

Feeder protection and control

REF615R

The REF615R is a dedicated feeder IED perfectly aligned for the protection, control, measurement, and supervision of utility substations and industrial power systems. The REF615R is designed for users looking for a 19" rack mount form of ABB's Relion® REF615. The REF615R utilizes the same form and fit as the DPU2000R relay and provides exact wire-alike matching rear terminals. This wire-alike feature makes the REF615R the ideal solution for upgrading to the industry's latest technologies. The REF615R is a member of ABB's Relion family and part of its 615 protection and control product series. The 615 series IEDs are characterized by their compact, withdrawable design. Engineered from the ground up, the 615 series has been designed to unleash the full potential of the IEC 61850 standard for communication and interoperability of substation automation devices while providing Modbus® and DNP simultaneously in one standard configuration.

Application

The REF615R provides main protection for overhead lines, cable feeders, and busbar systems of distribution substations. It can be applied for protection and control of grounded and ungrounded distribution systems.

One configuration tailored to meet and exceed these DPU2000R ANSI and IEC configurations:

- Standard: 587R... (ANSI); 687R...(IEC)
- Synch Check: 587C...(ANSI); 687C...(IEC)
- SEF: 587E...(ANSI); 687E...(IEC)

Unique REF615R features

- Four major ease of replacement benefits for ANSI and IEC DPU2000R users:
 - Same form and fit eliminates panel cutting or rack repositioning
 - Wire-alike I/O and CT/VT connections greatly reduce drawing modification time
 - Comparable protection and control plus more included
 - Near SCADA-alike for DNP3.0 points & Modbus registers
- Six setting groups
- Drawout design
- Underground, overhead cable fault detection (CFD) - optional
- High-speed (< 1 ms) outputs - optional



- Field selectable 1A or 5A CT inputs
- Advanced user programmable function blocks
- 16 programmable pushbuttons
- High impedance (HIZ) fault detection - optional
- Arc flash detection (AFD) - optional
- Thermal overload protection of feeder cable
- Ring-lug terminals for all inputs and outputs
- Large, customizable, easy to read LCD screen
- Environmentally friendly design with RoHS compliance
- Web browser based HMI
- PCM600 Software Tool - tools for basic IEC61850 configuration are included at no additional charge in PCM600

Protection and control

The REF615R is the most powerful, advanced and simplest feeder protection relay in its class, offering time and instantaneous overcurrent, negative sequence overcurrent, phase discontinuity, breaker failure, thermal overload, and voltage metering and protection. The relay features optional high impedance fault (HIZ) and sensitive earth fault (SEF) protection for grounded and ungrounded distribution systems. The relay incorporates a flexible three-phase multi-shot auto-reclose function for automatic feeder restoration in temporary faults on overhead lines.

Enhanced with safety options, the relay offers a three-channel arc-fault detection system for supervision of the switchgear as an option.

The REF615R integrates basic control functionality, which facilitates the control of one circuit breaker via the relay's front panel human machine interface (HMI) or remote control system. To protect the relay from unauthorized access and to maintain the integrity of information, the relay has been provided with a four-level, role-based user authentication system, with individual passwords for the viewer, operator, engineer, and administrator levels. The access control system applies to the front panel HMI, embedded web browser based HMI, and the PCM600 relay setting and configuration tool.

Standardized communication

As a standard feature, REF615R supports the IEC 61850 standard for inter-device communication in substations along with the industry standards DNP 3.0 and Modbus protocols. The implementation of the IEC 61850 substation communication standard in REF615R encompasses both vertical and horizontal communication, including GOOSE messaging and parameter setting according to IEC 61850-8-1. The substation configuration language enables the use of engineering tools for automated configuration, commissioning, and maintenance of substation devices.

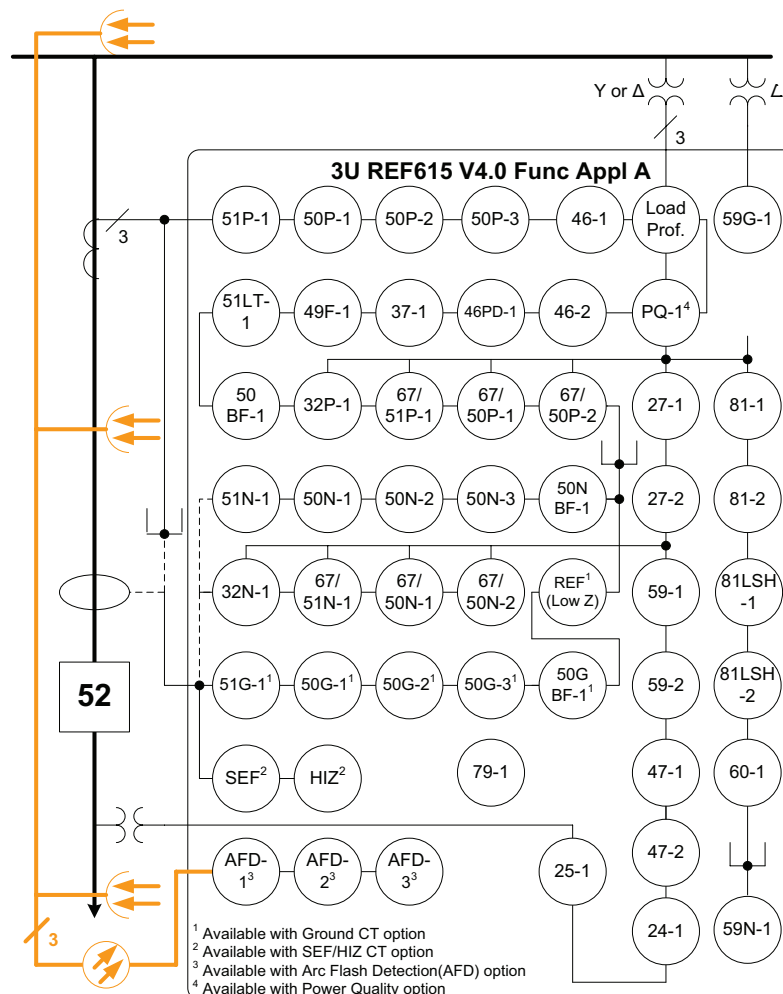
Pre-emptive condition monitoring

For continuous knowledge of the operational availability of the REF615R features, a comprehensive set of monitoring functions to supervise the relay health, the trip circuit, and the circuit breaker health is included. The breaker monitoring can include checking the wear and tear of the circuit breaker, the spring charging time of the breaker operating mechanism and the gas pressure of the breaker chambers. The relay also monitors the breaker travel time and the number of circuit breaker operations to provide basic information for scheduling breaker maintenance.

Bus protection via GOOSE

The IEC 61850 implementation in REF615R includes fast peer-to-peer communication, over the substation bus. Use GOOSE communication between REF615R IEDs of the incoming and outgoing feeders of a substation to form a stable, reliable, and high-speed busbar protection system. The cost-effective GOOSE-based busbar protection is obtained by configuring the IEDs and the operational availability of the protection is assured by continuous supervision of the protection IEDs and their GOOSE messaging over the station bus. No separate hard-wiring is needed for the horizontal communication between the switchgear cubicles.

REF615R V4.0 Functional Application A



Functions and Features		Functional Application
Included = •, Optional = ○		A
Protection	ANSI Function Name	
Phase overcurrents	51P, 50P	•
Phase long time overcurrent	51LT	•
Directional phase overcurrents	67P	•
Phase power directional	32P	•
Neutral overcurrents	51N, 50N	•
Ground overcurrents	51G, 50G	○
Directional neutral overcurrents	67N	•
Neutral power directional	32N	•
Sensitive earth fault (SEF)	50SEF	○
Negative sequence overcurrents	46	•
Load sheds and restorations	81LSH	•
Underfrequencies, overfrequencies, rate-of-changes	81	•
High impedance fault (HIZ)	HIZ	○
Thermal overload	49F	•
Phase discontinuity	46PD	•
Cold load inrush detection (seconds, minutes)	62CLD	•
Undercurrent	37	•
Restricted earth fault(REF), low impedance	REF	○
Phase undervoltages	27	•
Phase overvoltages	59	•
Phase sequence overvoltages	47	•
Ground overvoltage	59G	•
Neutral overvoltage	59N	•
Circuit breaker failure	50BF, 50NBF	•
Electrically latched/self-resetting trip digital outputs	86/94-1, 86/94-2	•
Arc flash detection via three lens sensors	AFD-1, AFD-2, AFD-3	○
Control		
Circuit breaker control	52	•
Autoreclose	79	•
Synchronism check	25	•
Monitoring and Supervision		
Trip circuit monitoring	TCM	•
Breaker condition monitoring	52CM	•
Fuse failure	60	•
Open CT secondary monitoring	CCM	•
Cable fault detection (CFD) for underground and overhead feeder cables	CFD	○
Measurement		
Three-phase currents	IA, IB, IC	•
Sequence currents	I1, I2, I0	•
Ground current	IG	•
Demand phase currents		•
Maximum and minimum demand values		•
Three-phase voltages	VA, VB, VC	•
Sequence voltages	V1, V2, V0	•
Ground voltage	VG	•
Power and energy (1-phase, 3-phases) and power factor	P, E and PF	•
Fault location	FLO	•
Power quality	PQ	○
Automation & Communications		
100Base-TX Ethernet (RJ45)		○
100Base-FX Ethernet(LC)		○
100Base-TX Ethernet(RJ45) + RS-485(1x4-wire or 2x2-wire) + IIRIG-B		○
100Base-FX Ethernet(LC) + RS-485(1x4-wire or 2x2-wire) + IIRIG-B		○
100Base-TX and -FX Ethernet (1 * LC, 2 * RJ45) + serial glass fiber (ST)		○

Automation & Communications (continued)	ANSI Function Name	Functional Application
Included = •, Optional = ○		A
100Base-TX Ethernet (3 * RJ45) + serial glass fiber (ST)		○
Ethernet 100Base-TX (RJ45) + configurable RS232/RS485 + [RS485 or serial glass fiber (ST) + IRIG-B] ¹		○
Records		
Sequence of events recorder	SER	•
Fault recorder	FLR	•
Digital fault (waveform) recorder	DFR	•
Load profile	LoadProf	•

¹May not be combined with Arc Flash Detection (AFD) option

Analog inputs

- Three phase currents: 5/1 A programmable
- Ground current: 5/1 A programmable or 0.2 A
- Rated frequency: 60/50 Hz programmable
- Three-phase and ground voltages: programmable nominal secondary voltage

Binary inputs and outputs

- Eleven binary inputs standard
- Seven programmable outputs
- Three outputs configurable to NO or NC standard. One configurable output if HSO option is selected.
- One Form C self-check alarm output
- High-speed outputs (HSO) optional

Communication

- IEC 61850-8-1 with GOOSE messaging
- DNP3.0 Level 2+ over TCP/IP
- Modbus over TCP/IP
- Time synchronization via SNTP (primary and backup servers)
- Optional serial RS-485 port programmable for DNP3.0 Level 2+ or Modbus RTU
- Optional IRIG-B time synchronization

Control voltage

- Option 1: 48 ... 250 V dc, 48 ... 240 V ac
- Option 2: 24 ... 60 V dc

Product dimensions and weights

- Product Dimensions: 19.00" (482.60 mm) W x 5.22" (132.59 mm) H x 9.08" (230.66 mm) D
- Product Weight: 11.9 lb (5.4 kg)

The REF615R fits the same cutout as the DPU2000R. Dimensions of that cutout are available in the product guide and product manual and can be downloaded from the Relion website at www.abb.com/relion.

Tools

- PCM600 V2.5 for setting, configuration and data retrieval
- COM600 Station Automation series products V4.0
- Web browser based user interface (IE 7.0 or later)

Certificates

- UL Listed product, File E103204

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