



Protection Features:

- 4 Element (3 Phase + EF) Non Directional Over current IDMT/DMT.
- Selection of Curve: Five selectable curve (Normal Inverse1 (C1), Normal Inverse2, (C2) Very inverse (C3), Extremely inverse (C4), Long time inverse (C5)) and Definite Time (C6)
- Instantaneous Over-Current Protection with adjustable timer.
- Breaker Failure detection
- In-built CB Trip Circuit Supervision function during pre closing and post closing of CB.
- CT secondary 5A or 1A as per ordering information.
- **4 Separate Element for each phase and Earth fault**
- **Wide range Power supply input 24V to 230V AC/DC ($\pm 20\%$)**

- **Cold Load Pickup**
- **RS422/RS485 (at rear side) Communication Port for remote SCADA (only for ADR241C i.e. communicable Relay).**

Relay Design Features:

- 16 x 2 LCD Backlit display for Parameter and setting display
- Online display of CB status and other digital and logical status.
- Continuous monitoring of module's internal hardware and alarm generation in case of failure of any critical components.
- 4 Digital Output contacts for local alarm as Trip
- 2 dedicated status input for Trip Circuit Monitoring
- 5 nos of Fault data stored with keypad interface and time stamping.



Description:

ADR141C is second generation Numerical 3OC + 1EF Over Current Relay. It consist all the necessary protection and monitoring functions required for Normal feeder. It consist of

1. High Speed Digital DSP Controller
2. Analog Measuring Module
3. Power supply Module
4. Digital Input output module.

The High speed Digital Signal Controller continuously monitors phase, E/F current along with different optical isolated status connections. The high-speed micro-controller samples these current signals through a **A/D converter**. The Digital Signal performs powerful **Numerical Algorithms** to find out RMS of fundamental & harmonic contents of the current then this value is used for protection and metering function. All measurement is tuned to fundamental frequency i.e. 50Hz, thus relay remain stable during distorted waveform generated electronics loco-motive. All these measure values are then used for different protection function such as IDMT/DMT Over current protection, Instantaneous Over current protection, Earth Fault protection, etc. These measured values are also displayed on large 16 x 2 LCD display for metering purpose. The **DSC** also monitors different digital input through optical isolator and perform some monitoring function such trip circuit supervision, and control potential free contact for control CB and generate ALARM and Tele-signalling

The power supply module is basically DC – DC converted designed using modern PWM based Switching mode technique to convert station battery supply to the 12V and 24Vdc low voltage supply for relay electronics and control circuit. It also provides necessary isolation from station battery. The power supply module is design using very advance PWM controller which allow very wide input supply variation i.e. 24V to 230VAC/DC ($\pm 20\%$) covering 24Vdc, 30Vdc, and 110V dc and 220Vdc station battery requirement.

The relay is having total 4 nos of high intensity dual LED for easy identification of type of fault for easy user interface. All LEDs and control output R1 to R4 are fully programmable via keypad interface

Main Functions

The ADR141C are having following protection functions.

1. Non Directional phase Over current element. ($I_p >$, and $I_p >>$)
2. Non Directional EF element ($I_e >$ and $I_e >>$).
3. Trip Circuit Supervision.
4. Breaker Failure Detection.
5. Monitoring Functions.

Each of these functions are independently programmable and can be enable or disable as per user requirement.

Over Current & EF Element:

The ADR141C is member of Ashida Numerical Relay family design for protection general feeder. The relay has one stage of IDMT/DMT



setting and one stage of instantaneous setting. ($I_p > I_p >> I_E > I_E >>$). All major international IDMT curves are available. Range for first stage is 10% to 250% and 50% to 3000% for instantaneous stage for phase and I_e . Although the curves tend towards infinite when the current approaches I_s (general threshold), the minimum guaranteed value of the operating current for all the curves with the inverse time characteristic is 1.1Is (with a tolerance of $\pm 0.05I_s$).

Inverse Time Curves:-

The stage of phase and earth fault over current selected with an Inverse Definite Minimum Time (IDMT) characteristic. The time delay is calculated by following mathematical formula

$$t = \frac{K \cdot a}{\left(\frac{I}{I_{ref}}\right)^b - 1}$$

| Curve Type | Description | a | b |
|------------|--------------------|------|------|
| C1 | Standard Inverse_1 | 0.14 | 0.02 |
| C2 | Standard Inverse_2 | 0.06 | 0.02 |
| C3 | Very Inverse | 13.5 | 1 |
| C4 | Extremely inverse | 80 | 2 |
| C5 | Long Time Inverse | 120 | 1 |
| C6 | Define Time | - | - |

Trip circuit Supervision:-

The ADR141C is having 2 separate digital Opto-isolated status input which can be used to continuously monitor continuity of trip-circuit. The general scheme is as shown in fig.

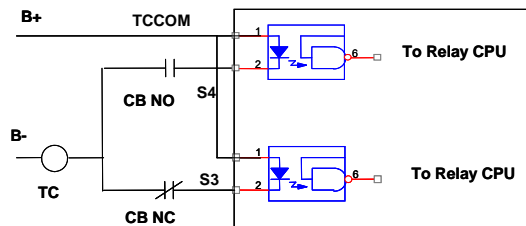


Fig. Trip Circuit Logic

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.

The output can be assigned to any of 4 relay RL1 to RL4, The Trip circuit supervision logic set reset PROTH (Protection healthy) bit, it normally ON and become OFF at following condition

- ✓ When DC supply is not sufficient (DC fail)
- ✓ When CB NO and CB NC both are active or inactive i.e. CB NO as well as CB NC both are close or open.
- ✓ Relay detects any internal hard ware Error.

Breaker Failure Detection:-

Normally after tripping current should become Zero within 100 – 200ms time depend upon type of fault and breaker mechanism. After Fault ADR141C trigger internal timer (settable from 50ms to 800m) if fault is not cleared during this time then relay declare as Breaker fail (LBB



function) and set BF bit. This bit can be assigned to any of the output relay.

Cold Load pickup:-

When the Circuit breaker is closed on a load, the load current take sudden inrush current. This inrush current may be more than 4 to 5 times of rated load current. The duration can be as high as 200ms. Due to this inrush current many times relay get operate which is undesirable. General practice is to keep normal setting to such high value so that it will not mal operate at initial closing which result increase in fault clearance time. To avoid such problem relay is equipped with special features known as COLD LOAD PICKUP. Whenever a circuit breaker is turn on relay sense through CB auxiliary contact and start internal timer known as CL timer. During this time it takes separate set of setting, so that the relays will not mal operate on inrush current.

Programmable DI/DO and LED:-

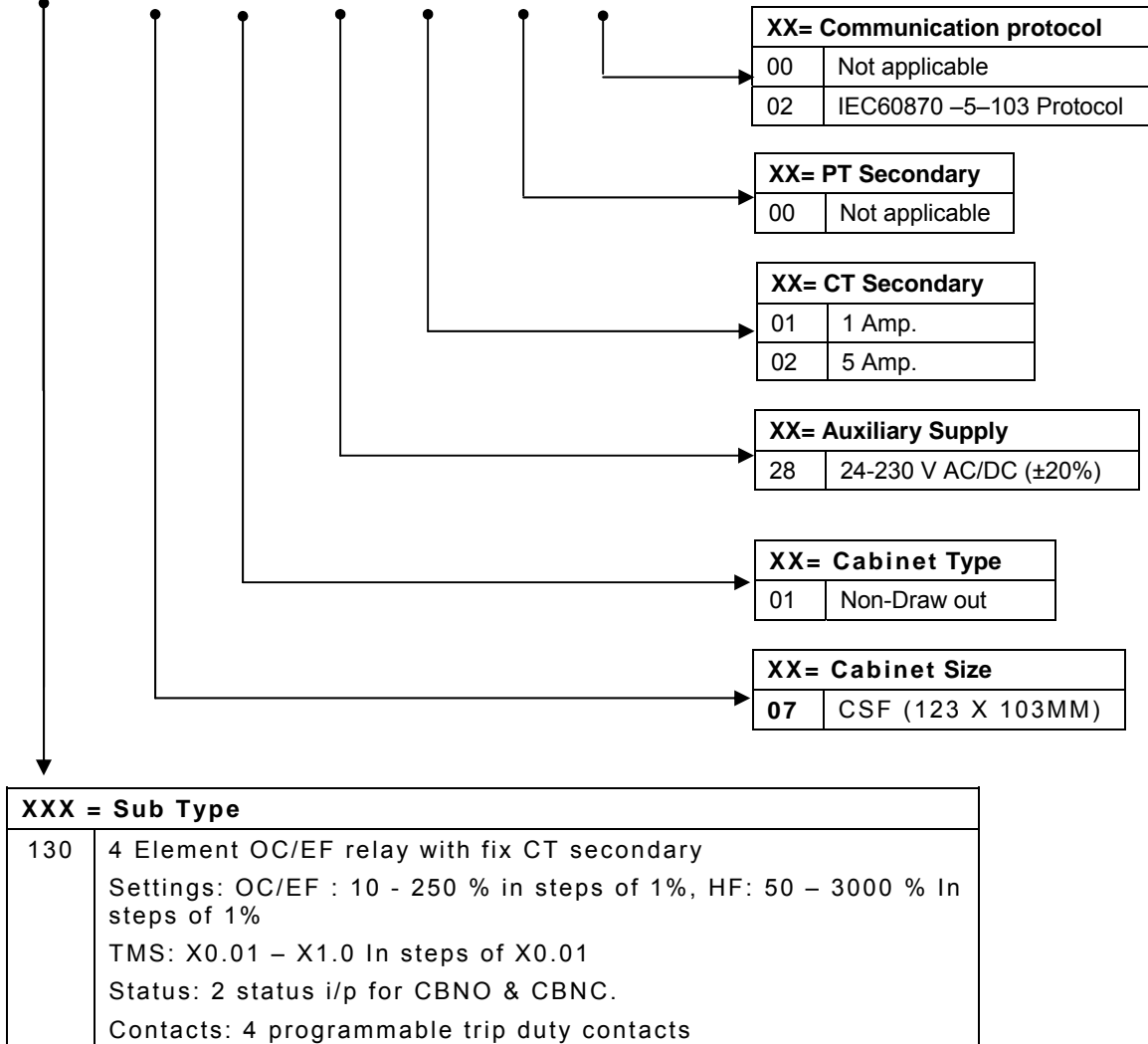
The ADR141C has 4 digital outputs, 2 Opto-isolated input and 8 general purpose LEDs. These can be programmed by local key board. Any logical of physical status can be assigned to any relay contact The logic of digital status input as well as logical status can be formed and assigned to any of the relay output. The RL1 relay is by default assign to TRIP CB.



While Ordering Specify the following Information for **ADR141C** Relay

Definition of Model No of Aditya Series of Relays

AM - XXX - XX - XX - XX - XX - XX - XX



Ordering information:

A D R 1 4 1 C - A M - 1 3 0 - 0 7 - 0 1 - 2 8 - 0 2 - 0 0 - 0 0

Example

ADR141C - AM-130-07-01-28-02-00-00

ADR241C - AM-130-07-01-28-02-00-02



Technical Specifications:

| General specifications | | | |
|------------------------|------------------------------|--|--------------------------------|
| Sr. No. | Specification | Particulars | |
| I. | Current Input | : CT secondary 5Amp or 1Amp as per ordering information | |
| II. | Aux. Supply | : 24 – 230V AC/DC. (±20%) | |
| III. | VA burden on CT | : Less than 0.2VA | |
| IV. | VA burden on Aux. | : Less than 10 Watts | |
| V. | Operating Temp. range | : -10 deg. To + 65 deg. | |
| VI. | Continuous carrying capacity | : 2 x of rated for CT and 1.5 x of rated for PT | |
| VII. | Pick up | : Within 1.1 times of set value. | |
| VIII. | Reset Value | : 95% to 90% of pick up. | |
| IX. | Output Contact | : 4 Trip duty user assignable | |
| X. | Contact Rating | : Continuous: 5A : Make & carry for 0.5 sec : 30A : Make carry for 3 sec : 15A | |
| XI. | Opto Isolated input | : 1 for CB NO & 1 for CB NC | |
| XII. | Thermal With stand for CT | : 20 x of rated for 3.0 sec. | |
| General Settings | | | |
| XIII. | General setting | : New PassWord | 0 – 99 in steps of 1 |
| | | : Unit Id | 0 – 250 in steps of 1 |
| | | : CT Sec | 5A |
| | | : CT Primary | 10 – 3000in steps of 1 |
| | | : Test Block | 01: YES, 02: NO |
| | | : Trip Ckt. | 01: YES, 02: NO |
| | | : BF Enable | 01: YES, 02: NO |
| | | : BF Delay | 50 – 800 ms. steps of 50ms |
| | : Frequency | 50HZ / 60HZ | |
| Relay Settings | | | |
| XIV. | Phase Section (Ip) | : IP> Enable | YES / NO |
| | | : IP> Settings | 10% – 250% in steps of 1%. |
| | | : IP> Time Multiplier (TMS) | x0.01 – x1.00 in steps of 0.01 |
| | | : IP>> Enable | YES / NO |
| | | : IP>> Settings | 50% – 3000% insteps of 50% |
| | | : Ie> Enable | YES / NO |
| | | : Ie> Settings | 10% – 250% in steps of 1%. |
| | | : Ie> Time Multiplier (TMS) | x0.01 – x1.00 in steps of 0.01 |
| | | : Ie>> Enable | YES / NO |
| | | : Ie>> Settings | 50% – 3000% insteps of 50% |



| | | | |
|--|---------------------------|---|--|
| | | : IP>> Delay | 0 – 2.00 Sec in steps of 0.01Sec. |
| | | : IP> Curve (Operating Time) | C1 – C6 (IDMT curve C1 – C5 or Define Time C6) |
| | | : IE> Curve (Operating Time) | C1 – C6 (IDMT curve C1 – C5 or Define Time C6) |
| | | : Ip>> Delay | 0 – 2.00 Sec in steps of 0.01Sec. |
| | | : Ie>> Delay | 0 – 2.00 Sec in steps of 0.01Sec. |
| | | : Ip> C6 Delay | 0 – 99.9 Sec in steps of 0.1Sec. |
| | | : Ie> C6 Delay | 0 – 99.9 Sec in steps of 0.1Sec. |
| Cold Load settings | | | |
| XV. | Phase Section (Ip) | : CL Enable | 01: YES, 02: NO |
| | | : CL Timer | 0.1 – 10.00S in steps of 0.01 sec |
| | | : IP> Settings | 10% – 250% in steps of 1%. |
| | | : IP> Time Multiplier (TMS) | x0.01 – x1.00 in steps of 0.01 |
| | | : IP>> Enable | YES / NO |
| | | : IP>> Settings | 50% – 3000% insteps of 50% |
| | | : Ie> Enable | YES / NO |
| | | : Ie> Settings | 10% – 250% in steps of 1%. |
| | | : Ie> Time Multiplier (TMS) | x0.01 – x1.00 in steps of 0.01 |
| | | : Ie>> Enable | YES / NO |
| | | : Ie>> Settings | 50% – 3000% insteps of 50% |
| | | : IP> Curve (Operating Time) | C1 – C6 (IDMT curve C1 – C5 or Define Time C6) |
| | | : IE> Curve (Operating Time) | C1 – C6 (IDMT curve C1 – C5 or Define Time C6) |
| | | : Ip>> Delay | 0 – 2.00 Sec in steps of 0.01Sec. |
| | | : Ie>> Delay | 0 – 2.00 Sec in steps of 0.01Sec. |
| | | : Ip> C6 Delay | 0 – 99.9 Sec in steps of 0.1Sec. |
| | | : Ie> C6 Delay | 0 – 99.9 Sec in steps of 0.1Sec. |
| Operational Indicators (Flags) 4 user assignable bicolour output LED Default assignment | | | |
| XVI. | LED1 - PROT.H /ON | : Green LED indicates Relay OK (Protection Healthy) : Red LED indicates Fault in following conditions. 1. Problem in relay Hardware. 2. Trip Circuit Fault | |
| | LED 2 - PICK-UP | : Red LED indicate Start of timer Self Reset (SR) Type | |
| | LED 3 - FAULT | : Red LED indicate Relay Operated Flag (HR) | |
| | LED 4 - TRIP | : Red LED indicates Output TRIP relay contact closer (SR) Type | |



| Drawing References | | | |
|--------------------|--|-----------------------------------|------------------|
| XVII. | | : For Typical External connection | - ADV02705 |
| | | : For Typical External connection | - ADV02706 |
| | | : For Cabinet Type | - MAC01501 (CSF) |

| Mechanical Specifications | | |
|---------------------------|----------------------|--|
| I. | Net Weight | : Approx. 1.7 Kg. |
| II. | Enclosure Protection | IEC 60259 For Front : IP52 For Rear : IP20 |

| Compliance to Standards | | | |
|---|-----------------------------------|---|--|
| SR. NO. | TEST | STANDARDS | TEST SPECIFICATIONS |
| Impulse, Dielectric and Insulation Requirement | | | |
| i. | Impulse Voltage Test | IEC 60255-27:2005 (incl. corrigendum 2007) | Test Voltage 5kv, 1.2/50 μ V Energy 0.5 J Polarity +ve and -ve No. of impulses 3 on each polarity Duration between impulses 5sec. EUT Condition Non Energized |
| ii. | Dielectric Voltage Withstand Test | IEC 60255-27:2005 (incl. corrigendum 2007) | Product shall withstand for 1 minute between 1) 2kV all terminals connected together with case earth. 2) 2kV independent circuit with case earth. |
| iii. | Insulation Resistance Test | IEC 60255-27:2005 (incl. corrigendum 2007) | Product shall have minimum insulation resistance of 100 M Ω at 500VDC Supply |
| Immunity Test | | | |
| iv. | High Frequency Disturbance Test | IEC60255-26(ed3.0)-2013 | 1) 2.5 kV Common Mode a) Between Independent Ckt. and case earth. b) Independent circuit. 2) 1 kV Differential Mode a) Independent circuit. EUT Condition : Energized |
| v. | Electrostatic Discharge | IEC60255-26(ed3.0)-2013 | 1) 8kV air discharge 2) 6kV contact discharge Test Mode : Direct and Indirect Method EUT Condition : Energized |
| vi. | Surge Test | EN61000-4-5. IEC60255-26(ed3.0)-2013 | Front time / time to half value 1.2 / 50 (8 / 20) μ s Source impedance 2 Ω Common Mode \pm 2 KV |



| | | | | |
|----------------------------|--|---|---------------------------------------|-----------------------------|
| | | | Differential Mode | ± 1 KV |
| | | | EUT Condition | Energized |
| vii. | Fast Transient | EN 61000-4-4:2004, IEC60255-26(ed3.0)-2013 | Rise time(Tr)/Duration time(Td) | 5 / 50 ns |
| | | | Repetition rate | 5 KHz and 100 KHz |
| | | | Test Voltage | ± 2 KV |
| | | | EUT Condition | Energized |
| viii. | Radiated radio freq. Electromagnetic field | EN 61000-4-3: 2006+A1:2008 IEC60255-26(ed3.0)-2013 | Voltage Level | 10 V/m |
| | | | Frequency Range | 80 - 1000 MHz |
| | | | Modulation | 80% AM @ 1 KHz |
| | | | Spot Frequency | 80, 160, 380, 450 & 900 MHz |
| Mechanical Tests | | | | |
| ix. | Vibration Response Test | EN 60255-21-1:1996 Class 2 | Frequency Range | 10 Hz to 150 Hz |
| | | | Cross Over Frequency | 58 to 60 Hz |
| | | | Peak displacement before Cross Over | 0.075mm |
| | | | Peak acceleration after Cross Over | 1 gn |
| | | | No. of Sweep Cycles per Axis | 1 |
| | | | EUT condition | Energized |
| x. | Shock Response Test | EN 60255-21-2:1996 Class 2 | Peak Acceleration | 10 gn |
| | | | Pulse Duration | 11 ms |
| | | | No. of Pulses in each Direction | 5 |
| | | | EUT Condition | Energized |
| Environmental Tests | | | | |
| xi. | Dry Heat Operational Test | IEC 60068-2-2 Bd | Operating Temperature | +20°C to +70°C |
| | | | Maximum rate of change of temperature | 1° C per min |
| | | | Duration | 16 hour |
| | | | EUT Condition | Energized |
| xii. | Dry Heat Storage Test | IEC 60068-2-2 Bd | Operating Temperature | +20°C to +70°C |
| | | | Maximum rate of change of temperature | 1° C per min |
| | | | Duration | 16 hour |
| | | | EUT Condition | Not Energized |
| xiii. | Cold Operational Test | IEC 60255-1, EN 60068-2-1 | Test Temperature | -25°C |
| | | | Rate of change of temperature | 1°C/min |
| | | | Duration of Cycle | 16 hrs. |
| | | | EUT Condition | Energized |



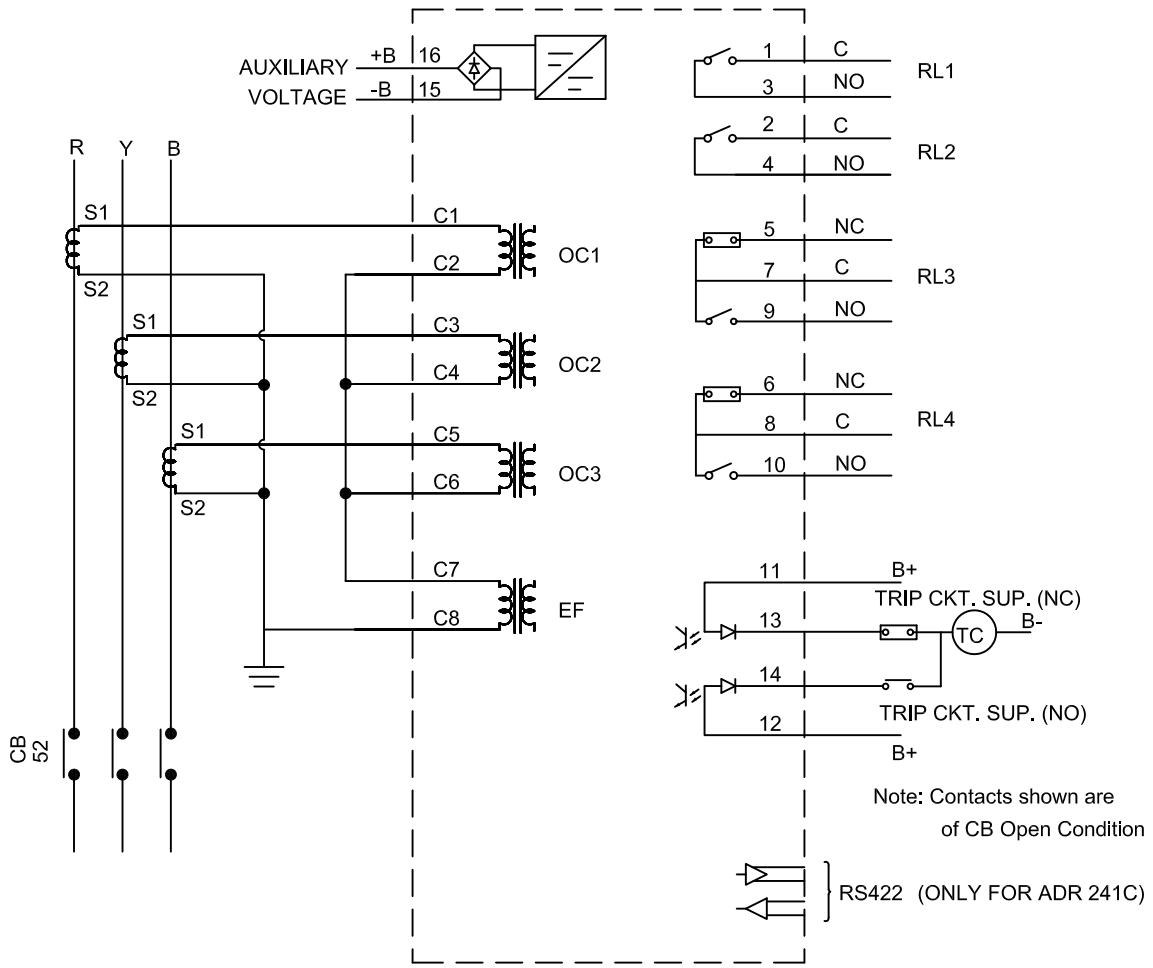
| | | | | |
|------|----------------------|------------------------------|-------------------------------|-----------|
| xiv. | Cold Storage Test | IEC 60255-1, EN 60068-2-1 | Test Temperature | -25°C |
| | | | Rate of change of temperature | 1°C/min |
| | | | Duration of Cycle | 16 hrs. |
| | | | EUT Condition | Energized |

Revision Note

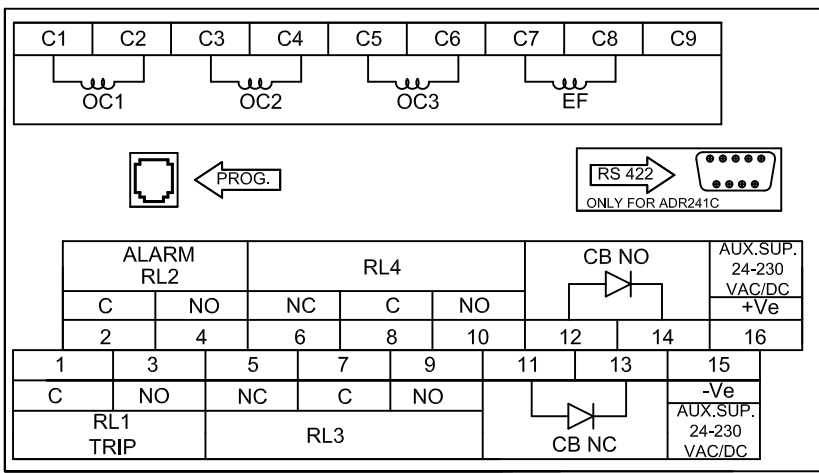
| Rev. No. | Date | Description |
|----------|------------|---|
| 01 | 05.09.2012 | Original specifications |
| 02 | 22.11.2015 | Compliance to Standard modified 3 phase 4 wire system electrical diagram added |



For 3 PHASE, 3 WIRE SYSTEM



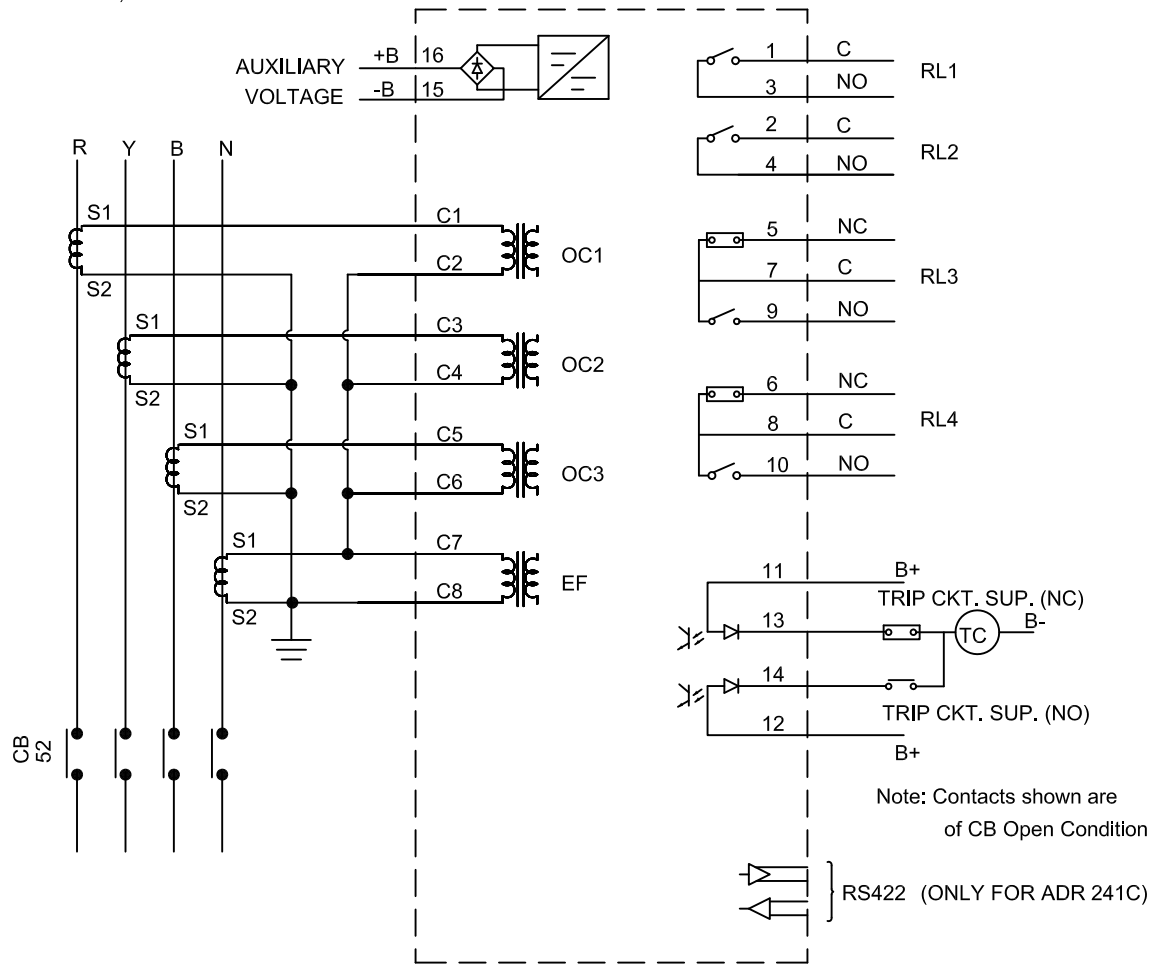
BACK TERMINAL DETAILS



| | | | | | |
|-----------------------|------------------|---------------------------|----------------------|--------------------|--------------|
| Dim : MM | TOL : | FINISH: | MATERIAL: | | |
| Perpaed by JEFFREY | Checked by SJ | Approved by - date SMK | Filename ADV02705 | Date 20.11.2015 | Scale NTS |

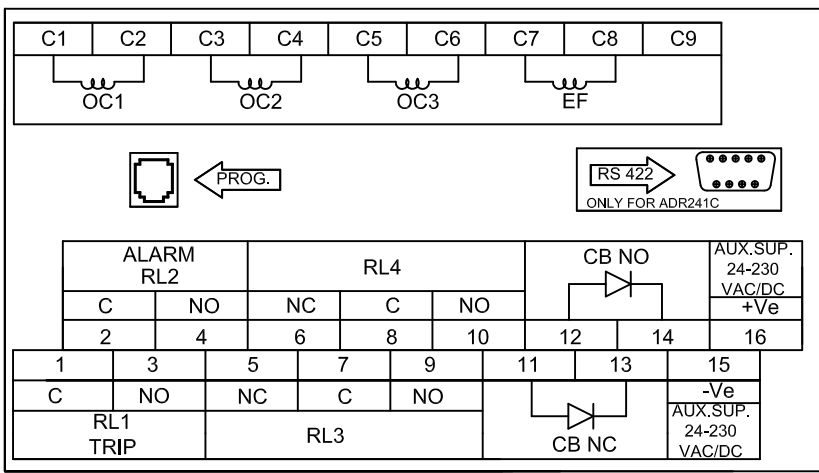
| | | | |
|---|---|---------------|-----------------|
| ASHIDA Electronics Pvt. Ltd. | Title : - ELECTRICAL CONNECTION & BACK TERMINAL DETIALS FOR NUMERICAL OVER CURRENT RELAY ADR141C / ADR241C | | |
| | Drawing_ Ref. ADV02705 | Edition 00 | Sheet 1 OF 1 |

For 3 PHASE, 4 WIRE SYSTEM



Note: Contacts shown are of CB Open Condition

BACK TERMINAL DETAILS



| | | | | | |
|-----------------------|------------------|---------------------------|----------------------|--------------------|--------------|
| Dim : MM | TOL : | FINISH: | MATERIAL: | | |
| Perpaed by JEFFREY | Checked by SJ | Approved by - date SMK | Filename ADV02706 | Date 20.11.2015 | Scale NTS |

ASHIDA Electronics Pvt. Ltd.

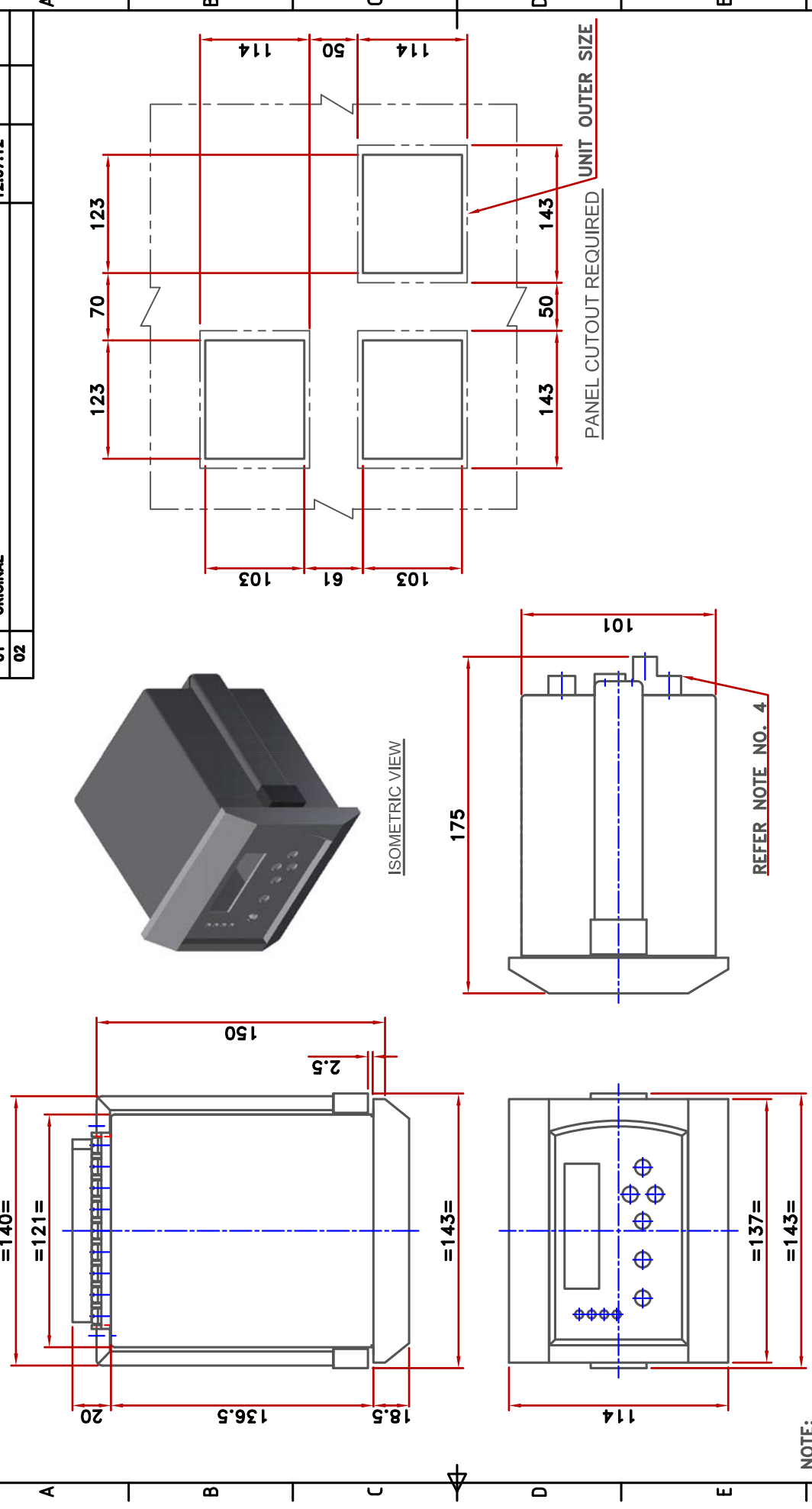
Title : - ELECTRICAL CONNECTION & BACK TERMINAL DETIALS FOR NUMERICAL OVER CURRENT RELAY ADR141C / ADR241C

Drawing_ Ref. ADV02706

Edition 00

Sheet 1 OF 1

| | | | | |
|--------|---------------|----------|-----------|---------|
| Rev.No | Revision note | Date | Signature | Checked |
| 01 | ORIGINAL | 12.07.12 | | |
| 02 | | | | |



- NOTE:
- PANEL CUTOUT SIZE 123mm x 103mm.
 - FRONT BEZEL SIZE 137mm x 114mm.
 - BOX SIZE WITH CLAMP 143mm x 114mm x 175mm.
 - THE TERMINAL ARE SHOW FOR GUIDANCE ONLY THE ACTUAL SIZE AND TYPE OF TERMINAL DEPEND UPON PRODUCT REFER RESPECTIVE PRODUCT DETAILS.
 - ALL DIMENSIONS IN MM.

| | | |
|---|------------------|--------------------|
| TOL :±0.2MM | MATERIAL :- | PROJECTION:- |
| Prepared by RV | Checked by SG | Approved by SMK |
| Filename MAC01501 | Date 12.07.12 | Scale 1 : 2.5 |
| ASHIDA Electronics Pvt.Ltd. TITLE : MECHANICAL DETAILS FOR HORIZONTAL CABINET CSF | | |
| Drawing Ref.: MAC01501 | Edition 00 | Sheet 1/1 |