Bay Control Unit – ADR245B

Instruction Manual

Software Version: V1.xx

Hardware Version: V1.xx

Preface

The BCU ADR245B Instruction Manual describes common aspects of Bay Control Unit application and use of product. It includes the necessary information related to safety, installation, settings, test and operating BCU functionality. The instruction manual can be used by power engineers and other experienced personnel for bay control unit applications.

It is neither the intention of this manual to cover all details and variations in equipment, nor does this manual provide data for every possible contingency regarding installation or operation. The availability and design of all features and options are subject to modification without notice.

Safety Guide &

General Information

SAFETY AND GENERAL INFORMATION

INTRODUCTION

This guide and relevant operating or service manual documents for the equipment provide full information of safe handling, commissioning and testing of this equipment and also includes description of equipment label markings.

The technical data in this safety guide is typical. Please read technical data section of the relevant product publication(s) for data specific to particular equipment.

Before using the equipment, the user should be familiar with the contents of this Safety Guide and the ratings on the equipment's rating label.

Before the equipment is installed, commissioned or serviced, the external connection diagram should be referred.

HEALTH AND SAFETY

This 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 associated with the equipment will be familiar with the contents of that Safety Section or this Safety Guide.

When electrical equipment is in operation, dangerous voltages will be present in certain parts of the equipment. Failure to warning notices, incorrect use or improper handling may endanger personnel / equipment, 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 or operate the equipment.

Qualified personnel are individuals who

- Are familiar with the installation, commissioning, operation of the equipment and of the system to which it is being connected.
- Are able to safely perform switching operation in accordance with accepted safety 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 operating manual of the equipment 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 doubts or specific problems, do not take any action without proper authorization. Contact the appropriate person from Ashida Technical / After Sales Service department and request the necessary information.

SYMBOLS AND EXTERNAL LABELS ON THE EQUIPMENT

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

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 GUIDE IS THE DIRECT EQUIVALENT OF THE NORTH AMERICAN TERM GROUND.**

INSTALLING, COMMISSIONING AND SERVICING

Equipment connections

Personnel undertaking installation, commissioning or servicing work for this equipment is to be made 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 and current connections should be made using insulated crimp terminations to ensure that terminal block insulation requirements are maintained for safety.

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.

The recommended minimum protective conductor (earth) wire size is 2.5 mm^2 or as per industries standard practice. The protective conductor (earth) connection must be of low-inductance and as short as possible.

All connections to the equipment must have a defined potential.

Before energizing the equipment, the following points should be checked:

- Voltage rating / polarity (rating label / equipment documentation);
- CT circuit rating (rating label) and integrity of connections;
- Integrity of the protective conductor (earth) connection (where applicable);
- Voltage and current 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/CUL Listed or Recognized equipment

To maintain UL and CSA/CUL Listing / Recognized status for North America the equipment should be installed using UL or CSA Listed or Recognized parts for the following items: connection cables, protective fuses / fuse holders or circuit breakers, insulation crimp terminals and replacement internal battery, as specified in the equipment documentation.

For external protective fuses a UL or CSA Listed fuse shall be used. The Listed type shall be a Class J time delay fuse, with a maximum current rating of 15A and a minimum D.C. rating of 250 Vdc. for example type AJT15.

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

Equipment operating conditions

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

Current transformer circuits

Do not open the secondary circuit of a live CT since the high voltage produced may be lethal to personnel and could damage insulation.

Generally, for safety, the secondary of the line CT must be shorted before opening any connections to it.

For most equipment with ring-terminal connections, the threaded terminal block for current transformer termination has automatic CT shorting on removal of the module. Therefore external shorting of the CTs may not be required, but it is advisable to use external CT shorting as general practice.

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. After the completion of test, to discharge capacitors the voltage should be gradually reduced to zero 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.

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.

DECOMMISSIONING AND DISPOSAL

Decommissioning

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 decommissioning.

Disposal

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

TECHNICAL SPECIFICATIONS FOR SAFETY

Protective Fuse Rating

The recommended maximum rating of the external protective fuse for equipments is 8A, high rupture capacity (HRC) Red Spot type NIT, or TIA, or equivalent, unless otherwise stated in the technical data section of the equipment documentation. The protective fuse should be located as close to the unit as possible.

DANGER - CTs must NOT be fused since open circuiting them may produce lethal hazardous voltages 7.2 Protective Class

Protective Class

IEC 60255-27: 2005	Class I (unless otherwise specified in the equipment documentation).
EN 60255-27: 2005	This equipment requires a protective conductor (earth) connection to ensure user safety.

Installation Category

IEC 60255-27.2005 Category III (Overvoltage Category III)	: At 2 kV, 50Hz between all terminals connected together and earth for 1 minute 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

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 mounted in a specific cabinet or housing which will enable it to meet the requirements of IEC 60529 with the classification of degree of protection IP52 (dust and splashing water protected).

Pollution Degree 2 Compliance is demonstrated by reference to safety standards.

Altitude Operation up to 2000m

IEC 60255-27:2005

EN 60255-27: 2005

CE MARKING

Directives:

Compliance demonstrated by reference to safety standards

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Section 1

Introduction and Specifications

Contents

1 INTRODUCTION AND SPECIFICATIONS

1.1 Overview

ASHIDA having legacy experience in the field of Protection Relays has designed Multifunction Bay Control Unit. The BCU-ADR245B provides comprehensive control features and statistical metering for HV and MV switchgear and substation general services.

The BCU-ADR245B supports multiple protocols with IEC 61850 native platform which fulfil all requirements in the electrical sector.

1.2 Features

Value added Features:

- Fully compliance to IEC 61850 Ed.1 & Ed.2.
- Software selectable IEC 61850 Edition 1 or Edition 2
- Pre-configured for single breaker with selective single or three phase Tripping.
- Dual LCD Graphical display for SLD and 20x4 LCD for simultaneous viewing of multiple parameters.
- Large 5” LCD display with Touch Screen for local control and visualization.
- Self-Supervision Function.
- Password Protection.
- L/R mode selectable via push buttons at front for control operation
- Phase Rotation for ease of wiring

Communications:

- Fully communicable with IEC standard protocol – IEC 61850, MODBUS TCP/ RTU, IEC-103 & IEC-104.
- Accurate Time Synchronization through IRIG-B or SNTP.
- Goose publisher & Subscriber for interoperability
- USB port at front for local interface.
- 2 no’s of Ethernet (RJ45/Fibre Optic), RS485 & IRIG-B ports at rear.
- HSR/PRP option for fast and redundant network

Control & Protection Functions:

- Interlocking modules for different switchgear arrangement.
- CB Control Operation through HMI.
- Four Independent Setting Groups.
- Single Pole/ Three Pole Multi shot Auto Recloser

- Single Pole/ Three Pole Trip Circuit supervision
- Single Pole/ Three Pole Breaker Failure detection (50BF).
- Single Pole/ Three Pole SOTF.
- 8 no's of 4 – 20 mA Analogue Inputs.

Logic:

- Tripping Logic.
- Trip matrix logic.
- Logic gates - AND, OR, NOT, NAND, NOR, XOR, SR FLIP-FLOP, & COUNTER are available with operating and reset delay.
- User friendly logic programming software RTV2
- Live tracking of logic operations

Hardware:

- 8 no's (4I + 4V) of Analogue Input & 8 no's 4 to 20mA current inputs
- Power Supply module from 24–230V AC/DC.
- Internal dual power supply to minimize failures.
- Programmable maximum 64 nos. of Digital Inputs for Status Indication
- Programmable maximum 32 nos. of Outputs for Operations/Tripping.
- Virtual Inputs & Outputs for achieving complex schemes
- 16 no's of programmable target LED's for indication with dual colour.
- 9 no's Dedicated keys for parameterization and + touch control Graphics LCD display.

Measurements:

- Primary & Secondary magnitude of phase to neutral, phase to phase, Neutral (ground), zero sequence, positive sequence & Negative sequence currents with angle.
- Primary & Secondary magnitude of phase to neutral, phase to phase, Neutral (ground), zero sequence, positive sequence & Negative sequence & Sync voltages with angle.
- Line Frequency and Sync Frequency measurements.
- Single phase, three phase, Max & Average –Real, Reactive & Apparent Power Measurements.
- Three phase real & reactive exported & imported power.
- Three phase real power of demand period.

Monitoring:

- Disturbance Recorder.
- 10 no's of disturbances.

- Programmable 14 no's of Analogue Channels.
- Programmable 32 no's of Digital Channels.
- 10 no's of Fault Records.
- 1024 no's of Event Records.

Software Support

- Online / Offline Setting Editor.
- Programmable logic scheme Editor.
- Settings upload / download.
- Online Measurement.
- Event & Fault analysis.
- Disturbance analysis.

Ordering Information

ORDERING INFORMATION												
	1-4	5	6	7	8	9	10	11	12	13	14	15
Model	245B	x	x	x	x	x	x	x	x	x	x	x
Example	245B	M	3	0	2	1	3	8	0	2	3	R
Bay Control Unit												
Sub Type												
Modular Version		M										
Variant												
BCU			3									
Language												
English				0								
Protocol												
IEC-103					0							
MODBUS RTU					1							
IEC 61850					2							
MODBUS TCP					4							
IEC104					6							
CT/PT & RTD												
Default : 4CT, CT Selection: 1A/5A, 4PT:63.5V						0						
4CT, CT Selection: 1A/5A, 3PT: 63.5V + 1PT: Sync Check + Analogue Input						1						
4CT, CT Selection: 1A/5A, 4PT: 63.5V + 8 Analogue						2						
4CT, CT Selection: 1A/5A, 4PT: 63.5V + 1PT: Sync Check						3						

Digital Outputs					
8 DO	0				
16 DO	1				
24 DO	2				
32 DO	3				
Digital Inputs					
8 DI		0			
16 DI		1			
24 DI		2			
32 DI		3			
48 DI		5			
56 DI		8			
64 DI		9			
DI Setting Threshold					
18VDC			0		
35VDC			1		
77VDC			2		
154VDC			3		
Auxiliary Supply					
24 – 230 VDC / AC				2	
Cabinet Version					
Modular Version M-14					2
Modular Version M-19					3

Communication Ports	
DUAL 10/100 Base-T Ethernet RJ45 Rear Port	F
DUAL 10/100 Base-T Ethernet RJ45 Rear Port & RS-485 Rear Port	H
DUAL 10/100 Base-T Ethernet RJ45 Rear Port + IRIGB Port #	L
DUAL FO Ethernet Rear Port & RS-485 Rear Port	N
DUAL FO Ethernet Rear Port & RS-485 Rear Port + IRIGB Port #	P
DUAL 10/100 Base-T Ethernet RJ45 Rear Port & RS-485 Rear Port (with PRP)	R
DUAL FO Eth Rear Port & RS-485 Rear Port (with PRP)	S

Applications

The BCU-ADR245B consists of all necessary function required for substation automation. One of the main features of this is to concentrate and process data. This information can come from a variety of sources, both analogue and digital. For example, BCU-ADR245B can acquire analogue data from current and voltage transformers and digital data can be acquired over serial communication using variety of protocol or via hardwired links. All data can be mapped to other protocols such as IEC101 / 104 which can be transmitted to local or remote SCADA terminal. Digital data can be used for interlock for variety of logics such as auto bus transfer scheme etc.

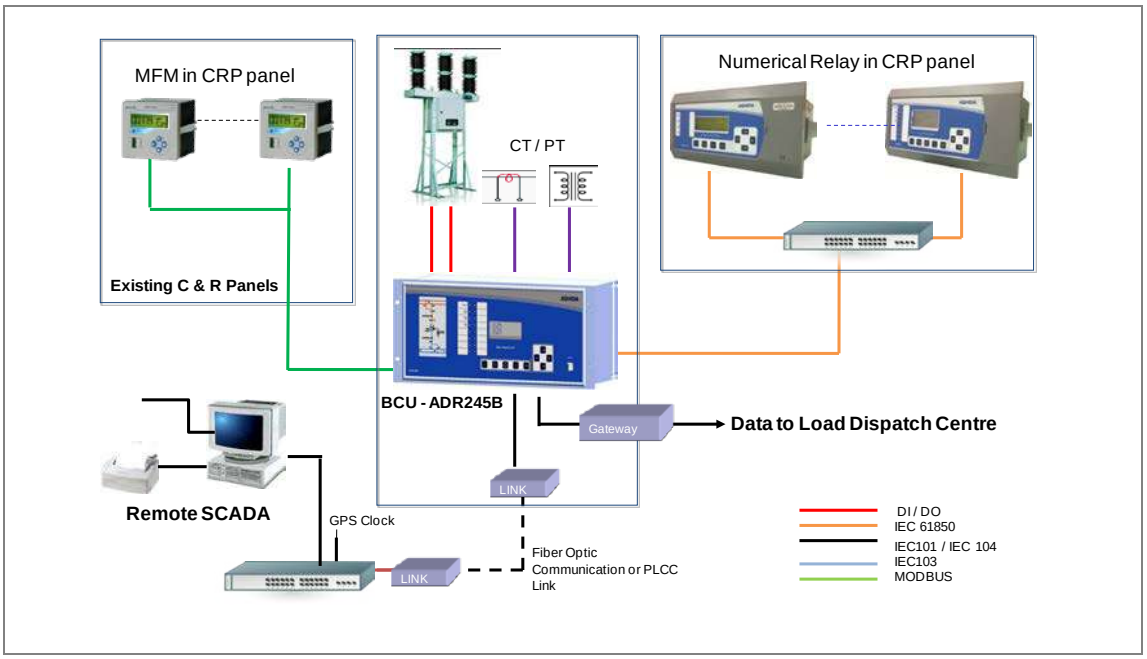

Figure 1: Typical architecture of ADR245B-BCU

1.3 TECHNICAL SPECIFICATIONS

AC Measuring Input:		
I.	Measurement Accuracy	Typical ± 2% at In
II.	Nominal Frequency Range For Current Inputs	50/60 Hz (Selectable in BCU Menu)
III.	Frequency measurement range	45 Hz – 65 Hz
IV.	Phase rotation	ABC

Current Input:		
I.	CT secondary	1 / 5 Amp (Selectable)
II.	Nominal Burden at In (without tripping condition)	< 0.20 VA at rated current (In)
III.	Thermal Withstand Capacity	250 x rated current (In) for 1sec 50 x rated current (In) for 3sec 4 x rated current (In) continuous
IV.	Measurement Linearity Range for Non – Offset AC Current	Linear up to 40 In

Voltage Input:		
I.	PT Nominal voltage (Vn)	AC 63.5 Volts
II.	Nominal Burden at Vn (without tripping condition)	< 0.20 VA at rated voltage (Vn)
III.	Thermal Withstand Capacity	2.6 x rated voltage (Vn) for 10sec 2 x rated voltage (Vn) continuous
IV.	Measurement Linearity Range	Linear up to 120Volts

Auxiliary Supply Input:			
I.	Nominal operating range	24 – 230V AC (50Hz / 60Hz) or 24 – 230V DC	
II.	Voltage operating range	80% of lower nominal range and 120% of upper nominal range (For DC Supply) 80% of lower nominal range and 110% of upper nominal range (For AC Supply)	
III.	Nominal Burden on 24 – 230V Auxiliary Power Supply	24 – 230 VAC	< 24 VA without status energize < 30 VA with all status & output energies
		24 – 230 VDC	< 12 W without status energize < 15 W with all status & output energies
IV.	Tolerable AC ripple	Up to 15% of highest dc supply, As per IEC 60255-26: 2013	
V.	BCU power up time	< 2.5 Sec	

Opto Isolated Input:					
I.	Opto Isolated input operating Range	24–230VDC	48–230VDC	110–230VDC	230 VDC
II.	Threshold Voltage for DC	18 VDC	35 VDC	77 VDC	154 VDC
	Maximum operating voltage range (RMS Voltage)	250 VDC			

III.	Drop out	Within 85% of threshold voltage value
IV.	VA Burden of Opto Isolated Status Input	For each status < 1.5 Watt / VA
V.	Filtering Time	< 40ms
VI.	Logic input recognition time	: For all Status filtering time + 5ms ± 5ms

Output contact (Non Latching contact) :		
I.	Continuous	5A/250Vac
	Make & carry	30Amp for 3sec AC /DC
	Breaking capacity	AC- 1250VA max @ 250V(PF 0.4)
		DC- 100W Resistive max. 5A or 300V
		50 Watt Inductive (L/R 45ms) max. 5A or 300V
	Operating Time	<10msec
	Minimum no. of operations	10,000 operation loaded condition & unloaded 100,000 operations

Processing Specifications and Oscillography:	
AC Voltages and Currents Inputs	: 32 samples per power system cycle
Processor:	: 32 bits
ADC resolution	: 16 bits
Frequency band	: 45 to 55Hz for 50Hz and 55 to 65Hz for 60Hz power system cycle
Protection and control processing	: 1/4 times per power system cycle
Oscillography	: 32 samples per cycle
Length	: 1.5 sec for each recording (Maximum 10 nos. of recording)
Oscillography triggering	: Programmable 5% to 95%
Time stamp resolution	: 1ms

Accuracy of protection function:			
I.	**Breaker Failure (50BF):**		
	For operating Value	Pick-up	Setting ±5%
		Reset current	Setting ±10%
	For operating Time	DT Operation	±5% or 60ms whichever is greater
		CBF Reset Time	<65ms *

II.	**SOTF:**		
	For operating Value	Pickup	0.95 x Setting ±5%
		Drop –off	1.05 x Setting ±5%
	For operating Time	Operating time	±5% or 65ms whichever is greater
III.	**Auto Recloser:**		
	For operating Time	DT Operation	±5% or 65ms whichever is greater

** Note: Filtering time (typically 25ms) is added when timer initiate or reset by external Binary input*

Operating condition:		
I.	Relative Humidity	: Humidity (RH) 95% maximum
II.	Operating temperature range	: -25 ºC to +65 ºC
III.	Storage temperature range	: -25 ºC to +70 ºC

Terminals specification:		
I.	AC current and Voltage Input Terminals	M4 Threaded terminals for ring lug connection. Suitable up to 4 mm^2
II.	Auxiliary & Input/output Terminals	Phoenix connector. Suitable up to 2.5 mm^2 pin type lugs
III.	Note on M4/M5 Terminal Torque	Use torque control screw driver with 1.2 N-m torque maximum
IV	Rear Communication Terminal	Phoenix connector two wire RS 485 signal levels Suitable up to Multi core shielded

Mechanical & Environmental specification:		
I.	Design	Flush mounting case
II.	Weight	8.2 Kg approximate Modular 19''
III.	Pollution Degree	II

Drawing References:			
I.	**MODULAR M – 14"**	: For Cabinet Type	- AEM1911006
		: For Back Connections (16DI & 16DO)	- ADV15501
		: For Typical External Connections (16DI & 16DO)	- ADV15601
		: For Back Connections (20DI & 12DO)	- ADV15701

		: For Typical External Connections (20DI & 12DO)	- ADV15801
II.	**MODULAR M – 19”**	: For Cabinet Type	- MAC1911001
		: For Back Connections	- ADV14303
		: For Typical External Connections	- ADV14403

1.4 Typical Tests Information

The BCU Comply with following standard:

Sr. No.	Tests	Standard
Electromagnetic Compatibility Type Test:		
I.	High Frequency Disturbance Test	IEC60255-22-1, IEC60255-26 (ed3)
II.	Electrostatic Discharge Test- Direct Application	IEC60255-22-2, IEC60255-26 (ed3)
III.	Fast Transient Disturbance Test	IEC60255-22-4, IEC60255-26 (ed3)
IV.	Surge Immunity Test	IEC60255-22-5, IEC60255-26 (ed3)
V.	Power Frequency Immunity Test	IEC60255-22-7, IEC60255-26 (ed3)
VI.	Power Frequency Magnetic Field Immunity Test	IEC61000-4-8, IEC60255-26 (ed3)
VII.	Pulse Magnetic Field Immunity Test	IEC61000-4-9, IEC60255-26 (ed3)
VIII.	Radiated Electromagnetic Field Disturbance Test	IEC60255-22-3, IEC60255-26 (ed3)
IX.	Conducted Disturbance Induced By Radio Frequency Field	IEC60255-22-6, IEC60255-26 (ed3)
X.	Power Supply Immunity Test	IEC60255-11 & IEC61000-4-11
XI.	Conducted & Radiated frequency Emission Test	IEC60255-25, IEC60255-26 (ed3)

Insulation Tests:		
I.	High Voltage Test	IEC60255-27
II.	Impulse Voltage Test	IEC60255-27
III.	Insulation Resistance	IEC60255-27

Environmental tests:		
I.	Cold test	: IEC-60068-2-1
II.	Dry heat test	: IEC-60068-2-2
III.	Damp heat test, steady state	: IEC-60068-2-78
IV.	Change of Temperature	: IEC-60068-2-14
V.	Damp heat test, cyclic	: IEC-60068-2-30
VI.	Enclosure Protection Test (IP54)	: IEC 60529

CE compliance		
I.	Immunity	: IEC-60255-26
II.	Emissive Test	: IEC- 60255-26
III.	Low voltage directive	: EN-50178

Mechanical tests		
I.	Vibration Endurance Test	: IEC 60255-21-1
II.	Vibration Response Test	: IEC 60255-21-1
III.	Bump Test	: IEC 60255-21-2
IV.	Shock Withstand Test	: IEC 60255-21-2
V.	Shock Response Test	: IEC 60255-21-2
VI.	Seismic Test	: IEC 60255-21-3

***NOTE:** Detailed type test reports are available on request.*

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Section 2

Installation and Procedure

Contents

2 INSTALATION AND PROCEDURE

2.1 Overview

The first step in applying the BCU-ADR245B is installing and connecting the BCU in panel. This section describes common installation features and requirements.

To install and connect the BCU safely and effectively, User must be familiar with BCU configuration features and options. User should carefully plan BCU placement, cable connections, and BCU communication.

This section contains drawings of typical AC and DC connections to the BCU-ADR245B. Use these drawings as a starting point for planning particular BCU application.

2.2 Handling

2.2.1 Handling the Goods

Our products are of robust construction but require careful treatment before installation on site. This section discusses the requirements for receiving and unpacking the goods, as well as associated considerations regarding product care and personal safety.

Caution: Before lifting or moving the equipment, User should be familiar with the Safety Information chapter of this manual.

2.2.2 Receipt of the Goods

On receipt, ensure the correct product has been delivered. Unpack the product immediately to ensure there has been no external damage in transit. If the product has been damaged, make a claim to the transport contractor and notify us promptly.

For products not intended for immediate installation, repack them in their original delivery packaging.

2.2.3 Unpacking the Goods

When unpacking and installing the product, take care not to damage any of the parts and make sure that additional components are not accidentally left in the packing or are lost. Do not discard any CDROMs or technical documentation. These should accompany the unit to its destination substation and put in a dedicated place.

The site should be well lit to aid inspection, clean, dry and reasonably free from dust and excessive vibration. This particularly applies where installation is being carried out at the same time as construction work.

2.2.4 Storing the Goods

If the unit is not installed immediately, store it in a place free from dust and moisture in its original packaging. Keep any de-humidifier bags included in the packing. The de-humidifier crystals lose their efficiency if the bag is exposed to ambient conditions. Restore the crystals before replacing it in the carton. Bags should be placed on flat racks and spaced to allow circulation around them. The time taken for regeneration will depend on the size of the bag. If a ventilating, circulating oven is not available, when using an ordinary oven, open the door on a regular basis to let out the steam given off by the regenerating silica gel. On subsequent unpacking, make sure that any dust on the carton does not fall inside. Avoid storing in locations of high humidity. In locations of high humidity the packaging may become impregnated with moisture and the de-humidifier crystals will lose their efficiency.

The device can be stored between –25º to +65ºC

2.2.5 Dismantling the Goods

If you need to dismantle the device, always observe standard ESD (Electrostatic Discharge) precautions.

The minimum precautions to be followed are as follows:

- Use an antistatic wrist band earthed to a suitable earthing point.
- Avoid touching the electronic components and PCBs.

2.3 Installation Procedure

2.3.1 Safe Mounting for Modular version

BCU-ADR245B supports rack mounting and can be mounted into panels using M6 X 15 screws. The fitting screws are supplied along with the BCU.

Procedure for mounting the device into panel:

Loose the M6 X 15 screws from the BCU, then insert the BCU in to the panel cut-out as show below.

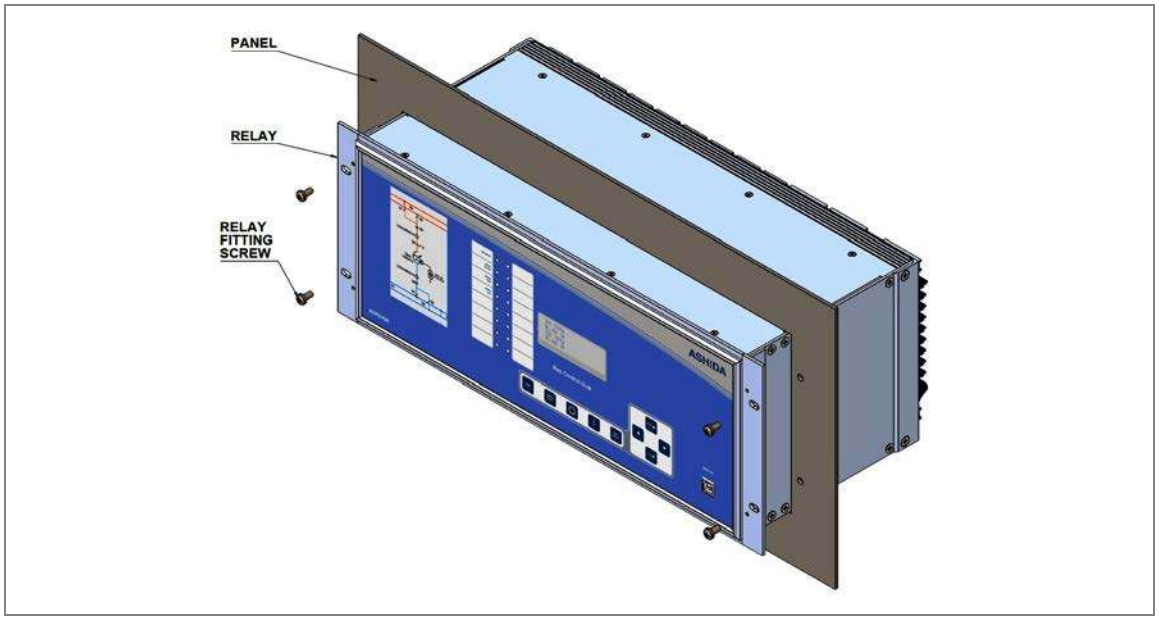


Figure 1: Inserting BCU in to the panel cut-out

After inserting the BCU in the Panel, use M6 X 15 Screws to fasten the BCU to the Panel.

Caution: All screws should be fastened properly. Always use M6 X15 screws

The BCU after fastening to the Panel with M6 X 15 Screws is shown below.

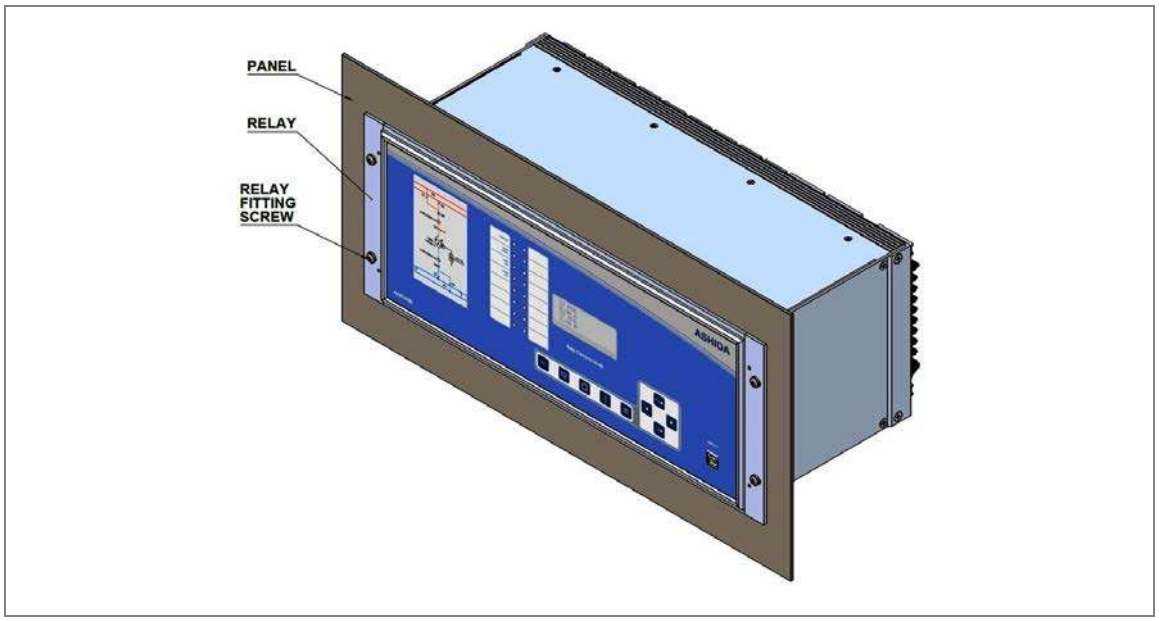


Figure 2: BCU mounted on the panel

2.3.2 BCU Connection and Diagram

Before installation of the BCU, check the correct working procedure as to ensure safety. The Terminal exposed during installation may present a hazardous voltage unless the equipment is electrically isolated. Any disassembly of the equipment may expose parts to hazardous voltage. Electronic parts may be damaged if suitable electrostatic discharge (ESD) precautions are not taken. Voltage and current connection should be made using insulated crimp termination to ensure that terminal block insulation requirements are maintained for safety. To ensure that wires are correctly terminated the correct crimp terminal and tool for wire size should be used. The equipment must be connected in accordance with the appropriate connection diagram.

2.3.3 Before Energizing following should be checked

1. Voltage rating and polarity.
2. CT circuit rating and integrity of connection.
3. Protective fuse rating.
4. Integrity of the earthing connection.
5. Voltage and current rating of external wiring, applicable as per application.

2.3.4 BCU Operating Condition

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

2.3.5 Current Transformer (CT) Circuit

Do not open the secondary circuit of a live CT as the high voltage produced may be lethal to personnel and could damage insulation. The unit is provided with special withdraw able case which automatically short CT connection, but as standard practice and for additional safety it recommended to short CT secondary of the line CT connection before removing relay from circuit.

2.3.6 Insulation and dielectric strength testing

Insulation testing may leave capacitors charged up to a hazardous voltage. At the end of each part test the voltage should be gradually reduced to zero to discharge capacitors as this may result in damage.

2.3.7 Cables and Connectors

This section describes the type of wiring and connections that should be used when installing the device. For pin-out details please refer to the wiring diagrams.

Caution: Before carrying out any work on the equipment, user should be familiar with the Safety Section and the ratings on the equipment's rating label.

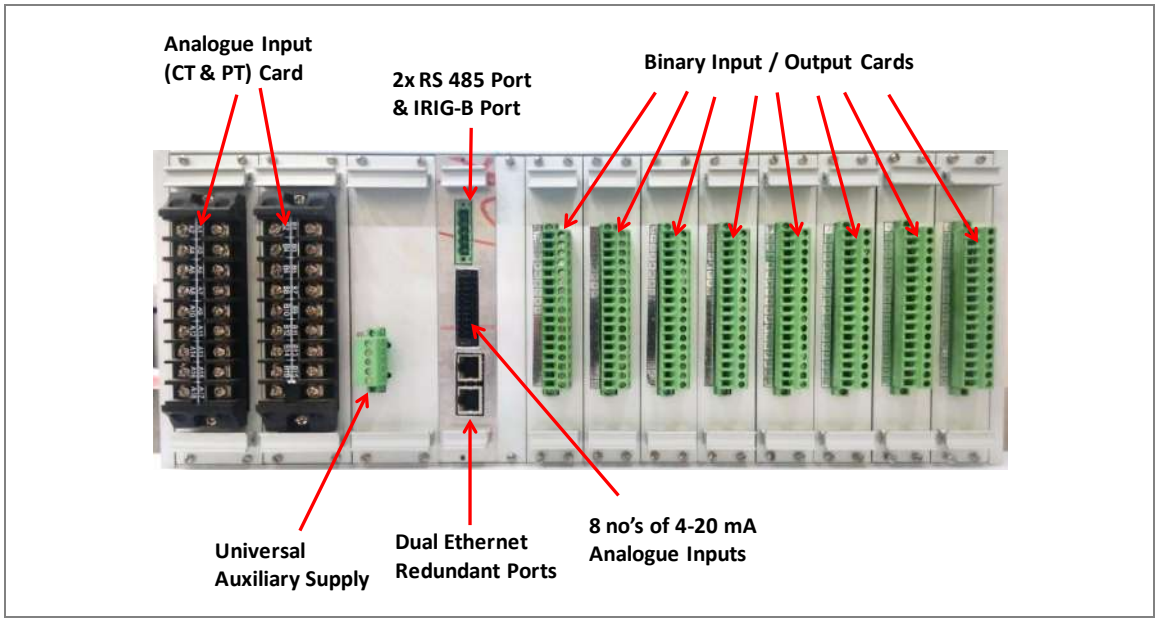


Figure 3: Rear view-Terminal Connection of BCU-ADR245B

2.4 Terminal Blocks

2.4.1 CT / PT Connections:

The terminal blocks for CT / PT connections of BCU-ADR245B are as shown below.

The terminal blocks of BCU-ADR245B version consists of up to 36 x M4 screw terminals. M4 terminal blocks are used for CT and PT connections. The wires should be terminated with rings using 90° ring terminals, with no more than two rings per terminal.

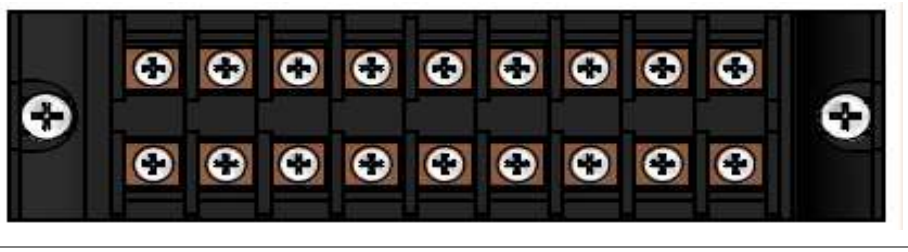


Figure 4: Terminal blocks used in Modular Version

Caution: Always fit an insulating sleeve over the ring terminal.

Current transformers would generally be wired with 2.5 mm2 PVC insulated multi-stranded copper wire terminated with M4 ring terminals. The wires should be terminated with rings using 90º ring terminals, with no more than two rings per terminal.

Due to the physical limitations of the ring terminal, the maximum wire size user can use is 4.0 mm2 using ring terminals.

The wire should have a minimum voltage rating of 300 V RMS.

Caution: Current transformer circuits must never be fused.

Note: For 5A CT secondary, we recommend using 2 x 2.5 mm2 PVC insulated multi-stranded copper wire.

2.4.2 Auxiliary Power Supply, Input / Output Connections

The terminal block of BCU-ADR245B used for Auxiliary supply is as shown below. These should be wired with 2.5 mm2 PVC insulated multi-stranded copper wire terminated with M4 straight pin type lugs, with no more one lug per terminal. The wire should have a minimum voltage rating of 300 V RMS.

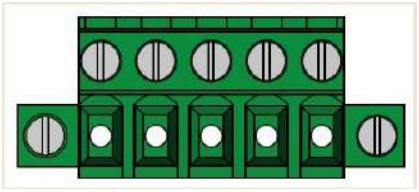


Figure 5: Terminal blocks for Auxiliary Supply

As per the application, in case auxiliary supply input of the BCU needs to be wired, then adequate care should be taken to wire as per polarity marking on the Terminal sticker at the rear side of the BCU. The supply range is also mentioned on the Terminal sticker and before energising, care should be taken to confirm that the auxiliary supply being wired is within range.

2.4.3 Binary Input / Output Connections

The terminal block of BCU-ADR245B used for Status input, relay output contacts is as shown below. The wires should be terminated with straight pin type lugs, with no more one lug per terminal. These should be wired with 1 mm2 PVC insulated multi-stranded copper wire terminated with straight pin type lugs.

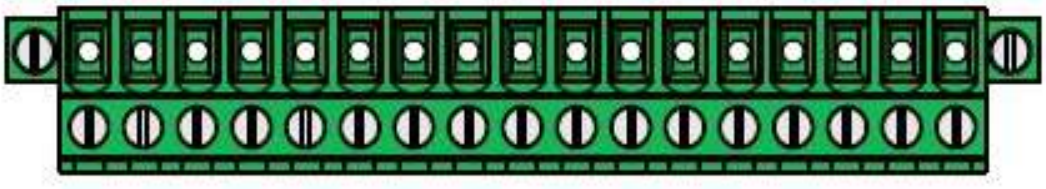


Figure 6: Terminal blocks for Inputs and Outputs

2.4.4 Rear Port connection

The rear port (RS485) is intended for use with a permanently wired connection to a remote SCADA system. The physical connectivity is achieved using this terminal for signal connection. The terminal block is located at the rear side of the BCU as shown below.

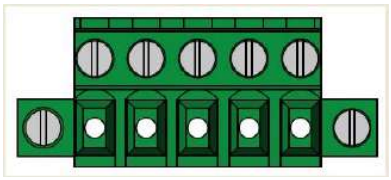


Figure 7: Rear Port terminal block

For connecting the RS485, use screened cable with a maximum total length of 1000 m or 200 nF total cable capacitance.

A typical cable specification would be:

Each core: 16/0.2 mm2 copper conductors, PVC insulated

Nominal conductor area: 0.5 mm2 per core

Screen: Overall braid, PVC sheathed

There is no electrical connection of the cable screen to the device. The link is provided purely to link together the two cable screens.

2.4.5 Earth Connection

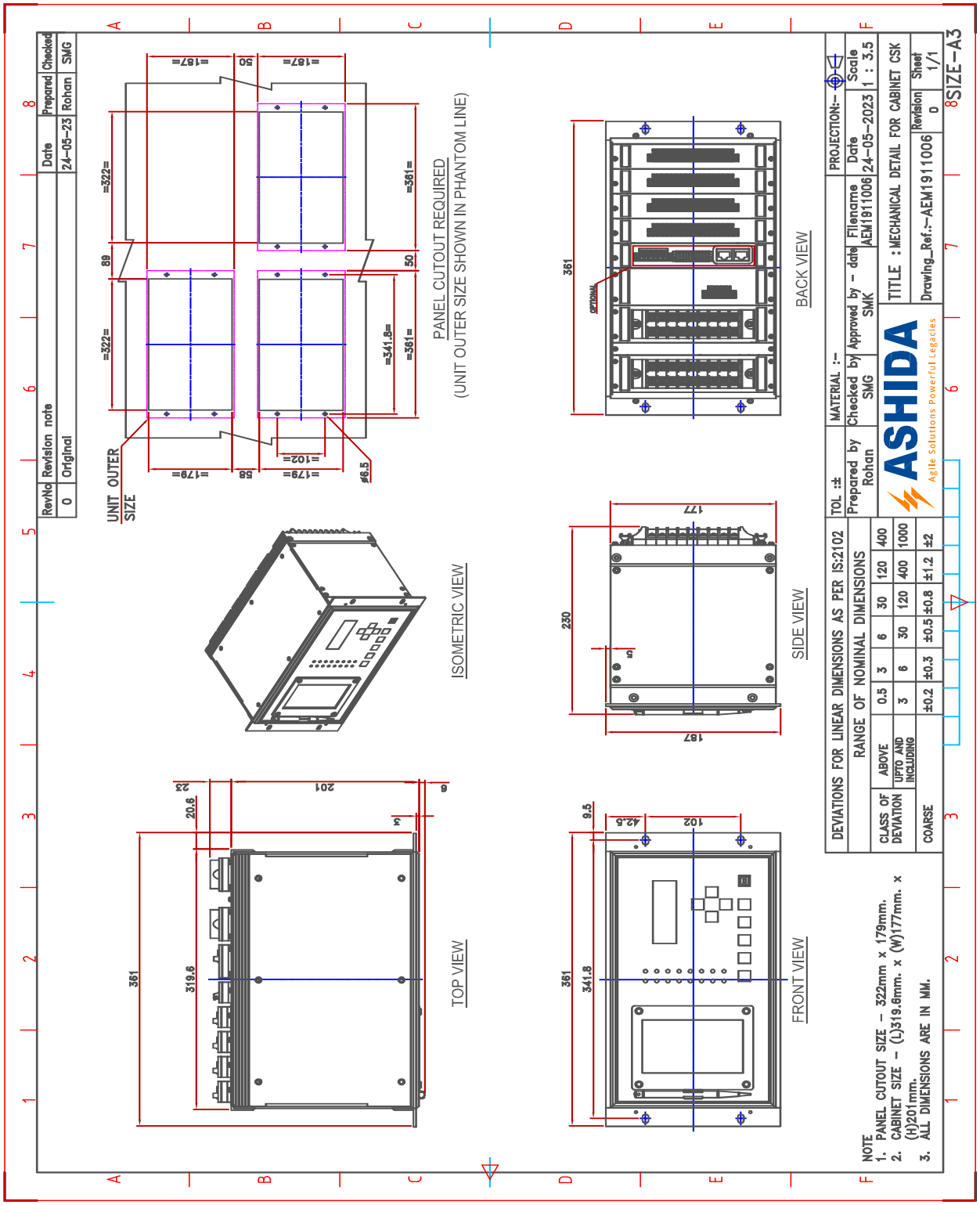
Every device must be connected to the cubicle earthing bar. Earthing terminal is provided on back side of the BCU. Ensure that the BCU earthing is connected to the local earth bar. With several BCUs present; make sure that the copper earth bar is properly installed for solidity connecting to the earthing terminal of each BCU equipment box.

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. The recommended minimum protective conductor (earth) wire size is 2.5 mm² or as per industry standard practice. The protective conductor (earth) connection must be of low-inductance and as short as possible.

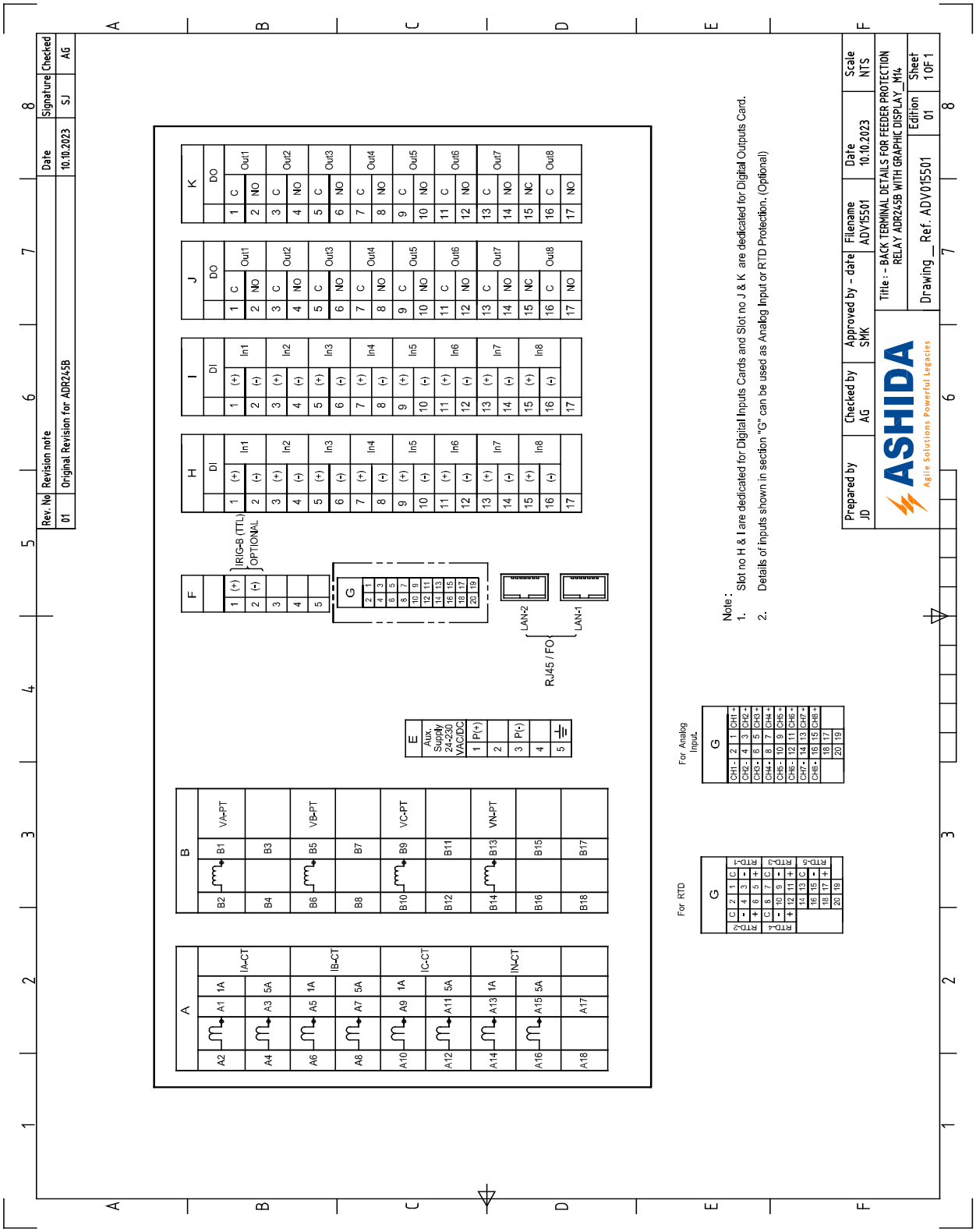
Note: To prevent any possibility of electrolytic action between brass or copper ground conductors and the rear panel of the product, precautions should be taken to isolate them from one another. This could be achieved in several ways, including placing a nickel-plated or insulating washer between the conductor and the product case, or using tinned ring terminals.

2.5 Mechanical Dimensions & Electrical Connection

2.5.1 Mechanical Dimension Modular – M14" Model

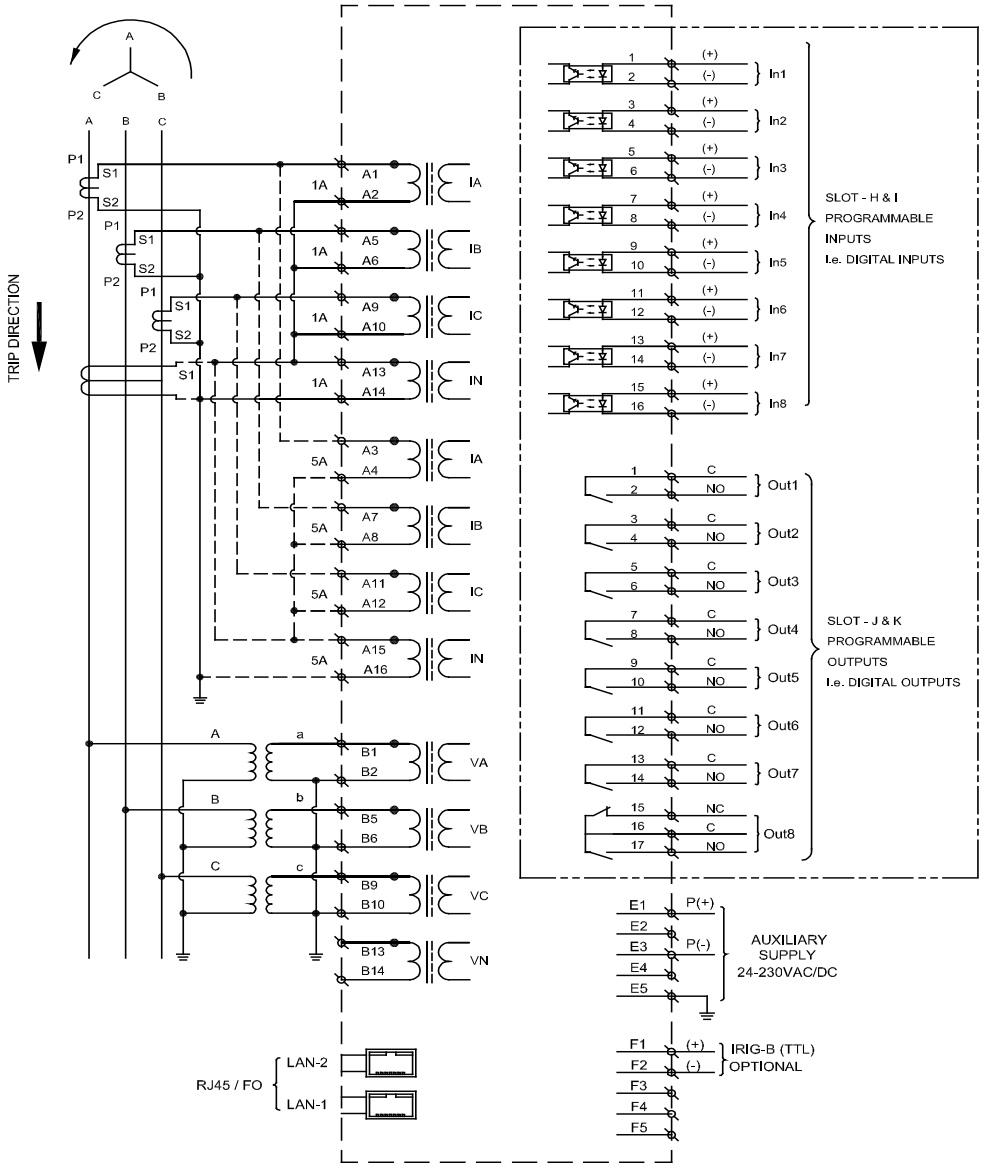


2.5.2 Back Terminal Details Modular – M14" Model (16DI & 16DO)



2.5.3 Electrical Connection Modular – M14" Model (16DI & 16DO)

Rev No	Revision note	Date	Signature	Checked
01	Original Revision for ADR245B	10.10.2023	AG	



Note :

1. Slot no H & I are dedicated for Digital Inputs Cards and Slot no J & K are dedicated for Digital Outputs Cards.
2. 16 Digital Inputs and 16 Digital Outputs.

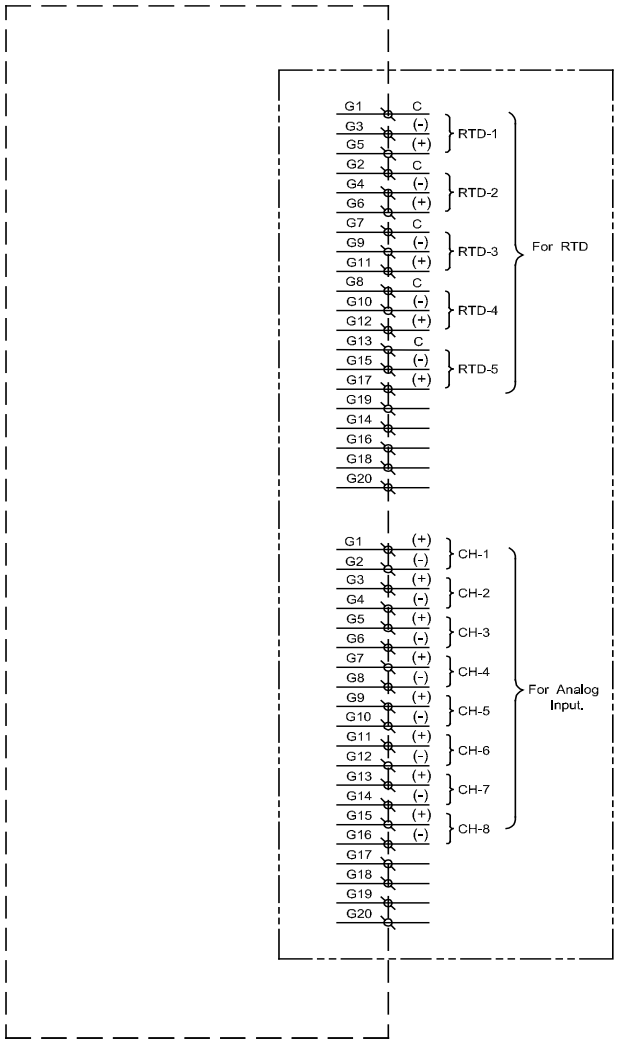
Perpaed by	Checked by	Approved by - date	Filename	Date	Scale
JD	AG	SMK	ADV15601	10.10.2023	NTS

ASHIDA
Agile Solutions Powerful Legacies

Title : - ELECTRICAL CONNECTION FOR FEEDER PROTECTION RELAY ADR245B WITH GRAPHIC DISPLAY__M14

Drawing__ Ref. ADV15601 | Edition 01 | Sheet 1 OF 2

Rev No	Revision note	Date	Signature	Checked
01	Original Revision for ADR245B	10.10.2023	AG	



Note :
Details of Inputs shown In section "G" can be used as Analog Input or RTD Protection. (Optional)

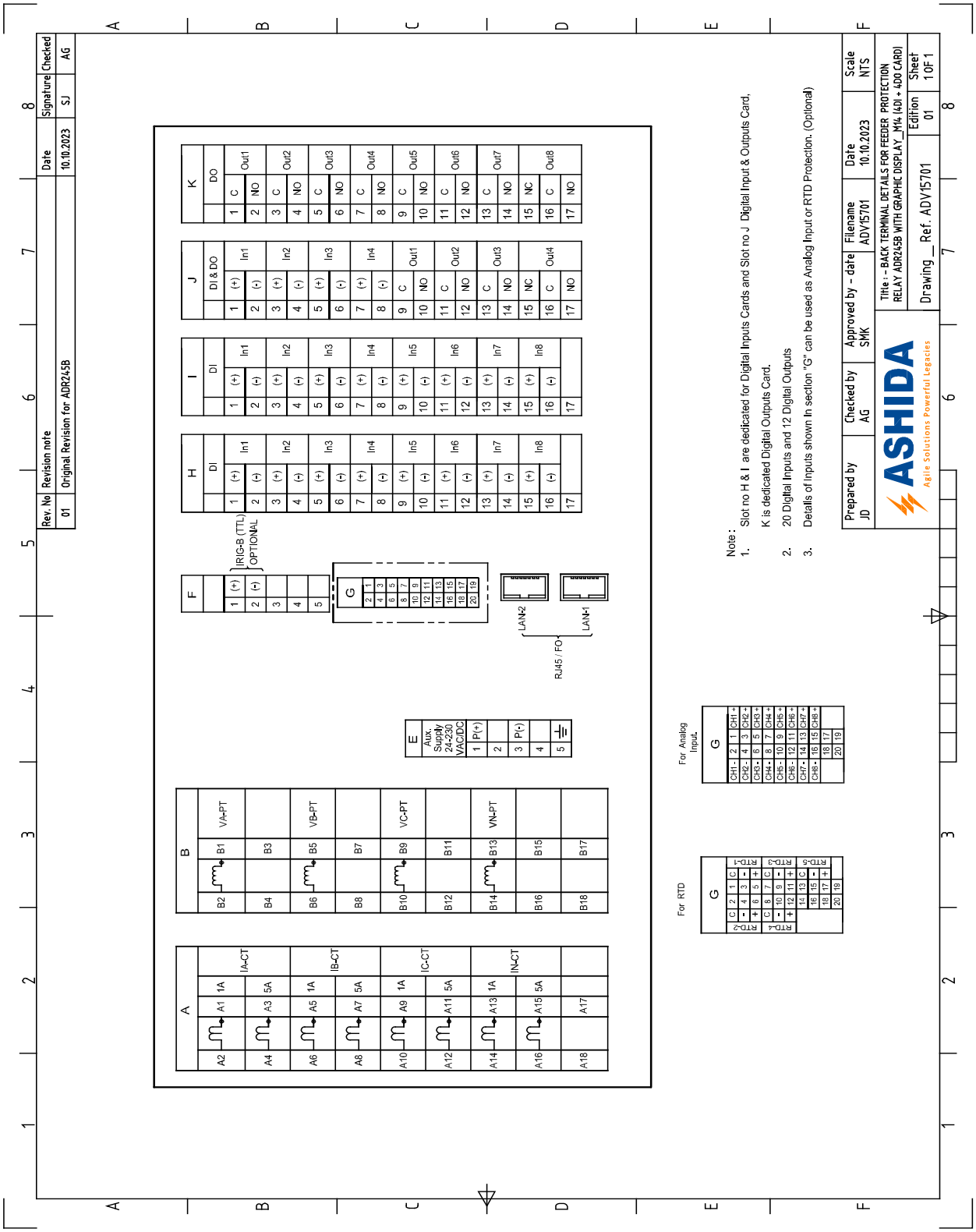
Perpaed by	Checked by	Approved by - date	Filename	Date	Scale
JD	AG	SMK	ADV15601	10.10.2023	NTS

ASHIDA
Agile Solutions Powerful Legacies

Title : - ELECTRICAL CONNECTION FOR FEEDER PROTECTION RELAY ADR245B WITH GRAPHIC DISPLAY__M14

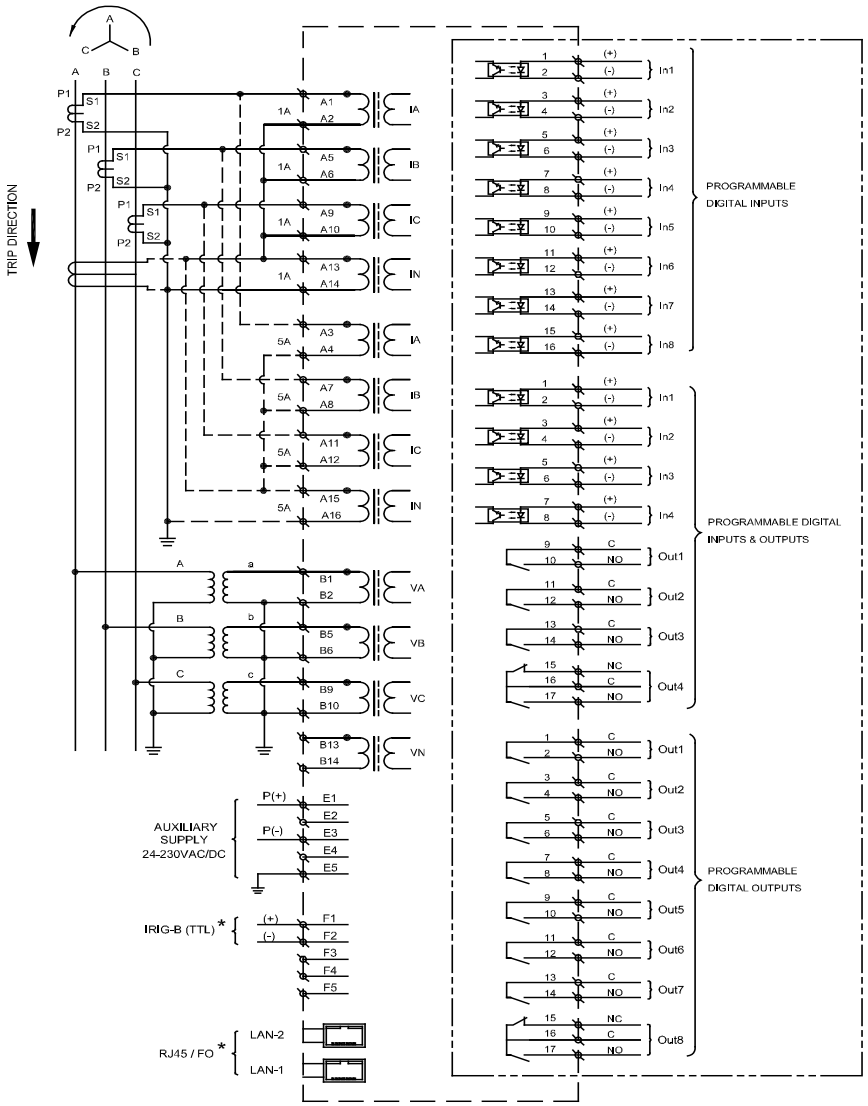
Drawing__ Ref. ADV15601	Edition	Sheet
	01	2 OF 2

2.5.4 Back Terminal Details Modular M14" Model (20DI & 12DO)



2.5.5 Electrical Connection Details Modular M14" Model (20DI & 12DO)

Rev No	Revision note	Date	Signature	Checked
01	Original Revision for ADR245B	10.10.2023	SJ	AG



Note :
1. One Card 4 Digital Inputs & 4 Digital Outputs Card is provided as per requirement.
(i.e. For 20 Digital Inputs and 12 Digital Outputs / For 12 Digital Inputs and 20 Digital Outputs

(*) Optional

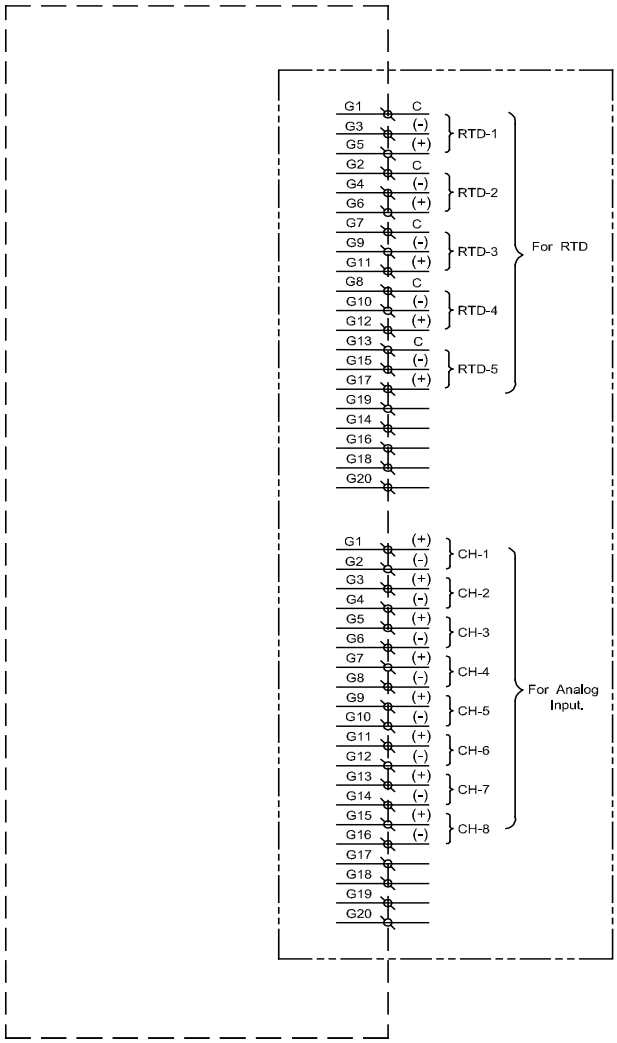
Perpaed by	Checked by	Approved by – date	Filename	Date	Scale
JD	AG	SMK	ADV15801	10.10.2023	NTS

ASHIDA
Agile Solutions Powerful Legacies

Title : – ELECTRICAL CONNECTION FOR FEEDER PROTECTION RELAY. ADR245B WITH GRAPHIC DISPLAY_M14 (4DI + 4DO CARD)

Drawing_ Ref. ADV15801 | Edition 01 | Sheet 1 OF 2

Rev No	Revision note	Date	Signature	Checked
01	Original Revision for ADR245B	10.10.2023	SJ	AG



Note :
Details of Inputs shown In section "G" can be used as Analog Input or RTD Protection. (Optional)

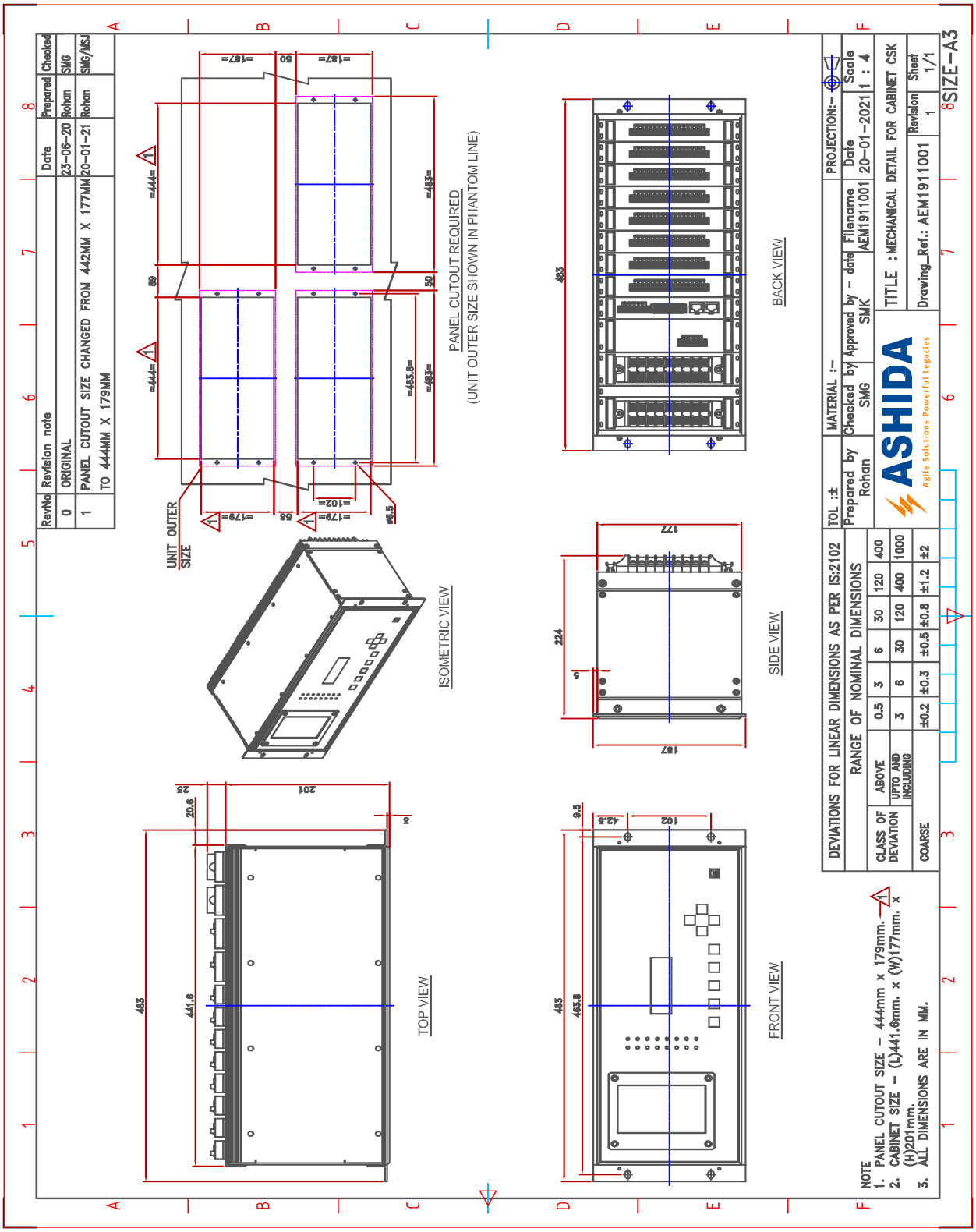
Perpaed by	Checked by	Approved by – date	Filename	Date	Scale
JD	AG	SMK	ADV15801	10.10.2023	NTS

ASHIDA
Agile Solutions Powerful Legacies

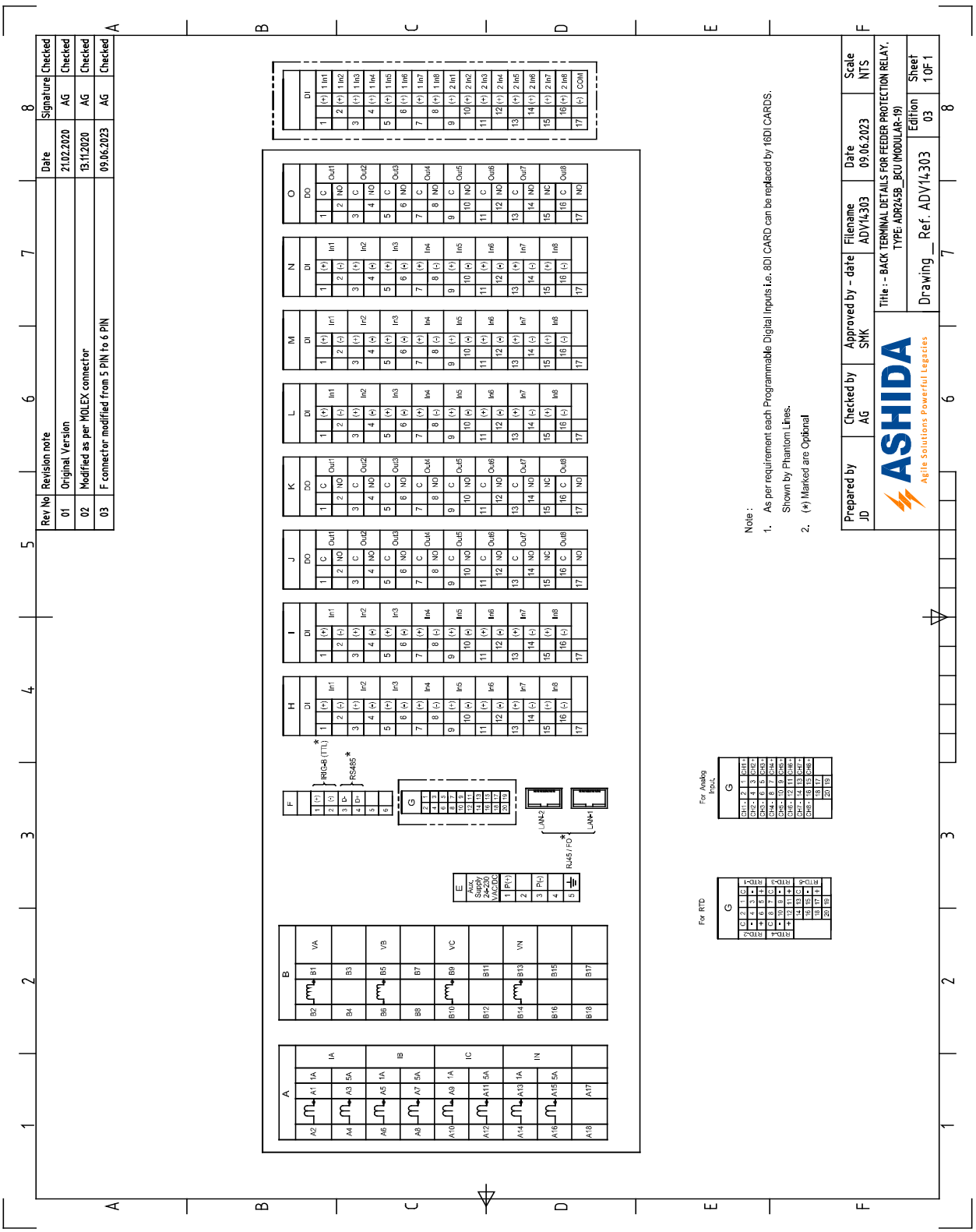
Title : – ELECTRICAL CONNECTION FOR FEEDER PROTECTION RELAY. ADR245B WITH GRAPHIC DISPLAY_M14 (4DI + 4DO CARD)

Drawing_ Ref. ADV15801 | Edition 01 | Sheet 2 OF 2

2.5.6 Mechanical Details Modular M19" Model

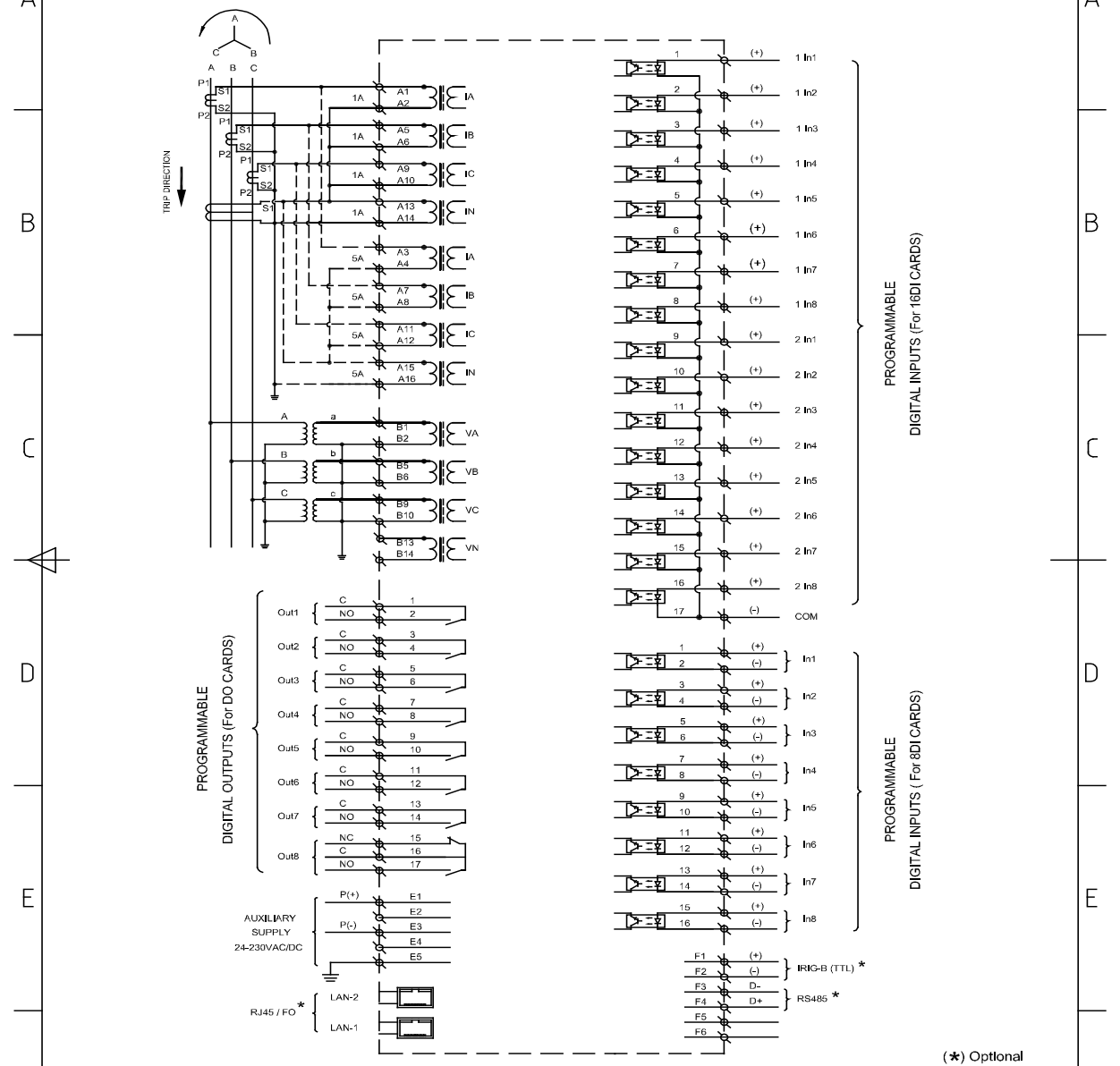


2.5.7 Back Terminal Details Modular M19" Model



2.5.8 Electrical Connection Details Modular M19" Model

Rev No	Revision note	Date	Signature	Checked
01	Original Version	09.06.2023	AG	
02	Digital Inputs Symbol corrected	03.08.2020	AG	
03	F connector modified from 5 PIN to 6 PIN	09.06.2023	AG	



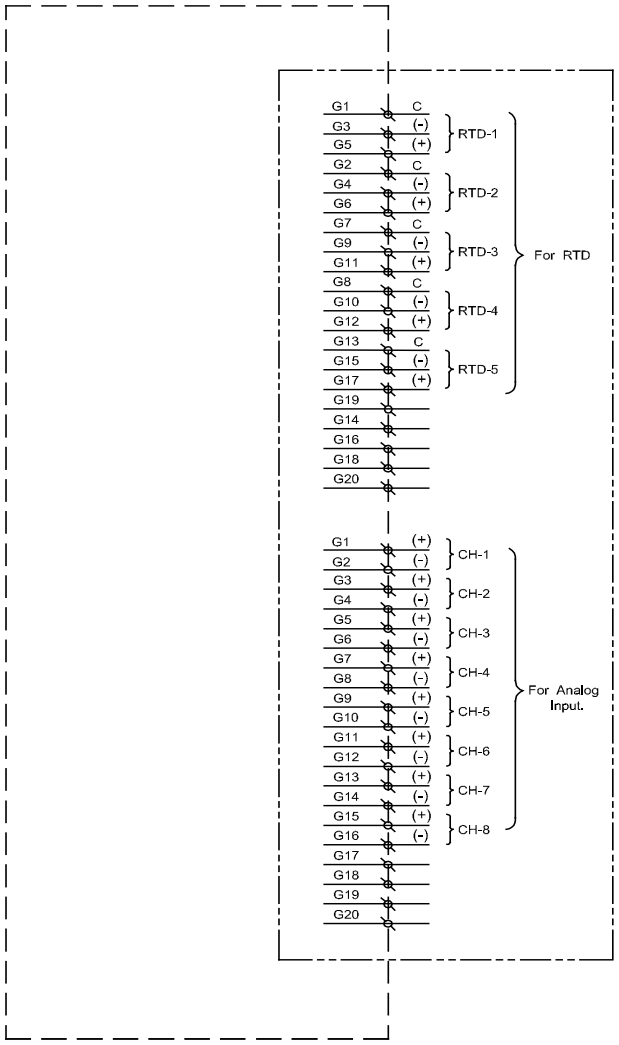
Perpaed by	Checked by	Approved by - date	Filename	Date	Scale
JD	AG	SMK	ADV14403	09.06.2023	NTS

ASHIDA
Agile Solutions Powerful Legacies

Title : - ELECTRICAL CONNECTION FOR FEEDER PROTECTION RELAY.
TYPE: ADR245B_BCU (MODULAR-19)

Drawing_ Ref. ADV14403	Edition	Sheet
	03	1 OF 2

Rev No	Revision note	Date	Signature	Checked
01	Original Version	21.02.2020	AG	
02	Digital Inputs Symbol corrected	03.08.2020	AG	
03	F connector modified from 5 PIN to 6 PIN	09.06.2023	AG	



Note :
Details of Inputs shown In section "G" can be used as Analog Input or RTD Protection. (Optional)

Perpaed by	Checked by	Approved by - date	Filename	Date	Scale
JD	AG	SMK	ADV14403	09.06.2023	NTS

ASHIDA
Agile Solutions Powerful Legacies

Title : - ELECTRICAL CONNECTION FOR FEEDER PROTECTION RELAY.
TYPE: ADR245B_BCU (MODULAR-19)

Drawing_ Ref. ADV14403	Edition	Sheet
	03	2 OF 2

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Section 3

Communication Software Information

Contents

3.A. RTV2 SOFTWARE INFORMATION

A.1 Overview

ASHIDA Provides following Software solution to support the BCU-ADR245B and the other ASHIDA products.

Sr. No.	Application Software	Description
1	RTV2 Software	Customizes BCU-ADR245B Settings and configure communication, input and output for specific applications

This section describes how to get started with the BCU-ADR245B and RTV2 software. It particularly explains about the software setup and working procedure.

A.1.1 RTV2 Software Features

Connections	BCU-ADR245B is connected to the PC through Front port as well as Rear port.
Settings Editor	Provides online as well as offline utility to interface with ASHIDA BCU
AProLogic	Allows user to program the inputs, outputs and LEDs
61850 Configuration	Allows user to configure the IEC61850 communication.
Open Pro+ Configurator	Allow user to configure GUI
Events	Provides event analysis tools.
History Faults	Provides History fault analysis tool
Disturbance Record	Provides Oscillography analysis tools.
Time Synchronization	Local clock time synchronized data is available.
Measurements	Provides online power system parameter measurements
Status	Provides status of the input, output and protection functions tool.
Control	Provides the control function tool (output, input, LED)
Alias	Allows user to label the outputs and inputs.

Note: The screen shot of RTV2 software is common for BCU and Relays.

A.2 Installation and Setup

A.2.1 System Requirement

ASHIDA Relay Talk System Version2 requires the following hardware/software platform to run the application

Sr. No.	Requirement	Description
1	Operating System	Windows XP/7/8/8.1/10 (32-bit or 64-bit)
2	Processors	1GHz or above
3	RAM	512MB or above

4	Dot net Framework	Microsoft .Net Framework 3/3.51

A.2.2 Microsoft .Net Framework 3.5.1

Turn windows features on for “Microsoft .Net Framework” Check the Microsoft .Net Framework and click Ok. If “.Net” feature is not available then use following link to download .Net Framework: http://www.microsoft.com/en-in/download/details.aspx?id=21 If the above link fails to work, you may need to search in http://www.microsoft.com for Microsoft .Net Framework 3.5.1

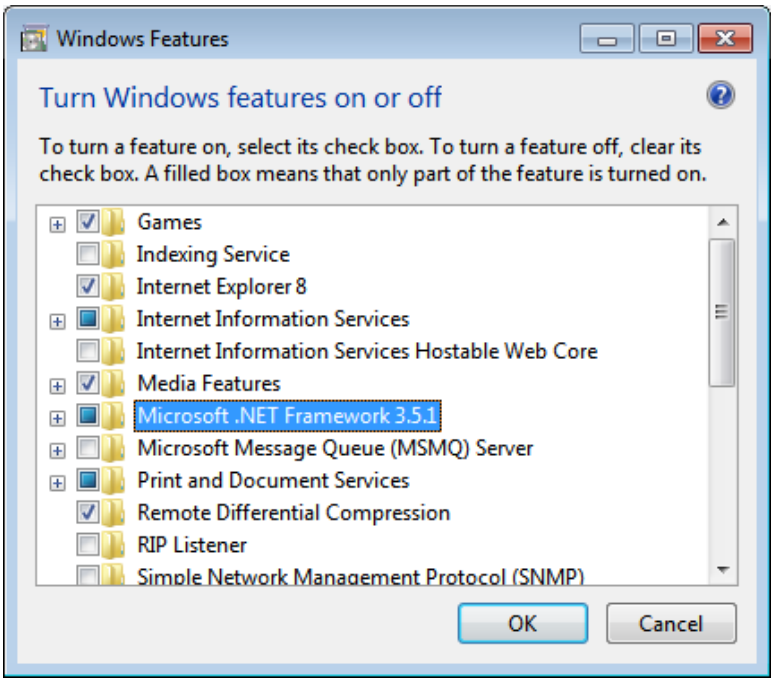


Figure 1: Turn windows features on or off

A.2.3 Installing ASHIDA Relay-Talk System

The ASHIDA Relay-Talk System is delivered as a single installation file named ‘ASHIDA Relay-Talk System.exe’. To install ASHIDA Relay-Talk System simply open the file and follow the directions.

To install, double click on “ASHIDA Relay-Talk SystemSetup.exe” setup file. Following window will appear.

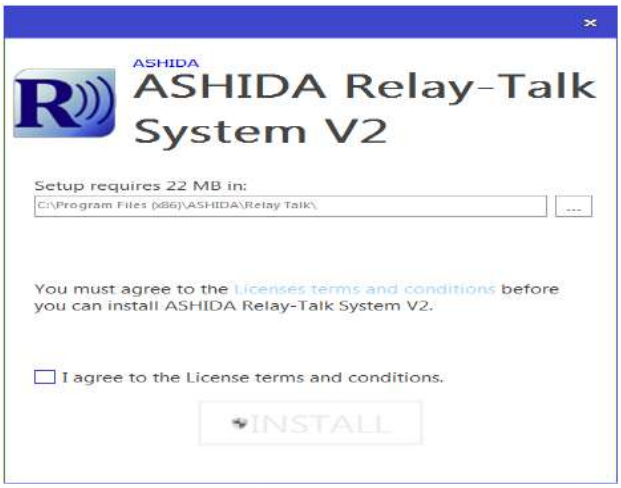


Figure 2: Startup screen of Relay Talk System Version2

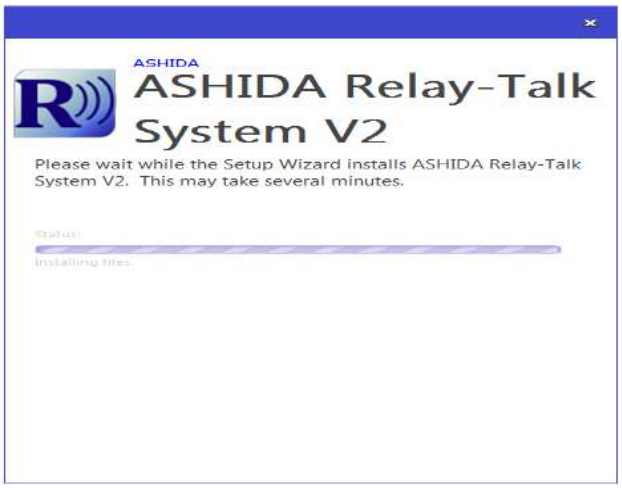


Figure 3: Installing ASHIDA Relay Talk System V2

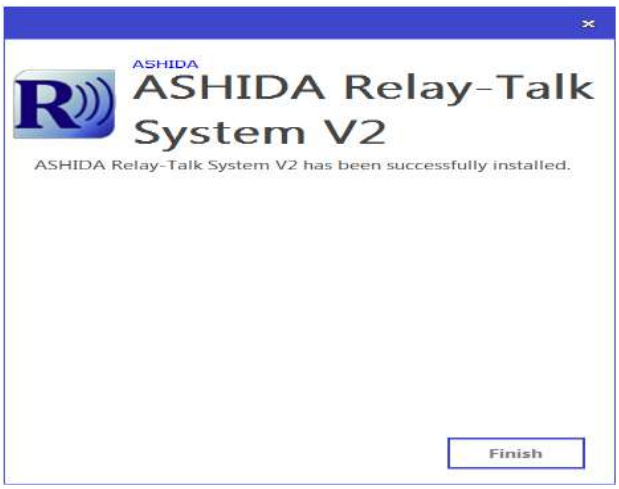


Figure 4: Relay Talk System Version2 setup installation complete

This completes the installation of ASHIDA Relay-Talk System. Click “Finish” and start using ASHIDA Relay-Talk System.

In addition to installing the required files on your system the installation application performs the following steps.

Creates entries in the Start->Programs menu to access the features of the ASHIDA Relay-Talk System

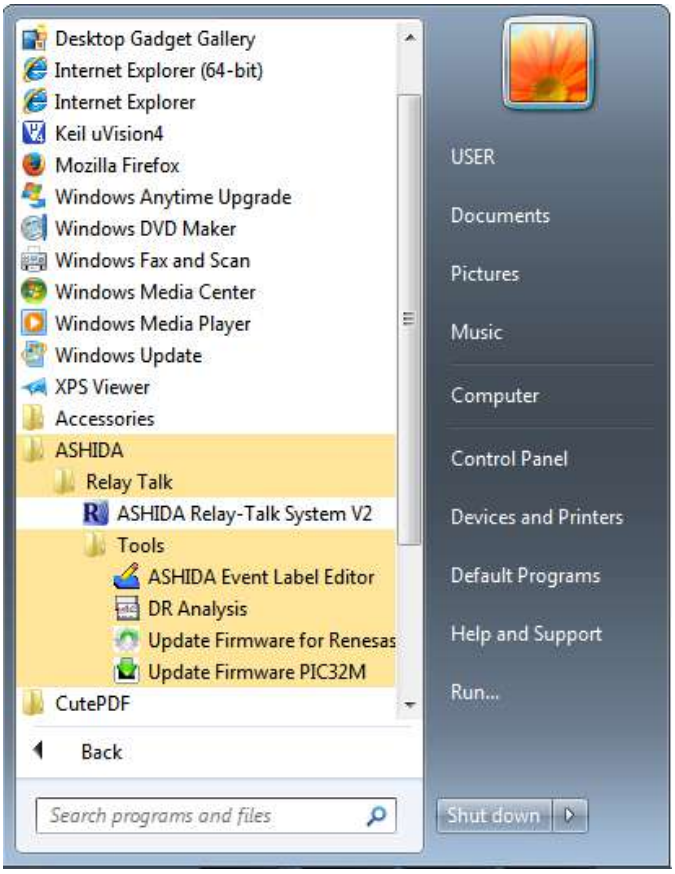


Figure 5: Relay Talk System Version2 in programs menu

A.2.4 Uninstalling and Repair ASHIDA Relay-Talk System

Step 1: To Uninstall the software go to windows Control Panel −>‘Add/Remove Programs’.

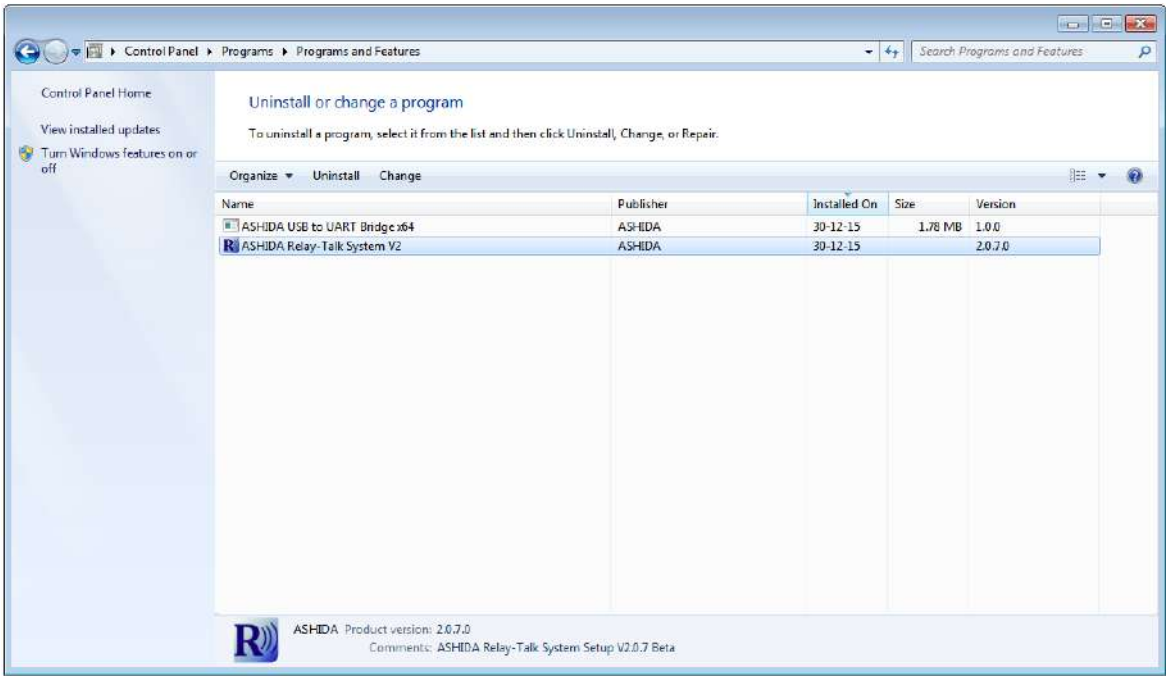


Figure 6: Relay Talk System Version2 in Programs

Step 2: Right click on ASHIDA Relay-Talk System

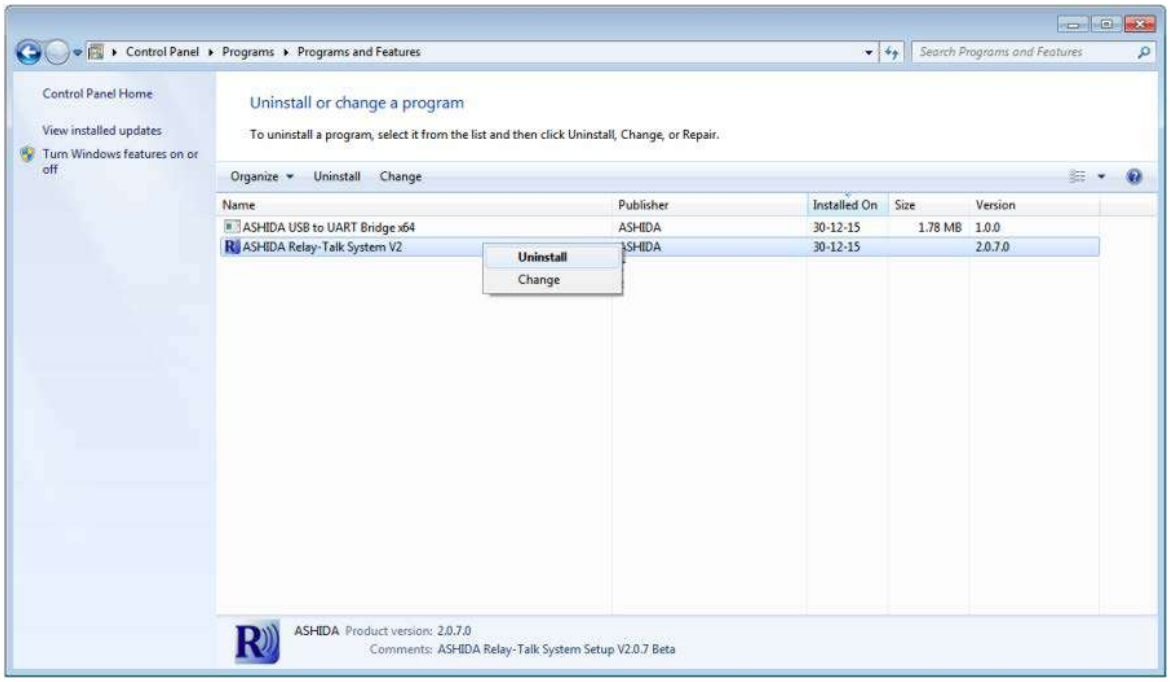


Figure 7: Confirmation to un-install Relay Talk System Version2

Step 3: To uninstall Relay Talk System Version2 click yes button.

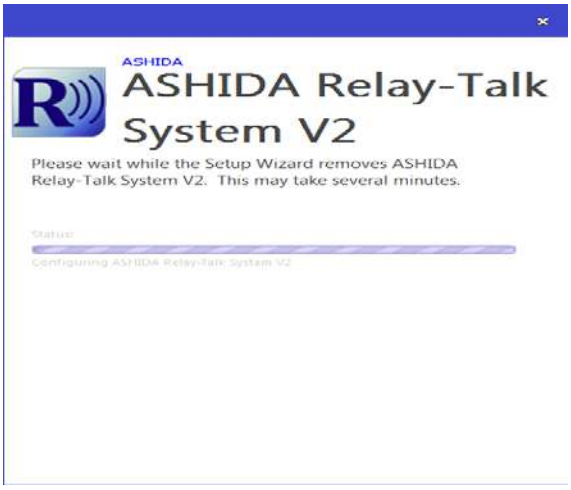


Figure 8: Relay Talk System Version2 – Un-Installation in Progress

A.3 ASHIDA Relay Talk System Version 2 (RTV2 S/W)

This section will guide the user for using ASHIDA Relay Talk System Version2, establishing the configuration and interface with the device.

To start Relay Talk System Version2:

- Click Start−>Programs −> ASHIDA−> Relay Talk−> ASHIDA Relay-Talk System V2
- Or click ASHIDA RelayTalk.exe in the Install directory (e.g. C:\Program Files \ASHIDA\Relay Talk\ ASHIDA RelayTalk.exe)

PC to BCU Connection

Personal computer can be interfaced to the BCU by using USB cable.

Relay Talk System Version2 – Main Screen

Following is the main screen of ASHIDA Relay Talk System Version2.

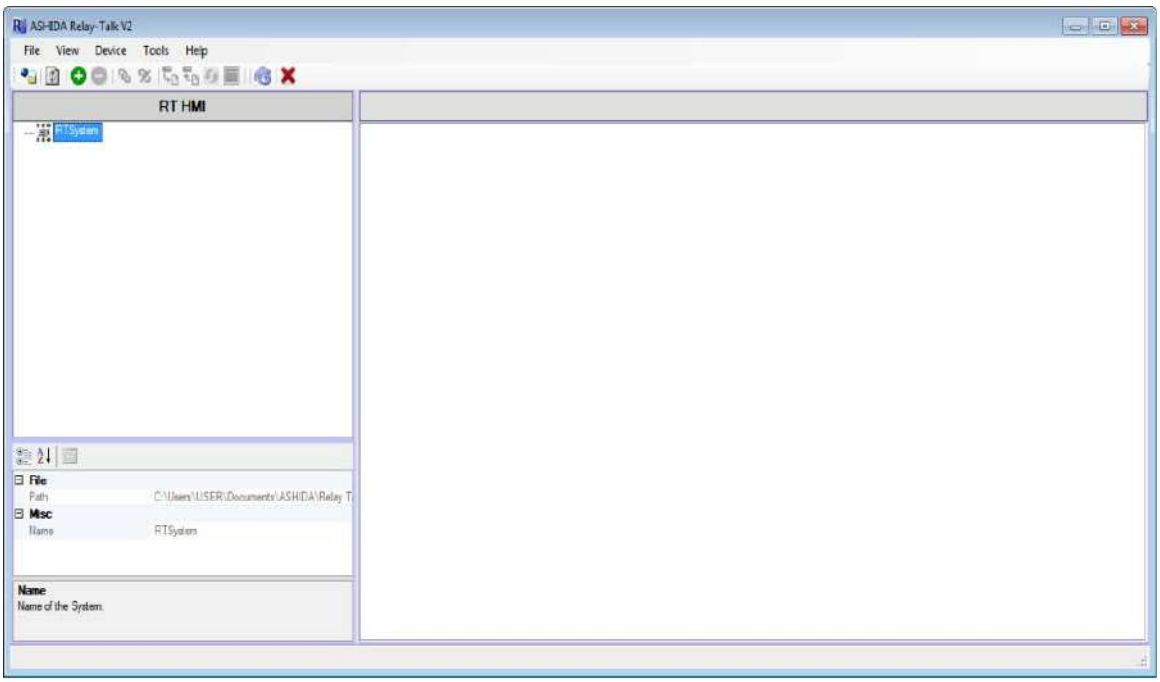


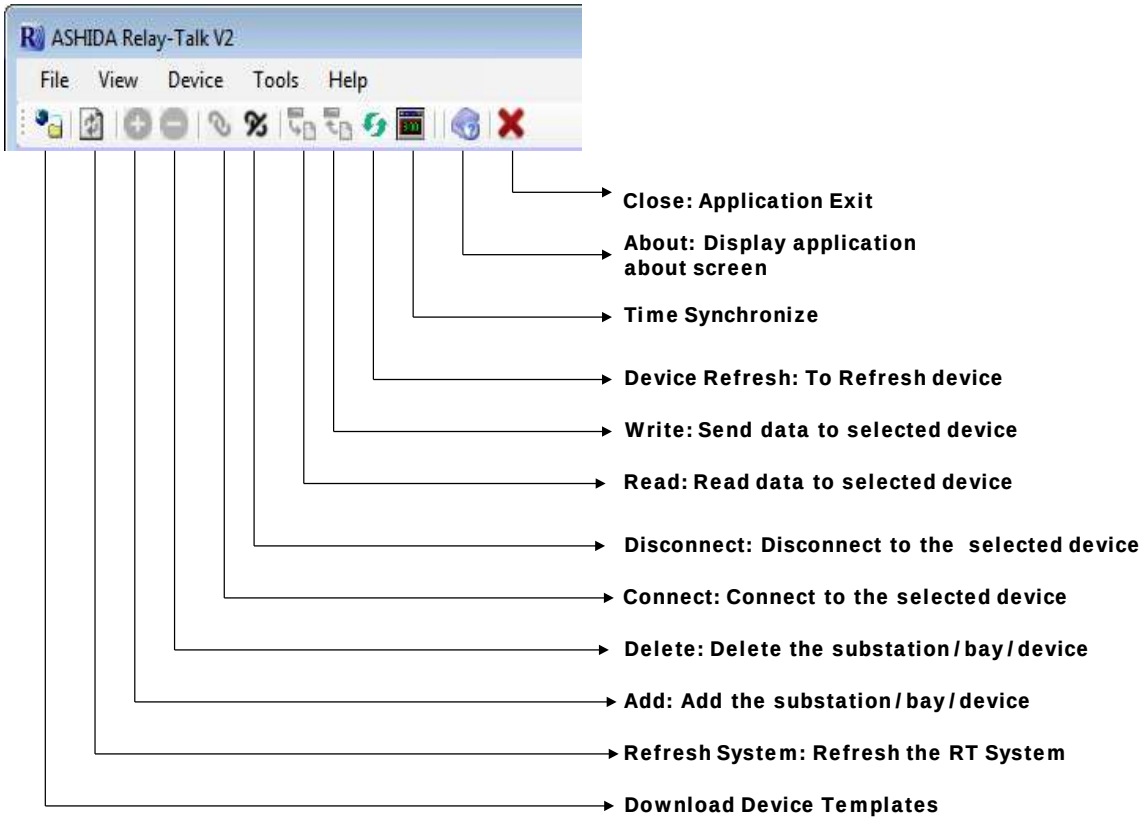
Figure 9: Main window of Relay Talk System Version2

A.3.1 Features in RTV2 Software

- Connection: Edit connection preference settings to interface with ASHIDA BCU Series.
- Settings: This function is to edit settings in online/offline mode. Also to read and write Settings from/to device.
- Event list: Can view the event list from device in online mode.
- Disturbance Record viewer: Can view the Disturbance record from device in online mode.
- History Faults: Can read the History Faults from Device with time and date in Online and Offline mode.
- Parameter View: Can read all Analogue parameters, Digital status from device in online mode.
- Status: Can read various events/Faults with date time online.
- Control: Can perform control operations
- Alias: This function is to edit DI/DO labels.

A.3.2 Standard Toolbar buttons

Following figure shows description of toolbar buttons:



A.3.3 Download Device Template

To Download Device template, click on “Download Device Template”. Following window will appear.

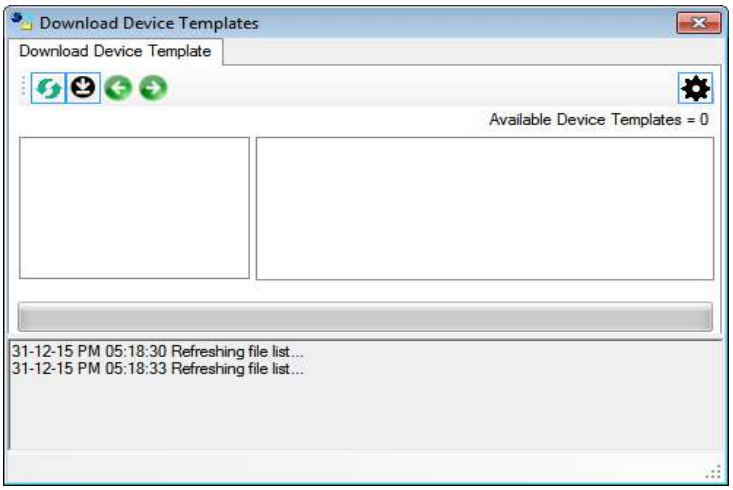


Figure 10: Download Device Template screen

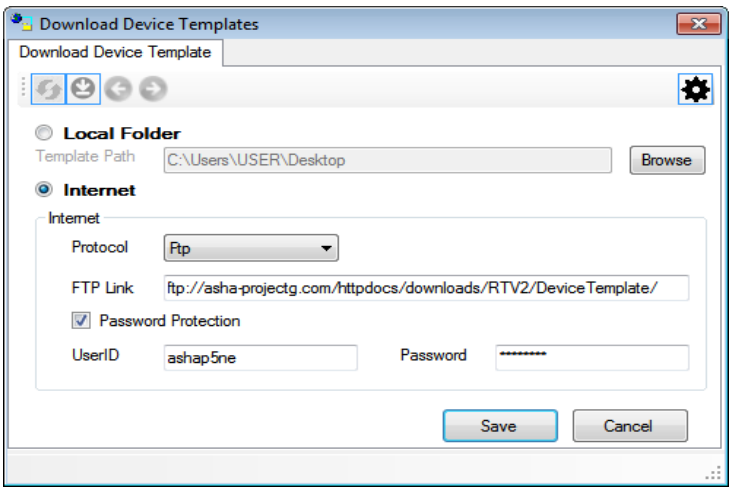


Figure 11: Download Device Template

Write Web URL and click save. Then click on Refresh button to check available Device templates. Select suitable Device template to download, and click on Download button.

A.4 Substation

A.4.1 Adding Substation to RT System

To add new substations right click on “RT System”. Following context menu will appear.

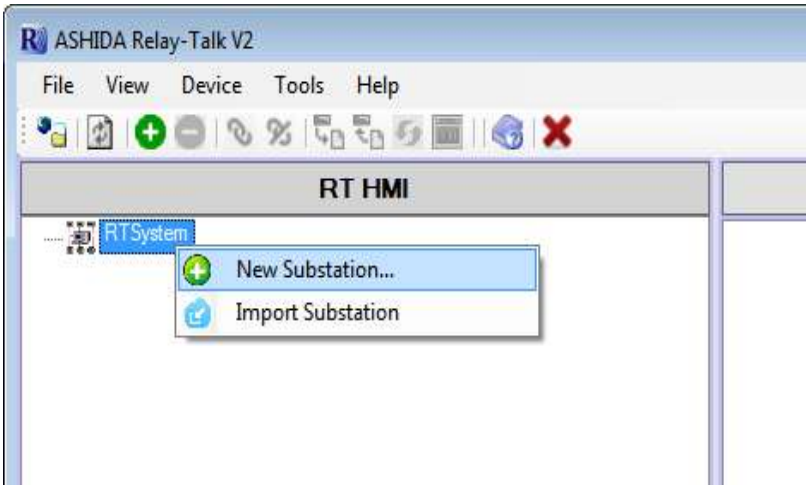


Figure 12: Add new substation

Now click on “New Substation” following window will appear.

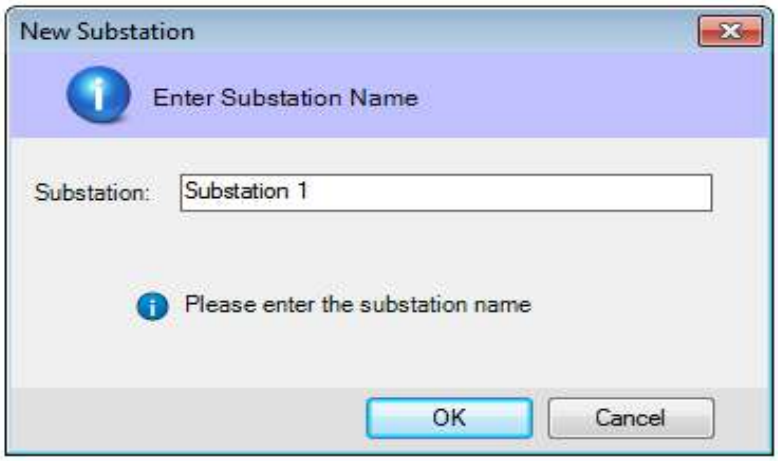


Figure 13: Write new substation name

Type a substation name and click OK. A new substation will be added in RT System.

A.4.2 Import Substation

To import substation right click on “RT System”. Following context menu will appear.

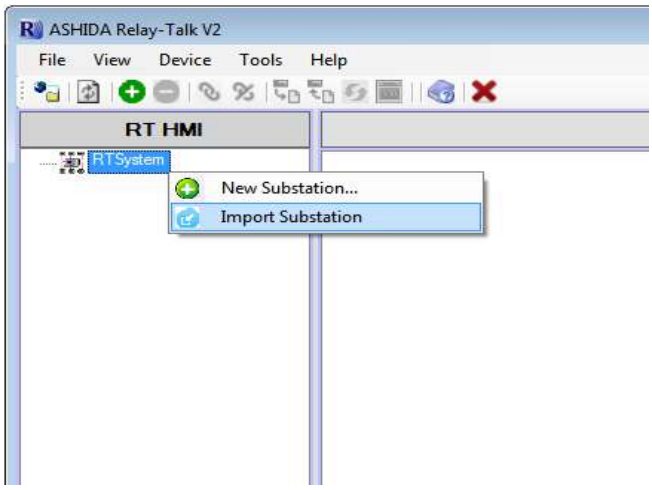


Figure 14: Import substation

Now click on “Import Substation”. In the “Import substation” dialogue select a system archive to import and click Open.

A.4.3 Export Substation

To export substation right click on substation. Following context menu will appear.

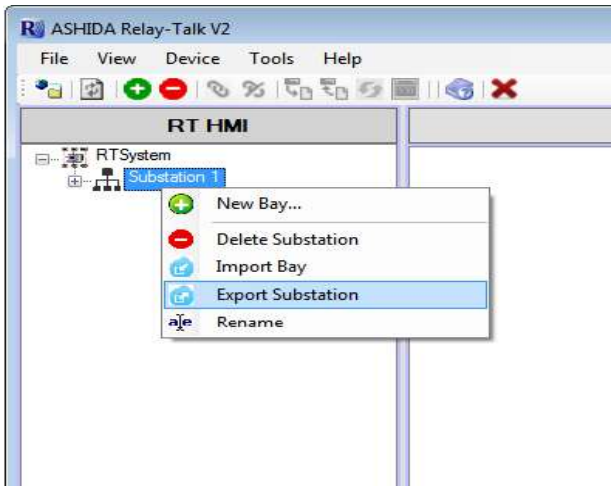


Figure 15: Export substation

Now click on “Export Substation” following window will appear.

Figure 16: Export substation dialogue

In the “Export substation” dialogue, select a destination path and click Ok.

A.5 Bay

A.5.1 Adding Bay to Substation

To add a new Bay right click on substation. Following context menu will appear.

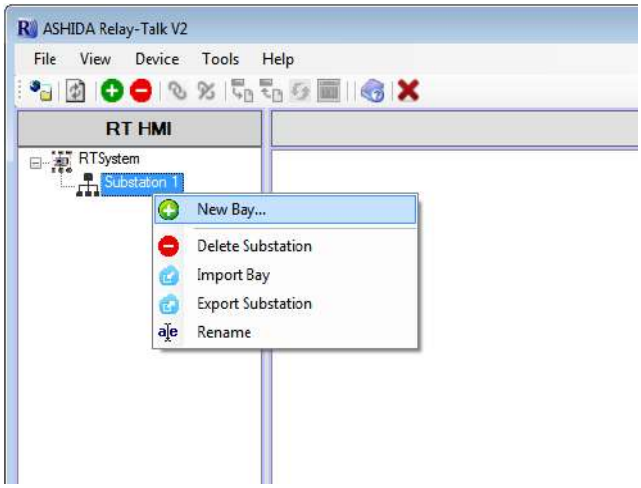


Figure 17: Add new Bay

Click on “New Bay” following window will appear.

Figure 18: Add new bay name

Type a bay name and click OK. A new bay will be added to RT System.

A.5.2 Import Bay

To import bay right click on substation. Following context menu will appear.

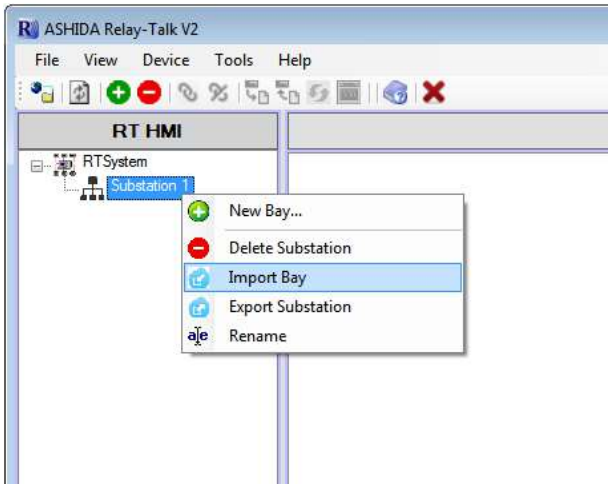


Figure 19: Import Bay

Now click on “Import Bay”. In the “Import Bay” dialogue select a system archive to import and click Open.

A.5.3 Export Bay

To export bay right click on Bay. Following context menu will appear.

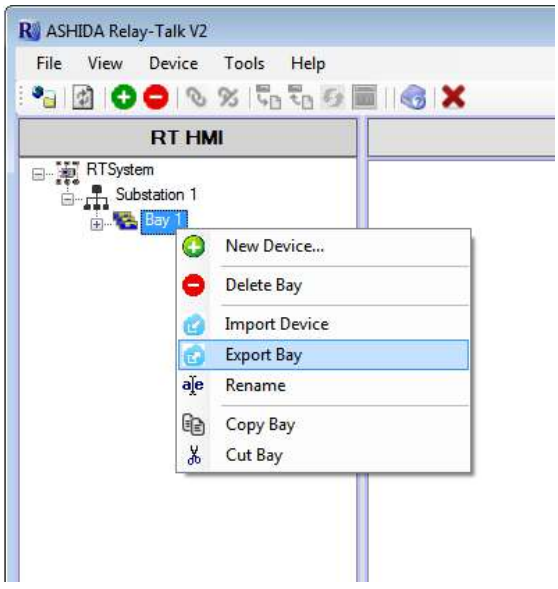


Figure 20: Export Bay

Now click on “Export Bay” following window will appear.

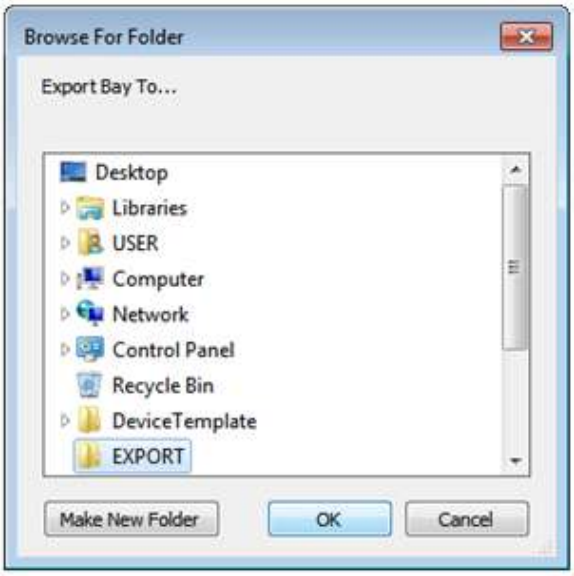


Figure 21: Export Bay Dialogue

In the “Export Bay” dialogue, select a destination path and click Ok.

A.6 Device

This section is generalized and applicable for all ASHIDA BCU models. The User should choose relevant Device Template based on BCU Model.

A.6.1 Adding New Device

To add a device right click on bay and select “New Device”

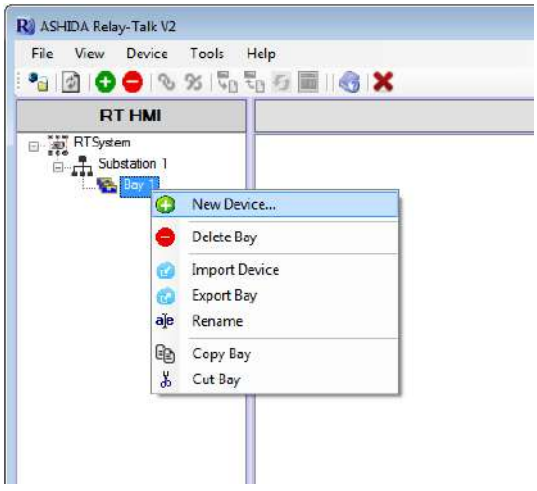


Figure 22: Add new device

After Downloading the device template, Click on Add Device then list of Available Device templates will display as follows:

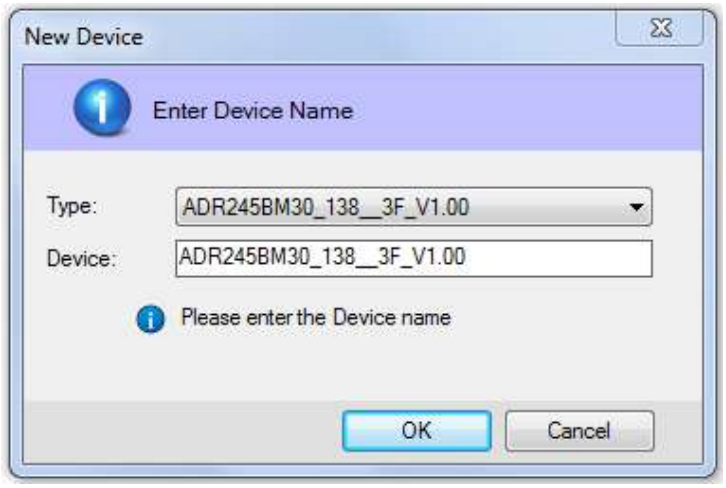


Figure 23: Enter device name

Choose suitable Device template from available types. Type a device name and click Ok. New Device will be added to selected bay.

A.6.2 Import Device

To import device right click on bay. Following context menu will appear.

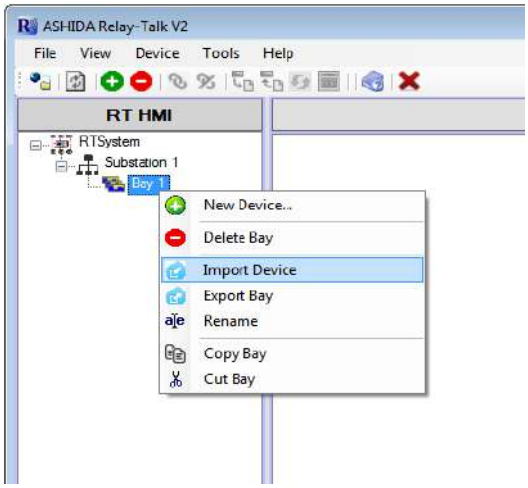


Figure 24: Import Device

Now click on “Import Device”. In the “Import Device” dialogue select a system archive to Import and click open.

A.6.3 Export Device

To export device right click on Device. Following context menu will appear.

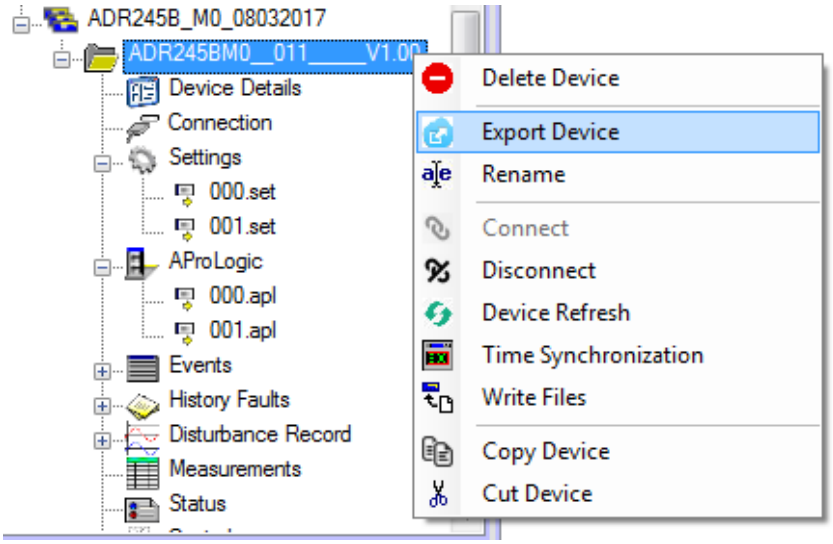


Figure 25: Export Device

Now click on “Export Device” following window will appear.

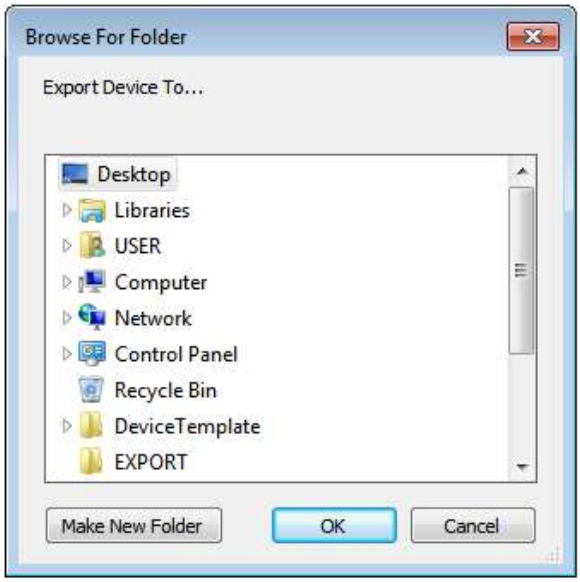


Figure 26: Export Device dialogue

In the “Export Device” dialogue, select a destination path and click Ok.

A.7 Communication Setting

A.7.1 Editing connection settings of Device

To Edit or Initialize Serial communication Settings Double click on Connection button. Following window will appear on screen.

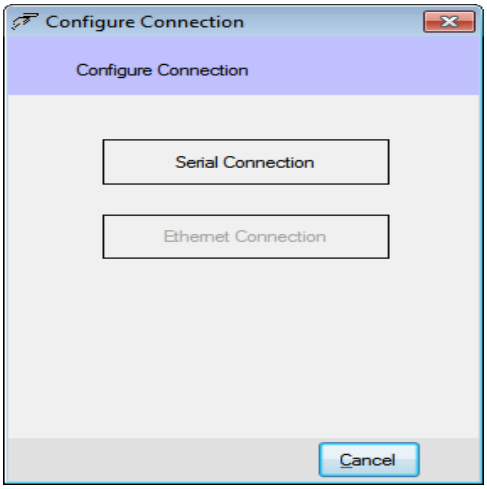


Figure 27: Serial Connection

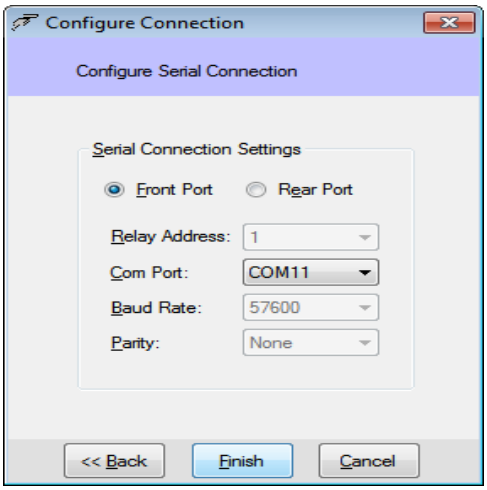


Figure 28: Communication settings

Edit communication settings as required and click Finish to save.

A.7.2 Communicating with Device

Once the communication settings are complete, the Device can communicate using ASHIDA Relay Talk System Version2. The Configurator internally uses a separate communication driver to communicate with the device. This communication driver communicates with the device using

communication parameters (e.g. com port, baud rate, parity) supplied in device connection. Status of this driver is reflected in bottom status bar at the rightmost corner.

Figure 29: Offline/Online status

It is 'offline' in red background at the start of the system & once the driver is successfully loaded it turns to 'online' in green background. No communication with the device is possible till the driver is successfully started & is 'online'. Select the device and then click on Connect button.

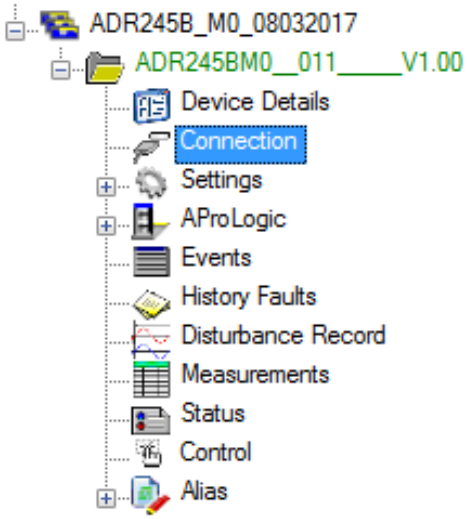


Figure 30: Connect to device

After successful communication, device name will turn into green colour.

A.8 Settings

A.8.1 To View Settings files from Device

Stored settings can see under Settings node like 000.set etc.

To read the settings from device double click on Settings file, then following settings menu will appear on screen.

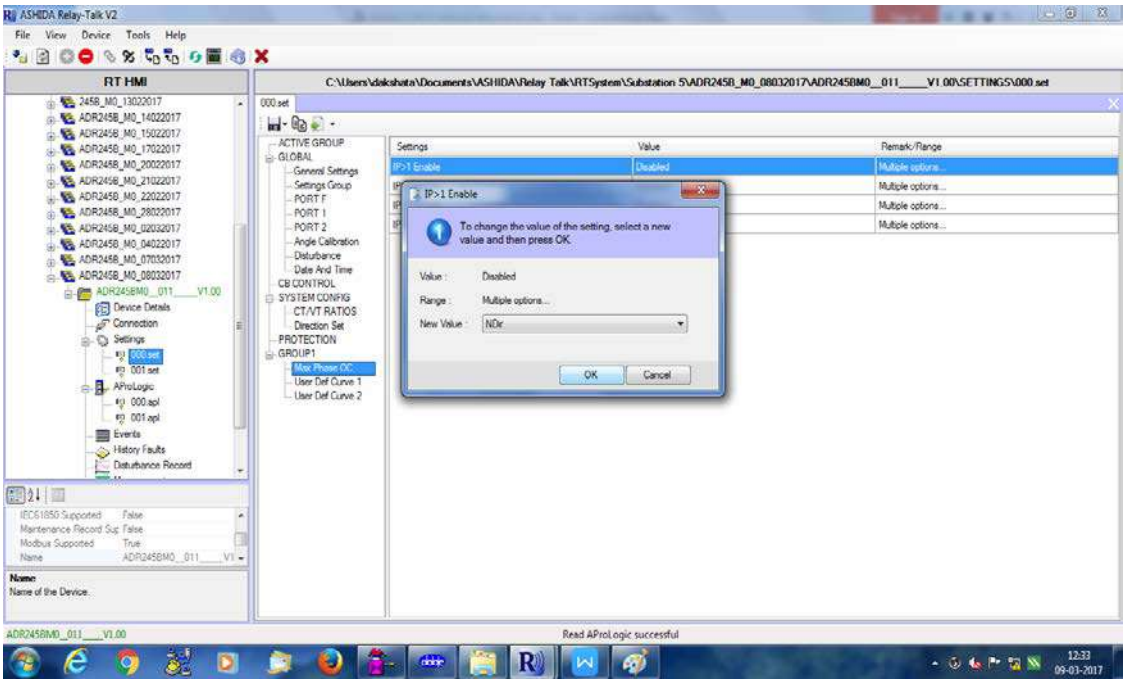


Figure 31: View Settings File

Note: - Settings with gray coloured lines are Read-Only Settings. To edit the editable settings double click on the same.

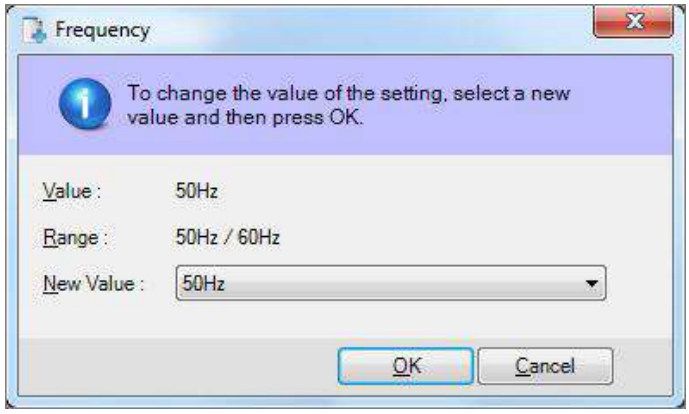


Figure 32: Edit settings file

A.8.2 Downloading Settings from Device

To download settings from device, right click on Settings node. Following window will appear.

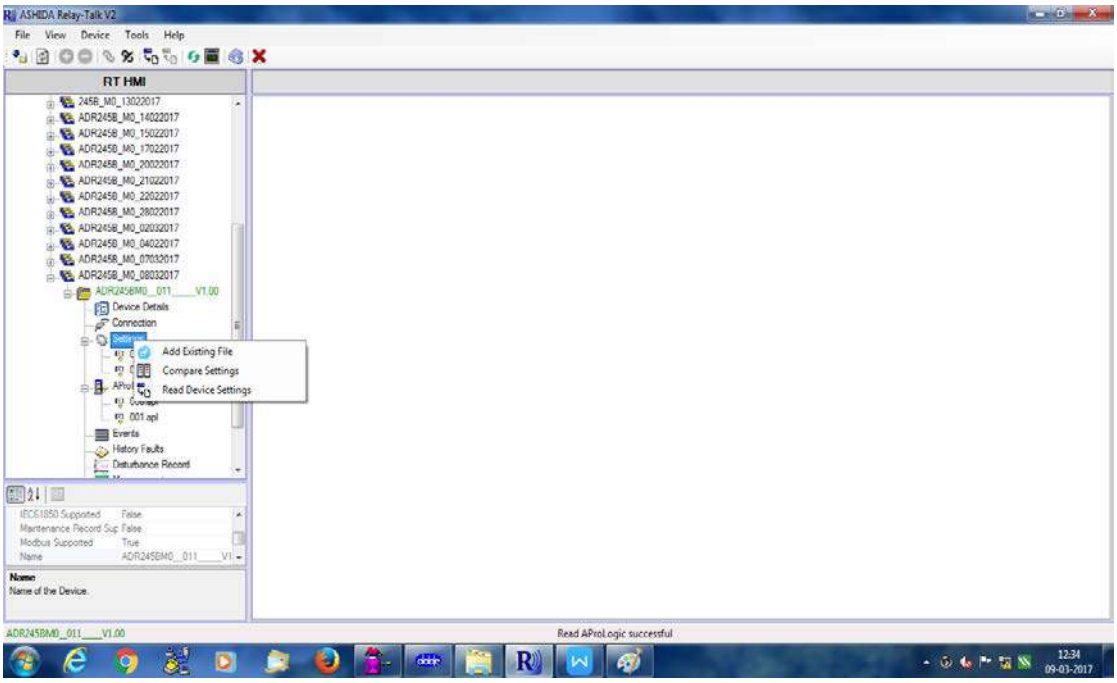


Figure 33: Read device settings

Click “Read Device Settings” to read the settings file. Following window will appear

Figure 34: Read settings file name

Type a setting file name and click Ok. It will download the device template.

After successfully reading the settings file of the device double click on set file. Following window will appear.

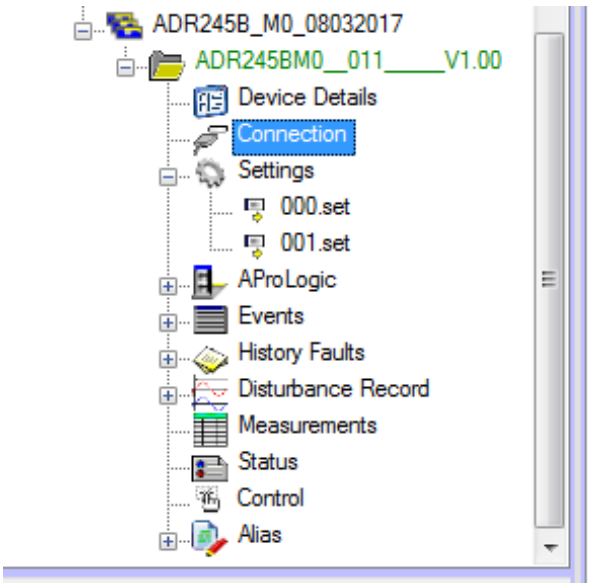


Figure 35: New setting files display

A.8.3 Restore Settings from Device

If there is no settings file available, it can be retrieve using “Restore Settings File” from Device Template.

To restore settings from device, right click on Settings node. Following window will appear.

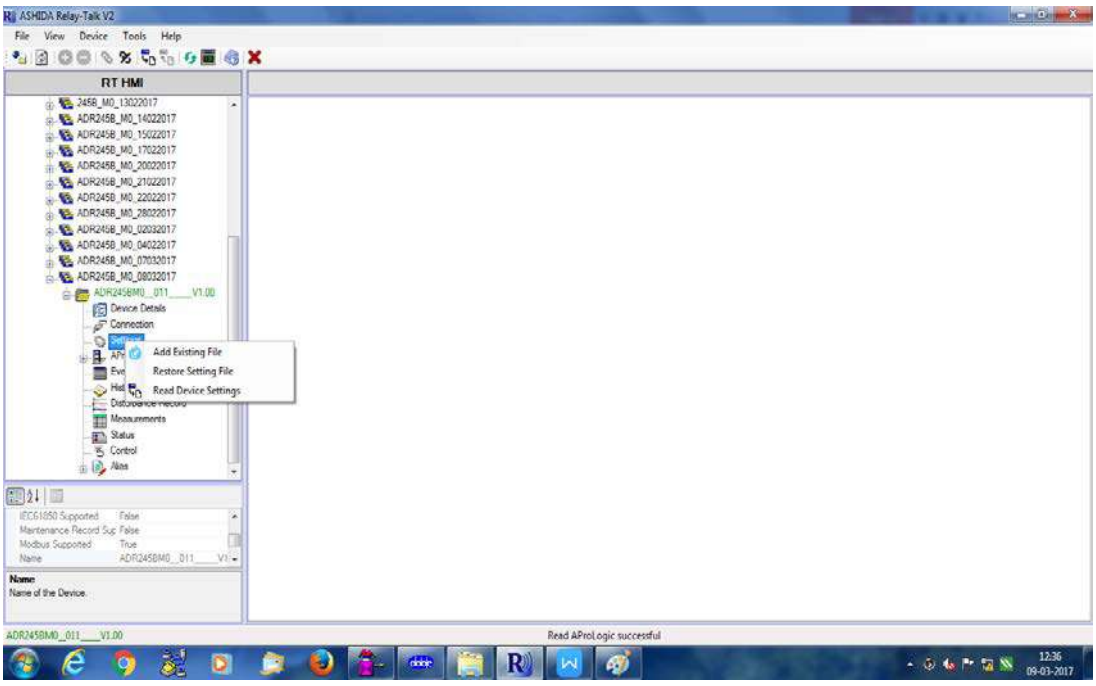


Figure 36: Restore setting files

Click “Restore Settings File” to restore the settings.

A.9 AProLogic

The BCU is provided with tool known as AproLogic, in which user can program his/her logics as per is requirement such as Motor reacceleration/ Auto Bus Transfer Scheme (ATS) etc. All type of gates such OR/NOR/NOT/NAND/AND/XOR/XNOR/SR Flip-flop are available along with Operating / Resetting Timer.

It consists of “Input Groups” & “Output Groups”. Input groups consist of assignable protection Pickup & Trip Inputs, CB Control Inputs, Binary Inputs, Network inputs i.e. GOOSE Subscriber, Logic equation inputs i.e. Boolean equation & Virtual Input Output equations. Output groups consists of Binary outputs, Logic equation inputs i.e. Boolean equation & Virtual Input Output equations, LEDs Green/Red, Network outputs i.e. GOOSE subscribers, General commands like Remote reset, general trip, DR Trig, CB 52A, CB 52B, etc. (For actual list of input / output signal please refer communication map). We can assign Inputs from Input Group to particular output from Output groups by creating logic equation using gates OR, AND, NOR, NAND, XOR, Flip Flop, Counter by assigning settable Operating Time & Reset time to Boolean equation.

A.9.1 Read AProLogic

To read new AProLogic file from the device right click on AProLogic and select 'Read AProLogic’. To open existing AProLogic file, double click on *.apl file.

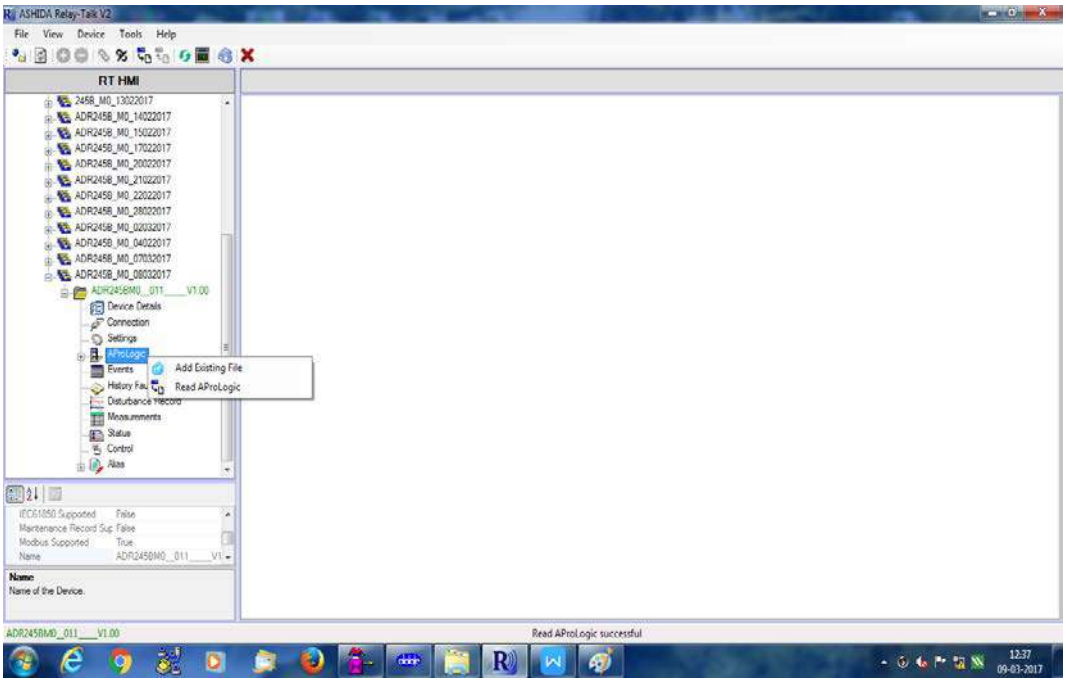


Figure 37: Read AProLogic

Save as dialog box will appear for saving the name of the file. Click OK to save the file.

A.9.2 Edit and Write the AProLogic to a Device

Select a device and expand AProLogic node. Double click on iom file and the file will open in the main document window. Select output, assign applicable inputs. Edit TOperating, TReset and HR/SR.

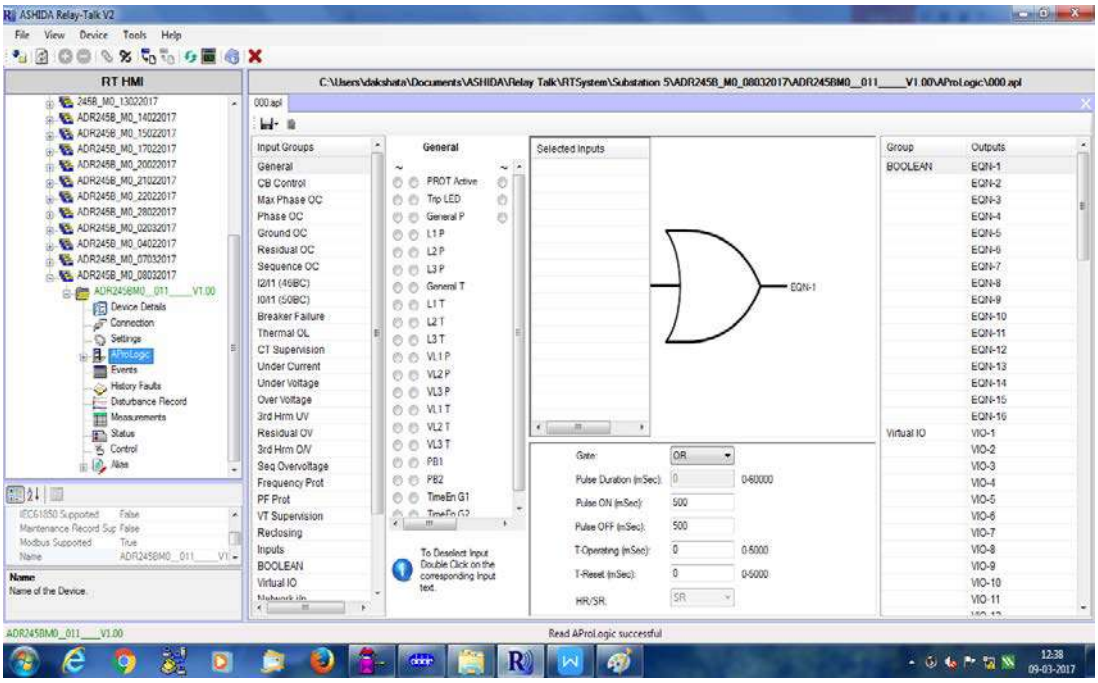


Figure 38: Edit TOperating, TReset and HR/SR

A.9.2.1 Logical Equation for Gate Operation

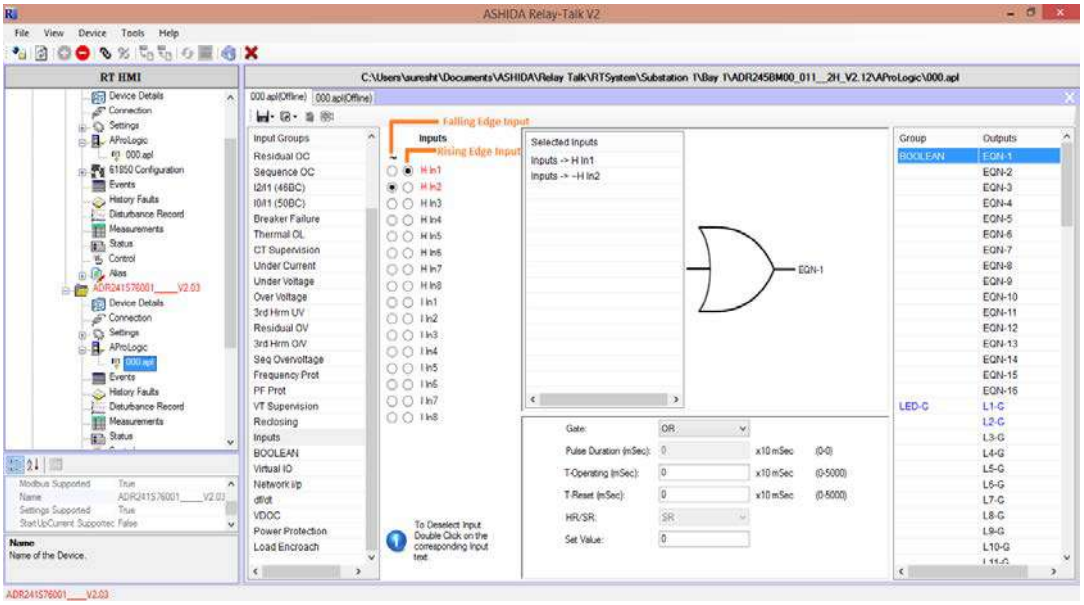


Figure 39: OR, AND, NOR, NAND, XOR Gate

Select the Output from Output group & then select input from Input groups assign to Selected Input section & select the OR or AND or NOR or NAND or XOR gate from gate selection button and set T. operating Time & T. Reset Time as per requirement. Assigned Output will operate as per selected gate.

A.9.2.2 Logical Equation for Flip Flop Operation

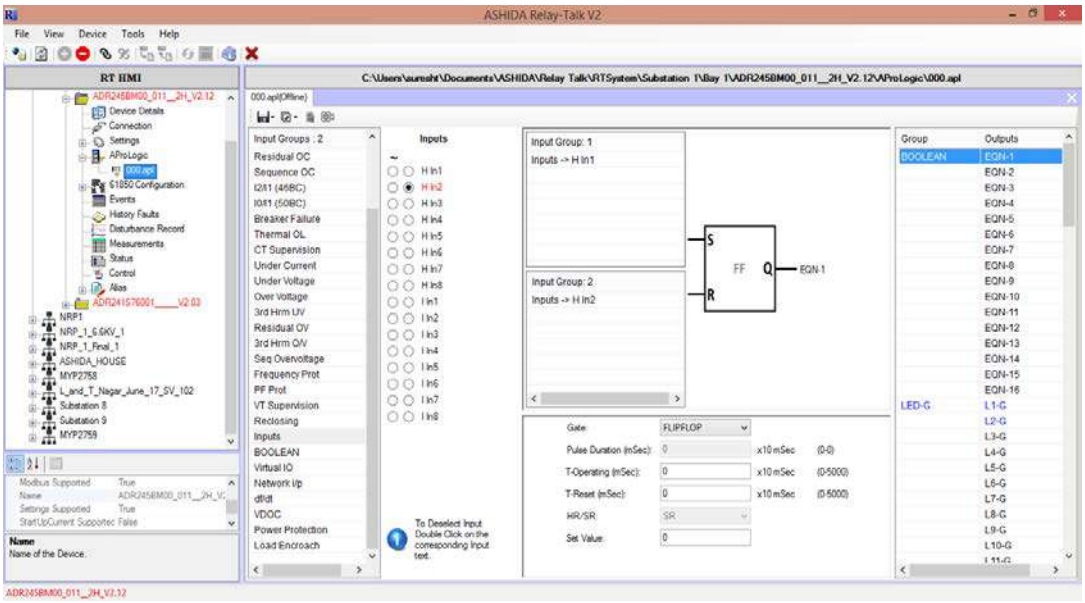


Figure 40. Flip Flop Gate

of Flip Flop gate: When Input H In 1 of Input Group 1 when becomes High to low assigned to S input of FF will be high & Output Q of FF will be High continuously as per T. operating time set when Input H In 2 of Input Group 2 when becomes High to low assigned at R input of FF the High out Q will become Low considering the T. Reset time.

A.9.2.3 Logical Equation for Counter Gate:

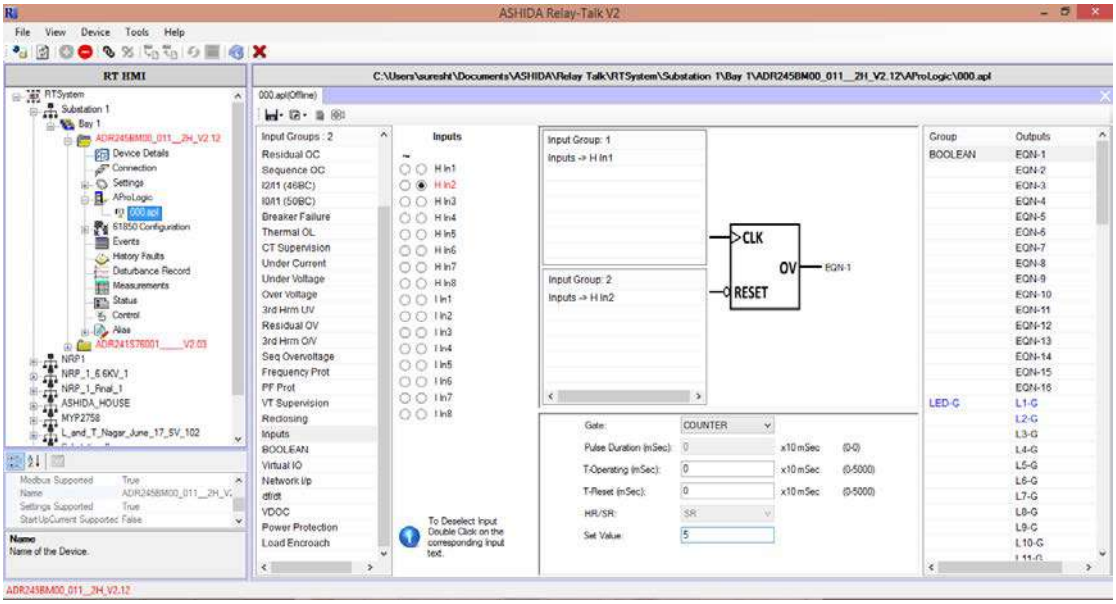


Figure 41: *Counter Gate*

Counter gate consists of Inputs “CLK & Reset” & output “OV” which operates on the “Set Value”. When Input H In 1 of Input Group 1 when becomes High to low assigned to CLK input only at 5th time (set value) Counter gate output OV will be high & Output OV of counter gate will be High continuously as per T. operating time set when Input H In 2 of Input Group 2 when becomes High to low assigned at Reset input of counter gate the High out OV will become Low considering the T. Reset time.

An example logic implementation using Boolean Equation is shown below:

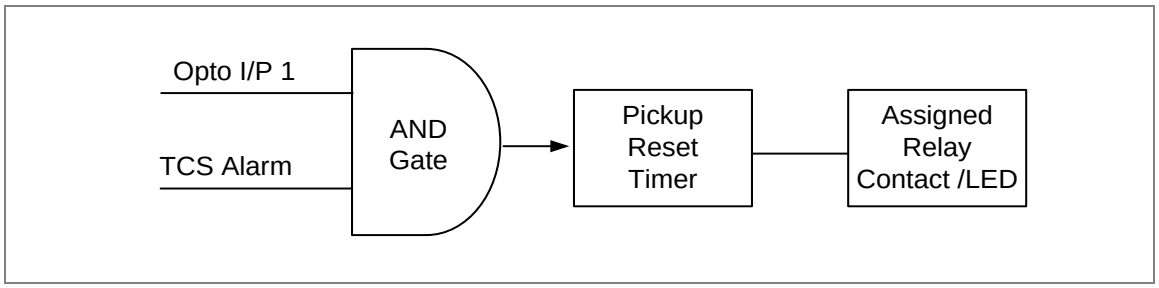
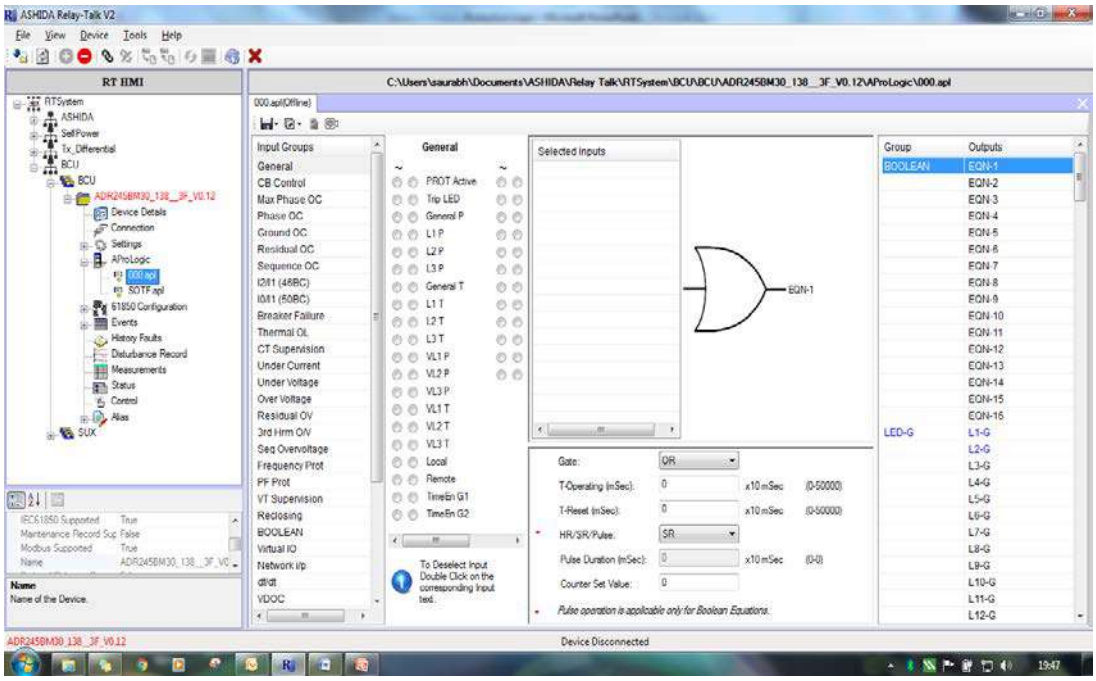
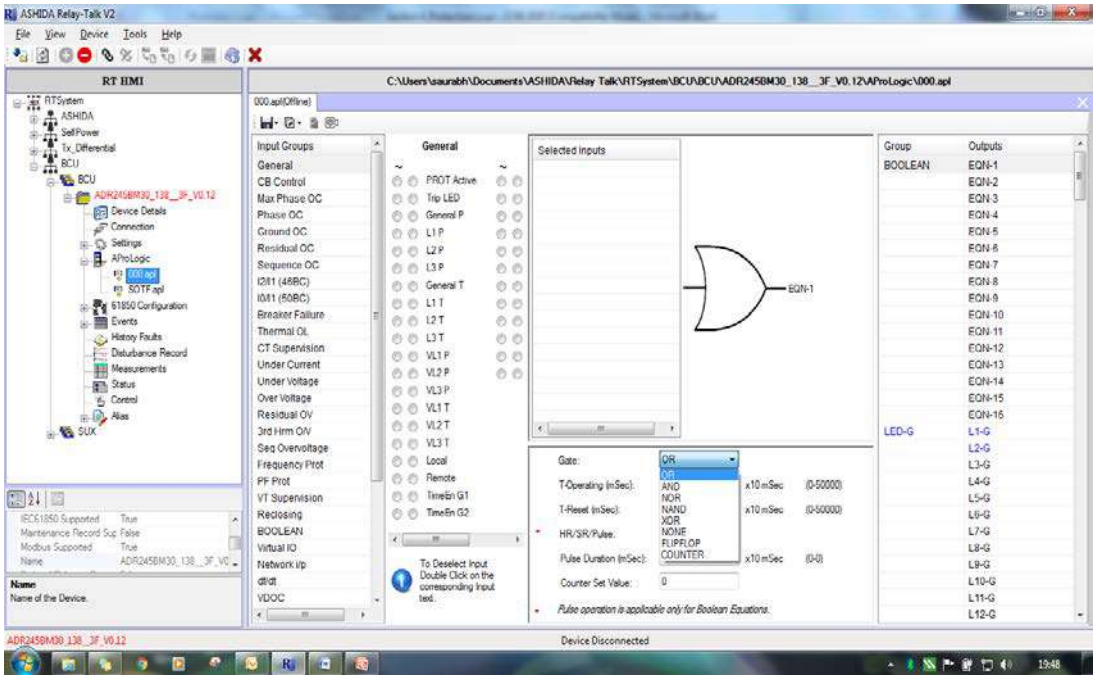


Figure 42 : *AND Equation Logic Example*

In the above example of logic implementation, there are two inputs to the AND equations, one is ‘SF6 Gas low signal’ and other input is ‘TCS Alarm’ which is internally generated signal. When both the input signals are active. Then the result of AND equation will be active. This output can be used to block all protection functions through an external wiring.

Programmable Logic Configuration Via RTV2 Software:





A.9.3 View AProLogic Report

To view AProLogic Report open “*.apl” file and click on Report Option.

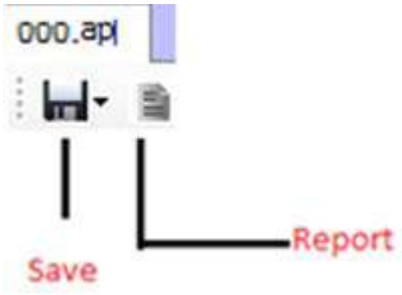


Figure 43: Save & Report

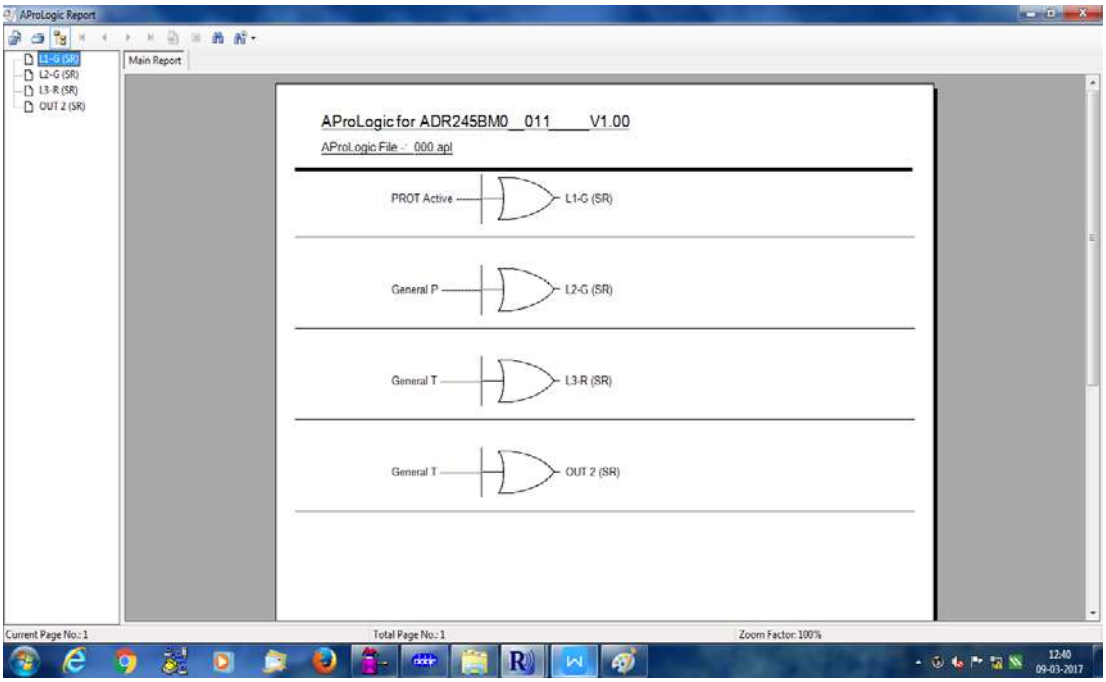


Figure 44: AProLogic Report

A.9.4 Restore AProLogic from Device

If there is no setting file available, it can be retrieved using “Restore Settings File” from Device Template.

To restore AProLogic from device, right click on AProLogic node. Following window will appear.

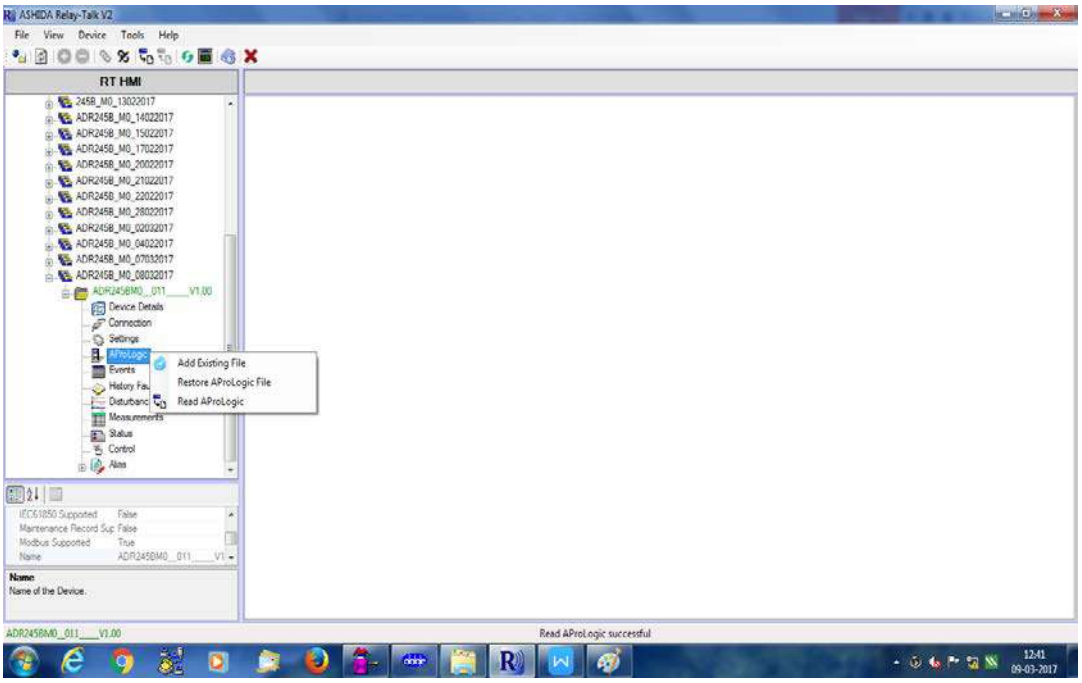


Figure 45: Restore AProLogic files

Click “Restore AProLogic File” to restore AProLogic.

A.10 Events

The event records can view directly on BCU screen, or can view in ASHIDA Relay Talk System Version2.

When any Events occurs Event file will automatically generate under Events node or Events can be read from BCU using ‘Read Events’

A.10.1 Read Events

To read new event file from the device right click on Events and select 'Read Events’.

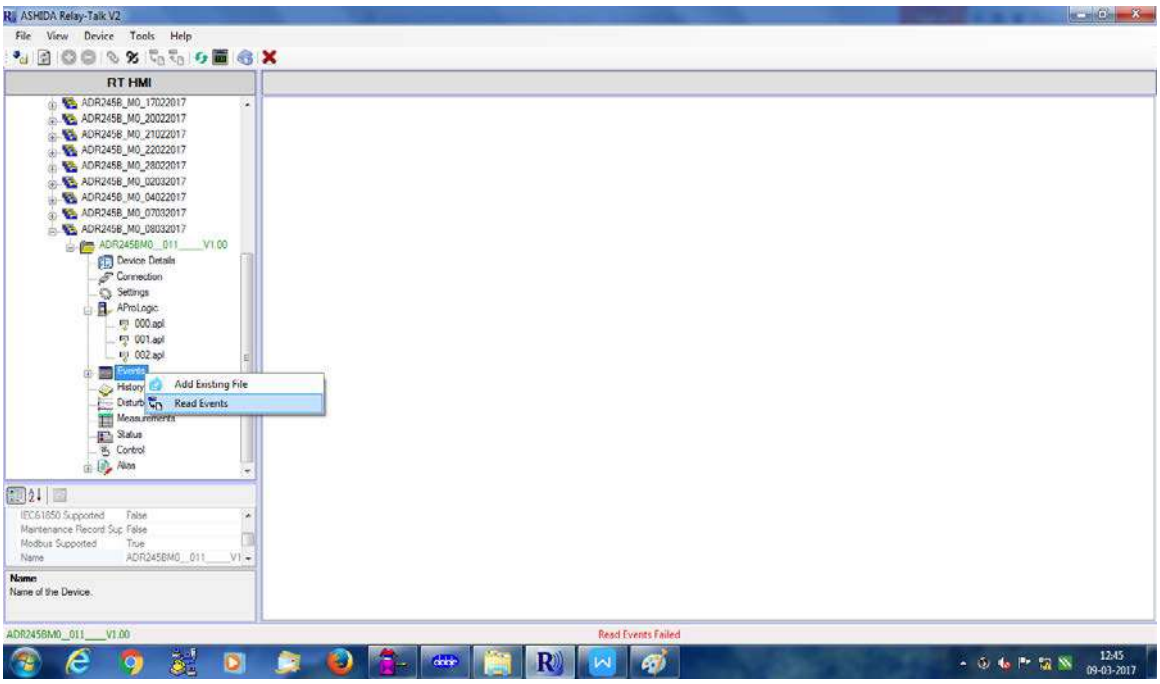


Figure 46: Read IO Mask

A.10.2 To View Events

To view events data, double click on Event file. Event list with time, date and parameters will display on screen. Following window will appear on screen.

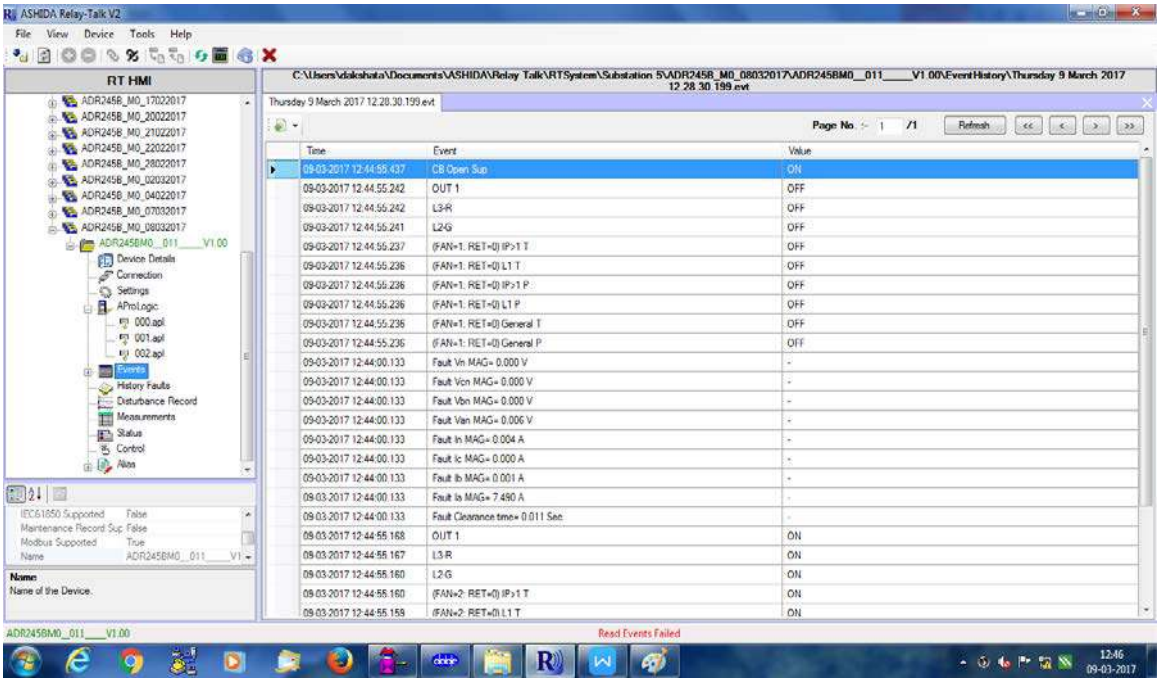


Figure 47: View Events

A.11 History Faults

History Faults are continuously recorded till the memory is available, when the memory gets full, the oldest fault automatically get erased and the new fault will recorded on the same.

(Like First In First Out Logic)

Trip count, Tripping Timing, Fault Flags and Fault Value with Time and date will display in history faults.

A.11.1 To read the History Faults from Device

To Read history Faults from device right click on History Faults then click on Read History Faults. Following window will appear on screen.

History file will get added under the History Faults node.

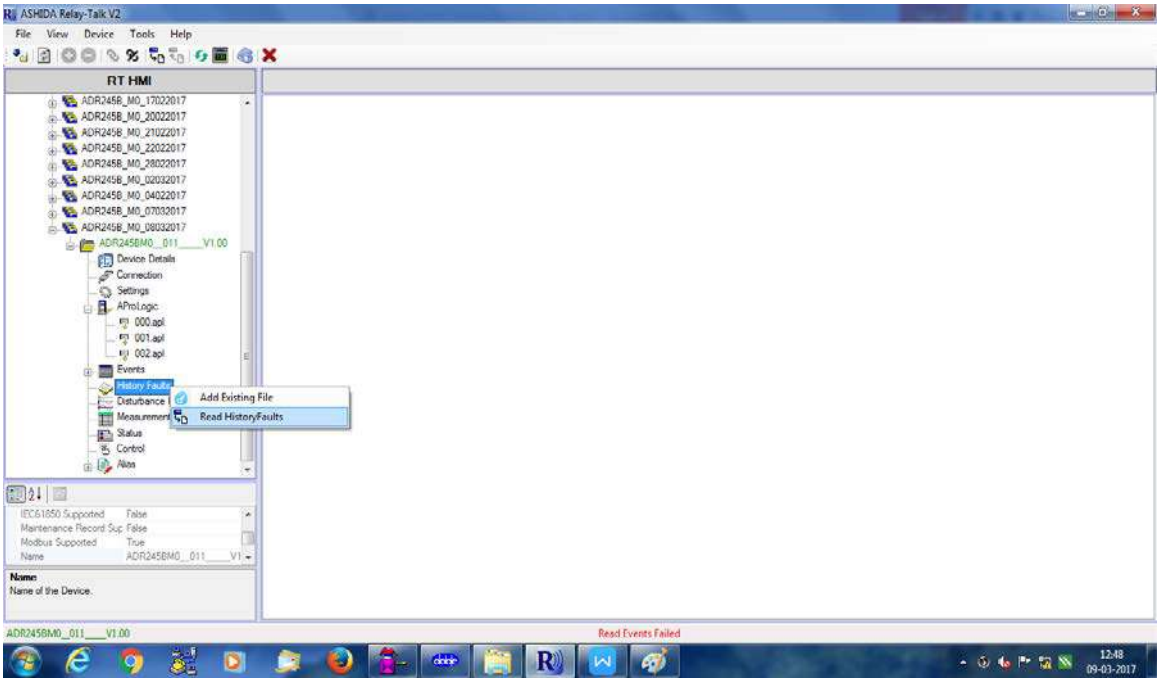


Figure 48: Read History faults

A.11.2 To view the History Faults file

To View the History Fault file double click on respective History Fault file.

Following window will appear on screen.

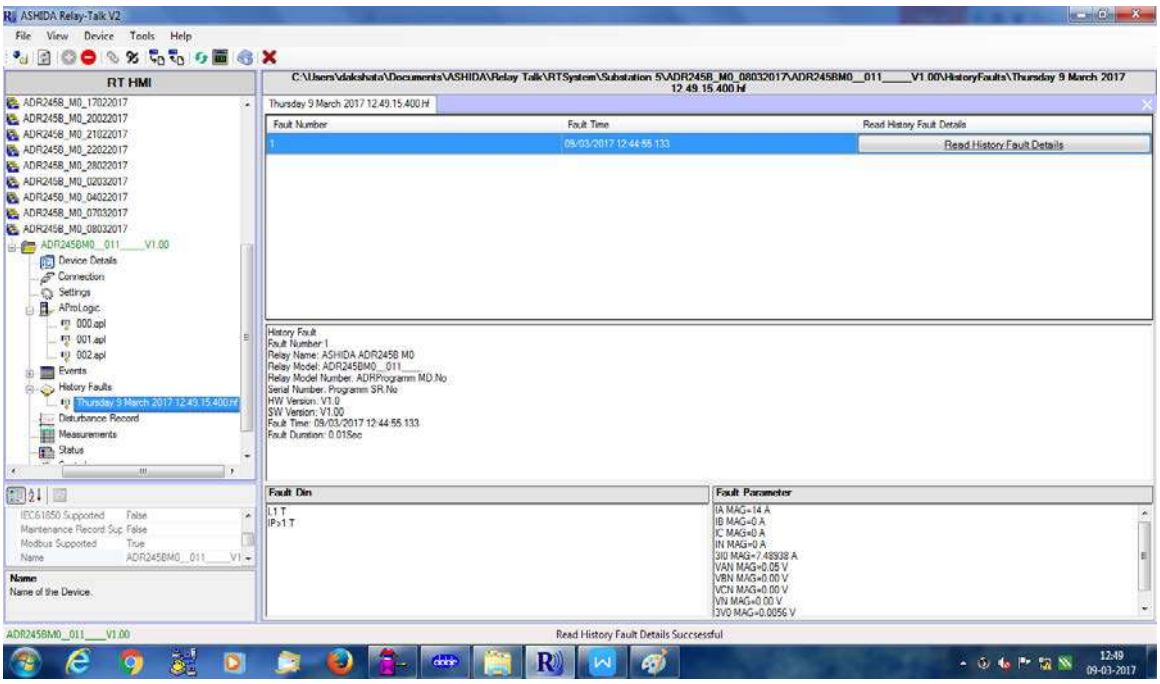


Figure 49: View History Faults file

A.12 Alias

To edit DI/DO labels of specific Function number and Information number go to Alias node. Double click on Alias node screen which will open in the main document window. Double click on record which needs to change. Following window will appear on screen.

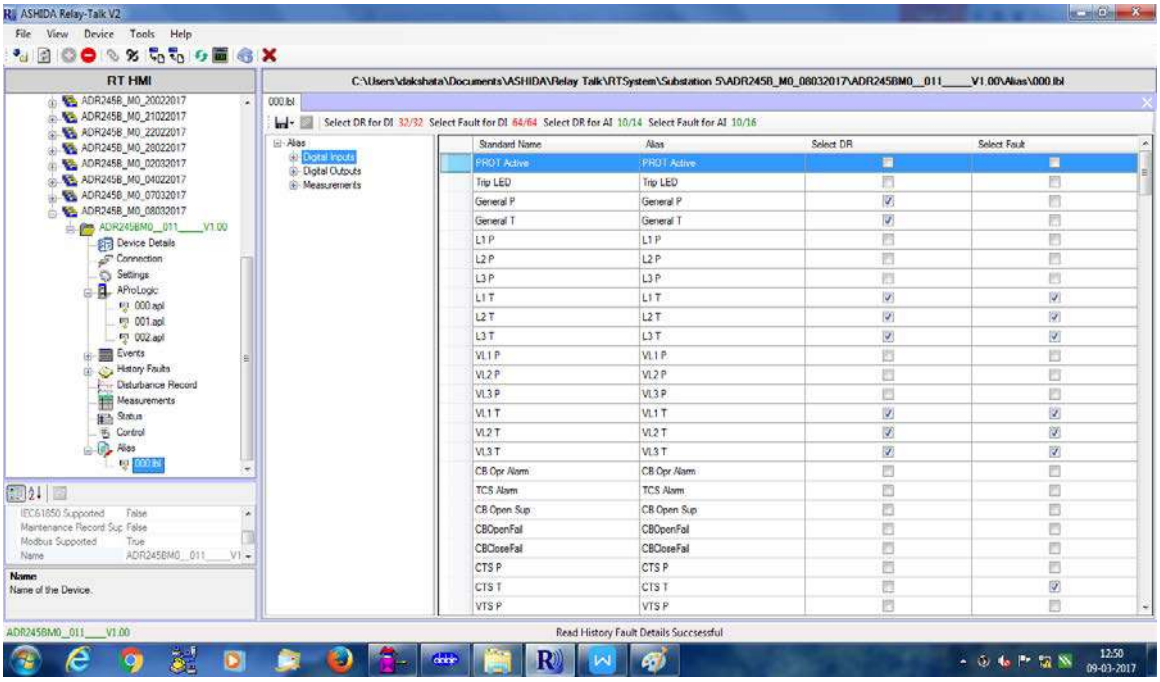


Figure 50: Alias screen

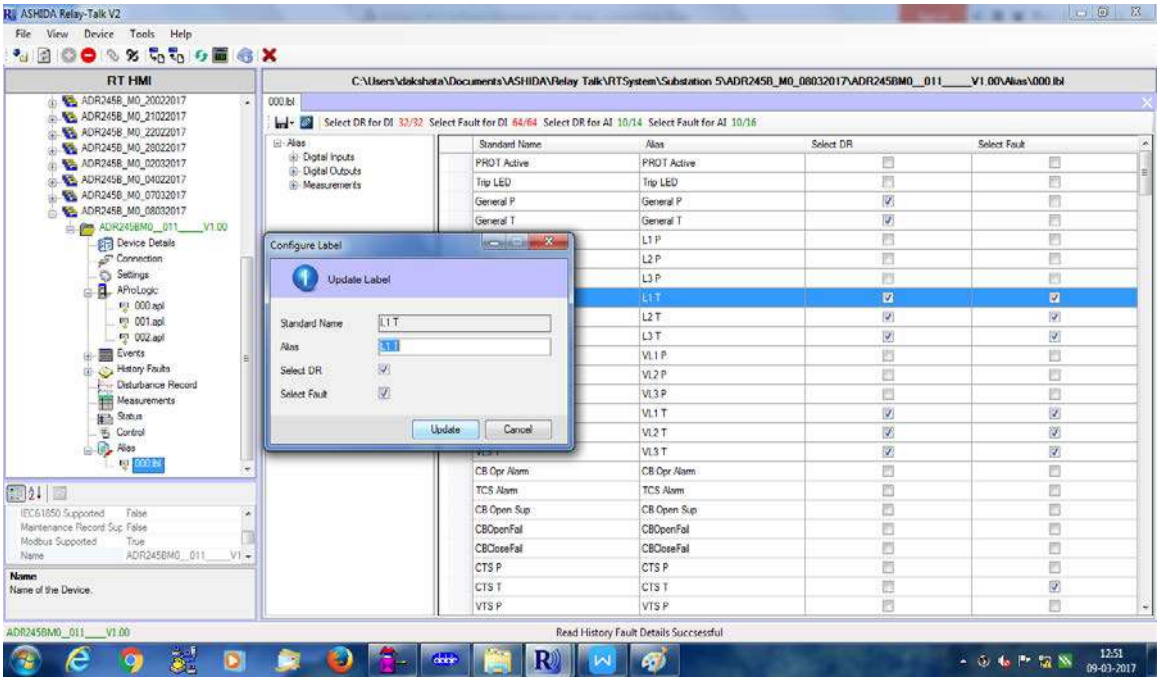


Figure 51: Change Alias

A.13 Control

Select a device and go to Control node. Double click on Control node screen which will open in the main document window. Select Control and press Operate Control button.

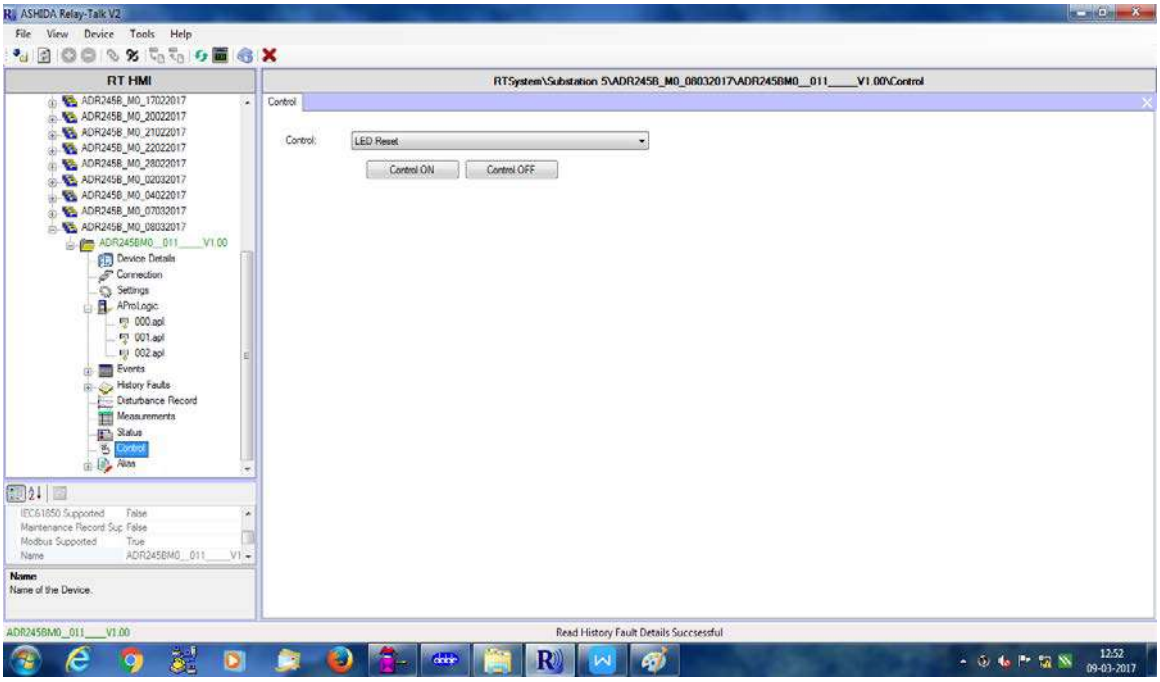


Figure 52: Operate Control

A.14 Disturbance Record

Disturbance record is continuously recorded till the memory is available. When the memory will be full, the oldest record automatically gets erased and the new record will record on the same. (Like First In First out Logic).

Disturbance record stores 12 samples per cycle. The same record can be shown in ASHIDA Relay Talk System Version2. The following window shows the recorded disturbance record.

A.14.1 Show the Disturbance Record from Device

To View Disturbance Record right click on 'Disturbance Record'.

Following window will appear on screen.

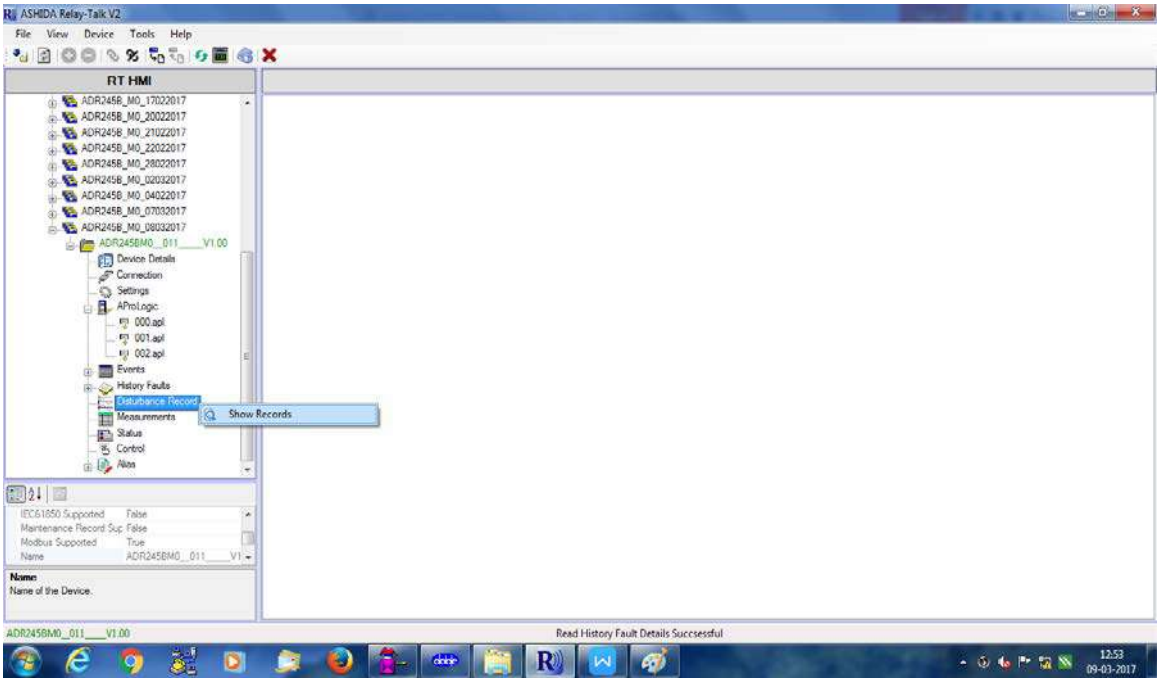


Figure 53: Show Disturbance Record

A.14.2 Read Disturbance Record from Device

To extract disturbance record click “Read DR” from the grid. Following window will appear.

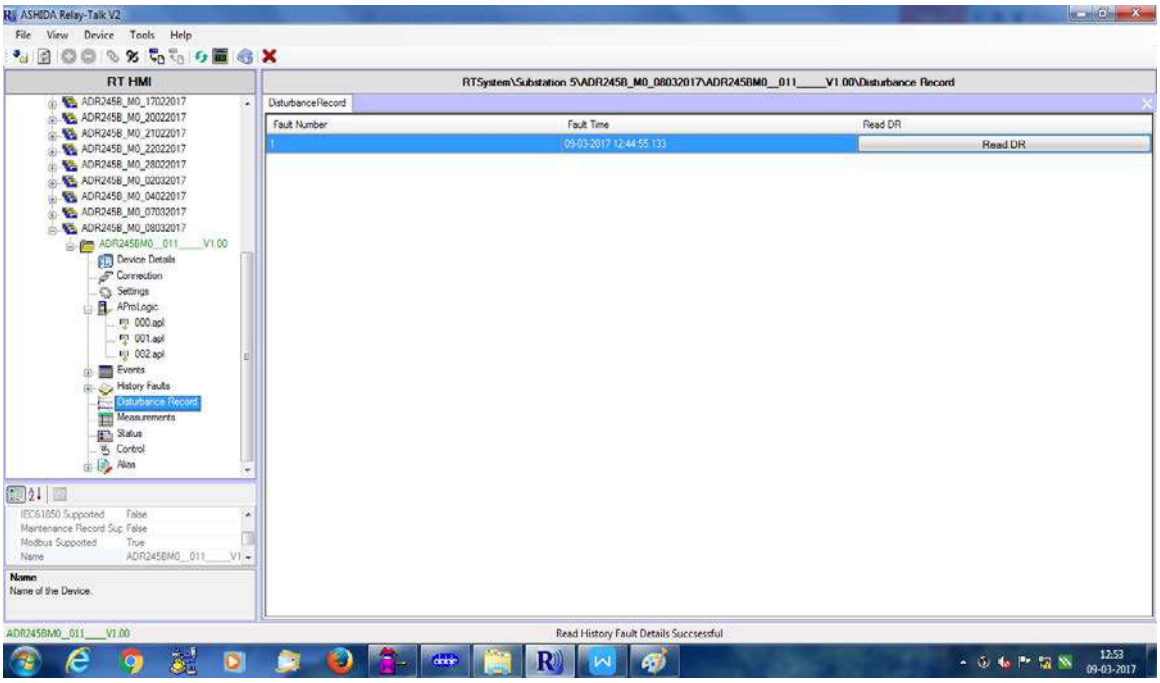


Figure 54: View Disturbance Record

After successful reading, extracted disturbance record file will appear in the Disturbance record node.

A.14.3 View Disturbance Record file

To view the disturbance record file double click on the file. It will open the file in DR Analysis and RELAY-DRV.

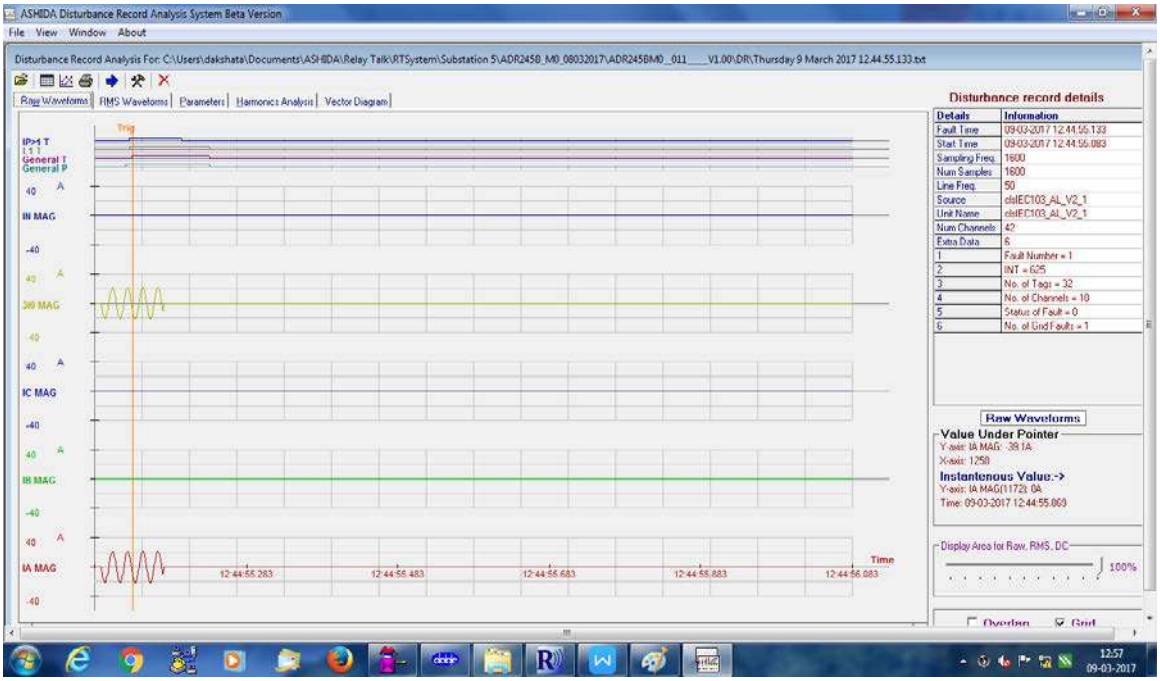


Figure 55: View disturbance record in RELAY-DRV

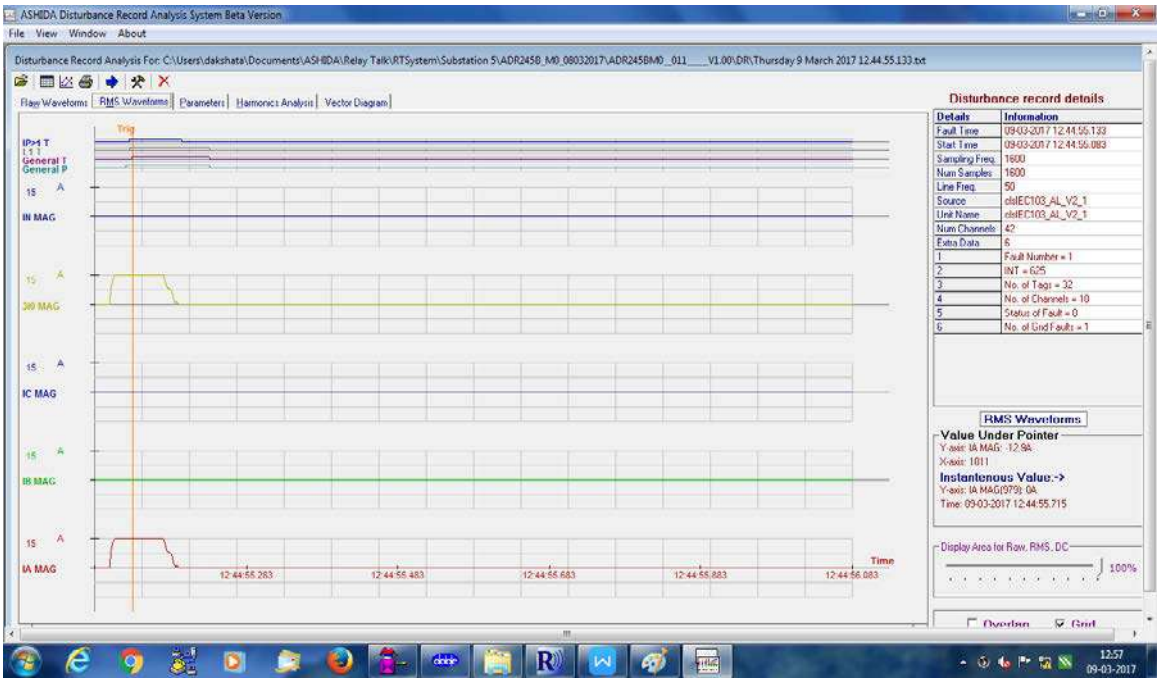


Figure 56: View disturbance record in RELAY-DRV

A.15 Measurements

The BCU produces a variety of both directly measured values and calculated values. These measurement values are updated on a per second basis and can view in the “Measurements” columns on the BCU screen or via ASHIDA Relay Talk System Version2.

To view online measurements from device double click on Measurement node.

Measurements will be shown as follows:

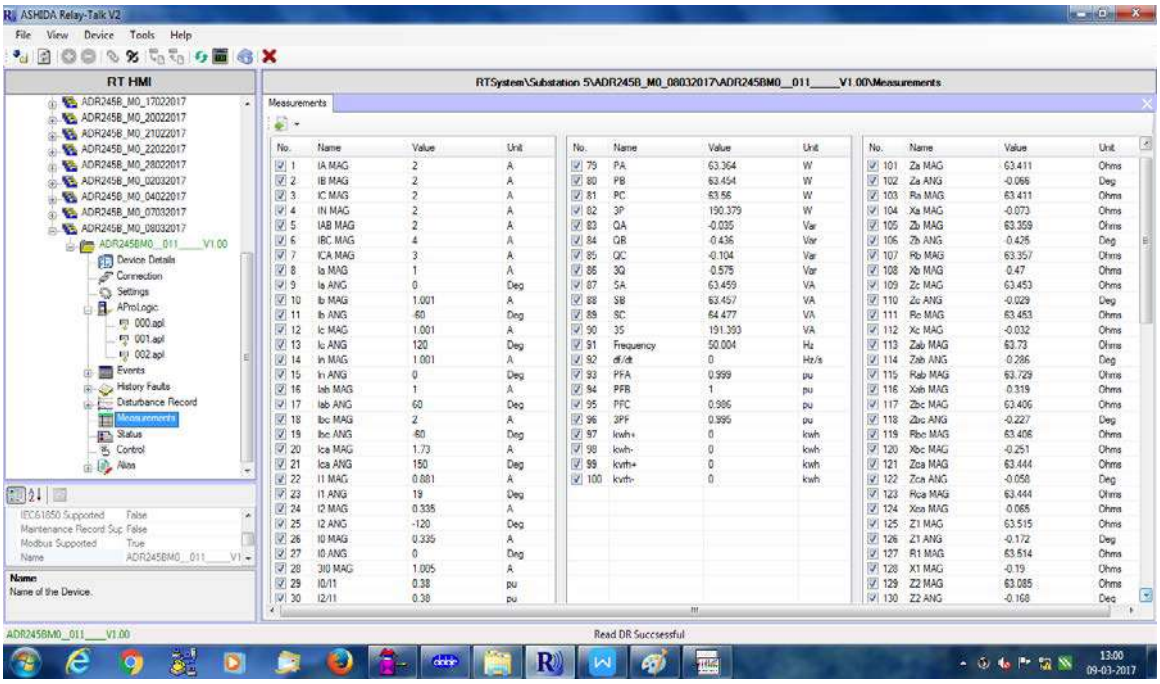


Figure 57: View Measurements

A.16 Status

Status Screen is provided to view the online value of the status. To view status, right click on Status node and select show status. Status list screen will appear with value and time.

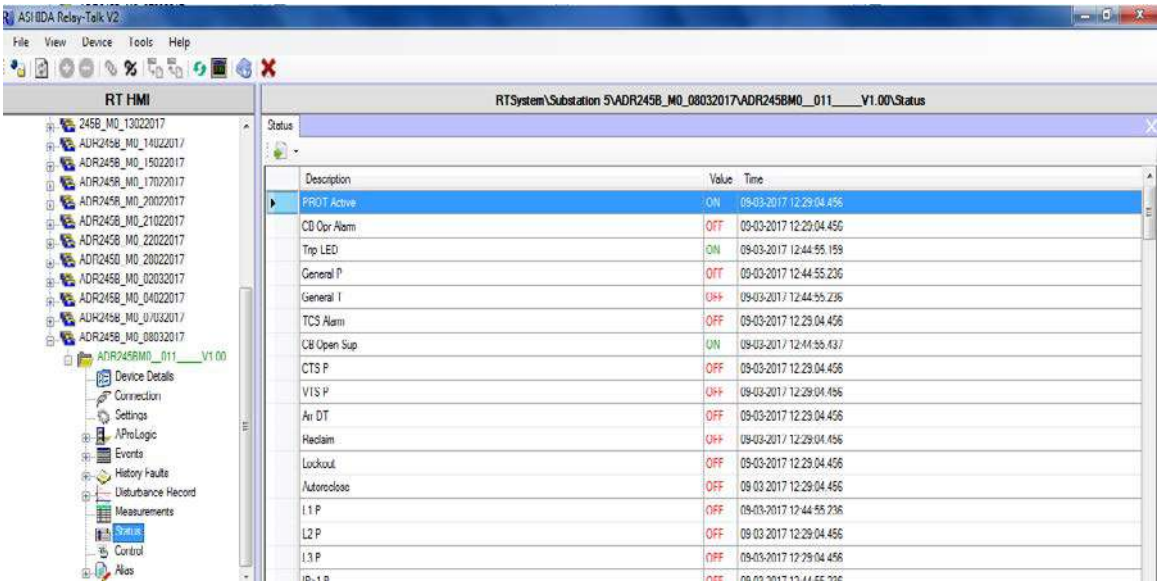


Figure 58: View Status

A.17 Maintenance Record

Maintenance record is the feature will read the history errors from the device and display them. Types of errors are internal hardware error, CB & Trip circuit errors.

A.17.1 Read Maintenance Record from Device

To View Maintenance Record right click on 'Read Maintenance Record'. Following window will appear on screen.

Maintenance Record file will added under the Maintenance Record node.

A.17.2 View Maintenance Record from Device

To view Maintenance Record data, double click on Maintenance Record file. Maintenance Record list with time will display on screen.

A.18 Options

This section will give list of path and Settings associated with this Configurator. To view this screen, click on Options under Tools.

A.18.1 System Folders Information

In this screen user will find Application system paths those are as follows:

- Application Folder Path

- Device Template Path
- RT System Path

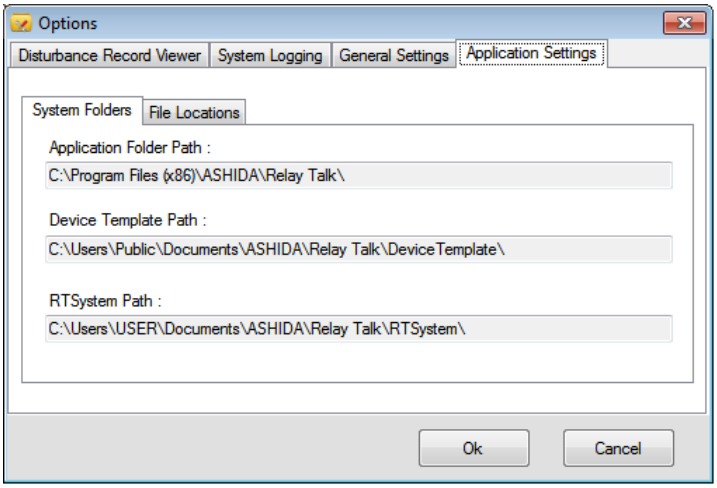


Figure 59: System Folder Information

A.18.2 File Location Information

In this screen user will find Application file paths those are as follows:

SASConfig.mdb File Path

Log File Path

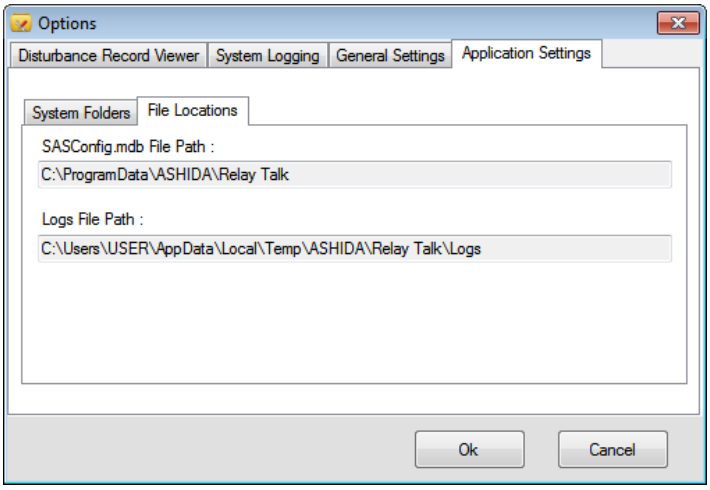


Figure 60: File Location Information

A.18.3 General Settings Information

In this screen user, will find General Setting of Device Timeout those are as follows:

Device connect Timeout (Sec)

Device Read Timeout (Sec)

Read DR Timeout (Sec)

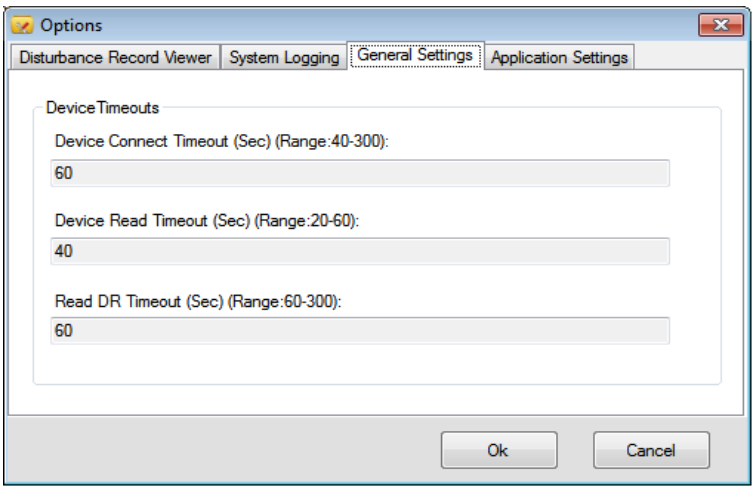


Figure 61: General Settings Information

A.18.4 Introduction

IEC 61850 Configurator is a software tool specifically designed to interface with ASHIDA BCU's. This section provides a brief overview of IEC 61850 Configurator is intended to get you up and running.

A.18.5 Overview of the IEC 61850 Configurator

IEC 61850 Configurator provides online as well as offline utility to configure GOOSE interface of ASHIDA BCU series.

A.18.6 Key Features

- Configuration of GOOSE publisher interface
- Configuration of GOOSE subscriber interface
- Ability to export ICD file for configured device
- Ability to import SCL files with data of GOOSE publishers from other devices

A.18.7 Environment

IEC 61850 Configurator requires the following hardware/software platform to run the application.

Requirement	Description
Operating System	Windows XP/7/8/8.1/10
Dot net Framework	.Net Framework 3/3.5

A.18.8 IEC 61850 Configurator

This section will guide the user for using IEC 61850 Configurator, do the configuration for ASHIDA devices and interface with the device.

A.18.9 IEC 61850 Configurator - Main Screen

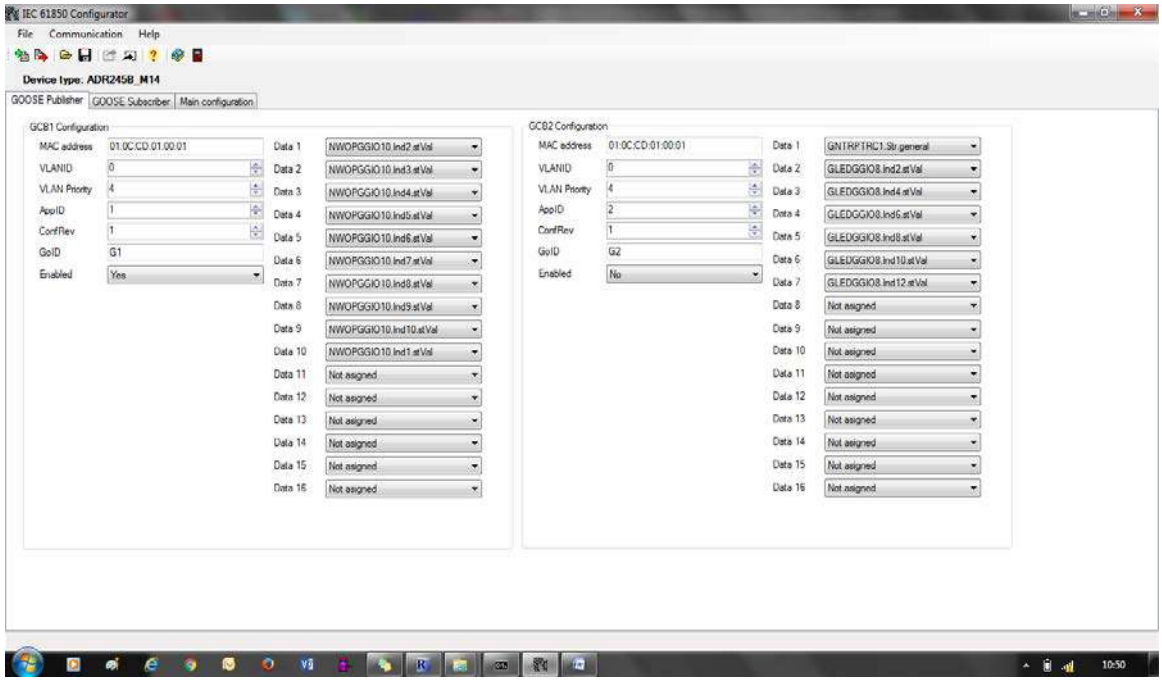


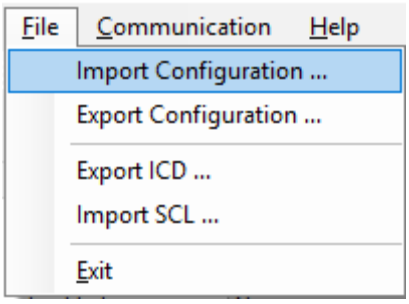
Figure 62: Main Screen of Goose Configurator

A.18.10 Following functions are provided in IEC 61850 Configurator.

- Import Configuration - import configuration of GOOSE interfaces (for publisher and subscriber) from previously created file
- Export Configuration - export configuration of GOOSE interfaces (for publisher and subscriber) to file
- Export ICD - export ICD file with current configuration
- Import SCL - import SCL file containing definitions of GOOSE publishers of other devices to subscribe to
- Exit - close application
- Read Configuration - read current configuration of GOOSE interfaces (for publisher and subscriber) from device
- Write Configuration - write configuration of GOOSE interfaces (for publisher and subscriber) to the device (to activate new configuration restart of the device will be required)
- Help index - show index of on-line help
- About - show dialog box with program version and release date

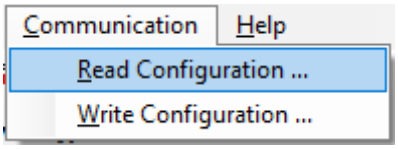
A.18.11 Menu commands

File menu is used to group commands operating on files:



- Import Configuration - import configuration of GOOSE interfaces (for publisher and subscriber) from previously created file
- Export Configuration - export configuration of GOOSE interfaces (for publisher and subscriber) to file
- Export ICD - export ICD file with current configuration
- Import SCL - import SCL file containing definitions of GOOSE publishers of other devices to subscribe to
- Exit - close application

Communication menu is used to group commands used to communicate with configured device



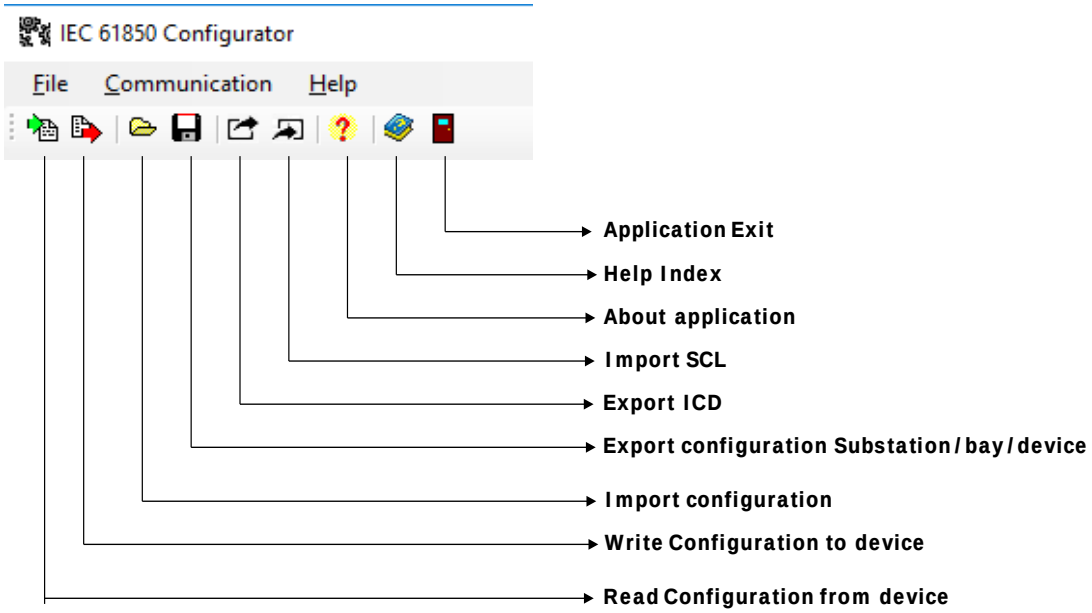
- Read Configuration - read current configuration of GOOSE interfaces (for publisher and subscriber) from device
- Write Configuration - write configuration of GOOSE interfaces (for publisher and subscriber) to the device (to activate new configuration restart of the device will be required)

Help menu is grouping function related to on-line help

- *Help index* - show index of on-line help
- *About* - show dialog box with program version and release date

A.18.12 Standard Toolbar buttons

Following figure shows description of toolbar buttons:



A.18.13 Main configuration view

Main Configuration tab shows IEC 61850 parameters read from the device. View consists of:

- IED Name - name of the device in IEC 61850 network
- Logical Device - name of the logial device
- Name Plate - description of the device
- Version of the Device
- IP address of the device
- Mask of the IP network
- Gateway IP address
- SNTP Server address (used for time synchronization)

Those parameters are available only for preview and can be changed form device MMI or by another tool.

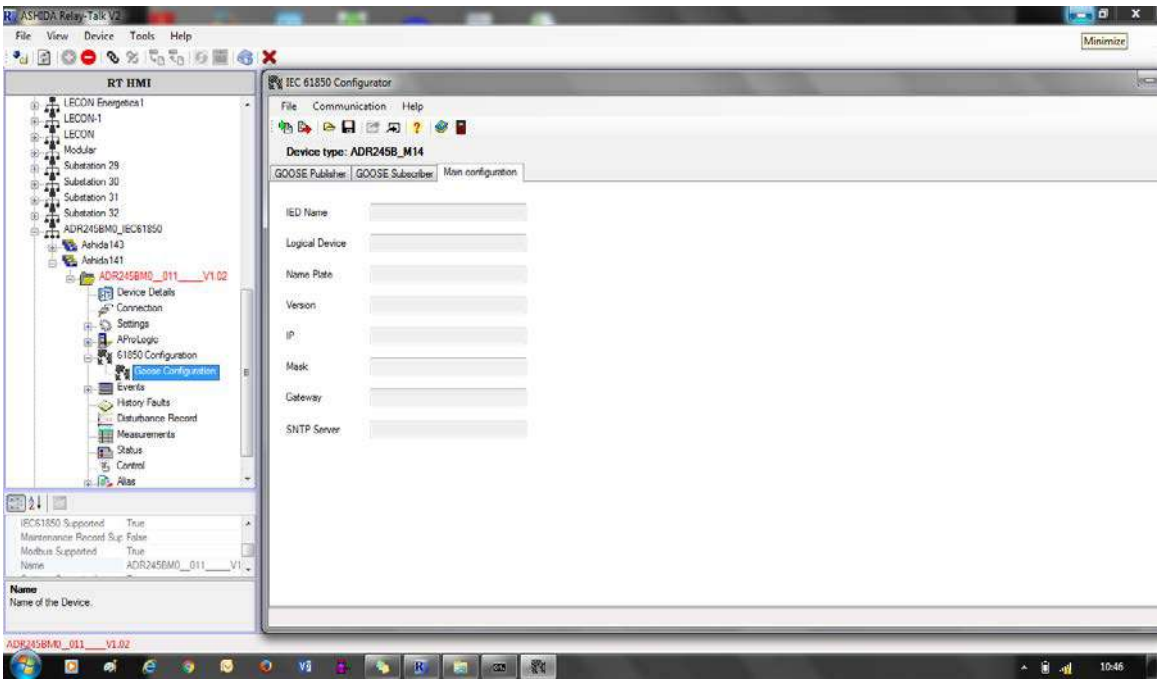


Figure 63: Main Configuration

A.18.14 GOOSE publisher view

GOOSE Publisher tab shows contents of currently sent (published) GOOSE messages. BCU can send two independent GOOSE streams controlled by two GCB (GOOSE Control Blocks). Following GOOSE publisher parameters can be configured:

- Ethernet Destination MAC address.
- Application ID.
- Configuration revision.
- Goose ID.
- List of published signals (contents of the published dataset).

A.18.15 Each GCB can be enabled or disabled.

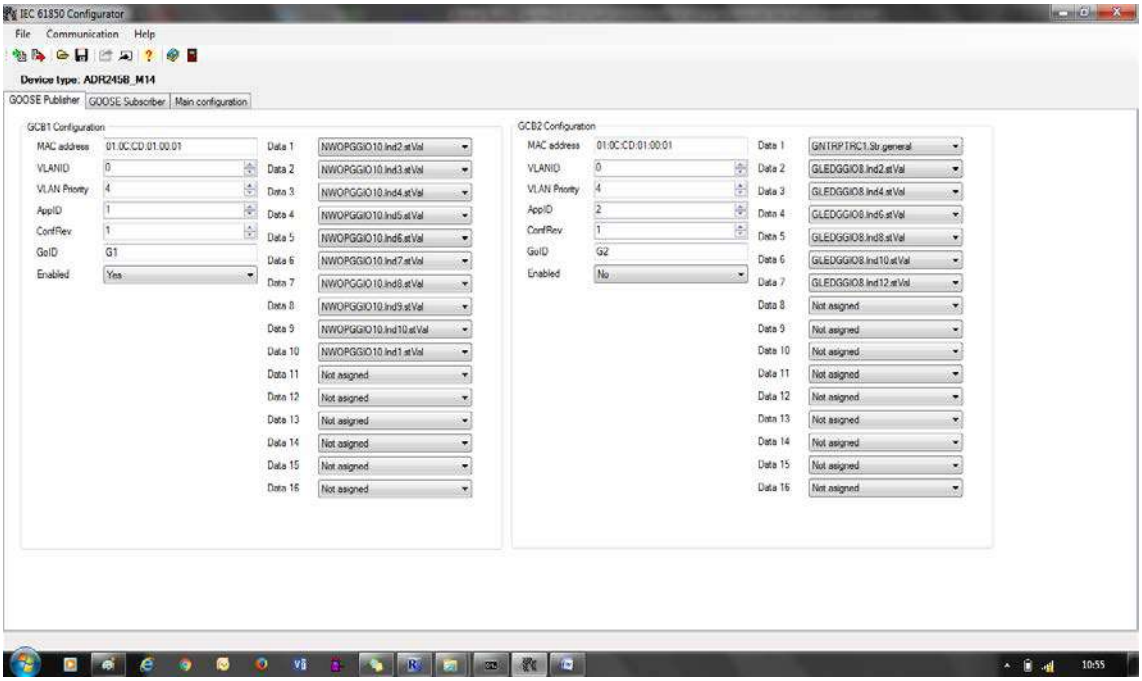


Figure 64: Goose Publisher

> *Note: Network output (NWOPGGIO10.Ind1.sTVal) signal is Publisher which can be published to any other make device or to our own make IED's*

A.18.16 GOOSE subscriber view

GOOSE Subscriber tab shows filtering parameters that will be used to receive and accept for processing (subscribe) GOOSE messages published by other devices. Message filter is composed of following parts:

- Ethernet Destination MAC address (common for all subscribed signals).
- For each input signal
- Application ID.
- Data index in GOOSE message (index in published dataset)

A.18.17 GOOSE subscriber functionality can be globally enabled or disabled

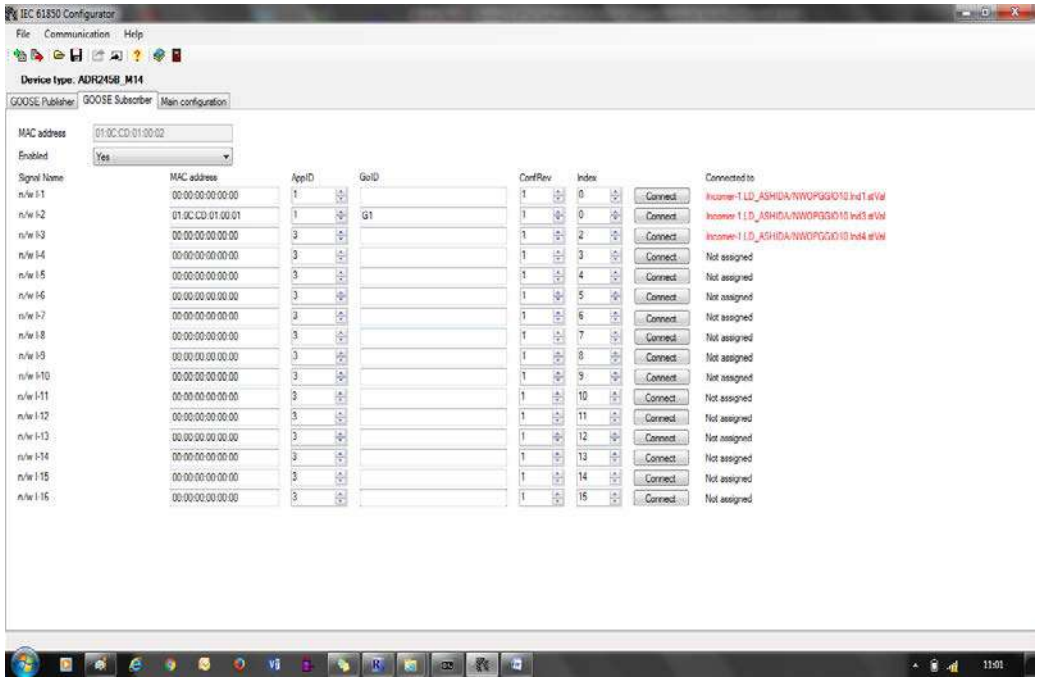


Figure 65: Goose Subscriber

> *Note: Network Input 1(n/w I -1) signal is Subscriber which can be used to receive configured signal from any other IED's*

To facilitate configuration parameters of data published by other devices can be imported from SCL files using Import SCL option from File menu. Imported signals can assigned to inputs by clicking Connect button. After that dialog window will popup allowing user to select published signal by reference. After accepting the selection App ID, Index and MAC Address for subscriber will be updated.

3.B. OPENPRO+ CONFIGURATOR

OpenPro+ Configurator is a software tool designed to generate a configuration file in XML format for OpenPro+ devices. The OpenPro+ device will act as a protocol gateway using this configuration file.

This tool provides feature to export configuration in INI format. It also supports importing IED template, to ease configuration. This tool also validates the XML file against a pre-defined schema ensuring its validity.

To start OpenPro+ Configurator:
Click Start−> All Programs −> OpenPro+ Configurator −> OpenPro+ Configurator

B.1.1 OpenPro+ Configurator - Main Screen

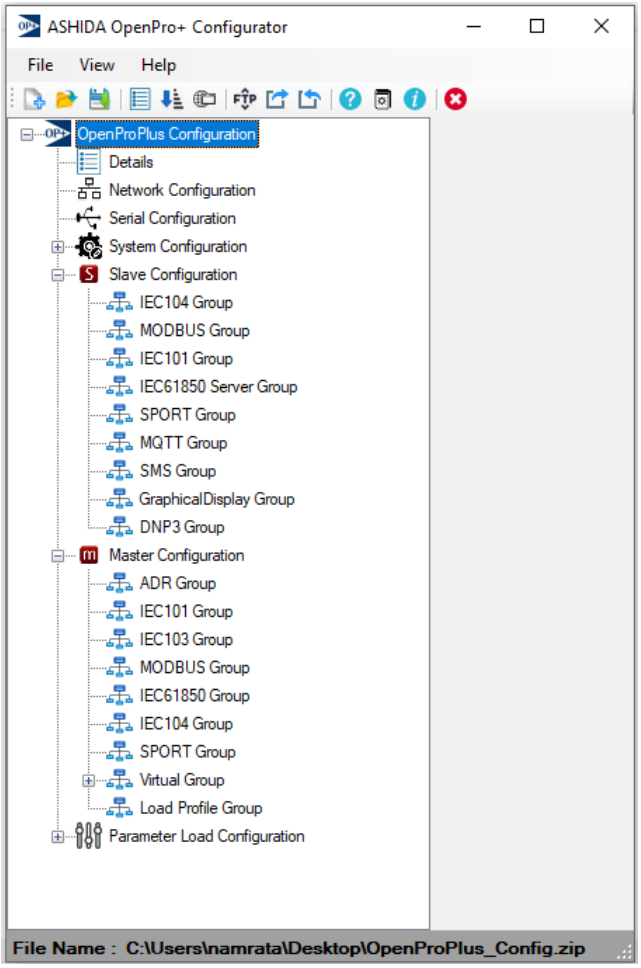


Figure 66: OpenPro+ Configurator Main Screen

B.1.2 Exiting OpenPro+ Configurator

You can close OpenPro+ Configurator at any point during the running of the application .To exit OpenPro+ Configurator perform the following steps:

- From File Menu, choose Exit .If there is any open configuration, a warning window will appear to confirm whether the user would like to save the configuration before closing OpenPro+ Configurator. Refer Figure 67

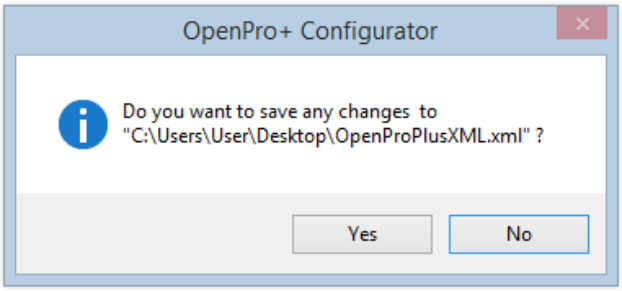


Figure 67: Prompting to Save Configuration before exiting OpenPro+ Configurator

- Click yes, to save the configuration at desired location before exiting OpenPro+ Configurator. Click NO, not to save the configuration and to continue with existing OpenPro+ Configurator.

B.1.3 Menu commands

File menu consists of menu options performed on files. Refer Figure 68

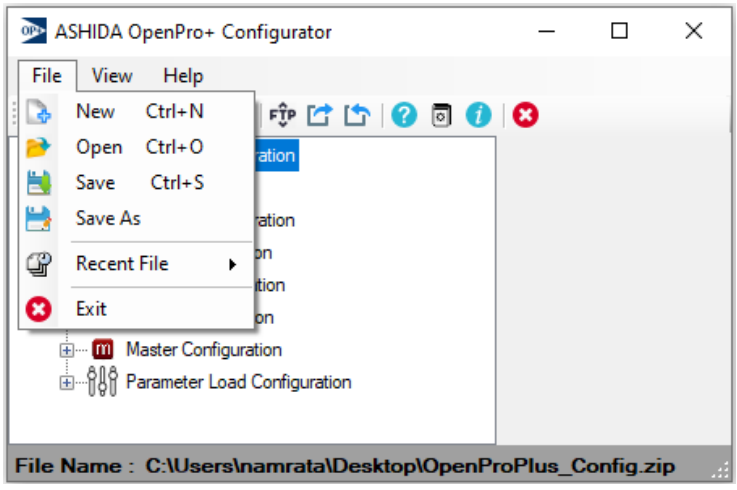


Figure 68: Main Menu

- New – Create a new configuration file.
- Open – Open an existing configuration file.
- Save – Save current state into configuration file.
- Save As – Save current configuration state with different file name.
- Recent Files – Shortcuts for recently opened files can be seen under Recent files.

- Exit - To exit application use Exit from menu or use close button.

View menu consists of menu options related to viewing of bars and modules. Refer Figure 69

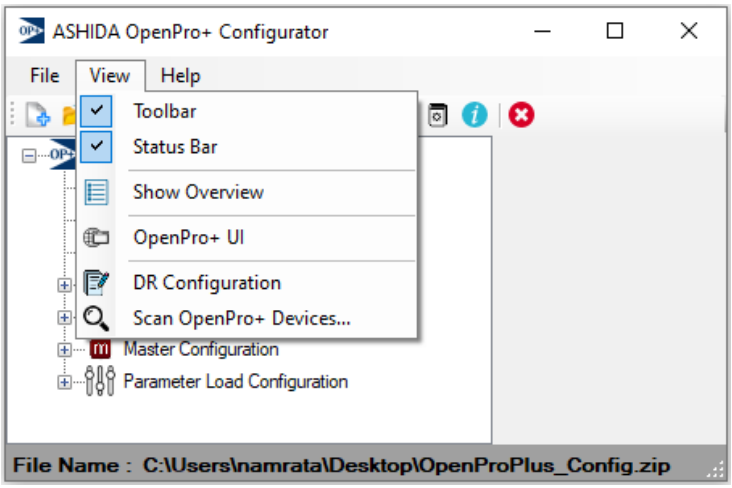


Figure 69: View Menu

- Toolbar – Show /Hide the toolbar
- Status bar – Show/Hide the status bar.
- Show Overview – Displays the overview module in separate window.
- OpenPro+ UI – Open and upload XML .

Help menu consists of product help & info. Refer Figure 70

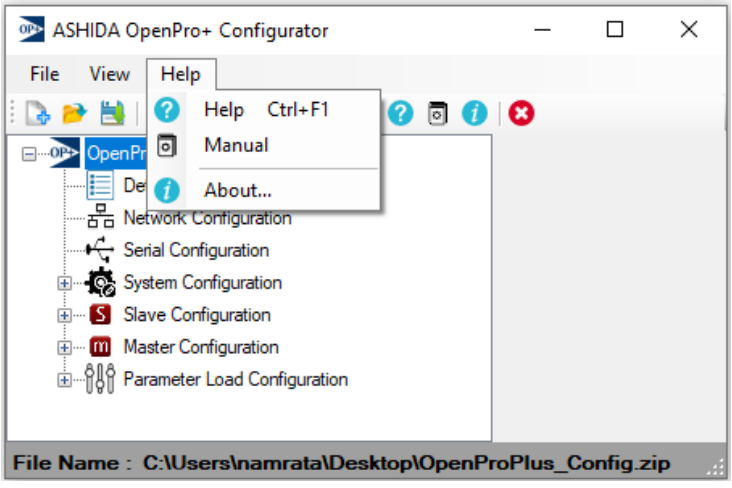


Figure 70: Help

- Help – Show product help.
- Manual – Show product manual.
- About – Show product info like version, company, copyright, etc.

B.1.4 Standard Toolbar buttons

Following figure shows description of toolbar buttons: Refer Figure 71

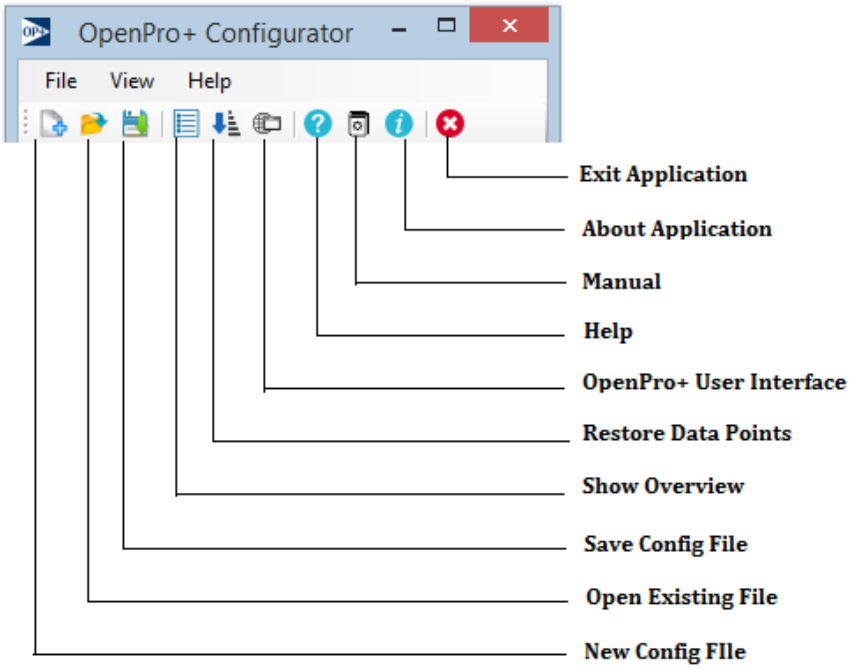


Figure 71: Standard Toolbar

B.1.5 Details

Details view is used to configure few top level parameters like XmlVersion, Device Type, Hardware Version, Software Version, Device and Description. Refer Figure 72

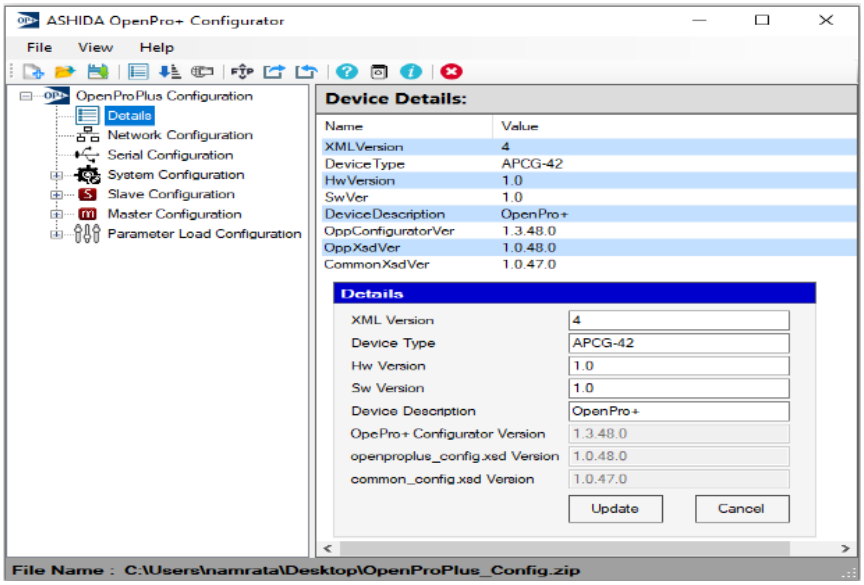


Figure 72: Details

B.2 System Layer Configuration

B.2.1 Network Configuration

The tool loads pre-defined network interfaces supported by the OpenPro+ devices.Network Configuration allows user to configure the network parameters like PortName, Connection Type, IP Address, VirtualIP Address, Gateway, etc. Refer Figure 73

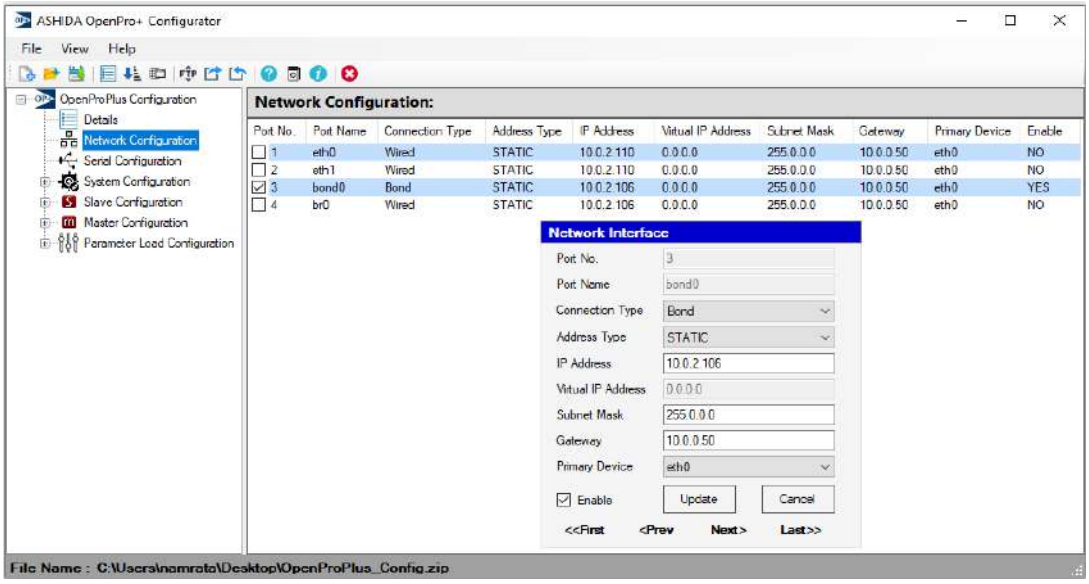


Figure 73: Network Configuration

B.2.2 Serial Configuration

The tools loads pre-defined serial interfaces supported by the OpenPro+ devices. Serial Configuration allows user to configure the serial parameters like PortName, Connection Type, Baud Rate, DataBites, StopBits, IP Address, VirtualIP Address, Gateway, etc. Refer Figure 74

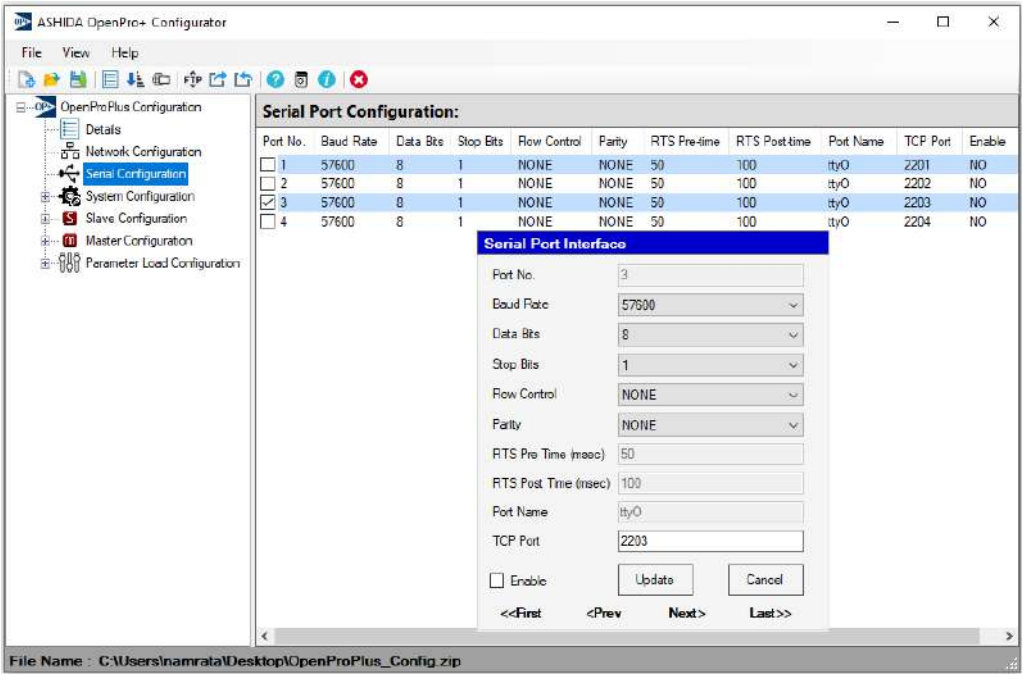


Figure 74: Serial Configuration

B.2.3 System Configuration

System Config allows user to configure system level parameters like Redundancy mode, Time Sync Source, Log settings, etc. If Time Sync Source is selected as 'NTP', we can specify the NTP server as well. Refer Figure 75

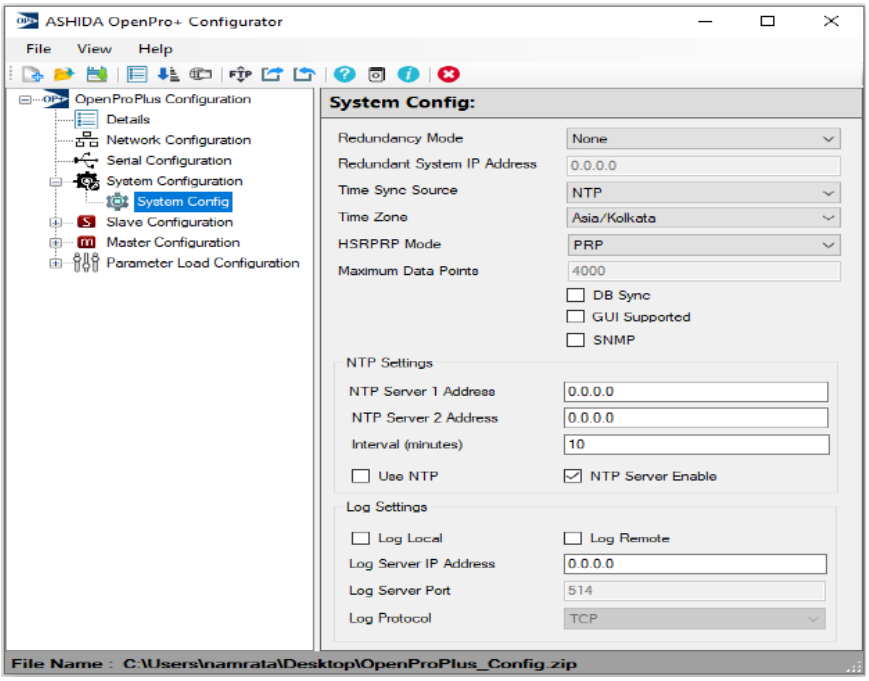


Figure 75: System Configuration

B.3 Slave Configuration

Protocol slaves can be configured for the selected OpenPro+ device (BCU). User can configure multiple slaves. Refer Figure 76

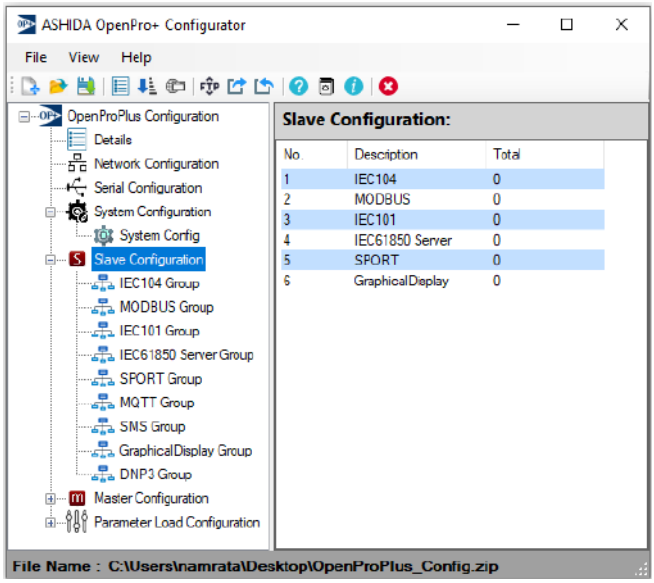


Figure 76: Slave Configuration

B.3.1 IEC61850 Server Group

OpenPro+ device (BCU) can be configured as IEC61850 Server. The user can add multiple slaves and configure its various parameters like Edition, Remote IP Address, IEDName, etc. To make IEC61850 Server online mark it as “Run”. Refer Figure 77

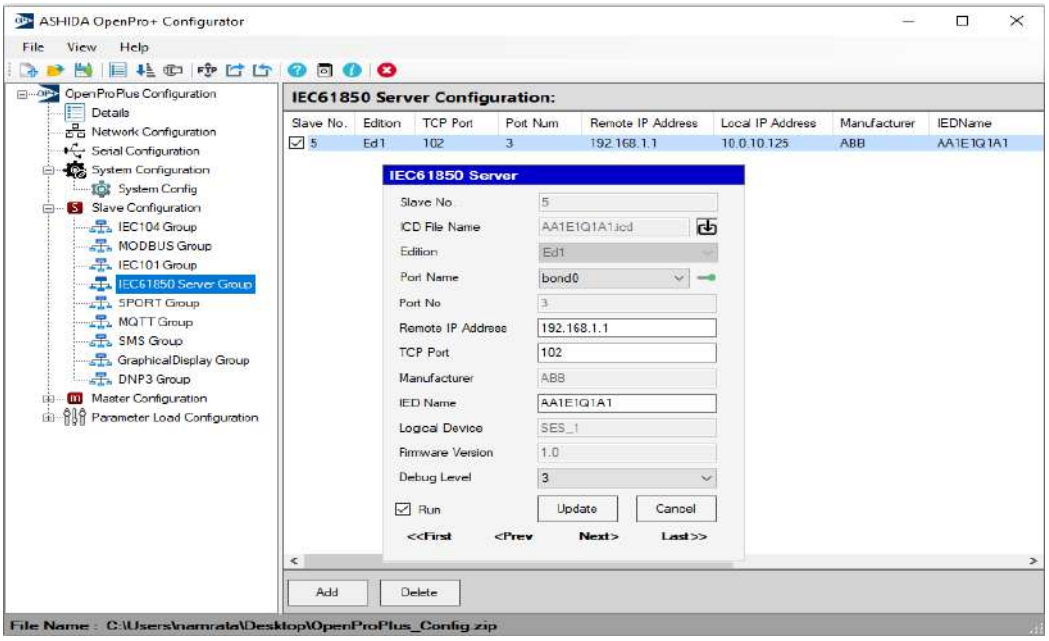


Figure 77: IEC61850Server Slave Configuration

B.3.2 Graphical Display Slave Group

BCU can be configured for Graphical Display slave Group. The user can add slave and configure its various parameters like Type, GridRows, GridColumns, FirmwareVersion, etc. To make Graphical Display Server online mark it as “Run”. Refer Figure 78

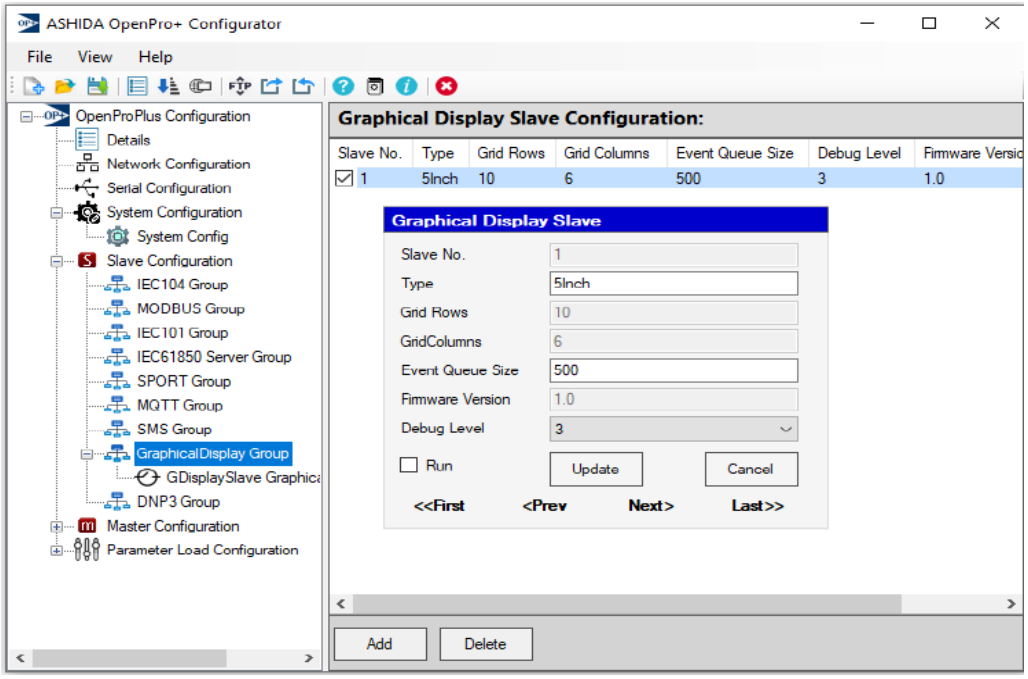


Figure 78: Graphical Display Slave Group

B.3.2.1 GDisplay Slave Group

BCU can be configured for GDisplay Group.The user can create SLD or import Txt file and then map data points to SLD.

B.3.2.1.1 Steps to Import .Txt File:

1. Click on “Import SLD” button.
2. Browse .Txt File.
3. Click on “Update” button.

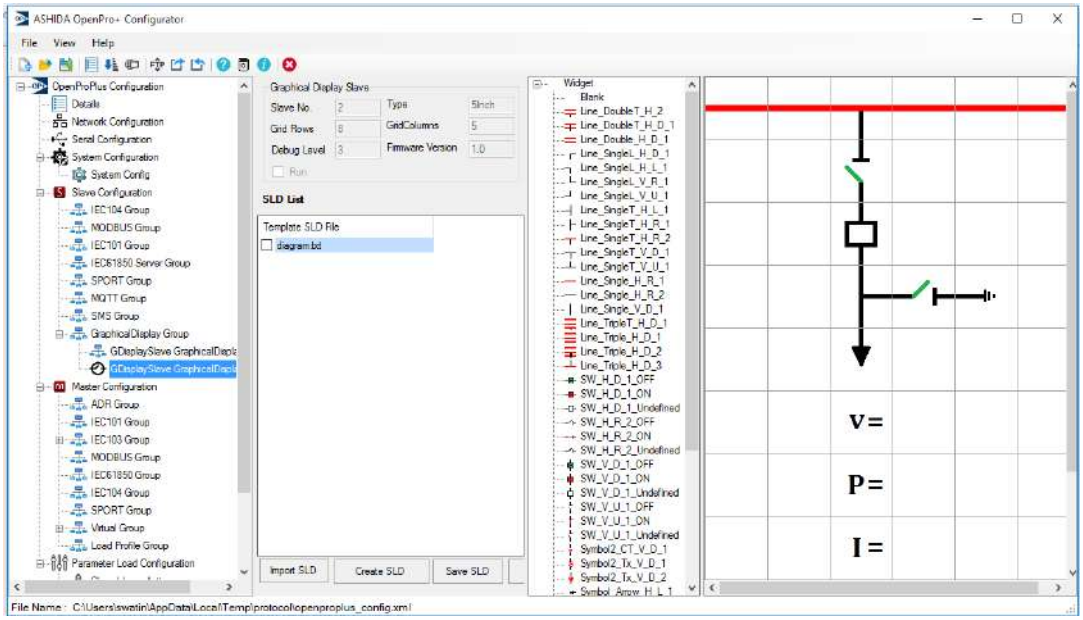


Figure 79: Import .Txt File

B.3.2.1.2 Steps to Create SLD

1. Click on “Create SLD” button.
2. Drag and Drop widgets from available list of widgets in to the required cell.
3. If you want to modify or clear widget then select widget from cell right click on it and select clear image option.
4. After complete SLD Click on “Save SLD” button.

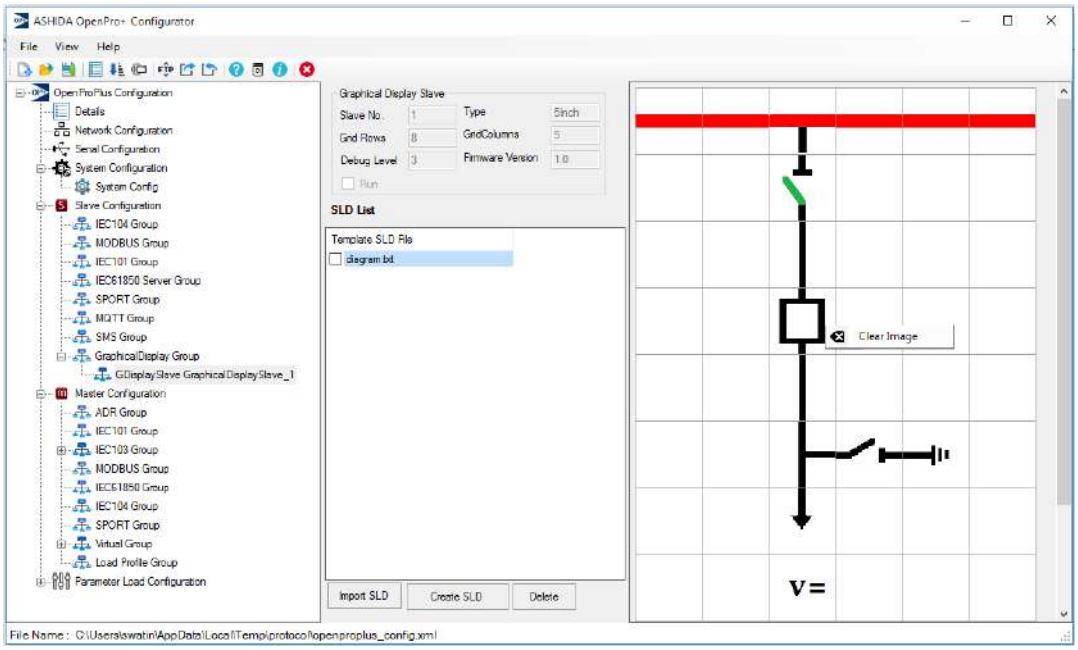


Figure 80: Create SLD

B.3.2.1.3 Create Widget

User can also create new widget using paint and then newly created widget need to copy into the resources folder of Configurator tool. Refer Figure 81 & Figure 82

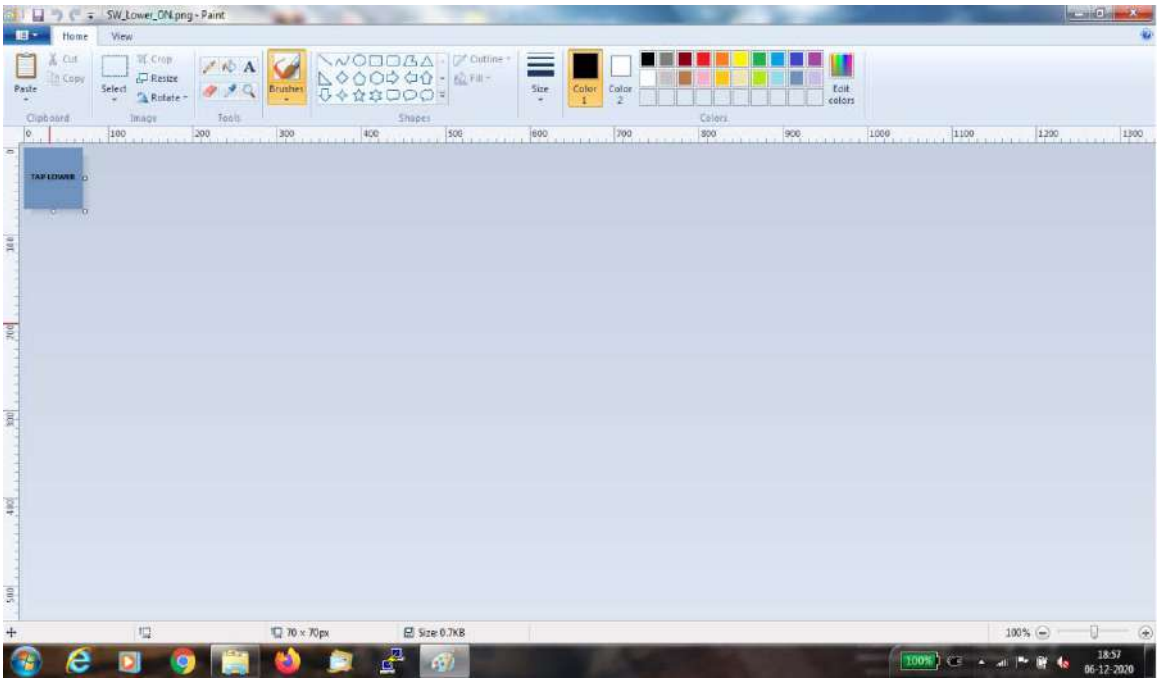


Figure 81: Create Widget

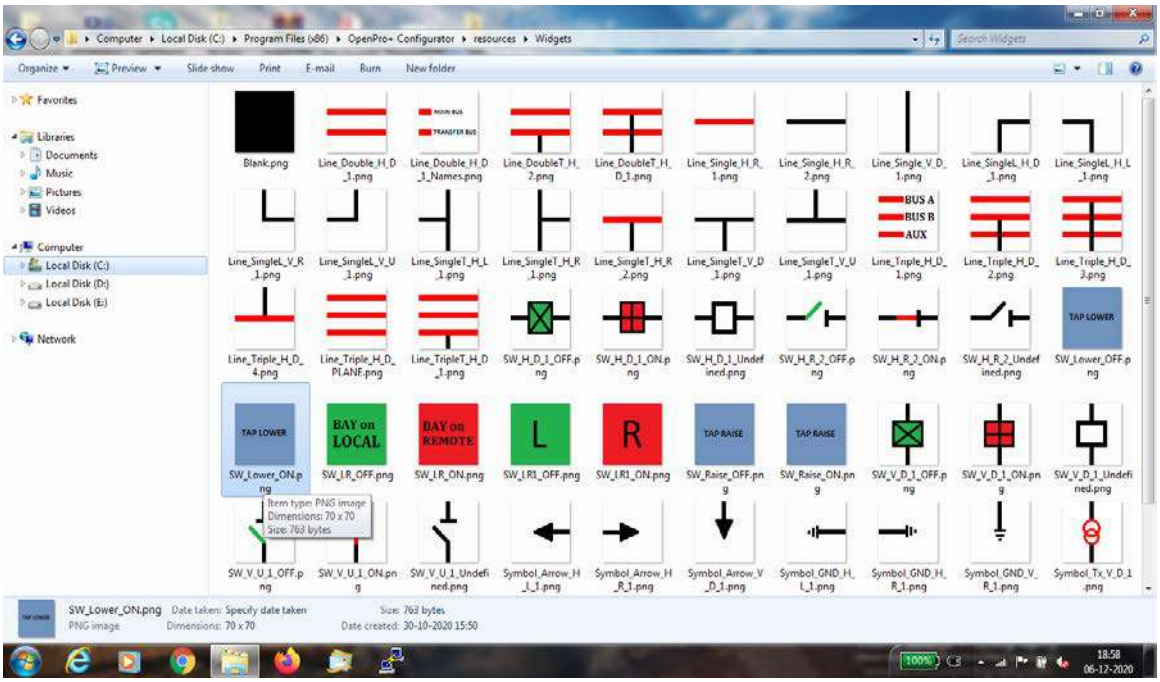


Figure 82: Save Widget

B.4 Master Configuration

The tool supports various masters like ADR, IEC101, IEC103, MODBUS, IEC61850 Client and Virtual.You can add multiple masters and set their respective parameters. You can add multiple masters and set their respective parameters. Refer Figure 83

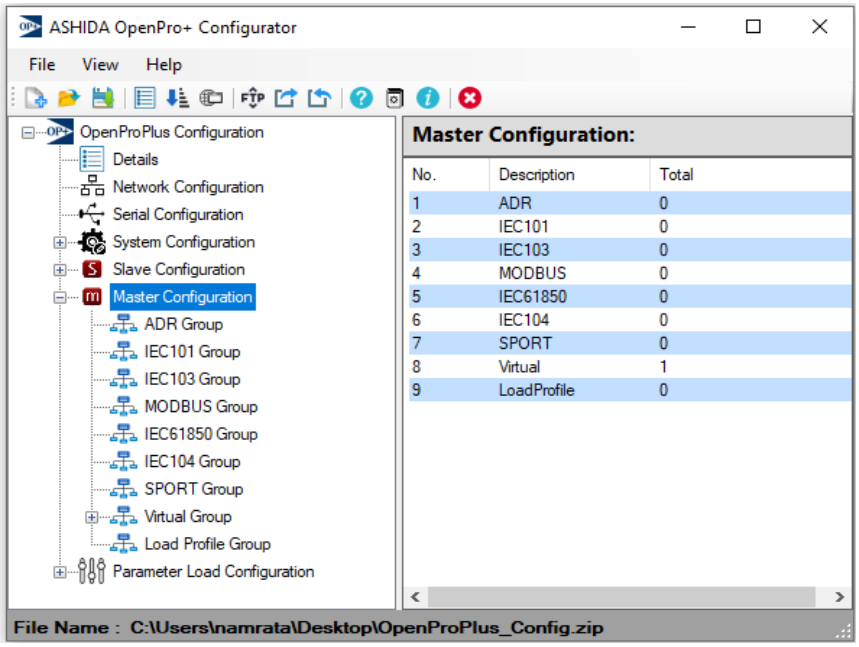


Figure 83: Master Configuration

B.4.1 ADR Group

ADR Group is divided using ADR Master Configuration, ADR_IED, ADR_IED Details, ADR_AI, ADR_AO, ADR_DI, ADR_DO, ADR_EN.

B.4.1.1 ADR Master Configuration

The user can add an ADR master and set its various parameters like Polling Interval, Polling Time Sync, Refresh Interval, Debug Level, etc .To make ADR Master online mark it as Run. Refer Figure 84

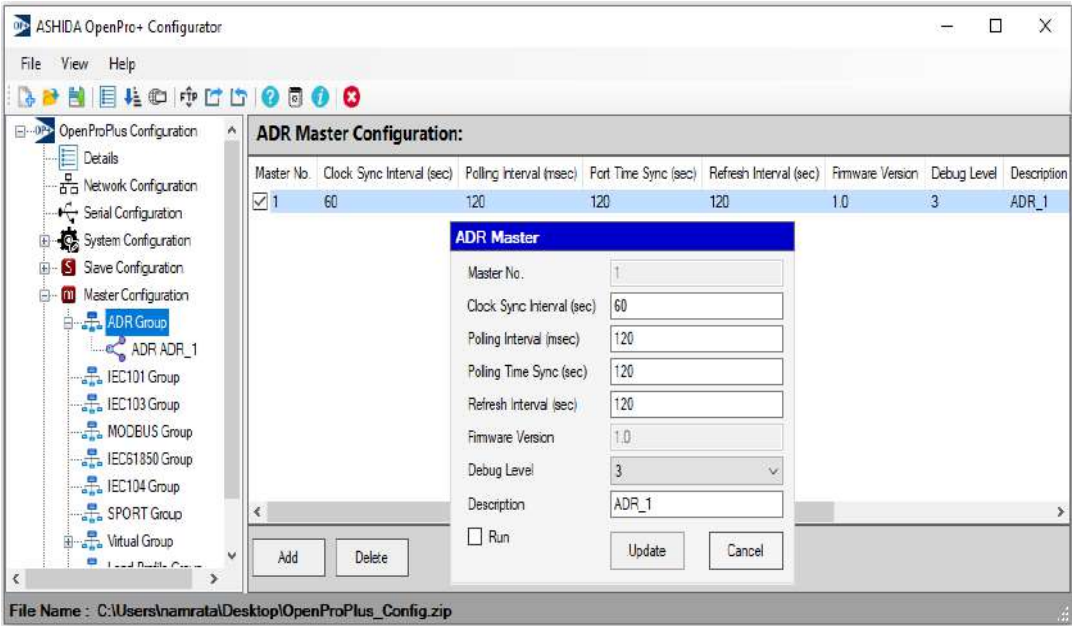


Figure 84: ADR Master Configuration

B.4.1.2 ADR IED

The user can add IED for ADR Master and set its parameters like UnitID, Device, Retries, Timeout, Description, etc. ADR IED allows user to Export IED and Import IED. Refer Figure 85 ADR IED details displays data points count for ADR_AI, ADR_AO, ADR_DI,ADR_DO, ADR_EN Configuration and mapping side . Refer Figure 86

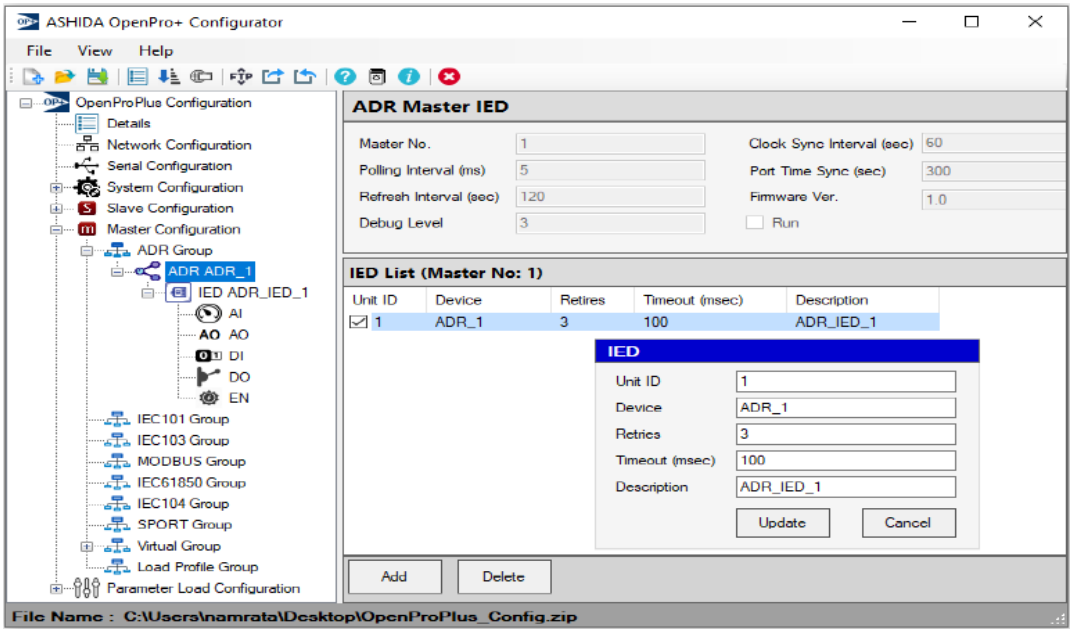


Figure 85: ADR IED

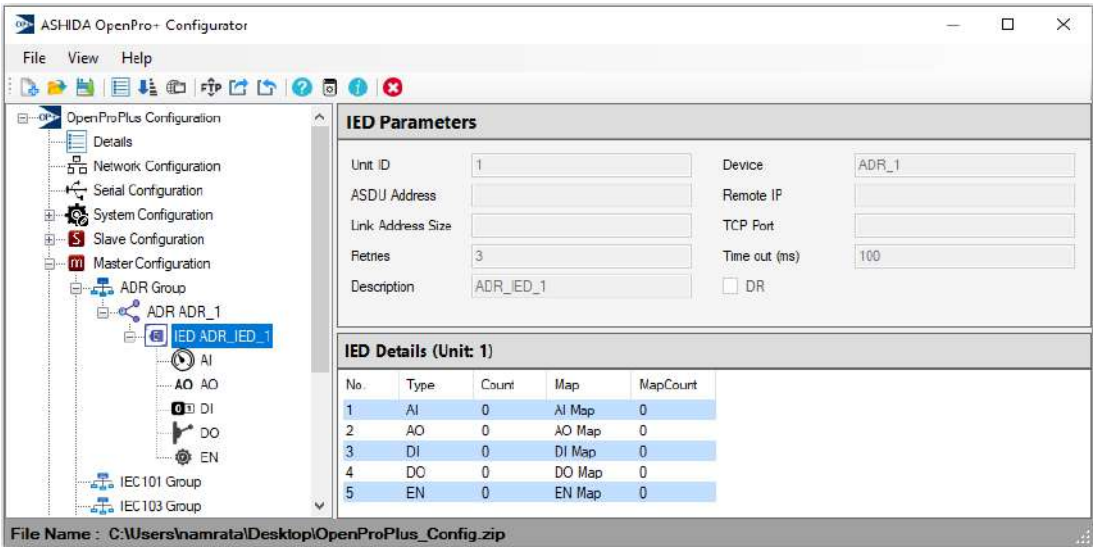


Figure 86: ADR IED Details

B.4.1.2.1 ADR AI & AI_Map

The user can add various datapoints like AI (Analog Input's) for ADR Master and set its parameters like ResponseType, Index, SubIndex, DataType, Multiplier, Constant, Description, etc. Refer Figure 87

The OpenPro+ Configurator tool also allows user to map AI data points to protocol slaves and sets mapping parameters like Reporting Index, DataType, Multiplier, Constant, Description, etc. depending on the slave type this object belongs to.

AI data can be mapped to IEC104 slave AI as follows.Click on IEC104 1. Refer Figure 88

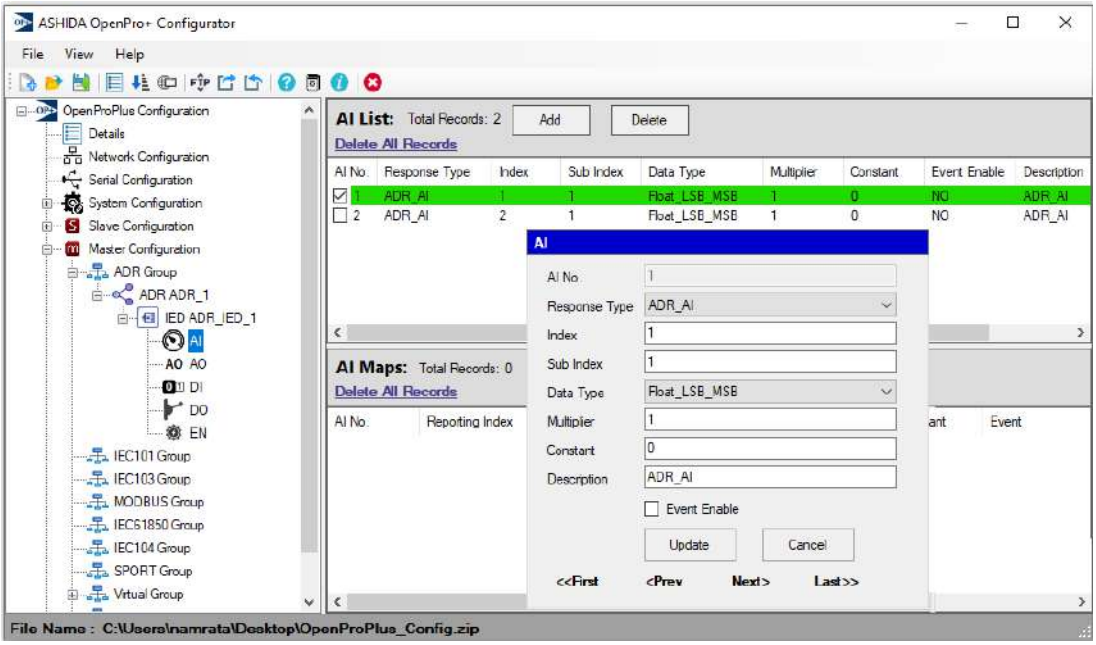


Figure 87: ADR AI

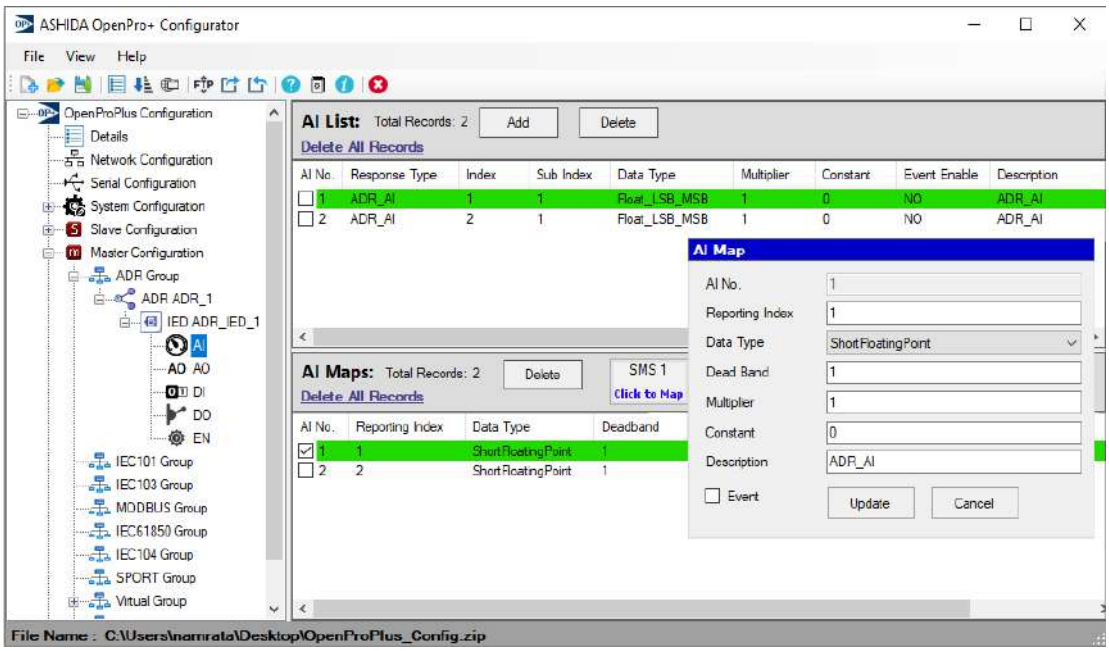


Figure 88: ADR AIMap

B.4.1.2.2 ADR AO & AO_Map

The user can add various datapoints like AO (Analog Output's) for ADR Master and set its parameters like ResponseType, Index, SubIndex, DataType, Multiplier, Constant, Description, etc. Refer Figure 89

The OpenPro+ Configurator tool also allows user to map AO data points to protocol slaves and sets mapping parameters like Reporting Index, DataType, Multiplier, Constant, Description, etc. depending on the slave type this object belongs to.AO data can be mapped to IEC104 slave AO as follows. Refer Figure 90

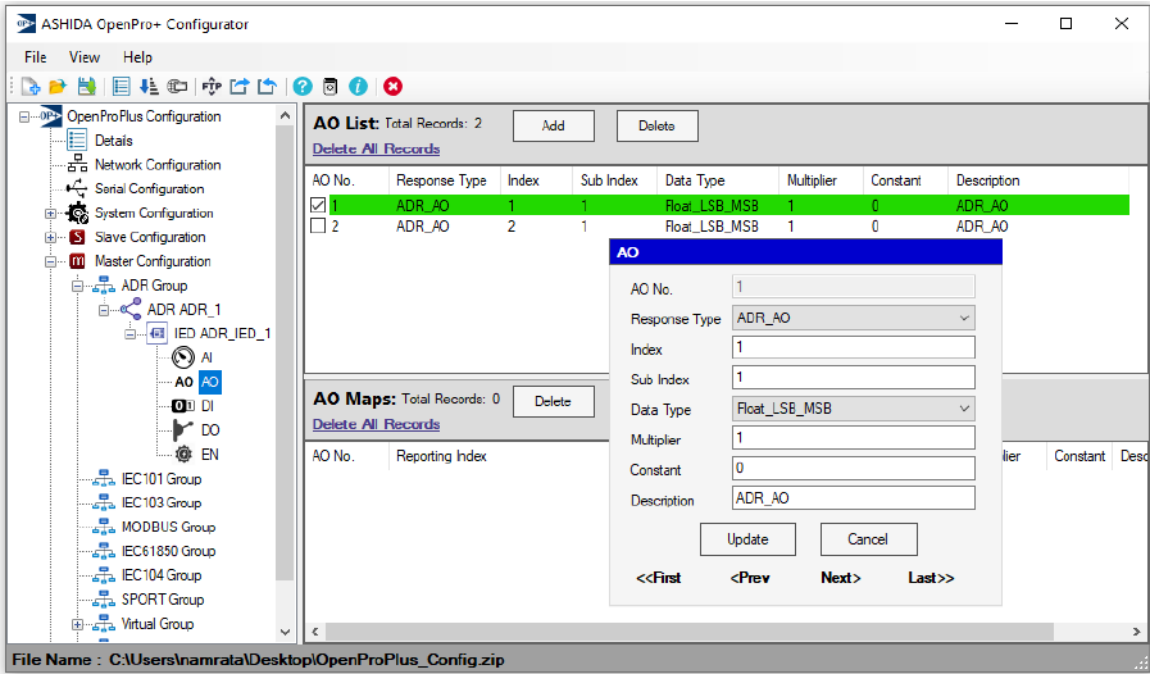


Figure 89: ADR AO

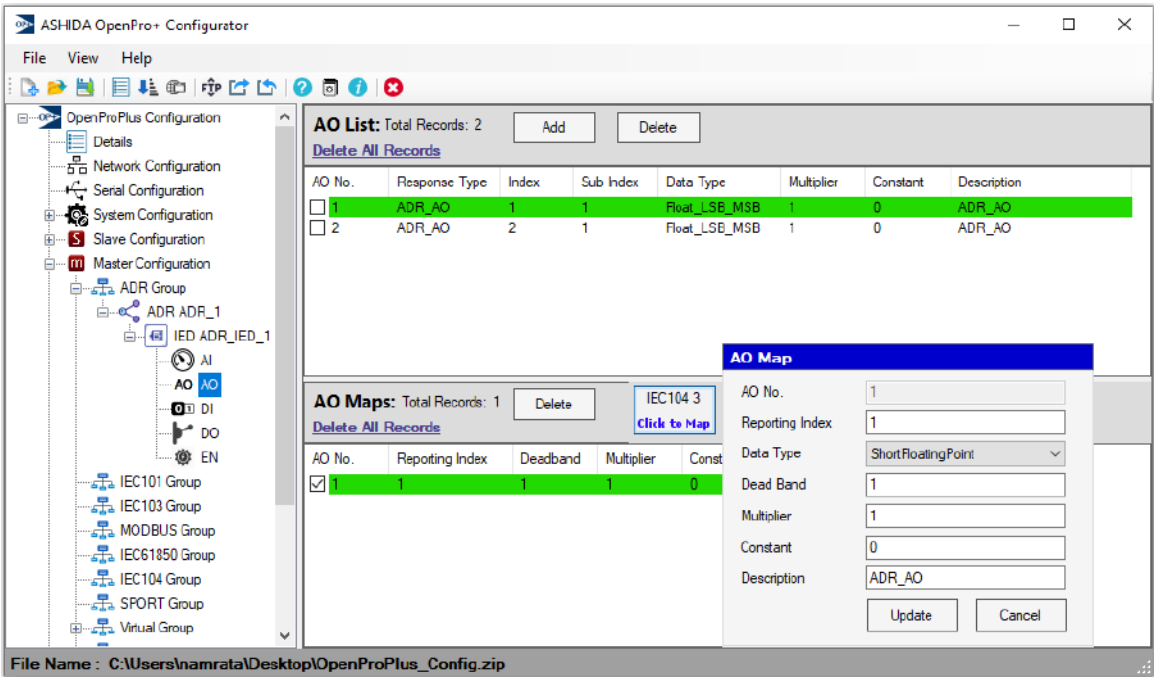


Figure 90: ADR AO Map

B.4.1.2.3 ADR DI & DI_Map

The user can add various datapoints like DI (Digital Input's) for ADR Master and set its parameters like ResponseType, Index, SubIndex,Event_True, Event_False, Description, etc.
Refer Figure 91

The OpenPro+ Configurator tool also allows user to map DI data points to protocol slaves and sets mapping parameters like Reporting Index, DataType, Bit Position, Description, etc. depending on the slave type this object belongs to. DI data can be mapped to IEC104 slave DI as follows. Refer Figure 92

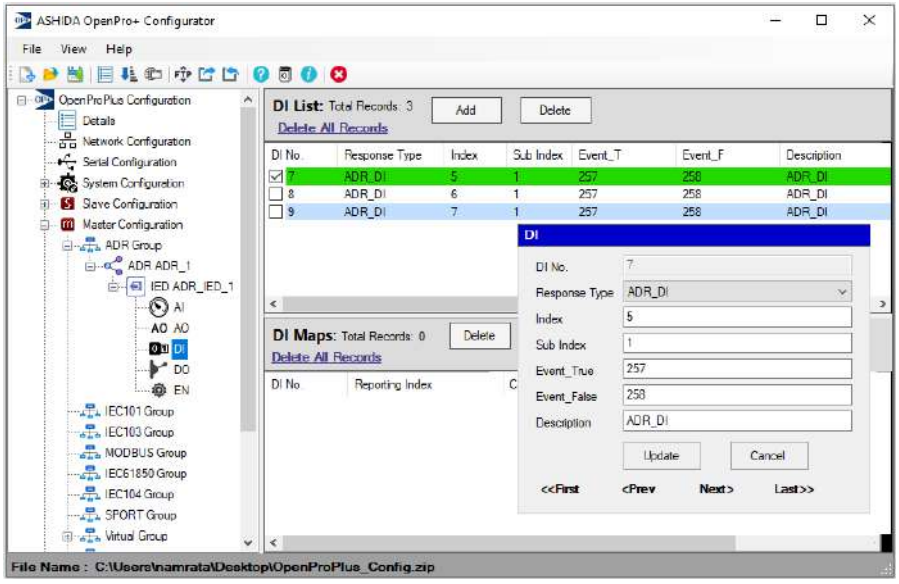


Figure 91: ADR DI

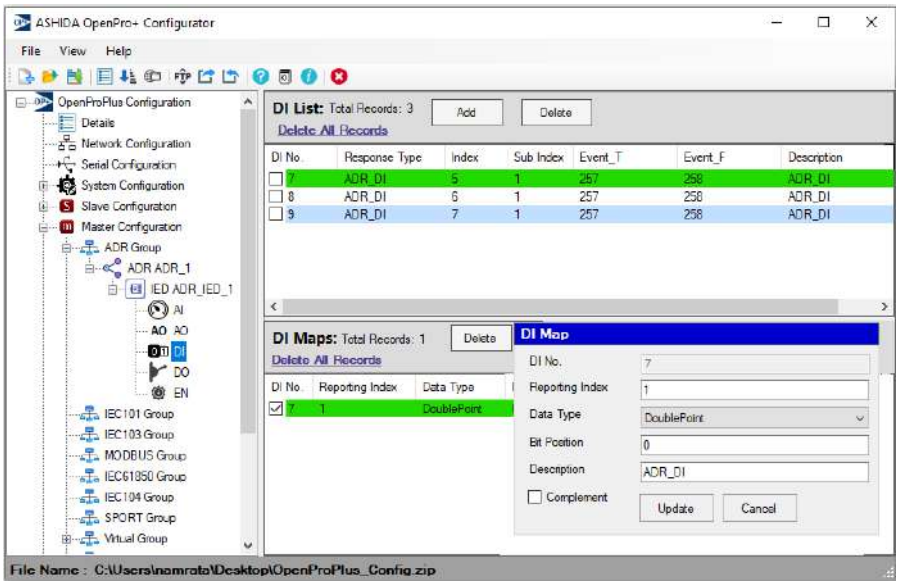


Figure 92: ADR DI Map

B.4.1.2.4 ADR DO & DO_Map

The user can add various datapoints like DO (Digital Output's) for ADR Master and set its parameters like ResponseType, Index,SubIndex, Control Type, Pulse Duration, Description, Enable DI, etc. Refer Figure 93

The OpenPro+ Configurator tool also allows user to map DO data points to protocol slaves and sets mapping parameters like Reporting Index, DataType, Bit Position, Description, etc. depending on the slave type this object belongs to. DI data can be mapped to IEC104 slave DO as follows. Refer Figure 94

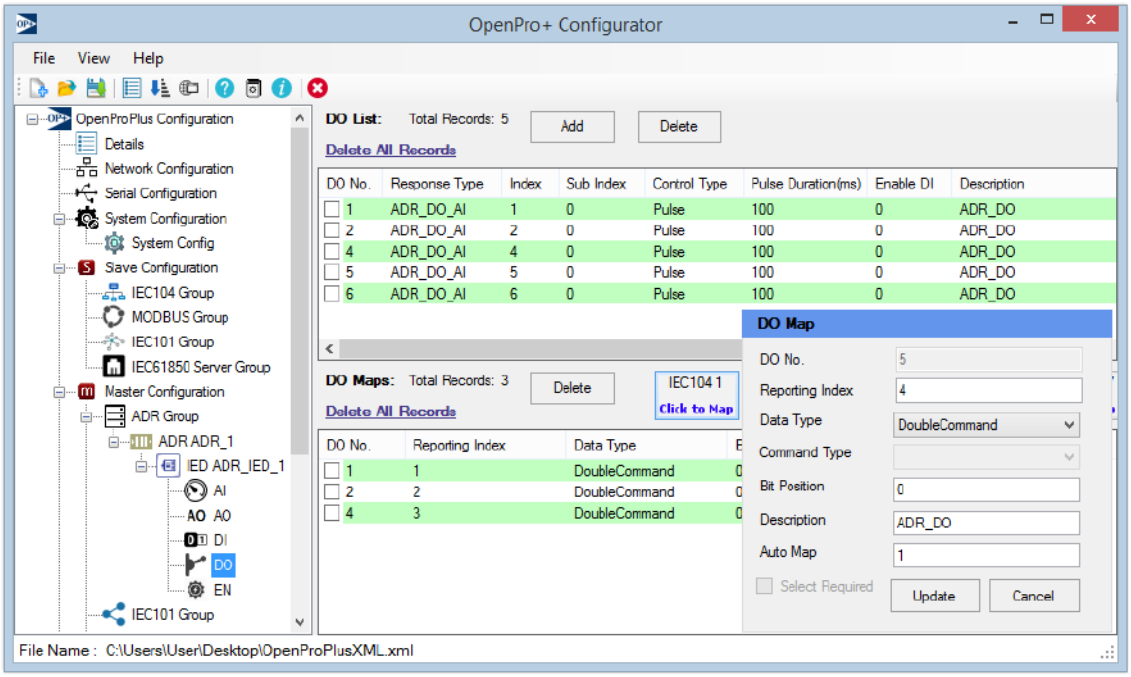


Figure 93: ADR DO

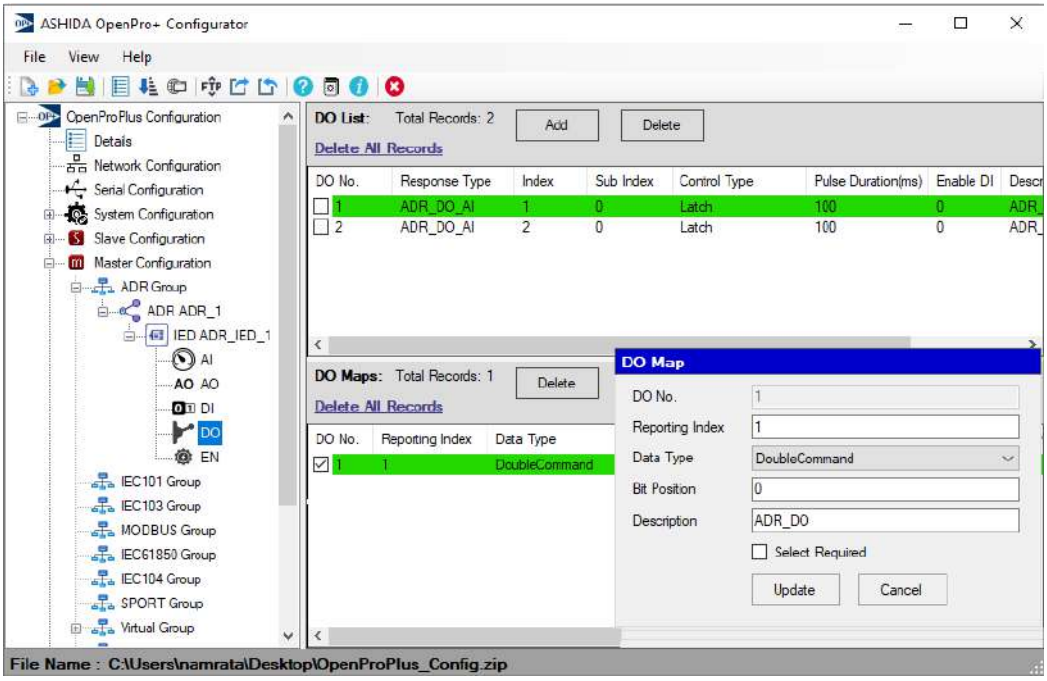


Figure 94: ADR DO Map

B.4.1.2.5 ADR EN & EN_Map

The user can add various datapoints like EN (Energy) for ADR Master and set its parameters like ResponseType, Index, SubIndex,Control Type, Multiplier,Constant, Description, Enable DI, etc. Refer Figure 95

The OpenPro+ Configurator tool also allows user to map EN data points to protocol slaves and sets mapping parameters like Reporting Index, DataType, Bit Position, Multiplier, Constant, Description, etc. depending on the slave type this object belongs to. EN data can be mapped to IEC104 slave EN as follows. Refer Figure 96

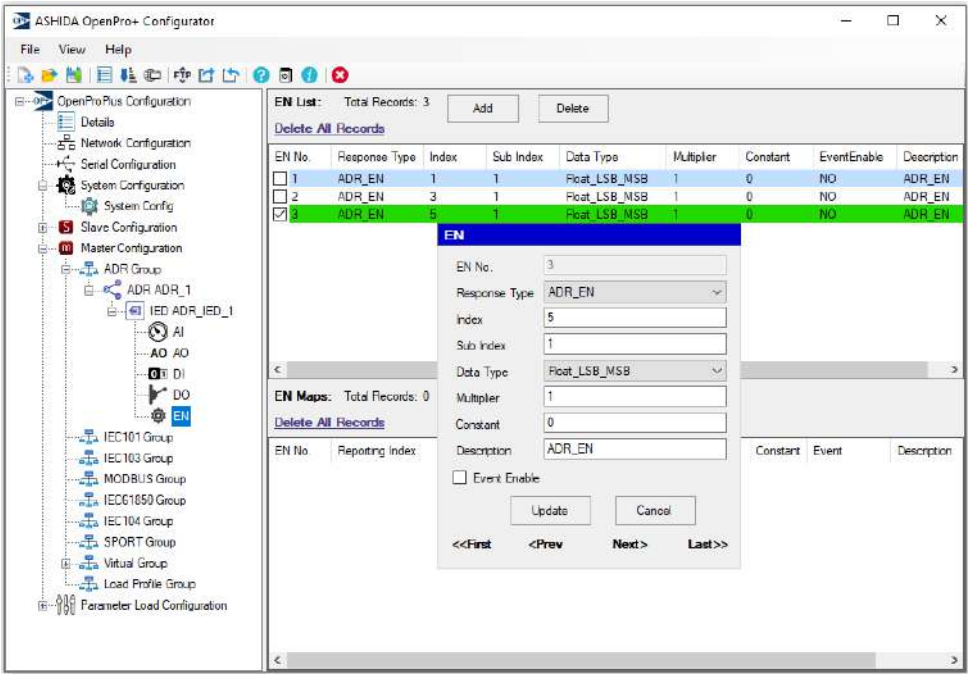


Figure 95: ADR EN

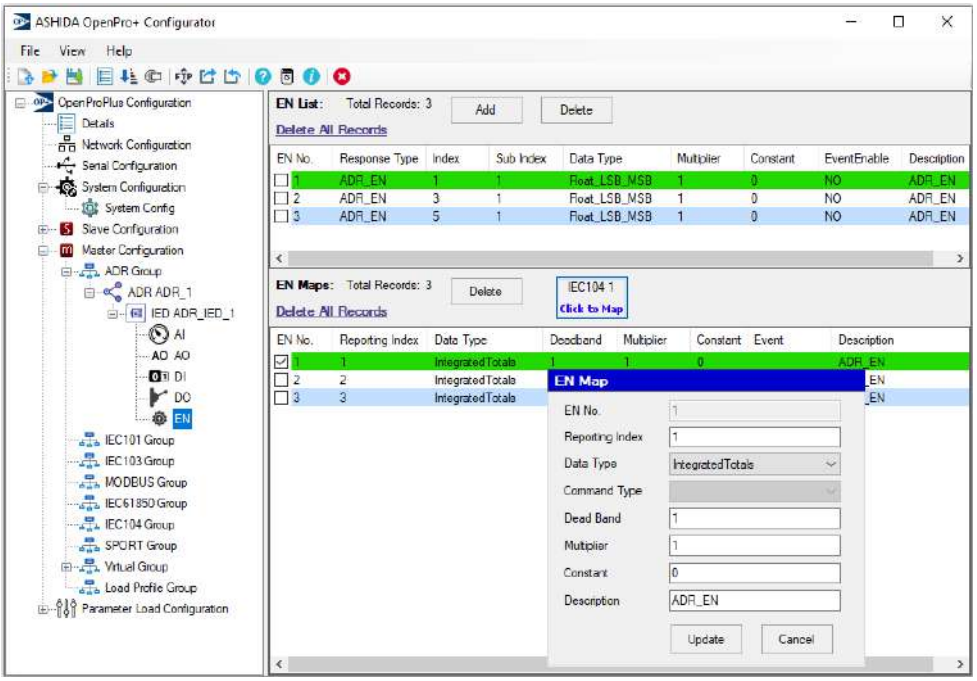


Figure 96: ADR EN Map

B.4.2 IEC103 Group

IEC103 Group is divided using IEC103 Master Configuration, IEC103_IED, IEC103_IED Details, IEC103_AI, IEC103_AO, IEC103_DI, IEC103_DO, IEC103_EN.

B.4.2.1 IEC103 Master Configuration

The user can add an IEC103 master and set its various parameters like Port No., GI Time, Clock Sync Interval, Refresh Interval, ,Description, Debug Level, Run, etc .To make IEC103 Master online mark it as Run.Click on IEC103 Group . Refer Figure 97

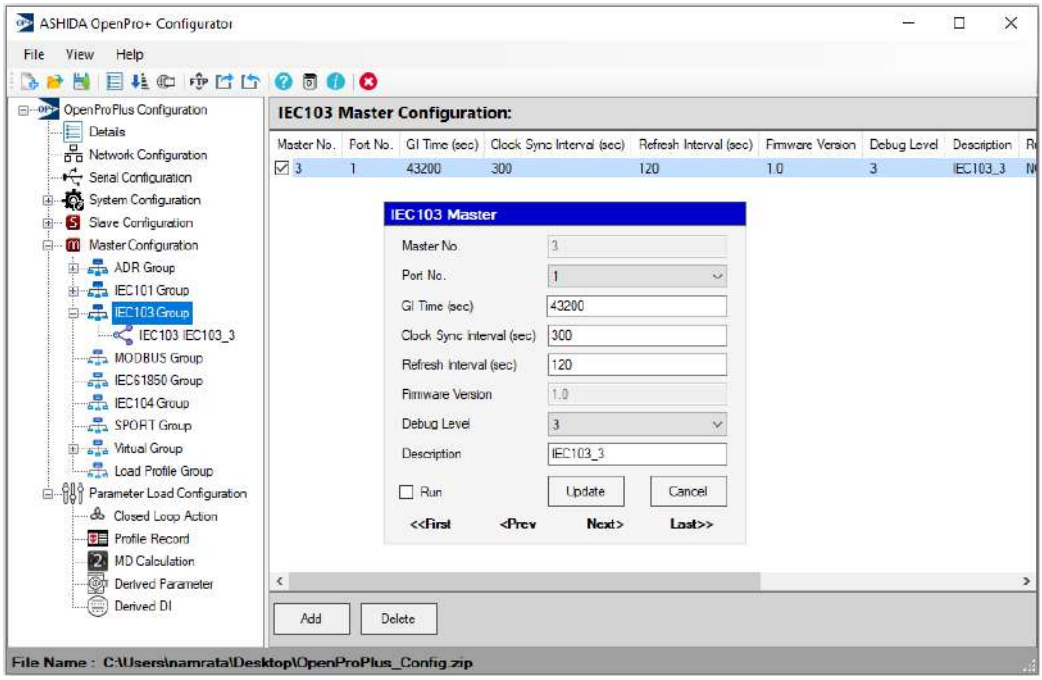


Figure 97: IEC103 Master Configuration

B.4.2.2 IEC103 IED

The user can add IED for IEC103 Master and set its parameters like UnitID, ASDU Size, Device, Retries, TimeOut, DR Applicable, Description, etc. IEC103 IED allows user to Export IED and Import IED. Click on IEC103 Refer Figure 98

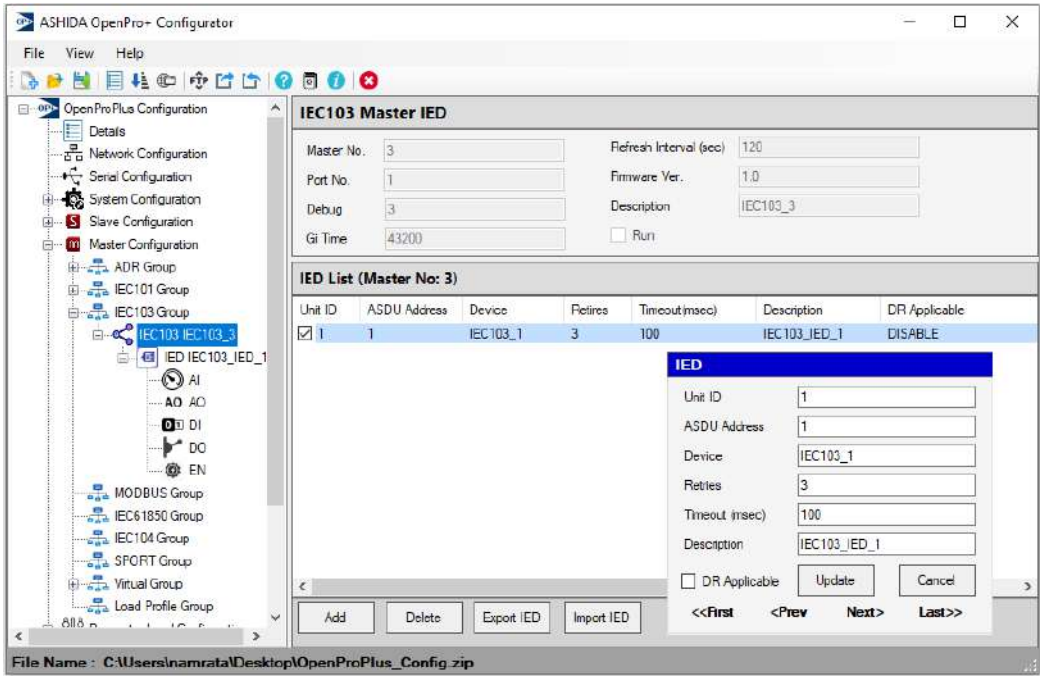


Figure 98: IEC103 Master IED

IEC103 IED details displays data points count for IEC103_AI, IEC103_DI, IEC103_DO, IEC103_EN Configuration and Mapping side. Click on IED IEC103_IED_. Refer Figure 99.

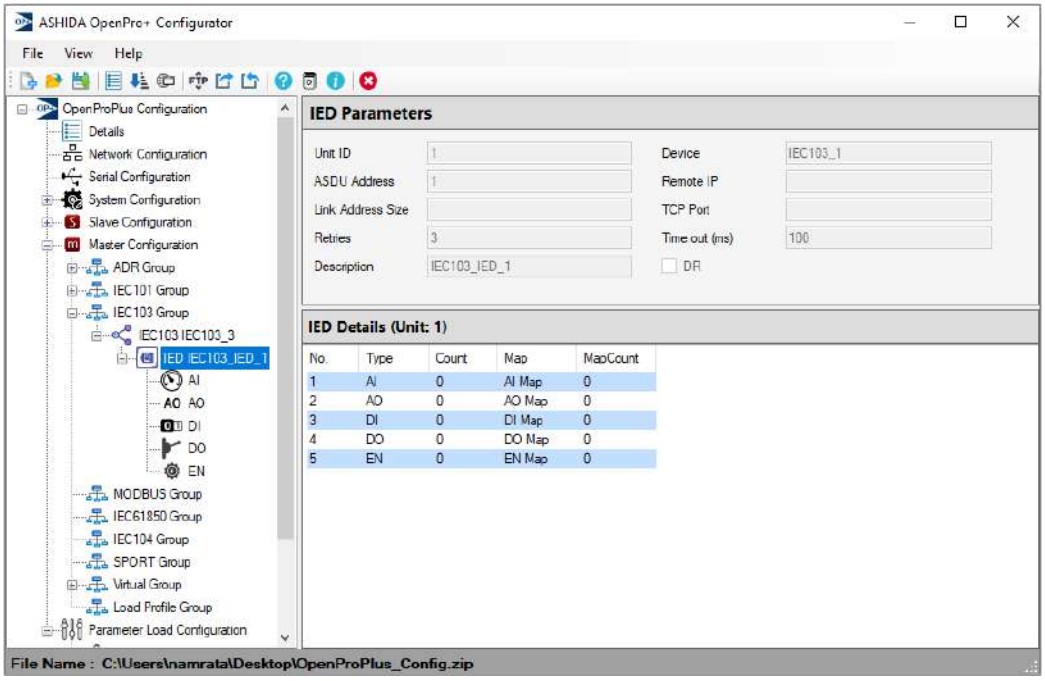


Figure 99: IEC103 IED Details

B.4.2.2.1 IEC103AI & SLD AI_Map

The user can add various datapoints like AI (Analog Input's) for IEC103 Master and set its parameters like ResponseType, Index, SubIndex, DataType,Multiplier, Constant, Description, etc. Click on IEC103_AI .

The OpenPro+ Configurator tool also allows user to map AI data points to protocol slaves and sets mapping parameters like CellNo, Widgets, Unit, Description, etc. depending on the slave type this object belongs to. AI data can be mapped to SLD slave AI as follows. Click on SLD 1.

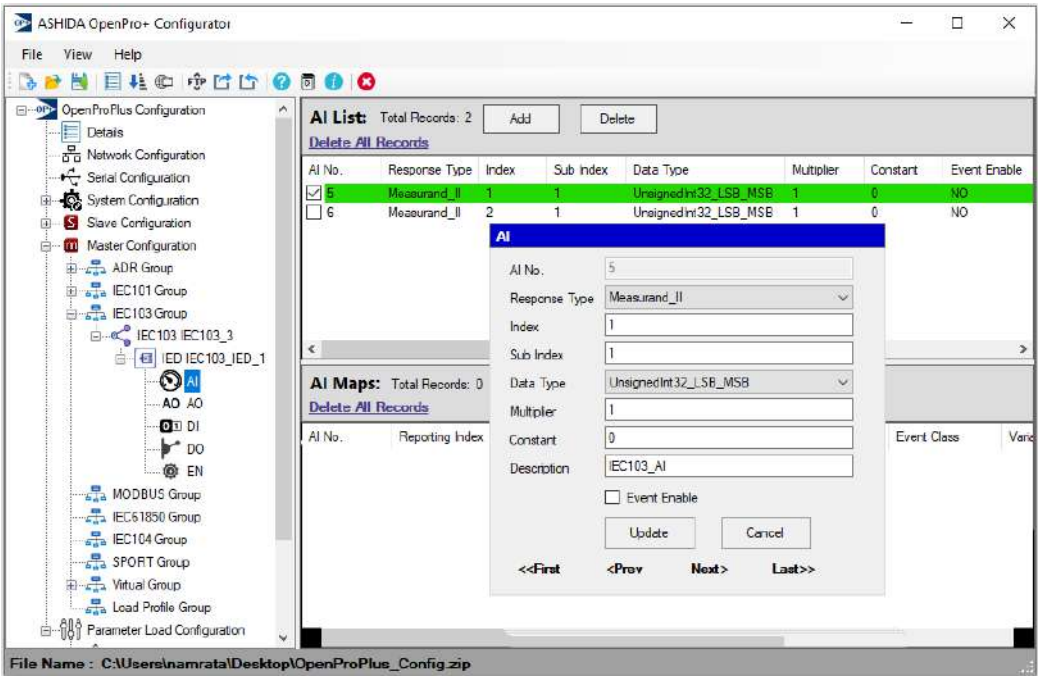


Figure 100: IEC103 AI

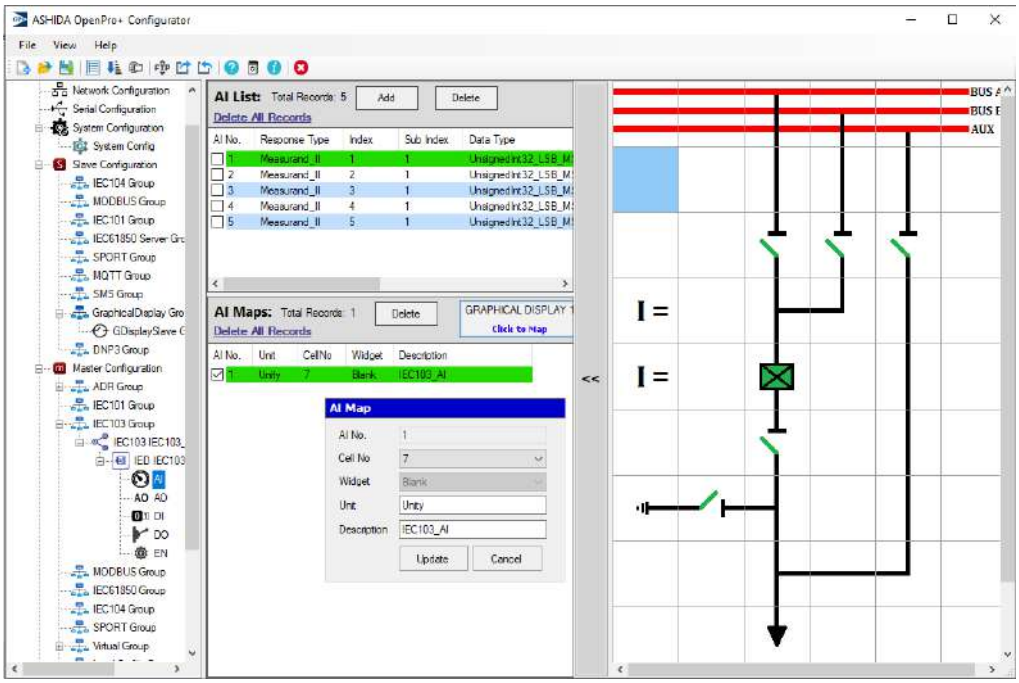


Figure 101: SLD AIMap

B.4.2.2.2 IEC103DI & SLD DI_Map

The user can add various datapoints like DI (Digital Input's) for IEC103 Master and set its parameters like ResponseType, Index, SubIndex, DataType, Multiplier, Constant, Description, etc. Click on IEC103_DI .

The OpenPro+ Configurator tool also allows user to map DI data points to Graphical Display slave and sets mapping parameters like CellNo, Widgets, Description, etc. depending on the slave type this object belongs to. DI data can be mapped to SLD slave DI as follows.

Select DI which we want to map to Graphical Display then select Slave under which you want to map DI. DI Map window will appear in that you have to select cell number in which you want to map selected DI then assign description if you want and Update.

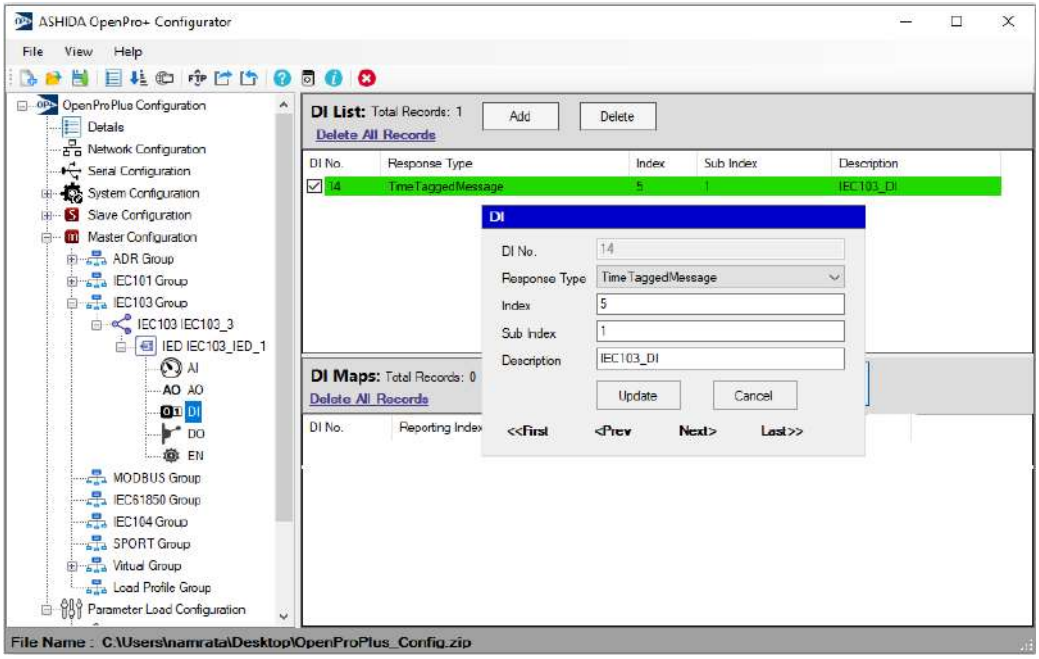


Figure 102: IEC103DI

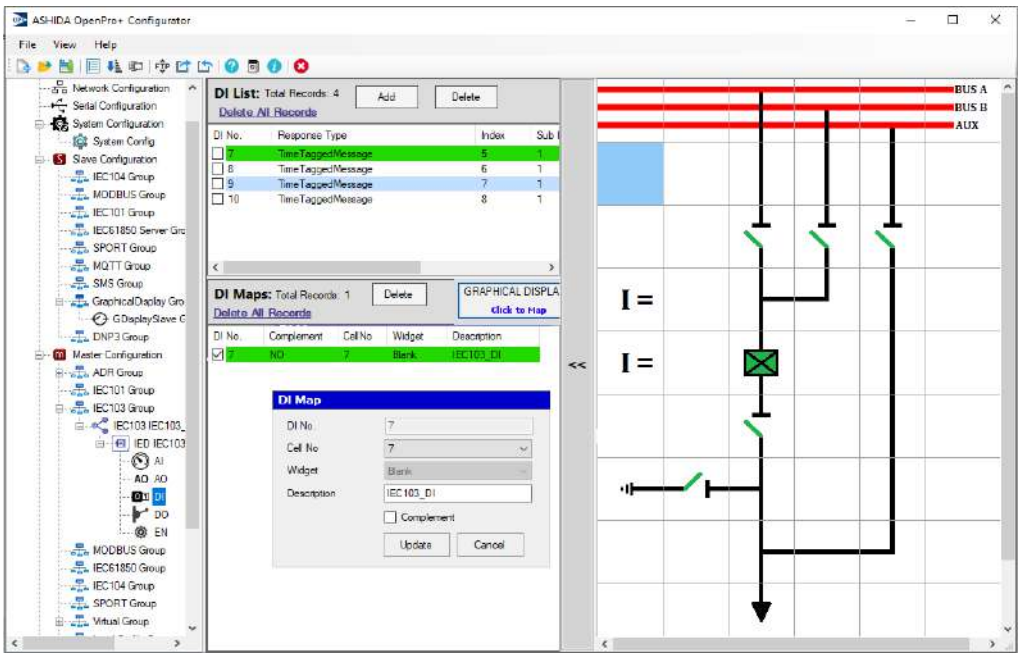


Figure 103: SLD DIMap

B.4.2.2.3 IEC103DO& SLD DO_Map

The user can add various datapoints like DO (Digital Output) for IEC103 Master and set its parameters like ResponseType, Index, SubIndex, DataType, Multiplier, Constant, Description, etc. Click on IEC103_DO.

The OpenPro+ Configurator tool also allows user to map DO data points to protocol slaves and sets mapping parameters like CellNo, Widgets, Unit, Description, etc. depending on the slave type this object belongs to. DO data can be mapped to SLD slave DO as follows.

Select DO which we want to map to Graphical Display then select Slave under which you want to map DO. DO Map window will appear in that you have to select cell number in which you want to map selected DO then assign description if you want and Update.

Note: If you want to map DCO hat is single Index for both Close and open operation then we have to map same index twice into the same cell as shown in Figure 104

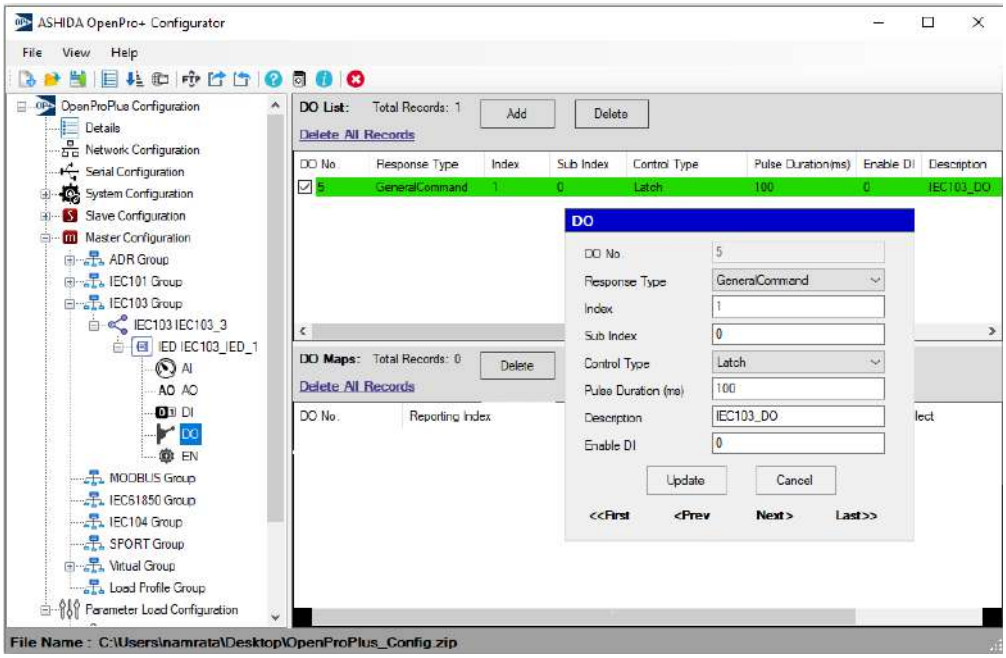


Figure 104: SLD DO

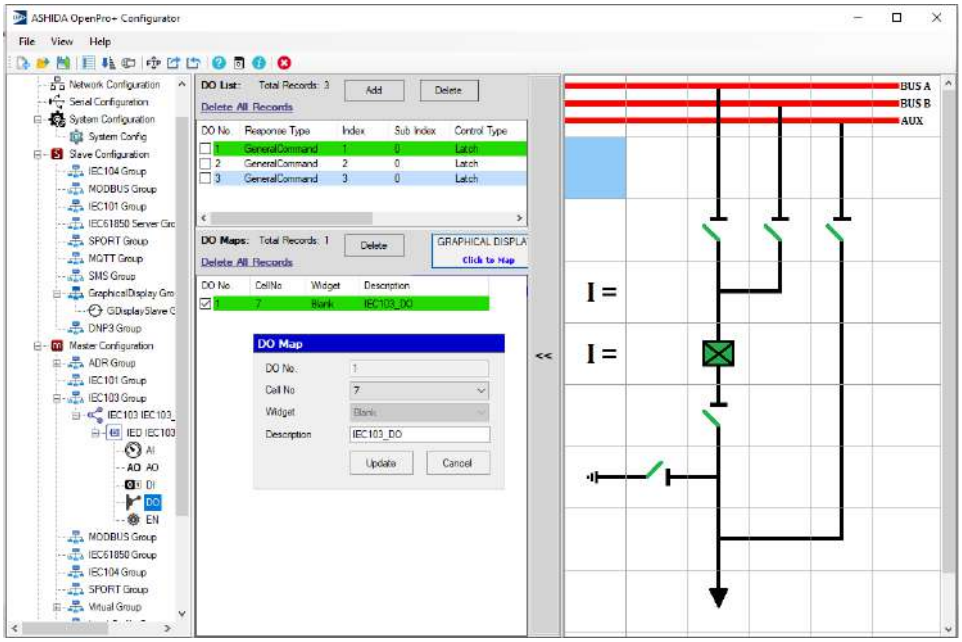


Figure 105: SLD DOMap

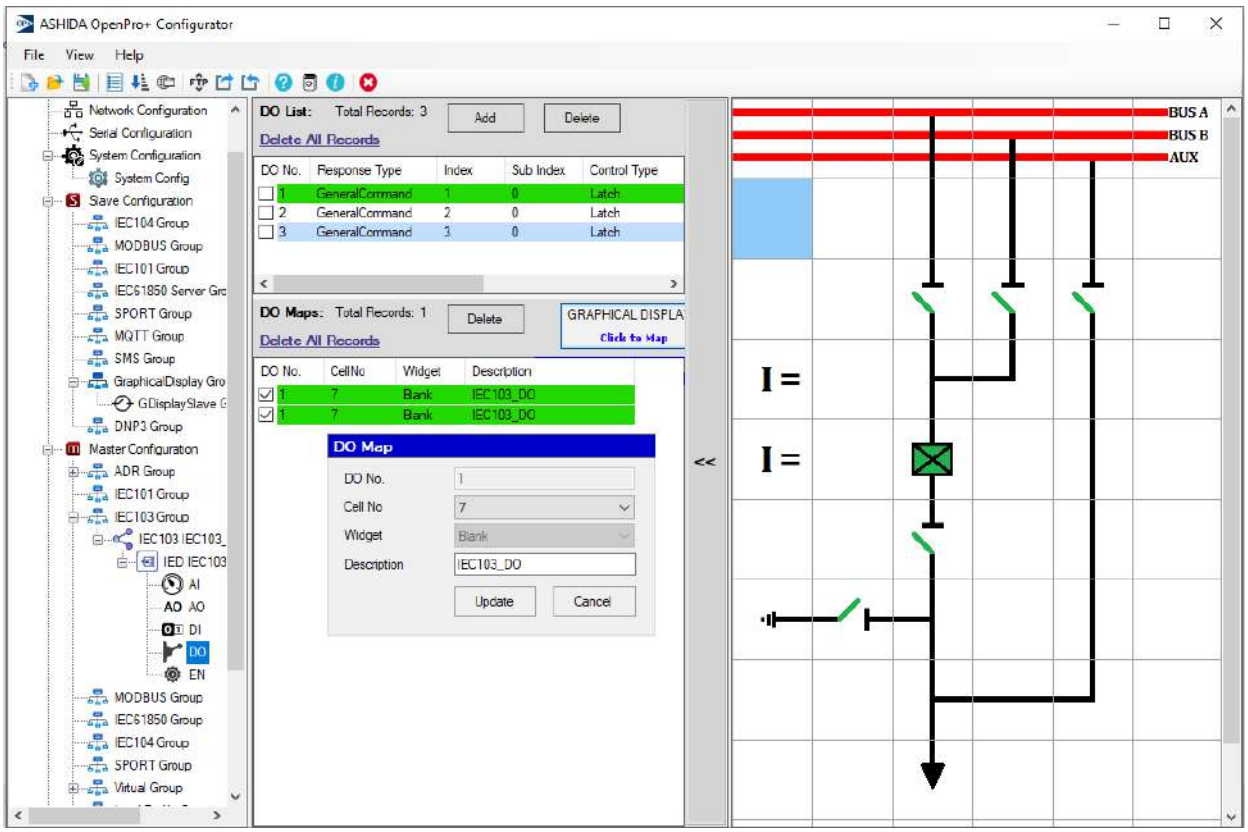


Figure 106: SLD DOMap

B.4.3 Virtual Group

Virtual Group is divided using Virtual Master Configuration, Virtual_IED, Virtual_IED Details, Virtual_AI, Virtual_DI.

B.4.3.1 Virtual Master Configuration

To view Virtual Master click on Virtual Group . Refer Figure 107

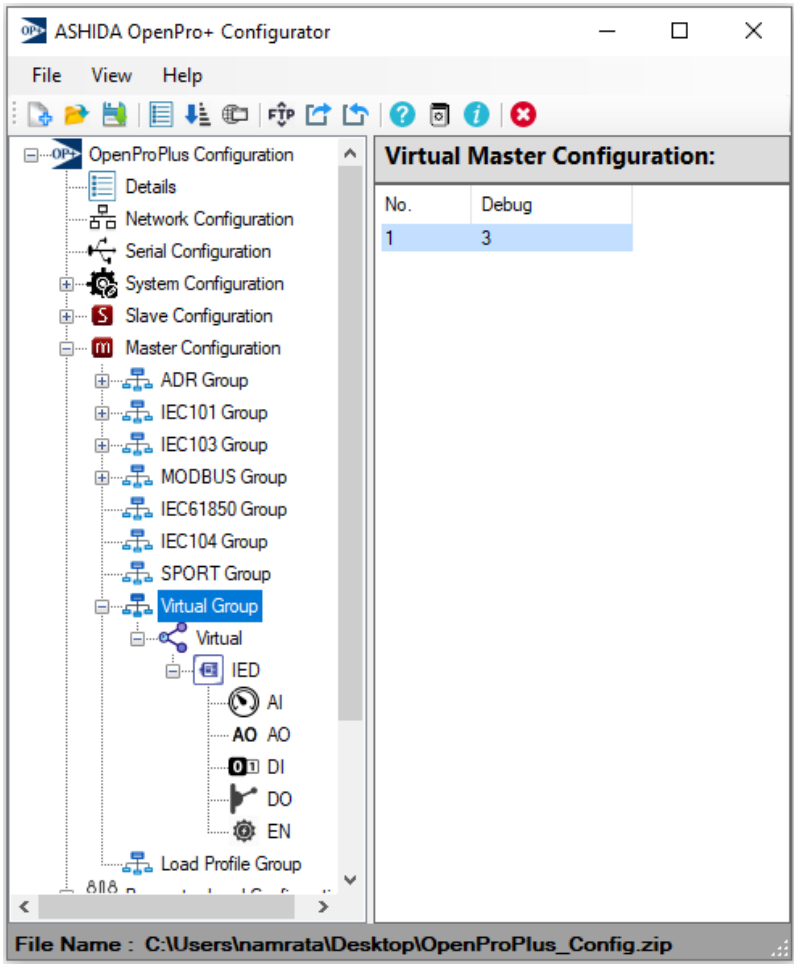


Figure 107: Virtual Master Configuration

B.4.3.1.1 Virtual IED

To view Virtual IED details click on IED . Refer Figure 108

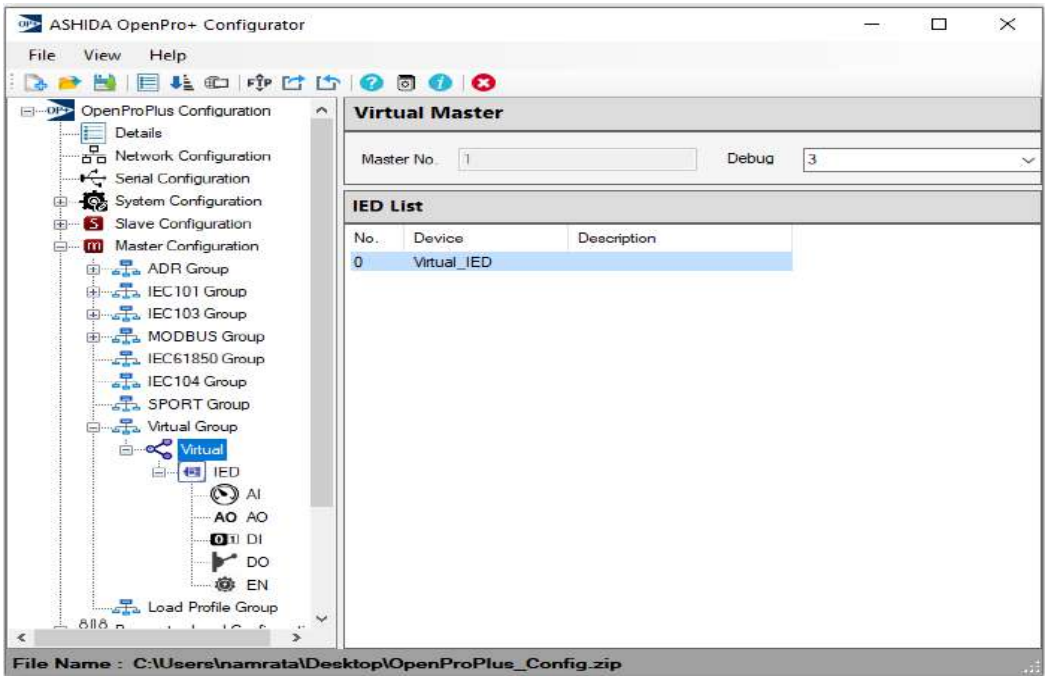


Figure 108: Virtual IED

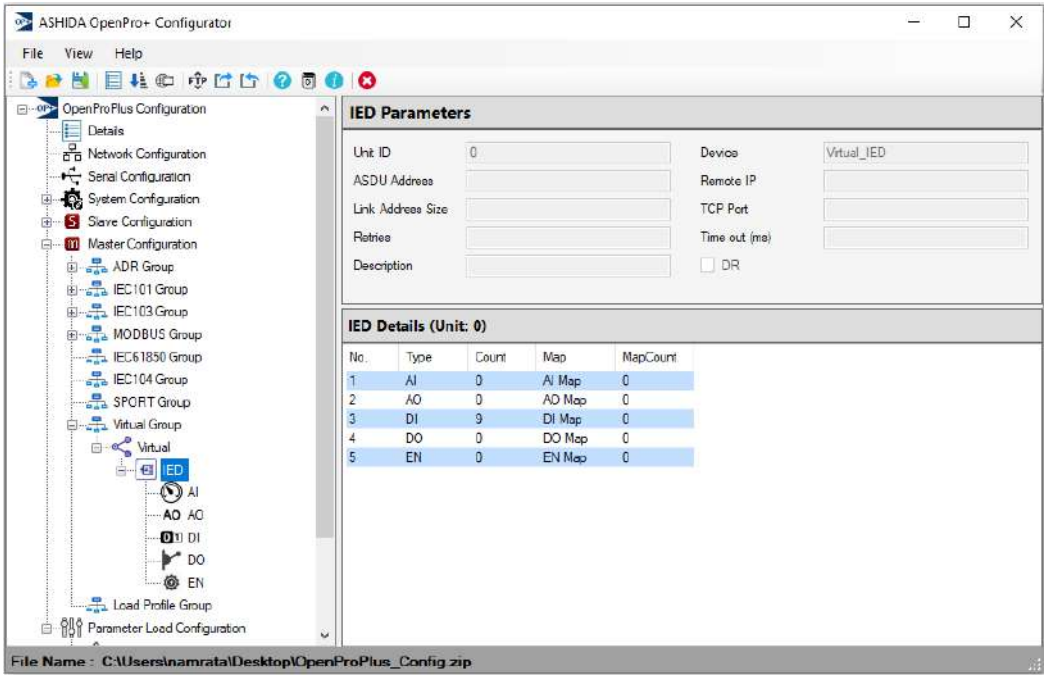


Figure 109: Virtual IED Details

B.4.3.1.1.1 Virtual DI & DI_Map

OpenPro+ Configurator will automatically create default entries for data points in Virtual Master e.g.LAN ports, Serial ports. Only map entries can be manually created by user.Click on Virtual_DI. Refer Figure 109

The OpenPro+ Configurator tool also allows user to map DI data points to protocol slaves and sets mapping parameters like Reporting Index, DataType, Bit Position, Description, etc. depending on the slave type this object belongs to.

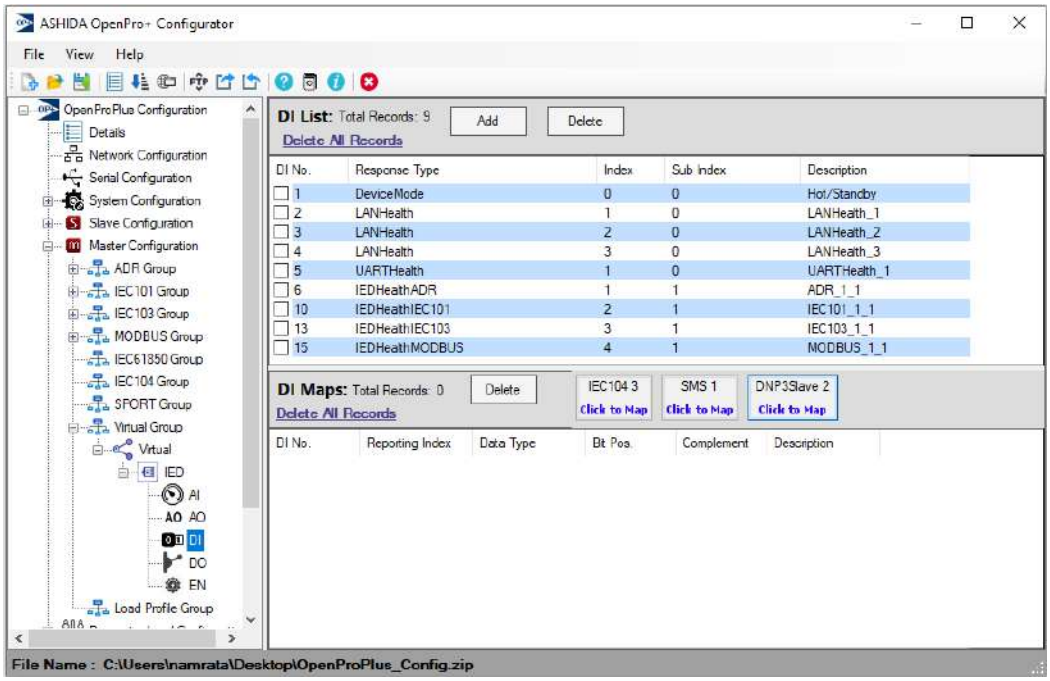


Figure 110: Virtual DI

B.5 Parameter Load Configuration

Parameter Load Configuration contains various virtual parameters generated from existing data points. This page shows count of different types of virtual parameters.Click on Parameter Load Configuration . Refer Figure 111

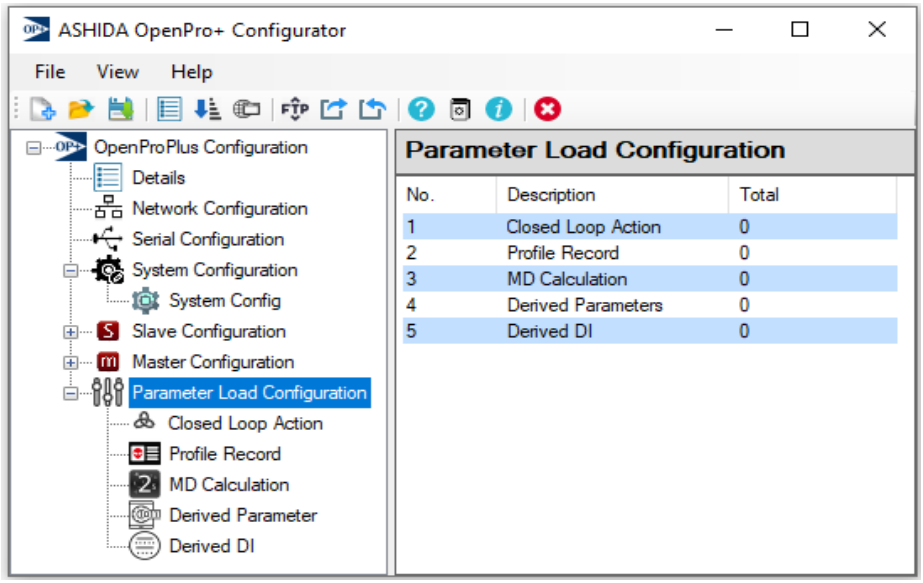


Figure 111: Parameter Load Configuration

B.5.1 Closed Loop Action

OpenPro+ Configurator tool allows user to add closed loop action entries. Click on Closed Loop Action . Refer Figure 112

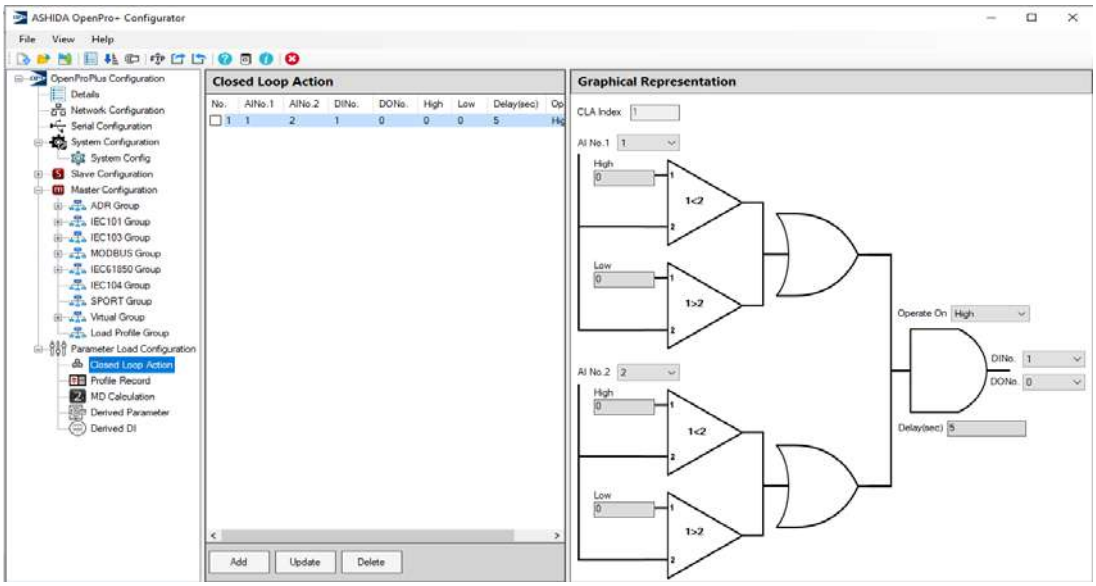


Figure 112: Closed Loop Action

B.5.2 Profile Record

OpenPro+ Configurator tool allows user to add Profile Record entries.Click on Profile Record. Refer Figure 113

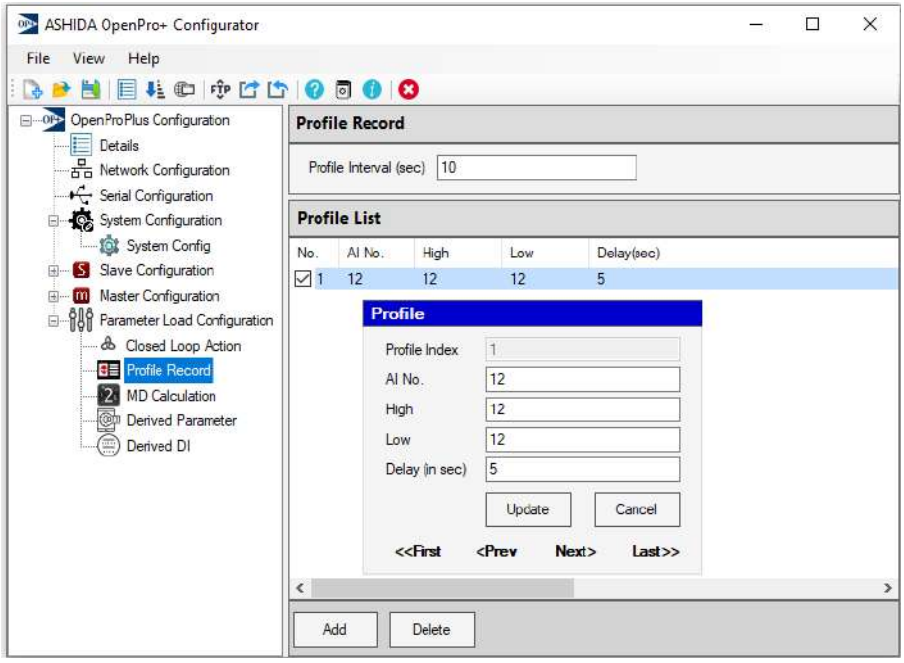


Figure 113: Profile Record

B.5.3 Derived Parameter

OpenPro+ Configurator tool allows user to add Derived Parameters entries. Click on Derived Parameters. Refer Figure 114

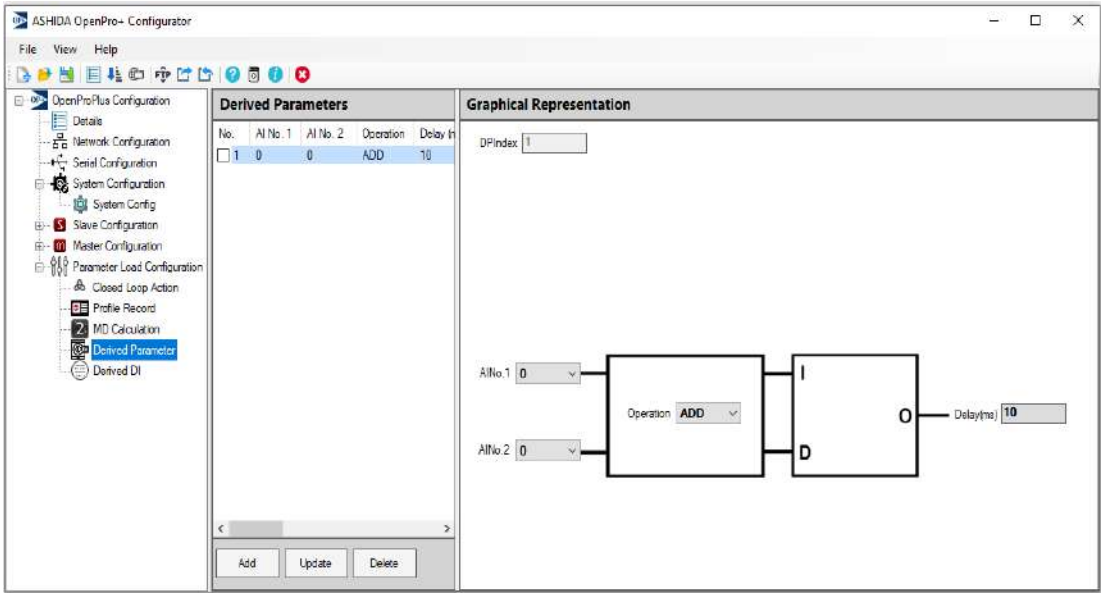


Figure 114: Derived Parameters

B.5.4 Derived DI

OpenPro+ Configurator tool allows user to add Derived DI entries. Click on Derived DI. Refer Figure 115

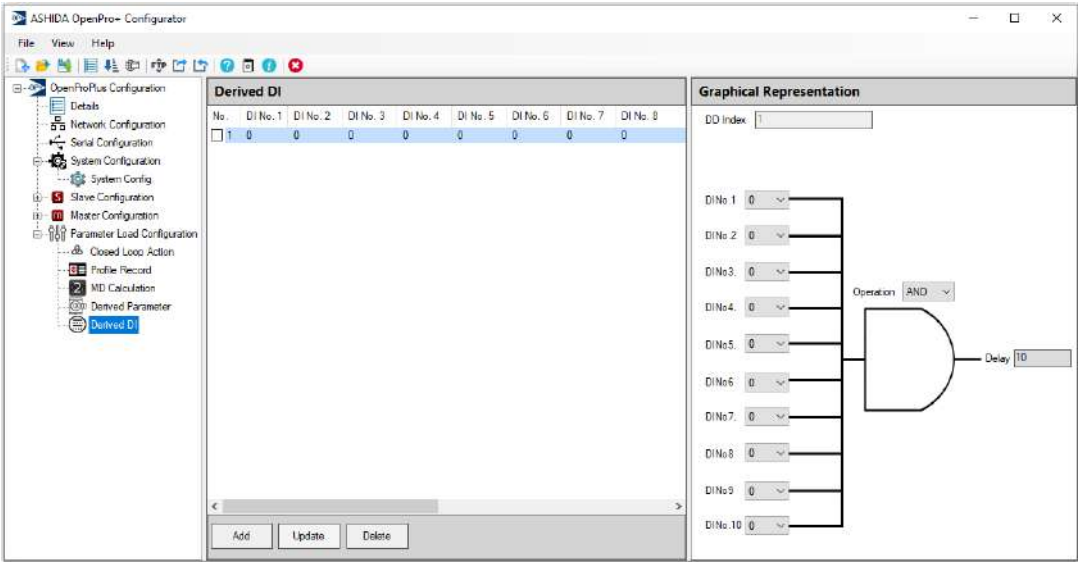


Figure 115: Derived DI

B.6 OpenPro+ Configurator UI

To View OpenPro+ Configurator UI click on View --> OpenPro+ UI . The following window will appear . Refer Figure 116

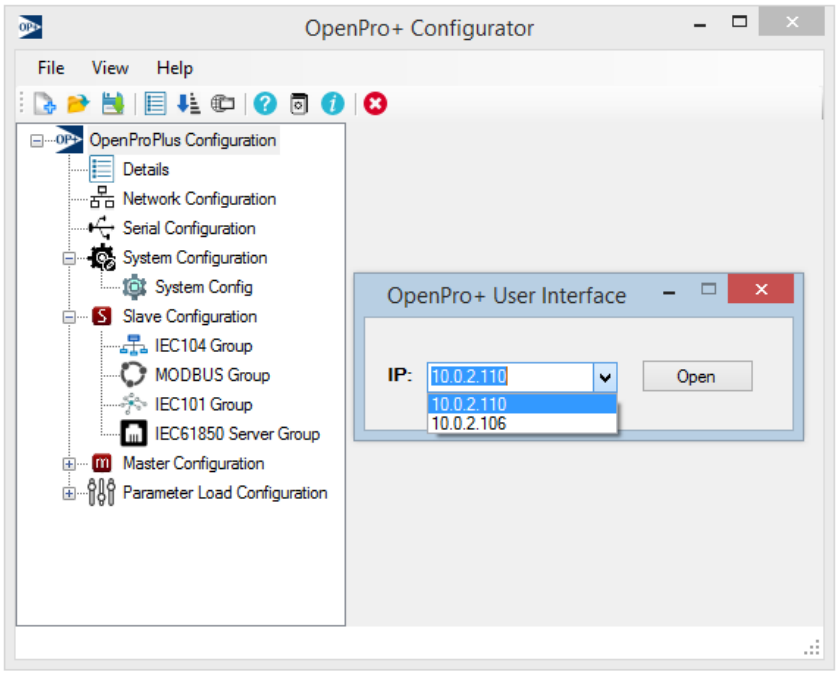


Figure 116: OpenPro+ Configurator UI

Enter IP And Click on “Open” Button. It will open “OpenPro+ UI” in web browser. Refer Figure 117

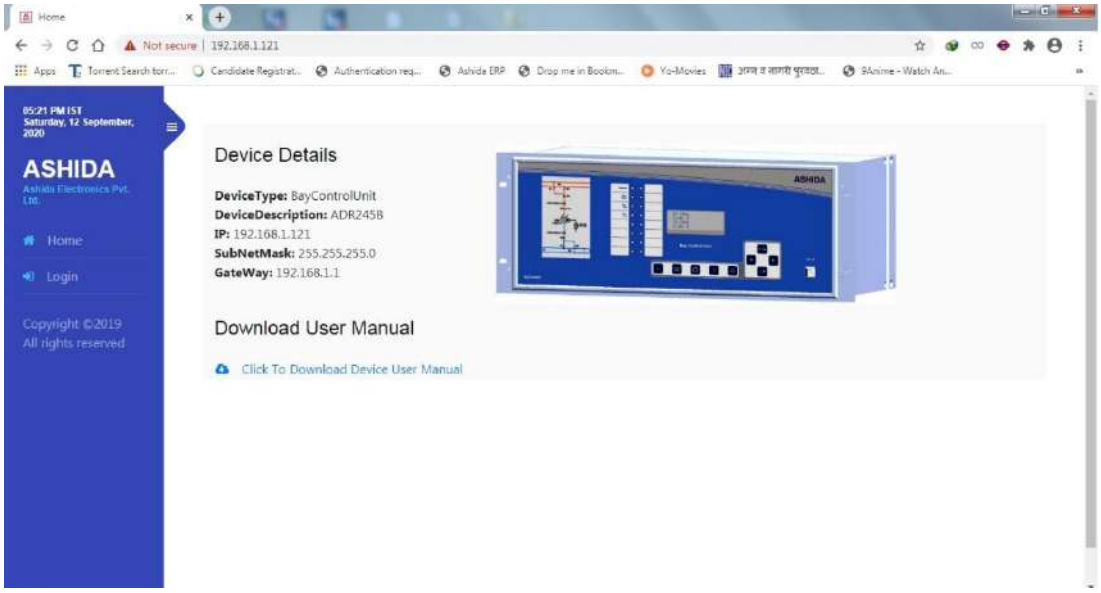
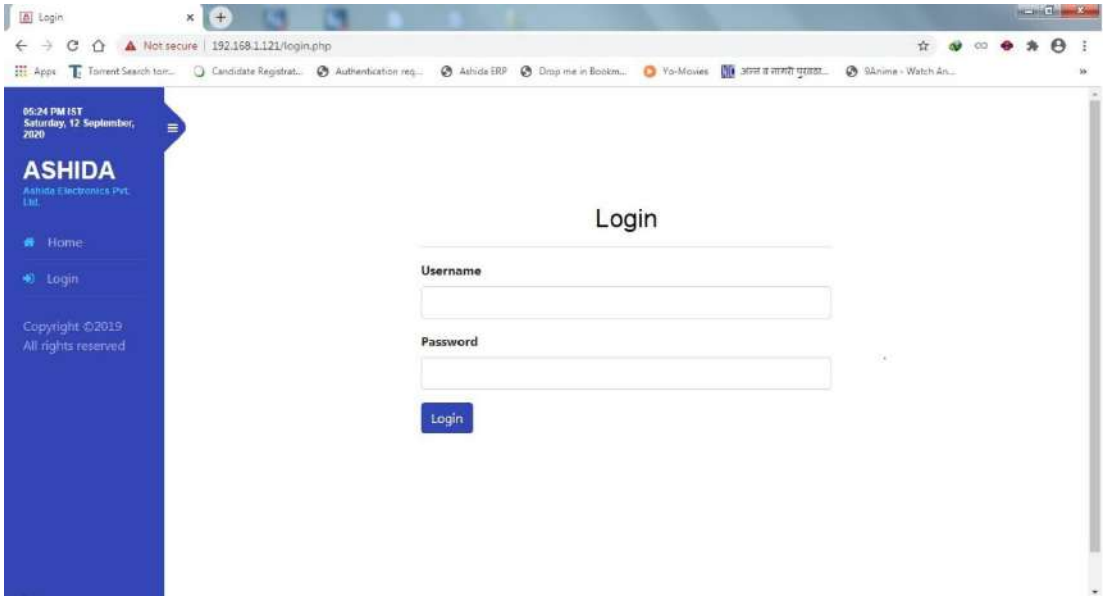


Figure 117: OpenPro+ UI Login

Then click to Login option, the following window will appear.



After successful Login, by entering the valid credentials I.e. Username=Admin & Password=Admin@123, the following web page will appear.

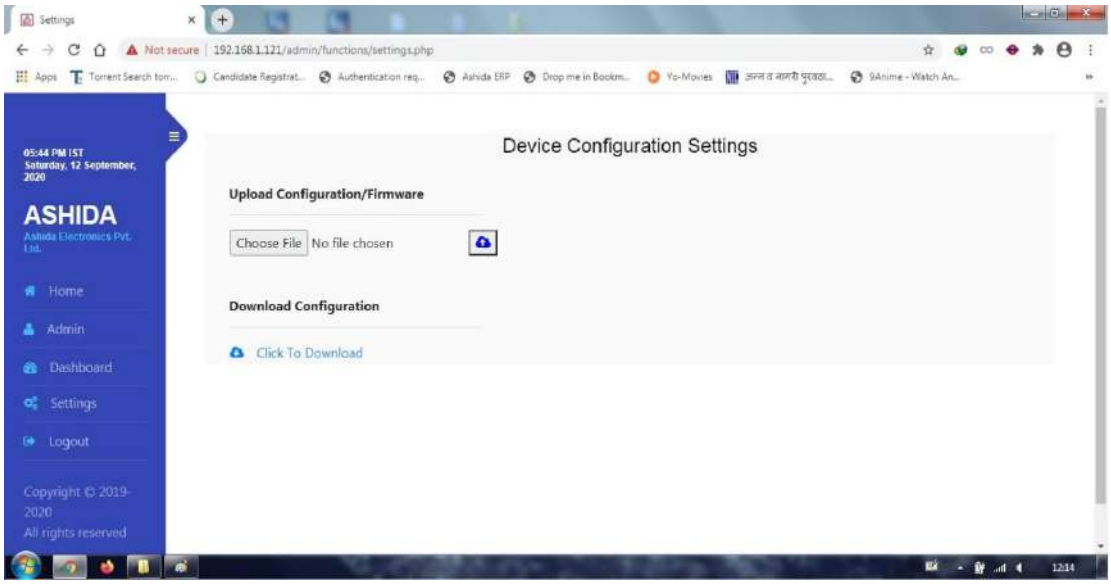


Figure 118: OpenPro+ Upload & Download XML

B.7 Troubleshooting

This section provides assistance diagnosing and correcting installation and common problems while running the OpenPro+ Configurator.

Schema File Missing Error

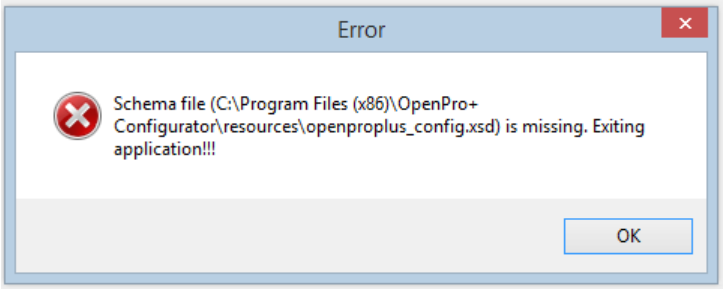


Figure 119: Schema File (openproplus.config) Missing Error

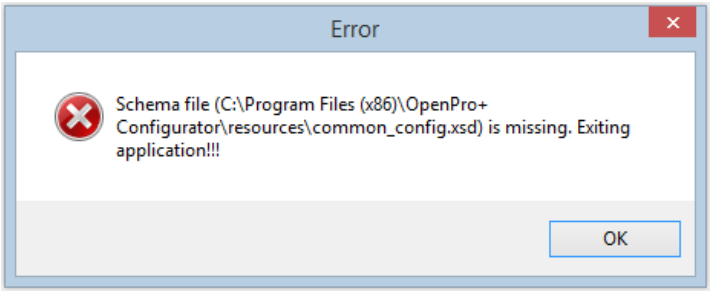


Figure 120: Schema File (common.config) Missing Error

Error	Troubleshoot
Schema file is missing	Check that common_config.xsd & openproplus_config.xsd exists in [Install Folder/resources/]

Not A Valid XML File

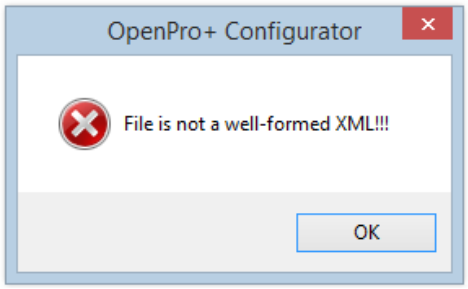


Figure 121: Not A Valid XML

Error	Troubleshoot
File is not a well-formed XML.	The file is not an XML file or is not well-formed (contains errors).

Config File Does Not Match Schema Definition

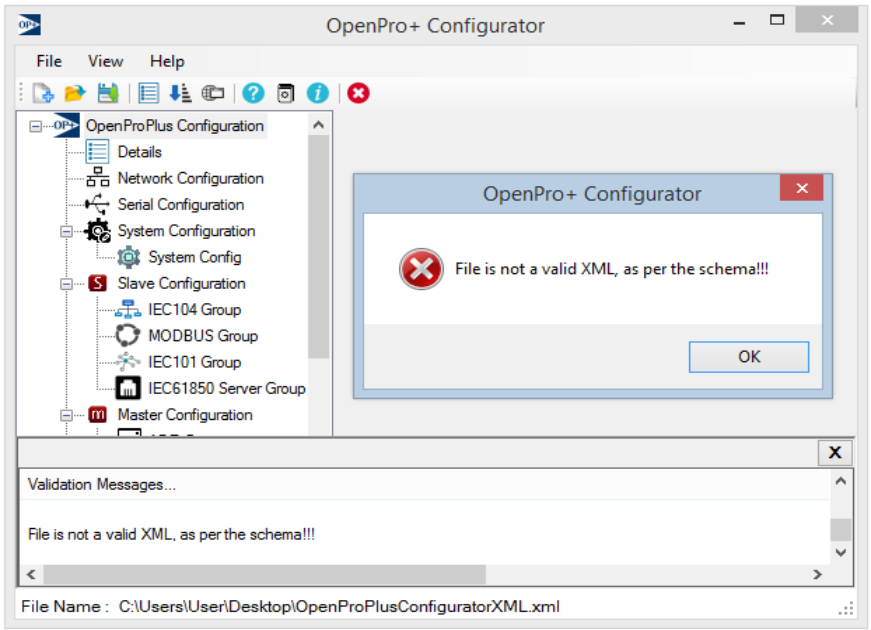


Figure 122: Config File Does Not match Schema Definition

Error	Troubleshoot
File is not a valid XML, as per the schema.	Check that the file you load is a valid OpenPro+ config file & satisfy schema definition. The 'Validation Messages' window describes the error along with Line No. wherever there is a conflict.

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Section 4

Protection Logic

Contents

4 PROTECTION FUNCTION & LOGIC FUNCTIONS

4.1 Overview

This section describes the BCU-ADR245B IED settings, including the protection elements and basic functions, control Input/output logic, as well as the settings associated with the protection function.

Application data.

Application Data describes the list of information that you will need to know about the protected equipment before calculating the BCU settings.

Global Settings.

List of general setting and communication port setting.

Reclosing.

Describes all the Auto reclosing IED settings and logic needed for automatic reclosing for the temporary fault.

Breaker Failure Setting.

Describes all the Breaker Failure settings and logic needed for Breaker failure on internal protection trip or external BF initiation.

SOTF.

Describes all the switch on to fault settings and logic needed for trip breaker under the fault condition.

CB Open Pole.

Describes all the CB Open Pole settings and logic needed CB Open Pole condition.

Sync Check

Describes all the Sync Check settings and logic needed Sync Check condition

Analogue Input

Describes all the Sync Check settings.

Programmable Logic control.

Describes programmable and logic equation that the user can build their own logic for various application.

4.2 Application Data

It is required to have the field data which is used to calculate the parameter settings which has to be set in the IED. Hence the following inputs are required to calculate the parameter settings in the BCU.

- Highest expected load current.
- Current transformer primary and secondary ratings and Connections
- Voltage transformer ratios and connections
- System nominal frequency
- Expected fault current magnitudes for ground and three-phase Faults

4.3 GLOBAL Settings

4.3.1 General Settings

Frequency Settings

System nominal frequency can be set under general setting as given in below table.

SL.NO	Setting Parameters	Setting ranges
1.	System Frequency	50Hz/60Hz

The above setting has to be set based on the Electrical power system parameters.

4.3.2 Settings Group

The following settings are used to select the specific Group setting based on the application.

SL.NO	Setting Parameters	Setting ranges
1.	Active Group	G1/G2/G3/G4
2.	Copy From	G1/G2/G3/G4
3.	Copy To	No Operation/G1/G2/G3/G4
4.	G1	Disabled/Enabled/Time Enable
5.	GroupChange Delay	0 to 400s in step of 0.1s
6.	G2	Disabled/Enabled/Time Enable
7.	GroupChange Delay	0 to 400s in step of 0.1s
8.	G3	Disabled/Enabled/Time Enable
9.	GroupChange Delay	0 to 400s in step of 0.1s
10.	G4	Disabled/Enabled/Time Enable
11.	GroupChange Delay	0 to 400s in step of 0.1s

The four groups are available for specific application based on the customer requirement. Especially it is applicable for group change over logic as follows.

Group 1 to Group 2 Changeover when G2 is set as Enabled condition

Step 1: Assign the In1 input to Active G2 setting under AProLogic configuration.

Step 2: G2 setting must be set as Enabled under setting group parameter in Global Menu.

Step 3: Energise the binary input IN1 using the DC supply 24 -230V dc

Output 1: Group1 is changed to Group 2 setting.

Step 4: Disconnect the dc supply to the binary input In1.

Step 5: The Group2 setting will be changed to Group1 setting.

Group 1 to Group 2 Changeover when Group 2 is set as TimeEnabled condition

Step 1: Assign the any binary input (IN1) to Active G2 setting under AProLogic configuration.

Step 2: G2 setting must be set as “TimeEnabled” under “Setting Group” parameter in Global Menu.

Step 3: Energise any binary input (IN1) through the DC supply 24 – 230V dc

Output 1: Group1 is changed to Group 2 setting.

Step 4: After disconnect the dc supply to the binary input In1.

Step 5: The Group2 setting will be changed to group1 setting after the GroupChange delay under setting group parameter.

Note: The same procedure can be repeated for remaining three groups

4.3.3 Port F Communication setting

The Communication settings of BCU-ADR245B IED are listed in below table which is necessary for the communication between the IED and Personal computer.

SL.NO	Setting Parameters	Setting ranges
1	Unit ID	1
2	Baud Rate	57600
3	Set Parity	None

The above settings are used to establish the proper communication between the IED and Relay Talk V2 software from the Computer. The above settings should be set same in configuration for the successful communication.

4.3.4 Port 1 Communication setting

SL.NO	Setting Parameters	Setting ranges
1.	Unit ID	1 to 250
2.	IP Address	192.168.001.121
3.	Subnet Mask	255.255.255.000
4.	Default gateway	192.168.001.001
5.	Prim. SNTP	000.000.000.000
6.	Sec. SNTP	000.000.000.000
7.	Protocol	Disabled/Enabled
8.	Ethernet Mode	Fixed /Dual
9.	Operating Mode	Failover/Switchover
10.	Primary	LAN1 / LAN2
11	Ethernet Mode*	Dual
12	Operating Mode*	PRP / HSR
13	Primary*	LAN1

*NOTE: *marked settings are available in PRP model only*

The above settings must be configured in the BCU for the successful IEC61850 communication.

4.3.5 Port R Communication setting

The port R Communication settings of BCU-ADR245B IED are listed in below table which is necessary for the communication between the IED and Local / SCADA Personal computer.

SL.NO	Setting Parameters	Setting ranges
1.	Unit ID	1
2.	Baud Rate	57600
3.	Set Parity	None

The above settings are used to establish the proper communication between the IED and Relay Talk V2 software from the Computer. The above settings should be set same in configuration for the successful communication.

4.3.6 IRIGB Port (Optional)

This port is used to enable or disable the option for the time synchronisation purpose.
Once this port is enabled then SNTP time synchronisation will be disabled automatically.

4.3.7 Disturbance Record Setting

A **"Pre-Trigger"** setting is provided with setting range of 5% to 95% in step of 1%. This is used to set the post fault delay in the Disturbance Recorder. The BCU provide 10 nos. of Disturbance Records of 1.5 second duration (each).

4.4 CB CONTROL

4.4.1 CB Supervision Function:

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 BCU-ADR245B incorporates a circuit breaker and trip circuit monitoring function, giving an indication of the position of the circuit breaker contacts and trip circuit healthiness. This indication is available either on the BCU front panel or via the communications network.

The circuit breaker state monitoring function is available in CB CONTROL menu.

4.4.2 Trip Circuit Supervision Alarm

The Trip Circuit Supervision is used to monitor healthiness of circuit breaker. The trip circuit extends beyond the enclosure and passes through more components, such as fuse, wires, contacts, auxiliary switch contact and so on. The failure of any components results bypassing the protection.

The BCU is provide seperate TCS for Gang operated /Pole operated CB, for Pole operated scheam pole wise trip circuit supervision function is available which continuously monitor continuity of trip circuit of each pole and generate ALARM to take appropriate action.

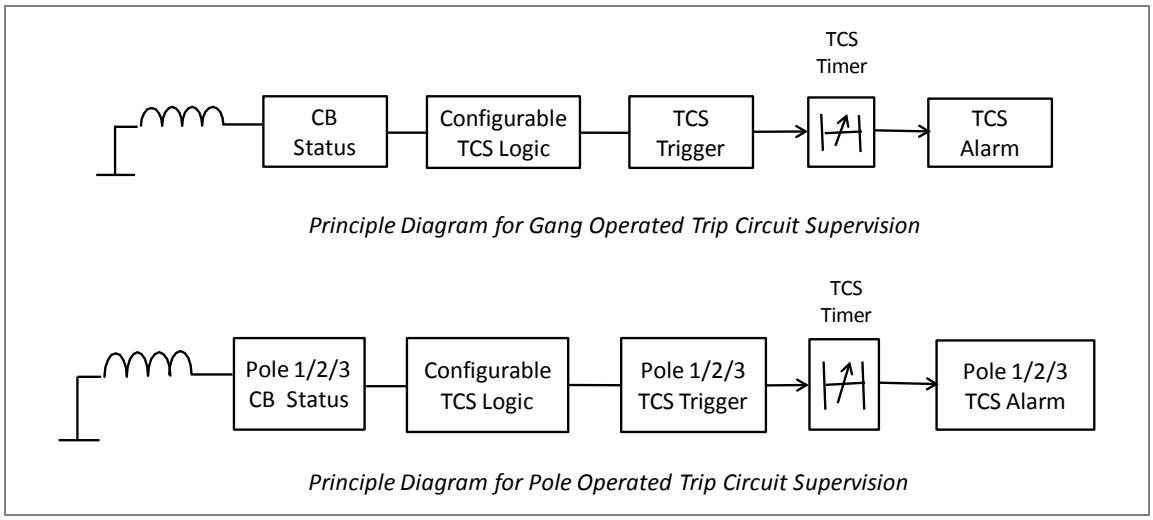


Figure 1: Principle Diagram for Gang/ Pole Operated Trip Circuit Supervision

The figure 1 represents the principle logic for Gang operated / Pole operated Trip Circuit Supervision

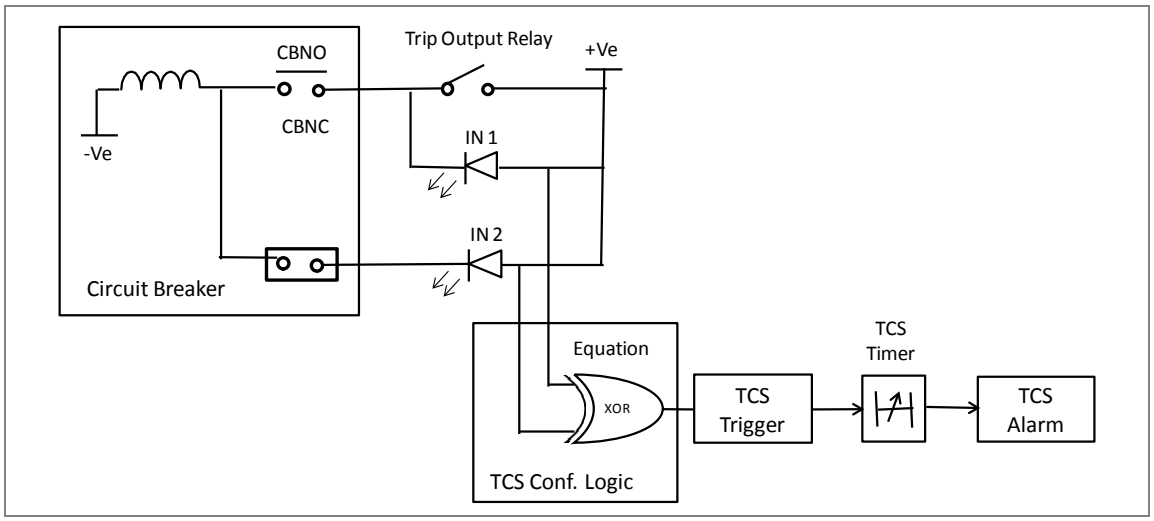


Figure 2: Logic Diagram for Pole Operated Trip Circuit Supervision

The figure 2 represents the logic for Gang operated & Pole operated Trip Circuit Supervision using CBNO & CBNC both status, It monitor continuity of trip circuit through either normally open (NO) or normally close (NC) contact of CB connected to digital input assigned to TCS Trigger. If any discontinuity is observed, then the BCU generates TCS Alarm after a set time delay an Alarm message is displayed on LCD display and Event is stored in the Event Record.

4.4.3 CB Open Supervision and CB Open Operation Alarm

Periodic maintenance of circuit breakers is necessary to ensure that the trip circuit and mechanism operates correctly and also that the breaking capability has not been compromised due to previous fault interruptions. Generally, such maintenance is based on a fixed time interval. These methods of monitoring circuit breaker condition give a rough guide only and can lead to excessive maintenance.

The BCU record various statistics related to each circuit breaker trip operation, allowing a more accurate assessment of the circuit breaker condition to be determined. For each circuit breaker trip operation the BCU records statistics as shown in the following

Record in Measurement	Description
TC	“Trip Counter” This counter indicate numbers of protection trip.
3PBOT	“Breaker Opening Time” This is a circuit breaker opening time in ms for gang operated CB scheme selection.
3PBOC	“Breaker Opening Counter” This is counter indicate numbers of CB operation for gang operated CB scheme selection.
P1BOT	“Breaker Opening Time” This is a Pole-1 circuit breaker opening time in ms for pole operated CB scheme selection.

P1BOC	“Breaker Opening Counter” This is counter indicate numbers of CB operation for pole-1 for pole operated CB scheme selection
P2BOT	“Breaker Opening Time” This is a Pole-2 circuit breaker opening time in ms for pole operated CB scheme selection.
P2BOC	“Breaker Opening Counter” This is counter indicate numbers of CB operation for pole-2 for pole operated CB scheme selection
P3BOT	“Breaker Opening Time” This is a Pole-3 circuit breaker opening time in ms for pole operated CB scheme selection.
P3BOC	“Breaker Opening Counter” This is counter indicate numbers of CB operation for pole-3 for pole operated CB scheme selection

The above counters in the CB condition monitoring function may be reset to zero, after maintenance inspection and overhaul.

4.4.3.1 CB Open Supervision

Slow CB operation is also indicative of the need for mechanism maintenance. Therefore, an alarm is provided and is settable in the range of 50ms to 1s. This time is set in relation to the specified breaking time of the circuit breaker.

The BCU provides seperte CB Supervision for Gang operated / Pole operated scheme (polewise detection). The diagram indicate operation CB open supervision logic.

The BCU starts internal timer as soon as any protection function is operated, and monitor CB operation through CB52B contact assign to any of binary input through AProLogic.

If breaker opening time is more than set “CB Open Time” then BCU generates CB Open Supervision ALARM. An Alarm message is displayed on LCD display and the start LED is start blinking & event is stored in Event Record. (Note that this time also include contact operating time of BCU and time between CB main contact and auxiliary contact if any).

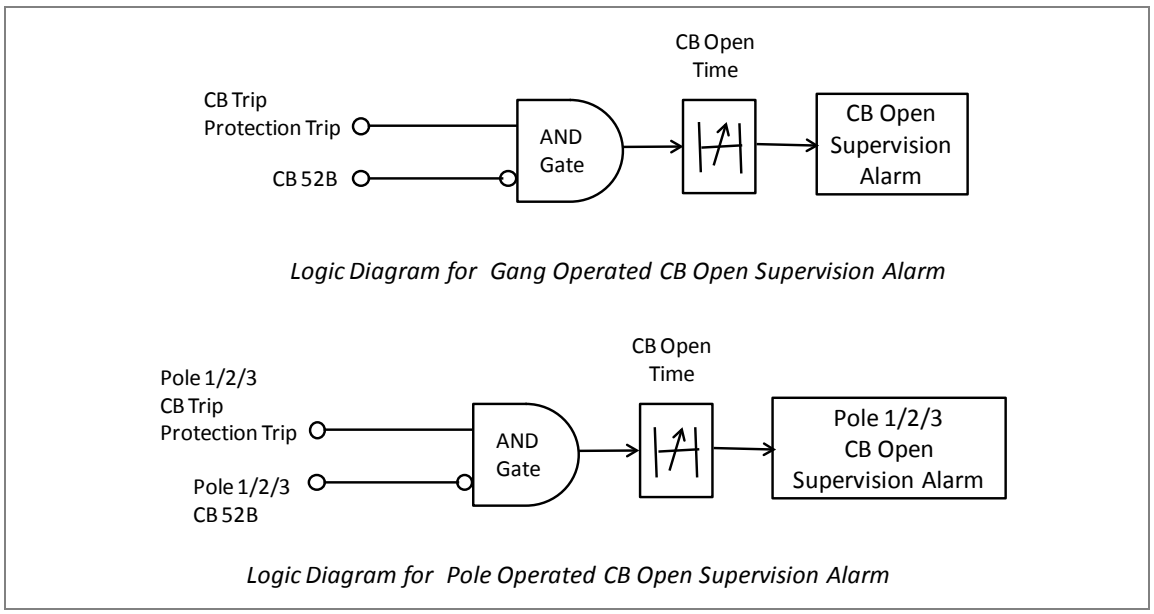


Figure 3: Logic Diagram for Gang / Pole operated CB Open Supervision Alarm

4.4.3.2 CB Open Operation Alarm

For each circuit breaker trip operation, the BCU records statistics. CB Operations Displays the number of opening commands executed by the CB. Every operation of a circuit breaker results in some degree of wear for its components. Thus, routine maintenance, such as oiling of mechanisms, may based upon the number of CB operations. The BCU-ADR245B monitor the circuit breaker operation maintain by two type of counters, one is TC “Breaker Trip Counter” which will increment when BCU provide trip command based on operation of protection function and second one is BOC “Breaker Opening Counter” will increment when the state CB 52B Opto I/P change low to high (which is connected to CB NC Contact). The BCU compares “Breaker Opening Counter” with “CB Open Operations” setting when counter cross the set value BCU generate CB Open Operation ALARM, indicating when preventative maintenance is due. An Alarm message is displayed on LCD display and the start LED starts blinking & event is stored in Event Record.

4.4.3.3 L/R Switch

Local and Remote push buttons are provide on front panel for CB Operation, by using L/R push buttons the type of CB Operation can be selected. Local and Remote push buttons are provided in RTV2 configuration for configuration any output and LEDs.

4.4.4 CB CONTROL Operation:

The Circuit Breaker (CB) can be control either locally through BCU HMI or remotely through SCADA system Type of Control operation can be set from “CB Control ” menu (i.e. Disable, Local, Remote or Local + Remote) in the “CB CONTROL menu”.

4.4.4.1 For CB OPEN command

Once CB Open command is received from locally or remotely, the assigned output contact to the CB (52B) will operate, simultaneously the BCU starts monitoring Status of opto input CB TRIP, if the status of CB (52B) is not active with in “CB open pulse time” (settable in the range of 0.1 to 50 sec), then BCU generate “CB Open Fail Alarm” on LCD display and event will be stored in Event Record. The ALARM can be assign to any LED or output contact.

The operation of Open Fail is explained in following diagram:

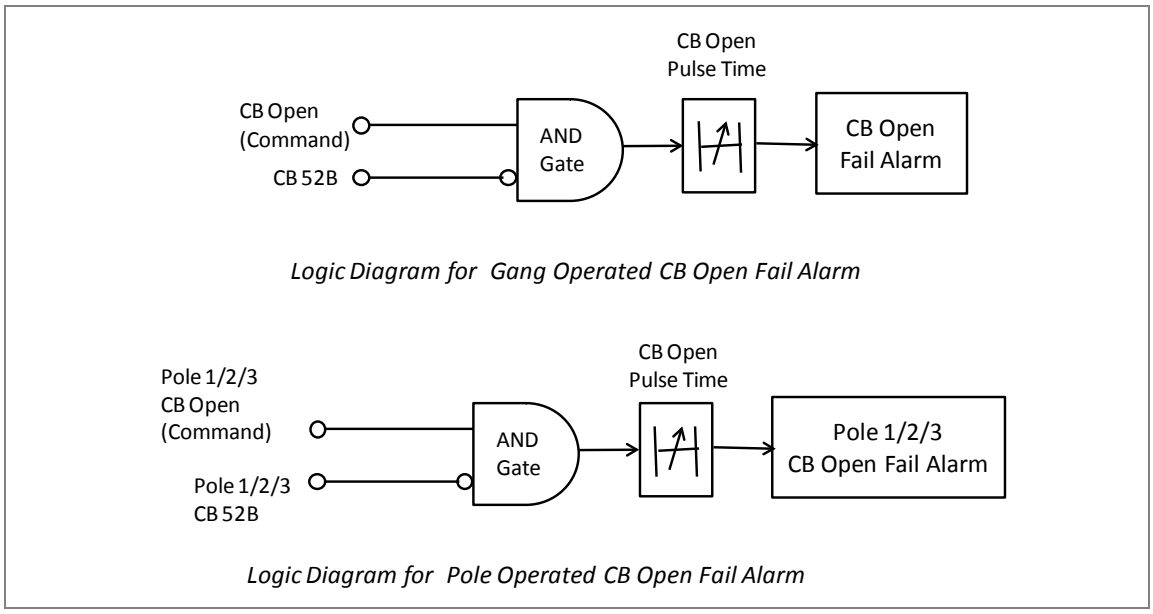


Figure 4: CB Open Fail Alarm for Gang operated & Polse operated scheme

4.4.4.2 For CB CLOSE command

Once CB Close command is received from locally or remotely, the assigned output contact to the CB close will operate, simultaneously the BCU starts monitoring Status of opto input CB (52A), if the status of CB (52A) is not active with in “CB close pulse time” (settable in the range of 0.1 to 50 sec), then BCU generate “CB Close Fail Alarm” on LCD display and event will be stored in Event Record. The ALARM can be assign to any LED or output contact.

The operation of Close Fail is explained in following diagram:

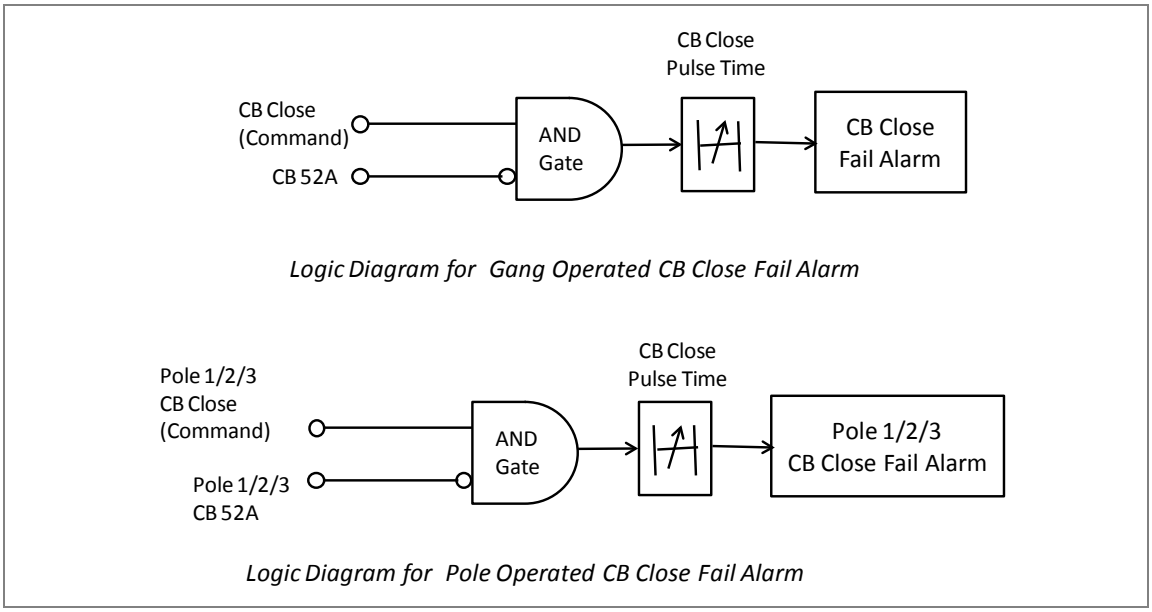


Figure 5: CB Close Fail Alarm for Gang operated & Polse operated scheme

4.5 SYSTEM CONFIG Settings

CT/VT Ratio Setting

SL.NO	Setting Parameters	Setting ranges
1.	Ph CT Secondary	1A/5A
2.	Ph CT Primary	10 to 30000A
3.	EF CT Secondary	1A/5A
4.	EF CT Primary	10 to 30000A
5.	PH VT Primary	0.1 to 800 KV in step of 0.1kV (L-N)
6.	PH VT Selection	Line to Ground
7.	PH VT Secondary	50 to 150 in step of 0.1V (L-N)
8.	Sync VT Primary	0.1 to 800 KV in step of 0.1kV (L-L)
9.	Sync VT Primary	Line to Line
10.	Sync VT Secondary	50.0 to 150.0V in step of 0.1V (L-L)

The above settings are used to set the Current transformer and potential transformer settings to establish proper measurements of Power system parameters based on power system condition.

4.6 Reclosing

The BCU-ADR245B provides Auto Recloser feature that reclose the circuit breaker under temporary fault condition.

As per CB selection scheme (Gang Operate/ Pole Operate) based on single phase or three phase protection trip, this feature allows systems to continue with power supply under temporary fault condition.

Reclosing Enable	Disable / Enable
Number of Shots	1 – 4
DT1	0.1 – 180.0 s in step of 0.1 s
DT2	0.1 – 180.0 s in step of 0.1 s
DT3	0.1 – 180.0 s in step of 0.1 s
DT4	0.1 – 180.0 s in step of 0.1 s
Reclaim Timer	10 – 300 s in step of 0.1 s
AR CB monitor	52A / 52B
AR Mode (applicable only for pole operated scheme)	1P / '1P/3P' / 3P

*Note: *AR Mode setting is visible only for pole operated scheme is selected*

4.6.1 Internal AR Operating Logic

The BCU-ADR245B is provided with 4 shot Auto Recloser function. There are 4 timer for auto Recloser 1) Dead Time for shot 1 (DT1) 2) Dead Time for shot 2 (DT2) 3) Dead Time for shot 3 (DT3) 4) Dead Time for shot 4 (DT4) and 5) Reclaim Time (RT).

BCU-ADR245B start AR sequence (trigger dead Time 1 i.e. DT1) after clearing of fault and CB monitoring status is high (i.e. 52A status must be ON to OFF or 52B status must be OFF to ON set in AR CB monitor). After Dead Time1 i.e. DT1 is over BCU provides reclose command and start reclaim timer RT. If second fault occur during RT BCU trigger Dead Time 2 i.e DT2. If third fault occur during RT BCU trigger Dead Time 3 i.e DT3, If Fourth fault occur during RT BCU trigger Dead Time 4 i.e DT4 and after time delay it again provide reclose command and retrigger RT. If fifth fault occur during RT BCU generate Lock-Out alarm and block further reclose. The Lock-Out condition can be reset locally as well remotely by SCADA through communication digital status input.

The below logic diagram explains the logic for AR function

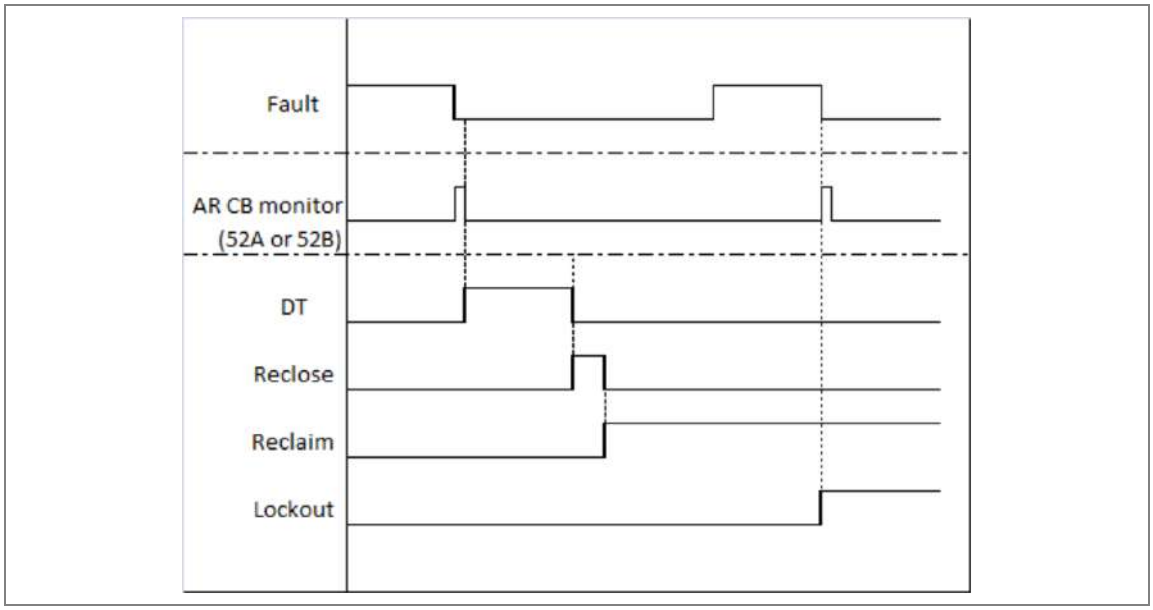


Figure 6: Logic Diagram for reclosing logic

NOTE:

- For every shot, Dead time will start after clearing fault and monitoring CB status (52A or 52B)
- For AR CB monitor selection 52A, BCU check changeover of CB52A status must be ON to OFF. (for pole operated scheme separate status of P1CB 52A, P2CB 52A, P3CB 52A is check)
- For AR CB monitor selection 52B, BCU check changeover of CB52B status must be OFF to ON. (for pole operated scheme separate status of P1CB 52B, P2CB 52B, P3CB 52B is check)

4.6.2 External AR Operating Logic

After external AR trigger status is ON, relay start dead Time 1 i.e. DT1, during DT relay check history of CB (i.e. CB should be in close condition before 200ms of AR Trigger) and CB monitoring status is high (i.e. 52A status must be ON to OFF or 52B status must be OFF to ON set in AR CB monitor) After DT time delay relay provides reclose command and start reclaim timer RT. If second fault occurs during RT, relay triggers DT2. If third fault occurs during RT, relay triggers DT3. If Fourth fault occurs during RT, relay triggers DT4 and after time delay, it again provides reclose command and retrigger RT. If fifth fault occur during RT Relay generate Lock-Out alarm and block further reclose. The Lock-Out condition can be reset locally as well remotely by SCADA through communication digital status input.

If history of CB status before 200ms of AR Trigger is open then relay should block/bypass AR.

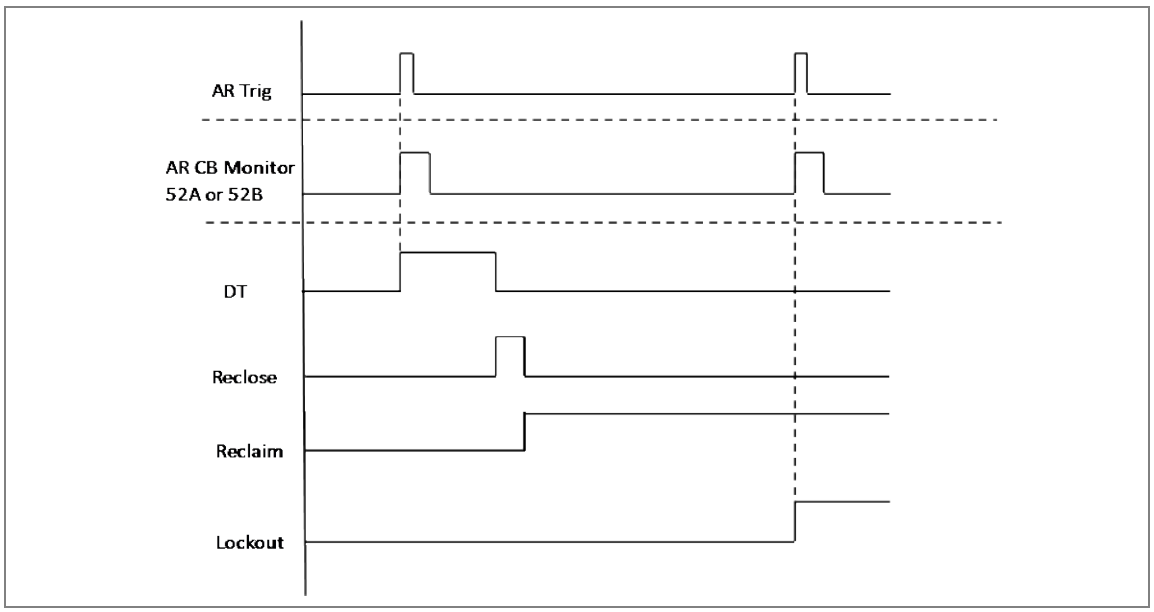


Figure 7: Logic Diagram for reclosing logic

4.6.3 ARR Blocking Logic

If flags assigned to ARR Bypass function are high, BCU blocks the auto reclosing of CB for respective phase for pole opearted scheme or gang operated scheme.

4.6.4 Gang Operated Scheme

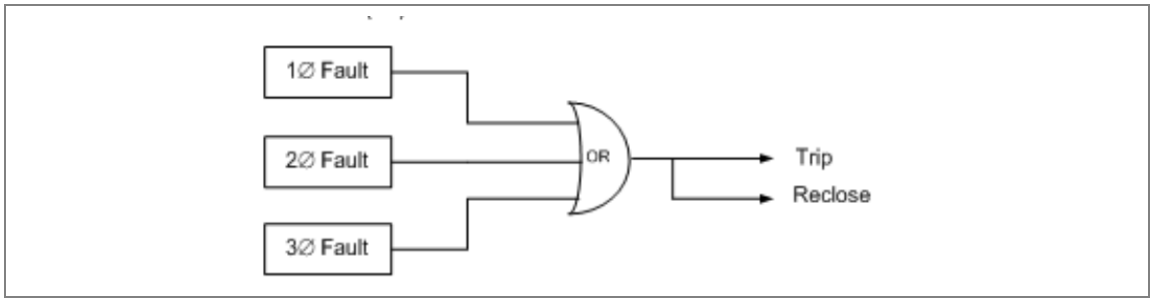


Figure 8: Gang Operated scheme for reclosing logic

- In case of Single phase / two phase / three phase fault, BCU generate Trip command to CB and follows the Auto Recloser sequence.
- If assign flags for ARR Bypass function is high, BCU blocks the auto reclosing of CB for Gang Operated Scheme.

4.6.5 Pole Operated Scheme

Three types of mode can be set (select mode) for Pole Operated auto reclose scheme.

Single Pole Operation (1P).

Single Pole or Three Pole Operation (1P / 3P).

Three Pole Operation (3P).

1. Condition for Select mode selection as single pole operation (1P):

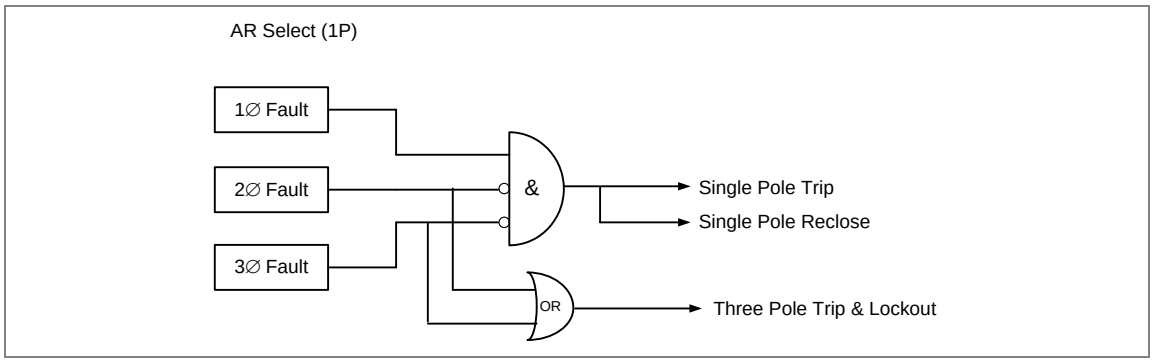


Figure 9: Logic Diagram of Auto Reclose selection as 1P

- After single phase fault, ARR sequence is start, BCU follows single pole auto reclose sequence.
- In Two or Three phase fault, BCU should generate trip in three pole and goes in Lock out.
- In case of single phase fault, after ARR sequence is started and fault is occurs in other phase during DT timer is in process, BCU generate three pole trip and goes in Lockout.
- If one pole is goes in lockout and then fault is occur in rest of the phases, BCU issues three pole tripping & further ARR sequence is block/ bypass.

2. Condition for select mode selection as single pole or three pole (1P or 3P)

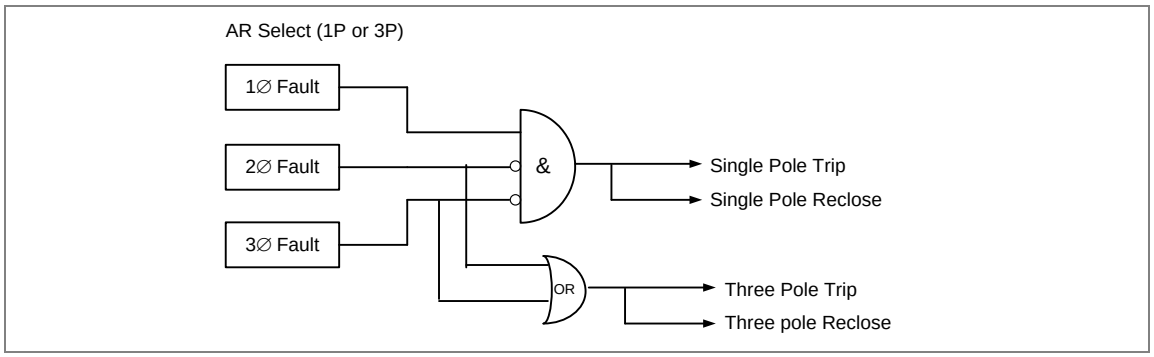


Figure 10: Logic Diagram of Auto Reclose selection as 1P or 3P

- After single phase fault, ARR sequence is start, relay follow single pole Auto reclose sequence
- In Two phase or three phase fault, relay should generate trip in three pole and follow Three pole Auto reclose sequence.

- In case of single phase fault, after ARR sequence is started and fault occurs in other phases during DT timer is in progress, relay should generate three pole tripping and follow three pole Auto reclose sequence.
- If one pole is goes into lockout and then fault is occur in rest of the phases, relay should issue three pole tripping & further sequence of ARR should bypass / block.

3. Condition for Select mode selection as three pole operation (3P):

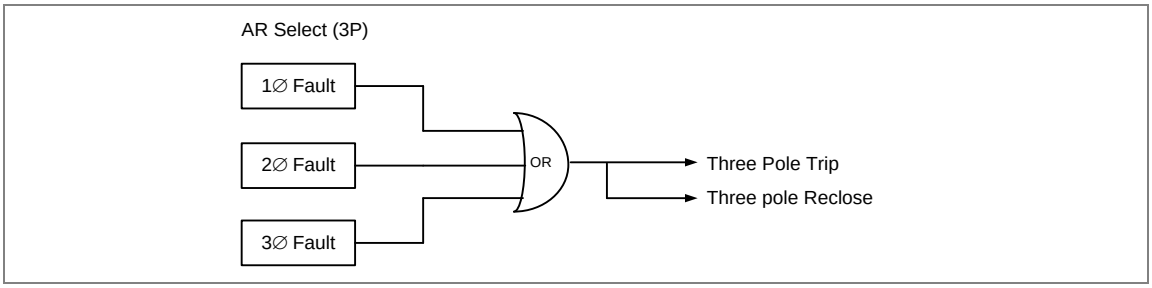


Figure 11: Logic Diagram of Auto Reclose selection as 3P

- In case of Single phase / two phase / three phase fault, relay should generate three pole trips and follow three pole Auto reclose sequence.
- In case of single-phase fault, after ARR sequence is started and fault occur in other phase, relay should generate three pole tripping and follow Three pole Auto reclose sequence.

4.7 Circuit Breaker Failure Detection Function (Breaker Failure)

The single pole / three pole Circuit Breaker Failure detection is provided in “Breaker Failure” menu. If the Circuit Breaker fails to operate within the settable time following the protection trip then BCU generates a circuit breaker failure trip signal.

Following the inception of a fault one or more main protection devices will operate. Operation of the circuit breaker is essential to isolate the fault, and prevent damage or further damage to the power system.

For transmission and sub-transmission systems, slow fault clearance can also threaten system stability. It is therefore common practice to install circuit breaker failure protection, which monitors that the circuit breaker has opened within a reasonable time. If the fault current has not been interrupted following a set time delay from circuit breaker trip initiation, breaker failure protection (CBF) will operate.

CBF operation can be use to operate back-trip upstream circuit breakers to ensure that the fault is isolated correctly.

4.7.1.1 CBF Operating Logic (CB FAIL)

The CBF Operating function provided for “Breaker Failure” menu. The CB failure protection logic is performing as follows.

Two independent stages are available with separate time delay for Breaker Failure protection i.e. t50BF-1 Status with Time delay t50BF-1 Delay & t50BF-2 Status with Time delay t50BF-2 Delay

The t50BF-1 Delay & t50BF-2 Delay timer is initiated, when a trip order is issued through the internal protection trip or by an External “50BF Ext” digital input signal is high, the BCU issues trip in 50BF-1 T / 50BF-2 T signal when the respective “T 50BF Delay” is expired.

The following four ways to reset 50BF Protection trip (50BF Reset = 1)

- I<: the 50BF trip will reset when the relevant phase current is less than minimum set current
- CB Open + I<: the 50BF trip will reset when both conditions are satisfied, first condition is when the relevant phase current is less than minimum set current and second condition is CB must be opened (i.e. CB(52B) status is active)
- Prot Reset + I<: the 50BF trip will reset when both conditions are satisfied, first condition is Protection reset and second condition is the relevant phase current is less than minimum set current
- CB Open: CB must be opened (i.e. CB(52B) status is active)

Following diagram explains the function of **CBF logic**

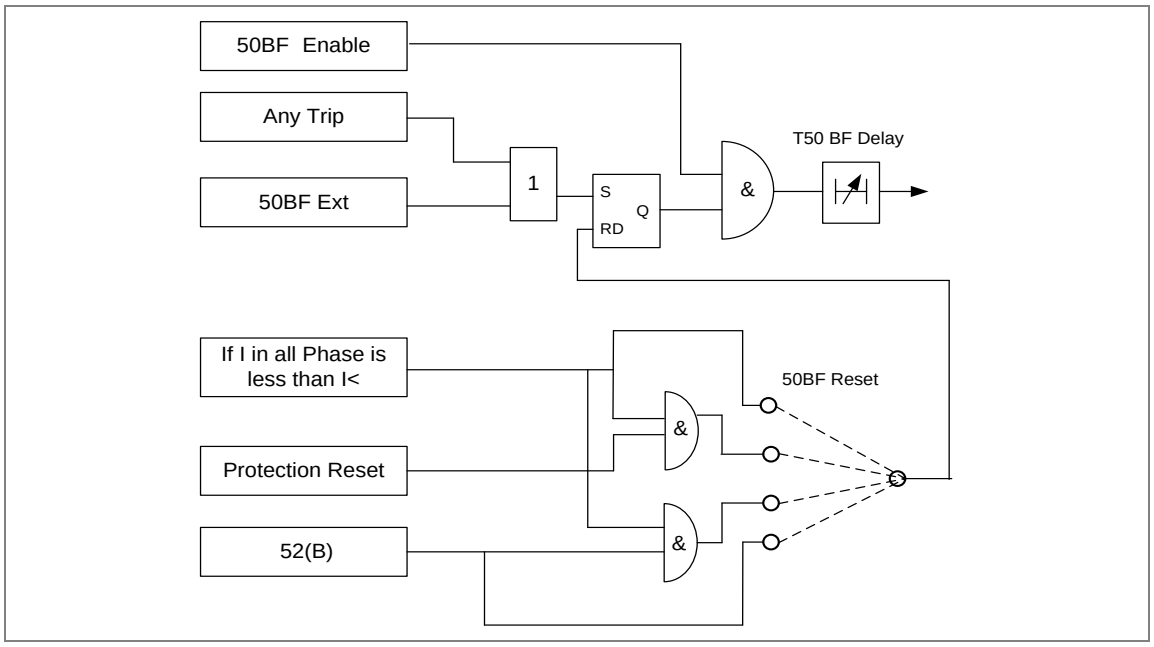


Figure 12: CBF Operation and Reset Logic

The Gang Operated and Pole Operated CB schemes based on single phase or three phase protection trip are provided for 50BF function. The below logic diagrams explains the logic of Gang Operation and Pole Operated Scheme. The Reset logic for both the scheme is same as explained in figure.

The first stage can be used to Re-Trip the breaker and second stage can be use for trip upstrim breaker.

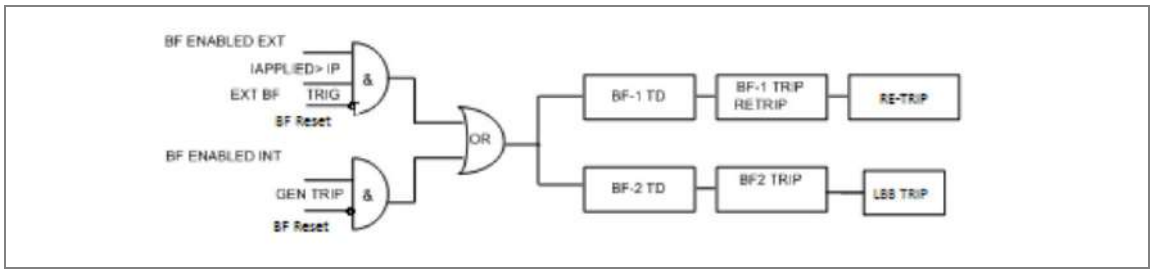


Figure 13: CBF Operation for Gang Operated scheme.

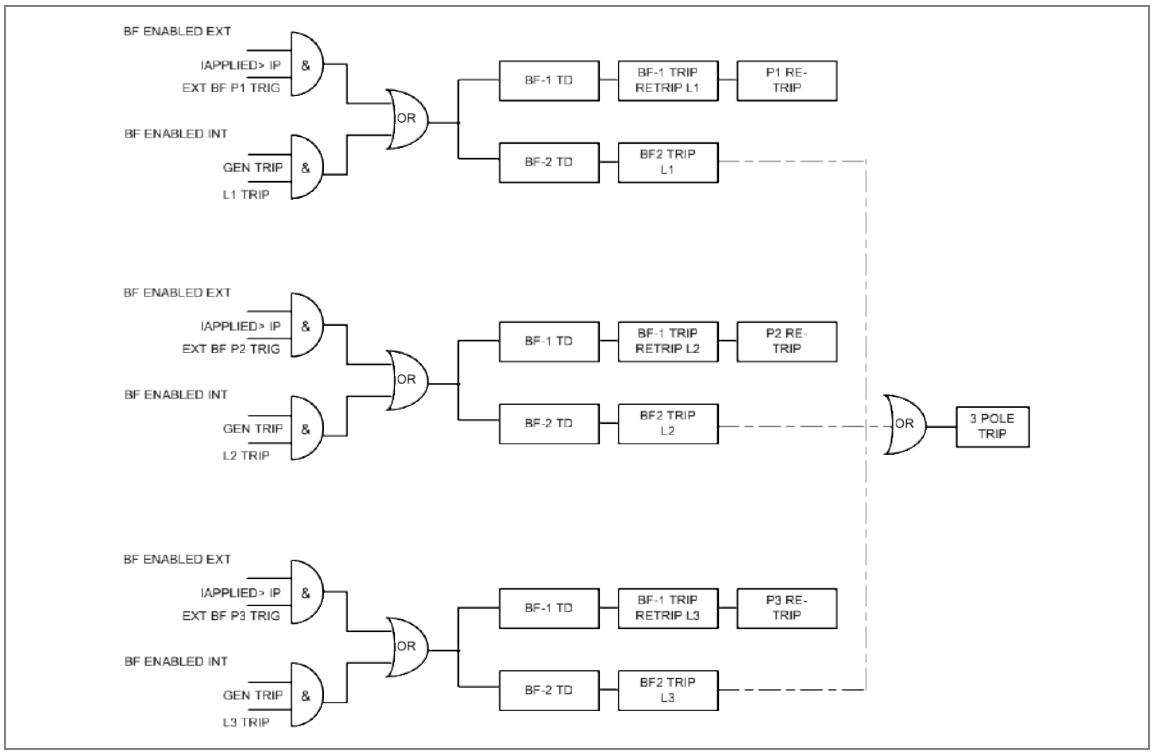


Figure 14: CBF Operation for Pole Operated scheme

NOTE: For 3 poles LBB operation user should use BF2 stage by assign P1, P2, P3 in OR gate through AProLogic.

4.8 CB Open Pole (Applicable for Pole Operated Scheme)

CB open pole function is used to detect the open condition of respective pole.

There are three modes of pole open detection V&I mode, V&52A mode and I&52A mode.

Open Pole	Disabled / Enabled
Mode	V&I / I&52A / V&52A
V<	5 to 100v in step of 0.1v
I<	0.05 to 20A in step of 0.01 A
tPO Delay	0 to 100s in step of 0.02s

4.8.1 CB Open Pole Logic using V&I

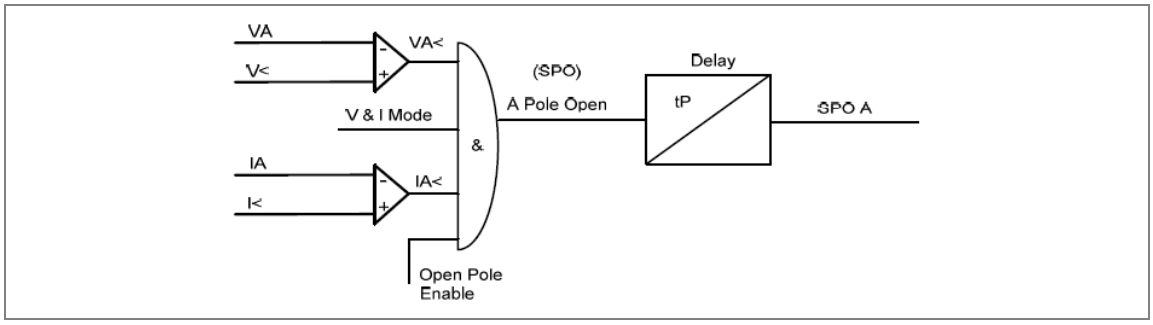


Figure 15: CB Open Pole logic using V&I mode for single pole

For V&I mode relay check votage & current of respective pole, if the voltage and current both are less than set value, then relay declare that respective pole is open as explain in above figure..

If all three phase voltage and current both are less than set value , then relay declare that 3pole open. Logic is explain in below figure.

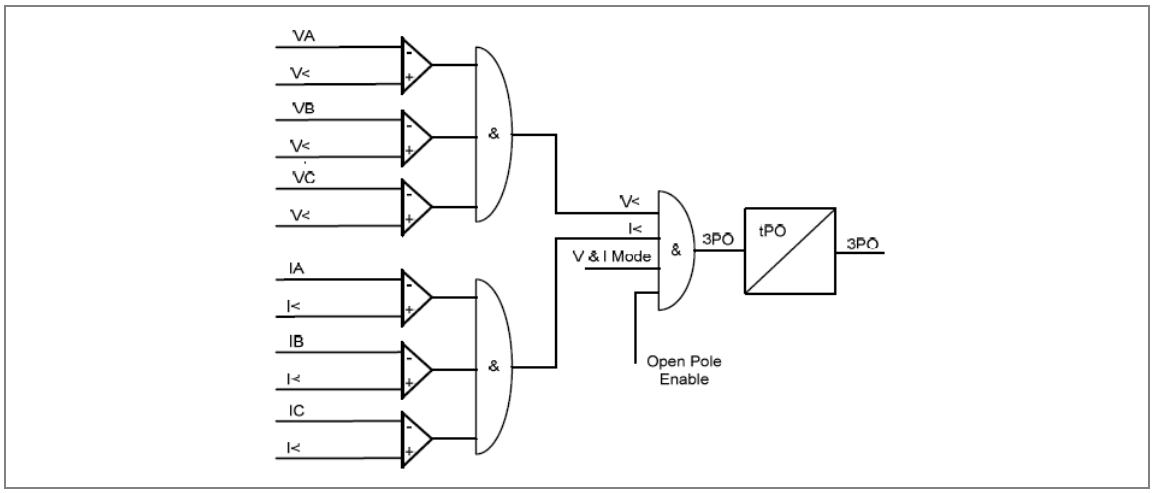


Figure 16: CB Open Pole logic using V&I mode for three pole

4.8.2 CB Open Pole Logic using I&52A mode

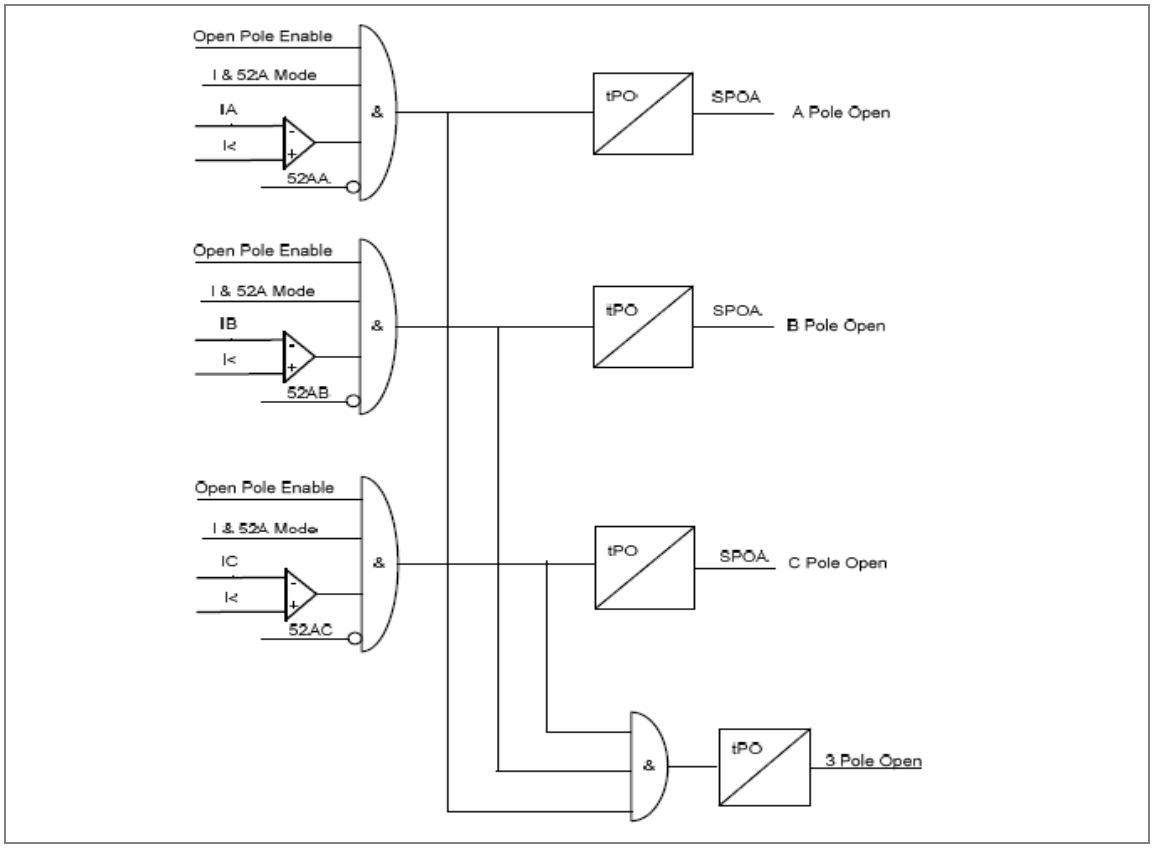


Figure 17: CB Open Pole logic using I&52A mode

For I&52A mode relay check 52A staus (CBNO) of respective pole & current of respective pole, if the 52A statue of respective pole is off and current is less than set value, then relay declare that respective pole is open as explain in above figure.

If all three pole open is detected then relay declare 3pole open.

4.8.3 CB Open Pole Logic using V&52A mode

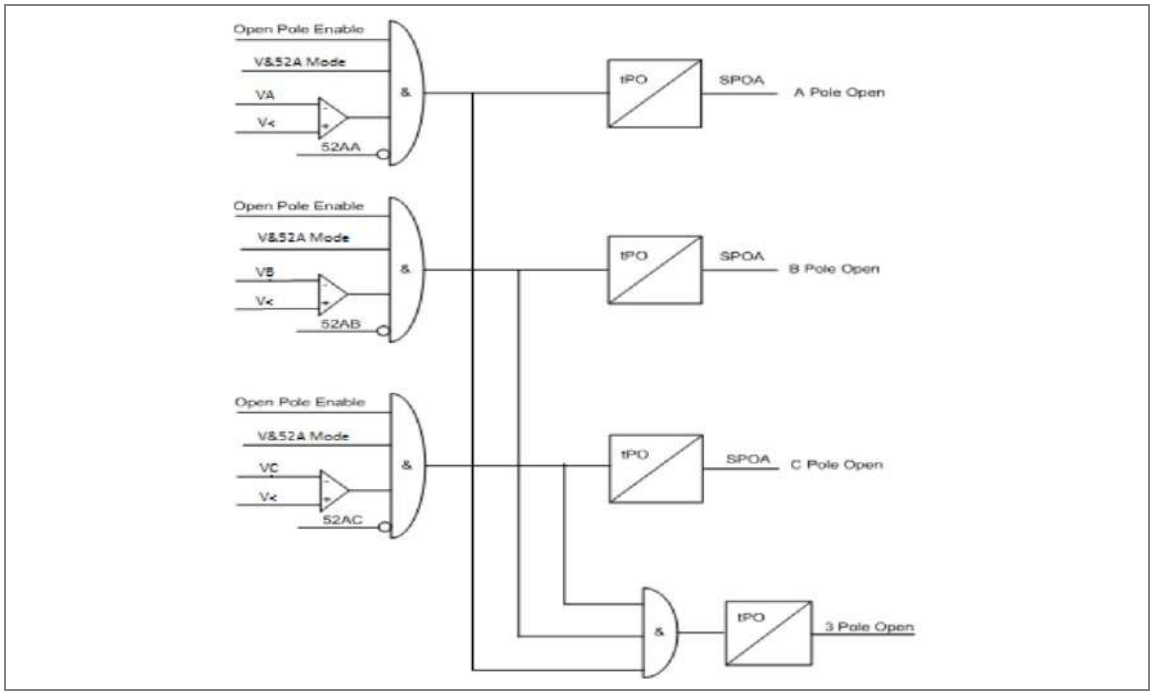


Figure 18: CB Open Pole logic using V&52A mode

For V&52A mode relay check 52A staus (CBNO) of respective pole & voltage of respective pole, if the 52A statue of respective pole is off and voltage is less than set value, then relay declare that respective pole is open as explain in above figure.

If all three pole open is detected then relay declare 3pole open.

Pole discrepancy:

For Pole discrepancy usually refers to differences in operating times between the 3 phases or poles of a switching device within the same operation of CB close.

After 3 pole Tripping if we issue CB close operation, if all poles are not operate simelteniously (i.e. feedback from respective CB is not recive) within tCBmonitor time the relay shall generate pole discrepancy alarm.

4.9 SOTF

BCU-ADR245B provides switch on to fault function to protect fault during closing of CB. The SOTF shall be detected by using either CB close input or Deadline detection logic shown in figures.

The following settings are available in BCU for SOTF function.

SOTF Enable	Disabled / Enabled
Closepulse input	Enabled / Deadline Det

50SOTF_I	0.05 to 20A in step of 0.01A
27SOTF_V	5 to 100V in step of 0.1V
tSOTF trip delay	0 to 5s in step of 0.01s
tClosepulse Delay	0 to 5s in step of 0.01s

4.9.1 SOTF Logic using CB close function

4.9.1.1 SOTF Logic using CB close function for Pole Operated Scheme

The relay check 52A staus (CBNO) of respective Pole & monitor voltage and current of respective phase, after closing of respective Pole i.e. CB52A statue of respective pole is ON, relay start tClosepulse Delay, during this time if voltage in respective phase is less than set 27SOTF_V value and current is more than set 50SOTF_I value, then relay declare SOTF.

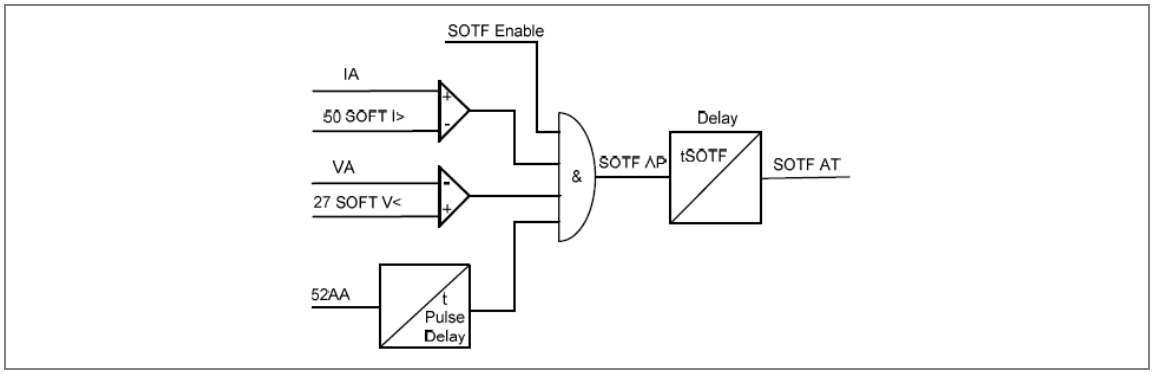


Figure 19: SOTF logic for pole operated CB scheme selection

4.9.1.2 SOTF Logic using CB close function for gang Operated Scheme

The relay check 52A staus (CBNO) of respective CB & monitor phase voltage and current, after detection of closing of CB i.e. CB52A statue of CB is ON, Relay start tClosepulse Delay, during this time if voltage in any phase is less than set 27SOTF_V value current is more than set 50SOTF_I value, then relay declare SOTF.

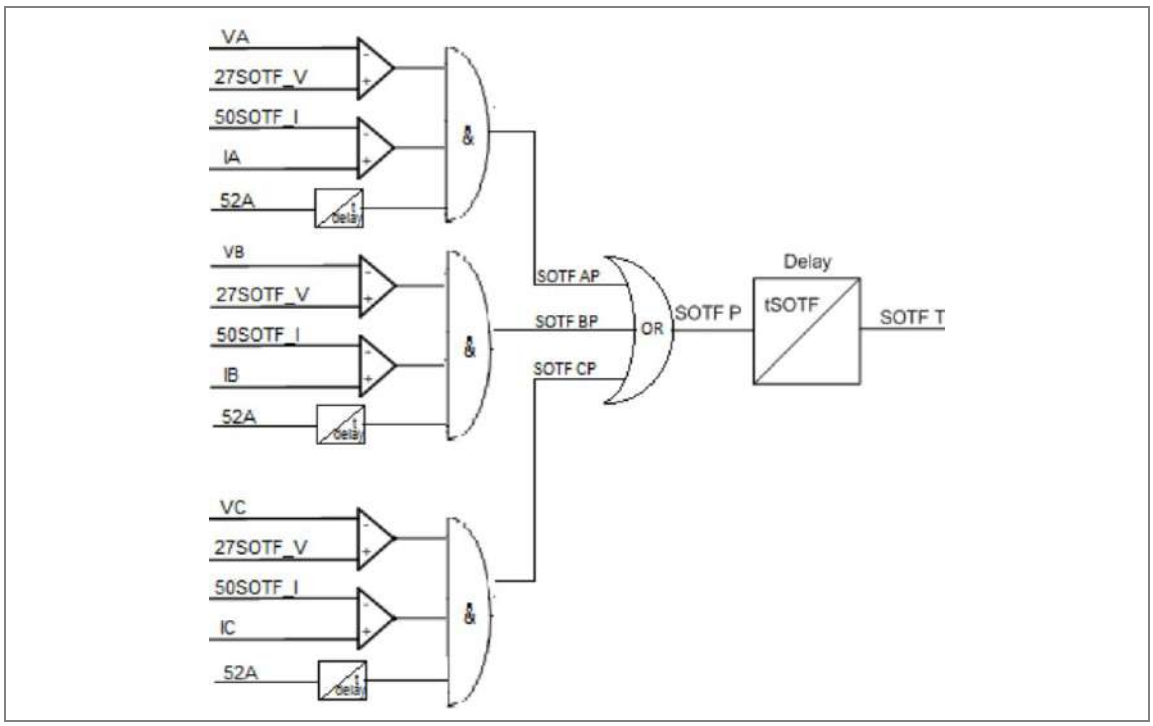
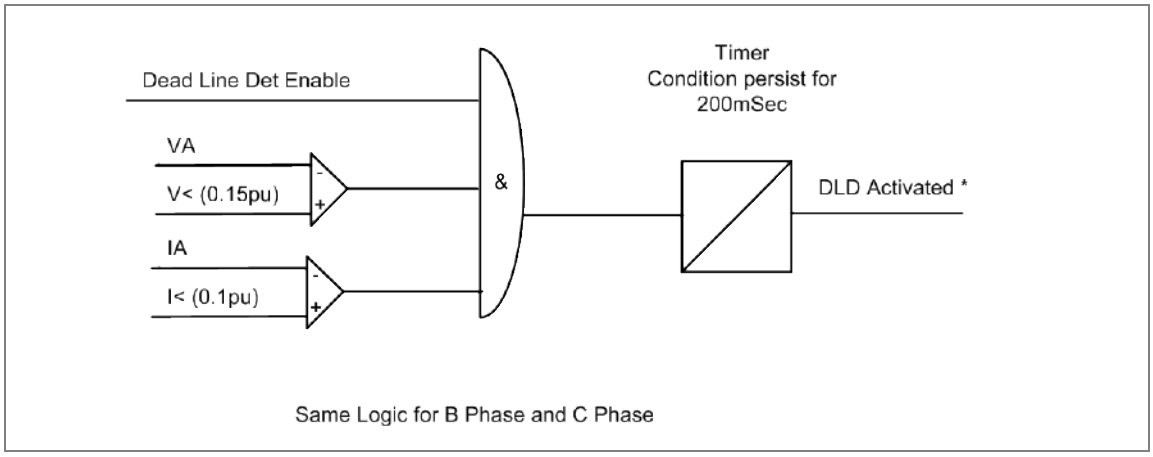


Figure 20: SOTF logic for gang operated CB scheme selection

4.9.2 SOTF Logic using Deadline Detection (Applicable for Pole Operated Scheme)

The SOTF operation can be detect by dedline Activated, if we set Closepulse input as Deadline Det. Relay check that respective pole voltage should be less than 0.15pu and current should be less than 0.1pu for more than 200ms, relay decleares DLD Activeted.



After DLD Activated, if voltage is restore above 0.15pu & current restore above 0.1pu, relay start tClosepulse Delay, during this time if voltage in respective phase is less than set 27SOTF_V value and current is more than set 50SOTF_I value, then relay declare SOTF

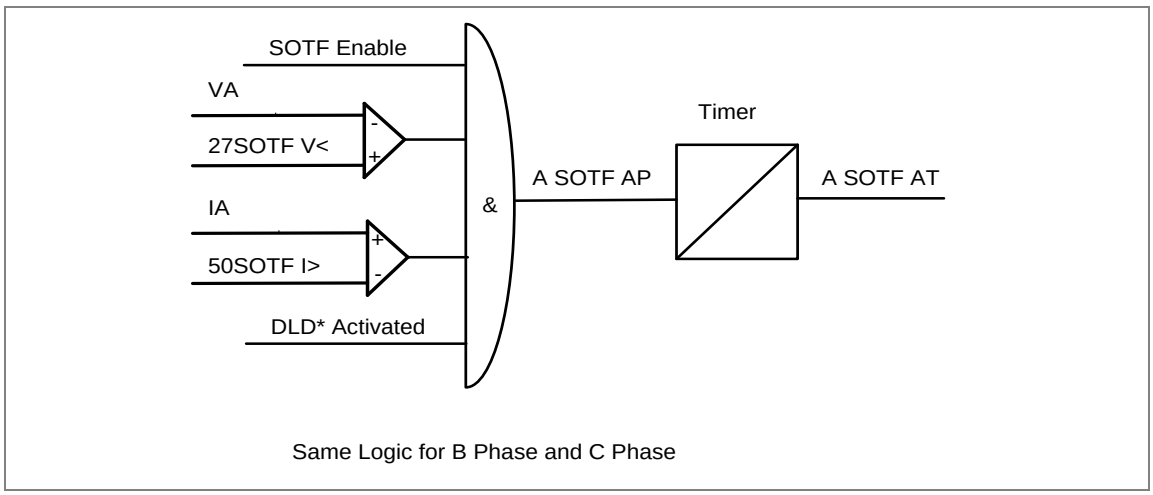


Figure 21: SOTF logic using dead line detection for pole operated CB scheme selection

4.10 Synchronization check (Sync Check)

Sync check function is required to before closing line or transformer circuit breaker to connect with the electric powers system grid.

In BCU-ADR245B, the below parameters are required to set for proper closing of the circuit breaker or to establish proper synchronizing between the power system component and the grid. The following settings are used for sync check function.

Parameter	Setting Range	Description
VHI	50% to 150% in step of 1%	Voltage High Window.
VLI	50% to 150% in step of 1%	Voltage Low window.
Delta V	5% to 100% in step of 1%	Minimum Voltage Deviation settings for Sync check operation
Delta Angle	0 to 80 deg in step of 0.1 deg	Minimum Angle Deviation settings for Sync check operation
Delta F	0.5 to 5 Hz in step of 0.1 Hz	Minimum Frequency Deviation settings for Sync check operation
tSync Pulse	1 to 500 cycle in step of 1 cycle	Synchronizing close Pulse Duration.
LiveLine DeadBus	Disabled/Enabled	This function is used to enable or disable LLDB indication.
V<	10 to 100 % in step of 1%	The voltage threshold to detect LLDB (Bus/Sync PT voltage should be less & Line/Phase PT voltage is above V< setting)
LiveBus DeadLine	Disabled/Enabled	This function is used to enable or disable LBDL indication.
V<	10 to 100 % in step of 1%	The voltage threshold to detect LBDL (Line/Phase PT voltage should be less & Bus/Sync PT voltage is above V< setting)

DeadLine DeadBus	Disabled/Enabled	This function is used to enable or disable DLDB indication.
V<	10 to 80 % in step of 1%	The voltage threshold to detect DLDB (Line/Phase PT voltage & Bus/Sync PT voltage should be less V< setting)

In BCU-ADR245B, the Sync check function logic is enabled when the “Sync check Enable” parameter set as Enabled. The below logic diagram explains about the synchronisation logic where the transformer or line circuit breaker required to close to connect with live bus in the power system network.

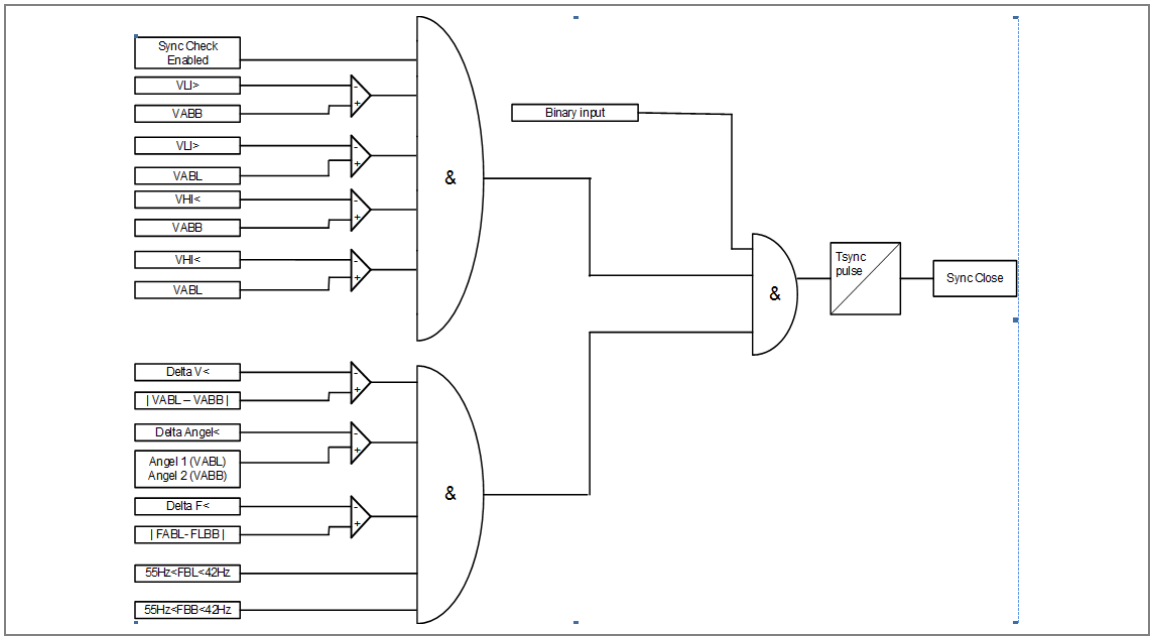


Figure 22: Synchronization check Logic

The sync check function is initiated only when the Phase to Phase Voltage of live Bus and live Line are above higher Voltage set limit “VLI” and below the higher voltage set limit “VHI” and also it checks the positive sequence voltage is greater than the 0.7 times of Nominal voltage.
Once the above logic is initiated based on above condition, then the functions further checks whether the difference between the phase to phase Voltage Amplitude of live bus and phase to phase Voltage Amplitude of live line is within the set “Delta V” parameter, Angle difference of live bus and of live line with in the set value set in the parameter “Delta Angle” and frequency difference of live line and live line are within the in the set value set in the parameter “Delta F” then BCU issues the Sync close output with the pulse duration of “tsync pulse ” setting.

Live Line and Dead Bus Logic:

The BCU-ADR245B, Live Line and Dead Bus Logic is enabled when the “LiveLine DeadBus” parameter set as Enabled.

Parameter	Range of setting	Description
LiveLine DeadBus	Disabled / Enabled	This setting is used to enable or disable live line dead bus logic.
V<	10% to 100% in step of 1%	The minimum line voltage required to close the breaker

The following logic diagram explains about the live line and dead bus logic.

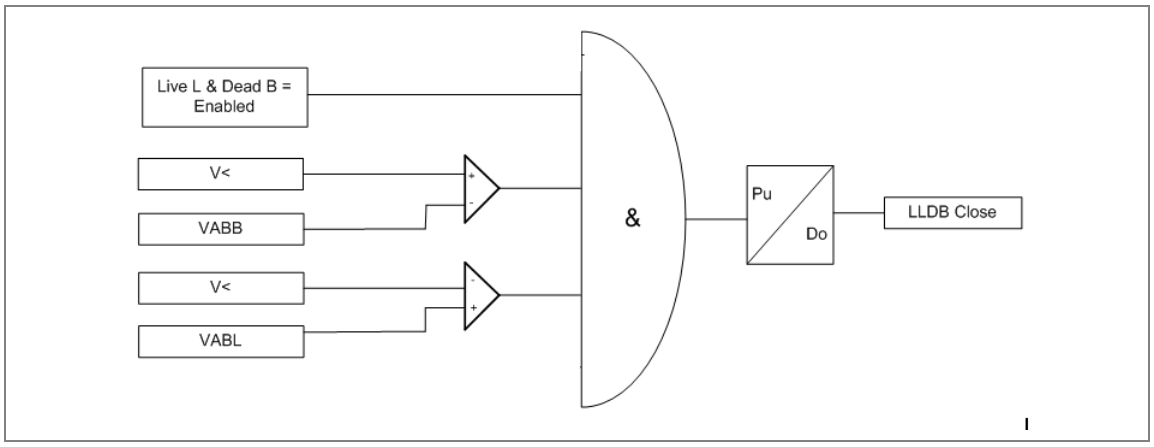


Figure 23: Live Line Dead Bus Logic

The above logic checks whether the Phase to Phase Voltage of Line are above under Voltage set limit (v<) and Phase to Phase Voltage of Bus (Sync PT) are below the under voltage set limit (v<). After satisfied above condition LLDB close command issued to the close the breaker.

Live Bus and Dead Line Logic:

The BCU-ADR245B, Live Bus and Dead Line Logic is enabled when the “LiveBus DeadLine” parameter set as Enabled.

Parameter	Range of setting	Description
LiveBus DeadLine	Disabled / Enabled	This setting is used to enable or disable live Bus dead Line logic.
V<	10% to 100% in step of 1%	The line voltage must be less than the under voltage setting to close the breaker

The following logic diagram explains about the live line and dead bus logic. The logic checks whether the Phase to Phase Voltage of Line are below the under Voltage set limit (v<) and Phase to Phase Voltage of Bus (Sync PT) are above the under voltage set limit (v<). Then the LBDL close command issued to the close the breaker.

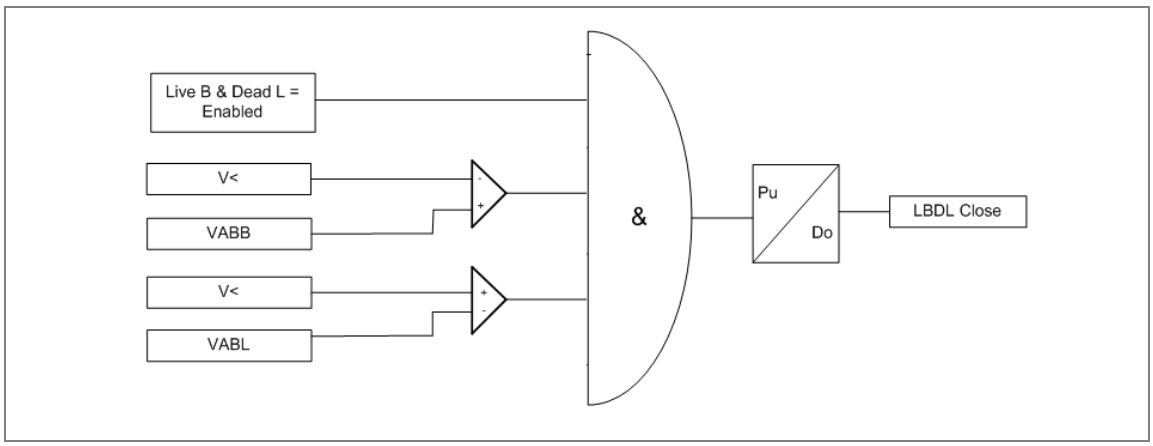


Figure 24: Live Bus and Dead Line Logic

Dead Line and Dead Bus Logic:

The BCU-ADR245B, Dead Line and Dead Bus Logic are enabled when the "DeadLine DeadBus" parameter set as Enabled.

Parameter	Range of setting	Description
DeadLine DeadBus	Disabled / Enabled	This setting is used to enable or disable Dead Line Dead Bus logic.
V<	10% to 80% in step of 1%	The line & bus voltage must be less than the under voltage setting to close the breaker

The following logic diagram explains about the Dead Line Dead Bus logic.

The logic checks whether the Phase to Phase Voltage of Line is below the under Voltage set limit (v<) as well as Phase to Phase Voltage of Bus also below the under voltage set limit (v<) and positive sequence voltage (V1) should be below 20% of rated value.

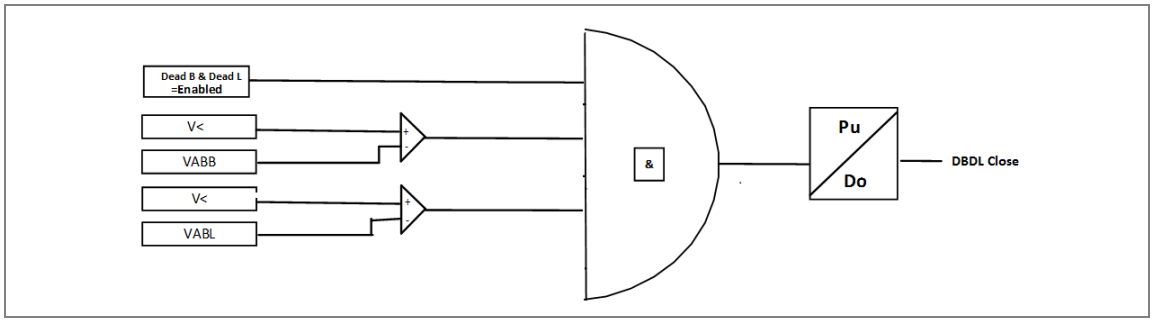


Figure 25: Dead Line Dead Bus Logic

4.11 Analogue Input (Optional)

The BCU-ADR245B provides 8 no's of Analogue Inputs. The relay sense input from Transducer (range is 4 to 20 mA). The minimum and maximum range using Low range & High range setting & for alarm two levels can be assign for Low warn & High warn. Analog Inputs are provided with low and high ranges with four level settings as given below.

- Low range
- High range
- LowarmLevel1
- LowarmLevel2
- HiwarmLevel1
- HiwarmLevel2

The eight analog inputs seperately can be set the thershold level by using above parametes based on the customer requirement or applications.

4.12 Programmable Logic control

The BCU-ADR245B provides total 16 nos. of target & programmable LEDs with dual colours indication and maximum 64 Digital inputs and 32 digital outputs (as per model selection). The LEDs and outputs can be programmed through PC software (RTV2 software).

The BCU-ADR245B integrates complete logic equations to allow Customization of the product based on customer application. User can program AND / OR / XOR / NOT / NAND / NOR / SR Flipflops / counter Logic equations with pick up and reset timer at the output. Independent Boolean equations can be used and every result of equation can be time delayed and assigned to any output contacts and LEDs.

Any protection functions, Control Operations and opto I/Ps are used as inputs to the logic equations and result of equation can be time delayed and assigned to any output contacts and LEDs.

The following example explain AND logic equation. (For more details please refer to Section 3 PC software information, AproLogic sub-section)

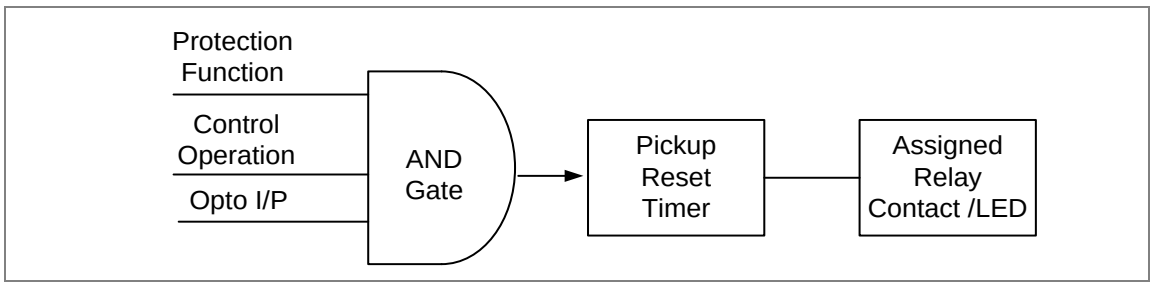


Figure 26: AND Equation Logic

4.12.1 Output Control Operation

The ouptut contacts can be operated through SCADA by using control command. The output is operated by “ON” command and reset by “OFF” command from SCADA. For operation of outputs, user must assign input signals to “Controlled ON Enable” to accept ON command and “Controlled OFF Enable” to accept OFF command of respective output and assigned input signal must be Active for successful operation.

4.12.2 Double Point Indications (DPI) and Double Command Operation (DCO)

The ADR245B relay provides Double Point Indications (DPI) and Double Command Operations (DCO). The no. of DPI and DCO are dependent upon model selection. User can assign any digital input to “DPI ON” & “DPI OFF” for double point indication and any digital ouput to “DCO ON” & “DCO OFF” for doble command.

NOTE: only 1 signal can be permitted to assinged for DPI & DCO ON & OFF.

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Section 5

Metering Section

Contents

5 MEASUREMENT SHEET

5.1 Measurement 1

Measurement 1 displays the Voltage, Current and symmetrical components based on the power system network.

Parameter		Unit	Description
IA MAG	= 0.00A	A	Primary current in phase A
IB MAG	= 0.00A	A	Primary current in phase B
IC MAG	= 0.00A	A	Primary current in phase C
IN MAG	= 0.00A	A	Primary current in Neutral CT
IAB MAG	= 0.00A	A	Primary phase to phase current in AB
IBC MAG	= 0.00A	A	Primary phase to phase current in BC
ICA MAG	= 0.00A	A	Primary phase to phase current in CA
Ia MAG	= 0.000A	A	Secondary current in phase A
Ia ANG	= 0 Degree	Degree	Angle of Phase current A
Ib MAG	= 0.000A	A	Secondary current in phase B
Ib ANG	= 0 Degree	Degree	Angle of Phase current B
Ic MAG	= 0.000A	A	Secondary current in phase C
Ic ANG	= 0 Degree	Degree	Angle of phase current C
In MAG	= 0.000A	A	Secondary current in Neutral CT
In ANG	= 0 Degree	Degree	Angle of secondary current in Neutral CT
Iab MAG	= 0.00A	A	Secondary phase to phase current in AB
Iab ANG	= 0 Degree	Degree	Angle of Phase to phase current AB
Ibc MAG	= 0.00A	A	Secondary phase to phase current in BC
Ibc ANG	= 0 Degree	Degree	Angle of Phase to phase current BC
Ica MAG	= 0.00A	A	Secondary phase to phase current in CA
Ica ANG	= 0 Degree	Degree	Angle of phase to phase current CA
I1 P MAG	= 0.00A	A	Primary Positive sequence current
I2 P MAG	=0.00A	A	Primary Negative sequence current
I1 MAG	= 0.000A	A	Secondary Positive sequence current
I1 ANG	= 0 Degree	Degree	Angle of Positive sequence current
I2 MAG	=0.000A	A	Secondary Negative sequence current
I2 ANG	= 0 Degree	Degree	Angle of Negative sequence current

I0 MAG	= 0.000A	A	Secondary Zero sequence current
I0 ANG	= 0 Degree	Degree	Angle of zero sequence of current
3I0 MAG	= 0.000A	A	Secondary Residual current
I0/I1	=00.00pu	pu	Ratio of Zero sequence to Positive sequence current
I2/I1	= 00.00pu	pu	Ratio of Negative sequence to Positive sequence current
Ia RMS	= 0.000A	A	Secondary RMS current in phase A
Ib RMS	= 0.000A	A	Secondary RMS current in phase B
Ic RMS	= 0.000A	A	Secondary RMS current in phase C
VAN MAG	= 0.00 V	V	Primary Voltage in phase A
VBN MAG	= 0.00 V	V	Primary Voltage in phase B
VCN MAG	= 0.00 V	V	Primary Voltage in phase C
VSYNCMAG	= 0.00 V	V	Primary Sync Voltage
VAB MAG	= 0.00 V	V	Primary Phase to phase Voltage in AB
VBC MAG	= 0.00 V	V	Primary Phase to phase Voltage in BC
VCA MAG	= 0.00 V	V	Primary Phase to phase Voltage in CA
Van MAG	= 0.000 V	V	Secondary Voltage in phase to neutral Voltage in phase A
Van ANG	= 0 Degree	Degree	Angle of Secondary Phase to neutral Voltage in phase A
Vbn MAG	= 0.000 V	V	Secondary Voltage in phase to neutral Voltage in phase B
Vbn ANG	= 0 Degree	Degree	Angle of Secondary Phase to neutral Voltage in phase B
Vcn MAG	= 0.000 V	V	Secondary Voltage in phase to neutral Voltage in phase C
Vcn ANG	= 0 Degree	Degree	Angle of Secondary Phase to neutral Voltage in phase C
VSync MAG	= 0.000 V	V	Secondary Sync Voltage
VSync ANG	= 0 Degree	Degree	Angle of Secondary Sync Voltage
Vab MAG	= 0.000 V	V	Secondary phase to Phase Voltage in AB
Vab ANG	= 0 Degree	Degree	Angle of phase to Phase Voltage in AB
Vbc MAG	= 0.000 V	V	Secondary phase to Phase Voltage in BC
Vbc ANG	= 0 Degree	Degree	Angle of phase to Phase Voltage in BC
Vca MAG	= 0.000 V	V	Secondary phase to Phase Voltage in CA
Vca ANG	= 0 Degree	Degree	Angle of phase to Phase Voltage in CA
V1 MAG	= 0.00 V	V	Secondary Positive sequence Voltage
V1 ANG	= 0 Degree	Degree	Angle of positive sequence voltage
V2 MAG	= 0.00 V	V	Secondary Negative sequence Voltage
V2 ANG	= 0 Degree	Degree	Angle of Negative Sequence Voltage.
V0 MAG	= 0.00 V	V	Secondary Zero sequence Voltage

V0 ANG	= 0 Degree	Degree	Angle of zero sequence voltage.
3V0 MAG	= 0.00 V	V	Secondary Residual Voltage
Va RMS	= 0.00 V	V	Secondary RMS Voltage in phase A
Vb RMS	= 0.00 V	V	Secondary RMS Voltage in phase B
Vc RMS	= 0.00 V	V	Secondary RMS Voltage in phase C
3HVan MAG	= 0.000 V	V	Secondary 3Hrm. Voltage in phase A
3HVbn MAG	= 0.000 V	V	Secondary 3Hrm. Voltage in phase B
3HVcn MAG	= 0.000 V	V	Secondary 3Hrm. Voltage in phase C
3HVe MAG	= 0.000 V	V	Secondary 3Hrm. Voltage in Derived EF
3HVn MAG	= 0.000 V	V	Secondary 3Hrm. Voltage in Measured EF
Th State	= 0%	%	Thermal State
TrangA	= 0.000 Deg	Degree	Torque Angle of phase A
TrangB	= 0.000 Deg	Degree	Torque Angle of phase B
TrangC	= 0.000 Deg	Degree	Torque Angle of phase C
TrangN	= 0.000 Deg	Degree	Torque Angle of Measured EF
TrangV0N	= 0.000 Deg	Degree	Torque Angle between Derived & Measured EF current
TrangV0I0	= 0.000 Deg	Degree	Torque Angle between Derived EF voltage & current
TrangV2N	= 0.000 Deg	Degree	Torque Angle between NPS voltage & Measured EF current
TrangV2I0	= 0.000 Deg	Degree	Torque Angle between NPS voltage & Derived EF current

5.2 Measurement 2

Measurement2 displays the Real Power, Reactive Power, Apparent Power, Frequency and Power factor based on the power system network.

Parameter		Unit	Description
pa	= 0.000W	W	Real power of phase A in secondary
pb	= 0.000W	W	Real power of phase B in secondary
pc	= 0.000W	W	Real power of phase C in secondary
3p	= 0.000W	W	Real power of three phase in secondary
qa	= 0.000VAr	Var	Reactive power of phase A in secondary
qb	= 0.000VAr	Var	Reactive power of phase B in secondary
qc	= 0.000VAr	Var	Reactive power of phase C in secondary
3q	= 0.000VAr	Var	Reactive power of three phase in secondary
sa	= 0.000VA	VA	Apparent power of phase A in secondary

sb	= 0.000VA	VA	Apparent power of phase B in secondary
sc	= 0.000VA	VA	Apparent power of phase C in secondary
3s	= 0.000VA	VA	Apparent power of three phase in secondary
PA	= 0.000 KW	KW	Real power of phase A in Primary
PB	= 0.000 KW	KW	Real power of phase B in Primary
PC	= 0.000 KW	KW	Real power of phase C in Primary
3P	= 0.000 KW	KW	Real power of three phase in Primary
QA	= 0.000KVar	KVar	Reactive power of phase A in Primary
QB	= 0.000KVar	KVar	Reactive power of phase B in Primary
QC	= 0.000KVar	KVar	Reactive power of phase C in Primary
3Q	= 0.000KVar	KVar	Reactive power of three phase in Primary
SA	= 0.000 KVA	KVA	Apparent power of phase A in Primary
SB	= 0.000 KVA	KVA	Apparent power of phase B in Primary
SC	= 0.000 KVA	KVA	Apparent power of phase C in Primary
3S	= 0.000 KVA	KVA	Apparent power of three phase in Primary
Max 3S	= 0.000 KVA	KVA	Maximum Apparent power of three phase in Primary
Avg 3P	= 0.000 KW	KW	Average Real power of three phase in Primary
Avg 3Q	= 0.000 KVar	KVar	Average Reactive power of three phase in Primary
Avg 3S	= 0.000 KVA	KVA	Average Apparent power of three phase in Primary
Ph Freq.	=00.000 Hz	Hz	Measured Phase Frequency
Sync Freq	= 00.000 Hz	Hz	Measured Sync Frequency
df/dt	=00.000 Hz/S	Hz/S	Rate of change of Frequency
PFA	= 100.000 %	%	Power Factor of A Phase
PFB	= 100.000 %	%	Power Factor of B Phase
PFC	= 100.000 %	%	Power Factor of C Phase
3PF	= 100.000 %	%	Power Factor of three phase
Kwh+	= 00000.00	kWh	Three phase real power exported
Kwh-	= 00000.00	kWh	Three phase real power imported
kVrh+	= 00000.00	KVrh	Three phase reactive power exported
kVrh-	= 00000.00	KVrh	Three phase reactive power imported
Pow Dem	= 00000.000	kWh	Three phase real power of demand period

5.3 Measurement 3

Measurement 3 displays the phase impedance and symmetrical impedance of the power system network.

Parameter		Unit	Description
Za MAG	= 0.000 Ohms	Ohms	Impedance of Phase-A
Za ANG	= 0.000 Deg	Degree	Angle of Phase-A
Ra MAG	= 0.000 Ohms	Ohms	Resistance of Phase-A
Xa MAG	= 0.000 Ohms	Ohms	Reactance of Phase-A
Zb MAG	= 0.000 Ohms	Ohms	Impedance of Phase-B
Zb ANG	= 0.000 Deg	Degree	Angle of Phase-B
Rb MAG	= 0.000 Ohms	Ohms	Resistance of Phase-B
Xb MAG	= 0.000 Ohms	Ohms	Reactance of Phase-B
Zc MAG	= 0.000 Ohms	Ohms	Impedance of Phase-C
Zc ANG	= 0.000 Deg	Degree	Angle of Phase-C
Rc MAG	= 0.000 Ohms	Ohms	Resistance of Phase-C
Xc MAG	= 0.000 Ohms	Ohms	Reactance of Phase-C
Zab MAG	= 0.000 Ohms	Ohms	Impedance of Phase-AB
Zab ANG	= 0.000 Deg	Degree	Angle of Phase-AB
Rab MAG	= 0.000 Ohms	Ohms	Resistance of Phase-AB
Xab MAG	= 0.000 Ohms	Ohms	Reactance of Phase-AB
Zbc MAG	= 0.000 Ohms	Ohms	Impedance of Phase-BC
Zbc ANG	= 0.000 Deg	Degree	Angle of Phase-BC
Rbc MAG	= 0.000 Ohms	Ohms	Resistance of Phase-BC
Xbc MAG	= 0.000 Ohms	Ohms	Reactance of Phase-BC
Zca MAG	= 0.000 Ohms	Ohms	Impedance of Phase-CA
Zca ANG	= 0.000 Deg	Degree	Angle of Phase-CA
Rca MAG	= 0.000 Ohms	Ohms	Resistance of Phase-CA
Xca MAG	= 0.000 Ohms	Ohms	Reactance of Phase-CA
Z1 MAG	= 0.000 Ohms	Ohms	Positive Sequence Impedance
Z1 ANG	= 0.000 Deg	Degree	Positive Sequence Angle
R1 MAG	= 0.000 Ohms	Ohms	Positive sequence Resistance
X1 MAG	= 0.000 Ohms	Ohms	Positive sequence Reactance
Z2 MAG	= 0.000 Ohms	Ohms	Negative Sequence Impedance
Z2 ANG	= 0.000 Deg	Degree	Negative Sequence Angle

R2 MAG	= 0.000 Ohms	Ohms	Negative sequence Resistance
X2 MAG	= 0.000 Ohms	Ohms	Negative sequence Reactance
Z0 MAG	= 0.000 Ohms	Ohms	Zero Sequence Impedance
Z0 ANG	= 0.000 Deg	Degree	Zero Sequence Angle
R0 MAG	= 0.000 Ohms	Ohms	Zero sequence Resistance
X0 MAG	= 0.000 Ohms	Ohms	Zero sequence Reactance

5.4 Measurement 4 (optional)

Measurement 4 displays the primary and secondary value of the Analogue inputs.

Parameter		Unit	Description
AI-1	= 0.000 mA	mA	Secondary Value of Analogue Input-1
AI-2	= 0.000 mA	mA	Secondary Value of Analogue Input-2
AI-3	= 0.000 mA	mA	Secondary Value of Analogue Input-3
AI-4	= 0.000 mA	mA	Secondary Value of Analogue Input-4
AI-5	= 0.000 mA	mA	Secondary Value of Analogue Input-5
AI-6	= 0.000 mA	mA	Secondary Value of Analogue Input-6
AI-7	= 0.000 mA	mA	Secondary Value of Analogue Input-7
AI-8	= 0.000 mA	mA	Secondary Value of Analogue Input-8
AI-1P	= 0.000 mA	mA	Primary Value of Analogue Input-1
AI-2P	= 0.000 mA	mA	Primary Value of Analogue Input-2
AI-3P	= 0.000 mA	mA	Primary Value of Analogue Input-3
AI-4P	= 0.000 mA	mA	Primary Value of Analogue Input-4
AI-5P	= 0.000 mA	mA	Primary Value of Analogue Input-5
AI-6P	= 0.000 mA	mA	Primary Value of Analogue Input-6
AI-7P	= 0.000 mA	mA	Primary Value of Analogue Input-7
AI-8P	= 0.000 mA	mA	Primary Value of Analogue Input-8

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Section 6

Settings Sheet

Contents

6 SETTING SHEET

6.1 GLOBAL

6.1.1 General Settings

Sr. No	Parameter	Defaults setting	Setting / Ranges
1.	Password	0000	0000 to zzzz / ZZZZ
This setting specifies to enter the set password			
2.	FID	Feeder_ID	-
This setting specifies to enter the Feeder Identification Setting.			
3.	SID	SubStn_ID	-
This setting specifies to enter the Station Identification Setting.			
4.	Phase	ABC	Read only
This setting specifies to enter the Phase selection Setting.			
5.	System Frequency	50Hz	50Hz / 60Hz
This setting determines to select the system frequency			
6.	Opto I/P Supply	DC	Read only
This setting specifies to select opt coupler i/p to status as AC/DC			
7.	CB Scheme	Gang Operated	Gang Operated / Pole Operated
This setting specifies to select the CB Scheme.			
8.	Select Pole	3P	3P / P1 / P2 / P3
This setting specifies to select the pole			
9.	CB Operation	No Operation	CB Open / CB Close / No Operation
This setting use to operate CB through HMI (Setting should be set as Local / Local + Remote in CB Control Menu)			
10.	Remote Operation	No Operation	No operation / Enabled / Time Enabled
This setting use to enable the Remote mode of control which is used to control the circuit breaker operation.			
11.	tRPassword	0.50 S	00.10 to 50.00 sec in step of 0.01s
This setting defines the duration of the Remote Operation of BCU			
12.	Local Operation	No Operation	No operation / Enabled/ Time Enabled
This setting use to enable the Local mode of control which is used to control the circuit breaker operation.			
13.	tLPassword	0.50 S	00.10 to 50.00 sec in step of 0.01s
This setting defines the duration of the Local Operation of BCU			

14.	Config Port	PORT F	PORT F / PORT 1
This setting specifies to select communication port for 103 communications through RTV2.			
15.	Timesync Master	PORT 1	PORT F/ PORT 1
This setting is used to set the timesync Master			
16.	Description	ASHIDA ADR245B M3	Read only
This is read only setting is used to display the type of the BCU.			
17.	Model no	ADR245BM3XXXXXX	Read only
This is read only setting is used to display the model no of the BCU.			
18.	Serial No	xxx245Bxxxx	Read only
This is read only setting is used to display the Serial No of the BCU.			
19.	Software Version	245BM3xxxxxxVx.xx	Read only
This is read only setting is used to display the software version of the BCU.			
20.	Hardware Version	Vx.xx	Read only
This is read only setting is used to display the Hardware version of the BCU.			
21.	Virtual Scheme 1	Disabled	Disabled / Enabled
This setting is used to enable Virtual bit in AProLogic			
22.	Virtual Scheme 2	Disabled	Disabled / Enabled
This setting is used to enable Virtual bit in AProLogic			
23.	Select CT Model	0X0000	Read only
This setting is used for Selection of setting menu & Measurement menu			
24.	Sync Function	Disabled	Disabled / Enabled
This setting is used to enable Sync Check Function			
25.	Sync Start	No Operation	No Operation / Enabled
This setting is used to Start Sync Check Function			
26.	Sync Phase	AB	AB / BC / CA
This setting is used to select the Sync Check Phase.			

6.1.2 Settings Group

Sr. No	Parameter	Defaults setting	Setting / Ranges
1.	Factory Defaults	No Operation	No Operation / All Settings / Setting Group 1 / Setting Group 2 / Setting Group 3 / Setting Group 4
This setting is determined the settings to restore a setting group to factory default settings. To restore the default values to the settings in any Group settings, set the 'Factory Defaults cell to the relevant Group number. Alternatively it is possible to set the 'restore defaults' cell to 'all settings' to restore the default values to all of the IED's settings, not just the Group settings.			

The default settings will be placed in Flash and will only be used by the IED after they have been confirmed by the user.			
2.	Active Group	G1	G1 / G2 / G3 / G4
This setting determines to selects the active setting group.			
3.	Copy From	G1	G1 / G2 / G3 / G4
This setting allows settings to be copied from a selected setting group.			
4.	Copy To	No operation	No operation / G1 / G2 / G3 / G4
This setting allows settings to be copied to a selected setting group			
5.	G1	Enabled	Disabled / Enabled / Time Enabled
This setting determines to enable/ disable the setting group 1.If the setting group 1 is enabled from the configuration setting, then all associated settings and signals are available in Group 1 setting menu.			
6.	GroupChange Delay	5.0s	0 to 400.0s in step of 0.1s
This setting defines duration for which the setting of changed group is remains activate			
7.	G2	Disabled	Disabled / Enabled / Time Enabled
This setting determines to enable/ disable the setting group 2.If the setting group 2 is enabled from the configuration setting, then all associated settings and signals are available in Group 2 setting menu.			
8.	GroupChange Delay	5.0s	0 to 400.0s in step of 0.1s
This setting defines duration for which the setting of changed group is remains activate			
9.	G3	Disabled	Disabled / Enabled / Time Enabled
This setting determines to enable/ disable the setting group 3.If the setting group 3 is enabled from the configuration setting, then all associated settings and signals are available in Group3 setting menu.			
10.	GroupChange Delay	5.0s	0 to 400.0s in step of 0.1s
This setting defines duration for which the setting of changed group is remains activate			
11.	G4	Disabled	Disabled / Enabled / Time Enabled
This setting determines to enable/ disable the setting group 4.If the setting group 4 is enabled from the configuration setting, then all associated settings and signals are available in Group 4 setting menu.			
12.	GroupChange Delay	5.0s	0 to 400.0s in step of 0.1s
This setting defines duration for which the setting of changed group is remains activate			

6.1.3 PORT F

Sr. No	Parameter	Defaults setting	Setting / Ranges
1.	Unit ID	1	Read only
This cell sets the unique address for the BCU such that only one BCU is accessed by master station software.			
2.	Baud Rate	57600	Read only
This cell controls the communication speed between BCU and master station. It is important that both BCU and master station are set at the same speed setting.			

3.	Set Parity	None	Read only
This cell controls the Rear Port parity format used in the data frames. It is important that both BCU and master station are set with the same parity setting.			

6.1.4 PORT 1

Sr. No	Parameter	Defaults setting	Setting / Ranges
1.	Unit ID	1	1 to 247 in step of 1
This cell sets the unique address for the BCU such that only one BCU is accessed by master station software.			
2.	IP address	192.168.001.121	Range 0 to 255 in step of 1
This setting is used to set the IP address of the BCU			
3.	Subnet mask	255.255.255.000	Range 0 to 255 in step of 1
This setting is used to set the subnet mask of the BCU			
4.	Default gateway	192.168.001.001	Range 0 to 255 in step of 1
The setting is used to set the default gateway			
5.	Pri. SNTP	000.000.000.000	Range 0 to 255 in step of 1
This setting is used to set pri. SNTP			
6.	Sec. SNTP	000.000.000.000	Range 0 to 255 in step of 1
This setting is used to set Sec. SNTP			
7.	Protocol	Disabled	Disabled / Enabled
This setting is used to select the communication Protocol			
8.	Ethernet Mode	Dual	Dual / fixed
This setting is used to set the Ethernet Mode as Dual or Fixed.			
9.	Operating Mode	Fail over	Fail over / Switch mode
This setting is used to set the Operating Mode of the IED			
10.	Primary	LAN 2	LAN1 / LAN 2
This setting is used to set primary communication of Ethernet Port in Fail Over Mode.			

6.1.5 PORT R

Sr. No	Parameter	Defaults setting	Setting / Ranges
1.	Unit ID	001	Read only
This cell sets the unique address for the BCU such that only one BCU is accessed by master station software.			
2.	Baud Rate	57600	Read only
This cell controls the communication speed between BCU and master station. It is important that both			

BCU and master station are set at the same speed setting.			
3.	Set Parity	Even	Read only
This cell controls the Rear Port parity format used in the data frames. It is important that both BCU and master station are set with the same parity setting.			

6.1.6 IRIG Port

Sr. No	Parameter	Defaults setting	Setting / Ranges
1.	IRIG Port	Disabled	Read only
This setting is used to Enable IRIG-B communication of the IED			

6.1.7 Angle Calibration

Sr. No	Parameter	Defaults setting	Setting / Ranges
1.	R Angle Offset	359.90	0 to 359.90 in step of 0.01
This setting is used to set the offset value for angle of R-phase.			
2.	Y Angle Offset	359.90	0 to 359.90 in step of 0.01
This setting is used to set the offset value for angle of Y-phase.			
3.	B Angle Offset	359.90	0 to 359.90 in step of 0.01
This setting is used to set the offset value for angle of B-phase.			
4.	E Angle Offset	359.90	0 to 359.90 in step of 0.01
This setting is used to set the offset value for angle of EF.			

6.1.8 Disturbance

Sr. No	Parameter	Defaults setting	Setting / Ranges
1.	Post Trigger	5%	5 to 95% in step of 1%
The Post Trigger is used to Pre-fault duration of the disturbance recorder.			
2.	Sampling	RAW Sample	Read-only
The setting is used to select samples of Disturbance Recorder.			

6.1.9 Display contrast

Sr. No	Parameter	Defaults setting	Setting / Ranges
1.	Contrast Set	15%	Read-only
This setting is used to adjust the display contrast			

6.1.10 DATE AND TIME settings

Sr. No	Parameter	Defaults setting	Setting / Ranges
1.	Password	0000	0000 to zzzz / ZZZZ
This setting specifies to enter the set password.			
2.	Local Time Enable	Fixed	Fixed / Flexible / Disabled
Setting to turn on/off local time adjustments. Fixed - A local time zone adjustment can be defined using the Local Time offset setting and all interfaces will use local time. Flexible - A local time zone adjustment can be defined using the Local Time offset setting and each interface can be assigned to the UTC zone or local time zone with the exception of the local interfaces which will always be in the local time zone. Disabled - No local time zone will be maintained. Time synchronization from any interface will be used to directly set the master clock and all displayed (or read) times on all interfaces will be based on the master clock with no adjustment.			
3.	Local Time Offset	0 Mins	-720 to + 720 in step of 15 Mins
Setting to specify an offset of -12 to +12 hrs in 15 minute intervals for local time zone. This adjustment is applied to the time based on the master clock which is UTC/GMT			
4.	DST Enable	Disabled	Read-only
5.	RP Time Zone	Local	UTC / Local
UTC / Local (Setting for the rear port 1 interface to specify if time synchronization received will be local or universal time co-ordinated.)			
6.	SET Hours	11 *	0 to 23 Hrs in step of 1.
Hour setting needed when BCU is not connected to SCADA system			
7.	SET Minutes	35 *	0 to 59 Mins in step of 1.
Minutes setting needed when BCU is not connected to SCADA system			
8.	SET Seconds	54 *	0 to 59 Sec. in step of 1.
Seconds setting needed when BCU is not connected to SCADA system			
9.	SET Date	05 *	1 to 31 Days in step of 1.
Date needed when BCU is not connected to SCADA system			
10.	SET Month	04 *	1 to 12 Months in step of 1.
Month needed when BCU is not connected to SCADA system			
11.	SET Year	18 *	0 to 99 Years in step of 1.
Year needed when BCU is not connected to SCADA system			

Note: * BCU shows current date & time, set into the BCU.

6.2 CB Control

Sr. No	Parameter	Defaults setting	Setting / Ranges
1.	Password	0000	0000 to zzzz / ZZZZ
This setting specifies to enter the set password			
2.	TCS Enable	Disabled	Disabled / Logic Low / Logic High
This setting determine to enable (activate) or disable (turn off) the Trip Circuit Supervision Alarm function			
3.	TCS Delay	0.50 S	0.1s to 10s in step of 0.1s
This setting is used to set the time-delay for the Trip Circuit supervision if BCU detect any discontinuity then BCU generate TCS alarm after set Tsup timer is over			
4.	CB Open S'vision	Enabled	Disabled / Enabled
This setting is used to enable (activate) or disable (turn off) the CB Open Supervision function			
5.	CB Open Time	300 ms	50ms to 1000ms in step of 10ms
This setting for the time-delay for the CB Open Time monitoring			
6.	CB Open Alarm	Enabled	Disabled / Enabled
This setting determine to enable (activate) or disable (turn off) the CB Open Alarm function			
7.	CB Oper. Counter	20000	10 to 50000 in step of 1
This setting is used to monitor the number CB Open operation and after set number of CB OPEN operations are over BCU give Alarm			
8.	CB Control By	Disabled	Disabled / Local / Remote / Local + Remote
This setting is used to selects the mode of control which is used to control the circuit breaker operation.			
9.	t CB Open Pulse	0.50s	00.10 to 50.00sec in step of 0.01s
This setting defines the duration of the t CB Open Pulse within which the CB should operate when a manual or control command is issued.			
10.	t CB Close Pulse	0.50s	00.10 to 50.00sec in step of 0.01s
This setting defines the duration of the t CB Close Pulse within which the CB should operate when a manual or control command is issued.			
11.	CB Monitoring	Enabled	Disabled / Enabled
This setting determine to enable (activate) or disable (turn off) the CB Monitoring function			
12.	t CB Monitoring	0.50s	00.10 to 50.00sec in step of 0.01s
This setting defines the duration of the t CB Monitoring within which the pole discrepancy monitor.			
13.	Invalid DPI Dur H	1.00s	1 to 600s in step of 1s
This setting defines the duration of the DPI status change of H slot.			
14.	Invalid DPI Dur I	1.00s	1 to 600s in step of 1s
This setting defines the duration of the DPI status change of I slot.			

15.	Invalid DPI Dur J	0.00s	Read-Only
This setting defines the duration of the DPI status change of J slot.			
16.	Invalid DPI Dur H	0.00s	Read-Only
This setting defines the duration of the DPI status change of K slot.			
17.	Invalid DPI Dur H	0.00s	Read-Only
This setting defines the duration of the DPI status change of L slot.			
18.	Invalid DPI Dur H	0.00s	Read-Only
This setting defines the duration of the DPI status change of M slot.			
19.	Invalid DPI Dur H	1.00s	1 to 600s in step of 1s
This setting defines the duration of the DPI status change of N slot.			
20.	Invalid DPI Dur H	1.00s	1 to 600s in step of 1s
This setting defines the duration of the DPI status change of O slot.			

6.3 REPORTING

Sr. No	Parameter	Display value on LCD
1.	Event	Display of all digital events with time stamping
2.	Status	Display Status of Digital Input & Digital Output
3.	Fault Record	Display the Records of fault i.e. parameter value, flag of fault & date and time of Fault
4.	Error Log	Display of error generated by BCU if any, in case of failure of hardware
5.	CB Data	Display of Trip Counter; Breaker Operation Counter; Breaker operating time, Recl Cnt
6.	Alarm Record	Display of latest Alarm Record

6.4 SYSTEM CONFIG

6.4.1 CT/VT RATIOS

Sr. No	Parameter	Defaults setting	Setting / Ranges
1.	Ph CT Secondary	1 A	1A / 5A
This setting is used to set the Earth fault CT secondary.			
2.	Ph CT Primary	10 A	10 to 30000A in step of 1A
This setting is used to set the Earth fault CT Primary.			
3.	EF CT Secondary	1 A	1A / 5A
This setting is used to set the Earth fault CT secondary.			

4.	EF CT Primary	10 A	10 to 30000A in step of 1A
This setting is used to set the Earth fault CT Primary.			
5.	PH VT Primary	1.0 KV	0.1 to 800KV in step of 0.1KV L-L
This setting is used to set the VT Primary.			
6.	PH VT Secondary	Line to Ground	Read only setting
7.	PH VT Secondary	63.5 V	50.0 to 150.0V in step of 0.1V
This setting is used to set the VT Secondary			
8.	Sync VT Primary	1.00KV	0.1 to 800KV
This setting is used to set the Sync VT Primary.			
9.	Sync VT Selection	Line to Line	Read only setting
10.	Sync VT Secondary	110.0 V	50.0 to 150.0V in step of 0.1V
This setting is used to set the Sync VT Secondary			
11.	Setting Values	Secondary	Read only setting
This setting used to set setting values in secondary.			
12.	Fix Dem Period	15 Mins	1 to 99 Mins in step of 1min
This setting used to set time for the fixed demand period.			

6.5 PROTECTIONS settings

Sr. No	Parameter	Defaults setting	Setting / Ranges
1.	Reclosing	Disabled	Disabled / Enabled
This setting determines to enable (activate) or disable (turn off) the Auto reclosing feature.			
2.	Breaker Failure	Disabled	Disabled / Enabled
This setting is used to enable or disable the Breaker failure function.			
3.	CB Open Pole	Disabled	Disabled / Enabled
This setting determines to enable (activate) or disable (turn off) the CB Open Pole function			
4.	SOTF	Disabled	Disabled / Enabled
This setting determines to enable (activate) or disable (turn off) the SOTF Function.			
5.	Sync Check	Disabled	Disabled / Enabled
This setting determines to enable (activate) or disable (turn off) the Sync Check Function.			
6.	Analogue Inputs	Disabled	Disabled / Enabled
This setting determines to enable (activate) or disable (turn off) the Analog Inputs Function.			

6.6 RECORD CONTROL settings:

Sr. No	Parameter	Defaults setting	Setting / Ranges
1.	Password	0000	0000 to zzzz / ZZZZ
This setting specifies to enter the set password			
2.	Clear Events	No	Yes / No
Selecting “Yes” will cause the existing Events Stored to be erased from the BCU.			
3.	Clear Faults	No	Yes / No
Selecting “Yes” will cause the existing Fault Records to be erased from the BCU.			
4.	Clear Disturbance	No	Yes / No
Selecting “Yes” will cause the existing Disturbance Records to be erased from the BCU.			
5.	Clear Error Record	No	Yes / No
Selecting “Yes” will cause the existing Maintenance Records to be erased from the BCU.			
6.	CB Data	No	Yes / No
Selecting “Yes” will cause the existing CB records to be clear to zero.			
7.	Thermal State	No	Yes / No
Selecting “Yes” will cause the existing Thermal state reset to zero.			
8.	Energy	No	Yes / No
Selecting “Yes” will cause the existing Energy records to be clear to zero.			

6.7 OUTPUT & LED TEST (COMMISSION TEST):

Sr. No	Parameter	Defaults setting	Setting / Ranges
1.	Password	0000	0000 to zzzz / ZZZZ
This setting specifies to enter the set password			
2.	Test Mode	Disabled	Disabled/Test Mode/Contacts Blocked
This setting allows secondary injection testing to be performed on the BCU itself.			
3.	Test Output J	000000	0 = Not Operated, 1 = Operated
This setting is used to select the output relay contacts that will be tested when the Contact Test cell is set to Apply Test.			
4.	Test Output K	000000	0 = Not Operated, 1 = Operated
This setting is used to select the output relay contacts that will be tested when the Contact Test cell is set to Apply Test.			
5.	Test Output L	000000	0 = Not Operated, 1 = Operated
This setting is used to select the output relay contacts that will be tested when the Contact Test cell is set to Apply Test.			

6.	Test Output M	000000	0 = Not Operated, 1 = Operated
This setting is used to select the output relay contacts that will be tested when the Contact Test cell is set to Apply Test.			
7.	Test Apply	No Operation	No Operation/Apply Test/Remove Test
This setting is used to Test contact operation of relay output.			
8.	Test LEDs	No Operation	No Operation / Apply Test
This setting is used to Test the 16 no's programmable LED's.			

6.8 Group 1 Settings

6.8.1 Reclosing

Sr. No	Parameter	Defaults setting	Setting / Ranges
1.	Password	0000	0000 to zzzz / ZZZZ
This setting specifies to enter the set password			
2.	Reclosing Enable	Disabled	Disabled/Enabled
This setting is used to enable or disable the reclosing function.			
3.	Number of Shots	1	1 to 4 in step of 1
This setting is used to set the No of reclosing shots.			
4.	DT1	1s	0.10 to 180.00s in step of 0.1s
This setting is used to set the dead time 1			
5.	DT2	1s	0.10 to 180.00s in step of 0.1s
This setting is used to set the dead time 2			
6.	DT3	1s	0.10 to 180.00s in step of 0.1s
This setting is used to set the dead time 3			
7.	DT4	1s	0.10 to 180.00s in step of 0.1s
This setting is used to set the dead time 4			
8.	Reclaim Time	10s	10.0s to 300.0 s in step of 0.1s
This setting is used to set the Reclaim time.			
9.	AR CB Monitor	52B	52A / 52B
This setting is used to set the CB Monitor for ARR function.			
10.	AR Mode	1P	1P / 3P / 1P/3P
This setting is used to set the AR Mode for ARR function.			

6.8.2 Breaker Failure

Sr. No	Parameter	Defaults setting	Setting / Ranges
1.	Password	0000	0000 to zzzz / ZZZZ
This setting specifies to enter the set password			
2.	50BF Enable	Disabled	Disabled / INT / EXT
This setting is used to Disabled or selects the Circuit Breaker Fail Status internal or External option.			
3.	t50BF-1 Status	Enabled	Disabled / Enabled
This setting determines the enable (activate) or disable (turn off) the Circuit Breaker Fail Status-1			
4.	t50BF-1 Delay	0.10 S	0s to 50s in step of 0.01s
This setting for the time-delay for the CB Fail Timer-1			
5.	t50BF-2 Status	Enabled	Disabled / Enabled
This setting determines the enable (activate) or disable (turn off) the Circuit Breaker Fail Status-2			
6.	t50BF-2 Delay	0.10 S	0s to 50s in step of 0.01s
This setting for the time-delay for the CB Fail Timer-2			
7.	50BF Reset	CB Open & I<	I< Only / CB Open & I< / Prot Reset & I< / CB Open
This setting is for the logic condition used to reset the Circuit Breaker Fail operation.			
8.	50BF_I<	1.00 A*In	0.05*In to 3.20*In in step of 0.01
This setting determines Reset setting for Circuit BF phase current.			
9.	50BF_3I0<	1.00 A*In	0.05*In to 3.20*In in step of 0.01
This setting determines Reset setting for 50BF Residual current.			
10.	Remove IP>P	Disabled	Disabled / Enabled
This setting for block phase over current function during 50BF is operated			
11.	Remove 3I0> P	Disabled	Disabled / Enabled
This setting for block residual fault over current function during 50BF is operated			

6.8.3 CB Open Pole

Sr. No	Parameter	Defaults setting	Settings / Ranges
1.	Password	0000	0000 to zzzz / ZZZZ
This setting specifies to enter the set password			
2.	Open Pole	Disabled	Disabled / Enabled
This setting is used to disable or enable the Open Pole setting.			
3.	Mode	I&V	I&V / I&52A / V&52A
This setting is used to set the mode of Open Pole			

4.	V<	10 V	5 to 100V in step of 0.1V
This setting is used to set the voltage value below which open pole initiate			
5.	I<	0.1 A	0.05 to 20 A in step of 0.01A
This setting is used to set the current value below which open pole initiate			
6.	tPO delay	1s	0 to 100 s in step of 0.02s
This setting is used to set the operating delay for open pole.			

6.8.4 SOTF

Sr. No	Parameter	Defaults setting	Settings / Ranges
1.	Password	0000	0000 to zzzz / ZZZZ
This setting specifies to enter the set password			
2.	SOTF Enable	Disabled	Disabled / Enabled
This setting is used to disabled or enabled the SOTF function.			
3.	Closepulse Input	Deadline Det	Enabled / Deadline Det
This setting is used to select the close pulse input for SOTF initiate.			
4.	27SOTF_I	1 A	0.05 to 20 A in step of 0.01A
This setting is used to set the current value above which SOTF trip is initiated.			
5.	27SOTF_V	40 V	5 to 100 V in step of 0.1V
This setting is used to set the voltage value below which SOTF trip is initiated.			
6.	tClosepulse Delay	0.2s	0 to 5 s in step of 0.01s
This setting is used to set the Timer for SOTF function.			
7.	tSOTFtrip Delay	0s	0 to 5 s in step of 0.01s
This setting is used to set the delay for SOTF trip.			

6.8.5 Sync Check

Sr. No	Parameter	Defaults setting	Settings / Ranges
1.	Password	0000	0000 to zzzz / ZZZZ
This setting specifies to enter the set password			
2.	Sync Check Enable	Disabled	Disabled / Enabled
This setting is used to disable or enable the Sync Check setting.			
3.	VHI	100%	50 to 150% in step of 1%
This setting is used to set the VHI highest voltage level.			
4.	VLI	100%	50 to 150% in step of 1%
This setting is used to set the VLI lower voltage level.			

5.	Delta V	10%	5 to 100% in step of 1%
This setting is used to set the Delta Voltage			
6.	Delta Angle	10.0 Deg	0 to 80Deg in step of 1Deg.
This setting is used to set the Delta Angle			
7.	Delta F	0.5Hz	0.5 to 5Hz in step of 0.1Hz.
This setting is used to set the Delta Frequency			
8.	tSync Pulse	2 Cycle	1 to 500Cycle in step of 1Cycle.
This setting is used to set the tSync Pulse			
9.	LiveLine DeadBus	Disabled	Disabled / Enabled
This setting is used to disable or enable the LiveLine DeadBus			
10.	V<	100%	50 to 150% in step of 1%
This setting is used to set the Bus Voltage to detect the dead bus.			
11.	LiveBus DeadLine	Disabled	Disabled / Enabled
This setting is used to disable or enable the LiveBus DeadLine			
12.	V<	100%	50 to 150% in step of 1%
This setting is used to set the line Voltage to detect dead line.			
13.	DeadLine DeadBus	Disabled	Disabled / Enabled
This setting is used to disable or enable the DeadLine DeadBus			
14.	V<	20%	10 to 80% in step of 1%
This setting is used to set the bus & line Voltage to detect dead line & dead bus.			

6.8.6 Analogue Input

Sr. No	Parameter	Defaults setting	Settings / Ranges
1.	Password	0000	0000 to zzzz / ZZZZ
This setting specifies to enter the set password			
2.	Analogue Input 1	Disabled	Disabled / Enabled
This setting is used to disable or enable the Analogue Input 1 setting.			
3.	AI-1 Low Range	4	-99999.0 to 99999.0
This setting is used to set the AI-1 Low Range			
4.	AI-1 High Range	20	-99999.0 to 99999.0
This setting is used to set the AI-1 High Range			
5.	AI-1LoWarn 1	Disabled	Disabled / Enabled
This setting is used to disable or enable the AI-1LoWarn 1			
6.	AI-1LoWarnLevel1	0	-99999.0 to 99999.0

This setting is used to set the range for AI-1LoWarnLevel1			
7.	AI-1LoWarn 2	Disabled	Disabled / Enabled
This setting is used to disable or enable the AI-1LoWarn 2			
8.	AI-1LoWarnLevel2	0	-99999.0 to 99999.0
This setting is used to set the range for AI-1LoWarnLevel2			
9.	AI-1HIWarn 1	Disabled	Disabled / Enabled
This setting is used to disable or enable the AI-1HiWarn 1			
10.	AI-1HIWarnLevel1	0	-99999.0 to 99999.0
This setting is used to set the range for AI-1HiWarnLevel1			
11.	AI-1HiWarn 2	Disabled	Disabled / Enabled
This setting is used to disable or enable the AI-1HiWarn 2			
12.	AI-1HiWarnLevel2	0	-99999.0 to 99999.0
This setting is used to set the range for AI-1HiWarnLevel2			
Note : Analogue Input 2 Enable, Analogue Input 3 Enable, Analogue Input 4 Enable, Analogue Input 5 Enable, Analogue Input 6 Enable, Analogue Input 7 Enable and Analogue Input 8 Enable setting are similar to Analogue Input 1 Enable			

6.9 ACTIVE GROUP

Sr. No	Parameter	Defaults setting	Setting / Ranges
1.	G1/ G4	G1	Read only
This setting displays the active group which is activated currently.			

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Section 7

Communication

Contents

7 COMMUNICATIONS

A communication interface and protocols are required to interface BCU-AR245B. A communication interface is the physical connection on device. Once user establishes physical connection, the user must use communication protocol to interface with the BCU.

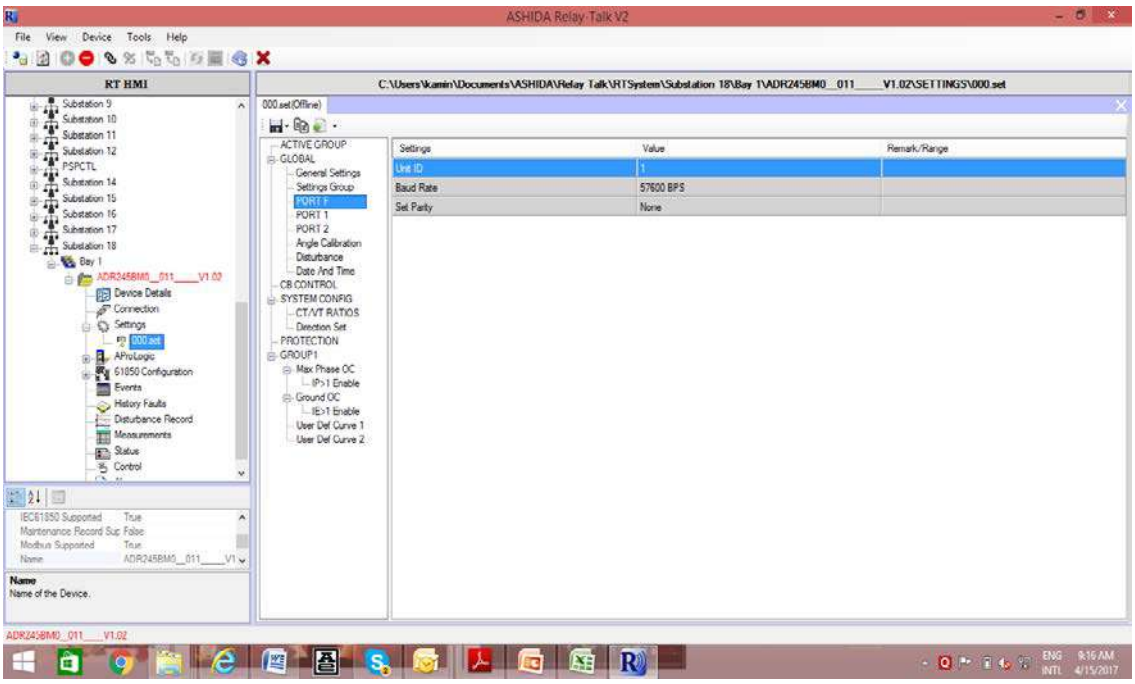
NOTE: This is a common document for BCU-ADR245B. Some of the features mentioned may not be available in different sub-types/models of BCU-ADR245B.

Physical Interfaces:

Port	Description	Location
Port F	USB Port	Front
Port 1	Ethernet Port RJ45/FO	Rear
Port R	RS485 Port	Rear

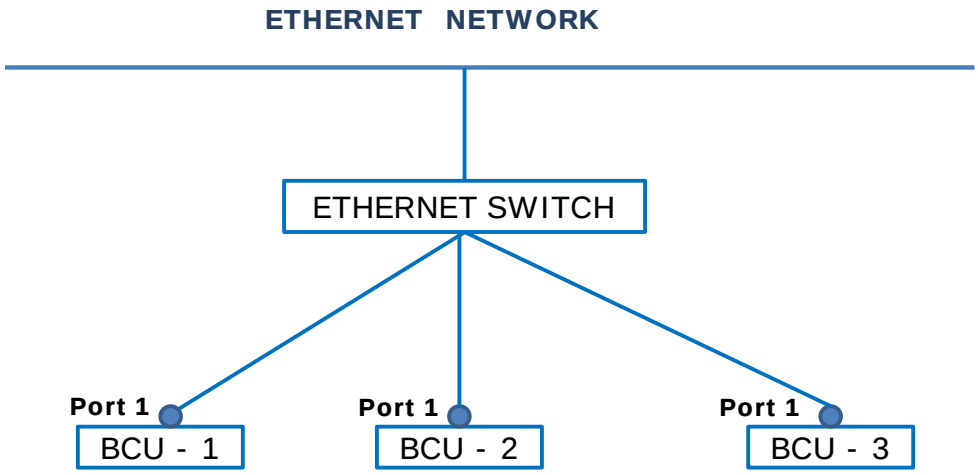
Port F:

Port F is front communication port, available on front side of the BCU. BCU parameterization software RTV2 is communicated via Port F. BCU parameters shall be uploaded and downloaded into the BCU. Once the RTV2 software is communicated to BCU via Port F, Disturbance records shall be downloaded in PC through RTV2 software by using Port F connection.

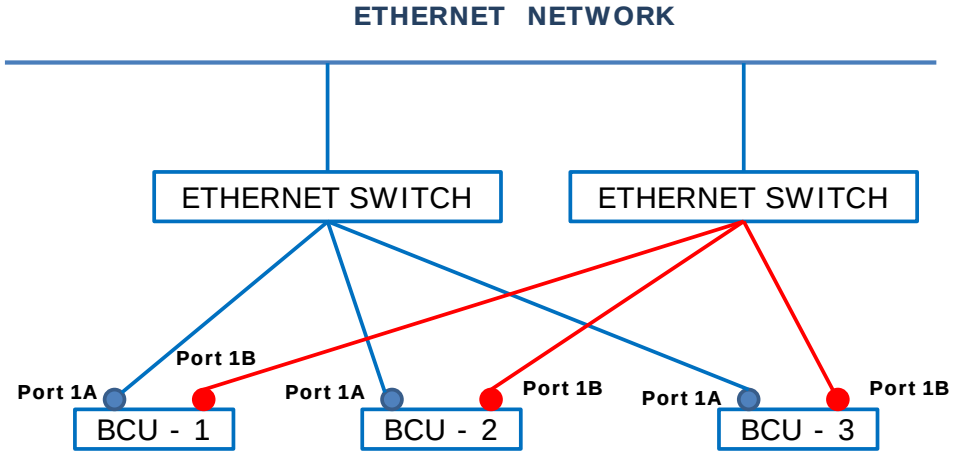


Port 1:

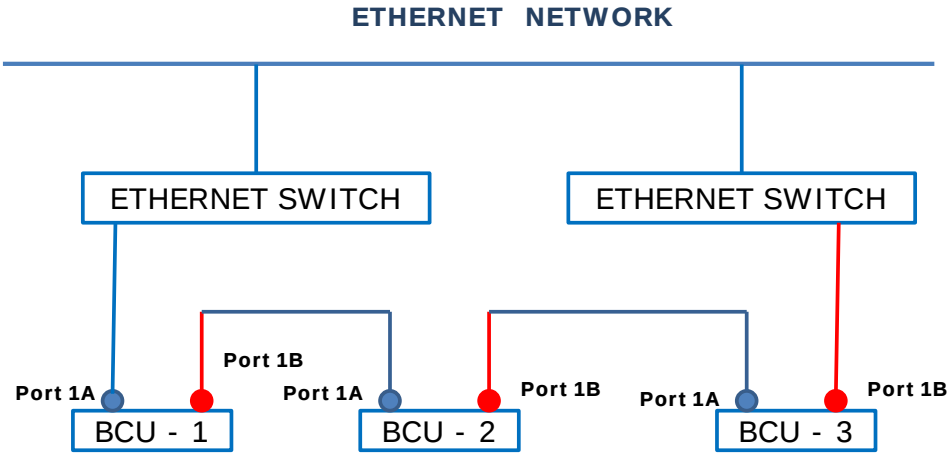
Port 1 is the Ethernet port. Ethernet port can be used for interfacing of BCU with Ethernet network. BCU-ADR245B Ethernet port options include single or dual copper Ethernet port configuration. The Port 1 can be assigned as a “fixed”, “failover”, “switch” mode options. Dual port option can be assigned for redundancy purpose or it can also be assigned as an unmanaged switch”. Below communication structures explains configuration in



Fixed Mode Option



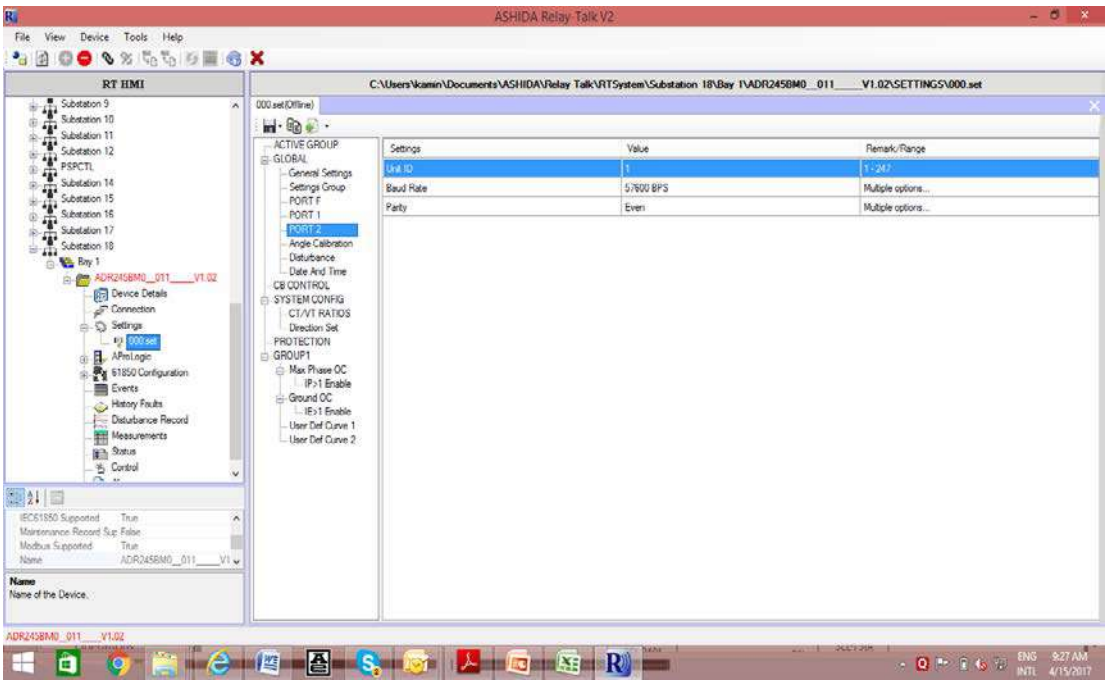
Fail Over Mode Option: Primary port fails then data transfer through Secondary Port



Switch Over Mode Option: Port 1A and Port 1B act as unmanaged Ethernet switch

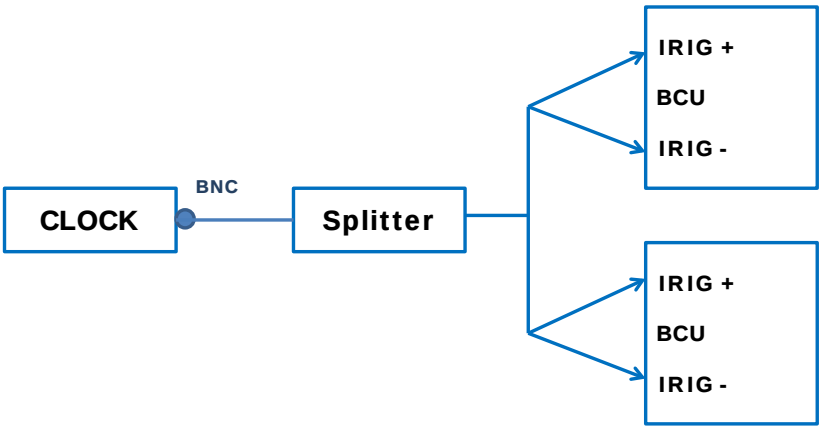
Port R:

Port R is RS485 serial port, available on rear side of BCU. BCU parameterization software RTV2 also can be communicated via Port R. BCU parameters shall be uploaded and downloaded in the BCU. Port R is generally used for SCADA communication purpose. IEC103 protocol and MODBUS RTU protocol shall be worked via Port R.



IRIG-B Port: (Optional)

The BCU-ADR245B has equipped with IRIG-B port. The facility is provided to accept demodulated time coded input for time synchronization with external source.



7.1 IRIG TIME CODE DESIGNATIONS

The letter B006 is used to designate one of the six IRIG code formats. Signal identification numbers are used to further describe specific characteristics. Thus, the complete IRIG time code designation consists of a letter and three digits as shown below.

1st Digit	Modulation
0	Unmodulated, DC Level Shift (DCLS), pulse-width coded
1	Amplitude modulated, sine wave carrier
2	Manchester modulated
2nd Digit	Carrier Frequency / Resolution
0	No carrier (DCLS)
1	100 Hz / 10 ms resolution
2	1 kHz / 1 ms resolution
3	10 kHz / 100 microsecond resolution
4	100 kHz / 10 microsecond resolution
3rd Digit	Coded Expressions
0	BCDTOY, CF, SBS
1	BCDTOY, CF
2	BCDTOY
3	BCDTOY, SBS
4	BCDTOY, BCDYEAR, CF, SBS
5	BCDTOY, BCDYEAR, CF
6	BCDTOY, BCDYEAR
7	BCDTOY, BCDYEAR, SBS

IRIG-B Overview

IRIG time code B (IRIG-B) is widely used in the electrical power industry. IRIG-B has a pulse rate of 100 pulses-per-second with an index count of 10 milliseconds over its one-second time frame. It contains time-of-year and year information in a BCD format, and (optionally) seconds-of-day in SBS. IRIG-B Signals IRIG-B is typically distributed as a DC level shift (DCLS), pulse-width coded signal ("unmodulated IRIG-B") in ADR series of Ashida.

IRIG-B Encoding

IRIG-B consists of 100 bits produced every second, 74 bits of which contain various time, date, time changes and time quality information of the time signal. Consisting of logic ones, zeros and position identifier bits, the time code provides a reliable method of transmitting time to synchronize power equipment devices. There are three functional groups of bits in the IRIG-B time code: Binary Coded Decimal (BCD), Control Functions (CF) and Straight Binary Seconds (SBS). The BCD group contains time information including seconds, minutes, hours and days, recycling yearly. The BCD time-of-year code (BCDTOY) reads zero (0) hours, minutes, seconds and fraction of seconds at 2400 each day and reads day 001 at 2400 of day 365, or day 366 in a leap year. The BCD year code (BCDYEAR) counts year and cycles to the next year on January 1st of each year and will count to year 2099. The (optional) SBS time-of-day code consists of the total elapsed seconds, recycling daily. SBS reads zero (0) seconds at 2400 each day excluding leap second days when a second may be added or subtracted. The CF group contains year, time quality, leap year, pending leap seconds and parity. Other CF bits are reserved for user-defined purposes, depending on application. Lastly, position identifiers separate the various components of the IRIG-B time code.

IRIG-B Implementation

Typical techniques for transmission of unmodulated IRIG-B (DCLS) include:
5V signal over coaxial cable or shielded twisted-pair cable
Multi-point distribution using 24 Vdc for signal and control power
RS-485 differential signal over shielded twisted-pair cable
RS-232 signal over shielded cable (short distances only)
Optical fibre.

7.2 MODBUS:

This section describes how the MODBUS standard is applied to the ADR Series platform. It is not a description of the standard itself. The level at which this section is written assumes that the reader is already familiar with the MODBUS standard.

The MODBUS protocol is a master/slave protocol, defined and administered by the MODBUS Organization. For further information on MODBUS and the protocol specifications please see the MODBUS web site (www.modbus.org).

7.2.1 MODBUS RTU

Overview: Physical Connection and Link Layer

For connecting on MODBUS use:

Rear serial port 'Port-R' - for permanent SCADA connection via RS 485

The MODBUS interface uses 'RTU' mode communication rather than 'ASCII' mode as this provides more efficient use of the communication bandwidth. This mode of communication is defined by the MODBUS standard.

The IED address and baud rate can be selected using the front panel menu or with RTV2 Software.

When using a serial interface, the data format is: 1 start bit, 8 data bits, 1 stop bit (a total of 10 bits per character).

7.2.2 MODBUS/TCP

Overview: Physical Connection and Link Layer

For connecting on MODBUS/TCP use:

Rear TCP port 'Port 1' - for permanent SCADA connection via Ethernet

7.2.3 Protocol Map

Function Codes supported:

Code	Function Name	Addresses starts with
02	Read Input Status	1x addresses
03	Read Holding Registers	4x addresses
04	Read Input Registers	3x addresses
05	Force Single Coil	0x addresses
16	Preset Multiple Registers	4x addresses

Exception Codes generated in case of an error:

Code	MODBUS Response Name	Product interpretation
01	Illegal Function Code	The function code received in query is not supported by the IED.
02	Illegal Data Address	The start address received in the query is not an allowable value. NOTE: If the start address received is correct but the range includes unsupported address this error is produced.

NOTE: *The addresses of the MODBUS registers start from 1 and the user may have to subtract 1 from the addresses, depending upon the configuration of the Master station configuration.*

NOTE: *In ASHIDA BCUs, the addresses of the MODBUS registers are flexible and may be changed for optimising speed of communication.*

Sr. No.	Function Code	03/16	Register	No. of Regs	Format	Reg. Type	Address Map
1	Time Synchronization (Unicast / Broadcast)						
			Year	1	16 bit	R/W	42049
			Month- Day	1	16 bit	R/W	42050
			Hour, Min	1	16 bit	R/W	42051
			Milliseconds	1	16 bit	R/W	42052

Sr. No.	Function Code	02	Register	No. of Regs	Format	Reg. Type	Address Map
2	Status and Logical Status						
			PROT Ready	1	1 bit	R	12772
			CB Open Sup	1	1 bit	R	12778
			CBOprAL	1	1 bit	R	12777
			Trip	1	1 bit	R	12779
			Close	1	1 bit	R	12780
			CBOpenFail	1	1 bit	R	12781
			CBCloseFail	1	1 bit	R	12782
			TCS Alarm	1	1 bit	R	12783
			P1CB Open Sup	1	1 bit	R	12787
			P1CBOprAL	1	1 bit	R	12786
			P1Trip	1	1 bit	R	12788
			P1Close	1	1 bit	R	12789
			P1CBOpenFail	1	1 bit	R	12791
			P1CBCloseFail	1	1 bit	R	12790
			P1TCS Alarm	1	1 bit	R	12792
			P2CB Open Sup	1	1 bit	R	12985
			P2CBOprAL	1	1 bit	R	12984

		P2Trip	1	1 bit	R	12986
		P2Close	1	1 bit	R	12987
		P2CBOpenFail	1	1 bit	R	12989
		P2CBCloseFail	1	1 bit	R	12988
		P2TCS Alarm	1	1 bit	R	12990
		P3CB Open Sup	1	1 bit	R	12992
		P3CBOprAL	1	1 bit	R	12991
		P3Trip	1	1 bit	R	12993
		P3Close	1	1 bit	R	12994
		P3CBOpenFail	1	1 bit	R	12996
		P3CBCloseFail	1	1 bit	R	12995
		P3TCS Alarm	1	1 bit	R	12997
		BCU Error	1	1 bit	R	12793
		AR Active	1	1 bit	R	12794
		Reclaim	1	1 bit	R	12795
		Lockout	1	1 bit	R	12796
		CB on by 'AR'	1	1 bit	R	12797
		General P	1	1 bit	R	15001
		General T	1	1 bit	R	15002
		50BF 1 P	1	1 bit	R	15053
		50BF 1 T	1	1 bit	R	15054
		P150BF 1 P	1	1 bit	R	12976
		P150BF 1 T	1	1 bit	R	12977
		P250BF 1 P	1	1 bit	R	12978
		P250BF 1 T	1	1 bit	R	12979
		P350BF 1 P	1	1 bit	R	12980
		P350BF 1 T	1	1 bit	R	12981
		50BF 2 P	1	1 bit	R	15176
		50BF 2 T	1	1 bit	R	15177
		P150BF 2 P	1	1 bit	R	13003
		P150BF 2 T	1	1 bit	R	13004
		P250BF 2 P	1	1 bit	R	13005
		P250BF 2 T	1	1 bit	R	13006
		P350BF 2 P	1	1 bit	R	13007
		P350BF 2 T	1	1 bit	R	13008
		Sync-In	1	1 bit	R	15308
		Sync-Out	1	1 bit	R	15309
		LLDB	1	1 bit	R	15310

		LBDL	1	1 bit	R	15311
		LLLB	1	1 bit	R	15313
		DBDL	1	1 bit	R	15314
		SP1O	1	1 bit	R	15372
		SP2O	1	1 bit	R	15373
		SP3O	1	1 bit	R	15374
		3PO	1	1 bit	R	15375
		Pole Discrepancy	1	1 bit	R	12998
		P1SOTF P	1	1 bit	R	15181
		P1SOTF T	1	1 bit	R	15184
		P2SOTF P	1	1 bit	R	15182
		P2SOTF T	1	1 bit	R	15185
		P3SOTF P	1	1 bit	R	15183
		P3SOTF T	1	1 bit	R	15186
		3PSOTF P	1	1 bit	R	15187
		3PSOTF T	1	1 bit	R	15188
		AI1LW1	1	1 bit	R	12894
		AI1LW2	1	1 bit	R	12895
		AI1HW1	1	1 bit	R	12896
		AI1HW2	1	1 bit	R	12897
		AI2LW1	1	1 bit	R	12898
		AI2LW2	1	1 bit	R	12899
		AI2HW1	1	1 bit	R	12900
		AI2HW2	1	1 bit	R	12901
		AI3LW1	1	1 bit	R	12902
		AI3LW2	1	1 bit	R	12903
		AI3HW1	1	1 bit	R	12904
		AI3HW2	1	1 bit	R	12905
		AI4LW1	1	1 bit	R	12906
		AI4LW2	1	1 bit	R	12907
		AI4HW1	1	1 bit	R	12908
		AI4HW2	1	1 bit	R	12909
		AI5LW1	1	1 bit	R	12910
		AI5LW2	1	1 bit	R	12911
		AI5HW1	1	1 bit	R	12912
		AI5HW2	1	1 bit	R	12913
		AI6LW1	1	1 bit	R	12914
		AI6LW2	1	1 bit	R	12915

		AI6HW1	1	1 bit	R	12916
		AI6HW2	1	1 bit	R	12917
		AI7LW1	1	1 bit	R	12918
		AI7LW2	1	1 bit	R	12919
		AI7HW1	1	1 bit	R	12920
		AI7HW2	1	1 bit	R	12921
		AI8LW1	1	1 bit	R	12922
		AI8LW2	1	1 bit	R	12923
		AI8HW1	1	1 bit	R	12924
		AI8HW2	1	1 bit	R	12925
		IN 1	1	1 bit	R	15601
		IN 2	1	1 bit	R	15602
		IN 3	1	1 bit	R	15603
		IN 4	1	1 bit	R	15604
		IN 5	1	1 bit	R	15605
		IN 6	1	1 bit	R	15606
		IN 7	1	1 bit	R	15607
		IN 8	1	1 bit	R	15608
		IN 9	1	1 bit	R	15609
		IN 10	1	1 bit	R	15610
		IN 11	1	1 bit	R	15611
		IN 12	1	1 bit	R	15612
		IN 13	1	1 bit	R	15613
		IN 14	1	1 bit	R	15614
		IN 15	1	1 bit	R	15615
		IN 16	1	1 bit	R	15616
		IN 17	1	1 bit	R	15617
		IN 18	1	1 bit	R	15618
		IN 19	1	1 bit	R	15619
		IN 20	1	1 bit	R	15620
		IN 21	1	1 bit	R	15621
		IN 22	1	1 bit	R	15622
		IN 23	1	1 bit	R	15623
		IN 24	1	1 bit	R	15624
		IN 25	1	1 bit	R	15625
		IN 26	1	1 bit	R	15626
		IN 27	1	1 bit	R	15627
		IN 28	1	1 bit	R	15628

		IN 29	1	1 bit	R	15629
		IN 30	1	1 bit	R	15630
		IN 31	1	1 bit	R	15631
		IN 32	1	1 bit	R	15632
		IN 33	1	1 bit	R	15633
		IN 34	1	1 bit	R	15634
		IN 35	1	1 bit	R	15635
		IN 36	1	1 bit	R	15636
		IN 37	1	1 bit	R	15637
		IN 38	1	1 bit	R	15638
		IN 39	1	1 bit	R	15639
		IN 40	1	1 bit	R	15640
		IN 41	1	1 bit	R	15641
		IN 42	1	1 bit	R	15642
		IN 43	1	1 bit	R	15643
		IN 44	1	1 bit	R	15644
		IN 45	1	1 bit	R	15645
		IN 46	1	1 bit	R	15646
		IN 47	1	1 bit	R	15647
		IN 48	1	1 bit	R	15648
		IN 49	1	1 bit	R	15649
		IN 50	1	1 bit	R	15650
		IN 51	1	1 bit	R	15651
		IN 52	1	1 bit	R	15652
		IN 53	1	1 bit	R	15653
		IN 54	1	1 bit	R	15654
		IN 55	1	1 bit	R	15655
		IN 56	1	1 bit	R	15656
		L1-G	1	1 bit	R	15701
		L2-G	1	1 bit	R	15702
		L3-G	1	1 bit	R	15703
		L4-G	1	1 bit	R	15704
		L5-G	1	1 bit	R	15705
		L6-G	1	1 bit	R	15706
		L7-G	1	1 bit	R	15707
		L8-G	1	1 bit	R	15708
		L9-G	1	1 bit	R	15709
		L10 G	1	1 bit	R	15710

		L11 G	1	1 bit	R	15711
		L12 G	1	1 bit	R	15712
		L13 G	1	1 bit	R	15713
		L14 G	1	1 bit	R	15714
		L15 G	1	1 bit	R	15715
		L16 G	1	1 bit	R	15716
		L1 R	1	1 bit	R	15751
		L2 R	1	1 bit	R	15752
		L3 R	1	1 bit	R	15753
		L4 R	1	1 bit	R	15754
		L5 R	1	1 bit	R	15755
		L6 R	1	1 bit	R	15756
		L7 R	1	1 bit	R	15757
		L8 R	1	1 bit	R	15758
		L9 R	1	1 bit	R	15759
		L10 R	1	1 bit	R	15760
		L11 R	1	1 bit	R	15761
		L12 R	1	1 bit	R	15762
		L13 R	1	1 bit	R	15763
		L14 R	1	1 bit	R	15764
		L15 R	1	1 bit	R	15765
		L16 R	1	1 bit	R	15766
		n/w O-1	1	1 bit	R	16001
		n/w O-2	1	1 bit	R	16002
		n/w O-3	1	1 bit	R	16003
		n/w O-4	1	1 bit	R	16004
		n/w O-5	1	1 bit	R	16005
		n/w O-6	1	1 bit	R	16006
		n/w O-7	1	1 bit	R	16007
		n/w O-8	1	1 bit	R	16008
		n/w O-9	1	1 bit	R	16009
		n/w O-10	1	1 bit	R	16010
		n/w O-11	1	1 bit	R	16011
		n/w O-12	1	1 bit	R	16012
		n/w O-13	1	1 bit	R	16013
		n/w O-14	1	1 bit	R	16014
		n/w O-15	1	1 bit	R	16015
		n/w O-16	1	1 bit	R	16016

		n/w I-1	1	1 bit	R	15801
		n/w I-2	1	1 bit	R	15802
		n/w I-3	1	1 bit	R	15803
		n/w I-4	1	1 bit	R	15804
		n/w I-5	1	1 bit	R	15805
		n/w I-6	1	1 bit	R	15806
		n/w I-7	1	1 bit	R	15807
		n/w I-8	1	1 bit	R	15808
		n/w I-9	1	1 bit	R	15809
		n/w I-10	1	1 bit	R	15810
		n/w I-11	1	1 bit	R	15811
		n/w I-12	1	1 bit	R	15812
		n/w I-13	1	1 bit	R	15813
		n/w I-14	1	1 bit	R	15814
		n/w I-15	1	1 bit	R	15815
		n/w I-16	1	1 bit	R	15816
		n/w I-17	1	1 bit	R	15817
		n/w I-18	1	1 bit	R	15818
		n/w I-19	1	1 bit	R	15819
		n/w I-20	1	1 bit	R	15820
		n/w I-21	1	1 bit	R	15821
		n/w I-22	1	1 bit	R	15822
		n/w I-23	1	1 bit	R	15823
		n/w I-24	1	1 bit	R	15824
		n/w I-25	1	1 bit	R	15825
		n/w I-26	1	1 bit	R	15826
		n/w I-27	1	1 bit	R	15827
		n/w I-28	1	1 bit	R	15828
		n/w I-29	1	1 bit	R	15829
		n/w I-30	1	1 bit	R	15830
		n/w I-31	1	1 bit	R	15831
		n/w I-32	1	1 bit	R	15832
		n/w I-33	1	1 bit	R	15833
		n/w I-34	1	1 bit	R	15834
		n/w I-35	1	1 bit	R	15835
		n/w I-36	1	1 bit	R	15836
		n/w I-37	1	1 bit	R	15837
		n/w I-38	1	1 bit	R	15838

		n/w I-39	1	1 bit	R	15839
		n/w I-40	1	1 bit	R	15840
		n/w I-41	1	1 bit	R	15841
		n/w I-42	1	1 bit	R	15842
		n/w I-43	1	1 bit	R	15843
		n/w I-44	1	1 bit	R	15844
		n/w I-45	1	1 bit	R	15845
		n/w I-46	1	1 bit	R	15846
		n/w I-47	1	1 bit	R	15847
		n/w I-48	1	1 bit	R	15848
		n/w I-49	1	1 bit	R	15849
		n/w I-50	1	1 bit	R	15850
		n/w I-51	1	1 bit	R	15851
		n/w I-52	1	1 bit	R	15852
		n/w I-53	1	1 bit	R	15853
		n/w I-54	1	1 bit	R	15854
		n/w I-55	1	1 bit	R	15855
		n/w I-56	1	1 bit	R	15856
		n/w I-57	1	1 bit	R	15857
		n/w I-58	1	1 bit	R	15858
		n/w I-59	1	1 bit	R	15859
		n/w I-60	1	1 bit	R	15860
		n/w I-61	1	1 bit	R	15861
		n/w I-62	1	1 bit	R	15862
		n/w I-63	1	1 bit	R	15863
		n/w I-64	1	1 bit	R	15864
		OUT 1	1	1 bit	R	16401
		OUT 2	1	1 bit	R	16402
		OUT 3	1	1 bit	R	16403
		OUT 4	1	1 bit	R	16404
		OUT 5	1	1 bit	R	16405
		OUT 6	1	1 bit	R	16406
		OUT 7	1	1 bit	R	16407
		OUT 8	1	1 bit	R	16408
		OUT 9	1	1 bit	R	16409
		OUT 10	1	1 bit	R	16410
		OUT 11	1	1 bit	R	16411
		OUT 12	1	1 bit	R	16412

		OUT 13	1	1 bit	R	16413
		OUT 14	1	1 bit	R	16414
		OUT 15	1	1 bit	R	16415
		OUT 16	1	1 bit	R	16416
		OUT 17	1	1 bit	R	16417
		OUT 18	1	1 bit	R	16418
		OUT 19	1	1 bit	R	16419
		OUT 20	1	1 bit	R	16420
		OUT 21	1	1 bit	R	16421
		OUT 22	1	1 bit	R	16422
		OUT 23	1	1 bit	R	16423
		OUT 24	1	1 bit	R	16424
		OUT 25	1	1 bit	R	16425
		OUT 26	1	1 bit	R	16426
		OUT 27	1	1 bit	R	16427
		OUT 28	1	1 bit	R	16428
		OUT 29	1	1 bit	R	16429
		OUT 30	1	1 bit	R	16430
		OUT 31	1	1 bit	R	16431
		OUT 32	1	1 bit	R	16432
		VIO-1	1	1 bit	R	16201
		VIO-2	1	1 bit	R	16202
		VIO-3	1	1 bit	R	16203
		VIO-4	1	1 bit	R	16204
		VIO-5	1	1 bit	R	16205
		VIO-6	1	1 bit	R	16206
		VIO-7	1	1 bit	R	16207
		VIO-8	1	1 bit	R	16208
		VIO-9	1	1 bit	R	16209
		VIO-10	1	1 bit	R	16210
		VIO-11	1	1 bit	R	16211
		VIO-12	1	1 bit	R	16212
		VIO-13	1	1 bit	R	16213
		VIO-14	1	1 bit	R	16214
		VIO-15	1	1 bit	R	16215
		VIO-16	1	1 bit	R	16216
		VIO-17	1	1 bit	R	16217
		VIO-18	1	1 bit	R	16218

		VIO-19	1	1 bit	R	16219
		VIO-20	1	1 bit	R	16220
		VIO-21	1	1 bit	R	16221
		VIO-22	1	1 bit	R	16222
		VIO-23	1	1 bit	R	16223
		VIO-24	1	1 bit	R	16224
		VIO-25	1	1 bit	R	16225
		VIO-26	1	1 bit	R	16226
		VIO-27	1	1 bit	R	16227
		VIO-28	1	1 bit	R	16228
		VIO-29	1	1 bit	R	16229
		VIO-30	1	1 bit	R	16230
		VIO-31	1	1 bit	R	16231
		VIO-32	1	1 bit	R	16232
		VIO-33	1	1 bit	R	16233
		VIO-34	1	1 bit	R	16234
		VIO-35	1	1 bit	R	16235
		VIO-36	1	1 bit	R	16236
		VIO-37	1	1 bit	R	16237
		VIO-38	1	1 bit	R	16238
		VIO-39	1	1 bit	R	16239
		VIO-40	1	1 bit	R	16240
		VIO-41	1	1 bit	R	16241
		VIO-42	1	1 bit	R	16242
		VIO-43	1	1 bit	R	16243
		VIO-44	1	1 bit	R	16244
		VIO-45	1	1 bit	R	16245
		VIO-46	1	1 bit	R	16246
		VIO-47	1	1 bit	R	16247
		VIO-48	1	1 bit	R	16248
		EQN-1	1	1 bit	R	16301
		EQN-2	1	1 bit	R	16302
		EQN-3	1	1 bit	R	16303
		EQN-4	1	1 bit	R	16304
		EQN-5	1	1 bit	R	16305
		EQN-6	1	1 bit	R	16306
		EQN-7	1	1 bit	R	16307
		EQN-8	1	1 bit	R	16308

		EQN-9	1	1 bit	R	16309
		EQN-10	1	1 bit	R	16310
		EQN-11	1	1 bit	R	16311
		EQN-12	1	1 bit	R	16312
		EQN-13	1	1 bit	R	16313
		EQN-14	1	1 bit	R	16314
		EQN-15	1	1 bit	R	16315
		EQN-16	1	1 bit	R	16316

Sr. No.	Function Code	05	Register	No. of Regs	Format	Reg. Type	Address Map
3	Outputs						
			LED Reset	1	16 bit	W	03025
			CB Trip	1	16 bit	W	03026
			CB Close	1	16 bit	W	03027
			P1CB Trip	1	16 bit	W	03094
			P1CB Close	1	16 bit	W	03095
			P2CB Trip	1	16 bit	W	03096
			P2CB Close	1	16 bit	W	03097
			P3CB Trip	1	16 bit	W	03098
			P3CB Close	1	16 bit	W	03099
			OUT 1	1	16 bit	W	03028
			OUT 2	1	16 bit	W	03029
			OUT 3	1	16 bit	W	03030
			OUT 4	1	16 bit	W	03031
			OUT 5	1	16 bit	W	03032
			OUT 6	1	16 bit	W	03033
			OUT 7	1	16 bit	W	03034
			OUT 8	1	16 bit	W	03035
			OUT 9	1	16 bit	W	03036
			OUT 10	1	16 bit	W	03037
			OUT 11	1	16 bit	W	03038
			OUT 12	1	16 bit	W	03039
			OUT 13	1	16 bit	W	03040
			OUT 14	1	16 bit	W	03041
			OUT 15	1	16 bit	W	03042
			OUT 16	1	16 bit	W	03043

		OUT 17	1	16 bit	W	03044
		OUT 18	1	16 bit	W	03045
		OUT 19	1	16 bit	W	03046
		OUT 20	1	16 bit	W	03047
		OUT 21	1	16 bit	W	03048
		OUT 22	1	16 bit	W	03049
		OUT 23	1	16 bit	W	03050
		OUT 24	1	16 bit	W	03051
		OUT 25	1	16 bit	W	03052
		OUT 26	1	16 bit	W	03053
		OUT 27	1	16 bit	W	03054
		OUT 28	1	16 bit	W	03055
		OUT 29	1	16 bit	W	03056
		OUT 30	1	16 bit	W	03057
		OUT 31	1	16 bit	W	03058
		OUT 32	1	16 bit	W	03059
		n/w I-1	1	16 bit	W	03101
		n/w I-2	1	16 bit	W	03102
		n/w I-3	1	16 bit	W	03103
		n/w I-4	1	16 bit	W	03104
		n/w I-5	1	16 bit	W	03105
		n/w I-6	1	16 bit	W	03106
		n/w I-7	1	16 bit	W	03107
		n/w I-8	1	16 bit	W	03108
		n/w I-9	1	16 bit	W	03109
		n/w I-10	1	16 bit	W	03110
		n/w I-11	1	16 bit	W	03111
		n/w I-12	1	16 bit	W	03112
		n/w I-13	1	16 bit	W	03113
		n/w I-14	1	16 bit	W	03114
		n/w I-15	1	16 bit	W	03115
		n/w I-16	1	16 bit	W	03116
		n/w I-17	1	16 bit	W	03117
		n/w I-18	1	16 bit	W	03118
		n/w I-19	1	16 bit	W	03119
		n/w I-20	1	16 bit	W	03120
		n/w I-21	1	16 bit	W	03121
		n/w I-22	1	16 bit	W	03122

		n/w I-23	1	16 bit	W	03123
		n/w I-24	1	16 bit	W	03124
		n/w I-25	1	16 bit	W	03125
		n/w I-26	1	16 bit	W	03126
		n/w I-27	1	16 bit	W	03127
		n/w I-28	1	16 bit	W	03128
		n/w I-29	1	16 bit	W	03129
		n/w I-30	1	16 bit	W	03130
		n/w I-31	1	16 bit	W	03131
		n/w I-32	1	16 bit	W	03132
		n/w I-33	1	16 bit	W	03133
		n/w I-34	1	16 bit	W	03134
		n/w I-35	1	16 bit	W	03135
		n/w I-36	1	16 bit	W	03136
		n/w I-37	1	16 bit	W	03137
		n/w I-38	1	16 bit	W	03138
		n/w I-39	1	16 bit	W	03139
		n/w I-40	1	16 bit	W	03140
		n/w I-41	1	16 bit	W	03205
		n/w I-42	1	16 bit	W	03206
		n/w I-43	1	16 bit	W	03207
		n/w I-44	1	16 bit	W	03208
		n/w I-45	1	16 bit	W	03209
		n/w I-46	1	16 bit	W	03210
		n/w I-47	1	16 bit	W	03211
		n/w I-48	1	16 bit	W	03212
		n/w I-49	1	16 bit	W	03113
		n/w I-50	1	16 bit	W	03114
		n/w I-51	1	16 bit	W	03115
		n/w I-52	1	16 bit	W	03116
		n/w I-53	1	16 bit	W	03117
		n/w I-54	1	16 bit	W	03118
		n/w I-55	1	16 bit	W	03119
		n/w I-56	1	16 bit	W	03120
		n/w I-57	1	16 bit	W	03121
		n/w I-58	1	16 bit	W	03122
		n/w I-59	1	16 bit	W	03123
		n/w I-60	1	16 bit	W	03124

		n/w I-61	1	16 bit	W	03125
		n/w I-62	1	16 bit	W	03126
		n/w I-63	1	16 bit	W	03127
		n/w I-64	1	16 bit	W	03128
		VIO-1	1	16 bit	W	03141
		VIO-2	1	16 bit	W	03142
		VIO-3	1	16 bit	W	03143
		VIO-4	1	16 bit	W	03144
		VIO-5	1	16 bit	W	03145
		VIO-6	1	16 bit	W	03146
		VIO-7	1	16 bit	W	03147
		VIO-8	1	16 bit	W	03148
		VIO-9	1	16 bit	W	03149
		VIO-10	1	16 bit	W	03150
		VIO-11	1	16 bit	W	03151
		VIO-12	1	16 bit	W	03152
		VIO-13	1	16 bit	W	03153
		VIO-14	1	16 bit	W	03154
		VIO-15	1	16 bit	W	03155
		VIO-16	1	16 bit	W	03156
		VIO-17	1	16 bit	W	03157
		VIO-18	1	16 bit	W	03158
		VIO-19	1	16 bit	W	03159
		VIO-20	1	16 bit	W	03160
		VIO-21	1	16 bit	W	03161
		VIO-22	1	16 bit	W	03162
		VIO-23	1	16 bit	W	03163
		VIO-24	1	16 bit	W	03164
		VIO-25	1	16 bit	W	03165
		VIO-26	1	16 bit	W	03166
		VIO-27	1	16 bit	W	03167
		VIO-28	1	16 bit	W	03168
		VIO-29	1	16 bit	W	03169
		VIO-30	1	16 bit	W	03170
		VIO-31	1	16 bit	W	03171
		VIO-32	1	16 bit	W	03172
		VIO-33	1	16 bit	W	03173
		VIO-34	1	16 bit	W	03174

		VIO-35	1	16 bit	W	03175
		VIO-36	1	16 bit	W	03176
		VIO-37	1	16 bit	W	03177
		VIO-38	1	16 bit	W	03178
		VIO-39	1	16 bit	W	03179
		VIO-40	1	16 bit	W	03180
		VIO-41	1	16 bit	W	03181
		VIO-42	1	16 bit	W	03182
		VIO-43	1	16 bit	W	03183
		VIO-44	1	16 bit	W	03184
		VIO-45	1	16 bit	W	03185
		VIO-46	1	16 bit	W	03186
		VIO-47	1	16 bit	W	03187
		VIO-48	1	16 bit	W	03188

Sr. No.	Function Code	03	Register	No. of Regs	Format	Reg. Type	Address Map
6	Parameters						
			IA MAG	2	32 bit Float	R	33281 - 33282
			IB MAG	2	32 bit Float	R	33283 - 33284
			IC MAG	2	32 bit Float	R	33285 - 33286
			VAN MAG	2	32 bit Float	R	33681 - 33682
			VBN MAG	2	32 bit Float	R	33683 - 33684
			VCN MAG	2	32 bit Float	R	33685 - 33686
			VAB MAG	2	32 bit Float	R	33689 - 33690
			VBC MAG	2	32 bit Float	R	33691 - 33692
			VCA MAG	2	32 bit Float	R	33693 - 33694
			PFA	2	32 bit Float	R	33905 - 33906
			PFB	2	32 bit Float	R	33907 - 33908
			PFC	2	32 bit Float	R	33909 - 33910
			3PF	2	32 bit Float	R	33911 - 33912
			FREQ	2	32 bit Float	R	33743 - 33744
			Sync FREQ	2	32 bit Float	R	33753 - 33754
			IN MAG	2	32 bit Float	R	33287 - 33288
			VSync MAG	2	32 bit Float	R	34035 - 34036
			TH STATE	2	32 bit Float	R	33491 - 33492
			Max 3S	2	32 bit Float	R	34037 - 34038

		Avg 3P	2	32 bit Float	R	34039 - 34040
		Avg 3Q	2	32 bit Float	R	34041 - 34042
		Avg 3S	2	32 bit Float	R	34043 - 34044
		PA	2	32 bit Float	R	34045 - 34046
		PB	2	32 bit Float	R	34047 - 34048
		PC	2	32 bit Float	R	34049 - 34050
		3P	2	32 bit Float	R	34051 - 34052
		QA	2	32 bit Float	R	34053 - 34054
		QB	2	32 bit Float	R	34055 - 34056
		QC	2	32 bit Float	R	34057 - 34058
		3Q	2	32 bit Float	R	34059 - 34060
		SA	2	32 bit Float	R	34061 - 34062
		SB	2	32 bit Float	R	34063 - 34064
		SC	2	32 bit Float	R	34065 - 34066
		3S	2	32 bit Float	R	34067 - 34068
		Dem Power	2	32 bit Float	R	34069 - 34070
		Kwh+	2	32 bit Float	R	33913 - 33914
		Kvrh+	2	32 bit Float	R	33915 - 33916
		Kwh-	2	32 bit Float	R	33917 - 33918
		Kvrh-	2	32 bit Float	R	33919 - 33920
		TC	2	Integer	R	33517 - 33518
		BOC	2	Integer	R	33519 - 33520
		BOT	2	32 bit Float	R	33521 - 33522

7.3 IEC60-870-5-103

The specification IEC 60870-5-103 (Telecontrol Equipment and Systems Part 5 Section 103: Transmission Protocols), defines the use of standards IEC 60870-5-1 to IEC 60870-5-5, which were designed for communication with protection equipment.

This section describes how the IEC 60870-5-103 standard is applied to the BCU-ADR245B. It is not a description of the standard itself. The level at which this section is written assumes that the reader is already familiar with the IEC 60870-5-103 standard.

This section should provide sufficient detail to enable understanding of the standard at a level required by most users.

The IEC 60870-5-103 interface is a master/slave interface with the device as the slave device. The device conforms to compatibility level 2, as defined in the IEC 60870-5-103.standard.

The following IEC 60870-5-103 facilities are supported by this interface:

- Initialization (reset)
- Time synchronisation
- Event record extraction
- General interrogation
- Cyclic measurements
- General commands
- Disturbance record extraction

7.3.1 Physical Connection and Link Layer

For connecting on IEC 60870-5-103 there are two options:

- Front USB Port.
- Rear serial port 1 - for permanent SCADA connection via RS 485.

The IED address and baud rate can be selected using the front panel menu or with RTV2 Configurator.

7.3.2 Initialisation

Whenever the device has been powered up, or if the communication parameters have been changed, a reset command is required to initialize the communications. The device will respond to either of the two reset commands; Reset CU or Reset FCB (Communication Unit or Frame Count Bit). The difference between the two commands is that the Reset CU command will clear any unsent messages in the transmit buffer, whereas the Reset FCB command does not delete any messages. The device 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 BCU will also produce a power up event, when the BCU is powered up.

7.3.3 Time Synchronisation

The time and date can be set using the time synchronisation feature of the IEC 60870-5-103 protocol. The device will correct the transmission delay depending on communication speed. For this, transmission time, required for the time synchronization frame from the Master to IED, considering current baud rate is added in the received time.

The device will correct the transmission delay depending on baud rate. If the time synchronisation message is sent as a send/confirm message then the device will respond with a confirm message. A time synchronisation Class 1 event will be generated/produced whether the time-synchronisation message is sent as a send confirm or a broadcast (send/no reply) message.

7.3.4 Spontaneous Events

Events are categorized using the following information:

- **Function type**
- **Information Number**

The IEC 60870-5-103 profile in the Menu Database contains a complete listing of all events produced by the device.

7.3.5 General Interrogation (GI)

The GI request can be used to read the status of the device, the function numbers, and information numbers that will be returned during the GI cycle. These are shown in the IEC 60870-5-103 profile in the Menu Database.

7.3.6 Cyclic Measurements

The device will produce measured values using ASDU 3, ASDU 9 & ASDU243. ASDU3 is reported with information number 147, ASDU9 is reported with information number 148 and ASDU243 is reported with function type 127 and information number 0. These three frames are reported alternately. This can be read from the device using a Class 2 poll. For every query the current online data is reported.

The device transmits its current measurands at 2.4 times the rated value and 1.2 times for voltage of the analogue value.

7.3.7 Commands

A list of the supported commands is contained in the section 7.3.9 Protocol Mapping (Sr. No.9). The device will respond to valid Control Command with ASDU1 and a cause of transmission indicating ‘Positive (COT-20) / Negative (COT-21) acknowledgement’. The device will respond to commands with invalid FUN/ INF combination with an ASDU 1, with a cause of transmission indicating ‘negative acknowledgement’.

7.3.8 Disturbance Records

The disturbance records are stored in uncompressed format and can be extracted using the standard mechanisms described in IEC 60870-5-103.This BCU supports up-to 10 records.

7.3.9 Protocol Mapping:

Sr. No.	INF	Description	GI	TYP	COT	FUN
1	Semantics of INFORMATION NUMBER : System Functions in monitor direction					
	0	End of general interrogation	-	8	10	255
	0	Time synchronization	-	6	8	255
	2	Reset FCB	-	5	3	160
	3	Reset CU	-	5	4	160
	4	Start/Restart	-	5	5	160
	5	Power on	-	5	6	160

Note: **X** under **GI heading** means DI Status is included in General Interrogation response.

Sr. No.	INF	Description	GI	TYP	COT	FUN
2	Semantics of INFORMATION NUMBER : Status Indications in monitor direction					
	22	Local Para	-	1	11,12	160
	18	PROT Active	X	2	9,11	160
	134	Password Rst	X	1	1,7	124
	223	Trip LED	X	1	1,7,9, 20,21	124
	36	TCS Alarm	X	1	1,7,9	160
	1	CBOpnSp	X	1	1,7	124
	135	CBOprAL	X	1	1,7,9	124
	123	CB Open	X	1	1,7,9,11,12	127
	125	CB Close	X	1	1,7,9,11,12	127
	156	CB Open Fail	X	1	1,7,9	124
	157	CB Close Fail	X	1	1,7,9	124
	214	P1TCS Alm	X	1	1,7,9	131
	217	P1CBOpnSp	X	1	1,7	131
	211	P1CBOprAL	X	1	1,7,9	131
	220	P1CB Open	X	1	1,7,9,11,12	131
	223	P1CB Close	X	1	1,7,9,11,12	131
	226	P1CB Open Fail	X	1	1,7,9	131
	229	P1CB Close Fail	X	1	1,7,9	131
	215	P2TCS Alm	X	1	1,7,9	131
	218	P2CBOpnSp	X	1	1,7	131
	212	P2CBOprAL	X	1	1,7,9	131
	221	P2CB Open	X	1	1,7,9,11,12	131
	224	P2CB Close	X	1	1,7,9,11,12	131
	227	P2CB Open Fail	X	1	1,7,9	131

230	P2CB Close Fail	X	1	1,7,9	131
216	P3TCS Alm	X	1	1,7,9	131
219	P3CBOpnSp	X	1	1,7	131
213	P3CBOprAL	X	1	1,7,9	131
22	P3CB Open	X	1	1,7,9,11,12	131
225	P3CB Close	X	1	1,7,9,11,12	131
228	P3CB Open Fail	X	1	1,7,9	131
231	P3CB Close Fail	X	1	1,7,9	131
27	IN 1	X	1	1,7,9	160
28	IN 2	X	1	1,7,9	160
29	IN 3	X	1	1,7,9	160
30	IN 4	X	1	1,7,9	160
31	IN 5	X	1	1,7,9	127
32	IN 6	X	1	1,7,9	127
33	IN 7	X	1	1,7,9	127
34	IN 8	X	1	1,7,9	127
35	IN 9	X	1	1,7,9	127
36	IN 10	X	1	1,7,9	127
37	IN 11	X	1	1,7,9	127
38	IN 12	X	1	1,7,9	127
39	IN 13	X	1	1,7,9	127
40	IN 14	X	1	1,7,9	127
41	IN 15	X	1	1,7,9	127
42	IN 16	X	1	1,7,9	127
43	IN 17	X	1	1,7,9	127
44	IN 18	X	1	1,7,9	127
45	IN 19	X	1	1,7,9	127
46	IN 20	X	1	1,7,9	127
47	IN 21	X	1	1,7,9	127
48	IN 22	X	1	1,7,9	127
49	IN 23	X	1	1,7,9	127
50	IN 24	X	1	1,7,9	127
51	IN 25	X	1	1,7,9	127
52	IN 26	X	1	1,7,9	127
53	IN 27	X	1	1,7,9	127
54	IN 28	X	1	1,7,9	127
55	IN 29	X	1	1,7,9	127
56	IN 30	X	1	1,7,9	127

57	IN 31	X	1	1,7,9	127
58	IN 32	X	1	1,7,9	127
59	IN 33	X	1	1,7,9	127
60	IN 34	X	1	1,7,9	127
61	IN 35	X	1	1,7,9	127
62	IN 36	X	1	1,7,9	127
63	IN 37	X	1	1,7,9	127
64	IN 38	X	1	1,7,9	127
65	IN 39	X	1	1,7,9	127
66	IN 40	X	1	1,7,9	127
73	IN 41	X	1	1,7,9	127
74	IN 42	X	1	1,7,9	127
75	IN 43	X	1	1,7,9	127
76	IN 44	X	1	1,7,9	127
77	IN 45	X	1	1,7,9	127
78	IN 46	X	1	1,7,9	127
79	IN 47	X	1	1,7,9	127
80	IN 48	X	1	1,7,9	127
81	IN 49	X	1	1,7,9	127
82	IN 50	X	1	1,7,9	127
86	IN 51	X	1	1,7,9	127
87	IN 52	X	1	1,7,9	127
88	IN 53	X	1	1,7,9	127
89	IN 54	X	1	1,7,9	127
90	IN 55	X	1	1,7,9	127
91	IN 56	X	1	1,7,9	127
201	L1-G	X	1	1,7,9	127
202	L2-G	X	1	1,7,9	127
203	L3-G	X	1	1,7,9	127
204	L4-G	X	1	1,7,9	127
205	L5-G	X	1	1,7,9	127
206	L6-G	X	1	1,7,9	127
207	L7-G	X	1	1,7,9	127
208	L8-G	X	1	1,7,9	127
209	L9-G	X	1	1,7,9	127
210	L10-G	X	1	1,7,9	127
211	L11-G	X	1	1,7,9	127
212	L12-G	X	1	1,7,9	127

	213	L13-G	X	1	1,7,9	127
	214	L14-G	X	1	1,7,9	127
	215	L15-G	X	1	1,7,9	127
	216	L16-G	X	1	1,7,9	127
	217	L1-R	X	1	1,7,9	127
	218	L2-R	X	1	1,7,9	127
	219	L3-R	X	1	1,7,9	127
	220	L4-R	X	1	1,7,9	127
	221	L5-R	X	1	1,7,9	127
	222	L6-R	X	1	1,7,9	127
	223	L7-R	X	1	1,7,9	127
	224	L8-R	X	1	1,7,9	127
	225	L9-R	X	1	1,7,9	127
	226	L10-R	X	1	1,7,9	127
	227	L11-R	X	1	1,7,9	127
	228	L12-R	X	1	1,7,9	127
	229	L13-R	X	1	1,7,9	127
	230	L14-R	X	1	1,7,9	127
	231	L15-R	X	1	1,7,9	127
	232	L16-R	X	1	1,7,9	127
	92	OUT 1	X	1	1,7,9,11,12,20,21	127
	93	OUT 2	X	1	1,7,9,11,12,20,21	127
	94	OUT 3	X	1	1,7,9,11,12,20,21	127
	95	OUT 4	X	1	1,7,9,11,12,20,21	127
	96	OUT 5	X	1	1,7,9,11,12,20,21	127
	97	OUT 6	X	1	1,7,9,11,12,20,21	127
	98	OUT 7	X	1	1,7,9,11,12,20,21	127
	99	OUT 8	X	1	1,7,9,11,12,20,21	127
	100	OUT 9	X	1	1,7,9,11,12,20,21	127
	101	OUT 10	X	1	1,7,9,11,12,20,21	127
	102	OUT 11	X	1	1,7,9,11,12,20,21	127
	103	OUT 12	X	1	1,7,9,11,12,20,21	127
	104	OUT 13	X	1	1,7,9,11,12,20,21	127
	105	OUT 14	X	1	1,7,9,11,12,20,21	127
	106	OUT 15	X	1	1,7,9,11,12,20,21	127
	107	OUT 16	X	1	1,7,9,11,12,20,21	127
	108	OUT 17	X	1	1,7,9,11,12,20,21	127
	109	OUT 18	X	1	1,7,9,11,12,20,21	127

	110	OUT 19	X	1	1,7,9,11,12,20,21	127
	111	OUT 20	X	1	1,7,9,11,12,20,21	127
	112	OUT 21	X	1	1,7,9,11,12,20,21	127
	113	OUT 22	X	1	1,7,9,11,12,20,21	127
	114	OUT 23	X	1	1,7,9,11,12,20,21	127
	115	OUT 24	X	1	1,7,9,11,12,20,21	127
	116	OUT 25	X	1	1,7,9,11,12,20,21	127
	117	OUT 26	X	1	1,7,9,11,12,20,21	127
	118	OUT 27	X	1	1,7,9,11,12,20,21	127
	119	OUT 28	X	1	1,7,9,11,12,20,21	127
	120	OUT 29	X	1	1,7,9,11,12,20,21	127
	121	OUT 30	X	1	1,7,9,11,12,20,21	127
	122	OUT 31	X	1	1,7,9,11,12,20,21	127
	126	OUT 32	X	1	1,7,9,11,12,20,21	127
	123	VIO-1	X	1	1,7,9	121
	124	VIO-2	X	1	1,7,9	121
	125	VIO-3	X	1	1,7,9	121
	126	VIO-4	X	1	1,7,9	121
	127	VIO-5	X	1	1,7,9	121
	128	VIO-6	X	1	1,7,9	121
	129	VIO-7	X	1	1,7,9	121
	130	VIO-8	X	1	1,7,9	121
	131	VIO-9	X	1	1,7,9	121
	132	VIO-10	X	1	1,7,9	121
	133	VIO-11	X	1	1,7,9	121
	134	VIO-12	X	1	1,7,9	121
	135	VIO-13	X	1	1,7,9	121
	136	VIO-14	X	1	1,7,9	121
	137	VIO-15	X	1	1,7,9	121
	138	VIO-16	X	1	1,7,9	121
	171	VIO-17	X	1	1,7,9	121
	172	VIO-18	X	1	1,7,9	121
	173	VIO-19	X	1	1,7,9	121
	174	VIO-20	X	1	1,7,9	121
	175	VIO-21	X	1	1,7,9	121
	176	VIO-22	X	1	1,7,9	121
	177	VIO-23	X	1	1,7,9	121
	178	VIO-24	X	1	1,7,9	121

	179	VIO-25	X	1	1,7,9	121
	180	VIO-26	X	1	1,7,9	121
	181	VIO-27	X	1	1,7,9	121
	182	VIO-28	X	1	1,7,9	121
	183	VIO-29	X	1	1,7,9	121
	184	VIO-30	X	1	1,7,9	121
	185	VIO-31	X	1	1,7,9	121
	186	VIO-32	X	1	1,7,9	121
	187	VIO-33	X	1	1,7,9	121
	188	VIO-34	X	1	1,7,9	121
	189	VIO-35	X	1	1,7,9	121
	190	VIO-36	X	1	1,7,9	121
	191	VIO-37	X	1	1,7,9	121
	192	VIO-38	X	1	1,7,9	121
	193	VIO-39	X	1	1,7,9	121
	194	VIO-40	X	1	1,7,9	121
	195	VIO-41	X	1	1,7,9	121
	196	VIO-42	X	1	1,7,9	121
	197	VIO-43	X	1	1,7,9	121
	198	VIO-44	X	1	1,7,9	121
	199	VIO-45	X	1	1,7,9	121
	200	VIO-46	X	1	1,7,9	121
	201	VIO-47	X	1	1,7,9	121
	202	VIO-48	X	1	1,7,9	121
	139	n/w O-1	X	1	1,7,9	121
	140	n/w O-2	X	1	1,7,9	121
	141	n/w O-3	X	1	1,7,9	121
	142	n/w O-4	X	1	1,7,9	121
	143	n/w O-5	X	1	1,7,9	121
	144	n/w O-6	X	1	1,7,9	121
	145	n/w O-7	X	1	1,7,9	121
	146	n/w O-8	X	1	1,7,9	121
	147	n/w O-9	X	1	1,7,9	121
	148	n/w O-10	X	1	1,7,9	121
	149	n/w O-11	X	1	1,7,9	121
	150	n/w O-12	X	1	1,7,9	121
	151	n/w O-13	X	1	1,7,9	121
	152	n/w O-14	X	1	1,7,9	121

	153	n/w O-15	X	1	1,7,9	121
	154	n/w O-16	X	1	1,7,9	121
	155	n/w I-1	X	1	1,7,9	121
	156	n/w I-2	X	1	1,7,9	121
	157	n/w I-3	X	1	1,7,9	121
	158	n/w I-4	X	1	1,7,9	121
	159	n/w I-5	X	1	1,7,9	121
	160	n/w I-6	X	1	1,7,9	121
	161	n/w I-7	X	1	1,7,9	121
	162	n/w I-8	X	1	1,7,9	121
	163	n/w I-9	X	1	1,7,9	121
	164	n/w I-10	X	1	1,7,9	121
	165	n/w I-11	X	1	1,7,9	121
	166	n/w I-12	X	1	1,7,9	121
	167	n/w I-13	X	1	1,7,9	121
	168	n/w I-14	X	1	1,7,9	121
	169	n/w I-15	X	1	1,7,9	121
	170	n/w I-16	X	1	1,7,9	121
	161	n/w I-17	X	1	1,7,9	131
	162	n/w I-18	X	1	1,7,9	131
	163	n/w I-19	X	1	1,7,9	131
	164	n/w I-20	X	1	1,7,9	131
	165	n/w I-21	X	1	1,7,9	131
	166	n/w I-22	X	1	1,7,9	131
	167	n/w I-23	X	1	1,7,9	131
	168	n/w I-24	X	1	1,7,9	131
	169	n/w I-25	X	1	1,7,9	131
	170	n/w I-26	X	1	1,7,9	131
	171	n/w I-27	X	1	1,7,9	131
	172	n/w I-28	X	1	1,7,9	131
	173	n/w I-29	X	1	1,7,9	131
	174	n/w I-30	X	1	1,7,9	131
	175	n/w I-31	X	1	1,7,9	131
	176	n/w I-32	X	1	1,7,9	131
	177	n/w I-33	X	1	1,7,9	131
	178	n/w I-34	X	1	1,7,9	131
	179	n/w I-35	X	1	1,7,9	131
	180	n/w I-36	X	1	1,7,9	131

	181	n/w I-37	X	1	1,7,9	131
	182	n/w I-38	X	1	1,7,9	131
	183	n/w I-39	X	1	1,7,9	131
	184	n/w I-40	X	1	1,7,9	131
	185	n/w I-41	X	1	1,7,9	131
	186	n/w I-42	X	1	1,7,9	131
	187	n/w I-43	X	1	1,7,9	131
	188	n/w I-44	X	1	1,7,9	131
	189	n/w I-45	X	1	1,7,9	131
	190	n/w I-46	X	1	1,7,9	131
	191	n/w I-47	X	1	1,7,9	131
	192	n/w I-48	X	1	1,7,9	131
	193	n/w I-49	X	1	1,7,9	131
	194	n/w I-50	X	1	1,7,9	131
	195	n/w I-51	X	1	1,7,9	131
	196	n/w I-52	X	1	1,7,9	131
	197	n/w I-53	X	1	1,7,9	131
	198	n/w I-54	X	1	1,7,9	131
	199	n/w I-55	X	1	1,7,9	131
	200	n/w I-56	X	1	1,7,9	131
	201	n/w I-57	X	1	1,7,9	131
	202	n/w I-58	X	1	1,7,9	131
	203	n/w I-59	X	1	1,7,9	131
	204	n/w I-60	X	1	1,7,9	131
	205	n/w I-61	X	1	1,7,9	131
	206	n/w I-62	X	1	1,7,9	131
	207	n/w I-63	X	1	1,7,9	131
	208	n/w I-64	X	1	1,7,9	131
	219	EQN-1	X	1	1,7,9	121
	220	EQN-2	X	1	1,7,9	121
	221	EQN-3	X	1	1,7,9	121
	222	EQN-4	X	1	1,7,9	121
	223	EQN-5	X	1	1,7,9	121
	224	EQN-6	X	1	1,7,9	121
	225	EQN-7	X	1	1,7,9	121
	226	EQN-8	X	1	1,7,9	121
	227	EQN-9	X	1	1,7,9	121
	228	EQN-10	X	1	1,7,9	121

	229	EQN-11	X	1	1,7,9	121
	230	EQN-12	X	1	1,7,9	121
	231	EQN-13	X	1	1,7,9	121
	232	EQN-14	X	1	1,7,9	121
	233	EQN-15	X	1	1,7,9	121
	234	EQN-16	X	1	1,7,9	121
	11	DPI Input 1	X	1	1,7,9	132
	12	DPI Input 2	X	1	1,7,9	132
	13	DPI Input 3	X	1	1,7,9	132
	14	DPI Input 4	X	1	1,7,9	132
	15	DPI Input 5	X	1	1,7,9	132
	16	DPI Input 6	X	1	1,7,9	132
	17	DPI Input 7	X	1	1,7,9	132
	18	DPI Input 8	X	1	1,7,9	132
	19	DPI Input 9	X	1	1,7,9	132
	20	DPI Input 10	X	1	1,7,9	132
	21	DPI Input 11	X	1	1,7,9	132
	22	DPI Input 12	X	1	1,7,9	132
	23	DPI Input 13	X	1	1,7,9	132
	24	DPI Input 14	X	1	1,7,9	132
	25	DPI Input 15	X	1	1,7,9	132
	26	DPI Input 16	X	1	1,7,9	132
	27	DPI Input 17	X	1	1,7,9	132
	28	DPI Input 18	X	1	1,7,9	132
	29	DPI Input 19	X	1	1,7,9	132
	30	DPI Input 20	X	1	1,7,9	132
	31	DPI Input 21	X	1	1,7,9	132
	32	DPI Input 22	X	1	1,7,9	132
	33	DPI Input 23	X	1	1,7,9	132
	34	DPI Input 24	X	1	1,7,9	132
	35	DPI Input 25	X	1	1,7,9	132
	36	DPI Input 26	X	1	1,7,9	132
	37	DPI Input 27	X	1	1,7,9	132
	38	DPI Input 28	X	1	1,7,9	132

Sr. No.	INF	Description	GI	TYP	COT	FUN
3	Semantics of INFORMATION NUMBER : Fault indications in monitor direction					
	84	General P	X	2	1,7,9	160
	64	L1 P	X	2	1,7,9	160
	65	L2 P	X	2	1,7,9	160
	66	L3 P	X	2	1,7,9	160
	26	50BF1 P	X	2	1,7,9	124
	92	P1BF1 P	X	2	1,7,9	131
	94	P2BF1 P	X	2	1,7,9	131
	96	P3BF1 P	X	2	1,7,9	131
	27	50BF2 P	X	2	1,7,9	124
	132	P1BF2 P	X	2	1,7,9	131
	134	P2BF2 P	X	2	1,7,9	131
	136	P3BF2 P	X	2	1,7,9	131
	39	VL1 P	X	2	1,7,9	121
	40	VL2 P	X	2	1,7,9	121
	41	VL3 P	X	2	1,7,9	121
	154	I> BbyBF	X	2	1,7,9	124
	155	3I0> BbyBF	X	2	1,7,9	124
	69	P1SOTF P	X	2	1,7,9	131
	70	P2SOTF P	X	2	1,7,9	131
	71	P3SOTF P	X	2	1,7,9	131
	75	SOTF P	X	2	1,7,9	131
	81	P1ASOTF P	X	2	1,7,9	131
	82	P2ASOTF P	X	2	1,7,9	131
	83	P3ASOTF P	X	2	1,7,9	131
	89	P1DLD	X	2	1,7,9	131
	90	P2DLD	X	2	1,7,9	131
	91	P3DLD	X	2	1,7,9	131
	47	ARR Trig	X	2	1,7,9	131
	35	Reclaim	X	2	1,7,9	131
	45	Lockout	X	2	1,7,9	131
	1	Reclaim(1P)	X	2	1,7,9	131
	37	DT1	X	2	1,7,9	131
	38	DT2	X	2	1,7,9	131
	39	DT3	X	2	1,7,9	131
	40	DT4	X	2	1,7,9	131
	41	SHOT1	X	2	1,7,9	131

	42	SHOT2	X	2	1,7,9	131
	43	SHOT3	X	2	1,7,9	131
	44	SHOT4	X	2	1,7,9	131
	5	P1 DT1	X	2	1,7,9	131
	6	P2 DT1	X	2	1,7,9	131
	7	P3 DT1	X	2	1,7,9	131
	8	P1 DT2	X	2	1,7,9	131
	9	P2 DT2	X	2	1,7,9	131
	10	P3 DT2	X	2	1,7,9	131
	11	P1 DT3	X	2	1,7,9	131
	12	P2 DT3	X	2	1,7,9	131
	13	P2 DT3	X	2	1,7,9	131
	14	P1 DT4	X	2	1,7,9	131
	15	P2 DT4	X	2	1,7,9	131
	16	P3 DT4	X	2	1,7,9	131
	17	P1 SHOT1	X	2	1,7,9	131
	18	P2 SHOT1	X	2	1,7,9	131
	19	P3 SHOT1	X	2	1,7,9	131
	20	P1 SHOT2	X	2	1,7,9	131
	21	P2 SHOT2	X	2	1,7,9	131
	22	P3 SHOT2	X	2	1,7,9	131
	23	P1 SHOT3	X	2	1,7,9	131
	24	P2 SHOT3	X	2	1,7,9	131
	25	P2 SHOT3	X	2	1,7,9	131
	26	P1 SHOT4	X	2	1,7,9	131
	27	P2 SHOT4	X	2	1,7,9	131
	28	P3 SHOT4	X	2	1,7,9	131
	29	P1 Lockout	X	2	1,7,9	131
	30	P2 Lockout	X	2	1,7,9	131
	31	P3 Lockout	X	2	1,7,9	131
	65	P1AR Trig	X	2	1,7,9	131
	66	P2AR Trig	X	2	1,7,9	131
	67	P3AR Trig	X	2	1,7,9	131
	2	P1 CB monitor	X	2	1,7,9	131
	3	P2 CB monitor	X	2	1,7,9	131
	4	P3 CB monitor	X	2	1,7,9	131
	36	CB monitor	X	2	1,7,9	131
	68	General T	-	2	1,7	160

	69	L1 T	-	2	1,7	160
	70	L2 T	-	2	1,7	160
	71	L3 T	-	2	1,7	160
	42	VL1 T	-	2	1,7	121
	43	VL2 T	-	2	1,7	121
	44	VL3 T	-	2	1,7	121
	85	50BF1 T	-	2	1,7	160
	93	P1BF1 T	-	2	1,7	131
	95	P2BF1 T	-	2	1,7	131
	97	P3BF1 T	-	2	1,7	131
	94	50BF2 T	-	2	1,7	160
	133	P1BF2 T	-	2	1,7	131
	135	P2BF2 T	-	2	1,7	131
	137	P3BF2 T	-	2	1,7	131
	111	Sync-In	X	2	1,7,9	126
	112	Sync-Out	X	2	1,7,9	126
	109	LLDB	X	2	1,7,9	126
	110	LBDL	X	2	1,7,9	126
	163	LLLB	X	2	1,7,9	126
	164	DBDL	X	2	1,7,9	126
	63	No Voltage	X	2	1,7,9	120
	72	P1SOTF T	-	2	1,7,9	131
	73	P2SOTF T	-	2	1,7,9	131
	74	P3SOTF T	-	2	1,7,9	131
	76	SOTF T	-	2	1,7,9	131
	84	P1ASOTF T	-	2	1,7,9	131
	85	P2ASOTF T	-	2	1,7,9	131
	86	P3ASOTF T	-	2	1,7,9	131
	122	VDOC>1 T	-	2	1,7,9	121
	49	SP1O	X	2	1,7,9	131
	50	SP2O	X	2	1,7,9	131
	51	SP3O	X	2	1,7,9	131
	52	3PO	X	2	1,7,9	131
	57	27P1O	X	2	1,7,9	131
	58	27P2O	X	2	1,7,9	131
	59	27P3O	X	2	1,7,9	131
	60	37P1O	X	2	1,7,9	131
	61	37P2O	X	2	1,7,9	131

	62	37P3O	X	2	1,7,9	131
	63	Pole Discrepancy	X	2	1,7,9	131
	101	AI1LW1	X	2	1,7,9	120
	102	AI1LW2	X	2	1,7,9	120
	103	AI1HW1	X	2	1,7,9	120
	104	AI1HW2	X	2	1,7,9	120
	105	AI2LW1	X	2	1,7,9	120
	106	AI2LW2	X	2	1,7,9	120
	107	AI2HW1	X	2	1,7,9	120
	108	AI2HW2	X	2	1,7,9	120
	109	AI3LW1	X	2	1,7,9	120
	110	AI3LW2	X	2	1,7,9	120
	111	AI3HW1	X	2	1,7,9	120
	112	AI3HW2	X	2	1,7,9	120
	113	AI4LW1	X	2	1,7,9	120
	114	AI4LW2	X	2	1,7,9	120
	115	AI4HW1	X	2	1,7,9	120
	116	AI4HW2	X	2	1,7,9	120
	117	AI5LW1	X	2	1,7,9	120
	118	AI5LW2	X	2	1,7,9	120
	119	AI5HW1	X	2	1,7,9	120
	120	AI5HW2	X	2	1,7,9	120
	121	AI6LW1	X	2	1,7,9	120
	122	AI6LW2	X	2	1,7,9	120
	123	AI6HW1	X	2	1,7,9	120
	124	AI6HW2	X	2	1,7,9	120
	125	AI7LW1	X	2	1,7,9	120
	126	AI7LW2	X	2	1,7,9	120
	127	AI7HW1	X	2	1,7,9	120
	128	AI7HW2	X	2	1,7,9	120
	129	AI8LW1	X	2	1,7,9	120
	130	AI8LW2	X	2	1,7,9	120
	131	AI8HW1	X	2	1,7,9	120
	132	AI8HW2	X	2	1,7,9	120

Sr. No.	INF	Description	GI	TYP	COT	FUN	Unit
4	Semantics of INFORMATION NUMBER : Fault Parameters in monitor direction						
	1	Fault Duration (sec)	-	4	1	122	Sec
	2	IaMAG	-	4	1	122	A
	3	IbMAG	-	4	1	122	A
	4	IcMAG	-	4	1	122	A
	5	InMAG	-	4	1	122	A
	15	VanMAG	-	4	1	122	V
	16	VbnMAG	-	4	1	122	V
	17	VcnMAG	-	4	1	122	V
	18	VnMAG	-	4	1	122	V

Sr. No.	INF	Description	GI	TYP	COT	FUN
5	Semantics of INFORMATION NUMBER : Measurands in monitor direction					
	148	Measurands IL1,2,3, VL1,2,3, P, Q, f	-	9	2,7	160
	147	Measurands IN, VEN	-	3	2,7	160
	0	IA MAG,IB MAG,IC MAG,IN MAG, Ia MAG, Ia ANG, Ib MAG, Ib ANG, Ic MAG, Ic ANG, In MAG, In ANG, I1 MAG,I1 ANG, I2 MAG,I2 ANG, I0 MAG, I0 ANG, I0/I1, I2/I1, Ia RMS, Ib RMS, Ic RMS, VAN MAG,VBN MAG, VCN MAG,VAB MAG, VBC MAG,VCA MAG, Van MAG,Van ANG, Vbn MAG,Vbn ANG, Vcn MAG,Vcn ANG, Vab MAG,Vab ANG Vbc MAG,Vbc ANG, Vca MAG,Vca ANG, V1 MAG,V1 ANG, V2 MAG,V2 ANG, V0 MAG,V0 ANG, Va RMS,Vb RMS, Vc RMS,PA,PB, PC,3P,QA,QB,QC,3Q,SA, SB,SC,3S,PFA,PFB,PFC, 3PF,kwh+,kwh-,kvrh+,kvrh-, Za MAG, Za ANG, Ra MAG, Xa MAG, Zb MAG, Zb ANG, Rb MAG, Xb MAG, Zc MAG, Zc ANG, Rc MAG, Xc MAG,	-	243	2,7	127

		Zab MAG, Zab ANG, Rab MAG, Xab MAG, Zbc MAG, Zbc ANG, Rbc MAG, Xbc MAG, Zca MAG, Zca ANG, Rca MAG, Xca MAG, Z1 MAG, Z1 ANG, R1 MAG, X1 MAG, Z2 MAG, Z2 ANG, R2 MAG, X2 MAG, Z0 MAG, Z0 ANG				

Sr. No.	INF	Description	GI	TYP	COT	FUN
6	Semantics of INFORMATION NUMBER: Fault list in monitor direction					
	0	List of Recorded DR	-	23	31	160

Sr. No.	INF	Description
7		Semantics of Actual Channel : Used for DR Transmission
	ACC	Description
	1	IA MAG
	2	IB MAG
	3	IC MAG
	4	3I0 MAG
	74	IN MAG
	5	VAN MAG
	6	VBN MAG
	7	VCN MAG
	8	3V0 MAG
	75	VSync MAG
	138	IAB MAG
	139	IBC MAG
	140	ICA MAG
	141	Ia MAG
	142	Ib MAG
	143	Ic MAG
	144	In MAG
	145	Iab MAG
	146	Ibc MAG
	147	Ica MAG

	129	I1 MAG
	130	I2 MAG
	148	I0 MAG
	151	Ia RMS
	152	Ib RMS
	153	Ic RMS
	133	VAB MAG
	134	VBC MAG
	135	VCA MAG
	154	Van MAG
	155	Vbn MAG
	156	Vcn MAG
	157	Vn MAG
	158	Vab MAG
	159	Vbc MAG
	160	Vca MAG
	131	V1 MAG
	132	V2 MAG
	161	V0 MAG
	162	Va RMS
	163	Vb RMS
	164	Vc RMS
	170	Th State
	191	Za MAG
	76	Ra MAG
	77	Xa MAG
	192	Zb MAG
	78	Rb MAG
	79	Xb MAG
	193	Zc MAG
	80	Rc MAG
	81	Xc MAG
	194	Zab MAG
	82	Rab MAG
	83	Xab MAG
	195	Zbc MAG
	84	Rbc MAG
	85	Xbc MAG

	196	Zca MAG
	86	Rca MAG
	87	Xca MAG
	197	Z1 MAG
	88	R1 MAG
	89	X1 MAG
	198	Z2 MAG
	199	R2 MAG
	200	X2 MAG
	201	Z0 MAG
	202	R0 MAG
	203	X0 MAG

NOTE: Maximum 14 analogues Chanel are available in DR.

In Above table first 10 channels are fix default assignment of analogue channel & user can assign any 6 of remaining analogue Chanel through Alias.

Sr. No.	INF	Description	GI	TYP	COT	FUN
8	Semantics of INFORMATION NUMBER : System Functions in control direction					
	0	Initialization of general interrogation	-	7	9	255
	0	Time synchronization	-	6	8	255

Sr. No.	INF	Description	GI	TYP	COT	FUN
9	Semantics of INFORMATION NUMBER : General commands in control direction					
	19	LED reset	ON	20	20	160
	123	CB Trip	ON/OFF	20	20	127
	125	CB Close	ON/OFF	20	20	127
	92	OUT 1	ON/OFF	20	20	127
	93	OUT 2	ON/OFF	20	20	127
	94	OUT 3	ON/OFF	20	20	127
	95	OUT 4	ON/OFF	20	20	127
	96	OUT 5	ON/OFF	20	20	127
	97	OUT 6	ON/OFF	20	20	127
	98	OUT 7	ON/OFF	20	20	127
	99	OUT 8	ON/OFF	20	20	127

100	OUT 9	ON/OFF	20	20	127
101	OUT 10	ON/OFF	20	20	127
102	OUT 11	ON/OFF	20	20	127
103	OUT 12	ON/OFF	20	20	127
104	OUT 13	ON/OFF	20	20	127
105	OUT 14	ON/OFF	20	20	127
106	OUT 15	ON/OFF	20	20	127
107	OUT 16	ON/OFF	20	20	127
108	OUT 17	ON/OFF	20	20	127
109	OUT 18	ON/OFF	20	20	127
110	OUT 19	ON/OFF	20	20	127
111	OUT 20	ON/OFF	20	20	127
112	OUT 21	ON/OFF	20	20	127
113	OUT 22	ON/OFF	20	20	127
114	OUT 23	ON/OFF	20	20	127
115	OUT 24	ON/OFF	20	20	127
116	OUT 25	ON/OFF	20	20	127
117	OUT 26	ON/OFF	20	20	127
118	OUT 27	ON/OFF	20	20	127
119	OUT 28	ON/OFF	20	20	127
120	OUT 29	ON/OFF	20	20	127
121	OUT 30	ON/OFF	20	20	127
122	OUT 31	ON/OFF	20	20	127
126	OUT 32	ON/OFF	20	20	127
43	DCO Output 1	ON/OFF	20	20	132
44	DCO Output 2	ON/OFF	20	20	132
45	DCO Output 3	ON/OFF	20	20	132
46	DCO Output 4	ON/OFF	20	20	132
47	DCO Output 5	ON/OFF	20	20	132
48	DCO Output 6	ON/OFF	20	20	132
49	DCO Output 7	ON/OFF	20	20	132
50	DCO Output 8	ON/OFF	20	20	132
51	DCO Output 9	ON/OFF	20	20	132
52	DCO Output 10	ON/OFF	20	20	132
53	DCO Output 11	ON/OFF	20	20	132
54	DCO Output 12	ON/OFF	20	20	132
55	DCO Output 13	ON/OFF	20	20	132
56	DCO Output 14	ON/OFF	20	20	132

	57	DCO Output 15	ON/OFF	20	20	132
	58	DCO Output 16	ON/OFF	20	20	132

7.4 IEC 61850

This document provides a proposal of mapping ASHIDA BCU process data into IEC61850 server objects.

The list of application functions of the ASHIDA BCUs is derived from the information specified as the project requirements in the document “IEC61850 Server for Ashida Electronics “Preliminary Requirement Specifications”. This document was approved by Ashida Electronics in October 2009 as the basis for the offer.

7.4.1 Protocol map

ARR Auto-Recloser (79) ED1

Data Attribute	Dataset
Arr3PRREC1STOpCntRs$stVal	dchg
Arr3PRREC1STAuto$stVal	dchg
Arr3PRREC1STOp$general	dchg
Arr3PRREC1STAutoRecSt$stVal	dchg

P1 ARR Auto-Recloser (79)ED1

Data Attribute	Dataset
ArrP1RREC2STOpCntRs$stVal	dchg
ArrP1RREC2STAuto$stVal	dchg
ArrP1RREC2STOp$general	dchg
ArrP1RREC2STAutoRecSt$stVal	dchg

P2 ARR Auto-Recloser (79)ED1

Data Attribute	Dataset
ArrP2RREC3STOpCntRs$stVal	dchg
ArrP2RREC3STAuto$stVal	dchg
ArrP2RREC3STOp$general	dchg
ArrP2RREC3STAutoRecSt$stVal	dchg

P3 ARR Auto-Recloser (79)ED1

Data Attribute	Dataset
ArrP3RREC4STOpCntRs$stVal	dchg
ArrP3RREC4STAuto$stVal	dchg
ArrP3RREC4STOp$general	dchg
ArrP3RREC4STAutoRecSt$stVal	dchg

ARR Auto-Recloser (79) ED2

Data Attribute	Dataset
Arr3PGGIO44STOpCntRs$stVal	dchg
Arr3PGGIO44STInd$stVal	dchg
Arr3PRREC1STOpCls$general	dchg
Arr3PRREC1STAutoRecSt$stVal	dchg

P1 ARR Auto-Recloser (79)ED2

Data Attribute	Dataset
ArrP1GGIO73STOpCntRs$stVal	dchg
ArrP1GGIO73STInd$stVal	dchg
ArrP1RREC2STOpCls$general	dchg
ArrP1RREC2STAutoRecSt$stVal	dchg

P2 ARR Auto-Recloser (79)ED2

Data Attribute	Dataset
ArrP2GGIO74STOpCntRs$stVal	dchg
ArrP2GGIO74STInd$stVal	dchg
ArrP2RREC3STOpCls$general	dchg
ArrP2RREC3STAutoRecSt$stVal	dchg

P3 ARR Auto-Recloser (79)ED2

Data Attribute	Dataset
ArrP3GGIO75STOpCntRs$stVal	dchg
ArrP3GGIO75STInd$stVal	dchg
ArrP3RREC4STOpCls$general	dchg
ArrP3RREC4STAutoRecSt$stVal	dchg

General Trip

Data Attribute	Dataset
GNTRPTRC1STOpCntRs$stVal	dchg
GNTRPTRC1STStr$general	dchg
GNTRPTRC1STStr$dirGeneral	dchg
GNTRPTRC1STOp$general	dchg

Sync-In

Data Attribute	Dataset
SYNCGGIO37STAlm$stVal	dchg

Sync-Out

Data Attribute	Dataset
SYNCGGIO38STAlm$stVal	dchg

LLDB

Data Attribute	Dataset
LLDBGGIO34STAlm$stVal	dchg

LBDL

Data Attribute	Dataset
LBDLGGIO35STAlm$stVal	dchg

LLLB

Data Attribute	Dataset
LLLBGGIO77STAlm$stVal	dchg

DBDL

Data Attribute	Dataset
DBDLGGIO76STAlm$stVal	dchg

BF1 Breaker Failure (50BF 1)

Data Attribute	Dataset
BF1RBRF1STOpCntRs$stVal	dchg
BF1RBRF1STStr$general	dchg
BF1RBRF1STStr$dirGeneral	dchg

BF1RBRF1STOpEx$general	dchg

P1BF1 Breaker Failure (50BF 1)

Data Attribute	Dataset
P1BF1RBRF2STOpCntRs$stVal	dchg
P1BF1RBRF2STStr$general	dchg
P1BF1RBRF2STStr$dirGeneral	dchg
P1BF1RBRF2STOpEx$general	dchg

P2BF1 Breaker Failure (50BF 1)

Data Attribute	Dataset
P2BF1RBRF3STOpCntRs$stVal	dchg
P2BF1RBRF3STStr$general	dchg
P2BF1RBRF3STStr$dirGeneral	dchg
P2BF1RBRF3STOpEx$general	dchg

P3BF1 Breaker Failure (50BF 1)

Data Attribute	Dataset
P3BF1RBRF4STOpCntRs$stVal	dchg
P3BF1RBRF4STStr$general	dchg
P3BF1RBRF4STStr$dirGeneral	dchg
P3BF1RBRF4STOpEx$general	dchg

BF2 Breaker Failure (50BF 2)

Data Attribute	Dataset
BF2RBRF5STOpCntRs$stVal	dchg
BF2RBRF5STStr$general	dchg
BF2RBRF5STStr$dirGeneral	dchg
BF2RBRF5STOpEx$general	dchg

BF2 Breaker Failure (50BF 2)

Data Attribute	Dataset
P1BF2RBRF6STOpCntRs$stVal	dchg
P1BF2RBRF6STStr$general	dchg
P1BF2RBRF6STStr$dirGeneral	dchg
P1BF2RBRF6STOpEx$general	dchg

BF2 Breaker Failure (50BF 2)

Data Attribute	Dataset
P2BF2RBRF7STOpCntRs$stVal	dchg
P2BF2RBRF7STStr$general	dchg
P2BF2RBRF7STStr$dirGeneral	dchg
P2BF2RBRF7STOpEx$general	dchg

BF2 Breaker Failure (50BF 2)

Data Attribute	Dataset
P3BF2RBRF8STOpCntRs$stVal	dchg
P3BF2RBRF8STStr$general	dchg
P3BF2RBRF8STStr$dirGeneral	dchg
P3BF2RBRF8STOpEx$general	dchg

CB Circuit Breaker, T1 CB NO, T2 CB NC, Trip CB Open, Close CB Close

Data Attribute	Dataset
CBCSWI1STLoc$stVal	dchg
CBCSWI1STOpCntRs$stVal	dchg
CBCSWI1COPos$Oper$ctlVal	
CBCSWI1STPos$stVal	dchg

P1 CB Circuit Breaker, T1 CB NO, T2 CB NC, Trip CB Open, Close CB Close

Data Attribute	Dataset
P1CBCSWI2STLoc$stVal	dchg
P1CBCSWI2STOpCntRs$stVal	dchg
P1CBCSWI2COPos$Oper$ctlVal	
P1CBCSWI2STPos$stVal	dchg

P2 CB Circuit Breaker, T1 CB NO, T2 CB NC, Trip CB Open, Close CB Close

Data Attribute	Dataset
P2CBCSWI3STLoc$stVal	dchg
P2CBCSWI3STOpCntRs$stVal	dchg
P2CBCSWI3COPos$Oper$ctlVal	
P2CBCSWI3STPos$stVal	dchg

P3 CB Circuit Breaker, T1 CB NO, T2 CB NC, Trip CB Open, Close CB Close

Data Attribute	Dataset
P3CBCSWI4STLoc$stVal	dchg
P3CBCSWI4STOpCntRs$stVal	dchg
P3CBCSWI4COPos$Oper$ctlVal	
P3CBCSWI4STPos$stVal	dchg

CB 1-2 Binary Status Input 1-2

Data Attribute	Dataset
CBGGIO4STInd1$stVal	dchg
CBGGIO4STInd2$stVal	dchg

CB 1-2 Binary Status Input 1-2

Data Attribute	Dataset
P1CBGGIO80STInd1$stVal	dchg
P1CBGGIO80STInd2$stVal	dchg

CB 1-2 Binary Status Input 1-2

Data Attribute	Dataset
P1CBGGIO81STInd1$stVal	dchg
P1CBGGIO81STInd2$stVal	dchg

CB 1-2 Binary Status Input 1-2

Data Attribute	Dataset
P1CBGGIO82STInd1$stVal	dchg
P1CBGGIO82STInd2$stVal	dchg

CB Open Sup Alarm

Data Attribute	Dataset
CBOpSGGIO28STAlm$stVal	dchg

P1 CB Open Sup Alarm

Data Attribute	Dataset
P1OpSGGIO89STAlm$stVal	dchg

P2 CB Open Sup Alarm

Data Attribute	Dataset
P2OpSGGIO90STAlm$stVal	dchg

P3 CB Open Sup Alarm

Data Attribute	Dataset
P3OpSGGIO91STAlm$stVal	dchg

CB Oper Alarm

Data Attribute	Dataset
CBOpAGGIO29STAlm$stVal	dchg

P1 CB Oper Alarm

Data Attribute	Dataset
P1OpAGGIO92STAlm$stVal	dchg

P2 CB Oper Alarm

Data Attribute	Dataset
P2OpAGGIO93STAlm$stVal	dchg

P3 CB Oper Alarm

Data Attribute	Dataset
P3OpAGGIO94STAlm$stVal	dchg

CB Open Fail Alarm

Data Attribute	Dataset
OpnFGGIO15STAlm$stVal	dchg

P1 CB Open Fail Alarm

Data Attribute	Dataset
P1OpFGGIO48STAlm$stVal	dchg

P2 CB Open Fail Alarm

Data Attribute	Dataset
P2OpFGGIO87STAlm$stVal	dchg

P3 CB Open Fail Alarm

Data Attribute	Dataset
P3OpFGGIO88STAlm$stVal	dchg

CB Close Fail Alarm

Data Attribute	Dataset
ClsFGGIO14STAlm$stVal	dchg

P1 CB Close Fail Alarm

Data Attribute	Dataset
P1CLFGGIO83STAlm$stVal	dchg

P2 CB Close Fail Alarm

Data Attribute	Dataset
P2CLFGGIO84STAlm$stVal	dchg

P3 CB Close Fail Alarm

Data Attribute	Dataset
P3CLFGGIO85STAlm$stVal	dchg

TCS Trip Circuit Supervision (94)

Data Attribute	Dataset
TCS3PGGIO3STAlm$stVal	dchg

P1TCS Trip Circuit Supervision (94)

Data Attribute	Dataset
P1TCSGGIO100STAlm$stVal	dchg

P2TCS Trip Circuit Supervision (94)

Data Attribute	Dataset
P2TCSGGIO101STAlm$stVal	dchg

P3TCS Trip Circuit Supervision (94)

Data Attribute	Dataset
P3TCSGGIO102STAlm$stVal	dchg

SOTF 3P

Data Attribute	Dataset
STF3PPTOC27STOpCntRs$stVal	dchg
STF3PPTOC27STStr$general	dchg
STF3PPTOC27STStr$dirGeneral	dchg
STF3PPTOC27STOp$general	dchg

SOTF P1

Data Attribute	Dataset
STFP1PTOC24STOpCntRs$stVal	dchg
STFP1PTOC24STStr$general	dchg
STFP1PTOC24STStr$dirGeneral	dchg
STFP1PTOC24STOp$general	dchg

SOTF P2

Data Attribute	Dataset
STFP2PTOC25STOpCntRs$stVal	dchg
STFP2PTOC25STStr$general	dchg
STFP2PTOC25STStr$dirGeneral	dchg
STFP2PTOC25STOp$general	dchg

SOTF P3

Data Attribute	Dataset
STFP3PTOC26STOpCntRs$stVal	dchg
STFP3PTOC26STStr$general	dchg
STFP3PTOC26STStr$dirGeneral	dchg
STFP3PTOC26STOp$general	dchg

Pole Discrepancy

Data Attribute	Dataset
PDSPGGIO39STAlm$stVal	dchg

P1 CB Open Pole

Data Attribute	Dataset
SPOP1GGIO40STAlm$stVal	dchg

P2 CB Open Pole

Data Attribute	Dataset
SPOP2GGIO41STAlm$stVal	dchg

P3 CB Open Pole

Data Attribute	Dataset
SPOP3GGIO42STAlm$stVal	dchg

3P CB Open Pole

Data Attribute	Dataset
SPO3PGGIO43STAlm$stVal	dchg

No Volt

Data Attribute	Dataset
NOVLTGGIO27STAlm$stVal	dchg

S1-8 Binary Status Input 1-8

Data Attribute	Dataset
SGGIO1STInd1$stval	dchg
SGGIO1STInd2$stVal	dchg
SGGIO1STInd3$stVal	dchg
SGGIO1STInd4$stVal	dchg
SGGIO1STInd5$stVal	dchg
SGGIO1STInd6$stVal	dchg
SGGIO1STInd7$stVal	dchg
SGGIO1STInd8$stVal	dchg

S9-24 Binary Status Input 9-24

Data Attribute	Dataset
SGGIO6STInd1$stval	dchg
SGGIO6STInd2$stVal	dchg
SGGIO6STInd3$stVal	dchg
SGGIO6STInd4$stVal	dchg
SGGIO6STInd5$stVal	dchg
SGGIO6STInd6$stVal	dchg
SGGIO6STInd7$stVal	dchg
SGGIO6STInd8$stVal	dchg

SGGIO6STInd9$stval	dchg
SGGIO6STInd10$stVal	dchg
SGGIO6STInd11$stVal	dchg
SGGIO6STInd12$stVal	dchg
SGGIO6STInd13$stVal	dchg
SGGIO6STInd14$stVal	dchg
SGGIO6STInd15$stVal	dchg
SGGIO6STInd16$stVal	dchg

S25-40 Binary Status Input 25-40

Data Attribute	Dataset
SGGIO32STInd1$stVal	dchg
SGGIO32STInd2$stVal	dchg
SGGIO32STInd3$stVal	dchg
SGGIO32STInd4$stVal	dchg
SGGIO32STInd5$stVal	dchg
SGGIO32STInd6$stVal	dchg
SGGIO32STInd7$stVal	dchg
SGGIO32STInd8$stVal	dchg
SGGIO32STInd9$stVal	dchg
SGGIO32STInd10$stVal	dchg
SGGIO32STInd11$stVal	dchg
SGGIO32STInd12$stVal	dchg
SGGIO32STInd13$stVal	dchg
SGGIO32STInd14$stVal	dchg
SGGIO32STInd15$stVal	dchg
SGGIO32STInd16$stVal	dchg

S41-56 Binary Status Input 41-56

Data Attribute	Dataset
SGGIO33STInd1$stVal	dchg
SGGIO33STInd2$stVal	dchg
SGGIO33STInd3$stVal	dchg
SGGIO33STInd4$stVal	dchg
SGGIO33STInd5$stVal	dchg
SGGIO33STInd6$stVal	dchg
SGGIO33STInd7$stVal	dchg
SGGIO33STInd8$stVal	dchg

SGGIO33STInd9$stVal	dchg
SGGIO33STInd10$stVal	dchg
SGGIO33STInd11$stVal	dchg
SGGIO33STInd12$stVal	dchg
SGGIO33STInd13$stVal	dchg
SGGIO33STInd14$stVal	dchg
SGGIO33STInd15$stVal	dchg
SGGIO33STInd16$stVal	dchg

RL1-8 Binary Control Output 1-8

Data Attribute	Dataset
RLGGIO2COSPCSO1$Oper$ctlVal	
RLGGIO2STSPCSO1$stVal	dchg
RLGGIO2COSPCSO2$Oper$ctlVal	
RLGGIO2STSPCSO2$stVal	dchg
RLGGIO2COSPCSO3$Oper$ctlVal	
RLGGIO2STSPCSO3$stVal	dchg
RLGGIO2COSPCSO4$Oper$ctlVal	
RLGGIO2STSPCSO4$stVal	dchg
RLGGIO2COSPCSO5$Oper$ctlVal	
RLGGIO2STSPCSO5$stVal	dchg
RLGGIO2COSPCSO6$Oper$ctlVal	
RLGGIO2STSPCSO6$stVal	dchg
RLGGIO2COSPCSO7$Oper$ctlVal	
RLGGIO2STSPCSO7$stVal	dchg
RLGGIO2COSPCSO8$Oper$ctlVal	
RLGGIO2STSPCSO8$stVal	dchg

RL9-16 Binary Control Output 9-16

Data Attribute	Dataset
RLGGIO7COSPCSO1$Oper$ctlVal	
RLGGIO7STSPCSO1$stVal	dchg
RLGGIO7COSPCSO2$Oper$ctlVal	
RLGGIO7STSPCSO2$stVal	dchg
RLGGIO7COSPCSO3$Oper$ctlVal	
RLGGIO7STSPCSO3$stVal	dchg
RLGGIO7COSPCSO4$Oper$ctlVal	
RLGGIO7STSPCSO4$stVal	dchg

RLGGIO7COSPCSO5$Oper$ctlVal	
RLGGIO7STSPCSO5$stVal	dchg
RLGGIO7COSPCSO6$Oper$ctlVal	
RLGGIO7STSPCSO6$stVal	dchg
RLGGIO7COSPCSO7$Oper$ctlVal	
RLGGIO7STSPCSO7$stVal	dchg
RLGGIO7COSPCSO8$Oper$ctlVal	
RLGGIO7STSPCSO8$stVal	dchg

RL17-24 Binary Control Output 17-24

Data Attribute	Dataset
RLGGIO30COSPCSO1$Oper$ctlVal	
RLGGIO30STSPCSO1$stVal	dchg
RLGGIO30COSPCSO2$Oper$ctlVal	
RLGGIO30STSPCSO2$stVal	dchg
RLGGIO30COSPCSO3$Oper$ctlVal	
RLGGIO30STSPCSO3$stVal	dchg
RLGGIO30COSPCSO4$Oper$ctlVal	
RLGGIO30STSPCSO4$stVal	dchg
RLGGIO30COSPCSO5$Oper$ctlVal	
RLGGIO30STSPCSO5$stVal	dchg
RLGGIO30COSPCSO6$Oper$ctlVal	
RLGGIO30STSPCSO6$stVal	dchg
RLGGIO30COSPCSO7$Oper$ctlVal	
RLGGIO30STSPCSO7$stVal	dchg
RLGGIO30COSPCSO8$Oper$ctlVal	
RLGGIO30STSPCSO8$stVal	dchg

RL25-32 Binary Control Output 25-32

Data Attribute	Dataset
RLGGIO31COSPCSO1$Oper$ctlVal	
RLGGIO31STSPCSO1$stVal	dchg
RLGGIO31COSPCSO2$Oper$ctlVal	
RLGGIO31STSPCSO2$stVal	dchg
RLGGIO31COSPCSO3$Oper$ctlVal	
RLGGIO31STSPCSO3$stVal	dchg
RLGGIO31COSPCSO4$Oper$ctlVal	
RLGGIO31STSPCSO4$stVal	dchg

RLGGIO31COSPCSO5$Oper$ctlVal	
RLGGIO31STSPCSO5$stVal	dchg
RLGGIO31COSPCSO6$Oper$ctlVal	
RLGGIO31STSPCSO6$stVal	dchg
RLGGIO31COSPCSO7$Oper$ctlVal	
RLGGIO31STSPCSO7$stVal	dchg
RLGGIO31COSPCSO8$Oper$ctlVal	
RLGGIO31STSPCSO8$stVal	dchg

Green LED 1-16 Green LEDs 1-16

Data Attribute	Dataset
GLEDGGIO8STInd1$stval	dchg
GLEDGGIO8STInd2$stVal	dchg
GLEDGGIO8STInd3$stVal	dchg
GLEDGGIO8STInd4$stVal	dchg
GLEDGGIO8STInd5$stVal	dchg
GLEDGGIO8STInd6$stVal	dchg
GLEDGGIO8STInd7$stVal	dchg
GLEDGGIO8STInd8$stVal	dchg
GLEDGGIO8STInd9$stval	dchg
GLEDGGIO8STInd10$stVal	dchg
GLEDGGIO8STInd11$stVal	dchg
GLEDGGIO8STInd12$stVal	dchg
GLEDGGIO8STInd13$stVal	dchg
GLEDGGIO8STInd14$stVal	dchg
GLEDGGIO8STInd15$stVal	dchg
GLEDGGIO8STInd16$stVal	dchg

Red LED 1-16 Red LEDs 1-16

Data Attribute	Dataset
RLEDGGIO9STInd1$stval	dchg
RLEDGGIO9STInd2$stVal	dchg
RLEDGGIO9STInd3$stVal	dchg
RLEDGGIO9STInd4$stVal	dchg
RLEDGGIO9STInd5$stVal	dchg
RLEDGGIO9STInd6$stVal	dchg
RLEDGGIO9STInd7$stVal	dchg
RLEDGGIO9STInd8$stVal	dchg

RLEDGGIO9STInd9$stval	dchg
RLEDGGIO9STInd10$stVal	dchg
RLEDGGIO9STInd11$stVal	dchg
RLEDGGIO9STInd12$stVal	dchg
RLEDGGIO9STInd13$stVal	dchg
RLEDGGIO9STInd14$stVal	dchg
RLEDGGIO9STInd15$stVal	dchg
RLEDGGIO9STInd16$stVal	dchg

NWOPs Indication 1-16 (network o/p)

Data Attribute	Dataset
NWOPGGIO10STInd1$stval	dchg
NWOPGGIO10STInd2$stVal	dchg
NWOPGGIO10STInd3$stVal	dchg
NWOPGGIO10STInd4$stVal	dchg
NWOPGGIO10STInd5$stVal	dchg
NWOPGGIO10STInd6$stVal	dchg
NWOPGGIO10STInd7$stVal	dchg
NWOPGGIO10STInd8$stVal	dchg
NWOPGGIO10STInd9$stval	dchg
NWOPGGIO10STInd10$stVal	dchg
NWOPGGIO10STInd11$stVal	dchg
NWOPGGIO10STInd12$stVal	dchg
NWOPGGIO10STInd13$stVal	dchg
NWOPGGIO10STInd14$stVal	dchg
NWOPGGIO10STInd15$stVal	dchg
NWOPGGIO10STInd16$stVal	dchg

NW1-16 NWIn Control Output 1-16

Data Attribute	Dataset
NWInGGIO11COSPCSO1$Oper$ctlVal	
NWInGGIO11STSPCSO1$stVal	dchg
NWInGGIO11COSPCSO2$Oper$ctlVal	
NWInGGIO11STSPCSO2$stVal	dchg
NWInGGIO11COSPCSO3$Oper$ctlVal	
NWInGGIO11STSPCSO3$stVal	dchg
NWInGGIO11COSPCSO4$Oper$ctlVal	
NWInGGIO11STSPCSO4$stVal	dchg

NWInGGIO11COSPCSO5$Oper$ctlVal	
NWInGGIO11STSPCSO5$stVal	dchg
NWInGGIO11COSPCSO6$Oper$ctlVal	
NWInGGIO11STSPCSO6$stVal	dchg
NWInGGIO11COSPCSO7$Oper$ctlVal	
NWInGGIO11STSPCSO7$stVal	dchg
NWInGGIO11COSPCSO8$Oper$ctlVal	
NWInGGIO11STSPCSO8$stVal	dchg
NWInGGIO11COSPCSO9$Oper$ctlVal	
NWInGGIO11STSPCSO9$stVal	dchg
NWInGGIO11COSPCS10$Oper$ctlVal	
NWInGGIO11STSPCS10$stVal	dchg
NWInGGIO11COSPCS11$Oper$ctlVal	
NWInGGIO11STSPCS11$stVal	dchg
NWInGGIO11COSPCS12$Oper$ctlVal	
NWInGGIO11STSPCS12$stVal	dchg
NWInGGIO11COSPCS13$Oper$ctlVal	
NWInGGIO11STSPCS13$stVal	dchg
NWInGGIO11COSPCS14$Oper$ctlVal	
NWInGGIO11STSPCS14$stVal	dchg
NWInGGIO11COSPCS15$Oper$ctlVal	
NWInGGIO11STSPCS15$stVal	dchg
NWInGGIO11COSPCS16$Oper$ctlVal	
NWInGGIO11STSPCS16$stVal	dchg

NW17-32 NWIn Control Output 17-32

Data Attribute	Dataset
NWInGGIO46COSPCSO1$Oper$ctlVal	
NWInGGIO46STSPCSO1$stVal	dchg
NWInGGIO46COSPCSO2$Oper$ctlVal	
NWInGGIO46STSPCSO2$stVal	dchg
NWInGGIO46COSPCSO3$Oper$ctlVal	
NWInGGIO46STSPCSO3$stVal	dchg
NWInGGIO46COSPCSO4$Oper$ctlVal	
NWInGGIO46STSPCSO4$stVal	dchg
NWInGGIO46COSPCSO5$Oper$ctlVal	
NWInGGIO46STSPCSO5$stVal	dchg
NWInGGIO46COSPCSO6$Oper$ctlVal	

NWInGGIO46STSPCSO6$stVal	dchg
NWInGGIO46COSPCSO7$Oper$ctlVal	
NWInGGIO46STSPCSO7$stVal	dchg
NWInGGIO46COSPCSO8$Oper$ctlVal	
NWInGGIO46STSPCSO8$stVal	dchg
NWInGGIO46COSPCSO9$Oper$ctlVal	
NWInGGIO46STSPCSO9$stVal	dchg
NWInGGIO46COSPCS10$Oper$ctlVal	
NWInGGIO46STSPCS10$stVal	dchg
NWInGGIO46COSPCS11$Oper$ctlVal	
NWInGGIO46STSPCS11$stVal	dchg
NWInGGIO46COSPCS12$Oper$ctlVal	
NWInGGIO46STSPCS12$stVal	dchg
NWInGGIO46COSPCS13$Oper$ctlVal	
NWInGGIO46STSPCS13$stVal	dchg
NWInGGIO46COSPCS14$Oper$ctlVal	
NWInGGIO46STSPCS14$stVal	dchg
NWInGGIO46COSPCS15$Oper$ctlVal	
NWInGGIO46STSPCS15$stVal	dchg
NWInGGIO46COSPCS16$Oper$ctlVal	
NWInGGIO46STSPCS16$stVal	dchg

NW33-48 NWIn Control Output 33-48

Data Attribute	Dataset
NWInGGIO47COSPCSO1$Oper$ctlVal	
NWInGGIO47STSPCSO1$stVal	dchg
NWInGGIO47COSPCSO2$Oper$ctlVal	
NWInGGIO47STSPCSO2$stVal	dchg
NWInGGIO47COSPCSO3$Oper$ctlVal	
NWInGGIO47STSPCSO3$stVal	dchg
NWInGGIO47COSPCSO4$Oper$ctlVal	
NWInGGIO47STSPCSO4$stVal	dchg
NWInGGIO47COSPCSO5$Oper$ctlVal	
NWInGGIO47STSPCSO5$stVal	dchg
NWInGGIO47COSPCSO6$Oper$ctlVal	
NWInGGIO47STSPCSO6$stVal	dchg
NWInGGIO47COSPCSO7$Oper$ctlVal	
NWInGGIO47STSPCSO7$stVal	dchg

NWInGGIO47COSPCSO8$Oper$ctlVal	
NWInGGIO47STSPCSO8$stVal	dchg
NWInGGIO47COSPCSO9$Oper$ctlVal	
NWInGGIO47STSPCSO9$stVal	dchg
NWInGGIO47COSPCS10$Oper$ctlVal	
NWInGGIO47STSPCS10$stVal	dchg
NWInGGIO47COSPCS11$Oper$ctlVal	
NWInGGIO47STSPCS11$stVal	dchg
NWInGGIO47COSPCS12$Oper$ctlVal	
NWInGGIO47STSPCS12$stVal	dchg
NWInGGIO47COSPCS13$Oper$ctlVal	
NWInGGIO47STSPCS13$stVal	dchg
NWInGGIO47COSPCS14$Oper$ctlVal	
NWInGGIO47STSPCS14$stVal	dchg
NWInGGIO47COSPCS15$Oper$ctlVal	
NWInGGIO47STSPCS15$stVal	dchg
NWInGGIO47COSPCS16$Oper$ctlVal	
NWInGGIO47STSPCS16$stVal	dchg

NW49-64 NWIn Control Output 49-64

Data Attribute	Dataset
NWInGGIO86COSPCSO1$Oper$ctlVal	
NWInGGIO86STSPCSO1$stVal	dchg
NWInGGIO86COSPCSO2$Oper$ctlVal	
NWInGGIO86STSPCSO2$stVal	dchg
NWInGGIO86COSPCSO3$Oper$ctlVal	
NWInGGIO86STSPCSO3$stVal	dchg
NWInGGIO86COSPCSO4$Oper$ctlVal	
NWInGGIO86STSPCSO4$stVal	dchg
NWInGGIO86COSPCSO5$Oper$ctlVal	
NWInGGIO86STSPCSO5$stVal	dchg
NWInGGIO86COSPCSO6$Oper$ctlVal	
NWInGGIO86STSPCSO6$stVal	dchg
NWInGGIO86COSPCSO7$Oper$ctlVal	
NWInGGIO86STSPCSO7$stVal	dchg
NWInGGIO86COSPCSO8$Oper$ctlVal	
NWInGGIO86STSPCSO8$stVal	dchg
NWInGGIO86COSPCSO9$Oper$ctlVal	

NWInGGIO86STSPCSO9$stVal	dchg
NWInGGIO86COSPCS10$Oper$ctlVal	
NWInGGIO86STSPCS10$stVal	dchg
NWInGGIO86COSPCS11$Oper$ctlVal	
NWInGGIO86STSPCS11$stVal	dchg
NWInGGIO86COSPCS12$Oper$ctlVal	
NWInGGIO86STSPCS12$stVal	dchg
NWInGGIO86COSPCS13$Oper$ctlVal	
NWInGGIO86STSPCS13$stVal	dchg
NWInGGIO86COSPCS14$Oper$ctlVal	
NWInGGIO86STSPCS14$stVal	dchg
NWInGGIO86COSPCS15$Oper$ctlVal	
NWInGGIO86STSPCS15$stVal	dchg
NWInGGIO86COSPCS16$Oper$ctlVal	
NWInGGIO86STSPCS16$stVal	dchg

VIO1-32 VIO Control Output 1-32

Data Attribute	Dataset
VIOGGIO12COSPCSO1$Oper$ctlVal	
VIOGGIO12STSPCSO1$stVal	dchg
VIOGGIO12COSPCSO2$Oper$ctlVal	
VIOGGIO12STSPCSO2$stVal	dchg
VIOGGIO12COSPCSO3$Oper$ctlVal	
VIOGGIO12STSPCSO3$stVal	dchg
VIOGGIO12COSPCSO4$Oper$ctlVal	
VIOGGIO12STSPCSO4$stVal	dchg
VIOGGIO12COSPCSO5$Oper$ctlVal	
VIOGGIO12STSPCSO5$stVal	dchg
VIOGGIO12COSPCSO6$Oper$ctlVal	
VIOGGIO12STSPCSO6$stVal	dchg
VIOGGIO12COSPCSO7$Oper$ctlVal	
VIOGGIO12STSPCSO7$stVal	dchg
VIOGGIO12COSPCSO8$Oper$ctlVal	
VIOGGIO12STSPCSO8$stVal	dchg
VIOGGIO12COSPCSO9$Oper$ctlVal	
VIOGGIO12STSPCSO9$stVal	dchg
VIOGGIO12COSPCS10$Oper$ctlVal	
VIOGGIO12STSPCS10$stVal	dchg

VIOGGIO12COSPCS11$Oper$ctlVal	
VIOGGIO12STSPCS11$stVal	dchg
VIOGGIO12COSPCS12$Oper$ctlVal	
VIOGGIO12STSPCS12$stVal	dchg
VIOGGIO12COSPCS13$Oper$ctlVal	
VIOGGIO12STSPCS13$stVal	dchg
VIOGGIO12COSPCS14$Oper$ctlVal	
VIOGGIO12STSPCS14$stVal	dchg
VIOGGIO12COSPCS15$Oper$ctlVal	
VIOGGIO12STSPCS15$stVal	dchg
VIOGGIO12COSPCS16$Oper$ctlVal	
VIOGGIO12STSPCS16$stVal	dchg
VIOGGIO12COSPCSO17$Oper$ctlVal	
VIOGGIO12STSPCSO17$stVal	dchg
VIOGGIO12COSPCSO18$Oper$ctlVal	
VIOGGIO12STSPCSO18$stVal	dchg
VIOGGIO12COSPCSO19$Oper$ctlVal	
VIOGGIO12STSPCSO19$stVal	dchg
VIOGGIO12COSPCSO20$Oper$ctlVal	
VIOGGIO12STSPCSO20$stVal	dchg
VIOGGIO12COSPCSO21$Oper$ctlVal	
VIOGGIO12STSPCSO21$stVal	dchg
VIOGGIO12COSPCSO22$Oper$ctlVal	
VIOGGIO12STSPCSO22$stVal	dchg
VIOGGIO12COSPCSO23$Oper$ctlVal	
VIOGGIO12STSPCSO23$stVal	dchg
VIOGGIO12COSPCSO24$Oper$ctlVal	
VIOGGIO12STSPCSO24$stVal	dchg
VIOGGIO12COSPCSO25$Oper$ctlVal	
VIOGGIO12STSPCSO25$stVal	dchg
VIOGGIO12COSPCS26$Oper$ctlVal	
VIOGGIO12STSPCS26$stVal	dchg
VIOGGIO12COSPCS27$Oper$ctlVal	
VIOGGIO12STSPCS27$stVal	dchg
VIOGGIO12COSPCS28$Oper$ctlVal	
VIOGGIO12STSPCS28$stVal	dchg
VIOGGIO12COSPCS29$Oper$ctlVal	
VIOGGIO12STSPCS29$stVal	dchg

VIOGGIO12COSPCS30$Oper$ctlVal	
VIOGGIO12STSPCS30$stVal	dchg
VIOGGIO12COSPCS31$Oper$ctlVal	
VIOGGIO12STSPCS31$stVal	dchg
VIOGGIO12COSPCS32$Oper$ctlVal	
VIOGGIO12STSPCS32$stVal	dchg

VIO33-48 VIO Control Output 33-48

Data Attribute	Dataset
VIOGGIO45COSPCSO1$Oper$ctlVal	
VIOGGIO45STSPCSO1$stVal	dchg
VIOGGIO45COSPCSO2$Oper$ctlVal	
VIOGGIO45STSPCSO2$stVal	dchg
VIOGGIO45COSPCSO3$Oper$ctlVal	
VIOGGIO45STSPCSO3$stVal	dchg
VIOGGIO45COSPCSO4$Oper$ctlVal	
VIOGGIO45STSPCSO4$stVal	dchg
VIOGGIO45COSPCSO5$Oper$ctlVal	
VIOGGIO45STSPCSO5$stVal	dchg
VIOGGIO45COSPCSO6$Oper$ctlVal	
VIOGGIO45STSPCSO6$stVal	dchg
VIOGGIO45COSPCSO7$Oper$ctlVal	
VIOGGIO45STSPCSO7$stVal	dchg
VIOGGIO45COSPCSO8$Oper$ctlVal	
VIOGGIO45STSPCSO8$stVal	dchg
VIOGGIO45COSPCSO9$Oper$ctlVal	
VIOGGIO45STSPCSO9$stVal	dchg
VIOGGIO45COSPCS10$Oper$ctlVal	
VIOGGIO45STSPCS10$stVal	dchg
VIOGGIO45COSPCS11$Oper$ctlVal	
VIOGGIO45STSPCS11$stVal	dchg
VIOGGIO45COSPCS12$Oper$ctlVal	
VIOGGIO45STSPCS12$stVal	dchg
VIOGGIO45COSPCS13$Oper$ctlVal	
VIOGGIO45STSPCS13$stVal	dchg
VIOGGIO45COSPCS14$Oper$ctlVal	
VIOGGIO45STSPCS14$stVal	dchg
VIOGGIO45COSPCS15$Oper$ctlVal	

VIOGGIO45STSPCS15$stVal	dchg
VIOGGIO45COSPCS16$Oper$ctlVal	
VIOGGIO45STSPCS16$stVal	dchg

EQN1-16 EQNs Indication 1-16

Data Attribute	Dataset
EQNGGIO13STInd1$stval	dchg
EQNGGIO13STInd2$stVal	dchg
EQNGGIO13STInd3$stVal	dchg
EQNGGIO13STInd4$stVal	dchg
EQNGGIO13STInd5$stVal	dchg
EQNGGIO13STInd6$stVal	dchg
EQNGGIO13STInd7$stVal	dchg
EQNGGIO13STInd8$stVal	dchg
EQNGGIO13STInd9$stval	dchg
EQNGGIO13STInd10$stVal	dchg
EQNGGIO13STInd11$stVal	dchg
EQNGGIO13STInd12$stVal	dchg
EQNGGIO13STInd13$stVal	dchg
EQNGGIO13STInd14$stVal	dchg
EQNGGIO13STInd15$stVal	dchg
EQNGGIO13STInd16$stVal	dchg

BCU Healthy

Data Attribute	Dataset
AshidaLPHD1STPhyHealth$stVal	dchg

BCU Error

Data Attribute	Dataset
ERRORGGIO16STAlm$stVal	dchg

LED reset

Data Attribute	Dataset
LLN0COLEDRs$Oper$ctlVal	dchg
LLN0STLEDRs$stVal	dchg

LAN Status 1-2

Data Attribute	Dataset
LANGGIO98STInd1$stVal	dchg
LANGGIO98STInd2$stVal	dchg

GOOSE SUB Alarm

Data Attribute	Dataset
SUBGGIO99STInd1$stVal	dchg

AI1 LW-HW

Data Attribute	Dataset
AI1GGIO49STInd1$stVal	dchg
AI1GGIO49STInd2$stVal	dchg
AI1GGIO49STInd3$stVal	dchg
AI1GGIO49STInd4$stVal	dchg

AI2 LW-HW

Data Attribute	Dataset
AI2GGIO50STInd1$stVal	dchg
AI2GGIO50STInd2$stVal	dchg
AI2GGIO50STInd3$stVal	dchg
AI2GGIO50STInd4$stVal	dchg

AI3 LW-HW

Data Attribute	Dataset
AI3GGIO51STInd1$stVal	dchg
AI3GGIO51STInd2$stVal	dchg
AI3GGIO51STInd3$stVal	dchg
AI3GGIO51STInd4$stVal	dchg

AI4 LW-HW

Data Attribute	Dataset
AI4GGIO52STInd1$stVal	dchg
AI4GGIO52STInd2$stVal	dchg
AI4GGIO52STInd3$stVal	dchg
AI4GGIO52STInd4$stVal	dchg

AI5 LW-HW

Data Attribute	Dataset
AI5GGIO53STInd1$stVal	dchg
AI5GGIO53STInd2$stVal	dchg
AI5GGIO53STInd3$stVal	dchg
AI5GGIO53STInd4$stVal	dchg

AI6 LW-HW

Data Attribute	Dataset
AI6GGIO54STInd1$stVal	dchg
AI6GGIO54STInd2$stVal	dchg
AI6GGIO54STInd3$stVal	dchg
AI6GGIO54STInd4$stVal	dchg

AI7 LW-HW

Data Attribute	Dataset
AI7GGIO55STInd1$stVal	dchg
AI7GGIO55STInd2$stVal	dchg
AI7GGIO55STInd3$stVal	dchg
AI7GGIO55STInd4$stVal	dchg

AI8 LW-HW

Data Attribute	Dataset
AI8GGIO56STInd1$stVal	dchg
AI8GGIO56STInd2$stVal	dchg
AI8GGIO56STInd3$stVal	dchg
AI8GGIO56STInd4$stVal	dchg

DPI1-28 DPI In Indication 1-28

Data Attribute	Dataset
DPInGGIO79STDPCSO1$stVal	dchg
DPInGGIO79STDPCSO2$stVal	dchg
DPInGGIO79STDPCSO3$stVal	dchg
DPInGGIO79STDPCSO4$stVal	dchg
DPInGGIO79STDPCSO5$stVal	dchg
DPInGGIO79STDPCSO6$stVal	dchg
DPInGGIO79STDPCSO7$stVal	dchg

DPInGGIO79STDPCSO8$stVal	dchg
DPInGGIO79STDPCSO9$stVal	dchg
DPInGGIO79STDPCSO10$stVal	dchg
DPInGGIO79STDPCSO11$stVal	dchg
DPInGGIO79STDPCSO12$stVal	dchg
DPInGGIO79STDPCSO13$stVal	dchg
DPInGGIO79STDPCSO14$stVal	dchg
DPInGGIO79STDPCSO15$stVal	dchg
DPInGGIO79STDPCSO16$stVal	dchg
DPInGGIO79STDPCSO17$stVal	dchg
DPInGGIO79STDPCSO18$stVal	dchg
DPInGGIO79STDPCSO19$stVal	dchg
DPInGGIO79STDPCSO20$stVal	dchg
DPInGGIO79STDPCSO21$stVal	dchg
DPInGGIO79STDPCSO22$stVal	dchg
DPInGGIO79STDPCSO23$stVal	dchg
DPInGGIO79STDPCSO24$stVal	dchg
DPInGGIO79STDPCSO25$stVal	dchg
DPInGGIO79STDPCSO26$stVal	dchg
DPInGGIO79STDPCSO27$stVal	dchg
DPInGGIO79STDPCSO28$stVal	dchg

DCO1-16 DCO Control Output 1-16

Data Attribute	Dataset
DPOutGGIO78COSPCSO1$Oper$ctlVal	
DPOutGGIO78STSPCSO1$stVal	dchg
DPOutGGIO78COSPCSO2$Oper$ctlVal	
DPOutGGIO78STSPCSO2$stVal	dchg
DPOutGGIO78COSPCSO3$Oper$ctlVal	
DPOutGGIO78STSPCSO3$stVal	dchg
DPOutGGIO78COSPCSO4$Oper$ctlVal	
DPOutGGIO78STSPCSO4$stVal	dchg
DPOutGGIO78COSPCSO5$Oper$ctlVal	
DPOutGGIO78STSPCSO5$stVal	dchg
DPOutGGIO78COSPCSO6$Oper$ctlVal	
DPOutGGIO78STSPCSO6$stVal	dchg
DPOutGGIO78COSPCSO7$Oper$ctlVal	
DPOutGGIO78STSPCSO7$stVal	dchg

DPOutGGIO78COSPCSO8$Oper$ctlVal	
DPOutGGIO78STSPCSO8$stVal	dchg
DPOutGGIO78COSPCSO9$Oper$ctlVal	
DPOutGGIO78STSPCSO9$stVal	dchg
DPOutGGIO78COSPCS10$Oper$ctlVal	
DPOutGGIO78STSPCS10$stVal	dchg
DPOutGGIO78COSPCS11$Oper$ctlVal	
DPOutGGIO78STSPCS11$stVal	dchg
DPOutGGIO78COSPCS12$Oper$ctlVal	
DPOutGGIO78STSPCS12$stVal	dchg
DPOutGGIO78COSPCS13$Oper$ctlVal	
DPOutGGIO78STSPCS13$stVal	dchg
DPOutGGIO78COSPCS14$Oper$ctlVal	
DPOutGGIO78STSPCS14$stVal	dchg
DPOutGGIO78COSPCS15$Oper$ctlVal	
DPOutGGIO78STSPCS15$stVal	dchg
DPOutGGIO78COSPCS16$Oper$ctlVal	
DPOutGGIO78STSPCS16$stVal	dchg

Measurands

Measurement Parameter	Data Attribute	Dataset
3P	MMXU1MXTotWmagf	dchg
3Q	MMXU1MXTotVArmagf	dchg
3S	MMXU1MXTotVAmagf	dchg
3PF	MMXU1MXTotPFmagf	dchg
FREQ	MMXU1MXHzmagf	dchg
VAB MAG	MMXU1MXPPV$phsAB$cValmagf	dchg
VBC MAG	MMXU1MXPPV$phsBC$cValmagf	dchg
VCA MAG	MMXU1MXPPV$phsCA$cValmagf	dchg
VAN MAG	MMXU1MXPhV$phsA$cValmagf	dchg
VBN MAG	MMXU1MXPhV$phsB$cValmagf	dchg
VCN MAG	MMXU1MXPhV$phsC$cValmagf	dchg
IA MAG	MMXU1MXA$phsA$cValmagf	dchg
IB MAG	MMXU1MXA$phsB$cValmagf	dchg
IC MAG	MMXU1MXA$phsC$cValmagf	dchg
PA	MMXU1MXW$phsA$cValmagf	dchg
PB	MMXU1MXW$phsB$cValmagf	dchg
PC	MMXU1MXW$phsC$cValmagf	dchg

QA	MMXU1MXVAr$phsA$cValmagf	dchg
QB	MMXU1MXVAr$phsB$cValmagf	dchg
QC	MMXU1MXVAr$phsC$cValmagf	dchg
SA	MMXU1MXVA$phsA$cValmagf	dchg
SB	MMXU1MXVA$phsB$cValmagf	dchg
SC	MMXU1MXVA$phsC$cValmagf	dchg
PFA	MMXU1MXPF$phsA$cValmagf	dchg
PFB	MMXU1MXPF$phsB$cValmagf	dchg
PFC	MMXU1MXPF$phsC$cValmagf	dchg
IN MAG	MMXU1MXA$neut$cValmagf	dchg
VSync MAG	VSYNCGGIO5MXAnInmagf	dchg
Th State	THSTGGIO20MXAnInmagf	dchg
BOT	BOTGGIO21MXAnInmagf	dchg
P1BOT	P1BOTGGIO95MXAnInmagf	dchg
P2BOT	P2BOTGGIO96MXAnInmagf	dchg
P3BOT	P3BOTGGIO97MXAnInmagf	dchg
MaxS	MaxSGGIO22MXAnInmagf	dchg
AvgP	AvgPGGIO23MXAnInmagf	dchg
AvgQ	AvgQGGIO24MXAnInmagf	dchg
AvgS	AvgSGGIO25MXAnInmagf	dchg
Power Demand	PWDGGIO26MXAnInmagf	dchg
Kwh+	FWDMMTR1STTotWh$actVal	dchg
KVrh+	FWDMMTR1STTotVArh$actVal	dchg
Kwh-	REVMMTR2STTotWh$actVal	dchg
KVrh-	REVMMTR2STTotVArh$actVal	dchg
I1 MAG	MSQI1MXSeqA$c1$cValmagf	dchg
I2 MAG	MSQI1MXSeqA$c2$cValmagf	dchg
I0 MAG	MSQI1MXSeqA$c3$cValmagf	dchg
V1 MAG	MSQI1MXSeqV$c1$cValmagf	dchg
V2 MAG	MSQI1MXSeqV$c2$cValmagf	dchg
V0 MAG	MSQI1MXSeqV$c3$cValmagf	dchg
Ia RMS	IaRMSGGIO17MXAnInmagf	dchg
Ib RMS	IbRMSGGIO18MXAnInmagf	dchg
Ic RMS	IcRMSGGIO19MXAnInmagf	dchg
Sync Freq	SYNCGGIO36MXAnInmagf	dchg
pa	MMXU2MXW$phsA$cValmagf	dchg
pb	MMXU2MXW$phsB$cValmagf	dchg
pc	MMXU2MXW$phsC$cValmagf	dchg

3p	MMXU2MXTotWmagf	dchg
qa	MMXU2MXVAr$phsA$cValmagf	dchg
qb	MMXU2MXVAr$phsB$cValmagf	dchg
qc	MMXU2MXVAr$phsC$cValmagf	dchg
3q	MMXU2MXTotVArmagf	dchg
sa	MMXU2MXVA$phsA$cValmagf	dchg
sb	MMXU2MXVA$phsB$cValmagf	dchg
sc	MMXU2MXVA$phsC$cValmagf	dchg
3s	MMXU2MXTotVAmagf	dchg
AI-1	AI1GGIO57MXAnInmagf	dchg
AI-2	AI1GGIO58MXAnInmagf	dchg
AI-3	AI1GGIO59MXAnInmagf	dchg
AI-4	AI1GGIO60MXAnInmagf	dchg
AI-5	AI1GGIO61MXAnInmagf	dchg
AI-6	AI1GGIO62MXAnInmagf	dchg
AI-7	AI1GGIO63MXAnInmagf	dchg
AI-8	AI1GGIO64MXAnInmagf	dchg
AI-1P	AI1GGIO65MXAnInmagf	dchg
AI-2P	AI1GGIO66MXAnInmagf	dchg
AI-3P	AI1GGIO67MXAnInmagf	dchg
AI-4P	AI1GGIO68MXAnInmagf	dchg
AI-5P	AI1GGIO69MXAnInmagf	dchg
AI-6P	AI1GGIO70MXAnInmagf	dchg
AI-7P	AI1GGIO71MXAnInmagf	dchg
AI-8P	AI1GGIO72MXAnInmagf	dchg

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Section 8

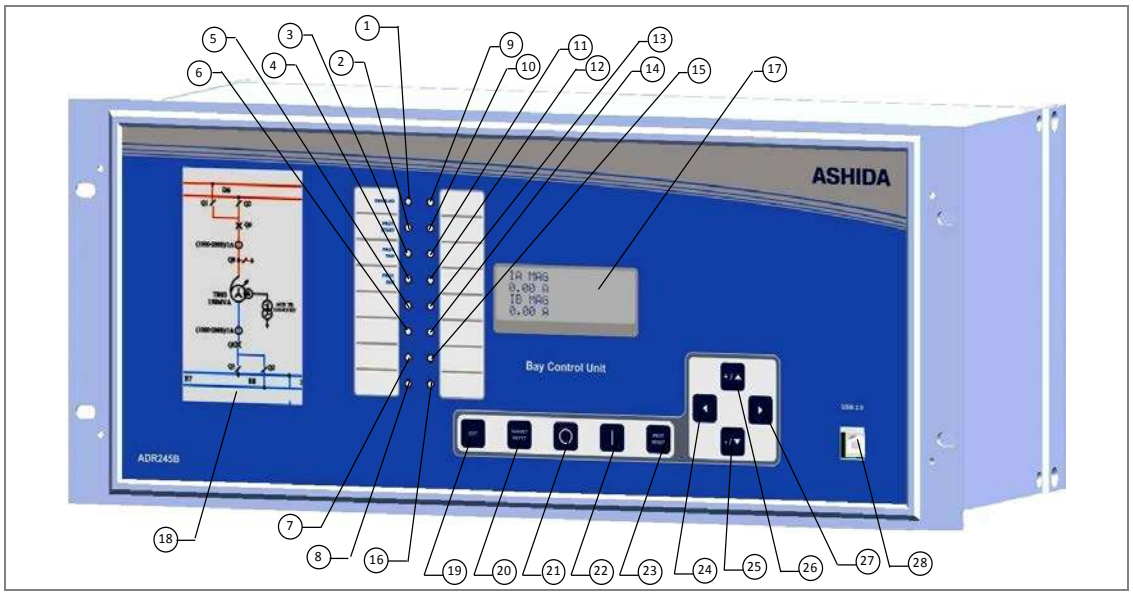
User Guide

Contents

8 USER GUIDE OVERVIEW

8.1 FRONT PANEL AND CONTROL

The HMI module is provided with 5" touch screen, 20x4 LCD, 9 numbers of soft feather touch keys and 16 numbers of dual LED's on the Front Panel of the BCU.



Sr. No.	Legend	Function
1.	L1	User Programmable Dual Colour LED Default Assignment : GREEN LED – Indicates BCU Enabled
2.	L2	User Programmable Dual Colour LED Default Assignment : GREEN LED – Indicates BCU Protection Start
3.	L3	User Programmable Dual Colour LED Default Assignment : RED LED – Indicates BCU Protection Trip
4.	L4	User Programmable Dual Colour LED
5.	L5	User Programmable Dual Colour LED
6.	L6	User Programmable Dual Colour LED
7.	L7	User Programmable Dual Colour LED
8.	L8	User Programmable Dual Colour LED
9.	L9	User Programmable Dual Colour LED
10.	L10	User Programmable Dual Colour LED
11.	L11	User Programmable Dual Colour LED

12.	L12	User Programmable Dual Colour LED
13.	L13	User Programmable Dual Colour LED
14.	L14	User Programmable Dual Colour LED
15.	L15	User Programmable Dual Colour LED
16.	L16	User Programmable Dual Colour LED
17.	LCD Display	20x4 LCD Display to observe settings and parameters of the BCU.
18.	Graphic Display	800x480 Graphic Display to observe SLD.
19.	EDIT	Feather Touch Key to 'EDIT' the setting
20.	TARGET RESET	Feather Touch Key 'TARGET RESET' to clear the fault LED indications, clear the Alarms and 'RESET' the Relay Contacts. To CANCEL the changes done in setting (By pressing this key all LED's ON for 1 sec and OFF)
21.	R	Feather Touch Key to select CB operation mode as Remote.
22.	L	Feather Touch Key to select CB operation mode as Local.
23.	PROT. RESET	Feather Touch Key "PROT. RESET" is provided for Hardware Reset. This key is interlocked with "TARGET RESET" key.
24.	◄	Feather Touch Key "Left Arrow" [◄] for navigating through the menus and submenus and also to **SAVE** the changes made in settings.
25.	+ /▲	Feather Touch Key "Plus" [+] to INCREMENT the values & the "Up Arrow" key [▲] to SCROLL the Main Menu up.
26.	- /▼	Feather Touch Key "Minus" [-] to 'DECREMENT' the values & the "Down Arrow" key [▼] to SCROLL the Main Menu down.
27.	►	Feather Touch Key Right Arrow [►] to VIEW the settings and to navigate through the menus and submenus.
28.	USB	USB communication Port

8.2 User interface

8.2.1 LCD Display

20x4 LCD with back lit is used as humans machine interface (HMI) for the followings:

- Display of BCU type, ID, model number and serial number
- Display of current software version
- Display of menu driven Protection Settings
- Display of online measurement of parameters
- Display of Date & Time.
- Display status of Current input.

- Display status of Voltage input.
- Display of fault data
- Display of Error Log for hardware and software faults

8.2.2 Graphic Display

- Display Single Line Diagram.
- Touch Screen.
- For Control Operation.
- Display of online measurement of parameters
- Display of Current status of all input.

8.2.3 Touch Keys

The function of BCU is controlled by the following keys provided on the Front Plate:

- "EDIT": Feather Touch Key "EDIT" is used to activate the settings to be modified (i.e. To activate the cursor).
- "TARGET RESET": Feather Touch Key 'TARGET RESET' is used to clear the fault LED indications, clear the Alarms and 'RESET' the Relay Contacts. To CANCEL the changes done in setting.
- "R" Feather Touch Key to select CB operation mode as Remote.
- "L" Feather Touch Key to select CB operation mode as Local.
- "PROT. RESET: Feather Touch Key "PROT. RESET" is used for Hardware Reset. This key is interlocked with TARGET RESET key.
- "(◄)" Left Arrow: Feather Touch Left arrow Key (◄) is used for navigating through the menus and submenus & to SAVE the changes done in setting.
- "(+ / ▲)" Plus / Up Arrow: Feather Touch Key Plus (+) is used to increment the setting value in the display. The UP Arrow (▲) is used to scroll the menu in up direction.
- "(- / ▼)" Minus / Down Arrow: Feather Touch Key Minus (-) is used to decrement the setting value in the display. The (▼) DOWN Arrow is used to scroll the menu in down direction.
- "(►)" Right Arrow: Feather Touch key Right Arrow (►) is used to VIEW the settings and to navigate through the menus and submenus.

Note: At the time of setting if changes are not carried within 100s then the display will reset itself and return to the main menu.

8.2.4 LEDS

The following Table explains the assignment process to LED. Here G represents Green LED and R Represent Red LED.

Sr. No.	Legend	Description
1	L1	User Programmable Dual Colour LED Default Assignment : GREEN LED – Indicates BCU Enabled
2	L2	User Programmable Dual Colour LED Default Assignment : GREEN LED – Indicates BCU Protection Start
3	L3	User Programmable Dual Colour LED Default Assignment : RED LED – Indicates BCU Protection Trip
4	L4	User Programmable Dual Colour LED
5	L5	User Programmable Dual Colour LED.
6	L6	User Programmable Dual Colour LED.
7	L7	User Programmable Dual Colour LED.
8	L8	User Programmable Dual Colour LED.
9	L9	User Programmable Dual Colour LED.
10	L10	User Programmable Dual Colour LED.
11	L11	User Programmable Dual Colour LED.
12	L12	User Programmable Dual Colour LED.
13	L13	User Programmable Dual Colour LED.
14	L14	User Programmable Dual Colour LED.
15	L15	User Programmable Dual Colour LED.
16	L16	User Programmable Dual Colour LED.

8.2.5 Communication ports

BCU is provided with open protocols like IEC 61850, MODBUS TCP/RTU, IEC60870-5-103 and IEC-104 for external communication.

1. USB port is provided at front side. It is used to retrieve Disturbance Records (last 10 faults); faults waveforms and parameterization using Relay Talk software.
2. RS485 (2 wire) port is provided at rear side and it is used for SCADA communication.
3. 2 no's of Ethernet Port (RJ45/FO) provided at rear side.
4. IRIG-B Port for time synchronisation (Optional).

8.3 EDITING PASSWORD / NEW PASSWORD and SAVING SETTINGS

MEASURMENT GLOBAL ▶ CB CONTOL REPORTING	This is default window showing the Main Menu. **Step 1**: By using Plus / Up arrow Key (+ /▲) or Minus / Down arrow key (- /▼) scroll the Main Menu / Group and select **GLOBAL** setting. **Step 2**: Press the right arrow key (▶) the BCU will display the next option.
General Settings ▶ Setting Group PORT F PORT 1	**Step 3**: By using Plus / Up arrow Key (+ /▲) or Minus / Down arrow key (- /▼) scroll the Main Menu / Group and select **General settings**. **Step 4**: Press the right arrow key (▶) the BCU will display the next option.
General Settings Password ****	This window will be displayed **Step 5**: Press the Edit Key to activate the settings
Password = 0001	This window will be display and the extreme right alpha / numerical number will start blinking. Note: The selected alpha / numerical number can be shifted right to left and left to right by using the left arrow key (◀) and Right Arrow key (▶).
Password = 0000	**Step 6**: Enter the previously set Password by using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼). **Step 7**: After editing the Password, press the EDIT Key.
Password = 0002 Wrong Password	This window is displayed; if in-corrected Password is entered and the display will move to the next option.

General Settings Password ****	
OR	
Password = 0000 Password OK	This window is displayed; if corrected Password is entered and the display will move to the next option.
General Settings Password 0000	This window will be display. **Step 8:** Enter the New Password by using the Plus / Up arrow key (+ / ▲) or the Minus / Down arrow key (- / ▼) option. [All Editable settings are password protected, so when the EDIT key is pressed it will display the password and the settable Alpha / Numerical value will start blinking]. The Password is four (4) digits alpha numeric. i.e. 0000 – zzzz/ZZZZ **Step 9:** After editing the Password, press the EDIT Key. The settable Alpha / Numerical value will stop blinking. **Step 10:** Press the Right arrow key (▶) to move to the next option
Press ◀ Key For Save Press Target Reset Key For Cancel	**Step 11**: Press the Left arrow key (◀) to **Save** the changes.
SAVE Settings	This window will flash for a moment and the control will return to the main menu.
ACTIVE GROUP MEASURMENT GLOBAL ▶ CB CONTOL	

Note: The User can use the Target Reset to Discard the settings.

Press ◄ Key **For Save** **Press Target Reset** **Key For Cancel**	**Step 1:** Press the **Target Reset** key to **Cancel** the Changes (i.e. to Discard the Settings)
DISCARD Settings	This window will flash for a moment and the control will return to the main menu.
ACTIVE GROUP **MEASURMENT** **GLOBAL ►** **CB CONTOL**	

RECOVER OF PASSWORD:

In case password is forgotten, then please contact the manufacturer.

The manufacture will provide One Time Password which will enable to set New Password.

For One Time Password the user must send the serial number, Date & Month display on BCU HMI. After receiving One Time Password, customer should follow the same procedure explain in Section 8 User Guide clause: 8.3 in instruction manual

8.4 MENUS

8.4.1 Default Display

After Power ON or when the TARGET RESET + PROT RESET Feather Touch Keys are pressed simultaneously; the BCU will display the following message.

ADR245B **Bay Control Unit**	This window will flash momentarily showing the following Type : **ADR245B** Name : Bay Control Unit

ID = 1 SW = V1.03	This window will flash momentarily showing the following Unit ID = **0001** Software Version = **V1.03**
IA MAG : 0.00 A IB MAG : 0.00 A	This is default window showing the Measurement Press the Right arrow key (▸) to move to the Main Menu.
MEASUREMENT ▸ GLOBAL CB CONTROL REPORTING	

8.4.2 Main Menu List

MEASUREMENT ▸ GLOBAL CB CONTROL REPORTING SYSTEM CONFIG PROTECTION Clear Records Output & LED Test GROUP 1 GROUP 2 GROUP 3 GROUP 4 ACTIVE GROUP	MEASUREMENT, GLOBAL, CB CONTROL, REPORTING, SYSTEM CONFIG, PROTECTION, Clear Records, Output & LED Test GROUP 1, GROUP 2, GROUP 3, GROUP 4 and ACTIVE GROUP. NOTE: Since the LCD Display consist only of 4 Lines, the Main Menu and their respective Sub Menu list can be scrolled up or down by using the Up Arrow key (▴) or the Down Arrow key (▾). The arrow pointer suggests that particular Main Menu is selected.

8.4.2.1 Main Menu List Details

MEASUREMENT ▸	This menu is to view **Measurement** i.e. Measurement 1, Measurement 2, Measurement 3 and Measurement 4. Press the Minus / Down arrow key (- / ▾) to move to the next option.

GLOBAL ▶	Password protected window for **"Global"** setting i.e. General Settings, Settings Group, Port F, Port 1, Port R, IRIG Port, Angle Calibration, Disturbance, Display Contrast & Date and Time. Press the Minus / Down arrow key (- /▼) to move to the next option.
CB CONTROL ▶	Password protected window for **"CB Control"** setting i.e. TCS Enable Disabled/ Logic High/ Logic Low, TCS Delay, CB Open S'vision Disabled/Enabled, CB Open Time, CB Oper. Alarm Disabled/Enabled, CB Oper. Counter, CB Control By Disabled/Local/Remote/Local+Remote, t CB Open Pulse and t CB Close Pulse, CB Monitoring Enabled/ Disabled, tCB Monitoring, Invalid DPI Dur H, Invalid DPI Dur I, Invalid DPI Dur J, Invalid DPI Dur K, Invalid DPI Dur L, Invalid DPI Dur M, Invalid DPI Dur N and Invalid DPI Dur O. Press the Minus / Down arrow key (- /▼) to move to the next option.
REPORTING ▶	This menu is to view **"Reporting"** i.e. Event, Status, Fault Records, Error Log, CB Data and Alarm Record. Press the Minus / Down arrow key (- /▼) to move to the next option.
SYSTEM CONFIG ▶	Password protected window for **"System Config"** setting i.e. CT/VT Ratio and Direction Setting. Press the Minus / Down arrow key (- /▼) to move to the next option.
PROTECTION ▶	Password protected window for **"Protection"** setting i.e. Reclosing Disabled/ Enabled, Breaker Failure Disabled/Enabled, CB Open Pole Disabled/Enabled, SOTF Disabled/Enabled, Sync Check Disabled/ Enabled (optional) and Analog Inputs Disabled/ Enabled (optional) Press the Minus / Down arrow key (- /▼) to move to the next option.

Clear Records ▶	Password protected window for **"Clear Records"** setting i.e. Events Yes/No, Faults Yes/No, Disturbance Yes/No, Error Record Yes/No, CB Data Yes/No, Thermal State Yes/No, Energy Yes/ No. Press the Minus / Down arrow key (- /▼) to move to the next option.
Output & LED Test ▶	Password protected window for **"Output & LED Test"** setting. i.e. Test Mode, Test Output J, Test Output K, Test Output L, Test Output M, Test Apply and Test LED. Press the Minus / Down arrow key (- /▼) to move to the next option.
GROUP 1 ▶	Password protected window for **"Group 1"** setting i.e. Reclosing, Breaker Failure, CB open Pole, SOTF, Sync Check and Analogue Inputs (**Optional**). NOTE: These setting are common to GROUP 2, GROUP 3 and GROUP 4. Press the Minus / Down arrow key (- /▼) to move to the next option.
ACTIVE GROUP ▶	This menu is to view **Active Group**. i.e. G1, G2, G3 and G4. Press the Minus / Down arrow key (- /▼) to move to the next option.
MEASUREMENT ▶	

8.4.3 Measurement

8.4.3.1 To View – Measurement 1

MEASUREMENTS ▶	This menu is to view **MEASUREMENT** i.e. Measurement 1, Measurement 2, Measurement 3 and Measurement 4. Note: Measurement 4 is Optional and is available only with Analogue Input Models. Press the Right arrow key (▶) to move to the next option.

Measurement 1 ▶ **Measurement 2** **Measurement 3** **Measurement 4**	By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **Measurement 1.** Press the Right arrow key (▶) to move to the next option.
IA MAG : **0.00 A** **IB MAG :** **0.00 A**	This window shows Primary Current in Phase A & Phase B. Press the Minus / Down arrow key (- /▼) to move to the next option.
IC MAG : **0.00 A** **IN MAG :** **0.00 A**	This window shows Primary Current in Phase C & Neutral. Press the Minus / Down arrow key (- /▼) to move to the next option.
IAB MAG : **0.00 A** **IBC MAG :** **0.00 A**	This window shows Primary Current in Phase AB & BC. Press the Minus / Down arrow key (- /▼) to move to the next option.
ICA MAG : **0.00 A** **Ia MAG :** **0.000 A**	This window shows Primary Current in Phase CA and Secondary Current in Phase a. Press the Minus / Down arrow key (- /▼) to move to the next option.
Ia ANG : **0 Deg** **Ib MAG :** **0.000 A**	This window shows angle of Phase a Current and Secondary Current in Phase b. Press the Minus / Down arrow key (- /▼) to move to the next option.
Ib ANG : **0 Deg** **Ic MAG :** **0.000 A**	This window shows angle of Phase b Current and Secondary Current in Phase c. Press the Minus / Down arrow key (- /▼) to move to the next option.

Ic ANG : **0 Deg** **In MAG :** **0.000 A**	This window shows angle of Phase c Current and Secondary Current in Neutral. Note : For SEF In MAG will be 0.0000A Press the Minus / Down arrow key (- /▼) to move to the next option.
In ANG : **0 Deg** **Iab MAG :** **0.00 A**	This window shows angle of Neutral Current and Secondary Current in Phase ab. Press the Minus / Down arrow key (- /▼) to move to the next option.
Iab ANG : **0 Deg** **Ibc MAG :** **0.00 A**	This window shows angle in Phase ab Current and Secondary Current in Phase bc. Press the Minus / Down arrow key (- /▼) to move to the next option.
Ibc ANG : **0 Deg** **Ica MAG :** **0.00 A**	This window shows angle of Phase bc Current and Secondary Current in Phase ca. Press the Minus / Down arrow key (- /▼) to move to the next option.
Ica ANG : **0 Deg** **I1 P MAG** **0.00 A**	This window shows angle in Phase CA Current and Primary Current of Positive sequence component. Press the Minus / Down arrow key (- /▼) to move to the next option.
I2 P MAG **0.00 A** **I1 MAG :** **0.000 A**	This window shows Primary Current of Negative sequence component and Secondary Current of Positive sequence component. Press the Minus / Down arrow key (- /▼) to move to the next option.
I1 ANG : **0 Deg** **I2 MAG :** **0.000 A**	This window shows angle of Positive Sequence Current and Secondary Current of Negative sequence component. Press the Minus / Down arrow key (- /▼) to move to the next option.

I2 ANG : 0 Deg I0 MAG : 0.000 A	This window shows angle of Negative Sequence Current and Secondary Current of Zero sequence component. Press the Minus / Down arrow key (- /▼) to move to the next option.
I0 ANG : 0 Deg 3I0 MAG : 0.000 A	This window shows angle of Zero Sequence Current and Secondary Current that is multiplied by three times of Zero sequence component. Press the Minus / Down arrow key (- /▼) to move to the next option.
I0/I1 : 0.00 pu I2/I1 : 0.00 pu	This window shows ratio of the Zero Sequence Current to positive sequence current and ratio of the Negative sequence current to positive sequence current. Press the Minus / Down arrow key (- /▼) to move to the next option.
Ia RMS 0.000 A Ib RMS 0.000 A	This window shows RMS Current in Phase A and RMS Current in Phase B. Press the Minus / Down arrow key (- /▼) to move to the next option.
Ic RMS 0.000 A VAN MAG 0.00 V	This window shows RMS Current in Phase C and Primary Voltage in phase A to Neutral. Press the Minus / Down arrow key (- /▼) to move to the next option.
VBN MAG : 0.00 V VCN MAG : 0.00 V	This window shows Primary Voltage in phase B to Neutral and Primary Voltage in phase C to Neutral. Press the Minus / Down arrow key (- /▼) to move to the next option.
VN MAG : 0.00 V VAB MAG : 0 V	This window shows Primary Voltage Measured Earth and Primary Voltage in phase AB. Press the Minus / Down arrow key (- /▼) to move to the next option.

OR	
VSYNC MAG : **0.00 V** **VAB MAG :** **0.00 V**	This window shows Primary Sync Voltage and Primary Voltage in phase AB. Note: Available with SYNC CHECK function only Press the Minus / Down arrow key (- /▼) to move to the next option.
VBC MAG : **0.00 V** **VCA MAG :** **0.00 V**	This window shows Primary Voltage in phase BC and Primary Voltage in phase CA. Press the Minus / Down arrow key (- /▼) to move to the next option.
Van MAG : **0.000 V** **Van ANG :** **0 Deg**	This window shows Secondary Voltage in Phase A to neutral and Angle of Voltage in Phase A to Neutral. Press the Minus / Down arrow key (- /▼) to move to the next option.
Vbn MAG : **0.000 V** **Vbn ANG :** **0 Deg**	This window shows Secondary Voltage in Phase B to neutral, and Angle of Voltage in Phase B to Neutral. Press the Minus / Down arrow key (- /▼) to move to the next option.
Vcn MAG : **0.000 V** **Vcn ANG :** **0 Deg**	This window shows Secondary Voltage in Phase C to neutral, and Angle of Voltage in Phase C to Neutral. Press the Minus / Down arrow key (- /▼) to move to the next option.
Vn MAG : **0.000 V** **Vn Angle** **0 Deg**	This window shows Secondary Measured Earth Fault Voltage and Angle of Secondary Measured Earth Fault Voltage. Press the Minus / Down arrow key (- /▼) to move to the next option.
OR	
VSync MAG : **0.000 V** **VSycn ANG :** **0 Deg**	This window shows Secondary Sync Voltage and Angle (**optional**). Note: Available with SYNC CHECK function only Press the Minus / Down arrow key (- /▼) to move to the next option.

Vab MAG : **0.000 V** **Vab ANG :** **0 Deg**	This window shows Secondary Voltage in Phase AB and Angle of Voltage in Phase AB. Press the Minus / Down arrow key (- /▼) to move to the next option.
Vbc MAG : **0.000 V** **Vbc ANG :** **0 Deg**	This window shows Secondary Voltage in Phase BC and Angle of Voltage in Phase BC. Press the Minus / Down arrow key (- /▼) to move to the next option.
Vca MAG : **0.000 V** **Vca ANG :** **0 Deg**	This window shows Secondary Voltage in Phase CA and Angle of Voltage in Phase CA. Press the Minus / Down arrow key (- /▼) to move to the next option.
V1 MAG : **0.00 V** **V1 ANG :** **0 Deg**	This window shows secondary Voltage in Positive sequence component and angle of positive sequence voltage. Press the Minus / Down arrow key (- /▼) to move to the next option.
V2 MAG : **0.00 V** **V2 ANG :** **0 Deg**	This window shows secondary Voltage in Negative sequence component and angle of Negative sequence voltage. Press the Minus / Down arrow key (- /▼) to move to the next option.
V0 MAG : **0.00 V** **V0 ANG :** **0 Deg**	This window shows secondary Voltage in Zero sequence component and angle of Zero sequence voltage. Press the Minus / Down arrow key (- /▼) to move to the next option.
3V0 MAG : **0.00 V** **Va RMS :** **0.01 V**	This window shows secondary Voltage multiplied by three times Zero sequence component and RMS Voltage in phase A Press the Minus / Down arrow key (- /▼) to move to the next option.

Vb RMS : **0.00 V** **Vc RMS :** **0.00 V**	This window shows RMS secondary Voltage in phase B and RMS secondary Voltage in phase C. Press the Minus / Down arrow key (- /▼) to move to the next option.
3HVan MAG **0.000 V** **3HVbn MAG** **0.000 V**	This window shows 3RD HRM Voltages of Phase A & Phase B. Press the Minus / Down arrow key (- /▼) to move to the next option.
3HVcn MAG **0.000 V** **3HVe MAG** **0.000 V**	This window shows 3RD HRM Voltages of Phase C & EF. Press the Minus / Down arrow key (- /▼) to move to the next option.
3HVn MAG **0.000 V** **Th State :** **0 %**	This window shows 3RD HRM Voltages of 3V0 and Thermal State Press the Minus / Down arrow key (- /▼) to move to the next option.
TrangA : **0.000 Deg** **TrangB** **0.000 Deg**	This window shows Torque angle of Phase A and Phase B Press the Minus / Down arrow key (- /▼) to move to the next option.
TrangC : **0.000 Deg** **TrangN** **0.000 Deg**	This window shows Torque angle of Phase C and EF Press the Minus / Down arrow key (- /▼) to move to the next option.
TrangV0N : **0.000 Deg** **TrangV0I0** **0.000 Deg**	This window shows Torque angle between 3V0 & IN and Torque angle between 3V0 & I0. Press the Minus / Down arrow key (- /▼) to move to the next option.

TrangV2N : 0.000 Deg TrangV2I0 0.000 Deg	This window shows Torque angle between V2 & IN and Torque angle between V2 & I0. Press the Right arrow key (▸) to move to the Main Menu.
MEASUREMENTS ▸	

8.4.3.2 To View – Measurement 2

MEASUREMENTS ▸	This menu is to view **MEASUREMENT** i.e. Measurement 1, Measurement 2, Measurement 3 and Measurement 4. Note: Measurement 4 is Optional and is available only with Analogue Input Models. Press the Right arrow key (▸) to move to the next option.
Measurement 1 Measurement 2 ▸ Measurement 3 Measurement 4	By using the Plus / Up arrow key (+ / ▴) or the Minus / Down arrow key (- / ▾) select **Measurement 2.** Press the Right arrow key (▸) to move to the next option.
pa : 0.000 W pb: 0.000 W	This window shows Real power of phase A and Real power of phase B in Secondary Press the Minus / Down arrow key (- / ▾) to move to the next option.
pc : 0.000 W 3p: 0.000 W	This window shows Real power of phase C and Real power of three phases ABC in Secondary. Press the Minus / Down arrow key (- / ▾) to move to the next option.
qa : 0.000 Var qb : 0.000 Var	This window shows Reactive power in Phase A and Reactive power in Phase B in Secondary. Press the Minus / Down arrow key (- / ▾) to move to the next option.

qc : 0.000 Var 3q : 0.000 Var	This window Reactive power in Phase C and Reactive power in three Phase ABC in Secondary. Press the Minus / Down arrow key (- /▼) to move to the next option.
sa : 0.000 VA sb : 0.000 VA	This window shows Apparent power in Phase A and Apparent power in Phase B in Secondary. Press the Minus / Down arrow key (- /▼) to move to the next option.
sc : 0.000 VA 3s : 0.000 VA	This window shows Apparent power in Phase C and Apparent power in three Phases ABC in Secondary. Press the Minus / Down arrow key (- /▼) to move to the next option.
PA : 0.000 KW PB : 0.000 KW	This window shows Real power of phase A and Real power of phase B in primary. Press the Minus / Down arrow key (- /▼) to move to the next option.
PC : 0.000 KW 3P : 0.000 KW	This window shows Real power of phase C and Real power of three phases ABC in primary. Press the Minus / Down arrow key (- /▼) to move to the next option.
QA : 0.000 KVar QB : 0.000 KVar	This window shows Reactive power in Phase A and Reactive power in Phase B in primary. Press the Minus / Down arrow key (- /▼) to move to the next option.
QC : 0.000 KVar 3Q : 0.000 KVar	This window Reactive power in Phase C and Reactive power in three Phase ABC in primary. Press the Minus / Down arrow key (- /▼) to move to the next option.

SA : 0.000 KVA SB : 0.000 KVA	This window shows Apparent power in Phase A and Apparent power in Phase B in primary. Press the Minus / Down arrow key (- /▼) to move to the next option.
SC : 0.000 KVA 3S : 0.000 KVA	This window shows Apparent power in Phase C and Apparent power in three Phases ABC in primary. Press the Minus / Down arrow key (- /▼) to move to the next option.
Max 3S 0.000 KVA Avg 3P 0.000 KW	This window shows Maximum Apparent power of three phase in Primary and Average Real power of three phase in Primary Press the Minus / Down arrow key (- /▼) to move to the next option.
Avg 3Q 0.000 KVar Avg 3S 0.000 KVA	This window shows Average Reactive power of three phase in Primary and Average Apparent power of three phase in Primary. Press the Minus / Down arrow key (- /▼) to move to the next option.
Ph Freq : 0.000 Hz Sync Freq: 0.000 Hz	This window shows frequency of power network and. Measured Sync Frequency. (**Optional available with SYNC CHECK function only**). Press the Minus / Down arrow key (- /▼) to move to the next option.
df/dt 0.000 Hz/s PFA : 100.000 %	This window shows rate of change of frequency and Power Factor in Phase A, Press the Minus / Down arrow key (- /▼) to move to the next option.
PFB : 100.000 % PFC : 100.000 %	This window shows and Power Factor in Phase B and Power Factor in Phase C. Press the Minus / Down arrow key (- /▼) to move to the next option.

3PF : 100.000 % kwh+ : 0.000 kwh	This window shows Power Factor in Three Phases and Three phase real power exported Press the Minus / Down arrow key (- /▼) to move to the next option.
Kwh- : 0.000 kwh kvrh+ : 0.000 kvrh	This window shows Three phase real power imported and Three phase reactive power exported. Press the Minus / Down arrow key (- /▼) to move to the next option.
Kvrh- : 0.000 kvrh Pow Dem 0.000 kwh	This window shows Three phase reactive power imported and three phase real power of demand period. Press the Right arrow key (▶) to move to the Main Menu.
MEASUREMENTS ▶	

8.4.3.3 To View – Measurement 3

MEASUREMENTS ▶	This menu is to view **MEASUREMENT** i.e. Measurement 1, Measurement 2, Measurement 3 and Measurement 4. Note: Measurement 4 is Optional and is available only with Analogue Input Models. Press the Right arrow key (▶) to move to the next option.
Measurement 1 Measurement 2 Measurement 3 ▶ Measurement 4	By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **Measurement 3.** Press the Right arrow key (▶) to move to the next option.
Za MAG : 0.000 Ohms Za ANG : 0.000 Deg	This window shows Phase A Impedance and angle of Phase A Impedance. Press the Minus / Down arrow key (- /▼) to move to the next option.

Ra MAG : **0.000 Ohms** **Xa MAG :** **0.000 Ohms**	This window shows Phase A secondary Resistance and Phase A secondary Reactance. Press the Minus / Down arrow key (- /▼) to move to the next option.
Zb MAG: **0.000 Ohms** **Zb ANG :** **0.000 Deg**	This window shows Phase B secondary Impedance and angle of Phase B Impedance. Press the Minus / Down arrow key (- /▼) to move to the next option.
Rb MAG : **0.000 Ohms** **Xb MAG :** **0.000 Ohms**	This window shows Phase B secondary Resistance and Phase B secondary Reactance. Press the Minus / Down arrow key (- /▼) to move to the next option.
Zc MAG: **0.000 Ohms** **Zc ANG :** **0.000 Deg**	This window shows Phase C secondary Impedance and angle of Phase C Impedance. Press the Minus / Down arrow key (- /▼) to move to the next option.
Rc MAG : **0.000 Ohms** **Xc MAG :** **0.000 Ohms**	This window shows Phase C secondary Resistance and Phase C secondary Reactance. Press the Minus / Down arrow key (- /▼) to move to the next option.
Zab MAG: **0.000 Ohms** **Zab ANG :** **0.000 Deg**	This window shows Phase AB secondary Impedance and angle of Phase AB Impedance. Press the Minus / Down arrow key (- /▼) to move to the next option.
Rab MAG : **0.000 Ohms** **Xab MAG :** **0.000 Ohms**	This window shows Phase AB secondary Resistance and Phase AB secondary Reactance. Press the Minus / Down arrow key (- /▼) to move to the next option.

Zbc MAG: **0.000 Ohms** **Zbc ANG :** **0.000 Deg**	This window shows Phase BC secondary Impedance and angle of Phase BC Impedance. Press the Minus / Down arrow key (- /▼) to move to the next option.
Rbc MAG : **0.000 Ohms** **Xbc MAG :** **0.000 Ohms**	This window shows Phase BC secondary Resistance and Phase BC secondary Reactance. Press the Minus / Down arrow key (- /▼) to move to the next option.
Zca MAG: **0.000 Ohms** **Zca ANG :** **0.000 Deg**	This window shows Phase CA secondary Impedance and angle of Phase CA Impedance Press the Minus / Down arrow key (- /▼) to move to the next option.
Rca MAG : **0.000 Ohms** **Xca MAG :** **0.000 Ohms**	This window shows Phase CA secondary Resistance and Phase CA secondary Reactance. Press the Minus / Down arrow key (- /▼) to move to the next option.
Z1 MAG : **0.000 Ohms** **Z1 ANG :** **0.000 Deg**	This window shows positive sequence secondary Impedance and angle of positive sequence Impedance. Press the Minus / Down arrow key (- /▼) to move to the next option.
R1 MAG : **0.000 Ohms** **X1 MAG :** **0.000 Ohms**	This window shows positive sequence secondary Resistance and positive sequence secondary Reactance. Press the Minus / Down arrow key (- /▼) to move to the next option.
Z2 MAG : **0.000 Ohms** **Z2 ANG :** **0.000 Deg**	This window shows Negative sequence secondary Impedance and angle of Negative sequence Impedance Press the Minus / Down arrow key (- /▼) to move to the next option.

R2 MAG : 0.000 Ohms X2 MAG : 0.000 Ohms	This window shows Negative sequence secondary Resistance and Negative sequence secondary Reactance. Press the Minus / Down arrow key (- /▼) to move to the next option.
Z0 MAG : 0.000 Ohms Z0 ANG : 0.000 Deg	This window shows Zero sequence secondary Impedance and angle of Zero sequence Impedance Press the Minus / Down arrow key (- /▼) to move to the next option.
R0 MAG : 0.000 Ohms X0 MAG : 0.000 Ohms	This window shows Zero sequence secondary Resistance and Zero sequence secondary Reactance. Press the Right arrow key (▶) to move to the Main Menu.
MEASUREMENTS ▶	

8.4.3.4 To View – Measurement 4 (Optional)

MEASUREMENTS ▶	This menu is to view **MEASUREMENT** i.e. Measurement 1, Measurement 2, Measurement 3 and Measurement 4. Note: Measurement 4 is Optional and is available only with Analogue Input Models. Press the Right arrow key (▶) to move to the next option.
Measurement 1 Measurement 2 Measurement 3 Measurement 4 ▶	By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **Measurement 4.** Press the Right arrow key (▶) to move to the next option.
AI – 1 0.000 mA AI – 2 0.000 mA	This window shows Analogue Input measured Parameters for AI-1 and AI-2 Press the Minus / Down arrow key (- /▼) to move to the next option.

AI – 3 0.000 mA AI – 4 0.000 mA	This window shows Analogue Input measured Parameters for AI-3 and AI-4 Press the Minus / Down arrow key (- /▼) to move to the next option.
AI – 5 0.000 mA AI – 6 0.000 mA	This window shows Analogue Input measured Parameters for AI-5 and AI-6 Press the Minus / Down arrow key (- /▼) to move to the next option.
AI – 7 0.000 mA AI – 8 0.000 mA	This window shows Analogue Input measured Parameters for AI-7 and AI-8 Press the Minus / Down arrow key (- /▼) to move to the next option.
AI – 1P 0.000 mA AI – 2P 0.000 mA	This window shows Analogue Input Primary measured Parameters for AI-1P and AI-2P Press the Minus / Down arrow key (- /▼) to move to the next option.
AI – 3P 0.000 mA AI – 4P 0.000 mA	This window shows Analogue Input Primary measured Parameters for AI-3P and AI-4P Press the Minus / Down arrow key (- /▼) to move to the next option.
AI – 5P 0.000 mA AI – 6P 0.000 mA	This window shows Analogue Input Primary measured Parameters for AI-5P and AI-6P Press the Minus / Down arrow key (- /▼) to move to the next option.
AI – 7P 0.000 mA AI – 8P 0.000 mA	This window shows Analogue Input Primary measured Parameters for AI-7P and AI-8P Press the Right arrow key (▶) to move to the Main Menu.

MEASUREMENTS ▶	

8.4.4 GLOBAL

8.4.4.1 Global Setting – Menu List

GLOBAL ▶	Editable Setting Password protected window for **"Global"** setting. i.e. General Settings, Settings Group, Port F, Port 1, Port R, IRIG Port, Angle Calibration, Disturbance, Display Contrast & Date and Time. Press the Right arrow key (▸) to move to the next option.
General Settings ▶	Editable Setting Password protected window for **"General Settings"** i.e. Password, FID, SID, Phase Rotation, System Frequency, Opto I/P Supply, CB Scheme, Select Pole, CB Operation, Remote Operation, tRPassword, Local Operation, tLPassword, Config Port, Timesync Master, Description, Model Number, Serial Number, Software Version Hardware Version, Virtual Scheme 1, Virtual Scheme 2, CT Select Model, Sync Function, Sync Start and Sync Phase. Press the Minus / Down arrow key (- / ▾) to move to the next option.
Settings Group ▶	Editable Setting Password protected window for **"Settings Group"** i.e. Factory Defaults, Active Group, Copy From, Copy To, G1, G2, G3 and G4. Press the Minus / Down arrow key (- / ▾) to move to the next option.
PORT F ▶	Read-only setting To View **"PORT F"** setting i.e. Unit ID, Baud Rate and Set Parity. Press the Minus / Down arrow key (- / ▾) to move to the next

	option.
PORT 1 ▶	Editable Setting Password protected window for **"PORT 1"** setting i.e. Unit ID, IP Address, Subnet Mask, Default Gateway, Pri. SNTP, Sec. SNTP, Protocol, Ethernet Mode, Operating Mode and Primary. Press the Minus / Down arrow key (- /▼) to move to the next option.
PORT R ▶	Editable Setting Password protected window for **"PORT R"** setting i.e. Unit ID, Baud Rate and Set Parity. Press the Minus / Down arrow key (- /▼) to move to the next option.
IRIG Port ▶	Editable Setting Password protected window for **"IRIG Port"** setting i.e. IRIG Port. Press the Minus / Down arrow key (- /▼) to move to the next option.
Angle Calibration ▶	Editable Setting Password protected window for **"Angle Calibration"** setting. i.e. R Angle Offset, Y Angle Offset, B Angle Offset and E Angle Offset, Press the Minus / Down arrow key (- /▼) to move to the next option.
Disturbance ▶	Editable Setting Password protected window for **"Disturbance"** setting i.e. Post Trigger and Sampling Press the Minus / Down arrow key (- /▼) to move to the next option.
Display Contrast ▶	Read-Only Setting Password protected window for **"Display Contrast"** setting i.e. Contrast Set. Press the Minus / Down arrow key (- /▼) to move to the next

	option.
Date and Time ▶	Editable Setting Password protected window for **"Date and Time"** setting i.e. Local Time Enable, Local Time Offset, DST Enable, RP Time Zone, SET Hours, SET Minutes, SET Seconds, SET Date, SET Month and SET Year. Press the Left arrow key (◀) to move to the Main Menu.
GLOBAL ▶	

8.4.4.2 General Setting

GLOBAL ▶	Password protected window for **"Global"** setting. i.e. General Settings, Settings Group, Port F, Port 1, Port R, IRIG Port, Angle Calibration, Disturbance, Display Contrast & Date and Time. Press the Right arrow key (▶) to move to the next option.
General Setting ▶	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **General Setting**. Password protected window for **"General Settings"** i.e. Password, FID, SID, Phase Rotation, System Frequency, Opto I/P Supply, CB Scheme, Select Pole, CB Operation, Remote Operation, tRPassword, Local Operation, tLPassword, Config Port, Timesync Master, Description, Model Number, Serial Number, Software Version Hardware Version, Virtual Scheme 1, Virtual Scheme 2, CT Select Model, Sync Function, Sync Start and Sync Phase. Press the Right arrow key (▶) to move to the next option.
General Setting Password * * * *	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **Password** can be set. i.e. 0000 – zzzz/ZZZZ. (Refer Password settings)

	Press the Minus / Down arrow key (- /▼) to move to the next option.
General Setting **FID** **Feeder_ID**	Read-only setting This window shows the **FID** of the BCU. Press the Minus / Down arrow key (- /▼) to move to the next option.
General Setting **SID** **SubStn_ID**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **SID** can be set i.e. 0-9, a-z & A-Z. (Refer Password settings) Press the Minus / Down arrow key (- /▼) to move to the next option.
General Setting **Phase Rotation** **ABC**	Read-only setting This window shows the **Phase Rotation** as ABC. Press the Minus / Down arrow key (- /▼) to move to the next option.
General Setting **System Frequency** **50Hz**	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **System Frequency** can be set i.e. 50Hz / 60Hz. Press the Minus / Down arrow key (- /▼) to move to the next option.
General Setting **Opto I/P Supply** **DC**	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **Opto I/P Supply** can be set i.e. DC / AC. Press the Minus / Down arrow key (- /▼) to move to the next option.
General Setting **CB Scheme** **Gang Operated**	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **CB Scheme** can be set i.e. Gang Operated / Pole Operated.

	Press the Minus / Down arrow key (- /▼) to move to the next option.
General Setting **Select Pole** **3P**	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **Select Pole** can be set i.e. 3P / P1 / P2 / P3. Press the Minus / Down arrow key (- /▼) to move to the next option.
General Setting **CB Operation** **No Operation**	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **CB Operation** can be set i.e. CB Open / CB Close / No Operation. Press the Minus / Down arrow key (- /▼) to move to the next option.
General Setting **Remote Operation** **Enabled**	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **Remote Operation** can be set i.e. No Operation / Enabled / Time Enabled. Press the Minus / Down arrow key (- /▼) to move to the next option.
General Setting **tRPassword** **0.50s** **Range 0.01 – 50s**	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **tRPassword** can be set i.e. The setting range is from 0.01s to 50s in step of 0.01s Press the Minus / Down arrow key (- /▼) to move to the next option.
General Setting **Local Operation** **Enabled**	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **Local Operation** can be set i.e. No Operation / Enabled / Time Enabled. Press the Minus / Down arrow key (- /▼) to move to the next option.

General Setting **tLPassword** **0.50s** **Range 0.01 – 50s**	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **tLPassword** can be set i.e. The setting range is from 0.01s to 50s in step of 0.01s Press the Minus / Down arrow key (- /▼) to move to the next option.
General Setting **Config Port** **PORT F**	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **Config Port** can be set i.e. PORT F / PORT 1 Press the Minus / Down arrow key (- /▼) to move to the next option.
General Setting **Timesync Master** **PORT F**	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **Timesync Master** can be set i.e. PORT F / PORT 1 / IRIG B. Press the Minus / Down arrow key (- /▼) to move to the next option.
General Setting **Description** **ASHIDA ADR245B M3**	Read-only setting This window shows the **Description** of the BCU. Press the Minus / Down arrow key (- /▼) to move to the next option.
General Setting **Model Number** **ADR245BM3xxxxxxxxxB**	Read-only setting This window shows the **Model Number** of the BCU. Press the Minus / Down arrow key (- /▼) to move to the next option.
General Setting **Serial Number** **xxx245Bxxxx**	Read-only setting This window shows the **Serial Number** of the BCU. Press the Minus / Down arrow key (- /▼) to move to the next option.

General Setting **Software Version** **245BM3xxxxxxxVx.xx**	Read-only setting This window shows the **Software Version** of the BCU. Press the Minus / Down arrow key (- /▼) to move to the next option.
General Setting **Hardware Version** **Vx.xx**	Read-only setting This window shows the **Hardware Version** of the BCU. Press the Minus / Down arrow key (- /▼) to move to the next option.
General Setting **Virtual Scheme 1** **Disabled**	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **Virtual Scheme 1** can be set i.e. Disabled / Enabled. Press the Minus / Down arrow key (- /▼) to move to the next option.
General Setting **Virtual Scheme 2** **Disabled**	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **Virtual Scheme 2** can be set i.e. Disabled / Enabled. Press the Minus / Down arrow key (- /▼) to move to the next option.
General Setting **Select CT Model** **0X0000**	Read-Only setting This window shows the **Select CT Model** of the BCU. Press the Minus / Down arrow key (- /▼) to move to the next option.
General Setting **Sync Function** **Disabled**	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **Sync Function** can be set i.e. Disabled / Enabled. Note: If set as Disabled the Sync Function is Blocked, Press the Minus / Down arrow key (- /▼) to move to the next option.

General Setting Sync Start No Operation	Editable setting (available if Sync function is Enabled) By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **Sync Start** can be set i.e. No Operation / Enabled. Press the Minus / Down arrow key (- /▼) to move to the next option.
General Setting Sync Phase AB	Editable setting (available if Sync function is Enabled) By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **Sync Phase** can be set. i.e. AB / BC / CA Press the Right arrow key (▶) to move to the next option.
Press ◀ Key For Save Press Target Reset Key For Cancel	Press the Left arrow key (◀) to **Save** the changes.
SAVE Settings	This window will flash for a moment and it will move to the Main Menu.
GLOBAL ▶	

8.4.4.3 Settings Group

8.4.4.3.1 Settings Group (If Disabled / Enabled)

GLOBAL ▶	Password protected window for **"Global"** setting. i.e. General Settings, Settings Group, Port F, Port 1, Port R, IRIG Port, Angle Calibration, Disturbance, Display Contrast & Date and Time. Press the Right arrow key (▶) to move to the next option.

Settings Group ▶	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **Settings Group**. Password protected window for **"Settings Group"** i.e. Factory Defaults, Active Group, Copy From, Copy To, G1, G2, G3 and G4. Press the Right arrow key (▶) to move to the next option.
Settings Group **Factory Defaults** **No Operation**	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **Factory Defaults** can be set i.e. All Settings, No Operation, Setting Group 1, Setting Group 2, Setting Group 3 and Setting Group 4. Press the Minus / Down arrow key (- /▼) to move to the next option.
Settings Group **Active Group** **G1**	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **Active Group** can be set i.e. G1 / G2 / G3 / G4. Press the Minus / Down arrow key (- /▼) to move to the next option.
Settings Group **Copy from** **G1**	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **Copy from** can be set i.e. G1 / G2 / G3 / G4. Press the Minus / Down arrow key (- /▼) to move to the next option.
Settings Group **Copy to** **No Operation**	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **Copy to** can be set i.e. No Operation / G1 / G2 / G3 / G4. Press the Minus / Down arrow key (- /▼) to move to the next option.

Settings Group **G1** **Enabled**	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **G1** can be set i.e. Disabled / Enabled / TimeEnabled. Note : When set as Enabled Press the Minus / Down arrow key (- /▼) to move to the next option.
Settings Group **G2** **Enabled**	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **G2** can be set i.e. Disabled / Enabled / TimeEnabled. Note : When set as Enabled Press the Minus / Down arrow key (- /▼) to move to the next option.
Settings Group **G3** **Enabled**	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **G3** can be set i.e. Disabled / Enabled / TimeEnabled. Note : When set as Enabled Press the Minus / Down arrow key (- /▼) to move to the next option.
Settings Group **G4** **Enabled**	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **G4** can be set i.e. Disabled / Enabled / TimeEnabled. Note : When set as Enabled Press the Right arrow key (▶) to move to the next option.
Press ◀ Key **For Save** **Press Target Reset** **Key For Cancel**	Press the Left arrow key (◀) to **Save** the changes.

SAVE Settings	This window will flash for a moment and it will move to the Main Menu.
GLOBAL ▶	

8.4.4.3.2 Setting Group (If set as Time Enabled)

GLOBAL ▶	Password protected window for **"Global"** setting. i.e. General Settings, Settings Group, Port F, Port 1, Port R, IRIG Port, Angle Calibration, Disturbance, Display Contrast & Date and Time. Press the Right arrow key (▶) to move to the next option.
Settings Group ▶	Editable Setting By using the Plus / Up arrow key (+ / ▲) or the Minus / Down arrow key (- / ▼) select **Settings Group**. Password protected window for **"Settings Group"** i.e. Factory Defaults, Active Group, Copy From, Copy To, G1, G2, G3 and G4. Press the Right arrow key (▶) to move to the next option.
Settings Group **Factory Defaults** **No Operation**	Editable setting By using the Plus / Up arrow key (+ / ▲) or the Minus / Down arrow key (- / ▼) select **Factory Defaults** can be set i.e. All Settings, No Operation, Setting Group 1, Setting Group 2, Setting Group 3 and Setting Group 4. Press the Minus / Down arrow key (- / ▼) to move to the next option.
Settings Group **Active Group** **G1**	Editable setting By using the Plus / Up arrow key (+ / ▲) or the Minus / Down arrow key (- / ▼) select **Active Group** can be set i.e. G1 / G2 / G3 / G4. Press the Minus / Down arrow key (- / ▼) to move to the next

	option.
Settings Group **Copy from** **G1**	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **Copy from** can be set i.e. G1 / G2 / G3 / G4. Press the Minus / Down arrow key (- /▼) to move to the next option.
Settings Group **Copy to** **No Operation**	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **Copy to** can be set i.e. No Operation / G1 / G2 / G3 / G4. Press the Minus / Down arrow key (- /▼) to move to the next option.
Settings Group **G1** **TimeEnabled**	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **G1** can be set i.e. Disabled / Enabled / TimeEnabled. Note : When set as TimeEnabled Press the Minus / Down arrow key (- /▼) to move to the next option.
Settings Group **GroupChange Delay** **5.0 s** **Range 0 – 400 s**	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **Groupchange Delay** can be set i.e. The setting range is from 0 to 400s in step of 0.1s. Press the Minus / Down arrow key (- /▼) to move to the next option.
Settings Group **G2** **TimeEnabled**	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **G2** can be set i.e. Disabled / Enabled / TimeEnabled. Note : When set as TimeEnabled Press the Minus / Down arrow key (- /▼) to move to the next option.

Settings Group **GroupChange Delay** **5.0 s** **Range 0 – 400 s**	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **Groupchange Delay** can be set i.e. The setting range is from 0 to 400s in step of 0.1s. Press the Minus / Down arrow key (- /▼) to move to the next option.
Settings Group **G3** **TimeEnabled**	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **G3** can be set i.e. Disabled / Enabled / TimeEnabled. Note : When set as TimeEnabled Press the Minus / Down arrow key (- /▼) to move to the next option.
Settings Group **GroupChange Delay** **5.0 s** **Range 0 – 400 s**	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **Groupchange Delay** can be set i.e. The setting range is from 0 to 400s in step of 0.1s. Press the Minus / Down arrow key (- /▼) to move to the next option.
Settings Group **G4** **TimeEnabled**	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **G4** can be set i.e. Disabled / Enabled / TimeEnabled. Note : When set as TimeEnabled Press the Minus / Down arrow key (- /▼) to move to the next option.
Settings Group **GroupChange Delay** **5.0 s** **Range 0 – 400 s**	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **Groupchange Delay** can be set i.e. The setting range is from 0 to 400s in step of 0.1s. Press the Right arrow key (►) to move to the next option.

Press ◄ Key For Save Press Target Reset Key For Cancel	Press the Left arrow key (◄) to **Save** the changes.
SAVE Settings	This window will flash for a moment and it will move to the Main Menu.
GLOBAL ►	

8.4.4.4 PORT F

GLOBAL ►	Password protected window for **"Global"** setting. i.e. General Settings, Settings Group, Port F, Port 1, Port R, IRIG Port, Angle Calibration, Disturbance, Display Contrast & Date and Time. Press the Right arrow key (►) to move to the next option.

PORT F ►	Read-only setting By using the Plus / Up arrow key (+ / ▲) or the Minus / Down arrow key (- / ▼) select **PORT F**. This window shows **"PORT F"** setting i.e. Unit ID, Baud Rate and Set Parity. Press the Right arrow key (►) to move to the next option.
PORT F Unit ID 1	Read-only setting This window shows the **Unit ID** of the BCU. Press the Minus / Down arrow key (- / ▼) to move to the next option.

PORT F Baud Rate 57600 BPS	Read-only setting This window shows the **Baud Rate** of the BCU. Press the Minus / Down arrow key (- /▼) to move to the next option.
PORT F Set Parity None	Read-only setting This window shows the **Set Parity** of the BCU. Press the Right arrow key (▶) to move to the Main Menu.
GLOBAL ▶	

8.4.4.5 PORT 1

GLOBAL ▶	Password protected window for **"Global"** setting. i.e. General Settings, Settings Group, Port F, Port 1, Port R, IRIG Port, Angle Calibration, Disturbance, Display Contrast & Date and Time. Press the Right arrow key (▶) to move to the next option.
PORT 1 ▶	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **PORT 1.** Password protected window for **"PORT 1"** setting i.e. Unit ID, IP Address, Subnet Mask, Default Gateway, Pri. SNTP, Sec. SNTP, Protocol, Ethernet Mode, Operating Mode and Primary Press the Right arrow key (▶) to move to the next option.
PORT 1 Unit ID 1 Range 1 – 250	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the **Unit ID** address can be set**.** The setting range is from 001 to 250 in step of 001, which means total 250 devices can be connected to single computer. These settings are required to communicate with the SCADA computer. Press the Minus / Down arrow key (- /▼) to move to the next option.

PORT 1 **IP Address =** **192.168.001.121** **Range 0 – 255**	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the **IP Address** can be set in each of the decimal section. The setting range is from 0 to 255 in step of 1. *As per Editing Password setting.* Press the Minus / Down arrow key (- /▼) to move to the next option.
PORT 1 **Subnet Mask =** **255.255.255.000** **Range 0 – 255**	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the **Subnet Mask** can be set in each decimal section. The setting range is from 0 to 255 in step of 1. *As per Editing Password setting.* Press the Minus / Down arrow key (- /▼) to move to the next option.
PORT 1 **Default Gateway =** **192.168.001.001** **Range 0 – 255**	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the **Default Gateway** can be set in each decimal section. The setting range is from 0 to 255 in step of 1. *As per Editing Password setting.* Press the Minus / Down arrow key (- /▼) to move to the next option.
PORT 1 **Pri. SNTP =** **192.168.001.100** **Range 0 – 255**	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the **Pri. SNTP** can be set in each decimal section. The setting range is from 0 to 255 in step of 1. *As per Editing Password setting.* Press the Minus / Down arrow key (- /▼) to move to the next option.
PORT 1 **Sec. SNTP =** **192.168.001.110** **Range 0 – 255**	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the **Sec. SNTP** can be set in each decimal section. The setting range is from 0 to 255 in step of 1. *As per Editing Password setting.* Press the Minus / Down arrow key (- /▼) to move to the next

	option.
PORT 1 **Protocol** **Disabled**	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **Protocol** can be set i.e. Disabled / Enabled. Press the Minus / Down arrow key (- /▼) to move to the next option.
PORT 1 **Ethernet Mode** **Dual**	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **Ethernet Mode** can be set i.e. Dual / Fixed. Press the Minus / Down arrow key (- /▼) to move to the next option.
PORT 1 **Operating Mode** **Fail Over**	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **Operating Mode** can be set i.e. Fail Over / Switch Over. Press the Minus / Down arrow key (- /▼) to move to the next option.
PORT 1 **Primary** **LAN2**	Editable setting (Available if Operating Mode is set as Fail Over) By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **Primary** can be set. i.e. LAN1 / LAN2 Press the Right arrow key (▶) to move to the next option.
For PRP Model	
PORT 1 **Ethernet Mode** **Dual**	Read Only setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **Ethernet Mode** can be set i.e. Dual. Press the Minus / Down arrow key (- /▼) to move to the next option.

PORT 1 Operating Mode PRP	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **Operating Mode** can be set i.e. PRP / HSR. Press the Minus / Down arrow key (- /▼) to move to the next option.
PORT 1 Primary LAN2	Read Only setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **Primary** can be set. i.e. LAN2 Press the Right arrow key (▶) to move to the next option.
Press ◀ Key For Save Press Target Reset Key For Cancel	Press the Left arrow key (◀) to **Save** the changes.
SAVE Settings	This window will flash for a moment and it will move to the Main Menu.
GLOBAL ▶	

8.4.4.6 PORT R

GLOBAL ▶	Password protected window for **"Global"** setting. i.e. General Settings, Settings Group, Port F, Port 1, Port R, IRIG Port, Angle Calibration, Disturbance, Display Contrast & Date and Time. Press the Right arrow key (▶) to move to the next option.
PORT R ▶	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **PORT R.** Password protected window for **"PORT R"** setting i.e. Unit ID,

	Baud Rate and Set Parity. Press the Right arrow key (▸) to move to the next option.
PORT R Unit ID 1 Range 1 – 247	Read-only setting This window shows the **Unit ID** of the BCU. Press the Minus / Down arrow key (- /▾) to move to the next option.
PORT R Baud Rate 57600	Read-only setting This window shows the **Baud Rate** of the BCU. Press the Minus / Down arrow key (- /▾) to move to the next option.
PORT R Set Parity Even	Read-only setting This window shows the **Set Parity** of the BCU. Press the Right arrow key (▸) to move to the Main Menu.
Press ◂ Key For Save Press Target Reset Key For Cancel	Press the Left arrow key (◂) to **Save** the changes.
SAVE Settings	This window will flash for a moment and it will move to the Main Menu.
GLOBAL ▸	

8.4.4.7 IRIG Port (Optional)

GLOBAL ▸	Password protected window for **"Global"** setting. i.e. General Settings, Settings Group, Port F, Port 1, Port R, IRIG Port, Angle Calibration, Disturbance, Display Contrast & Date and Time.

	Press the Right arrow key (▸) to move to the next option.
IRIG Port ▸	Editable Setting By using the Plus / Up arrow key (+ / ▲) or the Minus / Down arrow key (- / ▼) select **IRIG Port.** Password protected window for **"IRIG Port"** setting. Press the Right arrow key (▸) to move to the next option.
IRIG Port **IRIG Port** **Disabled**	Editable setting By using the Plus / Up arrow key (+ / ▲) or the Minus / Down arrow key (- / ▼) the **IRIG Port** can be set i.e. Disabled / Enabled. Press the Right arrow key (▸) to move to the next option.
Press ◂ Key **For Save** **Press Target Reset** **Key For Cancel**	Press the Left arrow key (◂) to **Save** the changes.
SAVE Settings	This window will flash for a moment and it will move to the Main Menu.
GLOBAL ▸	

8.4.4.8 Angle Calibration

GLOBAL ▸	Password protected window for **"Global"** setting. i.e. General Settings, Settings Group, Port F, Port 1, Port R, IRIG Port, Angle Calibration, Disturbance, Display Contrast & Date and Time. Press the Right arrow key (▸) to move to the next option.

Angle Calibration ▶	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **Angle Calibration**. Password protected window for **"Angle Calibration"** setting i.e. R Angle Offset, Y Angle Offset, B Angle Offset and E Angle Offset. Press the Right arrow key (▶) to move to the next option.
Angle Calibration **R Angle Offset** **0.00** **Range 0 – 359.9**	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) **R Angle Offset** can be set. The setting range is from 0 to 359.90 in step of 0.01. Note: For calibration at manufacturer side only. Press the Minus / Down arrow key (- /▼) to move to the next option.
Angle Calibration **Y Angle Offset** **0.00** **Range 0 – 359.9**	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) **Y Angle Offset** can be set. The setting range is from 0 to 359.90 in step of 0.01. Note: For calibration at manufacturer side only. Press the Minus / Down arrow key (- /▼) to move to the next option.
Angle Calibration **B Angle Offset** **0.00** **Range 0 – 359.9**	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) **B Angle Offset** can be set. The setting range is from 0 to 359.90 in step of 0.01. Note: For calibration at manufacturer side only. Press the Minus / Down arrow key (- /▼) to move to the next option.
Angle Calibration **E Angle Offset** **0.00** **Range 0 – 359.9**	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) **E Angle Offset** can be set. The setting range is from 0 to 359.90 in step of 0.01. Note: For calibration at manufacturer side only. Press the Right arrow key (▶) to move to the next option.

Press ◄ Key For Save Press Target Reset Key For Cancel	Press the Left arrow key (◄) to **Save** the changes.
SAVE Settings	This window will flash for a moment and it will move to the Main Menu.
GLOBAL ►	

8.4.4.9 DISTURBANCE

GLOBAL ►	Password protected window for **"Global"** setting. i.e. General Settings, Settings Group, Port F, Port 1, Port R, IRIG Port, Angle Calibration, Disturbance, Display Contrast & Date and Time. Press the Right arrow key (►) to move to the next option.
Disturbance ►	Editable Setting By using the Plus / Up arrow key (+ / ▲) or the Minus / Down arrow key (- / ▼) select **Disturbance.** Password protected window for **"Disturbance"** setting i.e. Post Trigger and Sampling. Press the Right arrow key (►) to move to the next option.
Disturbance Post Trigger 10 % Range 5 – 95%	Editable setting By using the Plus / Up arrow key (+ / ▲) or the Minus / Down arrow key (- / ▼) **Post Trigger** can be set. The setting range is from 5% to 95% in step of 1%. Press the Minus / Down arrow key (- / ▼) to move to the next option.

Disturbance Sampling RAW Samples	Read-Only This window shows the **Sampling** selection of BCU. Press the Right arrow key (▸) to move to the next option.
Press ◂ Key For Save Press Target Reset Key For Cancel	Press the Left arrow key (◂) to **Save** the changes.
SAVE Settings	This window will flash for a moment and it will move to the Main Menu.
GLOBAL ▸	

8.4.4.10 Display Contrast

GLOBAL ▸	Password protected window for **"Global"** setting. i.e. General Settings, Settings Group, Port F, Port 1, Port R, IRIG Port, Angle Calibration, Disturbance, Display Contrast & Date and Time. Press the Right arrow key (▸) to move to the next option.
Display Contrast ▸	Read-only setting By using the Plus / Up arrow key (+ / ▴) or the Minus / Down arrow key (- / ▾) select **Display Contrast.** Press the Right arrow key (▸) to move to the next option.
Display contrast Contrast Set 15%	Read-only setting This window shows the **Contrast Set**. Press the Right arrow key (▸) to move to the Main Menu.

GLOBAL ▶	

8.4.4.11 Date and Time

8.4.4.11.1 Date and Time (If Disabled)

GLOBAL ▶	Password protected window for **"Global"** setting. i.e. General Settings, Settings Group, Port F, Port 1, Port R, IRIG Port, Angle Calibration, Disturbance, Display Contrast & Date and Time. Press the Right arrow key (▸) to move to the next option.
Date And Time ▶	Editable Setting By using the Plus / Up arrow key (+ / ▲) or the Minus / Down arrow key (- / ▼) select **Date And Time**. Password protected window for **"Date and Time"** setting. i.e. Local Time Enable, DST Enable, RP Time Zone, SET Hours, SET Minutes, SET Seconds, SET Date, SET Month and SET Year. Press the Right arrow key (▸) to move to the next option.
Date And Time **Date/Time** **Tm: 18:26:15** **Dt : 19/03/18**	Read-only setting This window shows the set **Date & Time** Press the Minus / Down arrow key (- / ▼) to move to the next option.
Date And Time **LocalTime Enable** **Disabled**	Editable Setting By using the Plus / Up arrow key (+ / ▲) or the Minus / Down arrow key (- / ▼) the desired **Local Time Enable** can be set. i.e. Disabled / Fixed / Flexible. Press the Minus / Down arrow key (- / ▼) to move to the next option.
Date And Time **DST Enabled** **Disabled**	Read-only setting This window shows the **DST Enable** setting. Press the Minus / Down arrow key (- / ▼) to move to the next

	option.
Date And Time **RP Time Zone** **Local**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **RP Time Zone** can be set i.e. Local / UTC Press the Minus / Down arrow key (- /▼) to move to the next option.
Date And Time **SET Hours** **14** **Range 0 – 23**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **SET Hours** can be set. The setting range is from 0 to 23 in step of 1. Press the Minus / Down arrow key (- /▼) to move to the next option.
Date And Time **SET Minutes** **14 Mins** **Range 0 – 59Mins**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **SET Minutes** can be set. The setting range is from 0 to 59 in step of 1. Press the Minus / Down arrow key (- /▼) to move to the next option.
Date And Time **SET Seconds** **14 s** **Range 0 – 59s**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **SET Seconds** can be set. The setting range is from 0 to 59 in step of 1. Press the Minus / Down arrow key (- /▼) to move to the next option.
Date And Time **SET Date** **19** **Range 1 – 31**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **SET Date** can be set. The setting range is from 1 to 31 in step of 1. Press the Minus / Down arrow key (- /▼) to move to the next option.

Date And Time **SET Month** **03** **Range 1 – 12**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **SET Month** can be set. The setting range is from 1 to 12 in step of 1. Press the Minus / Down arrow key (- /▼) to move to the next option.
Date And Time **SET Year** **18** **Range 0 – 99**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **SET Year** can be set. The setting range is from 0 to 99 in step of 1. Press the Right arrow key (▶) to move to the next option.
Press ◀ Key **For Save** **Press Target Reset** **Key For Cancel**	Press the Left arrow key (◀) to **Save** the changes.
SAVE Settings	This window will flash for a moment and it will move to the Main Menu.
GLOBAL ▶	

8.4.4.11.2 Date and Time (If Enabled)

GLOBAL ▶	Password protected window for **"Global"** setting. i.e. General Settings, Settings Group, Port F, Port 1, Port R, IRIG Port, Angle Calibration, Disturbance, Display Contrast & Date and Time. Press the Right arrow key (▶) to move to the next option.

Date And Time ▶	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **Date and Time**. Password protected window for **"Date and Time"** setting i.e. Local Time Enable, (Local Time Offset), DST Enable, RP Time Zone, SET Hours, SET Minutes, SET Seconds, SET Date, SET Month and SET Year. Press the Right arrow key (▶) to move to the next option.
Date And Time **Date/Time** **Tm: 18:26:15** **Dt: 08/07/20**	Read-only This window shows the set Date & Time Press the Minus / Down arrow key (- /▼) to move to the next option.
Date And Time **LocalTime Enable** **Fixed**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **Local Time Enable** can be set i.e. Disabled / Fixed / Flexible. Press the Minus / Down arrow key (- /▼) to move to the next option.
Date And Time **LocalTime Offset** **0 mins** **Range -720 – 720mins**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **Local Time Offset** can be set. The setting range is from -720 mins to 720 mins in step 15 mins. Press the Minus / Down arrow key (- /▼) to move to the next option.
Date And Time **DST Enabled** **Disabled**	Read-only setting This window shows the **DST Enable** setting. Press the Minus / Down arrow key (- /▼) to move to the next option.
Date And Time **RP Time Zone** **Local**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **RP Time Zone** can be set. i.e. Local / UTC

	Press the Minus / Down arrow key (- /▼) to move to the next option.
Date And Time **SET Hours** **14** **Range 0 – 23**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **SET Hours** can be set. The setting range is from 0 to 23 in step of 1. Press the Minus / Down arrow key (- /▼) to move to the next option.
Date And Time **SET Minutes** **14 Mins** **Range 0 – 59Mins**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **SET Minutes** can be set. The setting range is from 0 to 59 in step of 1. Press the Minus / Down arrow key (- /▼) to move to the next option.
Date And Time **SET Seconds** **14 s** **Range 0 – 59s**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **SET Seconds** can be set. The setting range is from 0 to 59 in step of 1. Press the Minus / Down arrow key (- /▼) to move to the next option.
Date And Time **SET Date** **19** **Range 1 – 31**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **SET Date** can be set. The setting range is from 1 to 31 in step of 1. Press the Minus / Down arrow key (- /▼) to move to the next option.
Date And Time **SET Month** **03** **Range 1 – 12**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **SET Month** can be set. The setting range is from 1 to 12 in step of 1. Press the Minus / Down arrow key (- /▼) to move to the next option.

Date And Time **SET Year** **18** **Range 0 – 99**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **SET Year** can be set. The setting range is from 0 to 99 in step of 1. Press the Right arrow key (►) to move to the next option.
Press ◄ Key **For Save** **Press Target Reset** **Key For Cancel**	Press the Left arrow key (◄) to **Save** the changes.
SAVE Settings	This window will flash for a moment and it will move to the Main Menu.
GLOBAL ►	

8.4.5 CB CONTROL

8.4.5.1 CB Control (If Disabled)

CB CONTROL ►	Password protected window for **"CB Control"** setting i.e. TCS Enable Disabled/ Logic High/ Logic Low, TCS Delay, CB Open S'vision Disabled/Enabled, CB Open Time, CB Oper. Alarm Disabled/Enabled, CB Oper. Counter, CB Control By Disabled/Local/Remote/Local+Remote, t CB Open Pulse and t CB Close Pulse, CB Monitoring Enabled/ Disabled, tCB Monitoring, Invalid DPI Dur H, Invalid DPI Dur I, Invalid DPI Dur J, Invalid DPI Dur K, Invalid DPI Dur L, Invalid DPI Dur M, Invalid DPI Dur N and Invalid DPI Dur O. Press the Right arrow key (►) to move to the next option.
CB CONTROL **TCS Enable** **Disabled**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **TCS Enable** can be set i.e. Disabled/Logic Low/Logic High.

	Press the Minus / Down arrow key (- /▼) to move to the next option.
CB CONTROL **CB Open S'vision** **Disabled**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **CB Open Supervision** can be set i.e. Disabled / Enabled. Press the Minus / Down arrow key (- /▼) to move to the next option.
CB CONTROL **CB Oper. Alarm** **Disabled**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **CB Oper. Alarm** can be set i.e. Disabled / Enabled. Press the Minus / Down arrow key (- /▼) to move to the next option.
CB CONTROL **CB Control by** **Disabled**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **CB Control By** can be set i.e. Disabled / Local / Remote / Local + Remote. Press the Minus / Down arrow key (- /▼) to move to the next option.
CB CONTROL **CB Monitoring** **Disabled**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **CB Monitoring** can be set i.e. Disabled / Enabled. Press the Minus / Down arrow key (- /▼) to move to the next option.
CB CONTROL **Invalid DPI Dur H** **1 s** **Range 1-600s**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **Invalid DPI Dur H** can be set The setting range is from 1 to 600 sec in step of 1 sec. Press the Minus / Down arrow key (- /▼) to move to the next option.

CB CONTROL **Invalid DPI Dur I** **1 s** **Range 1-600s**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **Invalid DPI Dur I** can be set The setting range is from 1 to 600 sec in step of 1 sec. Press the Minus / Down arrow key (- /▼) to move to the next option.
CB CONTROL **Invalid DPI Dur J** **0 s** **Range 1-600s**	Read-only setting This window shows the **Invalid DPI Dur J** setting. Press the Minus / Down arrow key (- /▼) to move to the next option.
CB CONTROL **Invalid DPI Dur K** **0 s** **Range 1-600s**	Read-only setting This window shows the **Invalid DPI Dur K** setting. Press the Minus / Down arrow key (- /▼) to move to the next option.
CB CONTROL **Invalid DPI Dur L** **0 s** **Range 1-600s**	Read-only setting This window shows the **Invalid DPI Dur L** setting. Press the Minus / Down arrow key (- /▼) to move to the next option.
CB CONTROL **Invalid DPI Dur M** **0 s** **Range 1-600s**	Read-only setting This window shows the **Invalid DPI Dur M** setting. Press the Minus / Down arrow key (- /▼) to move to the next option.
CB CONTROL **Invalid DPI Dur N** **1 s** **Range 1-600s**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **Invalid DPI Dur N** can be set The setting range is from 1 to 600 sec in step of 1 sec. Press the Minus / Down arrow key (- /▼) to move to the next option.
CB CONTROL **Invalid DPI Dur O** **1 s** **Range 1-600s**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **Invalid DPI Dur O** can be set The setting range is from 1 to 600 sec in step of 1 sec.

	Press the Right arrow key (▸) to move to the next option.
Press ◂ Key For Save Press Target Reset Key For Cancel	Press the Left arrow key (◂) to **Save** the changes.
SAVE Settings	This window will flash for a moment and it will move to the Main Menu.
CB CONTROL ▸	

8.4.5.2 CB Control (If Enabled)

CB CONTROL ▸	Password protected window for **"CB Control"** setting i.e. TCS Enable Disabled/ Logic High/ Logic Low, TCS Delay, CB Open S'vision Disabled/Enabled, CB Open Time, CB Oper. Alarm Disabled/Enabled, CB Oper. Counter, CB Control By Disabled/Local/Remote/Local+Remote, t CB Open Pulse and t CB Close Pulse, CB Monitoring Enabled/ Disabled, tCB Monitoring, Invalid DPI Dur H, Invalid DPI Dur I, Invalid DPI Dur J, Invalid DPI Dur K, Invalid DPI Dur L, Invalid DPI Dur M, Invalid DPI Dur N and Invalid DPI Dur O. Press the Right arrow key (▸) to move to the next option.
CB CONTROL TCS Enable Logic Low	Editable Setting By using the Plus / Up arrow key (+ / ▴) or the Minus / Down arrow key (- / ▾) the desired **TCS Enable** can be set i.e. Disabled / Logic Low / Logic High. Press the Right arrow key (▸) to move to the next option.

CB CONTROL **TCS Delay** **5.0 S** **Range 0.1 – 10.0s**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **TCS Delay** can be set. The setting range is from 0.1s to 10.0s in step of 10ms. Press the Left arrow key (◄) to move to the next option.
CB CONTROL **CB Open S'vision** **Enabled**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **CB Open Supervision** can be set i.e. Disabled / Enabled. Press the Right arrow key (►) to move to the next option.
CB CONTROL **CB Open Time** **300 ms** **Range 50 – 1000ms**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **CB Open Time** can be set. The setting range is from 50ms to 1000ms in step of 10ms Press the Left arrow key (◄) to move to the next option.
CB CONTROL **CB Oper. Alarm** **Enabled**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **CB Oper. Alarm** can be set i.e. Disabled / Enabled. Press the Right arrow key (►) to move to the next option.
CB CONTROL **CB Oper. Counter** **20000** **Range 10 – 50000**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **CB operation counter** can be set. The setting range is from 10 to 50000 in step of 1. Press the Left arrow key (◄) to move to the next option.
CB CONTROL **CB Control by** **Local**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **CB Control By** can be set i.e. Disabled / Local / Remote / Local + Remote. Press the Right arrow key (►) to move to the next option.

CB CONTROL **t CB Open Pulse** **0.50 s** **Range 0.1 – 50s**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **t CB Open Pulse** can be set. The setting range is from 0.10s to 50s in step of 0.01s Press the Minus / Down arrow key (- /▼) to move to the next option.
CB CONTROL **t CB Close Pulse** **0.50 s** **Range 0.1 – 50s**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **t CB Close Pulse** can be set. The setting range is from 0.10s to 50s in step of 0.01s Press the Left arrow key (◄) to move to the next option.
CB CONTROL **CB Monitoring** **Disabled**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **CB Monitoring** can be set i.e. Disabled / Enabled. Press the Right arrow key (►) to move to the next option.
CB CONTROL **t CB Monitoring** **0.50 s** **Range 0.1-50s**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **t CB Monitoring** can be set. The setting range is from 0.1 to 50 sec in step of 0.01 sec. Press the Left arrow key (◄) to move to the next option.
CB CONTROL **Invalid DPI Dur H** **1 s** **Range 1-600s**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **Invalid DPI Dur H** can be set. The setting range is from 1 to 600 sec in step of 1 sec. Press the Minus / Down arrow key (- /▼) to move to the next option.
CB CONTROL **Invalid DPI Dur I** **1 s** **Range 1-600s**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **Invalid DPI Dur I** can be set. The setting range is from 1 to 600 sec in step of 1 sec. Press the Minus / Down arrow key (- /▼) to move to the next option.

CB CONTROL **Invalid DPI Dur J** **0 s** **Range 1-600s**	Read-only setting This window shows the **Invalid DPI Dur J** setting. Press the Minus / Down arrow key (- /▼) to move to the next option.
CB CONTROL **Invalid DPI Dur K** **0 s** **Range 1-600s**	Read-only setting This window shows the **Invalid DPI Dur K** setting. Press the Minus / Down arrow key (- /▼) to move to the next option.
CB CONTROL **Invalid DPI Dur L** **0 s** **Range 1-600s**	Read-only setting This window shows the **Invalid DPI Dur L** setting. Press the Minus / Down arrow key (- /▼) to move to the next option.
CB CONTROL **Invalid DPI Dur M** **0 s** **Range 1-600s**	Read-only setting This window shows the **Invalid DPI Dur M** setting. Press the Minus / Down arrow key (- /▼) to move to the next option.
CB CONTROL **Invalid DPI Dur N** **1 s** **Range 1-600s**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **Invalid DPI Dur N** can be set. The setting range is from 1 to 600 sec in step of 1 sec. Press the Minus / Down arrow key (- /▼) to move to the next option.
CB CONTROL **Invalid DPI Dur O** **1 s** **Range 1-600s**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **Invalid DPI Dur O** can be set. The setting range is from 1 to 600 sec in step of 1 sec. Press the Right arrow key (▶) to move to the next option.
Press ◀ Key **For Save** **Press Target Reset** **Key For Cancel**	Press the Left arrow key (◀) to **Save** the changes.

SAVE Settings	This window will flash for a moment and it will move to the Main Menu.
CB CONTROL ▶	

8.4.6 REPORTING

REPORTING ▶	This menu is to view **"Reporting"** i.e. Event, Status, Fault Record, Error Log, CB Data and Alarm Record. Press the Right arrow key (▸) to move to the next option.
Event	This menu is to view **"Event"** Press the Minus / Down arrow key (- / ▾) to move to the next option.
Status	This menu is to view **"Status"** Press the Minus / Down arrow key (- / ▾) to move to the next option.
Fault Record	This menu is to view **"Fault Records"** Press the Minus / Down arrow key (- / ▾) to move to the next option.
Error Log	This menu is to view **"Error Log"** Press the Minus / Down arrow key (- / ▾) to move to the next option.

CB Data	This menu is to view **"CB Data"** Press the Minus / Down arrow key (- /▼) to move to the next option.
Alarm Record	This menu is to view **"Alarm Record"** Press the Left arrow key (◄) to move to the Main Menu.
REPORTING	

8.4.6.1 Events

8.4.6.1.1 To View – Events

Reporting ►	This menu is to view **"Reporting"** i.e. Event, Status, Fault Record, Error Log, CB Data and Alarm Record. Press the Right arrow key (►) to move to the next option.
Event ►	By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **"Event"** Press the Right arrow key (►) to move to the next option.
Event Num = 18	This window shows Event Number (i.e. Event Num 18) By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) you can select any "**Event Num"** Press the Right arrow key (►) to move to the next option.
Event Num = 18 **Date : 11/07/2020** **Time : 09:24:25:050**	This window shows Date and Time of the selected Event number Press the Minus / Down arrow key (- /▼) to move to the next option.

Event Num = 18 Th Trip ON	This window shows type & actual status of the event Press the Right arrow key (▸) to move to the Main Menu.
Reporting ▸	

8.4.6.2 Status

8.4.6.2.1 To View – Status

Reporting ▸	This menu is to view **"Reporting"** i.e. Event, Status, Fault Record, Error Log, CB Data and Alarm Record. Press the Right arrow key (▸) to move to the next option.
Status ▸	By using the Plus / Up arrow key (+ / ▴) or the Minus / Down arrow key (- / ▾) select **"Status"** Press the Right arrow key (▸) to move to the next option.
H1 In : 87654321 00000000 H2 In : 87654321 00000000	This window shows actual status of Digital Inputs Press the Minus / Down arrow key (- / ▾) to move to the next option.
I1 In : 87654321 00000000 I2 In : 87654321 00000000	This window shows actual status of Digital Inputs Press the Minus / Down arrow key (- / ▾) to move to the next option.
N1 In : 87654321 00000000 N2 In : 87654321 00000000	This window shows actual status of Digital Inputs Press the Minus / Down arrow key (- / ▾) to move to the next option.

O1 In : 87654321 00000000 O2 In : 87654321 00000000	This window shows actual status of Digital Inputs Press the Minus / Down arrow key (- /▼) to move to the next option.
J Out : 87654321 00000000 K Out : 87654321 00000000	This window shows actual status of Digital Output Press the Minus / Down arrow key (- /▼) to move to the next option.
L Out : 87654321 00000000 M Out : 87654321 00000000	This window shows actual status of Digital Output Press the Right arrow key (▶) to move to the Main Menu.
Reporting ▶	

8.4.6.3 Fault Record

8.4.6.3.1 To View – Fault Record

Reporting ▶	This menu is to view **"Reporting"** i.e. Event, Status, Fault Record, Error Log, CB Data and Alarm Record. Press the Right arrow key (▶) to move to the next option.
Fault Record ▶	By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **"Fault Record"** Press the Right arrow key (▶) to move to the next option.
Fault Num = 01	This window shows Fault Record (i.e. Fault Number 01 to 10) Press the Right arrow key (▶) to move to the next option.

Protection Trip **TC : 0** **Date: 10/07/2020** **Time: 10:39:25:527**	This window shows Type of fault, the Trip Counter, Date and time of the Fault. Press the Minus / Down arrow key (- /▼) to move to the next option.
Fault clear Time **0.000sec**	This window shows Fault clear Time of the Fault. Press the Right arrow key (▶) to move to the Main Menu.
Reporting ▶	

8.4.6.4 Error Log

8.4.6.4.1 To View – Error Log

Reporting ▶	This menu is to view **"Reporting"** i.e. Event, Status, Fault Record, Error Log, CB Data and Alarm Record. Press the Right arrow key (▶) to move to the next option.
Error Log ▶	By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **"Error Log"** Press the Right arrow key (▶) to move to the next option.
Maint Rec Num = **70** **Error Cod = 00000002** **RTC Error**	This window shows number of maintenance record with error code & error type Press the Right arrow key (▶) to move to the next option.
Errorcod : 00000002 **RTC Error** **21/06/2020** **10:39:25:527**	This window shows Date and Time of the Error. Press the Right arrow key (▶) to move to the Main Menu.

Reporting ▶	

8.4.6.5 CB Data

8.4.6.5.1 To View – CB Data

Reporting ▶	This menu is to view **"Reporting"** i.e. Event, Status, Fault Record, Error Log, CB Data and Alarm Record. Press the Right arrow key (▸) to move to the next option.
CB Data ▶	By using the Plus / Up arrow key (+ / ▲) or the Minus / Down arrow key (- / ▼) select **"CB Data"** Press the Right arrow key (▸) to move to the next option.
TC = 0 3PBOT = 0 mSec 3PBOC = 0 Recl Cnt 3P = 0	This window shows Tripping counter, Breaker Opening Time, Breaker Operation Counter & Reclose Counter of Three Pole. Press the Right arrow key (▸) to move to the next option.
P1BOT = 0 mSec P1BOC = 0 Recl Cnt P1 = 0	This window shows Breaker Opening Time, Breaker Operation Counter & Reclose Counter of Pole 1. Press the Right arrow key (▸) to move to the next option.
P2BOT = 0 mSec P2BOC = 0 Recl Cnt P2 = 0	This window shows Breaker Opening Time, Breaker Operation Counter & Reclose Counter of Pole 2. Press the Right arrow key (▸) to move to the next option.
P3BOT = 0 mSec P3BOC = 0 Recl Cnt P3 = 0	This window shows Breaker Opening Time, Breaker Operation Counter & Reclose Counter of Pole 3. Press the Right arrow key (▸) to move to the Main Menu.

Reporting ▶	

8.4.6.6 Alarm Record

8.4.6.6.1 To View – Alarm Record

Reporting ▶	This menu is to view **"Reporting"** i.e. Event, Status, Fault Record, Error Log, CB Data and Alarm Record. Press the Right arrow key (▸) to move to the next option.
Alarm Record ▶	By using the Plus / Up arrow key (+ / ▲) or the Minus / Down arrow key (- / ▼) select **"Alarm Record"** Press the Right arrow key (▸) to move to the next option.
TCS Alarm	This window shows Type of Alarm Press the Right arrow key (▸) to move to the next option.
21/06/2020 19:11:46:780	This window shows Date & Time of Alarm operation Press the Right arrow key (▸) to move to the Main Menu.
Reporting ▶	

8.4.7 System Config

8.4.7.1 System Config – Menu List

SYSTEM CONFIG ▶	Password protected window for **"System Config"** setting i.e. CT/VT Ratios and Direction Set. Press the Right arrow key (▶) to move to the next option.
CT/VT RATIOS ▶	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **CT/VT Ratios**. Password protected window for **"CT/VT Ratios"** setting i.e. PH CT Secondary, PH CT Primary, EF CT Secondary, EF CT Primary, PH VT Primary, PH VT Selection (Line to Ground) and PH VT Secondary, Sync VT Primary, Sync VT Selection (Line to Line) and Sync VT Secondary, setting Values and Fix Dem Period. Press the Minus / Down arrow key (- /▼) to move to the next option.
Direction Set ▶	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **Direction Set.** Password protected window for **"Direction Set"** setting. i.e. Phase MTA, Ground MTA, 3Io MTA and Open Delta Volt. Press the Left arrow key (◀) to move to the Main Menu.
SYSTEM CONFIG ▶	

8.4.7.2 CT/VT Ratios – System Config

SYSTEM CONFIG ▶	Password protected window for **"System Config"** setting. i.e. CT/VT Ratios and Direction Set. Press the Right arrow key (▶) to move to the next option.

CT/VT RATIOS ▶	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **CT/VT Ratios**. Password protected window for **"CT/VT Ratios"** setting i.e. PH CT Secondary, PH CT Primary, EF CT Secondary, EF CT Primary, PH VT Primary, PH VT Selection (Line to Ground) and PH VT Secondary, Sync VT Primary, Sync VT Selection (Line to Line) and Sync VT Secondary, setting Values and Fix Dem Period. Press the Right arrow key (▶) to move to the next option.
CT/VT RATIOS **PH CT Secondary** **1 A**	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) **PH CT Secondary** can be set i.e. 1A. / 5A. Note: Care should be taken to see proper connections are established at the back terminal, i.e. between Com. and 1 while selecting 1Amp and between Com. and 5 while selecting 5Amp. Press the Minus / Down arrow key (- /▼) to move to the next option.
CT/VT RATIOS **PH CT Primary** **10 A** **Range 10 – 30000A**	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) **PH CT Primary** can be set. The setting range is from 10 to 30000A in step of 1A. Press the Minus / Down arrow key (- /▼) to move to the next option.
CT/VT RATIOS **EF CT Secondary** **1 A**	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) **EF CT Secondary** can be set i.e. 1A. / 5A. Note: Care should be taken to see proper connections are established at the Back Terminal, i.e. between Com. and 1 while selecting 1Amp and between Com. and 5 while selecting 5Amp. Press the Minus / Down arrow key (- /▼) to move to the next option.

CT/VT RATIOS **EF CT Primary** **10 A** **Range 10 – 30000A**	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) **EF CT Primary** can be set. The setting range is from 10 to 30000A in step of 1A. Press the Minus / Down arrow key (- /▼) to move to the next option.
CT/VT RATIOS **PH VT Primary** **1.0 KV** **Range 1 – 800KV**	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) **PH VT Primary** can be set. The setting range is from 1KV to 800KV in step of 0.1KV. Press the Minus / Down arrow key (- /▼) to move to the next option.
CT/VT RATIOS **PH VT Selection** **Line to Ground**	Read-only setting This window shows the **PH VT Selection** (Line to Ground). Press the Minus / Down arrow key (- /▼) to move to the next option.
CT/VT RATIOS **PH VT Secondary** **63.5V** **Range 50 – 150V**	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) **PH VT Secondary** can be set. The setting range is from 50V to 150V in step of 0.1V. Press the Minus / Down arrow key (- /▼) to move to the next option.
CT/VT RATIOS **Sync VT Primary** **1.00 KV** **Range 0.1 – 1000KV**	Editable setting (Available if Sync function is Enabled) By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) **Sync VT Primary** can be set. The setting range is from 1.0V to 1000KV in step of 0.1V. Press the Minus / Down arrow key (- /▼) to move to the next option.
CT/VT RATIOS **Sync VT Selection** **Line to Line**	Read-only setting (Available if Sync function is Enabled) This window shows the **Sync VT Selection** (Line to Line). Press the Minus / Down arrow key (- /▼) to move to the next option.

CT/VT RATIOS **Sync VT Secondary** **110.0 V** **Range 50 – 150V**	Editable setting (Available if Sync function is Enabled) By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) **Sync VT Secondary** can be set. The setting range is from 50V to 150V in step of 0.1V. Press the Minus / Down arrow key (- /▼) to move to the next option.
CT/VT RATIOS **Setting Values** **Secondary**	Read-only setting This window shows the **Setting Values** i.e. Secondary. Press the Minus / Down arrow key (- /▼) to move to the next option.
CT/VT RATIOS **Fix Dem Period** **15 mins** **Range 1 – 99mins**	Editable setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) **Fix Dem Period** can be set. The setting range is from 1 to 99mins in step of 1min. Press the Right arrow key (▶) to move to the next option.
Press ◀ Key **For Save** **Press Target Reset** **Key For Cancel**	Press the Left arrow key (◀) to **Save** the changes.
SAVE Settings	This window will flash for a moment and it will move to the Main Menu.
SYSTEM CONFIG ▶	

8.4.8 PROTECTION

PROTECTION ▶	Password protected window for **"Protection"** setting. i.e. Max Phase OC Disabled/ Enabled, Phase OC Disabled/Enabled, Ground OC Disabled/Enabled, Residual OC Disabled/ Enabled, Sequence OC Disabled/Enabled, Under Voltage(27) Disabled/Enabled, Over Voltage(59) Disabled/Enabled, Residual OV (59N) Disabled/Enabled, Sequence OV Disabled/Enabled, Frequency (81) Disabled/ Enabled, df/dt (81R) Disabled/Enabled, Power Factor(55) Disabled/Enabled, I2/I1 (46BC) Disabled/Enabled, I0/I1 (50BC) Disabled/Enabled, VT Supervision Disabled/ Enabled, CT Supervision Disabled/Enabled, Reclosing Disabled/Enabled, Breaker Failure Disabled/Enabled, Undercurrent Disabled/Enabled, Thermal Overload Disabled/Enabled, Power Protection Disabled/ Enabled, Voltage Depend OC Disabled/Enabled, CB Open Pole Disabled/Enabled, SOTF Disabled/Enabled, Sync Check Disabled/Enabled and Analog Inputs Disabled/ Enabled (optional) Press the Right arrow key (▸) to move to the next option.
PROTECTION **Max Phase OC** **Enabled**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **Max Phase OC** can be set i.e. Disabled / Enabled. Press the Minus / Down arrow key (- /▼) to move to the next option.
PROTECTION **Phase OC** **Enabled**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **Phase OC** can be set i.e. Disabled / Enabled. Press the Minus / Down arrow key (- /▼) to move to the next option.
PROTECTION **Ground OC** **Enabled**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **Ground OC** can be set i.e. Disabled / Enabled. Press the Minus / Down arrow key (- /▼) to move to the next

	option.
PROTECTION **Residual OC** **Enabled**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **Residual OC** can be set i.e. Disabled / Enabled. Press the Minus / Down arrow key (- /▼) to move to the next option.
PROTECTION **Sequence OC** **Enabled**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **Sequence OC** can be set i.e. Disabled / Enabled. Press the Minus / Down arrow key (- /▼) to move to the next option.
PROTECTION **Under Voltage(27)** **Enabled**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **Under Voltage (27)** can be set i.e. Disabled / Enabled. Press the Minus / Down arrow key (- /▼) to move to the next option.
PROTECTION **Over Voltage(59)** **Enabled**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **Over Voltage (59)** can be set i.e. Disabled / Enabled. Press the Minus / Down arrow key (- /▼) to move to the next option.
PROTECTION **Residual OV (59N)** **Enabled**	Editable Setting By using the Plus / Up arrow **Residual OV (59N)** can be set i.e. Disabled / Enabled. Press the Minus / Down arrow key (- /▼) to move to the next option.

PROTECTION **Sequence OV** **Enabled**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **Sequence OV** can be set i.e. Disabled / Enabled. Press the Minus / Down arrow key (- /▼) to move to the next option.
PROTECTION **Frequency (81)** **Enabled**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **Frequency (81)** can be set i.e. Disabled / Enabled. Press the Minus / Down arrow key (- /▼) to move to the next option.
PROTECTION **df/dt (81R)** **Enabled**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **df/dt (81R)** can be set i.e. Disabled / Enabled. Press the Minus / Down arrow key (- /▼) to move to the next option.
PROTECTION **Power Factor (55)** **Enabled**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **Power Factor (55)** can be set i.e. Disabled / Enabled. Press the Minus / Down arrow key (- /▼) to move to the next option.
PROTECTION **I2/I1 (46BC)** **Enabled**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **I2/I1 (46BC)** can be set i.e. Disabled / Enabled. Press the Minus / Down arrow key (- /▼) to move to the next option.

PROTECTION **I0/I1 (50BC)** **Enabled**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **I0/I1 (50BC)** can be set i.e. Disabled / Enabled. Press the Minus / Down arrow key (- /▼) to move to the next option.
PROTECTION **VT Supervision** **Enabled**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **VT Supervision** can be set i.e. Disabled / Enabled. Press the Minus / Down arrow key (- /▼) to move to the next option.
PROTECTION **CT Supervision** **Enabled**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **CT Supervision** can be set i.e. Disabled / Enabled. Press the Minus / Down arrow key (- /▼) to move to the next option.
PROTECTION **Reclosing** **Enabled**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **Reclosing** can be set i.e. Disabled / Enabled. Press the Minus / Down arrow key (- /▼) to move to the next option.
PROTECTION **Breaker Failure** **Enabled**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **Breaker Failure** can be set i.e. Disabled / Enabled. Press the Minus / Down arrow key (- /▼) to move to the next option.

PROTECTION **Undercurrent** **Enabled**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **Undercurrent** can be set i.e. Disabled / Enabled. Press the Minus / Down arrow key (- /▼) to move to the next option.
PROTECTION **Thermal Overload** **Enabled**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **Thermal Overload** can be set i.e. Disabled / Enabled. Press the Minus / Down arrow key (- /▼) to move to the next option.
PROTECTION **Power Protection** **Enabled**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **Power Protection** can be set i.e. Disabled / Enabled. Press the Minus / Down arrow key (- /▼) to move to the next option.
PROTECTION **Voltage Depend OC** **Enabled**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **Voltage Depend OC** can be set i.e. Disabled / Enabled. Press the Minus / Down arrow key (- /▼) to move to the next option.
PROTECTION **CB Open Pole** **Enabled**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **CB Open Pole** can be set i.e. Disabled / Enabled. Press the Minus / Down arrow key (- /▼) to move to the next option.

PROTECTION **SOTF** **Enabled**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **SOTF** can be set i.e. Disabled / Enabled. Press the Minus / Down arrow key (- /▼) to move to the next option.
PROTECTION **Sync Check** **Enabled**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **Sync Check** can be set i.e. Disabled / Enabled. Press the Minus / Down arrow key (- /▼) to move to the next option.
PROTECTION **Analog Inputs** **Disabled**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **Analog Inputs** can be set i.e. Disabled / Enabled. Press the Right arrow key (▶) to move to the next option.
Press ◀ Key **For Save** **Press Target Reset** **Key For Cancel**	Press the Left arrow key (◀) to **Save** the changes.
SAVE Settings	This window will flash for a moment and it will move to the Main Menu.
PROTECTION ▶	

8.4.9 CLEAR RECORDS

8.4.9.1 Clear Records

CLEAR RECORDS ▶	Password protected window for **"Clear Records"** setting. i.e. Events Yes/No, Faults Yes/No, Disturbance Yes/No, Error Record Yes/No, CB Data Yes/No, Thermal State Yes/No, Energy Yes/ No. Press the Right arrow key (▸) to move to the next option.
Clear Records **Events** **No**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the Clear **Events Record** can be set i.e. Yes / No. Press the Minus / Down arrow key (- /▼) to move to the next option.
Clear Records **Faults** **No**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the Clear **Faults Record** can be set i.e. Yes / No. Press the Minus / Down arrow key (- /▼) to move to the next option.
Clear Records **Disturbance** **No**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the Clear **Disturbance Record** can be set i.e. Yes / No. Press the Minus / Down arrow key (- /▼) to move to the next option.
Clear Records **Error Record** **No**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the Clear **Error Record** can be set i.e. Yes / No. Press the Minus / Down arrow key (- /▼) to move to the next option.

Clear Records **CB Data** **No**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the Clear **CB Data Record** can be set i.e. Yes / No. Press the Minus / Down arrow key (- /▼) to move to the next option.
Clear Records **Thermal State** **No**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the Clear **Thermal State Record** can be set i.e. Yes / No. Press the Minus / Down arrow key (- /▼) to move to the next option.
Clear Records **Energy** **No**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the Clear **Energy Record** can be set i.e. Yes / No. Press the Right arrow key (▶) to move to the next option.
Press ◀ Key **For Save** **Press Target Reset** **Key For Cancel**	Press the Left arrow key (◀) to **Save** the changes.
SAVE Settings	This window will flash for a moment and it will move to the Main Menu.
CB CONTROL ▶	

8.4.10 OUTPUT & LED TEST

8.4.10.1 Output & LED Test

OUTPUT & LED TEST ▶	Password protected window for **"Output & LED Test"** setting i.e. Test Mode, Test Output J, Test Output K, Test Output L, Test Output M, Test Apply and Test LED. Press the Right arrow key (▶) to move to the next option.
Output & LED Test **Test Mode** **Disabled**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the **Test Mode** can be set i.e. Disabled / Test Mode / Contacts Blocked. Press the Minus / Down arrow key (- /▼) to move to the next option.
Output & LED Test **Test Output J** **00000000** **Range 0 – 1**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the **Test Output J** can be set i.e. 0 / 1 (0 = Not Operated / 1 = Operated) Press the Minus / Down arrow key (- /▼) to move to the next option.
Output & LED Test **Test Output K** **00000000** **Range 0 – 1**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the **Test Output K** can be set i.e. 0 / 1 (0 = Not Operated / 1 = Operated) Press the Minus / Down arrow key (- /▼) to move to the next option.
Output & LED Test **Test Output L** **00000000** **Range 0 – 1**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the **Test Output L** can be set i.e. 0 / 1 (0 = Not Operated / 1 = Operated) Press the Minus / Down arrow key (- /▼) to move to the next option.

Output & LED Test **Test Output M** **00000000** **Range 0 – 1**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the **Test Output M** can be set i.e. 0 / 1 (0 = Not Operated / 1 = Operated) Press the Minus / Down arrow key (- /▼) to move to the next option.
Output & LED Test **Test Apply** **No Operation**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the **Test Apply** can be set i.e. No Operation / Apply Test / Remove Test. Press the Minus / Down arrow key (- /▼) to move to the next option.
Output & LED Test **Test LED** **No Operation**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the **Test LED** can be set i.e. No Operation / Apply Test. Press the Right arrow key (▶) to move to the next option.
Press ◀ Key **For Save** **Press Target Reset** **Key For Cancel**	Press the Left arrow key (◀) to **Save** the changes.
SAVE Settings	This window will flash for a moment and it will move to the Main Menu.
OUTPUT & LED TEST ▶	

8.4.11 Group 1

8.4.11.1 Group 1 – Menu List

GROUP 1 ▶	Password protected window for **"Group 1"** setting i.e. Reclosing, Breaker Failure, CB Open Pole, SOTF, Sync Check and Analog Inputs (**Optional**). Press the Right arrow key (▶) to move to the next option.
Reclosing ▶	Editable Setting By using the Plus / Up arrow key (+ / ▲) or the Minus / Down arrow key (- / ▼) select **Reclosing.** Password protected window for **"Reclosing"** setting i.e. Reclosing Enable can be set as Disabled / Enabled. Press the Minus / Down arrow key (- / ▼) to move to the next option.
Breaker Failure ▶	Editable Setting By using the Plus / Up arrow key (+ / ▲) or the Minus / Down arrow key (- / ▼) select **Breaker Failure.** Password protected window for **"Breaker Failure"** setting i.e. 50 BF Enable can be set as Disabled / Ext / Int. Press the Minus / Down arrow key (- / ▼) to move to the next option.
CB Open Pole ▶	Editable Setting By using the Plus / Up arrow key (+ / ▲) or the Minus / Down arrow key (- / ▼) select **CB Open Pole.** Password protected window for **"CB Open Pole"** setting i.e. CB Open Pole can be set as Disabled / Enabled. Press the Minus / Down arrow key (- / ▼) to move to the next option.
SOTF ▶	Editable Setting By using the Plus / Up arrow key (+ / ▲) or the Minus / Down arrow key (- / ▼) select **SOTF.** Password protected window for **"SOTF"** setting i.e. SOTF can be set as Disabled / Enabled Press the Minus / Down arrow key (- / ▼) to move to the next option.

Sync Check ▶	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **Sync Check.** Password protected window for **"Sync Check"** setting i.e. Sync Check Enable can be set as Disabled / Enabled (VHI, VLI, Delta V, Delta Angle, Delta F, tSync Pulse, Liveline DeadBus, LiveBus DeadLine and DeadLine DeadBus). Press the Minus / Down arrow key (- /▼) to move to the next option.
Analog Input ▶	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **Analog Input. (Optional)** Password protected window for **"Analog Input"** setting i.e. Analog Input–1, Analog Input–2, Analog Input–3, Analog Input–4, Analog Input–5, Analog Input–6, Analog Input–7, Analog Input–8 can be set as Disabled / Enabled. Press the Left arrow key (◀) to move to the Main Menu.
GROUP 1 ▶	

8.4.11.2 Reclosing

8.4.11.2.1 To Set – Reclosing (If Disabled)

GROUP 1 ▶	Password protected window for **"Group 1"** setting i.e. Reclosing, Breaker Failure, CB Open Pole, SOTF, Sync Check and Analog Inputs (**Optional**). Press the Right arrow key (▶) to move to the next option.
Reclosing ▶	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **Reclosing.** Password protected window for **"Reclosing"** setting i.e. Reclosing Enable Disabled/Enabled. (Number of Shots, DT1, DT2, DT3, DT4, Reclaim Time and AR CB Monitor).

	Press the Right arrow key (▸) to move to the next option.
Reclosing **Reclosing Enable** **Disabled**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) Reclosing Enable can be set i.e. Disabled / Enabled. Note : When set as disabled. Press the Right arrow key (▸) to move to the next option.
Press ◂ Key **For Save** **Press Target Reset** **Key For Cancel**	Press the Left arrow key (◂) to **Save** the changes.
SAVE Settings	This window will flash for a moment and it will move to the Main Menu.
GROUP 1 ▸	

8.4.11.2.2 To Set – Reclosing (If Enabled)

GROUP 1 ▸	Password protected window for **"Group 1"** setting i.e. Reclosing, Breaker Failure, CB Open Pole, SOTF, Sync Check and Analog Inputs (**Optional**). Press the Right arrow key (▸) to move to the next option.
Reclosing ▸	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **Reclosing.** Password protected window for **"Reclosing"** setting i.e. Reclosing Enable Disabled/Enabled. (Number of Shots, DT1, DT2, DT3, DT4, Reclaim Time and AR CB Monitor). Press the Right arrow key (▸) to move to the next option.

Reclosing **Reclosing Enable** **Enabled**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) Reclosing Enable can be set i.e. Disabled / Enabled. Note: When set as Enabled. Press the Right arrow key (►) to move to the next option.
Reclosing Enable **Number of Shots** **1** **Range 1 – 4**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) **Number of Shots** can be set. The setting range is from 1 to 4 Press the Minus / Down arrow key (- /▼) to move to the next option.
Reclosing Enable **DT1** **1.0 s** **Range 0.1 – 180s**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) **DT1 (Dead Time)** can be set. The setting range is from 0.1 to 180.0secs in step of 0.1secs. Press the Minus / Down arrow key (- /▼) to move to the next option.
Reclosing Enable **DT2** **1.0 s** **Range 0.1 – 180s**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) **DT2 (Dead Time)** can be set. The setting range is from 0.1 to 180.0secs in step of 0.1secs. Press the Minus / Down arrow key (- /▼) to move to the next option.
Reclosing Enable **DT3** **1.0 s** **Range 0.1 – 180s**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) **DT3 (Dead Time)** can be set. The setting range is from 0.1 to 180.0secs in step of 0.1secs. Press the Minus / Down arrow key (- /▼) to move to the next option.

Reclosing Enable **DT4** **1.0 s** **Range 0.1 – 180s**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) **DT4 (Dead Time)** can be set. The setting range is from 0.1 to 180.0secs in step of 0.1secs. Press the Minus / Down arrow key (- /▼) to move to the next option.
Reclosing Enable **Reclaim Time** **10.0 s** **Range 10 – 300s**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) **Reclaim Time** can be set. The setting range is from 10 to 300secs in step of 0.1secs. Press the Right arrow key (▶) to move to the next option.
Reclosing Enable **AR CB Monitor** **52A**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) **AR CB Monitor** can be set i.e. 52A / 52B Press the Right arrow key (▶) to move to the next option.
Press ◀ Key **For Save** **Press Target Reset** **Key For Cancel**	Press the Left arrow key (◀) to **Save** the changes.
SAVE Settings	This window will flash for a moment and it will move to the Main Menu.
GROUP 1 ▶	

8.4.11.3 Breaker Failure

8.4.11.3.1 To Set – Breaker Failure (If Disabled)

GROUP 1 ▶	Password protected window for **"Group 1"** setting i.e. Reclosing, Breaker Failure, CB Open Pole, SOTF, Sync Check and Analog Inputs (**Optional**). Press the Right arrow key (▶) to move to the next option.
Breaker Failure ▶	Editable Setting By using the Plus / Up arrow key (+ / ▲) or the Minus / Down arrow key (- / ▼) select **Breaker Failure.** Password protected window for **"Breaker Failure"** setting i.e. 50BF Enable Disabled / Ext / Int [t50BF-1 Status, (t50BF-1 Delay), t50BF-2 Status (t50BF-2 Delay), 50BF Reset, 50BF_I<, 50BF_IE<, Remove IP> P and Remove 3I0> P]. Press the Right arrow key (▶) to move to the next option.
Breaker Failure **50BF Enable** **Disabled**	Editable Setting By using the Plus / Up arrow key (+ / ▲) or the Minus / Down arrow key (- / ▼) the desired **50BF Enable** can be set i.e. Disabled / Enabled. Note: When set as Disabled. Press the Right arrow key (▶) to move to the next option.
Press ◀ Key **For Save** **Press Target Reset** **Key For Cancel**	Press the Left arrow key (◀) to **Save** the changes.
SAVE Settings	This window will flash for a moment and it will move to the Main Menu.
GROUP 1 ▶	

8.4.11.3.2 To Set – Breaker Failure (If Enabled)

GROUP 1 ▶	Password protected window for **"Group 1"** setting i.e. Reclosing, Breaker Failure, CB Open Pole, SOTF, Sync Check and Analog Inputs (**Optional**). Press the Right arrow key (▶) to move to the next option.
Breaker Failure ▶	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **Breaker Failure.** Password protected window for **"Breaker Failure"** setting i.e. 50BF Enable Disabled / Ext / Int [t50BF-1 Status, (t50BF-1 Delay), t50BF-2 Status (t50BF-2 Delay), 50BF Reset, 50BF_I<, 50BF_IE<, Remove IP> P and Remove 3I0> P]. Press the Right arrow key (▶) to move to the next option.
Breaker Failure **50BF Enable** **Ext**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **50BF Enable** can be set i.e. Disabled / Ext / Int Note : If set as Ext / Int. Press the Right arrow key (▶) to move to the next option.
50BF Enable **t50BF-1 Status** **Enabled**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **t50BF-1 Status** settings can be set i.e. Disabled / Enabled. Note: If Disabled the t50BF-1 Status function is blocked. If set as Enabled. Press the Minus / Down arrow key (- /▼) to move to the next option.
50BF Enable **t50BF-1 Delay** **0.10 s** **Range 0 – 50s**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **t50BF-1 Delay** settings can be set**.** The setting range is from 0 to 50.00 s in step of 0.01 s. Press the Minus / Down arrow key (- /▼) to move to the next option.

50BF Enable **t50BF-2 Status** **Enabled**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **t50BF-2 Status** settings can be set**.** i.e. Disabled / Enabled. Note: If Disabled the t50BF-2 Status function is blocked. If set as Enabled. Press the Minus / Down arrow key (- /▼) to move to the next option.
50BF Enable **t50BF-2 Delay** **0.10 s** **Range 0 – 50s**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **t50BF-2 Delay** settings can be set**.** The setting range is from 0 to 50.00 s in step of 0.01 s. Press the Minus / Down arrow key (- /▼) to move to the next option.
50BF Enable **50BF Reset** **CB Open + I<**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **50BF Reset** can be set i.e. I< Only / CB Open / Prot Reset & I< / CB Open & I<. Press the Minus / Down arrow key (- /▼) to move to the next option.
50BF Enable **50BF_I<** **1.00 A** **Range 0.05 – 3.20 xIn**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **50BF_I<** can be set. The setting range is from 0.05 to 3.20 xIn in step of 0.01 xIn. Press the Minus / Down arrow key (- /▼) to move to the next option.
50BF Enable **50BF_3I0<** **1.00 A** **Range 0.05 – 3.20 xIn**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **50BF_3I0<** can be set. The setting range is from 0.05 to 3.20 xIn in step of 0.01 xIn. Press the Minus / Down arrow key (- /▼) to move to the next option.

50BF Enable **Remove IP> P** **Enabled**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **Remove IP> P** can be set i.e. Disabled / Enabled Press the Minus / Down arrow key (- /▼) to move to the next option.
50BF Enable **Remove 3I0> P** **Enabled**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼)the desired **Remove 3I0> P** can be set i.e. Disabled / Enabled Press the Right arrow key (►) to move to the next option.
Press ◄ Key **For Save** **Press Target Reset** **Key For Cancel**	Press the Left arrow key (◄) to **Save** the changes.
SAVE Settings	This window will flash for a moment and it will move to the Main Menu.
GROUP 1 ►	

8.4.11.4 CB Open Pole

8.4.11.4.1 To Set – CB Open Pole (If Disabled)

GROUP 1 ►	Password protected window for **"Group 1"** setting i.e. Reclosing, Breaker Failure, CB Open Pole, SOTF, Sync Check and Analog Inputs (**Optional**). Press the Right arrow key (►) to move to the next option.

CB Open Pole ▶	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **CB Open Pole.** Password protected window for **"CB Open Pole"** setting i.e. CB Open Pole Disabled / Enabled (Mode, V<, I<, and tPO Delay). Press the Right arrow key (▶) to move to the next option.
CB Open Pole **CB Open Pole** **Disabled**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **CB Open Pole** can be set i.e. Disabled / Enabled Note : When set as Disabled. Press the Right arrow key (▶) to move to the next option.
Press ◀ Key **For Save** **Press Target Reset** **Key For Cancel**	Press the Left arrow key (◀) to **Save** the changes.
SAVE Settings	This window will flash for a moment and it will move to the Main Menu.
GROUP 1 ▶	

8.4.11.4.2 To Set – CB Open Pole (If Enabled)

GROUP 1 ▶	Password protected window for **"Group 1"** setting i.e. Reclosing, Breaker Failure, CB Open Pole, SOTF, Sync Check and Analog Inputs (**Optional**). Press the Right arrow key (▶) to move to the next option.

CB Open Pole ▶	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **CB Open Pole.** Password protected window for **"CB Open Pole"** setting i.e. CB Open Pole Disabled / Enabled (Mode, V<, I<, and tPO Delay). Press the Right arrow key (▶) to move to the next option.
CB Open Pole **CB Open Pole** **Enabled**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **CB Open Pole** can be set i.e. Disabled / Enabled Press the Right arrow key (▶) to move to the next option.
CB Open Pole **Mode** **I&52A**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **Mode** can be set i.e. V&I / I&52A / V&52A Press the Minus / Down arrow key (- /▼) to move to the next option.
CB Open Pole **V<** **10 V** **Range 5 – 100 V**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **V<** can be set. The setting range is from 5 to 100 V in step of 0.1 V. Press the Minus / Down arrow key (- /▼) to move to the next option.
CB Open Pole **I<** **0.10 A** **Range 0.05 – 20.00 xIn**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **I<** can be set. The setting range is from 0.05 to 20.0 xIn in step of 0.01 xIn Press the Minus / Down arrow key (- /▼) to move to the next option.

CB Open Pole **tPO delay** **1.00 s** **Range 0 – 100s**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **tPO delay** can be set. The setting range is from 0 to 100s in step of 0.02s Press the Minus / Down arrow key (- /▼) to move to the next option.
Press ◄ Key **For Save** **Press Target Reset** **Key For Cancel**	Press the Left arrow key (◄) to **Save** the changes.
SAVE Settings	This window will flash for a moment and it will move to the Main Menu.
GROUP 1 ►	

8.4.11.5 SOTF

8.4.11.5.1 To Set – SOTF (If Disabled)

GROUP 1 ►	Password protected window for **"Group 1"** setting i.e. Reclosing, Breaker Failure, CB Open Pole, SOTF, Sync Check and Analog Inputs (**Optional**). Press the Right arrow key (►) to move to the next option.
SOTF ►	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **SOTF.** Password protected window for **"SOTF"** setting i.e. SOTF Disabled / Enabled (Close Input, 27SOTF_I, 27SOTF_V, tClosepulse Delay, tSOTFtrip Delay). Press the Right arrow key (►) to move to the next option.

SOTF **SOTF** **Disabled**	Editable Setting By using the Plus / Up arrow key (+ / ▲) or the Minus / Down arrow key (- / ▼) the desired **SOTF** can be set i.e. Disabled / Enabled Note : When set as Disabled. Press the Right arrow key (▶) to move to the next option.
Press ◀ Key **For Save** **Press Target Reset** **Key For Cancel**	Press the Left arrow key (◀) to **Save** the changes.
SAVE Settings	This window will flash for a moment and it will move to the Main Menu.
GROUP 1 ▶	

8.4.11.5.2 To Set – SOTF (If Enabled)

GROUP 1 ▶	Password protected window for **"Group 1"** setting i.e. Reclosing, Breaker Failure, CB Open Pole, SOTF, Sync Check and Analog Inputs (**Optional**). Press the Right arrow key (▶) to move to the next option.
SOTF ▶	Editable Setting By using the Plus / Up arrow key (+ / ▲) or the Minus / Down arrow key (- / ▼) select **SOTF.** Password protected window for **"SOTF"** setting i.e. SOTF Disabled / Enabled (Close Input, 27SOTF_I, 27SOTF_V, tClosepulse Delay, tSOTFtrip Delay). Press the Right arrow key (▶) to move to the next option.

SOTF **SOTF Enable** **Enabled**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **SOTF Enabled** can be set i.e. Disabled / Enabled Note: When set as Enabled Press the Minus / Down arrow key (- /▼) to move to the next option.
SOTF **Closepulse Input** **Deadline Det**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **Closepulse Input** can be set i.e. Enabled / Deadline Det. Press the Right arrow key (▶) to move to the next option.
Closepulse Input **27SOTF_I** **1.00 A** **Range 0.05A – 20.00 xIn**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **27SOTF_I** can be set. The setting range is from 0.05 to 20.00 xIn in step of 0.01 xIn. Press the Minus / Down arrow key (- /▼) to move to the next option.
Closepulse Input **27SOTF_V** **40.0 V** **Range 5 – 100 V**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **27SOTF_V** can be set. The setting range is from 5 to 100 V in step of 0.1V Press the Minus / Down arrow key (- /▼) to move to the next option.
Closepulse Input **tClosepulse Delay** **0.20 s** **Range 0 – 5s**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **tClosepulse Delay** can be set. The setting range is from 0 to 5s in step of 0.01s Press the Minus / Down arrow key (- /▼) to move to the next option.

Closepulse Input **tSOTFtrip Delay** **0.00 s** **Range 0 – 5s**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **tSOTFtrip Delay** can be set. The setting range is from 0 to 5s in step of 0.01s Press the Right arrow key (▶) to move to the next option.
Press ◀ Key **For Save** **Press Target Reset** **Key For Cancel**	Press the Left arrow key (◀) to **Save** the changes.
SAVE Settings	This window will flash for a moment and it will move to the Main Menu.
GROUP 1 ▶	

8.4.11.6 Sync Check

8.4.11.6.1 To Set – Sync Check (If Disabled)

GROUP 1 ▶	Password protected window for **"Group 1"** setting i.e. Reclosing, Breaker Failure, CB Open Pole, SOTF, Sync Check and Analog Inputs (**Optional**). Press the Right arrow key (▶) to move to the next option.
Sync Check ▶	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **Sync Check.** Password protected window for **"Sync Check"** setting i.e. Sync Check Enable can be set as Disabled / Enabled (VHI, VLI, Delta V, Delta Angle, Delta F, tSync Pulse, Liveline DeadBus, LiveBus DeadLine and DeadLine DeadBus). Press the Right arrow key (▶) to move to the next option.

Sync Check **Sync Check Enable** **Disabled**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **Sync Check Enable** can be set. i.e. Disabled / Enabled Note : When set as Disabled. Press the Right arrow key (▶) to move to the next option.
Press ◀ Key **For Save** **Press Target Reset** **Key For Cancel**	Press the Left arrow key (◀) to **Save** the changes.
SAVE Settings	This window will flash for a moment and it will move to the Main Menu.
GROUP 1 ▶	

8.4.11.6.2 To Set – Sync Check (If Enabled)

GROUP 1 ▶	Password protected window for **"Group 1"** setting i.e. Reclosing, Breaker Failure, CB Open Pole, SOTF, Sync Check and Analog Inputs (**Optional**). Press the Right arrow key (▶) to move to the next option.
Sync Check ▶	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) select **Sync Check.** Password protected window for **"Sync Check"** setting i.e. Sync Check Enable can be set as Disabled / Enabled (VHI, VLI, Delta V, Delta Angle, Delta F, tSync Pulse, Liveline DeadBus, LiveBus DeadLine and DeadLine DeadBus). Press the Right arrow key (▶) to move to the next option.

Sync Check **Sync Check Enable** **Enabled**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **Sync Check Enable** can be set i.e. Disabled / Enabled Note : When set as Enabled Press the Right arrow key (▶) to move to the next option.
Sync Check Enable **VHI** **100 %** **Range 50 – 150%**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **VHI** can be set. The setting range is from 50 to 150% in step of 1% Press the Minus / Down arrow key (- /▼) to move to the next option.
Sync Check Enable **VLI** **100 %** **Range 50 – 150%**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **VLI** can be set. The setting range is from 50 to 150% in step of 1% Press the Minus / Down arrow key (- /▼) to move to the next option.
Sync Check Enable **Delta V** **10 %** **Range 5 – 100%**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **V** can be set. The setting range is from 5 to 100% in step of 1% Press the Minus / Down arrow key (- /▼) to move to the next option.
Sync Check Enable **Delta Angle** **10.0 Deg** **Range 0 – 80Deg**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **Delta Angle** can be set. The setting range is from 0 to 80Deg in step of 1Deg. Press the Minus / Down arrow key (- /▼) to move to the next option.

Sync Check Enable **Delta F** **0.5 Hz** **Range 0.5 – 5Hz**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **Delta F** can be set. The setting range is from 0.5 to 5Hz in step of 0.1Hz. Press the Minus / Down arrow key (- /▼) to move to the next option.
Sync Check Enable **tSync Pulse** **2 Cycle** **Range 1 – 500Cycle**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **tSync Pulse** can be set. The setting range is from 1 to 500Cycle in step of 1Cycle. Press the Minus / Down arrow key (- /▼) to move to the next option.
Sync Check Enable **LiveLine DeadBus** **Enabled**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **LiveLine DeadBus** can be set i.e. Disabled / Enabled Press the Minus / Down arrow key (- /▼) to move to the next option.
Sync Check Enable **V<** **100 %** **Range 50 – 150%**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **V<** can be set. The setting range is from 50 to 150% in step of 1% Note : V< setting is not available If LiveLine DeadBus is disabled Press the Minus / Down arrow key (- /▼) to move to the next option.
Sync Check Enable **LiveBus DeadLine** **Enabled**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **LiveBus DeadLine** can be set i.e. Disabled / Enabled Press the Minus / Down arrow key (- /▼) to move to the next option.

Sync Check Enable **V<** **100 %** **Range 50 – 150%**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **V<** can be set i.e. The setting range is from 50 to 150% in step of 1% Note : V< setting is not available If LiveBus DeadLine is disabled Press the Right arrow key (►) to move to the next option.
Sync Check Enable **DeadLine DeadBus** **Enabled**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **DeadLine DeadBus** can be set i.e. Disabled / Enabled Press the Minus / Down arrow key (- /▼) to move to the next option.
Sync Check Enable **V<** **20 %** **Range 10 – 80%**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **V<** can be set i.e. The setting range is from 10 to 80% in step of 1% Note : V< setting is not available If DeadLine DeadBus is disabled Press the Right arrow key (►) to move to the next option.
Press ◄ Key **For SAVE** **Press Target Reset** **Key For Cancel**	Press the Left arrow key (◄) to **SAVE** the changes.
SAVE SETTINGS	This window will flash for a moment and it will move to the Main Menu.
GROUP 1 ►	

8.4.11.7 Analogue Input (Optional)

8.4.11.7.1 To Set – Analogue Input (If Disabled)

GROUP 1 ▶	Password protected window for **"Group 1"** setting i.e. Reclosing, Breaker Failure, CB Open Pole, SOTF, Sync Check and Analog Inputs (**Optional**). Press the Right arrow key (▶) to move to the next option.
Analog Input ▶	Editable Setting By using the Plus / Up arrow key (+ / ▲) or the Minus / Down arrow key (- / ▼) select **Analog Input.** Password protected window for **"Analog Input"** setting i.e. Analog Input–1, Analog Input–2, Analog Input–3, Analog Input–4, Analog Input–5, Analog Input–6, Analog Input–7, Analog Input–8 can be set as Disabled / Enabled Press the Right arrow key (▶) to move to the next option.
Analog Input **Analog Input 1** **Disabled**	Editable Setting By using the Plus / Up arrow key (+ / ▲) or the Minus / Down arrow key (- / ▼) the desired **Analog Input 1** can be set. i.e. Disabled / Enabled Note : When set as Disabled. Press the Right arrow key (▶) to move to the next option.
Press ◀ Key **For Save** **Press Target Reset** **Key For Cancel**	Press the Left arrow key (◀) to **Save** the changes.
SAVE Settings	This window will flash for a moment and it will move to the Main Menu.
GROUP 1 ▶	

8.4.11.7.2 To Set – Analogue Input (If Enabled)

GROUP 1 ▶	Password protected window for **"Group 1"** setting i.e. Reclosing, Breaker Failure, CB Open Pole, SOTF, Sync Check and Analog Inputs (**Optional**). Press the Right arrow key (▶) to move to the next option.
Analog Input ▶	Editable Setting By using the Plus / Up arrow key (+ / ▲) or the Minus / Down arrow key (- / ▼) select **Analog Input.** Password protected window for **"Analog Input"** setting i.e. Analog Input–1, Analog Input–2, Analog Input–3, Analog Input–4, Analog Input–5, Analog Input–6, Analog Input–7, Analog Input–8 can be set as Disabled / Enabled Press the Right arrow key (▶) to move to the next option.
Analog Input **Analog Input 1** **Enabled**	Editable Setting By using the Plus / Up arrow key (+ / ▲) or the Minus / Down arrow key (- / ▼) the desired **Analogue Input 1** can be set. i.e. Disabled / Enabled Note : When set as Enabled ***Settings given below will be similar to*** **Analog Input 2, Analog Input 3, Analog Input 4, Analog Input 5, Analog Input 6, Analog Input 7 and Analog Input 8.** Press the Right arrow key (▶) to move to the next option.
Analog Input 1 **AI-1 Low Range** **4.0** **Range -99990 – 99990**	Editable Setting By using the Plus / Up arrow key (+ / ▲) or the Minus / Down arrow key (- / ▼) the desired **AI-1 Low Range** can be set. The setting range is from -99990 to 99990 in step of 0.1 Press the Minus / Down arrow key (- / ▼) to move to the next option.
Analog Input 1 **AI-1 High Range** **20.0** **Range -99990 – 99990**	Editable Setting By using the Plus / Up arrow key (+ / ▲) or the Minus / Down arrow key (- / ▼) the desired **AI-1 High Range** can be set. The setting range is from -99990 to 99990 in step of 0.1 Press the Minus / Down arrow key (- / ▼) to move to the next option.

Analog Input 1 **AI-1 LoWarn 1** **Enabled**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **AI-1 LoWarn 1** can be set i.e. Disabled / Enabled Press the Minus / Down arrow key (- /▼) to move to the next option.
Analog Input 1 **AI-1 LoWarnLevel 1** **0.0** **Range -99990 – 99990**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **AI-1 LoWarnLevel 1** can be set. The setting range is from -99990 to 99990 in step of 0.1 Note : AI-1 LoWarnLevel 1 setting is not available If AI-1 LoWarn 1 is Disabled Press the Minus / Down arrow key (- /▼) to move to the next option.
Analog Input 1 **AI-1 LoWarn 2** **Enabled**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **AI-1 LoWarn 2** can be set i.e. Disabled / Enabled Press the Minus / Down arrow key (- /▼) to move to the next option.
Analog Input 1 **AI-1 LoWarnLevel 2** **0.0** **Range -99990 – 99990**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **AI-1 LoWarnLevel 2**can be set. The setting range is from -99990 to 99990 in step of 0.1 Note: AI-1 LoWarnLevel 2 setting is not available If AI-1 LoWarn 2 is Disabled Press the Minus / Down arrow key (- /▼) to move to the next option.
Analog Input 1 **AI-1 HiWarn 1** **Enabled**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **AI-1 HiWarn 1** can be set i.e. Disabled / Enabled Press the Minus / Down arrow key (- /▼) to move to the next

	option.
Analog Input 1 **AI-1 HiWarnLevel 1** **0.0** **Range -99990 – 99990**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **AI-1 HiWarnLevel 1** can be set. The setting range is from -99990 to 99990 in step of 0.1 Note : AI-1 HiWarnLevel 1 setting is not available If AI-1 HiWarn 1 is Disabled Press the Minus / Down arrow key (- /▼) to move to the next option.
Analog Input 1 **AI-1 HiWarn 2** **Enabled**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **AI-1 HiWarn 2** can be set i.e. Disabled / Enabled Press the Minus / Down arrow key (- /▼) to move to the next option.
Analog Input 1 **AI-1 HiWarnLevel 2** **0.0** **Range -99990 – 99990**	Editable Setting By using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) the desired **AI-1 HiWarnLevel 2** can be set. The setting range is from -99990 to 99990 in step of 0.1 Note: AI-1 HiWarnLevel 2 setting is not available If AI-1 HiWarn 2 is Disabled Press the Right arrow key (▶) to move to the next option.
Press ◀ Key **For SAVE** **Press Target Reset** **Key For Cancel**	Press the Left arrow key (◀) to **SAVE** the changes.
SAVE SETTINGS	This window will flash for a moment and it will move to the Main Menu.

GROUP 1 ▶	

8.4.12 Active Group

8.4.12.1 To View – Active Group

ACTIVE GROUP ▶	By using the Plus / Up arrow key (+ / ▲) or the Minus / Down arrow key (- / ▼) select **Active Group.** This menu is to view **ACTIVE GROUP**. i.e. G1, G2, G3 and G4. Press the Right arrow key (▶) to move to the next option.
Active Group **G1 – G4** **G1**	This window shows the **Active Group**. i.e. G1 Press the Right arrow key (▶) to move to the Main Menu
ACTIVE GROUP ▶	

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Section 9

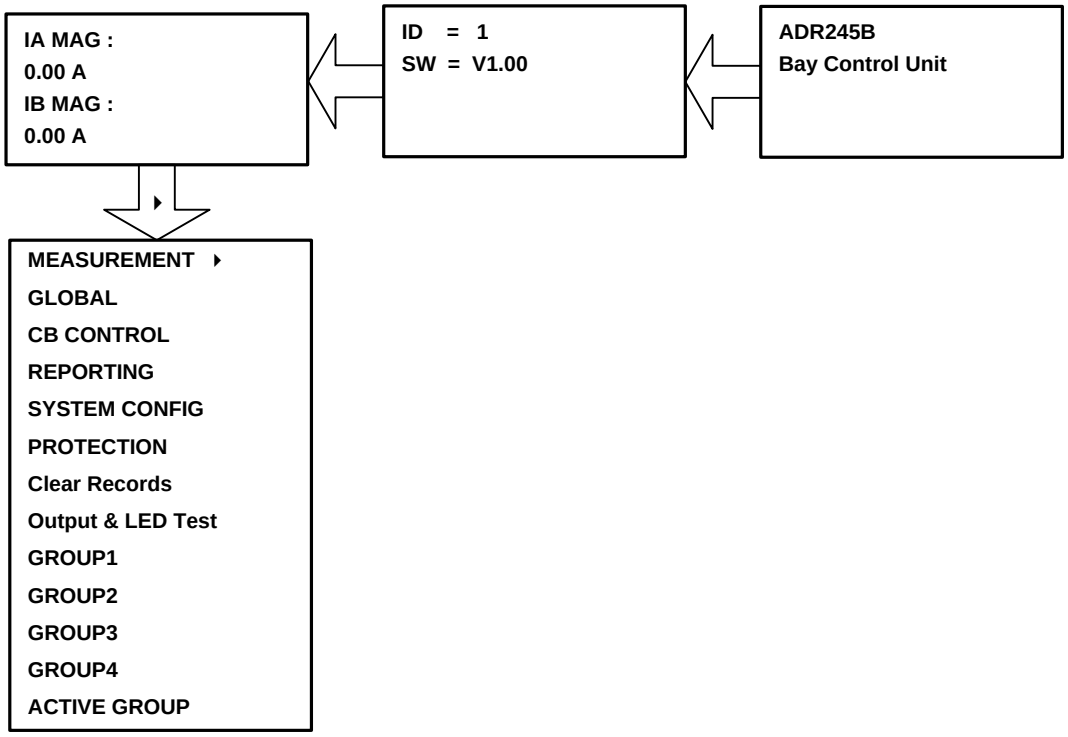
Flow Chart

Contents

9 FLOW CHART OVERVIEW

9.1 Main Menu

After the Power ON or when LED RESET + HW RESET key pressed the following windows will be displayed and the user can scroll the main menu as given below.



Note: By using the Up arrow key (▲) and the down arrow key (▼) the Main Menu settings can be scrolled.

9.2 EDIT and SAVE settings

This is default window showing the Main Menu.

Step 1 : By using Plus / Up arrow Key (+ /▲) or Minus / Down arrow key (- /▼) scroll the Main Menu / Group and select **GLOBAL** setting.

Step 2 : Press the right arrow key (▶) the BCU will display the next option.

Step 3 : By using Plus / Up arrow Key (+ /▲) or Minus / Down arrow key (- /▼) scroll the Main Menu / Group and select General setting.

Step 4 : Press the right arrow key (▶)the BCU will display the next option.

This window will be displayed

Step 5 : Press the Edit Key to activate the settings

This window will be display and the extreme right alpha / numerical number will start blinking.

Note: The selected alpha / numerical number can be shifted right to left and left to right by using the left arrow key (◀) and Right Arrow key (▶).

Step 6: Enter the perversely set Password by using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼).

Step 7: After editing the Password, press the EDIT Key.

This window will be display.

If In-correct Password is entered

This window will be display. If correct Password is entered.

Step 8: Enter the New Password by using the Plus / Up arrow key (+ /▲) or the Minus / Down arrow key (- /▼) option.

[All Editable settings are password protected so when the EDIT key is pressed it will display the password and the settable Alpha / Numerical value will start blinking].

The Password is four (4) digits alpha numeric. i.e. 0000 – zzzz/ZZZZ

Step 9: After editing the Password, press the EDIT Key. The settable Alpha / Numerical value will stop blinking.

Step 10: Press the Right arrow key (▶) to move to the next option

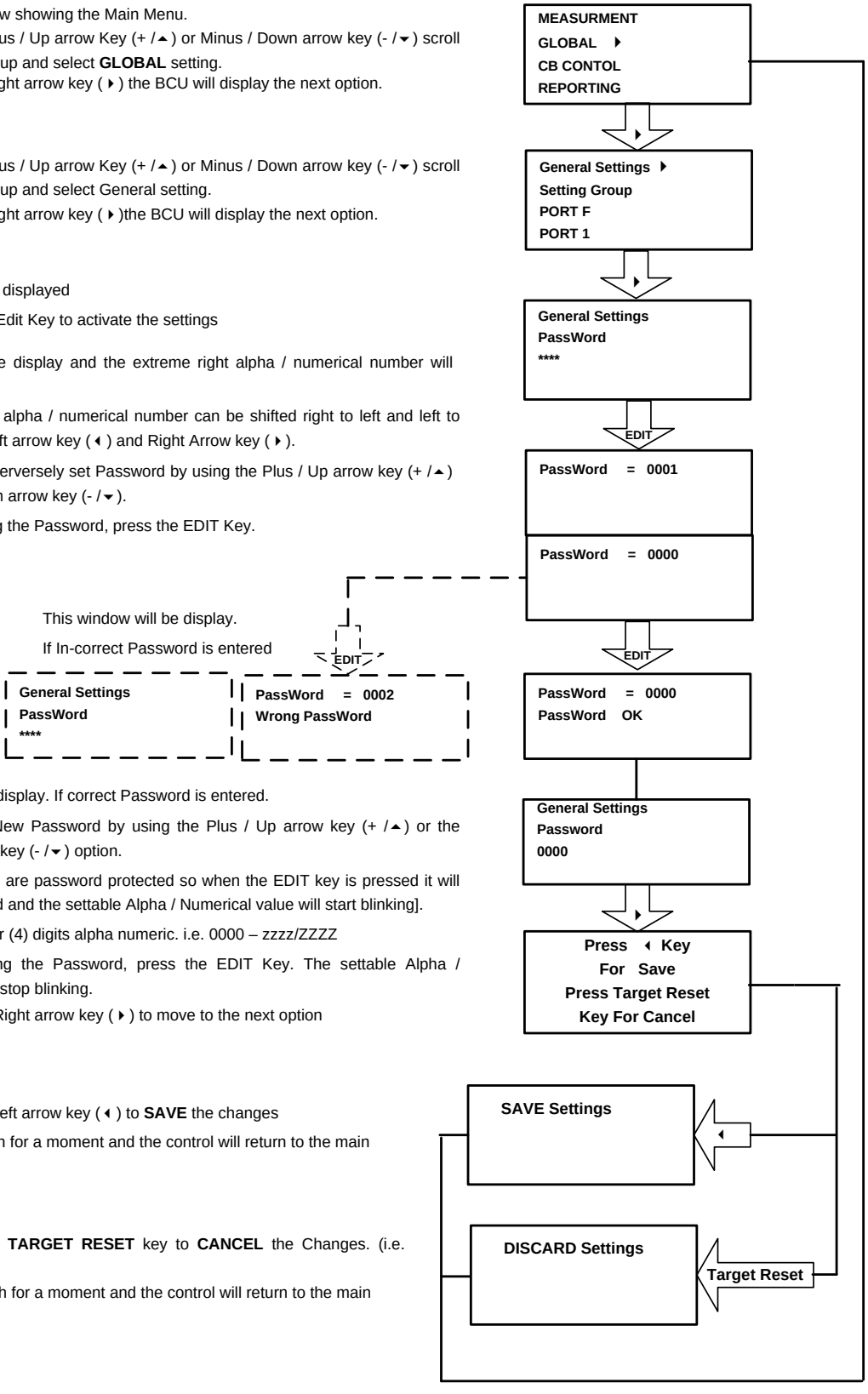
Step 11: Press the Left arrow key (◀) to **SAVE** the changes

This window will flash for a moment and the control will return to the main menu.

OR

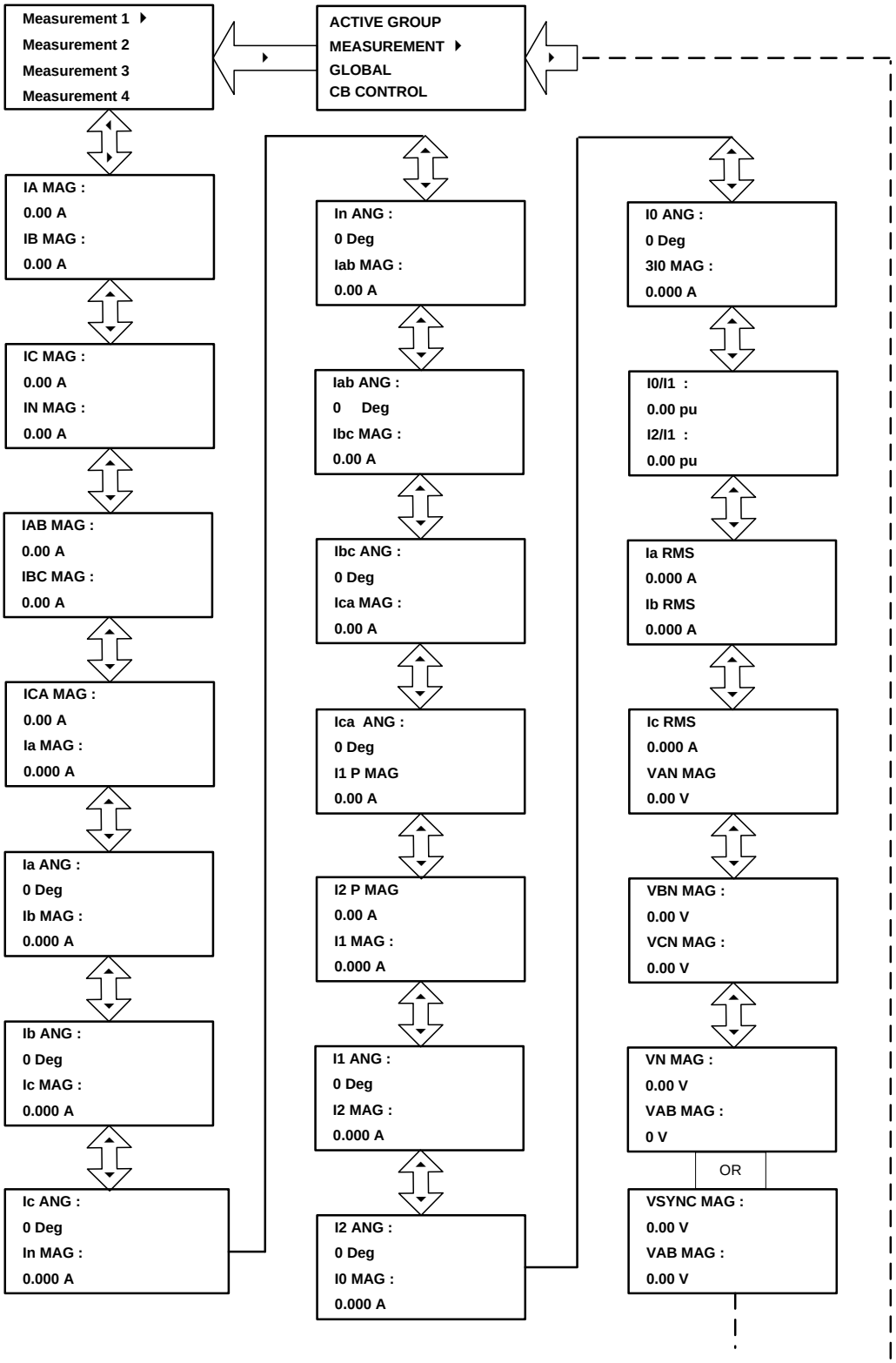
Step 12: Press the **TARGET RESET** key to **CANCEL** the Changes. (i.e. DISCARD Settings)

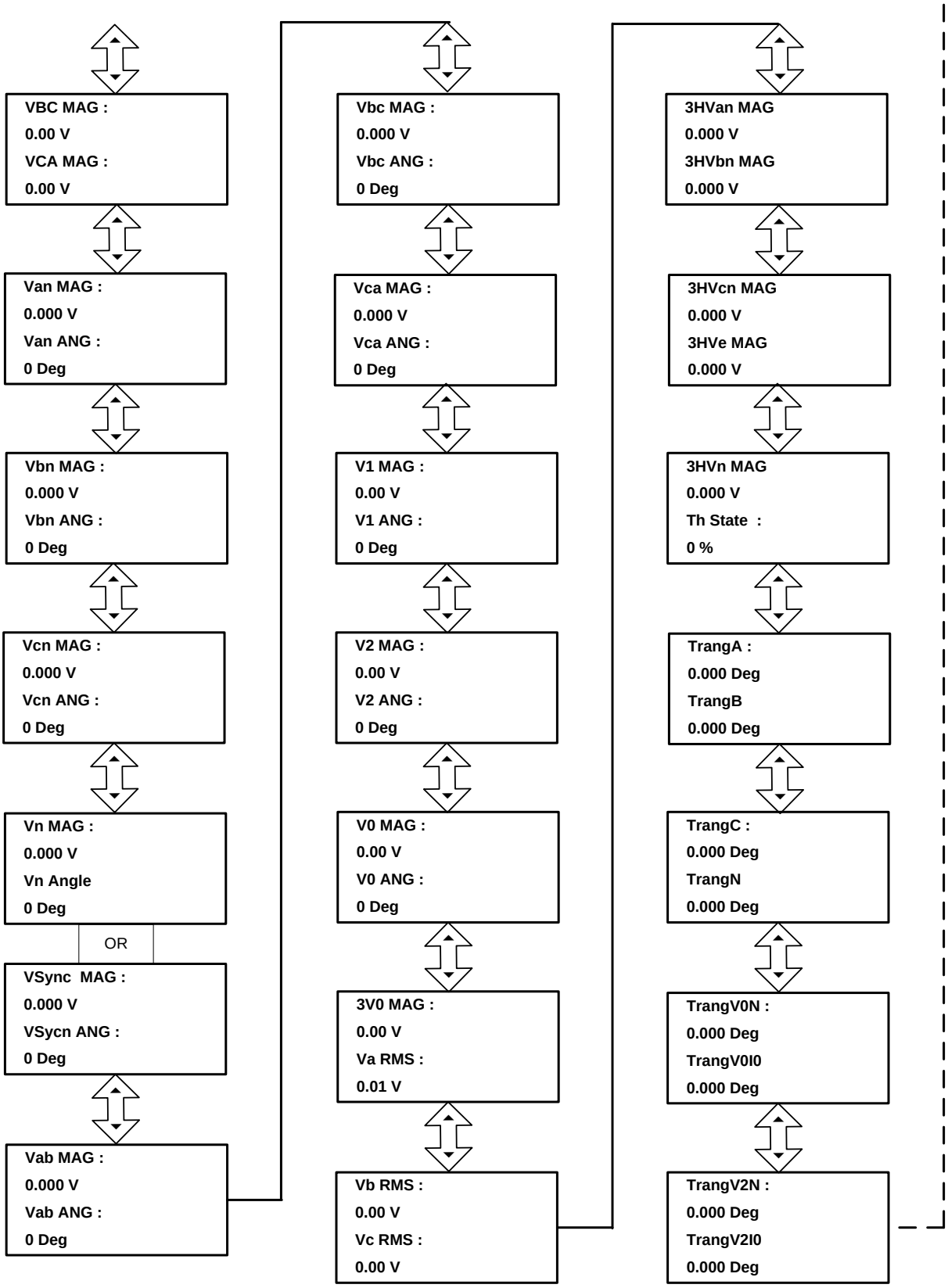
This window will flash for a moment and the control will return to the main menu.



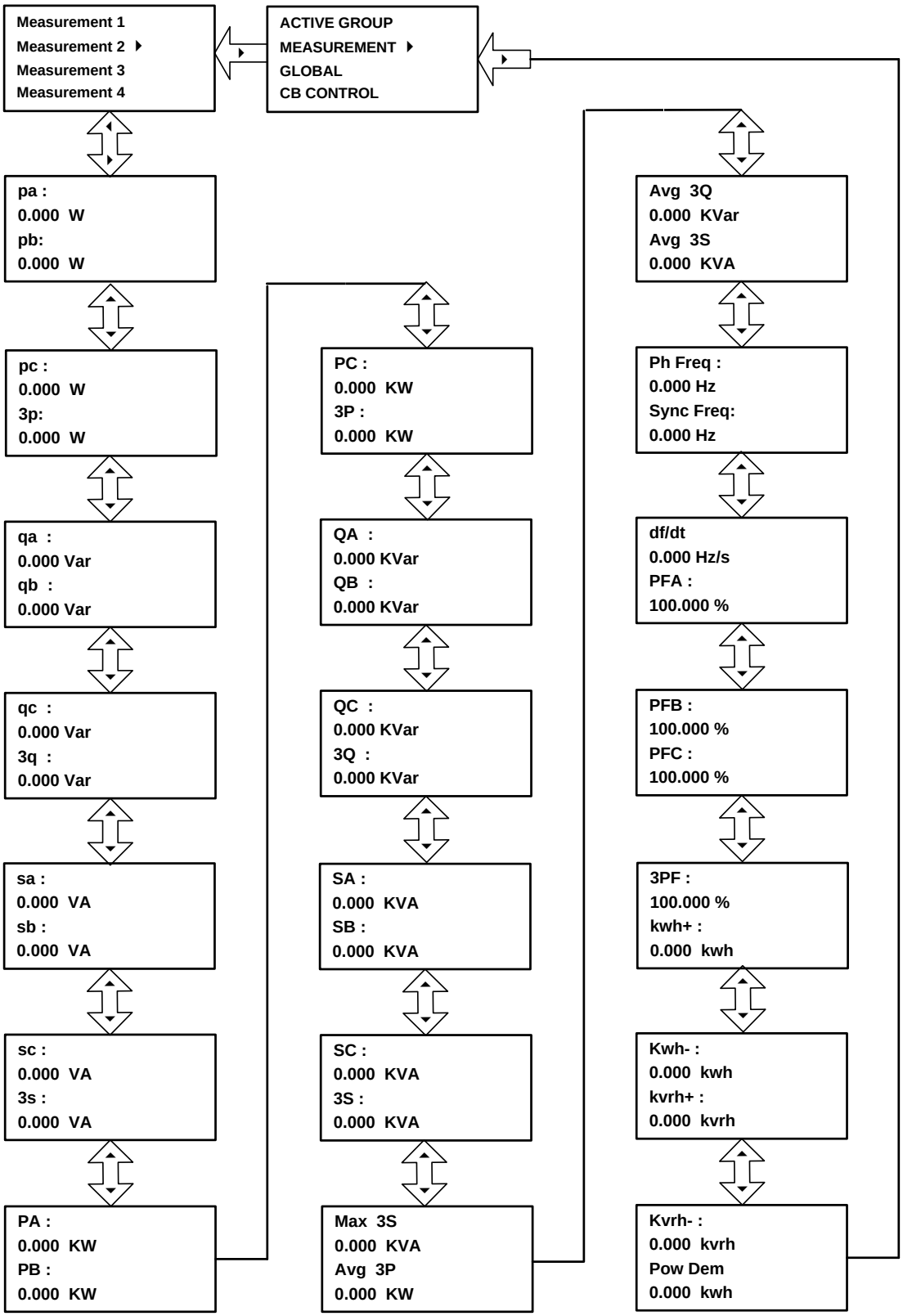
9.3 Measurement

9.3.1 To View – Measurement 1

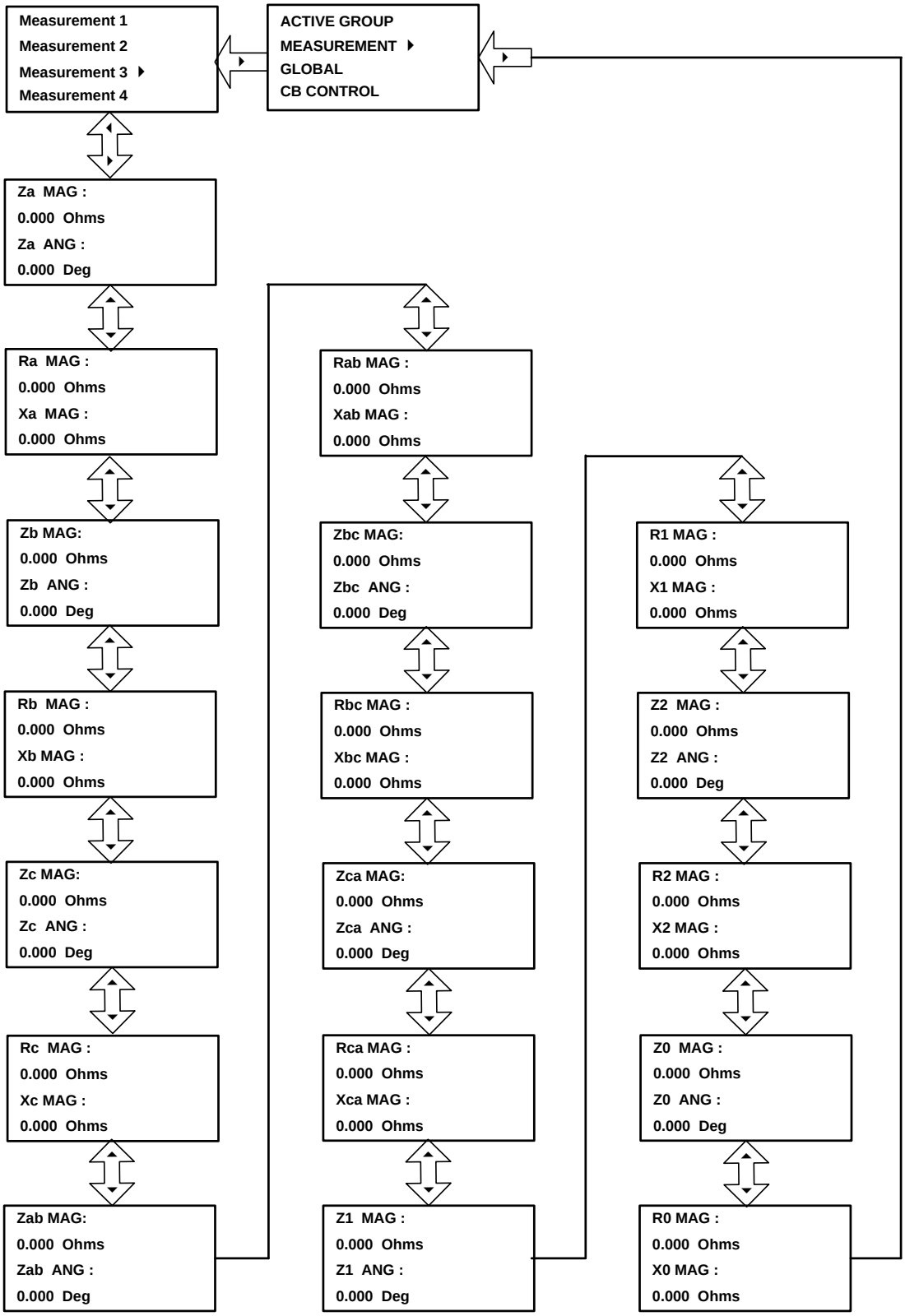



VBC MAG :
0.00 V
VCA MAG :
0.00 V
Van MAG :
0.000 V
Van ANG :
0 Deg
Vbn MAG :
0.000 V
Vbn ANG :
0 Deg
Vcn MAG :
0.000 V
Vcn ANG :
0 Deg
Vn MAG :
0.000 V
Vn Angle
0 Deg
OR
VSync MAG :
0.000 V
VSycn ANG :
0 Deg
Vab MAG :
0.000 V
Vab ANG :
0 Deg
Vbc MAG :
0.000 V
Vbc ANG :
0 Deg
Vca MAG :
0.000 V
Vca ANG :
0 Deg
V1 MAG :
0.00 V
V1 ANG :
0 Deg
V2 MAG :
0.00 V
V2 ANG :
0 Deg
V0 MAG :
0.00 V
V0 ANG :
0 Deg
3V0 MAG :
0.00 V
Va RMS :
0.01 V
Vb RMS :
0.00 V
Vc RMS :
0.00 V
3HVan MAG
0.000 V
3HVbn MAG
0.000 V
3HVcn MAG
0.000 V
3HVe MAG
0.000 V
3HVn MAG
0.000 V
Th State :
0 %
TrangA :
0.000 Deg
TrangB
0.000 Deg
TrangC :
0.000 Deg
TrangN
0.000 Deg
TrangV0N :
0.000 Deg
TrangV0I0
0.000 Deg
TrangV2N :
0.000 Deg
TrangV2I0
0.000 Deg

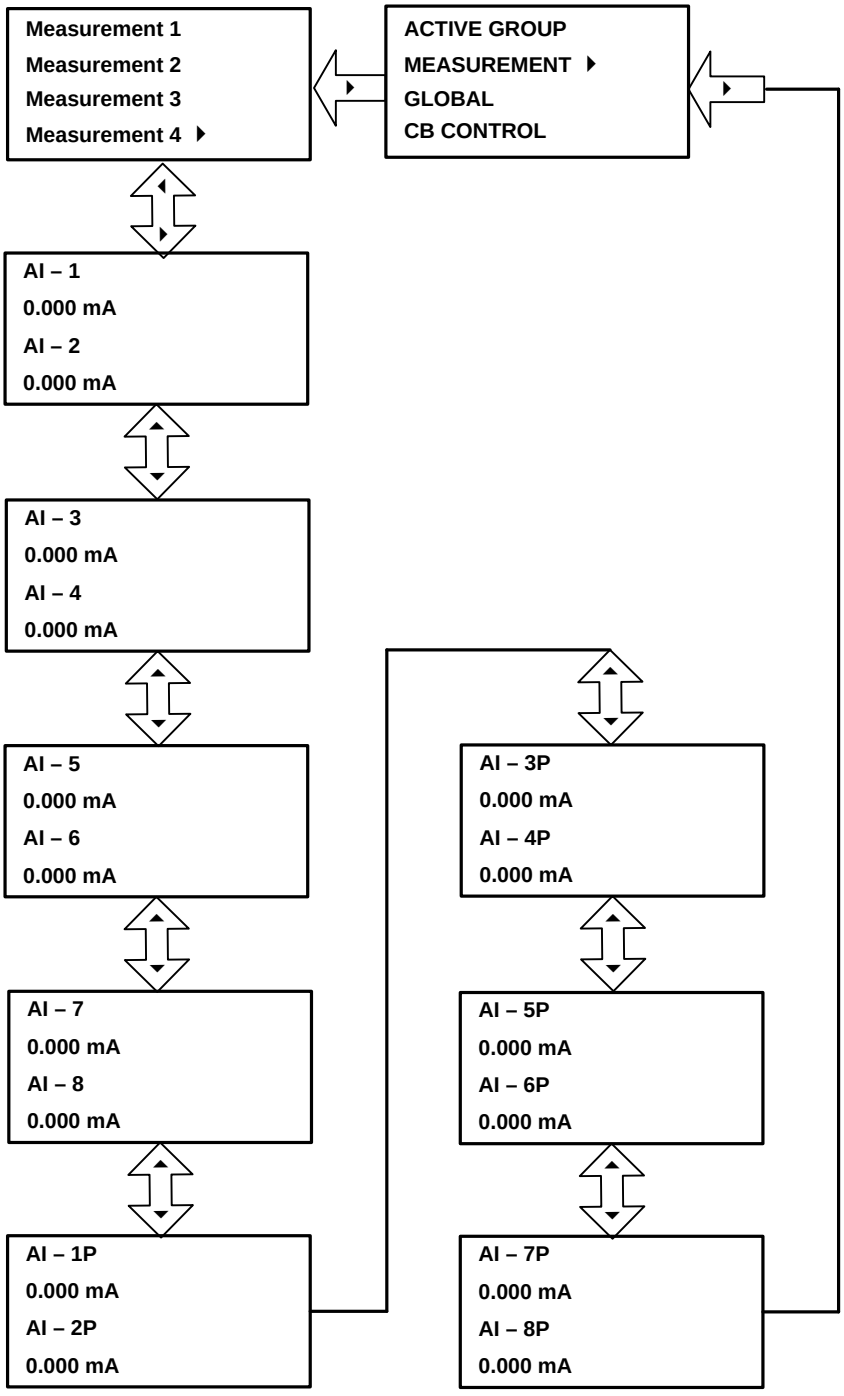
9.3.2 To View – Measurement 2



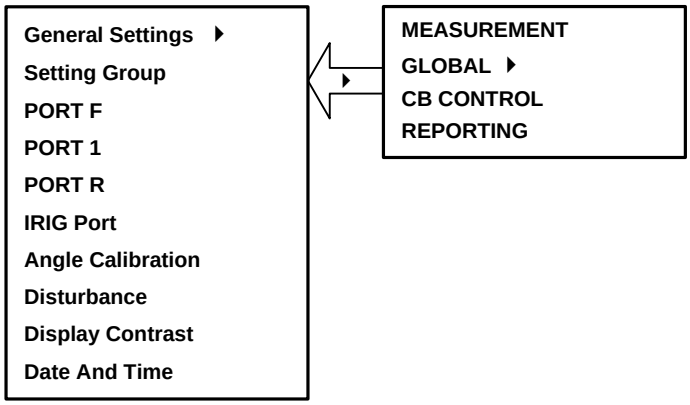
9.3.3 To View – Measurement 3



9.3.4 To View – Measurement 4

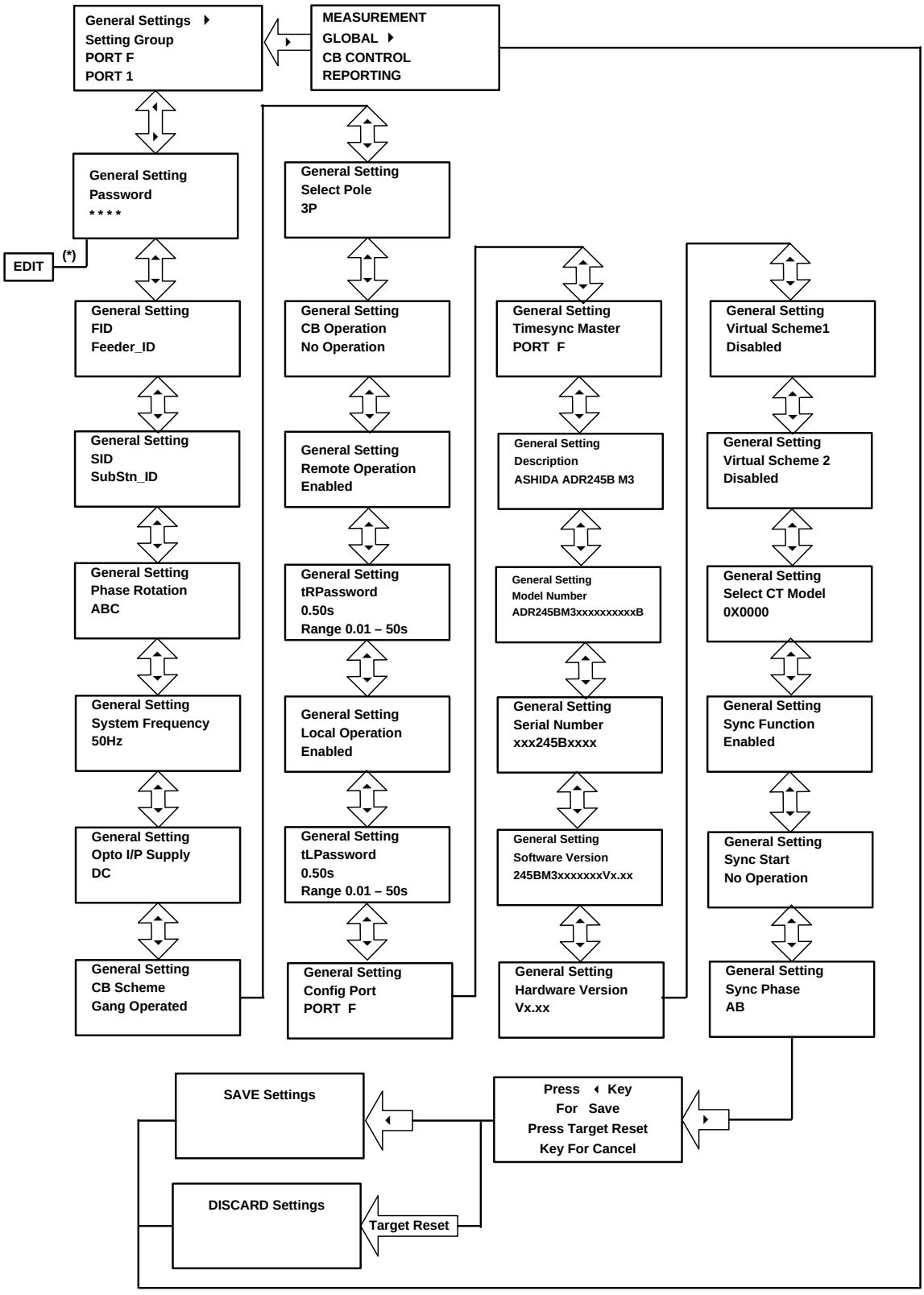


9.4 Global



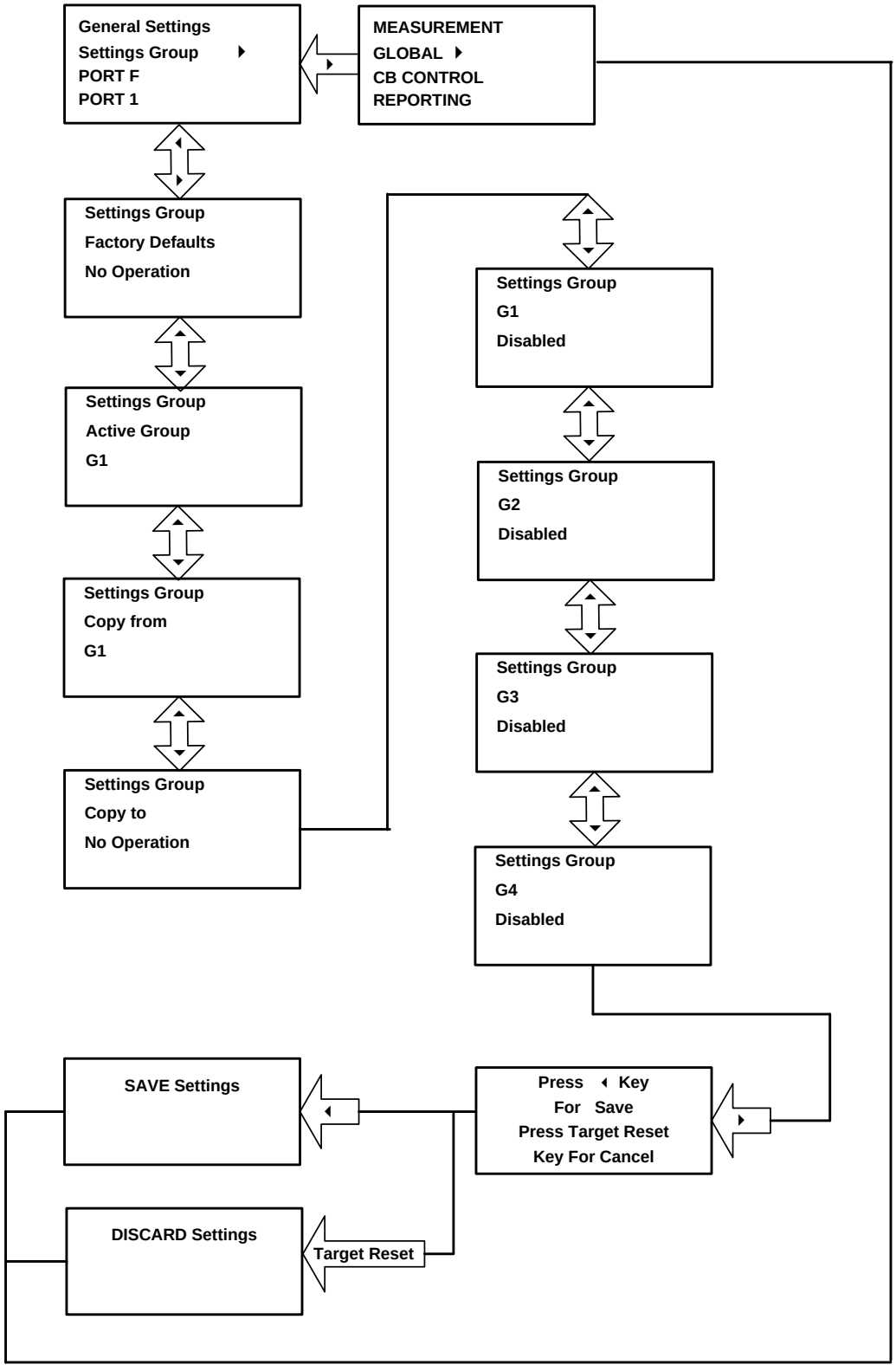
Note: By using the Up arrow key (▲) and the down arrow key (▼) the Main Menu settings can be scrolled.

9.4.1 General Settings

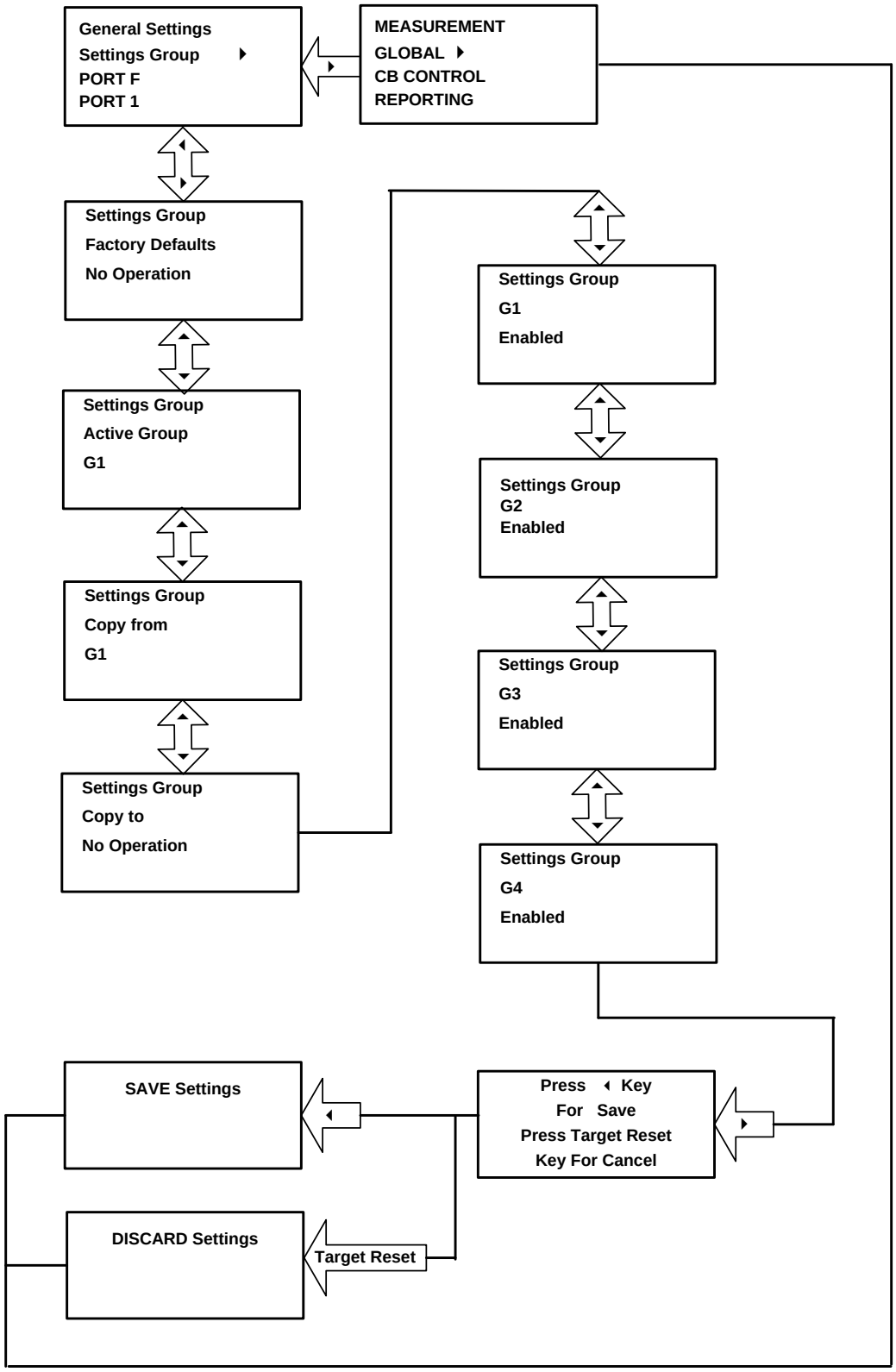


9.4.2 Setting Group

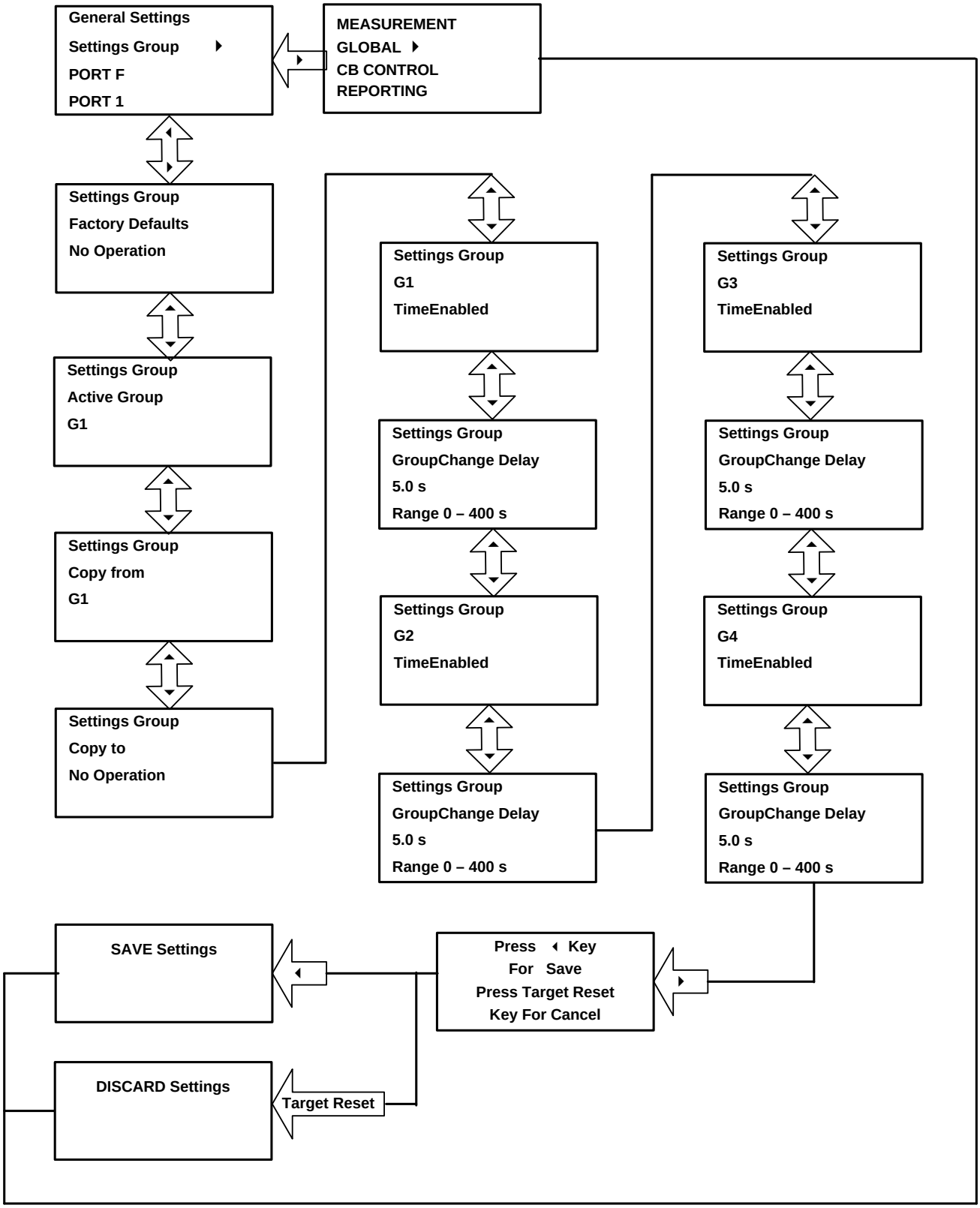
9.4.2.1 Setting Group (If Disabled)



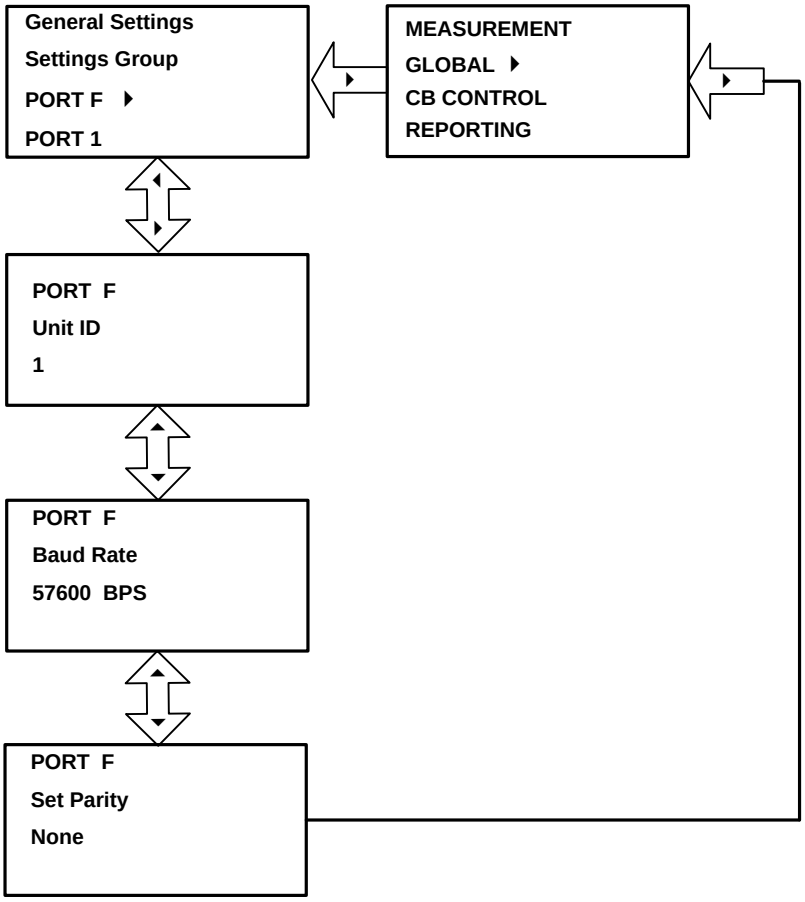
9.4.2.2 Setting Group (If Enabled)



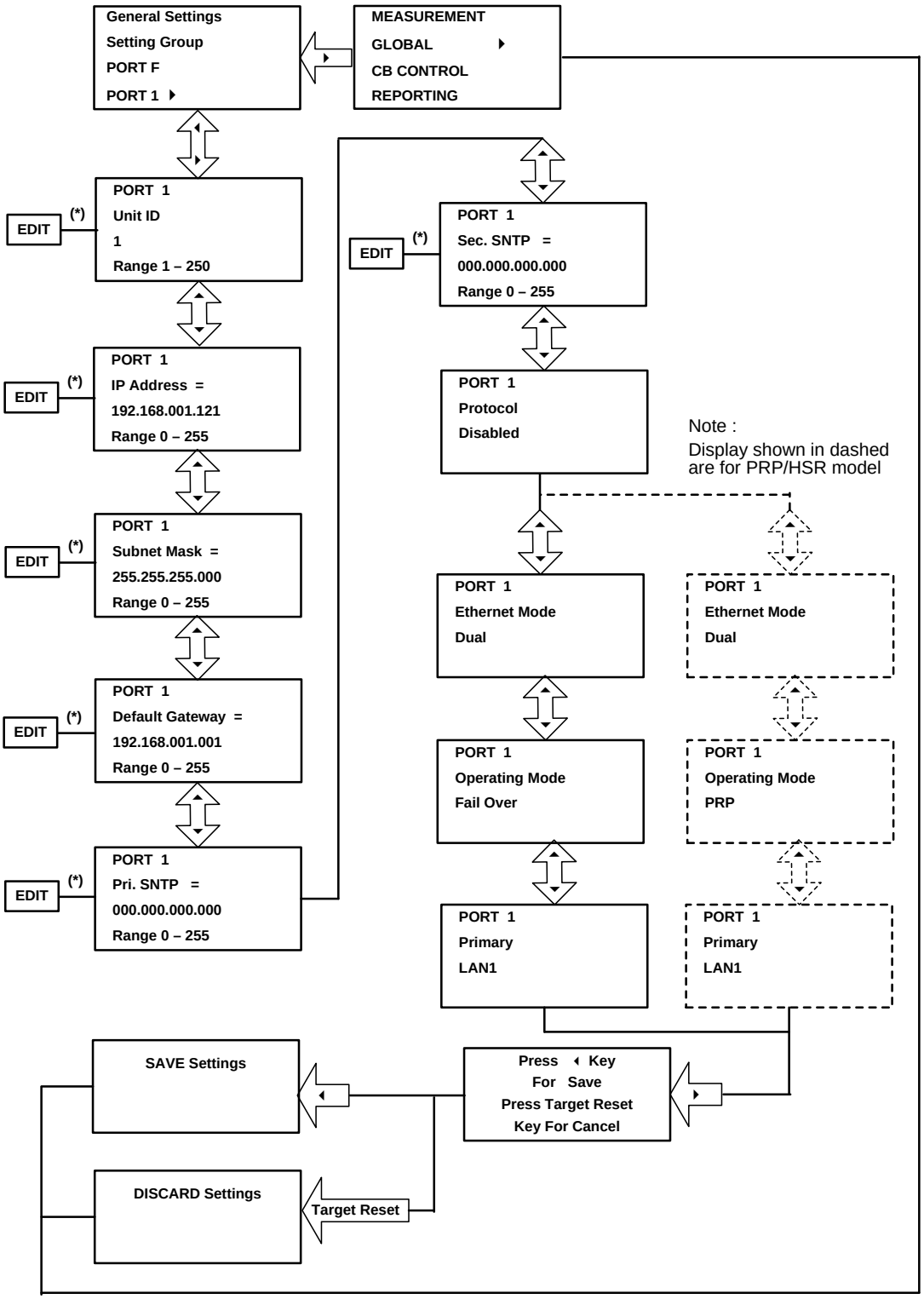
9.4.2.3 Setting Group (If TimeEnabled)



9.4.3 Port F

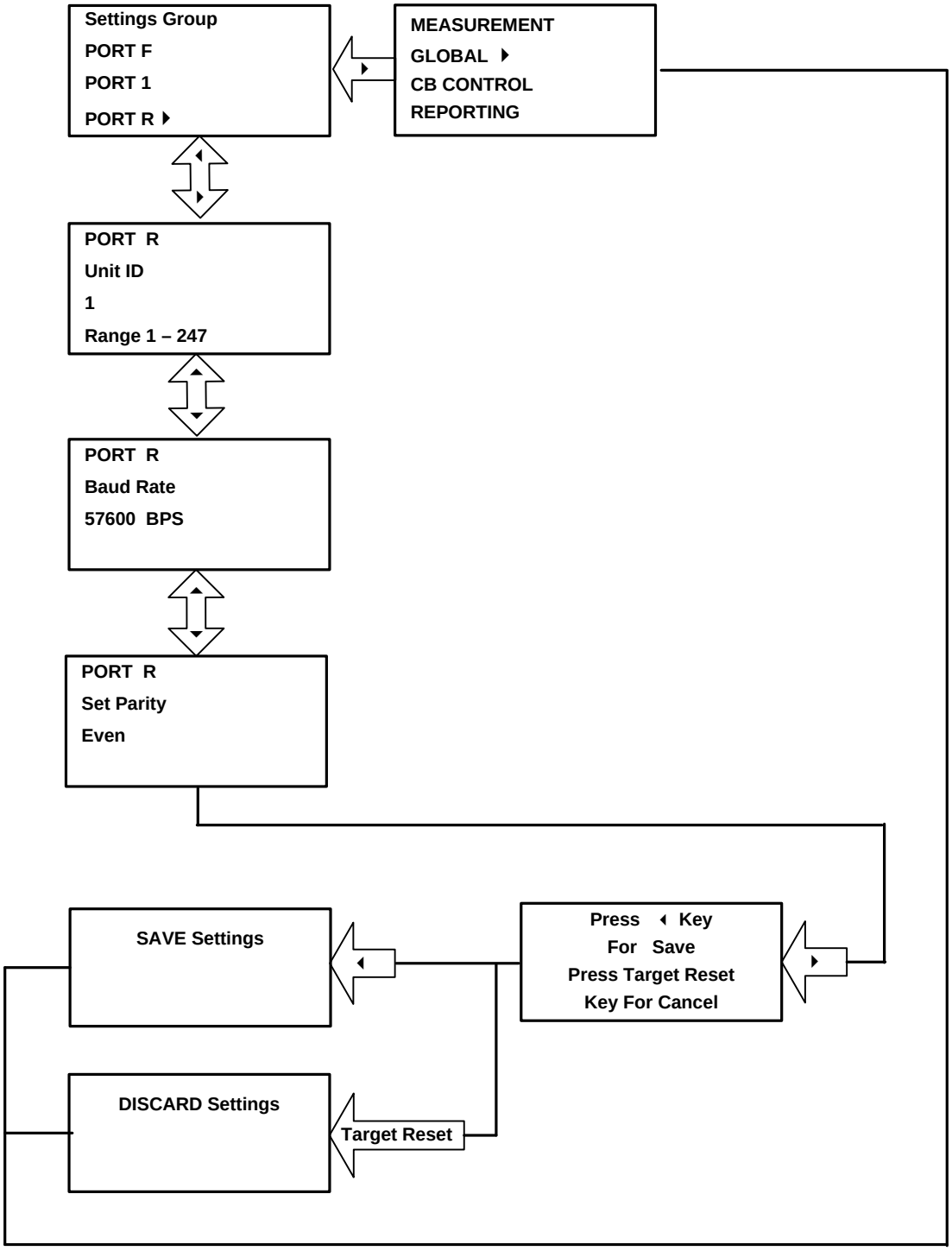

General Settings
Settings Group
PORT F
PORT 1
MEASUREMENT
GLOBAL
CB CONTROL
REPORTING
PORT F
Unit ID
1
PORT F
Baud Rate
57600 BPS
PORT F
Set Parity
None

9.4.4 Port 1

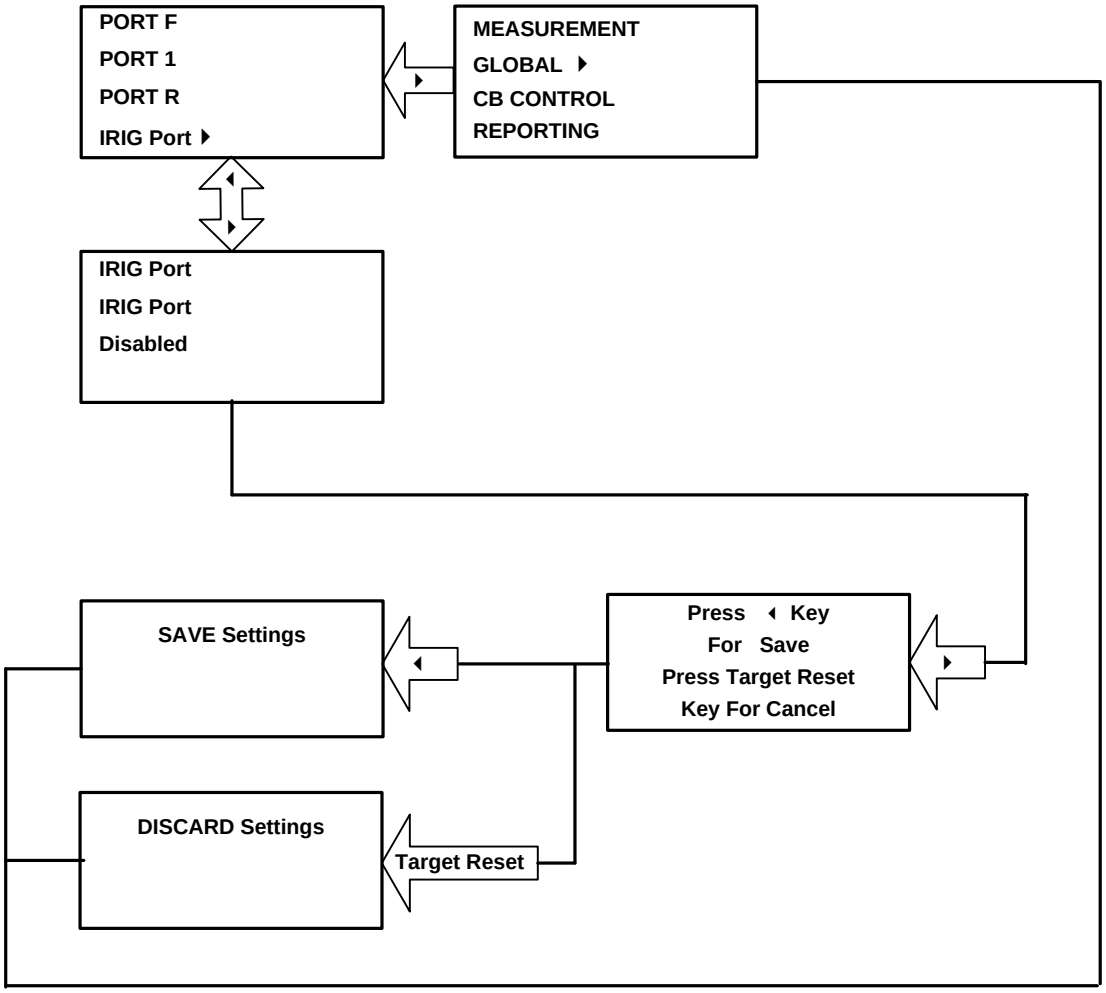


Note : (*) indicates Edit key used to modify settings. Refer Edit Password and Save Setting in Flow Chart.

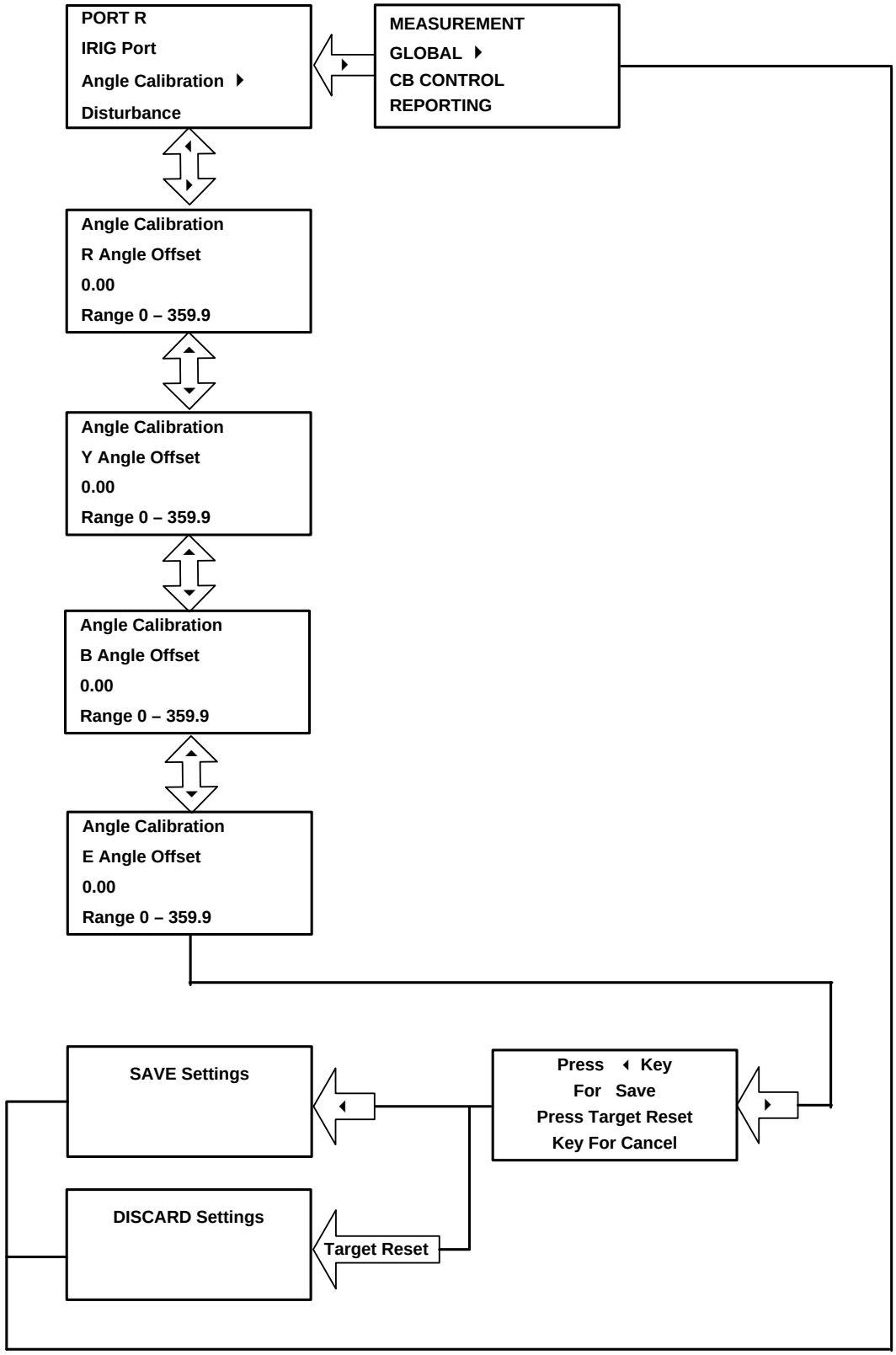
9.4.5 Port R


Settings Group
PORT F
PORT 1
PORT R
MEASUREMENT
GLOBAL
CB CONTROL
REPORTING
PORT R
Unit ID
1
Range 1 – 247
PORT R
Baud Rate
57600 BPS
PORT R
Set Parity
Even
SAVE Settings
Press Key
For Save
Press Target Reset
Key For Cancel
DISCARD Settings
Target Reset

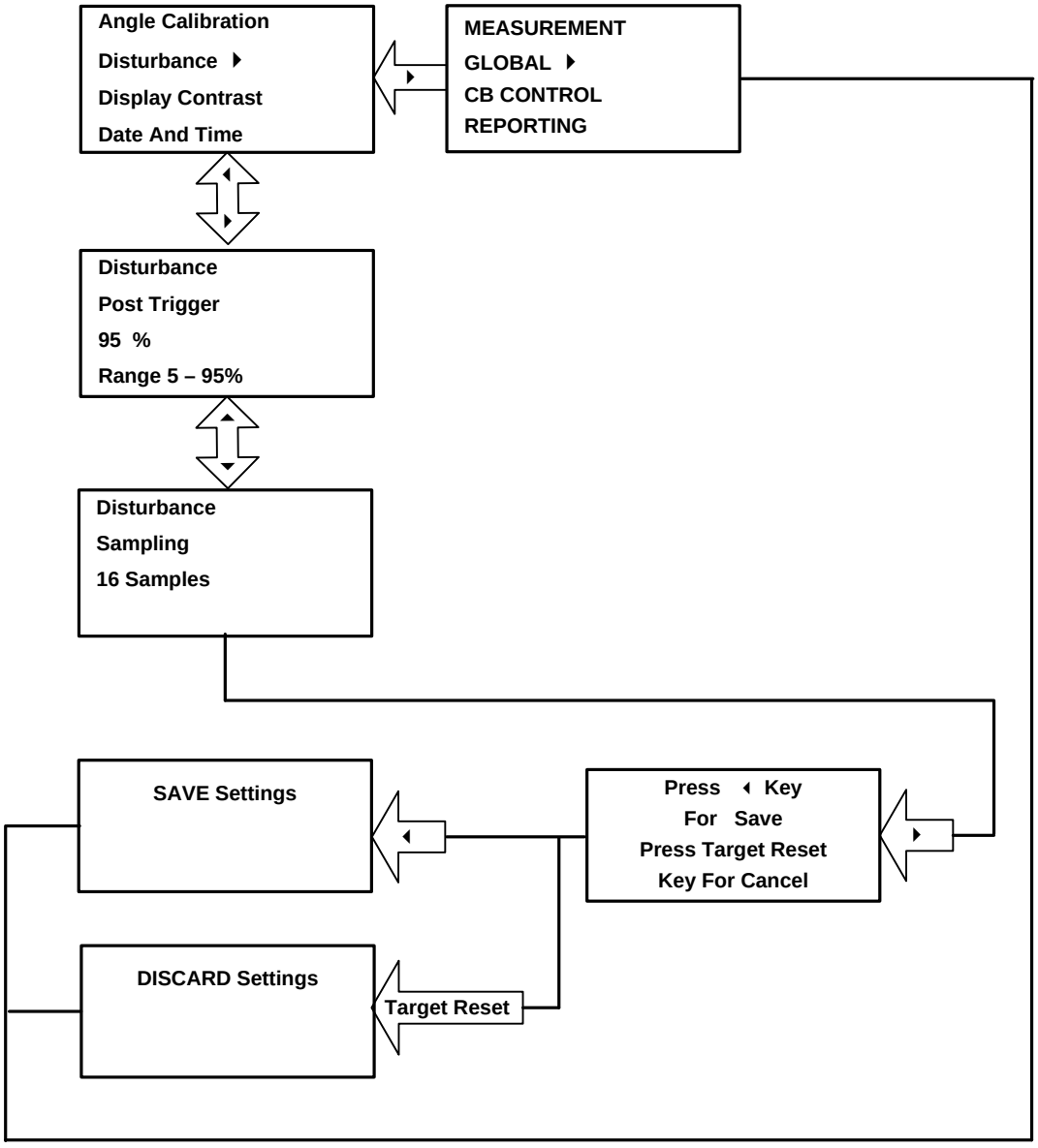
9.4.6 IRIG Port



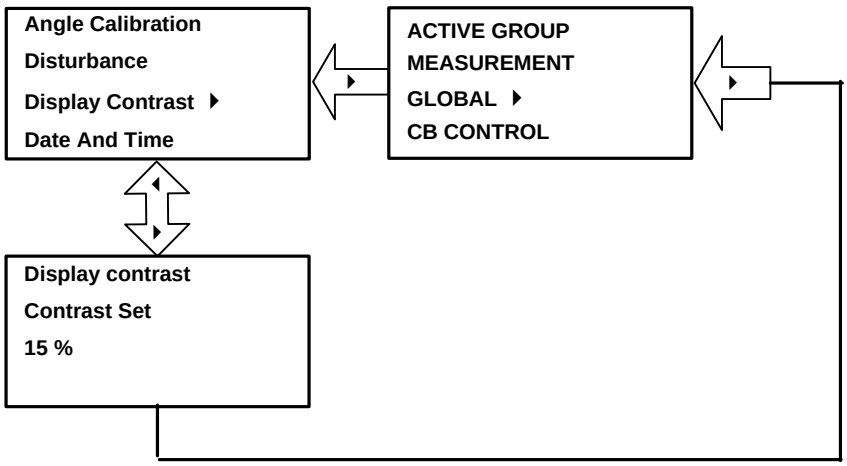
9.4.7 Angle Calibration



9.4.8 Disturbance

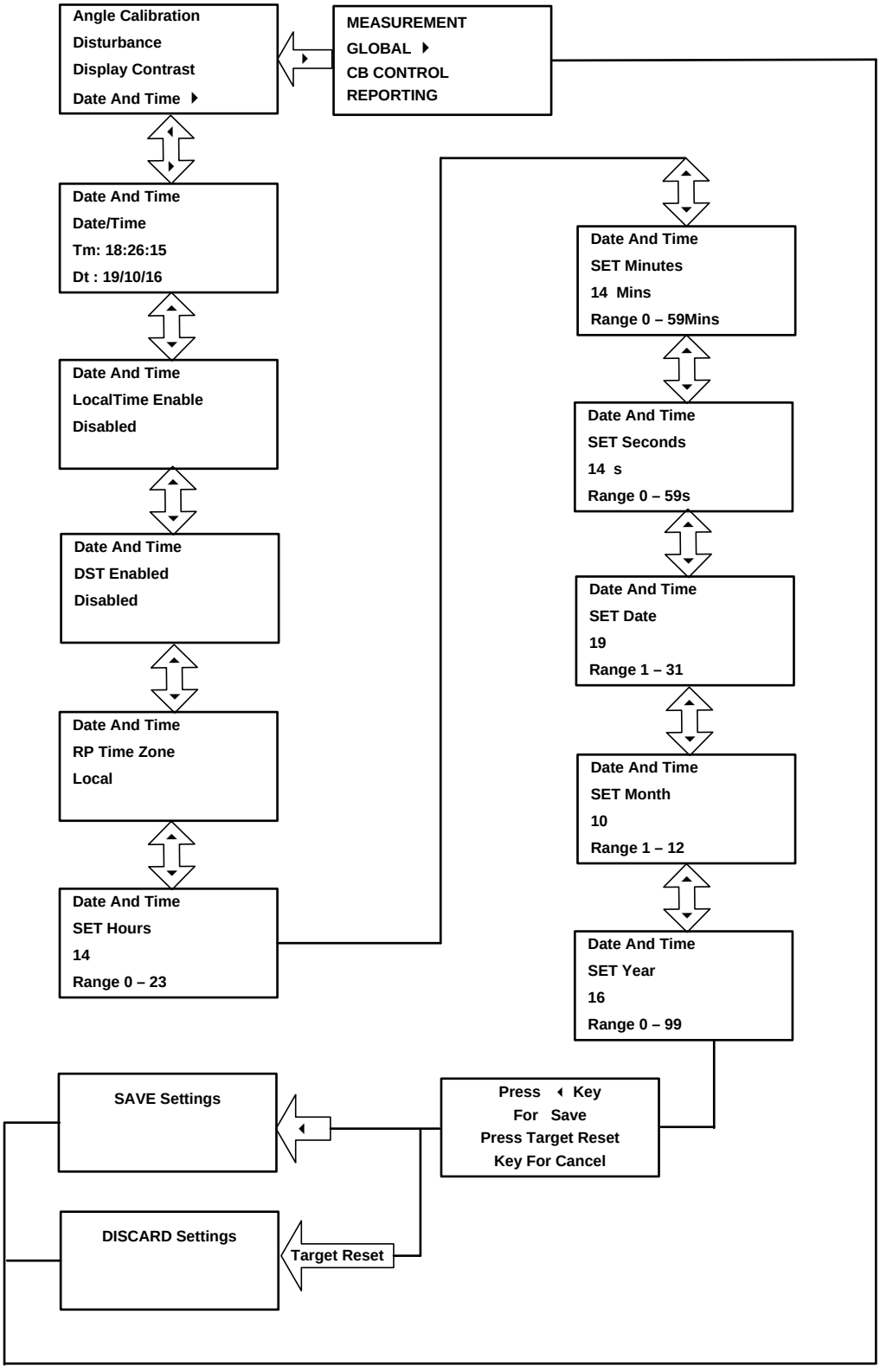


9.4.9 Display Contrast

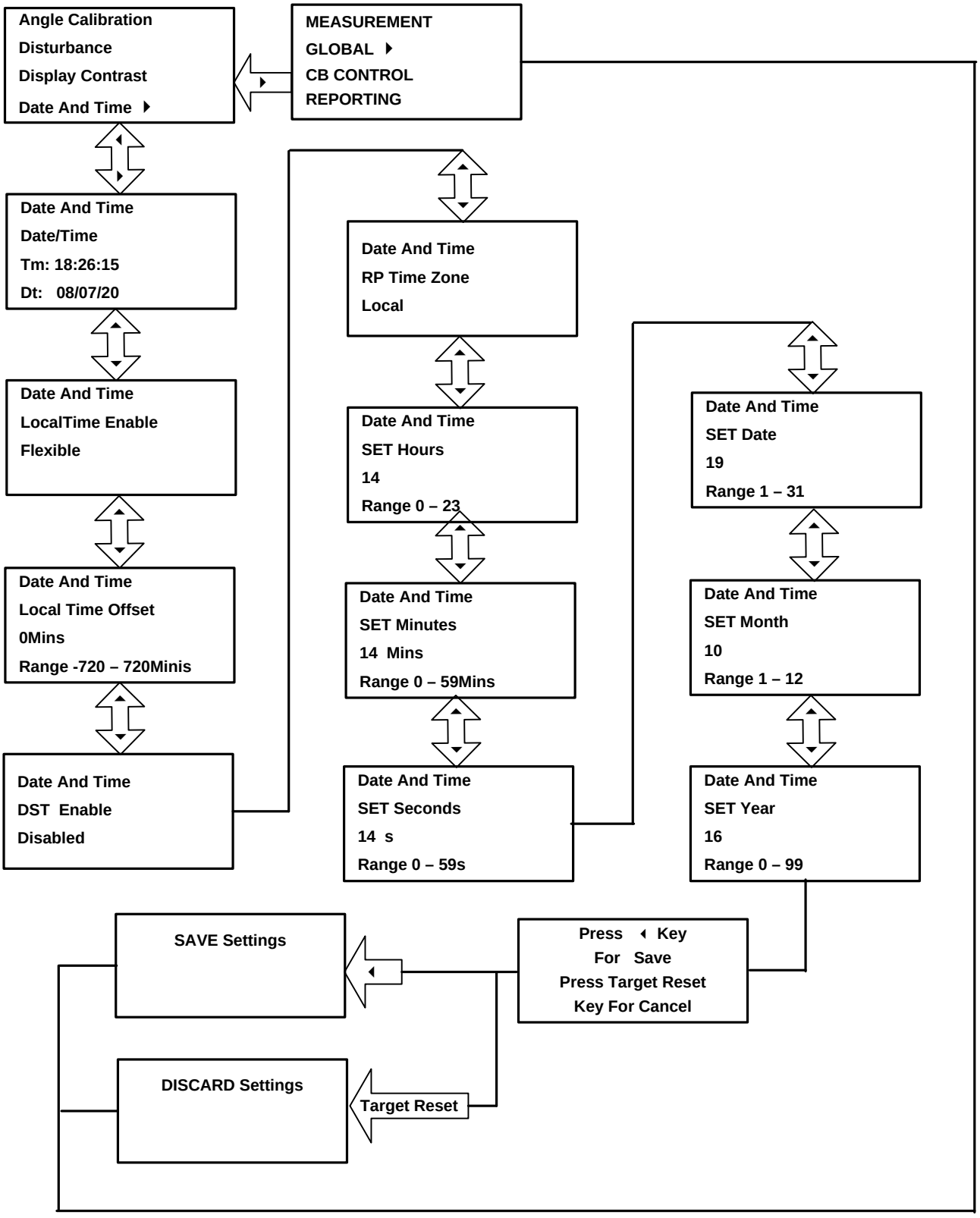


9.4.10 Date and Time

9.4.10.1 Date and Time (If Disabled)

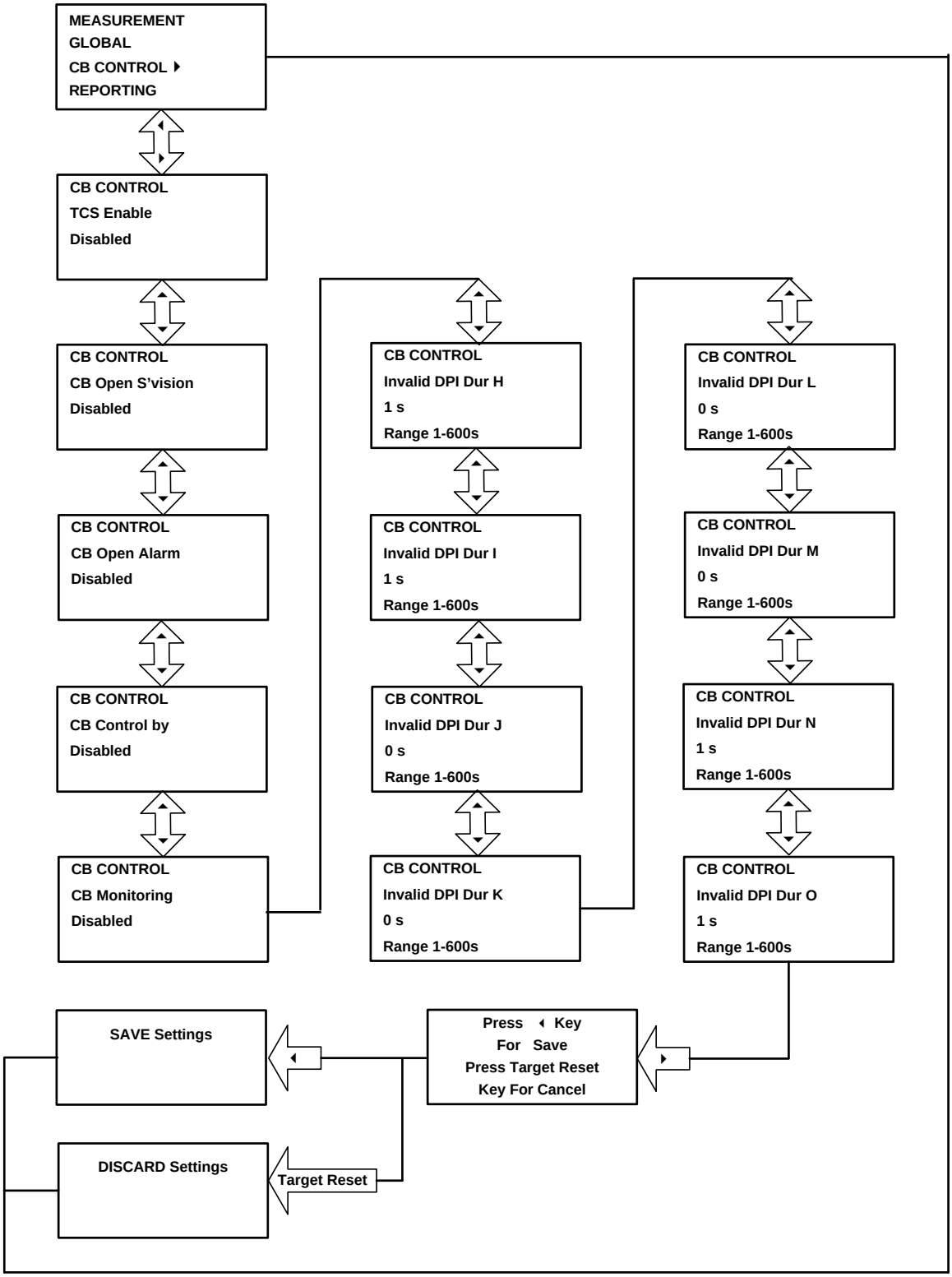


9.4.10.2 Date and Time (If Enabled)

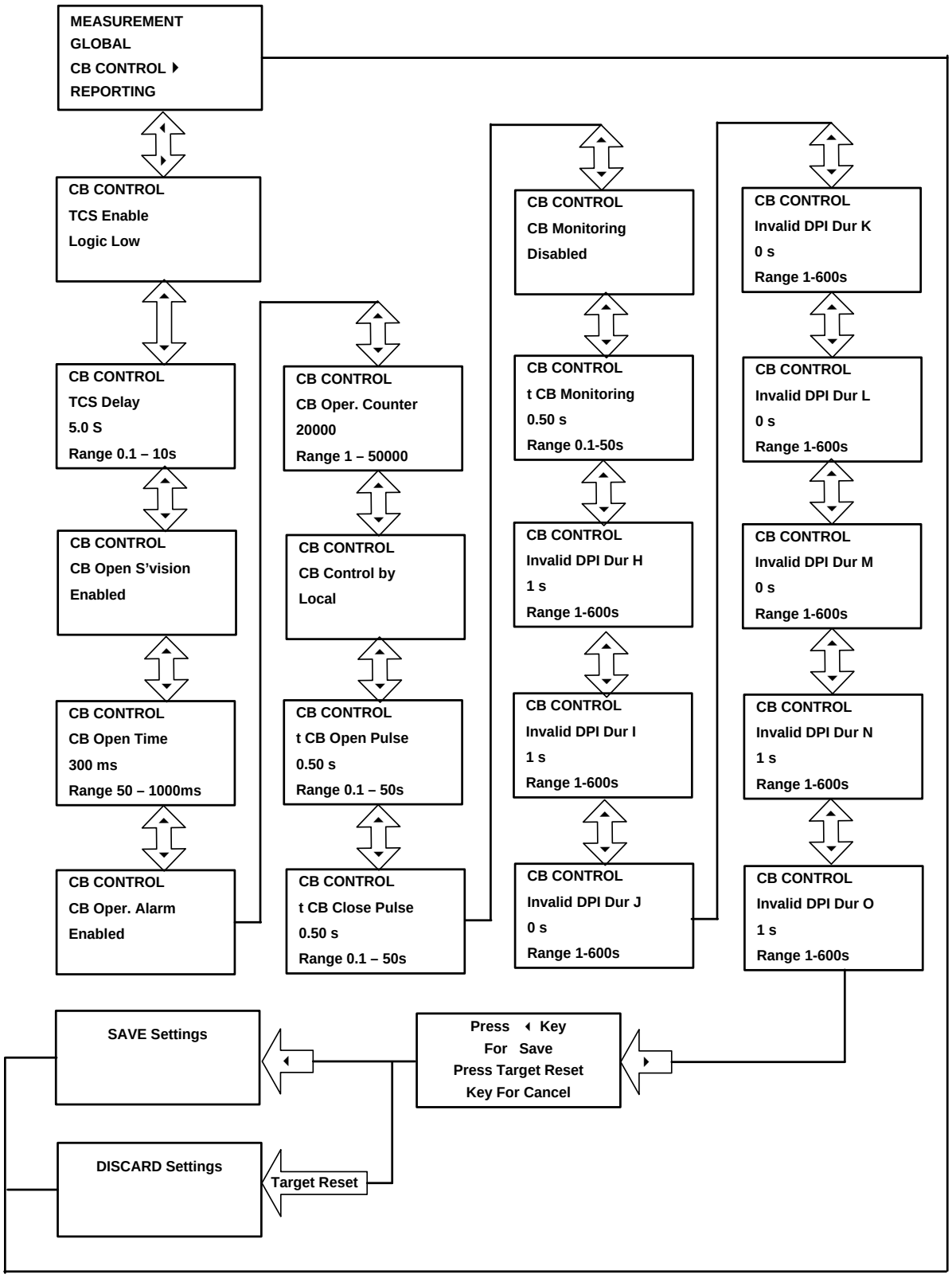


9.5 CB Control

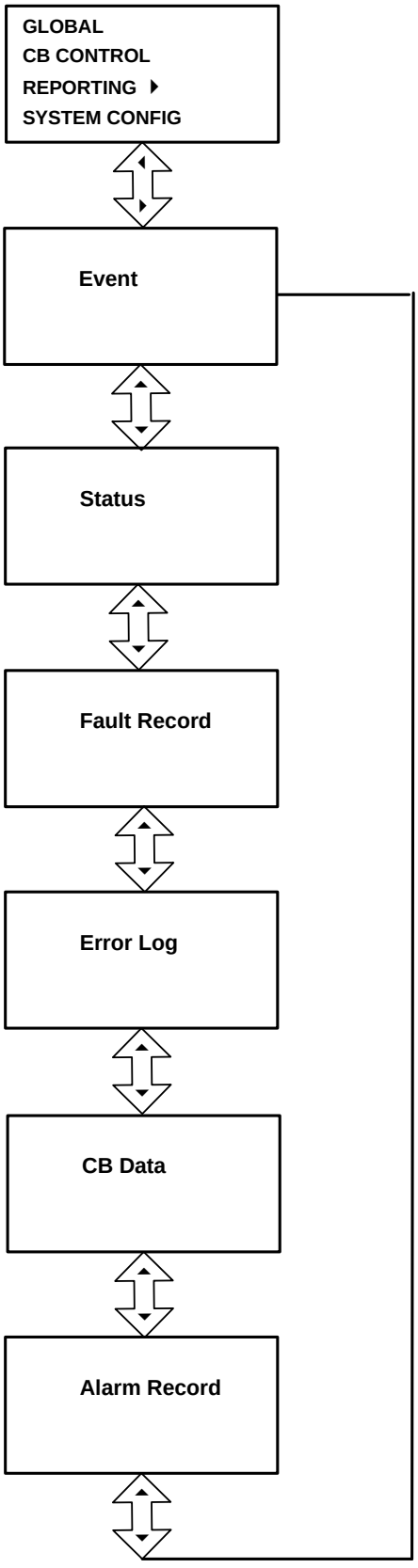
9.5.1 CB Control (If Disabled)



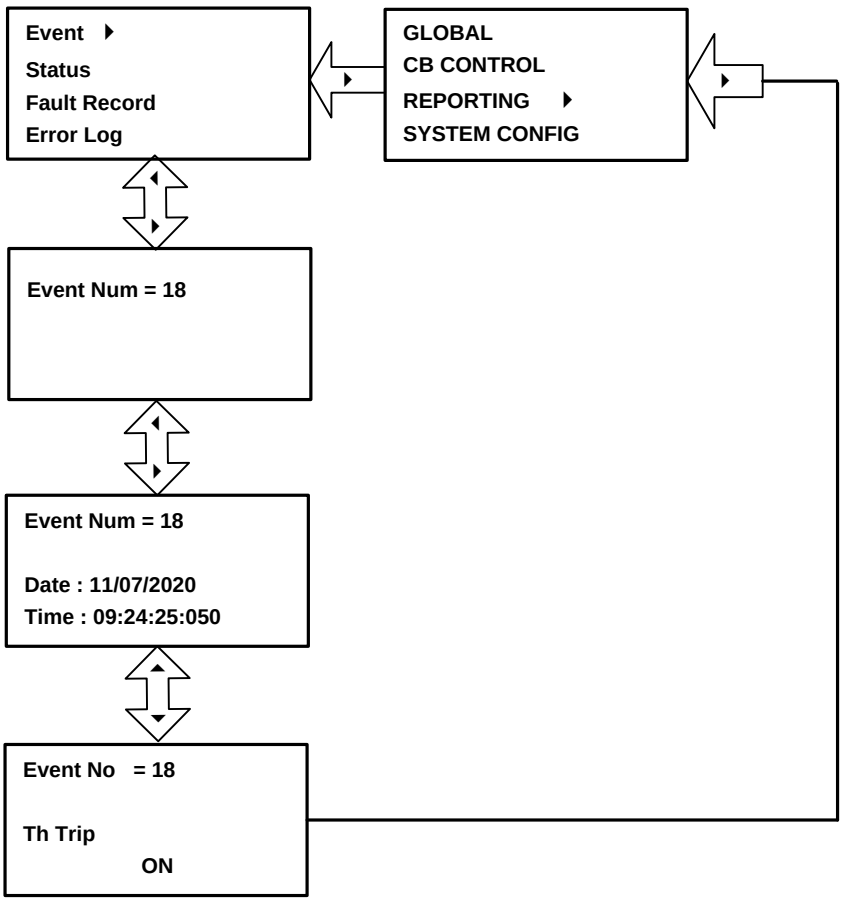
9.5.2 CB Control (If Enabled)



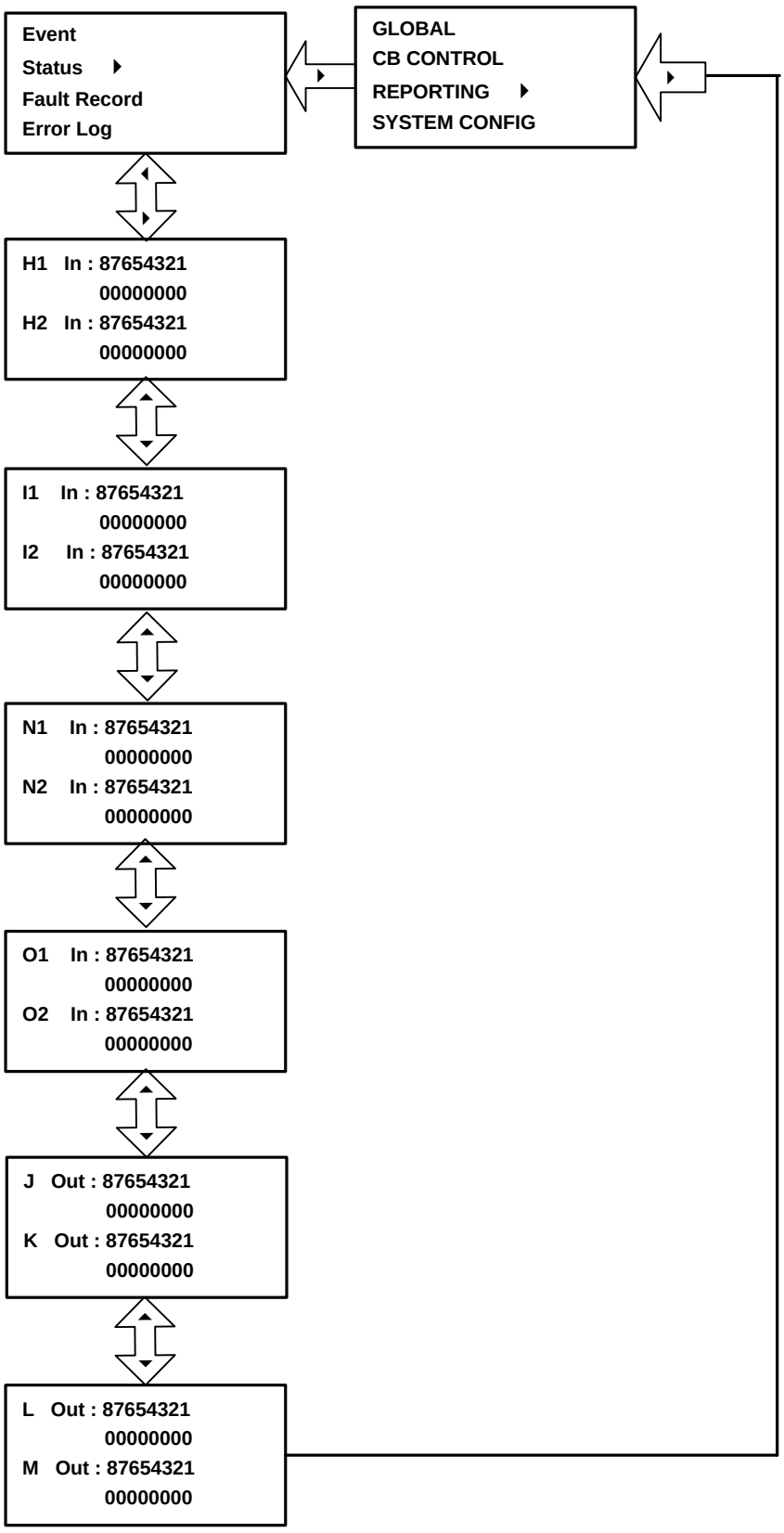
9.6 Reporting



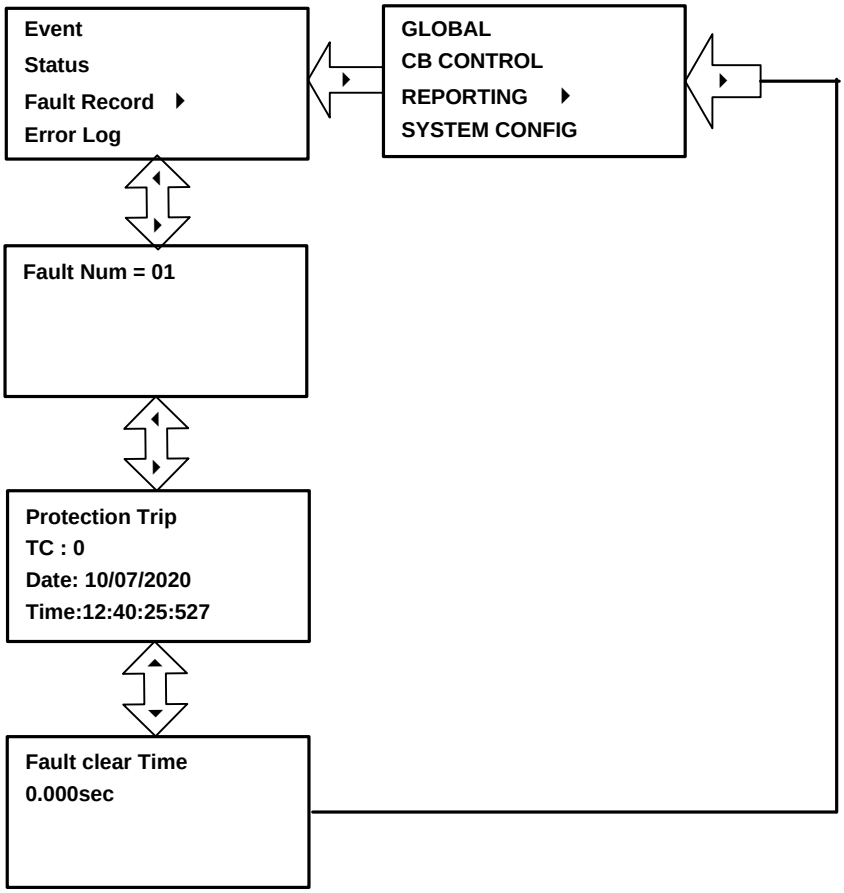
9.6.1 To View – Event



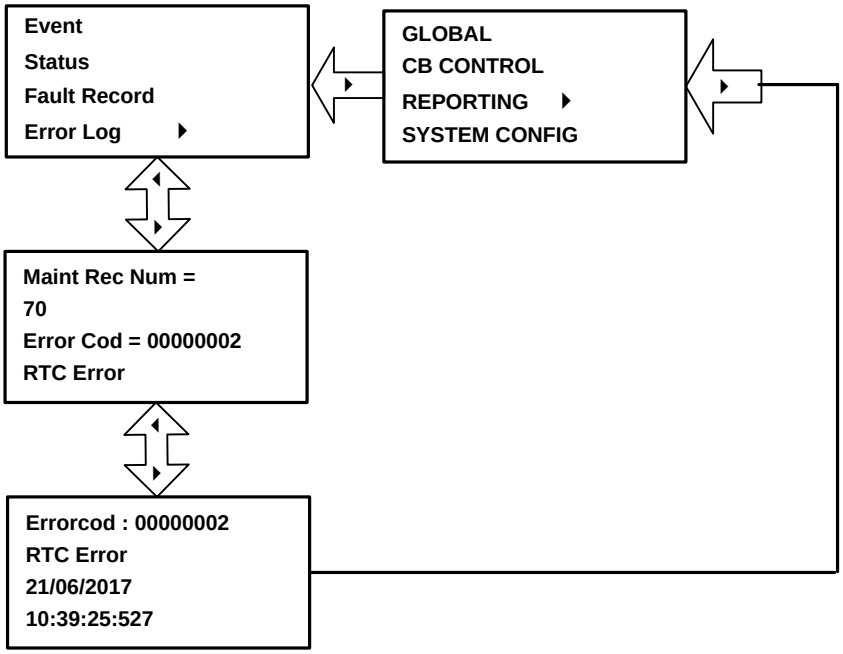
9.6.2 To View – Status



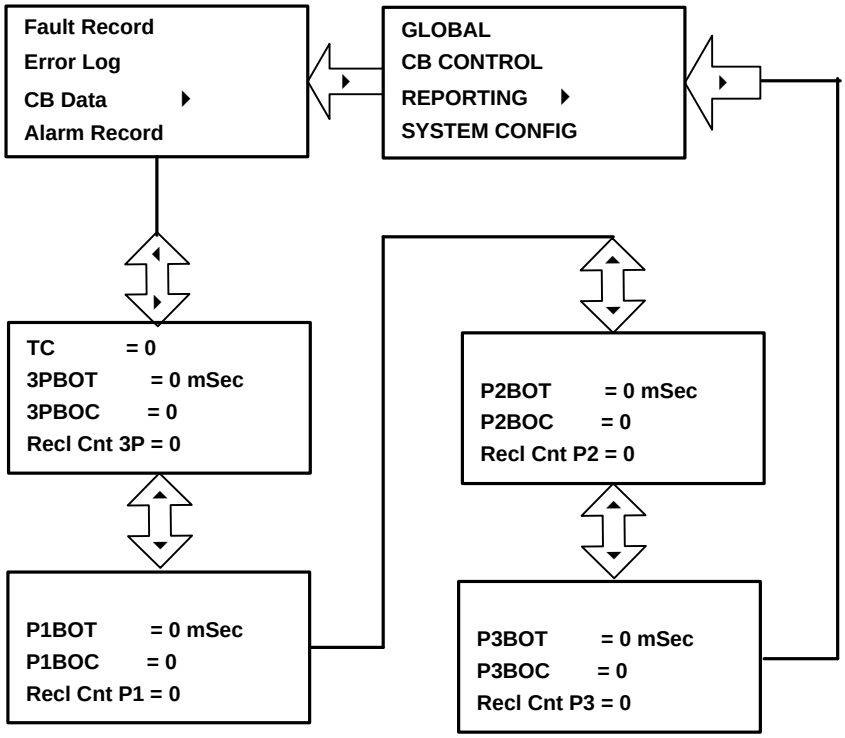
9.6.3 To View – Fault Record



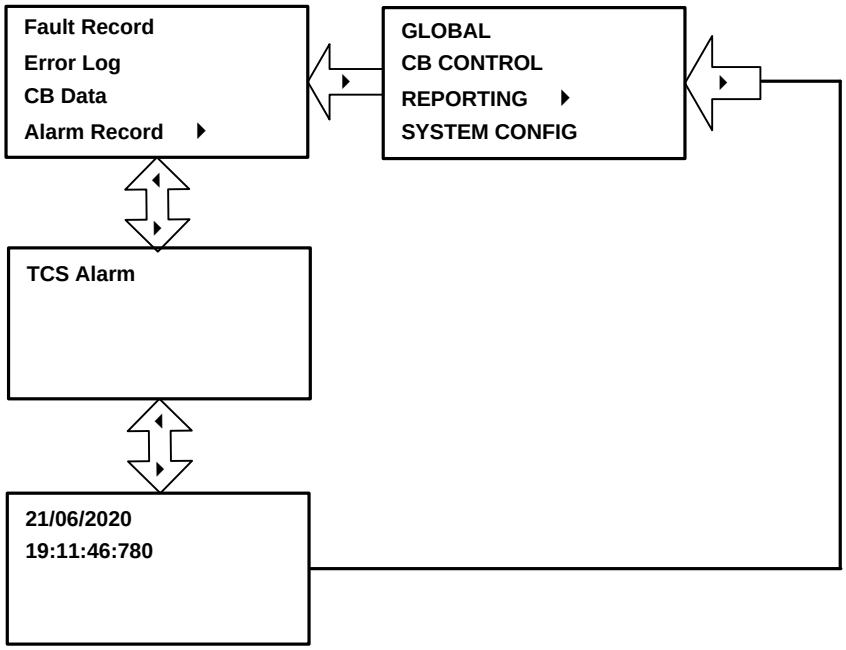
9.6.4 To View – Error Log



9.6.5 To View – CB Data

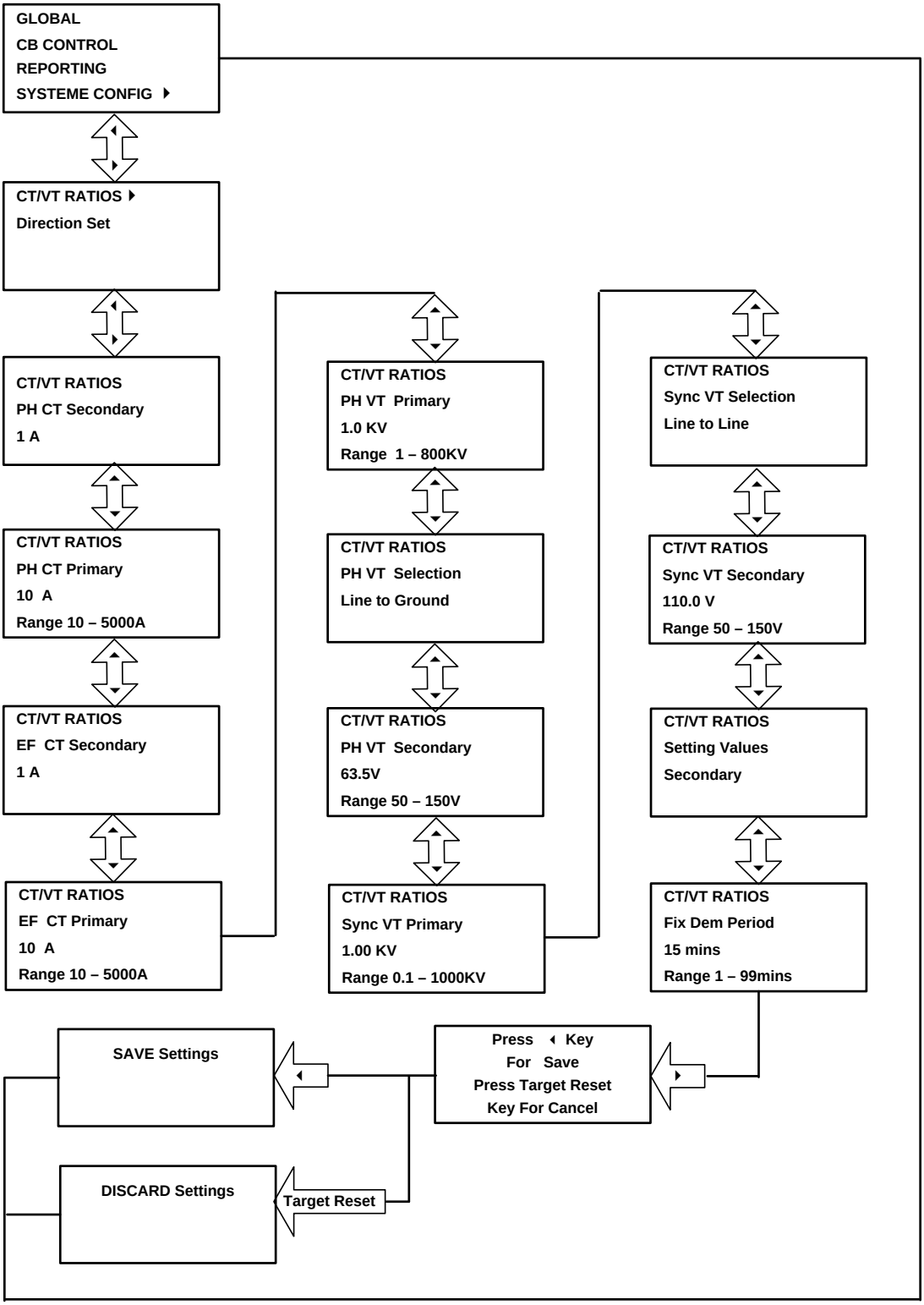


9.6.6 To View – Alarm Record

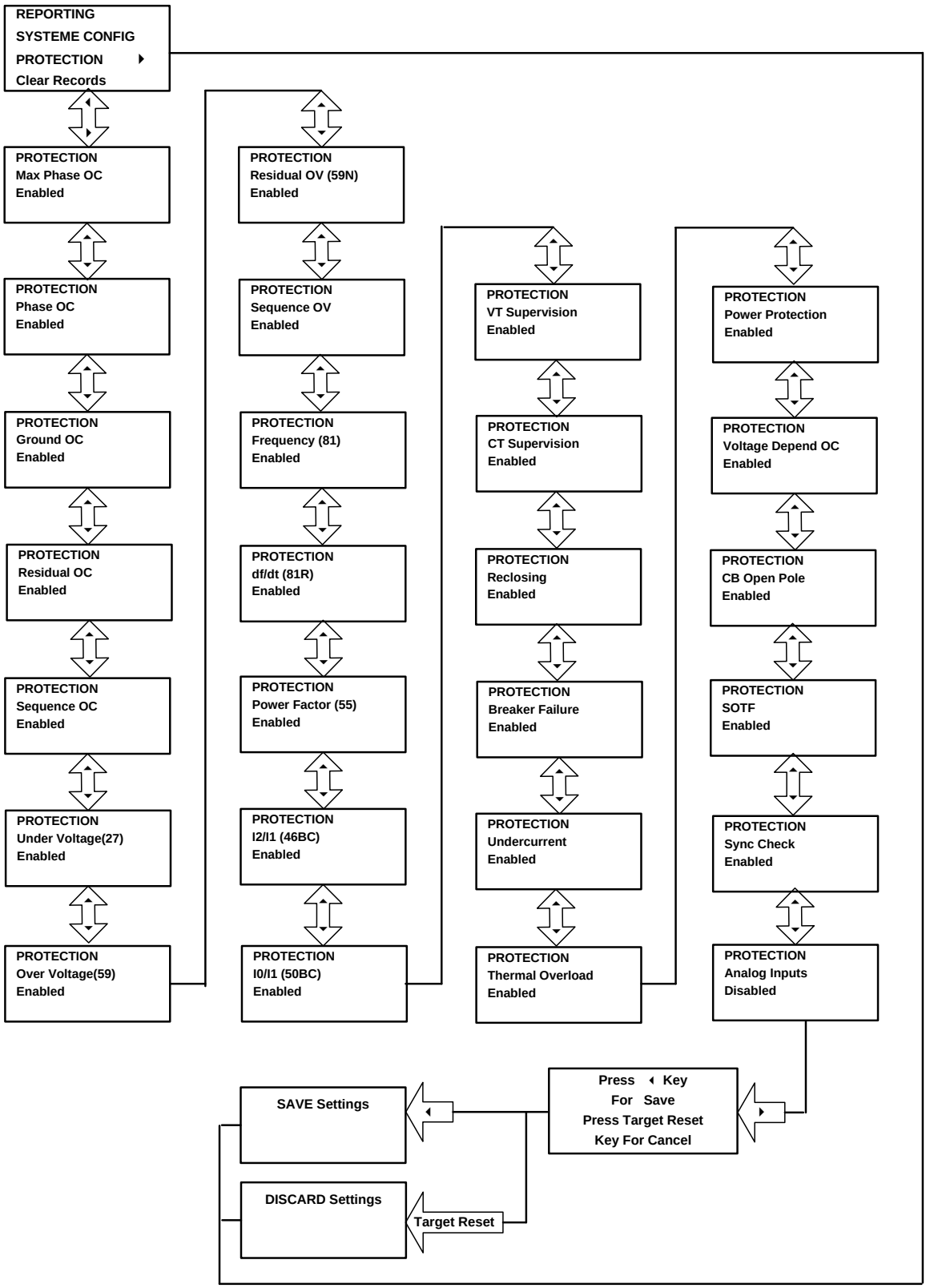


9.7 System Config

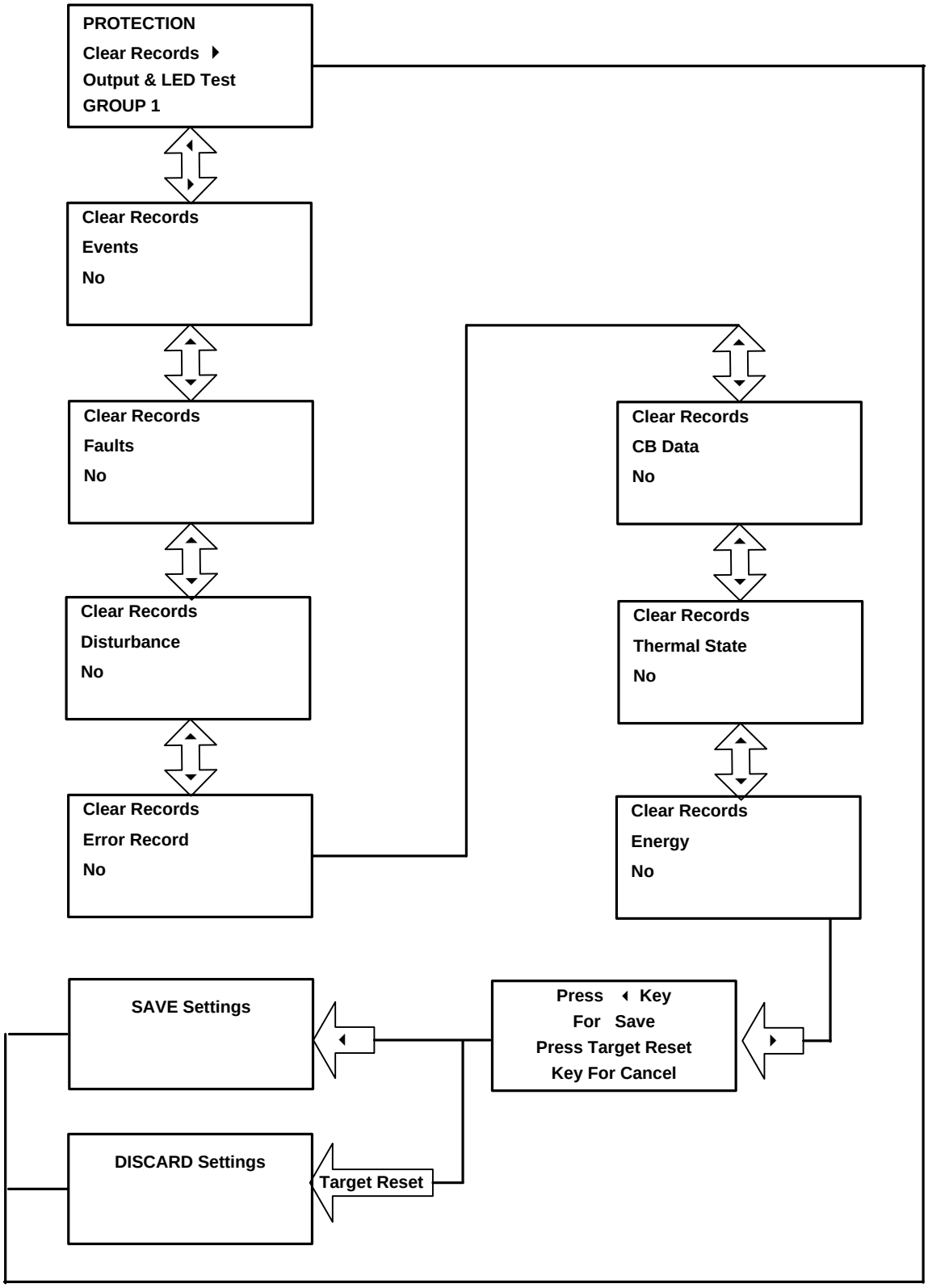
9.7.1 To Set – CT/VT Ratios



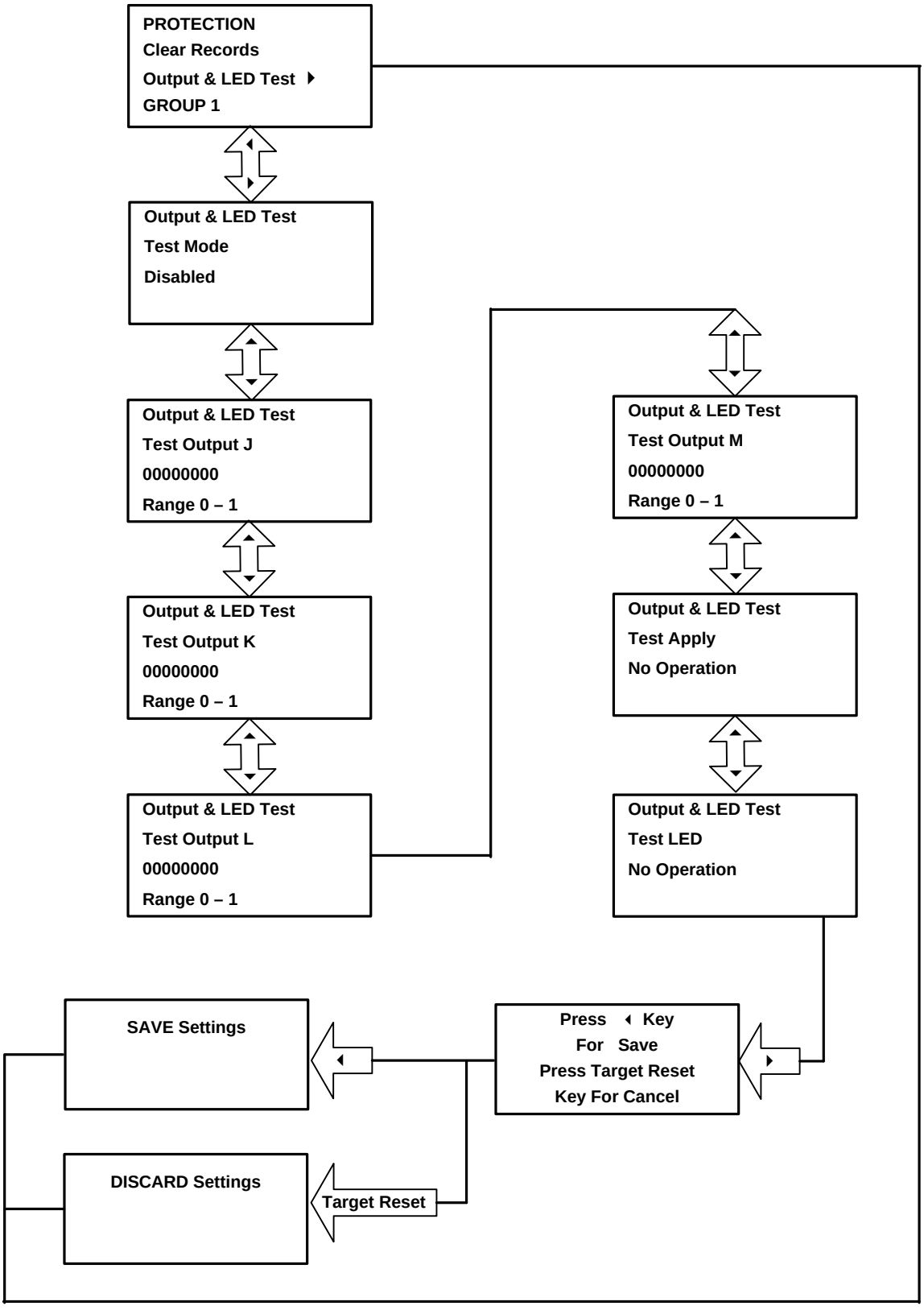
9.8 Protection



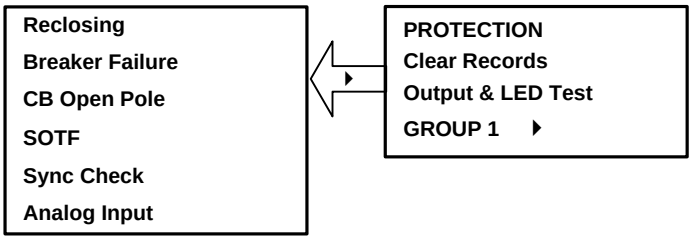
9.9 Clear Records



9.10 Output & LED Test



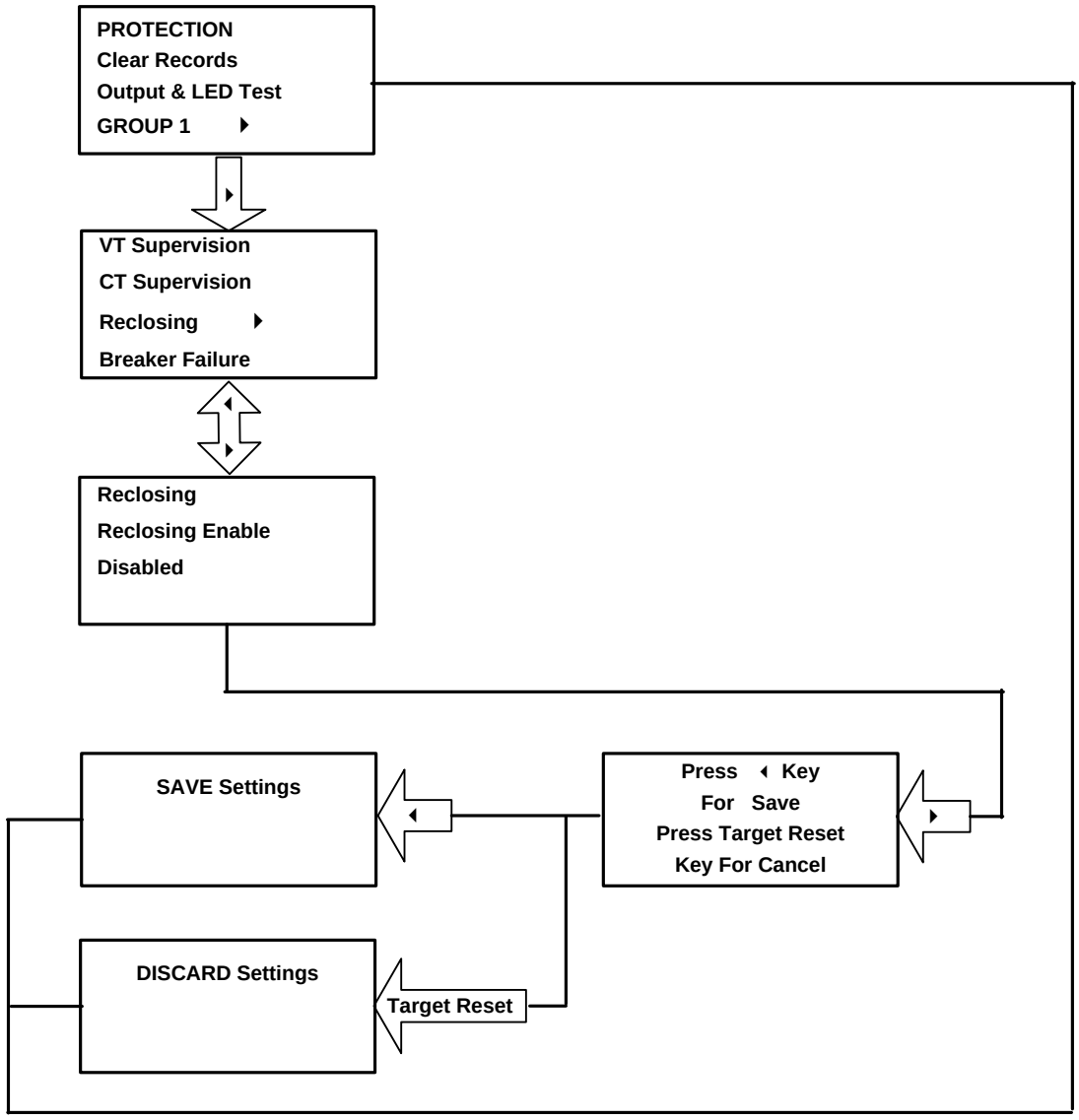
9.11 Group 1



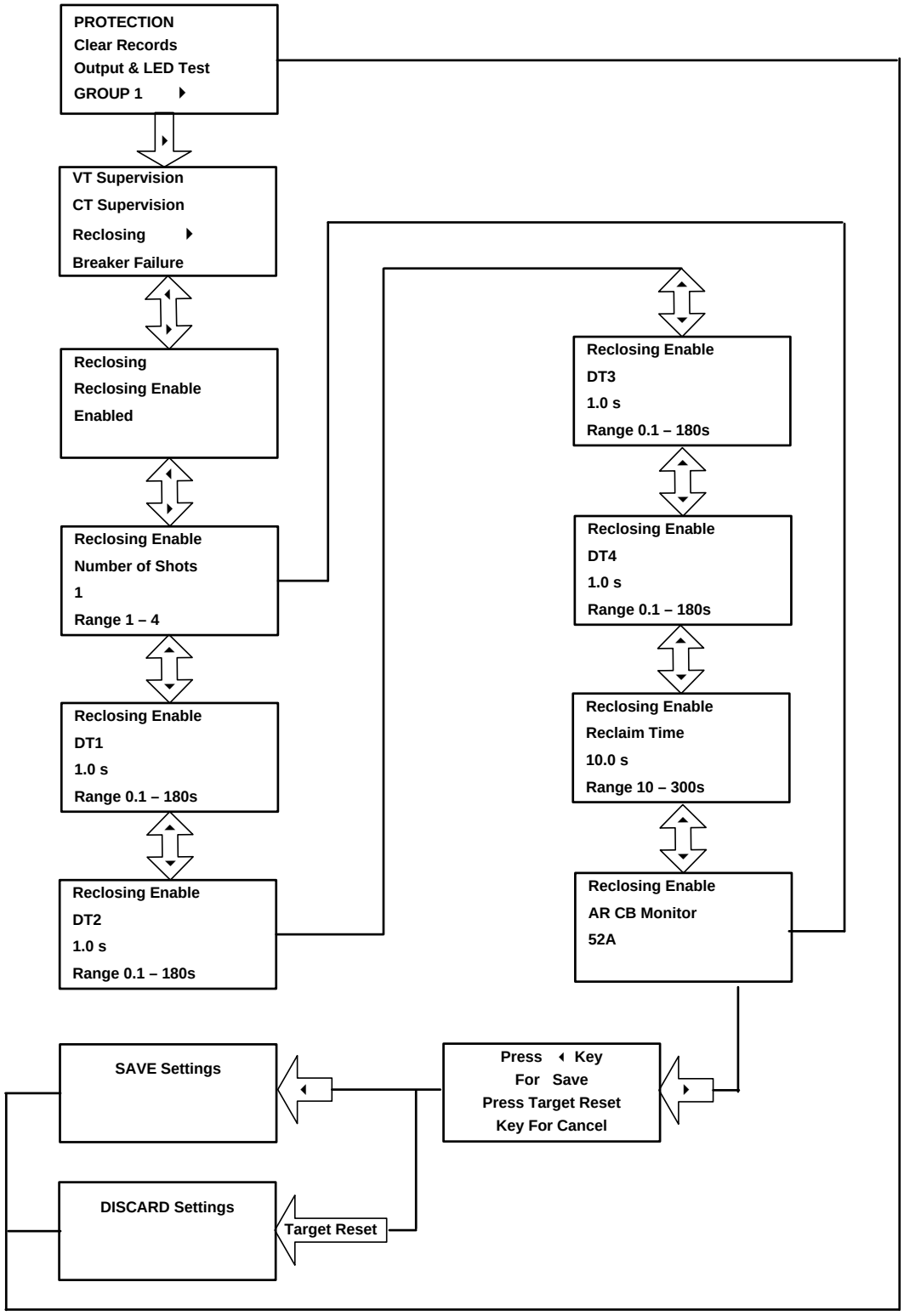
Note: By using the Up arrow key (▲) and the down arrow key (▼) the Main Menu settings can be scrolled.

9.11.1 Reclosing

9.11.1.1 Reclosing (If Disabled)

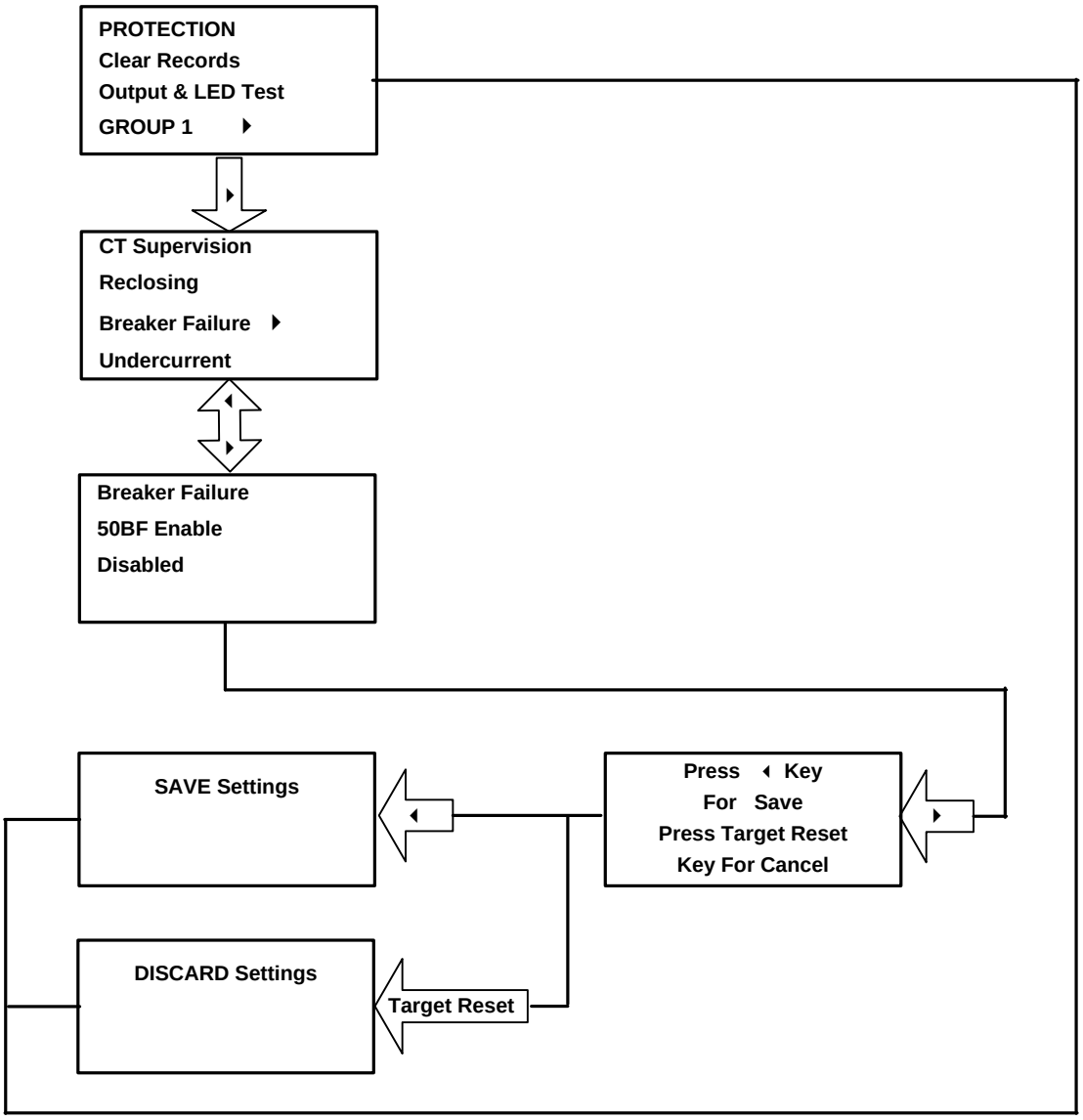


9.11.1.2 Reclosing (If Enabled)

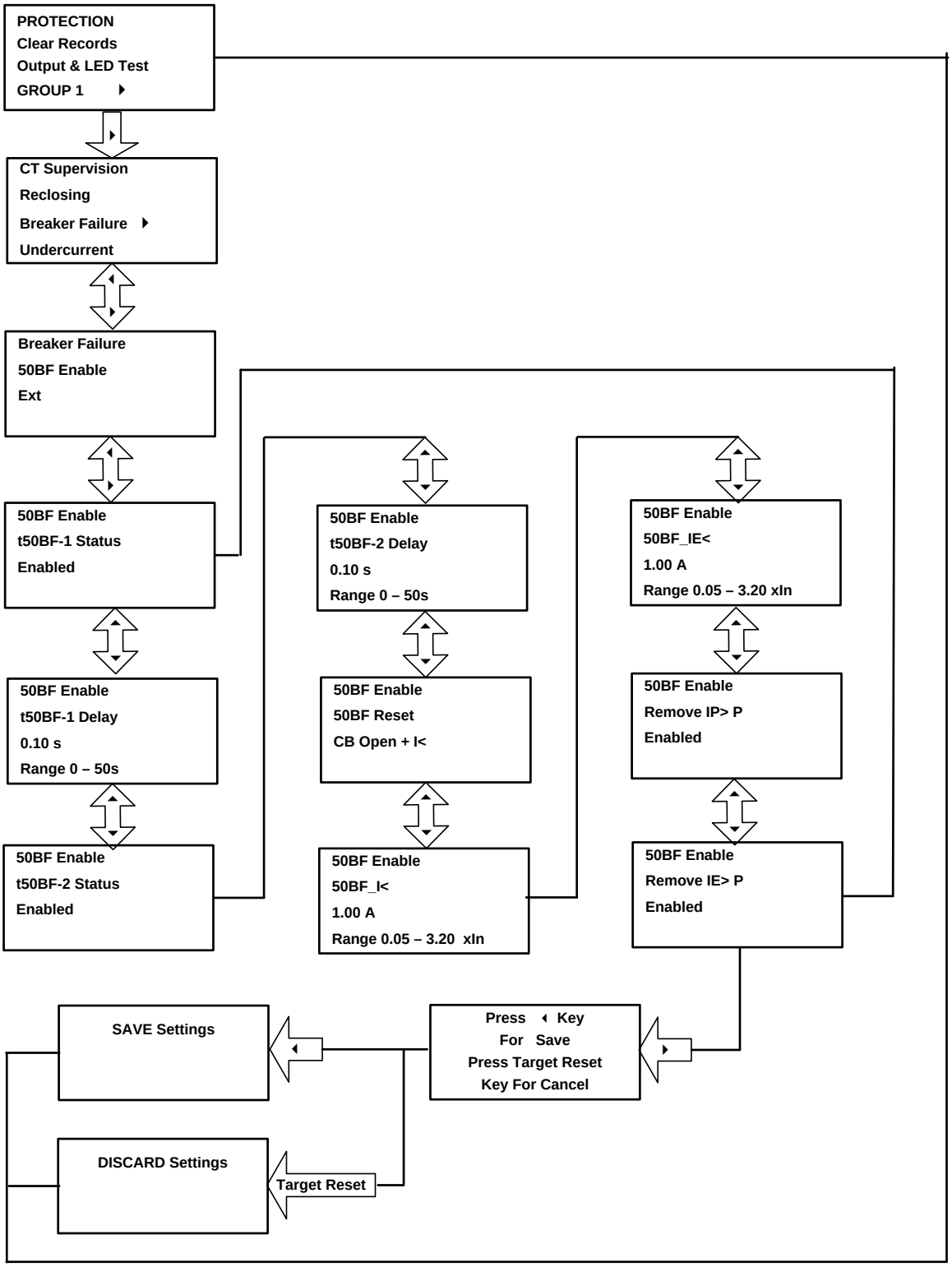


9.11.2 Breaker Failure

9.11.2.1 Breaker Failure (If Disabled)

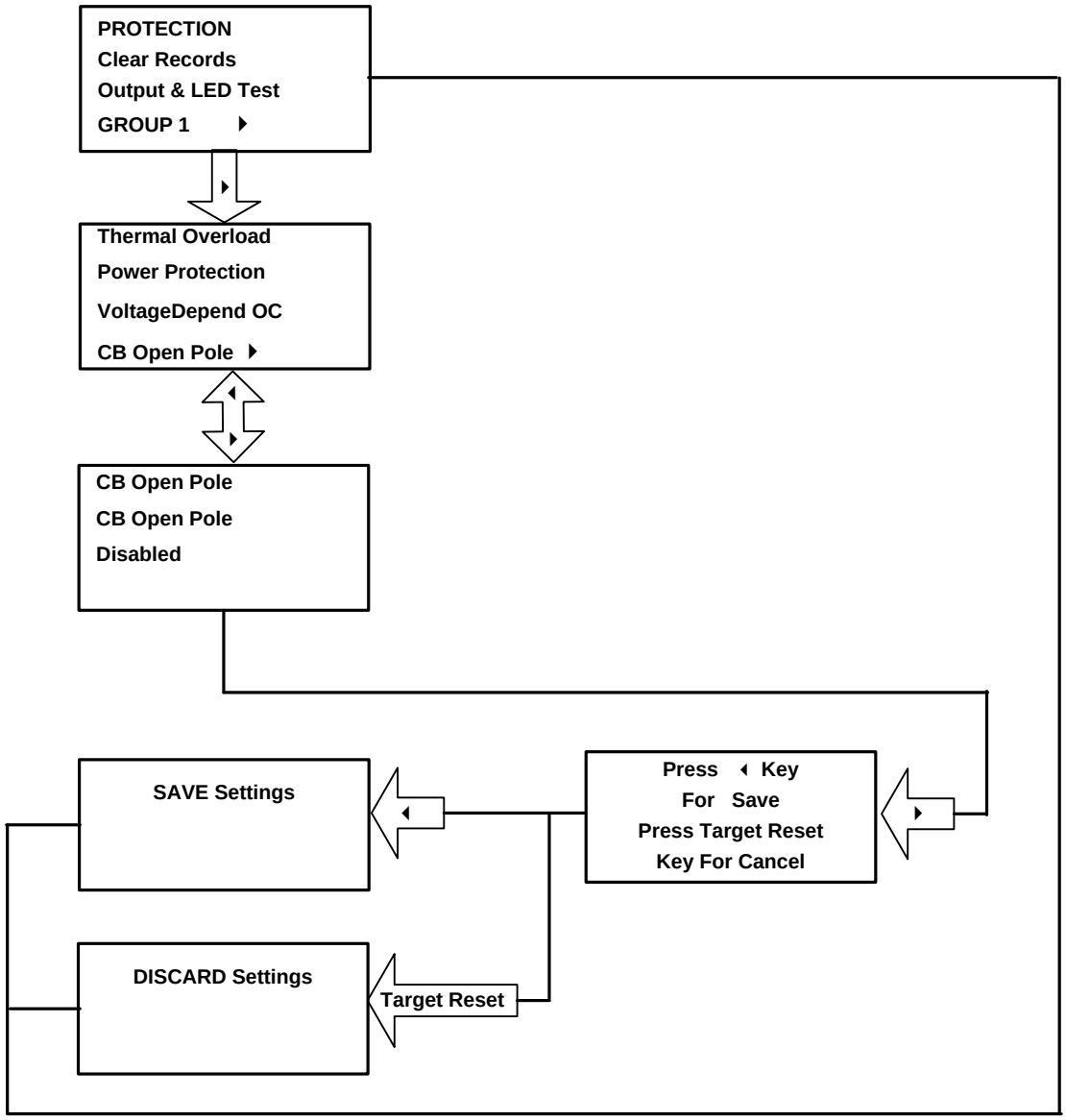


9.11.2.2 Breaker Failure (If Enabled)

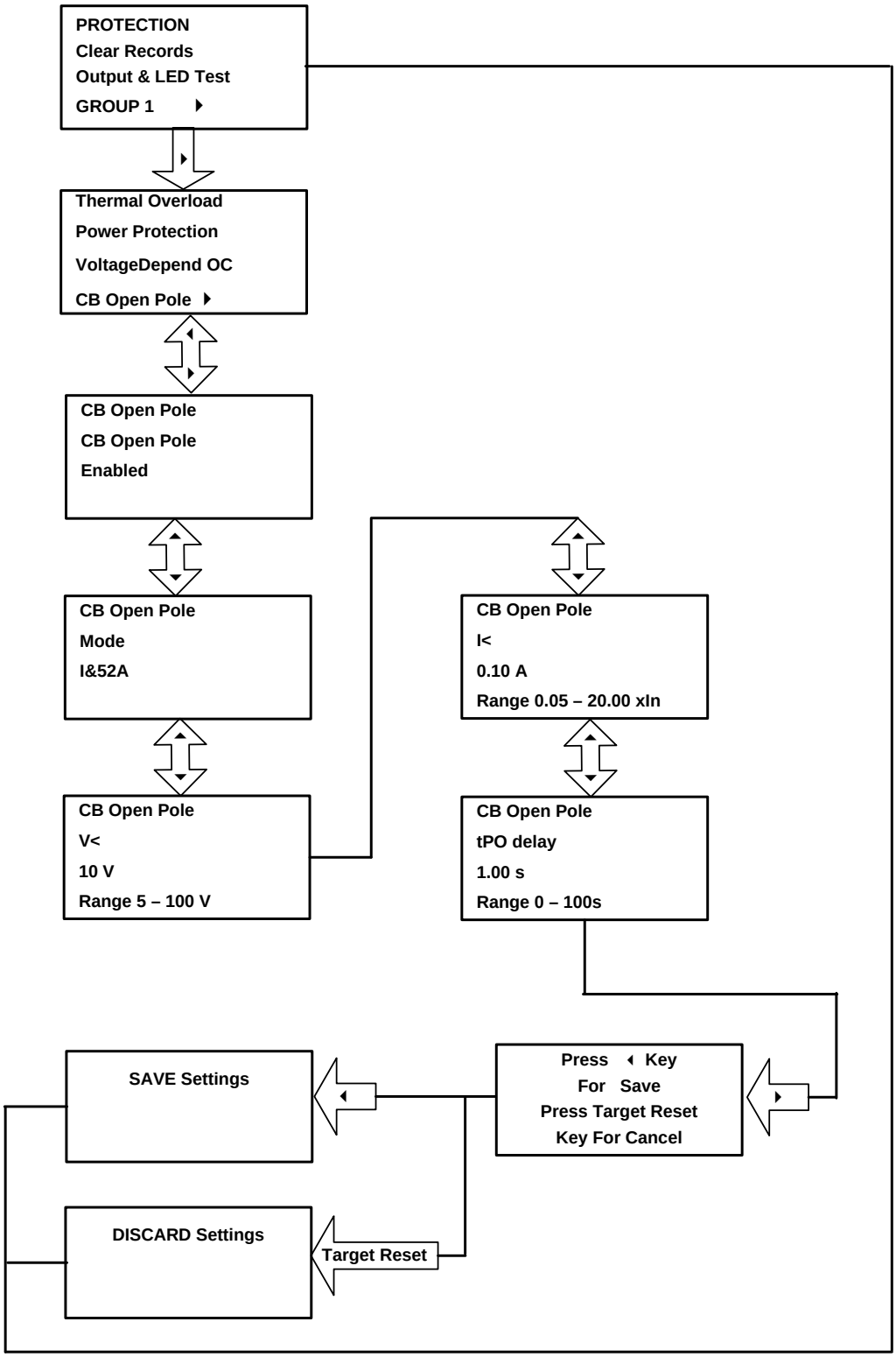


9.11.3 CB Open Pole

9.11.3.1 CB Open Pole (If Disabled)

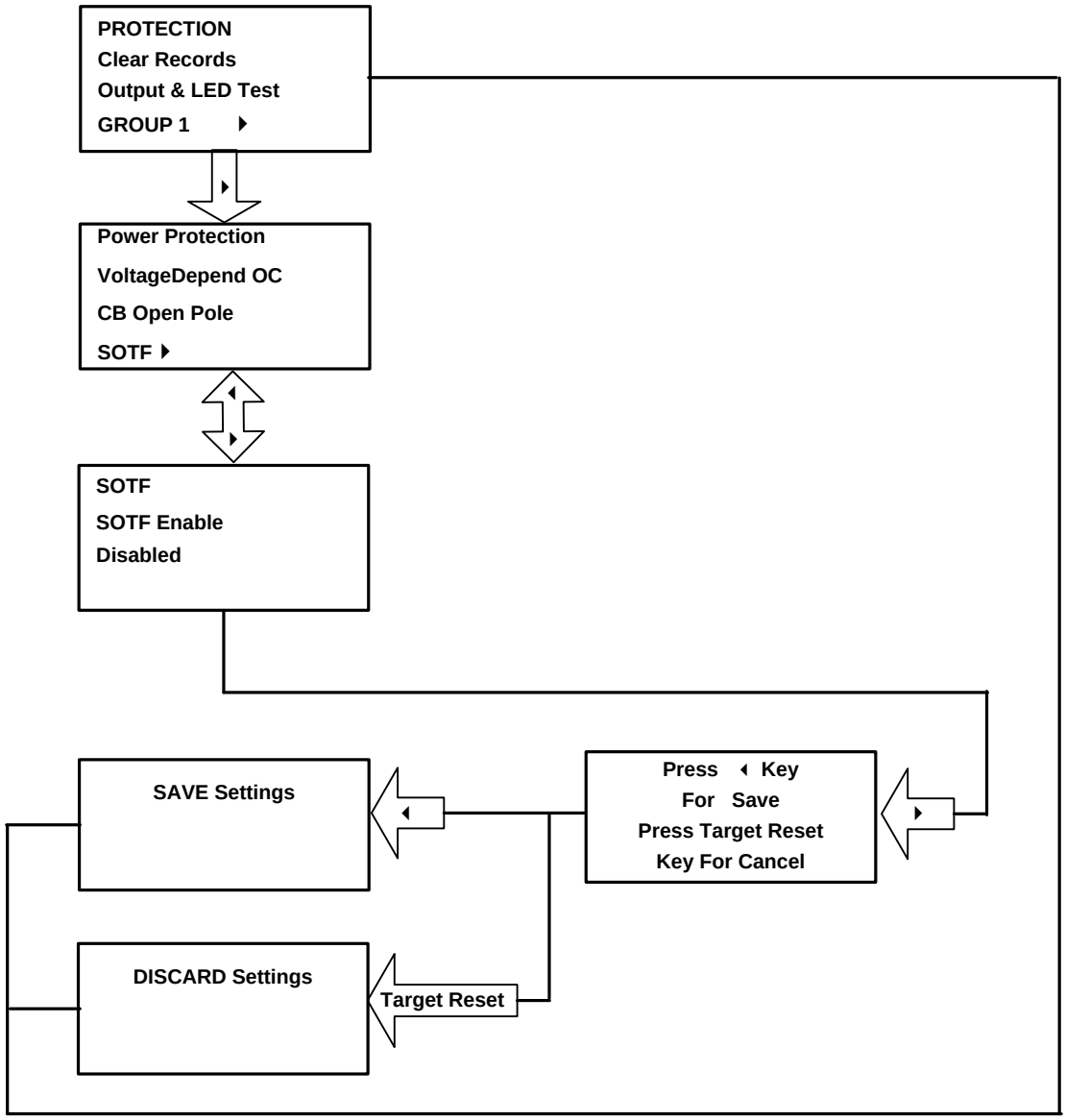


9.11.3.2 CB Open Pole (If Enabled)

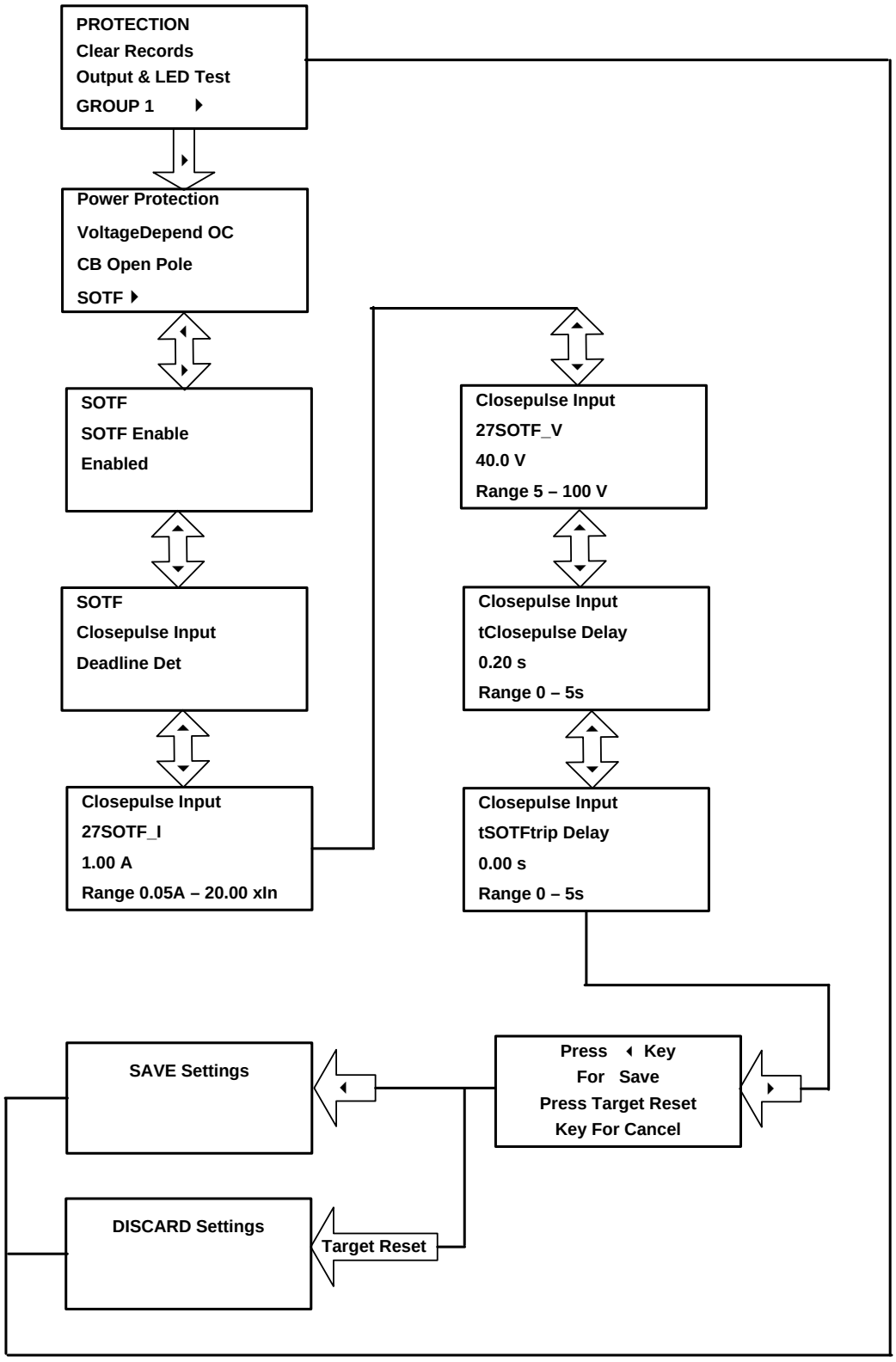


9.11.4 SOTF

9.11.4.1 SOTF (If Disabled)

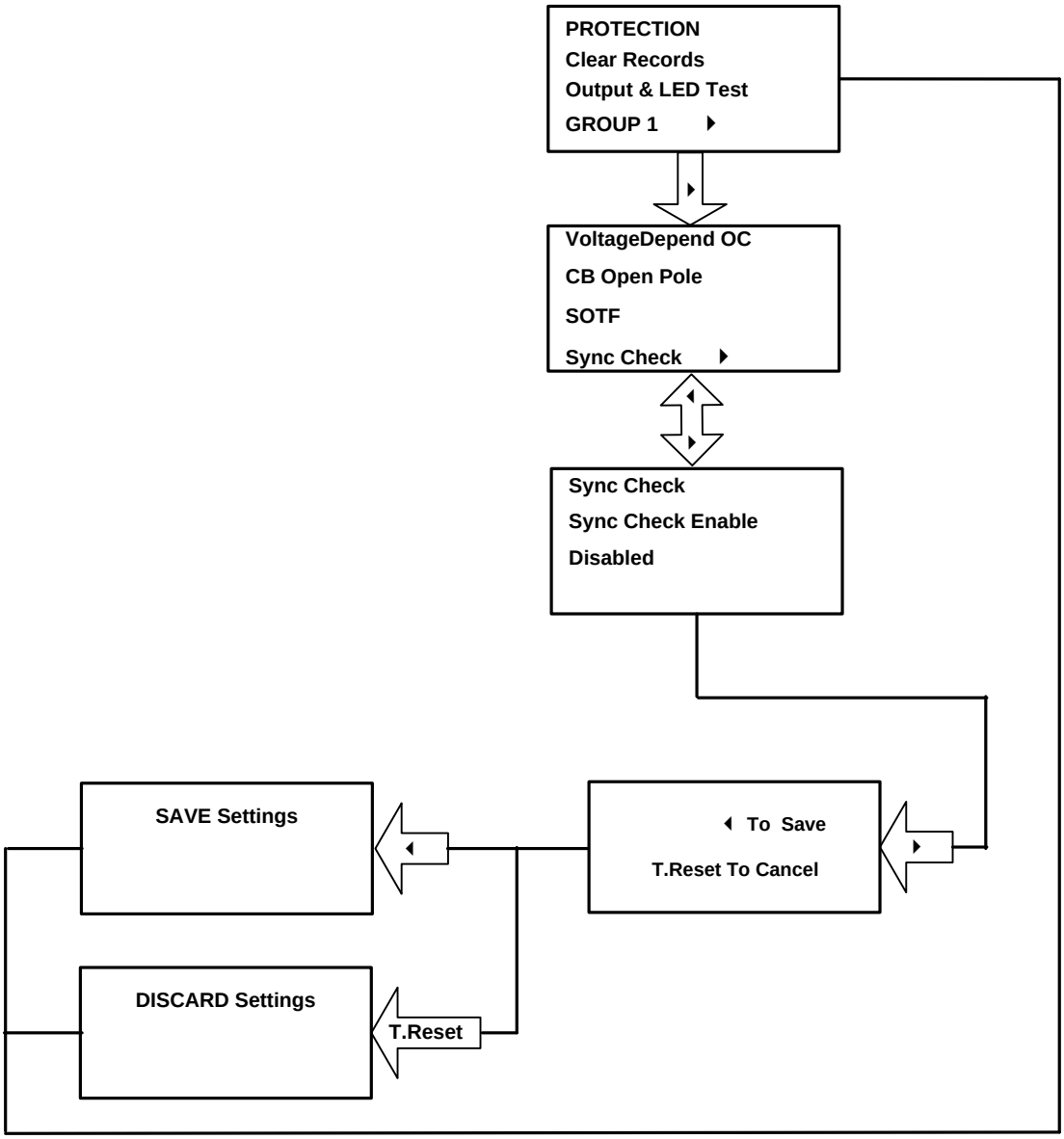


9.11.4.2 SOTF (If Enabled)

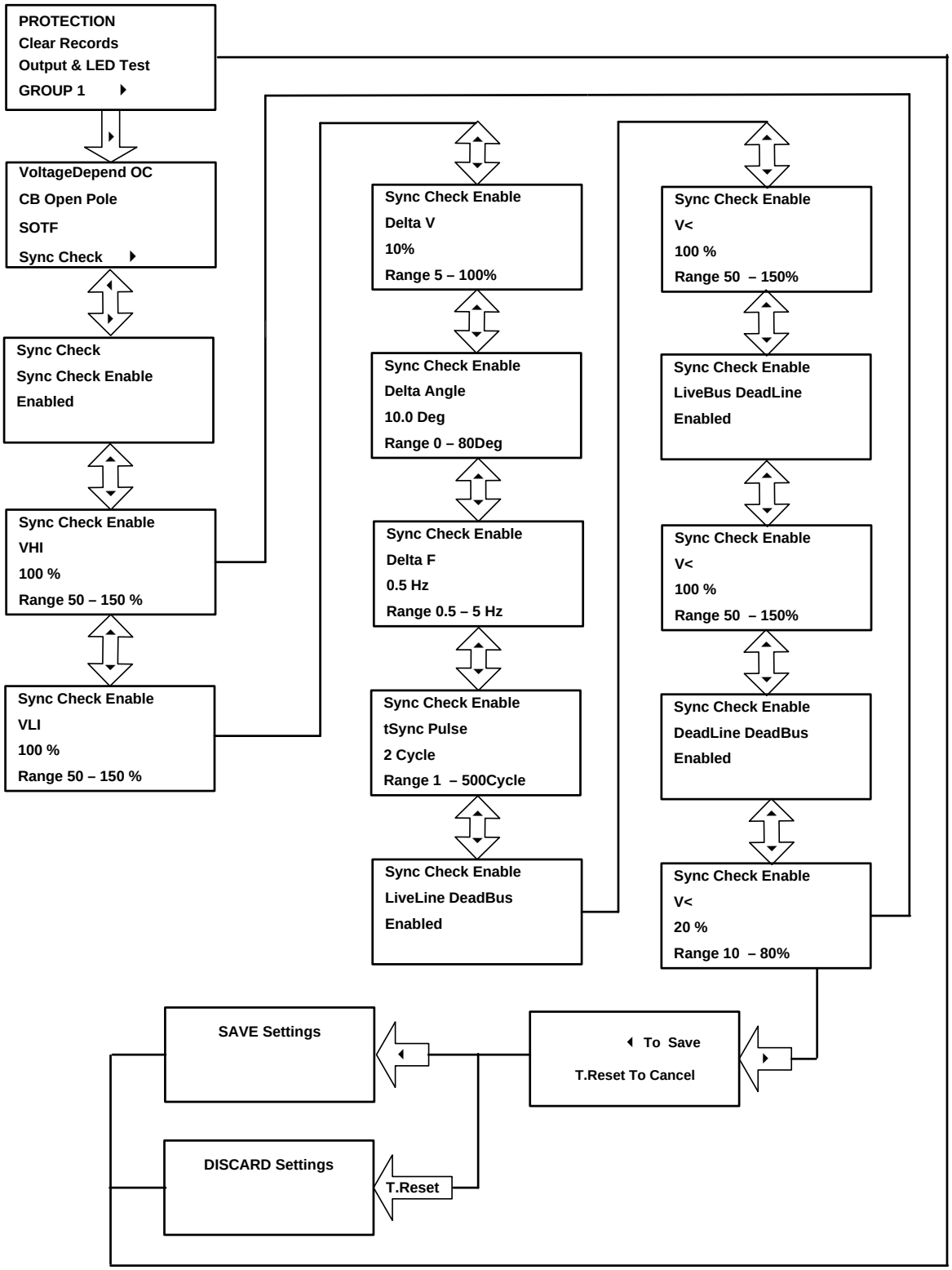


9.11.5 Sync Check

9.11.5.1 Sync Check (If Disabled)

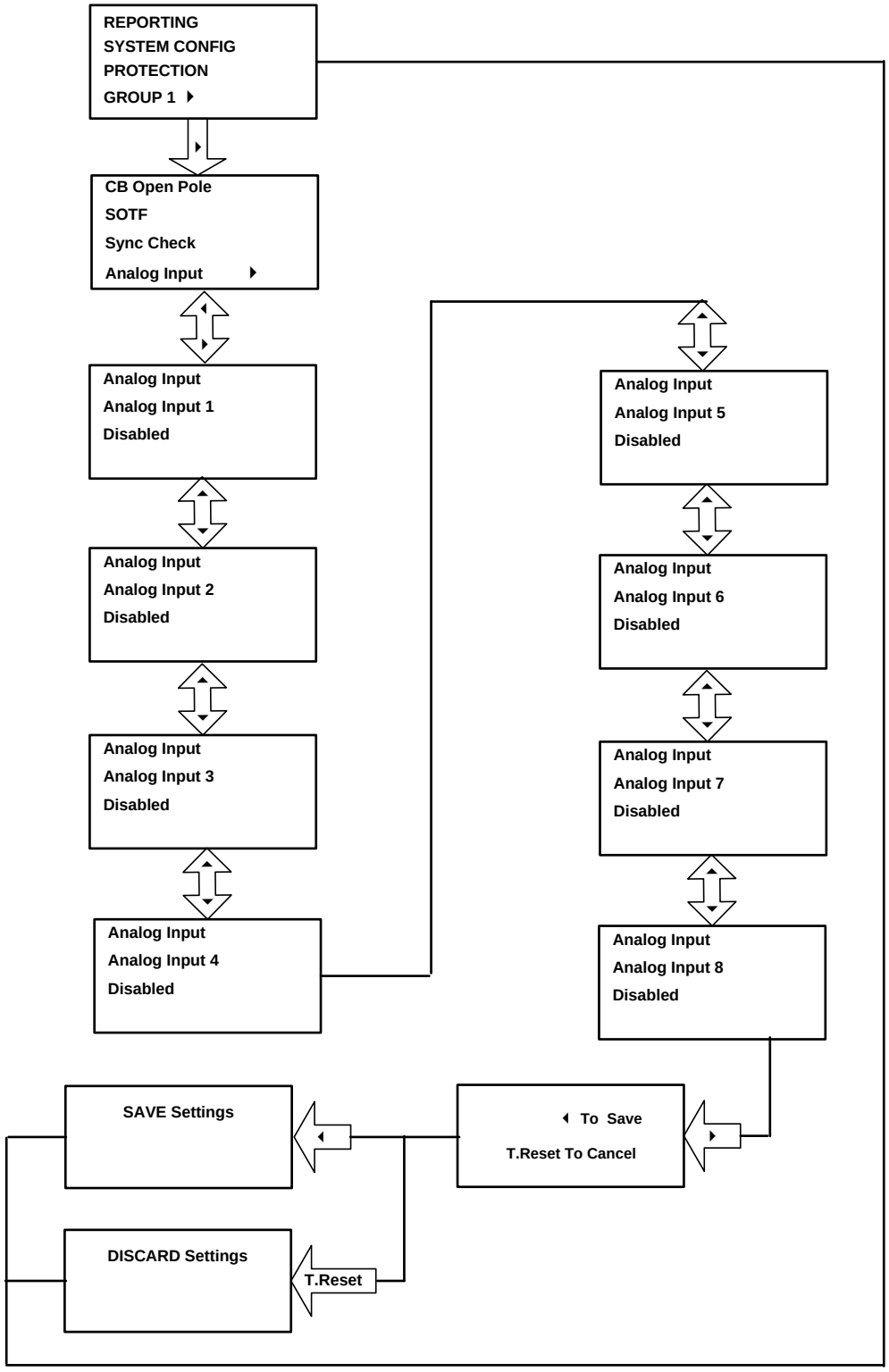


9.11.5.2 Sync Check (If Enabled)

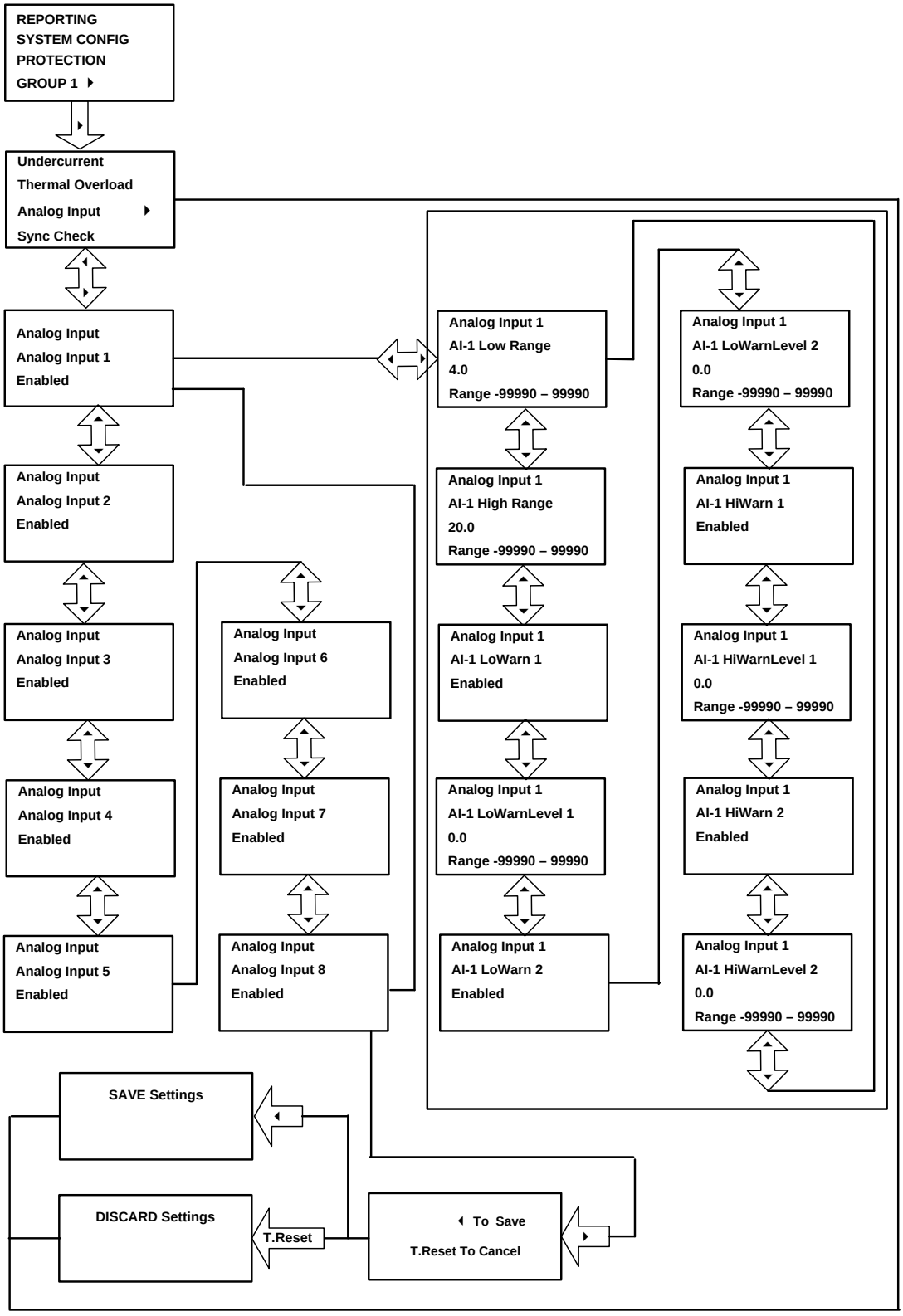


9.11.6 Analog Input

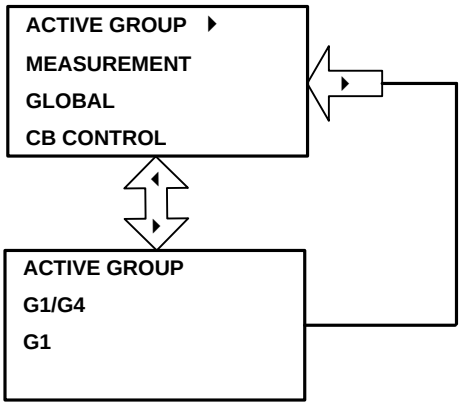
9.11.6.1 Analog Input (If Disabled)



9.11.6.2 Analog Input (If Enabled)



9.12 Active Group



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Section 10

Analyzing Event and Disturbance Record

Contents

10 ANALYZING EVENT AND DISTURBANCE RECORD

10.1 Overview

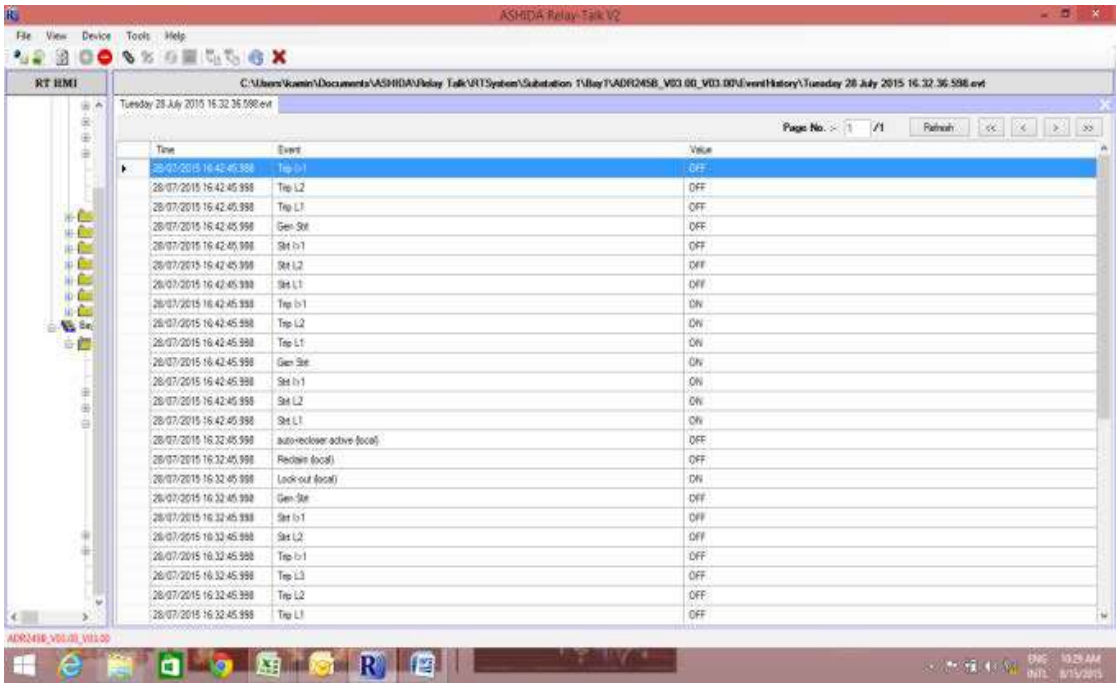
The BCU-ADR245B provides several tools (listed below) to analyze the cause of BCU operations. Use these tools to help diagnose the cause of the BCU operation and more quickly restore the protected equipment to service.

1. Event Recording
2. Disturbance Recording
3. History Faults Recoding

All records are stored in non-volatile memory, ensuring that a loss of power to the BCU-ADR245B will not result in lost data.

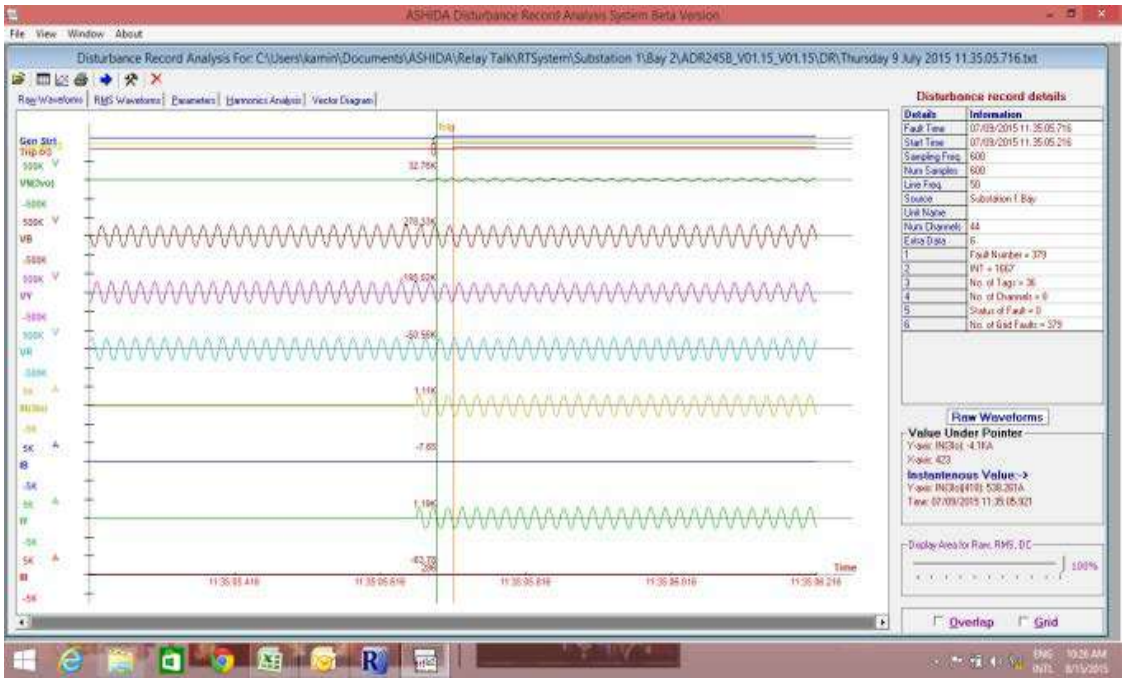
10.2 Event recording

BCU-ADR245B provides a feature to record and store 1024 nos. of events (with event time stamping is with 1mSec precision) in non-volatile memory through internally by protection and control functions and externally by triggering the digital inputs. And these can be extracted using communication port or can be seen on the LCD. The event can be triggered on time stamp through time synchronization or through internal clock setting.



10.3 Disturbance recording

BCU-ADR245B provides built in disturbance recording facility for recoding analogue and digital channels. BCU records 10 nos. of disturbances (1.5 Seconds length each) and stores it in non-volatile memory. Disturbance records can be saved in IEEE COMTRADE format and same can be analyzed in disturbance analysis software.



10.4 History Fault recording:

BCU-ADR245B provides built in history fault recording facility for recoding the fault with the voltage, current, symmetrical components parameter value. BCU records 10 nos. of history fault and stored it in non-volatile memory.

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Section 11

Testing and Commissioning

Contents

11 TESTING AND COMMISSIONING

11.1 Commissioning Tests & Equipments Required

The following tests help user to configure the settings in BCU-ADR245B and verify whether the BCU is properly working or not.

The tests are conducted to ensure whether the BCU settings and logics are correct or not. The procedure can be modified as necessary to conform to standard practices. For initial BCU installation this procedure can be used but user can configure the BCU according to the required application.

Install and connect BCU-ADR245B according to user's protection design.

Following instruments are used for testing the BCU:

- Digital Multi Meter True RMS
- Auxiliary AC/DC Supply
- For Calibration and Measurement customer can use numerical test kits like F6150 or CMC356 or MPRT or equivalent:
- Three-phase voltage and current source with phase angle control
- PC having USB port with serial communications cable with following software (minimum configuration):
- The IEC 60870-5-103 communication can be verified by using the ASHIDA Relay Talk-V2 software.
- The ASHIDA Relay Assist Software (Electrical Parameter Calculator) is used as commissioning support.

11.2 Checking of External Circuitry

Connection Tests

Step 1: Remove control voltage and AC signals from BCU-ADR245B by opening the appropriate breaker(s) or removing fuses

Step 2: Isolate the relay contact assigned to be the TRIP output

Step 3: Verify correct AC and DC connections by performing point-to-point continuity checks on the associated circuits.

Step 4: Apply AC or DC control voltage to the BCU. After the BCU is energized, the front-panel green ENABLED LED should illuminate.

Step 5: Use the appropriate serial cable (USB to serial Cable or equivalent) for connecting a PC with the BCU.

Step 6: Start the RTV2 software and establish communication with the BCU.

Step 7: Set the correct Date and Time in the BCU by using keypad at the front panel or serial port commands

Step 8: Verify the BCU Current Transformer and Potential Transformer connections.

Step 9: Connect the current or voltage AC test source to the appropriate BCU terminals. Disconnect the current transformer and voltage transformer (if present) secondary from the BCU prior to applying test source quantities.

Step 10: Apply rated current (1A or 5A)

Step 11: If the BCU is equipped with voltage inputs, apply rated voltage for user's application.

11.3 Check BCU Settings

The BCU settings are required to verify and ensure that protection application is functioning correctly. Enter all setting based on required protection application manually via the BCU front panel interface.

The commissioning of following points:

- Check the Sync Check, Auto Recloser, Breaker Failure etc. settings.
- Ensure the Contacts & LED's assignment is as per required function.
- Ensure the measurement of applied current is same as the current measured in CT secondary
- Ensure measurement of applied voltage is same as the voltage measured in PT secondary

Final Check:

After completion of functionality testing and verification of BCU setting, remove all tests as temporary shorting leads etc. if it is necessary to disconnect any of the external wiring from the BCU in order to perform the wiring verification test. It should be ensured that the CT connections are replaced in accordance with the relevant external connections or schemes diagram. Ensure all fault & Annunciation contacts, trip contacts has been reset before leaving BCU.

If BCU-ADR245B is a newly installed then the trip counter of BCU should be zero while the BCU is newly installation with CB. This counter can be reset by enabling CLEAR RECORDS Setting Menu. The user should clear fault memory of Event, Fault, DR, CB Data and other counter through this menu.

Post Instillation / Commissioning observation:

After successful installation, confirm amount of existing load voltage and current in each phase (IA, IB, and IC) and Earth Fault (IN). This can be confirmed with Analogue/ Digital current meter available on panel with BCU primary and secondary measurement window. In normal balanced load condition, current should be very low.

11.4 BCU Testing

11.4.1 BCU Calibration & Measurement

Before conducting actual test, confirm BCU calibration by following method:

- Connect BCU-ADR245B to current and voltage injector.
- Apply Current and Voltage to BCU.
- Check the current and voltage measurement on Graphical Display as well as LCD Display.
- Following chart shows terminal numbers of connections.

Terminal	BCU-ADR245B Terminal	BCU-ADR245B Relay Connection
Current IA	A1 – A2	Current IA_1A
	A3 – A4	Current IA_5A
Current IB	A5 - A6	Current IB_1A
	A7 – A8	Current IB_5A
Current IC	A9 – A10	Current IC_1A
	A11 – A12	Current IC_5A
Current IN	A13 – A14	Current IN_1A
	A15 – A16	Current IN_5A
Voltage VA	B1 – B2	Voltage VA
Voltage VB	B5 – B6	Voltage VB
Voltage VC	B9– B10	Voltage VC
Voltage VSync	B13– B14	Voltage VSync
Power Supply	E1, E3	Power Supply P(+) / P(-)
IRIG B Port	F1, F2	IRIG B Port (+ / -)
RS485 Port	F3, F4, F5	RS485 (D- / D+ / GND)
LAN-1	Ethernet	Ethernet
LAN-2	Ethernet	Ethernet
Input1	H1 – H2	IN1 (+ / -)
Input2	H3 – H4	IN2 (+ / -)
Input3	H5 – H6	IN3 (+ / -)
Input4	H7 – H8	IN4 (+ / -)
Input5	H9 – H10	IN5 (+ / -)
Input6	H11 – H12	IN6 (+ / -)
Input7	H13 – H14	IN7 (+ / -)
Input8	H15 – H16	IN8 (+ / -)
Input1	I1 – I2	IN1 (+ / -)
Input2	I1 – I3	IN2 (+ / -)
Input3	I1 – I4	IN3 (+ / -)
Input4	I1 – I5	IN4 (+ / -)

Input5	I1 – I6	IN5 (+ / -)
Input6	I1 – I7	IN6 (+ / -)
Input7	I1 – I8	IN7 (+ / -)
Input8	I1 – I9	IN8 (+ / -)
Input9	I1 – I10	IN9 (+ / -)
Input10	I1 – I11	IN10 (+ / -)
Input11	I1 – I12	IN11 (+ / -)
Input12	I1 – I13	IN12 (+ / -)
Input13	I1 – I14	IN13 (+ / -)
Input14	I1 – I15	IN14 (+ / -)
Input15	I1 – I16	IN15 (+ / -)
Input16	I1 – I17	IN16 (+ / -)
Input1	N1 – N2	IN1 (+ / -)
Input2	N1 – N3	IN2 (+ / -)
Input3	N1 – N4	IN3 (+ / -)
Input4	N1 – N5	IN4 (+ / -)
Input5	N1 – N6	IN5 (+ / -)
Input6	N1 – N7	IN6 (+ / -)
Input7	N1 – N8	IN7 (+ / -)
Input8	N1 – N9	IN8 (+ / -)
Input9	N1 – N10	IN9 (+ / -)
Input10	N1 – N11	IN10 (+ / -)
Input11	N1 – N12	IN11 (+ / -)
Input12	N1 – N13	IN12 (+ / -)
Input13	N1 – N14	IN13 (+ / -)
Input14	N1 – N15	IN14 (+ / -)
Input15	N1 – N16	IN15 (+ / -)
Input16	N1 – N17	IN16 (+ / -)
Input1	O1 – O2	IN1 (+ / -)
Input2	O1 – O3	IN2 (+ / -)
Input3	O1 – O4	IN3 (+ / -)
Input4	O1 – O5	IN4 (+ / -)
Input5	O1 – O6	IN5 (+ / -)
Input6	O1 – O7	IN6 (+ / -)
Input7	O1 – O8	IN7 (+ / -)
Input8	O1 – O9	IN8 (+ / -)
Input9	O1 – O10	IN9 (+ / -)
Input10	O1 – O11	IN10 (+ / -)

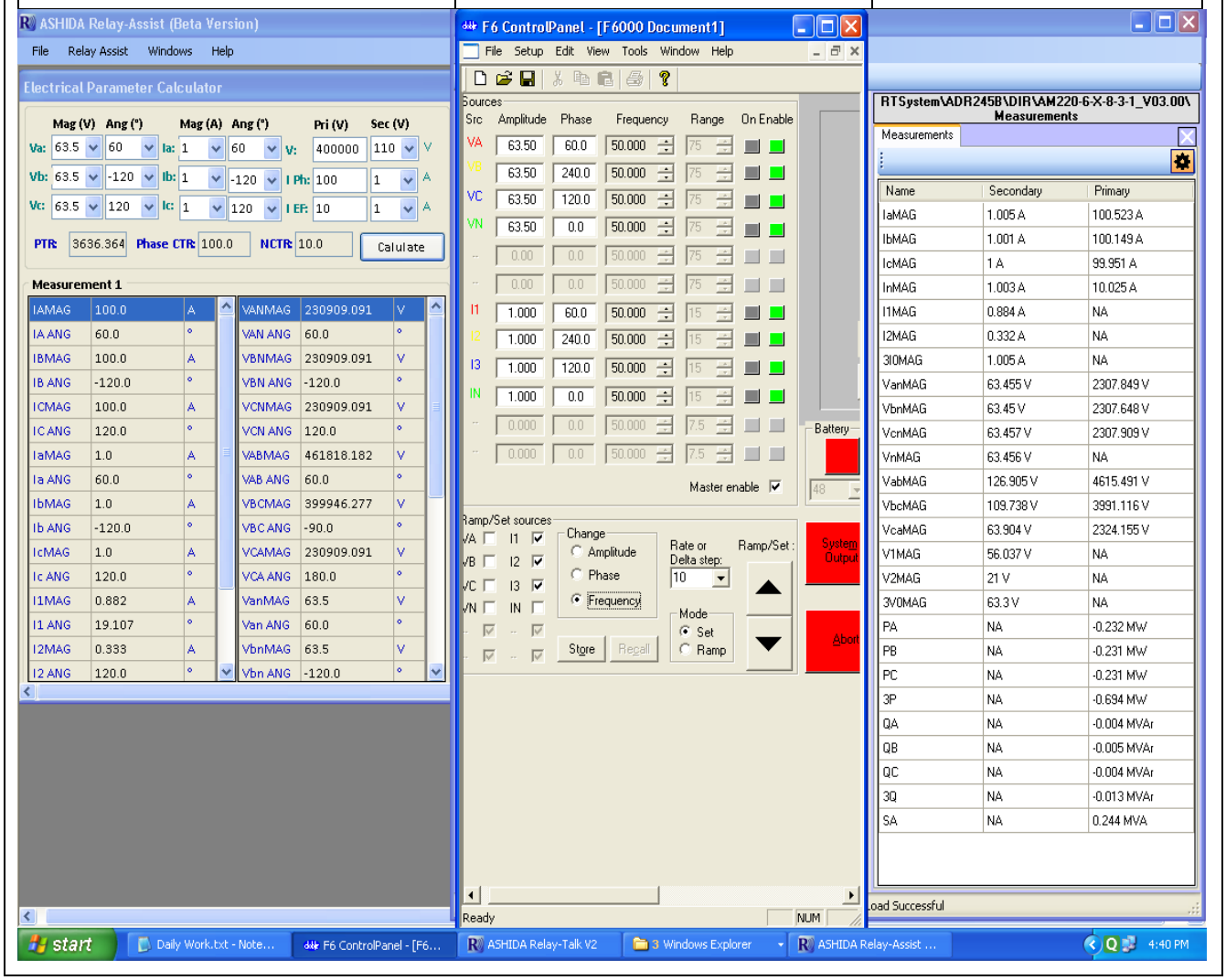
Input11	O1 – O12	IN11 (+ / -)
Input12	O1 – O13	IN12 (+ / -)
Input13	O1 – O14	IN13 (+ / -)
Input14	O1 – O15	IN14 (+ / -)
Input15	O1 – O16	IN15 (+ / -)
Input16	O1 – O17	IN16 (+ / -)
Output1	J1 – J2	C – NO
Output2	J3 – J4	C – NO
Output3	J5 – J6	C – NO
Output4	J7 – J8	C – NO
Output5	J9 – J10	C – NO
Output6	J11 – J12	C – NO
Output7	J13 – J14	C – NO
Output8	J15 – J16 – J17	C – NO – NC
Output1	K1 – K2	C – NO
Output2	K3 – K4	C – NO
Output3	K5 – K6	C – NO
Output4	K7 – K8	C – NO
Output5	K9 – K10	C – NO
Output6	K11 – K12	C – NO
Output7	K13 – K14	C – NO
Output8	K15 – K16 – K17	C – NO – NC
Output1	L1 – L2	C – NO
Output2	L3 – L4	C – NO
Output3	L5 – L6	C – NO
Output4	L7 – L8	C – NO
Output5	L9 – L10	C – NO
Output6	L11 – L12	C – NO
Output7	L13 – L14	C – NO
Output8	L15 – L16 – L17	C – NO – NC
Output1	M1 – M2	C – NO
Output2	M3 – M4	C – NO
Output3	M5 – M6	C – NO
Output4	M7 – M8	C – NO
Output5	M9 – M10	C – NO
Output6	M11 – M12	C – NO
Output7	M13 – M14	C – NO
Output8	M15 – M16 – M17	C – NO – NC

Step1. Connect all terminals as per the chart.

Step2. Adjust rated CT Secondary Current 1A/5A and Secondary Voltage as 63.5V. Observe the current & voltage value from measurement menu. The actual current & voltage should match with BCU graphical & LCD display.

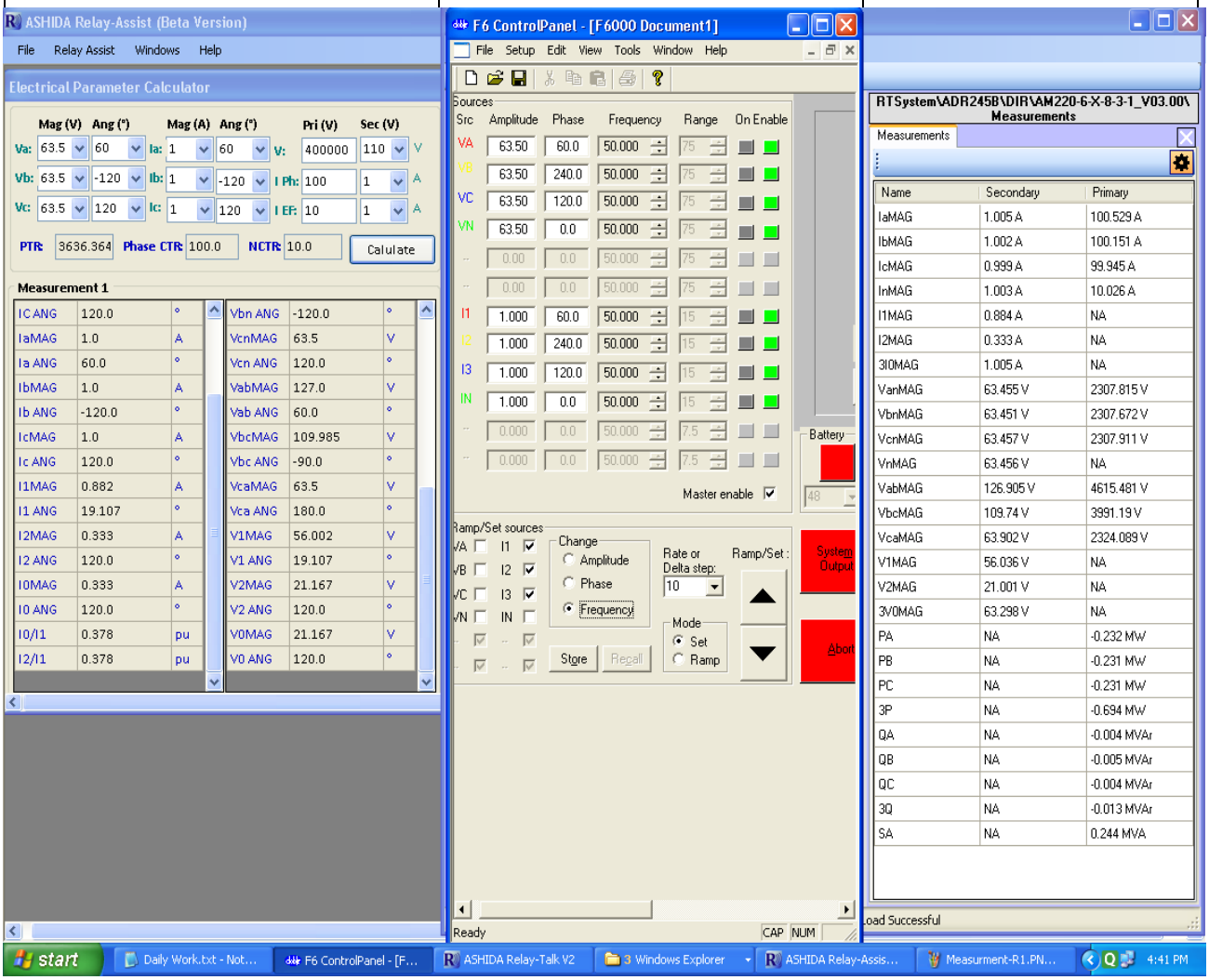
Step3. Repeat the same procedure for other element.

Three Phase Voltage & Current Measuring		
Calculated Value	**Applied Value**	**Measured value**

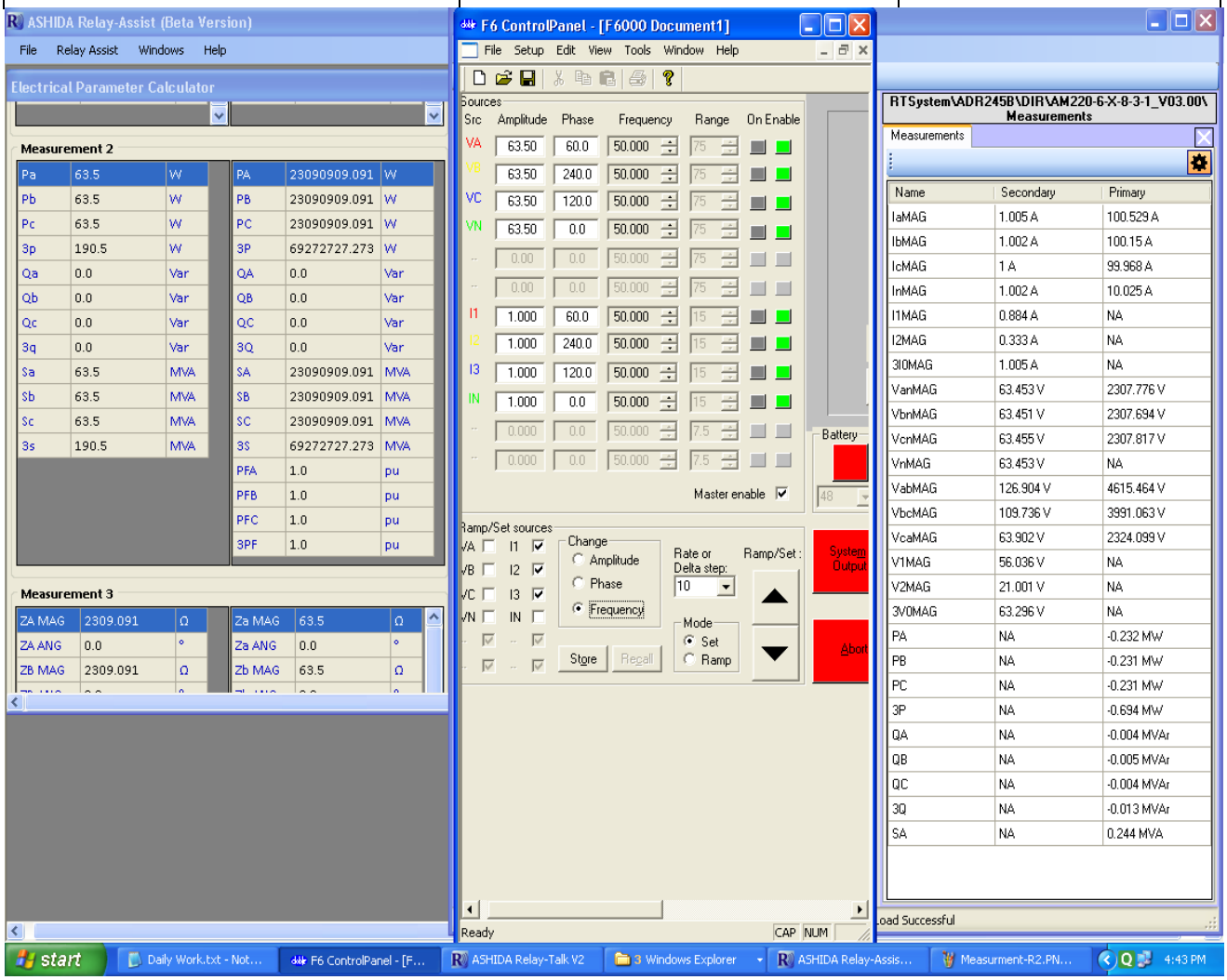


Sequence Voltage & Current Measuring

Calculated Value	Applied Value	Measured value



Power Measuring		
Calculated Value	**Applied Value**	**Measured value**



11.5 Testing of Binary Input:

1. The Binary inputs should be tested by applying 24-230V DC voltage to respective binary input terminals.
2. Observe binary input status on LCD display in Status menu of REPORTING
3. Following are the binary inputs terminals

Slots	Binary Input Terminals	Binary Input
Input1	H1 – H2	IN1 (+ / -)
Input2	H3 – H4	IN2 (+ / -)
Input3	H5 – H6	IN3 (+ / -)

Input4	H7 – H8	IN4 (+ / -)
Input5	H9 – H10	IN5 (+ / -)
Input6	H11 – H12	IN6 (+ / -)
Input7	H13 – H14	IN7 (+ / -)
Input8	H15 – H16	IN8 (+ / -)
Input1	I1 – I2	IN1 (+ / -)
Input2	I1 – I3	IN2 (+ / -)
Input3	I1 – I4	IN3 (+ / -)
Input4	I1 – I5	IN4 (+ / -)
Input5	I1 – I6	IN5 (+ / -)
Input6	I1 – I7	IN6 (+ / -)
Input7	I1 – I8	IN7 (+ / -)
Input8	I1 – I9	IN8 (+ / -)
Input9	I1 – I10	IN9 (+ / -)
Input10	I1 – I11	IN10 (+ / -)
Input11	I1 – I12	IN11 (+ / -)
Input12	I1 – I13	IN12 (+ / -)
Input13	I1 – I14	IN13 (+ / -)
Input14	I1 – I15	IN14 (+ / -)
Input15	I1 – I16	IN15 (+ / -)
Input16	I1 – I17	IN16 (+ / -)
Input1	N1 – N2	IN1 (+ / -)
Input2	N1 – N3	IN2 (+ / -)
Input3	N1 – N4	IN3 (+ / -)
Input4	N1 – N5	IN4 (+ / -)
Input5	N1 – N6	IN5 (+ / -)
Input6	N1 – N7	IN6 (+ / -)
Input7	N1 – N8	IN7 (+ / -)
Input8	N1 – N9	IN8 (+ / -)
Input9	N1 – N10	IN9 (+ / -)
Input10	N1 – N11	IN10 (+ / -)
Input11	N1 – N12	IN11 (+ / -)
Input12	N1 – N13	IN12 (+ / -)
Input13	N1 – N14	IN13 (+ / -)
Input14	N1 – N15	IN14 (+ / -)
Input15	N1 – N16	IN15 (+ / -)
Input16	N1 – N17	IN16 (+ / -)
Input1	O1 – O2	ON1 (+ / -)

Input2	O1 – O3	ON2 (+ / -)
Input3	O1 – O4	ON3 (+ / -)
Input4	O1 – O5	IN4 (+ / -)
Input5	O1 – O6	IN5 (+ / -)
Input6	O1 – O7	IN6 (+ / -)
Input7	O1 – O8	IN7 (+ / -)
Input8	O1 – O9	IN8 (+ / -)
Input9	O1 – O10	IN9 (+ / -)
Input10	O1 – O11	IN10 (+ / -)
Input11	O1 – O12	IN11 (+ / -)
Input12	O1 – O13	IN12 (+ / -)
Input13	O1 – O14	IN13 (+ / -)
Input14	O1 – O15	IN14 (+ / -)
Input15	O1 – O16	IN15 (+ / -)
Input16	O1 – O17	IN16 (+ / -)

11.6 Testing of Binary Output:

Output Contact Test:

- Assign all output contacts for any of the inputs.
- Then Apply voltage to respective Binary input so that respective output is operated.
- After tripping, check continuity in between NC, NO and C output contact terminals.
- After that remove voltage of Binary input and respective relay is reset.
- Again check the continuity in between NC, NO and C output contact terminal.

Slots	Binary Output Terminals	Binary Output
Output1	J1 – J2	C – NO
Output2	J3 – J4	C – NO
Output3	J5 – J6	C – NO
Output4	J7 – J8	C – NO
Output5	J9 – J10	C – NO
Output6	J11 – J12	C – NO
Output7	J13 – J14	C – NO
Output8	J15 – J16 – J17	C – NO – NC
Output1	K1 – K2	C – NO
Output2	K3 – K4	C – NO
Output3	K5 – K6	C – NO
Output4	K7 – K8	C – NO
Output5	K9 – K10	C – NO

Output6	K11 – K12	C – NO
Output7	K13 – K14	C – NO
Output8	K15 – K16 – K17	C – NO – NC
Output1	L1 – L2	C – NO
Output2	L3 – L4	C – NO
Output3	L5 – L6	C – NO
Output4	L7 – L8	C – NO
Output5	L9 – L10	C – NO
Output6	L11 – L12	C – NO
Output7	L13 – L14	C – NO
Output8	L15 – L16 – L17	C – NO – NC
Output1	M1 – M2	C – NO
Output2	M3 – M4	C – NO
Output3	M5 – M6	C – NO
Output4	M7 – M8	C – NO
Output5	M9 – M10	C – NO
Output6	M11 – M12	C – NO
Output7	M13 – M14	C – NO
Output8	M15 – M16 – M17	C – NO – NC

11.6.1 Status Test:

- Configure the required signals of BCU on graphical display.

Once BCU configured for Graphical Display slave as explained in software section, final configuration need to upload into BCU as explained section. On successful upload of configuration BCU will reboot. After reboot SLD will appear on BCU's Graphical display.

Figure 1: Reboot

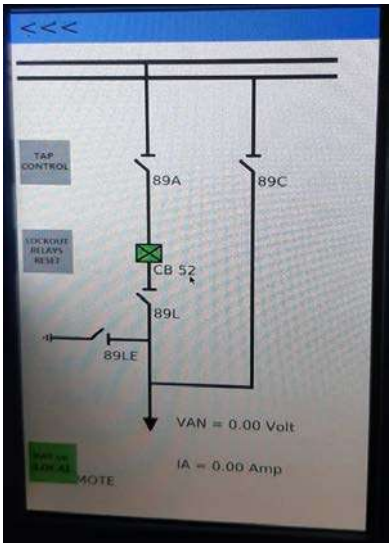


Figure 2: SLD update

- Make ON & OFF the configured signal.

The Binary inputs should be tested by applying 24-230V DC voltage to respective binary input terminals and then Observe change off binary input status on Graphical display SLD as shown in figure. 3 & figure 4

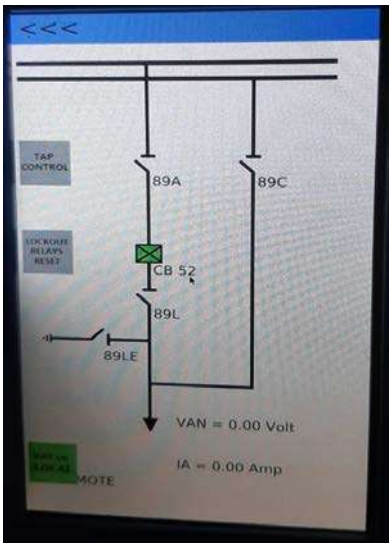


Figure 3: CB status OFF

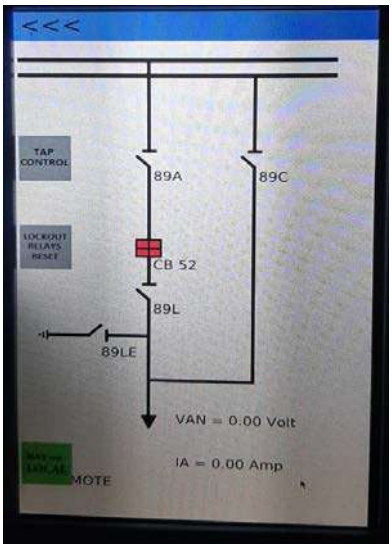


Figure 4: CB status ON

- Check the status of configured signal on graphical display in status /Alarms window.

Once DI signals are configured under 103 masters as explained in software section we can observed their status under Status/Alarms window. Following are the steps to open Status/Alarms window.

Step 1: Select "<<< "option on Graphical display.

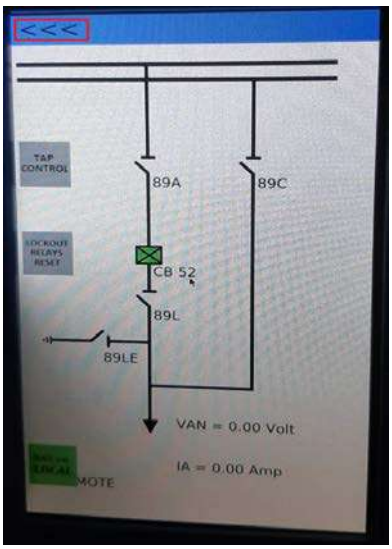


Figure 5

Following multiple options window will open.

Figure 6: Options

Step 2: Select Status/Alarms option from available list. Then list of all configured signals will appear in window as shown in figure. 7 Status change in DI will be highlighted with red color we can acknowledge this alarm by “ACK ALL ALRMS” button provided on screen. PgUp & PgDn buttons provided for scrolling of Alarm list.

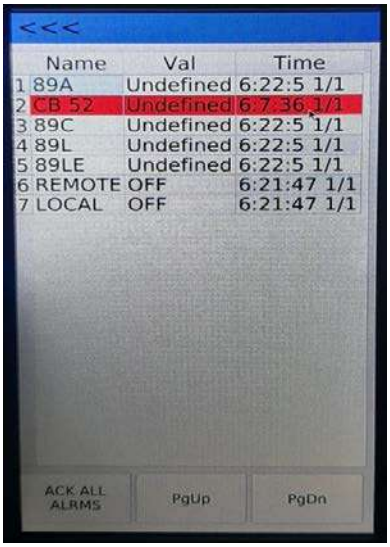


Figure 7: Status/Alarms

- Check the status of configured parameters on graphical display in Measurements window.

Once AI signals are configured under 103 masters as explained in software section we can observed their values under Measurements window. Following are the steps to open Measurements window.

Step 1: Select “<<< “option on Graphical display.

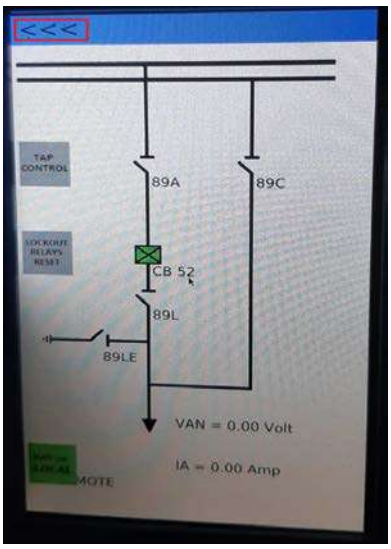


Figure 8

Following multiple options window will open.

Figure 9: Options

Step 2: Select Measurements option from available list. Then list of all configured parameters will appear in window as shown in figure 10. PgUp & PgDn buttons provided for scrolling of Alarm list.

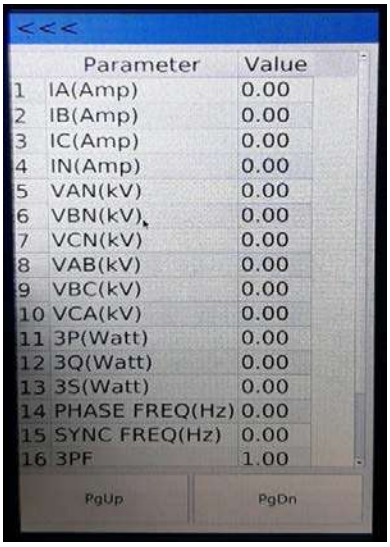


Figure 10: Measurements

- Check the DO command on graphical display.

Once DO are configured under 103 master as explained in software section

Following are the steps to check control operations through Graphical Display.

Step 1: Select object you want operate on Graphical display. Once you select object control window will appear as shown in figure 11.

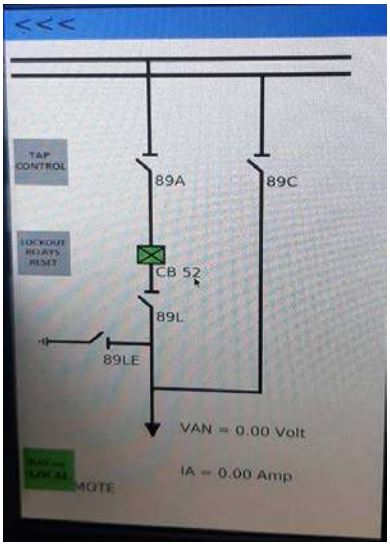


Figure 11

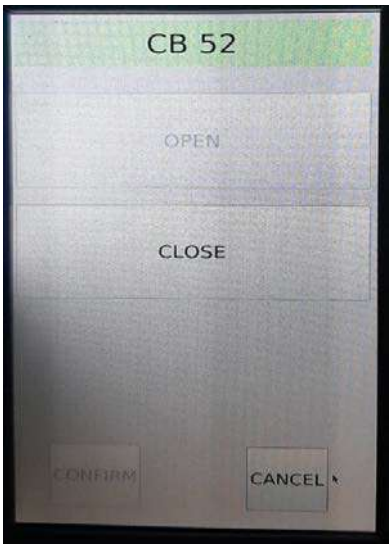


Figure 12: Control window

Step 2: Select control operation from screen. Then password window will appear as shown in figure 13. Once you enter correct password (Admin@123) control command will initiate from Graphical Display and Graphical Display will wait for status change feedback as shown in figure 14.

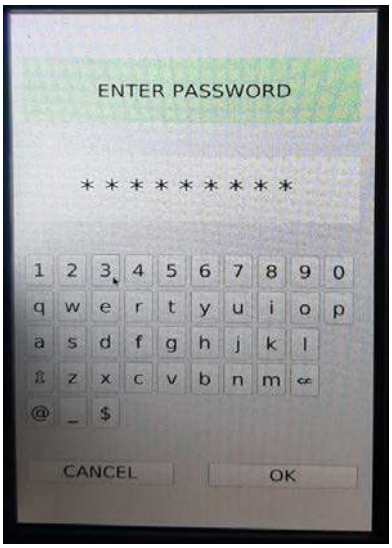


Figure 13: Password window

Figure 14: Feedback window

Once feedback of status change received updated status will appear on Graphical display as shown in Figure 15.

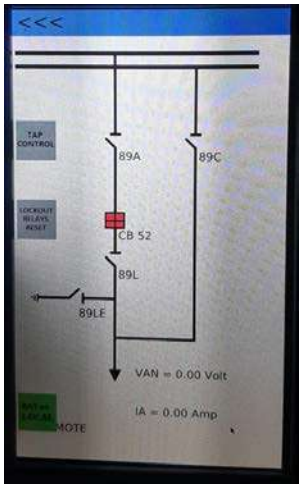


Figure 15: Status update

Note: For successful operation of control command through Graphical display Local/Remote switch must be set on Local mode.

- Setting:

Through settings option we can adjust the brightness of Graphical Display and control command session timeout period as shown in figure 17.

Figure 16

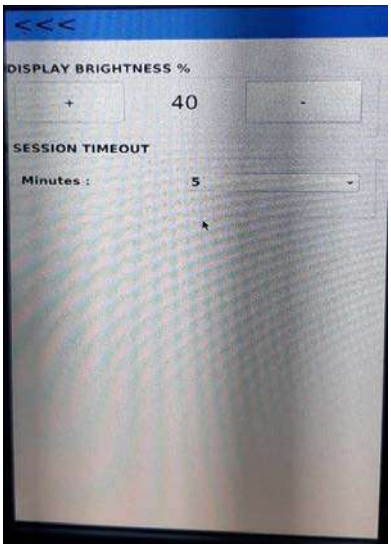


Figure 17: Brightness control and session timeout.

11.7 LED Test:

- Assign LED-L1 to LED-L16 for any Binary inputs.
- Apply voltage to respective Binary input so the respective LED is operated.
- After that remove voltage of Binary input and respective LED is off

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REVISION CONTROL SHEET

Issue	Date	Brief description of Revision
01	25.11.2019	Original Version
02	13.10.2020	Modified as per Software Version
03	10.12.2020	Modified BCU Manual without Protection Function
04	08.05.2021	IEC-103 Protocol map update
05	09.03.2023	BVQI Logo has been removed and updated with ISO Logo.
06	03.12.2024	ASHIDA Logo update & M14 model added

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