General features

The ENTEC EVR SF6 Gas Insulated Vacuum Recloser is an electronic automatic circuit recloser designed for the highest mechanical and electrical reliability.
The unique design of auto recloser meets the latest technology with the combination of vacuum interruption, bi-stable magnetic actuator sealed in a stainless steel tank with SF6 Gas as the insulation medium and a microprocessor based control.

The mechanism is operated by a magnetic actuator which the opening and closing coil is respectively equipped with.
As the actuator uses magnetic latching, the mechanical parts are drastically reduced, resulting in high reliability and maintenance free operation during the life time.

The operation of recloser uses only battery power sources or a low-voltage power source supplying from low voltage distribution line by utility or potential transformer and a fully charged battery. Trip and close capacitors provide recloser operation over hundreds of open-close operations as the back-up power upon loss of control power.

This allows the independent recloser operation by the high voltage supply, the low voltage supply, the battery, and capacitor. EVR recloser also has the dead line operation capability required for SCADA and distribution automation.

The control cubicle is heat insulated with polyurethane to minimize temperature variation and protected from solar heating as adopting sunshine cover to the outside and heat insulation inside of control cubicle.

Vents of the control cubicle are screened against vermin's entry and door is sealed with a seamless rubber gasket.

Especially all electronic parts built in microprocessor control are fully protected from entry of moisture and its condensation so as to be used in any places such as tropical, moderate and severe humidity.

A current transformer and a capacitive voltage transformer are moulded in the horizontally arranged epoxy bushing.
These sensors provide to incorporate the functions of an overcurrent protection relay, a ground fault relay, a sensitive earth fault relay and to measure line current, voltage, real and reactive power, power factor, demand Watts and VARs, Frequency and so on.

All measured values and event records are stored in the microprocessor control for transmission or off-line analysis.
The recloser functions, settings and data records are programmable and readable with Lap top or remote communication.

The microprocessor based electronic recloser offers superior co-ordination and application capability meeting IEEE C37.112, IEC255-3, McGraw Edision protection curves and designed in accordance with ANSI / IEEE C37.60 and manufactured under a quality system conforming to ISO9001.

Personal computer based on Interface Software supports on-line and off-line programming, monitoring, measuring and control of recloser via RS232 port.
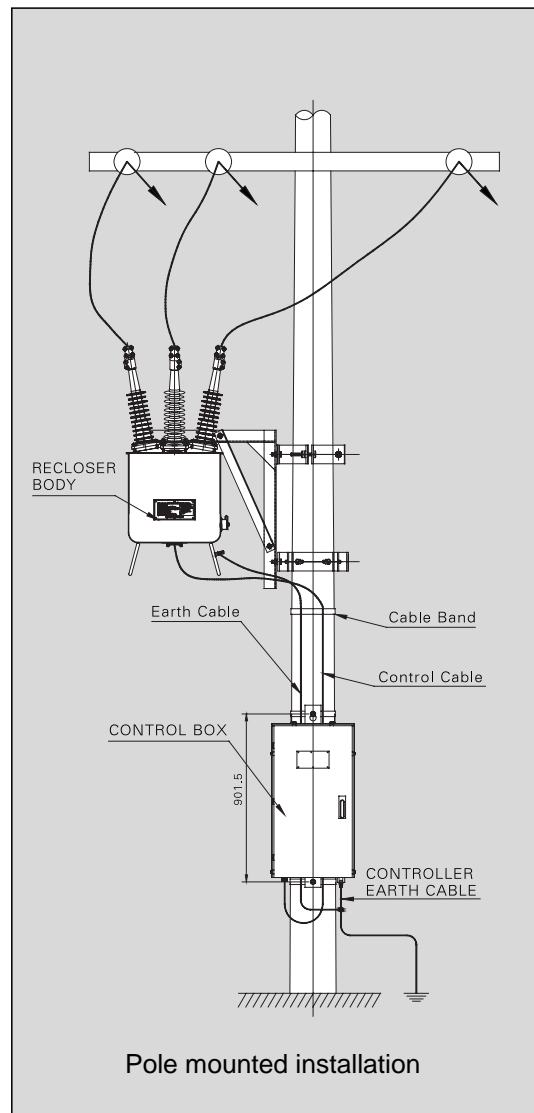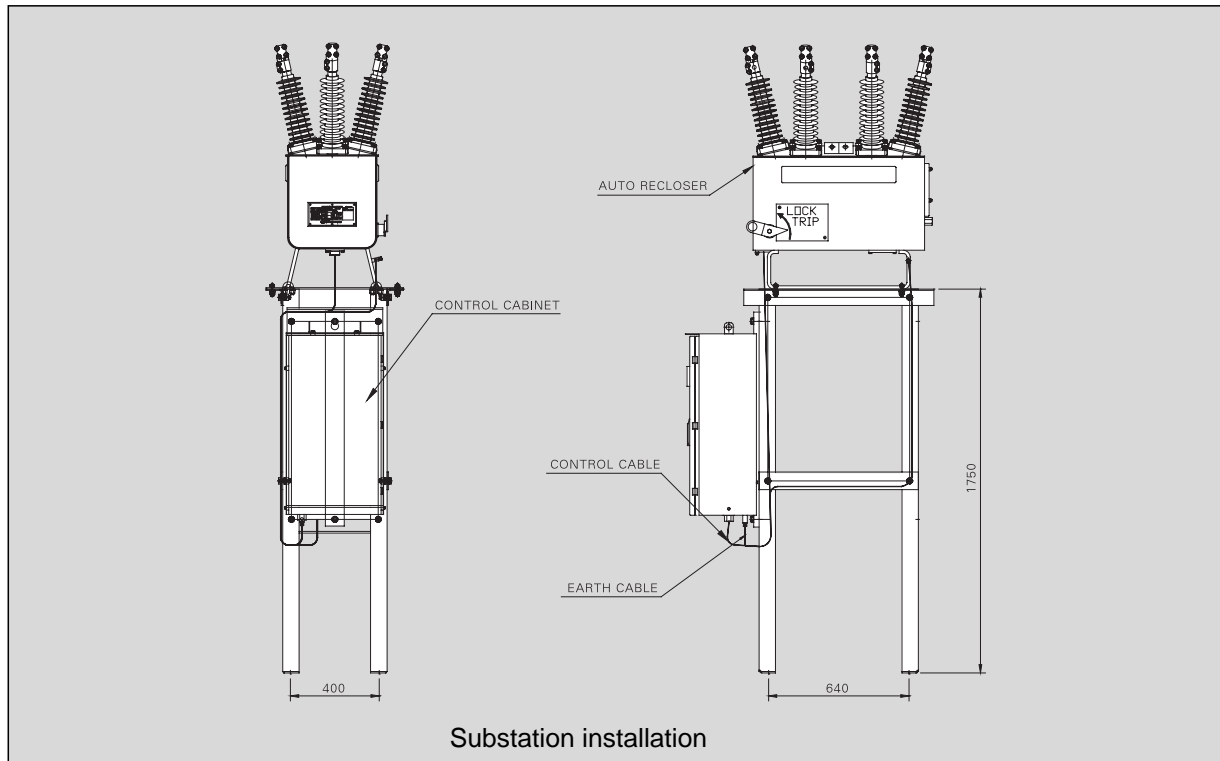All telemetry communication can be supported with DNP3.0, MODBUS and IEC60870-5-101/104 protocols.

■ The advantages of magnetic actuator

- Elimination of mechanical latches and
  associated linkage provide reliable,
  trouble free operation
- Dramatic reduction in moving parts provides
  maintenance free and ten thousand
  operations without periodic maintenance

- Compact, light weight and minimum
  mounting space
- High response time in instantaneous
  reclose
- Reduced installation and operating cost

Key features

1. Reliable single moving parts with bi-stable
   magnetic actuator.
2. All mechanical parts sealed in stainless
   steel enclosure filled with SF_6 gas.
3. Each of the internal or external power
   sources is available upon client's requirements.
4. Vacuum interruption with no hazardous
   arcing products.
5. EPDM bushing with mold-cone
   lead or silicone rubber bushing available
6. Light weight design for easy pole mounting
   and substation installation.
7. Maintenance free over 10,000 operations.
8. Manual trip and lockout provision by a hot stick
   operation on the ground level.
9. Pressure relief device for internal arc withstand.
10. Information input and retrieval via built-in key
    pad or a computer using the RS232 port.
11. Microprocessor controller protection
    -DNP 3.0, MODBUS(IEC60870‑5‑101/104)
     communication protocols and SCADA capability
    -Record of operation, fault and waveform data for
     line and load profile data
    -Three curve standards: IEEE, IEC and 37non-
     standard inverse time curves
12. Multi-function metering
13. Capacitive voltage divider is provided for
    measuring.

RECLOSER BODY

Earth Cable

Cable Band

Control Cable

CONTROL BOX

901.5

CONTROLLER EARTH CABLE

Pole mounted installation

AUTO RECLOSER

CONTROL CABINET

LOCK TRIP

CONTROL CABLE

EARTH CABLE

1750

400

640

Substation installation

Control & Protection

■ Microprocessor based recloser control technology provides complete distribution system protection and control with local and remote operation.

■ IEEE C37.112, IEC255-3, McGraw Edison protection characteristics are provided with 37 time-current basic curves that are changeable by reprogramming with vertical shift and constant time adder and selected and modified with the T-C characteristics from the local keypad or via the RS232 port by Lap top.

■ Recording of historical fault data
Event recording of fault magnitude and history data provide system analysis information for need of line maintenance through transient faults and permanent outages.

■ Percentage display of vacuum contact life shows the anticipated contact life depending on the size and number of faults interrupted.

■ Current metering monitors instantaneous line current values showing on the control panel LCD display..

■ Membrane keypad and LCD display perform the function for data input or retrieval, date display and status indication.

■ Users can operate Close and Trip, and also control EVRC2A with key buttons on the user interface panel; Protection Enabled, Ground Enabled, SEF Enabled, Recloser Enabled, Control Locked, Remote Enabled, Alternate - Settings, Program 1, Program 2, Hot line tag.

■ RS232 communication link allows the function for data input or retrieval using a personal computer and reprogramming or modification of time-current curves of protection can easily be done at any time via the RS232 port.

■ Sequence co-ordination offers the function of preventing unnecessary operation of the backup recloser when two more reclosers are connected in series.

■ Minimum response time of 45ms specifies the fastest clearing time for the line protection.

■ Cold load pick up characteristic prevents the recloser to trip from the expected transient current when manual closing of auto recloser locally or remotely is applied for the healthy system.

■ Two programmable setting groups

■ Remote control facility.

■ Programmable settings can be made easily and quickly through the keypad on the front control panel or personal computer.

■ Recloser duty monitor provides duty cycle information which is accessible via the keypad, RS232 port and communication links which measures and records duty cycle.

■ Security coding of selected operations ensures that only authorized personnel can access and change control operating settings and characteristics.
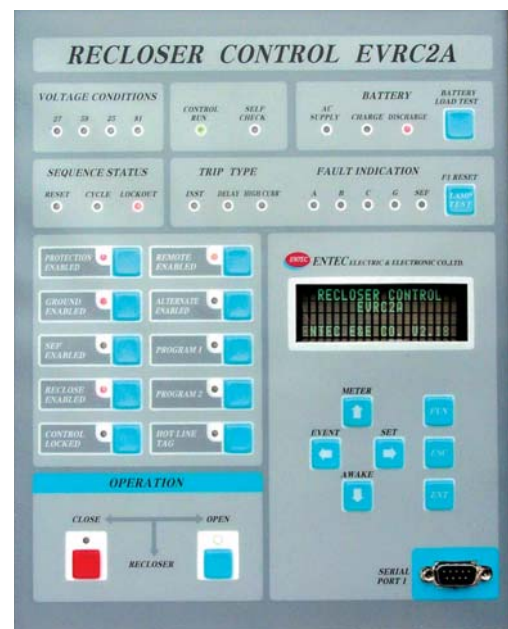

EVRC2A User Interface Panel

Microprocessor Based Recloser Control EVRC2A
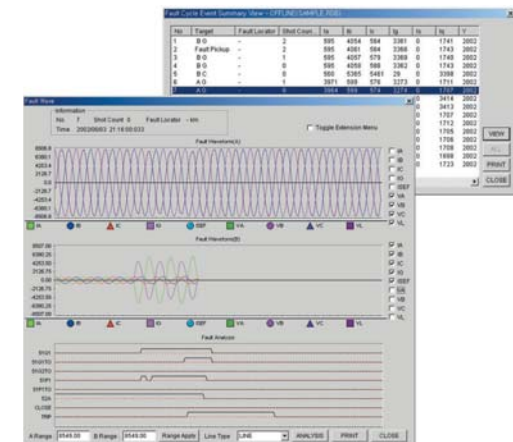
Features

- Reduced distribution automation costs
- RTU and control mounted in one control cubicle with space for radio and modem
- DNP 3.0, MODBUS, IEC60870-5-101/104 communication protocols and SCADA capability
- 12Vdc ~ 24Vdc auxiliary power available for modem or radio
- Voltage, current and power metering
- Record of operation, fault waveform data for line and load profile data
- Un-interruptable power supply with trip and close
- Inner heat insulation for polyurethane foaming
- Microsoft Windows-based EVRC2A interface software
- DynSync Software that can monitor and control a remote controller (EVRC2A/ETR300R) in PC based on Window


EVRC2A cubicle
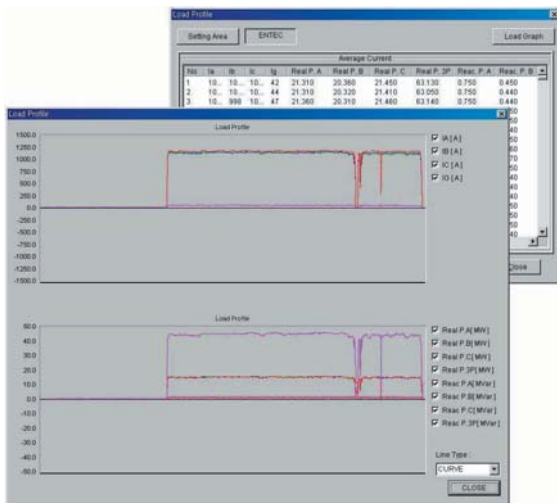
Average load profile & waveform

Protections

- User TCC construction capability
- Three curve standards: IEEE, IEC and 37non-standard inverse time curves
- Protective settings in nonvolatile memory during power failure
- Delay time overcurrent protection(51P, 51G)
- Instantaneous overcurrent protection(50P, 50G)
- Negative sequence overcurrent protection(46) SEF protection
- Source and load side synchronism check
- Cold load pickup and sequence coordination Under/Overfrequency and load shedding(81)
- Under/Overvoltage, detection and alarm(27,59)
- Directional controls(67)

Fault events & 15 Cycles waveform
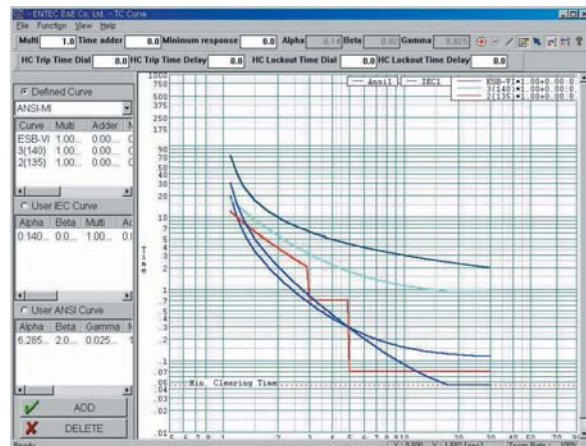
Editor for TCC modification

Mutli-metering

- Current
- Voltage
- Measures KW and KWH, power factor, demand Watts and VARs and frequency
- Load profile data & oscillogram

Remote Communication

- RS‑232 & 485 ports, RJ45(TCP/IP)
- DNP3.0, MODBUS, IEC60870-5-101/104 Communication protocols
- Built in RTU
- Complete remotely access for recloser functions, settings metering and data records

## Microprocessor Based Recloser Control ETR300‑R

ETR300-R includes common features associated with EVRC2A and provides more enhanced functions in protection, monitoring, metering, communication and recorder.
ETR300-R can also support your power distribution system to be more reliable with power quality management (PQM).

Enhanced features

- Analysis of current/voltage normal & negative sequence for power quality monitoring.
- Recording of PQM with fault waveform of 128 sampling and 20 cycles.
- Harmonics analysis of electric data. (THD/TDD content ratio)
- monitoring of Sag, Swell, Interruption, over & low voltage, unbalance and etc.
- Improvement of fault detection algorithm
- Automatic isolation of faulted section site and interconnection with other healty section.
- Improved measuring accuracy
- Time synchronization and Position Information by GPS support
- Multi-Protocol support. (DNP3.0, MODBUS, IEC60870-5-101/104 & IEC61850)
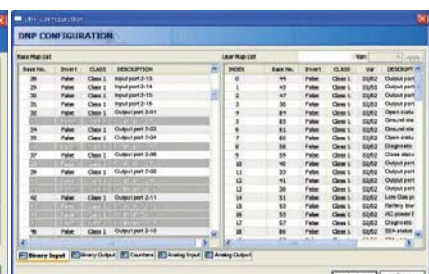- User programmable logic(PLC) support
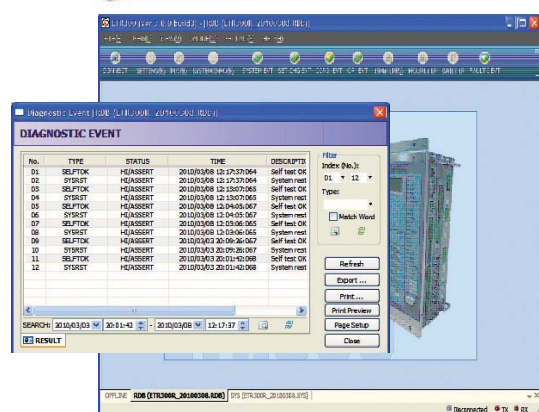
Interface Software
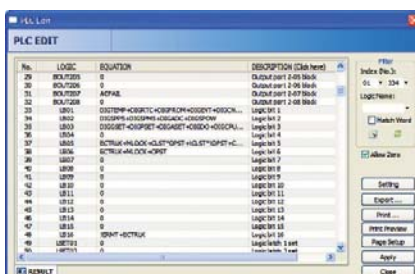
PLC Editor
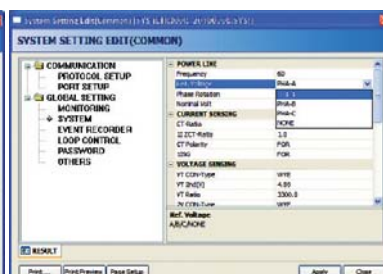
Setting Configuration

DNP Index Reconfiguration

Technical Control Specifications

RATINGS

Rated frequency	50 or 60 Hz
Control voltage	110/220 AC / 125VDC(Option)

ENVIRONMENTAL

Ambient temperature range	Storage -40℃ to +85℃
	Operation -25℃ to +70℃
Humidity	100%
Degree of protection	IP55
Insulation test voltage	2kV 50/60Hz, One minute
Impulse voltage withstand	6kV Peak, 1.2/50μs ANSI C62.45, IEC 61000-4-5
Interference test withstand	SWC ANSI C37.90.1, IEC 61000-4-4
Radio frequency interference	IEC 255-22-3 Class Ⅲ, ANSI C37.90.2

GENERAL PROTECTION (CT ratio 1000:1)

Phase time overcurrent	
Phase instantaneous overcurrent	
Ground time overcurrent	
Ground instantaneous overcurrent	
Sensitive earth fault	
Phase and ground time curves	IEEE C37.112, IEC255-3, User programmable curves 37 non standard inverse time curves

RECLOSE

Reclose times	Programmable from 1 to 4
Reclosing(Dead) times	1st reclose : 0.5-600 sec in 0.01sec steps
	2nd reclose: 1.0-600 sec in 0.01sec steps
	3rd reclose : 1.0-600 sec in 0.01sec steps
	4th reclose : 1.0-600 sec in 0.01sec steps
Reset (Reclaim) times	1-600 sec in 1sec steps

METERING (At rated voltage and current)

	CVD
Current	$\pm1\%$
Voltage	$\pm2.5\%$
Watt hours	$\pm5\%$
Vars hours	$\pm3\%$
Demands	$\pm5\%$
Power factor	±0.05
Frequency	±0.05Hz

RECORDING

RECORDING	EVRC2A	ETR300-R
Waveform capture	Last 32 events with 15 cycles & 16 samples	Last 32 events with 20 cycles & 128 samples
System event	Last 2048 events	Last 2048 events
Diagnostic event	Last 512 events	Last 512 events
Load profile	Last5120events,42days/60Min. (5,10,15,20,30,60, min interval)	Last1024events,42days/60Min. (5,10,15,20,30,60min interval)
Counter	Trip, fault, system restart	Trip, fault, system restart, PQM
Recloser wear	Phase A,B,C	Phase A,B,C
PQM		Last 100 events

Construction
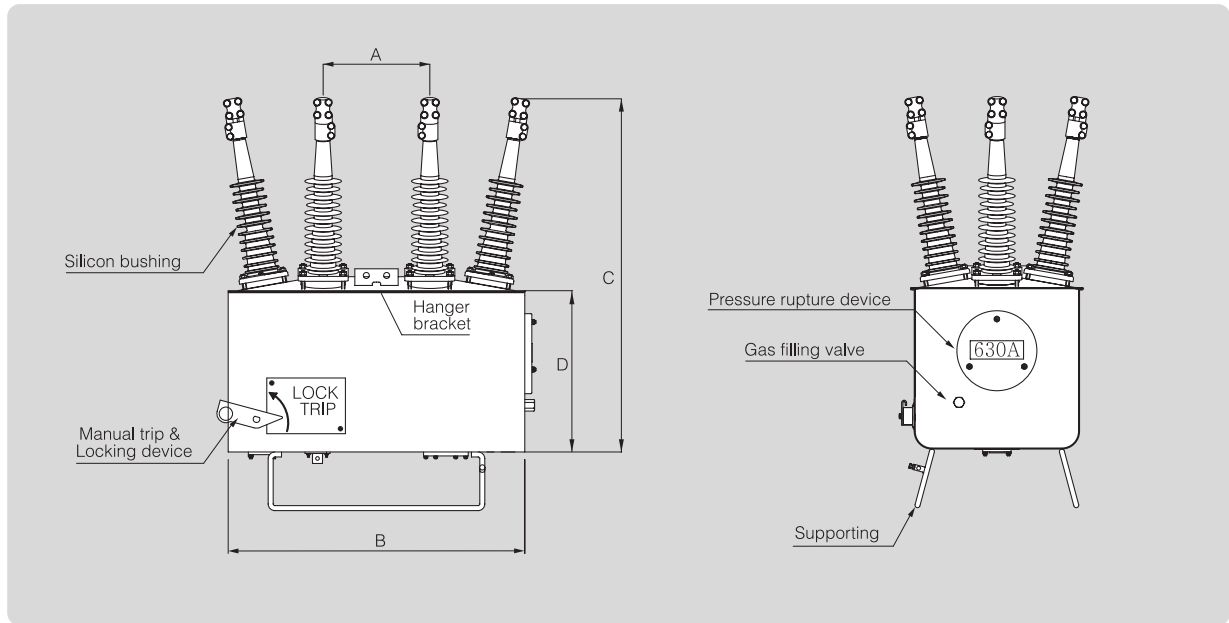
	A	B	C	D
EVR-1	300	780	920	430
EVR-2	300	780	1034	430
EVR-3	320	890	1235	460

Electrical ratings

Description	Unit	EVR-1	EVR-2	EVR-3
Rated maximum voltage	kV rms	15	27	38
Continuous current	A rms	630	630	630/800
Frequency	Hz	50/60	50/60	50/60
Short circuit interrupting current	kA rms	12.5	12.5	12.5/16
Short time withstand current. 3sec	kA rms	12.5	12.5	12.5/16
Making current	kA peak	32.5	32.5	32.5/40
Cable charging interrupting current	A rms	5	5	5
Transformer magnetizing interrupting current	A rms	22	22	22/28
Basic impulse withstand voltage($1.2 \times 50 \mu s$)	kV crest	110	150	170
Power frequency withstand voltage, dry	kV	50	60	70
Power frequency withstand voltage, wet	kV	45	50/60	60/70
- Operating control voltage		AC 110V, 220V external sources		
- Ambient temperature	℃	-25 to 70		
- Degree of protection		IP55		
- Maximum mechanical and electrical operations(c-o)	No	10,000		

• Other ratings is available upon request.
• ENTEC reserves the right to change the design and specification without notice.

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