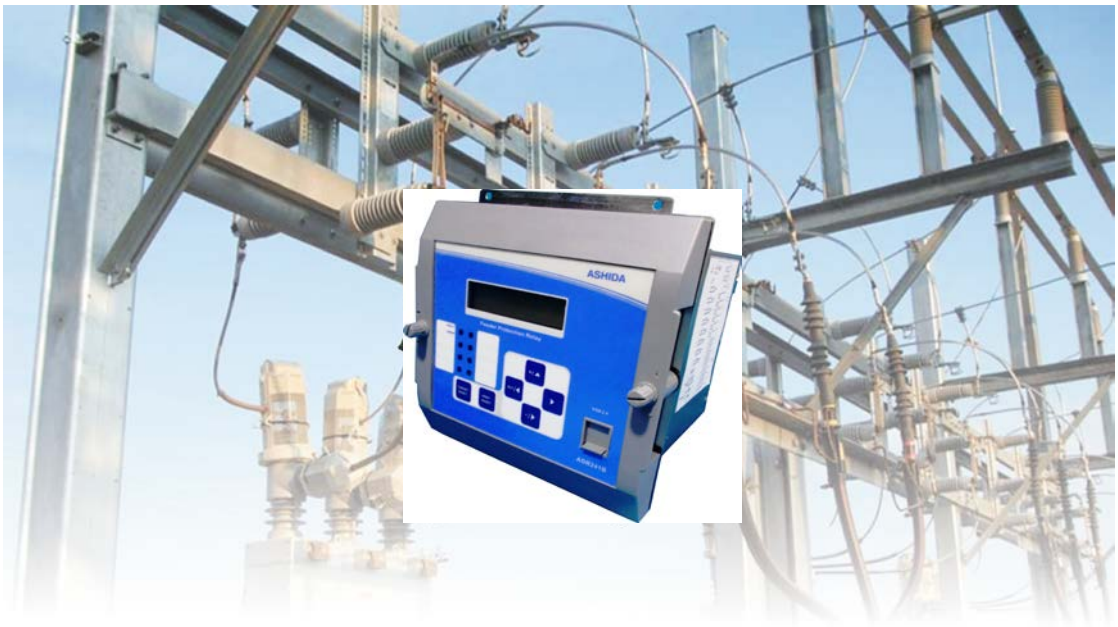


FEEDER PROTECTION RELAY TYPE ADR241B

Introduction:

ASHIDA has designed economical & reliable Multifunction ADR241B Draw-out/Non draw-out Protection & Control System. The simple and compact construction of Aditya series, ADR241B relay provides integrated Protection, Control and Monitoring functions for Sub Transmission Lines, Underground cables, and Distributed Feeders. Draw-out/Non draw-out* versions are available based on ordering information.

Functional Overview:

Key Protection & Control Functions:

- Draw-out / Non draw-out* cabinet
- Four Independent Settings Groups
- Thermal Overload Protection (49)
- Non Directional Phase & Ground Over Current Function (50/51/51N/50N)
- Two Independent Stages for Non Directional Phase Over Current Protection.
- Two Stages of Non Directional Ground Over Current Protection.
- Internally Derived (3I0>) / Externally measured Ground Over Current Protection.
- Inverse time Over Current Protection (IEC & IEEE curves) + User define curve.
- Harmonic blocking and unblocking feature.
- Cold load pick up.

- High Impedance Restricted Earth Fault Protection (64R).
- Inverse & Definite time Negative Sequence Over Current Protection (46).
- Broken Conductor Protection (46BC)
- Breaker Failure detection (50BF)
- Trip circuit supervision function
- Programmable Inputs & Outputs
- CB Close / Trip from HMI
- Target LEDs for indication with dual colours (8 nos.)
- Self Supervision of relay.
- Metering function
- Disturbance Recording (10 nos.)
- Event Recording (512 nos.)
- Fault Recording on HMI display (10 nos.)
- Non-Volatile memory.
- Fully communicable with IEC standard protocol IEC60870-5-103, IEC61850 and Modbus.
- Separate communication port for SCADA Communication
- PC front port communication for convenient relay settings
- Dual Ethernet Port is provided at rear side
- User friendly local operation with key pad
- Liquid crystal display (16x2) with backlight
- Password Protection.

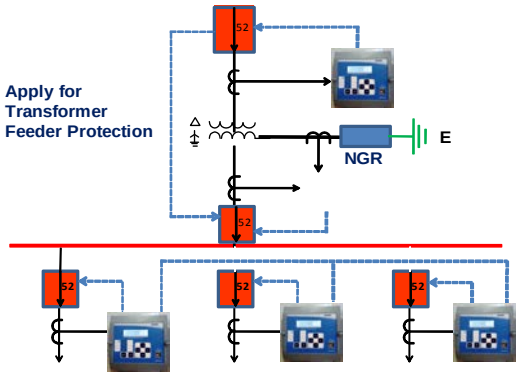
Software Support:

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

Applications:

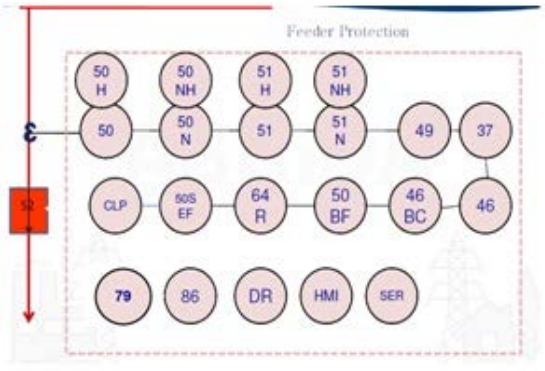
ADR241B numerical multifunction relay designed for Sub Transmission line protection, Underground cable & Distributed feeder protection applications. Relay designed with fast and selective tripping ensures the stability and availability of electrical power system.

ADR241B relay apply for protection, control & monitoring of radial and ring main feeder to achieve sensitivity and selectivity on phase and ground faults.



Radial feeder application

The functional overview of ADR241B:



Protection functions Overview

ANSI Code	Description
CLP	Cold load pick up
37	Under current Protection
46	Negative Phase Sequence Protection
46BC	Broken Conductor Detection
49	Thermal overload Protection
50	Instantaneous/Definite Time Phase Over current Protection
51	Inverse Time Phase Over current Protection
50SEF	Sensitive Ground Over current Protection
51N	Inverse Time Ground Over current Protection
64R	High Impedance Restricted Earth Fault Protection
50BF	Breaker Failure
79	Auto reclosing
86	Lockout (Trip command)

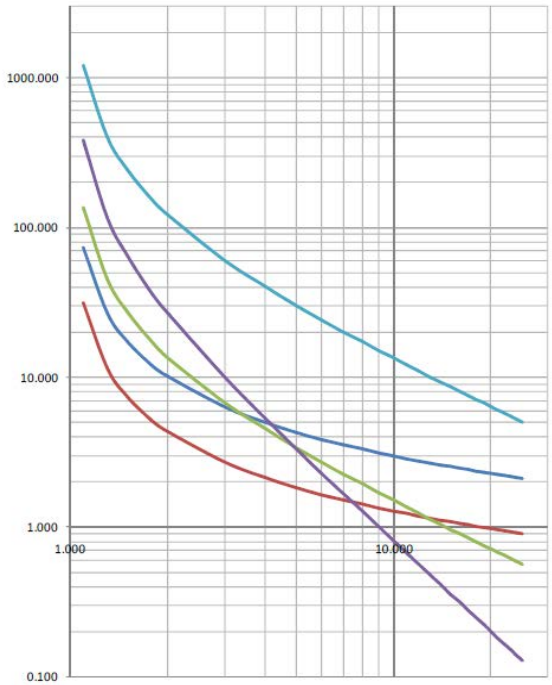
Non Directional Over Current Protection (50/50N/51/51N):

The core functionality of ADR241B relay is equipped with multi function feeder protection. The relay provides Non Directional phase and ground over current protection with multiple settings (Two stages for phase over current and ground over current) for various power system applications and wide range of protection settings. The function is equipped with digital filter algorithms, providing the rejection of higher harmonics & DC offset. Selectable IEC / IEEE inverse time curves & user define curve with non directional over current protection will be providing greater selectivity, flexibility and sensitivity to users for better relay co-ordinations.

ADR241B relay provides inverse time over current characteristic for phase and ground over current elements. Each stage of phase and ground over current elements are independently settable with inverse time or definite time characteristic. The following tripping characteristics are available;

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

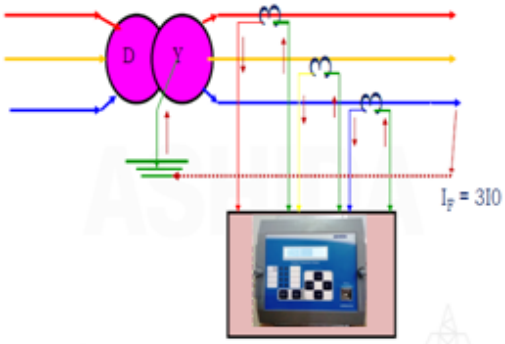
Description	Standard	K	α	L
IEC S Inverse	IEC	0.14	0.02	0
S Inverse 1.3 Sec	---	0.06	0.02	0
IEC V Inverse	IEC	13.5	1	0
IEC E Inverse	IEC	80	2	0
UK LT Inverse	UK	120	1	0
IEEE M Inverse	IEEE	0.0515	0.02	0.114
IEEE V Inverse	IEEE	19.61	2	0.491
IEEE E Inverse	IEEE	28.2	2	0.1217
US Inverse	C08	5.95	2	0.18
US ST Inverse	C02	0.02394	0.02	0.01694



IEC/ IEEE Inverse curves for tripping of over current elements

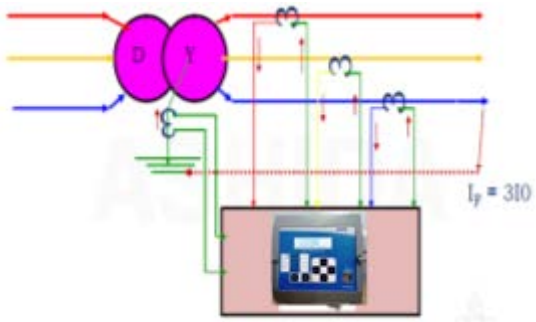
ADR241B relay provides the inverse time dropout characteristic (electromechanical relay reset) for IEEE curves. The output of protection function shall be reset after dropout time delay.

ADR241B relay provides two stages of definite time/inverse time internally derived zero sequence over current (3I0>) protection to detects asymmetrical faults in electrical network. It can apply to over head transmission line, underground cable, and feeder. The ground current (3I0>) calculated from three line currents.

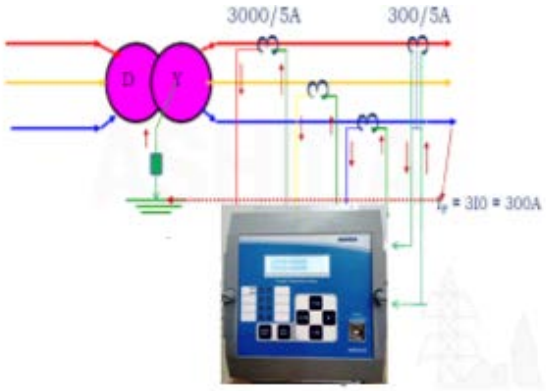


Internally derived residual over current application

ADR241B relay provides two stages of externally ground over current protection. ADR241B relay measures ground fault current through neutral CT input. Externally ground CT input can also apply for high impedance restricted earth fault protection or sensitive ground fault protection through CBCT.



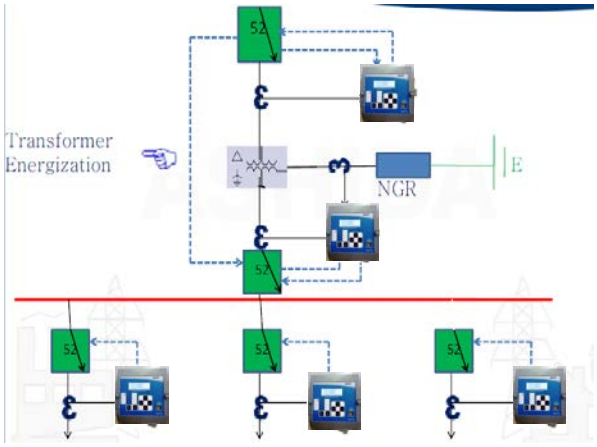
Externally measured ground over current through neutral CT



Externally measured ground over current through CBCT

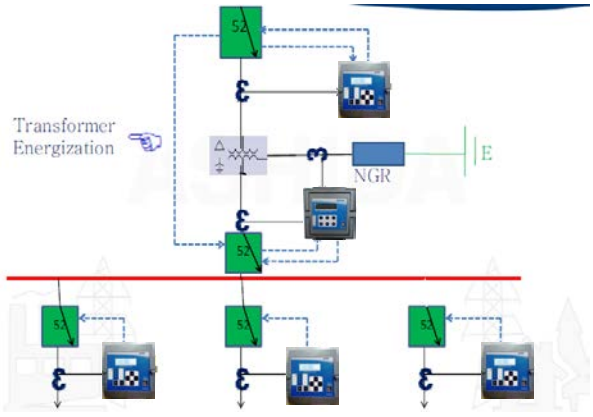
Harmonic blocking / Unblocking for Over Current Protection (50H/51H/50NH/51NH):

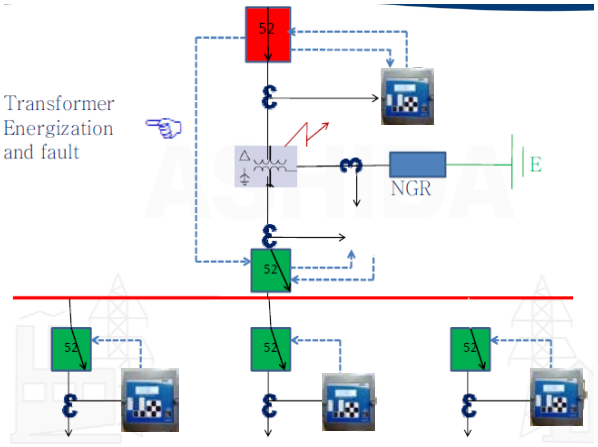
Harmonic blocking / unblocking feature equipped in ADR241B relay provides stability on inrush current during transformer energization. Harmonic blocking/unblocking feature is independent for each stage of phase and ground over current protection.



Additional functions (CLP):

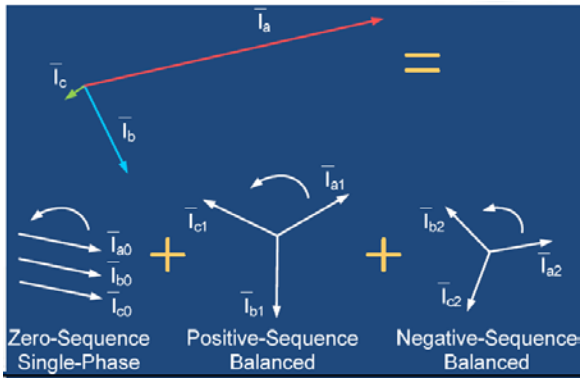
ADR241B provides the cold load pick up (CLP) function. User can select this function for application. Cold load pick up function provided in relay for multiple applications. The application of this feature can be use to avoid wrong operation on inrush current during transformer energization without compromising sensitivity of over current protection.



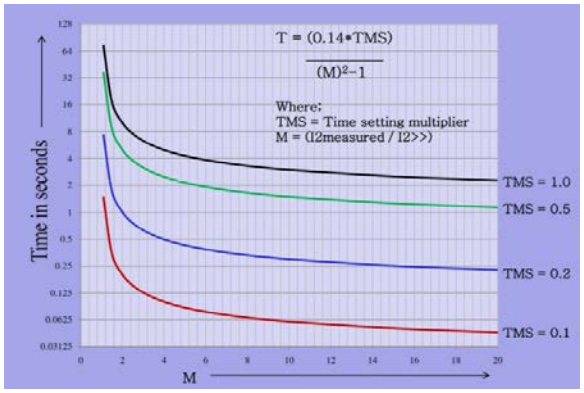


Negative Phase Sequence Over Current Protection (46):

Two independent stages of Definite and Inverse time Negative sequence over current protection will be providing back up protection of over head transmission line / underground cable / feeder against unbalanced faults, very high resistive phase/ground faults and unbalanced loads. Protection can also apply in condition when there is a very high resistive ground fault and ground element may not sense the fault current.

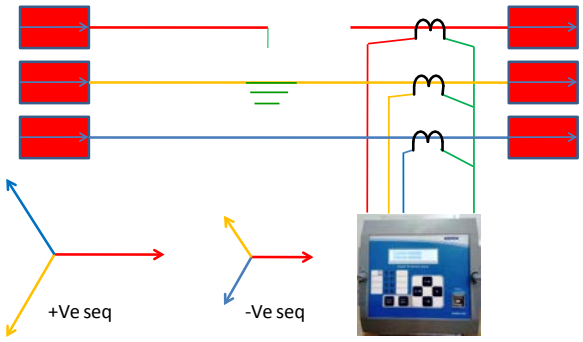


The negative phase sequence over current element can be programmed as IDMT or definite time characteristic. ADR241B relay provides ten selectable IEC / IEEE inverse curves and one user define curve for each stage.



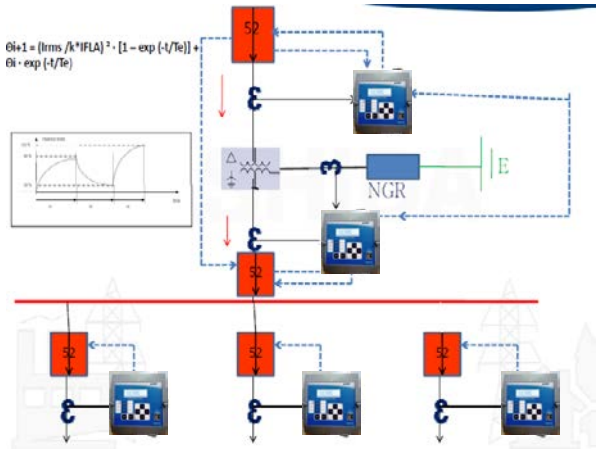
Broken Conductor Protection (46BC):

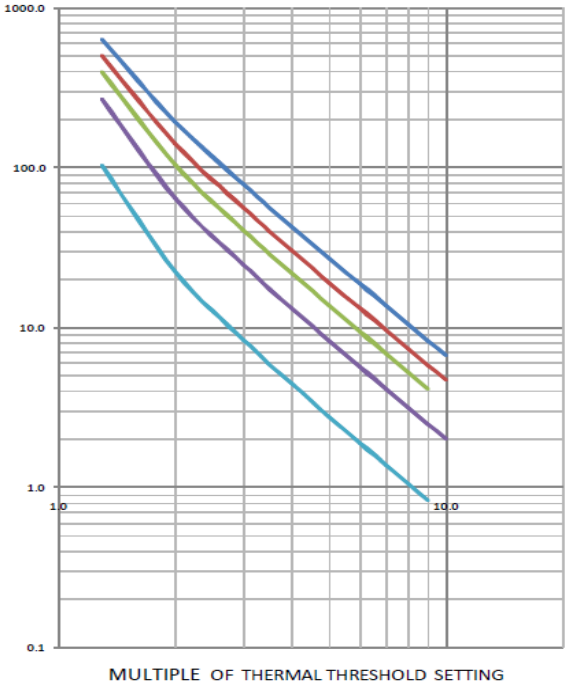
ADR241B equipped with broken conductor detection protection. Broken conductor condition can be detected by ratio of Negative sequence current to Positive sequence current (I2/I1) provides higher sensitivity on High resistive fault.



Thermal overload Protection (49):

ADR241B relay provides thermal over load protection of transformer against over load conditions. Relay estimate thermal contents and initiate alarm & tripping if the thermal contents are higher than the preset value. Trip time of relay follows the according to the thermal time constant value set in to relay.



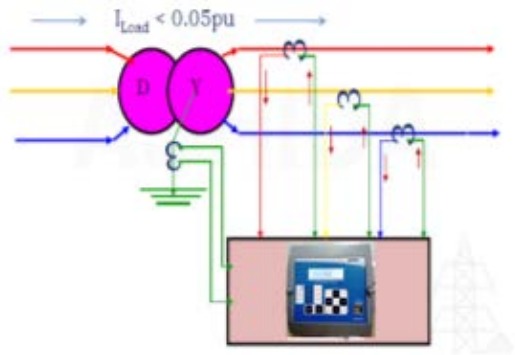


Breaker Failure detection (50BF):

If the fault current is not interrupted after a time delay expired, circuit breaker failures detected, and execute trip command to upstream circuit breaker. ADR241B relay incorporates circuit breaker failure protection to detect failure of tripping command execution due to mechanical or electrical problems in circuit breaker.

Under current detection (37):

ADR241B provide under current protection with definite time delay option.

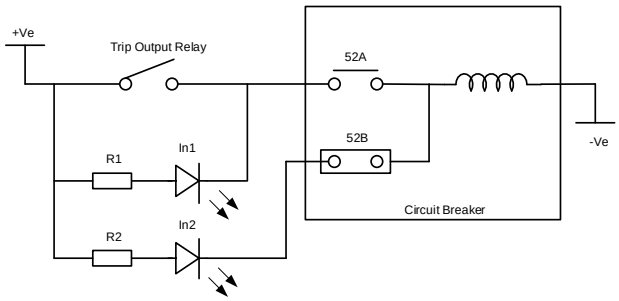


Trip circuit supervision (74T):

Any binary inputs for circuit breaker poles can be used for monitoring the circuit breaker trip coils including connecting cables. Relay initiate alarm whenever the circuit breaker control/DC circuitry gets interrupted.

The ADR241B is having 2 separate digital opto-coupler status input which can be used to continuously monitor healthiness of trip-circuit.

Trip Circuit Supervision Logic



Relay monitor Trip coil continuity through CB NO during close condition and through CB NC during Trip condition. If any discontinuity observed it generate Alarm signal.

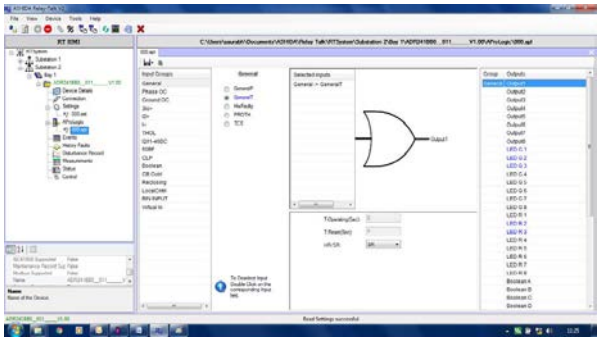
Reclosing / Auto reclosing (79):

The ADR241B is provided with 4 shot Auto recloser function. Numbers of shots are selectable. 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). After clearing of fault ADR241B trigger dead Time 1 i.e. DT1. after the time delay Relay provide reclose command and start reclaim timer RT. If second fault occur during RT relay trigger Dead Time 2 i.e. DT2. If third fault occur during Reclaim Time relay trigger Dead Time 3 i.e. DT3, If Fourth fault occur during RT relay trigger Dead Time 4 i.e. DT4 and after time delay it again provide reclose command and retrigger RT. If fifth fault occur during Reclaim Time 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.

Programmable Inputs, Outputs & Logic:

The ADR241B relay equipped with 8 nos. of programmable digital outputs and 8 nos. of optically isolated digital inputs. All 8 nos. of digital inputs are the programmable digital inputs to be configured for desired applications including trip circuit supervision. The ADR241B-DO support basic DI/DO programming with 4 Equation including all type of gates such OR / NOR / NOT / NAND / AND / XOR. The LEDs,

Digital input, Digital output, Equation can be programmed through PC software (RTV2 software)



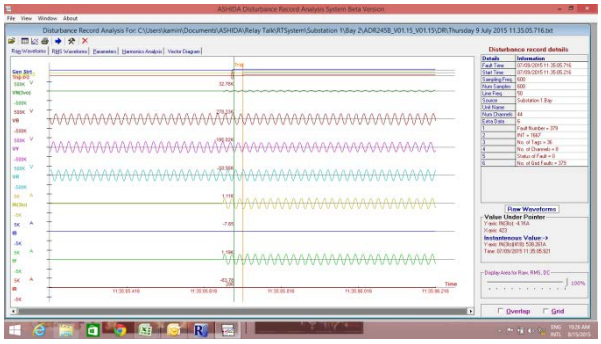
For more details refer Instruction Manual

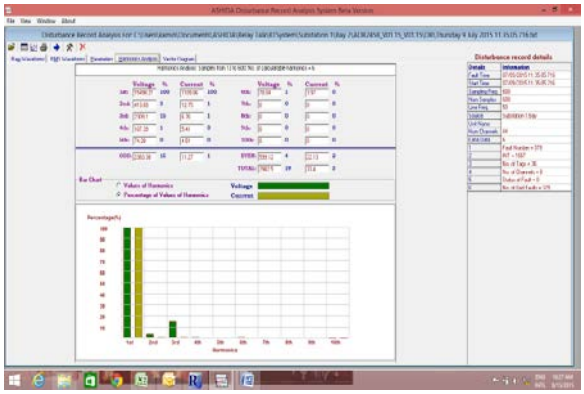
Event Recording:

ADR241B relay is providing feature to record and store 512 nos. of events in non-volatile memory through internally by protection and control functions and externally by triggering of digital inputs, and can be extracted using communication port or viewed on front of LCD display. The event shall be trigger on time stamp through time synchronization or internal clock setting.

Disturbance recording:

ADR241B relay is provides built in disturbance recording facility for recoding of analogue and digital channels. Relay records 10 nos. of disturbances and store in to non-volatile memory. Disturbance records can be saved in IEEE COMTRADE format and same can be analyzed in disturbance analysis software.





Fault recording:

ADR241B relay is providing fault record facility. The fault records can be display either on HMI display or in RTV2 software. The relay can records 10 nos. of fault records in non-volatile memory.

Metering:

Online metering feature of ADR241B relay is providing metering of parameters (i.e. current magnitude) on HMI display or in RTV2 software.

Independent Protection settings groups:

ADR241B relay provides four independent settings groups to allow operate relay on different power system operating conditions.

IEC 60870-5-103 Protocol:

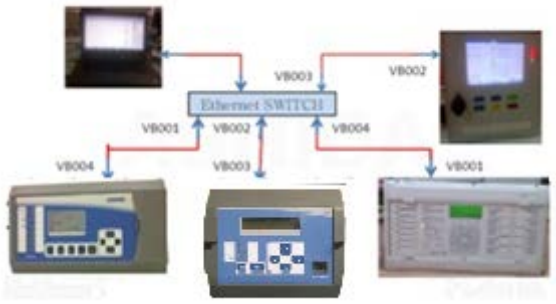
ADR241B relay provides internationally standardized protocol for communication via RS485 port of protection relays. IEC 60870-5-103 protocol used worldwide and supported by relay manufacturers.

IEC 61850 Protocol:

ADR241B relay provides internationally standardized protocol IEC61850 for substation automation via Ethernet port of protection relays.

IEC61850 GOOSE and Interoperability:

ADR241B 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. ADR241B support total 16 simultaneous GOOSE signal which can publish and received by other relays having IEC61850 protocol. Similarly ADR241B can able subscribed total 16 nos of simultaneous signal published by other relays and can be use for interlocks. The ADR241B is tested for most of other make relays.



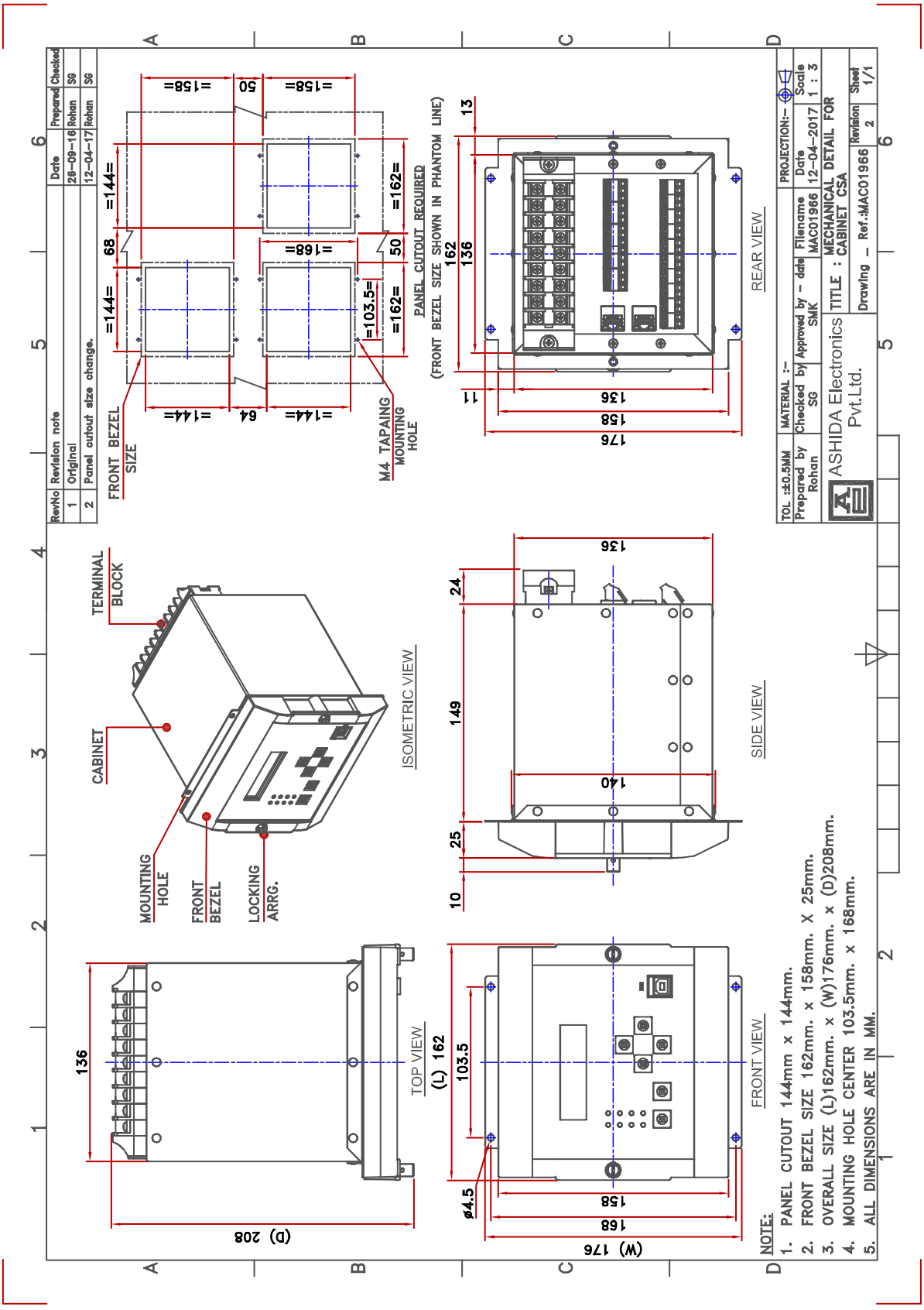
Typical Tests Information:

The Relay Confirm to following standard			
Electromagnetic Compatibility Type Test:			
Sr. No.	**Standard**		**Test**
1.	High Frequency Disturbance Test	IEC60255-22-1	: Frequency : 1MHz Damped Oscillatory : Longitudinal :2.5 KV Common Mode, 1 KV Differential Mode : Duration: sec duration 2 sec. : On Mains Port.
2.	Electrostatic Discharge Test- Direct Application	IEC60255-22-2	: IEC 61000-4-2. : Contact discharge: 2, 4, 6 kV, : Air discharge: 2, 4 8 KV : Polarity: both +ve and –Ve polarities.
3.	Fast Transient Disturbance Test	IEC60255-22-4	: Class A : 4KV; 5/50ns; 5KHz & 100KHz: Repetition rate 300ms; Both polarities; Ri = 50Ω; duration 1 min.
4.	Surge Immunity Test	IEC60255-26 & IEC61000-4-5	: Differential Mode = 2kV : Common Mode = 4kV : 1.2/50μs, 8/20μs 5 surges of each polarity
5.	Power Frequency Immunity Test	IEC60255-22-7	: Class-A
6.	Pulse Magnetic Field Immunity Test	IEC61000-4-9	: TEST LEVEL 5, TEST specifications = 1000A/m field applied in all planes
7.	Radiated Electromagnetic Field Disturbance Test	IEC60255-22-3	: 10V/m, Performance Class-A : 10V/m, freq = 80MHz to 1GHz, 80% AM at 1kHz. SPF = 80, 160, 380, 450, 900 MHz
8.	Conducted Disturbance Induced By Radio Frequency Field	IEC60255-26	: Freq. 150kHz – 80MHz, Amplitude 10 V, Modulation 80% AM @ 1 KHz. SPF = 27 and 68 MHz
9.	Power Supply Immunity Test	IEC60255-11 & IEC61000-4-11	: DC voltage dip: 40% dip 200ms and 70% for 500ms for DC 10 & 20ms without loss of protection for DC 30ms, 50ms, 100ms, 200ms, 300ms, 0.5s, 1s and 5s with temporary loss of protection for DC AC voltage dip: 10, 20ms without loss of protection for AC 50ms, 100ms, 200ms, 0.5s, 5s with temporary loss of protection

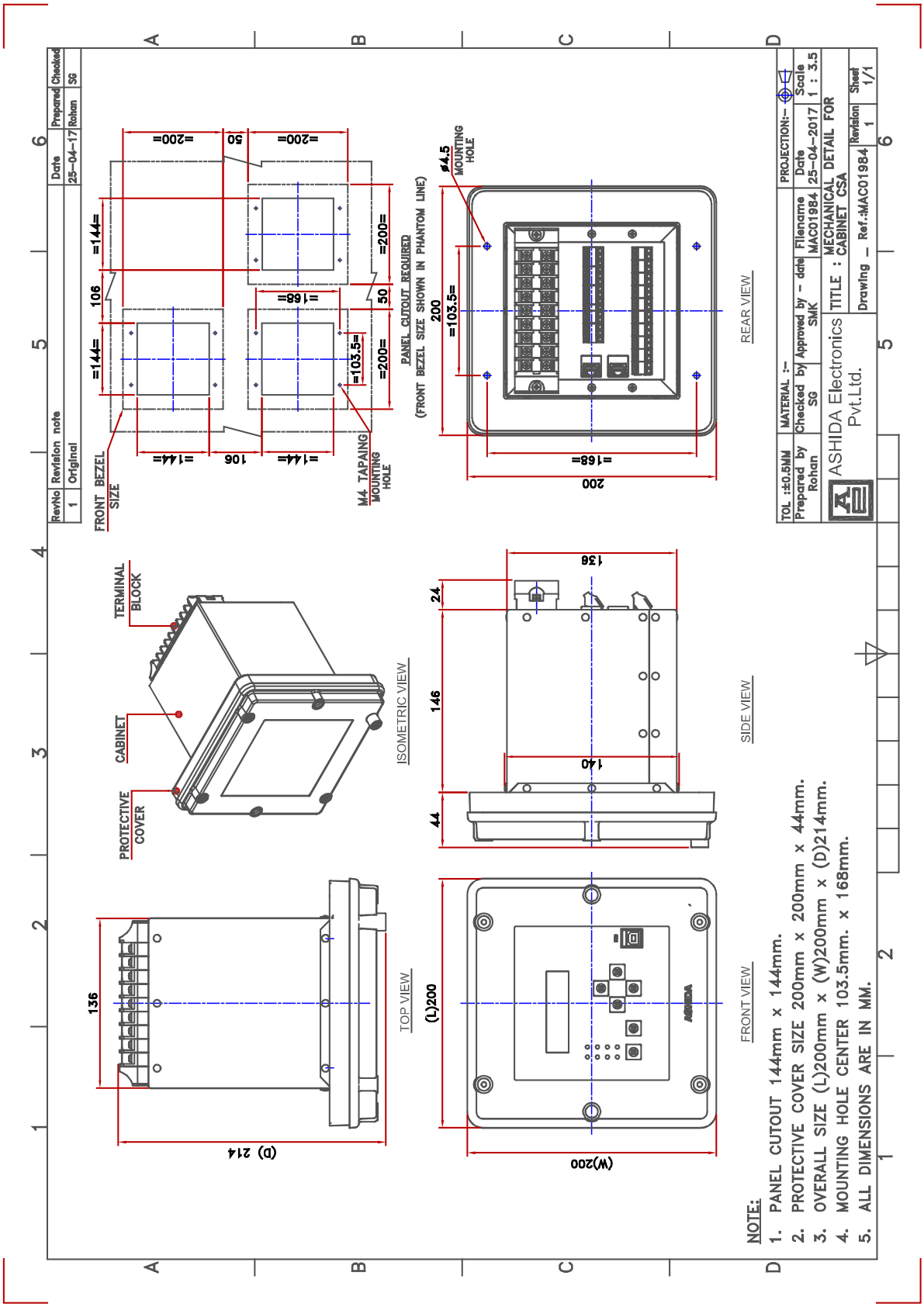
10.	Conducted & Radiated frequency Emission Test	IEC60255-25	: Conducted 0.15MHz - 0.5MHz, 79dB (microV) Q-Peak, 66dB (microV) for average 0.5MHz - 30MHz, 73dB (microV) Q-Peak, 60dB (microV) for average Radiated (3mtr) 30MHz - 230MHz, 50dB (microV) Q-Peak, 230MHz - 1GHz, 57dB (microV) Q-Peak,
Insulation Tests:			
11.	High Voltage Test	IEC60255-27	: At 2kV 50Hz between all terminal connected together and earth for 1 minutes
12.	Impulse Voltage Test	IEC60255-27	: Test voltage: 5KV (peak) 1.2 / 50us, : Energy :0.5 J, : Polarity : + ve and – Ve : Nos. of impulses : 3 positive and 3 negative impulse : Duration between Impulses : 5 sec.
13.	Insulation Resistance	IEC60255-27	: ≥ 100MΩ @ 500V DC
Environmental tests:			
14.	Cold test		: IEC-60068-2-1
15.	Dry heat test		: IEC-60068-2-2
16.	Damp heat test, steady state		: IEC-60068-2-78
17.	Change of Temperature		: IEC-60068-2-14
18.	Damp heat test, cyclic		: IEC-60068-2-30
19.	Enclosure Protection Test (IP54)		: IEC 60529
CE compliance			
20.	Immunity		: IEC-60255-26
21.	Emissive Test		: IEC- 60255-26
22.	Low voltage directive		: EN-50178
Mechanical tests			
23.	Vibration Endurance Test		: IEC 60255-21-1 class 2 : Frequency Range = 10Hz – 250Hz , acceleration. = 2gn : Sweep rate 1 octave/min; 20 cycle in 3 orthogonal axis.
24.	Vibration Response Test		: IEC 60255-21-1 class 2 : Frequency Range = 10Hz – 150Hz , acceleration. = 1gn : Sweep rate 1 octave/min; Displacement =0.075mm, in 3 orthogonal axis.
25.	Bump Test		: IEC 60255-21-2 Class-1 : 1000 bumps / direction of 10gn peak acceleration and 16ms pulse duration in each of the two opposite direction per axis as per No. of axes. 3.

26.	Shock Withstand Test	: IEC 60255-21-2 Class-1 : 3 shocks of 15gn peak acceleration and 11ms pulse in each of two opposite direction. No. of axis : 3
27.	Shock Response Test	: IEC 60255-21-2 Class-2 : 3 shocks of 10gn peak acceleration and 11ms pulse in each of two opposite direction. No. of axis : 3
28.	Seismic Test	: IEC 60255-21-3 Class-2 : Sweep 1/Axis (@a sweep rate of 1 octave/minute) vibration in the frequency range (5-35 Hz) at displacement X-axis: 7.5mm, Y-axis: 3.5mm amplitude of 3.5mm with acceleration of X-axis: 2gn, Y-axis: 1gn.

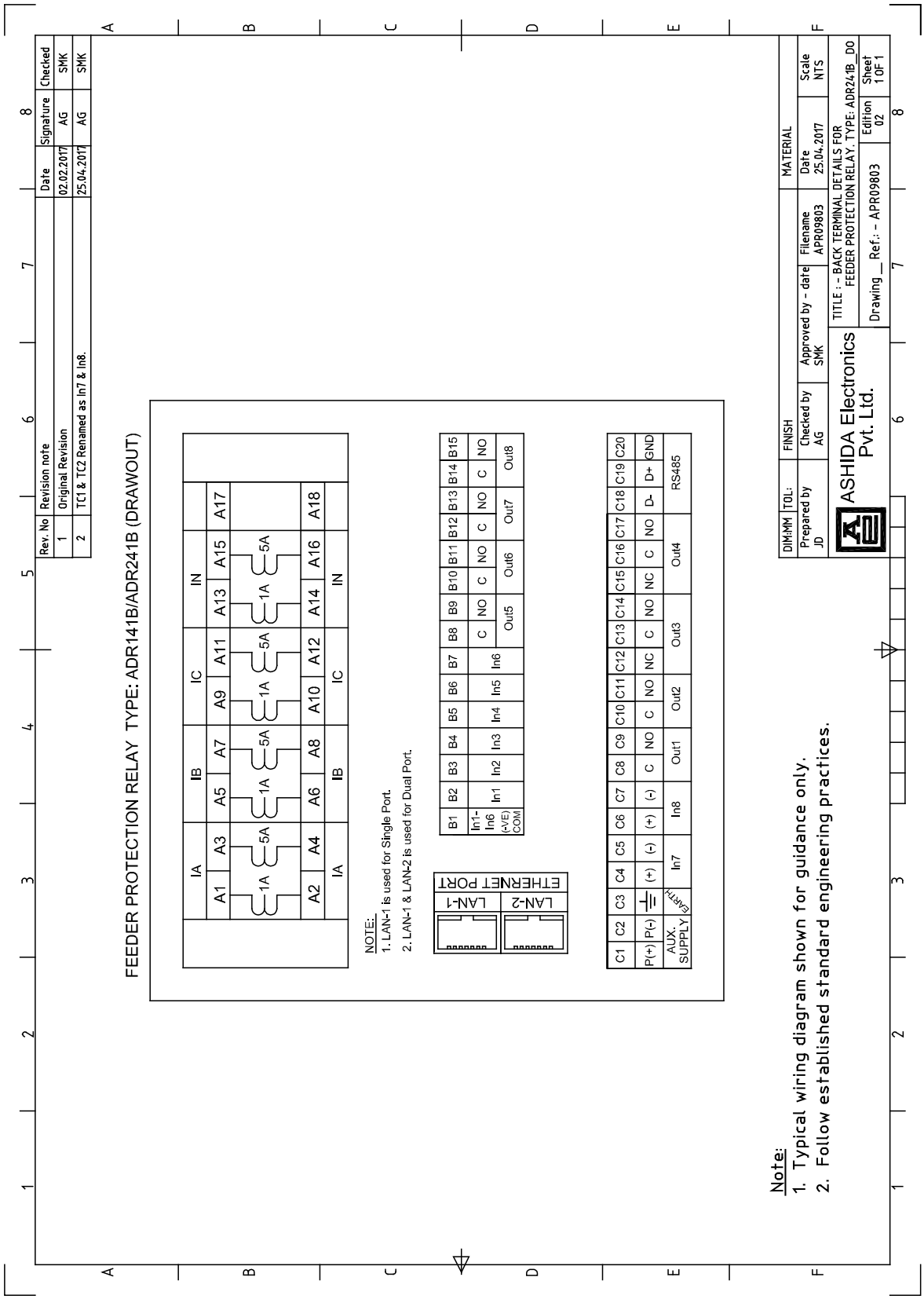
Mechanical Details without IP Cover



Mechanical Details with IP Cover

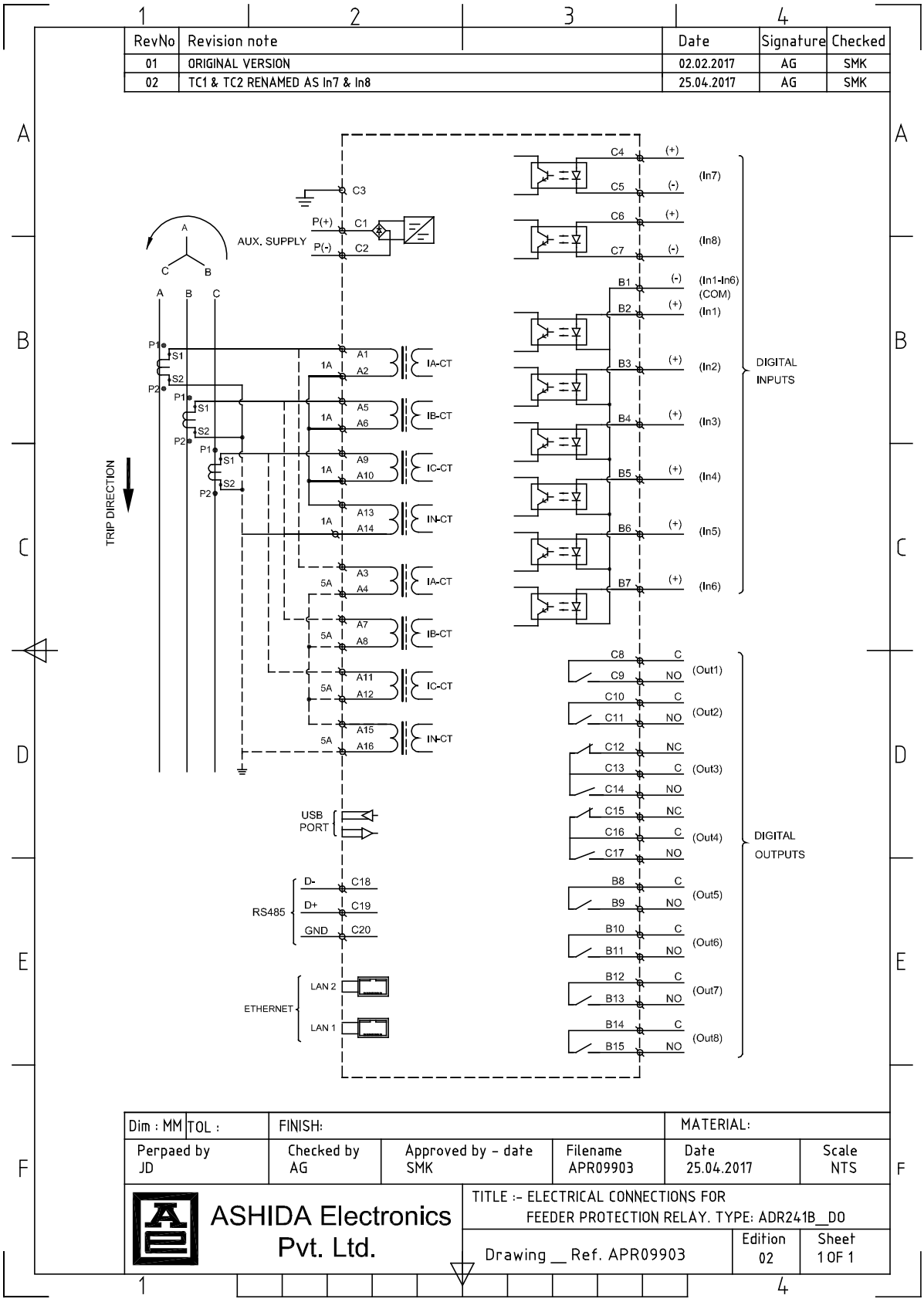


Back Terminal Details



Electrical Connection Details

RevNo	Revision note	Date	Signature	Checked
01	ORIGINAL VERSION	02.02.2017	AG	SMK
02	TC1 & TC2 RENAMED AS In7 & In8	25.04.2017	AG	SMK



Dim : MM	TOL :	FINISH:			MATERIAL:	
Perpaed by JD		Checked by AG	Approved by - date SMK	Filename APR09903	Date 25.04.2017	Scale NTS

ASHIDA Electronics Pvt. Ltd.

TITLE :- ELECTRICAL CONNECTIONS FOR FEEDER PROTECTION RELAY. TYPE: ADR241B_DO

Drawing _ Ref. APR09903 | Edition 02 | Sheet 1 OF 1

Ordering Information												
	1-4	5	6	7	8	9	10	11	12	13	14	15
Model	**241B**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Example	241B	B	0	0	0	0	0	0	2	2	1	B
FEEDER PROTECTION												
Cabinet Details												
Basic Version		B										
Variant												
Standard			0									
Language												
English				0								
Protocol												
IEC 103					0							
IEC 103 & IEC 61850					2							
IEC 103 & MODBUS TCP IP					4							
CT / PT												
Default: 4CT, CT Selection: 1A/5A (With Standard EF CT)						0						
Digital Outputs												
4 DO - Draw Out Cabinet							0					
8 DO - Draw out Cabinet							1					
Digital Inputs												
2 DI -Draw Out Cabinet (only available for 4DO model)								0				
8 DI - Draw out Cabinet (only available for 8DO model)								1				
DI Setting Threshold												
18VDC									0			
35VDC									1			
77VDC									2			
154VDC									3			
Auxiliary Supply												
24 – 230 VDC / VAC										2		
Cabinet Details												
Draw Out											1	
With IP54 protection cover (Only for Draw out Model)											4	
Communication Ports												
Disable / No Rear Port												0
RS-485 Rear Port												B
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

General Specifications:

AC Current Inputs:

1A Nominal

5A Nominal

Continuous Thermal Rating:

2 X In for Continuous

40 X In for 3s

100 X In for 1s

Dynamic Thermal rating

200X In for dynamic timing

Burden Rating:

< 0.2VA for current(In)

System Frequency:

50Hz / 60Hz

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

Power Supply:

Range: 24 to 230Vdc

Burden: <6 watts for DC

Digital Outputs:

Continuous carry: 5A

Make: 30A for 0.5s & 15A for 3s

Breaking capacity: 1250VA @ 250Vac, 100 watts @ 250Vdc resistive, 50 watts @ 250Vdc inductive (L/R = 45ms)

Digital Inputs:

Operating range: 24 – 230Vdc

Communication Ports:

Front Port – USB

Rear Ports – RS485 and Dual RJ45 port

Operating Temperature:

-25^{O}C to +65^{O}C

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

Humidity: 95% RH

Weight: < 2.5Kg

ASHIDA

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