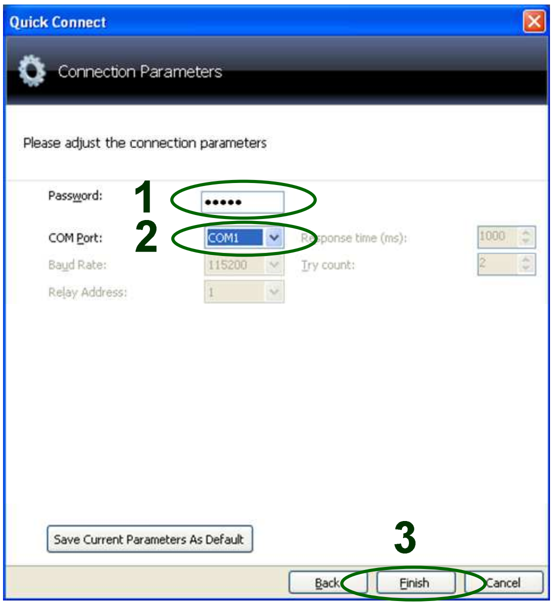
– Select ***Front USB port***:



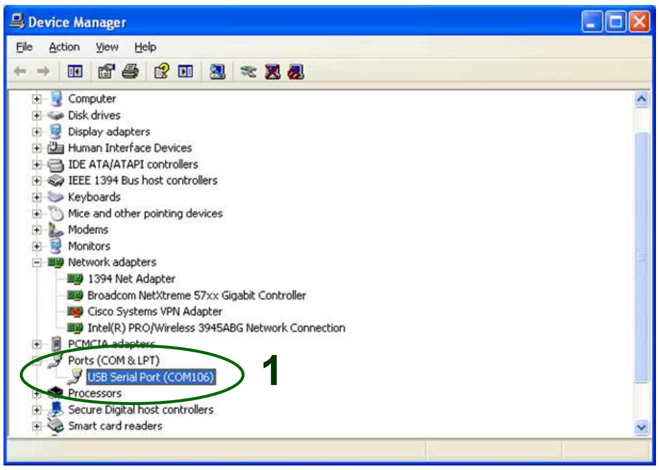
– Enter Password: administrator level (without limits) - the same as in the V11V which is connected via USB port. If the administrator password is not entered in the V11V – leave it as default. Note: the password could be unique for every V11V so if the password is forgotten – contact with SE service for help.

Select virtual COM (VCP) which was created by USB driver:

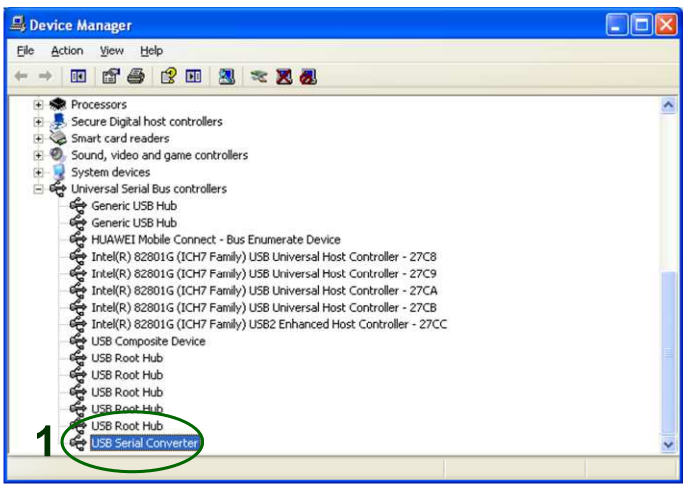
GS



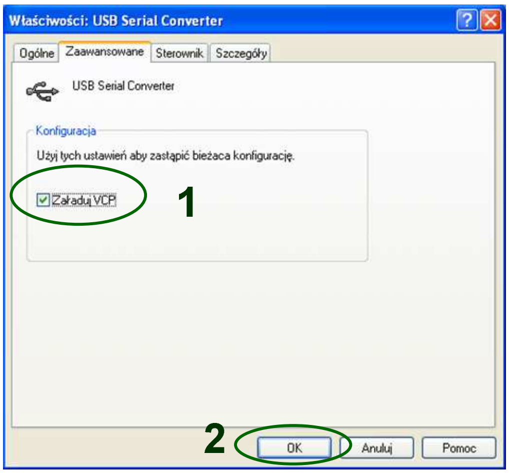
The virtual COM can be read in WINDOWS's "Device Manager" like below:



NOTE: If V11V is connected but no any USB Serial port is shown, it means that USB drivers are not installed or VCP (Virtual COM Port) option of USB Serial Converter is not selected. Check VCP option as below:

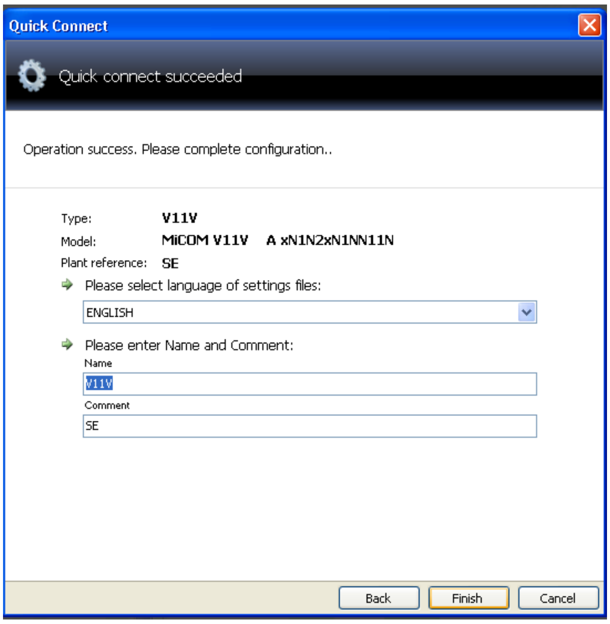


Right-click to open the contextual menu: Properties and Advanced:

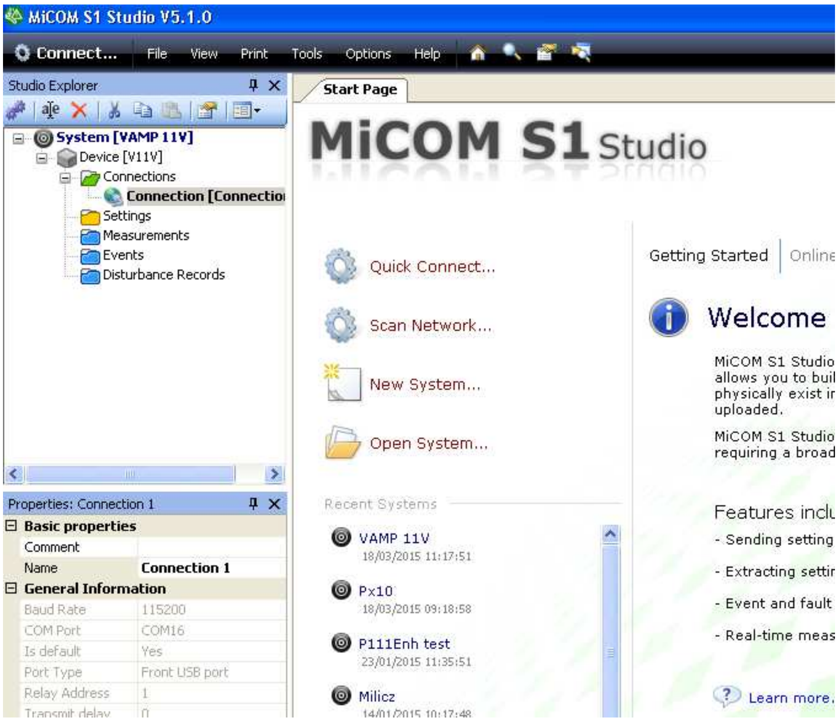


Unplug USB cable and plug in again. Restart MiCOM S1 Studio and repeat the procedure.

– Select ***Language***. Enter ***Name and Comment***:

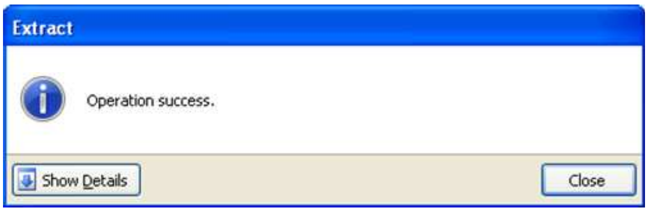


– The new Device is created:

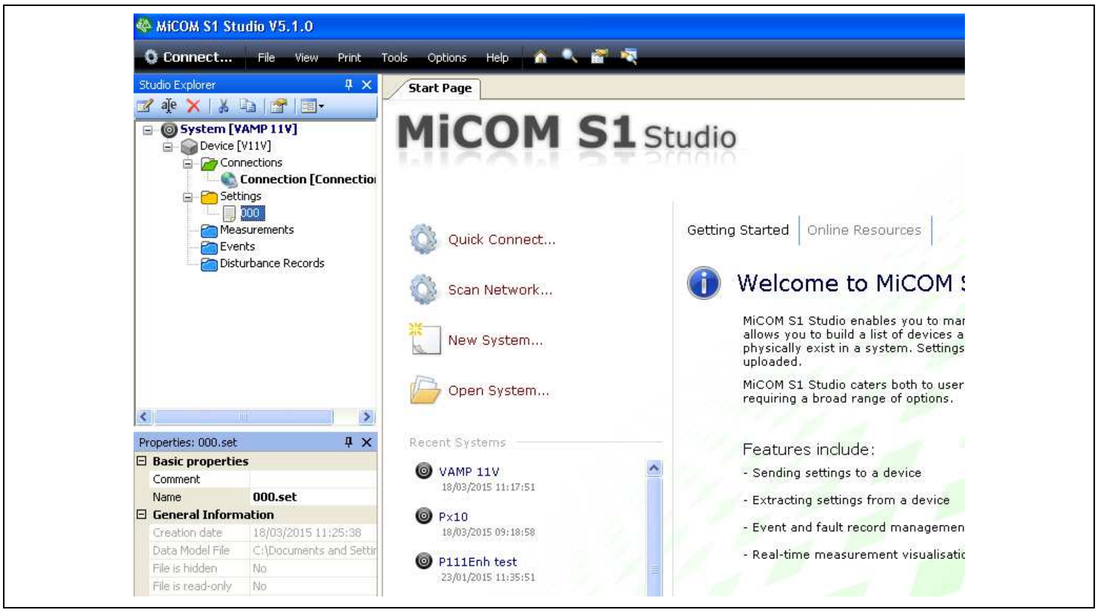


– Select ***Settings.*** Right-click to open the contextual menu: ***Extract Settings***:

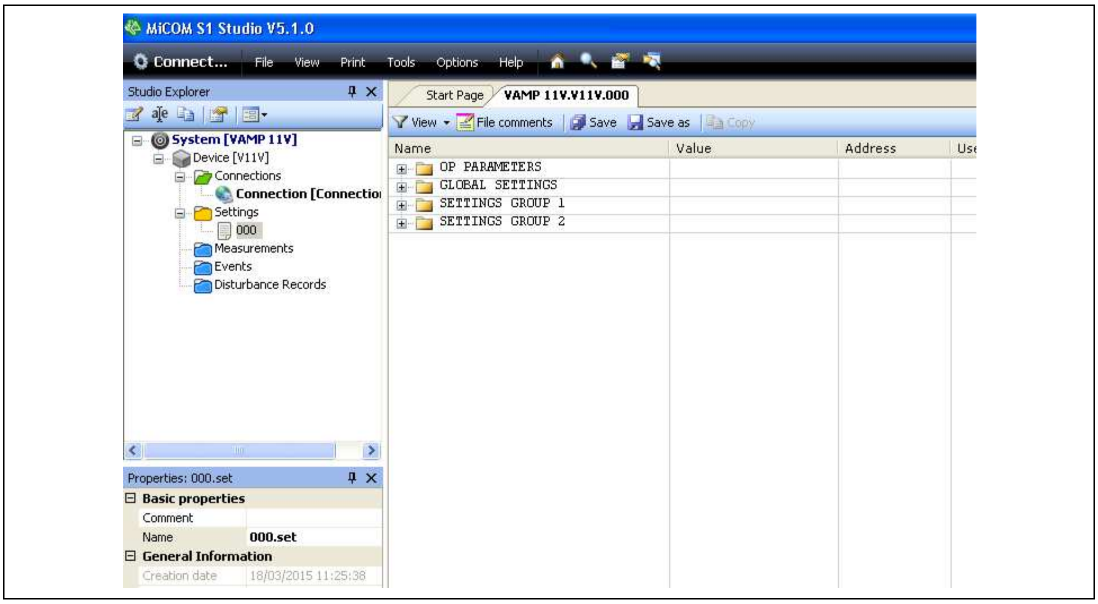
– Wait for the end of the process:



– V11V settings were saved on PC. The name of SET file is 000.set:



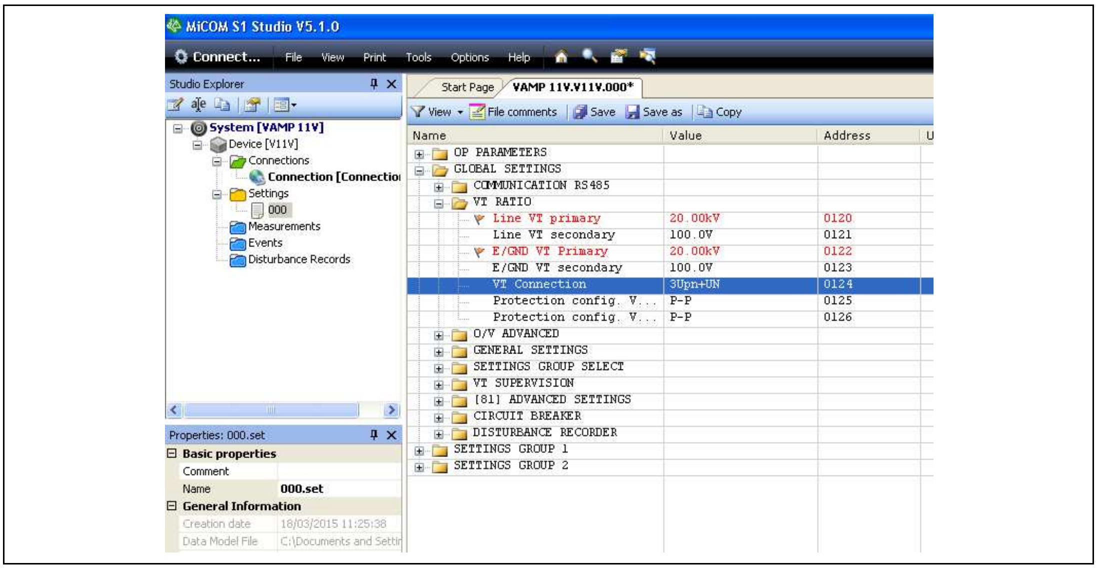
– Double Click on ***000.set*** set file to see settings on the right window of MiCOM S1 Studio:



– Change settings. ***Save*** changes

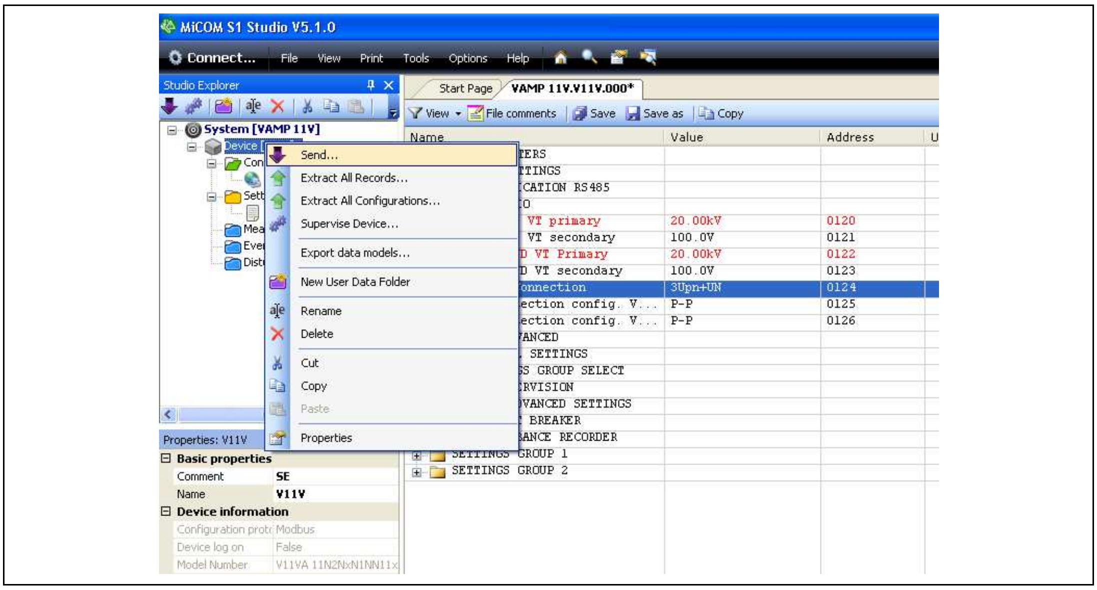
Note: If the changed settings are not ***Saved*** on hard disk of PC, MiCOM S1 Studio send setting file before changing. Be sure that Save icon was pressed:

GS

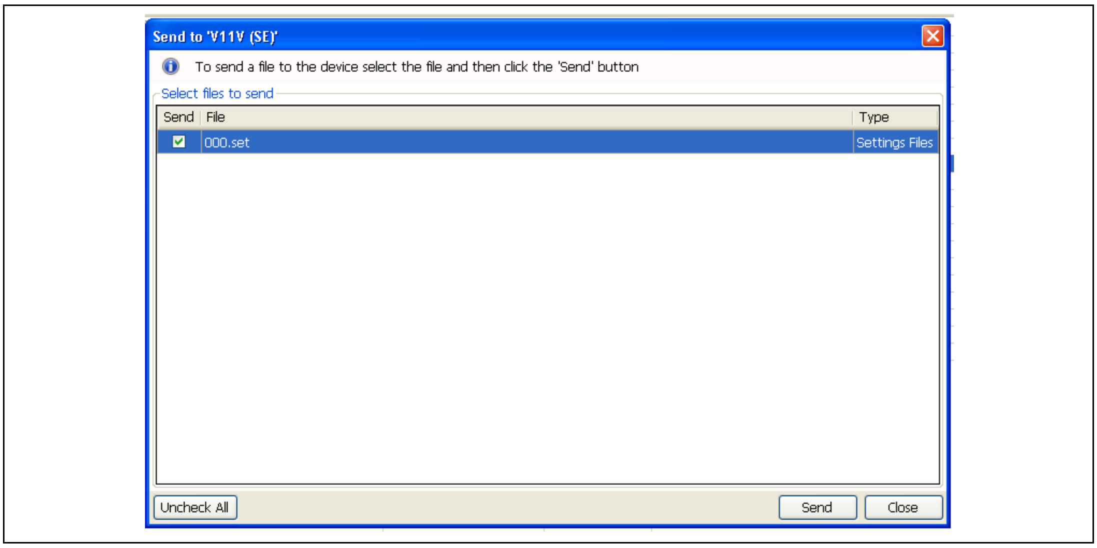


GS

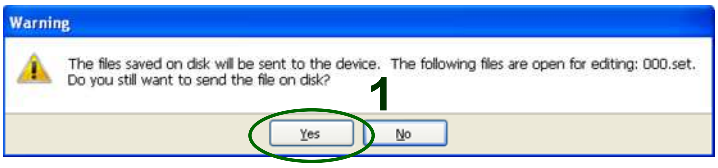
– Click on the name of ***Device*** and right-click to open the contextual menu: ***Send***:



– Select setting (***000.set***) file for sending. Press ***Send***:



– If ***000.set*** file was saved on the PC disc, press ***Yes*:**



– Wait for the end of operation. Press ***Close***:

Settings were sent to V11V.

3.5.4 Create a system

In MiCOM S1 Studio, a System provides a root node in the Studio Explorer panel from which all subsequent nodes are created.

Add substations, bays, voltage levels and devices to the system.

If a system is no longer needed, delete it using the delete command.

The use of Quick Connect will automatically create a default system, if one does not already exist. Systems are not opened automatically, unless ***Reopen last System at start-up*** is checked in the Preferences menu.

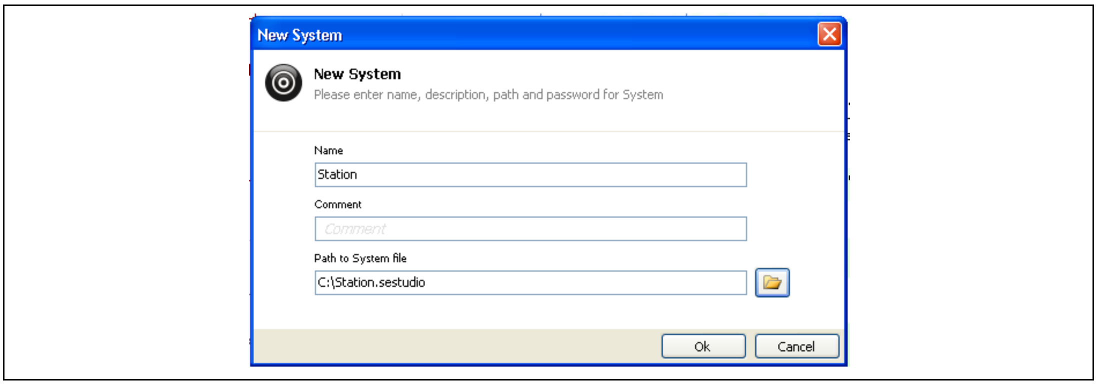
To create a new system:

– By default, the window displays the message “create new or open existing system”: click on "New" to create a new system.

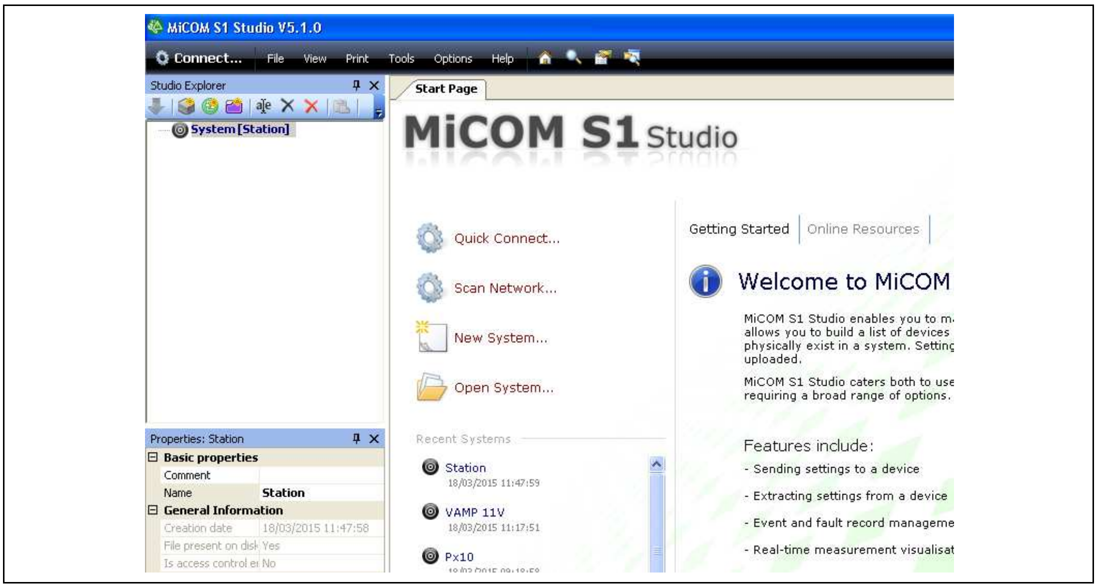
– If a system is loaded in the ***Studio Explorer*** window, right-click on the panel's background and select "New System" or the corresponding icon on Studio Explorer's toolbar.

GS

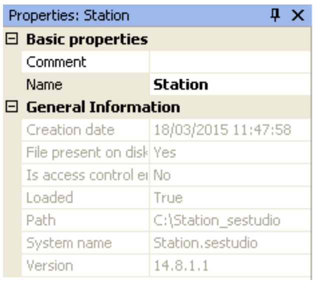
– The following window is displayed: Enter the name of the system, and the path to save the system file. Click ***OK***.



The new System is displayed in the Studio Explorer panel:

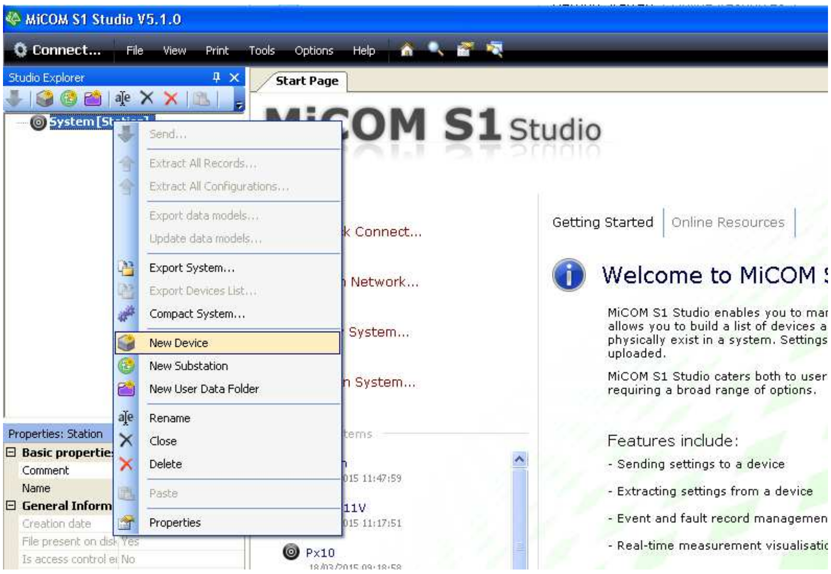


Note: If an item is selected in the Studio Explorer panel, its properties are displayed in the ***Properties*** panel:

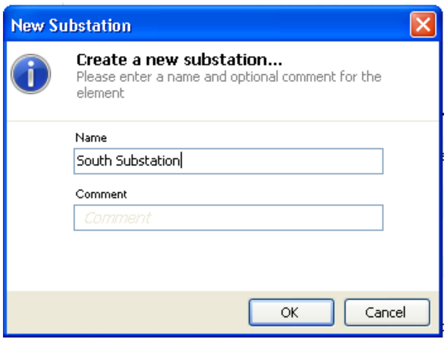


3.5.5 Create a new substation

Select the system: the menu bar is updated with the ***New device***, ***New substation***, ***Close***, ***Delete***, ***Paste***, ***Properties*** and ***Options*** icons.



Click on the ***New substation*** icon (or right-click to open the contextual menu). The following window is displayed:



GS

The new substation is displayed and the menu bar is updated when a substation is selected:

Click on the ***Import SCL*** button to import a Substation Configuration File.

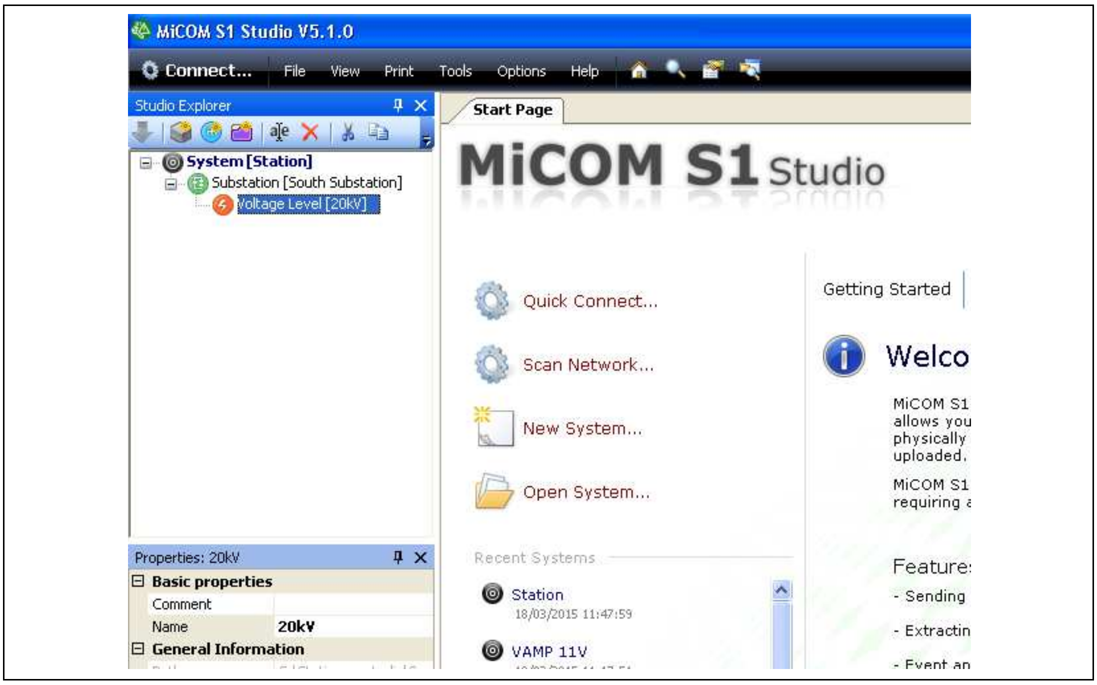
To create a substation configuration, click on the ***New voltage level*** button.

3.5.6 Create a new voltage level

Select the substation and click on the ***New station level*** button (or right-click to open the contextual menu).

In the ***Create a new voltage level***, enter the voltage level of the station.

The ***New voltage level*** is displayed and the ***New bay*** icon is displayed.



3.5.7 Create a new bay

Select the substation and click on the ***New bay*** button (or right-click to open the contextual menu).

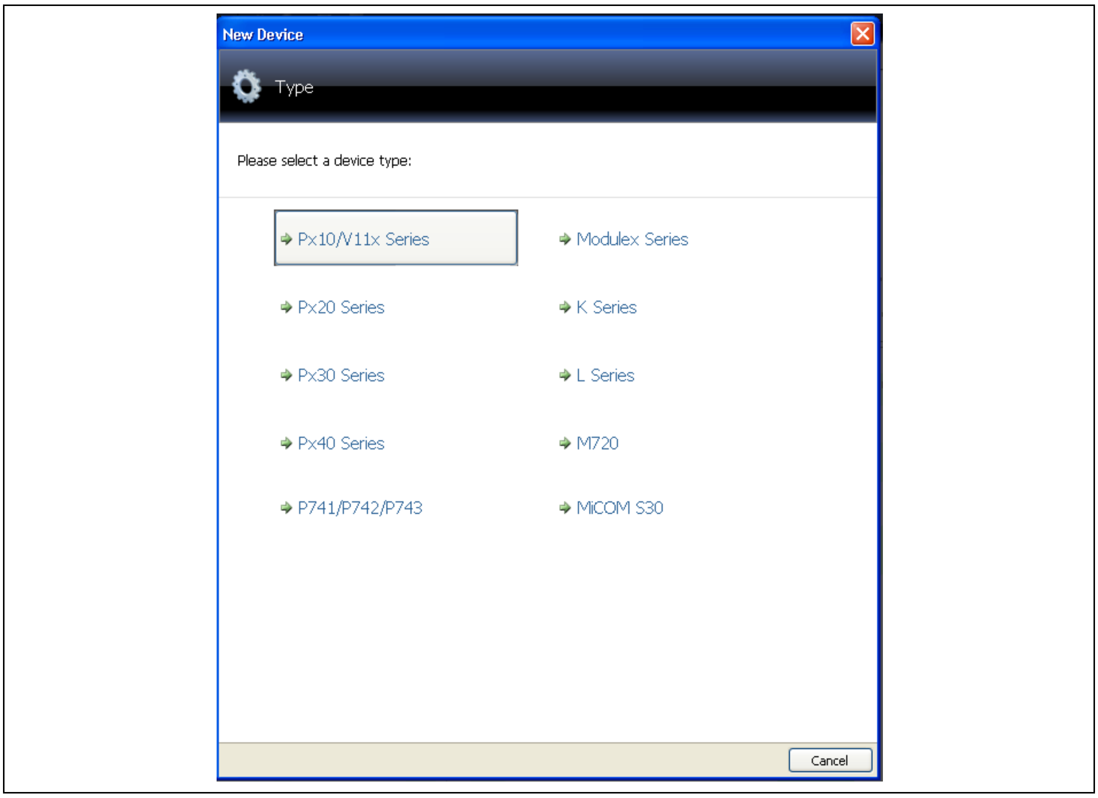
In the ***Create new bay*** window, enter the bay indication,

The new bay is displayed.

3.5.8 Create a new device

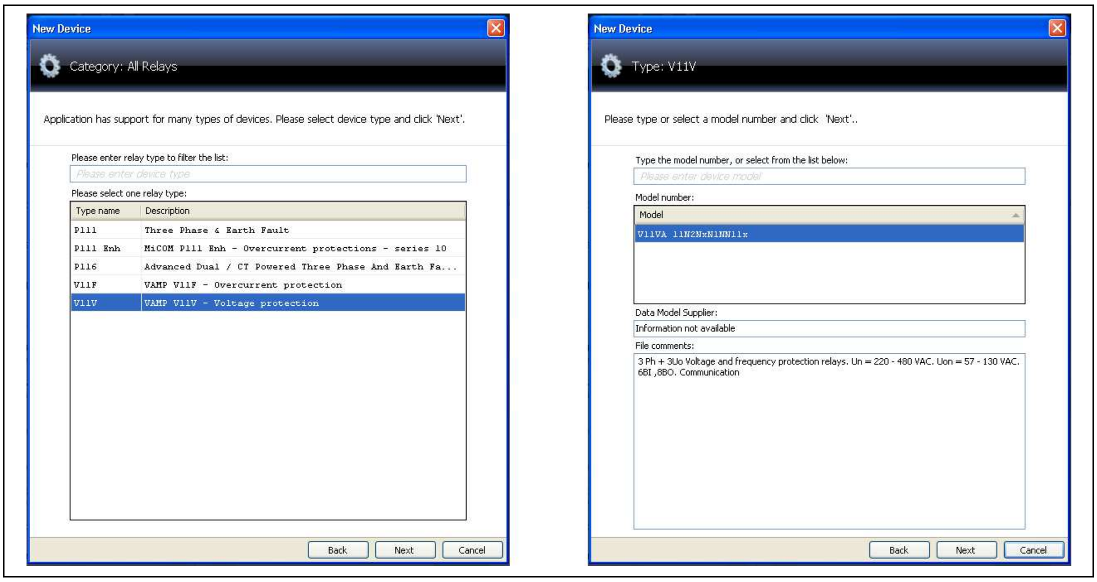
Click on the ***New device*** button (or right-click to open the contextual menu).

Select the device type:

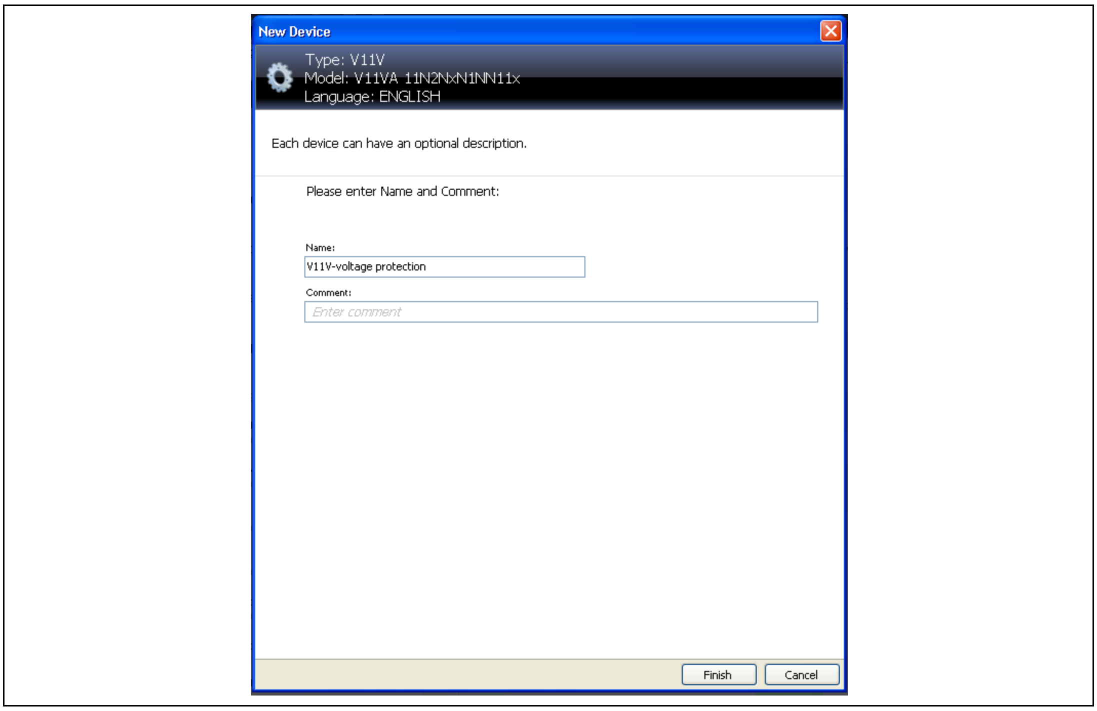


GS

Select the device type then click on ***Next***, select the model then click on ***Next***:

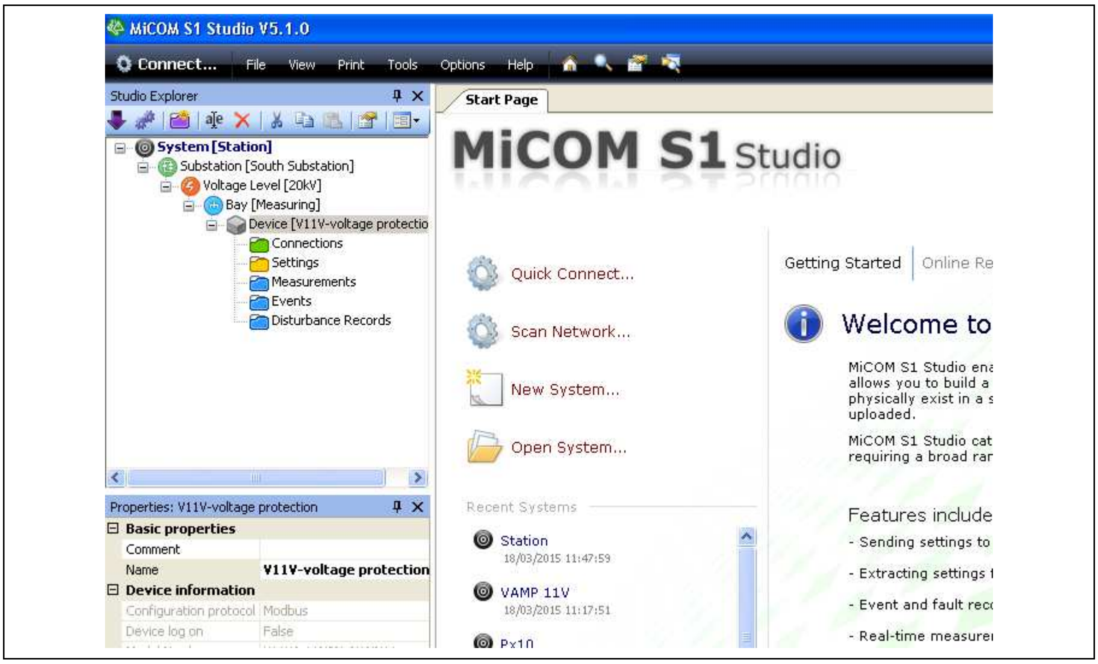


Enter the name and add a description to the device:



GS

The new device is created and displayed:



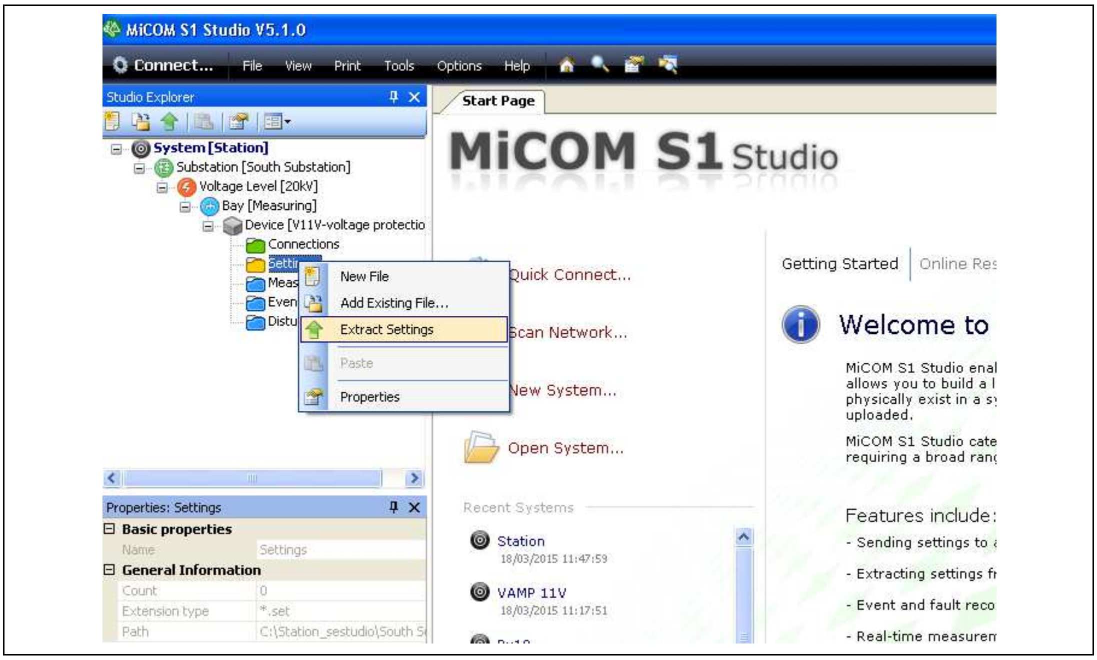
3.5.9 Open a Settings File

To open an existing file:

– If the file is saved or if the relay is not connected: Click on the ***Settings*** and right-click to open the contextual menu: ***Add Existing file***

GS

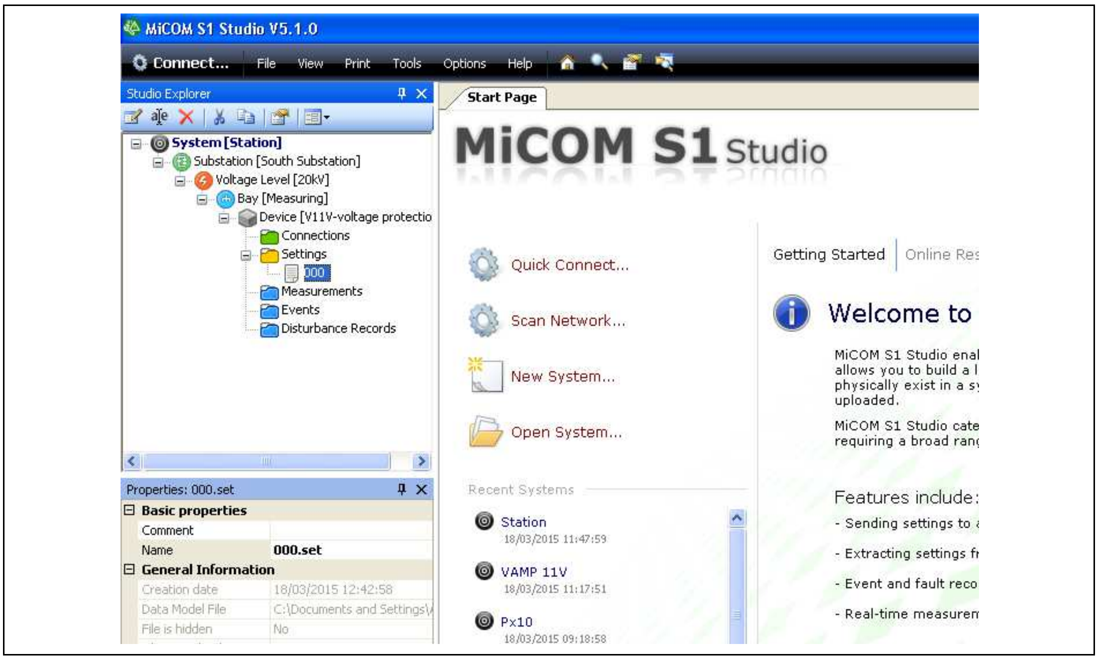
– If the relay is connected, extract its settings: Click on the ***Settings*** and right-click to open the contextual menu: ***Extract Settings***

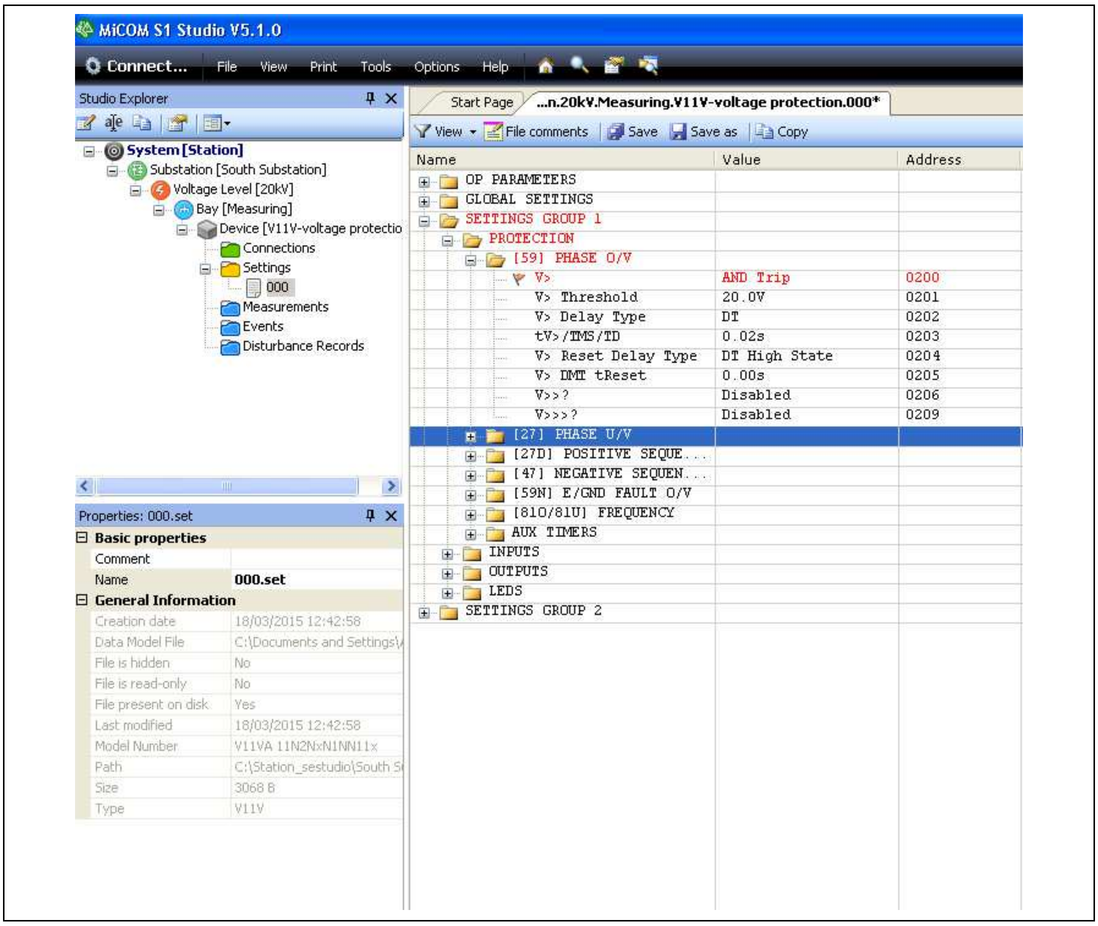


To open default settings:

– Click on the ***Settings*** and right-click to open the contextual menu: ***New File***

– The new setting file ***000.set*** is created:



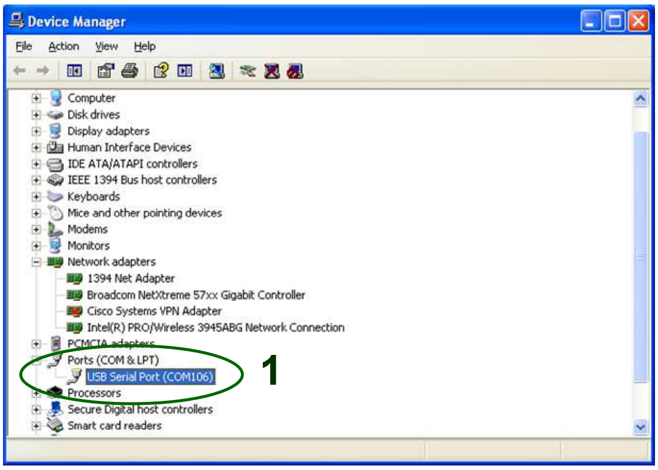


– Start working with VAMP 11V relay.

GS

3.6 Troubleshooting USB connection

The virtual COM can be read in WINDOWS's "Device Manager" like below:



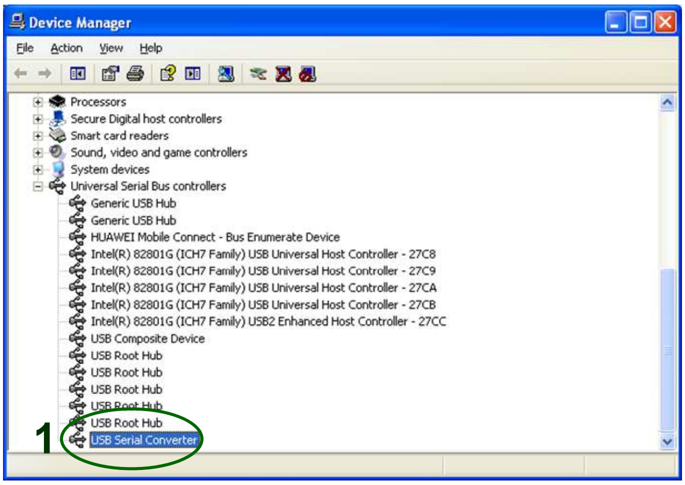
NOTE: If V11V is connected but no any USB Serial port is shown, it means that:

a) USB drivers are not installed

or

b) VCP (Virtual COM Port) option of USB Serial Converter is not selected.

USB drivers:

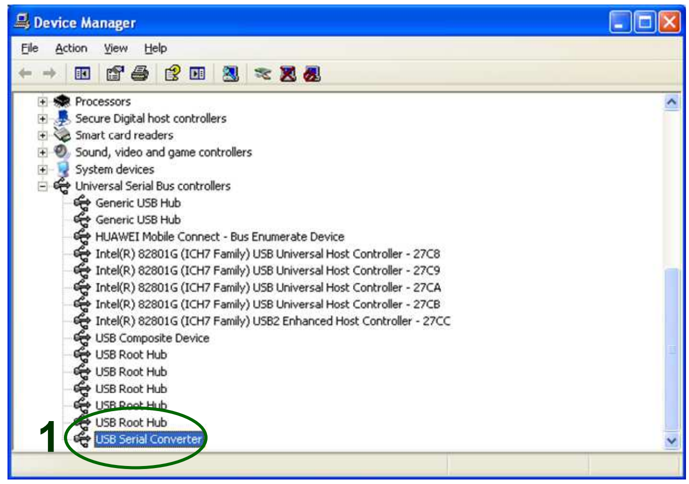


If you can't see "USB Serial Converter" it means that USB divers are not installed.

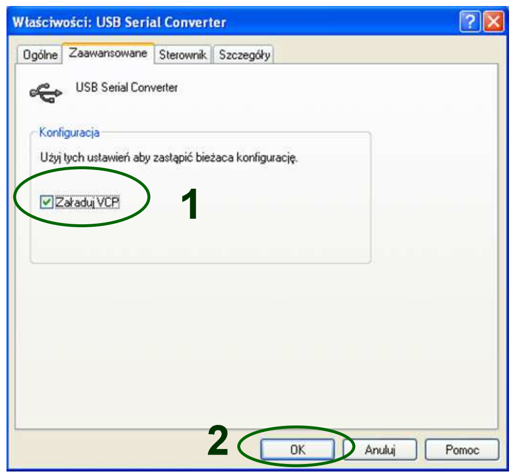
Refer section "3.2 USB Driver and virtual COM software installation"

VCP (Virtual COM Port)

On the window as below:



Check VCP option by right-click to open the contextual menu: Properties and Advanced:



Unplug USB cable and plug in again. Restart MiCOM S1 Studio and repeat the procedure.

GS

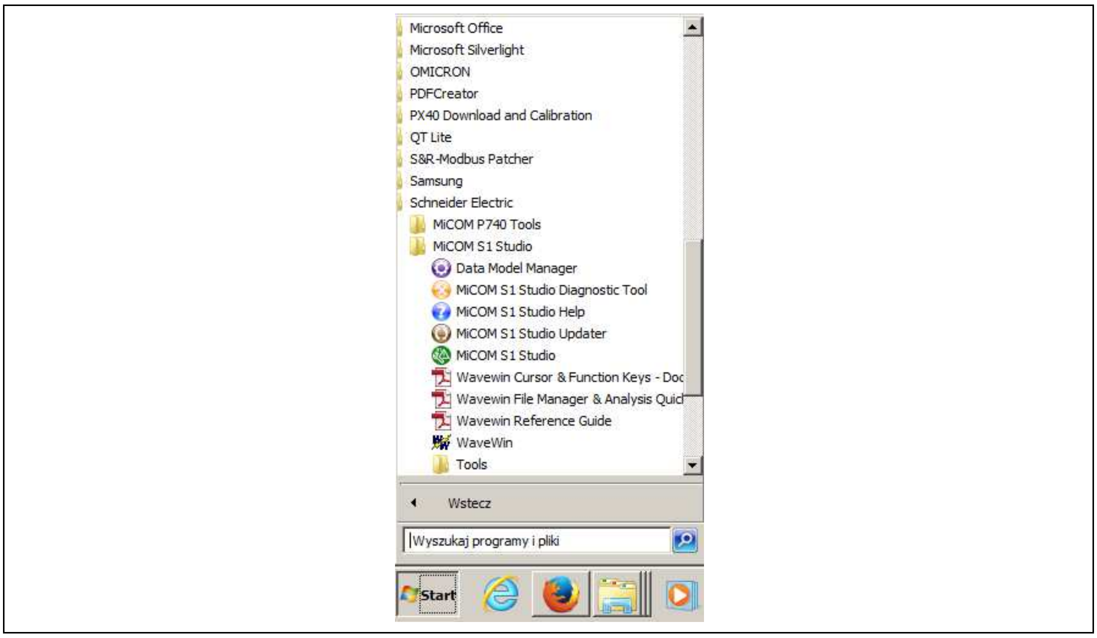
GS

3.7 Presentation and analysis of disturbances

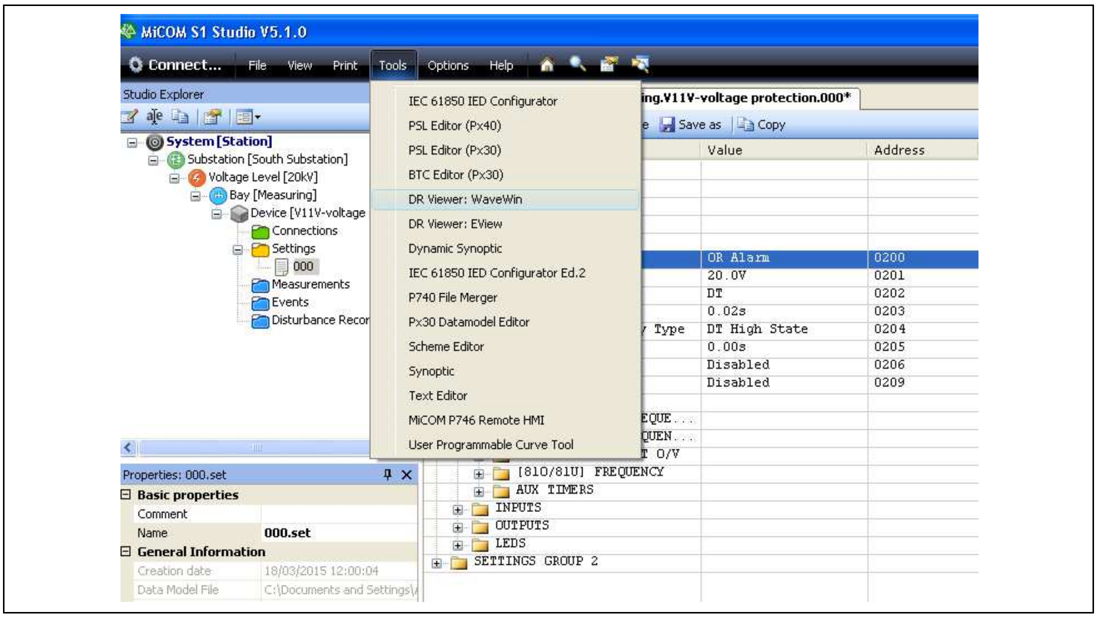
Reading and analysis of disturbance records is done using Wavewin.

To open Wavewin with MiCOM S1 Studio:

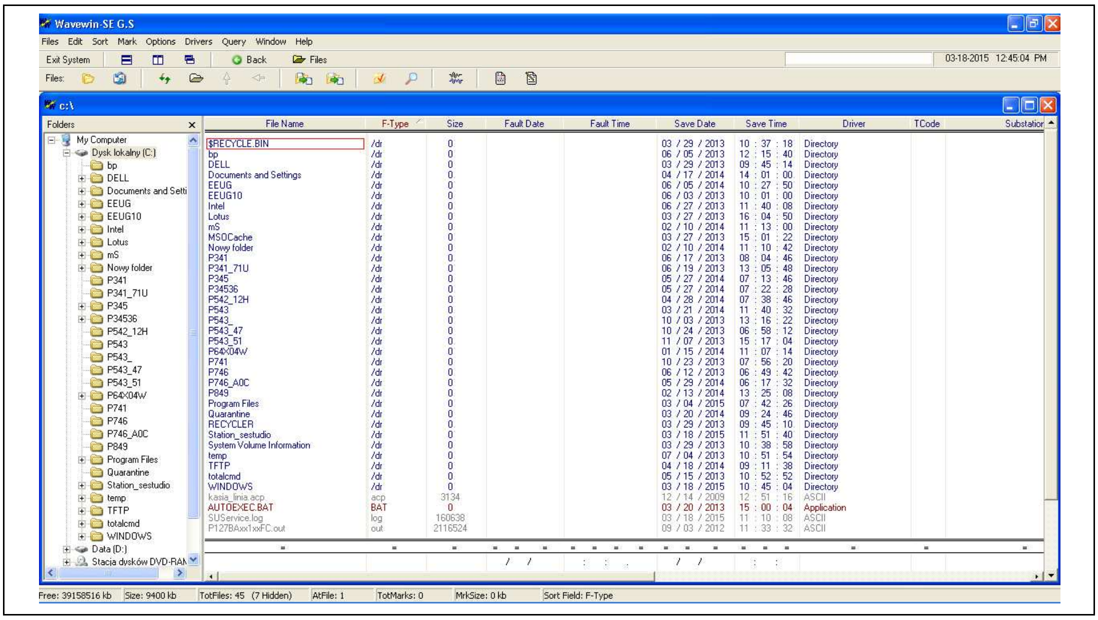
In the ***Programs*** menu, select ***MiCOM S1 Studio*** then ***PX20, Px20C, M, Modulex Series Tools*** then ***WaveWin***



Using MiCOM S1 Studio, open Wavewin using the ***Tools*** menu.



The Wavewin File Manager is displayed (refer to the Wavewin User’s guide to operate Wavewin).


Wavewin-SE G.S
Files Edit Sort Mark Options Drivers Query Window Help
Exit System
Back
Files
03-18-2015 12:45:04 PM
c:\
Folders
File Name
F-Type
Size
Fault Date
Fault Time
Save Date
Save Time
Driver
TCode
Substation
Free: 39158516 kb
Size: 9400 kb
TotFiles: 45 (7 Hidden)
AtFile: 1
TotMarks: 0
MrkSize: 0 kb
Sort Field: F-Type

GS

4. COMPANY CONTACT INFORMATION

If you need information pertaining to the operation of the VAMP 11x product that you have purchased, please contact your local Schneider Electric agent or the After Sales Service Department of Schneider Electric. Do not forget to give the serial number and reference of the VAMP 11x product.

The VAMP 11x product reference and serial numbers are documented under the upper hinged cover on the front of the relay. For more precise information, refer to the section "Relay Identification" in this chapter.

PLEASE PROVIDE THE FOLLOWING INFORMATION WHEN CONTACTING SCHNEIDER ELECTRIC:

- CORTEC code of the VAMP 11x relay
- Serial number of the VAMP 11x relay
- Schneider Electric order reference
- Schneider Electric operator reference

Schneider Electric Worldwide Contact Centre:

- Website: http://www.schneider-electric.com/CCC

ST

SETTINGS

Date: **1st December 2015**

Software Version: **1A**

Connection Diagrams: **10V11V**

CONTENTS

ST

1. GENERAL INFORMATION

The V11V must be configured to the system and application by means of the appropriate settings. This section gives instructions for determining the settings, which are located in the folder entitled, Schneider Electric Energy in the menu tree. The order in which the settings are listed and described in this chapter is: the protection settings, control and configuration settings (see section V11V/EN GS for the detailed relay menu map). The relay is supplied with a factory-set configuration of default settings

All voltage settings are in secondary side voltage (transform by VT). The voltage can be defined as phase to phase or phase to neutral measurements. We have four possibilities for VT connections, like as:

– 3Upn – connected three voltage phase to neutral

– 3Upn + UN – connected three voltage phase to neutral and earth fault voltage (open delta)

– 2Upp + UN – connected two voltage phase to phase and earth fault voltage (open delta)

– 3Upp + UN – connected three voltage phase to phase and earth fault voltage (open delta)

MiCOM S1 Studio 5.1.0 (or higher) can be used to download and upload protection and configuration setting values via the relay's USB port.

The protection and I/O settings include all the following items that become active once enabled in the configuration column of the relay menu database:

– Protection element settings,

– Output settings,

– Input settings,

– LED settings.

There are two groups of protection and I/O settings, with each group containing the same setting cells. One group of protection and I/O settings is selected as the active group, and is used by the protection elements. The settings for group 1 are shown. The settings are discussed in the same order in which they are displayed in the menu.

The menu structure is as follows:

- **DEFAULT WINDOW** - Voltage phase to phase and phase to neutral in multiples of Vn, all type voltage like above in Volts, CB Control window (A), Local/remote control window (NA), status of frequency protection (A)

- ***ALARM STATUS***

- ***RECORDS***

  - ***FAULT RECORD***

  - ***ALARM RECORD***

  - ***COUNTERS***

    - ***CONTROL COUNTER***

    - ***FAULT COUNTER***

  - ***MAXIMUM MEASURMENT VALUES***

- ***SETTING GROUP 1***

  - ***PROTECTION G1***

    - ***PHASE O/V G1 [59]***

ST

- *PHASE U/V G1 [27]*
- *E/GND FAULT O/V G1 [59N]*
- *NEGATIVE SEQUENCE O/V G1 [47]* (NA)
- *POSITIVE SEQUENCE U/V G1 [27D]* (A)
- *FREQUENCY G1 [81O/81U]* (A)
- *AUX TIMERS G1* (A)
- *OUTPUT RELAY CONFIGURATION G1*
- *INPUTS CONFIGURATION G1*
- *LEDS CONFIGURATION G1*
- *SETTING GROUP 2*
- *PROTECTION G2*
- *PHASE O/V G2 [59]*
- *PHASE U/V G2 [27]*
- *E/GND FAULT O/V G2 [59N]*
- *NEGATIVE SEQUENCE O/V G2 [47]* (NA)
- *POSITIVE SEQUENCE U/V G2 [27D]* (A)
- *FREQUENCY G2 [81O/81U]* (A)
- *AUX TIMERS G2* (A)
- *OUTPUT RELAY CONFIGURATION G2*
- *INPUTS CONFIGURATION G2*
- *LEDS CONFIGURATION G2*
- *GLOBAL SETTINGS*
- *LOC*
- *SETTING GROUP SELECT*
- *VT RATIO*
- *CIRCUIT BREAKER* (A)
- *VT SUPERVISION* (A)
- *[81] ADVANCED SETTINGS* (A)
- *VOLTAGE ADVANCED CONFIGURATION*
- *COMMUNICATION RS485* (NA)
- *DISTURBANCE RECORDER* (A)
- *COMMISSIONING*
- *SETTING CHANGE MODE*
- *OP PARAMETERS*
- *MEASUREMENTS*

ST

2. SETTINGS

2.1 Protection Settings

2.1.1 Phase O/V [59]

The overvoltage protection included in the V11V relays provides three-stage overvoltage protection with independent time-delay characteristics (DT or IDMT – dependent for stage), which can be set to operate from phase to phase or phase to neutral voltage. All overvoltage settings apply to all three phases but are independent for each of the three stages.

The first overvoltage stags have time-delayed characteristics which are selectable between inverse definite minimum time (IDMT) and definite time (DMT). The second and third stage has definite time characteristics (DMT) only.

<table>
<tr><th rowspan="2">Menu Text</th><th rowspan="2">Default Setting</th><th colspan="2">Setting Range</th><th rowspan="2">Step Size</th></tr>
<tr><th>Min.</th><th>Max.</th></tr>
<tr><td>V> ?</td><td>Disabled</td><td colspan="3">Disabled, OR Trip, OR Alarm, AND Trip, AND Alarm, OR Trip/52a (NA), OR Alarm/52a (NA), AND Trip/52a (NA), AND Alarm/52a (NA)</td></tr>
<tr><td colspan="5">Setting to disable or enable the protection element.
The protection element can be set to trip the CB (Enable Trip), only issue an Alarm signal (Enable Alarm), option OR means that, protection will work when fault appears in any one phase, for AND when fault appears in all three phases. Trip/52a and Alarm/52a means that we have possibility to block this protection function from state CB – turn off position.
If the protection element is set to 'Trip' it means that it is linked to the Protection trip (see LED and Output configuration) and Trip Command (see Output configuration) functions. Additionally this protection element will trigger fault recording, disturbance recording, as well as the Trip LED on the front panel.
If the protection element is set to 'Alarm' it means that it is linked to the Alarm function (see LED and Output configuration) and 'ALARM STATUS' indication.</td></tr>
<tr><td>V> Threshold</td><td>20 V
20 V</td><td>5 V
20 V</td><td>200 V
720 V</td><td>0.1 V
0.1 V</td></tr>
<tr><td colspan="5">Pick-up setting for the first stage of the overvoltage element.
We have two ranges of settings, first is for 57 – 130 VAC, second is for 220 – 480 VAC.</td></tr>
<tr><td>V> Delay Type</td><td>DT</td><td colspan="3">DT, IEC_SI, IEC_VI, IEC_EI, IEC_LTI, UK_STI, RECT, RI, IEEE_MI, IEEE_VI, IEEE_EI, CO2_Px20, US_CO8, RXIDG, BPN_EDF, CO2_Px40</td></tr>
<tr><td colspan="5">Setting for the tripping characteristic for the first stage overvoltage element.</td></tr>
<tr><td>tV> /TMS/TD</td><td>0.02 s</td><td>0.02 s*</td><td>200 s*</td><td>0.01 s*</td></tr>
<tr><td colspan="5">Setting for the time-delay for the definite time setting if selected for first stage element and setting for the time multiplier setting to adjust the operating time of the all IDMT.
* Range and step size for DMT curve. Range and step size for IDMT curves are described below:
1) TD: min=0.02 s; max=100 s, step size=0.01 s,
2) TMS: min=0.02 s; max=1.5 s, step size=0.01 s,
3) k: min=0.3 s; max=1 s, step size=0.01 s,
4) K: min=0.1 s; max=10 s, step size=0.1 s.</td></tr>
<tr><td>V> Reset Delay Type</td><td>DT High State</td><td colspan="2">DT High State or IDMT</td><td>N/A</td></tr>
<tr><td colspan="5">Setting to determine the type of reset/release characteristic of the IEEE/US curves.</td></tr>
<tr><td>V> DMT tReset</td><td>0 s</td><td>0 s</td><td>600 s</td><td>0.01 s</td></tr>
<tr><td colspan="5">Setting that determines the reset/release time for definite time reset characteristics.</td></tr>
</table>

ST

Menu Text	Default Setting	Setting Range		Step Size
		Min.	Max.	
V>> ?	Disabled	Disabled, OR Trip, OR Alarm, AND Trip, AND Alarm, OR Trip/52a (**NA**), OR Alarm/52a (**NA**), AND Trip/52a (**NA**), AND Alarm/52a (**NA**)		
See V>				
V>> Threshold	40 V 40 V	5 V 20 V	200 V 720 V	0.1 V 0.1 V
Pick-up setting for the second stage of the overvoltage element. We have two ranges of settings, first is for 57 – 130 VAC, second is for 220 – 480 VAC.				
tV>>	0.02 s	0.02 s	200 s	0.01 s
Setting for the time-delay for the definite time setting for this stage element.				
V>>> ?	Disabled	Disabled, OR Trip, OR Alarm, AND Trip, AND Alarm, OR Trip/52a (**NA**), OR Alarm/52a (**NA**), AND Trip/52a (**NA**), AND Alarm/52a (**NA**)		
See V>				
V>>> Threshold	50 V 50 V	5 V 20 V	200 V 720 V	0.1 V 0.1 V
Pick-up setting for the third stage of the overvoltage element. We have two ranges of settings, first is for 57 – 130 VAC, second is for 220 – 480 VAC.				
tV>>>	0.02 s	0.02 s	200 s	0.01 s
Setting for the time-delay for the definite time setting for this stage element.				

IDMT tripping can be blocked if any DMT stage is started, settings: ***IDMT interlock by DMT*** (***GLOBAL SETTINGS/O/V ADVANCED*** column). This settings is common for ***E/Gnd Fault O/V [59N], Phase O/V [59]*** and ***Phase U/V [27]***

Menu Text	Default Setting	Setting Range		Step Size
IDMT interlock by DMT stage	No	No	Yes	n/a
[27] Hysteresis	1.05	1.00	1.20	0.01
Sets drop off of undervoltage protection				
[59] Hysteresis	0.95	0.80	1.00	0.01
Sets drop off of overvoltage protection				

2.1.2 Phase U/V [27]

The undervoltage protection included in the V11V relays provides three-stage undervoltage protection with independent time-delay characteristics (DT or IDMT – dependent for stage), which can be set to operate from phase to phase or phase to neutral voltage. All undervoltage settings apply to all three phases but are independent for each of the three stages.

Menu Text	Default Setting	Setting Range		Step Size
		Min.	Max.	
V< ?	Disabled	Disabled, OR Trip, OR Alarm, AND Trip, AND Alarm, OR Trip/52a (**NA**), OR Alarm/52a (**NA**), AND Trip/52a (**NA**), AND Alarm/52a (**NA**)		
Setting to disable or enable the protection element. The protection element can be set to trip the CB (Enable ***Trip***), only issue an Alarm signal (Enable ***Alarm***), option ***OR*** means that, protection will work when fault appears in any one phase, for ***AND*** when fault appears in all three phases. ***Trip/52a*** and ***Alarm/52a*** means that we have possibility to block this protection function from state CB – turn off position. If the protection element is set to ***'Trip'*** it means that it is linked to the ***Protection trip*** (see LED and Output configuration) and ***Trip Command*** (see Output configuration) functions. Additionally this protection element will trigger fault recording, disturbance recording, as well as the ***Trip*** LED on the front panel. If the protection element is set to ***'Alarm'*** it means that it is linked to the ***Alarm*** function (see LED and Output configuration) and ***'ALARM STATUS'*** indication.				
V< Threshold	20 V 20 V	5 V 20 V	130 V 480 V	0.1 V 0.1 V
Pick-up setting for the first stage of the undervoltage element. We have two ranges of settings, first is for 57 – 130 VAC, second is for 220 – 480 VAC.				
V< Delay Type	DT	DT, IEC_SI, IEC_VI, IEC_EI, IEC_LTI, UK_STI, RECT, RI, IEEE_MI, IEEE_VI, IEEE_EI, CO2_Px20, US_CO8, RXIDG, BPN_EDF, CO2_Px40		
Setting for the tripping characteristic for the first stage undervoltage element.				
tV< /TMS/TD	0.02 s	0.02 s*	200 s*	0.01 s*
Setting for the time-delay for the definite time setting if selected for first stage element and setting for the time multiplier setting to adjust the operating time of the all IDMT. * Range and step size for DMT curve. Range and step size for IDMT curves are described below: 1) TD: min=0.02 s; max=100 s, step size=0.01 s, 2) TMS: min=0.02 s; max=1.5 s, step size=0.01 s, 3) k: min=0.3 s; max=1 s, step size=0.01 s, 4) K: min=0.1 s; max=10 s, step size=0.1 s.				
V< Reset Delay Type	DT High State	DT High State or IDMT		N/A
Setting to determine the type of reset/release characteristic of the IEEE/US curves.				
V< DMT tReset	0 s	0 s	600 s	0.01 s
Setting that determines the reset/release time for definite time reset characteristics.				
V<< ?	Disabled	Disabled, OR Trip, OR Alarm, AND Trip, AND Alarm, OR Trip/52a (**NA**), OR Alarm/52a (**NA**), AND Trip/52a (**NA**), AND Alarm/52a (**NA**)		
See V<				

Menu Text	Default Setting	Setting Range		Step Size
		Min.	Max.	
V<< Threshold	40 V 40 V	5 V 20 V	130 V 480 V	0.1 V 0.1 V
Pick-up setting for the second stage of the undervoltage element. We have two ranges of settings, first is for 57 – 130 VAC, second is for 220 – 480 VAC.				
tV<<	0.02 s	0.02 s	200 s	0.01 s
Setting for the time-delay for the definite time setting for this stage element.				
V<<< ?	Disabled	Disabled, OR Trip, OR Alarm, AND Trip, AND Alarm, OR Trip/52a (**NA**), OR Alarm/52a (**NA**), AND Trip/52a (**NA**), AND Alarm/52a (**NA**)		
See V<				
V<<< Threshold	50 V 50 V	5 V 20 V	130 V 480 V	0.1 V 0.1 V
Pick-up setting for the third stage of the undervoltage element. We have two ranges of settings, first is for 57 – 130 VAC, second is for 220 – 480 VAC.				
tV<<<	0.02 s	0.02 s	200 s	0.01 s
Setting for the time-delay for the definite time setting for this stage element.				

2.1.3 Positive sequence U/V [27D] (A)

This function is used to protect motors against faulty operation due to insufficient or unbalanced network voltage, and detection of reverse rotation of motor.

The positive sequence undervoltage element included in the V11V relays provides two stage non-directional undervoltage protection with independent time-delay characteristics. These characteristics are selectable between inverse definite minimum time (IDMT) and definite time (DT) for first stage. Second stage can operate only with DT characteristic.

Menu Text	Default Setting	Setting Range		Step Size
		Min.	Max.	
V1 < ?	Disabled	Disabled, Trip, Alarm, Trip/52a, Alarm/52a		
Setting to disable or enable the protection element. The protection element can be set to trip the CB (Enable ***Trip***), only issue an Alarm signal (Enable ***Alarm***). If the protection element is set to ***'Trip'*** it means that it is linked to the ***Protection trip*** (see LED and Output configuration) and ***Trip Command*** (see Output configuration) functions. Additionally this protection element will trigger fault recording, disturbance recording, as well as the ***Trip*** LED on the front panel. If the protection element is set to ***'Alarm'*** it means that it is linked to the ***Alarm*** function (see LED and Output configuration) and ***'ALARM STATUS'*** indication.				
V1< Threshold	20 V 20 V	5 V 20 V	130 V 480 V	0.1 V 0.1 V
Pick-up setting for the first stage positive sequence U/V element. We have two ranges of settings, first is for 57 – 130 VAC, second is for 220 – 480 VAC.				
V1< Delay Type	DT	DT, IEC_SI, IEC_VI, IEC_EI, IEC_LTI, UK_STI, RECT, RI, IEEE_MI, IEEE_VI, IEEE_EI, CO2_Px20, US_CO8, RXIDG, BPN_EDF, CO2_Px40		
Setting for the tripping characteristic for the first stage positive sequence U/V element.				
tV1</TMS/TD	0.02 s	0.02 s*	200 s*	0.01 s*
Setting for the time-delay for the definite time setting if selected for first stage element and setting for the time multiplier setting to adjust the operating time of the all IDMT. * Range and step size for DMT curve. Range and step size for IDMT curves are described below: 1) TD: min=0.02 s; max=100 s, step size=0.01 s, 2) TMS: min=0.02 s; max=1.5 s, step size=0.01 s, 3) k: min=0.3 s; max=1 s, step size=0.01 s, 4) K: min=0.1 s; max=10 s, step size=0.1 s.				
V1< Reset Delay Type	DT High State	DT High State or IDMT		N/A
Setting to determine the type of reset/release characteristic of the IEEE/US curves.				
V1< DMT tReset	0 s	0 s	600 s	0.01 s
Setting that determines the reset/release time for definite time reset characteristics.				
V1 << ?	Disabled	Disabled, Trip, Alarm, Trip/52a, Alarm/52a		
See V1<				
V1<< Threshold	40 V 40 V	5 V 20 V	130 V 480 V	0.1 V 0.1 V
Pick-up setting for the second stage positive sequence U/V element. We have two ranges of settings, first is for 57 – 130 VAC, second is for 220 – 480 VAC.				

ST

Menu Text	Default Setting	Setting Range		Step Size
		Min.	Max.	
tV1<<	0.02 s	0.02 s	200 s	0.01 s
Setting for the time-delay for the definite time setting for this stage element.				

2.1.4 Negative Sequence O/V [46] (**NA**)

This function is used to protect against unbalance resulting from phase inversion or unbalanced supply.

The negative sequence overvoltage element included in the V11V relays provides two stage non-directional overvoltage protection with independent time-delay characteristics. These characteristics are selectable between inverse definite minimum time (IDMT) and definite time (DT) for first stage, second stage can operate only with DT characteristic.

Menu Text	Default Setting	Setting Range Min.	Setting Range Max.	Step Size
V2> ?	Disabled	Disabled, Trip, Alarm, Trip/52a, Alarm/52a		
Setting to disable or enable the protection element. The protection element can be set to trip the CB (Enable ***Trip***), only issue an Alarm signal (Enable ***Alarm***. If the protection element is set to ***'Trip'*** it means that it is linked to the ***Protection trip*** (see LED and Output configuration) and ***Trip Command*** (see Output configuration) functions. Additionally this protection element will trigger fault recording, disturbance recording, as well as the ***Trip*** LED on the front panel. If the protection element is set to ***'Alarm'*** it means that it is linked to the ***Alarm*** function (see LED and Output configuration) and ***'ALARM STATUS'*** indication.				
V2> Threshold	20 V 20 V	5 V 20 V	200 V 720 V	0.1 V 0.1 V
Pick-up setting for the first stage negative sequence O/V element. We have two ranges of settings, first is for 57 – 130 VAC, second is for 220 – 480 VAC.				
V2> Delay Type	DT	DT, IEC_SI, IEC_VI, IEC_EI, IEC_LTI, UK_STI, RECT, RI, IEEE_MI, IEEE_VI, IEEE_EI, CO2_Px20, US_CO8, RXIDG, BPN_EDF, CO2_Px40		
Setting for the tripping characteristic for the first stage negative sequence O/V element.				
tV2>/TMS/TD	0.02 s	0.02 s*	200 s*	0.01 s*
Setting for the time-delay for the definite time setting if selected for first stage element and setting for the time multiplier setting to adjust the operating time of the all IDMT. * Range and step size for DMT curve. Range and step size for IDMT curves are described below: 1) TD: min=0.02 s; max=100 s, step size=0.01 s, 2) TMS: min=0.02 s; max=1.5 s, step size=0.01 s, 3) k: min=0.3 s; max=1 s, step size=0.01 s, 4) K: min=0.1 s; max=10 s, step size=0.1 s.				
V2> Reset Delay Type	DT High State	DT High State or IDMT		N/A
Setting to determine the type of reset/release characteristic of the IEEE/US curves.				
V2> DMT tReset	0 s	0 s	600 s	0.01 s
Setting that determines the reset/release time for definite time reset characteristics.				
V2>> ?	Disabled	Disabled, Trip, Alarm, Trip/52a, Alarm/52a		
See V2>>				
V2>> Threshold	40 V 40 V	5 V 20 V	200 V 720 V	0.1 V 0.1 V
Pick-up setting for the first stage negative sequence O/V element. We have two ranges of settings, first is for 57 – 130 VAC, second is for 220 – 480 VAC.				

Menu Text	Default Setting	Setting Range		Step Size
		Min.	Max.	
tV2>>	0.02 s	0.02 s	200 s	0.01 s
Setting for the time-delay for the definite time setting for this stage element.				

ST

2.1.5 E/GND FAULT O/V [59N]

The Earth fault element operates from a measured or calculated (from phase voltage) earth fault voltage value.

The first earth fault stage has time-delayed characteristics which are selectable between inverse definite minimum time (IDMT) and definite time (DT). The second and third stages have a definite time characteristic only.

<table>
<tr><th rowspan="2">Menu Text</th><th rowspan="2">Default Setting</th><th colspan="2">Setting Range</th><th rowspan="2">Step Size</th></tr>
<tr><th>Min.</th><th>Max.</th></tr>
<tr><td>VN> ?</td><td>Disabled</td><td colspan="3">Disabled, Trip (measured), Alarm (measured), Trip (Ua+Ub+Uc), Alarm (Ua+Ub+Uc)
Measured option is available in model N, A only</td></tr>
<tr><td colspan="5">Setting to disable or enable the protection element.
The protection element can be set to trip the CB (Enable Trip), only issue an Alarm signal (Enable Alarm). Trip/Alarm (measured) earth fault voltage will be measured, when we select Trip/Alarm (Ua+Ub+Uc) earth fault voltage will be calculated.
If the protection element is set to 'Trip' it means that it is linked to the Protection trip (see LED and Output configuration) and Trip Command (see Output configuration) functions. Additionally this protection element will trigger fault recording, disturbance recording, as well as the Trip LED on the front panel.
If the protection element is set to 'Alarm' it means that it is linked to the Alarm function (see LED and Output configuration) and 'ALARM STATUS' indication.</td></tr>
<tr><td>VN> Threshold</td><td>5 V</td><td>0.5 V</td><td>130 V</td><td>0.1 V</td></tr>
<tr><td colspan="5">Pick-up setting for the first stage of the overvoltage element.</td></tr>
<tr><td>VN> Delay Type</td><td>DT</td><td colspan="3">DT, IEC_SI, IEC_VI, IEC_EI, IEC_LTI, UK_STI, RECT, RI, IEEE_MI, IEEE_VI, IEEE_EI, CO2_Px20, US_CO8, RXIDG, BPN_EDF, CO2_Px40</td></tr>
<tr><td colspan="5">Setting for the tripping characteristic for the first stage E/F overvoltage element.</td></tr>
<tr><td>tVN> /TMS/TD</td><td>0.02 s</td><td>0.02 s*</td><td>200 s*</td><td>0.01 s*</td></tr>
<tr><td colspan="5">Setting for the time-delay for the definite time setting if selected for first stage element and setting for the time multiplier setting to adjust the operating time of the all IDMT.
* Range and step size for DMT curve. Range and step size for IDMT curves are described below:
1) TD: min=0.02 s; max=100 s, step size=0.01 s,
2) TMS: min=0.02 s; max=1.5 s, step size=0.01 s,
3) k: min=0.3 s; max=1 s, step size=0.01 s,
4) K: min=0.1 s; max=10 s, step size=0.1 s.</td></tr>
<tr><td>VN> Reset Delay Type</td><td>DT High State</td><td colspan="2">DT High State or IDMT</td><td>N/A</td></tr>
<tr><td colspan="5">Setting to determine the type of reset/release characteristic of the IEEE/US curves.</td></tr>
<tr><td>VN> DMT tReset</td><td>0 s</td><td>0 s</td><td>600 s</td><td>0.01 s</td></tr>
<tr><td colspan="5">Setting that determines the reset/release time for definite time reset characteristics.</td></tr>
<tr><td>VN>> ?</td><td>Disabled</td><td colspan="3">Disabled, Trip (measured), Alarm (measured), Trip (Ua+Ub+Uc), Alarm (Ua+Ub+Uc)
Measured option is available in model N, A only</td></tr>
<tr><td colspan="5">See VN></td></tr>
</table>

ST

Menu Text	Default Setting	Setting Range		Step Size
		Min.	Max.	
VN>> Threshold	10 V	0.5 V	130 V	0.1 V
Pick-up setting for the second stage of the overvoltage element.				
tVN>>	0.02 s	0.02 s	200 s	0.01 s
Setting for the time-delay for the definite time setting for this stage element.				
VN>>> ?	Disabled	Disabled, Trip (measured), Alarm (measured), Trip (Ua+Ub+Uc), Alarm (Ua+Ub+Uc) Measured option is available in model N, A only		
See VN>				
VN>>> Threshold	15 V	0.5 V	130 V	0.1 V
Pick-up setting for the third stage of the E/F overvoltage element. We have two ranges of settings, first is for 57 – 130 VAC, second is for 220 – 480 VAC.				
tVN>>>	0.02 s	0.02 s	200 s	0.01 s
Setting for the time-delay for the definite time setting for this stage element.				

2.1.6 FREQUENCY [81O/81U] (A)

This function has two possibility to work: underfrequency or overfrequency. Underfrequency is used to detection of abnormally low frequency compared to the rated frequency, to monitor power supply quality, overfrequency option can detect abnormally high frequency of power supply.

The frequency element included in the V11V relay provides six stages of non-directional overfrequency or underfrequency protection with independent time-delay characteristics. These characteristics are only definite time (DT) characteristic.

Menu Text	Default Setting	Setting Range		Step Size
		Min.	Max.	
f1 ?	Disabled	Disabled, f> Trip, f> Alarm, f< Trip, f< Alarm		
Setting to disable or enable the protection element. The protection element can be set to trip the CB (Enable ***Trip***), only issue an Alarm signal (Enable ***Alarm***). We can select overfrequency (***f>***) type or underfrequency (***f<***). If the protection element is set to ***'Trip'*** it means that it is linked to the ***Protection trip*** (see LED and Output configuration) and ***Trip Command*** (see Output configuration) functions. Additionally this protection element will trigger fault recording, disturbance recording, as well as the ***Trip*** LED on the front panel. If the protection element is set to ***'Alarm'*** it means that it is linked to the ***Alarm*** function (see LED and Output configuration) and ***'ALARM STATUS'*** indication.				
f1 Threshold	50 Hz	40 Hz	60 Hz	0.01 Hz
Pick-up setting for the first stage frequency element, when in ***GLOBAL SETTINGS /GENERAL SETTINGS/Nominal Frequency*** is set on 50Hz				
f1 Threshold	50 Hz	50 Hz	70 Hz	0.01 Hz
Pick-up setting for the first stage frequency element, when in ***GLOBAL SETTINGS /GENERAL SETTINGS/Nominal Frequency*** is set on 60Hz				
tf1	0.1 s	0.1 s	600 s	0.01 s
Setting for the time-delay for the definite time setting for first stage element.				
For f2 to f6 stages, settings are the same like for f1 stage				

2.1.7 Auxiliary Timers (AN)

Menu Text	Default Setting	Setting Range		Step Size
		Min.	Max.	
AUX1 ?	Disabled	Disabled , Trip, Alarm		
Setting to disable or enable the AUX element. The element can be set to: - trip the CB (Enable ***Trip***), - signal only (***Alarm***).				
tAUX1	0s	0 s	600 s	0.01 s
Setting for the operating time-delay of the ***AUX1*** function.				
AUX2 ?	Disabled	See AUX1?		
Same as AUX1				
tAUX2	0 s	0 s	600 s	0.01 s
Setting for the operating time-delay of the ***AUX2*** function.				
AUX3 ?	Disabled	See AUX1?		
Same as AUX1				
tAUX3	0 s	0 s	600 s	0.01 s
Setting for the operating time-delay of the ***AUX3*** function.				

ST

2.2 Input Configuration

Binary Input settings define which signals are mapped to the V11V opto-isolated inputs. Matrix configuration allows free mapping of any one function to each input.

Note:

- Model L has no inputs
- Model N has 2 binary inputs (L1 to L2)
- Model A has 6 binary inputs (L1 to L6)

Menu Text	Default Setting	Setting Range	Step Size
Description of bits:	L: 6,5,4,3,2,1		
Reverse Input Logic	000000	0-1	1
Reverse logic provides extra flexibility to the application. ***Reverse Input Logic*** means that the high state of a binary input causes the corresponding logic signal to be in low state. Default Setting: “000000” means that: L6: “0” – input L6 is without reverse logic. The state of L6 logic input is in line with the state of L6 binary input L5: “0” – see Input 6 L4: “0” – see Input 6 L3: “0” – see Input 6 L2: “0” – see Input 6 L1: “0” – see Input 6			
Mainten. Mode (**A**)	000000	0-1	1
Maintenance Mode ON/OFF change. The selection of the maintenance mode is possible via a logic input, using a control command (rear or front port), or from the front panel interface. The termination of the maintenance mode is done via a logic input, using a control command or by the front panel interface timing out (10 minutes) or turning the power supply off. This mode allows the user to verify the operation of the protection functions ***with*** or ***without*** actually sending any external command (tripping or signaling). If ***without*** option is selected, all the output contacts are blocked, and no command can be issued to these contacts, even if a protection threshold associated with one of these output contacts has been crossed.			
Reset Latched Sign	000000	0-1	1
The high state of this logic input resets all latched LEDs, Alarm and Trip Information.			
Reset Latched Outputs	000000	0-1	1
The high state of this logic input resets all latched contact outputs			
Blocking tV> (**NA**)	000000	0-1	1
The high state of this logic input enables the blocking logic function of the V> protection element (resets its associated time-delay).			
Blocking tV>> (**NA**)	000000	0-1	1
The high state of this logic input enables the blocking logic function of the V>> protection element (resets its associated time-delay)			
Blockinging tV>>> (**NA**)	000000	0-1	1
The high state of this logic input enables the blocking logic function of the V>>> protection element (resets its associated time-delay)			

ST

Menu Text	Default Setting	Setting Range	Step Size
Blocking tV< (**NA**)	000000	0-1	1
The high state of this logic input enables the blocking logic function of the V< element (resets its associated time-delay)			
Blocking tV<< (**NA**)	000000	0-1	1
The high state of this logic input enables the blocking logic function of the V<< protection element (resets its associated time-delay)			
Blocking tV<<< (**NA**)	000000	0-1	1
The high state of this logic input enables the blocking logic function of the V<<< protection element (resets its associated time-delay)			
Blocking tV1< (**A**)	000000	0-1	1
The high state of this logic input enables the blocking logic function of the V1< protection element (resets its associated time-delay)			
Blocking tV1<< (**A**)	000000	0-1	1
The high state of this logic input enables the blocking logic function of the V1<< element (resets its associated time-delay)			
Blocking tV2> (**NA**)	000000	0-1	1
The high state of this logic input enables the blocking logic function of the V2> (resets its associated time–delay)			
Blocking tV2>> (**NA**)	000000	0-1	1
The high state of this logic input enables the blocking logic function of the V2>> (resets its associated time–delay)			
Blocking tVN> (**NA**)	000000	0-1	1
The high state of this logic input enables the blocking logic function of the VN> (resets its associated time–delay)			
Blocking tVN>> (**NA**)	000000	0-1	1
The high state of this logic input enables the blocking logic function of the VN>> (resets its associated time–delay)			
Blocking tVN>>> (**NA**)	000000	0-1	1
The high state of this logic input enables the blocking logic function of the VN>>> (resets its associated time–delay)			
Blocking f1 (**A**)	000000	0-1	1
The high state of this logic input enables the blocking logic function of the f1 (resets its associated time–delay)			
Blocking f2 (**A**)	000000	0-1	1
The high state of this logic input enables the blocking logic function of the f2 (resets its associated time–delay)			
Blocking f3 (**A**)	000000	0-1	1
The high state of this logic input enables the blocking logic function of the f3 (resets its associated time–delay)			
Blocking f4 (**A**)	000000	0-1	1
The high state of this logic input enables the blocking logic function of the f4 (resets its associated time–delay)			
Blocking f5 (**A**)	000000	0-1	1

Menu Text	Default Setting	Setting Range	Step Size
The high state of this logic input enables the blocking logic function of the f5 (resets its associated time–delay)			
Blocking f6 (**A**)	000000	0-1	1
The high state of this logic input enables the blocking logic function of the f6 (resets its associated time–delay)			
AUX1 (**NA**)	000000	0-1	1
This logic input energizes the AUX1 function			
AUX2 (**NA**)	000000	0-1	1
This logic input energizes the AUX2 function			
AUX3 (**A**)	000000	0-1	1
This logic input energizes the AUX3 function			
AUX4 (**A**)	000000	0-1	1
This logic input energizes the AUX4 function. Note: 1. AUX4 has no timer therefore it is **not** included in the ***SETTING GROUP x/PROTECTION Gx/AUX TIMERS*** submenu. 2. AUX4 cannot be assigned directly to Protection Trip or Alarm functions. 3. AUX4 is used as a simple bridge between an input and the LEDs or an input and the outputs without any signaling (Alarm or Trip).			
AUX5 (**A**)	000000	0-1	1
This logic input energizes the AUX5 function. Note: 1. AUX5 has no timer therefore it is **not** included in the ***SETTING GROUP x/PROTECTION Gx/AUX TIMERS*** submenu. 2. AUX5 cannot be assigned directly to Protection Trip or Alarm functions. 3. AUX5 is used as a simple bridge between an input and the LEDs or an input and the outputs without any signaling (Alarm or Trip).			
CB Status 52A (**A**)	000000	0-1	1
This logic input provides the V11V with information about the turn on state of the CB. This information is used by the communication system and CB diagnostic function. Note: 1. If inputs are assigned to both: ***CB Status 52A*** and ***CB Status 52B***, the V11V uses a two-bit CB status logic. 2. If inputs are assigned to either ***CB Status 52A*** or ***CB Status 52B*** only, the V11V uses a one-bit CB status logic			

ST

<table>
<tr><th>Menu Text</th><th>Default Setting</th><th>Setting Range</th><th>Step Size</th></tr>
<tr><td>CB Status 52B (A)</td><td>000000</td><td>0-1</td><td>1</td></tr>
<tr><td colspan="4">This logic input provides the V11V with information about the turn off state of the CB. This information is used by the communication system and the CB diagnostic function.
Note: see above.</td></tr>
<tr><td>CB FLT Ext.Sign (A)</td><td>000000</td><td>0-1</td><td>1</td></tr>
<tr><td colspan="4">After switching the logic input’s state from low to high this function initiates the “tCB FLT ext” time-delay and blocks a close command. When this time-delay has elapsed the Alarm signal is issued.
The binary Input is used to indicate that there is sufficient energy in the CB operating mechanism to close and trip the CB.
The tCB FLT ext. time-delay is set at GLOBAL SETTINGS/CIRCUIT BREAKER/ tCB FLT ext.
The Alarm signal can be additionally assigned to output contacts using the CB FLT Ext.Sign output (SETTING GROUP x/OUTPUTRELAYS CONFIGURATION Gx/ CB FLT Ext.Sign).</td></tr>
<tr><td>Setting group 2 (NA)</td><td>000000</td><td>0-1</td><td>1</td></tr>
<tr><td colspan="4">The high state of this logic input switches the active setting group to Setting Group 2. Setting Group 1 is active from the low state of Logic Input.
Note: If two setting groups are switched via binary input, this input must be assigned to this function in both setting groups: Setting Group 1 and Setting Group 2. If it is not done there will be not changing of setting group via this input.</td></tr>
<tr><td>Manual Close (A)</td><td>000000</td><td>0-1</td><td>1</td></tr>
<tr><td colspan="4">Mapping of a control close function to the input. When activated, it is possible to control the output relays assigned to the Close CB function.
Note: Manual Close command is blocked if:
1. The front panel LEDs are lit (LED resetting is required)
2. An input is assigned to the CB FLT Ext.Sign function and the state of this function is high</td></tr>
<tr><td>Manual Trip (A)</td><td>000000</td><td>0-1</td><td>1</td></tr>
<tr><td colspan="4">Mapping of a control trip function to the input. When activated, it is possible to control the output relay(s) assigned to the Trip CB function</td></tr>
<tr><td>VTS (A)</td><td>000000</td><td>0-1</td><td>1</td></tr>
<tr><td colspan="4">VT supervision function works when input “VTS” is energising</td></tr>
<tr><td>Start Distur. R. (A)</td><td>000000</td><td>0-1</td><td>1</td></tr>
<tr><td colspan="4">This logic input triggers the Disturbance Recorder.</td></tr>
<tr><td>Local CTRL Mode (A)</td><td>000000</td><td>0-1</td><td>1</td></tr>
<tr><td colspan="4">Local mode condition (if enabled, any remote command to the output relays is forbidden).</td></tr>
<tr><td>Time Synchr. (A)</td><td>000000</td><td>0-1</td><td>1</td></tr>
<tr><td colspan="4">Assigning of a time synchronization input (see Application chapter).</td></tr>
</table>

2.3 Output Relay Configuration

Output settings define which signals are mapped to the V11V outputs.
Matrix configuration allows free mapping of any one function to each output.

Note:

- Model L have RL1 to RL3 + WD outputs
- Model N have RL1 to RL5 + WD outputs
- Model A have RL1 to RL7 + WD outputs

Menu Text	Default Setting	Setting Range	Step Size
Description of bits:	**RL: 7,6,5,4,3,2,1**		
Latched Outputs	0000000	0-1	1
Each output can be configured with or without latching. Default Setting: "0000000" means that: RL7: "0" – output RL7 is not latched. The high state of the function mapped to the output determines the high state of RL7. The low state of this function determines the low state of RL7 (**A**). RL6: "0" – see RL7 (**A**). RL5: "0" – see RL7 (**NA**). RL4: "0" – see RL7 (**NA**). RL3: "0" – see RL7 (**LNA**). RL2: "0" – see RL7 (**LNA**). RL1: "0" – see RL7 (**LNA**). The high state of the function mapped to the output determines the high state of the output relay. The low state of this function does not change the state of the output relay. For the low state of output relay, it is necessary to activate the ***Reset of Latched Output*** function (via a binary input, from the front panel or via a communication port)			
Reverse outp.log.	0000000	0-1	1
Reverse outp. logic gives more application flexibility. If reverse logic is chosen for the output, after the V11V is powered (auxiliary voltage) the output contacts close. Any high state function connected with this output will open the contacts of the output relay.			
Protection Trip	0000000	0-1	1
Protection Trip is high if any protection element configured to ***Trip*** is high (voltage-based protection elements and external protection elements: AUX1, AUX2, AUX3 for model A and for AUX1, AUX2 model N).			
Prot.Trip pulse	0000000	0-1	1
Protection Trip pulse is energized via ***Protection Trip*** (see above). This command has a pulse duration not less than **tOpen** time set at ***GLOBAL SETTINGS/CIRCUIT BREAKER/tOpen pulse min***.			
Trip CB Order (**A**)	0000000	0-1	1
The **Trip CB Order** function is high during the set time if the manual trip command is executed (communication port, front panel, binary inputs) (the trip pulse is set at ***GLOBAL SETTINGS/CIRCUIT BREAKER/ tOpen pulse min***)			
Close CB Order (**A**)	0000000	0-1	1
The ***Close CB Order*** function is high during the set time if the manual close command or Auto-reclose function are executed (Communication port, binary input, front panel). The close pulse is set at ***GLOBAL SETTINGS/CIRCUIT BREAKER/ tClose Pulse***.			

ST

ST

Menu Text	Default Setting	Setting Range	Step Size
Alarm	00000000	0-1	1
The ***Alarm*** function is high if any protection element configured to ***Alarm*** is high (voltage-based protection element and external protection elements: **AUX1**, **AUX2**, **AUX3**). Default Setting: “00000000” means that: RL7: “0” –RL7 contact is not assigned to the *Alarm* function RL6: “0” – see RL7 (**A**). RL5: “0” – see RL7 (**NA**). RL4: “0” – see RL7 (**NA**). RL3: “0” – see RL7 (**LNA**). RL2: “0” – see RL7 (**LNA**). RL1: “0” – see RL7 (**LNA**).			
Start V>	0000000	0-1	1
Start V> is high if the V> protection element has started (voltage above the set V> threshold).			
Start V>>	0000000	0-1	1
Start V>> is high if the V>> protection element has started (voltage above the set V>> threshold).			
Start V>>>	0000000	0-1	1
Start V>>> is high if the V>>> protection element has started (voltage above the set V>>> threshold).			
Start V<	0000000	0-1	1
Start V< is high if the V< protection element has started (voltage below the set V< threshold).			
Start V<<	0000000	0-1	1
Start V<< is high if the V<< protection element has started (voltage below the set V<< threshold).			
Start V<<<	0000000	0-1	1
Start V<<< is high if the V<<< protection element has started (voltage below the set V< threshold).			
Start V1< (**A**)	0000000	0-1	1
Start V1< is high if the V1< protection element has started (V1 below the set V1< threshold).			
Start V1<< (**A**)	0000000	0-1	1
Start V1<< is high if the V1<< protection element has started (V1 below the set V1<< threshold).			
Start V2> (**NA**)	0000000	0-1	1
Start V2> is high if the V2> protection element has started (V2 above the set V2> threshold).			
Start V2>> (**NA**)	0000000	0-1	1
Start V2>> is high if the V2>> protection element has started (V2 above the set V2>> threshold).			
Start VN>	0000000	0-1	1
Start VN> is high if the VN> protection element has started (VN above the set VN> threshold).			
Start VN>>	0000000	0-1	1

Menu Text	Default Setting	Setting Range	Step Size
Start VN>> is high if the VN>> protection element has started (VN above the set VN>> threshold).			
Start VN>>>	0000000	0-1	1
Start VN>>> is high if the VN>>> protection element has started (VN above the set VN>>> threshold).			
Start f1 (**A**)	0000000	0-1	1
Start f1 is high if the f1 protection element has started (f above or below the set f1 threshold – is contingent on what we set).			
Start f2 (**A**)	0000000	0-1	1
Start f2 is high if the f2 protection element has started (f above or below the set f2 threshold – is contingent on what we set).			
Start f3 (**A**)	0000000	0-1	1
Start f3 is high if the f3 protection element has started (f above or below the set f3 threshold – is contingent on what we set).			
Start f4 (**A**)	0000000	0-1	1
Start f4 is high if the f4 protection element has started (f above or below the set f4 threshold – is contingent on what we set).			
Start f5 (**A**)	0000000	0-1	1
Start f5 is high if the f5 protection element has started (f above or below the set f5 threshold – is contingent on what we set).			
Start f6 (**A**)	0000000	0-1	1
Start f6 is high if the f6 protection element has started (f above or below the set f6 threshold – is contingent on what we set).			
AUX1 (**NA**)	0000000	0-1	1
AUX1 is high if the input assigned to AUX1 is set high.			
AUX2 (**NA**)	0000000	0-1	1
AUX2 is high if the input assigned to AUX2 is set high.			
AUX3 (**A**)	0000000	0-1	1
AUX3 is high if the input assigned to AUX3 is set high.			
AUX4 (**A**)	0000000	0-1	1
AUX4 is high if the input assigned to AUX4 is set high.			
AUX5 (**A**)	0000000	0-1	1
AUX5 is high if the input assigned to AUX5 is set high.			
tV>	0000000	0-1	1
tV> is high if the set time-delay for the V> element has elapsed			
tV>>	0000000	0-1	1
tV>> is high if the set time-delay for the V>> element has elapsed			
tV>>>	0000000	0-1	1
tV>>> is high if the set time-delay for the V>>> element has elapsed			
tV<	0000000	0-1	1
tV< is high if the set time-delay for the V< element has elapsed			
tV<<	0000000	0-1	1

ST

Menu Text	Default Setting	Setting Range	Step Size
tV<< is high if the set time-delay for the V<< element has elapsed			
tV<<<	0000000	0-1	1
tV<<< is high if the set time-delay for the V<<< element has elapsed			
tV1< (**A**)	0000000	0-1	1
tV1< is high if the set time-delay for the V1< element has elapsed			
tV1<< (**A**)	0000000	0-1	1
tV1<< is high if the set time-delay for the V1<< element has elapsed			
tV2> (**NA**)	0000000	0-1	1
tV2> is high if the set time-delay for the V2> element has elapsed			
tV2>> (**NA**)	0000000	0-1	1
tV2>> is high if the set time-delay for the V2>> element has elapsed			
tVN>	0000000	0-1	1
tVN> is high if the set time-delay for the VN> element has elapsed			
tVN>>	0000000	0-1	1
tVN>> is high if the set time-delay for the VN>> element has elapsed			
tVN>>>	0000000	0-1	1
tVN>>> is high if the set time-delay for the VN>>> element has elapsed			
tf1 (**A**)	0000000	0-1	1
tf1 is high if the set time-delay for the f1 element has elapsed			
tf2 (**A**)	0000000	0-1	1
tf2 is high if the set time-delay for the f2 element has elapsed			
tf3 (**A**)	0000000	0-1	1
tf3 is high if the set time-delay for the f3 element has elapsed			
tf4 (**A**)	0000000	0-1	1
tf4 is high if the set time-delay for the f4 element has elapsed			
tf5 (**A**)	0000000	0-1	1
tf5 is high if the set time-delay for the f5 element has elapsed			
tf6 (**A**)	0000000	0-1	1
tf6 is high if the set time-delay for the f6 element has elapsed			
tAUX1 (**NA**)	0000000	0-1	1
tAUX1 is high if the set time-delay for the AUX1 element has elapsed			
tAUX2 (**NA**)	0000000	0-1	1
tAUX2 is high if the set time-delay for the AUX2 element has elapsed			
tAUX3 (**A**)	0000000	0-1	1
tAUX3 is high if the set time-delay for the AUX3 element has elapsed			
CB Alarm (**A**)	0000000	0-1	1
CB Alarm : Circuit Breaker Alarm function signal			
tCB FLT Ext.Sign (**A**)	0000000	0-1	1

Menu Text	Default Setting	Setting Range	Step Size
tCB FLT Ext.Sign is high if the ***tCB FLT ext.*** time-delay has elapsed. The counter is started if the function ***CB FLT Ext.Sign*** assigned to binary input is high. Binary input is used to indicate that there is sufficient energy in the CB operating mechanism to close and trip the CB. The ***tCB FLT ext.*** time-delay is set at ***GLOBAL SETTINGS/CIRCUIT BREAKER/ tCB FLT ext***. The binary input is set at SETTING GROUP x/INPUTS CONFIGURATION Gx/ CB FLT Ext.Sign.			
Setting Group 1 (**NA**)	0000000	0-1	1
Setting Group 1 is active (switched via a binary input, the front panel, RS485 comms).			
tVTS (**A**)	0000000	0-1	1
tVTS is active (VT supervision fail).			
fout (**A**)	0000000	0-1	1
Frequency is out of range.			

2.4 LED Configuration

LED configuration settings define which signals are mapped to the V11V LEDs. Matrix configuration allows free mapping of any one function to each LED.

Menu Text	Default Setting	Setting Range	Step Size
Description of bits:	LED: 7,6,5,4,3,2	LED: 7,6,5,4,3,2	
Latched LEDs	000000	0–1	1
Each LED can be configured with or without latching. Default Setting: “000000” means that: LED7: “0” – LED 7 is latched until the LEDs are reset (Binary Input, Front panel, communication system) LED6: “0” – see LED7 LED5: “0” – see LED7 LED4: “0” – see LED7 LED3: “0” – see LED7 LED2: “0” – see LED7			
Alarm	000000	0–1	1
This LED is lit if any protection element set to “Alarm” is high (voltage-based protection elements, external protection elements: AUX1, AUX2, AUX3, VT Supervision, CB FLT ext). Default Setting: “000000” means that: LED7: “0” – LED 7 is not assigned to an Alarm LED6: “0” – see LED7 LED5: “0” – see LED7 LED4: “0” – see LED7 LED3: “0” – see LED7 LED2: “0” – see LED7			
Start V>	000000	0-1	1
This LED is lit if ***start V>*** is high.			
Start V>>	000000	0-1	1
This LED is lit if ***Start V>>*** is high.			
Start V>>>	000000	0-1	1
This LED is lit if ***Start V>>>*** is high.			
Start V<	000000	0-1	1
This LED is lit if **Start V<** is high.			
Start V<<	000000	0-1	1
This LED is lit if **Start V<<** is high.			
Start V<<<	000000	0-1	1
This LED is lit if **Start V<<<** is high.			
Start V1< (**A**)	000000	0-1	1
This LED is lit if ***Start V1<*** is high.			
Start V1<< (**A**)	000000	0-1	1
This LED is lit if ***Start V1<<*** is.			
Start V2> (**NA**)	000000	0-1	1
This LED is lit if ***Start V2>*** is high.			

Menu Text	Default Setting	Setting Range	Step Size
Start V2>> (**NA**)	000000	0-1	1
This LED is lit if ***Start V2>>*** is high.			
Start VN>	000000	0-1	1
This LED is lit if ***Start VN>*** is high.			
Start VN>>	000000	0-1	1
This LED is lit if ***Start VN>>*** is high.			
Start VN>>>	000000	0-1	1
This LED is lit if ***Start VN>>>*** is high.			
Start f1 (**A**)	000000	0-1	1
This LED is lit if ***Start f1*** is high if the f1 protection element has started.			
Start f2 (**A**)	00000	0-1	1
This LED is lit if ***Start f2*** is high if the f2 protection element has started.			
Start f3 (**A**)	000000	0-1	1
This LED is lit if ***Start f3*** is high if the f3 protection element has started.			
Start f4 (**A**)	000000	0-1	1
This LED is lit if ***Start f4*** is high if the f4 protection element has started.			
Start f5 (**A**)	000000	0-1	1
This LED is lit if ***Start f5*** is high if the f5 protection element has started.			
Start f6 (**A**)	000000	0-1	1
This LED is lit if ***Start f6*** is high if the f6 protection element has started.			
AUX1 (**NA**)	000000	0-1	1
This LED is lit if ***AUX***1 is high if the input assigned to AUX1 is set high.			
AUX2 (**NA**)	000000	0-1	1
This LED is lit if ***AUX2*** is high if the input assigned to AUX2 is set high.			
AUX3 (**A**)	000000	0-1	1
This LED is lit if ***AUX3*** is high if the input assigned to AUX3 is set high.			
AUX4 (**A**)	000000	0-1	1
This LED is lit if ***AUX4*** is high if the input assigned to AUX4 is set high.			
AUX5 (**A**)	000000	0-1	1
This LED is lit if **AUX5** is high if the input assigned to AUX5 is set high.			
tV>	000000	0-1	1
This LED is lit if ***tV>*** is high.			
tV>>	000000	0-1	1
This LED is lit if **tV>>** is high.			
tV>>>	000000	0-1	1
This LED is lit if ***tV>>>*** is high.			
tV<	000000	0-1	1
This LED is lit if ***tV<*** is high.			
tV<<	000000	0-1	1

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Menu Text	Default Setting	Setting Range	Step Size
This LED is lit if **tV<<** is high.			
tV<<<	000000	0-1	1
This LED is lit if ***tV<<<*** is high.			
tV1< (**A**)	000000	0-1	1
This LED is lit if ***tV1<*** is high.			
tV1<< (**A**)	000000	0-1	1
This LED is lit if ***tV1<<*** is high.			
tV2> (**NA**)	000000	0-1	1
This LED is lit if ***tV2>*** is high.			
tV2>> (**NA**)	000000	0-1	1
This LED is lit if ***tV2>>*** is high.			
tVN>	000000	0-1	1
This LED is lit if ***tVN>*** is high.			
tVN>>	000000	0-1	1
This LED is lit if ***tVN>>*** is high.			
tVN>>>	000000	0-1	1
This LED is lit if ***tVN>>>*** is high.			
tf1 (**A**)	000000	0-1	1
This LED is lit if ***tf1*** is high.			
tf2 (**A**)	000000	0-1	1
This LED is lit if ***tf2*** is high.			
tf3 (**A**)	000000	0-1	1
This LED is lit if ***tf3*** is high.			
tf4 (**A**)	000000	0-1	1
This LED is lit if ***tf4*** is high.			
tf5 (**A**)	000000	0-1	1
This LED is lit if ***tf5*** is high.			
tf6 (**A**)	000000	0-1	1
This LED is lit if ***tf6*** is high.			
tAUX1 (**NA**)	000000	0-1	1
This LED is lit if ***tAUX1*** is high.			
tAUX2 (**NA**)	000000	0-1	1
This LED is lit if ***tAUX2*** is high.			
tAUX3 (**A**)	000000	0-1	1
This LED is lit if ***tAUX3*** is high.			
Local CTRL Mode (**A**)	000000	0-1	1
This LED is lit if relay is local mode.			
CB Alarm (**A**)	000000	0-1	1
This LED is lit if we have ***CB Alarm.***			

ST

Menu Text	Default Setting	Setting Range	Step Size
tCB FLT Ext.Sign (**A**)	000000	0-1	1
This LED is lit if ***tCB FLT Ext.Sign*** is high.			
Setting Group 1 (**NA**)	000000	0-1	1
This LED is lit if ***Setting Group 1*** is active.			
tVTS (**A**)	000000	0-1	1
This LED is lit if ***tVTS*** is active (VT supervision fail).			
fout (**A**)	000000	0-1	1
This LED is lit if ***Frequency*** is out of range.			

3. GLOBAL SETTINGS

3.1 LOC

<table>
<tr><th>Menu Text</th><th>Default Setting</th><th>Available Settings</th></tr>
<tr><td>Language</td><td>English</td><td>English
German
French
Spanish
Russian
Turkish
Regional</td></tr>
<tr><td colspan="3">This cell is used to change the language of the menu.
The REGIONAL language is used if it is necessary to customize labels in the V11V menu. For example: the CB Fail label instead of the AUX1 label. To change the labels in the V11V menu, the Menu Creator Software is used. All available V11V language versions can be used as a template for a Regional menu.</td></tr>
<tr><td>Default Display</td><td>Measurements P – P [V]</td><td>Meas. P – P [V]
Meas. P – P [Un]
Meas. P – N [V]
Meas. P – N [Un]
CB Control (A)
L/R Mode (A)</td></tr>
<tr><td colspan="3">This cell is used to change the default display window:
0: Measurements in phase to phase voltage
1: Measurements in phase to phase voltage refer to Un
2: Measurements in phase to neutral voltage
3: Measurements in phase to neutral voltage refer to Un
4: CB control window for CB control (close and trip command)
5: L/R Status Local/Remote and for presenting Control Mode state information</td></tr>
<tr><td>LEDs Reset</td><td>Manual only</td><td>Manual only
Protect.Start
Close Command (A)</td></tr>
<tr><td colspan="3">This cell is used to change the resetting method of latched LEDs in the menu.
0: Manual only – Resetting of latched LEDs via manual reset only (C clear key, input, USB,RS485)
1: Protect.Start – Resetting of latched LEDs upon any protection start (set for CB tripping) or via manual reset
2: Close Command - Resetting of latched LEDs upon Close Command applied by V11V</td></tr>
<tr><td>Latched Outputs Reset</td><td>Manual only</td><td>Manual only
Protect.Start
Close Command (A)</td></tr>
<tr><td colspan="3">This cell is used to change the resetting method of latched outputs in the menu.
0: Manual only – Resetting of latched outputs via manual reset only (C clear key, input, USB,RS485)
1: Protect.Start – Resetting of latched outputs upon any protection start (set for CB tripping) or via manual reset
2: Close Command - Resetting of latched outputs upon Close Command applied by V11V</td></tr>
<tr><td>Trip Info Reset</td><td>Manual only</td><td>Manual only
Protect.Start
Close Command (A)</td></tr>
</table>

Menu Text	Default Setting	Available Settings
This cell is used to change the resetting method of latched outputs in the menu. **0: Manual only** – Resetting of trip info reset via manual reset only (***C*** clear key, input, USB, RS485) **1*: Protect.Start*** – Resetting of trip info reset upon any protection start (set for CB tripping) or via manual reset **2*: Close Command*** - Resetting of trip info reset upon Close Command applied by V11V		
Alarm Info Latching	Self Reset	Self Reset Manual Reset
This cell is used to change the resetting method of Alarm indication windows (ALARM STATUS) **0*: Self Reset –*** This option means that if an alarm signal has disappeared no information is available in the ***ALARM STATUS*** column **1*: Manual Reset –*** this option means that if an alarm signal has disappeared information is still available in the ***ALARM STATUS*** column until it is reset in the ***ALARM STATUS/ Alarm Reset*** cell.		
Nominal Frequency	50Hz	50Hz 60Hz
This cell is used to set the nominal frequency of the power system.		
Control Keys Confirm	No	No (Without) Yes (With)
This cell is used to select the way of close/trip command execution from the front panel (CB Close key/CB Open key). No: after pressing CB Close key or CB Open key the command is executed instantaneously Yes: after pressing CB Close key or CB Open key the new window will be appeared to confirm or cancel the control command (Close or Trip). After pressing OK key the control command is executed or after pressing C clear key the control command is cancelled.		

ST

3.2 Setting Group Select

Menu Text	Default Setting	Available Settings
Number of Groups	One	One Two
This cell is used to choose the number of setting groups available in the V11V. By choosing ***One Group*** all settings related to Group 2 are hidden in the menu.		
Setting Group	Group 1	Group 1 Group 2
This cell is used to change the current setting group.		
t Change Settings Group (G1 -> G2)	0.00 s	0.00 to 200 s, step 0.01 s
This cell is used to set the time-delay changing between the setting Group 1 and Group 2.		

3.3 VT's Supervision (AN)

Menu Text	Default Setting	Available Settings
VT's Supervision	Disabled	Disabled Enabled
This cell is used to enabled voltage transformer supervision function.		
Detection Mode	VTS Input	VTS Input Delta U_r Delta U_r or VTS Input
This cell is visible when ***GLOBAL SETTINGS/VT RATIO/VT Connection*** is set to: 3Upn+UN, or 2Upp+UN, or 3Upp+UN. In other case (3Upn) is fixed ***VTS Input*** only. This cell is used to change the detection mode of VT failure. U_r – difference between: VN measured and VN calculated		
Delta V_r	15V	2V to 130V step 0,1V
This cell is visible when ***GLOBAL SETTINGS/VT SUPERVISION/Detection Mode*** is set to: Delta Ur, or Delta U_r or VTS Input		
tVTS	5.00 s	0.00s to 100 s, step 0.01 s
This cell is used to change the operating time delay of the element upon detection of a voltage transformer supervision.		
Inhibit VTS / 52a	No	No Yes
This cell is used to enabled blocking logic of VTS supervision from state CB – turn off position.		
Block [27] U/V	No	No Yes
This cell is used to enabled blocking logic of V< protection from tVTS function.		
Block [59] O/V	No	No Yes
This cell is used to enabled blocking logic of V> protection from tVTS function.		
Block [59N] E/GND O/V	No	No Yes
This cell is used to enabled blocking logic of VN> protection from tVTS function.		
Block [27D] POS. SEQ. U/V	No	No Yes
This cell is used to enabled blocking logic of V1< protection from tVTS function.		
Block [47] NEG. SEQ. O/V	No	No Yes
This cell is used to enabled blocking logic of V2> protection from tVTS function.		

ST

Menu Text	Default Setting	Available Settings
Block [81] freq.	No	No Yes
This cell is used to enabled blocking logic of frequency protection from tVTS function.		

3.4 VT Ratio

Menu Text	Default Setting	Setting Range		Step Size
		Min.	Max.	
Line VT Primary	0.1 kV 0.22 kV	0.05 kV	65 kV	0.01 kV
Sets the voltage transformer input's primary voltage rating. Default value depends on Phase range (see: Line VT Sec) Default setting 0.1 kV is set for Phase Range 50 - 130 V Default setting 0.22 kV is set for Phase Range 220 - 480 V				
Line VT Sec	100 V	57 V	130 V	0.1 V
Sets the voltage transformer input's secondary voltage rating. Set for 57-130VAC measuring range.				
Line VT Sec	220 V	220 V	480 V	0.1 V
Sets the voltage transformer input's secondary voltage rating. Set for 220-480VAC measuring range.				
E/Gnd VT Primary	0.1 kV	0.05 kV	65 kV	0.01 kV
Sets the earth fault transformer input's primary voltage rating.				
E/Gnd VT Sec	100 V	57 V	130 V	0.1 V
Sets the earth fault transformer input's secondary voltage rating.				
VT Connection (**AN**)	3Upn+UN	N/A	N/A	3Upn 3Upn+UN 2Upp+UN 3Upp+UN
Sets type of analog connection of VT				
Prot. Config. V>	P-P	N/A	N/A	P-N P-P
Sets type of voltage which is use in protections				
Prot. Config. V<	P-P	N/A	N/A	P-N P-P
Sets type of voltage which is use in protections				

3.5 Circuit Breaker

Menu Text	Default Setting	Setting Range		Step Size
		Min.	Max.	
tOpen Pulse min	0.1 s	0.1 s	10 s	0.01 s
Defines the duration of the trip pulse used by the Autoreclose, **Trip Command** and **Trip CB *Order*** outputs.				
tClose Pulse	0.1 s	0.1 s	10 s	0.01 s
Defines the duration of the close pulse used by the ***Close CB Order*** output.				
Time Delay for Close	0 s	0 s	200 s	0.01 s
Defines the time-delay for Manual or Remote CB close commands.				
tCB FLT ext (**A**)	16 s	1 s	200 s	1 s

ST

<table>
<tr><th rowspan="2">Menu Text</th><th rowspan="2">Default Setting</th><th colspan="2">Setting Range</th><th rowspan="2">Step Size</th></tr>
<tr><th>Min.</th><th>Max.</th></tr>
<tr><td colspan="5">A settable time-delay is included for manual closure with this circuit breaker check. If the circuit breaker does not indicate a healthy condition in this time period following a close command, then the relay will lockout and set off an alarm.</td></tr>
<tr><td>Remote Mode (A)</td><td>0: Remote only</td><td colspan="3">Remote only
Remote+Local</td></tr>
<tr><td colspan="5">This cell is used to define Remote CB control mode.
0: Remote only – If V11V is in Remote mode it is possible to apply a close and a trip command via RS485 only.
1: Remote+Local – In Remote mode it is possible to close and trip CB via RS485 or locally (Default window menu, Front panel keys, binary input).</td></tr>
<tr><td>CB Supervision (AN)</td><td>No</td><td>No</td><td>Yes</td><td>n/a</td></tr>
<tr><td colspan="5">Selection of the time monitoring function of CB open and close operations.
If Yes is selected, the CB Open Time and CB Close Time menu are displayed. (ALARM signalling).</td></tr>
<tr><td>Max CB Open Time (A)</td><td>0.1 s</td><td>0.1 s</td><td>10 s</td><td>0.01 s</td></tr>
<tr><td colspan="5">Displays the Alarm time threshold for a CB open operation.</td></tr>
<tr><td>Max CB Close Time (A)</td><td>0.5 s</td><td>0.1 s</td><td>10 s</td><td>0.01 s</td></tr>
<tr><td colspan="5">Displays the Alarm time threshold for a CB close operation.</td></tr>
</table>

ST

3.6 Voltage Advanced Configuration

<table>
<tr><th>Menu Text</th><th>Default Setting</th><th colspan="2">Setting Range</th><th>Step Size</th></tr>
<tr><td>IDMT interlock by DMT stage</td><td>No</td><td>No</td><td>Yes</td><td>n/a</td></tr>
<tr><td colspan="5">IDMT tripping can be blocked if any DMT stage is started settings: IDMT interlock by DMT (GLOBAL SETTINGS/O/V ADVANCED column).</td></tr>
<tr><td>U/V Hysteresis</td><td>1.05</td><td>1.00</td><td>1.20</td><td>0.01</td></tr>
<tr><td colspan="5">Sets drop off of undervoltage protection. Applies function with DT curve. For IDMT curves see V11V/EN TD v1.0 chapter, table in point 7.</td></tr>
<tr><td>O/V Hysteresis</td><td>0.95</td><td>0.80</td><td>1.00</td><td>0.01</td></tr>
<tr><td colspan="5">Sets drop off of overvoltage protection. Applies function with DT curve. For IDMT curves see V11V/EN TD v1.0 chapter, table in point 7.</td></tr>
</table>

3.7 [81] Advanced Settings (A)

Menu Text	Default Setting	Setting Range		Step Size
		Min.	Max.	
Prot. Freq. Blocking	65 V	5 V	100 V	1 V
Sets threshold of voltage below [81] function is blocked				
Meas. Valid. Nb of halfcycles	4	1	10	1
Sets numbers of halfcycles which are need to confirm working [81] protection				

3.8 Communication (AN)

<table>
<tr><th rowspan="2">Menu Text</th><th rowspan="2">Default Setting</th><th colspan="2">Setting Range</th><th rowspan="2">Step Size</th></tr>
<tr><th>Min.</th><th>Max.</th></tr>
<tr><td>Relay Address</td><td>247</td><td>1</td><td>247</td><td>1</td></tr>
<tr><td colspan="5">This cell sets the unique address for the relay so that only one relay is accessed by the master station's software. This address is applied for RS485 port only.
Note: USB port has fixed address: 1.</td></tr>
<tr><td>Protocol</td><td>IEC103</td><td colspan="3">Modbus
IEC103
Modbus (DE)</td></tr>
<tr><td colspan="5">This cell sets the type of protocol for RS485:
0: Modbus RTU protocol (used for MS1S)
1: IEC103 protocol
2: Modbus (DE) valid with Modbus Standard
This setting parameter is applied for RS485 port only.
Note: USB port has fixed protocol: Modbus.</td></tr>
<tr><td>Baud Rate</td><td>19200 bits/s</td><td colspan="3">4800 bits/s , 9600 bits/s, 19200 bits/s, 38400 bits/s, 57600 bits/s, 115200 bits/s</td></tr>
<tr><td colspan="5">This cell controls the communication speed between relay and master station. It is important that both the relay and the master station have the same speed setting.
This setting parameter is applied for RS485 port only.
Note: USB port has fixed Baud Rate: 115.2 kbits/s.</td></tr>
<tr><td>Parity</td><td>None</td><td colspan="3">None, Odd, Even</td></tr>
<tr><td colspan="5">This cell controls the parity format used in the data frames. It is important that both the relay and the master station have the same parity setting.
This setting parameter is applied for RS485 port only.
Note: USB port has fixed Parity: No parity.</td></tr>
<tr><td>Stop bits</td><td>1 stop bit</td><td colspan="3">1 stop bit, 2 stop bits</td></tr>
<tr><td colspan="5">This cell controls the stop bit format used in the data frames. It is important that both the relay and the master station have the same stop bits setting.
This setting parameter is applied for RS485 port only.
Note: USB port has fixed Stop bits: 1 stop bit.</td></tr>
</table>

Note: The above parameters are relevant to the RS485 port only.

The USB port has the non-settable following parameters:
- Protocol: Modbus RTU
- Address: 1
- Baud Rate: 115.2 kbits/s
- Comms. Mode:
  - Data Bit: 8
  - Stop bit: 1
  - Parity: none

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3.9 Disturbance Recorder (A)

The Disturb Record submenu makes it possible to set and read out disturbance records. Up to 4 second's duration but not more than 5 disturbance records can be stored.

Total number of records available in disturbance recorder is:

- One - for set Max Record Time from in range: 2.01s – 4.00s
- Two – for set Max Record Time from in range: 1.34s – 2.00s
- Three – for set Max Record Time from in range: 1.01s – 1.33s
- Four – for set Max Record Time from in range: 0.81s – 1.00s
- Five - for set Max Record Time from in range: 0.10s – 0.80s

The beginning of the record can be adjusted with a selected pre-fault time. It is possible to limit the duration of a record.

Menu Text	Default Setting	Setting Range		Step Size
		Min.	Max.	
Pre-Time	0.1 s	0.1 s	2 s	0.01 s
Setting for the disturbance record pre-fault time. The pre-fault time sets the beginning of the disturbance record. In this example, the record starts 100 ms before the disturbance. Its length can be limited by setting.				
Post-Trip Time	0.1 s	0.1 s	1 s	0.01 s
Setting for the disturbance record post-fault time. The total disturbance recording time is: pre-fault time + high state of triggering criteria (Start or Trip time) + post-fault time. The above total recording time is limited by setting.				
Disturbance Rec.Trig.	on Inst.	on Inst. on Trip		
Setting for the trigger criteria: ***0: on Inst***. – the trigger is the disturbance indicated by the starting of a protection element set to trip the CB. If this option is chosen the total recording time is: pre-fault time + duration of protection start + post-fault time, but no longer than the value of ***Max Record Time***. When delay time of any protection function exceeds ***Max Record Time*** and after this delay time TRIP signal occurs then TRIP is recorded in the next additional record. ***1: on Trip***. – the trigger is the disturbance indicated by a protection element trip. If this option is chosen the total recording time is: pre-fault time + duration of protection trip+ post-fault time, but no longer than the value of ***Max Record Time***.				
Max Record Time	1.5 s	0.1 s	4 s	0.01 s
Setting for the maximum total recording time.				

4. COMMISSIONING

This column contains menu cells which allow the status of the opto-isolated inputs, output relay contacts to be monitored. Additionally there are cells to test the operation of the output contacts, user-programmable LEDs.

<table>
<tr><th>Menu Text</th><th colspan="2">Default Setting</th><th colspan="2">Available Settings</th></tr>
<tr><td>Description of bits:</td><td colspan="2">L: 6,5,4,3,2,1</td><td colspan="2"></td></tr>
<tr><td>Input Status (AN)</td><td colspan="4">000000</td></tr>
<tr><td colspan="5">This menu cell displays the status of the relay’s opto-isolated inputs as a binary string, a ‘1’ indicating an energised opto-isolated input and a ‘0’ a de-energised one - for standard input logic. If the inputs logic is reversed (for any input) than ‘1’ indicates a de-energised and ‘0’ energised input.</td></tr>
<tr><td>Description of bits:</td><td colspan="2">RL: 7,6,5,4,3,2,1</td><td colspan="2"></td></tr>
<tr><td>Output Status</td><td colspan="4">0000000</td></tr>
<tr><td colspan="5">This menu cell displays the status of the digital signals used to energize the output relays as a binary string, a ‘1’ indicating an operated state and ‘0’ a non-operated state.</td></tr>
<tr><td>Maintenance Mode (A)</td><td colspan="2">No</td><td colspan="2">No
Yes, outp.trips
Yes, outp.block</td></tr>
<tr><td colspan="5">Choose whether you want to activate the MAINTENANCE MODE of the relay.
MAINTENANCE MODE allows to test contact outputs and functional tests.
For changing this value Control password have to be entered.
If “No” is selected, all menu cells below are hidden.
If “Yes,outp.trips” or “Yes” – ALARM LED is lit and 10 minutes timer is started for returning to “No” option. In this time V11V is in SETTING MODE. Changing of test values and execution of command are allowed.
If “Yes,outp.block” is selected, output relays are disconnected from the protection and automation functions.</td></tr>
<tr><td>Description of bits:</td><td colspan="2">RL: 7,6,5,4,3,2,1</td><td colspan="2"></td></tr>
<tr><td>Test Pattern (A)</td><td colspan="4">0000000</td></tr>
<tr><td colspan="5">This menu cell is used to set outputs for the test. The digit: 1 set in this cell means that this output will be energized after the test command is applied.
If the test is applied (COMMISSIONING/Test outputs cell) outputs set in this cell will be energized for the duration of Contact Test Time.</td></tr>
<tr><td>Contact Test Time (A)</td><td>0.0 s</td><td>0 s</td><td>200 s</td><td>0.01 s</td></tr>
<tr><td colspan="5">Set the time pulse of contact closing during the tests.</td></tr>
<tr><td>Test outputs (A)</td><td colspan="2">no operation</td><td colspan="2">no operation
Apply test</td></tr>
<tr><td colspan="5">This menu cell is used to apply a test to the outputs set in the Test Pattern cell.
To apply the output test: Press OK, change a setting option from 0 to 1 (1: Apply test), confirm this action by pressing the OK key. After this, outputs (set in Test Pattern cell) are energized for the duration of Contact Test Time.
Note: If the Test control password is not equal to 0 before changing of option (from 0 to 1) at least Test control password should be entered (as for every other V11V setting).</td></tr>
</table>

<table>
<tr><th>Menu Text</th><th colspan="2">Default Setting</th><th colspan="2">Available Settings</th></tr>
<tr><td>Functional Test (A)</td><td colspan="2">V></td><td colspan="2">V>
V>>
V>>>
V<
V<<
V<<<
VN>
VN>>
VN>>>
V2>
V2>>
V1<
V1<<
f1
f2
f3
f4
f5
f6</td></tr>
<tr><td colspan="5">This menu cell is used to set a protection element for Functional tests.</td></tr>
<tr><td>Functional Test End (A)</td><td colspan="2">Time</td><td colspan="2">CB trip
Time</td></tr>
<tr><td colspan="5">This menu cell is used to choose the method of ending the test procedure.
0: CB trip – the test is applied until Trip signal
1: Time – the test is ended after the Functional Test Time set value.</td></tr>
<tr><td>Functional Test Time (A)</td><td>0.1 s</td><td>0.1 s</td><td>200 s</td><td>0.01 s</td></tr>
<tr><td colspan="5">Setting for the time pulse of contact closing during Functional tests.</td></tr>
<tr><td>Functional Test (A)</td><td colspan="2">no operat.</td><td colspan="2">no operat.
Apply Test</td></tr>
<tr><td colspan="5">This menu cell is used to apply test of outputs which were set in Functional Test pattern cell.
To apply output test: Press enter, change a setting option from no operat. to Operate, confirm this action by pressing OK key. After that outputs (set in Functional Test pattern cell) are energized via Functional Test Time.
Note: if Test control password is not equal 0 before changing of option (from no operat. to Operat) at least Test control password should be entered (like for every V11V setting).</td></tr>
</table>

ST

5. SETTING CHANGE MODE

This column contains menu cells which allow the settings and configuration to be changed.

Before any change to the settings it is necessary to set a V11V's ***Edit Setting Mode*** to ***Without limits*** or ***Protection only***. If changing of parameters is allowed, the LEDs light up one by one until the ***Setting Change status*** cell is in the ***Protected*** state.

In the ***Without limits*** state, it is possible to change all of the settings.

In the ***Protection only*** state, it is only possible to change protection settings (***PROTECTION*** columns)

In the ***Control*** state, it is possible to control the CB in the default window and apply ***MAINTENANCE MODE*** for outputs and functional tests . If the password is set to 0, no password is necessary to control the CB.

In the ***Protected*** state, settings are password-protected.

Menu Text	Default Setting	Available Settings
Edit Settings?	Enter PSWD	0000 – 9999
This cell is used to switch the P111Enh to Edit Settings in order to allow changing the settings.		
Setting Change	Protected	Protected/Without limits/Protection only/Test Control
This cell displays the level of rights to change settings.		
Change Password		0000 – 9999
This cell is displayed if the password is entered. To change the password it is necessary to press the OK key and enter the new password. After that it is necessary to press enter to save the new password.		

To access the ***Edit Setting*** Menu window faster, press the left and up keys at the same time.

This action makes the menu jump to the ***Edit Setting*** cell.

Then press the OK key, a password will be requested.

Enter the password (the default factory password is "0000" for every password level)

In the ***Without limits*** or the ***Protection only*** state, all the LEDs will then light up, in rapid sequence. This indicates that the V11V is operating in Edit Mode: the parameters can be changed in this state.

In the ***Control*** state there is no any LED signaling (no lighting up in rapid sequence as above).

After having set all the required parameters, press simultaneously the 4 and 8 keys, then press the OK key once

6. OP PARAMETERS

This column contains menu cells to show some of the V11V 's parameters.

Menu Text	Default Setting	Available Settings
Description	V11V	Read only
This cell is used to show the type of relay.		
Serial Nb	000000	Read only
This cell is used to show the serial number of the relay.		
Reference	SE MiCOM	Read only
This cell is used to show the relay's manufacturer.		
Software Version	1.A	Read only
This cell is used to show the software version (firmware)		
Hardware Version	Model A	Read only
This cell is used to show the hardware version ordered		
Active Set Group	Group 1	Read only
This cell is used to show the active setting group		
Date	01/01/08	00/00/00 – 99/99/99
This cell is used to set the date of the internal clock		
Time	00:00:00	00:00:00 – 23/59/59
This cell is used to set the time of the internal clock Note: 1. A back-up clock capacitor is charged from an auxiliary voltage supply (terminals 11-12) only. The capacitor's energy allows storage of real time information for up to 2 days. When the back-up capacitor is completely discharged, it takes less than 10 minutes to recharge it completely 2. If the clock has no real time information (the back-up capacitor is recharged) and the current exceeds the minimum current required for operation, the real time is set to 01/01/2008 00:00:00. Therefore events are dated with reference to this start time value.		
Nominal Frequency:	50Hz or 60Hz	Read only
This cell is used to show the nominal frequency setting.		

ST

OP

OPERATION

Date:	**1st December 2015**
Software Version:	**1A**
Connection Diagrams:	**10V11V01**

OP

CONTENTS

FIGURES

1. OPERATION OF INDIVIDUAL PROTECTION FUNCTIONS

The following sections detail the individual protection functions.

1.1 Overvoltage Protection

The overvoltage protection included in the V11V relays provides three-stage overvoltage protection with independent time-delay characteristics (DT or IDMT – depending on stage), which can be set to operate from phase to phase or phase to neutral voltage. All overvoltage settings apply to all three phases but are independent for each of the three stages.

Each protection stage can be selected to Trip the CB (works when all three phases are faulty – AND option, or if in any one phase fault appears – OR option) or to indicate a signal (Alarm) only, there is possibility to chose trip and alarm with blocking option from state of CB contacts (52a).

If an overvoltage protection stage **(V>, V>> or V>>>)** is set to ***Trip***, it means that that stage is linked to the ***Protect.Trip*** and ***Prot.Trip pulse*** functions (see LED and Output configuration).

If an overvoltage protection stage **(V>, V>> or V>>>)** is set to ***Alarm***, it means that that stage is linked to the ***Alarm*** function (see LED and Output configuration).

If ***OR Trip*** is selected, the overvoltage stage will trip when any phase is faulty (works similarly for alarm option).

If ***AND Trip*** is selected, the overvoltage stage will trip when all phases are faulty (works similarly for alarm option).

If ***OR Trip/52a*** is selected, the overvoltage stage will trip when any phase is faulty and there is confirmation of closed state of breaker (works similarly for alarm option).

If ***AND Trip/52a*** is selected, the overvoltage stage will trip when all phases are faulty and there is confirmation of closed state of breaker (works similarly for alarm option).

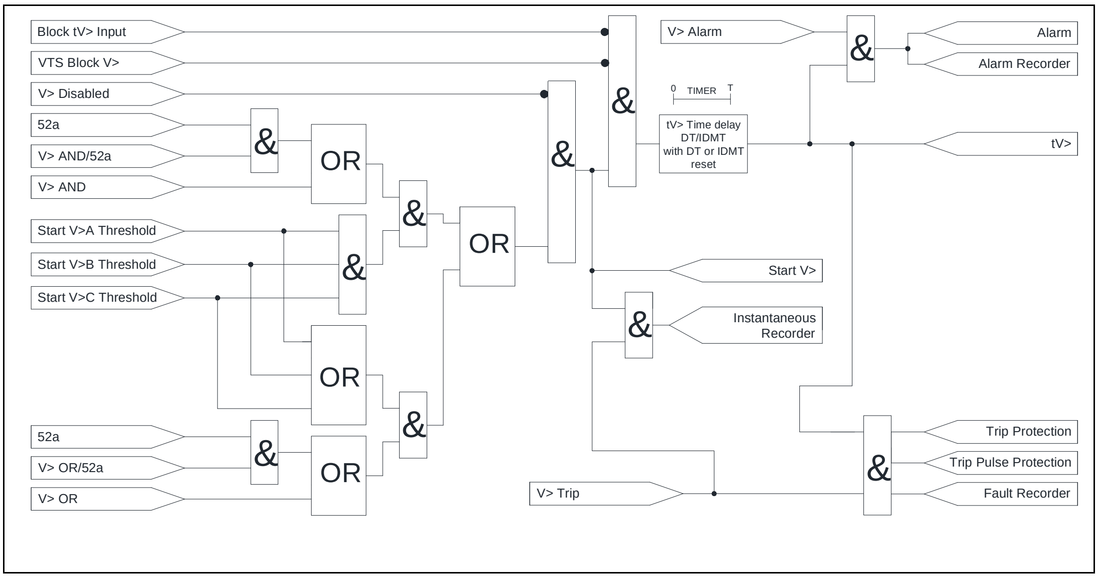


Figure 1: Overvoltage protection logic diagram

OP

1.1.1 Operation Time-Delay

The first (V>) and second (V>>) stages of overvoltage protection have time-delayed characteristics which are selectable between inverse definite minimum time (IDMT) and definite time (DT). The third (V>>>) stage has a definite time characteristic only.

The inverse time-delayed characteristics indicated above comply with the following formula:

IEC/UK/FR curves: $$t = TMS \cdot \left(\frac{k}{(\frac{G}{Gs})^{\alpha} - P} + c\right);$$

IEEE/US curves: $$t = TD \cdot \left(\frac{k}{(\frac{G}{Gs})^{\alpha} - P} + c\right);$$

where:

t = Operating time in [s],

k, P, c = Constant,

G = Measured voltage in [V],

TMS = Time multiplier setting for IEC curves,

TD = Time dial setting for IEEE curves,

Gs = Voltage threshold setting in [V],

α = Constant.

Type of Curve according to IEC60255-151 std definition	**Standard**	**k**	**c**	**α**	**P**
IEC Standard Inverse Time (SI)	IEC/A	0.14	0	0.02	1
IEC Very Inverse Time (VI)	IEC/B	13.5	0	1	1
IEC Extremely Inverse Time (EI)	IEC/C	80	0	2	1
IEC Long Time Inverse (LTI)	IEC	120	0	1	1
FR Short Time Inverse (STI)	FR	0.05	0	0.04	1
UK Rectifier (Rect)	UK	45900	0	5.6	1
IEEE Moderately Inverse Time (MI)	IEEE (IEC/D)	0.0515	0.114	0.02	1
IEEE Very Inverse Time (VI)	IEEE (IEC/E)	19.61	0.491	2	1
IEEE Extremely Inverse Time (EI)	IEEE (IEC/F)	28.2	0.1217	2	1
US Time Inverse (CO8)	US	5.848	0.1654	2	1
US Short Time Inverse (CO2 P20)	US	0.02394	0.01694	0.02	1
US Short Time Inverse (CO2 P40)	US	0.16758	0.11858	0.02	1
BNP (EDF)	EDF	1000	0.655	2	1
RI		-4.2373	0	-1	1.43644

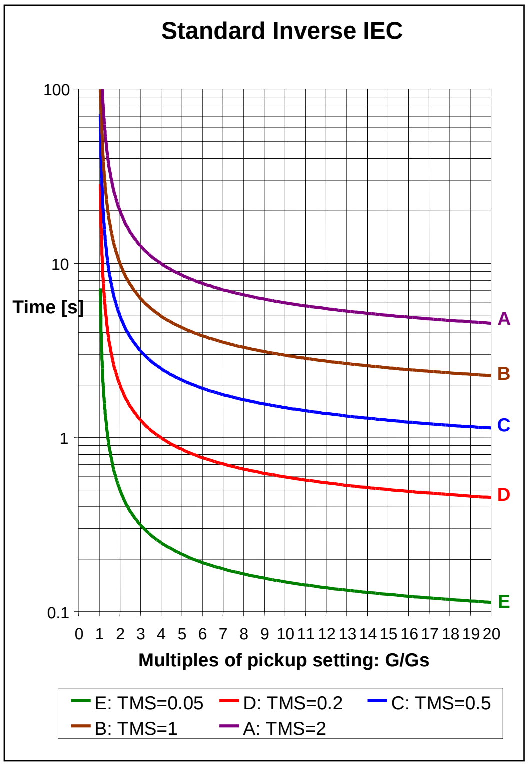
A time multiplier setting TMS is used to adjust the operating time of IEC & UK IDMT curves.

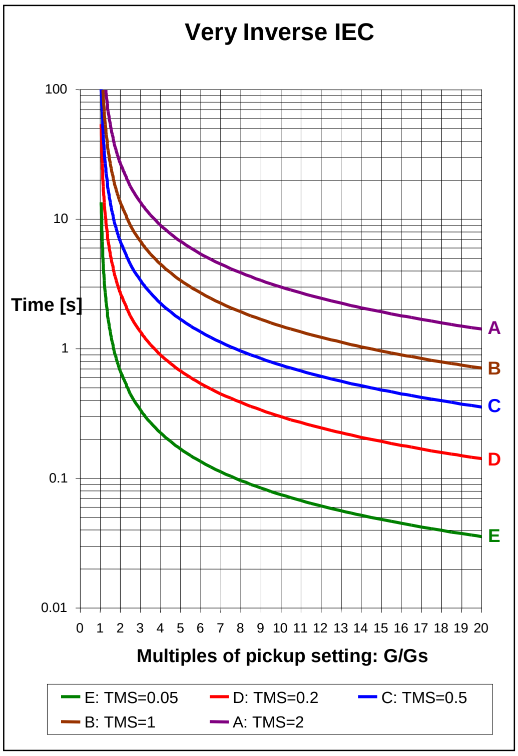
A time multiplier setting TD is used to adjust the operating time of IEEE or US IDMT curves.

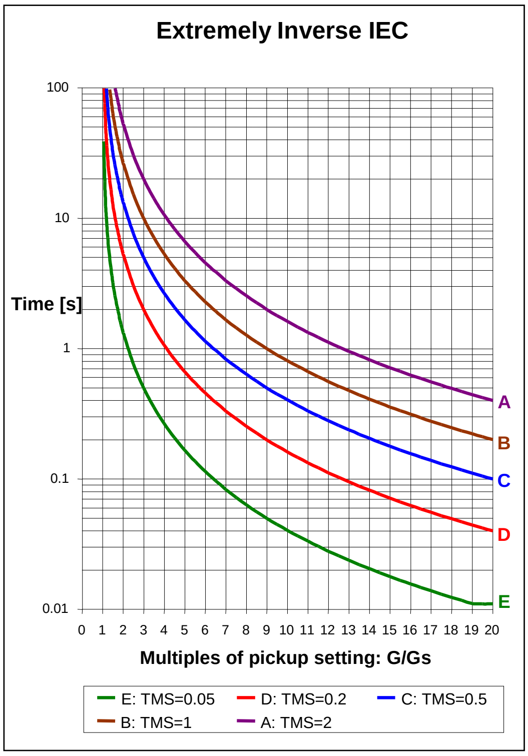
Note:

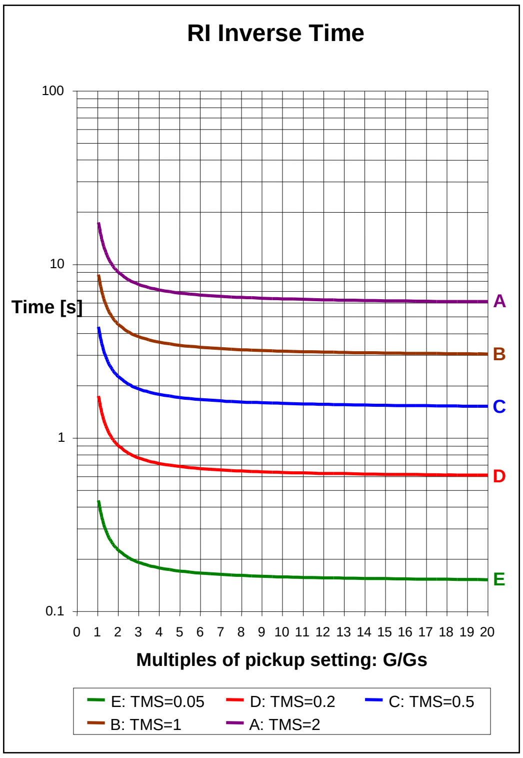
1. For (CO2 P20), TD is defined like in MiCOM P20 series
2. For (CO2 P40), TD is defined like in MiCOM P40 series

The difference between above two characteristics is in definition of TD setting value only.

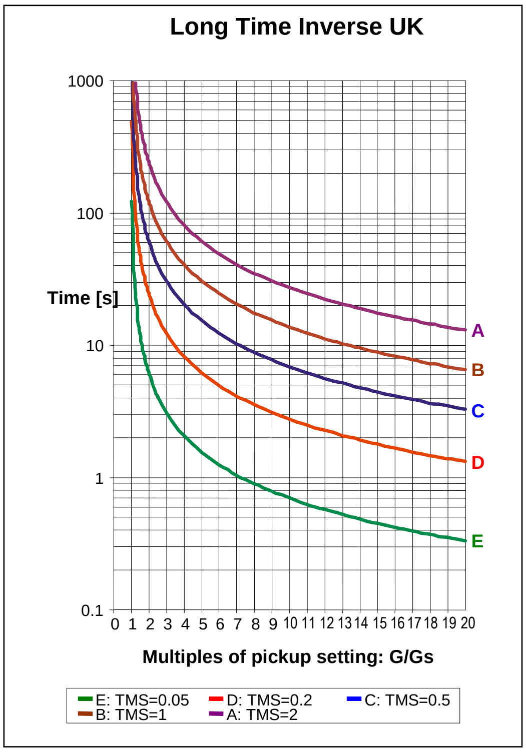


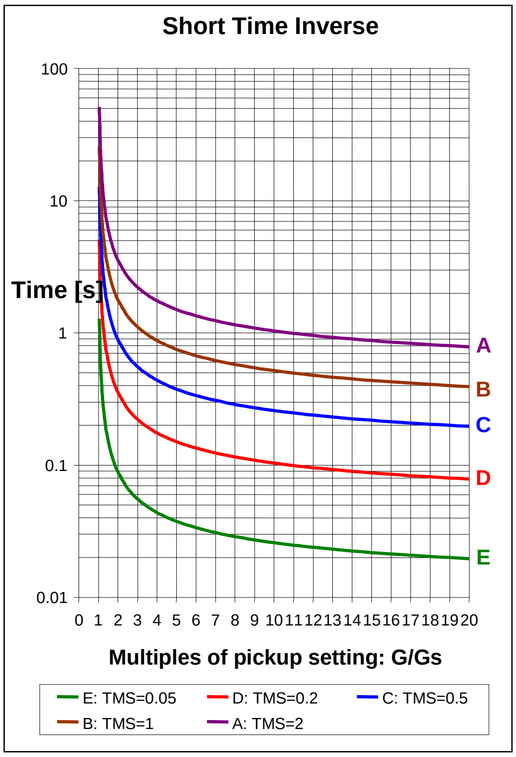


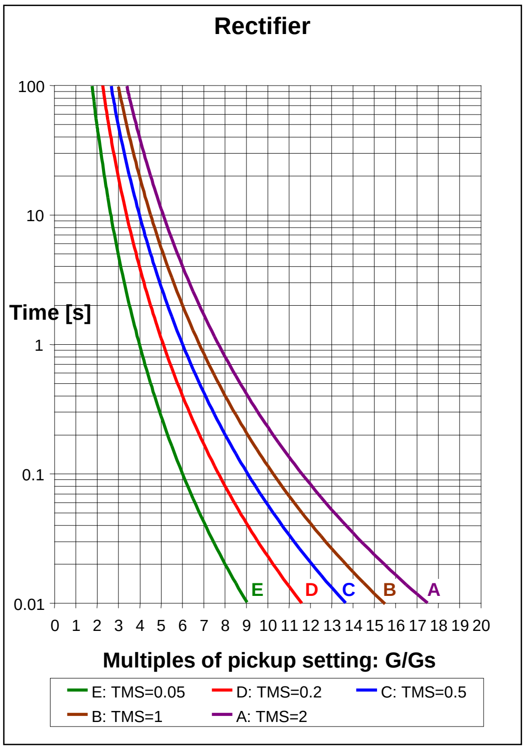


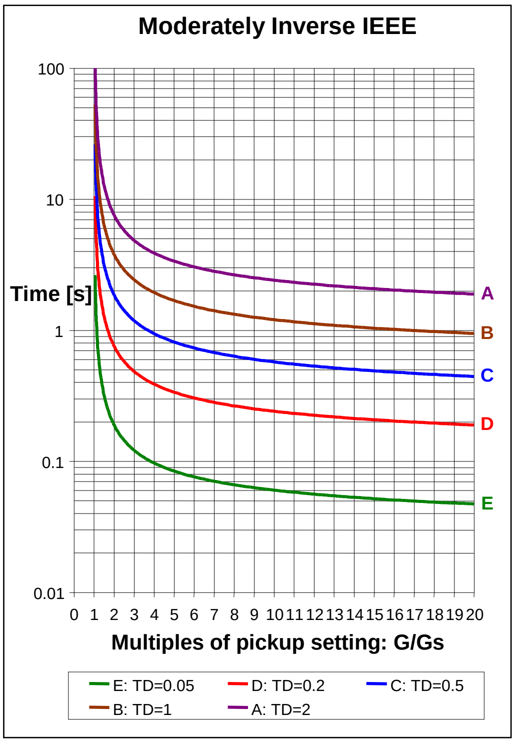


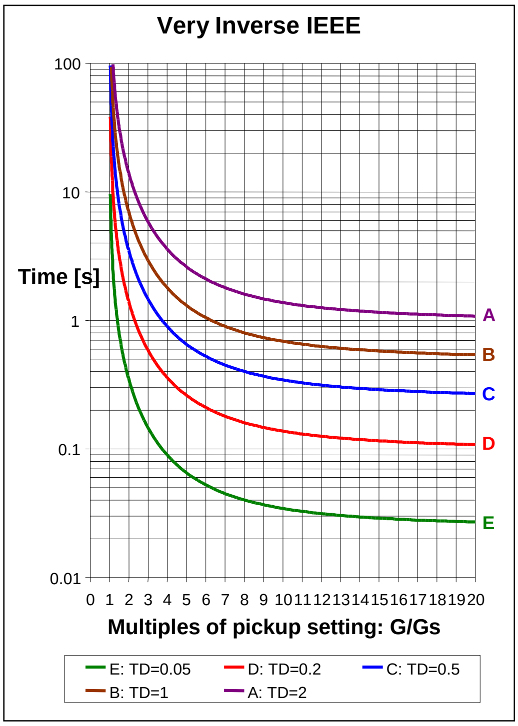
OP

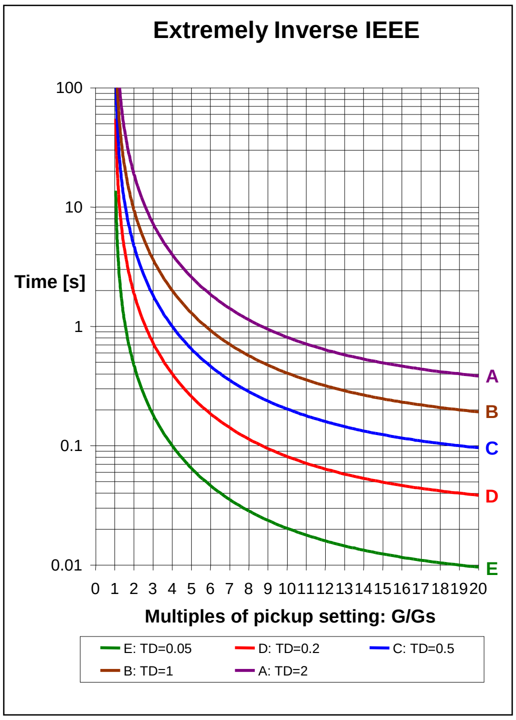

Long Time Inverse UK
1000
100
10
1
0.1
Time [s]
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Multiples of pickup setting: G/Gs
A
B
C
D
E
E: TMS=0.05
D: TMS=0.2
C: TMS=0.5
B: TMS=1
A: TMS=2

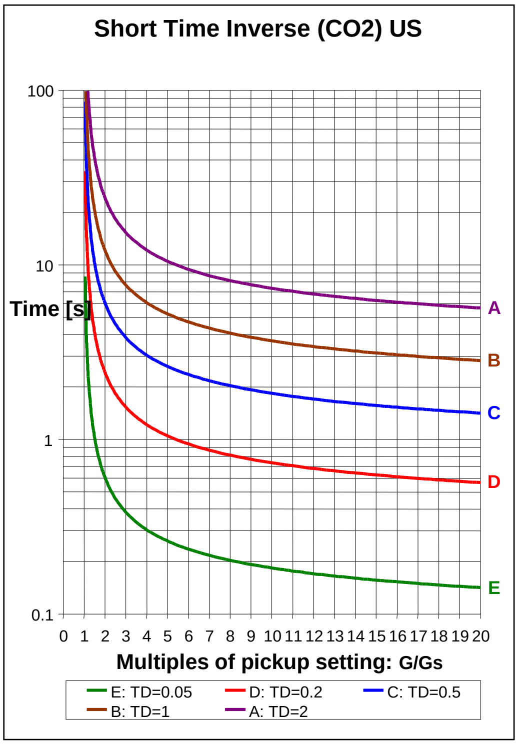

Short Time Inverse
100
10
1
0.1
0.01
Time [s]
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Multiples of pickup setting: G/Gs
A
B
C
D
E
E: TMS=0.05
D: TMS=0.2
C: TMS=0.5
B: TMS=1
A: TMS=2

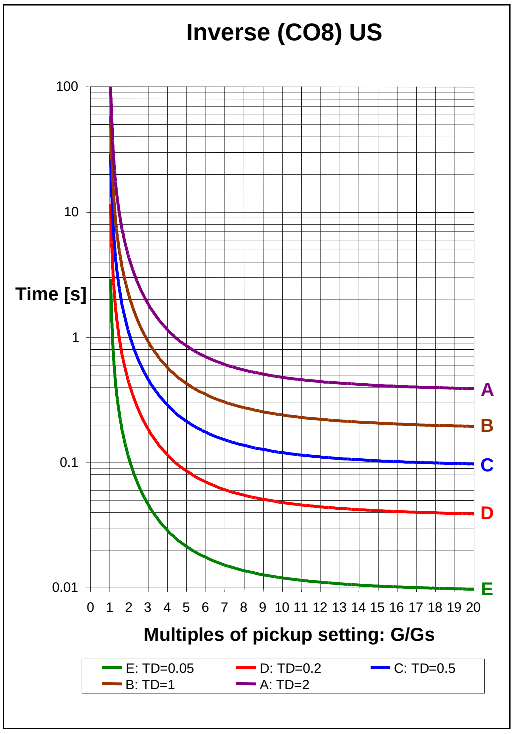

Rectifier
100
10
1
0.1
0.01
Time [s]
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Multiples of pickup setting: G/Gs
E
D
C
B
A
E: TMS=0.05
D: TMS=0.2
C: TMS=0.5
B: TMS=1
A: TMS=2


Moderately Inverse IEEE
100
10
1
0.1
0.01
Time [s]
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Multiples of pickup setting: G/Gs
A
B
C
D
E
E: TD=0.05
D: TD=0.2
C: TD=0.5
B: TD=1
A: TD=2









OP

RXIDG Curves

The curves available follow the formula:

t = 5.8 – 1.35 * Un (1/ (k * Us/U))

Where:

t = tripping time

k = coefficient (from 0.3 to 1, by steps of 0.01)

Us = value of the programmed threshold (Pick-up value)

U = value of measured voltage

Timer Hold Facility

First stage of overvoltage protection in the V11V relay are provided with a timer hold facility, which may either be set to zero or to a definite time value. Setting of the timer to zero means that the overvoltage timer for that stage will reset instantaneously once the voltage falls below 95% of the threshold setting. Setting of the hold timer to a value other than zero, delays the resetting of the protection element timers for this period. When the reset time of the overvoltage relay is instantaneous, the relay will be repeatedly reset and not be able to trip until the fault becomes permanent. By using the Timer Hold facility the relay will integrate the fault pulses, thereby reducing fault clearance time.

The timer hold facility can be found for the first overvoltage stages as settings ***V> DMT tRESET"***. Note that this cell is not visible for the IEC/IEEE/US curves if an inverse time reset characteristic has been selected (***SETTING GROUP x/PROTECTION Gx/ PHASE O/V G1(G2)/ V>) Reset Delay Type 1:IDMT*** setting), as the reset time is then determined by the programmed time dial setting.

OP

Reset IDMT Characteristic

IEEE/US /IEC

The IEEE/US/IEC curves may have an inverse time reset characteristic (***V> Reset Delay Type 1: IDMT*** setting) or instantaneous reset ***(V> Reset Delay Type 0:DMT*** setting). If IDMT reset is selected (***V> Reset Delay Type 1: IDMT*** setting) then the following menu will be available: ***V> RTD/RTMS RESET***. The following equation can be used to calculate the inverse reset time for IEEE/IEC curves:

IEC:
$$reset\ time = \mathrm{RTMS} \cdot \frac{\mathrm{tr}}{1-(\frac{G}{Gs})^{\mathrm{P}}}$$

IEEE:
$$reset\ time = \mathrm{RTD} \cdot \frac{\mathrm{tr}}{1-(\frac{G}{Gs})^{\mathrm{P}}}$$

where:

RTD = Time dial setting for IEEE/US curves,

RTMS = A time multiplier setting for IEC curves,

tr = Constant (see table below),

P = Constant (see table below).

Note: To be in line with IEEE/IEC the RTMS (RTD) value should be equal to the TMS (TD) value. The setting for RTMS or RTD is given to adjust the reset characteristic to specific applications. Typically RTMS = TMS and RTD = TD.

Type of Curve	Standard	tr	P
IEC Standard Inverse Time (SI)	IEC/A	12.1	2
IEC Very Inverse Time (VI)	IEC/B	43.2	2
IEC Extremely Inverse Time (EI)	IEC/C	80	2
IEC Long Time Inverse (LTI)	IEC	0	2
FR Short Time Inverse (STI)	FR	0	2
UK Rectifier (Rect)	UK	0	2
IEEE Moderately Inverse Time (MI)	IEEE (IEC/D)	4.9	2

IEEE Very Inverse Time (VI)	IEEE (IEC/E)	21.6	2
IEEE Extremely Inverse Time (EI)	IEEE (IEC/F)	29.1	2
Time Inverse (CO8)	US	5.95	2
Short Time Inverse (CO2_P20)	US	2.261	2
Short Time Inverse (CO2_P40)	US	2.261	2
BNP EDF	BNP EDF	0	2
RXIDG	RXIDG	0	0

Note:

1. For CO2_P20, RTD is defined like in MiCOM P20 series
2. For CO2_P40, RTD is defined like in MiCOM P40 series

The difference between above two characteristics is in definition of TD setting value only.

Reset DMT Characteristic

If Delay Type V> is set as DMT curve, the Reset Delay Type is consequently a DMT type. This applies independently from Reset Delay Type cell setting.

1.2 Undervoltage Protection

The undervoltage protection included in the V11V relays provides three-stage undervoltage protection with independent time-delay characteristics (DT or IDMT – depending on stage), which can be set to operate from phase to phase or phase to neutral voltage. All undervoltage settings apply to all three phases but are independent for each of the three stages.

Each protection stage can be also selected to Trip the CB (works when all three phases are faulty – AND option, or if any one phase is faulty – OR option) or to indicate a signal (Alarm) only, there is possibility to chose trip and alarm with blocking option from state of CB contacts (52a).

If an undervoltage protection stage (V**<**, V**<<** or V**<<<**) is set to ***Trip***, it means that that stage is linked to the ***Protect.Trip*** and ***Prot.Trip pulse*** functions (see LED and Output configuration).

If an undervoltage protection stage (V**<**, V**<<** or V**<<<**) is set to ***Alarm***, it means that that stage is linked to the ***Alarm*** function (see LED and Output configuration).

If ***OR Trip*** is selected, the undervoltage stage will trip when any one phase is faulty (works similarly for alarm option).

If ***AND Trip*** is selected, the undervoltage stage will trip when all phases are faulty (works similarly for alarm option).

If ***OR Trip/52a*** is selected, the undervoltage stage will trip when any one phase is faulty and there is confirmation of closed state of breaker (works similarly for alarm option).

If ***AND Trip/52a*** is selected, the undervoltage stage will trip when all phases are faulty and there is confirmation of closed state of breaker (works similarly for alarm option).

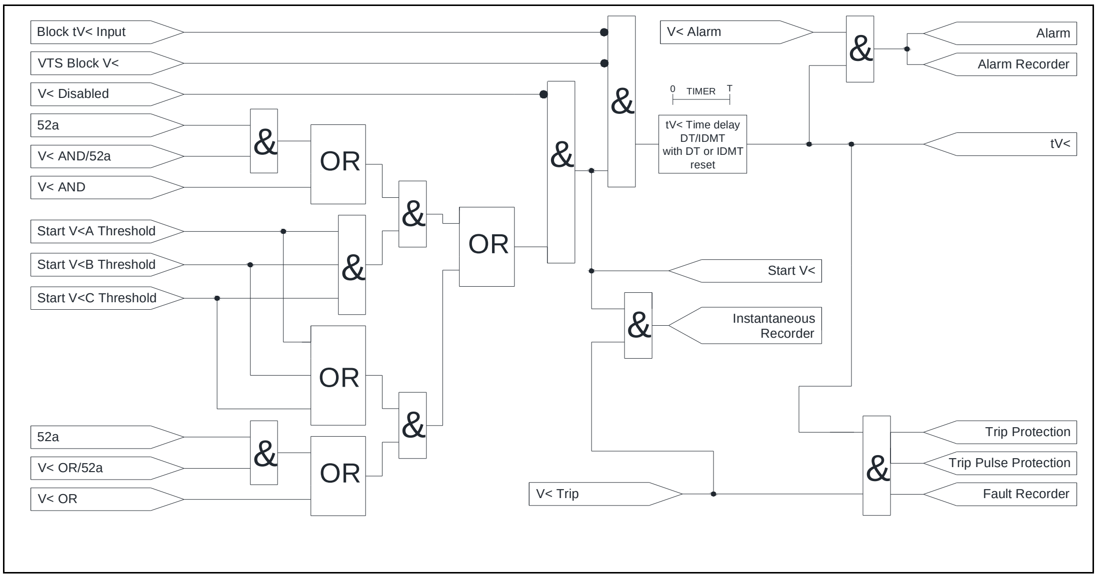


Figure 2: Undervoltage Protection Logic Diagram

The types of IDMT characteristics are the same like in overvoltage protection. For more information about time-delay characteristic, please refer to section 1.1.1 of this chapter, about time delayed reset characteristic please refer to section 1.1.2.

1.3 Earth Fault Overvoltage Protection

The Earth fault element operates from a measured or calculated (from phase voltage) earth fault voltage value.

The first earth fault stage has time-delayed characteristics which are selectable between inverse definite minimum time (IDMT) and definite time (DT). The second and third stages have a definite time characteristic only.

If an earth fault stage (***VN>, VN>>*** or ***VN>>>***) is set to ***Trip,*** it means that that stage is linked to the ***Protect.Trip*** and ***Prot.Trip pulse*** functions (see LED and Output configuration).

If an earth fault stage (***VN>, VN>>*** or ***VN>>>***) is set to ***Alarm***, it means that that stage is linked to the ***Alarm*** function (see LED and Output configuration).

If ***Trip (measured)*** is selected, the earth fault stage will trip from measured zero sequence of voltage.

If ***Alarm (measured)*** is selected, the earth fault stage will indicate alarm from measured zero sequence of voltage.

If ***Trip (Ua+Ub+Uc)*** is selected, the earth fault stage will trip from calculated zero sequence of voltage.

If ***Alarm (Ua+Ub+Uc)*** is selected, the earth fault stage will indicate alarm from calculated zero sequence of voltage

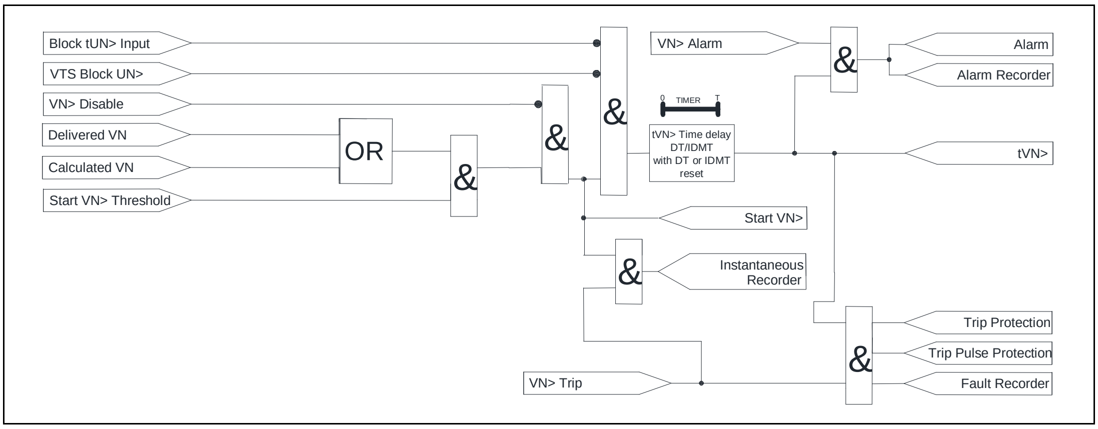


Figure 3: Earth Fault protection logic diagram for UN>. For other two stages, the logic diagram is the same but without the IDMT characteristics

The types of IDMT characteristics are the same, like in overvoltage protection. For more information about time-delay characteristic, please refer to section 1.1.1 of this chapter, about time delayed reset characteristic please refer to section 1.1.2.

OP

1.4 Negative Sequence Overvoltage Protection (Model N, A)

This function is used to protect against unbalance resulting from phase inversion or unbalanced supply.

The negative sequence overvoltage element included in the V11V relays provides two stage non-directional negative sequence overvoltage protection with independent time-delay characteristics. These characteristics are selectable between inverse definite minimum time (IDMT) and definite time (DT) for first stage, second stage can operate only with DT characteristic.

If the ***V2>*** protection element is set to ***Trip***, it means that the element is linked to the ***Protect.Trip*** and ***Prot.Trip pulse*** functions (see LED and Output configuration).

If the ***V2>*** protection element is set to ***Alarm***, it means that that element is linked to the ***Alarm*** function (see LED and Output configuration).

OP

If ***Trip*** is selected, the negative sequence overvoltage stage will trip when negative sequence of voltage exceeds set threshold value.

If ***Alarm*** is selected, the negative sequence overvoltage stage will indicate when negative sequence of voltage exceeds set threshold value.

If ***Trip/52a*** is selected, the negative sequence overvoltage stage will trip when negative sequence of voltage exceeds set threshold value and there is a confirmation of closed state of breaker.

If ***Alarm/52a*** is selected, the negative sequence overvoltage stage will indicate when negative sequence of voltage exceeds set threshold value and there is a confirmation of closed state of breaker.

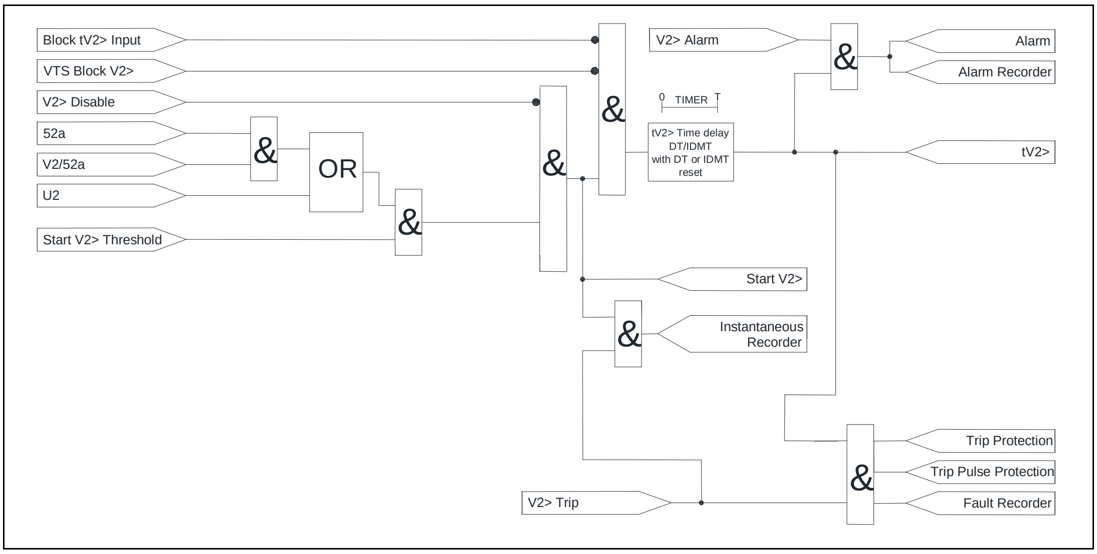


Figure 4: Negative sequence overvoltage protection logic

The types of IDMT characteristics are the same, like in overvoltage protection. For more information about time-delay characteristic, please refer to section 1.1.1 of this chapter technical manual, about time delayed reset characteristic please refer to section 1.1.2.

1.5 Positive Sequence Undervoltage Protection (Model A)

This function is used to protect motors against faulty operation due to insufficient or unbalanced network voltage, and detection of reverse rotation of motor.

The positive sequence undervoltage element included in the V11V relays provides two stage non-directional positive sequence undervoltage protection with independent time-delay characteristics. These characteristics are selectable between inverse definite minimum time (IDMT) and definite time (DT) for first stage. Second stage can operate only with DT characteristic.

If the ***V1<*** protection element is set to ***Trip***, it means that that element is linked to the ***Protect.Trip*** and ***Prot.Trip pulse*** functions (see LED and Output configuration).

If the ***V1<*** protection element is set to ***Alarm***, it means that that element is linked to the ***Alarm*** function (see LED and Output configuration).

If ***Trip*** is selected, the positive sequence overvoltage stage will trip when positive sequence of voltage exceeds set threshold value.

If ***Alarm*** is selected, the positive sequence overvoltage stage will indicate when positive sequence of voltage exceeds set threshold value.

If ***Trip/52a*** is selected, the positive sequence overvoltage stage will trip when positive sequence of voltage exceeds set threshold value and there is a confirmation of closed state of breaker.

If ***Alarm/52a*** is selected, the positive sequence overvoltage stage will indicate when positive sequence of voltage exceeds set threshold value and there is a confirmation of closed state of breaker.

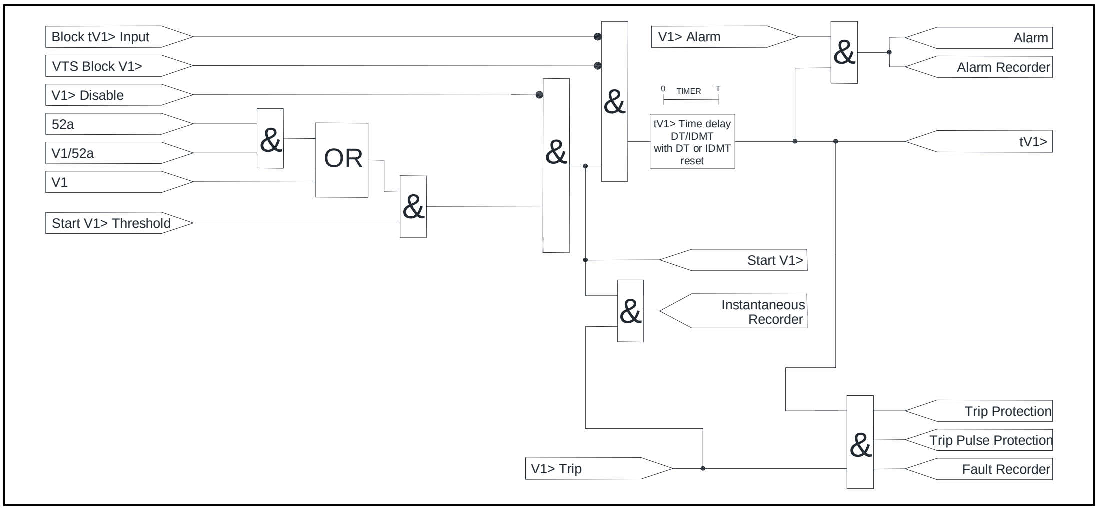


Figure 5: Positive Sequence Undervoltage Protection logic

The types of IDMT characteristics are the same, like in overvoltage protection. For more information about time-delay characteristic, please refer to section 1.1.1 of this chapter technical manual, about time delayed reset characteristic please refer to section 1.1.2.

OP

1.6 Frequency Protection (Model A)

This function has two possibilities of working: underfrequency and overfrequency. Underfrequency is used to detect abnormal, low frequency compared to the rated frequency, to monitor power supply quality, overfrequency option can detect abnormal, high frequency of power supply.

The frequency element included in the V11V relay provides six stages of non-directional overfrequency or underfrequency protection with independent time-delay characteristics. These characteristics are only definite time (DT) characteristic.

If the ***f> (or f<)*** protection element is set to ***Trip***, it means that that element is linked to the ***Protect.Trip*** and ***Prot.Trip pulse*** functions (see LED and Output configuration).

If the ***f*** protection element is set to ***Alarm***, it means that that element is linked to the ***Alarm*** function (see LED and Output configuration).

If ***f> Trip*** is selected, the frequency stage will work in overfrequency option and trip when frequency exceeds set threshold value.

If ***f> Alarm*** is selected, the frequency stage will work in overfrequency option and indicate alarm when frequency exceeds set threshold value.

If ***f< Trip*** is selected, the frequency stage will work in underfrequency option and trip when frequency exceeds set threshold value.

If ***f< Alarm*** is selected, the frequency stage will work in underfrequency option and indicate alarm when frequency exceeds set threshold value.

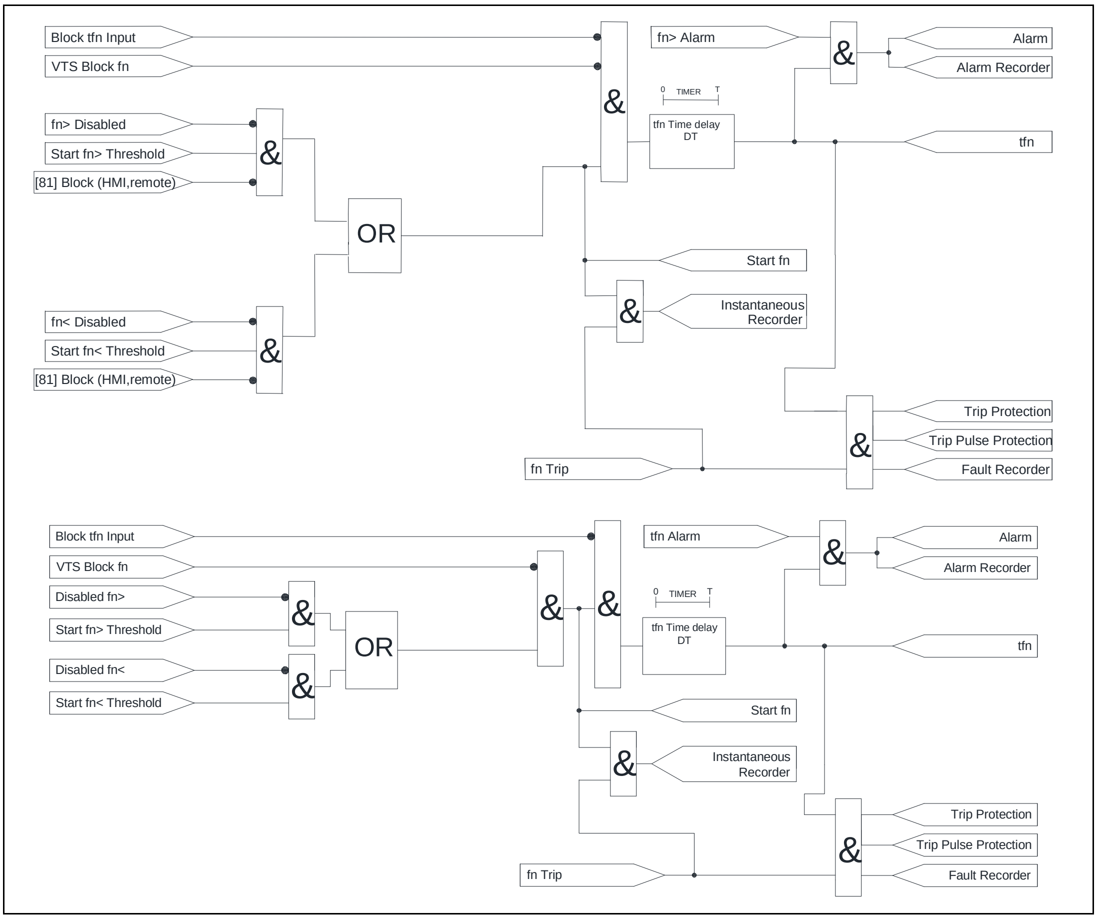


Figure 6: Frequency protection logic

1.7 Auxiliary Timers (Model NA)

Four auxiliary timers, tAux1, tAux2 and tAux3 are available and associated with logic inputs Aux1, Aux2 and Aux3 (refer to the ***SETTING GROUP x/INPUTS CONFIGURATION*** menu). When these inputs are energized, the associated timers start and, when the set time has elapsed, the associated LEDs (***SETTING GROUP 1(2)/LEDs CONFIGURATION*** menu) are lit up or/and the associated output relays close (refer to the ***SETTING GROUP 1(2)/OUTPUT RELAYS CONFIGURATION*** menu). Time-delays can be independently set from 0 ms to 600 s.

Each auxiliary timer can be set independently to:

- ***Disable***: Function is turn off,
- ***Trip***: Protection Trip signal,
- ***Alarm***: Alarm signal.

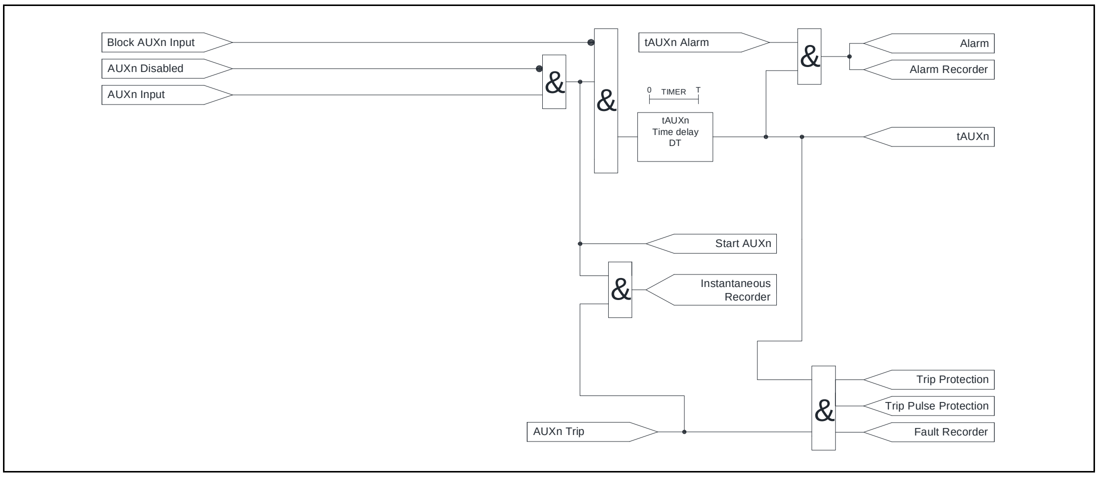


Figure 7: AUX Timer Logic (AUX1-AUX3)

In the ***SETTING GROUP x/INPUTS CONFIGURATION*** menu ***AUX4*** and/or ***AUX5*** can be mapped to inputs. These input functions have no timers (instantaneous action). They can be used as bridges between inputs and LEDs or inputs and outputs. It is not possible to link this input function to a ***Trip*** or ***Alarm*** signal.

OP

1.8 Blocking Logic Function (Model N, A)

Each stage of the protection element can be blocked via an appropriately configured binary input. Binary inputs can be assigned to the following functions (***SETTING GROUPx/INPUT CONFIGURATION Gx***):

- Block.tV>, (**NA**)
- Block.tV>>, (**NA**)
- Block.tV>>>, (**NA**)
- Block.tV<, (**NA**)
- Block.tV<<, (**NA**)
- Block.tV<<<, (**NA**)
- Block.tV1<, (**A**)
- Block.tV1<<, (**A**)
- Block.tV2>, (**NA**)
- Block.tV2>>, (**NA**)
- Block.tVN>, (**NA**)
- Block.tVN>>, (**NA**)
- Block.tVN>>>, (**NA**)
- Block.tf1, (**A**)
- Block.tf2, (**A**)
- Block.tf3, (**A**)
- Block.tf4, (**A**)
- Block.tf5, (**A**)
- Block.tf6. (**A**)

Such a configured input can be used by the blocking logic function or by a protection element disabling function (AUX).

The blocking logic function can be applied to radial feeder circuits where there is little or no back feed. For parallel feeders, ring circuits or where there can be a back feed from generators, directional relays should be considered.

The blocking logic function allows the upstream IDMT relay to be blocked by the start output of a downstream relay that has detected the presence of a fault voltage above its threshold. Thus both upstream and downstream relays can have the same voltage and time settings, and the blocking feature will automatically provide grading.

2. OPERATION OF NON PROTECTION FUNCTIONS

2.1 VT Supervision (Model N, A)

The voltage transformer supervision function is used to detect any failure of the analog inputs to the relay. This may be caused by internal voltage transformer faults, overloading or faults on the interconnecting wiring to relays.

VT supervision function can block protection function according to the settings, when VT loss is detected.

The detection mode can be selected in ***GLOBAL SETTINGS/VT SUPERVISION/ DETECTION MODE***:

– **VTS input** – VT supervision function works when input “VTS” is energized,

– **DELTA Vr** – VT supervision function works when internal calculation confirms a problem with VT,

– **DELTA Vr and VTS** – VT supervision function works when internal calculation confirms a problem with VT and/or input “VTS” is energized.

There is a possibility to set time delay to activate blocked protection function by VT supervision in ***GLOBAL SETTINGS/VT SUPERVISION/tVTS.***

The blocking protection by VT supervision can be selected in ***GLOBAL SETTINGS/VT SUPERVISION.***

2.2 Circuit Breaker State Monitoring (Model A)

An operator at a remote location requires a reliable indication of the state of the switchgear. Without an indication that each circuit breaker is either open or closed, the operator has insufficient information to decide on switching operations. The VAMP 11V relays incorporate circuit breaker state monitoring, giving an indication of the position of the circuit breaker.

This indication is available either on the relay front panel or via the communication network.

The CB position can be selected in ***SETTING GROUPx/INPUT CONFIGURATION Gx***):

- CB status 52A,
- CB status 52B.

If two inputs are assigned to both above inputs, CB status is based on both indications.

If only one function is used, CB status is based on a single-bit information only (the second is derived from the first one).

If CB Supervision function is activated (***GLOBAL SETTINGS/CIRCUIT BREAKER/CB Supervision?: 1:Yes***), CB monitoring logic detects abnormal CB’s position (opened and closed, or not opened and not closed) in the monitoring window: the max value from settings: ***Max CB Close Time*** or ***Max CB Open Time*** (***GLOBAL SETTINGS/CIRCUIT BREAKER*** column). CB monitoring logic checks CB position permanently, if an abnormal CB status is detected by the time longer than the monitoring window, the Alarm is issued (***Alarm State of CB***).

The CB’s status can be displayed on the V11V front panel using programmable LEDs. To assign an input to the CB status, an AUX function must be used.

For example:

L1 is assigned to CB status 52a and AUX4,

L2 is assigned to CB status 52a and AUX5,

LED 6 is assigned to AUX4,

LED 7 is assigned to AUX5.

In the above configuration LED6 indicates the CB closed position and LED7 indicates the CB open position.

If the Control menu cell is selected as the default display, the CB status is indicated on the LCD display:

```
CB status: Opened
CTRL: no operat.
```

OP

2.3 Local / Remote Mode (Model N, A)

The goal of this feature is to make possible to block commands sent remotely through communication networks (such as setting parameters, control commands, etc.), so as to prevent any accidents or mal operations during maintenance work performed on site.

Local Mode can be achieved by:

- Control Mode default cell in the menu:

LR Status: L+R
CTRL: no operat.

- A digital input labelled: ***Local CTRL Mode***

When the ***Local CTRL Mode*** input is energized, all remote commands are blocked. When the ***Local CTRL Mode*** input is de-energized, remote control commands can be issued. In Local mode, only the synchronizing time signal is allowed.

The Remote mode is set in ***GLOBAL SETTINGS/CIRCUIT BREAKER/Remote CTRL Mode:***

- ***0: Remote only*** – Only Remote control is permitted. All manual controls (HMI, Close/Trip function keys, Binary Inputs assigned to Manual Close or Trip) are blocked,
- ***1: Remote + LOC -*** Remote and Local controls are permitted.

Control Mode default cell:

The first line of CTRL Mode cell allows monitoring of the Local/Remote Mode status:

- ***Status: Local*** - Local mode,
- ***Stat: Remote*** – Remote Mode. ***GLOBAL SETTINGS/CIRCUIT BREAKER/Remote CTRL Mode*** is set to ***0: Remote only***,
- ***Status: L+R*** – Remote Mode. ***GLOBAL SETTINGS/CIRCUIT BREAKER/Remote CTRL Mode*** is set to ***1: Remote + Loc***.

The second line is used to change Local/Remote Mode in the menu:

- ***CTRL: no operat***. – No operation,
- ***CTRL: Local*** – Local Mode command,
- ***CTRL: Remote*** – Remote Mode command.

To change from ***Remote*** to ***Local*** mode it is necessary to press the OK key, enter Control Password (if it is set), press the OK key twice (confirm password and select changing). Press down or up key to choose ***Local*** confirm by Enter. LR Status indicates: LR Status: Local.

To change from ***Local*** to ***Remote*** mode it is necessary to press the OK key, enter Control Password (if it is set), press the OK key twice (confirm the password and select the change). Press the or key to select ***Remote*** then confirm by pressing the OK key. LR Status indicates: ***LR Status L+R*** (option ***Remote CTRL Mode 1: Remote + Local***) or ***LR Status Remote*** (option ***Remote CTRL Mode 0: Remote***) .

Note: if the Control Password is set to zero: no asking about password will appear – the Control Password is disabled.

It is possible to map the Local Mode state to a LED by assigning the LED to the ***Local CTRL Mode*** function (***SETTING GROUP x/LEDs CONFIGURATION Gx***).

2.4 Setting Group Selection

VAMP V11V relays has two protection setting groups called ***PROTECTION G1*** and ***PROTECTION G2***. Only one group is active at the same time.

If a group is used in an application it is possible to remove the other group from the menu in order to simplify the setting procedure. If one group only is chosen the relay uses Group 1 even if the other parameters are set to Group 2 (Input, Menu, Remote Group Setting).

The selection of the number of groups is done in ***GLOBAL SETTINGS/SETTING GROUP SELECT/Number of Groups: 1: One Group*** or ***2: Two Groups*****.**

If ***1: One Group*** is selected, the ***SETTING GROUP 2*** column and the setting group cell are hidden in the menu.

Switching between groups can be done via:

- a selected binary input assigned to the **Setting Group 2** logic input (***SETTING GROUP x/INPUTS CONFIGURATION Gx*** submenu),
- the relay front panel interface (***GLOBAL SETTINGS/SETTING GROUP SELECT/ Setting Group: 1: Group1*** or ***2: Group2***),
- through the communications port (refer to the Mapping Database for detailed information).

OP

Switching between setting groups can be done even while a protection function is active, but it resets all timers, LEDs on V11V front panel).

The user can check which one of the setting groups is active in the ***OP PARAMETERS*** menu: ***Active Set Group*** cell.

The user can also assign the active group (***Setting Group x*** function) to an output relay (***SETTING GROUP x/OUTPUT RELAYS CONFIGURATION Gx***) or to any LED (***SETTING GROUP x/LEDs CONFIGURATION G1***).

Setting group change via a digital input

It is possible to change the setting group by energizing a digital input (operates on level: logic input is low – setting group 1, logic input is high – setting group 2).

If the setting group switchover is done via a binary input, the change from Group 1 to Group 2 is executed after the set time-delay: ***t Change Setting G1->G2*** (***GLOBAL SETTINGS/SETTING GROUP SELECT***). The switch from Group 2 back to Group 1 is instantaneous.

Warning: If the digital input that has been assigned to the setting group change operates on level (low or high), it is not possible to change the setting group via remote communications.

Switch between Active Groups via a Binary Input

When powering up the relay, the selected group (Group 1 or Group 2) corresponds to the state of the logic input assigned to ***Setting Group 2***. This means:

A – ***Reverse Inp.Logic*** = 0 and ***Setting Group 2*** = 1
(***SETTING GROUP x/INPUTS CONFIGURATION Gx*** submenu),

If the programmed logic input starts being supplied with +V, then after the ***t Change Setting G1->G2*** time-delay the active group will be G2.
If the programmed logic input is not supplied with +V , then the active group will be G1.

B – ***Reverse Inp.Logic*** = 1 and ***Setting Group 2*** = 1
(***SETTING GROUP x/INPUTS CONFIGURATION Gx*** submenu),

If the programmed logic input is supplied with +V, then the active group will be G1.
If the programmed logic input stops being supplied with +V , then after the ***t Change Setting G1->G2*** time-delay the active group will be G2.

Notes:

1. Binary Input configuration is associated with both Setting Groups, so that if in a Setting Group the selected binary input is assigned to ***Setting Group 2***, in the other group it must be set to ***Setting Group 2*** as well, otherwise no switch will occur.

2. If the V11V is powered-up and Group 2 is selected via a binary input, the ***t Change Setting G1->G2*** time-delay is ignored (changing to setting group 2 is instantaneous – without time-delay).

3. The setting group switch is based on the level of the binary input. So as long as Setting Group 2's logic signal is high, the V11V uses Setting Group 2.

Switch between Active Groups via the Menu or a Remote Command (RS485, USB)

By using the relay front panel interface it is possible to change the active setting group: ***1: Group1*** or ***2: Group2*** (menu cell: ***GLOBAL SETTINGS/SETTING GROUP SELECT/ Setting Group***).

This menu cell is commonly used for switching groups from the front panel interface and via a remote command (RS485 or USB).

It means that if the ***GLOBAL SETTINGS/SETTING GROUP SELECT/Setting Group*** menu cell is set to ***1: Group1*** and the remote setting group 2 command is executed, the value of menu cell: ***GLOBAL SETTINGS/SETTING GROUP SELECT/Setting Group*** will be changed to ***2: Group2*** (Active group: 2).

Setting group 1 will be applied if:

- ***1: Group1*** is set in the ***GLOBAL SETTINGS/SETTING GROUP SELECT/Setting Group*** menu cell from the relay's front panel interface,

- the remote setting group 1 command is executed. The value of the ***GLOBAL SETTINGS/SETTING GROUP SELECT/Setting Group*** menu cell will then be changed to ***1: Group1***.

Priority

Warning: If the digital input that has been assigned to the setting group change operating on level (low or high), it is not possible to change the setting group via neither remote communications nor the front panel.

The detailed logic table for setting group selection is shown below:

Binary Input Setting Group 2 (NA)	Front Panel and Remote Setting	Active Group
Not configured	G1	G1
Not configured	G2	G2
G1	G1	G1
G1	G2	G1
G2	G1	G2
G2	G2	G2

Note: If a setting group change initiated by a remote command has not been effected due to priority settings, that command is ignored (not recorded in the V11V logic for the future, when priority settings allow changing).

It is possible to assign an Active Group state to an output contact by setting the output contact to the ***Setting Group x*** output (***SETTING GROUP x/OUTPUT RELAYS CONFIGURATION Gx***.

If Active Group signaling is required, some LEDs should be assigned to the ***Setting Group x*** function (***SETTING GROUP x/LEDs CONFIGURATION Gx***).

2.5 Commissioning

2.5.1 Maintenance Mode (Model A)

This menu allows the user to check the operation of the protection functions.

It is possible to set following ***Maintenance mode*** options (settings):

- "***No***" - ***Maintenance mode*** is disabled. All window cells below are hidden (***Maintenance mode*** is the latest cell in ***COMMISIONING*** column)
- "***Yes***" - ***Maintenance mode*** is enabled. In this mode all test cells in ***COMMISIONING*** column are shown. During tests outputs are energized.
- "***Yes,outp.block***" - ***Maintenance mode*** is enabled and all test cells in ***COMMISIONING*** column are shown. In this mode, the high states of output functions are ignored (control of outputs is blocked).

This option allows the user to check the operation of the protection functions without actually sending any external command (Tripping or signalling).

Depends on the rear protocol selected in menu, transmission of information to SCADA is blocked (Modbus RTU) or sent (IEC 103) with additional information to know that V11V is in Maintenance mode (refer to Communication chapter and EN 60870-5-103 standard).

Changing of setting from "***No***" to "***Yes,….***" from the front panel activates this mode for **10 minutes only**. After this time the option is automatically switched to "***No***".

The selection of the maintenance mode is possible by logic input (the level), control command (rear or front port), or by front panel interface. The maintenance mode is terminated by:

- Low state of logic input assigned to ***Maintenance mode*** function,
- Control command which activate this mode (rear command or setting: "***Yes,….***") and by turning off the power supply.

Note: Maintenance rear command is available in Modbus protocol only

Maintenance Mode
1: Yes

It is possible to assign the state of ***Maintenance Mode*** to programmable LEDs.

In "***Yes,outp.block***" case, all the output contacts are blocked, and no command can be issued to these contacts, even if a protection threshold associated with one of these output contacts has been crossed. (If a protection threshold is exceeded, all associated LEDs will be ON, even the TRIP LED, if protection element is set to ***Trip***).

If the Maintenance Mode is set in menu ("***Yes***" or "***Yes,outp.block***") after 10 minutes this function returns automatically to ***Maintenance mode*** "***No***" (function disabled).

If the input assigned ***to Maintenance Mode*** is logical high the Maintenance Mode is active (without any time limitation) up to low state of the logical input.

2.5.2 Outputs test

This function is available after activation of ***Maintenance mode***.

The commissioning cells allow the user to check the external wiring to the relay's output contacts. To do this, the user has to set to 1 the desired output contact's corresponding bit, and this will close the contact and allow the continuity of the wiring to be checked.

Test	7654321
Pattern	0000000

In the cell below, the contact test time can be set:

Contact Test
Time 1.00s

If the outputs for test are selected and Time for output closing is set, the closing command can be executed in this cell:

Test output
0: no operation

To execute the test, press OK key, press the ▲ or ▼ key to select ***1: Apply test*** and confirm action by OK. The contact will be closed for the duration of the ***Contact Test Time*** pulse.

OP

2.5.3 Functional test

This function is available after activation of ***Maintenance mode***

The next commissioning cells allow the user to check the functional output configuration of the V11V. To do this, the user has only to select which protection element will be triggered, and this will close the contact assigned to this protection element and allow the continuity of the wiring to be checked.

Functional Test
0: U>

In the cell below the end of the functional test can be configured:

Functional Test
End 0: CB trip

The following options are possible:

- ***0: CB trip*** – after triggering of functional test, the test is interrupted after trip command,
- ***1: Time*** – the protection element will be triggered for the duration of the pulse time,

If the ***1: Time*** option is selected it is necessary to set the pulse length:

Contact Test Time
Time 001.00s

The next cell is used for functional test execution:

Functional Test
CTRL: no operation

To execute this test, press the OK key, press the ▲ or ▼ key to select ***1: Operate*** and confirm action by pressing OK. The contact will be closed for the duration of the ***Contact Test Time*** pulse.

NOTE: In ***Maintenance Mode*** V11V works with full functionality (ready to trip in a fault condition, even during functional test). During functional test of selected stage (for example tU>), V11V measures voltages so the rest active stages (for example tU>>, tUN>, etc) work on the measured voltage from the field. Test voltage is seen in tested stage only (for example tU>): two times greater than tU> current setting value in all phases. After test, in the fault record all recorded voltages values are based on the voltage measured in the field.

2.6 Circuit Breaker Control

The relay includes the following options for control of a single circuit breaker:

- Local tripping and closing, via the relay menu or function keys,

- Local tripping and closing, via relay binary inputs, (**A**)

- Remote tripping and closing, using the relay communications, (**NA**)

If a local/remote external selector switch is to be used, it is recommended that separate relay output contacts are assigned to remote circuit breaker control and protection trip. This enables the control outputs to be selected via a local/remote selector switch as shown in Figure 8.

Where this feature is not required or is connected to a V11V binary input, the same output contact(s) can be used for both protection (***Protect.Trip*** output) and remote tripping (***Trip CB order*** output).

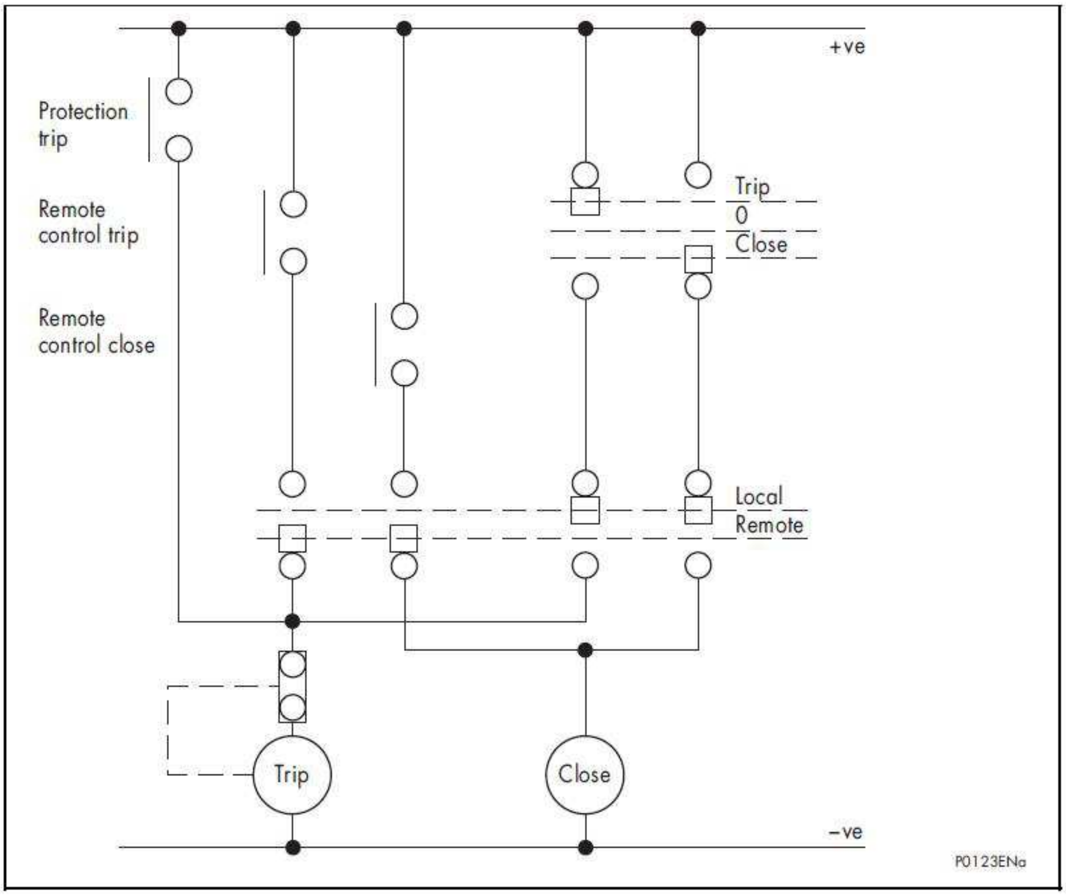


Figure 8: Remote Control of Circuit Breaker

A manual trip will be permitted when the circuit breaker is initially closed. Likewise, a close command can only be issued if the CB is initially open. To confirm these states it will be necessary to use the breaker 52A (assigned to ***CB status 52A*** input) and/or 52B (assigned to ***CB status 52B*** input) contacts. Under these circumstances manual CB control will be possible. Additionally, it will be not possible to see the CB status in the Control default cell.

Once a CB Close command is initiated the output contact (***Close CB order)*** can be set to operate following a user-defined time-delay (***Time-delay for Close*** setting in ***GLOBAL SETTINGS/CIRCUIT BREAKER*** menu). This would give personnel time to move safely away from the circuit breaker following the close command. This time-delay will apply to all manual CB Close commands.

The length of the trip or close control pulse can be set via the ***tOpen pulse min*** and ***tClose Pulse*** settings respectively (***GLOBAL SETTINGS/CIRCUIT BREAKER*** menu). This should be set as long enough to ensure the breaker has completed its open or close cycle before the pulse has elapsed.

Note: The manual trip and close commands are found in the default Control cell and the Close/Trip keys on the front panel.

If an attempt to close the breaker is being made, and a protection trip signal is generated, the protection trip command overrides the close command.

If ***CB FLT Ext.Sign*** is assigned to a binary input this signal is checked before manual closing of the CB. This function uses the signal received at the relay's binary input to confirm whether the breaker is capable of closing (sufficient circuit breaker energy for example). A user-settable time-delay, ***tCB FLT ext***, is included for manual closure. If, following a close command, the CB does not signal a healthy condition before the timer elapses, then the relay will lockout and issue an alarm.

Note: Trip and close commands work independently from CB status. It means that the Trip/Close command will be executed even if CB status is discrepancy (00 - undefined or 11 - faulty).

OP

2.7 Real Time Clock Synchronization via Opto-Inputs (Model A)

In modern protective schemes it is often desirable to synchronize the relay’s real time clock so that events from different relays can be placed in chronological order. This can be done using the communication interface connected to the substation control system or via a binary input. Any of the available binary inputs on the V11V relay can be selected for synchronization. Pulsing this input will result in the real time clock snapping to the nearest minute. The recommended pulse duration is 20 ms to be repeated no more than once per minute. An example of the time synchronization function is shown.

Time of “Sync. Pulse”	Corrected Time
19:47:00.000 to 19:47:29.999	19:47:00.000
19:47:30.000 to 19:47:59.999	19:48:00.000

Note: The above assumes a time format of hh:mm:ss

The input is configured in the ***SETTING GROUPx/INPUT CONFIGURATION Gx*** menu. The input must be assigned to the ***Time Synchr.*** Input (Model A).

2.8 Resetting of Latched LEDs and Outputs

How latched LEDs and outputs are reset is determined by the inputs assigned to the resetting of latched LED. Outputs can be reset via external inputs, by pressing the C clear key on the V11V front panel if the LCD shows the default display or via the communication port.

The resetting configuration can be entered in the ***GLOBAL SETTINGS/LOC*** menu:

- LEDs Reset:
    - ***0: Manual only*** (via Inputs, HMI C key, Remote Reset command)
    - ***1: Protection start*** (Start of a protection element set to Trip)
- Ltchd Outp. Reset:
    - ***0: Manual only*** (via Inputs, HMI C key, Remote Reset command)
    - ***1: Protection start*** (Start of a protection element set to Trip)

The ***Manual only*** option prevents a close command from being issued without readout of the cause of trip by maintenance personnel. It reduces the risk to switch on to fault.

The ***Manual only*** option prevents a close command from being issued without readout of the cause of trip by maintenance personnel. It reduces the risk to switch on to fault.

The ***Protection start*** option allows to signal the latest trip only: Start of any protection element set to trip the CB, reset all latched LEDs and show the default display.

2.9 Records

2.9.1 Fault Recorder

Each time any of the set thresholds are crossed, an instantaneous record is created and displayed in the ***RECORDS/FAULT RECORD*** menu. Information on the last five starts is available, with the duration of the signal.

The following information is displayed in the ***RECORDS/FAULT RECORD*** menu: time, date, origin (crossing of a voltage threshold or start of a protection element's time-delay), and voltage values.

Each time any of the set protection elements trips (***Protect.Trip*** output), a fault record is created and stored in memory. The fault record tags up to 20 faults and stores them in a non-volatile (FRAM) memory. This allows the operator to identify and analyze system failures. When the available memory space is exhausted, the new fault automatically overwrites the oldest fault.

The user can view the latest fault record in the ***RECORD/FAULT RECORDS*** menu, where the user can choose to display up to 20 stored records. These records are the fault flags, the fault measurements, etc. Also note that the time stamp displayed in the fault record itself will be more accurate than the corresponding time stamp given in the event record. This is due to the fact that events are logged some time after the actual fault is recorded.

2.9.2 Alarm Recorder

Each time any of the set protection element issues an ALARM signal (***Alarm*** output), an Alarm record is created and stored in memory. The fault record tags up to 5 faults and stores them in a non-volatile (FRAM) memory. This allows the operator to identify and analyze system failures. When the available memory space is exhausted, the new alarm automatically overwrites the oldest alarm.

The user can view the latest Alarm record in the ***RECORD/ALARM RECORDS*** menu, where he or she can choose to display up to 5 stored records. These records are the alarm flags, the alarm measurements, etc. Also note that the time stamp displayed in the Alarm record itself will be more accurate than the corresponding time stamp given in the event record.

2.10 Disturbance Recorder (Model A)

The integral disturbance recorder has a memory space specifically dedicated to the storage of disturbance records. Up to 4 seconds of disturbance recording can be stored. When the available memory space is exhausted, the new record automatically overwrites the oldest record.

The recorder stores actual samples that are taken at a rate of 16 samples per cycle.

Each disturbance record consists of analogue and digital channels. (Note that the relevant CT ratios for the analogue channels are also extracted to enable scaling to primary quantities).

The disturbance recorder is set in the ***GLOBAL SETTINGS/DISTURBANCE RECORDER*** menu.

The total disturbance recording time is 4s but not more than 5 records are available.

Total number of records available in disturbance recorder is:

- One **-** for set Max Record Time from in range: 2.01s – 4.00s
- Two – for set Max Record Time from in range: 1.51s – 2.00s
- Three – for set Max Record Time from in range: 1.01s – 1.33s
- Four – for set Max Record Time from in range: 0.81s – 1.00s
- Five **-** for set Max Record Time from in range: 0.10s – 0.8s

Triggering of disturbance recording depends on the ***Disturb.Rec.Trig.*** configuration:

- ***0: on Inst.*** – Start of a protection element set to ***Trip***,
- ***1: on Trip*** – Trip by a protection element followed by the ***Protect.Trip*** output.

If the ***0: on Inst***. option is selected the record consists of: Pre-fault time + duration of the "any Start" signal presence + Post-fault time.

If the ***1: on Trip*** option is selected the record consists of: Pre-fault time + duration of the Trip signal presence (***Protect.Trip*** function active) + Post-fault time.

The pre-fault time can be set in the cell: ***GLOBAL SETTINGS/DISTURBANCE RECORDER/Pre-Time***. If the pre-fault time is set to 100 ms, recording starts 100 ms before the disturbance.

The post-fault time can be set in the cell: ***GLOBAL SETTINGS/DISTURBANCE RECORDER/Post Trip Time***. If the post trip time is set to 100 ms, recording stops 100 ms after the trip signal.

2.11 Event Records (Model N, A)

The relay records and time-tags up to 200 events and stores them in a non-volatile (FRAM) memory. This allows the system operator to analyze the sequence of events that has occurred within the relay after a particular power system condition, or switching sequence, etc. When the available space is exhausted, the new fault automatically overwrites the oldest fault.

The real time clock within the relay time-tags each event, with a resolution of 1 ms.

The user can view the event records either locally via the USB port, or remotely, via the rear EIA(RS)485 port.

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APPLICATION NOTES

Date:	**1st December 2015**
Software Version:	**1A**
Connection Diagrams:	**10V11V02**

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FIGURES

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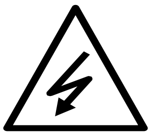
1. INTRODUCTION

1.1 Description of relay V11V

The relay V11V range is Schneider Electric universal voltage/frequency protection. This protection have been designed to control, protect and monitor industrial power network, public power grid.

Before carrying out any work on the equipment, the user should be familiar with the contents of the Safety Guide, SFTY/4L M/E11 or later issue, or the safety and technical data section of the technical manual and also the ratings on the equipment rating label.



For safety reasons, no work must be carried out on the V11V until all power sources to the unit have been disconnected.

2. APPLICATION OF INDIVIDUAL PROTECTION FUNCTIONS

The following sections detail individual protection functions in addition to where and how they may be applied. Each section provides some worked examples on how the settings are applied to the relay.

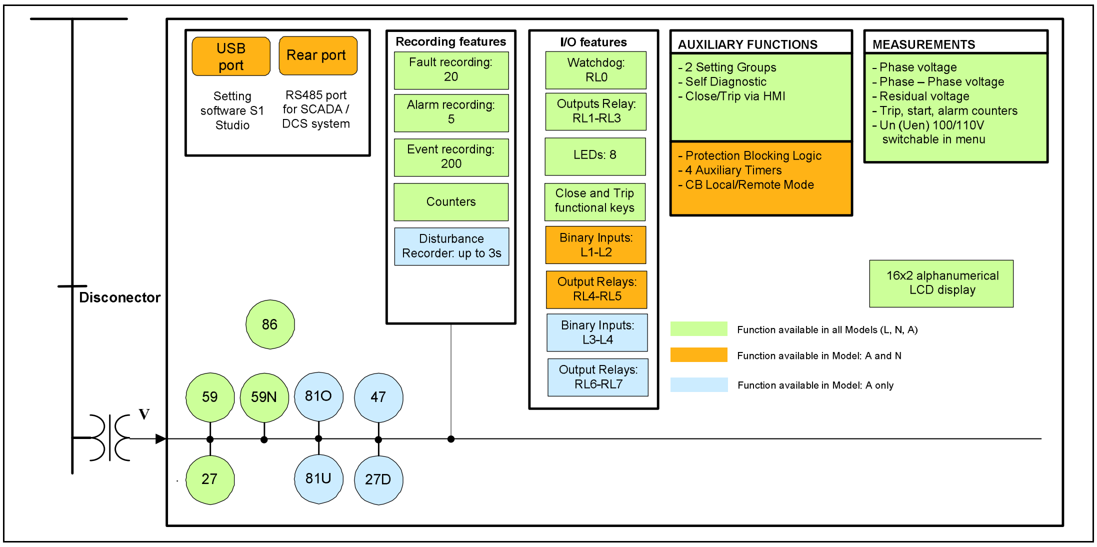


Figure 1: V11V single-line functional diagram (all options included)

2.1 Earth and phase overvoltage functions

Vamp 11V relays provide definite and independent time-delayed overvoltage protection.

Each phase voltage and earth voltage (or calculated earth voltage) input is associated with three stages.

The first and second timer stages for phase overvoltage and first stage for earth fault can be set to definite time-delay or inverse time-delay using the IEC_SI, IEC_VI, IEC_EI, IEC_LTI, UK_STI, C02_P20, US_ C08, IEEE_MI, IEEE_VI, IEEE_EI, RXIDG, BPN EDF, RI, RECT, C02_P40 curves. Their parameters are shown in the Technical Data chapter of this Technical Guide.

The third stage for o/v and second and third for e/f o/v can be set as definite time-delay only.

The instantaneous stages are labeled “V>” for the first stage, “V>>” and “V>>>” for the second and third instantaneous stages respectively (“VN>”, “VN>>” and “VN>>>” for earth fault elements).

The time-delayed stages are labeled “tV>” for the first stage, “tV>>” and “tV>>>” for the second and third time-delayed stages respectively (“tVN>”, “tVN>>” and “tVN>>>” for the time-delayed earth fault stages).

The protection elements trip when the following conditions are realized:

- A phase to phase or phase to neutral voltages exceeds the set overvoltage threshold
- The relevant time-delay has elapsed
- The blocking logic (if used) is not activated.

The following diagrams show the functionality for each stage.

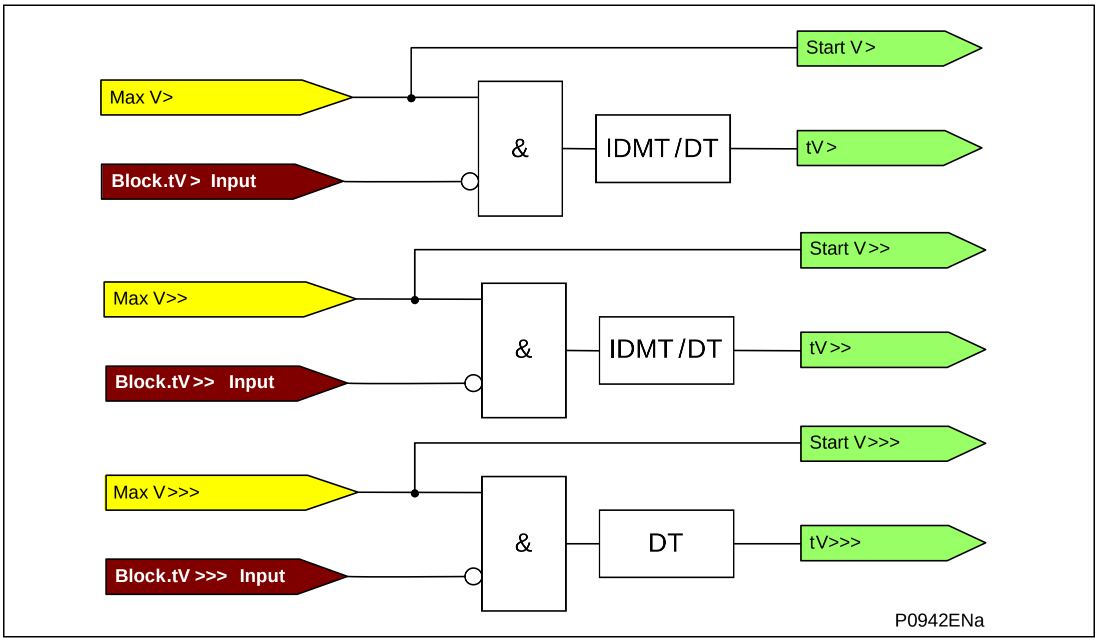


Figure 2: Logic diagram for the phase stages V>, V>> and V>>>

The logic associated with the earth fault stage is identical to the logic described above. The stages V> & tV>, V>> & tV>> and V>>> & tV>>> are respectively replaced by the stages VN> & tVN>, VN>> & tVN>>, VN>>> & tVN>>>.

Thanks to the "Blocking Logic" function, it is possible to freeze the timer as long as the "Block Logic" signal is active.

As soon as the blocking “Block Logic" signal drops, if the overvoltage value is still over the set threshold, the time-delay resumes using the value prior to the activation of the blocking function as its new initial value. This allows faster clearance of the fault after resetting of the “Block Logic" signal.

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2.1.1 Instantaneous function

As soon as a phase (or earth) timer stage starts running, the instantaneous output associated with that stage is activated. This output indicates that the protection element has detected a phase (or earth) fault and that the corresponding time-delay has started. This time-delay can be blocked via the associated "Block Logic" logic input. If this blocking input is activated by an output contact of a downstream relay, the logic that will lead to the trip command is then blocked only if the relay that is the closest to the fault can see and therefore eliminate the fault. This principle is known as «Blocking logic» or «Blocking». It is described in more detail in this document.

2.1.2 DMT timer stages

The three phase (earth) overvoltage stages can be assigned definite time-delays. The time to operate is equal to the set time-delay plus the time for the output contact to operate (typically about 30 ms) and the time required to detect the overvoltage condition (maximum 20 ms at 50 Hz).

For DMT stages, a definite-time "tReset" reset timer is associated with the first phase o/v stage, and with the first earth fault stage.

2.1.3 IDMT timer stages

The first and the second (V>, V>>) and e/f (VN>) overvoltage stages can be selected with an inverse maximum time (IDMT) characteristic.

The time-delay in relay operation is calculated with a mathematical formula that depends on the relay voltage and TMS (IEC and UK) or TD (IEEE and US) values.

There are twelve inverse time characteristics available:

- SI: Standard Inverse Time Characteristic (IEC/A)
- VI: Very Inverse Time Characteristic (IEC/B)
- EI: Extremely Inverse Time Characteristic (EC/C)
- LTI: Long Time Inverse Characteristic (IEC)
- STI: Short Time Inverse Characteristic (FR)
- RC: Rectifier Characteristic (UK)
- MI: Medium Inverse Time Characteristic (IEEE, IEC/D)
- VI: Very Inverse Time Characteristic (IEEE, IEC/E)
- EI: Extremely Inverse Time Characteristic (IEEE, IEC/F)
- CO2 P20: Short Time Inverse Characteristic (US)
- CO2 P40: Short Time Inverse Characteristic (US)
- CO8: Inverse Characteristic (US)
- RI: Electromechanical Inverse Characteristic
- BNP Time Charactristic (EDF)
- RXIDG Time Charactristic

The mathematical formulae and curves for the twelve Inverse Time characteristics available with the V11V are presented in chapter OP ("Operation").

2.1.4 Reset timer

The first overvoltage [V>] and the first earth fault [VN>] stages have a reset timer.

The value that is set for this reset timer corresponds to the minimum time during which the voltage value needs to be lower than 95% of the phase to phase or phase to neutral (or earth) threshold before the corresponding phase (or earth) time-delay is reset.

Note: This rule does not apply when the protection element is triggered. When the protection element is triggered, the time-delay tV> (or tVN>) is immediately reset.

DMT stages have DMT reset timers only.

IDMT characteristics can be associated with either a DMT or an IDMT reset timer. This selection is made in the menu:

- phase voltage: ***SETTING GROUP x/PROTECTION Gx /[59] PHASE O/V Gx /Reset Delay Type***: ***0:DT High State or 1: IDMT***
- earth voltage: ***SETTING GROUP x/PROTECTION Gx /[59N] E/GND FAULT O/V Gx/Reset Delay Type***: ***0: DT High State or 1: IDMT***

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DMT Reset Timer

Type of timer associated with the first & second phase (50/51 only) stages	DMT Reset Timer
DT High State (see note below)	0 ms to 600 s
IDMT	0 ms to 600 s

For the first phase and earth overvoltage stages, the Vamp 11V has a timer hold facility, ***DMT tReset***, which can be set to a definite time value or to an inverse time characteristic.

This timer hold facility is used to reduce fault clearance times and is also useful in situations where intermittent faults may be experienced. This can for example be the case on a plastic-insulated cable. In that case, the fault energy may cause the cable insulation to melt and reseal, thereby extinguishing the fault. This process repeats itself a couple of times giving a succession of fault current pulses, each of increasing duration with reducing intervals between the pulses, until the fault becomes permanent.

When the reset time of the overvoltage relay is instantaneous the relay will be repeatedly reset and unable to trip until the fault becomes permanent. By using the Timer Hold facility, the relay will integrate the fault voltage pulses, thereby reducing fault clearance time.

The Vamp 11V's reset timer ***DMT tReset*** can be found in the following menu cells:

- ***SETTING GROUP x/PROTECTION Gx /[59] PHASE O/V Gx /DMT tReset*** for the phase.
- ***SETTING GROUP x/PROTECTION Gx /[59N] E/GND FAULT O/V Gx /DMT tReset*** for the earth.

IDMT Reset Timer (IDMT Reset Characteristic)

When the reset time of the overvoltage relay is instantaneous, the relay will be repeatedly reset and unable to trip until the fault becomes permanent. By using the Timer Hold facility for IDMT characteristics the relay will integrate the fault voltage pulses, thereby reducing fault clearance time.

For IDMT it is possible to set the timer hold facility based on the following formulae:

IEC: $t = RTMS \times \left(\dfrac{tr}{1 - \left(\dfrac{G}{Gs} \right)^{p}} \right)$

IEEE and US: $t = RTD \times \left(\dfrac{tr}{1 - \left(\dfrac{G}{Gs} \right)^{p}} \right)$

where:

t Reset time

tr, p Constant (see table)

G Value of the measured voltage

Gs Value of the programmed threshold (pick-up value)

RTMS Reset time multiplier setting between 0.02 and 1.5.

RTD Reset time multiplier setting between 0.02 and 100.

Type of curve	Standard	tr	p
US Short time inverse	C02_P40	2.261	2
US Short time inverse	C02_P20	2.261	2
Long time inverse	C08	5.95	2
IEEE Moderately inverse (MI)	IEEE	4.9	2
IEEE Very inverse (VI)	IEEE	21.6	2
IEEE Extremely Inverse (EI)	IEEE	29.1	2
IEC Standard Inverse Time (SI)	IEC/A	12.1	2
IEC Very Inverse Time (VI)	IEC/B	43.2	2
IEC Extremely Inverse Time (EI)	IEC/C	80	2
IEC Long Time Inverse (LTI)	IEC	0	2
FR Short Time Inverse (STI)	FR	0	2
UK Rectifier (Rect)	UK	0	2
BNP EDF	BNP EDF	0	2
RXIDG	RXIDG	0	0
RI	RI	0	2

Table 1: The value of “tr” for IDMT characteristics

Notes: 1. According to the IEEE and US standards, RTD should be equal to TD. By separately setting the values for RTD and TD it is possible to adapt the reset time to a specific application.

2. Typically for IEC characteristic RTMS can be set equal to TMS.

2.1.5 Earth fault protection

Earth fault (E/F) voltage can be measured on the e/f input (A,N) or calculated from phase voltage.

Three stages are available: VN>, VN>> and VN>>>. The first stage has IDMT or DT characteristics. The types of characteristics are the same as for V> (refer to section 2.1.3).

2.2 Phase undervoltage functions

Vamp 11V relays provide definite and independent time-delayed undervoltage protection.

Each phase voltage input is associated with three stages.

The first timer stage for phase undervoltage can be set to definite time-delay or inverse time-delay using the IEC_SI, IEC_VI, IEC_EI, IEC_LTI, UK_STI, C02_P20, US_ C08, IEEE_MI, IEEE_VI, IEEE_EI, RXIDG, BPN EDF, RI, RECT, C02_P40 curves. Their parameters are shown in the Technical Data chapter of this Technical Guide.

The second and third stage for u/v can be set as definite time-delay only.

The instantaneous stages are labeled “V<” for the first stage, “V<<” and “V<<<” for the second and third instantaneous stages respectively.

The time-delayed stages are labeled “tV<” for the first stage, “tV<<” and “tV<<<” for the second and third time-delayed stages respectively.

The protection elements trip when the following conditions are realized:

- A phase to phase or phase to neutral voltages exceeds the set undervoltage threshold
- The relevant time-delay has elapsed
- The blocking logic (if used) is not activated.

The first phase undervoltage stages [V</tV<] has a reset timer.

The value that is set for this reset timer corresponds to the minimum time during which the voltage value needs to be higher than 102% of threshold before the corresponding phase time-delay is reset.

Note: This rule does not apply when the protection element is triggered. When the protection element is triggered, the time-delay tV< is immediately reset.

All other information about undervoltage functions are similar to o/v function. Refer to 2.1.

2.3 Positive sequence undervoltage (A)

Positive sequence undervoltage function has two independent stages. Each stage can work to trip and signal to alarm.
We have possibility to block this function from sate of the connector (when state is open function is blocked) or from input.

The first s positive sequence undervoltage stage can be set to definite time-delay or inverse time-delay using the IEC_SI, IEC_VI, IEC_EI, IEC_LTI, UK_STI, C02_P20, US_ C08, IEEE_MI, IEEE_VI, IEEE_EI, RXIDG, BPN EDF, RI, RECT, C02_P40 curves. Their parameters are shown in the Technical Data chapter of this Technical Guide.

The second stage can be set as definite time-delay only.

The instantaneous stages are labeled “V1<” for the first stage, “V1<<” for the second instantaneous stages respectively.

The time-delayed stages are labeled “tV1<” for the first stage, “tV1<<” for the second time-delayed stages respectively.

The protection elements trip when the following conditions are realized:

- A positive sequence of the voltage exceeds the set undervoltage threshold
- The relevant time-delay has elapsed
- The blocking logic (if used) is not activated.

The first stage [V1</tV1<] has a reset timer.

The value that is set for this reset timer corresponds to the minimum time during which the voltage value needs to be higher than 102% of threshold before the corresponding phase time-delay is reset.

Note: This rule does not apply when the protection element is triggered. When the protection element is triggered, the time-delay tV1< is immediately reset.

All other information about undervoltage functions are similar to o/v function. Refer to 2.1.

2.4 Negative sequence overvoltage (N, A)

Negative sequence overvoltage function has two independent stages. Each stage can work to trip and signal to alarm.
We have possibility to block this function from sate of the connector (when state is open function is blocked) or from input.

The first negative sequence overvoltage stage can be set to definite time-delay or inverse time-delay using the IEC_SI, IEC_VI, IEC_EI, IEC_LTI, UK_STI, C02_P20, US_ C08, IEEE_MI, IEEE_VI, IEEE_EI, RXIDG, BPN EDF, RI, RECT, C02_P40 curves. Their parameters are shown in the Technical Data chapter of this Technical Guide.

The second stage can be set as definite time-delay only.

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The instantaneous stages are labeled “V2>” for the first stage, “V2>>” for the second instantaneous stages respectively.

The time-delayed stages are labeled “tV2>” for the first stage, “tV2>>” for the second time-delayed stages respectively.

The protection elements trip when the following conditions are realized:

- A negative sequence of the voltage exceeds the set overvoltage threshold
- The relevant time-delay has elapsed
- The blocking logic (if used) is not activated.

All other information about undervoltage functions are similar to o/v function. Refer to 2.1.

2.5 Underfrequency protection (A)

Frequency variations on a power system are an indication that the power balance between generation and load has been lost. In particular, under-frequency implies that the net load is in excess of the available generation. Such a condition can arise, when an interconnected system splits, and the load left connected to one of the subsystems is in excess of the capacity of the generators in that particular subsystem. Industrial plants that are dependent on utilities to supply part of their loads will experience under-frequency conditions when the incoming lines are lost.

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An underfrequency condition at nominal voltage can result in over-fluxing of generators and transformers and many types of industrial loads have limited tolerances on the operating frequency and running speeds e.g. synchronous motors. Sustained underfrequency has implications on the stability of the system, whereby any subsequent disturbance may lead to damage to frequency sensitive equipment and even blackouts, if the underfrequency condition is not corrected sufficiently fast.

The underfrequency protection settings are found in the

SETTING GROUP x/PROTECTION Gx /[81O/81U] FREQUENCY/f?/f< trip/alarm.

2.5.1 Setting guidelines

In order to minimize the effects of underfrequency on a system, a multi stage load shedding scheme may be used with the plant loads prioritized and grouped. During an underfrequency condition, the load groups are disconnected sequentially depending on the level of underfrequency, with the highest priority group being the last one to be disconnected.

The effectiveness of each stage of load shedding depends on what proportion of the power deficiency it represents. If the load shedding stage is too small compared to the prevailing generation deficiency, then the improvement in frequency may be non-existent. This aspect should be taken into account when forming the load groups.

Time delays should be sufficient to override any transient dips in frequency, as well as to provide time for the frequency controls in the system to respond. This should be balanced against the system survival requirement since excessive time delays may jeopardize system stability. Time delay settings of 5 - 20s are typical.

The relatively long time delays are intended to provide time for the system controls to respond and will work well in a situation where the decline of system frequency is slow. For situations where rapid decline of frequency is expected, the load shedding scheme above should be supplemented by rate of change of frequency protection elements.

2.6 Overfrequency protection (A)

Over frequency running of a generator arises when the mechanical power input to the machine exceeds the electrical output. This could happen, for instance, when there is a sudden loss of load due to tripping of an outgoing feeder from the plant to a load center. Under such over speed conditions, the governor should respond quickly so as to obtain a balance between the mechanical input and electrical output, thereby restoring normal frequency. Over frequency protection is required as a back-up to cater for slow response of frequency control equipment.

The underfrequency protection settings are found in the

SETTING GROUP x/PROTECTION Gx /[81O/81U] FREQUENCY/fx/f< trip/alarm.

2.6.1 Setting guidelines

Following faults on the network, or other operational requirements, it is possible that various subsystems will be formed within the power network and it is likely that each of these subsystems will suffer from a generation to load imbalance. The “islands” where generation exceeds the existing load will be subject to over frequency conditions, the level of frequency being a function of the percentage of excess generation. Severe over frequency conditions may be unacceptable to many industrial loads, since running speeds of motors will be affected.

2.7 LOCAL / REMOTE MODE (N, A)

2.7.1 General

The goal of this feature is to make it possible to block commands sent remotely through communication networks (such as setting parameters, control commands, etc.), so as to prevent any accidents or maloperation during maintenance work performed on site.

A digital input labeled “***Local CTRL mode***” is assigned to this feature. In Local mode, only the synchronizing time signal is allowed.

The local mode can also be set in default CTRL mode cell. The Local/Remote mode state is displayed in this cell.

2.7.2 Setting

The Remote Mode state can be set in the ***GLOBAL SETTINGS/CIRCUIT BREAKER/ Remote Mode*** cell:

- ***0: Remote only*** – Local control via an input or/and the HMI or/and the Close/Trip key are blocked.
- ***1: Remote + Local*** – Local and Remote control are permitted.

When the “Local” input is energized, all remote commands are blocked. When the “Local” input is de-energized, remote control commands are accepted.

If local/remote switching has to be done outside of the V11V, the output configuration can be as follows (Figure 3):

- the protection trip is assigned to the ***Prot.Trip pulse*** output,
- the remote close command is assigned to the ***Close CB Order*** output,
- the remote trip command is assigned to the ***Trip CB Order*** output.

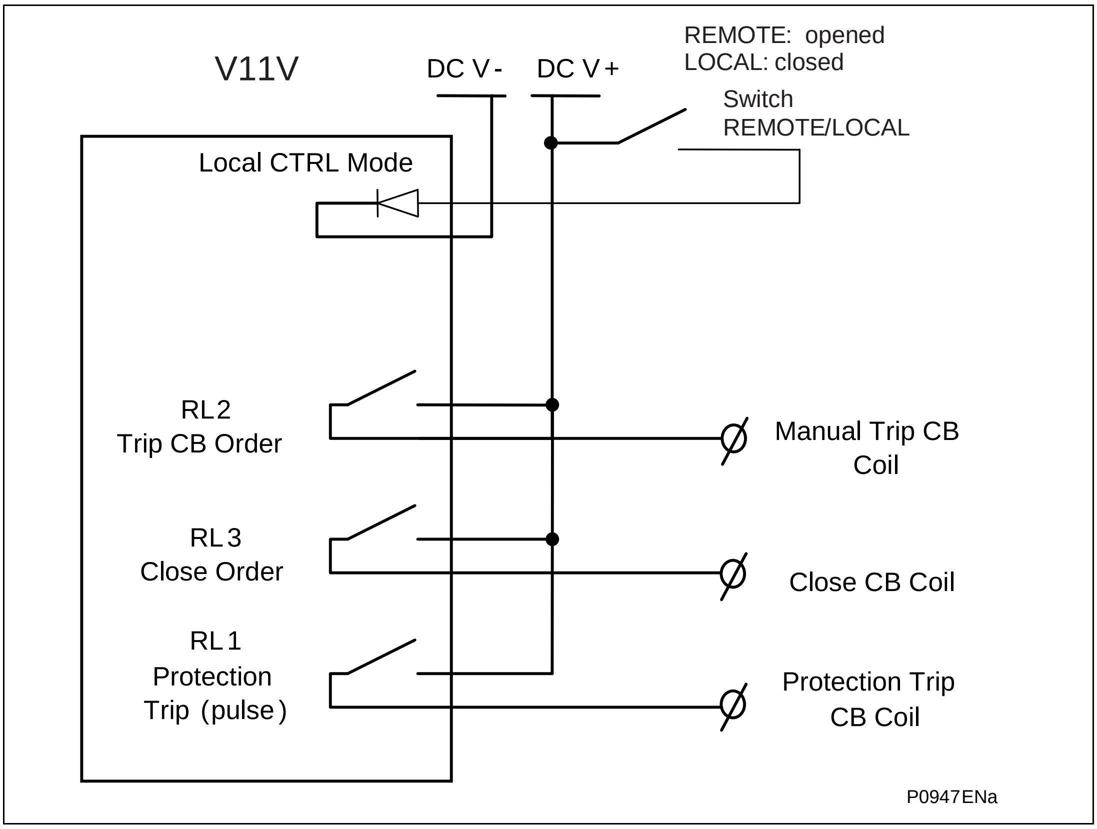

Figure 3: Example of Local/Remote Application

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2.8 Auxiliary timers (N, A)

Two for model N and three auxiliary timers tAux1, tAux2, tAux3 are available and associated with Aux1, Aux2, Aux3 logic inputs (refer to ***SETTING GROUP x/INPUTS*** menu).

When these inputs are energized, the associated timers start and, when the set time has elapsed, the associated output relays close (refer to ***SETTING GROUP x/OUTPUT RELAYS CONFIGURATION Gx***). Time-delays can be independently set from 0 ms to 600 s (***SETTING GROUP x/PROTECTION Gx/AUX TIMERS*** menu).

AUX function can be configured to:

- Trip (***Protect.Trip***, ***Prot.Trip pulse***, Disturbance and Fault Recorder, **TRIP** LED and FLAG)
- Alarm (***Alarm***, ***Alarm*** LED),

For more details about: Trip, Alarm refer to the Operation Chapter (V11V/EN OP)

AUX and ***tAUX*** signal can be assigned to LEDs or outputs.

Binary Inputs can be configured to AUX4 and AUX5. These AUX functions have no timers and can be used as logic bridge between inputs and: LEDs and/or outputs.

2.9 Setting Group Selection

V11V relays have two protection setting groups called PROTECTION G1 and PROTECTION G2. Only a one group is active at any time.

If a group is used in an application it is possible to remove the other group from the menu in order to simplify the setting procedure. If one group only is chosen the relay uses Group 1 even if the other parameters are set to Group 2 (Inputs, Menu, Remote Group Setting).

The selection of the number of groups is done at ***GLOBAL SETTINGS/SETTING GROUP SELECT/ Number of Groups: 1: One Group*** or ***2: Two Groups.***

If ***1: One Group*** is selected, the ***SETTING GROUP 2*** column and the setting group cell are hidden in relay menu.

Switching between the groups can be done via:

- a selected binary input assigned to the **Setting Group 2** logic input (***SETTING GROUP x/INPUTS*** submenu),
- the relay front panel interface (***GLOBAL SETTINGS/SETTING GROUP SELECT/ Number of Groups: 0: One Group*** or ***1: Two Groups***),
- through the communications port (refer to Mapping Database for detailed information).

Switching between setting groups can be done even while a protection function is active (no timers are resetting).

The user can check which one of the setting groups is active looking in the ***OP PARAMETERS*** menu: ***Active Set Group*** cell.

The user can also assign the active group (***Setting Group x*** function) to an output relay (***SETTING GROUP x/OUTPUT RELAYS CONFIGURATION Gx***) or to an LED (***SETTING GROUP x/LEDs CONFIGURATION G1***).

Setting group change via a digital input

It is possible to change the setting group by energizing a digital input (on level).

If the setting group switchover is done via a binary input, the change from One Group to Two Groups is executed.

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Switch between Active Groups via a Binary Input

When powering up the relay, the selected group (One Group or Two Groups) corresponds to the state of the logic input assigned to ***Setting Group 2***. This means:

A – ***Reverse Inp.Logic*** = 0 and ***Setting Group 2*** = 1
(***SETTING GROUP x/INPUTS CONFIGURATION Gx*** submenu),

If the programmed logic input starts being supplied with +V, then after the ***t Change Setting G1->G2*** time-delay the active group will be G2. If the programmed logic input is not supplied with +V, then the active group will be G1.

B – ***Reverse Inp.Logic*** = 1 and ***Setting Group 2*** = 1
(***SETTING GROUP x/INPUTS CONFIGURATION Gx*** submenu),

If the programmed logic input is supplied with +V, then the active group will be G1. If the programmed logic input stops being supplied with +V, then after the ***t Change Setting G1->G2*** time-delay the active group will be G2.

Notes:

1. Binary Input configuration is associated with both Setting Groups, so that if in a Setting Group the selected binary input is assigned to ***Setting Group 2***, in the other group it must be set to ***Setting Group 2*** as well, otherwise no switch will occur.

2. If the V11V is powering up and Group 2 is selected via a binary input, the ***t Change Setting G1->G2*** time-delay is ignored (changing to setting group 2 is instantaneous – without time-delay).

3. The setting group switch is based on the level of the binary input. So as long as Setting Group 2's logic signal is high, the V11V uses Setting Group 2.

Switch between Active Groups via the Menu or a Remote Command (RS485, USB)

By using the relay front panel interface it is possible to change the active setting group: ***0: One Group*** or ***1: Two Groups*** (menu cell: ***GLOBAL SETTINGS/SETTING GROUP SELECT/ Setting Group***).

Above menu cell is common for changing from panel interface and via remote command (RS485 or USB).

Above menu cell is common for changing from panel interface and via remote command (RS485 or USB).

It means that if the ***GLOBAL SETTINGS/SETTING GROUP SELECT/ Setting Group*** menu cell is set to ***0: One Group*** and the remote setting group 2 command is executed, the value of menu cell: ***GLOBAL SETTINGS/SETTING GROUP SELECT/ Setting Group*** will be changed to ***1: Two Groups*** value (Active group: 2).

Setting group 1 will be applied if:

- ***0: One Group*** is set in the ***GLOBAL SETTINGS/SETTING GROUP SELECT/ Number of Groups*** menu cell from the relay's front panel interface,

  or
- the remote setting One Group command is executed. The value of the ***GLOBAL SETTINGS/SETTING GROUP SELECT/ Number of Groups*** menu cell will then be changed to ***0: One Group***.

WARNING: If the digital input has been assigned to the setting group change, it is not possible to change the setting group via remote communications. If changing via Menu or RS485 is required ensure that no input is assigned to ***Setting Group 2***.

Priority

The detailed logic table for setting group selection is shown below:

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Binary Input *Setting Group 2*	Front Panel and Remote Setting	Active Group
Not configured	G1	G1
Not configured	G2	G2
G1	G1	G1
G1	G2	G1
G2	G1	G2
G2	G2	G2

Note: If a setting group change initiated by a remote command has not been effected due of priority settings, that command is ignored (not recorded in the V11V's logic for the future, when priority settings allow changing).

It is possible to assign an Active Group state to an output contact by setting the output contact to the ***Setting Group x*** output (***SETTING GROUP x/OUTPUT RELAYS CONFIGURATION Gx***.

If Active Group signaling is required, some LEDs should be assigned to the ***Setting Group x*** function (***SETTING GROUP x/LEDs CONFIGURATION Gx***).

2.10 Maintenance Mode (A)

This menu allows the user to check the operation of the protection functions.

It is possible to set following ***Maintenance mode*** options (settings):

- "***No***" - ***Maintenance mode*** is disabled. All window cells below are hidden (***Maintenance mode*** is the latest cell in ***COMMISIONING*** column)

- "***Yes,outp.trips***" - ***Maintenance mode*** is enabled. In this mode all test cells in ***COMMISIONING*** column are shown. During tests outputs are energized.

- "***Yes,outp.block***" - ***Maintenance mode*** is enabled and all test cells in ***COMMISIONING*** column are shown. In this mode, the high state of output functions are ignored (control of outputs are blocked).

  This option allows the user to check the operation of the protection functions without actually sending any external command (Tripping or signalling).

Depends on the rear protocol selected in menu, transmission of information to SCADA is sent with some limitation (Modbus RTU) or sent (IEC 103) with additional information to know that V11V is in Maintenance mode (refer to Communication chapter and EN 60870-5-103 standard).

Changing of setting from "***No***" to "***Yes,….***" from the front panel activate this mode for 5 minutes only. After this time the option is automatically switched to "***No***".

The selection of the maintenance mode is possible by logic input (the level), control command (rear or front port), or by front panel interface. The maintenance mode is terminated by:

- Low state of logic input assigned to ***Maintenance mode*** function,
- Control command which activate this mode (rear command or setting: "***Yes,….***") and by turning off the power supply.

Note: Maintenance rear command is available in Modbus protocol only

When this menu is activated (set to: "***Yes,outp.trips***" or "***Yes,outp.block***"), the Alarm led is lit. Additionally it is possible to configure Maintenance Mode to programmable LED.

In "***Yes,outp.block***" case, all the output contacts are blocked, and no command can be issued to these contacts, even if a protection threshold associated with one of these output contacts has been crossed (If a protection threshold is crossed, all associated LEDs will be ON, even the TRIP LED, if protection element is set to ***Trip***).

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2.11 Circuit Breaker State Monitoring (Model A)

An operator at a remote location requires a reliable indication of the state of the switchgear. Without an indication that each circuit breaker is either open or closed, the operator has insufficient information to decide on switching operations. The Vamp 11V relays incorporate a circuit breaker state monitoring feature, giving an indication of the position of the circuit breaker.

This indication is available either on the relay's front panel or via the communication network.

The positions of the CB contacts can be selected under the ***SETTING GROUP x/INPUTS CONFIGURATION Gx*** and ***SETTING GROUP x/LEDs CONFIGURATION Gx*** menus using **AUX4** (in parallel with **CB Status 52A**) and **AUX5** (in parallel with **CB Status 52B**).

AUX4 (CB closed) and AUX5 (CB opened) must be assigned to LEDs in ***SETTING GROUP x/LEDs CONFIGURATION Gx*** menu.

2.12 Circuit Breaker Condition Monitoring (A)

Periodic maintenance of circuit breakers is generally based on a fixed time interval, or a fixed number of fault current interruptions.

The relays record the following controls and statistics related to each circuit breaker trip operation:

- time-delay setting,
- monitoring time for CB open and close operations,
- trip CB time from external signal,
- tripping and closing pulse time

2.13 Real time clock synchronization via opto-inputs (A)

In modern protection schemes it is often desirable to synchronize the relay's real time clock so that events from various relays can be placed in chronological order. This can be done using the communication interface connected to the substation control system or via a binary input. Any of the available binary inputs on the V11V relay can be selected for synchronization. Pulsing this input will result in the real time clock snapping to the nearest minute. Synchronization pulse should be repeated no more than once per minute. An example of the time synchronization function is shown.

Time of “Sync. Pulse”	Corrected Time
19:47:00.000 to 19:47:29.999	19:47:00.000
19:47:30.000 to 19:47:59.999	19:48:00.000

Note: The above assumes a time format of hh:mm:ss

The input is configured in the ***SETTING GROUPx/INPUT CONFIGURATION Gx*** menu. The input must be assigned to ***Time Synchr.***

2.14 Event Records (A, N)

The relay records and time-tags up to 200 events and stores them in a non-volatile (Fram) memory. This allows the system operator to analyze the sequence of events that has occurred within the relay after a particular power system condition, or switching sequence, etc. When the available space is exhausted, the new fault automatically overwrites the oldest fault.

The real time clock within the relay time-tags each event, with a resolution of 1 ms.

The user can view the event records either locally via the USB port, or remotely, via the rear EIA(RS)485 port.

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2.15 Disturbance Recorder (A)

The integral disturbance recorder has a memory space specifically dedicated to the storage of disturbance records. Up to 4 seconds of disturbance recording can be stored. When the available memory space is exhausted, the new record automatically overwrites the oldest record.

The recorder stores actual samples that are taken at a rate of 16 samples per cycle.

Each disturbance record consists of analogue and digital channels. (Note that the relevant VT ratios for the analogue channels are also extracted to enable scaling to primary quantities).

The disturbance recorder is set in the ***GLOBAL SETTINGS/DISTURBANCE RECORDER*** menu.

The total disturbance recording time is 4 s but not more than 5 records are available.

Total number of records available in disturbance recorder is:

- o One - for set Max Record Time from in range: 2.01s – 4.00s
- o Two – for set Max Record Time from in range: 1.34s – 2.00s
- o Three – for set Max Record Time from in range: 1.01s – 1.33s
- o Four – for set Max Record Time from in range: 0.81s – 1.00s
- o Five - for set Max Record Time from in range: 0.10s – 0.80s

Triggering of disturbance recording depends on the ***Disturb.Rec.Trig.*** configuration:

- ***0: on Inst.*** – Start of a protection element set to ***Trip***,
- ***1: on Trip*** – Trip by a protection element followed by the ***Protect.Trip*** output.

If the ***0: on Inst***. option is selected the record consists of: Pre-fault time + duration of the "any Start" signal presence + Post-fault time.

If the ***1: on Trip*** option is selected the record consists of: Pre-fault time + duration of the Trip signal presence (***Protect.Trip*** function active) + Post-fault time.

The pre-fault time can be set in the cell: ***GLOBAL SETTINGS/DISTURBANCE RECORDER/Pre-Time***. If the pre-fault time is set to 100 ms, recording starts 100 ms before the disturbance.

The post trip time can be set in the cell: ***GLOBAL SETTINGS/DISTURBANCE RECORDER/Post Trip Time***. If the post-fault time is set to 100 ms, recording stops 100 ms after the disturbance.

2.16 External trip (N, A)

A Binary Input can be configured to CB trip by using the AUX1, AUX2 (Model N) or AUX1, AUX2, AUX3 (Model A) functions.

The AUX1 – AUX3 functions have a timer so a trip can be time-delayed.

tAUX1 – tAUX3 can be mapped to:

- RL1,
- RL2,
- RL3,
- RL4,
- RL5,
- RL6, (Model A only),
- RL7, (Model A only);
- Trip (protection trip)
- Alarm signal
- Programmable LEDs

If it is configured to Trip (protection trip), tAUX1 – tAUX3 will illuminate the “Trip” LED.

3. VT REQUIREMENTS

In choosing the VT for use with the V11V relays, it is only necessary to consider the accuracy requirements and the output burden of the VT is sufficient to supply the relay demands. Protection classes 3P or 6P are usually adequate in terms of accuracy but care should be taken that the VT is not over-sized as this may lead to resonance problems. Typically, the output burden of the VT could be 10% higher than the total connected burden of all connected devices

4. AUXILIARY SUPPLY FUSE RATING

In the Safety section of this manual, the maximum allowable fuse rating of 16 A is quoted. To allow time grading with upstream fuses, a lower fuse link current rating is often preferable. Use of standard ratings of between 6 A and 16 A is recommended. Low voltage fuse links, rated at 250 V minimum and compliant with IEC 60269-2 general application type gG, with high rupturing capacity are acceptable. This gives equivalent characteristics to HRC "red spot" fuses type NIT/TIA often specified historically.

The table below recommends advisory limits on relays connected per fused spur. This applies to the V11V**,** as these have inrush current limitation on switch-on, to conserve the fuse-link.

Maximum Number of V11V Relays Recommended Per Fuse				
Battery Nominal Voltage	6 A	10 A Fuse	15 or 16 A Fuse	Fuse Rating > 16 A
24 to 60 Vac/dc	2	4	6	Not permitted
90 to 240 Vac/ 90 to 250 Vdc	6	10	16	Not permitted

Alternatively, miniature circuit breakers (MCB) may be used to protect the auxiliary supply circuits.

MEASUREMENTS AND RECORDING

MR

Date:	**1st December 2015**
Software Version:	**1A**
Connection Diagrams:	**10V11V01**

CONTENTS

1. MEASUREMENTS AND RECORDING

1.1 Introduction

The V11V is equipped with integral fault recording facilities suitable for analysis of complex system disturbances. Fault records can be read out by setting software MiCOM S1 Studio (5.1.0 software version) via the USB port accessible on the V11V front panel (model N and A). The USB port offers a communications facility to the V11V.

Communications can be established via the USB port even if the V11V is not supplied by the auxiliary voltage. (**A**)

Access to the USB port is protected by means of a plastic cover.

1.2 Event records (not available in model L)

The relay records and time tags up to 200 events and stores them in non-volatile FRAM memory. This enables the system operator to establish the sequence of events that occurred within the relay following a particular power system condition, switching sequence etc. When the available space is exhausted, the oldest event is automatically overwritten by the most recent.

The real time clock within the relay provides the time tag for each event, to a resolution of 1 ms.

The event records are available for remote viewing, via the communications ports RS485 or USB.

For extraction from a remote source via communications ports, refer to the SCADA Communications section (V11V/EN CT), where the procedure is fully explained.

Types of event

An event may be a change of state of a control input or output relay, a trip condition, etc. The following sections show the various items that constitute an event.

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Change of state of binary inputs

If one or more of the binary inputs has changed state since the last time that the protection algorithm ran, the new status is logged as an event. The information is available if the event is extracted and viewed via a PC.

Change of state of one or more output relay contacts

If one or more of the output relay contacts have changed state since the last time that the protection algorithm ran, then the new status is logged as an event. The information is available if the event is extracted and viewed via PC.

Relay alarm conditions

Any alarm conditions generated by the relays will also be logged as individual events. The following table shows examples of some of the alarm conditions and how they appear in the event list:

Alarm Condition	Event Text	Event Value
Auxiliary Supply Fail	Vx Fail ON/OFF	Bit position 0 in 32 bit field
VT Supply Fail	VT Supply Fail ON/OFF	Bit position 1 in 32 bit field

The above table shows the abbreviated description that is given to the various alarm conditions and also a corresponding value between 0 and 31. This value is appended to each alarm. It is used by the event extraction software, such as MiCOM S1 Studio, to identify the alarm. Either ON or OFF is shown after the description to signify whether the particular condition is operational or has reset.

Protection element trips

Any operation of protection elements (a trip condition) will be logged as an event record, consisting of a text string indicating the operated element and an event value. Again, this value is intended for use by the event extraction software, such as MiCOM S1 Studio.

1.3 Fault records

Each fault record is generated with time stamp.

The following data is recorded for any relevant elements that operated during a fault, and can be viewed in each of the last 20 fault records:

(i) Event Text (the reason for a trip):

V> trip
V>> trip
V>>> trip
V< trip
V<< trip
V<<< trip
VN> trip
VN>> trip
VN>>> trip
V2> trip (**N, A**)
V2>> trip (**N, A**)
V1< trip (**A**)
V1<< trip (**A**)
f1 trip (**A**)
f2 trip (**A**)
f3 trip (**A**)
f4 trip (**A**)
f5 trip (**A**)
f6 trip (**A**)
AUX1 trip (**N, A**)
AUX2 trip (**N, A**)
AUX3 trip (**N, A**)

(ii) Active setting Group

(iii) Fault Time an Fault Date

(iv) Fault Orgin: type of fault (for example: phase A-B, A-B-C, etc)

(v) Event Value:

Per phase record of the voltage value during the fault: Vφ and measured VN.

Fault records are stored in non-volatile memory (FRAM memory). This type of memory does not require any maintenance (no battery inside the V11V). Fault records are stored without any time limitation even if the V11V is not supplied from any power source.

1.4 Alarm records

Each alarm record is generated with time stamp.

The following data is recorded for any relevant elements that operated during an alarm, and can be viewed in each of the last 5 alarm records:

(i) Event Text (the reason for a protection alarm):

V> alarm
V>> alarm
V>>> alarm
V< alarm
V<< alarm
V<<< alarm

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VN> alarm
VN>> alarm
VN>>> alarm
V2> alarm (**N, A**)
V2>> alarm (**N, A**)
V1< alarm (**A**)
V1<< alarm (**A**)
f1 trip (**A**)
f2 trip (**A**)
f3 trip (**A**)
f4 trip (**A**)
f5 trip (**A**)
f6 trip (**A**)
AUX1 trip (**NA**)
AUX2 trip (**NA**)
AUX3 trip (**NA**)

(ii) Active setting Group

(iii) Alarm Time an Alarm Date

(iv) Alarm Orgin: type of alarm (for example: phase A-B, A-B-C, etc)

(v) Event Value:

Per phase record of the voltage value during the alarm: Vφ and measured VN

Alarm records are stored in non-volatile memory (FRAM memory). This type of memory does not require any maintenance (no battery inside the V11V). Alarm records are stored without any time limitation even if the V11V is not supplied from any power source.

1.5 Alarm status

Alarm status presents the current Alarm signals.

The Alarm signals information can be with latching or without latching, depends on the setting value ***GLOBAL SETTINGS/LOC/***

- Alarms Info 0:Self-reset – only current Alarm status is displayed,

- Alarms Info 1:Latching – Alarm information is latched up to reset in cell: ALARM STATUS/Reset Press ENTER cell.

The following Alarm is viewed:

tV> Alarm	Alarm by the first phase overvoltage stage
tV>> Alarm	Alarm by the second phase overvoltage stage
tV>>> Alarm	Alarm by the third phase overvoltage stage
tV< Alarm	Alarm by the first phase undervoltage stage
tV<< Alarm	Alarm by the second phase undervoltage stage
tV<<< Alarm	Alarm by the third phase undervoltage stage
tVN> Alarm	Alarm by the first earth fault overvoltage stage
tVN>> Alarm	Alarm by the second earth fault overvoltage stage
tVN>>> Alarm	Alarm by the third earth fault overvoltage stage
tV2> Alarm (**NA**)	Alarm by the first negative sequence overvoltage stage
tV2>> Alarm (**NA**)	Alarm by the second negative sequence overvoltage stage
tV1< Alarm (**A**)	Alarm by the first positive sequence undervoltage stage
tV1<< Alarm (**A**)	Alarm by the second positive sequence undervoltage stage
tf1 Alarm (**A**)	Alarm by the first frequency protection stage
tf2 Alarm (**A**)	Alarm by the second frequency protection stage
tf3 Alarm (**A**)	Alarm by the third frequency protection stage
tf4 Alarm (**A**)	Alarm by the fourth frequency protection stage
tf5 Alarm (**A**)	Alarm by the fifth frequency protection stage

tf5 Alarm (**A**)	Alarm by the fifth frequency protection stage
tf6 Alarm (**A**)	Alarm by the sixth frequency protection stage
CB Time Monit. Alarm. (**A**)	The monitoring time for CB opening/closing
CB Curr.Diagn. Alarm. (**A**)	Summation of the current interrupted by the CB
CB Nb Diagn. Alarm. (**A**)	CB open operations counter monitoring
Hardw.Warning Alarm	Any hardware problem detected
State of CB Alarm (**NA**)	The abnormal CB's position for two bits CB's connection (00 or 11)
tAUX2 Alarm (**NA**)	tAUX2 time-delay elapsed
tAUX3 Alarm (**NA**)	tAUX3 time-delay elapsed
tAUX4 Alarm (**NA**)	tAUX4 time-delay elapsed
tCB FLTY Ext.Sign. Alarm (**A**)	An input mapped to this function detects CB problems that may influence control possibilities (for example spring problem, insufficient pressure, etc.)

1.6 Measurements

The relay produces a variety of directly measured power system quantities:

Va, Vb, Vc - fundamental harmonic values,

Vab, Vbc, Vca - fundamental harmonic values,

V1 (**A**), V2 (**N, A**) - calculated fundamental harmonic ratio,

f (**A**) - frequency,

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1.7 Counters

The V11V counters are available in the ***RECORDS/COUNTERS*** menu:

- ***CONTROL COUNTER***:
  - ***No. Trips*** – Number of manual trip commands (inputs, menu default Control Window, trip key, remote control via RS485 or USB)
  - ***No. Close -*** Number of manual close commands (inputs, menu default Control Window, trip key, remote control via RS485 or USB)

  Counters can be reset in the ***CONTROL COUNTER*** column.
- ***FAULT COUNTER***:
  - ***No. Fault Trips –*** Number of trip commands from protection elements (voltage-based protection element trip, AUX trips and Auto-recloser trips)
  - ***No. Fault Starts*** – Number of timer starts by protection elements set to trip (voltage-based protection element and AUX)
  - ***No. Alarms*** - Number of Alarm signals from protection elements set to Alarm or functions mapped to an Alarm signal,
  - ***No. HW Warnings*** – Number of hardware problems detected by the self-monitoring function.

  Counters can be reset in the ***FAULT COUNTER*** column.

1.8 Disturbance Recorder (Model A)

The integral disturbance recorder has an area of memory specifically set aside for record storage. The number of records that may be stored by the relay is dependent upon the selected recording duration:

Total number of records available in disturbance recorder is:

- One - for set Max Record Time from in range: 2.01s – 4.00s
- Two – for set Max Record Time from in range: 1.51s – 2.00s
- Three – for set Max Record Time from in range: 1.01s – 1.33s
- Four – for set Max Record Time from in range: 0.81s – 1.00s
- Five - for set Max Record Time from in range: 0.10s – 0.8s

The recorder stores actual samples that are taken at a rate of 16 samples per cycle. Each disturbance record consists of eight analog data channels and thirty-two digital data channels. The relevant VT ratios for the analog channels are also extracted to enable scaling to primary quantities.

Note: If a VT ratio is set to less than a unit, the relay will choose a scaling factor of zero for the appropriate channel.

The "**DISTURBANCE RECORDER**" menu column is shown in the following table:

Menu Text	Default Setting	Setting Range		Step Size
		Min.	Max.	
Pre-Time	0.1 s	0.1 s	2 s	0.01 s
Setting for the disturbance record pre-fault time. The pre-fault time adjusts the beginning of the disturbance record: In this example, the record starts 100ms before the disturbance. Its length can be limited by setting.				
Post-Fault Time	0.1 s	0.1 s	1 s	0.01 s

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Setting for the disturbance record post-fault time. The total disturbance recording time is: pre-fault time + high state of triggering criteria (Start or Trip time)+ post-fault time. The above total recording time is limited by setting.				
Disturbance Rec.Trig.	0: on Inst.	0: on Inst. 1: on Trip		
Setting for the trigger criteria: ***0: on Inst***. – the trigger is the disturbance indicated by the starting of a protection element set to trip the CB. If this option is chosen the total recording time is: pre-fault time + duration of protection start + post-fault time, but no longer than the value of ***Max Record Time***. When delay time of any protection function exceeds ***Max Record Time*** and after this delay time TRIP signal occurs then TRIP is recorded in the next additional record. ***1: on Trip***. – the trigger is the disturbance indicated by a protection element trip. If this option is chosen the total recording time is: pre-fault time + duration of protection trip+ post-fault time, but no longer than the value of ***Max Record Time***.				
Max Record Time	1.5 s	0.1 s	4 s	0.01 s
Setting for the maximum total recording time. If default value is kept (4 s) it means that 4 records will be recorded.				

It is not possible to display the disturbance records locally on the LCD; they must be extracted using suitable software such as MiCOM S1 Studio.

1.9 Measurement Settings

The following settings under the measurements heading can be used to configure the relay measurement function.

1.9.1 VT Ratio

GLOBAL SETTINGS/VT RATIO menu

Menu Text	Default Setting	Setting Range		Step Size
		Min.	Max.	
Line VT Primary	0.1 kV	0.05k	65k	0.01k
Sets the phase voltage transformer input's primary voltage rating.				
Line VT Sec	100 V	57	130	0.1
Sets the phase voltage transformer input's secondary voltage rating.				
E/Gnd VT Primary	0.1kV	0.05k	65k	0.01k
Sets the earth fault voltage transformer input's primary voltage rating.				
E/Gnd VT Sec	100 V	57	130	0.1
Sets the earth fault voltage transformer input's secondary voltage rating.				
VT connection	3Upn	3Upn, 3Upn+UN, 2Upp+UN, 3Upp+UN		N/A
Sets the VT connection type to analog input V11V				
Protection config V>	P – P	P – P, P – N		N/A
Selection of the overvoltage protection type: Phase – Phase or Phase – Neutral				
Protection config V<	P – P	P – P, P – N		N/A
Selection of the undervoltage protection type: Phase – Phase or Phase – Neutral				

1.9.2 Default Measuring Window

Default window is after connection of power supply to V11V or after resetting of signaling.

GLOBAL SETTINGS/LOC menu

Menu Text	Default Setting	Available Settings
Default Display	0:Meas. P – P	0: Meas. P – P [V] 1: Meas. P – P [Un] 2: Meas. P – N [V] 3: Meas. P – N [Un] 4: Control CB (**N, A**) 5: Local Mode (**A**)
This cell is used to change the default display window 0: Measurements in volts (phase to phase) 1: Measurements referred to Un (phase to phase) 2: Measurements in volts (phase to neutral) 3: Measurements referred to Un (phase to neutral) 4: Control Mode window for changing of the CB control mode (**N, A**) 5: Local/Remote mode and for presenting Control Mode state information (**A**)		

MR

COMMISSIONING

CM

Date:	**1st December 2015**
Software Version:	**1A**
Connection Diagrams:	**10V11V01**

CONTENTS

INTRODUCTION

The VAMP 11V feeder protection relays are fully numerical in design, implementing all protection and non-protection functions in software. The relays employ a high degree of self-monitoring. The commissioning tests do not need to be as extensive as with non-numeric electronic or electro-mechanical relays.

In the commissioning of numeric relays, it is only necessary to verify that the hardware is functioning correctly and that the application-specific software settings have been applied to the relay. It is considered unnecessary to test every function of the relay if the settings have been verified by one of the following methods:

- Extracting the settings applied to the relay using appropriate setting software (preferred method),
- Via the operator interface.

Unless previously agreed to the contrary, the customer will be responsible for determining the application-specific settings applied to the relay and for testing of any scheme logic applied by external wiring.

Blank commissioning test and setting records are provided at the end of this chapter for completion as required.

BEFORE CARRYING OUT ANY WORK ON THE EQUIPMENT, THE USER SHOULD BE FAMILIAR WITH THE CONTENTS OF THE SAFETY GUIDE SFTY/4L M/E11 OR LATER ISSUE, OR THE SAFETY AND TECHNICAL DATA SECTION OF THE TECHNICAL MANUAL AND ALSO THE RATINGS ON THE EQUIPMENT RATING LABEL.

For safety reasons, no work must be carried out on the V11V until all power sources to the unit have been disconnected.

1. SETTING FAMILIARIZATION

When commissioning a VAMP 11V relay for the first time, sufficient time should be allowed to enable the user to become familiar with the method by which the settings are applied.

The Getting Started chapter (V11V/EN GS) contains a detailed description of the V11V relay.

Via the front panel all the settings can be changed (refer to Settings chapter V11V/EN ST of this manual), LEDs and alarms reset, and fault and event records cleared. However, menu cells with access levels higher than the default level will require the appropriate password to be entered, before changes can be made.

Alternatively, if a portable PC is available together with suitable setting software (such as MiCOM S1 Studio 5.1.0 or higher), the menu can be viewed a page at a time to display a full column of data and text. This PC software also allows settings to be entered more easily, saved to a file on disk for future reference or printed to produce a setting record. Refer to the PC software user manual for details (refer to Getting Started V11V/EN GS). If the software is being used for the first time, allow sufficient time to become familiar with its operation.

2. EQUIPMENT REQUIRED FOR COMMISSIONING

2.1 Minimum equipment required

Voltmeter test set with chronometer (range: 0 to 240 VAC).

Multimeter with suitable ac current range, and AC/DC voltage ranges of 0 – 250 V respectively.

Continuity tester (if not included in multimeter).

Phasemeter.

Indicates the order of succession of phases.

Note: Modern test equipment may contain many of the above features in one unit.

3. PRODUCT CHECKS

These product checks cover all aspects of the relay and should be carried out to ensure that the unit has not been physically damaged prior to commissioning, that it is functioning correctly and that all input quantity measurements are within the stated tolerances.

If the application-specific settings have been applied to the relay prior to commissioning, it is advisable to make a copy of the settings to allow their restoration later. This could be done by:

- Obtaining a setting file from the customer.
- Extracting the settings from the relay itself (this again requires a portable PC with appropriate setting software)
- Manually creating a setting record. This could be done using a copy of the setting record located at the end of this chapter to record the settings. As the relay's menu is scrolled through sequentially via the front panel user interface.

3.1 With the relay de-energized

The following group of tests should be carried out without powering the V11V.

WARNING: NEVER OPEN CIRCUIT THE SECONDARY CIRCUIT OF A CURRENT TRANSFORMER SINCE THE HIGH VOLTAGE PRODUCED MAY BE LETHAL AND COULD DAMAGE INSULATION.

The voltage transformer connections must be isolated from the relay for these checks. If an P991 test block is provided, the required isolation can easily be achieved by inserting test plug type P992 which effectively open circuits all wiring routed through the test block.

Before inserting the test plug, reference should be made to the scheme (wiring) diagram to ensure that this will not potentially cause damage or a safety hazard.

If a test block is not provided, the voltage transformer supply to the relay should be isolated by means of the panel links or connecting blocks. Where means of isolating the auxiliary supply and trip circuit (e.g. isolation links, fuses, MCB, etc.) are provided, these should be used. If this is not possible, the wiring to these circuits will have to be disconnected and the exposed ends suitably terminated to prevent them from being a safety hazard.

3.1.1 Visual inspection

The rating information given under the top access cover on the front of the relay should be checked. Check that the relay being tested is correct for the protected line/circuit. Ensure that the circuit reference and system details are entered into the setting record sheet. Double-check the VT primary voltage rating, and be sure to record the actual VT setting used.

Carefully examine the relay to check that no physical damage has occurred since installation.

3.1.2 Insulation

Insulation resistance tests are only necessary during commissioning and if they have not been performed during installation.

Isolate all wiring from the earth and test the insulation with an electronic or brushless insulation tester at a dc voltage not exceeding 500V. Terminals of the grouped circuits should be temporarily connected together.

The main groups of relay terminals are:

Voltage transformer circuits,

Auxiliary voltage supply

Binary control inputs (**NA**)

Relay contacts

EIA(RS)485 communication port (**NA**)

The insulation resistance should be greater than 100 MΩ at 500 V.

On completion of the insulation resistance tests, ensure all external wiring is correctly reconnected to the relay.

3.1.3 External wiring

Check that the external wiring is correct when compared to the relevant relay and scheme diagram. Ensure as far as practical that the phase sequence is as expected. The relay diagram number appears on the rating label on the upper side of the case.

The connections should be checked against the scheme (wiring) diagram.

3.1.4 Auxiliary supply voltage (Vx)

The relay can be operated from either a dc only or AC/DC auxiliary supply depending on the relay's nominal supply rating. The incoming voltage must be within the operating range specified in Table 1.

Without energizing the relay measure the auxiliary supply to ensure it is within the operating range.

Nominal auxiliary voltage Vx (ordering options)	24 – 60 Vdc/ 24 – 60 Vac (50/60 Hz) (A and N) 24 – 250 Vdc/ 24 – 240 Vac (50/60 Hz) (only L) 90 – 250 Vdc/ 90 – 240 Vac (50/60 Hz) (A and N)
Operating range	19 – 72 V (dc), 19 – 66 V (ac) (A and N) 19 – 300 V (dc), 19 – 265 V (ac) (only L) 72 – 300 V (dc), 72 – 265 V (ac) (A and N)
Tolerable AC ripple	Up to 12% for a dc supply, per IEC 60255-11: 2008

Table 1: Operational range of auxiliary supply Vx

It should be noted that the relay can withstand an ac ripple of up to 12% of the upper rated voltage on the dc auxiliary supply.

Do not energize the relay or interface unit using the battery charger with the battery disconnected as this can irreparably damage the relay's power supply circuitry.

Energize the relay only if the auxiliary supply is within the specified operating ranges. If a test block is provided, it may be necessary to link across the front of the test plug to connect the auxiliary supply to the relay.

Note: Vx nominal supply rating is common to auxiliary voltage supply and binary control inputs

3.2 With the relay energized

The following group of tests verifies that the relay hardware and software are functioning correctly and should be carried out while the V11V is powered.

MV isolators should be opened and the MV side should be connected to the earth to allow safe operation of the CB.

3.2.1 Light emitting diodes (LEDs)

On power up the green LED should have lit up and stayed on indicating that the relay is healthy. The relay has a non-volatile memory that remembers the state (on or off) of the alarm, trip and, if configured to latch, LED indicators when the relay was last energized from an auxiliary supply. Therefore these indicators may also lit up when the auxiliary supply is applied.

Latching of LEDs can be configured via MiCOM S1 Studio 5.1.0 (or higher) setting software (USB port) or manually by the front panel

Default configuration of LEDs (except ***Trip*** LED): without latching

Note: The above default configuration can be changed using the MiCOM S1 Studio 5.1.0 (or higher) setting software (USB port).

Trip LED is fixed to protection trip with latching.

The eight LEDs are on the front panel of the relay:

- The green ***Healthy*** LED indicates that the V11V is powered and no internal faults are detected. A flashing LED indicates a hardware problem on the V11V. Not lit – V11V has no power supply
- Red ***Trip*** LED: indicates that the time-delay of the protection element set to trip has elapsed
- Yellow ***Alarm*** LED: indicates that the time-delay of the protection element set to Alarm has elapsed or that non-protection functions as issued an Alarm signal. This LED can be programmed as 3-7 LEDs too.

  Note: By default ***Alarm*** LED is not configured to Alarm. It is necessary to configure this LED for Alarm function via MiCOM S1 Studio 5.1.0 (or higher) setting software (USB port) or manually by the front panel

After establishing the connection between PC and V11V via the USB port, the green ***Healthy*** LED should be lit permanently (it means that the V11V is powered), even if V11V is not connected to auxiliary voltage supply.

The remaining LEDs can be checked via the "LEDs Reset" function. This function can be mapped to the L1 – L8 inputs.

All red LEDs should be lit within 1 s.

<u>Default LEDs setting (both Setting Groups):</u>

- LED2 – LED7: not configured.

3.2.2 Binary Inputs

This test checks that all the binary inputs on the relay are functioning correctly.

The binary inputs should be energized one at a time, see external connection diagrams (V11V/EN IN) for terminal numbers.

The V11V is fitted with an LCD display which makes it possible to view the state of the binary inputs, in the ***COMMISSIONING/Opto I/P Status*** menu cell. This information is also available via the MiCOM S1 Studio 5.1.0 (or higher) Measurement Viewer software. Refer to MiCOM S1 Studio 5.1.0 (or higher) user manual for details.

If it is not possible to use the Measurement Viewer software, it is necessary to check the binary inputs by means of a functional test of the entire configuration.

Check that the correct nominal voltage and correct polarity are applied to the opto-inputs, then connect the field voltage to the appropriate terminals for the input being tested.

Note: The binary inputs may be energized from an external DC auxiliary supply (e.g. the substation battery) in some installations. Check that this is not the case before connecting the field voltage, otherwise damage to the relay may result. If an external 24/27 V, 30/34 V, 48/54 V, 110/125 V, 220/250 V supply is being used it will be directly connected to the relay's optically isolated inputs. If an external supply is being used then it must be energized for this test but only if it has been confirmed that it is suitably rated with less than 12% AC ripple.

<u>Default factory settings:</u>

- L1 binary input (**NA**): not configured
- L2 binary input (**NA**): not configured
- L3 binary input(**A**): not configured
- L4 binary input(**A**): not configured
- L5 binary input (**A**): not configured
- L6 binary input (**A**): not configured

Reverse Input Logic indicates the low state of the Binary Input triggered by a programmable function.

3.2.3 Output Relays

To check output contacts it is necessary to carry out a functional test of the entire configuration.

Note: It should be ensured that thermal ratings of anything connected to the output relays during the contact test procedure are not exceeded by the associated output relay being operated for too long. It is therefore advised that the time between application and removal of the contact test is kept to the minimum.

<u>Default factory settings:</u>

- RL1 binary input (**LNA**): not configured
- RL2 binary input (**LNA**): not configured
- RL3 binary inputL(**LNA**): not configured
- RL4 binary input(**NA**): not configured
- RL5 binary input (**NA**): not configured
- RL6 binary input (**A**): not configured
- RL7 binary input (**A**): not configured

Reverse Output Logic means that after powering the V11V, n/o contacts are closed. Output triggering via a programmable function opens the contacts (rest position).

3.2.4 Rear Communications Port (**NA**)

This test should only be performed where the relay is to be accessed from a remote location and will vary depending on the communications standard adopted.

It is not the intention of the test to verify the operation of the complete system from the relay to the remote location, just the relay's rear communications port and any protocol converter necessary.

3.2.4.1 IEC60870-5-103 (VDEW) communications

IEC60870-5-103/VDEW communication systems are designed to have a local Master Station and this should be used to verify that the relay's EIA(RS)485 port, is working.

The relay address and baud rate settings for EIA(RS)485 can be set by using local communication via the USB port (setting software) or via the relay's front panel.

Default Factory Setting:

- Baud Rate: 19.2 bps
- Parity: No parity
- Stop Bits: one stop bit
- Data Bits: 8 (fixed)

Also ensure that the relay's address and baud rate settings in the application software are the same as those set via the USB port.

Check that, using the Master Station, communications with the relay can be established.

3.2.4.2 MODBUS communications

Connect a portable PC running the appropriate MODBUS Master Station software to the relay's first rear EIA(RS)485 port via an EIA(RS)485 to EIA(RS)232 interface converter. The terminal numbers for the relay's EIA(RS)485 port are up to 31.

The relay address, Parity and Baud Rate settings for EIA(RS)485 are set by using local communication via USB port (MiCOM S1 Studio 5.1.0 (or higher) software).

Default Factory Setting:

- Baud Rate: 19.2 bps
- Parity: No parity
- Stop Bits: one stop bit
- Data Bits: 8 (fixed)

Ensure that the relay's address and baud rate settings in the application software are the same as those set via the USB port.

Check that communications with the relay can be established.

3.2.5 USB communications port

The USB port is used for local communications between a PC and the V11V.

Note: Max current necessary to supply V11V from USB port is 450mA. USB standard offers 500mA for a one PC's USB controller, so it is not recommended to connect any additional devices to the same PC's USB controller. If the total power consumption from a one PC's USB controller is greater than 500mA, V11V can be in permanent rest (V11V display and the green *Healthy* LED will be flashing)

The USB port integrates electronic boards only to allow communications with the V11V via the HMI and USB interfaces. Input (binary and voltage) and Output boards are not supplied.

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For local communications, the MiCOM S1 Studio 5.1.0 (or higher) setting software is used.

USB parameters (not settable in the V11V):

- Protocol: Modbus RTU
- Address: 1
- Baud Rate: 115.2 kbits/s
- Data Bits: 8
- Stop bit: 1
- Parity: None

3.2.6 Voltage inputs

This test verifies that the accuracy of voltage measurement is within the acceptable tolerances.

The V11V measures the fundamental components of voltage.

Apply a voltage equal to the rating of the line voltage transformer secondary winding to each voltage transformer input of the corresponding rating, in turn (see external connection diagram (V11V/EN IN) for appropriate terminal numbers), checking its magnitude using a multimeter/test set readout. The corresponding reading can then be checked in the MEASUREMENT column of the menu or via the MiCOM S1 Studio 5.1.0 (or higher) /Measurement Viewer connected to the V11V via USB port. Refer to the PC software user manual for details.

If MiCOM S1 Studio 5.1.0 (or higher) is not available, it is necessary to test the protection stages to measure the accuracy of analogue inputs.

Measuring accuracy of the relay:

Reference Conditions:

Sinusoidal signals with nominal frequency fn total harmonic distortion = 2 %, ambient temperature 20 °C and nominal auxiliary voltage Vx.

Deviation relative to the relevant nominal value under reference conditions.

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Operating Data

Voltage/Residual voltage:	±2% at Un
Frequency:	±10mHz

4. SETTING CHECKS

The setting checks ensure that all of the application-specific relay settings (i.e. the relay's functions), for the particular installation, have been correctly applied to the relay.

Note: The trip circuit should remain isolated during these checks to prevent accidental operation of the associated circuit breaker.

4.1 Apply application-Specific Settings

There are two methods of applying the settings to the relay:

Downloading them from a pre-prepared setting file to the relay using a portable PC running the MiCOM S1 Studio 5.1.0 (or higher) support software. Communication between the PC and the V11V is done via the relay's USB front port, located at the bottom of front panel, or rear communications port. This method is preferred for transferring function settings as it is much faster and there is less margin for error.

If a setting file has been created for the particular application and is available on an external memory disk, this will further reduce the commissioning time.

Enter them manually via the relay's operator interface.

Application notes for the setting values are given in Application Notes chapter V11V/EN AP of this manual.

4.2 Demonstrate correct relay operation

The above tests have already demonstrated that the relay is within calibration, thus the purpose of these tests is as follows:

- To determine that the primary protection functions of the relay, overvoltage, earth-fault etc. can trip according to the correct application settings.
- by monitoring the response to a selection of fault injections.

4.2.1 Overvoltage protection testing

This test, performed on stage 1 of the overvoltage protection function, demonstrates that the relay is operating correctly at the application-specific settings.

4.2.1.1 Connection and preliminaries

The testing voltage for 3Up-n connection is fed via terminals: C9-C10, C11-C12, and C13-C14 connected to VTs. The type of connection is shown in Figure 1. The external connection diagram is also available for the V11V front panel.

Connect the auxiliary voltage supply to the V11V's terminals A1 and A2.

Connect the trip output RL1 to trip circuit of CB so that its operation will trip the test set and stop the timer.

The timer should be compatible with the RL1 output.

Connect the voltage output of the test set to phase "A" of the relay voltage transformer input (terminals C9 and C10).

Ensure that the timer starts when the current is applied to the relay.

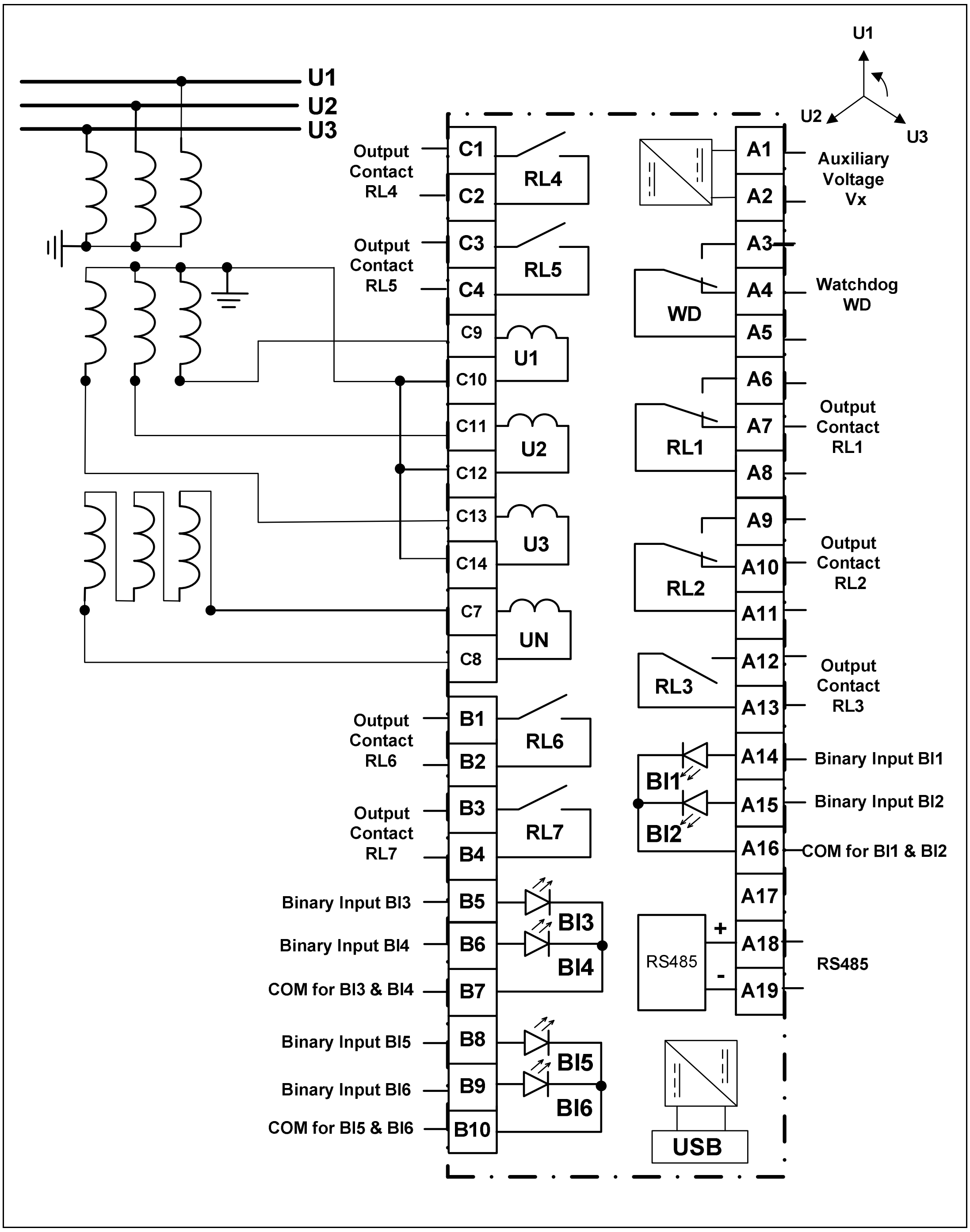

Figure 1: Model A Connection Diagram

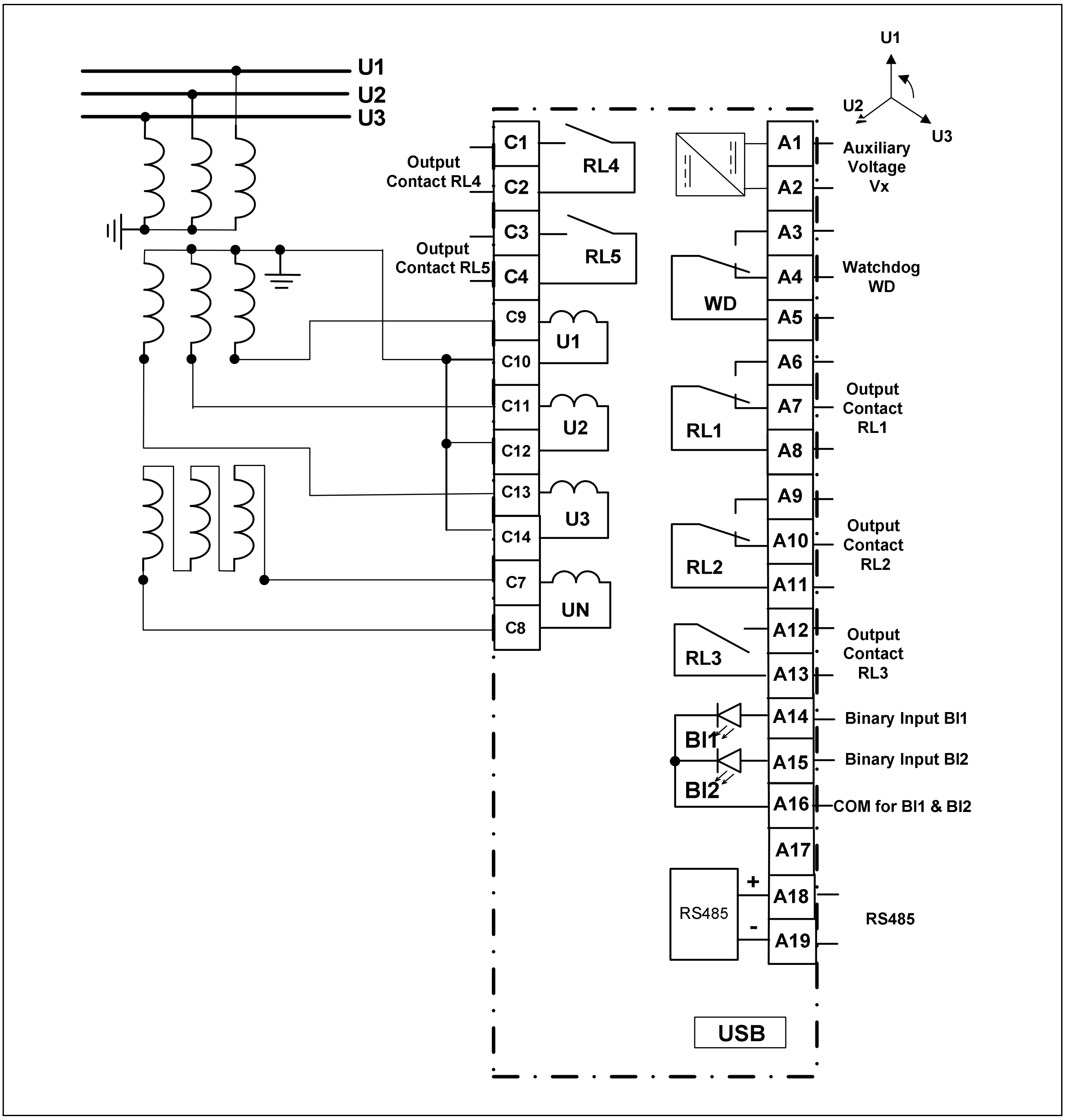

Figure 2: V11V Model N Connection Diagram

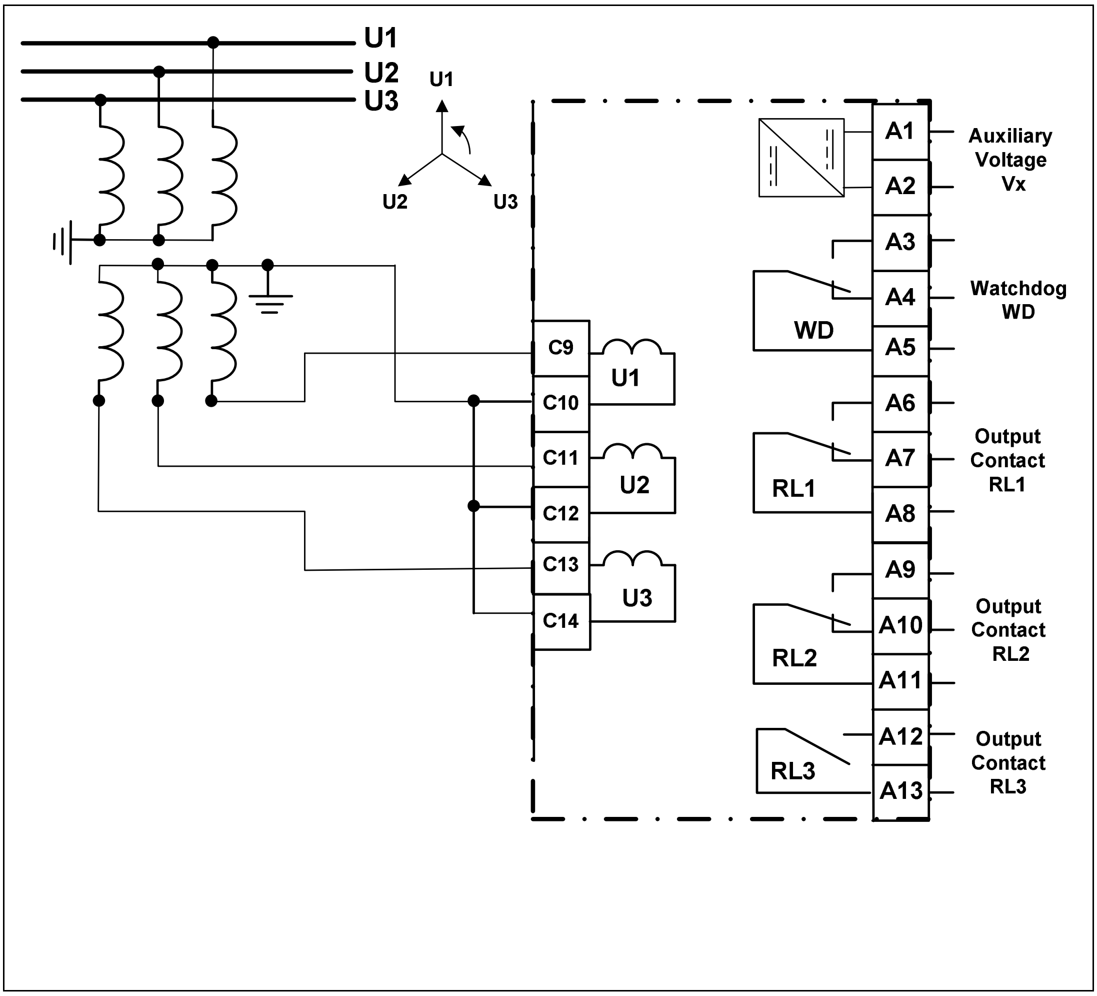

Figure 3: V11V Model L Connection Diagram

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4.2.1.2 Perform the test

Ensure that the timer is reset.

Apply to the relay a voltage of twice the setting for V> (refer to chapter V11V/EN ST of this manual) and make a note of the time displayed when the **chronometer** stops.

WARNING: **During injected voltage from voltage source in secondary side, remember about separate secondary side VT – possibility induction voltage in primary side of VT .**

4.2.1.3 Check the Operating Time

Check that the operating time recorded by the timer is within the range shown in Table 2.

Notes: Except for the definite time characteristic, the operating times given in Table 2 are for a time multiplier or time dial setting of 1. Therefore, to obtain the operating time at other time multiplier or time dial settings, the time given in Table 2 must be multiplied by the setting for IDMT characteristics.

For all characteristics, allowance must be made for the accuracy of the test equipment being used.

Characteristic	Operating Time at Twice Voltage Setting and Time Multiplier/Time Dial Setting of 1.0	
	Nominal (Seconds)	Range (Seconds)
DT	tU> Time Delay Setting	Setting ±5%
IEC S Inverse	10.03	9.28 – 11.78
IEC V Inverse	13.50	12.49 – 14.51
IEC E Inverse	26.67	24.67 – 29.67
UK LT Inverse	120.00	111.00 – 129.00
UK ST Inverse	1.78	1.65 – 1.91
IEEE M Inverse	3.8	3.52 – 4.08
IEEE V Inverse	7.03	6.51 – 7.55
IEEE E Inverse	9.52	8.81 – 10.23
US Inverse (CO8)	2.16	2.00 – 2.32
US Inverse (CO2 P40)	12.12	11.22 – 13.02
RI Inverse	4.52	4.19 – 4.86

Table 2: Characteristic Operating Times for U>

Reconfigure to test a phase B fault. Repeat the test in section 1, this time ensuring that the breaker trip output relative to phase B operation trips correctly. Record the tripping time for phase B. Repeat for phase C fault.

5. FUNCTIONAL TESTS

VAMP 11V has special functions for this purpose available in COMMISIONING column.

In Model A the special function ***Maintenance Mode*** is available for more comfortable testing of the relay.

Note: If ***Maintenance Mode*** is not selected all test cells are hidden in V11V menu.

It is possible to set following ***Maintenance mode*** options (settings):

- "***No***" - ***Maintenance mode*** is disabled. All window cells below are hidden (***Maintenance mode*** is the latest cell in ***COMMISIONING*** column)
- "***Yes***" - ***Maintenance mode*** is enabled. In this mode all test cells in ***COMMISIONING*** column are shown. During tests outputs are energized.
- "***Yes,outp.block***" - ***Maintenance mode*** is enabled and all test cells in ***COMMISIONING*** column are shown. In this mode, the high state of output functions are ignored (control of outputs are blocked).

  This option allows the user to check the operation of the protection functions without actually sending any external command (Tripping or signalling).

Depends on the rear protocol selected in menu, transmission of information to SCADA is blocked (Modbus RTU) or sent (IEC 103) with additional information to know that V11V is in Maintenance mode (refer to Communication chapter and EN 60870-5-103 standard).

Changing of setting from "***No***" to "***Yes,….***" from the front panel activate this mode for **10 minutes only**. After this time the option is automatically switched to "***No***".

The selection of the maintenance mode is possible by logic input (the level), control command (rear or front port), or by front panel interface. The maintenance mode is terminated by:

- Low state of logic input assigned to ***Maintenance mode*** function,
- Control command which activate this mode (rear command or setting: "***Yes,….***") and by turning off the power supply.

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Note: Maintenance rear command is available in Modbus protocol only

Maintenance Mode
1: Yes

When this menu is activated (set to YES: "***Yes***" or "***Yes,outp.block***"), the Alarm led is lit.

In "***Yes,outp.block***" case, all the output contacts are blocked, and no command can be issued to these contacts, even if a protection threshold associated with one of these output contacts has been crossed. If a protection threshold is crossed, all associated LEDs will be ON, even the TRIP LED, if protection element is set to ***Trip***.

The commissioning cells allow the user to check the external wiring to the relay's output contacts. This function is available after activation of ***Maintenance mode.*** To do this, the user has only to set to 1 the desired output contact's corresponding bit, and this will close the contact and allow the continuity of the wiring to be checked.

Test	7654321
Pattern	0000000

In the cell below, the contact test time can be set:

Contact Test	
Time	001.00s

If the outputs for test are selected and Time for output closing is set, the closing command can be executed in this cell:

```
Test output
0: no operation
```

To execute the test, press OK key, press the or key to select ***1: Apply test*** and confirm action by OK. The contact will be closed for the duration of the ***Contact Test Time*** pulse.

The next commissioning cells, which appears in ***Maintenance mode***, allows the user to check the functional output configuration of the V11V. To do this, the user has only to select which protection element will be triggered, and this will close the contact assigned to this protection element and allow the continuity of the wiring to be checked.

```
Functional Test
0: V>
```

In the cell below the end of the functional test can be configured:

```
Functional Test
End 0: CB trip
```

The following options are possible:

- ***0: CB trip*** – after triggering the functional test, the test is interrupted after trip command.
- ***1: Time*** – the protection element will be triggered for the duration of the pulse time.

If the ***1: Time*** option is selected it is necessary to set the pulse length:

```
Contact Test
Time            001.00s
```

The next cell is used for functional test execution:

```
Functional Test
CTRL: no operation
```

To execute this test, press the OK key, press the or key to select ***1: Operate*** and confirm action by pressing OK. The contact will be closed for the duration of the ***Contact Test Time*** pulse.

6. COMMISSIONING TEST RECORD

Date:	______________	Engineer:	______________
Station:		Circuit:	______________
		System Frequency:	Hz

V11V Front Plate Information

Overvoltage protection relay	**VAMP 11V**
Model number	
Serial number	

Test Equipment Used

This section should be completed to allow future identification of protective devices that have been commissioned using equipment, that is later found to be defective or incompatible, but may not be detected during the commissioning procedure.

Injection test set	Model: Serial No:	
Insulation tester	Model: Serial No:	
Setting software:	Type: Version:	

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		Delete as appropriate
	Have all relevant safety instructions been followed?	Yes ☐ No ☐
1.	**Product Checks**	
1.1	**With the relay de-energized**	
1.1.1	Visual inspection	
1.1.1.1	Relay damaged?	Yes ☐ No ☐
1.1.1.2	Rating information correct for installation?	Yes ☐ No ☐
1.1.2	Insulation resistance >100MΩ at 500V dc	Yes ☐ No ☐ Not Tested ☐
1.1.3	External wiring	
1.1.3.1	Wiring checked against diagram?	Yes ☐ No ☐
1.1.4	Measured auxiliary voltage supply	______ V ac

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1.2 With the relay energized

1.2.1	Light-emitting diodes and Watchdog Contact	
1.2.1.1	Connect the auxiliary voltage supply to terminals A1 and A2. Are the green ***Healthy*** LED and the ***WD*** output contact (A3-A5) working?	Yes ☐ No ☐
1.2.1.2	Establish connection between PC and V11V via USB port. Green ***Healthy*** LED working?	Yes ☐ No ☐
1.2.1.3	Reset LEDs by pressing the C key on the V11V's front panel. Red LED flashing rapidly?	Yes ☐ No ☐
1.2.2	Inputs	
1.2.2.1	Auxiliary voltage for binary control inputs: Value measured (see: **COMMISSIONING/Opto I/P *Status*** window of menu) (**NA**)	_____ V dc
1.2.2.2	L1 binary input working? (**NA**)	Yes ☐ No ☐
1.2.2.3	L2 binary input working? (**NA**)	Yes ☐ No ☐
1.2.2.4	L3 binary input working? (**A**)	Yes ☐ No ☐
1.2.2.5	L4 binary input working? (**A**)	Yes ☐ No ☐
1.2.2.6	L5 binary input working? (**A**)	Yes ☐ No ☐
1.2.2.7	L6 binary input working? (**A**)	Yes ☐ No ☐
1.2.3	Outputs (for tests in model B and E, ***COMMISSIONING/ Test outputs*** cell can be used)	
1.2.3.1	Output Relays	
1.2.3.1.1	Relay 1 working? (**LNA**)	Yes ☐ No ☐
1.2.3.1.2	Relay 2 working? (**LNA**)	Yes ☐ No ☐
1.2.3.1.3	Relay 3 working? (**LNA**)	Yes ☐ No ☐
1.2.3.1.4	Relay 4 working? (**NA**)	Yes ☐ No ☐
1.2.3.1.5	Relay 5 working? (**NA**)	Yes ☐ No ☐
1.2.3.1.6	Relay 6 working? (**A**)	Yes ☐ No ☐
1.2.3.1.7	Relay 7 working? (**A**)	Yes ☐ No ☐
1.2.3.1.7	Relay WD working? (**LNA**)	Yes ☐ No ☐
1.2.3.2	Close CB, after which apply voltage above setting value. CB has opened?	Yes ☐ No ☐
1.2.4	Communications between PC and MiCOM S1 Studio 5.1.0 (or higher) setting software established?	Yes ☐ No ☐

2. Setting Checks

2.1	Protection function timing tested?	Yes ☐ No ☐
	Applied voltage	_____ V
	Expected operating time	_____ s

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	Measured operating time	______ s
3.	Final Checks	
3.1	All test equipment, leads, shorts and test blocks removed safely?	Yes ☐ No ☐
3.2	Disturbed customer wiring re-checked?	Yes ☐ No ☐ N/A ☐
3.3	All commissioning tests disabled?	Yes ☐ No ☐
3.4	Records reset (via software)?	Yes ☐ No ☐

COMMENTS #
(# Optional, for site observations or utility-specific notes).

Commissioning Engineer

Customer Witness

Date:

Date:

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7. SETTING RECORD

Date:		Engineer:	
Station:		Circuit:	
		System Frequency:	Hz
		VT Ratio (tap in use):	/ V

Front Plate Information

Overvoltage protection relay	**VAMP 11V**
Model number	
Serial number	

Delete as appropriate

Column	Identification of Relay	
OP PARAMETERS	Firmware version	
	Hardware version	

Column	Global Setting Data		
GLOBAL SETTINGS/ LOC	Language	0: English ☐ 2: French ☐ 4: Russian ☐ 6: Regional ☐	1: German ☐ 3: Spanish ☐ 5: Turkish ☐
	Default Display	0: Meas. P-P[V] ☐ 2: Meas. P-N[V] ☐ 4: CB Control ☐	1: Meas. P-P[Un] ☐ 3: Meas. P-N[Un] ☐ 5: L/R Status ☐
	LEDs Reset	0: Manual only ☐ 2: Close Command ☐	1: Protect.Start ☐
	Trip Info Reset	0: Manual only ☐ 2: Close Command ☐	1: Protect.Start ☐
	Latched Alarm Reset	0: Self ☐	1: Manual ☐
	Nominal Frequency	0: 50Hz ☐	1: 60Hz ☐
	Control Keys Confirm.	0: No ☐	1:Yes ☐
GLOBAL SETTINGS/ SETTING GROUP SELECT	Number of Groups	1: One Group ☐ 2: Two Groups ☐	
	Setting Group	0: Group 1 ☐	1: Group 2 ☐
	t Change Settings G1→G2	s	
GLOBAL SETTINGS/ CT RATIO	Line VT primary	V	
	Line VT Sec	V	
	E/Gnd VT primary	V	
	E/Gnd VT Sec	V	
	VT connections	0: 3Upn ☐ 2: 2Upp+UN ☐	1: 3Upn+UN ☐ 3: 3Upp+UN ☐

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Column	Global Setting Data	
	Prot. Config. V>; V2>	0: P-P ☐ 1: P-N ☐
	Prot. Config. V<; V1<	0: P-P ☐ 1: P-N ☐
GLOBAL SETTINGS/ CIRCUIT BREAKER (**A**)	tOpen pulse min	s
	tClose Pulse	s
	Time Delay for Close	s
	tCB FLT Ext. Sign.	s
	Remote CTRL Mode	0:Remote only ☐ 1:Remote+Local ☐
GLOBAL SETTINGS/ O/V ADVANCED	IDMT Interlock by DMT	0:No ☐ 1:Yes ☐
	[27] Hysteresis	
	[59] Hysteresis	
GLOBAL SETTINGS/ [81] ADVANCED SETTINGS (**A**)	Prot. Freq. Blocking	V
	Inhibit Blocking [81]>	Hz/s
	Meas. Valid. Nb. Of Cycle	
GLOBAL SETTINGS/ COMMUNICATION (**A**)	Relay Address RS485	
	Protocol	0: Modbus RTU ☐ 1: IEC103 ☐
	Baud Rate RS485	4800 ☐ 9600 ☐ 19200 ☐ 38400 ☐ 57600 ☐ 115200 ☐
	Parity RS485	0: No parity ☐ 1: Odd parity ☐ 2: Even parity ☐
	StopBits RS485	0: 1 stop bit ☐ 1: 2 stop bits ☐
GLOBAL SETTINGS/ DISTURBANCE RECORDER (**A**)	Pre-Time	s
	Post Trip Time	s
	Disturbance Rec.Trig.	0: on Inst. ☐ 1: on Trip ☐
	Max Record Time	s

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OVERVOLTAGE G1		
SETTING GROUP 1/ PROTECTION G1/ PHASE O/V [59] G1		Settings
1	V> ?	0: Disabled ☐ 1: OR Trip ☐ 2: OR Alarm ☐ 3: AND Trip ☐ 4: AND Alarm ☐ 5: OR Trip/52a ☐ 6: OR Alarm/52a ☐ 7: AND Trip/52a ☐ 8: AND Alarm/52a ☐
2	V> Threshold	V
3	V> Delay Type	
4	tV>/TMS/TD	s
5	V> Reset Delay Type	0: DMT ☐ 1: IDMT ☐
6	V> DMT tReset	s
7	V>> ?	0: Disabled ☐ 1: OR Trip ☐ 2: OR Alarm ☐ 3: AND Trip ☐ 4: AND Alarm ☐ 5: OR Trip/52a ☐ 6: OR Alarm/52a ☐ 7: AND Trip/52a ☐ 8: AND Alarm/52a ☐
8	V>> Threshold	V
9	tV>>	s
10	V>>> ?	0: Disabled ☐ 1: OR Trip ☐ 2: OR Alarm ☐ 3: AND Trip ☐ 4: AND Alarm ☐ 5: OR Trip/52a ☐ 6: OR Alarm/52a ☐ 7: AND Trip/52a ☐ 8: AND Alarm/52a ☐
11	V>>> Threshold	V
12	tV>>>	s

UNDERVOLTAGE G1		
SETTING GROUP 1/ PROTECTION G1/ PHASE U/V [27] G1		Settings
1	V< ?	0: Disabled ☐ 1: OR Trip ☐ 2: OR Alarm ☐ 3: AND Trip ☐ 4: AND Alarm ☐ 5: OR Trip/52a ☐ 6: OR Alarm/52a ☐ 7: AND Trip/52a ☐ 8: AND Alarm/52a ☐
2	V< Threshold	V
3	V< Delay Type	
4	tV</TMS/TD	s
5	V< Reset Delay Type	0: DMT ☐ 1: IDMT ☐
6	V< DMT tReset	s
7	V<< ?	0: Disabled ☐ 1: OR Trip ☐ 2: OR Alarm ☐ 3: AND Trip ☐ 4: AND Alarm ☐ 5: OR Trip/52a ☐ 6: OR Alarm/52a ☐ 7: AND Trip/52a ☐ 8: AND Alarm/52a ☐
8	V<< Threshold	V
9	tV<<	s
10	V<<< ?	0: Disabled ☐ 1: OR Trip ☐ 2: OR Alarm ☐ 3: AND Trip ☐ 4: AND Alarm ☐ 5: OR Trip/52a ☐ 6: OR Alarm/52a ☐ 7: AND Trip/52a ☐ 8: AND Alarm/52a ☐
11	V<<< Threshold	V
12	tV<<<	s

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POSITIVE SEQUENCE UNDERVOLTAGE G1 (A)		
SETTING GROUP 1/ PROTECTION G1/ POSITIVE SEQUENCE U/V G1 [27D]		Settings
1	V1< ?	0: Disabled ☐ 1: Trip ☐ 2: Alarm ☐ 3: Trip/52a ☐ 4: Alarm/52a ☐
2	V1< Threshold	V
3	V1< Delay Type	
4	tV1</TMS/TD	s
5	V1< Reset Delay Type	0: DMT ☐ 1: IDMT ☐
6	V1< DMT tReset	s
7	V1<< ?	0: Disabled ☐ 1: Trip ☐ 2: Alarm ☐ 3: Trip/52a ☐ 4: Alarm/52a ☐
8	V1<< Threshold	V
9	tV1<<	s

NEGATIVE SEQUENCE OVERVOLTAGE G1 (NA)		
SETTING GROUP 1/ PROTECTION G1/ NEGATIVE SEQUENCE O/V G1		Settings
1	V2> ?	0: Disabled ☐ 1: Trip ☐ 2: Alarm ☐ 3: Trip/52a ☐ 4: Alarm/52a ☐
2	V2> Threshold	V
3	V2> Delay Type	
4	tV2>/TMS/TD	s
5	V2> Reset Delay Type	0: DMT ☐ 1: IDMT ☐
6	V2> DMT tReset	s
7	V2>> ?	0: Disabled ☐ 1: Trip ☐ 2: Alarm ☐ 3: Trip/52a ☐ 4: Alarm/52a ☐
8	V2>> Threshold	V
9	tV2>>	s

EARTH FAULT OVERVOLTAGE G1		
SETTING GROUP 1/ PROTECTION G1/ E/GND FAULT O/V [59] G1		Settings
1	VN> ?	0: Disabled ☐ 1: Trip (measured) (**NA**) ☐ 2: Alarm (measured) (**NA**) ☐ 3: Trip (Ua+Ub+Uc) ☐ 4: Alarm (Ua+Ub+Uc) ☐
2	VN> Threshold	V
3	VN> Delay Type	
4	tVN>/TMS/TD	s
5	VN> Reset Delay Type	0: DMT ☐ 1: IDMT ☐
6	VN> DMT tReset	s
7	VN>> ?	0: Disabled ☐ 1: OR Trip ☐ 2: OR Alarm ☐ 3: AND Trip ☐ 4: AND Alarm ☐ 5: OR Trip/52a ☐ 6: OR Alarm/52a ☐ 7: AND Trip/52a ☐ 8: AND Alarm/52a ☐
8	VN>> Threshold	V
9	tVN>>	s
10	VN>>> ?	0: Disabled ☐ 1: OR Trip ☐ 2: OR Alarm ☐ 3: AND Trip ☐ 4: AND Alarm ☐ 5: OR Trip/52a ☐ 6: OR Alarm/52a ☐ 7: AND Trip/52a ☐ 8: AND Alarm/52a ☐
11	VN>>> Threshold	V
12	tVN>>>	s

FREQUENCY [81O/81U] G1 (A)		
SETTING GROUP 1/ PROTECTION G1 / FREQUENCY [81O/81U] G1		Settings
1	f1 ?	0: Disabled ☐ 1: f> Trip ☐ 2: f> Alarm ☐ 3: f< Trip ☐ 4: f< Alarm ☐
2	f1 Threshold	Hz
3	tf1	s
4	f2 ?	0: Disabled ☐ 1: f> Trip ☐ 2: f> Alarm ☐ 3: f< Trip ☐ 4: f< Alarm ☐
5	f2 Threshold	Hz
6	tf2	s
7	f3 ?	0: Disabled ☐ 1: f> Trip ☐ 2: f> Alarm ☐ 3: f< Trip ☐ 4: f< Alarm ☐
8	f3 Threshold	Hz
9	tf3	s
10	f4 ?	0: Disabled ☐ 1: f> Trip ☐ 2: f> Alarm ☐ 3: f< Trip ☐ 4: f< Alarm ☐
11	f4 Threshold	Hz
12	tf4	s
13	f5 ?	0: Disabled ☐ 1: f> Trip ☐ 2: f> Alarm ☐ 3: f< Trip ☐ 4: f< Alarm ☐
14	f5 Threshold	Hz
15	tf5	s
16	f6 ?	0: Disabled ☐ 1: f> Trip ☐ 2: f> Alarm ☐ 3: f< Trip ☐ 4: f< Alarm ☐
17	f6 Threshold	Hz
18	tf6	s

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AUX TIMERS G1 (NA)		
SETTING GROUP 1/ PROTECTION G1 / AUX TIMERS G1		Group 1 Settings
1	AUX1 ? (NA)	0: Disabled ☐ 1: Trip ☐ 2: Alarm ☐
2	tAUX1	s
3	AUX2 ? (NA)	0: Disabled ☐ 1: Trip ☐ 2: Alarm ☐
4	tAUX2	s
5	AUX3 ? (A)	0: Disabled ☐ 1: Trip ☐ 2: Alarm ☐
6	tAUX3	s

SETTING GROUP 1/ INPUT CONFIGURATION G1		INPUTS CONFIGURATION G1					
		L6	L5	L4	L3	L2	L1
		A	A	A	A	NA	NA
1	Reverse Input Logic						
2	Mainten. Mode						
3	Reset Latch Sign						
4	Reset Latchd Out						
5	Block. tV> (NA)						
6	Block. tV>> (NA)						
7	Block. tV>>> (NA)						
8	Block. tV< (NA)						
9	Block. tV<< (NA)						
10	Block. tV<<< (NA)						
11	Block. tV1< (A)						
12	Block. tV1<< (A)						
13	Block. tV2> (NA)						
14	Block. tV2>> (NA)						
15	Block. tVN> (NA)						
16	Block. tVN>> (NA)						
17	Block. tVN>>> (NA)						
18	Block. f1 (A)						
19	Block. f2 (A)						

SETTING GROUP 1/ INPUT CONFIGURATION G1		INPUTS CONFIGURATION G1					
		L6	L5	L4	L3	L2	L1
		A	**A**	**A**	**A**	**NA**	**NA**
20	Block. f3 (**A**)						
21	Block. f4 (**A**)						
22	Block. f5 (**A**)						
23	Block. f6 (**A**)						
24	AUX1(**NA**)						
25	AUX2 (**NA**)						
26	AUX2 (**A**)						
27	AUX3 (**A**)						
28	AUX4 (**A**)						
29	AUX5 (**A**)						
30	CB Status 52A (**A**)						
31	CB Status 52B (**A**)						
32	Setting group 2 (**NA**)						
33	Manual Close (**A**)						
34	Manual Trip (**A**)						
35	VTS (**A**)						
36	Start Distur. R. (**A**)						
37	Local CTRL Mode (**A**)						
38	Time Synchr. (**A**)						

SETTING GROUP 1/ OUTPUT RELAY CONFIGURATION G1		OUTPUT RELAYS CONFIGURATION G1							
		WD	RL7	RL6	RL5	RL4	RL3	RL2	RL1
		LNA	**A**	**A**	**NA**	**NA**	**LNA**	**LNA**	**LNA**
1	Latched outputs								
2	Reverse outp. logic								
3	Protect. Trip								
4	Prot.Trip pulse								
5	Trip CB Order (**A**)								
6	Close CB Order (**A**)								
7	Alarm								
8	Start V>								
9	Start V>>								
10	Start V>>>								
11	Start V<								
12	Start V<<								
13	Start V<<<								
14	Start V1< (**A**)								
15	Start V1<< (**A**)								
16	Start V2> (**NA**)								
17	Start V2>> (**NA**)								
18	Start VN>								
19	Start VN>>								
20	Start VN>>>								
21	Start f1 (**A**)								
22	Start f2 (**A**)								
23	Start f3 (**A**)								
24	Start f4 (**A**)								
25	Start f5 (**A**)								
26	Start f6 (**A**)								
27	AUX1 (**NA**)								
28	AUX2 (**NA**)								
29	AUX3 (**A**)								
30	AUX4 (**A**)								
31	AUX5 (**A**)								
32	tV>								
33	tV>>								
34	tV>>>								

35	tV<								
36	tV<<								
37	tV<<<								
38	tV1< (**A**)								
39	tV1<< (**A**)								
40	tV2> (**NA**)								
41	tV2>> (**NA**)								
42	CB Alarm (**AE**)								
43	tVN>								
44	tVN>>								
45	tVN>>>								
46	tf1 (**A**)								
47	tf2 (**A**)								
48	tf3 (**A**)								
49	tf4 (**A**)								
50	tf5 (**A**)								
51	tf6 (**A**)								
52	tAUX1 (**NA**)								
53	tAUX2 (**NA**)								
54	tAUX3 (**A**)								
55	CB Alarm (**A**)								
56	tCB FLT Ext.Sign (**A**)								
57	Setting Group 1 (**NA**)								
58	tVTS (**A**)								
59	fout (**A**)								

LEDs CONFIGURATION G1							
SETTING GROUP 1/ LEDs CONFIGURATION G1		LED2	LED3	LED4	LED5	LED6	LED7
1	Latched LEDs						
2	Alarm						
3	Start V>						
4	Start V>>						
5	Start V>>>						
6	Start V<						
7	Start V<<						
8	Start V<<<						
9	Start V1< (**A**)						
10	Start V1<< (**A**)						
11	Start V2> (**NA**)						
12	Start V2>> (**NA**)						
13	Start VN>						
14	Start VN>>						
15	Start VN>>>						
16	Start f1 (**A**)						
17	Start f2 (**A**)						
18	Start f3 (**A**)						
19	Start f4 (**A**)						
20	Start f5 (**A**)						
21	Start f6 (**A**)						
22	AUX1 (**NA**)						
23	AUX2 (**NA**)						
24	AUX3 (**A**)						
25	AUX4 (**A**)						
26	AUX5 (**A**)						
27	tV>						
28	tV>>						
29	tV>>>						
30	tV<						
31	tV<<						
32	tV<<<						
33	tV1< (**A**)						
34	tV1<< (**A**)						
35	tV2> (**NA**)						
36	tV2>> (**NA**)						
37	CB Alarm (**AE**)						
38	tVN>						

LEDs CONFIGURATION G1							
SETTING GROUP 1/ LEDs CONFIGURATION G1		LED2	LED3	LED4	LED5	LED6	LED7
39	tVN>>						
40	tVN>>>						
41	tf1 (**A**)						
42	tf2 (**A**)						
43	tf3 (**A**)						
44	tf4 (**A**)						
45	tf5 (**A**)						
46	tf6 (**A**)						
47	tAUX1 (**NA**)						
48	tAUX2 (**NA**)						
49	tAUX3 (**A**)						
50	CB Alarm (**A**)						
51	tCB FLT Ext.Sign (**A**)						
52	Setting Group 1 (**NA**)						
53	tVTS (**A**)						
54	fout (**A**)						

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OVERVOLTAGE G2		
SETTING GROUP 2/ PROTECTION G2/ PHASE O/V [59] G2		Settings
1	V> ?	0: Disabled ☐ 1: OR Trip ☐ 2: OR Alarm ☐ 3: AND Trip ☐ 4: AND Alarm ☐ 5: OR Trip/52a ☐ 6: OR Alarm/52a ☐ 7: AND Trip/52a ☐ 8: AND Alarm/52a ☐
2	V> Threshold	V
3	V> Delay Type	
4	tV>/TMS/TD	s
5	V> Reset Delay Type	0: DMT ☐ 1: IDMT ☐
6	V> DMT tReset	s
7	V>> ?	0: Disabled ☐ 1: OR Trip ☐ 2: OR Alarm ☐ 3: AND Trip ☐ 4: AND Alarm ☐ 5: OR Trip/52a ☐ 6: OR Alarm/52a ☐ 7: AND Trip/52a ☐ 8: AND Alarm/52a ☐
8	V>> Threshold	V
9	tV>>	s
10	V>>> ?	0: Disabled ☐ 1: OR Trip ☐ 2: OR Alarm ☐ 3: AND Trip ☐ 4: AND Alarm ☐ 5: OR Trip/52a ☐ 6: OR Alarm/52a ☐ 7: AND Trip/52a ☐ 8: AND Alarm/52a ☐
11	V>>> Threshold	V
12	tV>>>	s

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UNDERVOLTAGE G2		
SETTING GROUP 2/ PROTECTION G2/ PHASE U/V [27] G2		Settings
1	V< ?	0: Disabled ☐ 1: OR Trip ☐ 2: OR Alarm ☐ 3: AND Trip ☐ 4: AND Alarm ☐ 5: OR Trip/52a ☐ 6: OR Alarm/52a ☐ 7: AND Trip/52a ☐ 8: AND Alarm/52a ☐
2	V< Threshold	V
3	V< Delay Type	
4	tV</TMS/TD	s
5	V< Reset Delay Type	0: DMT ☐ 1: IDMT ☐
6	V< DMT tReset	s
7	V<< ?	0: Disabled ☐ 1: OR Trip ☐ 2: OR Alarm ☐ 3: AND Trip ☐ 4: AND Alarm ☐ 5: OR Trip/52a ☐ 6: OR Alarm/52a ☐ 7: AND Trip/52a ☐ 8: AND Alarm/52a ☐
8	V<< Threshold	V
9	tV<<	s
10	V<<< ?	0: Disabled ☐ 1: OR Trip ☐ 2: OR Alarm ☐ 3: AND Trip ☐ 4: AND Alarm ☐ 5: OR Trip/52a ☐ 6: OR Alarm/52a ☐ 7: AND Trip/52a ☐ 8: AND Alarm/52a ☐
11	V<<< Threshold	V
12	tV<<<	s

POSITIVE SEQUENCE UNDERVOLTAGE G2 (A)		
SETTING GROUP 2/ PROTECTION G2/ POSITIVE SEQUENCE U/V G2 [27D]		Settings
1	V1< ?	0: Disabled ☐ 1: Trip ☐ 2: Alarm ☐ 3: Trip/52a ☐ 4: Alarm/52a ☐
2	V1< Threshold	V
3	V1< Delay Type	
4	tV1</TMS/TD	s
5	V1< Reset Delay Type	0: DMT ☐ 1: IDMT ☐
6	V1< DMT tReset	s
7	V1<< ?	0: Disabled ☐ 1: Trip ☐ 2: Alarm ☐ 3: Trip/52a ☐ 4: Alarm/52a ☐
8	V1<< Threshold	V
9	tV1<<	s

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NEGATIVE SEQUENCE OVERVOLTAGE G2 (NA)		
SETTING GROUP 2/ PROTECTION G2/ NEGATIVE SEQUENCE O/V G2		Settings
1	V2> ?	0: Disabled ☐ 1: Trip ☐ 2: Alarm ☐ 3: Trip/52a ☐ 4: Alarm/52a ☐
2	V2> Threshold	V
3	V2> Delay Type	
4	tV2>/TMS/TD	s
5	V2> Reset Delay Type	0: DMT ☐ 1: IDMT ☐
6	V2> DMT tReset	s
7	V2>> ?	0: Disabled ☐ 1: Trip ☐ 2: Alarm ☐ 3: Trip/52a ☐ 4: Alarm/52a ☐
8	V2>> Threshold	V
9	tV2>>	s

EARTH FAULT OVERVOLTAGE G2		
SETTING GROUP 2/ PROTECTION G2/ E/GND FAULT O/V [59] G2		Settings
1	VN> ?	0: Disabled ☐ 1: Trip (measured) (**NA**) ☐ 2: Alarm (measured) (**NA**) ☐ 3: Trip (Ua+Ub+Uc) ☐ 4: Alarm (Ua+Ub+Uc) ☐
2	VN> Threshold	V
3	VN> Delay Type	
4	tVN>/TMS/TD	s
5	VN> Reset Delay Type	0: DMT ☐ 1: IDMT ☐
6	VN> DMT tReset	s
7	VN>> ?	0: Disabled ☐ 1: OR Trip ☐ 2: OR Alarm ☐ 3: AND Trip ☐ 4: AND Alarm ☐ 5: OR Trip/52a ☐ 6: OR Alarm/52a ☐ 7: AND Trip/52a ☐ 8: AND Alarm/52a ☐
8	VN>> Threshold	V
9	tVN>>	s
10	VN>>> ?	0: Disabled ☐ 1: OR Trip ☐ 2: OR Alarm ☐ 3: AND Trip ☐ 4: AND Alarm ☐ 5: OR Trip/52a ☐ 6: OR Alarm/52a ☐ 7: AND Trip/52a ☐ 8: AND Alarm/52a ☐
11	VN>>> Threshold	V
12	tVN>>>	s

FREQUENCY [81O/81U] G2 (A)		
SETTING GROUP 2/ PROTECTION G2 / FREQUENCY [81O/81U] G2		Settings
1	f1 ?	0: Disabled ☐ 1: f> Trip ☐ 2: f> Alarm ☐ 3: f< Trip ☐ 4: f< Alarm ☐
2	f1 Threshold	Hz
3	tf1	s
4	f2 ?	0: Disabled ☐ 1: f> Trip ☐ 2: f> Alarm ☐ 3: f< Trip ☐ 4: f< Alarm ☐
5	f2 Threshold	Hz
6	tf2	s
7	f3 ?	0: Disabled ☐ 1: f> Trip ☐ 2: f> Alarm ☐ 3: f< Trip ☐ 4: f< Alarm ☐
8	f3 Threshold	Hz
9	tf3	s
10	f4 ?	0: Disabled ☐ 1: f> Trip ☐ 2: f> Alarm ☐ 3: f< Trip ☐ 4: f< Alarm ☐
11	f4 Threshold	Hz
12	tf4	s
13	f5 ?	0: Disabled ☐ 1: f> Trip ☐ 2: f> Alarm ☐ 3: f< Trip ☐ 4: f< Alarm ☐
14	f5 Threshold	Hz
15	tf5	s
16	f6 ?	0: Disabled ☐ 1: f> Trip ☐ 2: f> Alarm ☐ 3: f< Trip ☐ 4: f< Alarm ☐
17	f6 Threshold	Hz
18	tf6	s

AUX TIMERS G2 (NA)		
SETTING GROUP 2/ PROTECTION G2 / AUX TIMERS G2		Group 1 Settings
1	AUX1 ? (NA)	0: Disabled ☐ 1: Trip ☐ 2: Alarm ☐
2	tAUX1	s
3	AUX2 ? (NA)	0: Disabled ☐ 1: Trip ☐ 2: Alarm ☐
4	tAUX2	s
5	AUX3 ? (A)	0: Disabled ☐ 1: Trip ☐ 2: Alarm ☐
6	tAUX3	s

SETTING GROUP 2/ INPUT CONFIGURATION G2		INPUTS CONFIGURATION G2					
		L6	L5	L4	L3	L2	L1
		A	A	A	A	NA	NA
1	Reverse Input Logic						
2	Mainten. Mode						
3	Reset Latch Sign						
4	Reset Latchd Out						
5	Block. tV> (NA)						
6	Block. tV>> (NA)						
7	Block. tV>>> (NA)						
8	Block. tV< (NA)						
9	Block. tV<< (NA)						
10	Block. tV<<< (NA)						
11	Block. tV1< (A)						
12	Block. tV1<< (A)						
13	Block. tV2> (NA)						
14	Block. tV2>> (NA)						
15	Block. tVN> (NA)						
16	Block. tVN>> N (A)						
17	Block. tVN>>> (NA)						
18	Block. f1 (A)						
19	Block. f2 (A)						

CM

SETTING GROUP 2/ INPUT CONFIGURATION G2		INPUTS CONFIGURATION G2					
		L6	L5	L4	L3	L2	L1
		A	**A**	**A**	**A**	**NA**	**NA**
20	Block. f3 (**A**)						
21	Block. f4 (**A**)						
22	Block. f5 (**A**)						
23	Block. f6 (**A**)						
24	AUX1(**NA**)						
25	AUX2 (**NA**)						
26	AUX2 (**A**)						
27	AUX3 (**A**)						
28	AUX4 (**A**)						
29	AUX5 (**A**)						
30	CB Status 52A (**A**)						
31	CB Status 52B (**A**)						
32	Setting group 2 (**NA**)						
33	Manual Close (**A**)						
34	Manual Trip (**A**)						
35	VTS (**A**)						
36	Start Distur. R. (**A**)						
37	Local CTRL Mode (**A**)						
38	Time Synchr. (**A**)						

SETTING GROUP 2/ OUTPUT RELAY CONFIGURATION G2		OUTPUT RELAYS CONFIGURATION G2							
		WD	RL7	RL6	RL5	RL4	RL3	RL2	RL1
		LNA	**A**	**A**	**NA**	**NA**	**LNA**	**LNA**	**LNA**
1	Latched outputs								
2	Reverse outp. logic								
3	Protect. Trip								
4	Prot.Trip pulse								
5	Trip CB Order (**A**)								
6	Close CB Order (**A**)								
7	Alarm								
8	Start V>								
9	Start V>>								
10	Start V>>>								
11	Start V<								
12	Start V<<								
13	Start V<<<								
14	Start V1< (**A**)								
15	Start V1<< (**A**)								
16	Start V2> (**NA**)								
17	Start V2>> (**NA**)								
18	Start VN>								
19	Start VN>>								
20	Start VN>>>								
21	Start f1 (**A**)								
22	Start f2 (**A**)								
23	Start f3 (**A**)								
24	Start f4 (**A**)								
25	Start f5 (**A**)								
26	Start f6 (**A**)								
27	AUX1 (**NA**)								
28	AUX2 (**NA**)								
29	AUX3 (**A**)								
30	AUX4 (**A**)								
31	AUX5 (**A**)								
32	tV>								

CM

33	tV>>								
34	tV>>>								
35	tV<								
36	tV<<								
37	tV<<<								
38	tV1< (**A**)								
39	tV1<< (**A**)								
40	tV2> (**NA**)								
41	tV2>> (**NA**)								
42	CB Alarm (**A**)								
43	tVN>								
44	tVN>>								
45	tVN>>>								
46	tf1 (**A**)								
47	tf2 (**A**)								
48	tf3 (**A**)								
49	tf4 (**A**)								
50	tf5 (**A**)								
51	tf6 (**A**)								
52	tAUX1 (**NA**)								
53	tAUX2 (**NA**)								
54	tAUX3 (**A**)								
55	CB Alarm (**A**)								
56	tCB FLT Ext.Sign (**A**)								
57	Setting Group 1 (**NA**)								
58	tVTS (**A**)								
59	fout (**A**)								

LEDs CONFIGURATION G2							
SETTING GROUP 2/ LEDs CONFIGURATION G2		LED2	LED3	LED4	LED5	LED6	LED7
1	Latched LEDs						
2	Alarm						
3	Start V>						
4	Start V>>						
5	Start V>>>						
6	Start V<						
7	Start V<<						
8	Start V<<<						
9	Start V1< (**A**)						
10	Start V1<< (**A**)						
11	Start V2> (**NA**)						
12	Start V2>> (**NA**)						
13	Start VN>						
14	Start VN>>						
15	Start VN>>>						
16	Start f1 (**A**)						
17	Start f2 (**A**)						
18	Start f3 (**A**)						
19	Start f4 (**A**)						
20	Start f5 (**A**)						
21	Start f6 (**A**)						
22	AUX1 (**A**)						
23	AUX2 (**A**)						
24	AUX3 (**A**)						
25	AUX4 (**A**)						
26	AUX5 (**A**)						
27	tV>						
28	tV>>						
29	tV>>>						
30	tV<						
31	tV<<						
32	tV<<<						
33	tV1< (**A**)						
34	tV1<< (**A**)						
35	tV2> (**NA**)						
36	tV2>> (**NA**)						
37	CB Alarm (**A**)						
38	tVN>						

CM

LEDs CONFIGURATION G2							
SETTING GROUP 2/ LEDs CONFIGURATION G2		LED2	LED3	LED4	LED5	LED6	LED7
39	tVN>>						
40	tVN>>>						
41	tf1 (**A**)						
42	tf2 (**A**)						
43	tf3 (**A**)						
44	tf4 (**A**)						
45	tf5 (**A**)						
46	tf6 (**A**)						
47	tAUX1 (**A**)						
48	tAUX2 (**A**)						
49	tAUX3 (**A**)						
50	CB Alarm (**A**)						
51	tCB FLT Ext.Sign (**A**)						
52	Setting Group 1 (**NA**)						
53	tVTS (**A**)						
54	fout (**A**)						

Commissioning Engineer

Customer Witness

Date:

Date:

MAINTENANCE

MT

Date:	**1st December 2015**
Software Version:	**1A**
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CONTENTS

Maintenance

1.1 Maintenance period

It is recommended that products supplied by SCHNEIDER ELECTRIC ENERGY receive periodic monitoring after installation. In view of the critical nature of protective relays and their infrequent operation, it is desirable to confirm that they are operating correctly, at regular intervals.

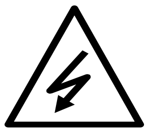
SCHNEIDER ELECTRIC ENERGY protective relays are designed for a life in excess of 20 years.

VAMP 11x relays are self-monitoring and so require less maintenance than earlier designs of relay. Most problems will set off an alarm so that remedial action can be taken. However, some periodic tests should be carried out to ensure that the relay is functioning correctly and that the external wiring is intact.

1.2 Maintenance checks

Although some functionality checks can be performed from a remote location by utilizing the communications ability of the relays, these are predominantly restricted to checking that the relay is measuring the applied voltages accurately. Therefore it is recommended that maintenance checks are performed locally (i.e. at the substation itself).

Before carrying out any work on the equipment, the user should be familiar with the contents of the Safety Guide SFTY/4L M/E11 or later issue, OR the safety and technical data section of the technical manual and also the ratings on the equipment rating label.



For safety reasons, no work must be carried out on the V11V until all power sources to the unit have been disconnected.

1.2.1 Binary Inputs

Binary inputs can be checked to ensure that the relay responds to its energization by repeating the commissioning test detailed in section 3.2.2 of the Commissioning chapter (V11V/EN CM).

1.2.2 Outputs

Output relays operation can be checked by repeating the commissioning test detailed in section 3.2.3 of the Commissioning chapter (V11V/EN CM).

1.2.3 Measurement Accuracy

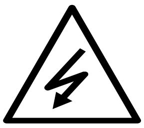
If the power system is energized, the values measured by the relay can be compared with known system values to check that they are in the approximate expected range. If they are, then the analogue/digital conversion and calculations are being performed correctly by the relay. Suitable test methods can be found in sections 3.2.6 of the Commissioning chapter (V11V/EN CM).

Alternatively, the values measured by the relay can be checked against known values injected into the relay via the test block, if fitted, or injected directly into the relay terminals. These tests will prove the calibration accuracy is being maintained.

1.3 Method of Repair

It is recommended that the V11V relay is returned to an SCHNEIDER ELECTRIC ENERGY service centre for repair.

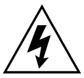
Before carrying out any work on the equipment, the user should be familiar with the contents of the Safety Guide SFTY/4L M/E11 or later issue, OR the safety and technical data section of the technical manual and also the ratings on the equipment rating label.



For safety reasons, no work must be carried out on the V11V until all power sources to the unit have been disconnected.

1.4 Cleaning

Before cleaning the equipment ensure that all current transformers and voltage input connections are isolated to prevent any possibility of an electric shock whilst cleaning.



The equipment may be cleaned using a lint-free cloth moistened with clean water. The use of detergents, solvents or abrasive cleaners is not recommended as they may damage the relay's surface and leave a conductive residue.

TROUBLESHOOTING

TS

Date:	**1st December 2015**
Software Version:	**1A**
Connection Diagrams:	**10V11V01**

CONTENTS

1. INTRODUCTION

BEFORE CARRYING OUT ANY WORK ON THE EQUIPMENT, THE USER SHOULD BE FAMILIAR WITH THE CONTENTS OF THE SAFETY GUIDE SFTY/4L M/E11 OR LATER ISSUE, or THE SAFETY AND TECHNICAL DATA SECTION OF THE TECHNICAL MANUAL AND ALSO THE RATINGS ON THE EQUIPMENT RATING LABEL.

For safety reasons, no work must be carried out on the V11V until all power sources to the unit have been disconnected.

The purpose of this section of the service manual is to allow an error condition on the relay to be identified so that appropriate corrective action can be taken.

In cases where a faulty relay is being returned to the manufacturer or one of their approved service centers, a completed copy of the Repair/Modification Return Authorization Form located at the end of this section should be included.

2. INITIAL PROBLEM IDENTIFICATION

Consult the table below to find the description that best matches the problem experienced, then consult the section referenced to perform a more detailed analysis of the problem.

Symptom	Refer To
Relay fails to power up	Section 3
Maloperation of the relay during testing	Section 4

Table 1: Problem identification

3. POWER UP ERRORS

V11V can be powered up using the following power sources:

- USB connection to PC (model N, A)
- Auxiliary voltage (Vx)

If the relay does not appear to power up then the following procedure can be used to determine whether the fault is in the external wiring or in the power supply module of the relay.

Test	Check	Action
1	1. Connect the V11V to a PC via the USB port. 2. Disconnect the PC from the V11V USB port.	(i) If the green “Healthy” LED and display are lit then proceed to test 2. (ii) If the green “Healthy” LED and display are not lit then proceed to test 2.
2	1. Apply a Vx auxiliary voltage on terminals A1-A2 (check the level on the V11V nominal label) 2. Check whether the green “Healthy” LED on the V11V front panel is lit. 3. Disconnect the ac auxiliary voltage from terminals A1-A2.	(i) If the green “Healthy” LED and display are lit then proceed to test 3. (ii) If the green “Healthy” LED and display are not lit then send the relay back to Schneider Electric Energy's repair centre.

Table 2: Failure of relay to power up

4. MALOPERATION OF THE RELAY DURING TESTING

4.1 Failure of Binary Inputs (N, A only)

The binary inputs are configured in the ***SETTING GROUPx/INPUTS CONFIGURATION*** column for each setting group. If an input does not appear to be recognized by the relay scheme logic the ***COMMISSIONING/Opto I/P Status*** menu option can be used to verify whether the problem is in the binary input itself or the mapping of its signal to the scheme logic functions. If the binary input appears to be read correctly then it is necessary to examine its configuration.

Ensure the voltage rating for the opto inputs has been configured correctly with applied voltage. If the binary input state is not read correctly by the relay the applied signal should be tested. Verify the connections to the binary input using the correct wiring diagram. Next, using a voltmeter verify that 80% opto setting voltage is present on the terminals of the binary input in the energized state. If the signal is being correctly applied to the relay then the failure may be on the input card itself.

Notes: 1. If the V11V is exclusively powered from the USB port, only some of the relay's electronic circuits (necessary for communications) are supplied. For this reason, inputs are in high state (independent of the voltage at the terminals). Any action pertaining to binary inputs is blocked.

2. Only the logical state of the inputs is given in the ***COMMISSIONING /Opto I/P Status*** cell, not presence of voltage at the terminals. For example: If Vx (high state) and Reverse Input Logic are set (function active in low state of binary input) at the terminals of a binary input in the **COMMISSIONING /Opto I/P Status** cell, the logical state of the input is low (logical status after application of the Reverse Input Logic function).

4.2 Failure of Output Contacts

An apparent failure of the relay's output contacts may be caused by the relay configuration; the following tests should be performed to identify the real cause of the failure. Tests of outputs can be performed using the ***COMMISSIONING/Test outputs*** cell. The command is executed and the configured outputs (***COMMISSIONING/Test Pattern***) will be energized for the duration of ***Contact Test Time*** (***COMMISSIONING***) – only model A.

Test	Check	Action
1	Is the Out of Service LED illuminated?	Illumination of this LED may indicate that the relay is in test mode or that the protection has been disabled due to a hardware verify error (see Table 2).
2	Examine the ***Test outputs*** (A) in the Commissioning section of the menu.	If the relevant bits of the contact status are operated then proceed to test 4, if not proceed to test 3.
3	Verify by examination of the fault record whether the protection element is operating correctly.	If the protection element does not operate verify whether the test is being correctly applied. If the protection element operates then it is necessary to check the configuration, to ensure that the configuration of the protection element to the contacts is correct.
4	Using the procedure described in the Commissioning chapter (V11V/EN CM) energize every output (note the correct external connection diagram should be consulted). A continuity tester can be connected at the rear of the relay for this purpose.	If the output relay operates then the problem must be situated in the external wiring to the relay. If the output relay does not operate this could indicate a failure of the output relay contacts (note that the self-tests verify that the relay coil is being energized). Ensure that the closed resistance is not too high for the continuity tester to detect.

Table 3: Failure of Output Contacts

TS

5. REPAIR AND MODIFICATION PROCEDURE

Please follow these 5 steps to return an Automation product to us:

1. Get the Repair and Modification Authorization Form (RMA)

Find a copy of the RMA form at the end of this section.

To obtain an electronic version of the RMA form for e-mailing, please connect your local Schneider Electric Energy service.

2. Fill in RMA form

Fill in only the white part of the form.

Please ensure that all fields marked **(M)** are completed such as:

- Equipment model
- Model No. and Serial No.
- Description of failure or modification required (please be specific)
- Value for customs (in case the product requires export)
- Delivery and invoice addresses
- Contact details

3. Send RMA form to your local contact

4. Receive shipping information from local service contact

Your local service contact will provide you with all the information:

- Pricing details
- RMA n°
- Repair center address

If required, an acceptance of the quote must be delivered before going to the next step. .

5. Send the product to the repair center

- Address the shipment to the repair center specified by your local contact
- Ensure all items are protected by appropriate packaging: anti-static bag and foam protection
- Ensure a copy of the import invoice is enclosed with the unit being returned
- Ensure a copy of the RMA form is enclosed with the unit being returned
- E-mail or fax a copy of the import invoice and air waybill to your local contact.

SYMBOLS AND GLOSSARY

Date:	**1st December 2015**
Software Version:	**1A**
Connection Diagrams:	**10V11V01**

SG

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Logic Symbols

Symbols	Explanation
>	**Greater than:** Used to indicate an “over” threshold, such as overvoltage.
C/O	**A changeover contact having normally closed and normally open connections:** Often called a “form C” contact.
CB	Circuit breaker.
VT	Voltage transformer.
Dly	Time delay.
DT	**Abbreviation of “Definite Time”:** An element which always responds with the same constant time-delay on operation.
E/F	**Earth fault:** Directly equivalent to ground fault.
Flt.	**Abbreviation of “Fault”:** Typically used to indicate faulted phase selection.
FN	Function.
Gnd.	**Abbreviation of “Ground”:** Used in distance settings to identify settings that relate to ground (earth) faults.
V	Voltage
V<	**First stage of undervoltage protection:** Could be labeled 27-1 in ANSI terminology.
V<<	**Second stage of undervoltage protection:** Could be labeled 27-2 in ANSI terminology.
V<<<	**Third stage of undervoltage protection:** Could be labeled 27-3 in ANSI terminology.
V>	**First stage of overvoltage protection:** Could be labeled 59-1 in ANSI terminology.
V>>	**Second stage of overvoltage protection:** Could be labeled 59-2 in ANSI terminology.
V>>>	**Third stage of overvoltage protection:** Could be labeled 59-3 in ANSI terminology.
VN	**Earth Fault voltage:** Equals the neutral voltage measured at the analog input.
V2>	**Negative sequence overvoltage protection** Could be labeled 47 in ANSI terminology.
V1<	**Positive sequence undervoltage protection** Could be labeled 27D in ANSI terminology.
V2	**Negative sequence of voltage**.
V1	**Positive sequence of voltage**.
F	**Frequency protection**
AUX	**Auxiliary timers**
VA	**Phase A voltage:**

Symbols	Explanation
	Might be phase L1, red phase.. or other, in customer terminology.
VB	**Phase B voltage:** Might be phase L2, yellow phase.. or other, in customer terminology.
VC	**Phase C voltage:** Might be phase L3, blue phase.. or other, in customer terminology.
IDMT	**Inverse definite minimum time:** A characteristic whose trip time depends on the measured input (e.g. voltage) according to an inverse-time curve.
Un	**The rated nominal voltage of the VT:** Software selectable (57-130)V.
Uen	**The rated nominal voltage of the E/F CT:** Software selectable (57-130)V.
VN	**Neutral voltage, or residual voltage:** This results from an external summation of the three measured phase voltages.
Inst.	**An element with “instantaneous” operation:** i.e. having no deliberate time delay.
I/O	**Abbreviation of “Inputs and Outputs”:** Used in connection with the number of opto-coupled inputs and output contacts within the relay.
I/P	Abbreviation of “Input”.
LD	**Abbreviation of “Level Detector”:** An element responding to a voltage below its set threshold.
LED	**Light emitting diode:** Red or green indicator on the relay front-panel.
N	**Indication of “Neutral” involvement in a fault:** i.e. a ground (earth) fault.
N/A	Not applicable.
N/C	**A normally closed or “break” contact:** Often called a “form B” contact.
N/O	**A normally open or “make” contact:** Often called a “form A” contact.
O/P	Abbreviation of “output”.
Opto	**An opto-coupled logic input:** Alternative terminology: binary input.
PCB	Printed circuit board.
Ph	**Abbreviation of “Phase”:** Used in distance settings to identify settings that relate to phase-phase faults.
VN>	The first stage of earth fault protection element [59N]
VN>>	The second stage of earth fault protection element [59N]
VN>>>	The third stage of earth fault protection element [59N]
Rx	**Abbreviation of “Receive”:** Typically used to indicate a communication receive line/pin.

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Symbols	Explanation
T	A time delay.
TE	**A standard for measuring the width of a relay case:** One inch = 5TE units.
TMS	The time multiplier setting applied to IEC or UK inverse-time curves
TD	The time multiplier setting applied to IEEE or US inverse-time curves
Tx	**Abbreviation of "Transmit":** Typically used to indicate a communication transmit line/pin.

Retardation time

Retardation time is the time which protection relay needs to notice, that a fault has been cleared during the operation time delay. This parameter is important when grading the operation time delay settings between protection relays.

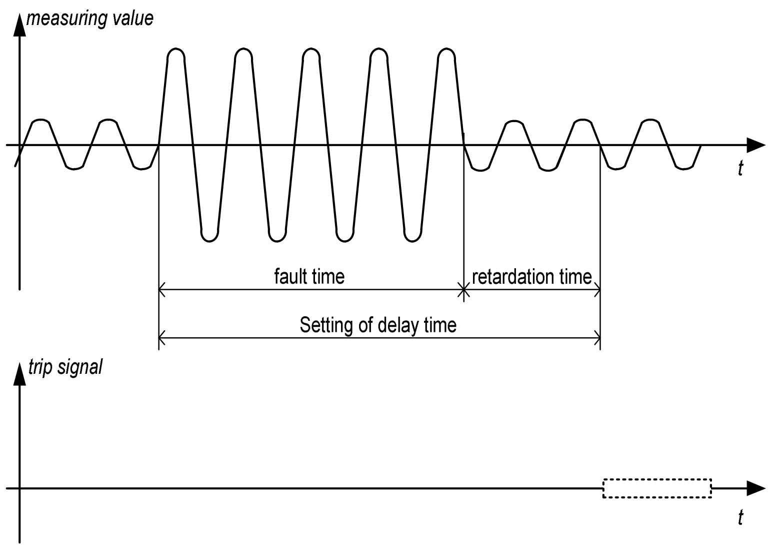

Figure 1: Definition for retardation time

Example - when there is a big fault in an outgoing feeder, it might start i.e. pick-up both the incoming and outgoing feeder relay. However the fault must be cleared by the outgoing feeder relay and the incoming feeder relay must not trip. Although the operating delay setting of the incoming feeder is more than at the outgoing feeder, the incoming feeder might still trip, if the operation time difference is not big enough. The difference must be more than the retardation time of the incoming feeder relay plus the operating time of the outgoing feeder circuit breaker. Figure 1 shows overvoltage fault see from the incoming feeder, when the outgoing feeder does clear the fault. If the operation delay setting would be slightly shorter or if the fault duration would be slightly longer than in the figure, an unselective trip might happen (dotted pulse in the above figure). In VAMP 11x devices the retardation time is less than 40 ms.

SG

INSTALLATION

Date:	**1st December 2015**
Software Version:	**1A**
Connection Diagrams:	**10V11V01**

IN

IN

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FIGURES

IN

1. RECEIPT OF RELAYS

Upon receipt, relays should be examined immediately to ensure no external damage has been sustained in transit. If damage has been sustained, a claim should be made to the transport contractor and Schneider Electric Energy should be promptly notified.

Relays that are supplied unmounted and not intended for immediate installation should be returned to their protective polythene bags and delivery carton. Section 3 of V11V/EN IN gives more information about the storage of relays.

2. HANDLING OF ELECTRONIC EQUIPMENT

A person’s normal movements can easily generate electrostatic potentials of several thousand volts. Discharge of these voltages into semi-conductor devices when handling electronic circuits can cause serious damage that, although not always immediately apparent can reduce the reliability of the circuit. The relay’s electronic circuits are protected from electrostatic discharge when housed in the case. Do not expose them to risk by removing the front panel or printed circuit boards unnecessarily.

Each printed circuit board incorporates the highest practicable protection for its semi-conductor devices. However, if it becomes necessary to remove a printed circuit board, the following precautions should be taken to preserve the high reliability and long life for which the relay has been designed and manufactured.

Before removing a printed circuit board, ensure that you are at the same electrostatic potential as the equipment by touching the case.

Handle analog input modules by the front panel, frame or edges of the circuit boards. Printed circuit boards should only be handled by their edges. Avoid touching the electronic components, printed circuit tracks or connectors.

Do not pass the module to another person without first ensuring you are both at the same electrostatic potential. Shaking hands achieves equipotential.

Place the module on an anti-static surface, or on a conducting surface that is at the same potential as you.

If it is necessary to store or transport printed circuit boards removed from the case, place them individually in electrically conducting anti-static bags.

In the unlikely event that you are making measurements on the internal electronic circuitry of a relay in service, it is preferable that you are earthed to the case with a conductive wrist strap. Wrist straps should have a resistance to ground between 500 kΩ and 10 MΩ. If a wrist strap is not available you should maintain regular contact with the case to prevent a build-up of electrostatic potential. Instrumentation which may be used for making measurements should also be earthed to the case whenever possible.

More information on safe working procedures for all electronic equipment can be found in BS EN 100015: Part 1:1992. It is strongly recommended that detailed investigations on electronic circuitry or modification work should be carried out in a special handling area such as described in the British Standard document.

3. STORAGE

If relays are not to be installed immediately upon receipt, they should be stored in a place free from dust and moisture in their original cartons. Where de-humidifier bags have been included in the packing they should be retained.

Care should be taken on subsequent unpacking that any dust, which has collected on the carton, does not fall inside. In locations of high humidity the carton and packing may become impregnated with moisture and the de-humidifier crystals will lose their efficiency.

Prior to installation, relays should be stored at a temperature of between –40°C to +70°C (-40°F to +158°F).

4. UNPACKING

Care must be taken when unpacking and installing the relays so that none of the parts are damaged and additional components are not accidentally left in the packing or lost. Ensure that any User's CD ROM or technical documentation is NOT discarded – this should accompany the relay to its destination substation.

Relays must only be handled by qualified persons.

The site should be well lit to facilitate inspection, clean, dry and reasonably free from dust and excessive vibration.

5. RELAY MOUNTING

Individual relays are normally supplied with an outline diagram showing the dimensions. This information can also be found in the product publication.

Flush mounted version:

Make a cut-out in mounting plate according to fig. 1. Then insert the relay into it. Fit fastening elements (see fig. 1) into the slots in the sides of the housing, and keep turning the fastening screws until the relay is securely fixed to the plate. To remove the relay undo the screws, so that the fastening element could be taken out, and then the relay could be withdrawn from the cut-out in the mounting plate.

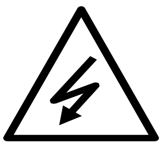
Mounting on the wall:

Flush mounting case of V11V can be mounted on the wall by using optional Wall Mounting Case Adaptor (ordering number: REL10030)

Insert the relay into wall mounting adaptor according to fig. 2. Fit fastening elements (see fig. 2) into the slots in the sides of the housing, and keep turning the fastening screws until the relay is securely fixed to the wall mounting adaptor. To remove the relay undo the screws, so that the fastening element could be taken out, and then the relay could be withdrawn from the wall mounting adaptor.

6. RELAY WIRING

BEFORE CARRYING OUT ANY WORK ON THE EQUIPMENT, THE USER SHOULD BE FAMILIAR WITH THE CONTENTS OF THE SAFETY GUIDE SFTY/4L M/E11 OR LATER ISSUE, OR THE SAFETY AND TECHNICAL DATA SECTION OF THE TECHNICAL MANUAL AND ALSO THE RATINGS ON THE EQUIPMENT RATING LABEL.



For safety reasons, no work must be carried out on the V11V until all power sources to the unit have been disconnected.

The measuring voltage inputs of the V11V should be connected to the secondary wires of the power system VTs as shown in the connection diagrams in section 8. "External Connection Diagram" of this chapter V11V/EN IN.

The VT types which can be connected to the V11V's voltage input terminals are shown in section 3 of the Applications chapter V11V/EN AP.

6.1 Terminal Block Connections

AC Voltage Input Terminals

Threaded M3 screw-type plug-in terminals, with wire protection for conductor cross-section

(i) 0.2 - 6 mm^2 single-core

(ii) 0.2 - 4 mm^2 finely stranded

General Input/Output Terminals

For power supply, binary and contact inputs, output contacts and COM for rear communications.

Threaded M3 screw-type plug-in terminals, with wire protection for conductor cross-section

(i) 0.2 - 4 mm^2 single-core

(ii) 0.2 - 2.5 mm^2 finely stranded

Connections to the equipment must only be made using single strand wire or stranded wire with the use of insulated crimp terminals to maintain insulation requirements.

Where UL Listing of the equipment is not required the recommended fuse type for external wiring is a high rupture capacity (HRC) type with a maximum current rating of 16 Amps and a minimum DC rating of 250 Vdc, for example the Red Spot NIT or TIA type.

To maintain UL and CUL Listing of the equipment for North America a UL Listed fuse shall be used. The UL Listed type shall be a Class J time delay fuse, with a maximum current rating of 15 A and a minimum DC rating of 250 Vdc, for example type AJT15.

The protective fuse(s) should be located as close to the unit as possible.

6.2 USB Port

Connection to the USB (**NA**) port can be made by means of an USB cable. The USB port allows the user to download settings or fault records from the V11V or change I/O configuration.

To access this port it is necessary to remove the cover plate on the V11V front panel.

A typical cable specification would be:

Cable Type: USB 2.0

Connectors:

PC: type A male

V11V: type mini B 5-pin male

USB Cable: minimum 1P*28AWG/2C*24AWG, max: 2m

Communication software: MiCOM S1 Studio (5.1.0 or higher)

The virtual COM port for USB communications should be set in as follows:

Address: 1

Baud rate*:* 115 200 bits/s

Data bit: 8

Stop bit: 1

Parity: None

6.3 Rear Communications Port (in Model L optional)

EIA(RS)485 signal levels, two wire

Connections located on the general-purpose terminal block, M3 screw

For screened twisted pair cable, distance to be bridged: multi-endpoint link: max. 100m

For Modbus RTU or IEC-103 protocol; Isolation to SELV level

7. V11V CASE AND ADAPTOR DIMENSIONS

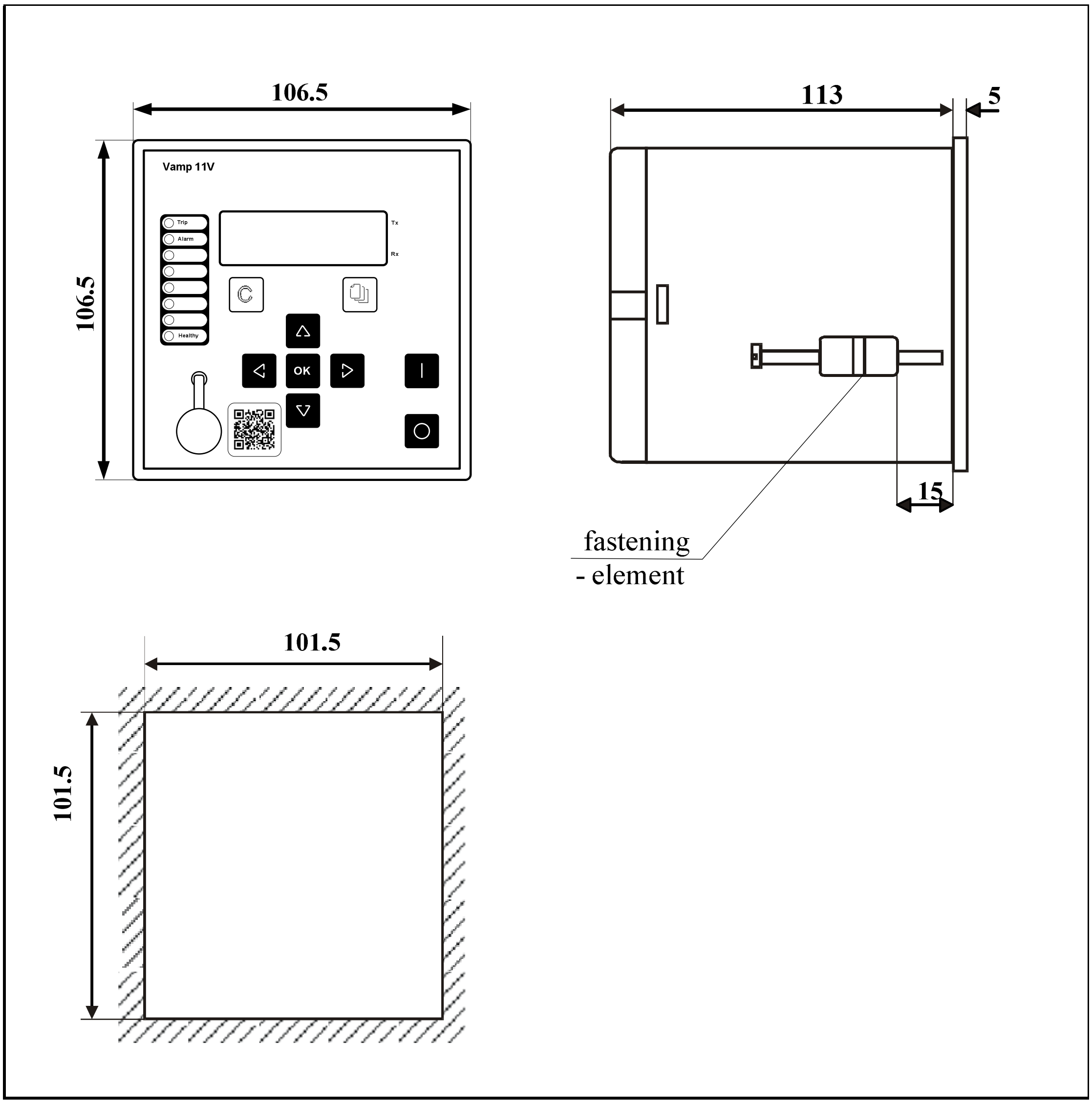


Figure 1: Dimensions. V11V flush mounting basic case

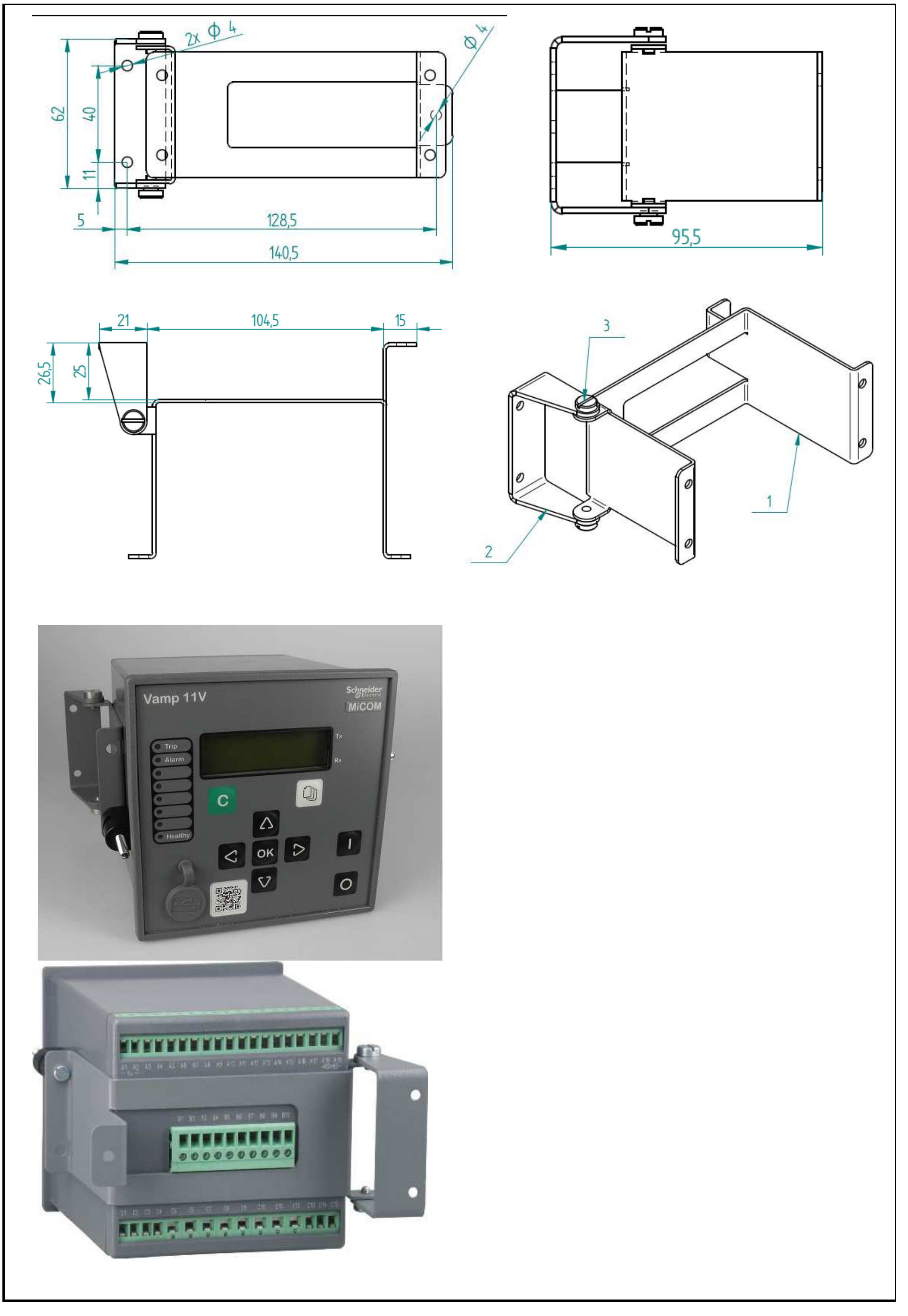


Figure 2: Dimensions. Wall mounting case adaptor

8. EXTERNAL CONNECTION DIAGRAMS

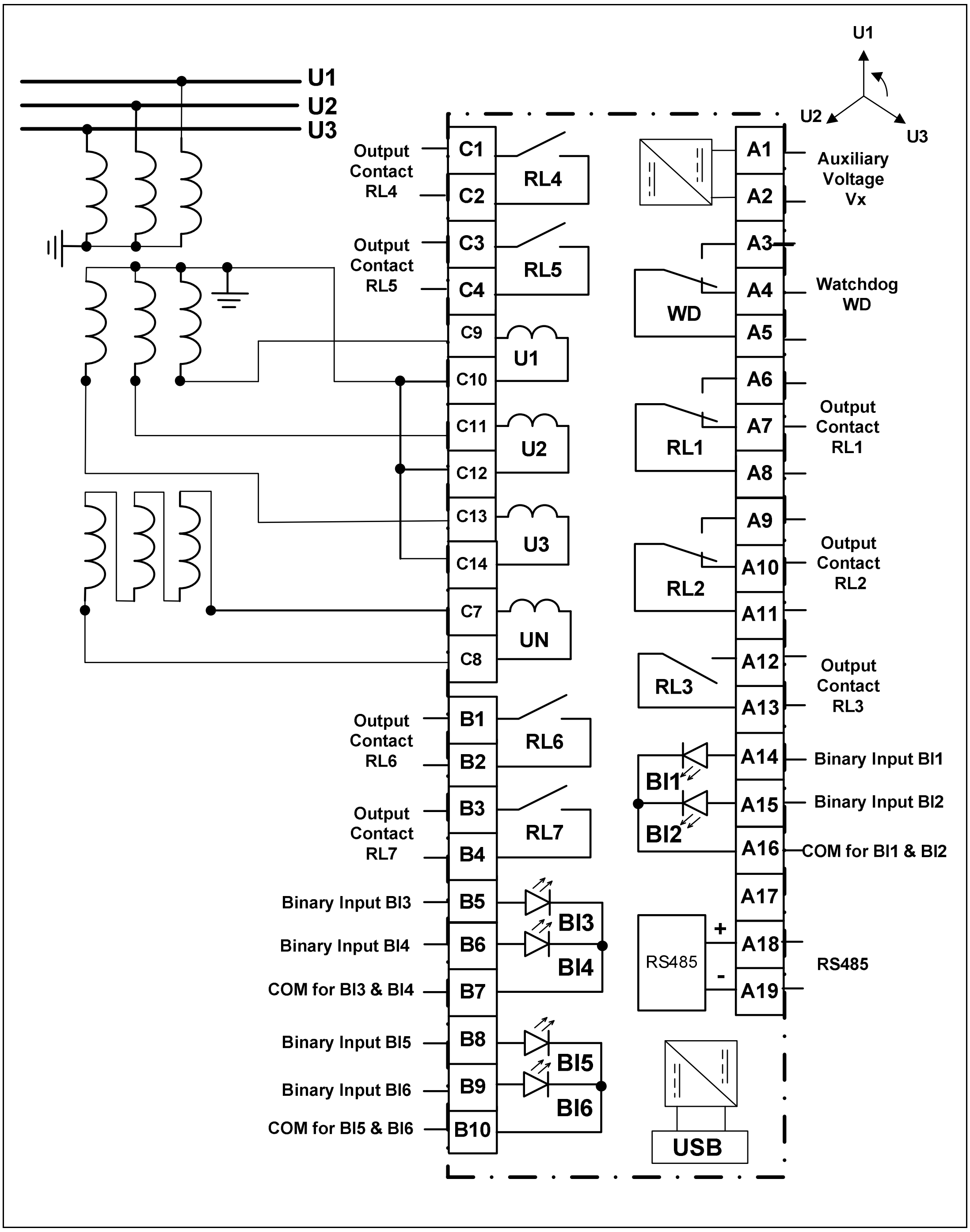


Figure 3: Model A

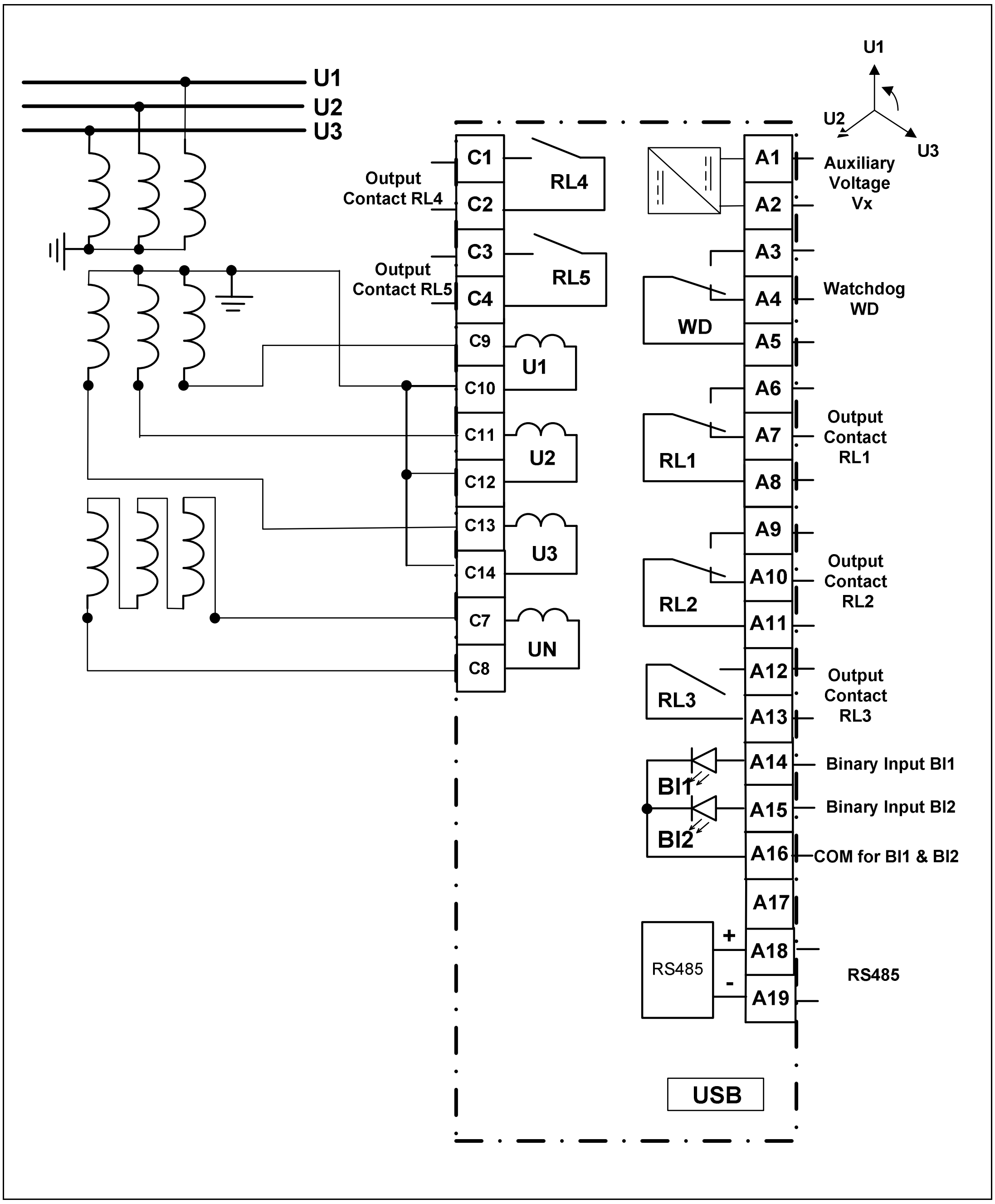


Figure 4: Model N

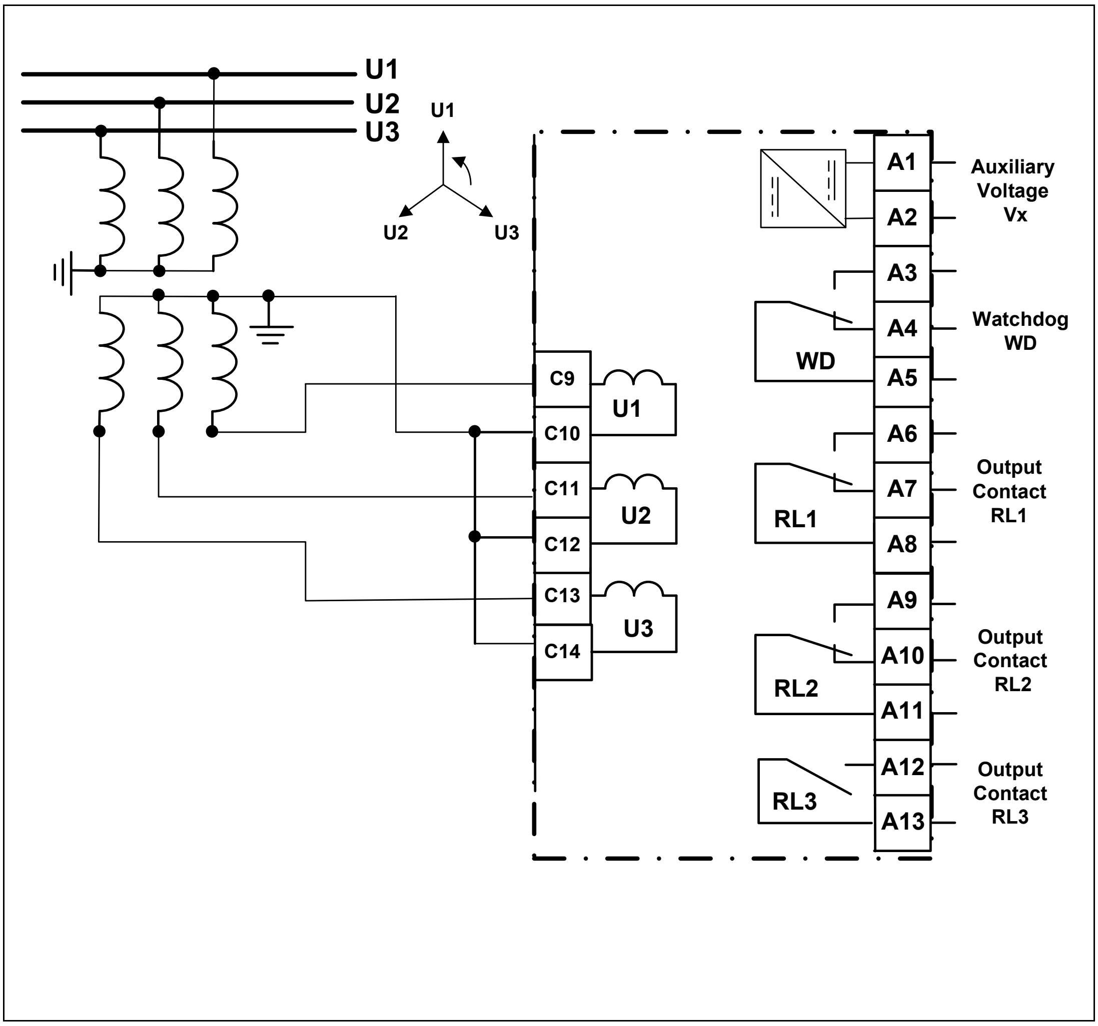


Figure 5: Model L

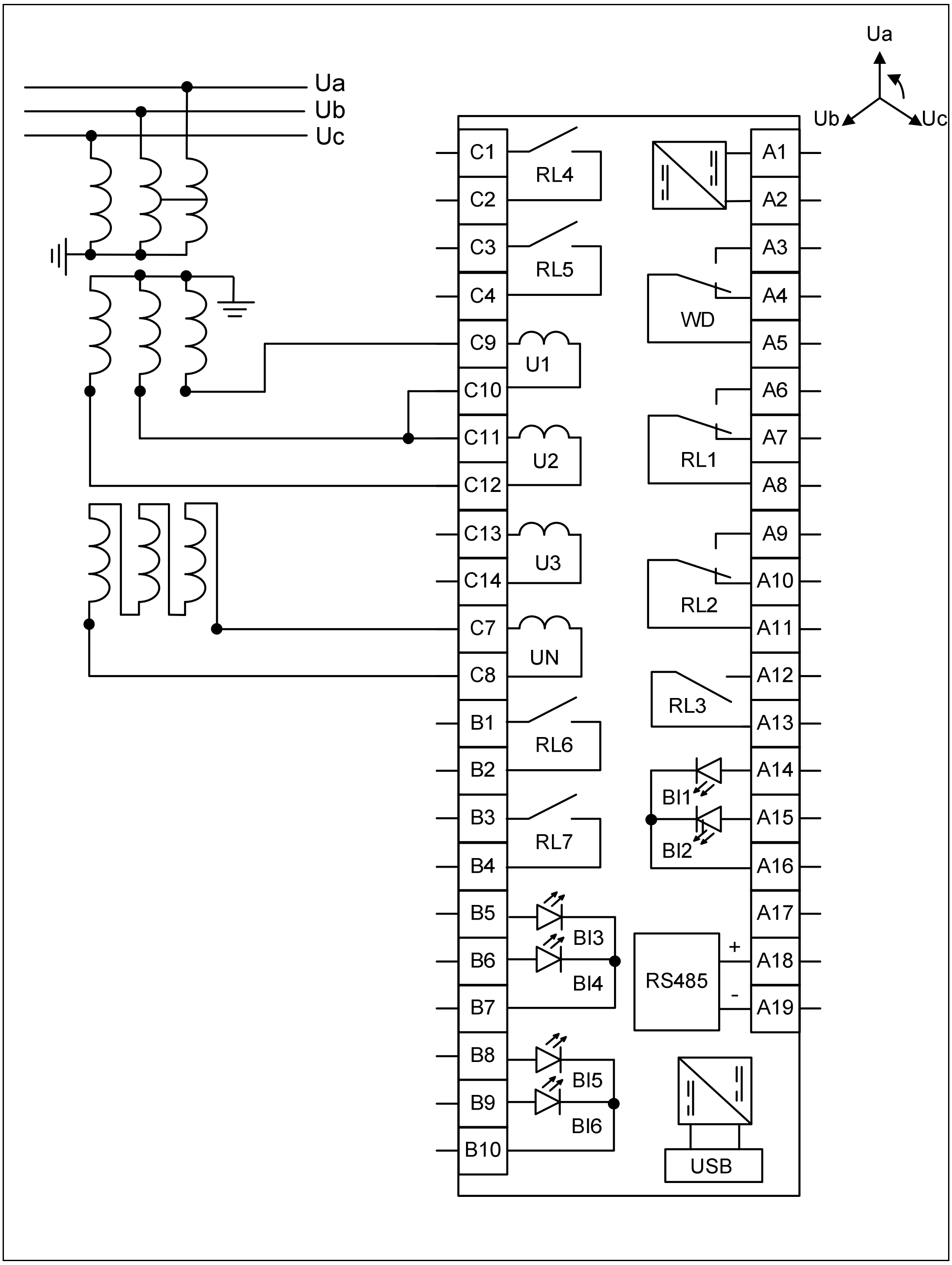


Figure 6: Model A – application example 2Upp and UN

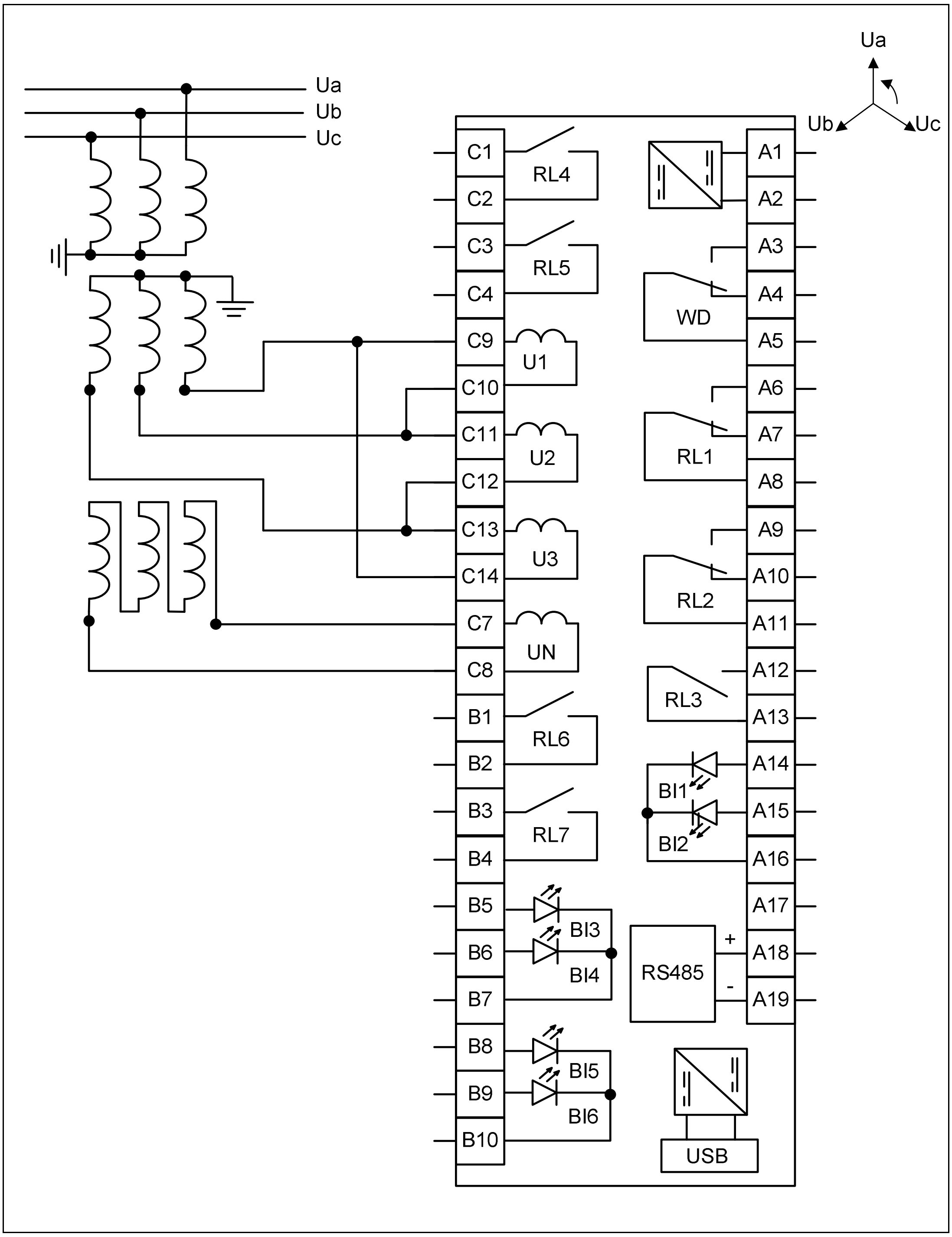


Figure 7: Model A – application example 3Upp and UN

IN

COMMUNICATION DATABASE

CT

Date:	**1st December 2015**
Software Version:	**1A**
Connection Diagrams:	**10V11V01**

CT

CONTENT

CT

CT

1. INTRODUCTION

1.1 Purpose of this document

This document describes the characteristics of the different communication protocol of **VAMP 11V** relay.

The available communication protocols of **VAMP 11V only model N and A** relays are as follows:

- MODBUS.
- IEC 60870-5-103.

NOTE:

V11V has hardware options which are called Models: Model N, Model A, which has different functions.

This document shows all available functions in V11V. To see which function are available in model refer to the rest chapters/sections of this manual.

For example: disturbance recorder is available in model A only, etc.

1.2 Glossary

VA, VB, VC	: voltage measured on the concerned phases (A, B, C)
VN	: residual voltage measured by earth input
pf	: soft weight of a word of 16 bits
PF	: heavy weight of a word of 16 bits.

2. MODBUS PROTOCOL

VAMP 11V relay can communicate by a RS 485 link behind the unit following the MODBUS MODICON RTU protocol.

2.1 Technical characteristics of the MODBUS connection

2.1.1 Parameters of the MODBUS connection

The different parameters of the MODBUS connection are as follows :

- Isolated two-point RS485 connection (2kV 50Hz),
- MODBUS MODICON line protocol in RTU mode
- Communication speed can be configured by an operator dialog in the front panel of the relay :

Baud rate
4800
9600
38400
57600
115200

Transmission mode of the configured characters by operator dialog:

Mode
1 start / 8 bits / 1 stop : total 10 bits
1 start / 8 bits / even parity / 1 stop : total 11 bits
1 start / 8 bits / odd parity / 1 stop : total 11 bits
1 start / 8 bits / 2 stop : total 11 bits

2.1.2 Synchronisation of exchanges messages

All character received after a silence on the line with more or equal to a transmission time of 3 characters is considered as a firm start.

2.1.3 Message validity check

The frame validity is working with a cyclical redundancy code CRC with 16 bits. The generator polynomial is:

$1 + x^2 + x^{15} + x^{16}$ = 1010 0000 0000 0001 binary = A001h

Address of the VAMP 11V relays

The address of the VAMP 11V relay on a same MODBUS network is situated between 1 and 255. The address 0 is reserved for the broadcast messages

CT

2.2 MODBUS functions of the V11V relays

The MODBUS functions implemented on the VAMP relays are :

Function 3 or 4 : Reading of n words

Function 5 : Writing of 1 bit

Function 6 : Writing of 1 word

Function 7 : Fast reading of 8 bits

Function 16 : Writing of n words

2.3 Presentation of the MODBUS protocol

Master slave protocol, all exchange understands a master query and a slave response

Frame size received from **VAMP 11V** relay

Frame transmitted by the master (query) :

Slave number	Function code	Information	CRC1 6
1 byte	1 byte	n bytes	2 bytes
0 à FFh	1 à 10h		

Slave number:

The slave number is situated between 1 and 247.

A frame transmitted with a slave number 0 is globally addressed to all pieces of equipment (broadcast frame)

Function code:

Requested MODBUS function (1 to 16)

Information:

Contains the parameters of the selected function.

CRC16:

Value of the CRC16 calculated by the master.

Note: The VAMP 11V relay does not respond to globally broadcast frames sent out by the master.

2.3.1 Format of frames sent by the VAMP 11V relay

Frame sent by the VAMP 11V relay (response)

Slave number	Function code	Data	CRC16
1 byte	1 byte	n bytes	2 bytes
1 à FFh	1 à 10h		

CT

Slave number :

The slave number is situated between 1 and 247.

Function code :

Processed MODBUS function (1 to 16) .

Data :

Contains reply data to master query .

CRC 16:

Value of the CRC 16 calculated by the slave.

2.3.2 Messages validity check

When **VAMP 11V** relay receive a master query, it validates the frame :

- If the CRC is false, the frame is invalid. **VAMP 11V** relay do not reply to the query. The master must retransmit its query. Excepting a broadcast message, this is the only case of non-reply by **VAMP 11V** relay to a master query.
- If the CRC is good but the VAMP relay can not process the query, it sends an exception response.

Warning frame sent by the VAMP relay (response)

Slave number	Function code	Warning code	CRC16
1 byte	1 byte	1 byte	2 bytes
1 to FFh	81h or 83h or 8Ah or 8Bh		pf ... PF

Slave number :

The slave number is situated between 1 and 247.

Function code :

The function code returned by the VAMP relay in the warning frame is the code in which the most significant bit (b7) is forced to 1.

Warning code :

On the 8 warning codes of the MODBUS protocol, the VAMP relay manages two of them :

- code 01 : function code unauthorised or unknown.
- code 03 : a value in the data field is unauthorised (incorrect data).

Control of pages being read

Control of pages being written

Control of addresses in pages

Length of request messages

CRC16:

Value of the CRC16 calculated by the slave.

CT

2.4 VAMP 11V relay database organisation

2.4.1 Description of the application mapping

2.4.1.1 Settings

VAMP 11V application mapping has 9 pages of parameters.

Page 0h: Product information, remote signalling, measurements

Page 1h: General remote parameters

Page 2h: Setting group 1 remote parameters

Page 3h: Setting group 2 remote parameters

Page 4h: Remote controls

Pages 5h/6h: Reserved pages

Pages 7h: Quick reading byte

Pages 8h: Time synchronisation

2.4.1.2 Disturbance Records

Before uploading any disturbance record, a service request must be send to select the record number to be uploaded.

The answer following this request contain the following information:

- Numbers of samples (pre and post time)
- Phase VT ratio
- Earth VT ratio
- Internal phase and earth ratios
- Number of the last disturbance mapping page
- Number of samples in this last disturbance mapping page

The mapping pages used for this service request are from 38h to 3Ch.

Pages 9h to 21h : Contain the disturbance data (25 pages)

A disturbance mapping page contains 250 words:

0900 to 09FAh : 250 disturbance data words
0A00 to 0AFAh : 250 disturbance data words
0B00 to 0BFAh : 250 disturbance data words

......
2100 to 21FAh : 250 disturbance data words

The disturbance data pages contain the sample of a single channel from a record.

Page 22h : contains the index of the disturbance

Page 38h to 3Ch : Selection of the disturbance record and channel

Page 3Dh : A dedicated request allows to know the number of disturbance records stored in FRAM memory.

CT

2.4.1.3 Event records

To upload the event records two requests are allowed:

Page 35h: Request to upload an event record without acknowledge of this event.

Used addresses:

3500h : EVENT 1

.....
3563h : EVENT 100

Page 36h: Request to upload the non-acknowledged oldest stored event record.

Two modes are available for the acknowledgement: automatic acknowledgement or manual acknowledgement

The mode depends of the state of bit 12 of telecommand word (address 400 h).

If this bit is set, then the acknowledgement is manual else the acknowledgement is automatic.

In automatic mode, the reading of the event acknowledges the event.

In manual mode, it is necessary to write a specific command to acknowledge the oldest event

(set the bit 13 of control word 400 h)

2.4.1.4 Fault records

Page 37h: Page dedicated to upload fault record

Used addresses:

3700h : FAULT 1
3701h : FAULT 2

.....
3704h : FAULT 5

Page 3Eh: Request to upload the non-acknowledged oldest stored fault record.

Two modes are available for the acknowledgement: automatic acknowledgement or manual acknowledgement

The mode depends of the state of bit 12 of telecommand word (address 400 h).

If this bit is set, then the acknowledgement is manual else the acknowledgement is automatic.

In automatic mode, the reading of the fault acknowledges automatically the event.

In manual mode, it is necessary to write a specific command to acknowledge the oldest fault.

(set the bit 14 of control word 400 h)

2.4.1.5 Characteristics

Page 0h can only be read through communication.

Pages 1h, 2h, 3h and 4h can be read and write.

Page 7h can be access in quick reading only.

Page 8h can be write.

They are describe more precisely in the following chapters.

2.4.2 Page 0h : Product information, remote signalling, measurements

Read access only

Address	Group	Description	Values range	Step	Unit	Forma t	Default Value
0000	**Product Information**	Relay description characters 1 and 2	32-127		-	F10	V1
0001		Relay description characters 3 and 4	32-127		-	F10	1V
0002		Relay description characters 5 and 6	32-127		-	F10	
0003		Unit reference characters 1 and 2	32-127		-	F10	SE
0004		Unit reference characters 3 and 4	32-127		-	F10	
0005		Software Version	10 to 99		-	F15	
0006		Hardware Version	0 to 4		-	F58	
0007		Line VT Sec	0 to 1		-	F21	
0008		E/Gnd VT Sec	0 to 1		-	F23	
0009		Active Set Group	0 to 1		-	F32	0
000A		Nominal frequency	0 to 1		-	F57	0
000B - 000F		Reserved			-		
0010	**Remote signalling**	Logical inputs status	0 to 15	1	bits	F11	
0011		Voltage Protection disable status (1)	0 to 15	1	bits	F12	
0012		Protection Function disable status (2)	0 to 15	1	bits	F12A	
0013		Output contacts status	0 to 15	1	bits	F24	
0014		Logical LEDs status	0 to 15	1	bits	F25	
0015		Voltage Protection starting status (1)	0 to 15	1	bits	F28	
0016		Protection Fuction starting status (2)	0 to 15	1	bits	F28A	
0017		Voltage Protection trip status (1)	0 to 15	1	bits	F29	
0018		Protection Fuction trip status (2)	0 to 15	1	bits	F29A	
0019		Voltage Protection Alarm status 1	0 to 15	1	bits	F31	
001A		Protection Fuction Alarm status 2	0 to 15	1	bits	F31A	
001B		CB status	0 to 4	1	-	F30	
001C		Reserved					
001D		Reserved					
001E		Local/Romote Mode Status	0 to 2	1	-	F61	
001F		Maintance Mode	0 to 2	1	-	F62	
0020		Hardware Warning	0 to 15	1	-	F26	

Address	Group	Description	Values range	Step	Unit	Format	Default Value
0021		Output information: V>	0 to 15	1	bits	F37	
0022		Output information: V>>	0 to 15	1	bits	F37	
0023		Output information: V>>>	0 to 15	1	bits	F37	
0024		Output information: V<	0 to 15	1	bits	F37	
0025		Output information: V<<	0 to 15	1	bits	F37	
0026		Output information: V<<<	0 to 15	1	bits	F37	
0027		Output information: VN>	0 to 15	1	bits	F50	
0028		Output information: VN>>	0 to 15	1	bits	F50	
0029		Output information: VN>>>	0 to 15	1	bits	F50	
002A		Output information: V2>	0 to 15	1	bits	F50	
002B		Output information: V2>>	0 to 15	1	bits	F50	
002C		Output information: V1<	0 to 15	1	bits	F50	
002D		Output information: V1<<	0 to 15	1	bits	F50	
002E		Output information: AUX1	0 to 15	1	bits	F50	
002F		Output information: AUX2	0 to 15	1	bits	F50	
0030		Output information: AUX3	0 to 15	1	bits	F50	
0031		Reserved					
0032		Output information: tf1	0 to 15	1	bits	F50	
0033		Output information: tf2	0 to 15	1	bits	F50	
0034		Output information: tf3	0 to 15	1	bits	F50	
0035		Output information: tf4	0 to 15	1	bits	F50	
0036		Output information: tf5	0 to 15	1	bits	F50	
0037		Output information: tf6	0 to 15	1	bits	F50	
0038 - 003F		Reserved					
0040	**Remote measurements**	Phase VA (L1) voltage [V]	0 to 65535	1	[V]/10	F1	
0041		Phase VB (L2) voltage [V]	0 to 65535	1	[V]/10	F1	
0042		Phase VC (L3) voltage [V]	0 to 65535	1	[V]/10	F1	
0043		Phase VAB (L1-L2) voltage [V]	0 to 65535	1	[V]/10	F1	
0044		Phase VBC (L2-L3) voltage [V]	0 to 65535	1	[V]/10	F1	
0045		Phase UCA (L3-L1) voltage [V]	0 to 65535	1	[V]/10	F1	
0046		E/F VN (UE) measured voltage [V]	0 to 65535	1	[V]/10	F1	
0047		E/F 3Uo derived voltage [V]	0 to 65535	1	[V]/10	F1	
0048		V1 possitive sequence voltage [V]	0 to 65535	1	[V]/10	F1	
0049		V2 negative seq. voltage [V]	0 to 65535	1	[V]/10	F1	
004A		Frequency	0 to 65535	1	[Hz]/100	F1	
004B		Reserved					
004C		E/F for default display	0 to 65535	1	[V]/10	F1	
004D		Delta Vr	0 to 65535	1	[V]/10	F1	

Address	Group	Description	Values range	Step	Unit	Format	Default Value
004E - 004F		Reserved					
0050		Phase VA (L1) voltage [Un]	0 to 65535	1	[Un]/1000	F1	
0051		Phase VB (L2) voltage [Un]	0 to 65535	1	[Un]/1000	F1	
0052		Phase VC (L3) voltage [Un]	0 to 65535	1	[Un]/1000	F1	
0053		Phase VAB (L1-L2) voltage [Un]	0 to 65535	1	[Un]/1000	F1	
0054		Phase VBC (L2-L3) voltage [Un]	0 to 65535	1	[Un]/1000	F1	
0055		Phase VAB (L3-L1) voltage [Un]	0 to 65535	1	[Un]/1000	F1	
0056		E/F VN (UE) measured voltage [Un]	0 to 65535	1	[Un]/1000	F1	
0057		E/F 3Uo derived voltage [Un]	0 to 65535	1	[Un]/1000	F1	
0058		V1 possitive sequence voltage [Un]	0 to 65535	1	[Un]/1000	F1	
0059		V2 negative seq. voltage [Un]	0 to 65535	1	[Un]/1000	F1	
005A		Reserved					
005B		Reserved					
005C		E/F for default display	0 to 65535	1	[Un]/1000	F1	
005D - 007F		Reserved					
0080		Max Va	0 to 65535	1	[Un]/1000	F1	
0081		Max Vb	0 to 65535	1	[Un]/1000	F1	
0082		Max Vc	0 to 65535	1	[Un]/1000	F1	
0083		Max Vab	0 to 65535	1	[Un]/1000	F1	
0084		Max Vbc	0 to 65535	1	[Un]/1000	F1	
0085		Max Vca	0 to 65535	1	[Un]/1000	F1	
0086 - 00FF		Reserved					

2.4.3 Page 1h, VAMP 11V : general remote parameters

Read and write access

Address	Group	Description	Values range	Step	Unit	Format	Default Value
0100	**Remote parameters**	Address	1 to 127	1	-	F1	1
0101		Protocol for RS485	0 to 1	1		F56	0
0102		Baud Rate	0 to 5	1		F19	2
0103		Parity	0 to 2	1		F20	0
0104		Stop bits	0 to 1	1		F22	0
0105-010F		Reserved					
0110	**Counters**	Trips Number	0 to 65535	1	-	F1	0
0111		Close Number	0 to 65535	1	-	F1	0
0112		Fault Trips Number	0 to 65535	1	-	F1	0
0113		Fault Start Number	0 to 65535	1	-	F1	0
0114		Alarm Number	0 to 65535	1	-	F1	0
0115		HW Warnings Number	0 to 65535	1	-	F1	0
0116		CB close Monitoring	0 to 65535	1	-	F1	0
0117		CB open Monitoring	0 to 65535	1	-	F1	0
0118-011F		Reserved					
0120	**VT Ratio**	**Line VT primary**	5 to 6500	1	[kV]/100	F1	
0121		Line VT Sec.	570 to 1300 2200 to 4800	1	[V]/10	F1	
0122		E/Gnd VT Primary	5 to 6500	1	[kV]/100	F1	
0123		E/GND VT Sec.	570 to 1300	1	[V]/10	F1	
0124		VT connection	0 to 3	1	-	F90	0
0125		Protection configuration V>	0 to 1	1	-	F91	0
0126		Protection configuration V<	0 to 1	1	-	F91	0
0127 - 0136		Reserved					
0137	**Voltage Advanced Settings**	**Reserved**					
0138		IDMT interlock by DMT stage	0 to 1	1	-	F88	0
0139		[27] Hysteresis	100 to 120	1	[1]/100	F1	
013A		[59] Hysteresis	80 to 100	1	[1]/100	F1	
013B – 013F		Reserved					
GLOBAL SETTINGS							
0140	**LOC**	**Language**	0 to 6	1	-	F52	0
0141		Default display	0 to 5	1	-	F53	0
0142		LEDs Reset by	0 to 2	1	-	F54	0
0143		Ltchd Outp Reset	0 to 2	1	-	F54	0
0144		Trip Info Reset	0 to 2	1	-	F54	0
0145		Alarm Display Reset	0 to 1	1	-	F55	0

Address	Group	Description	Values range	Step	Unit	Format	Default Value
0146		Nominal frequency	0 to 1	1	-	F57	0
0147		Control Keys Confirmation	0 to 1	1	-	F82	0
0148-014F		Reserved					
0150	**SETTING GROUP SELECT**	**Number of Setting Groups**	0 to 1	1	-	F71	0
0151		Setting group change	0 to 1	1	-	F32	0
0152		t Change Setting G1->G2	0 to 20000	1	[s]/100	F1	0
0153-015F		Reserved					
0160	**VT Supervision**	**VTS Supervision**	0 to 1	1	-	F66	
0161		Detection Mode	0 to 2	1	-	F92	
0162		Delta Vr	20 to 1300	1	[V]/10	F1	
0163		tVTS	0 to 10000	1	[s]/100	F1	
0164		Inhibit VTS/52a	0 to 1		-	F63	
0165		Block function V<	0 to 1		-	F63	
0166		Block function V>	0 to 1		-	F63	
0167		Block function VN>	0 to 1		-	F63	
0168		Block function V1<	0 to 1		-	F63	
0169		Block function V2<	0 to 1		-	F63	
016A		Block function frequency	0 to 1		-	F63	
016A - 0173		Reserved					
0174	**[81] Advanced settings**	**Protect. Frequency block**	5 to 100	1	[V]	F1	
0175		Reserved					
0176		Meas. Validation NB (halfcycles)	1 to 10	1	-	F1	4
0176 – 017F		Reserved					
0180	**CIRCUIT BREAKER**	**tOpen pulse min**	10 to 1000	1	[s]/100	F1	50
0181		tClose Pulse	10 to 1000	1	[s]/100	F1	50
0182		Time Delay for close Command	0 to 20000	1	[s]/100	F1	0
0183		Reserved					
0184		tCB FLT ext.sign.	1 to 200	1	[s]	F1	16
0185		Remote Mode	0 to 1	1	-	F73	
0186 - 0188		Reserved					
0189		CB Supervision?	0 to 1	1	-	F63	0
018A		Max CB Open Time	10 to 1000	1	[s]/100	F1	10
018B		Max CB Close Time	10 to 1000	1	[s]/100	F1	10
018C - 0199		Reserved					
019A	**DISTURBANCE**	**Pre-Time**	10 to 200	1	[s]/100	F1	10

Address	Group	Description	Values range	Step	Unit	Format	Default Value
	RECORDER						
019B		Post TripTime	10 to 100	1	[s]/100	F1	10
019C		Distrurb Rec Trig	0 to 1	1	-	F65	0
019D		Max record Time	10 to 400	1	[s]/100	F1	10
019E-01A4		Reserved					
01A5	**COMMISIONING**	**Maintenace Mode**	0 to 2	1	-	F62	0
01A6		Test Pattern			bits	F36	00000000
01A7		Contact Test Time	0 to 20000	1	[s]/100	F1	10
01A8		Reserved					
01A9		Functional Test Pattern	0 to 18	1	-	F76	0
01AA		Functional Test End	0 to 1	1	-	F77	0
01AB		Functional Test Time	10 to 20000	1	[s]/100	F1	10
01AC-01FF		Reserved					

2.4.4 Page 2h : setting Group 1

Access in reading and in writing

Address	Group	Description	Values range	Step	Unit	Format	Default Value
0200	Setting Group 1 / Protection G1/Overvoltage	V> ?	0 - 8	1	-	F16	0
0201		V> Threshold	1 to 65535	1	[V]/10	F1	
0202		V> Delay Type	1 to 15	1	-	F18	
0203		tV>/TMS/TD	1 to 65535	1	[s]/100	F1	
0204		V> Reset Delay Type	0 - 1	1	-	F41	
0205		V> DMT tReset	1 to 65535	1	[s]/100	F1	
0206		V>>?	0 - 8	1	-	F16	
0207		V>> Threshold	1 to 65535	1	[V]/10	F1	
0208		tV>>	1 to 65535	1	[s]/100	F1	
0209		V>>>?	0 to 15	1	-	F16	
020A		V>>> Threshold	1 to 65535	1	[V]/10	F1	
020B		tV>>>	1 to 65535	1	[s]/100	F1	
020C	Setting Group 1 / Protection G1 /Undervoltage	V<?	0 - 8	1	-	F16	
020D		V< Threshold	1 to 65535	1	[V]/10	F1	
020E		V< Delay Type	0 to 15	1	[-]	F18	
020F		tV</TMS/TD	1 to 65535	1	[s] /100	F1	
0210		V< Reset Delay Type	0 - 1	1	[-]	F41	
0211		V< DMT tReset	1 to 65535	1	[s] /100	F1	
0212		V<<?	0 - 8	1	[-]	F16	
0213		V<< Threshold	1 to 65535	1	[V]/10	F1	
0214		tV<<	1 to 65535	1	[s] /100	F1	
0215		V<<<?	0 - 8	1	[-]	F16	
0216		V<<< Threshold	1 to 65535	1	[V]/10	F1	
0217		tV<<<	1 to 65535	1	[s] /100	F1	
0218	Setting Group 1 / Protection G1 /Positive sequence undervoltage	V1<?	0 - 8	1	[-]	F16	
0219		V1< Threshold	1 to 65535	1	[V]/10	F1	
021A		V1< Delay Type	0 to 15	1	[-]	F18	
021B		tV1< TMS/TD	1 to 65535	1	[s] /100	F1	
021C		V1< Reset Delay Type	0 - 1	1	[-]	F41	
021D		V1< DMT tReset	1 to 65535	1	[s] /100	F1	
021E		V1<<?	0 - 8	1	[-]	F16	
021F		V1<< Threshold	1 to 65535	1	[V]/10	F1	
0220		tV1<<	1 to 65535	1	[s] /100	F1	

Address	Group	Description	Values range	Step	Unit	Format	Default Value
0221	Setting Group 1 / Protection G1 /Negative sequence undervoltage	V2>?	0 - 8	1	[-]	F16	
0222		V2> Threshold	1 to 65535	1	[V]/10	F1	
0223		V2> Delay Type	0 to 15	1	[-]	F18	
0224		tV2> TMS/TD	1 to 65535	1	[s] /100	F1	
0225		V2> Reset Delay Type	0 - 1	1	[-]	F41	
0226		V2> DMT tReset	1 to 65535	1	[s] /100	F1	
0227		V2>>?	0 - 8	1	[-]	F16	
0228		V2>> Threshold	1 to 65535	1	[V]/10	F1	
0229		tV2>>	1 to 65535	1	[s] /100	F1	
022A	Setting Group 1 / Protection G1 /Earth fault overvoltage	VN>?	0 to 4	1	[-]	F95	
022B		VN> Threshold	1 to 65535	1	[V]/10	F1	
022C		VN> Delay Type	0 to 15	1	[-]	F18	
022D		tVN>/TMS/TD	1 to 65535	1	[s] /100	F1	
022E		VN> Reset Delay Type	0 - 1	1	[-]	F41	
022F		VN> DMT tReset	1 to 65535	1	[s] /100	F1	
0230		VN>>?	0 to 4	1	[-]	F95	
0231		VN>> Threshold	1 to 65535	1	[V]/10	F1	
0232		tVN>>	1 to 65535	1	[s] /100	F1	
0233		VN>>>?	0 to 4	1	[-]	F95	
0234		VN>>> Threshold	1 to 65535	1	[V]/10	F1	
0235		tVN>>>	1 to 65535	1	[s] /100	F1	
0236	Setting Group 1 / Protection G1 /Frequency	f1?	0 to 4	1	[-]	F84	
0237		f1 Threshold	1 to 65535	1	[Hz]/100	F1	
0238		tf1	1 to 65535	1	[s] /100	F1	
0239		f2?	0 to 4	1	[-]	F84	
023A		f2 Threshold	1 to 65535	1	[Hz]/100	F1	
023B		tf2	1 to 65535	1	[s] /100	F1	
023C		f3?	0 to 4	1	[-]	F84	
023D		f3 Threshold	1 to 65535	1	[Hz]/100	F1	
023E		tf3	1 to 65535	1	[s] /100	F1	
023F		f4?	0 to 4	1	[-]	F84	
0240		f4 Threshold	1 to 65535	1	[Hz]/100	F1	
0241		tf4	1 to 65535	1	[s] /100	F1	
0242		f5?	0 to 4	1	[-]	F84	
0243		f5 Threshold	1 to 65535	1	[Hz]/100	F1	

Address	Group	Description	Values range	Step	Unit	Format	Default Value
0244		tf5	1 to 65535	1	[s] /100	F1	
0245		f6?	0 to 4	1	[-]	F84	
0246		f6 Threshold	1 to 65535	1	[Hz]/100	F1	
0247		tf6	1 to 65535	1	[s] /100	F1	
0252	Setting Group 1 / Protection G1 /Auxilirary timers	AUX1?	0 to 3	1	[-]	F94	
0253		tAUX1	0 to 60000	1	[s] /100	F1	
0254		AUX2?	0 to 3	1	[-]	F94	
0255		tAUX2	0 to 60000	1	[s] /100	F1	
0256		AUX3?	0 to 3	1	[-]	F94	
0257		tAUX3	0 to 60000	1	[s] /100	F1	
0258	Setting group 1 /Inputs configuration G1	Reverse Input Logic	0 to 5	1	[-]	F35	
0259		Maintenance Mode	0 to 5	1	[-]	F35	
025A		Reset Latched Signaling	0 to 5	1	[-]	F35	
025B		Reset Latched Outputs	0 to 5	1	[-]	F35	
025C		Blocking tV>	0 to 5	1	[-]	F35	
025D		Blocking tV>>	0 to 5	1	[-]	F35	
025E		Blocking tV>>>	0 to 5	1	[-]	F35	
025F		Blocking tV<	0 to 5	1	[-]	F35	
0260		Blocking tV<<	0 to 5	1	[-]	F35	
0261		Blocking tV<<<	0 to 5	1	[-]	F35	
0262		Blocking tV1<	0 to 5	1	[-]	F35	
0263		Blocking tV1<<	0 to 5	1	[-]	F35	
0264		Blocking tV2>	0 to 5	1	[-]	F35	
0265		Blocking tV2>>	0 to 5	1	[-]	F35	
0266		Blocking tVN>	0 to 5	1	[-]	F35	
0267		Blocking tVN>>	0 to 5	1	[-]	F35	
0268		Blocking tVN>>>	0 to 5	1	[-]	F35	
0269		Blocking tf1	0 to 5	1	[-]	F35	
026A		Blocking tf2	0 to 5	1	[-]	F35	
026B		Blocking tf3	0 to 5	1	[-]	F35	
026C		Blocking tf4	0 to 5	1	[-]	F35	
026D		Blocking tf5	0 to 5	1	[-]	F35	
026E		Blocking tf6	0 to 5	1	[-]	F35	
0272		AUX1	0 to 5	1	[-]	F35	
0273		AUX2	0 to 5	1	[-]	F35	
0274		AUX3	0 to 5	1	[-]	F35	
0275		AUX4	0 to 5	1	[-]	F35	
0276		AUX5	0 to 5	1	[-]	F35	

Address	Group	Description	Values range	Step	Unit	Format	Default Value
0277		CB status 52A	0 to 5	1	[-]	F35	
0278		CB status 52B	0 to 5	1	[-]	F35	
0279		CB FLT ext.	0 to 5	1	[-]	F35	
027A		Setting Group 2	0 to 5	1	[-]	F35	
027B		Manual Close	0 to 5	1	[-]	F35	
027C		Manual Trip	0 to 5	1	[-]	F35	
027D		VTS	0 to 5	1	[-]	F35	
027E		Strt Disturb	0 to 5	1	[-]	F35	
027F		Local Mode	0 to 5	1	[-]	F35	
0280		Time synchr	0 to 5	1	[-]	F35	
0281	Setting group 1 /Outputs configuration G1	Latched outputs	0 to 6	1	[-]	F36	
0282		Reverse outp. Logic	0 to 6	1	[-]	F36	
0283		Protect. Trip	0 to 6	1	[-]	F36	
0284		Protection Trip (pulse)	0 to 6	1	[-]	F36	
0285		Trip CB	0 to 6	1	[-]	F36	
0286		Close CB	0 to 6	1	[-]	F36	
0287		Alarm	0 to 6	1	[-]	F36	
0288		Start V>	0 to 6	1	[-]	F36	
0289		Start V>>	0 to 6	1	[-]	F36	
028A		Start V>>>	0 to 6	1	[-]	F36	
028B		Start V<	0 to 6	1	[-]	F36	
028C		start V<<	0 to 6	1	[-]	F36	
028D		start V<<<	0 to 6	1	[-]	F36	
028E		start V1<	0 to 6	1	[-]	F36	
028F		start V1<<	0 to 6	1	[-]	F36	
0290		start V2>	0 to 6	1	[-]	F36	
0291		Start V2>>	0 to 6	1	[-]	F36	
0292		Start VN>	0 to 6	1	[-]	F36	
0293		start VN>>	0 to 6	1	[-]	F36	
0294		Start VN>>>	0 to 6	1	[-]	F36	
0295		Start f1	0 to 6	1	[-]	F36	
0296		Start f2	0 to 6	1	[-]	F36	
0297		Start f3	0 to 6	1	[-]	F36	
0298		Start f4	0 to 6	1	[-]	F36	
0299		Start f5	0 to 6	1	[-]	F36	
029A		Start f6	0 to 6	1	[-]	F36	
029E		AUX1	0 to 6	1	[-]	F36	
029F		AUX2	0 to 6	1	[-]	F36	
02A0		AUX3	0 to 6	1	[-]	F36	

Address	Group	Description	Values range	Step	Unit	Format	Default Value
02A1		AUX4	0 to 6	1	[-]	F36	
02A2		AUX5	0 to 6	1	[-]	F36	
02A3		tV>	0 to 6	1	[-]	F36	
02A4		tV>>	0 to 6	1	[-]	F36	
02A5		tV>>>	0 to 6	1	[-]	F36	
02A6		tV<	0 to 6	1	[-]	F36	
02A7		tV<<	0 to 6	1	[-]	F36	
02A8		tV<<<	0 to 6	1	[-]	F36	
02A9		tV1<	0 to 6	1	[-]	F36	
02AA		tV1<<	0 to 6	1	[-]	F36	
02AB		tV2>	0 to 6	1	[-]	F36	
02AC		tV2>>	0 to 6	1	[-]	F36	
02AD		tVN>	0 to 6	1	[-]	F36	
02AE		tVN>>	0 to 6	1	[-]	F36	
02AF		tVN>>>	0 to 6	1	[-]	F36	
02B0		tf1	0 to 6	1	[-]	F36	
02B1		tf2	0 to 6	1	[-]	F36	
02B2		tf3	0 to 6	1	[-]	F36	
02B3		tf4	0 to 6	1	[-]	F36	
02B4		tf5	0 to 6	1	[-]	F36	
02B5		tf6	0 to 6	1	[-]	F36	
02B9		tAUX1	0 to 6	1	[-]	F36	
02BA		tAUX2	0 to 6	1	[-]	F36	
02BB		tAUX3	0 to 6	1	[-]	F36	
02BC		CB Alarm	0 to 6	1	[-]	F36	
02BD		tCB Faulty ext.	0 to 6	1	[-]	F36	
02BE		Setting Group 1	0 to 6	1	[-]	F36	
02BF		tVTS	0 to 6	1	[-]	F36	
02C0		fout	0 to 6	1	[-]	F36	
02C1	Setting group 1 /LED's configuration G1	Latched LEDs	0 to 5	1	[-]	F39	
02C2		Alarm	0 to 5	1	[-]	F39	
02C3		Start V>	0 to 5	1	[-]	F39	
02C4		Start V>>	0 to 5	1	[-]	F39	
02C5		Start V>>>	0 to 5	1	[-]	F39	
02C6		Start V<	0 to 5	1	[-]	F39	
02C7		start V<<	0 to 5	1	[-]	F39	
02C8		start V<<<	0 to 5	1	[-]	F39	
02C9		start V1<	0 to 5	1	[-]	F39	
02CA		start V1<<	0 to 5	1	[-]	F39	

Address	Group	Description	Values range	Step	Unit	Format	Default Value
02CB		start V2>	0 to 5	1	[-]	F39	
02CC		Start V2>>	0 to 5	1	[-]	F39	
02CD		Start VN>	0 to 5	1	[-]	F39	
02CE		start VN>>	0 to 5	1	[-]	F39	
02CF		Start VN>>>	0 to 5	1	[-]	F39	
02D0		Start f1	0 to 5	1	[-]	F39	
02D1		Start f2	0 to 5	1	[-]	F39	
02D2		Start f3	0 to 5	1	[-]	F39	
02D3		Start f4	0 to 5	1	[-]	F39	
02D4		Start f5	0 to 5	1	[-]	F39	
02D5		Start f6	0 to 5	1	[-]	F39	
02D9		AUX1	0 to 5	1	[-]	F39	
02DA		AUX2	0 to 5	1	[-]	F39	
02DB		AUX3	0 to 5	1	[-]	F39	
02DC		AUX4	0 to 5	1	[-]	F39	
02DD		AUX5	0 to 5	1	[-]	F39	
02DE		tV>	0 to 5	1	[-]	F39	
02DF		tV>>	0 to 5	1	[-]	F39	
02E0		tV>>>	0 to 5	1	[-]	F39	
02E1		tV<	0 to 5	1	[-]	F39	
02E2		tV<<	0 to 5	1	[-]	F39	
02E3		tV<<<	0 to 5	1	[-]	F39	
02E4		tV1<	0 to 5	1	[-]	F39	
02E5		tV1<<	0 to 5	1	[-]	F39	
02E6		tV2>	0 to 5	1	[-]	F39	
02E7		tV2>>	0 to 5	1	[-]	F39	
02E8		tVN>	0 to 5	1	[-]	F39	
02E9		tVN>>	0 to 5	1	[-]	F39	
02EA		tVN>>>	0 to 5	1	[-]	F39	
02EB		tf1	0 to 5	1	[-]	F39	
02EC		tf2	0 to 5	1	[-]	F39	
02ED		tf3	0 to 5	1	[-]	F39	
02EE		tf4	0 to 5	1	[-]	F39	
02EF		tf5	0 to 5	1	[-]	F39	
02F0		tf6	0 to 5	1	[-]	F39	
02F4		tAUX1	0 to 5	1	[-]	F39	
02F5		tAUX2	0 to 5	1	[-]	F39	
02F6		tAUX3	0 to 5	1	[-]	F39	
02F7		Local Mode	0 to 5	1	[-]	F39	
02F8		CB Alarm	0 to 5	1	[-]	F39	

Address	Group	Description	Values range	Step	Unit	Format	Default Value
02F9		Maintenance Mode	0 to 5	1	[-]	F39	
02FA		tCB FLT ext.	0 to 5	1	[-]	F39	
02FB		Setting Group	0 to 5	1	[-]	F39	
02FC		tVTS	0 to 5	1	[-]	F39	
02FD		fout	0 to 5	1	[-]	F39	

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Access in reading and in writing

Address	Group	Description	Values range	Step	Unit	Format	Default Value
0300	Setting Group 2 / Protection G2/Overvoltage	V> ?	0 - 8	1	-	F16	0
0301		V> Threshold	1 to 65535	1	[V]/10	F1	
0302		V> Delay Type	0 to 15	1	-	F18	
0303		tV>/TMS/TD	1 to 65535	1	[s]/100	F1	
0304		V> Reset Delay Type	0 - 1	1	-	F41	
0305		V> DMT tReset	1 to 65535	1	[s]/100	F1	
0306		V>>?	0 - 8	1	-	F16	
0307		V>> Threshold	1 to 65535	1	[V]/10	F1	
0308		tV>>	1 to 65535	1	[s]/100	F1	
0309		V>>>?	0 to 8	1	-	F16	
030A		V>>> Threshold	1 to 65535	1	[V]/10	F1	
030B		tV>>>	1 to 65535	1	[s]/100	F1	
030C	Setting Group 2 / Protection G2 /Undervoltage	V<?	0 to 8	1	[-]	F16	
030D		V< Threshold	1 to 65535	1	[V]/10	F1	
030E		V< Delay Type	0 to 15	1	[-]	F18	
030F		tV</TMS/TD	1 to 65535	1	[s] /100	F1	
0310		V< Reset Delay Type	0 - 1	1	[-]	F41	
0311		V< DMT tReset	1 to 65535	1	[s] /100	F1	
0312		V<<?	0 - 8	1	[-]	F16	
0313		V<< Threshold	1 to 65535	1	[V]/10	F1	
0314		tV<<	1 to 65535	1	[s] /100	F1	
0315		V<<<?	0 - 8	1	[-]	F16	
0316		V<<< Threshold	1 to 65535	1	[V]/10	F1	
0317		tV<<<	1 to 65535	1	[s] /100	F1	
0318	Setting Group 2 / Protection G2 /Positive sequence undervoltage	V1<?	0 - 8	1	[-]	F16	
0319		V1< Threshold	1 to 65535	1	[V]/10	F1	
031A		V1< Delay Type	0 to 15	1	[-]	F18	
031B		tV1< TMS/TD	1 to 65535	1	[s] /100	F1	
031C		V1< Reset Delay Type	0 - 1	1	[-]	F41	
031D		V1< DMT tReset	1 to 65535	1	[s] /100	F1	
031E		V1<<?	0 - 8	1	[-]	F16	
031F		V1<< Threshold	1 to 65535	1	[V]/10	F1	
0320		tV1<<	1 to 65535	1	[s] /100	F1	

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Address	Group	Description	Values range	Step	Unit	Format	Default Value
0321	Setting Group 2 / Protection G2 /Negative sequence undervoltage	V2>?	0 - 8	1	[-]	F16	
0322		V2> Threshold	1 to 65535	1	[V]/10	F1	
0323		V2> Delay Type	0 to 15	1	[-]	F18	
0324		tV2> TMS/TD	1 to 65535	1	[s] /100	F1	
0325		V2> Reset Delay Type	0 - 1	1	[-]	F41	
0326		V2> DMT tReset	1 to 65535	1	[s] /100	F1	
0327		V2>>?	0 - 8	1	[-]	F16	
0328		V2>> Threshold	1 to 65535	1	[V]/10	F1	
0329		tV2>>	1 to 65535	1	[s] /100	F1	
032A	Setting Group 2 / Protection G2 /Earth fault overvoltage	UN>?	0 to 4	1	[-]	F95	
032B		VN> Threshold	1 to 65535	1	[V]/10	F1	
032C		VN> Delay Type	0 to 15	1	[-]	F18	
032D		tVN>/TMS/TD	1 to 65535	1	[s] /100	F1	
032E		VN> Reset Delay Type	0 - 1	1	[-]	F41	
032F		VN> DMT tReset	1 to 65535	1	[s] /100	F1	
0330		VN>>?	0 to 4	1	[-]	F95	
0331		VN>> Threshold	1 to 65535	1	[V]/10	F1	
0332		tVN>>	1 to 65535	1	[s] /100	F1	
0333		VN>>>?	0 to 4	1	[-]	F95	
0334		VN>>> Threshold	1 to 65535	1	[V]/10	F1	
0335		tVN>>>	1 to 65535	1	[s] /100	F1	
0336	Setting Group 2 / Protection G2 /Frequency	f1?	0 to 4	1	[-]	F84	
0337		f1 Threshold	1 to 65535	1	[Hz]/100	F1	
0338		tf1	1 to 65535	1	[s] /100	F1	
0339		f2?	0 to 4	1	[-]	F84	
033A		f2 Threshold	1 to 65535	1	[Hz]/100	F1	
033B		tf2	1 to 65535	1	[s] /100	F1	
033C		f3?	0 to 4	1	[-]	F84	
033D		f3 Threshold	1 to 65535	1	[Hz]/100	F1	
033E		tf3	1 to 65535	1	[s] /100	F1	
033F		f4?	0 to 4	1	[-]	F84	
0340		f4 Threshold	1 to 65535	1	[Hz]/100	F1	
0341		tf4	1 to 65535	1	[s] /100	F1	
0342		f5?	0 to 4	1	[-]	F84	
0343		f5 Threshold	1 to 65535	1	[Hz]/100	F1	

Address	Group	Description	Values range	Step	Unit	Format	Default Value
0344		tf5	1 to 65535	1	[s] /100	F1	
0345		f6?	0 to 4	1	[-]	F84	
0346		f6 Threshold	1 to 65535	1	[Hz]/100	F1	
0347		tf6	1 to 65535	1	[s] /100	F1	
0352	Setting Group 2 / Protection G2 /Auxilirary timers	AUX1?	0 to 3	1	[-]	F94	
0353		tAUX1	1 to 60000	1	[s] /100	F1	
0354		AUX2?	0 to 3	1	[-]	F94	
0355		tAUX2	1 to 60000	1	[s] /100	F1	
0356		AUX3?	0 to 3	1	[-]	F94	
0257		tAUX3	1 to 60000	1	[s] /100	F1	
0358	Setting group 2 /Inputs configuration G2	Reverse Input Logic	0 to 5	1	[-]	F35	
0359		Maintenance Mode	0 to 5	1	[-]	F35	
035A		Reset Latched Signaling	0 to 5	1	[-]	F35	
035B		Reset Latched Outputs	0 to 5	1	[-]	F35	
035C		Blocking tV>	0 to 5	1	[-]	F35	
035D		Blocking tV>>	0 to 5	1	[-]	F35	
035E		Blocking tV>>>	0 to 5	1	[-]	F35	
035F		Blocking tV<	0 to 5	1	[-]	F35	
0360		Blocking tV<<	0 to 5	1	[-]	F35	
0361		Blocking tV<<<	0 to 5	1	[-]	F35	
0362		Blocking tV1<	0 to 5	1	[-]	F35	
0363		Blocking tV1<<	0 to 5	1	[-]	F35	
0364		Blocking tV2>	0 to 5	1	[-]	F35	
0365		Blocking tV2>>	0 to 5	1	[-]	F35	
0366		Blocking tVN>	0 to 5	1	[-]	F35	
0367		Blocking tVN>>	0 to 5	1	[-]	F35	
0368		Blocking tVN>>>	0 to 5	1	[-]	F35	
0369		Blocking tf1	0 to 5	1	[-]	F35	
036A		Blocking tf2	0 to 5	1	[-]	F35	
036B		Blocking tf3	0 to 5	1	[-]	F35	
036C		Blocking tf4	0 to 5	1	[-]	F35	
036D		Blocking tf5	0 to 5	1	[-]	F35	
036E		Blocking tf6	0 to 5	1	[-]	F35	
0372		AUX1	0 to 5	1	[-]	F35	
0373		AUX2	0 to 5	1	[-]	F35	
0374		AUX3	0 to 5	1	[-]	F35	
0375		AUX4	0 to 5	1	[-]	F35	
0376		AUX5	0 to 5	1	[-]	F35	

Address	Group	Description	Values range	Step	Unit	Format	Default Value
0377		CB status 52A	0 to 5	1	[-]	F35	
0378		CB status 52B	0 to 5	1	[-]	F35	
0379		CB FLT ext.	0 to 5	1	[-]	F35	
037A		Setting Group 2	0 to 5	1	[-]	F35	
0327B		Manual Close	0 to 5	1	[-]	F35	
037C		Manual Trip	0 to 5	1	[-]	F35	
037D		VTS	0 to 5	1	[-]	F35	
037E		Strt Disturb	0 to 5	1	[-]	F35	
037F		Local Mode	0 to 5	1	[-]	F35	
0380		Time synchr	0 to 5	1	[-]	F35	
0381	Setting group 2 /Outputs configuration G2	Latched outputs	0 to 6	1	[-]	F36	
0382		Reverse outp. Logic	0 to 6	1	[-]	F36	
0383		Protect. Trip	0 to 6	1	[-]	F36	
0384		Protection Trip (pulse)	0 to 6	1	[-]	F36	
0385		Trip CB	0 to 6	1	[-]	F36	
0386		Close CB	0 to 6	1	[-]	F36	
0387		Alarm	0 to 6	1	[-]	F36	
0388		Start V>	0 to 6	1	[-]	F36	
0389		Start V>>	0 to 6	1	[-]	F36	
038A		Start V>>>	0 to 6	1	[-]	F36	
038B		Start V<	0 to 6	1	[-]	F36	
038C		start V<<	0 to 6	1	[-]	F36	
038D		start V<<<	0 to 6	1	[-]	F36	
038E		start V1<	0 to 6	1	[-]	F36	
038F		start V1<<	0 to 6	1	[-]	F36	
0390		start V2>	0 to 6	1	[-]	F36	
0391		Start V2>>	0 to 6	1	[-]	F36	
0392		Start VN>	0 to 6	1	[-]	F36	
0393		start VN>>	0 to 6	1	[-]	F36	
0394		Start VN>>>	0 to 6	1	[-]	F36	
0395		Start f1	0 to 6	1	[-]	F36	
0396		Start f2	0 to 6	1	[-]	F36	
0397		Start f3	0 to 6	1	[-]	F36	
0398		Start f4	0 to 6	1	[-]	F36	
0399		Start f5	0 to 6	1	[-]	F36	
039A		Start f6	0 to 6	1	[-]	F36	
039E		AUX1	0 to 6	1	[-]	F36	
039F		AUX2	0 to 6	1	[-]	F36	
03A0		AUX3	0 to 6	1	[-]	F36	

Address	Group	Description	Values range	Step	Unit	Format	Default Value
03A1		AUX4	0 to 6	1	[-]	F36	
03A2		AUX5	0 to 6	1	[-]	F36	
03A3		tV>	0 to 6	1	[-]	F36	
03A4		tV>>	0 to 6	1	[-]	F36	
03A5		tV>>>	0 to 6	1	[-]	F36	
03A6		tV<	0 to 6	1	[-]	F36	
03A7		tV<<	0 to 6	1	[-]	F36	
03A8		tV<<<	0 to 6	1	[-]	F36	
03A9		tV1<	0 to 6	1	[-]	F36	
03AA		tV1<<	0 to 6	1	[-]	F36	
03AB		tV2>	0 to 6	1	[-]	F36	
03AC		tV2>>	0 to 6	1	[-]	F36	
03AD		tVN>	0 to 6	1	[-]	F36	
03AE		tVN>>	0 to 6	1	[-]	F36	
03AF		tVN>>>	0 to 6	1	[-]	F36	
03B0		tf1	0 to 6	1	[-]	F36	
03B1		tf2	0 to 6	1	[-]	F36	
03B2		tf3	0 to 6	1	[-]	F36	
03B3		tf4	0 to 6	1	[-]	F36	
03B4		tf5	0 to 6	1	[-]	F36	
03B5		tf6	0 to 6	1	[-]	F36	
03B9		tAUX1	0 to 6	1	[-]	F36	
03BA		tAUX2	0 to 6	1	[-]	F36	
03BB		tAUX3	0 to 6	1	[-]	F36	
03BC		CB Alarm	0 to 6	1	[-]	F36	
03BD		tCB Faulty ext.	0 to 6	1	[-]	F36	
03BE		Setting Group 1	0 to 6	1	[-]	F36	
03BF		tVTS	0 to 6	1	[-]	F36	
03C0		fout	0 to 6	1	[-]	F36	
03C1	Setting group 2 /LED's configuration G2	Latched LEDs	0 to 5	1	[-]	F39	
03C2		Alarm	0 to 5	1	[-]	F39	
03C3		Start V>	0 to 5	1	[-]	F39	
03C4		Start V>>	0 to 5	1	[-]	F39	
03C5		Start V>>>	0 to 5	1	[-]	F39	
03C6		Start V<	0 to 5	1	[-]	F39	
03C7		start V<<	0 to 5	1	[-]	F39	
03C8		start V<<<	0 to 5	1	[-]	F39	
03C9		start V1<	0 to 5	1	[-]	F39	
03CA		start V1<<	0 to 5	1	[-]	F39	

Address	Group	Description	Values range	Step	Unit	Format	Default Value
03CB		start V2>	0 to 5	1	[-]	F39	
03CC		Start V2>>	0 to 5	1	[-]	F39	
03CD		Start VN>	0 to 5	1	[-]	F39	
03CE		start VN>>	0 to 5	1	[-]	F39	
03CF		Start VN>>>	0 to 5	1	[-]	F39	
03D0		Start f1	0 to 5	1	[-]	F39	
03D1		Start f2	0 to 5	1	[-]	F39	
03D2		Start f3	0 to 5	1	[-]	F39	
03D3		Start f4	0 to 5	1	[-]	F39	
03D4		Start f5	0 to 5	1	[-]	F39	
03D5		Start f6	0 to 5	1	[-]	F39	
03D9		AUX1	0 to 5	1	[-]	F39	
03DA		AUX2	0 to 5	1	[-]	F39	
03DB		AUX3	0 to 5	1	[-]	F39	
03DC		AUX4	0 to 5	1	[-]	F39	
03DD		AUX5	0 to 5	1	[-]	F39	
03DE		tV>	0 to 5	1	[-]	F39	
03DF		tV>>	0 to 5	1	[-]	F39	
03E0		tV>>>	0 to 5	1	[-]	F39	
03E1		tV<	0 to 5	1	[-]	F39	
03E2		tV<<	0 to 5	1	[-]	F39	
03E3		tV<<<	0 to 5	1	[-]	F39	
03E4		tV1<	0 to 5	1	[-]	F39	
03E5		tV1<<	0 to 5	1	[-]	F39	
03E6		tV2>	0 to 5	1	[-]	F39	
03E7		tV2>>	0 to 5	1	[-]	F39	
03E8		tVN>	0 to 5	1	[-]	F39	
03E9		tVN>>	0 to 5	1	[-]	F39	
03EA		tVN>>>	0 to 5	1	[-]	F39	
03EB		tf1	0 to 5	1	[-]	F39	
03EC		tf2	0 to 5	1	[-]	F39	
03ED		tf3	0 to 5	1	[-]	F39	
03EE		tf4	0 to 5	1	[-]	F39	
03EF		tf5	0 to 5	1	[-]	F39	
03F0		tf6	0 to 5	1	[-]	F39	
03F4		tAUX1	0 to 5	1	[-]	F39	
03F5		tAUX2	0 to 5	1	[-]	F39	
03F6		tAUX3	0 to 5	1	[-]	F39	
03F7		Local Mode	0 to 5	1	[-]	F39	
03F8		CB Alarm	0 to 5	1	[-]	F39	

Address	Group	Description	Values range	Step	Unit	Format	Default Value
03F9		Maintenance Mode	0 to 5	1	[-]	F39	
03FA		tCB FLT ext.	0 to 5	1	[-]	F39	
03FB		Setting Group	0 to 5	1	[-]	F39	
03FC		tVTS	0 to 5	1	[-]	F39	
03FD		fout	0 to 5	1	[-]	F39	

2.4.6 Page 4h : remote controls (**AN)**

Access in writing. (MODBUS Function 5)

Address	Group	Description	Values range	Step	Unit	Format	Default Value
0400	**Remote control**	Remote control word 1	0 to 15	bits	-	F38	0
0401		Remote control word 2	0 to 15	bits	-	F38A	0
0402		Remote control word 3	0 to 15	bits	-	F38B	0

2.4.7 Pages 5h/6h

These pages are reserved

2.4.8 Page 7h

Access in quick reading only (MODBUS 07 function)

Address	Group	Description	Values range	Step	Unit	Format	Default Value
0700	**Quick reading byte**	Relay status description		1	-	F49	0

2.4.9 Page 8h : time synchronisation

Access in writing for n words (function 16). The time synchronisation format is based on 8 bits (4 words) (Inverted IEC 870-5-4 CP56Time2a):.

<table>
<tr><th>Timer</th><th>Address (hex)</th><th>Nb bytes</th><th>Mask (hex)</th><th>Values range</th><th>Unit</th></tr>
<tr><td></td><td rowspan="2">0800</td><td>1 (Hi)</td><td></td><td></td><td></td></tr>
<tr><td>Year</td><td>1 (Lo)</td><td>7F</td><td>0 – 99
(2000-2093)</td><td>Year</td></tr>
<tr><td>Month</td><td rowspan="3">0801</td><td>1 (Hi)</td><td>0F</td><td>1 - 12</td><td>month</td></tr>
<tr><td>Day of week</td><td>1 (Lo)</td><td>E0</td><td>1 – 7
(Monday – Sunday)</td><td>Day</td></tr>
<tr><td>day of month</td><td>1 (Lo)</td><td>1F</td><td>1 – 31</td><td>Day</td></tr>
<tr><td>Season</td><td rowspan="4">0802</td><td>1 (Hi)</td><td>80</td><td>0 – 1
(summer-winter)
Not used</td><td></td></tr>
<tr><td>Hour</td><td>1 (Hi)</td><td>1F</td><td>0-23</td><td>Hour</td></tr>
<tr><td>Invalidity</td><td>1 (Lo)</td><td>80</td><td>0 -1 (valid – invalid)</td><td></td></tr>
<tr><td>Minute</td><td>1 (Lo)</td><td>3F</td><td>0-59</td><td>Minute</td></tr>
<tr><td>Millisecond pF+pf</td><td>0803</td><td>2</td><td>FFFF</td><td>0 – 59999</td><td>ms</td></tr>
</table>

2.4.10 Mapping access characteristics

- Description of accessible addresses in reading of words (**function 03** and **04**).

PAGE 00h 0000h to 0054h	PAGE 01h 0100h to 0184h	PAGE 02h 0200h to 02FAh
PAGE 03h 0300h to 03F6h		

- Definition of accessible addresses in writing of 1 word (**function 06**).

PAGE 01h 0100h to 0184h	PAGE 02h 0200h to 02FAh	PAGE 03h 0300h to 03FAh

- Definition of accessible addresses in writing of n words (**function 16**).

PAGE 01h 0100h to 0184h	PAGE 02h 0200h to 02FAh	PAGE 03h 0300h to 03FAh
PAGE 08h 0800h to 0803h		

- Definition of accessible addresses in reading of bits (**function 01** and **02**).

Not available

- Definition of accessible addresses in writing of 1 bit (**function 05**).

PAGE 04h
0400h to 0402h

WARNING: THE BITS NUMBER MUST NOT BE HIGHER THAN 16.

2.4.11 Page 9h to 21h: disturbance record data (25 pages)

Access in words writing (**function 03**)
Each disturbance mapping page contain 250 words.

Address	Contents
0900h to 09FAh	250 disturbance data words
0A00h to 0AFAh	250 disturbance data words
0B00h to 0BFAh	250 disturbance data words
0C00h to 0CFAh	250 disturbance data words
0D00h to 0DFAh	250 disturbance data words
0E00h to 0DFAh	250 disturbance data words
0F00h to 0FFAh	250 disturbance data words
1000h to 10FAh	250 disturbance data words
1100h to 11FAh	250 disturbance data words
1200h to 12FAh	250 disturbance data words
1300h to 13FAh	250 disturbance data words
1400h to 14FAh	250 disturbance data words
1500h to 15FAh	250 disturbance data words
1600h to 16FAh	250 disturbance data words
1700h to 17FAh	250 disturbance data words
1800h to 18FAh	250 disturbance data words
1900h to 19FAh	250 disturbance data words
1A00h to 1AFAh	250 disturbance data words
1B00h to 1BFAh	250 disturbance data words
1C00h to 1CFAh	250 disturbance data words
1D00h to 1DFAh	250 disturbance data words
1E00h to 1EFAh	250 disturbance data words
1F00h to 1FFAh	250 disturbance data words
2000h to 20FAh	250 disturbance data words
2100h to 21FAh	250 disturbance data words

NB: The disturbance data pages contain values of one channel from one given disturbance record.

2.4.11.1 Meaning of each value channel

- VA, VB, VC and VN channels:

The value is an signed 16 bits word equivalent to the ADC value

Calculation formula for phase voltage values

Values in Volts can be calculated in following way:

$$\text{Value UA} = \sqrt{2} \cdot \frac{\text{sample\_UA} \cdot \text{Internal\_PhA} \cdot \text{Phase\_Primary\_VT\_Un}}{\text{Phase\_Secondary\_VT\_Un} \cdot 2000}$$

$$\text{Value UB} = \sqrt{2} \cdot \frac{\text{sample\_UB} \cdot \text{Internal\_PhB} \cdot \text{Phase\_Primary\_VT\_Un}}{\text{Phase\_Secondary\_VT\_Un} \cdot 2000}$$

$$\text{Value UC} = \sqrt{2} \cdot \frac{\text{sample\_UC} \cdot \text{Internal\_PhC} \cdot \text{Phase\_Primary\_VT\_Un}}{\text{Phase\_Secondary\_VT\_Un} \cdot 2000}$$

Where:
Internal_PhA, Internal_PhB, Internal_PhC: Internal scalling (see point 2.4.17 (Page 38h to 3Ch))

Calculation formula for neutral voltage values

Value in Volts can be calculated in following way:

$$\text{Value UN} = \sqrt{2} \cdot \frac{\text{sample\_UN} \cdot \text{Internal\_N} \cdot \text{Earth\_Primary\_VT\_Uen}}{\text{Earth\_Secondary\_VT\_Uen} \cdot 2000}$$

Where:
Internal_N: Internal scalling (see point 2.4.17 (Page 38h to 3Ch))

- Frequency channel:

Time between two samples in microseconds

- Logic channels:

Logic channel	Contents
Bit 0	Binary Input 1
Bit 1	Binary Input 2
Bit 2	Binary Input 3
Bit 3	Binary Input 4
Bit 4	Binary Input 5
Bit 5	Binary Input 6
Bit 6	None (reserved)
Bit 7	None (reserved)
Bit 8	Output RL1
Bit 9	Output RL2
Bit 10	Output RL3
Bit 11	Output RL4
Bit 12	Output RL5
Bit 13	Output RL6
Bit 14	Protection Trip
Bit 15	Start of protection which trips

2.4.12 Page 22h: disturbance record index frame

Access in word reading (function 03)

Address	Contents
2200h	Disturbance data index frame

Disturbance record index frame

Word	Contents
n° 1	Disturbance record number
n° 2	Disturbance record finish date (second)
n° 3	Disturbance record finish date (second)
n° 4	Disturbance record finish date (millisecond)
n° 5	Disturbance record finish date (millisecond)
n° 6	Disturbance record starting condition : 1 : tripping 2 : instantaneous 3 : remote command 4 : logic input
n° 7	Frequency at the post-time beginning

2.4.13 Page 35h (addresses 3500h to 354Ah) : event record data (9 words)

Word n° 1: Event meaning

Word n° 2: MODBUS associated value

Word n° 3: MODBUS address

Word n° 4: *Reserved*

Words n° 5 & 6 & 7 & 8: Event date is Inverted IEC 870-5-4 CP56Time2a:

See format Page 8h

Word n° 9: Acknowledge
0=event non acknowledged
1= event acknowledged)

Code	Meaning of the event	Type	MODBUS address
00	No event	-	
01	CB closing (Remote/menu HMI)	F38 ↑	0400h (bit 15)
02	CB tripping (Remote/menu HMI)	F38 ↑	0400h (bit 7)
03	Reset latched outputs (Remote)	F38 ↑	0400h (bit 2)
04	Reset signaling (Remote)	F38 ↑	0400h (bit 1)
05	Reset signaling and latched outputs (Remote)	F38 ↑	0400h (bit 3)
06	Clear fault and disturbance recorder	F38A ↑	0401h (bit 0)
07	Clear event recorder	F38A ↑	0401h (bit 1)
08	Reserved		

Code	Meaning of the event	Type	MODBUS address
09	Warm restart	↑	-
10	START V>	F37↑↓	0021h (bit 0)
11	START V>>	F37↑↓	0022h (bit 0)
12	START V>>>	F37↑↓	0023h (bit 0)
13	START V<	F37↑↓	0024h (bit 0)
14	START V<<	F37↑↓	0025h (bit 0)
15	START V<<<	F37↑↓	0026h (bit 0)
16	START VN>	F37↑↓	0027h (bit 0)
17	START VN>>	F37↑↓	0028h (bit 0)
18	START VN>>>	F37↑↓	0029h (bit 0)
19	START V1<	F37↑↓	002Ch (bit 0)
20	START V1<<	F37↑↓	002Dh (bit 0)
21	START V2>	F37↑↓	002Ch (bit 0)
22	START V2>>	F37↑↓	002Dh (bit 0)
23	START f1	F37↑↓	002Dh (bit 0)
24	START f2	F30 ↑	001Bh (value 4)
25	START f3	F31A ↑	001Ah (bit 10)
26	START f4	F51 ↑↓	002Ah (bit 0)
27	START f5	F11 ↑↓	0010h
28	START f6	F24 ↑↓	0013h
29	Reserved	F37↑↓	0023h (bit 0)
30	Reserved	F37↑↓	0023h (bit 6)
31	Reserved	F50 ↑↓	002Dh (bit 0)
32	Start Aux1	F50 ↑↓	002Dh (bit 6)
33	Start Aux2	F51 ↑↓	0028 (bit 6)
34	Start Aux3	F51 ↑↓	0029h (bit 6)
35	CB Fail Ext.	F32↑	0009h (bit 0)
36	CB status: opened	F30 ↑	001Bh (value 0)
37	CB status: closed	F30 ↑	001Bh (value 1)
38	CB status: faulty	F30 ↑	001Bh (value 3)
39	CB status: undefined	F30 ↑	001Bh (value 4)
40	tV>	F31 ↑↓	0019h (bit 4)
41	tV>>	F31 ↑↓	0019h (bit 5)
42	tV>>>	F31A ↑↓	0020h (bit 5)
43	tV<	F31A ↑↓	0020h (bit 6)
44	tV<<	F31 ↑↓	0019h (bit 8)
45	tV<<<	F31 ↑↓	0019h (bit 10)
46	tVN>	F51 ↑↓	0027h (bit 0)
47	tVN>>	F51 ↑↓	0028h (bit 0)

CT

Code	Meaning of the event	Type	MODBUS address
48	tVN>>>	F38 ↑	0400h (bit 8)
49	tV1<	F38 ↑	0400h (bit 9)
50	tV1<<	F38 ↑	0400h (bit 5)
51	tV2>		
52	tV2>>		
53	tf1		
54	tf2		
55	tf3	F38A↑	0401h (bit 9)
56	tf4	F38A↑	0401h (bit 5)
57	tf5	F38A↑	0401h (bit 14)
58	tf6	F38A↑	0401h (bit 15)
59	Reserved	↑	
60	Reserved	F38A↑	0401h (bit 3)
61	Reserved		
62	tAUX1		
63	tAUX2		
64	tAUX3	F31A ↑	001Ah (bit 10)
65	tCB Faulty External Signal.	F31A ↑	001Ah (bit 10)
66	CHANGE OF INPUT LOGIC STATE	F11 ↑↓	0010h
67	CHANGE OF OUTPUT LOGIC STATE	F24 ↑↓	0013h
68	Setting Group 1 active	F32↑	0009h (bit 0)
69	Setting Group 2 active	F32↑	0009h (bit 1)
70	tV> Alarm		
71	tV>> Alarm		
72	tV>>> Alarm		
73	tV< Alarm		
74	tV<< Alarm		
75	tV<<< Alarm		
76	tVN> Alarm		
77	tVN>> Alarm		
78	tVN>>> Alarm		
79	tV1< Alarm		
80	tV1<< Alarm		
81	tV2> Alarm		
82	tV2>> Alarm		
83	tf1 Alarm		
84	tf2 Alarm		
85	tf3 Alarm		
86	tf4 Alarm		

Code	Meaning of the event	Type	MODBUS address
87	tf5 Alarm		
88	tf6 Alarm		
89-91	Reserved		
92	tAUX1 Alarm		
93	tAUX2 Alarm		
94	tAUX3 Alarm		
95	Reserved		
96	Local CTRL mode	F61↑	001Eh (value: 2)
97	Remote CTRL mode	F61↑	001Eh (value: 1)
98	Local and remote CTRL mode	F61↑	001Eh (value: 0)
99	Setting change to Group 1 (Remote)	F38↑	0400h (bit 6)
100	Setting change to Group 2 (Remote)	F38↑	0400h (bit 11)
101	Reserved		
102	Setting Group 2 set via Input	F104↑↓	0035h (bit 8)
103	Relays Test (Commissiong Test) active	↑	-
104	Functional test V> ON	↑	-
105	Functional test V> OFF	↑	-
106	Functional test V>> ON	↑	-
107	Functional test V>> OFF	↑	-
108	Functional test V>>> ON	↑	-
109	Functional test V>>> OFF	↑	-
110	Functional test V< ON	↑	-
111	Functional test V< OFF	↑	-
112	Functional test V<< ON	↑	-
113	Functional test V<< OFF	↑	-
114	Functional test V<<< ON	↑	-
115	Functional test V<<< OFF	↑	-
116	Functional test VN> ON	↑	-
117	Functional test VN> OFF	↑	-
118	Functional test VN>> ON	↑	-
119	Functional test VN>> OFF	↑	-
120	Functional test VN>>> ON	↑	-
121	Functional test VN>>> OFF	↑	-
122	Functional test V2> ON	↑	-
123	Functional test V2> OFF	↑	-
124	Functional test V2>> ON	↑	-
125	Functional test V2>> OFF	↑	-
126	Functional test V1< ON	↑	-
127	Functional test V1< OFF	↑	-

Code	Meaning of the event	Type	MODBUS address
128	Functional test f1 ON	↑	-
129	Functional test f1 OFF	↑	-
130	Functional test f2 ON	↑	-
131	Functional test f2 OFF	↑	-
132	Functional test f3 ON	↑	-
133	Functional test f3 OFF	↑	-
134	Voltage Protection disable status	F12↑↓	0011h
135	Protection disable status	F12A↑↓	0012h
136	Blocking tV> active	F37↑↓	0021h (bit 4)
137	Blocking tV>> active	F37↑↓	0022h (bit 4)
138	Blocking tV>>> active	F37↑↓	0023h (bit 4)
139	Blocking tV< active	F37↑↓	0024h (bit 4)
140	Blocking tV<< active	F37↑↓	0025h (bit 4)
141	Blocking tV<<< active	F37↑↓	0026h (bit 4)
142	Blocking tV1< active	F50↑↓	0027h (bit 4)
143	Blocking tV1<< active	F50↑↓	0028h (bit 4)
144	Blocking tV2> active	F50↑↓	0028h (bit 4)
145	Blocking tV2>> active	F50↑↓	002Ch (bit 4)
146	Blocking tVN> active	F50↑↓	002Dh (bit 4)
147	Blocking tVN>> active	F50↑↓	002Ah (bit 4)
148	Blocking tVN>>> active	F50↑↓	002Bh (bit 4)
149	Blocking tf1 active	F50↑↓	0032h (bit 4)
150	Blocking tf2 active	F50↑↓	0033h (bit 4)
151	Blocking tf3 active	F50↑↓	0034h (bit 4)
152	Blocking tf4 active	F50↑↓	0035h (bit 4)
153	Blocking tf5 active	F50↑↓	0036h (bit 4)
154	Blocking tf6 active	F50↑↓	0037h (bit 4)
155	Reserved		
156	Reserved		
157	Reserved		
158	Acknowledgement of the hardware alarm	F38↑	0401h (bit 5)
159	Disable acknowledgment of events	F38↑	0400h (bit 12)
160	Acknowledgment of the oldest event	F38↑	0400h (bit 13)
161	Acknowledgment of the oldest fault	F38↑	0400h (bit 14)
162	Acknowledgment of the oldest disturbance recorder	F38A↑	0401h (bit 8)
163	Disturbance recorder remote start	F38A↑	0401h (bit 5)
164	Fault counter reset	F38A↑	0401h (bit 12)
165	Control counter reset	F38A↑	0401h (bit 13)
166	Maintenance mode	F38A↑	0401h (bit 6)

Code	Meaning of the event	Type	MODBUS address
167	End of maintenance mode	F38A↑	0401h (bit 7)
168	Manual Close via Input	↑	-
169	Manual Close via Function Key	↑	-
170	Manual Trip via Input	↑	-
171	Manual trip via Function Key	↑	-
172	Start Disturbance recorder via Input	↑	-
173	Local CTRL mode via Input active	↑	-
174	Local CTRL mode via HMI or RS485 active	↑	-
175	Administrator password entered	↑	-
176	Protection password entered	↑	-
177	Control password entered	↑	-
178	Reset LEDs and latched outputs via HMI (C key)	↑	-
179	Reset signalling via Input	F104↑	0035h (bit 1)
180	Reset latched outputs via Input	F104↑	0035h (bit 2)
181	Reset signalling on close	↑	-
182	State of CB Alarm	F31A↑↓	001Ah (bit 2)
183	Alarm VTS	↑↓	-
184	f<> internally locked (fOUT)	↑↓	-
185	f<> blocked (Remote/menu HMI)	↑↓	-

Note: The double arrow ↑↓ means the event is generated on event occurrence (↑) and on event disappearance (↓).

On event occurrence, the corresponding bit of the associated format is set to « 1 ».

On event disappearance, the corresponding bit of the associated format is set to « 0 ».

2.4.14 Page 36h

Most older event data

Access in word reading (**function 03**)

Address	Contents
3600h	Most older event data

2.4.15 Page 37h : fault record value data

Access in word reading (**function 03**)

Address	Contents
3700h	Fault value record n°1
3701h	Fault value record n°2
3702h	Fault value record n°3
3703h	Fault value record n°4
3704h	Fault value record n°5

Address	Contents
3705h	Fault value record n°6
3706h	Fault value record n°7
3707h	Fault value record n°8
3708h	Fault value record n°9
3709h	Fault value record n°10
3710h	Fault value record n°11
3711h	Fault value record n°12
3712h	Fault value record n°13
3713h	Fault value record n°14
3714h	Fault value record n°15
3715h	Fault value record n°16
3716h	Fault value record n°17
3717h	Fault value record n°18
3718h	Fault value record n°19
3719h	Fault value record n°20

Word n° 1 : Fault number

Words n° 2 & 3 & 4 & 5: see table below (Inverted IEC 870-5-4 CP56Time2a)

Timer	Address (hex)	Nb bytes	Mask (hex)	Values range	Unit
	Word n° 2	1 (Hi)			
Year		1 (Lo)	7F	0 – 99 (2000-2093)	Year
Month	Word n° 3	1 (Hi)	0F	1 - 12	month
Day of week		1 (Lo)	E0	1 – 7 **Not used**	Day
day of month		1 (Lo)	1F	1 – 31	Day
Season	Word n° 4	1 (Hi)	80	0 – 1 (summer-winter) **Not used**	
Hour		1 (Hi)	1F	0-23	Hour
Invalidity		1 (Lo)	80	0 -1 (valid – invalid)	
Minute		1 (Lo)	3F	0-59	Minute
Millisecond pF+pf	Word n° 5	2	FFFF	0 – 59999	ms (included s)

Word n° 6 : Reserved

Word n° 7 : Active setting group during the fault (1 or 2)

Word n° 8 : Fault origin

0= none
1= phase A

2= phase B
3= phase C
4= phases A-B
5= phases A-C
6= phases B-C
7= phases A-B-C
8= earth

Word n° 9: Fault recording starting origin

Fault nature code meaning

Code	Fault origin
00	Null event
01	Reserved
03	tV> trip
04	tV>> trip
05	tV>>> trip
06	tVN> trip
07	tVN>> trip
08	tVN>>> trip
09	Reserved
10	
11	t Aux 1 trip
12	t Aux 2 trip
13	tU2> trip
14	Reserved
15	t Aux 3 trip
16	t Aux 4 trip
17	CB Fail trip
18	
19	Reserved
20	CBext trip

CT

Word n° 10: Fault value voltage (nominal value)

Word n° 11: Phase A voltage value (nominal value)

Word n° 12: Phase B voltage value (nominal value)

Word n° 13: Phase C voltage value (nominal value)

Word n° 14: Earth voltage value (nominal value)

Word n° 15: Acknowledge of fault 0 : fault non-acknowledged
1 : fault acknowledged

2.4.15.1 Calculation formula for phase voltage values

Line phase voltage value (primary value) = phase sampled value (e.g. word 10, 11, 12 or 13) * {line primary VT ratio (address 0120h)/Line VT sec (address 0121h)} V/10

2.4.15.2 Calculation formula for neutral voltage values

Neutrale voltage value (primary value) = phase sampled value (e.g. word 10, 11, 12 or 13) * {line primary VT ratio (address 0122h)/Line VT sec (address 0123h)} V/10

2.4.16 Page 3Eh : most older Fault record value data

Access in word reading (**function 03**)

Address	Contents
3E00h	Most older Fault record

2.4.17 Page 38h to 3Ch: Disturbance recorder

Selection of the disturbance record and channel (36 bytes are uploaded for each address reading)

Access in word reading (**function 03**)

Address	Disturbance record number	Format
3800h	1	VA
3801h	1	VB
3802h	1	VC
3803h	1	VN
3804h	1	Frequency
3805h	1	Logic input and outputs
3900h	2	VA
3901h	2	VB
3902h	2	VC
3903h	2	VN
3904h	2	Frequency
3905h	2	Logic input and outputs
3A00h	3	VA
3A01h	3	VB
3A02h	3	VC
3A03h	3	VN
3A04h	3	Frequency
3A05h	3	Logic input and outputs
3B00h	4	VA
3B01h	4	VB
3B02h	4	VC
3B03h	4	VN
3B04h	4	Frequency
3B05h	4	Logic input and outputs
3C00h	1	VA

3C01h	1	VB
3C02h	1	VC
3C03h	1	VN
3C04h	1	Frequency
3C05h	1	Logic input and outputs

Word n° 1 : Number of samples included in the mapping
Word n° 2 : Sample number in pre-time
Word n° 3 : Sample number in post-time
Word n° 4 : Line VT primary nominal voltage **(*Phase_Primary_VT_Un*)**
Word n° 5 : Line VT secondary nominal voltage **(*Phase_ Secondary _VT_Un*)**
Word n° 6 : E/GND VT primary nominal voltage **(*Earth_Primary_VT_Uen*)**
Word n° 7 : E/GND VT secondary nominal voltage **(*Earth_ Secondary _VT_Uen*)**
Float[1] n° 1 : Phase A Internal PhA ratio (***Internal_PhA***)
Float[1] n° 2 : Phase B internal PhB ratio (***Internal_PhB***)
Float[1] n° 3 : Phase C internal PhC ratio (***Internal_PhC***)
Float[1] n° 4 : Earth internal ratio (***Internal_N***)
Word n° 8 : Mapping last page number
Word n° 9 : Number of words in the mapping last page

1) Float – 4 bytes floating point number

2.4.17.1 Calculation formula for phase voltage values

Values in Amps can be calculated in following way:

$$\mathrm{Value\,UA} = \sqrt{2}\cdot\frac{\mathrm{sample\_UA(e.g.3800h)\cdot Internal\_PhA\cdot Phase\_Primary\_VT\_Un}}{\mathrm{Phase\_Secondary\_VT\_Un\cdot 2000}}$$

$$\mathrm{Value\,UB} = \sqrt{2}\cdot\frac{\mathrm{sample\_UB(e.g.3801h)\cdot Internal\_PhB\cdot Phase\_Primary\_VT\_Un}}{\mathrm{Phase\_Secondary\_VT\_Un\cdot 2000}}$$

$$\mathrm{Value\,UC} = \sqrt{2}\cdot\frac{\mathrm{sample\_UC(e.g.3802h)\cdot Internal\_PhC\cdot Phase\_Primary\_VT\_Un}}{\mathrm{Phase\_Secondary\_VT\_Un\cdot 2000}}$$

2.4.17.2 Calculation formula for neutral voltage values

Value in Amps can be calculated in following way:

$$\mathrm{Value\,IN} = \sqrt{2}\cdot\frac{\mathrm{sample\_UN(e.g.3803h)\cdot Internal\_N\cdot Earth\_Primary\_VT\_Uen}}{\mathrm{Earth\_Secondary\_VT\_Uen\cdot 2000}}$$

CT

2.4.18 Pages 3Dh : number of disturbance records available

Access in word reading (function 03)

Address	Contents
3D00h	Number of disturbance records available

Word n° 1 : Number of disturbance records available

Word n° 2: Oldest disturbance record number (n)
Words n° 3 & 4 : Oldest disturbance record date (second)
Words n° 5 & 6 : Oldest disturbance record date (millisecond)
Word n° 7 : Disturbance record starting origin
1= Protection trip
2= instantaneous threshold
3= remote command
4= logic input
Word n° 8 : Acknowledge

Word n° 9 : Disturbance record previous number (n+1)
Words n° 10 & 11: Previous disturbance record date (second)
Words n° 12 & 13: Previous disturbance record date (millisecond)
Word n° 14 : Disturbance record starting origin
1= Protection trip
2= instantaneous threshold
3= remote command
4= logic input
Word n° 15 : Acknowledge
Word n° 16 : Disturbance record previous number (n+2)
Words n° 17 & 18: Previous disturbance record date (second)
Words n° 19 & 20: Previous disturbance record date (millisecond)
Word n° 21 : Disturbance record starting origin
1= Protection trip
2= instantaneous threshold
3= remote command
4= logic input
Word n° 22 : Acknowledge
Word n° 23 : Disturbance record previous number (n+3)
Words n° 24 & 25: Previous disturbance record date (second)
Words n° 26 & 27: Previous disturbance record date (millisecond)
Word n° 28 : Disturbance record starting origin
1= Protection trip
2= instantaneous threshold
3= remote command
4= logic input
Word n° 29 : Acknowledge
Word n° 30 : Disturbance record previous number (n+4)
Words n° 31 & 32: Previous disturbance record date (second)
Words n° 33 & 34: Previous disturbance record date (millisecond)
Word n° 35 : Disturbance record starting origin
1= Protection trip
2= instantaneous threshold
3= remote command
4= logic input
Word n° 36 : Acknowledge

2.4.19 Description of the mapping format, VAMP 11V

CODE	DESCRIPTION
F1	Unsigned integer – numerical data : 0 – 65535
F10	Characters ASCII byte 1: ASCII character 32-127 byte 2: ASCII character 32-127
F11	Unsigned integer -Binary input status bit 0: logic input 1 bit 1: logic input 2 bit 2: logic input 3 bit 3: logic input 4 bit 4: logic input 5 bit 5: logic input 6 bit 6-15: reserved
F12	Unsigned integer – Voltage Protection disable status bit 0: V> disabled bit 1: V>> disabled bit 2: V>>> disabled bit 3: V< disabled bit 4: V<< disabled bit 5: V<<< disabled bit 6: VN> disabled bit 7: VN>> disabled bit 8: VN>>> disabled bit 9: V2> disabled (**AN**) bit 10: V2>> disabled (**AN**) bit 11: V1< disabled (**A**) bit 12: V1<< disabled (**A**) bit 13 to 15: reserved
F12A	Unsigned integer – Protection Function disable status bit 0: f1 disabled (**A**) bit 1: f2 disabled (**A**) bit 2: f3 disabled (**A**) bit 3: f4 disabled (**A**) bit 4: f5 disabled (**A**) bit 5: f6 disabled (**A**) bit 6: reserved bit 7: reserved bit 8: reserved bit 9: AUX 1 disabled (**A**) bit 10: AUX 2 disabled (**A**) bit 11: AUX 3 disabled (**A**) bit 12 to 15: reserved
F15	Two-digit decimal number - Firmware version 1st digit - major version 2nd digit - minor version 10: 1A 11: 1B 12: 1C 13: 1D etc.
F16	Unsigned integer – Configuration 0: disabled 1: enable OR Trip 2: enable OR Alarm 3: enable AND Trip 4: enable AND Alarm 5: enable OR Trip/52a (**AN**) 6: enable OR Alarm/52a (**AN**) 7: enable AND Trip/52a (**AN**) 8: enable AND Alarm/52a (**AN**)
F17	Unsigned integer - Hardware version 00: 4BO, no RS485 (Model L) 01: 4BO, RS485 (model L with RS485)

CODE	DESCRIPTION
	10: 2BI, 4BO, no RS485 (Model N) 11: 6BI, 8BO, RS485 (model A)
F18	Unsigned integer – curves type 0: DT 1: SI IEC 2: VI IEC 3: EI IEC 4: LTI (IEC) 5: STI (IEC) 6: RC Rectifier curve 7: RI curve 8: MI IEEE 9: VI IEEE 10: EI IEEE 11: STI (US C02-P20) 12: LTI (US CO8) 13: RXIDG 14: BPN EDF 15: STI (US C02-P40)
F19	Unsigned integer - Baud rate value 0: 4800 baud 1: 9600 baud 2: 19200 baud 3: 38400 baud 4: 57600 baud 5: 115200 baud
F20	Unsigned integer – Parity 0: none 1: even 2: odd
F21	Unsigned integer – VT secondary 1: 57-130V 2: 220-480V
F22	Unsigned integer – Stop 0: 1 stop 1: 2 stop
F23	Unsigned integer – VT secondary E/Gnd 0: none 1: 57-130V
F24	Unsigned integer - Logical output status bit 0: logic output RL1 bit 1: logic output RL2 bit 2: logic output RL3 bit 3: logic output RL4 bit 4: logic output RL5 bit 5: logic output RL6 bit 6: logic output RL7 bit 7 to 15: reserved
F25	Unsigned integer - Logical LED status bit 0: Trip bit 1: LED2 (Alarm) bit 2: LED3 bit 3: LED4 bit 4: LED5 bit 5: LED6 bit 6: LED7 bit 7: Healthy bit 8-15: reserved
F26	Unsigned integer - Logical heathy status bit 0 to 3: reserved bit 4: Healthy bit 10-15: reserved

CODE	DESCRIPTION
F28	Unsigned integer - Protection start status bit 0: V> bit 1: V>> bit 2: V>>> bit 3: V< bit 4: V<< bit 5: V<<< bit 6: VN> bit 7: VN>> bit 8: VN>>> bit 9: V2> (**AN**) bit 10: V2>> (**AN**) bit 11: V1< (**A**) bit 12: V1<< (**A**) bit 13: starting in phase A bit 14: starting in phase B bit 15: starting in phase C
F28A	Unsigned integer - Protection start status bit 0: f1 (**A**) bit 1: f2 (**A**) bit 2: f3 (**A**) bit 3: f4 (**A**) bit 4: f5 (**A**) bit 5: f6 (**A**) bit 6: reserved bit 7: reserved bit 8 : reserved bit 9: AUX1 (**A**) bit 10: AUX2 (**A**) bit 11: AUX3 (**A**) bit 12 to 15: reserved
F29	Unsigned integer – Protection Function trip status bit 0: tV> trip bit 1: tV>> trip bit 2: tV>>> trip bit 3: tV< trip bit 4: tV<< trip bit 5: tV<<< trip bit 6: tVN> trip bit 7: tVN>> trip bit 8: tVN>>> trip bit 9: tV2> trip (**AN**) bit 10: tV2>> trip (**AN**) bit 11: tV1< trip (**A**) bit 12: tV1<< trip (**A**) bit 13: trip phase A bit 14: trip phase B bit 15: trip phase C
F29A	Unsigned integer - Protection Function trip status bit 0: tf1 trip (**A**) bit 1: tf2 trip (**A**) bit 2: tf3 trip (**A**) bit 3: tf4 trip (**A**) bit 4: tf5 trip (**A**) bit 5: tf6 trip (**A**) bit 6: reserved bit 7: reserved bit 8: reserved bit 9: tAUX1 trip (**A**) bit 10: tAUX2 trip (**A**) bit 11: tAUX3 trip (**A**) bit 12 to 15: reserved

CODE	DESCRIPTION
F30	Unsigned integer - CB status 0: CB opened 1: CB closed 2: reserved 3: CB position faulty 4: CB position undefined
F31	Unsigned integer (bit)- Protection Alarm status bit 0: tV> alarm bit 1: tV>> alarm bit 2: tV>>> alarm bit 3: tV< alarm bit 4: tV<< alarm bit 5: tV<<< alarm bit 6: tVN> alarm bit 7: tVN>> alarm bit 8: tVN>>> alarm bit 9: tV2> alarm (**AN**) bit 10: tV2>> alarm (**AN**) bit 11: tV1< alarm (**A**) bit 12: tV1<< alarm (**A**) bit 13: alarm phase A bit 14: alarm phase B bit 15: alarm phase C
F31A	Unsigned integer - Alarm Function status bit 0: tf1 alarm (**A**) bit 1: tf2 alarm (**A**) bit 2: tf3 alarm (**A**) bit 3: tf4 alarm (**A**) bit 4: tf5 alarm (**A**) bit 5: tf6 alarm (**A**) bit 6: reserved bit 7: reserved bit 8: reserved bit 9: tAUX1 alarm (**A**) bit 10: tAUX2 alarm (**A**) bit 11: tAUX3 alarm (**A**) bit 12: alarm t CB not healthy (**AN**) bit 13: alarm CB (**AN**) bit 14: alarm tVTS (**AN**) bit 15: alarm VT Supervision (**AN**)
F32	Unsigned integer - Setting group 0: Setting group 1 1: Setting group 2
F35	Unsigned integer -Input configuration bit 0: Input L1 bit 1: Input L2 bit 2: Input L3 bit 3: Input L4 bit 4: Input L5 bit 5: Input L6 bit 6-15: reserved
F36	Unsigned integer -Output configuration bit 0: RL1 bit 1: RL2 bit 2: RL3 bit 3: RL4 bit 4: RL5 bit 5: RL6 bit 6: RL7 bit 7-15: reserved

CODE	DESCRIPTION
F37	Unsigned integer: threshold phase information status: bit 0: information thresold exceeded (V>, V>>, V>>>, V<, V<<, V<<<) bit 1: Instantaneous VA bit 2: Instantaneous VB bit 3: Instantaneous VC bit 4: reserved bit 5: Instantaneous information (V>, V>>, V>>>, V<, V<<, V<<<)(after blocking) bit 6: Triping information (V>, V>>, V>>>, V<, V<<, V<<<) bit 7 to 15: reserved
F38	Unsigned integer - Remote control word 1 bit 0: Warm restart (**AN**) bit 1: Reset LEDs (**AN**) bit 2: Reset Outputs (**AN**) bit 3: Reset LEDs and Outputs (**AN**) bit 4: Local Mode (**A**) bit 5: Reset latched Alarms (**AN**) bit 6: Setting change to Group 1 (**AN**) bit 7: Remote or HMI CB open order (**AN**) bit 8: f<> Remote blocking (**A**) bit 9: f<> Remote unblocking (**A**) bit 10: Remote Mode (**A**) bit 11: Setting change to Group 2 (**AN**) bit 12: Disable automatic acknowledgement of events (**AN**) bit 13: Oldest event acknowledge (**AN**) bit 14: Oldest fault acknowledge (**AN**) bit 15: Remote or via HMI CB close order (**AN**)
F38A	Unsigned integer - Remote control word 2 bit 0: Clear Recorders (**AN**) bit 1: Clear Events (**AN**) bit 2: reserved bit 3: reserved bit 4: Peak value reset (**AN**) bit 5: Disturbance record remote start (**A**) bit 6: Maintenance mode (**A**) bit 7: End of maintenance mode (**A**) bit 8: Acknowledgement of the oldest disturbance record (**A**) bit 9: reserved bit 10: reserved bit 11: reserved bit 12: Reset Fault counters (**AN**) bit 13: Reset control counters (**AN**) bit 14: reserved bit 15: reserved
F38B	Unsigned integer – Remote control word 3 bit 0: reserved bit 1: Enable automatic acknowledgement of events (**AN**) bit 2-15: reserved
F39	Unsigned integer - LED function bit 0: LED2 (Alarm) bit 1: LED3 bit 2: LED4 bit 3: LED5 bit 4: LED6 bit 5: LED7 bit 6-15: reserved
F41	Unsigned integer - Curve Type 0: DT 1: IDMT

CODE	DESCRIPTION
F49	Unsigned integer - relay status bit 0: Relay status (major alarms) bit 1: Minor hardware alarm bit 2: Presence of non-acknowledged event bit 3: Synchronisation state bit 4: reserved bit 5: Presence of non-acknowledged fault record bit 6-15: reserved
F50	Unsigned integer: threshold V2, VN, V1, f, AUXx information status: bit 0: information threshold exceeded bit 1: reserved bit 2: reserved bit 3: reserved bit 4: reserved bit 5: Instantaneous information (V2, V1, VN, f, AUXx)(after blockig) bit 6: Tripping information (V2, VN, V1, f, AUXx) bit 7 to 15: reserved
F52	Unsigned integer: information about language in menu 0: English 1: German 2: French 3: Spanish 4: Russian 5: Turkish 6: Regional
F53	Unsigned integer: information about default window in menu 0: Measurements P- P [V] 1: Measurements P-P [Un] 2: Measurements P-N [V] 3: Measurements P-N [Un] 4: Control CB 5: Local mode
F54	Unsigned integer 0: Manual only 1: Protection start 2: Close command
F55	Unsigned integer - Alarm Display Reset 0: Self-Reset 1: Manual Reset
F56	Unsigned integer - Protocol 0: Modbus 1: IEC103
F57	Unsigned integer – Nominal Frequency 0: 50Hz 1: 60Hz
F58	Unsigned integer – Hardware version 0: Standard 1: Model L 2: Model L+RS485 3: Model N 4: Model A
F60	Inverted CP56Time2a Format
F61	Unsigned integer - Local/Remote Mode 0: Local and Remote 1: Remote only 2: Local only
F62	Unsigned integer – Maintenance Mode. Read only (remote modification has no effect) 0: No 1: Yes – output trips 2: Yes – output blocking

CODE	DESCRIPTION
F63	Unsigned integer – Configuration 0: No 1: Yes
F64	Unsigned integer – Configuration 0: Protection reset 1: CB Reset
F65	Unsigned integer – Disturbance recorder configuration 0: On Instantenous 1: On Trip
F66	Unsigned integer – Configuration 0: Disabled 1: Enabled
F71	Unsigned integer - Number of setting groups: 0: One Group 1:Two Groups
F73	Unsigned integer - Remote Mode configuration 0: Remote Only 1:Remote + Local
F76	Unsigned integer – Functional test pattern 0: V> 1: V>> 2: V>>> 3: V< 4: V<< 5: V<<< 6: VN> 7: VN>> 8: VN>>> 9: V2> 10: V2>> 11: V1< 12: V1<< 13: f1 14: f2 15: f3 16: f4 17: f5 18: f6
F77	Unsigned integer - Functional Test End 0: CB Trip 1: Time elapsed
F82	Unsigned integer – Control key confirmation 0: without confirmation 1: with confirmation
F84	Unsigned integer - Configuration: 0: disable 1: f> Trip 2: f> Alarm 3: f< Trip 4: f< Alarm
F88	Unsigned integer – IDMT Interlock by DMT 0: No 1: Yes
F90	Unsigned Integer - VT connection 0: 3Upn 1: 3Upn+UN 2: 2Upp+UN 3: 3Upp+UN

CODE	DESCRIPTION
F91	Unsigned integer – Protection configuration 0: P-N 1: P-P
F92	Unsigned integer – VTS input 0: VTS input 1: Delta Vr=VN-3Vo 2: Delta Vr=VN-3Vo and VTS input
F94	Unsigned integer - Configuration 0: disabled 1: Trip 2: Alarm
F95	Unsigned integer - Configuration 0: disable 1: Trip (measured) 2: Alarm (measured) 3: Trip (Ua+Ub+Uc) 4: Alarm (Ua+Ub+Uc)

2.4.20 Request to retrieve the oldest non-acknowledge event

Slave number	Function code	Word address	Word number	CRC
xx	03h	36h 00	00 09h	xx xx

This event request may be answered an error message with the error code :

EVT_EN_COURS_ECRIT (5) : An event is being written into the saved FRAM.

Note : On event retrieval, two possibilities exist regarding the event record acknowledgement :
a) Automatic event record acknowledgement on event retrieval.
b) Non automatic event record acknowledgement on event retrieval.

a) Automatic event record acknowledgement on event retrieval :

The bit12 of the remote order frame (format F38 – mapping address 0400h) shall be set to 0. On event retrieval, this event record is acknowledged.

b) Non automatic event record acknowledgement on event retrieval :

The bit12 of the remote order frame (format F38 – mapping address 0400h) shall be set to 1. On event retrieval, this event record is not acknowledged. To acknowledge this event, an other remote order shall be sent to the relay. The bit 13 of this frame (format F38 – mapping address 0400h) shall be set to 1.

2.4.21 Request to retrieve a dedicated event

Slave number	Function code	Word address	Word number	CRC
xx	03h	Refer to mapping	00 09h	xx xx

This event request may be answered an error message with the error code :

EVT_EN_COURS_ECRIT (5) : An event is being written into the saved FRAM.

Note : This event retrieval does not acknowledge this event.

2.4.22 Modbus request definition used to retrieve the fault records

Two ways can be followed to retrieve a fault record :

- Send a request to retrieve the oldest non-acknowledge fault record.
- Send a request to retrieve a dedicated fault record.

2.4.22.1 Request to retrieve the oldest non-acknowledge fault record

Slave number	Function code	Word address	Word number	CRC
xx	03h	3Eh 00	00 0Fh	xx xx

CT

Note : On fault retrieval, two possibilities exist regarding the fault record acknowledgement:
a) Automatic fault record acknowledgement on event retrieval.
b) Non automatic fault record acknowledgement on event retrieval.

a) Automatic fault record acknowledgement on fault retrieval:

The bit12 of the remote order frame (format F38 – mapping address 0400h) shall be set to 0. On fault retrieval, this fault record is acknowledged.

b) Non automatic fault record acknowledgement on fault retrieval :

The bit12 of the remote order frame (format F38 – mapping address 0400h) shall be set to 1. On fault retrieval, this fault record is not acknowledged.

To acknowledge this fault, an other remote order shall be sent to the relay. The bit 14 of this frame (format F38 – mapping address 0400h) shall be set to 1.

2.4.22.2 Request to retrieve a dedicated fault record

Slave number	Function code	Word address	Word number	CRC
xx	03h	Refer to mapping	00 0Fh	xx xx

Note : This fault value retrieval does not acknowledge this fault record.

3. IEC60870-5-103 INTERFACE

The IEC60870-5-103 interface is a master/slave interface with the relay as the slave device. This protocol is based on the VDEW communication protocol. The relay conforms to compatibility level 2, compatibility level 3 is not supported.

The following IEC60870-5-103 facilities are supported by this interface:

Initialisation (Reset)

Time Synchronisation

Event Record Extraction

General Interrogation

Cyclic Measurements

General Commands

Physical connection and link layer

Connection is available for IEC60870-5-103 through the rear RS485 port. It is possible to select both the relay address and baud rate using the front panel interface. Following a change, a reset command is required to re-establish communications.

The parameters of the communication are the following:

Even Parity

8 Data bits

1 stop bit

Data rate 9600 or 19200 bauds

Initialisation

Initialisation is implemented according to clause 7.4.1 of IEC 60870-5-103.

Whenever the relay has been powered up, or if the communication parameters have been changed a reset command is required to initialise the communications. The relay will respond to either of the two reset commands (Reset CU or Reset FCB), the difference being that the Reset CU will clear any unsent messages in the relay's transmit buffer.

The relay will respond to the reset command with an identification message ASDU 5, the Cause Of Transmission COT of this response will be either Reset CU or Reset FCB depending on the nature of the reset command. The following information will be contained in the data section of this ASDU:

Manufacturer Name: SE VAMP

According to the specification “Communication Architecture (ACA), Part 4: Communication based on IEC 60870-5-103” (Issue H, April 2010) the Software Identification Section will contain the relay model number and the version number to identify the type of relay.

CT

Software Identification Section, Byte 0:	Numerical part of device type, hex, low
Software Identification Section, Byte 1:	Numerical part of device type, hex, low
Software Identification Section, Byte 2:	Software version, hex, low
Software Identification Section, Byte 3:	Software version, hex, high

Letters in the software version are converted to numerical values according to the following rule: A=0, B=1, C=2, D=3 etc.

The Software Identification Section of V11V, version 1A, will then contain ‘111’ and ‘10’ as hexadecimal coded values:

Byte 0: 74H

Byte 1: 00H

Byte 2: 10H

Byte 3: 00H

In addition to the above identification message, if the relay has been powered up it will also produce a power up event.

Time synchronisation

Time synchronisation is implemented according to clause 7.4.2 of IEC 60870-5-103.

The relay time and date can be set using the time synchronisation feature of the IEC60870-5-103 protocol. The relay will correct for the transmission delay as specified in IEC60870-5-103. If the time synchronisation message is sent as a send/confirm message then the relay will respond with a confirm. Whether the time synchronisation message is sent as a send confirm or a broadcast (send/no reply) message, a time synchronisation message will be returned as Class 1 data.

Spontaneous events

The events created by the relay will be passed to the master station using the compatible range and the private range of IEC 60870-5-103 function types and information numbers.

Events are categorised using the following information:

Common Address

Function Type

Information number

3.10-3.14 contains a complete listing of all events produced by the relay.

General interrogation

General interrogation is implemented according to clause 7.4.3 of IEC 60870-5-103.

The GI request can be used to read the status of the relay, the function numbers, information numbers and common address offsets that will be returned during the GI cycle are indicated in 3.10-3.14.

Cyclic measurements

The relay will produce measured values using ASDU 3 and ASDU 9 on a cyclical basis. They can be read from the relay using a Class 2 poll.

It should be noted that the measurands transmitted by the relay are sent as a proportion of 2.4 times the rated value of the analogue value. The selection of 2.4 for a particular value is indicated in 3.10-3.14.

Commands

Command transmission is implemented according to clause 7.4.4 of IEC 60870-5-103.

A list of the supported commands is contained in 3.10-3.14. The relay will respond to all other commands with an ASDU 1, with a cause of transmission (COT) of negative acknowledgement of a command

Blocking of monitor direction

The relay does not support a facility to block messages in the Monitor direction.

Spontaneous messages managed by VAMP 11V

These messages includes a sub-assembly of events which are generated on the relay, because some generated events are not registered in VDEW. They are the most priority messages.

An event is always generated on the rising edge of the information.

Some events can be generated on the rising or lowering edge.

In the list below, events only generated on rising edge will be tagged with a ‘*’.

The following list of processed events contains the messages for the compatible and the private range for all overvoltage protection functions, with the associated FUNCTION TYPE, INFORMATION NUMBER, ASDU TYPE, CAUSE OF TRANSMISSION

FUN <160>: Function type in Public range for Overvoltage Protections (compatible).

FUN <162> ,<163>, <164>, <165>, <168>: Function type in Private range (Reserved for Overvoltage Protections).

Status indications in monitor direction (Type Identification 1)

ASCI	Description	FUN	INF	ASDU	COT	ADDR	Notes
	LEDs and flags indication reset	160	19	1	1,7,11,12, 20, 21	*	
	Reset Latch. Sign Inp	162	223	1	1,7,11,12, 20, 21	*	
	Reset Latched Outputs (Inp+COM)	162	46	1	1,7,11,12, 20, 21	*	
	Reset Latched Signaling. and Outputs (HMI+COM)	249	131	1	1,7,11,12, 20, 21	*	
	Reset Latched Outputs (Inp)	162	86	1	1,7	*	
	Maintenance (Test) Mode Inp	162	157	1	1,7		
	Maintenance Mode (Test Mode)	160	21	1	11		
	Local Mode	160	22	1	11		
	Relay Blocked/faulty (Hardware Warning)	160	47	1	1,7		
	Setting Group number 1	160	23	1	1,7,11,12, 20, 21		
	Setting Group number 2	160	24	1	1,7,11,12, 20, 21		
	Auxiliary input 1	160	27	1	1,7,11		Status of input - it includes reverse logic configuration
	Auxiliary input 2	160	28	1	1,7,11		as above
	Auxiliary input 3	160	29	1	1,7,11		as above
	Auxiliary input 4	160	30	1	1,7,11		as above
	Auxiliary input 5	163	81	1	1,7,11		as above
	Auxiliary input 6	163	82	1	1,7,11		as above
	Input 1	163	160	1	1,7		Presence of the voltage on the input terminals
	Input 2	163	161	1	1,7		as above
	Input 3	163	162	1	1,7		as above

	Input 4	163	163	1	1,7		as above
	Input 5	163	164	1	1,7		as above
	Input 6	163	165	1	1,7		as above
	Relay output 1	249	1	1	1,7		Logical state of the output - before Reverse Logic. Logical state of the output can differ from Physical state - terminals if Reverse Logic for this output is set
	Relay output 2	249	2	1	1,7		as above
	Relay output 3	249	3	1	1,7		as above
	Relay output 4	249	4	1	1,7		as above
	Relay output 5	249	5	1	1,7		as above
	Relay output 6	249	6	1	1,7		as above
	Relay output 7	249	7	1	1,7		as above
	Relay output 8	249	8	1	1,7		as above
	Manual. Trip Ext (Inp)	162	148	1	1,7	*	
	Trip CB Order (Inp+HMI+RS485)	162	9	1	1,7	*	
	Manual. Close Ext (Inp)	162	47	1	1,7	*	
	Manual. Close Command (Inp+HMI)	162	246	1	1,7	*	
	Close CB Order (Inp+HMI+RS485)	162	239	1	1,7	*	
	CB Status 52A Inp	163	253	1	1,7		
	CBM: tCB FLT (faulty) Ext. Alarm	165	45	1	1,7		
	CBM: CB Time Monitoring Alarm	165	46	1	1,7	*	
	CBM: State of CB (not correct) ALARM	165	47	1	1,7		
	FT_RC: Faulty time tag	163	74	1	1,7	*	
59	Blocking tV> Ext (Inp)	163	18	1	1,7		
59	Blocking tV>> Ext (Inp)	163	19	1	1,7		
59	Blocking tV>>> Ext (Inp)	165	67	1	1,7		
27	Blocking tV< Ext (Inp)	163	20	1	1,7		
27	27: Blocking tV<< Ext (Inp)	163	21	1	1,7		
27	Blocking tV<<< Ext (Inp)	165	70	1	1,7		
59N	Blocking tVN> Ext (Inp)	163	22	1	1,7		
59N	Blocking tVN>> Ext (Inp)	163	23	1	1,7		
59N	Blocking tVN>>> Ext (Inp)	165	73	1	1,7		
27D	Blocking tV1< Ext (Inp)	163	26	1	1,7		
27D	Blocking tV1<< Ext (Inp)	163	27	1	1,7		
47	Blocking tV2> Ext (Inp)	163	28	1	1,7		
47	Blocking tV2>> Ext (Inp)	163	29	1	1,7		
81	Blocking tf1 Ext (Inp)	162	4	1	1,7		

81	Blocking tf2 Ext (Inp)	164	5	1	1,7		
81	Blocking tf3 Ext (Inp)	164	6	1	1,7		
81	Blocking tf4 Ext (Inp)	162	7	1	1,7		
81	Blocking tf5 Ext (Inp)	165	76	1	1,7		
81	Blocking tf6 Ext (Inp)	165	79	1	1,7		
81	f Out	165	80	1	1,7		
81	Blocked by V<	164	3	1	1,7		
VTS	VTS Enabled	165	102	1	1,7		
VTS	Start VTS	163	71	1	1,7		
VTS	VTS Ext	165	81	1	1,7		
VTS	tVTS	165	101	1	1,7		

Fault Indications in monitor direction (Type Identification 2)

ASCI	Description	FUN	INF	ASDU	COT	ADDR	Notes
	General Trip	160	68	2	1,7	*	
59	Start / pick-up V>/V>>/V>>> A (-B)	163	32	2	1,7		
59	Start / pick-up V>/V>>/V>>> B (-C)	163	33	2	1,7		
59	Start / pick-up V>/V>>/V>>> C (-A)	163	34	2	1,7		
59	Start / pick-up V>	163	30	2	1,7		
59	tV> elapsed	163	36	2	1,7	*	
59	Trip tV>	165	82	2	1,7	*	
59	Start / pick-up V>>	163	31	2	1,7		
59	tV>> elapsed	163	38	2	1,7	*	
59	Trip tV>>	165	83	2	1,7	*	
59	Start / pick-up V>>>	165	65	2	1,7		
59	tV>>> elapsed	165	66	2	1,7	*	
59	Trip tV>>>	165	84	2	1,7	*	
27	Start / pick-up V</V<</V<<< A (-B)	163	41	2	1,7		
27	Start / pick-up V</V<</V<<< B (-C)	163	42	2	1,7		
27	Start / pick-up V</V<</V<<< C (-A)	163	43	2	1,7		
27	Start / pick-up V<	163	39	2	1,7		
27	tV< elapsed	163	45	2	1,7	*	
27	Trip tV<	165	85	2	1,7	*	
27	Start / pick-up V<<	163	40	2	1,7		
27	tV<< elapsed	163	47	2	1,7	*	
27	Trip tV<<	165	86	2	1,7	*	
27	Start / pick-up V<<<	165	68	2	1,7		
27	tV<<< elapsed	165	69	2	1,7	*	
27	Trip tV<<<	165	87	2	1,7	*	
59N	Start / pick-up VN>	163	49	2	1,7		
59N	tVN> elapsed	163	51	2	1,7	*	
59N	Trip tVN>	165	88	2	1,7	*	
59N	Start / pick-up VN>>	163	50	2	1,7		
59N	tVN>> elapsed	163	52	2	1,7	*	
59N	Trip tVN>>	165	89	2	1,7	*	
59N	Start / pick-up VN>>>	165	71	2	1,7		
59N	tVN>>> elapsed	165	72	2	1,7	*	
59N	Trip signal tVN>>>	165	90	2	1,7	*	

CT

27D	Start / pick-up V1<	163	57	2	1,7		
27D	tV1< elapsed	163	59	2	1,7	*	
27D	Trip signal tV1<	165	91	2	1,7	*	
27D	Start / pick-up V1<<	163	58	2	1,7		
27D	tV1<< elapsed	163	60	2	1,7	*	
27D	Trip signal tV1<<	165	92	2	1,7	*	
47	Start / pick-up V2>	163	62	2	1,7		
47	tV2> elapsed	163	64	2	1,7	*	
47	Trip signal tV2>	165	93	2	1,7	*	
47	Start / pick-up V2>>	163	63	2	1,7		
47	tV2>> elapsed	163	65	2	1,7	*	
47	Trip signal tV2>>	165	94	2	1,7	*	
81	Start / pick-up f1	162	8	2	1,7		
81	tf1 elapsed	165	95	2	1,7	*	
81	Trip signal tf1	164	12	2	1,7	*	
81	Start / pick-up f2	164	13	2	1,7		
81	tf2 elapsed	165	96	2	1,7	*	
81	Trip signal tf2	164	17	2	1,7	*	
81	Start / pick-up f3	164	18	2	1,7		
81	tf3 elapsed	165	97	2	1,7	*	
81	Trip signal tf3	165	22	2	1,7	*	
81	Start / pick-up f4	164	23	2	1,7		
81	tf4 elapsed	165	98	2	1,7	*	
81	Trip signal tf4	165	64	2	1,7	*	
81	Start / pick-up f5	165	74	2	1,7		
81	tf5 elapsed	165	99	2	1,7	*	
81	Trip signal tf5	165	75	2	1,7	*	
81	Start / pick-up f6	165	77	2	1,7		
81	tf6 elapsed	165	100	2	1,7	*	
81	Trip signal tf6	165	78	2	1,7	*	
AUX	*Start AUX1*	163	93	2	1,7		
AUX	tAUX1 elapsed	163	94	2	1,7		
AUX	Trip tAUX1	165	22	2	1,7	*	
AUX	*Start AUX2*	163	95	2	1,7		
AUX	tAUX2 elapsed	163	96	2	1,7		
AUX	Trip tAUX2	165	23	2	1,7	*	
AUX	*Start AUX3*	163	97	2	1,7		
AUX	tAUX3 elapsed	163	98	2	1,7		
AUX	Trip tAUX3	165	24	2	1,7	*	
FT_RC	System disturb. runn	162	241	2	1,7		
FT_RC	Record. in progress	162	220	2	1,7		
FT_RC	Start Distur. Recorder INP+COM	162	172	2	1,7		
FT_RC	Trigger INP	162	22	2	1,7		

CT

Control indications in monitor direction:

CB monitoring: FUN<242>;INF <1>; COT<1, 7,11>,<ADDR>

NOTE: The value of CB monitoring DPI can have 4 stages:

DPI
<0000 0000> "Undefined / Between closed and opened"

<0000 0001> "opened"

<0000 0010> "closed"

<0000 0011> "Undefined / Faulty"

List of data contained in General Interrogation

It is given in the answer to the General Interrogation (GI).

Relay state information are Class 1 data, they are systematically sent to the master station, during a General Interrogation.

The list of processed data, following a General Interrogation, is given below: it is a sub-assembly of the spontaneous message list, so like spontaneous messages, these data are generated on rising and lowering edge.

Status indications (monitor direction):

ASCI	Description	FUN	INF	ASDU	COT	ADDR	Notes
	Maintenance (Test) Mode Inp	162	157	1	9		
	Maintenance Mode (Test Mode)	160	21	1	9		
	Local Mode	160	22	1	9		
	Relay Blocked/faulty (Hardware Warning)	160	47	1	9		
	Setting Group number 1	160	23	1	9		
	Setting Group number 2	160	24	1	9		
	Auxiliary input 1 (logical state)	160	27	1	9		Status of input - it includes reverse logic configuration
	Auxiliary input 2 (logical state)	160	28	1	9		as above
	Auxiliary input 3 (logical state)	160	29	1	9		as above
	Auxiliary input 4 (logical state)	160	30	1	9		as above
	Auxiliary input 5 (logical state)	163	81	1	9		as above
	Auxiliary input 6 (logical state)	163	82	1	9		as above
	Input 1	163	160	1	9		Presence of the voltage on the input terminals
	Input 2	163	161	1	9		as above
	Input 3	163	162	1	9		as above
	Input 4	163	163	1	9		as above
	Input 5	163	164	1	9		as above
	Input 6	163	165	1	9		as above
	Relay output 1	249	1	1	9		*Logical state of the output - before Reverse Logic. Logical state of the output can differ from Physical state - terminals if Reverse Logic*

							for this output is set
	Relay output 2	249	2	1	9		as above
	Relay output 3	249	3	1	9		as above
	Relay output 4	249	4	1	9		as above
	Relay output 5	249	5	1	9		as above
	Relay output 6	249	6	1	9		as above
	Relay output 7	249	7	1	9		as above
	Relay output 8	249	8	1	9		as above
59	Blocking tV> Ext (Inp)	163	18	1	1,7		
59	Blocking tV>> Ext (Inp)	163	19	1	1,7		
59	Blocking tV>>> Ext (Inp)	165	67	1	1,7		
27	Blocking tV< Ext (Inp)	163	20	1	1,7		
27	Blocking tV<< Ext (Inp)	163	21	1	1,7		
27	Blocking tV<<< Ext (Inp)	165	70	1	1,7		
59N	Blocking tVN> Ext (Inp)	163	22	1	1,7		
59N	Blocking tVN>> Ext (Inp)	163	23	1	1,7		
59N	Blocking tVN>>> Ext (Inp)	165	73	1	1,7		
27D	Blocking tV1< Ext (Inp)	163	26	1	1,7		
27D	Blocking tV1<< Ext (Inp)	163	27	1	1,7		
47	Blocking tV2> Ext (Inp)	163	28	1	1,7		
47	Blocking tV2>> Ext (Inp)	163	29	1	1,7		
	CB Status 52A Inp	163	253	1	9		
CBM	tCB FLT (faulty) Ext. Alarm	165	45	1	9		
CBM	State of CB (not correct) ALARM	165	47	1	9		
VTS	VTS Enabled	165	102	1	1,7		
VTS	Start VTS	163	71	1	1,7		
VTS	VTS Ext	165	81	1	1,7		
VTS	tVTS	165	101	1	1,7		

Fault Indications in monitor direction

ASCI	Description	FUN	INF	ASDU	CO9T	ADDR	Notes
59	Start / pick-up V>/V>>/V>>> A (-B)	163	32	2	9		
59	Start / pick-up V>/V>>/V>>> B (-C)	163	33	2	9		
59	Start / pick-up V>/V>>/V>>> C (-A)	163	34	2	9		
59	Start / pick-up V>	163	30	2	9		
59	Start / pick-up V>>	163	31	2	9		
59	Start / pick-up V>>>	165	65	2	9		
27	Start / pick-up V</V<</V<<< A (-B)	163	41	2	9		
27	Start / pick-up V</V<</V<<< B (-C)	163	42	2	9		
27	Start / pick-up	163	43	2	9		

FIRMWARE AND SERVICE MANUAL VERSION HISTORY

Date:	**1st December 2015**
Software Version:	**1A**
Connection Diagrams:	**10V11V01**

VH

Relay type: VAMP 11V							
Software Version		**Hardware Suffix**	**Original Date of Issue**	**Description of Changes**	**S1 Studio Compatibility**	**Technical Documentation**
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