

**NUMERICAL UNDER VOLTAGE & PT FUSE FAIL  
MONITORING RELAY  
ANUV 041[AN SERIES]**

# User Manual



**ALUMINIUM INDUSTRIES LIMITED  
RELAYS DIVISION, TRIVANDRUM**

# **ANUV 041**

## Numerical Under Voltage & PT Fuse Fail monitoring Relay

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# **SAFETY REQUIREMENTS**



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## INTRODUCTION

Before using this product, be sure to read this chapter carefully.

This chapter describes safety precautions when using the relay. Before installing and using the equipment, read and understand this chapter thoroughly.

It's not a secret – electricity can be dangerous and when things go wrong lives can be at stake!

Electrical engineers are Industrial safety doctors, so it's our duty to keep employees health and maintain a quality of life that we all deserve by providing safe work practices to avoid electrical accidents.

### How much electricity is dangerous?????

CURRENT	EFFECT
0.5 – 3mA	Tingling sensations
3 – 10mA	Muscle contractions (painful)
10 – 40mA	“can't let go” phenomena
40 – 75mA	Respiratory paralysis (possibly fatal)
75 – 200mA	Ventricular fibrillation (likely fatal)
200 – 500mA	Heart clamps tight
>1.5A	Tissue and organs began to burn

**Fact: A 10-amp circuit breaker was designed to protect equipment – not people!**

The relay is developed with zero percentage of risk factor by its own design. The current carrying paths and circuits are isolated from the metal case and structure. Suitable clearance depending on the type of insulation required for different classes are provided.

The relay confirms to Product safety requirement standard IEC 60255-27.

## HEALTH AND SAFETY

It deals with the handling of relay in proper way. An individual to be considered as 'qualified' with regard to certain equipment in the workplace, but 'unqualified' as to other equipment. "An employee, who is undergoing on the job training and who, in the course of such training, has demonstrated the ability to perform duties safely at his or her level of training and who is under the direct supervision of a qualified person also considered to be a qualified person for the performance of those duties."

The following requirements must be met, in the order given, before circuits or equipments are re-energized, even temporarily.

- People handling the equipment should be aware about the relay safety handset.
- Ensure that the product is in the off condition before working on the conducting or terminal side.
- A qualified person must conduct tests and visual inspections, as necessary, to verify that tools electrical jumpers, shorts, grounds and other such devices have been removed, so that the circuits and equipments can be safely re-energized.
- Employees exposed to the hazards associated with re-energizing the circuit or equipment must be warned to stay clear of the circuits and equipment.
- Each lock and tag must be removed by the employee who applied it or someone else under that employee's direct supervision.
- A visual determination that all employees are clear of the circuits and equipments must be made.

For any queries related to relays, feel free to contact ALIND.

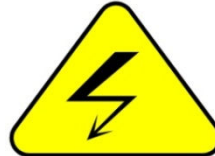
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**SYMBOLS AND LABELS USED IN THE RELAY**

## 1. FRONT SIDE



Caution: refer to equipment documentation



Caution: risk of electric shock

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## 2. REAR SIDE

**WARNING**

1. No user serviceable components inside.
2. Refer servicing to authorized personnel.



Protective Conductor (\*Earth) terminal

Functional/Protective Conductor (\*Earth) terminal.



CMOS Battery provided for the RTC (Real Time Clock) purpose.  
Confirm polarity of the battery while replacing.

**WARNING****Current transformer circuit**

Never allow the current transformer (CT) secondary circuit connected to this equipment to be opened while the primary system is live. Opening the CT circuit will produce a dangerous high voltage.

**Exposed terminals**

Do not touch the terminals of this equipment while the power is on, as the high voltage generated is dangerous.

**Residual voltage**

Hazardous voltage can be present in the DC circuit just after switching off the DC power supply. It takes about 30 seconds for the voltage to discharge.

**CAUTION****Earth**

Earth the earthing terminal of the equipment securely.

**Operation conditions**

Use the equipment within the range of ambient temperature, humidity and dust as detailed in the specification and in an environment free of abnormal vibration.

**Ratings**

Before applying AC voltage and current or DC power supply to the equipment, check that they conform to the equipment ratings.

**Printed circuit board**

Do not attach and remove the printed circuit board while the DC power to the equipment is on, as this may cause the equipment to malfunction.

**External circuit**

When connecting the output contacts of the equipment to an external circuit, carefully check the supply voltage used and prevent the connected circuit from overheating.

**Connection cable**

Carefully handle the connection cable without applying excessive force.





**Modification**

Do not modify this equipment, as this may cause the equipment to malfunction, and any such cases, warranty may be affected.

**DECOMMISSIONING 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, the capacitors should be safely discharged via the external terminals prior to de-commissioning.

**Disposal**

When disposing of this equipment, do so in a safe manner according to local regulations. It is recommended that incineration and disposal to water courses is avoided. Ensure the relay is in de energized condition and take precautions to avoid short circuits.



## TECHNICAL SPECIFICATIONS FOR SAFETY

### 1. Protective class

IEC 60255-27:2005      Class I (This equipment requires a protective conductor (earth) connection to ensure user safety.)

### 2. Environment

IEC 60255-27:2005      Pollution degree 2 (Normally only non-conductive pollution occurs except occasionally a temporary conductivity caused by condensation is to be expected.)

### 3. Overvoltage Category

IEC 60255-27:2005      Category III (The auxiliary energizing circuits of the equipment are connected to a common battery, common mode transient voltages of a relatively high value may appear on the supply leads, and differential mode voltages may arise from switching in other circuits connected to the same battery source.)

### 4. Contact data

Test voltage across open contact: 1 kV DC for 1 min

# **INTRODUCTION**



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BRIEF DESCRIPTION

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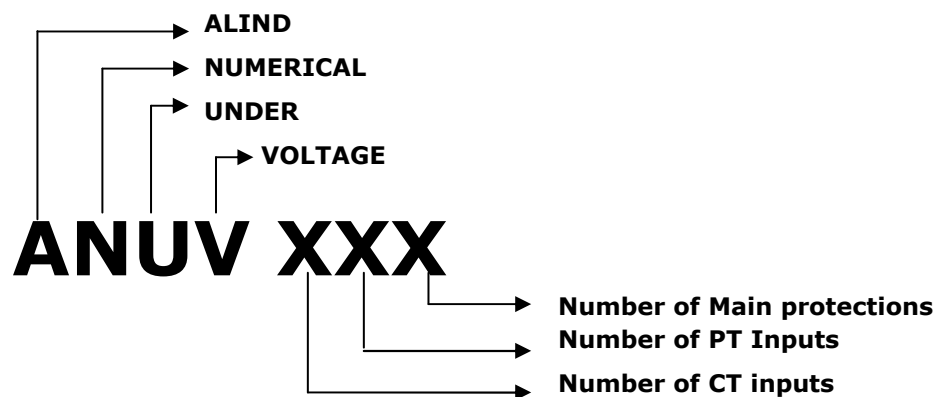


## AN SERIES (ALIND NUMERICAL SERIES)

- Advanced Digital Fourier Transform based Numerical algorithm design using 16-bit Digital Signal Controller (DSC).
- Compact Construction covering several protection modules saving panel space.
- Man-Machine Communication through 20x4 character LCD display and LEDs.
- Self supervision of both hardware and software units.
- Interface ability with SCADA is achieved through IEC 60870-5-103 communication protocol.
- Facility for storing fault waveforms (Disturbance recorder) and events with date and Time stamping. At a time a total of 5000 events and 200 latest fault waveforms (Disturbance recorder) will be stored in the relay.
- Graphical User Interface for Harmonic analysis, DC analysis and di/dt analysis can be done on the uploaded fault waveforms with facility for report generation.
- Facility to access/modify the relay settings both online as well as through menu in local PC through SCADA at RCC.
- Relay Indication (LED) reset from RCC.
- Suitable password protection.
- IP 54 grade enclosure protection.
- GPS time Synchronization Facility.
- Settable CT and PT ratios.
- CB close and open command initiation from relay through RCC.

### ANUV RELAYS

ANUV 041 relay is Numerical Under voltage & PTF relay. Under voltage protection is required at SP for tripping the Bridging CB at SP when an under voltage occurs in a feed extension condition due to the tripping of the feeder breaker at TSS or opening of SSP Bridging interrupter at the feeding end.



**MAIN FUNCTIONS**

SI No.	PARTICULARS
<b>1</b>	<b>Main Protection</b>
1.1	Under Voltage Protection
1.2	PTFF Protection
<b>2</b>	<b>Status Inputs</b>
2.1	Trip Circuit Supervision

**GENERAL FUNCTIONS**

SI No.	PARTICULARS	ANUV 041
1.	Password protection	✓
2.	Event Memory	5000
3.	Disturbance recorder waveforms	200
4.	50 cycles (45 pre and 5 post fault) of fault waveform	✓
5	<b>COMMUNICATION</b>	
5.1	GUI Interface	Mini USB
5.2	Isolated RS 485 Interface	✓
5.3	Communication Protocol Interface- IEC 60870-5-103	✓
5.4	Date/time synchronization through PC	✓
6	<b>MONITORING</b>	
6.1	Traction PT1(L)	✓
6.2	Traction PT1(R)	✓
6.3	Traction PT2(L)	✓
6.4	Traction PT2(R)	✓

# **HANDLING INSTALLATIONS & CASE DIMENSIONS**



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HANDLING OF RELAY

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STORAGE

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RELAY AND RACK MOUNTING

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CASE DIMENSIONS

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## **HANDLING OF RELAY**

Protective relays generally of robust construction require careful treatment prior to installation on site. Care must be taken when unpacking and installing the relays so that none of the parts are damaged. Relays must be handled by skilled personnel. The following should be taken into account while handling the relay:

- ✦ The relay use components that are sensitive to electrostatic discharges. The relay comprises of various semi-conductor devices which can damage if touched by means of direct contact. Handle the cards in static free environment since electrostatic discharge can affect performance of the relay or cause damage to the cards.
- ✦ The electronic circuits are well protected by the metal case and the internal module should not be withdrawn unnecessarily.
- ✦ The relay is normally shipped in separately packed condition. After unpacking, see if there is any mechanical damage to the cabinet, the nameplate, terminal blocks etc. Damage of any such sort identified shall be intimated to works.
- ✦ Avoid plugging in/ pulling out the cards when the power is ON.
- ✦ Do not apply CT inputs when auxiliary supply is switched OFF.
- ✦ If the cards are withdrawn for testing, ensure proper positioning while replacing.
- ✦ Keep the relays in well-packed condition in a dust-free dry environment without direct exposure to sunlight.

The relay is shipped from factory after detailed testing by our Quality Control Department. However, according to the customer requirement the relay settings/ functions can be verified before commissioning at respective sites with proper testing kits.

## **STORAGE**

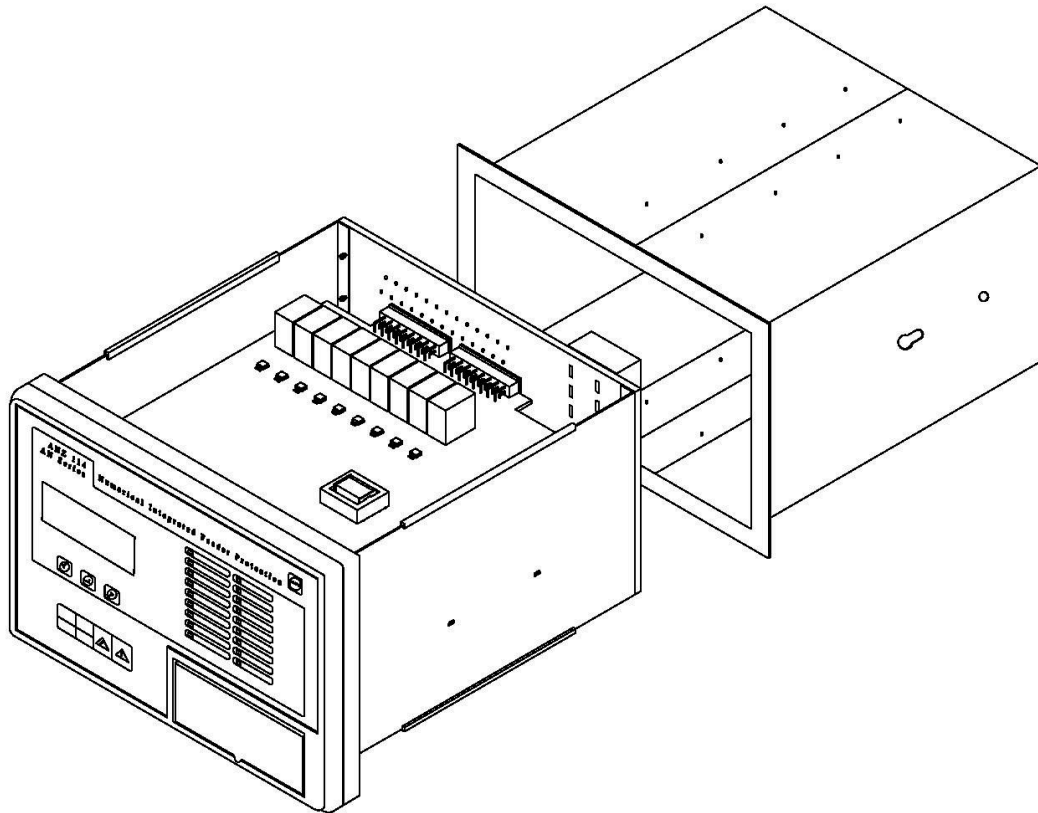
If relays are not to be installed immediately upon receipt they should be stored in a place free from dust and moisture in their original boxes. At most care should be taken while storage.

Storage temperature: -25°C to +70°C.

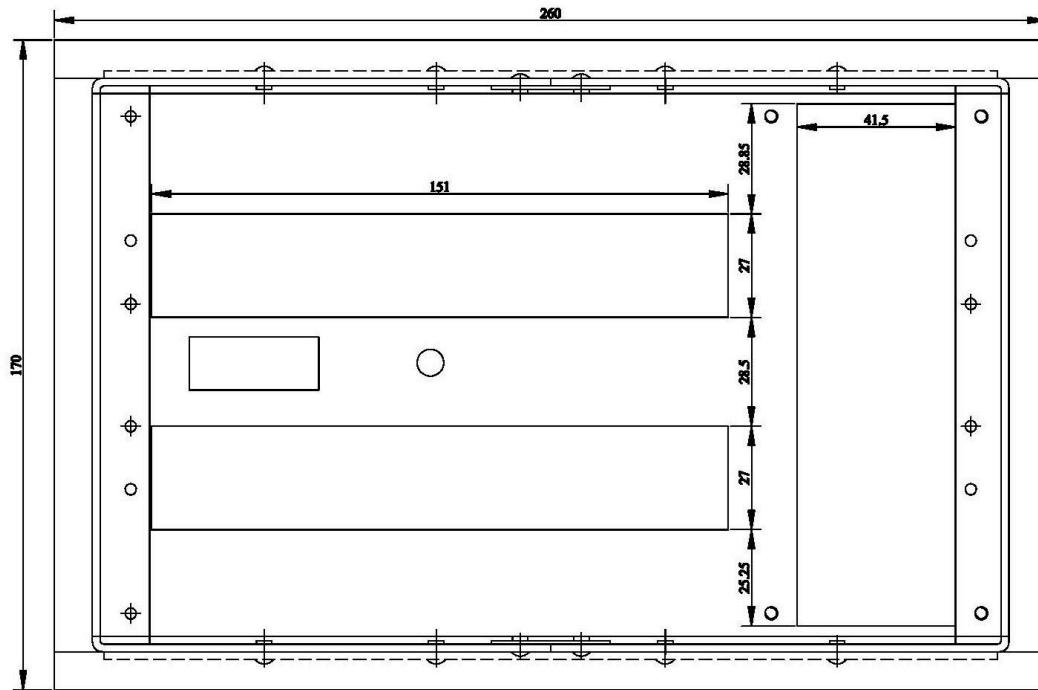


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**RELAY AND RACK MOUNTING**

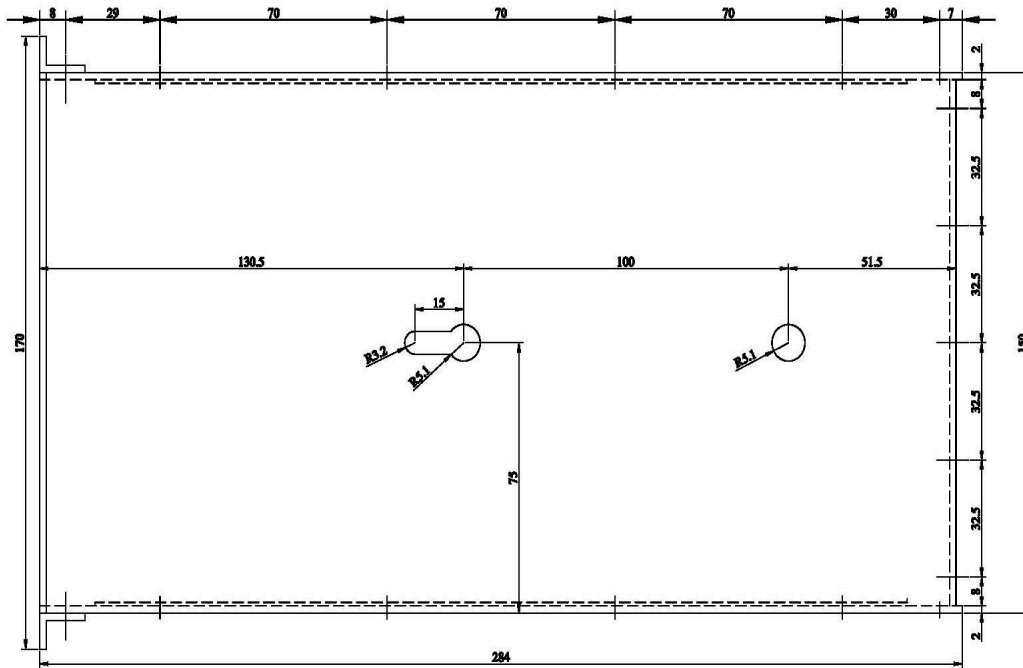


CASE DIMENSIONS



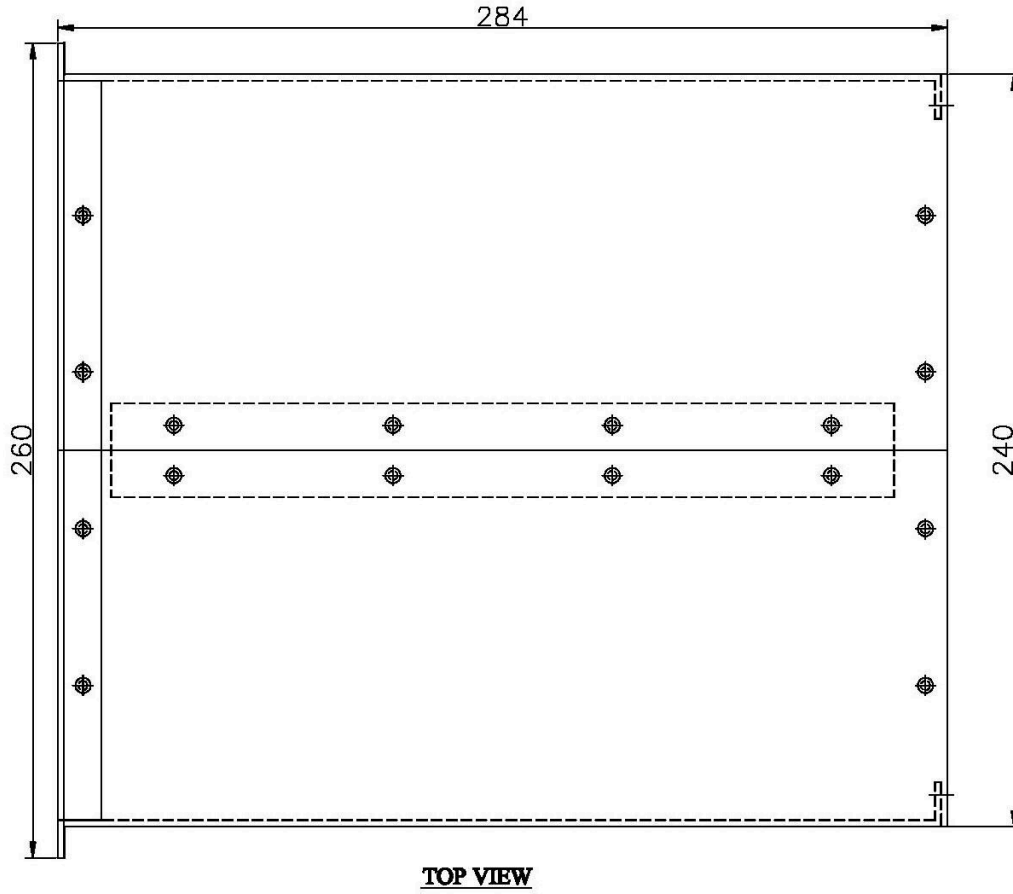
⊕ 8 Holes for Rivet    ○ 4 Holes Ø4

FRONT VIEW



SIDE VIEW





# USER GUIDE



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FRONT PANEL INDICATIONS

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PCB DESCRIPTION

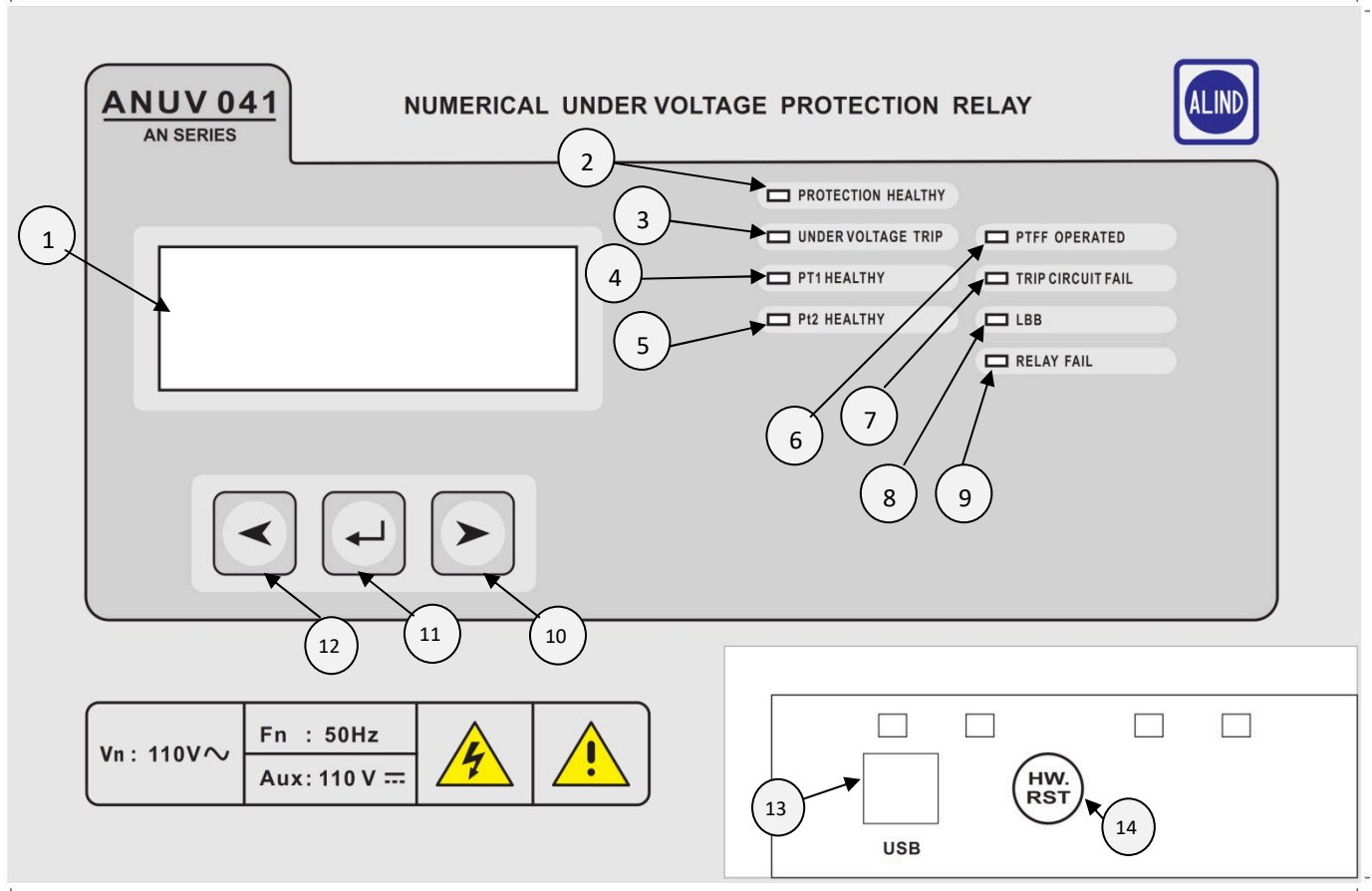
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RELAY SETTINGS AND ALGORITHM

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# FRONT PANEL INDICATIONS



No	Legend	ANUV 041
1.	LCD DISPLAY	✓
2.	PROTECTION HEALTHY (Green/Amber)	✓
3.	UNDER VOLTAGE TRIP (RED)	✓
4.	PT1 L HEALTHY (RED)	✓
5.	PT1 R HEALTHY (RED)	✓
6.	PTFF OPERATED (RED)	✓
7.	TRIP CKT FAIL (RED)	✓
8.	LBB (RED)	✓
9.	RELAY FAIL (RED)	✓
10.	>	✓
11.	↶	✓
12.	<	✓
13.	USB	✓
14.	H.RST	✓

## LCD DISPLAY

A 20 x 4 LCD display is provided for easy viewing of parameters, relay settings, fault event records, date& time, error counter etc. The display backlit can be made ON by pressing any push button key except H.Rst key and the display backlit leaves for about 20 seconds.

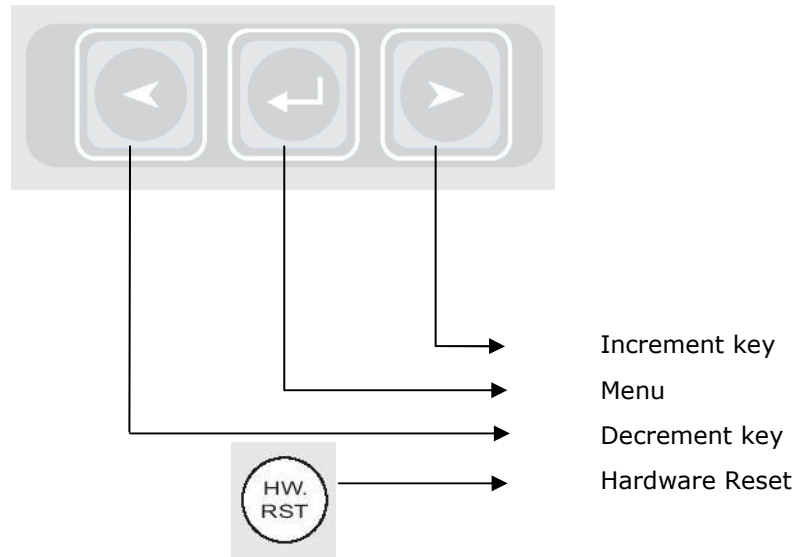
Backlight automatically turns on when any tripping occurs on the relay.





## Navigation Keys

The relay is provided with four switches.

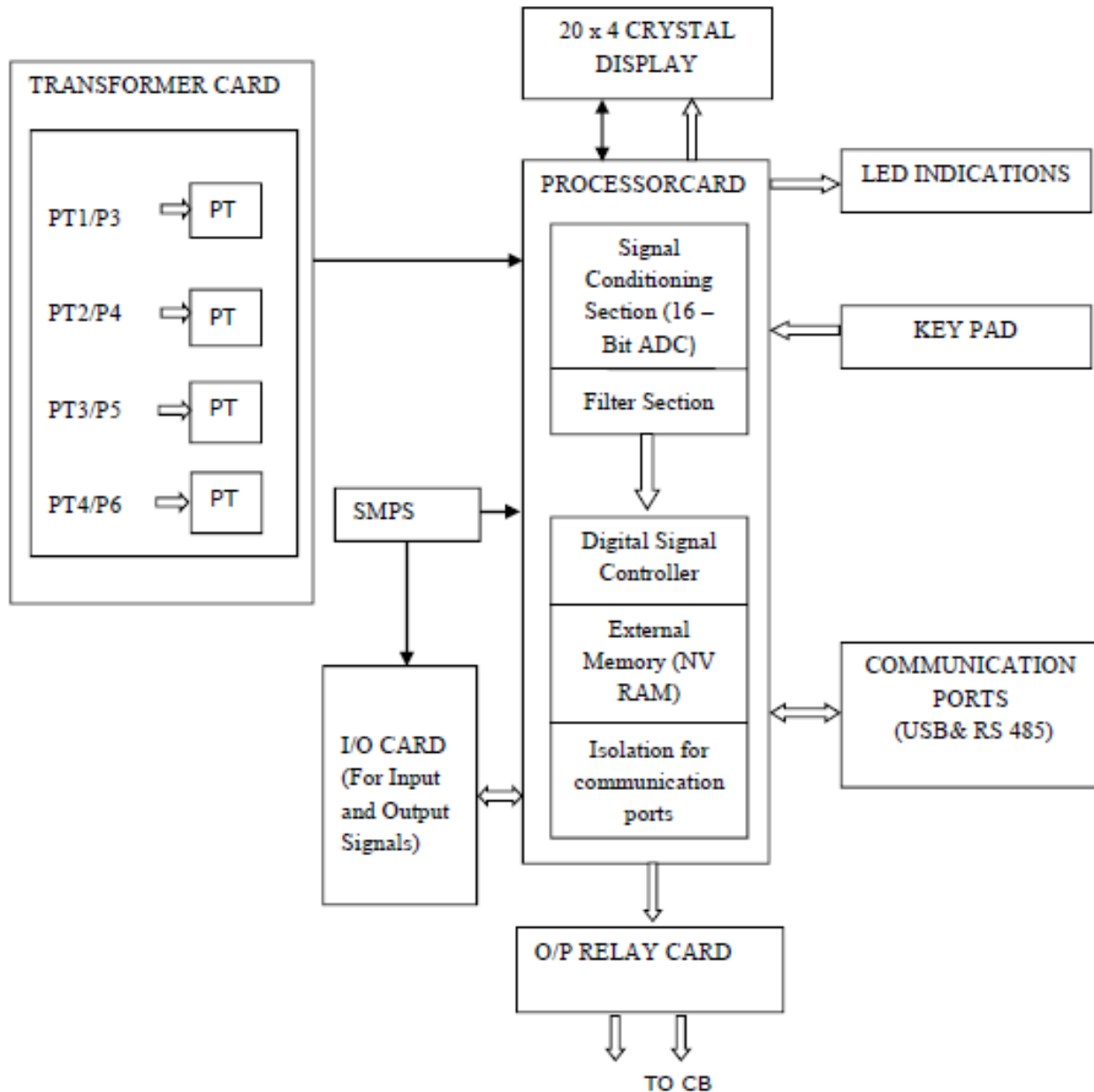


1. Accessing menu: - Long press the center button continuously for 3 seconds.
2. Access Second window of measurements (R, X, Thermal factor):- Simultaneously press center button and right button.
3. Access previous fault record: - Left press to cycle through faults. Long press left key continuously to see the 3 trip windows of a particular fault.
4. Access trip counters:- Single right press from normal display leads to the counter menu with counters for all major faults

## INTERNAL ARCHITECTURE

### INTERNAL SYSTEM LEVEL ARCHITECTURE- ANTD 601

The internal system level architecture of ANTD 601 relay including card to card architecture in brief is shown below.



## ANUV 041

### 1. DSP Controller

The dsPIC DSC (Digital Signal Controller) is a 16-bit modified Harvard RISC (Reduced Instruction Set Computer) machine that combines the control advantages of a high-performance 16-bit microcontroller with the high computation speed of a fully implemented Digital Signal Processor (DSP).

The DSP controller continuously monitors the currents and voltages. Based on this the controller performs different calculations and whenever an abnormal condition occurs it distinguishes the type of fault and issues trip command to the circuit breaker.

### 2. Data Acquisition

The Current signals are scaled and isolated using Current Transformer (CT). These isolated analog signals are filtered to minimize the effects of electromagnetic interference and noise in the high frequency range.

The analog signals are then fed to the Analog to Digital Converter which has a 16 bit resolution. The DSP controller will take the 32 samples per cycles of each Current for the computational purpose. If any fault occurs the parameters will be stored in to the non-volatile memory with date and time stampings and this can be downloaded for further analysis in the disturbance recorder.

### 3. Power Supply Module

This module gives the necessary regulated voltages like +5V, -5V, and +24V to various cards in the module. The normal operating voltage range is 45 VDC to 170 VDC. The +24V is used for driving the output relays in the I/O card and O/P relay card. The +5V and -5V is supplied to the processor, I/O card and Display PCB for normal relay operations. The isolated +5V is dedicated to the communication ports of the relay.

### 4. Communication Module

The relay is having 2 communications port, USB and RS 485. The relay is using IEC 60870-5-103 communication protocol for communication through RS485 and USB (Proprietary).

#### USB Communication Port

USB port is provided for uploading/downloading relay settings and events.

1. The software is capable of analyzing the peak, RMS & average values of current, Harmonic analysis of current waveforms and determination of fault clearing time.
2. Waveform pointed by user displays the current & sample value of the particular point.

#### RS 485 Communication Port

RS 485 port is provided for SCADA connectivity. Using RS485 port online fault data of critical parameters, disturbance record (Waveform), event record (Trip data), Automatic Supervision and Control (healthiness of Relay), Alarm and Event Handling, Data Acquisition, Calculating and Reporting, Parameter Setting, Resetting Indicating LEDs, Trip Circuit supervision, Relay Fail Indication etc can be downloaded. The communication complies with IEC 60870-5-103 protocol.

### 5. Man Machine Interface

Man Machine Interface is through a 20x4 LCD display and keys in the front panel of the relay. Necessary LEDs are provided in front panel for indicating the operation of different element.



## 6. Disturbance Recorder

The relay has the facility to record 50 cycles (45 pre-fault and 5 post faults) of fault waveforms. Latest 200 waveforms of Current can be stored in the relay. This data is retrievable through USB & RS485 communication ports using UI software and SCADA respectively.

## 7. Event Recorder & Disturbance Recorder

The relay is capable of storing 5000 number of events with date and time stamping of 1ms accuracy. The event data comprise of:

- Tripping of different protection elements (I, Fault clearing time, Fault date & time)
- Trip circuit supervision
- Relay pick up
- Relay reset
- CB Trip
- CB Close
- Change of status input
- Relay setting changed (GUI & Keypad)
- Relay Fail.

## ENERGIZING THE RELAY

1. Before turning ON the relay, proper earthing should be provided.
2. Visual Inspection for any physical damage in housing, display etc shall be checked.
3. Operating voltage range: **45 to 170 VDC.**  
Operating voltage: **110 V DC.**
4. Prefer regulated power supply of 110VDC.
5. Auxiliary power supply shall be provided to the terminals 14 & 15 of TB-A with the help of an MCB.
6. Switch on the power supply. Measure the voltage between the terminals 14 & 15 of TB-A, and ensure that the voltage is within the normal operating range.
7. After the relay is powered ON, the following shall be noticed.
8. Protection healthy LED glow green in color which indicates that the relay is functioning OK, otherwise it goes amber.

## PCB DESCRIPTION

The relay comprises of the following hardware.

Main PCBs. –Display PCB, Communication PCB, Controller PCB, Stack PCB, Trip relay & transformer PCB, SMPS PCB, I/O & status PCB, Back panel PCB.

**Display PCB:** The Display PCB is mounted at the front plate of the unit. It consists of the 20x4 LCD, LED indications, Keyboard circuits, and LED controller.

**Controller PCB:** The Controller PCB is mounted on the back side of the Display PCB. This PCB consists of major components such as DSP controllers, ADC and its filter circuits, Memory ICs, RTC.



The Analog signals are filtered and digitized in this board. The DSP takes decision based on this digital samples and initiates necessary commands.

**Communication PCB:** The communication PCB is mounted at the front side. This PCB supports the communication through USB for data exchange. Also the Hardware Reset Switch is mounted in this PCB.

**Stack PCB:** Internal communications between the PCB's are ensured with the help of stack PCB.

**Trip relay &Transformer PCB:** All the CTs, PTs and Tripping Relays are assembled in this board. This board will give necessary trip commands to the master trip relay or breaker which is installed in the yard. Necessary relay initiating signals are wired to these output relays from the Controller Board.

**SMPS PCB:** The SMPS PCB provides the necessary Power supply voltages to the different PCBs mounted inside the relay. The SMPS is a DC-DC converter. The SMPS provides +24V, +5V, -5V and isolated +5 V. The +24 V supply is used for the driving the output relays in the I/O PCB and Trip Relay PCB. The +5V and -5V is supplied to the controller PCB, Display PCB, and I/O PCB for normal operations. The isolated +5V is dedicated to the communications ports of the relay.

**I/O & status PCB:** The I/O PCB deals with the necessary I/O lines such as Input status lines and Digital Output contacts. A separate controller provided in this board performs the necessary I/O operations in conjunction with the DSP controller in the Processor PCB. The I/O PCB is mounted vertically on to the stack PCB.

**Back PCB:** This PCB consists of terminal blocks for external interface with the site and power connector which connects SMPS, I/O and CT PT PCB's. The RS 485 port is also mounted in this PCB. The terminal block (TB-A) is having CT shorting facility. Since the rack with Terminal Blocks is having the CT shorting facility, the relay can be withdrawn.

**Communication PCB:** This PCB is mounted on the front plate of the relay and it consists of USB port and H.RST (Hardware Reset Key).



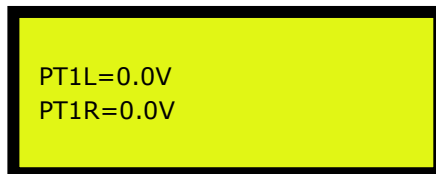
## RELAY SETTINGS AND ALGORITHM

### ANUV 041

After Power ON, the relay boot screen shows



Then comes the online parameter display



To scroll between online displays, press **Right** key after holding **←** key.

### Setting Mode

Press and hold **←** for 5 seconds

Relay will enter to setting mode.

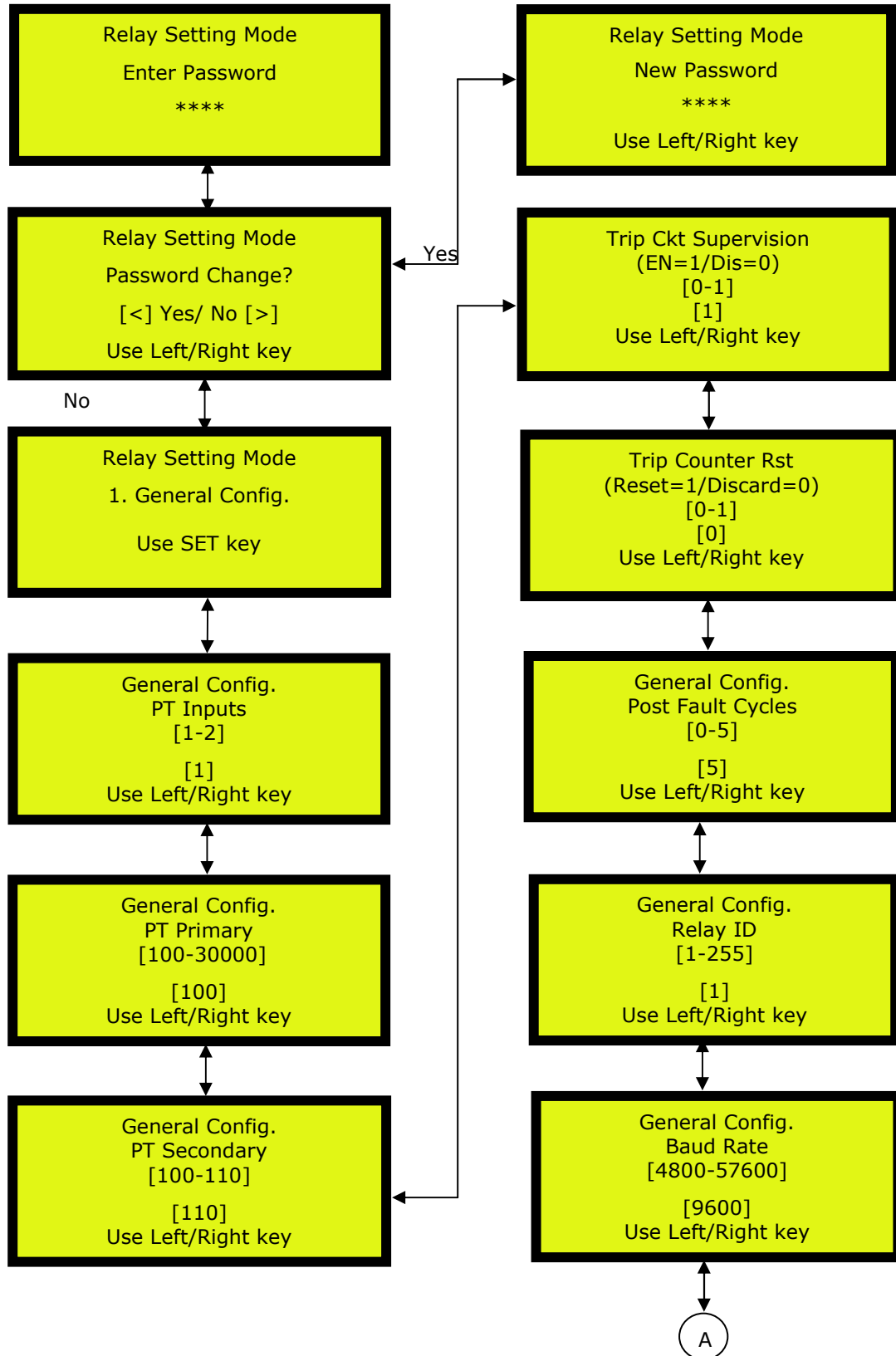
Enter the password and press **←** key. The default password setting is '1000'

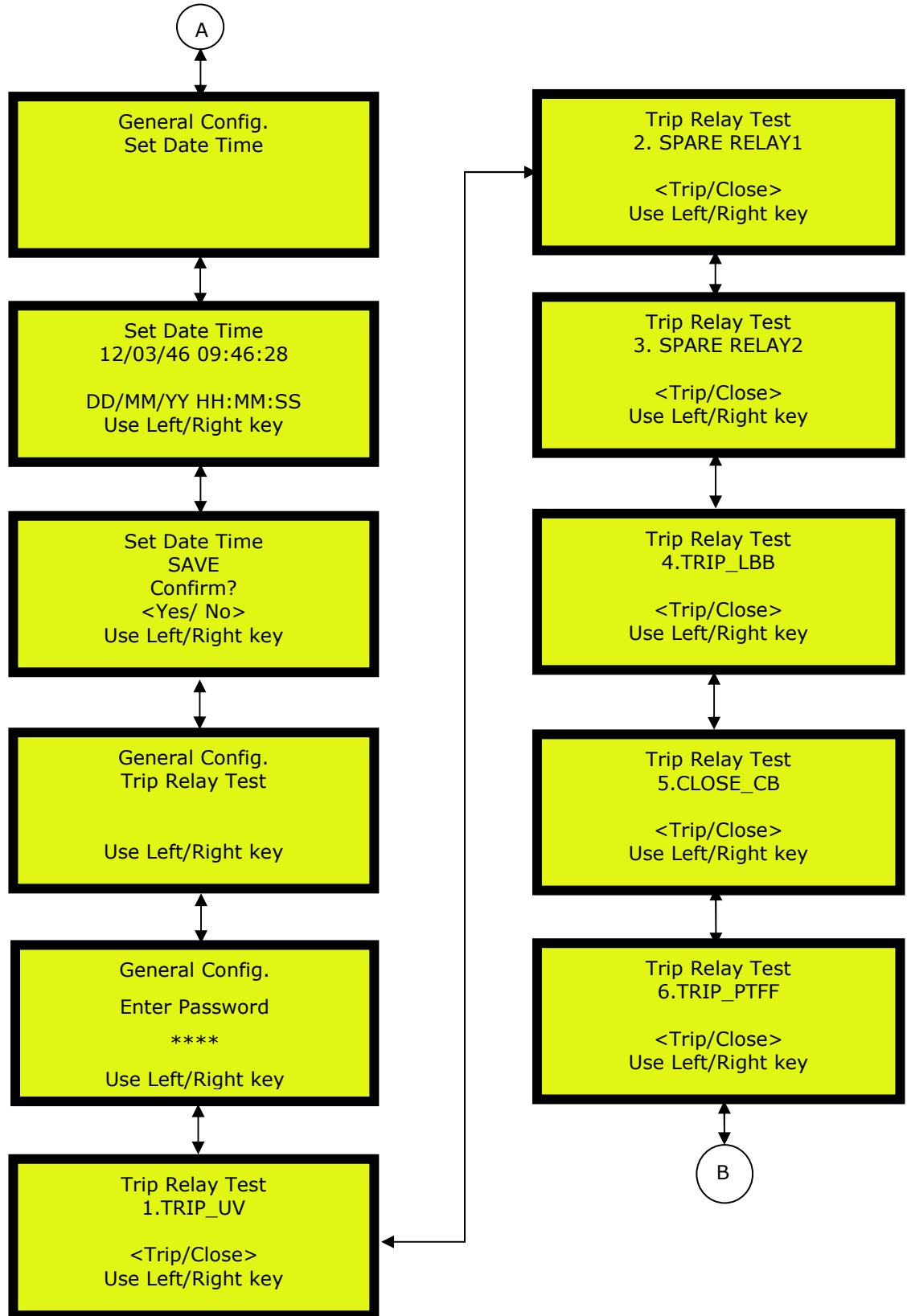
To change settings:

- a) Press **←** to change the settings.
- b) Press **Right** key to increment
- c) Press **Left** key to decrement
- d) Press **←** to accept change.
- e) To coming back to main **MENU** while operating, press **Left** and **Right** key simultaneously.
- f) Repeat the process for all settings
- g) After completing the settings, the relay shows the message '**SETTINGS UPDATED**' and returns to the operating mode.

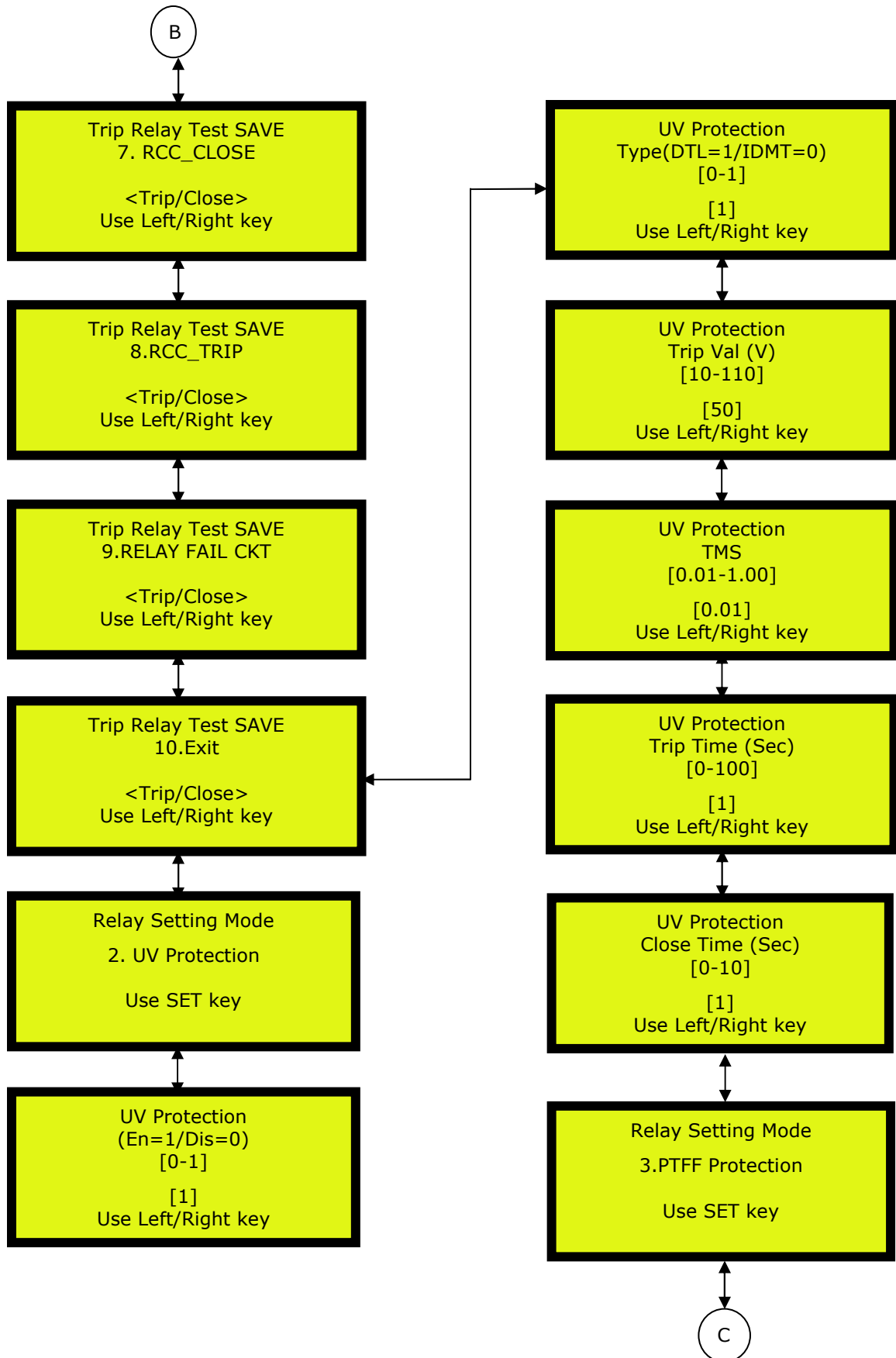


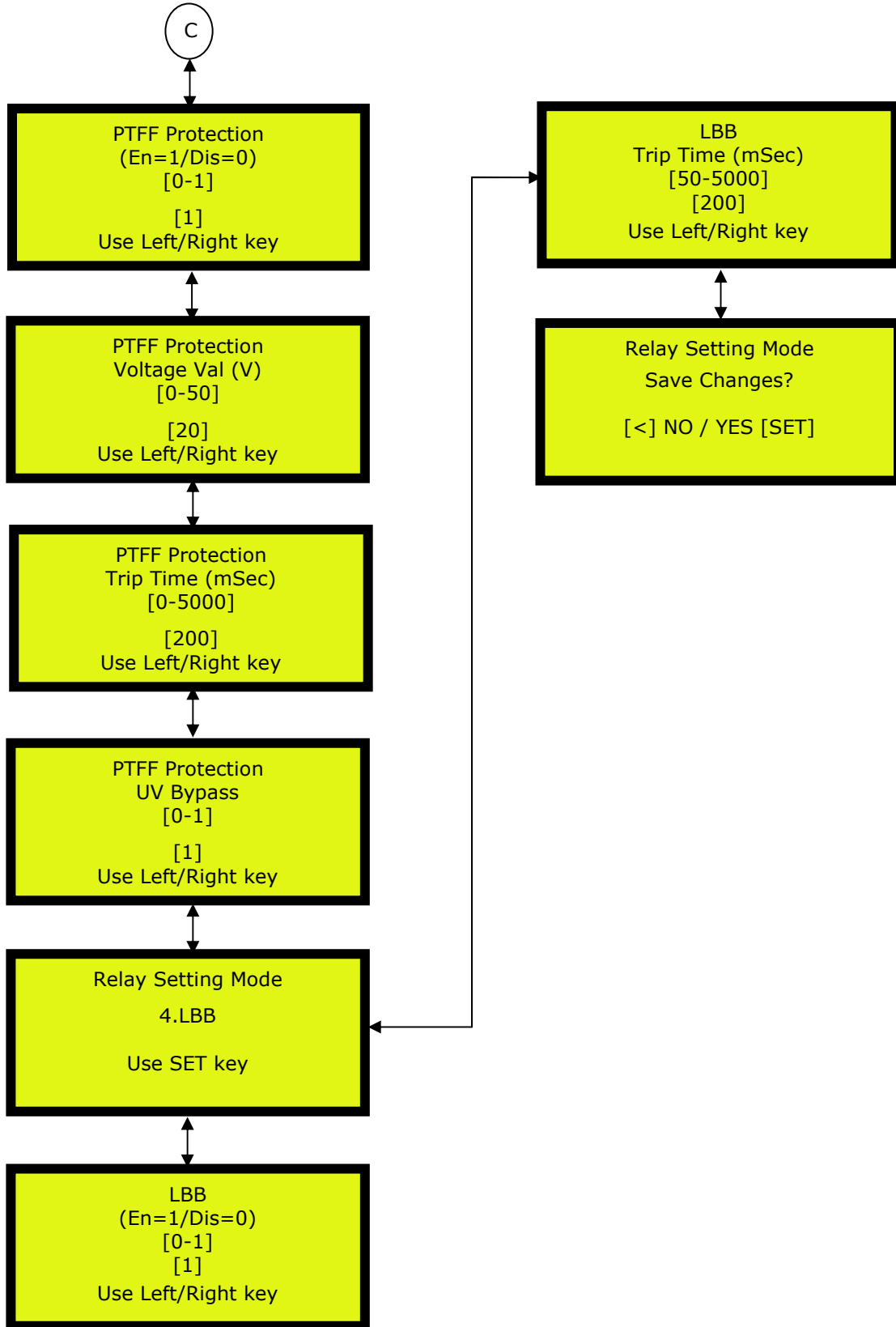
**Relay Settings Algorithm**











# **TECHNICAL DATA & CHARACTERISTIC CURVES**



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## DESCRIPTION OF PROTECTION FUNCTIONS

The ANUV offers both Under Voltage Protection and PTFF protection. Under Voltage protection is required at SP for tripping the Bridging CB if an Under Voltage occurs in a feed extension condition due to tripping of feeder breaker at TSS or opening of SSP Bridging interrupter at the feeding end.

### Relay Characteristics & Principle

#### Under Voltage Trip

ANUV 041 has UV trip element for PT R input. Relay initiates Under Voltage trip by sensing the PT R voltage when the Bridging CB is in closed condition. If PT R voltage reads below the setting for the set time, relay shall trip the Bridging CB to avoid unwanted feeding to faulty zone.

#### PT Fuse Failure Protection

PTFF protection checks Traction voltage at both ends of VT fuse ie PT L (left) and PT R (right).

PTFF shall act when PT R reads below the setting and PT L reads above the setting while BRIDGING CB is closed.

Under voltage trip function can be disabled in PTFF condition via settings.

#### Under Voltage Close

The NC closing element in relay is used to avoid WPC. One NC contact is provided in the relay which will make only when PT1L and PT1R are absent.

## TECHNICAL SPECIFICATIONS

Sl. No	Specification	REF.	Particulars
1.	<b>Auxiliary Supply</b>	V <sub>DC</sub>	45 to 170 VDC
2.	<b>Current Input(rated)</b>	In	5 Amps
3.	<b>Frequency</b>	Fn	50 Hz
4.	<b>VA burden on CT</b>		Less than 0.5 VA
5.	<b>VA burden on Aux</b>		Less than 15 Watts(energized) Less than 10 watts( de-energized)
6.	<b>Operating Temp Range</b>		-25°C to + 70 °C
7.	<b>Max. &amp; Minimum relative humidity</b>		100% & 22%
8.	<b>Continuous Current Carry Capacity of CT</b>		3In; 15A
9.	<b>Thermal Withstand for CT</b>		40In for 1 sec
10.	<b>Contact details</b>		
	a) Current carrying capacity		5A
	b) Making and carry for 3 sec at 250V,50Hz		30A
	c) Making capacity at 250V,50-60Hz AC		5A
	d) Breaking Capacity		
	i) AC 220V, 50-60Hz, Cos $\phi$ =0.4		5A



	ii) DC 220V, L/R= 45ms	0.5A
11.	<b>Trip Circuit Test</b>	Yes / No
12.	<b>Type of communication ports</b>	USB and RS485
13.	<b>Overall dimensions</b> Width Height Depth	263 mm 173 mm 330 mm
14.	<b>Weight</b>	6.9 kg approx.

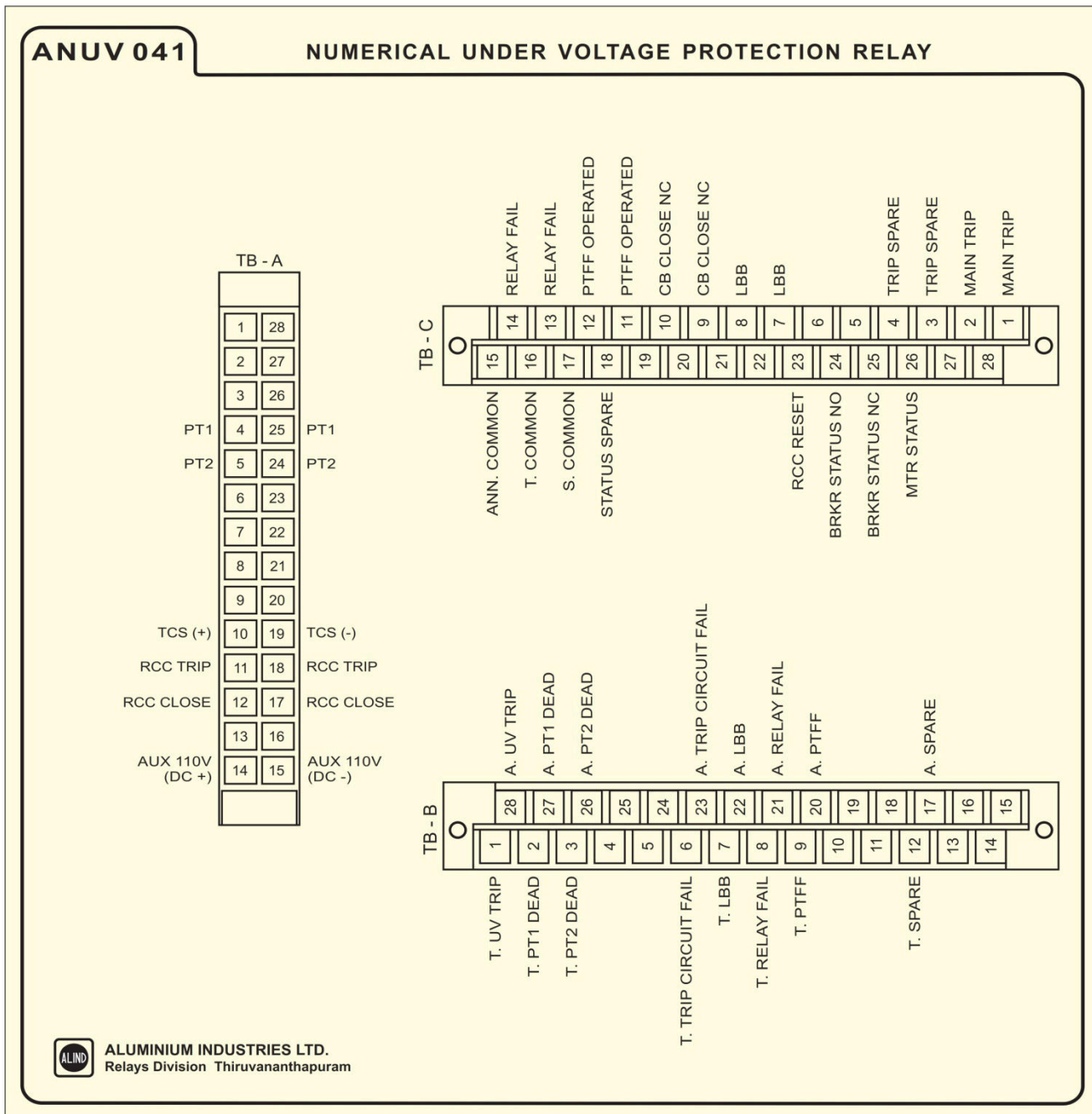
## RELAY SETTINGS

General Settings	Particulars
<b>Password protection (YES/NO)</b>	<b>0000-9999</b>
<b>1. General Config.</b>	
PT Inputs	1.PT1 only 2.PT1 & PT2
PT1 Primary	100-30000V in steps of 10V
PT1 Secondary	100/110V selectable
PT2 Primary*	* 100-30000V in steps of 10V
PT2 Secondary*	* 100/110V selectable
Trip counter Reset	Reset/Discard
Post fault cycle	0 to 5 in steps of 1
Relay ID	1 to 255 in steps of 1
Baud Rate	4800-57600 in steps of 200
Set Date Time	(Yes/No) DD/MM/YY HH:MM:SS
<b>2.Under voltage Protection</b>	EN/DIS
Characteristics [Trip]	DTL/IDMT
Time setting [Trip delay]	0 to 100 Sec in steps of 1 Sec [DTL] 0.01 to 1.00 Sec in steps of 0.01 Sec [IDMT]
Time setting [CB close]*	0 to 10 Sec in steps of 1 Sec [DTL]
<b>3. PTF Protection</b>	EN/DIS
Voltage setting	0-50V in steps of 1V
Time	0-5000ms in steps of 10ms
UV bypass	ENABLE / DISABLE
<b>4.LBB</b>	EN/DIS
LBB Time	0 to 5000ms in steps of 1 ms

\*shall be available only when PT1& PT2 mode is selected under PT inputs



**TB DETAILS**



## RELAY CONFORMING STANDARDS

The relay conforms to the following standards:

SI No.	Standards	Description
I.	IEC 60255-151	FUNCTIONAL REQUIREMENTS FOR OVER/UNDER CURRENT PROTECTION.
II.	IEC 60255-5	INSULATION COORDINATION OF MEASURING RELAYS AND PROTECTION EQUIPMENT- REQUIREMENTS AND TESTS.
III.	IEC 60255-1	MEASURING RELAYS AND PROTECTION EQUIPMENT- COMMON REQUIREMENTS.
IV.	IEC 60255-21-1	VIBRATION TESTS (SINUSOIDAL)
V.	IEC 60255-21-2	SHOCK AND BUMP TESTS
VI.	IEC 60255-21-3	SEISMIC TESTS
VII.	IEC 60255-27	PRODUCT SAFETY REQUIREMENT.
VIII.	IEC 60255-26	ELECTROMAGNETIC COMPATIBILITY REQUIREMENT.
IX.	IEC 60529	DEGREES OF PROTECTION PROVIDED BY ENCLOSURES (IP CODE)
X.	IEC 61810-2	RELIABILITY.
XI.	IS 2705 (PART II, III&IV)	PROTECTIVE CURRENT TRANSFORMERS.
XII.	IS 3231 (PART 1 TO 3)	ELECTRICAL RELAYS FOR POWER SYSTEM PROTECTION.
XIII.	IS 8686	STATIC PROTECTIVE RELAYS.
XIV.	IEC 60068-2	ENVIRONMENTAL TESTS.
XV.	IEC 60870-5-103	COMMUNICATION PROTOCOL



# TROUBLESHOOTING



Under normal working conditions, the 'PROTECTION HEALTHY LED' provided in the front panel of the relay glows green. The same LED turns amber to recognize any fault inside the relay itself.

Following are certain guidelines for the relay to identify the nature of fault and necessary checking procedures to be adopted at site so that relay can be rectified suitably.

Sl. No.	Faults	Checks	Causes
1.	No power ON Indication or No display.	<ol style="list-style-type: none"> <li>1. Check the auxiliary DC supply to the relay rear terminals TB A-14: +110VDC TB A-15: -110VDC</li> <li>2. Check the continuity of the output terminal, after disconnecting the wires.</li> </ol>	<ol style="list-style-type: none"> <li>1. Due to power supply failure, the LED turns off.</li> <li>2. The varistor may short circuit to protect internal circuitry on transients.</li> </ol>
2.	Current Not reading/ Out of tolerance limit.	<ol style="list-style-type: none"> <li>1. Refer TB sticker for CT inputs.</li> <li>2. Check for the earthing of CT.</li> <li>3. Check if the terminals of TB-A is connected properly or for any lose contact.</li> <li>4. Check CT ratio and multiplying factor if any.</li> <li>5. Check the continuity of the output terminal, after disconnecting the wires.</li> </ol> <p>After checking of the above, measure the current using calibrated Clamp-On meter. If not OK, intimate to works.</p>	<ol style="list-style-type: none"> <li>1. The CT connector is having shorting facility. If the connector is not tight, CT secondary may get some low resistance path through the connector itself.</li> <li>2. If CT is not properly earthed; there is a chance of leakage current that may cause error in CT reading.</li> </ol>
3.	Relay Fail Indication	<ol style="list-style-type: none"> <li>1. Intimate to works.</li> <li>2. Press H.RST key in the relay front panel.</li> </ol>	<ol style="list-style-type: none"> <li>1. Supply variation to internal PCB's.</li> <li>2. DC supply fail.</li> </ol>

# COMMUNICATION



**CONTENT**

COMMUNICATION PROTOCOL(IEC 60870-5-103)

COMMUNICATION PORTS



## SYSTEM FUNCTIONS IN MONITOR DIRECTIONS

DESCRIPTION	GI	ASDU TYPE	FUN	INF	COT	COM
End of general interrogation	-	8	255	0	10	GLB
Time synchronization	-	6	255	0	8	GLB
Reset FCB	-	5	121	2	3	According to main FUN
Reset CU	-	5	121	3	4	According to main FUN
Reset CU/Start/Restart	-	5	121	4	5	According to main FUN

## STATUS INDICATION IN MONITOR DIRECTION

DESCRIPTION	GI	ASDU TYPE	FUN	INF	COT	COM
Protection Healthy/Active	-	1	121	18	1	↑
LED Reset	-	1	121	19	1	↑
Local Parameter Settings (Change)	-	1	121	22	1	↑
MTR Status	X	1	121	29	1,9	↑↓
CB open(NC)	X	1	121	30	1,9	↑↓
CB close(NO)	X	1	121	31	1,9	↑↓

## SUPERVISION INDICATIONS IN MONITOR DIRECTION

DESCRIPTION	GI	ASDU TYPE	FUN	INF	COT	COM
PT1(L) DEAD	X	1	121	160	1,9	↑↓
PT1(R) DEAD	X	1	121	161	1,9	↑↓
PT2(L) DEAD	X	1	121	162	1,9	↑↓
PT2(R) DEAD	X	1	121	163	1,9	↑↓
Trip circuit supervision	X	1	121	36	1,9	↑↓
PT fuse failure	X	1	121	38	1,9	↑↓
Relay Fail	-	1	121	40	1	↑

## FAULT INDICATION IN (MONITOR DIRECTIONS)

DESCRIPTION	GI	ASDU TYPE	FUN	INF	COT	COM
Breaker Failure (LBB)	X	2	121	85	1,9	↑↓
PT1 Under voltage pickup	X	2	121	100	1,9	↑↓
PT2 Under voltage pickup	X	2	121	101	1,9	↑↓
PT1 PTFF Start/Pick up	X	2	121	102	1,9	↑↓
PT2 PTFF Start/Pick up	X	2	121	103	1,9	↑↓
PT1 Under voltage Trip	-	2	121	110	1,9	↑↓
PT2 Under voltage Trip	-	2	121	111	1,9	↑↓
PT1 PTFF Trip	-	2	121	112	1,9	↑↓
PT2 PTFF Trip	-	2	121	113	1,9	↑↓
CB Close operation	-	2	121	164	1,9	↑↓

**MEASURAND IN MONITOR DIRECTION**

DESCRIPTION	GI	ASDU TYPE	FUN	INF	COT	COM
Measurand supervision PT 1(R)	-	9	121	148	2	↑↓
Measurand supervision PT1(L)	-	9	121	148	2	↑↓
Measurand supervision PT2(R)	-	9	121	148	2	↑↓
Measurand supervision PT2 (L)	-	9	121	148	2	↑↓

**TIME TAGED MEASURAND IN MONITOR DIRECTIONS**

DESCRIPTION	GI	ASDU TYPE	FUN	INF	COT	COM
PT-1 L	-	4	121	151	1	↑↓
PT-1 R	-	4	121	152	1	↑↓
PT-2 L	-	4	121	153	1	↑↓
PT-2 R	-	4	121	154	1	↑↓

**STANDARD INFORMATION NUMBERS IN CONTROL DIRECTION****SYSTEM FUNCTIONS IN CONTROL DIRECTION**

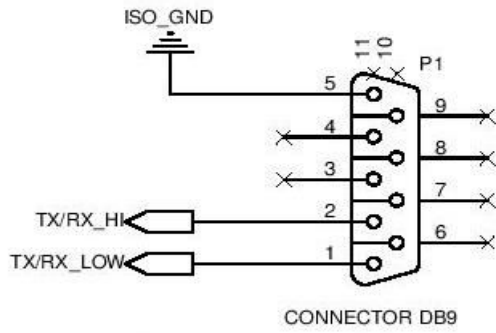
DESCRIPTION	GI	ASDU TYPE	FUN	INF	COT	COM
Initiation of general Interrogation	-	7	255	0	9	GLB
Time Synchronization	-	6	255	0	8	GLB

**GENERAL COMMANDS IN CONTROL DIRECTION**

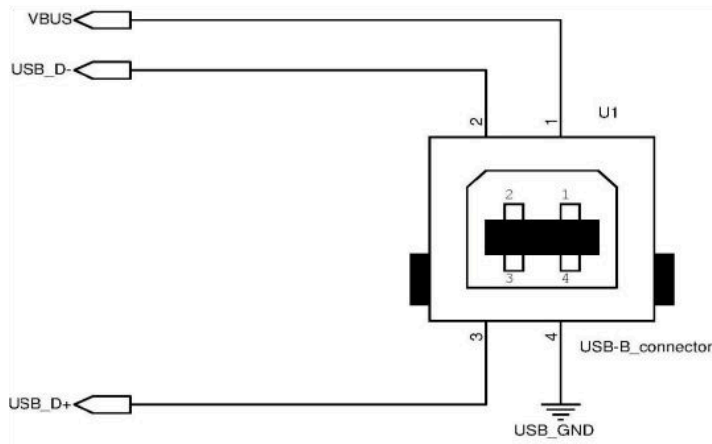
DESCRIPTION	GI	ASDU TYPE	FUN	INF	COT	COM
LED RESET	-	20	121	19	20	↑(PULSE)
CB TRIP	-	20	121	124	20	↑(PULSE)
CB CLOSE	-	20	121	125	20	↑(PULSE)

**COMMUNICATION PORTS**

RS 485 Port Configuration



USB Port Configuration



USB PIN OUT	
1	VBUS
2	DATA -
3	DATA +
4	GROUND



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