Scientific Journal of Impact Factor(SJIF): 3.134

e-ISSN(O): 2348-4470
p-ISSN(P): 2348-6406

International Journal of Advance Engineering and Research Development

Volume 2,Issue 3, March -2015

Recent Trades in Distribution System

Tamboli Mehulkumar Kishorbhai[1], Prof. Mangroliya Divyeshkumar G.[2]

[1]*M.E.Electrical Engg. PG Student, PIET, Waghodia, Vadodara, Gujarat.*
[2]*Asst. Prof. in EE Dept., PIET, Waghodia, Vadodara, Gujarat.*

ABSTRACT-*In this paper, presenting the new concept in distribution side.There are mainly primary distribution (66/11Kv) and secondary distribution (11Kv/440v). On the secondary distribution side radial feeder topology is generally establish with overhead lines. So, this topology is being replaced by ring main topology by using Ring Main Units on distribution feeders. So, there is totally a new concept on distribution side to improve the performance of the systemand maintain the power continuity. In this paper given the function of the RMU in the field and analyse the work base on the simulation in PSCAD software. Also given the fault analysis of field network RMU in simulation.*

KEY WORDS:RMU (Ring Main Unit)

I. INRODUCTION

Over the last decade, there are no changes on the distribution side mainly in secondary distribution (11kv/440v). The traditional type of 11/22 kV distribution adopts mainly radial system, the combination style of radial type and tree-style as a supplement. As a result of multi-users to connect to one power cord, any occurrence such as power line maintenance or failure will lead to all user's power off that are connecting on the power line of electricity. It is so poor reliability. Ring type and multi-loop distribution of regional opening and closing station and secondary substation model is widely used in the current to assign the power load to each terminal. The 11/22kV box-type ring main unite can act its function as the branch, sub-section and sub-connection so has been use vary widely.

Now a day's many technologies are developed in distribution side to improve the performance of the system. In distribution side generally radial system is use but recent trades is use ring main system for the better performance. So, with the implementation of new technology is RMU (Ring Main Units) in ring main system on the distribution side. So, by implementation RMU in radial feeder and convert the system in to ring main system. Which is save the time of fault clearance of overall feeder, reduce the power loss and maintain the continuity of power supply to the load.

II. HOW'S BETTER RING MAIN SYSTEM COMPARE TO RADIAL SYSTEM:

In the distribution related to the scheme generally radial system is use by constructing the overhead lines and somewhere underground cables are use. So, there is a separate feeders radiate from a single substation and feed to consumer at only one end. If the fault is occurs in feeder then all the consumers are disconnect from the supply because due to fault feeder relay is tripped and open the circuit breaker contact in substation. So overall feeder is disconnecting from the source this is the drawback of radial system.

So, the better solution for that is ring main system. It is very efficient compare to the radial. In this system, the primaries of distribution transformers form a loop. Means the feeders are outgoing from the substation that construct in form of loop. Loop circuit starts from the substation bus-bars, makes a loop by covering the area to be served, and return to the substation. It is call the ring main system. In this topology, if the fault is occurs in the loop then we can disconnect the faulty part from the system and supply from another path to the load. The main advantage is that, the voltage fluctuations at consumer's terminals are less and system is very reliable as each distributor is fed via two feeders.

RMU (RING MAIN UNIT):

Now a day's, RMU is the new concept in the distribution side to construct the ring main system on behalf of radial system. RMU is the combination of isolator, circuit breaker and relay. It is one of such kind of SF6 gas insulated metal-enclosed switchgears. All kind of functional units as load-break switch unit, switch & fuse unit, the unit with vacuum circuit breaker, etc. They are completely enclosure, all modular, and can be any combination of the characteristics of the extendibility freely, in order to provide customers a series of compact, safe, reliable, high performance and real case of maintenance-free products.

RMU DESCRIPTION:

In the RMU isolator and circuit breaker is connect on the common bus in the SF6 gas chamber and relay is connect with circuit breaker. Switch – disconnectors and circuit breakers have a similar architecture, a moving contact assembly with 3 stable positions (closed, open and earthed) moves vertically. Its design makes simultaneous closing of the switch or circuit breaker and the earthing is not operate at one time. The internal structure is shown in the fig.2

Fig.1 RMU compartments

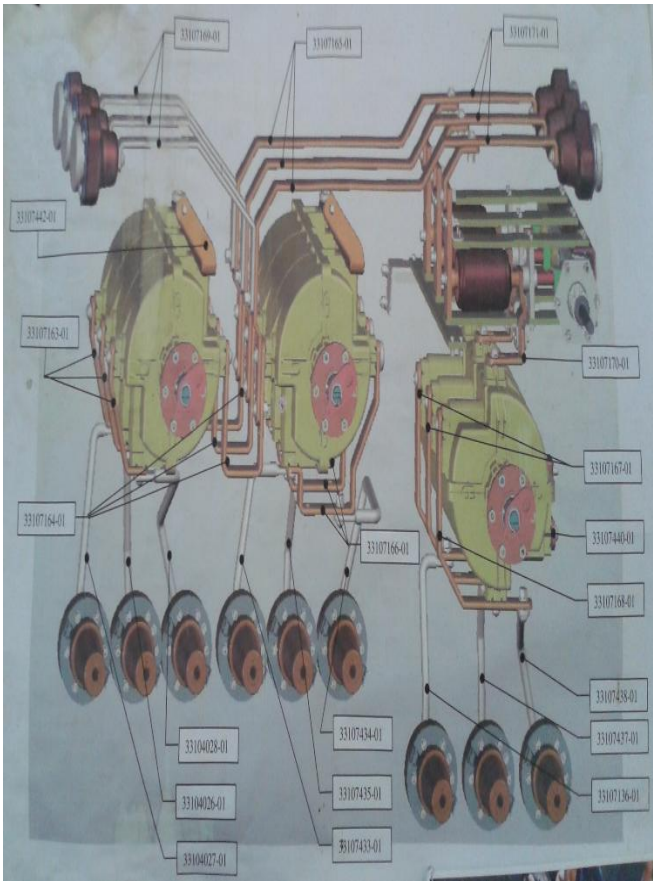
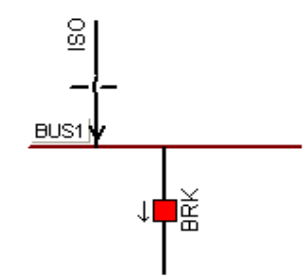
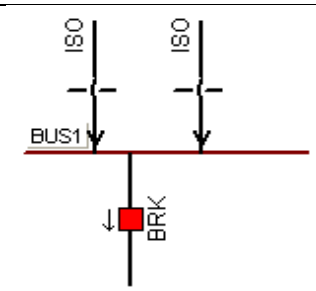
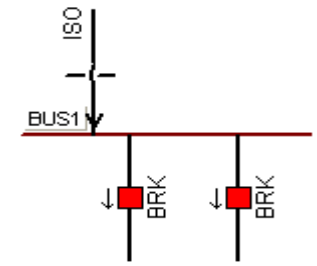
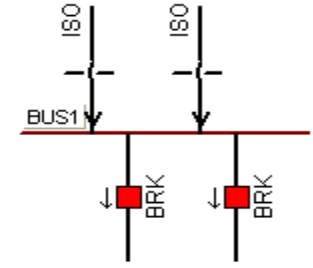
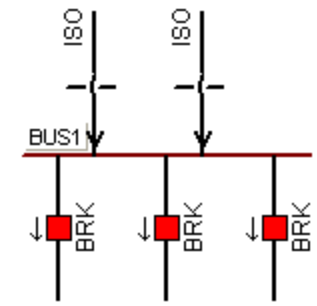


Fig.2 internal structure of RMU

DIFFERENT TYPES OF CONFIGURATION IN THE RMU:

Types of RMU	Configuration
RL R-isolator L-circuit breaker	
RRL	
RLL	
RRLL	
RRLLL	

Tabel-1 different types of RMU configuration

KEY FEATURES:

- **Safe and Reliable :** RMU adopts SF6 gas with a strong electro negativity and excellent dielectric insulation characteristics, and the insulation strength in SF6 is as about 2-3 times as in air in the condition of uniform electric field. SF6 is non-toxic, tasteless, and non-flammable, and has excellent arc control performance and cooling characteristic, all that makes it impossible for load switches to extinguish its electric arc quickly and reliability after breaking its current.

- **Small and Compact :** Excellent dielectric insulation characteristics of SF6 gas make it possible for RMU to be smaller, less weight, more compact to save a lot of place and area for customers, as well as excellent performance and reliability.

- **Advance and Flexible**

- **Minimum moving part**

- **Virtually maintenance free**

- **Enhance safety**

- **High degree of functionality with integrated features**

- **Multiple configuration options**

APPLICATION OF RMU:

- RMU are widely use to transform the electrical network of urban and rural area.

- In big industrial enterprise like steel, petrochemicals.

- In solar and wind power generation, construct the electrical network to collect the power supply which generate by solar cell or wind turbine.

- RMU are also applicable in municipal construction, commercial buildings, such as civil construction area.

III. IMPLEMENTATION OF SINGLE RMU IN SYSTEM

As shown in fig.3, single line diagram of Ring Main Unit in the system. As the supply incoming at the bus01is 66 kV. Which is step down to 66/11 kV at primary distribution in substation. Then 11 kV feeders are outgoing from the substation as the requirement of load and area. Here, BUS1 is RMU bus or on the bus RMU is configured. Main function of RMU is to provide the multiple source to consumer. So, when the main supply is fail due to fault or in maintenance then we can provide the supply by another source or stand by source. It also provide the zone wise protection in distribution feeder which is not affect to the another area supply.

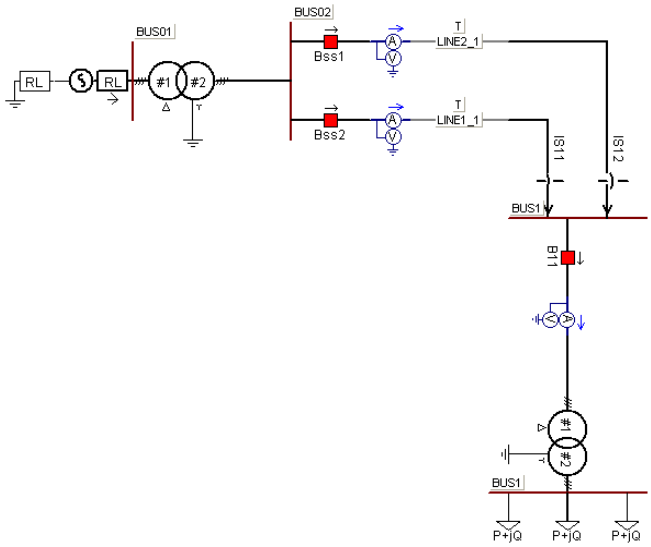


Fig.3 single line diagram of RMU in PSCAD

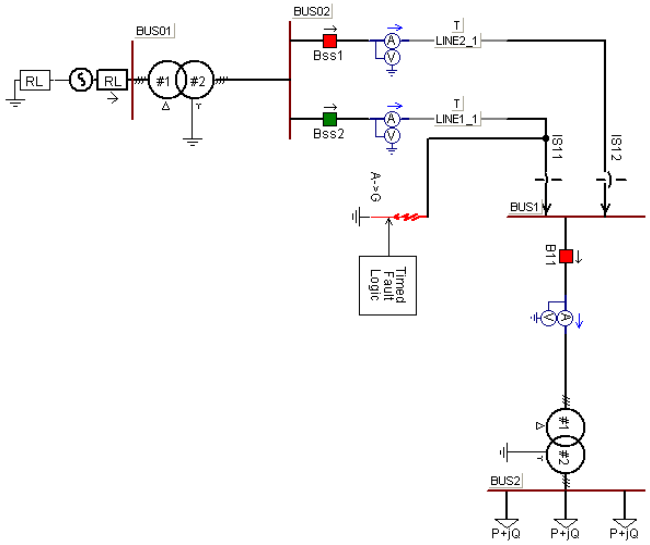
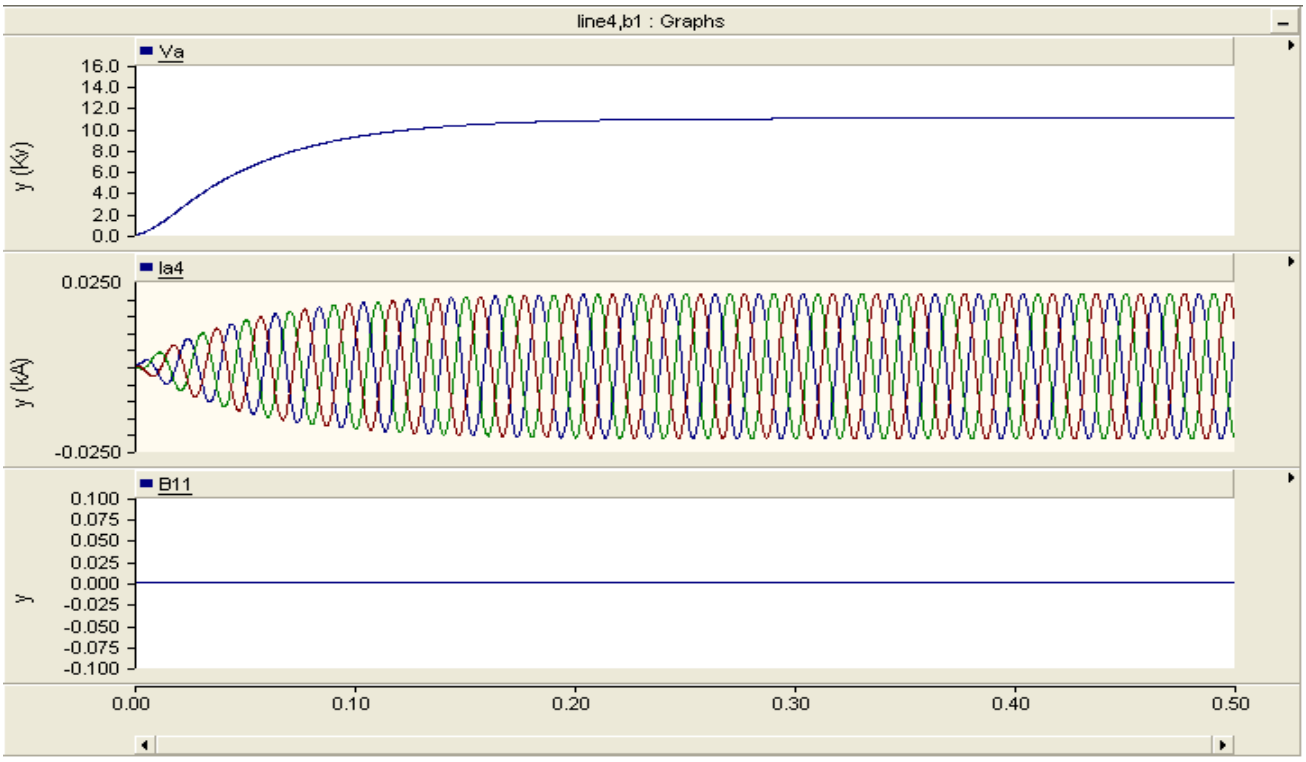


Fig.4 function of RMU in fault condition

Working configuration of RMU:

As sown in fig.3 RMU has two isolator and one circuit breaker which is call RRL configuration so there are two feeders in coming at RMU. So, one supply is act as main supply and another act as auxiliary supply.As shown in the fig.4, when the fault is occurs in the line 1, breaker of line 1 is operate and disconnect the line from the substation. At that time the supply at the incoming isolator1 is disconnect. But at the RMU second supply is incoming in isolator2. So, we can give the back power from this source, another source may be from same feeder or from another feeder. Supply provide at the RMU are also incoming from different feeder and create the ring main system. Line fault current and voltage be-four and after fault is shown in fig.5, another configuration of RMU is shown below fig.6



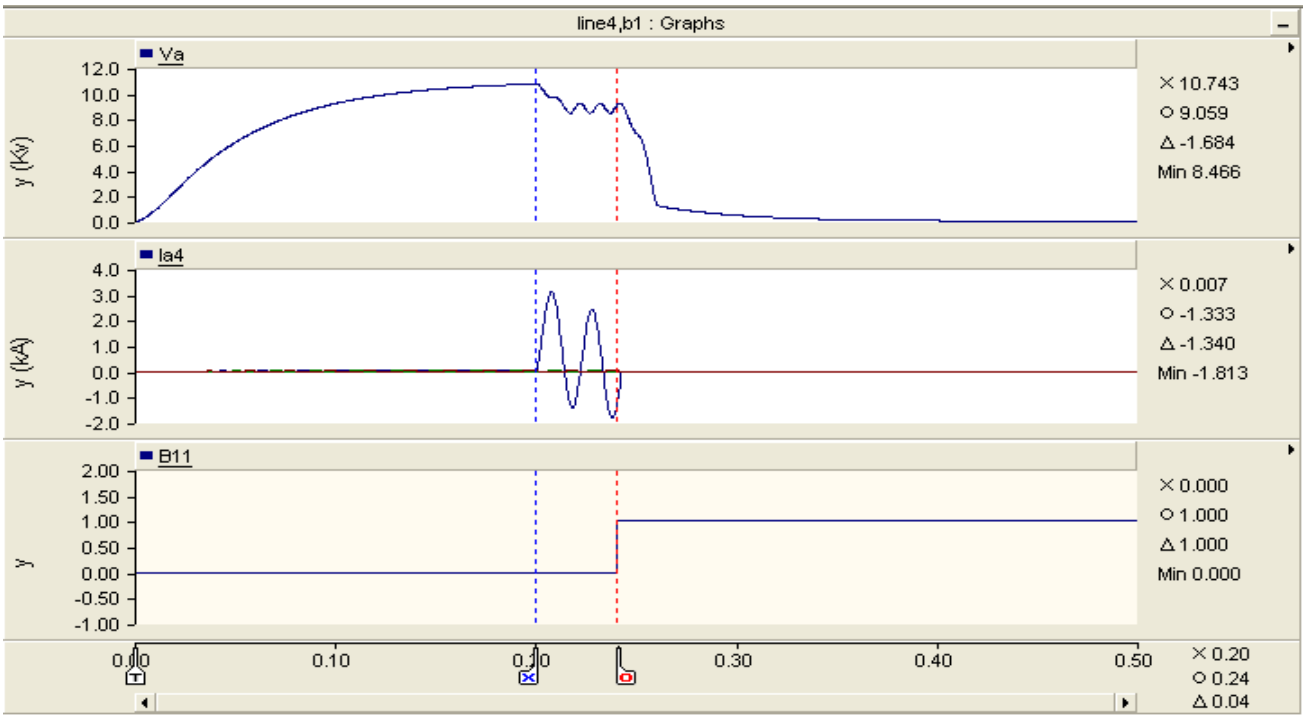


Fig.5 line current, voltage and breaker signal be-four fault and after fault

As shown in Fig.6 another configuration of RMU in the network. In this two RMU network first RMU is connect with main substation and forward connect to second RMU with load. On the second RMU it's interlink with another substation. So when the fault is occurs between RMU 1 and RMU 2 and main supply is disconnect at that time we can provide the power from the auxiliary connection or from the another substation which is interlink with RMU 2. Also due to over load condition in industrial area we can provide the sufficient power to the load by interlink of substation or another feeder threw RMU. But sometimes in field many RMU's are connect in series in the feeder and also interconnect with another feeder. In that situation, if the fault is occurs then three or four RMU's are tripped at one time which call mal-operation or sometimes also happen that substation relay is operate be-four RMU and cascade tripping is occurs. So, this types of problem is occurs in the field this problem is also shown in the Fig.7, to reduce that type of problem proper relay co-ordination is require.Fig.8 shows the signal of breaker operation in the short duration.

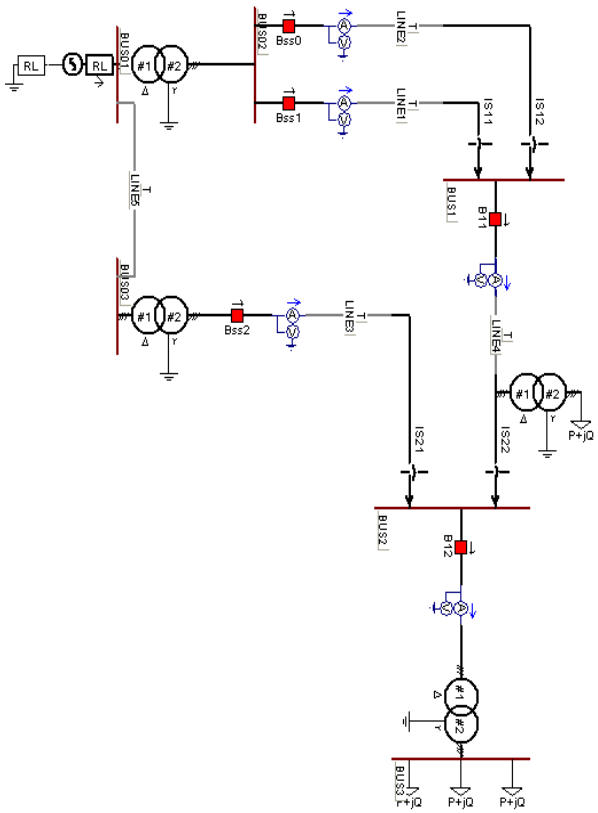


Fig.6 network of RMU to create Ring Main System

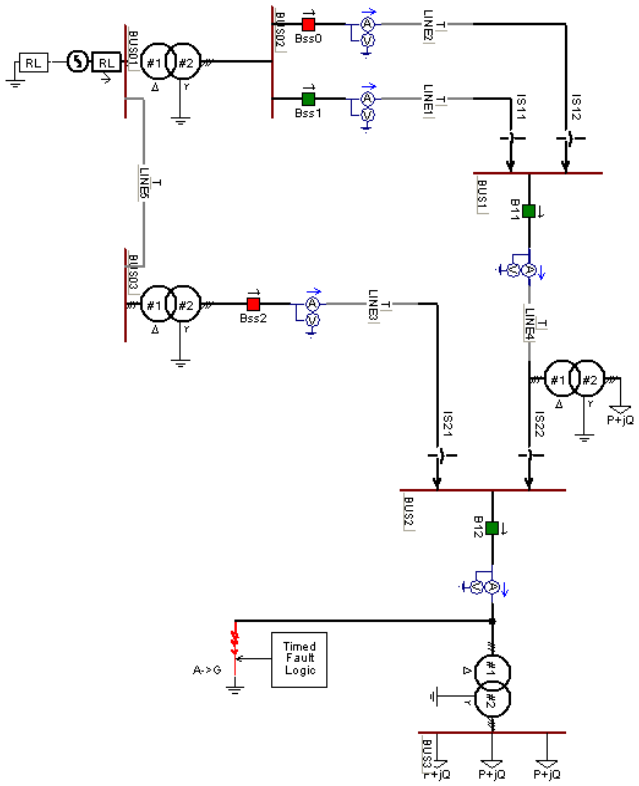


Fig.7 Mal-operation is occurs in system

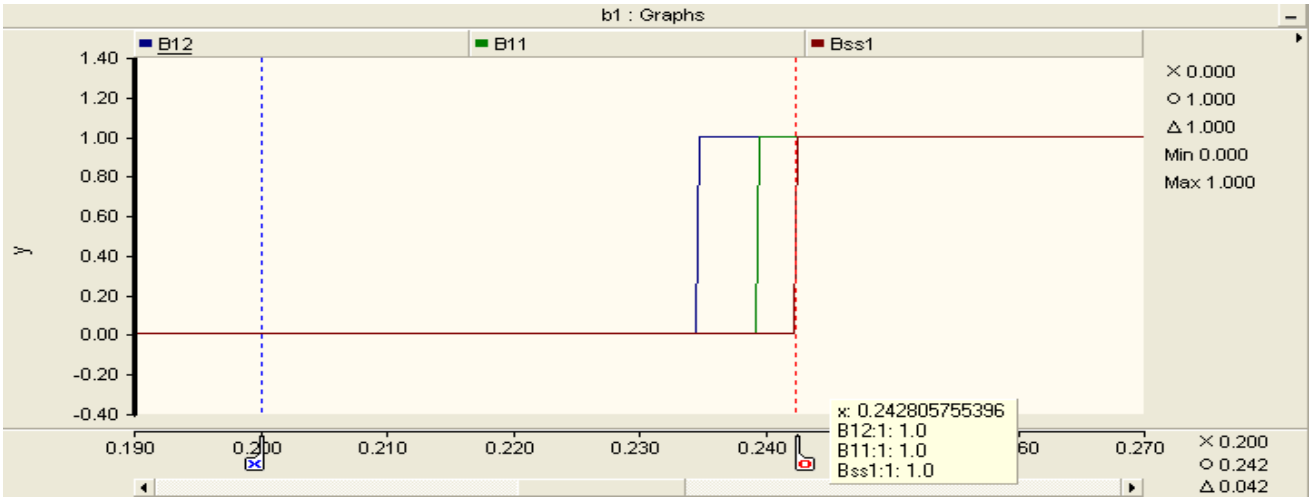


Fig.8 signal of breaker in mal-operation operation

IV. CONCLUSION

From the literature analysis and field survey, I conclude that while implementing the RMU in the distribution system it's improve the performance of the system and maintain the continuity of power to consumer. Also provide the multiple source to load at one place. Another part while fault is occurs then due to improper relay setting mal-operation is occurs and it may be convert in to cascade tripping. It can also reduce by the proper relay coordination of RMU in the field. It can be analysis in the software be-four construct the network in field.Also, from the simulation conclude that, when the fault is occurs in feeder at that time we can provide the supply to load from another path as well as disconnect the faulty part. So, we can maintain the power continuity to load.

ACKNOWLEDGEMENTS

Essentially thanks to DGVCL(Dakshin Gujarat Vij Company Limited) to allow me for the field analysis and give me the support for this analytical work

REFERENCES

[1] R. P. Leeuwerke, A. L. Brayford, A. Robinson and J. C. Tobias, "DEVELOPMENTS IN RING MAIN UNIT DESIGN FOR IMPROVED MV NETWORK PERFORMANCE" Power Engineering Journal - December 2000.
[2] Stylianos Nikitakis, Emac ltd – Greece, Georges Argyriou, Emac ltd-Greece, "THE SMARTER SINGLE BREAKER RMU. A FUSE-LESS, SINGLE BREAKER, AUTO-LOOP-SECTIONALIZING RMU." 22nd International Conference on Electricity Distribution, 10-13 June 2013.
[3] LarsHjort -HM Power AB – Sweden, TorbjornKarlssonProtrol AB – Sweden "SMART RING MAIN UNIT REDUCES OUTAGES TO A MINIMUM", 22nd International Conference on Electricity Distribution June 2013.
[4] SverreTorben, Tor Gulbrandsen ,"THE INTELLIGENT RING MAIN UNIT" ABB Kraft, Norway,IEE 1998.
[5] DGVCL(Dakshin Gujarat Vij Company Limited)

