Traction Feeder Protection Relay : A21R

Introduction:

ASHIDA has designed economical, reliable & compact construction of ADITYA series A21R relay provides Protection, Control and Monitoring functions.

A21R Traction Feeder Protection Relay specially designed for traction OHE protection as per RDSO Specifications TI-SPC-PSI-PROTCT-7101.

Functional Overview:

Key Protection & Control Functions:

- Two Independent Settings Groups.
- 3 Zone Distance Protections (21).
- Load Encroachment protection.
- Wrong Phase Coupling (Optional).
- Three Independent Stages for Back up Phase over Current Protection (50/51).
- PT Supervision.
- Under Voltage Protection (27).
- Auto Recloser (79).
- Trip circuit supervision (TCS).
- Breaker Failure Detection.
- Thermal Overload (49).
- Programmable Inputs & Outputs.
- 16 nos. of Programmable & Target LEDs for indications with dual colours.
- Self Supervision of relay.
- Metering function.
- Event Recording (1024 nos.).
- Fault Recording on HMI display (10 nos.).
- Disturbance Recording (10 nos.)
- Fully communicable with IEC standard open protocol IE C60870-5-103, & IEC 61850.
- SCADA communication.
- Single/Dual Ethernet ports (RJ45), RS485 port.
- PC front port communication for convenient relay settings.
- User friendly local operation with key pad.

- Large Liquid crystal display (20X4) with backlight.
- Password Protection.
- Measurement of Voltage, Current magnitudes, R, X & Z.

Software Support:

- Online / Offline Setting Editor.
- Programmable scheme logic Editor.
- Settings upload / download.
- Online Measurement.
- Disturbance analysis.
- Relay assistant for testing relay at site.

Applications:

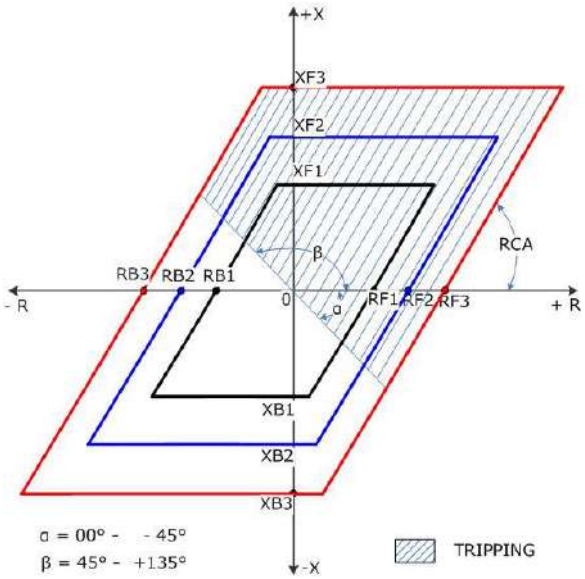
The A21R is second generation Numerical Integrated Feeder Protection Relay for Traction Application. It consist all the necessary protection and monitoring functions required for traction feeder.

The A21R provides protection for AC Traction Overhead Equipment and various electrical network and electrical installation.

Distance Protection:

The A21R consist of 3 zone distance protection with parallogram characteristic. All these zones are having independent setting and timer setting. These zones can be set as forward or backward independently.

Normally Zone 1 is instantaneous and zone 2 and zone 3 are with timer. The time delay setting is 0 to 30s in step of 0.01s. There are 4 The impedance setting range is 0.05 Ohm to 99.99 Ohm in step of 0.01 Ohm.



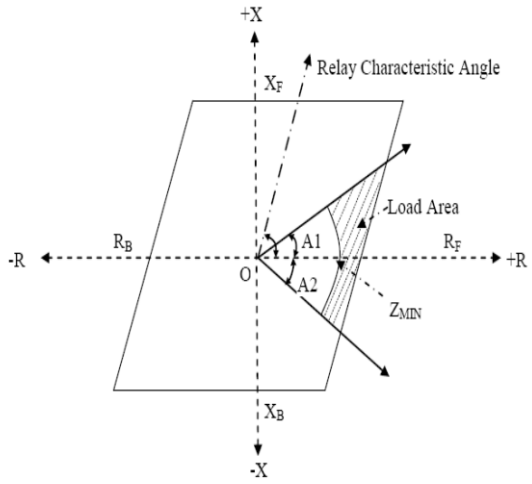
3 Zone parallelogram characteristics

Load Encroachment:

In overhead line applications, the margin of the load impedance may enter into the relay characteristics, then the relay may maloperate. This problem is called load encroachment.

The A21R relay also can able to reliably distinguish between faults and load at maximum load condition (load encroachment). To avoid malfunction of relay due to load encroachment, the load impedance area of the polygonal can be settable. This function is for blocking Zone operation in case impedance falls in this area when there is a load encroachment problem.

The following figure shows the load impedance area of the polygonal is for Load encroachment function.



Load Enchroachment

Switch On To Fault:

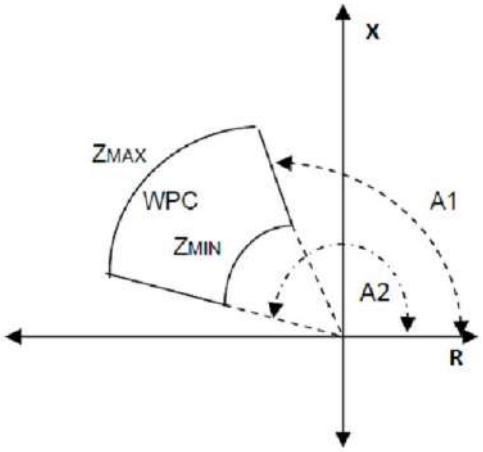
If breaker is close manually or through auto reclose, then SOTF current setting is become active which reduce any tripping delay of switch on to fault condition.

Wrong Phase Coupling (Optional):

Normally the feeder section can be coupled to other traction supply section for the failure of its own traction supply. This coupling is only permissible when the supply of a section has actually failed.

If two different phases' supplies are accidentally connected via the feeder, then there may be occurrence of phase-to-phase short circuit in sectioning post (SP), because of the existing distance zone cannot provide the required protection range, the A21R relay provide a separate WPC setting for the wrong phase coupling protection , the customer can enable or disable this function by using Enabled/Disabled option in the menu column "WPC Section".

The WPC Characteristics in R-X plane is shown in following Fig.



Wrong Phase Coupling characteristic

Backup OC:

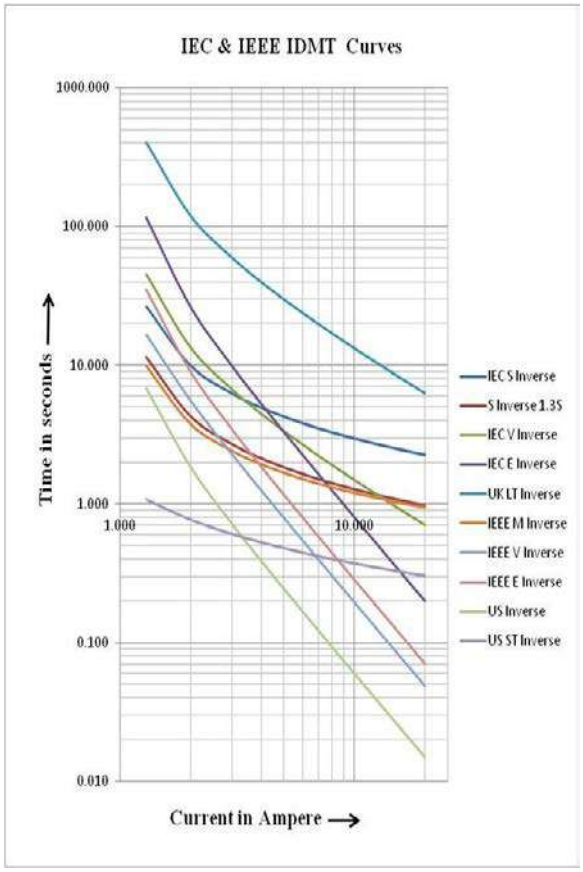
A21R relay provides three stages for phase over current elements. Each stage of Backup OC element is independently settable with inverse time or definite time characteristic. The following tripping characteristics are available;

- IEC Characteristic Curves
- IEEE Characteristic Curve
- Definite Time Over current

$$t = T * \left\{ \frac{K}{\left(\frac{I}{I_s} \right)^{\alpha} - 1} + L \right\}$$

Curve Description	K	α	L
IEC S Inverse	0.14	0.02	0
ST Inverse 1.3S	0.06	0.02	0
IEC V Inverse	13.5	1	0
IEC E inverse	80	2	0
UK LT Inverse	120	1	0
Define Time	-	-	-

IEEE M Inverse	0.0515	0.02	0.114
IEEE V Inverse	19.61	2	0.491
IEEE Inverse	28.2	2	0.1217
US Inverse	5.95	2	0.18
US ST Inverse	0.0239	0.02	0.0169



IDMT characteristic

PT Fuse Failure Detection Logic:

The PT Fuse Fail Detection Logic is used to detect failure of the AC voltage inputs to the Relay. This may be caused by internal potential transformer faults, overloading, or faults on the interconnecting wiring to Relays.

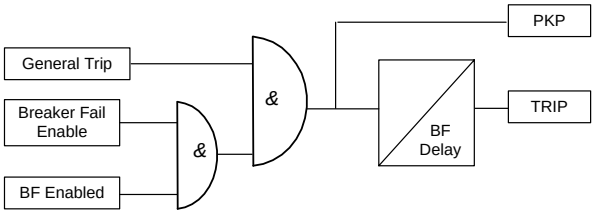
When PT voltage is less than set voltage and line current in between set limit for set time delay then, PTFF alarm generated and when PT voltage is less than the set value but the current is more than higher set limit of PTFF alarm, then PTFF trip is generated.

Under Voltage (27) (Optional) :

The relay is also provided with under-voltage protection features, to prevent closure of the concerned feeder circuit breaker, when the OHE is already in the energized condition (for example, during a feed extension) to avoid any Wrong Phase Coupling between different sub-stations. The setting range is 20 to 110V in steps of 1V and operating time is 0 to 5sec. in the steps of 10msec.

Breaker Failure Detection:

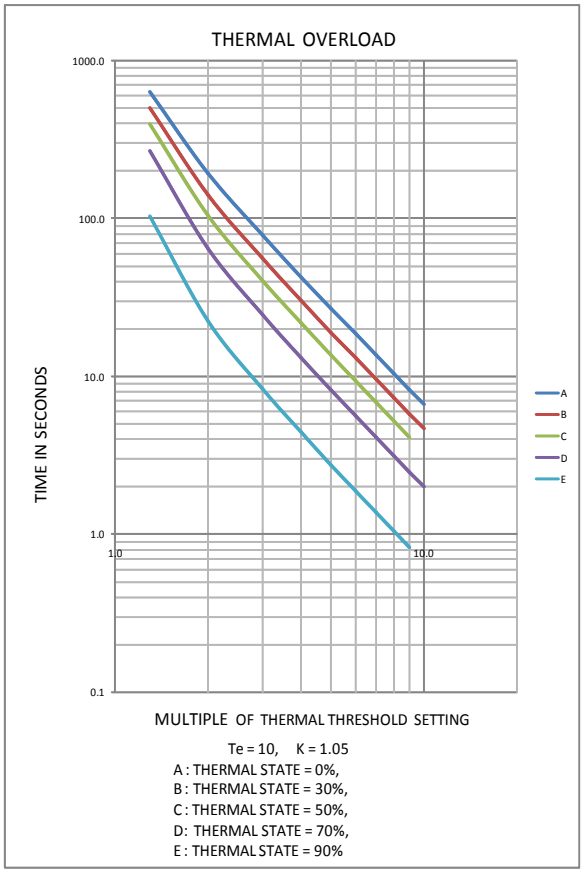
Normally after tripping current should become Zero within 100 – 200ms depend upon type of fault and breaker mechanism. After Fault A21R trigger internal timer (settable from 0s to 5.0s) If fault is not cleared during this time then relay declare as Breaker fail (LBB function) and operate assigned contacts. This contact can be used to trip back up breaker such as LV or can be used to generate ALARM signal.



Breaker Failure Logic

Thermal Overload Protection:

The thermal withstand capability of the power system equipment is affected by overheating prior to a fault. The temperature should not exceed the thermal withstands capability of power system equipment. The currents are measured and analyzed to monitor the thermal state.



Thermal Overload characteristic

Autorecloser:

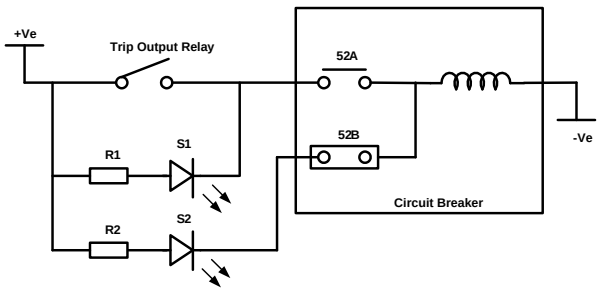
Auto-reclosure is a special function which is used on overhead line circuits to re-establish supply following a transient fault. The A21R is provided with Two shot auto recloser function, the operation of the auto-reclose sequence is controlled by two Dead Timers “DT1 &DT2”, “Reclaim Time RT” and No of Shot attempt “N SHOT” setting parameters.

Autorecloser Logic:

In mode Auto recloser follows conventional practice. Here when trip passes blocking logic, It trigger DT1 or DT2 timer depending upon nos. of shot setting (N shot), Reclaim Timer (RT) Condition and trip counter. After dead time (DT) relay provide reclose command, and start Reclaim time (RT). During RT relay trips further and numbers of trips are more than numbers of shots setting (N Shot) of relay. The relay goes in to lockout condition and block further reclose command.

Trip circuit super vision:

In A21R, we use two separate digital opto coupler status inputs in the XOR gate, which can be used to continuously monitor the continuity of the trip-circuit. The following diagram explain the logic of trip circuit supervision function.



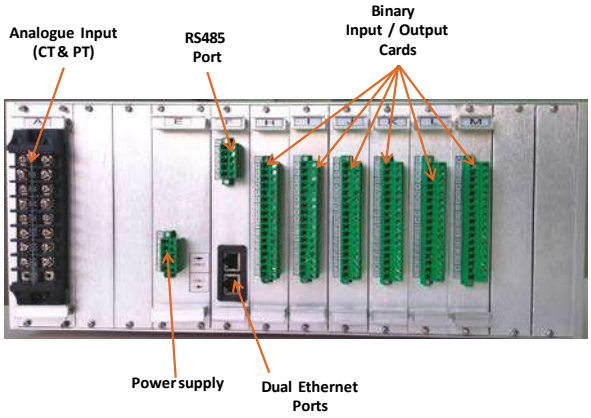
Trip Circuit Superversion Logic

It monitor continuity of trip circuit through either normally open (NO) or normally close (NC) contact of CB connected to opto

isolator digital input assigned to TCS. If any discontinuity is observed, then the relay generates “TC Alarm” after a certain time delay.

Programmable Inputs, Outputs & Logic:

The relay is provided with tool known as AproLogic, in which user can program their logics as per the requirement. All type of gates such OR/ NOR/ NOT/ NAND/ AND/ XOR/ XNOR/ SR Flip-flop and Counters are available along with Operating and Resetting Timer. For more details please refer to Instruction Manual.



Back side Terminals A21R

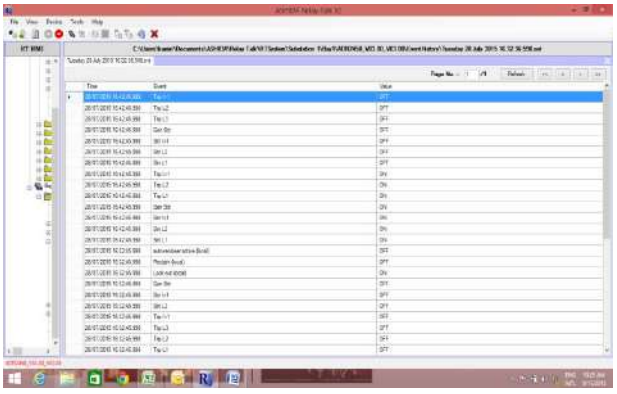
Programmable LEDs and Pushbuttons:

The A21R relay provides total 16 nos. of target and programmable LEDs with dual color indications. The LEDs can be programmed through PC software (RTV2 software).

The A21R also provides the programmable pushbuttons for circuit breaker CLOSE and OPEN from HMI of relay. Pushbuttons can be programmed through HMI or through RTV2 software.

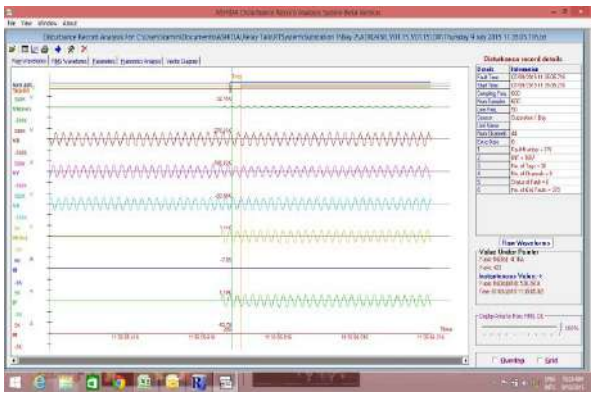
Event recording:

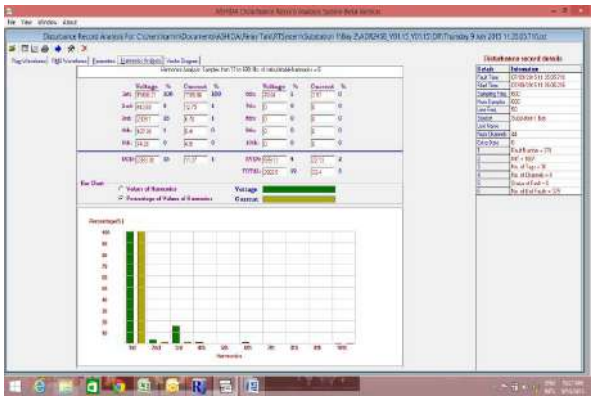
A21R relay provides a feature to record and store 1024 nos. of events (with event time stamping of 1mSec precision) in non-volatile memory through internally by protection and control functions and externally by triggering the digital inputs. And these can be extracted using communication port or can be seen on the LCD. The event can be triggered on time stamp through time synchronization or through internal clock setting.



Disturbance recording:

A21R relay provides built in disturbance recording facility for recoding analogue and digital channels. Relay records 10 nos. of disturbances of 1.5 sec 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.





Fault recording:

A21R relay provides fault recording facility. The fault records can be display either on HMI displayed or in RTV2 software. The relay can record 10 nos. of fault records in non-volatile memory.

Metering:

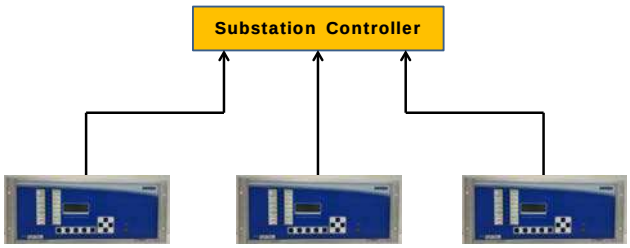
The online metering feature of the A21R relay provides metering of parameters such as current, voltage, R, X, and Z magnitude on the HMI display or in RTV2 software.

Independent Protection settings groups:

A21R relay provides two independent setting groups which allows the relay to operate on different power system conditions.

IEC 60870-5-103 Protocol:

A21R relay provides internationally standardized protocol for communication via RS485 port of protection relays. IEC 60870-5-103 protocol is used worldwide and supported by relay manufacturers.



IEC 60870–5–103 star type RS232 copper conductor connection

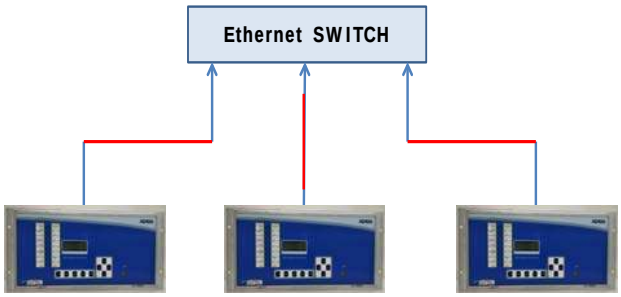
Ethernate base Protocol:

A21R relay provides IEC61850 internationally standardized protocol for substation automation via Ethernet port of protection relays (Ref ordering information for details)

IEC61850 GOOSE and Interoperability:

A21R support standard GOOSE messaging for relay to relay communication. Any logical (pickup, trip, etc) and physical (Digital Optical Isolated signal such CBNO /NC etc) can be publish via GOOSE configurator. A21R support total 16 simultaneous GOOSE signal which can publish and received by other relays having IEC61850 protocol. Similarly A21R can able

subscribed total 16 nos of simultaneous signal published by other relays and can be use for interlocks. The A21R is tested for most of other make relays.



Relay Settings:

Global:

Sr. No	Parameter	Setting / Ranges
1.	Password	0000 to zzzz / ZZZZ
2.	RID	-
3.	SID	-
4.	System Frequency	50Hz / 60Hz
5.	Opto I/P Supply	Read only
6.	Filter Time	0 to 100ms in steps of 1ms
7.	CB Operation	CB Open / CB Close / No Operation
8.	PB-1 Operation	Disabled/ Enabled / Time Enabled
9.	tPB-1 Pulse	0.10 to 50s in steps of 0.01s
10.	PB-2 Operation	Disabled/ Enabled / Time Enabled
11.	tPB-2 Pulse	0.10 to 50s in steps of 0.01s
12.	Config Port	PORT F/ PORT R / PORT 1
13.	Timesync Master	PORT F/ PORT R / PORT 1
14.	Description	Read only
15.	Model no	Read only
16.	Serial No	Read only
17.	Software Version	Read only
18.	Hardware Version	Read only
19.	Virtual Scheme 1	Disabled / Enabled
20.	Virtual Scheme 2	Disabled / Enabled
21.	Language	Read only

Settings Group

Sr. No	Parameter	Setting / Ranges
1.	Factory Defaults	No Operation / All Settings / Setting Group 1 / Setting Group 2
2.	Active Group	G1 / G2
3.	Copy From	G1 / G2
4.	Copy To	No operation / G1 / G2
5.	G1	Disabled / Enabled / Time Enabled
6.	GroupChange Delay	0 to 400.0s in steps of 0.1s
7.	G2	Disabled / Enabled / Time Enabled
8.	GroupChange Delay	0 to 400.0s in steps of 0.1s

PORT F

Sr. No	Parameter	Setting / Ranges
1.	Unit ID	Read only

2.	Baud Rate	Read only
3.	Set Parity	Read only

PORT 1

Sr. No	Parameter	Setting / Ranges
1.	Unit ID	1 to 250 in steps of 1
2.	IP address	Range 0 to 255 in steps of 1
3.	Subnet mask	Range 0 to 255 in steps of 1
4.	Default gateway	Range 0 to 255 in steps of 1
5.	Pri. SNTP	Range 0 to 255 in steps of 1
6.	Sec. SNTP	Range 0 to 255 in steps of 1
7.	Protocol	Disabled / Enabled
8.	Ethernet Mode	Dual / fixed
9.	Operating Mode	Fail over / Switch mode
10.	Primary	LAN1 / LAN 2

PORT R

Sr. No	Parameter	Setting / Ranges
1.	Unit ID	1 to 250 in steps of 1
2.	Baud Rate	9600 / 19200 / 38400 / 57600
3.	Set Parity	None / Even / Odd

Disturbance

Sr. No	Parameter	Setting / Ranges
1.	Post Trigger	5 to 95% in steps of 1%

DATE AND TIME

Sr. No	Parameter	Setting / Ranges
1.	Password	0000 to zzzz / ZZZZ
2.	Local Time Enable	Fixed / Flexible / Disabled
3.	Local Time Offset	-720 to + 720 in steps of 15 Mins
4.	RP Time Zone	UTC / Local
5.	SET Hours	0 to 23 Hrs in steps of 1.
6.	SET Minutes	0 to 59 Mins in steps of 1.
7.	SET Seconds	0 to 59 Sec. in steps of 1.
8.	SET Date	1 to 31 Days in steps of 1.
9.	SET Month	1 to 12 Months in steps of 1.
10.	SET Year	0 to 99 Years in steps of 1.

CB Control

Sr. No	Parameter	Setting / Ranges
1.	Password	0000 to zzzz / ZZZZ
2.	TCS Enable	Disabled / Logic Low / Logic High
3.	TCS Delay	0.1s to 10s in steps of 0.1s
4.	CB Open S'vision	Disabled / Enabled
5.	CB Open Time	50ms to 1000ms in steps of 10ms
6.	CB Open Alarm	Disabled / Enabled
7.	CB Oper. Counter	10 to 50000 in steps of 1
8.	Sigma I	Disabled / Enabled
9.	CB Rated I	1 to 5000A in steps of 1A
10.	M Constant	0.100 to 5.000 in steps of 0.001
11.	CB Control By	Disabled / Local / Remote / Local + Remote
12.	t CB Open Pulse	00.10 to 50.00sec in steps of 0.01s
13.	t CB Close Pulse	00.10 to 50.00sec in steps of 0.01s
14.	Invalid DPI Dur H	0.1 to 600s in steps of 0.01s
15.	Invalid DPI Dur I	0.1 to 600s in steps of 0.01s

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 Relay 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

SYSTEM CONFIG

CT/VT RATIOS

Sr. No	Parameter	Setting / Ranges
1.	CT Secondary	1A / 5A
2.	CT Primary	10 to 30000A in steps of 1A
3.	PT Primary	0.1 to 800KV in steps of 0.01kV L-L
4.	PH VT Secondary	Read only setting

Line Settings

Sr. No	Parameter	Setting / Ranges
1.	RCA	50 to 90 Deg in steps of 1 Deg

2.	Imin.	10% to 20% in steps of 1%
3.	Alpha	-45 to 0 Deg in steps of 1 Deg
4.	Beta	0 to 135 deg in steps of 1 Deg
5.	Fault Locator	Disabled / Enabled
6.	X Constatnt	0.04 to 5.00 in steps of 0.01
7.	Latch Value Index	3 to 20 in steps of 1

PROTECTION

Sr. No	Parameter	Setting / Ranges
1.	Password	0000 to zzzz / ZZZZ
2.	Distance Prot.	Disabled / Enabled
3.	Load Encroachment	Disabled / Enabled
4.	SOTF	Disabled / Enabled
5.	Backup OC	Disabled / Enabled
6.	Under Voltage	Disabled / Enabled
7.	PT Supervision	Disabled / Enabled
8.	Thermal Overload	Disabled / Enabled
9.	Auto Reclosing	Disabled / Enabled
10.	Breaker Failure	Disabled / Enabled

RECORD CONTROL

Sr. No	Parameter	Setting / Ranges
1.	Password	0000 to zzzz / ZZZZ
2.	Clear Events	Yes / No
3.	Clear Faults	Yes / No
4.	Clear Disturbance	Yes / No
5.	Clear Error Record	Yes / No
6.	CB Data	Yes / No
7.	Thermal State	Yes / No

OUTPUT & LED TEST

Sr. No	Parameter	Setting / Ranges
1.	Password	0000 to zzzz / ZZZZ
2.	Test Mode	Disabled/Test Mode/Contacts Blocked
3.	Test Output J	0 = Not Operated, 1 = Operated
4.	Test Output K	0 = Not Operated, 1 = Operated
5.	Test Output L	0 = Not Operated, 1 = Operated
6.	Test Output M	0 = Not Operated, 1 = Operated
7.	Test Apply	No Operation/Apply Test/Remove Test
8.	Test LEDs	No Operation / Apply Test

Group 1 Settings

Distance Prot.

Sr. No	Parameter	Settings / Ranges
1.	Zone 1 Enable	Disabled / Enabled
2.	Op Mode	Forward/Reverse/Non DIr
3.	FWD_R1	0.05 to 99.99 ohm in steps of 0.01 ohm
4.	REV_R1	0.05 to 99.99 ohm in steps of 0.01 ohm
5.	FWD_X1	0.05 to 99.99 ohm in steps of 0.01 ohm
6.	REV_X1	0.05 to 99.99 ohm in steps of 0.01 ohm
7.	tDZ1	0 to 30s in steps of 0.01s
8.	Zone1 2H BLK	Disabled / Enabled
9.	2H Thresh	10% to 30% in steps of 1%
10.	2ndHarm UB Enable	Disabled /only I>/ I> & V<
11.	I> 2HUB	80% to 2800% in steps of 1%
12.	V< 2HUB	5% to 50 % in steps of 1%

Zone1 Ext

Sr. No	Parameter	Settings / Ranges
1.	Zone1Ext	Disabled / Enabled
2.	FWD_R1	0.05 to 99.99 ohm in steps of 0.01 ohm
3.	REV_R1	0.05 to 99.99 ohm in steps of 0.01 ohm
4.	FWD_X1	0.05 to 99.99 ohm in steps of 0.01 ohm
5.	REV_X1	0.05 to 99.99 ohm in steps of 0.01 ohm

Load Encroachment

Sr. No	Parameter	Setting / Ranges
1	Password	0000 to zzzz / ZZZZ
2	ELOAD Enable	Disabled / Enabled
3	Zmin	0.1 to 99.99 ohm in steps of 0.01 ohm
4	AL1	0 to 70 Deg in steps of 1 Deg
5	AL2	0 to 70 Deg in steps of 1 Deg

Wrong Ph Coupling

Sr. No	Parameter	Settings / Ranges
1.	Password	0000 to zzzz / ZZZZ
2.	WPC Enable	Disabled / Enabled
3.	WPC Zmin	From 2.0 – 15.00 Ω in steps of 1.0
4.	WPC Zmax	From 20.0 – 60.00 Ω in steps of 1.0
5.	WPC Ang min-A1	From 90 – 180° in steps of 1 deg
6.	WPC Ang max-A2	From 90 – 180° in steps of 1 deg

7.	WPC Vmin Enable	Disabled / Enabled
8.	WPC Vmin	20 - 100 V step 0.1V
9.	2nd Harmonic	Disabled / Enabled
10.	2ndHarm Thresh	From 10% - 30% step 1%
11.	2ndHarm UB Enable	Disabled / only I> / I> & V<
12.	I> 2HUB	80% - 3200% in steps of 1%
13.	V< 2HUB	20% - 90 % step 1%

Regenerative OC

Sr. No	Parameter	Settings / Ranges
1.	Password	0000 to zzzz / ZZZZ
2.	Regenerative OC	Disabled / Enabled
3.	ROC Current	1% - 60% in steps of 1%
4.	ROC Angle	5 Deg - 20 Deg in steps of 1 deg
5.	ROC Voltage	10% - 100% in steps of 1%

SOTF

Sr. No	Parameter	Settings / Ranges
1.	Password	0000 to zzzz / ZZZZ
2.	SOTF Enable	Disabled / Enabled
3.	27SOTF_I	5% to 400% in steps of 1%
4.	27SOTF_V	5% to 95% in steps of 1%
5.	tClosepulse Delay	0 to 5 s in steps of 0.01s
6.	tSOTFtrip Delay	0 to 5 s in steps of 0.01s

Backup OC

Sr. No	Parameter	Settings / Ranges
1.	IP>1 Enable	Disabled / Enabled
2.	IP>1 Curve	Definite Time / IEC S Inverse / ST Inverse 1.3S / IEC V Inverse / IEC E Inverse / UK LT Inverse / IEEE M Inverse / IEEE V Inverse / IEEE E Inverse / US Inverse / US ST Inverse / User Def Curve-1 / User Def Curve-2
3.	IP>1	If DT 20% to 3000% in steps of 1% If IDMT then 5% to 400% in steps of 01%
4.	tIP>1 DT Delay	0 to 1899.9s in steps of 0.01s
5.	IP>1 TMS	0.01 to 1.5 in steps of 0.01
6.	IP>1 Time Dial	0.01 to 100.00 in steps of 0.01
7.	IP>1 D/O Char	Disabled / DT / IDMT
8.	tIP>1 tD/O Delay	0s to 100s in steps of 0.01s
9.	IP>1 D/O TMS	0.025 to 1.2 in steps of 0.005

10.	IP>1 2H BLK	Disabled / Enabled
11.	IP>1 2H Thresh	5% to 70% in steps of 1%
12.	IP>1 UB2H	400% to 2800% in steps of 1%

PT Supervision

Sr. No	Parameter	Settings / Ranges
1.	PTFF Enable	Disabled / Enabled
2.	PTFF V	1 to 20% in steps of 1%
3.	PTFF I Low	6 to 20% in steps of 1%
4.	PTFF I High	20 to 100% in steps of 1%
5.	tPTFF A	0 to 10s in steps of 0.1s

Under Voltage

Sr. No	Parameter	Setting / Ranges
1	Password	0000 to zzzz / ZZZZ
2	UV Set	20 to 110V in steps of 1V
3	UV Time Delay	0 to 5s in steps of 0.1s

Thermal Overload

Sr. No	Parameter	Setting / Ranges
1.	Password	0000 to zzzz / ZZZZ
2.	THOL Enable	Disabled / Single/ Dual
3.	Ith> Trip	8% to 400% in steps of 1%
4.	Ith>Alarm	50% to 100% in steps of 1%
5.	T1	1 to 200min in steps of 1min.
6.	T2	1 to 300min in steps of 1min.
7.	Service Factor	1 to 1.5 in steps of 0.01

Reclosing

Sr. No	Parameter	Setting / Ranges
1.	Password	0000 to zzzz / ZZZZ
2.	Reclosing Enable	Disabled/Enabled
3.	N Shots	1 to 2 in steps of 1
4.	DT1 F	0.10 to 1.00s in steps of 0.1s
5.	DT2 F	0.10 to 1.00s in steps of 0.1s
6.	Reclaim Time	6s to 60 s in steps of 1s
7.	AR CB Monitor	52A / 52B
8.	AR Bypass	Disabled/Enabled
9.	AR Bypass I	200% to 2000% in steps of 1%
10.	Z2 AR BY	Yes/ No

11.	Z2 AR BY	Yes/ No

Breaker Failure

Sr. No	Parameter	Setting / Ranges
1.	Password	0000 to zzzz / ZZZZ
2.	BF Enable	Disabled/Enabled
3.	BF Delay	0 s to 5s in steps of 0.01s

ACTIVE GROUP

Sr. No	Parameter	Setting / Ranges
1.	G1/ G2	Read only

Typical Tests Information:

The Relay Confirm to following standard

Sr. No.	Test	Standard
Electromagnetic Compatibility Type Test:		
1.	Damped Oscillatory Wave Test	IEC 60255-26 & IEC 61000-4-18
2.	Electrostatic Discharge Test	IEC 60255-26 & IEC 61000-4-2
3.	Electrical Fast Transient or Burst Requirements	IEC 60255-26 & IEC 61000-4-4
4.	Surge Immunity Test	IEC 60255-26 & IEC 61000-4-5
5.	Immunity to Conducted Disturbances Induces by Radio Frequency Field	IEC 60255-26 & IEC 61000-4-6
6.	Radiated, Radio Frequency, Electromagnetic Field Immunity Test	IEC 60255-26 & IEC 61000-4-3
7.	Power Frequency Immunity Test	IEC 60255-26 & IEC 61000-4-16

Auxiliary Supply Tests		
8.	Effect of DC Voltage Variation	IEC 60255-1 / IEC 60255-26
9.	A.C. Ripples in DC Auxiliary	IEC 60255-26 & IEC 61000-4-17

Insulation Tests:		
10.	High Voltage Test	IEC 60255-27
11.	Impulse Voltage Test	IEC 60255-27
12.	Insulation Resistance	IEC 60255-27

Environmental tests:		
13.	Cold test (Storage & Operational)	IEC 60255-1/ IEC 60068-2-1
14.	Dry heat test (Storage & Operational)	IEC 60255-1/ IEC 60068-2-2
15.	Damp heat steady state test	IEC 60255-1/ IEC 60068-2-78
16.	Damp heat cyclic test	IEC 60255-1/ IEC 60068-2-30
17.	Change of Temperature	IEC 60255-1/ IEC 60068-2-14
18.	Enclosure Protection Test (IP51)	IEC 60529

Mechanical tests		
19.	Vibration Endurance Test	IEC 60255-21-1
20.	Vibration Response Test	IEC 60255-21-1
21.	Bump Test	IEC 60255-21-2
22.	Shock Withstand Test	IEC 60255-21-2
23.	Shock Response Test	IEC 60255-21-2
24.	Seismic Test	IEC 60255-21-3

Accuracy & Functional Performance Tests		
25.	Making & Breaking Capacity Tests of Contacts	IEC 60255 – 1
26.	Mechanical Endurance Tests	IEC 60255 – 1

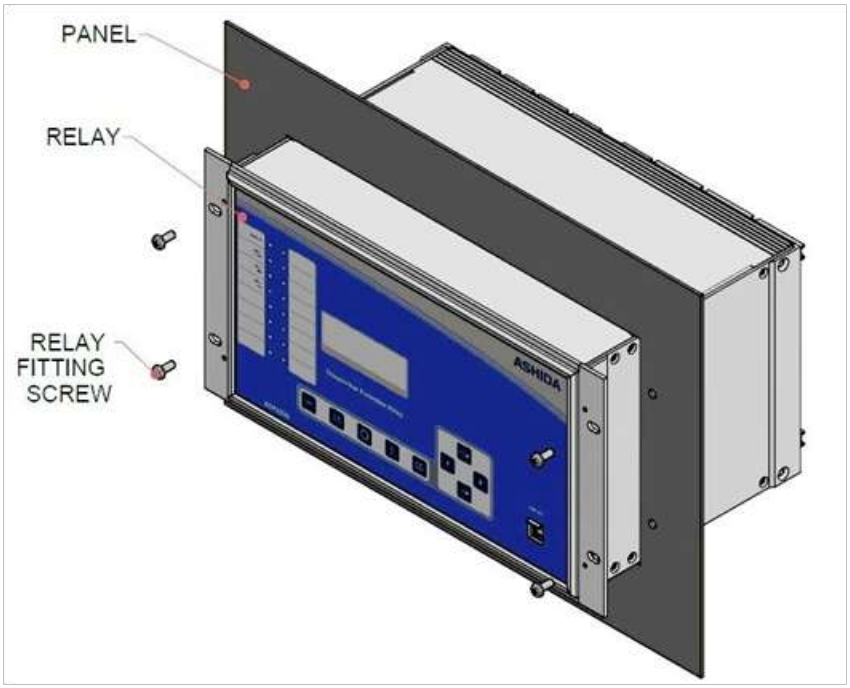
Thermal Withstand Tests		
27.	Over Current Test	IEC 60255-1
28.	Over Voltage Test	IEC 60255-1

*Detailed Type Test Reports are available on request

Drawings Information:

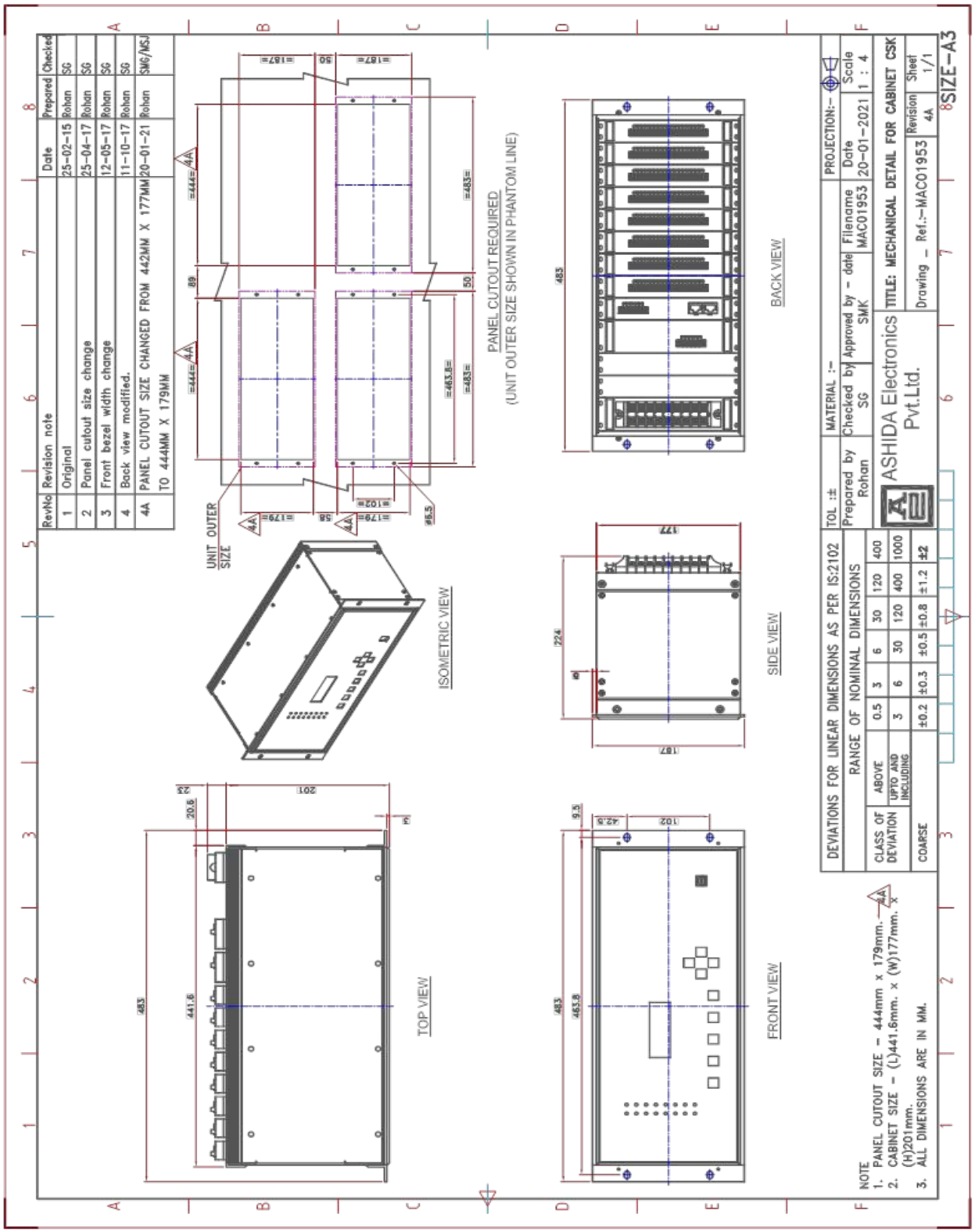
I.	Drawing References	: For Cabinet Type	MAC01953
		: For Back Connections	RLY06702
		: For Typical External Connections	ABD06702

Mounting Information:

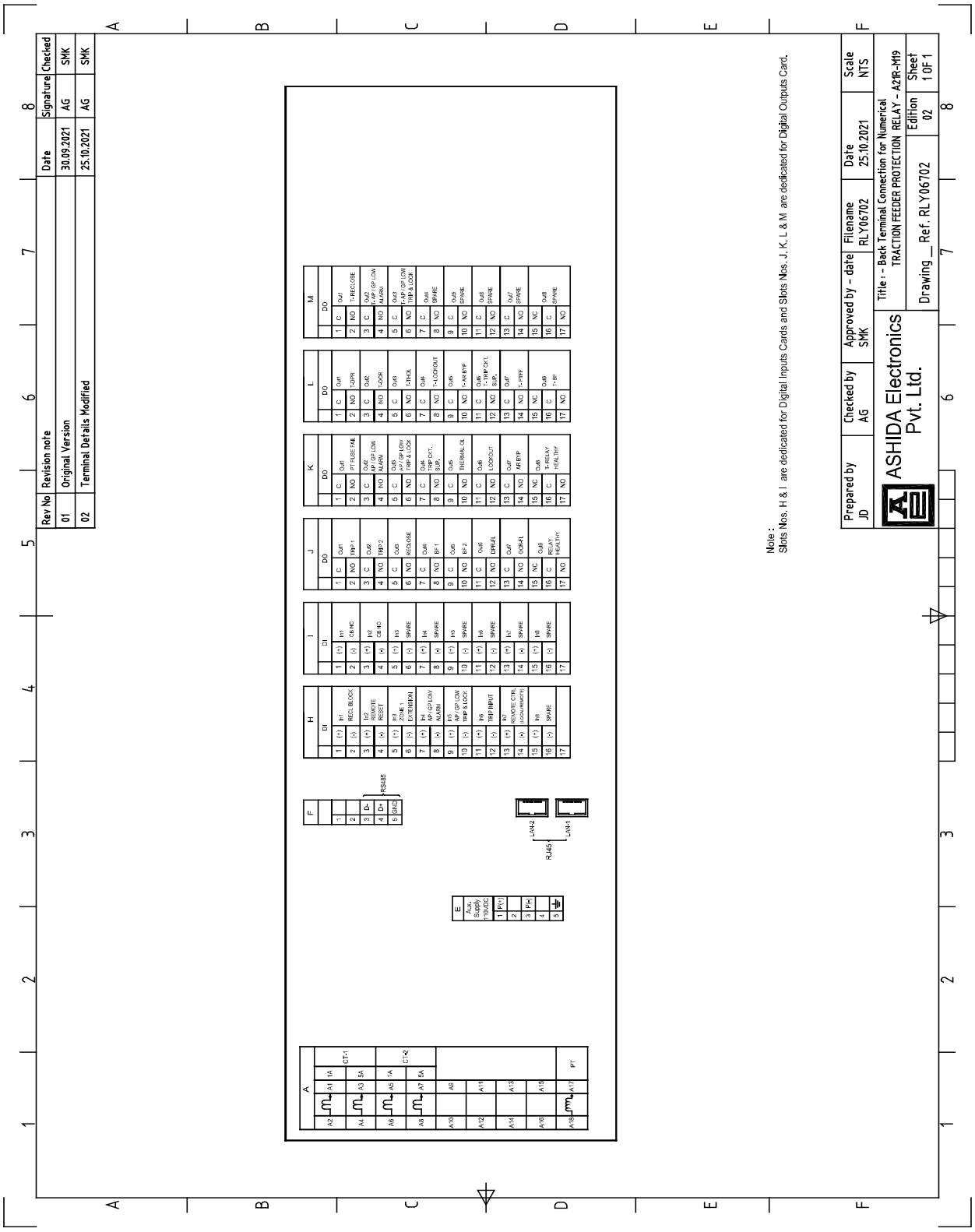


A21R 19” Modular – Rack mounting arrangement

Mechanical Details :

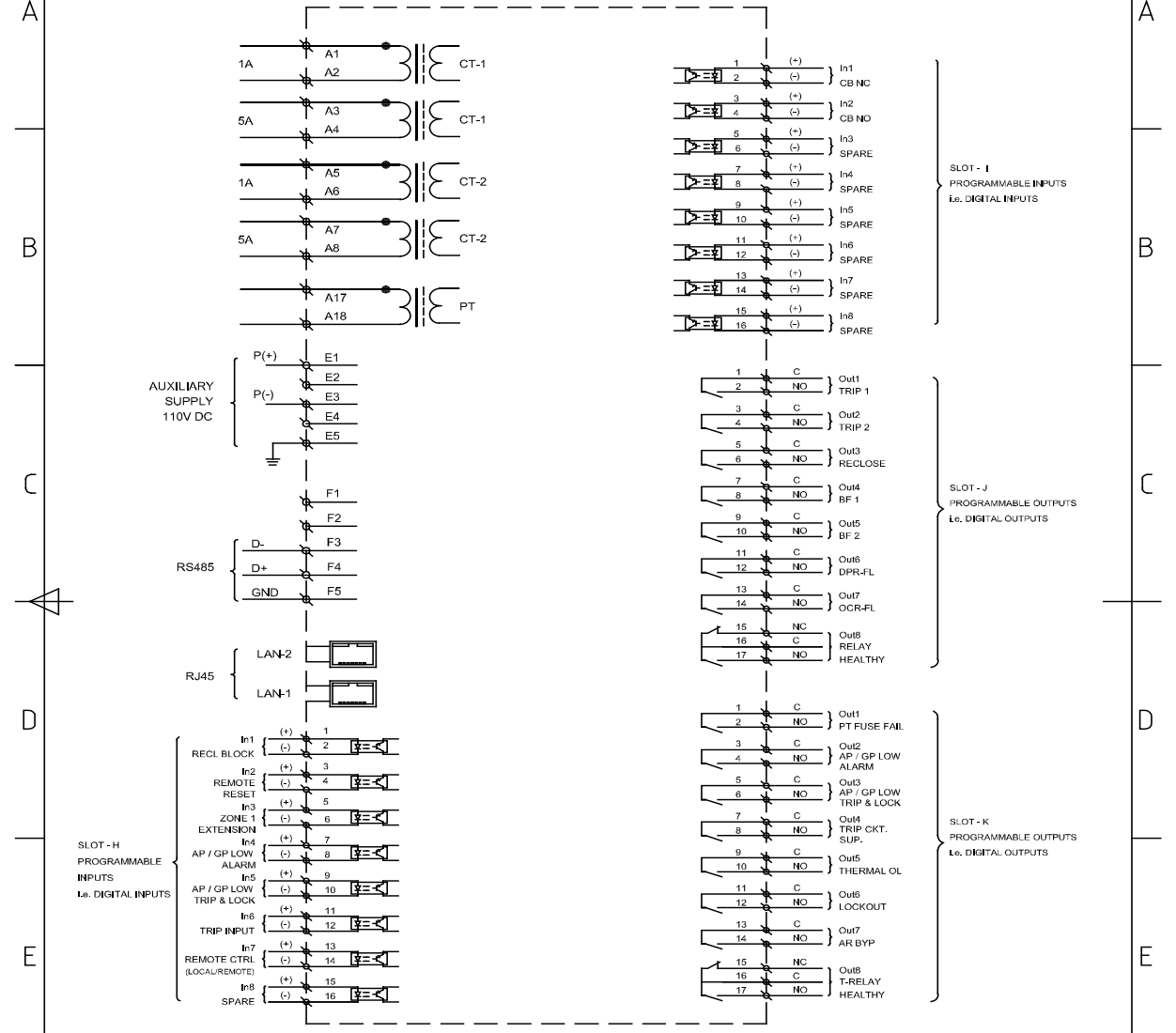


Back Terminal Details :



Electrical Connection Details :

Rev No	Revision note	Date	Signature	Checked
01	Original Version	30.09.2021	AG	
02	Terminal Details Modified	25.10.2021	AG	



Note :
Slots Nos. H & I are dedicated for Digital Inputs Cards and Slots Nos. J, K, L & M are dedicated for Digital Outputs Card

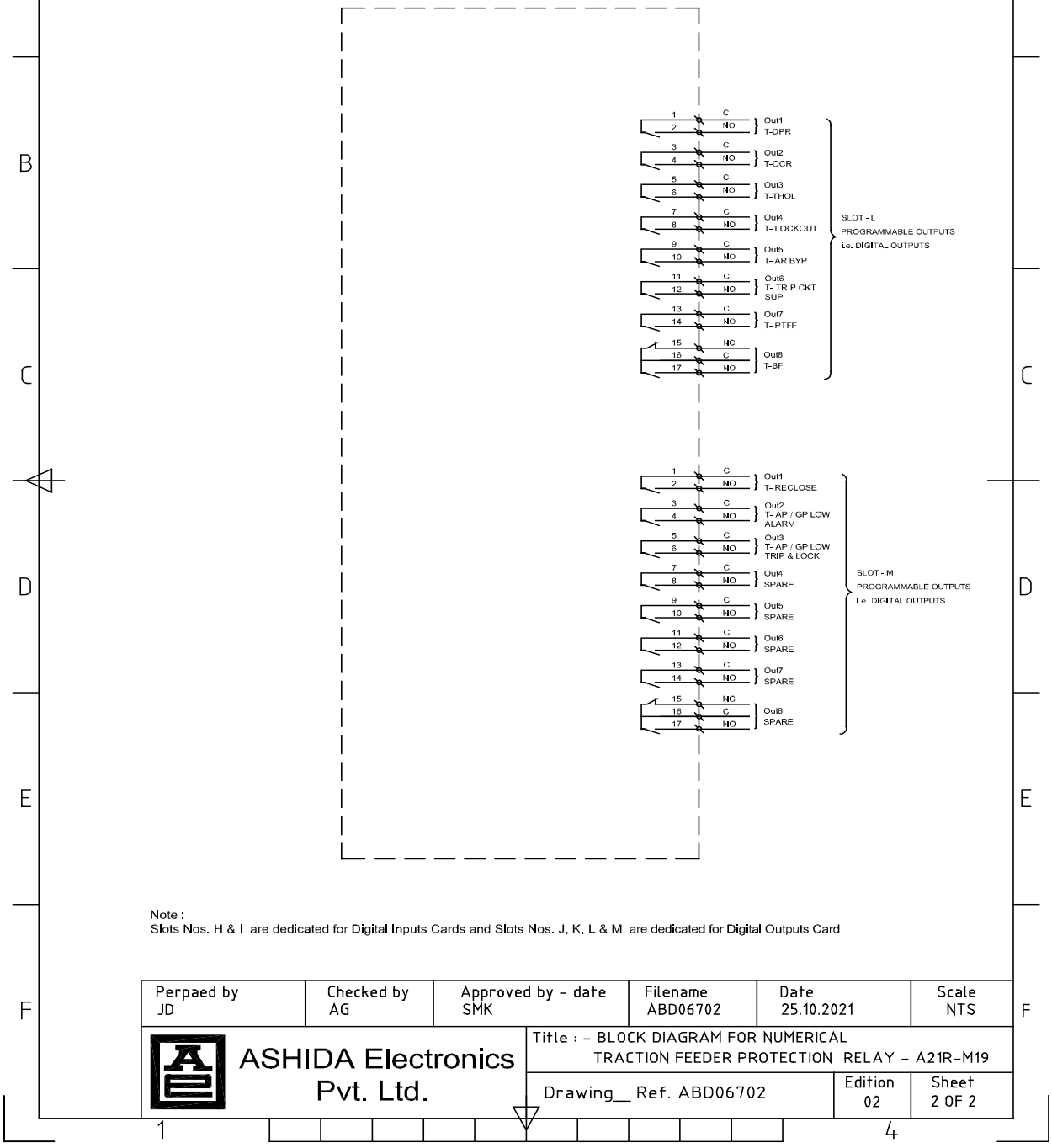
Perpaed by	Checked by	Approved by - date	Filename	Date	Scale
JD	AG	SMK	ABD06702	25.10.2021	NTS

ASHIDA Electronics Pvt. Ltd.

Title : - BLOCK DIAGRAM FOR NUMERICAL TRACTION FEEDER PROTECTION RELAY - A21R-M19

Drawing__ Ref. ABD06702 | Edition 02 | Sheet 1 OF 2

Rev No	Revision note	Date	Signature	Checked
01	Original Version	30.09.2021	AG	
02	Terminal Details Modified	25.10.2021	AG	



Note :
Slots Nos. H & I are dedicated for Digital Inputs Cards and Slots Nos. J, K, L & M are dedicated for Digital Outputs Card

Perpaed by	Checked by	Approved by – date	Filename	Date	Scale
JD	AG	SMK	ABD06702	25.10.2021	NTS

ASHIDA Electronics Pvt. Ltd.

Title : – BLOCK DIAGRAM FOR NUMERICAL TRACTION FEEDER PROTECTION RELAY – A21R-M19

Drawing__ Ref. ABD06702 | Edition 02 | Sheet 2 OF 2

General Specifications:

AC Current Inputs:

1A Nominal

5A Nominal

Thermal Withstand Capacity:

40 X In for 1s

4 X In for Continuous

Burden Rating:

< 0.2VA for 1A Nominal

< 0.2VA for 5A Nominal

AC Voltage Inputs:

1.15 X Vn for Continuous

1.5 X Vn for 10s

Over Voltage Category III

Pollution Degree 2

Rated Insulation Voltage: 2.5kV

Burden: <0.2VA

System Frequency:

50Hz / 60Hz

Frequency Tracking: 45 – 55Hz for 50Hz and 55 55 – 65Hz for 60Hz

Power Supply:

Range: 110 V DC +15%, -30%

Burden: < 20 Watt

Digital Outputs:

Continuous carry: 5A at 110V DC

Make: 30A for 200 ms at 110V DC

Breaking capacity: 1000 watts @ 110Vdc resistive, 30 watts @ 110Vdc inductive (L/R = 45ms)

Digital Inputs:

Operating range: 77 – 230 Vdc

Communication Ports:

Front Port – USB

Rear Ports – RJ45 (10-100/Base T Copper) & RS485

Operating Temperature:

Operating Temperature: -25^{O}C to +65^{O}C

Storage Temperature: -25^{O}C to +70^{O}C

Humidity: 95% RH

Weight: < 7kg Approximate

Ordering Information:

Ordering Information												
	1-4	5	6	7	8	9	10	11	12	13	14	15
Model	**A21R**	X	X	X	X	X	X	X	X	X	X	X
Example	**A21R**	M	0	0	2	0	3	1	2	3	3	H
FEEDER PROTECTION												
Cabinet Details												
Modular Version		M										
Variant												
2x25			0									
Language												
English				0								
Protocol												
IEC 103 (for all other protocol 103 will native)					0							
IEC 61850					2							
CT / PT												
2CT, CT Selection: 1A/5A, 1PT: 110.0V						0						
Digital Outputs												
16 DO							1					
32 DO							3					
Digital Inputs												
16 DI								1				
32 DI								3				
DI Setting Threshold												
18VDC									0			
35VDC									1			
77VDC									2			
154VDC									3			
Auxiliary Supply												
24VDC – 230 VDC										2		
110VDC										3		
Cabinet Details												
Modular Version M-19											3	
Communication Ports												
Disable / No Rear Port												0
RS-485 Rear Port												B
10/100 Base-T Ethernet RJ45 Rear Port												C
10/100 Base-T Ethernet RJ45 Rear Port & RS-485 Rear Port												E

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 & RS-485 Rear Port + IRIGB Port	M
DUAL FO Ethernet Rear Port & RS-485 Rear Port	N

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