Feeder protection and control REF620

The REF620 is a dedicated feeder IED perfectly aligned for the protection, control, measurement and supervision of utility substations and industrial power systems. REF620 is a member of ABB's Relion® family and a part of its 620 protection and control product series. The 620 series IEDs are characterized by flexibility and performance for demanding utility distribution and industrial applications. Engineered from the ground up, the 620 series has been designed to unleash the full potential of the IEC 61850 standard for communication and interoperability of substation automation devices.

Unique REF620 ANSI features

– Six setting groups
– Drawout design
– Underground, overhead cable fault detection (CFD)
– High-speed (< 1 ms) outputs
– High impedance (HIZ) fault detection
– Arc flash detection (AFD)
– Phase step distance protection
– Power quality
– Ring-lug terminals for all inputs and outputs
– Large, easy to read LCD screen
– Programmable push-buttons
– Environmentally friendly design with RoHS Compliance

Application

The REF620 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. It offers support for single breaker, 1,5 breaker and double breaker feeder configurations. Flexible order coding allows for choosing configurations to best fit your distribution feeder application needs.

Protection and control

The REF620 is the most powerful, advanced and simplest feeder protection relay in its class, perfectly offering time and instantaneous overcurrent, negative sequence overcurrent, phase step distance, phase discontinuity, breaker failure, thermal overload, and voltage metering and protection. The relay also features high impedance fault (HIZ) and sensitive earth fault (SEF) protection for grounded and ungrounded distribution systems.

Also, 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 primary equipment. The REF620 also integrates control functionality, which facilitates the control of up to 2 circuit breakers 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, Protection and Control IED Manager.

Standardized communication

REF620 genuinely supports the new IEC 61850 standard for inter-device communication in substations. The relay also supports the industry standard DNP3 and Modbus® protocols. For accurate time stamping, REF620 supports synchronization over Ethernet using SNTP or over a separate bus using IRIG-B.
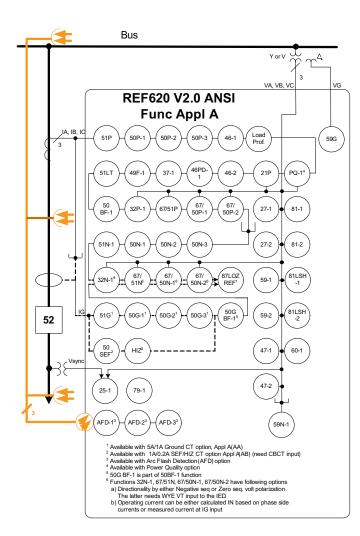
Power and productivity
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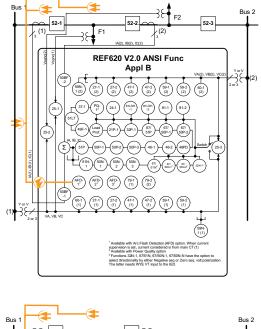
ABB

Pre-emptive condition monitoring

For continuous knowledge of the operational availability of the REF620 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.
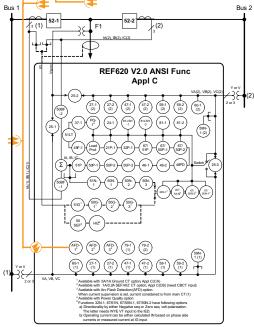
Bus protection via GOOSE

The IEC 61850 implementation in REF620 also includes fast peer-to-peer communication, over the substation bus. Use GOOSE communication between REF620 IEDs of the incoming and outgoing feeders of a substation cooperate 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.

REF620 V2.0 ANSI Functional Application A

REF620 V2.0 ANSI Functional Applications B & C

REF620 V2.0 ANSI Func Appl A

[1] Available with 5A/1A Ground CT option, Appl A(AA)
[2] Available with 1A/0.2A SEF/HIZ CT option Appl A(AB) (need CBCT input)
[3] Available with Arc Flash Detection (AFD) option
[4] Available with Power Quality option
[5] 50G BF-1 is part of 50BF-1 function
[6] Functions 32N-1, 67/51N, 67/50N-1, 67/50N-2 have following options
  a) Directionality by either Negative seq or Zero seq. volt polarization. The latter needs WYE VT input to the IED.
  b) Operating current can be either calculated IN based on phase side currents or measured current at IG input

REF620 V2.0 ANSI Func Appl B

[1] Available with Arc Flash Detection (AFD) option. When current supervision is set, current considered is from main CT (1)
[2] Available with Power Quality option
[3] Functions 32N-1, 67/51N, 67/50N-1, 67/50N-N have the option to select directionality by either Negative seq or Zero seq. volt polarization. The latter needs WYE VT input to the IED.

REF620 V2.0 ANSI Func Appl C

[1] Available with 5A/1A Ground CT option Appl C(CA)
[2] Available with 1A/0.2A SEF/HIZ CT option, Appl C(CB) (need CBCT input)
[3] Available with Arc Flash Detection (AFD) option. When current supervision is set, current considered is from main CT (1)
[4] Available with Power Quality option
[5] Functions 32N-1, 67/51N, 67/50N-1, 67/50N-2 have following options
  a) Directionality by either Negative seq or Zero seq. volt polarization. The latter needs WYE VT input to the IED.
  b) Operating current can be either calculated IN based on phase side currents or measured current at IG input

| Functions and Features | | Functional Application | | |
| Included = ●, Optional = O | | Firmware version 2.0 | | |
		A	B	C
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	O		O
Bus protection via GOOSE messaging	87B	●	●	●
Directional neutral overcurrents	67N	●	●	●
Neutral power directional	32N	●	●	●
Sensitive earth fault (SEF)	50SEF	O		O
Phase Distance Protection	21P	●	●	●
Negative sequence overcurrents	46	●	●	●
Load sheds and restorations	81LSH	●	●	●
Underfrequencies, overfrequencies, rate-of-changes	81	●	●	●
Cable fault detection (CFD) for underground and overhead feeder cables	CFD	●	●	●
High impedance fault (HIZ)	HIZ	O		O
Thermal overload	49F	●	●	●
Phase discontinuity	46PD	●	●	●
Cold load inrush detection (seconds, minutes)	62CLD	●	●	●
Undercurrent	37	●	●	●
Restricted earth fault(REF), low impedance	87LOZREF	O		
Phase undervoltages	27	●	●	●
Phase overvoltages	59	●	●	●
Phase sequence overvoltages	47	●	●	●
Ground overvoltage	59G	●		
Neutral overvoltage	59N	●	●	●
Circuit breaker failure	50BF, 50NBF	●	●	●
Three-phase Inrush Detector	INR	●	●	●
Electrically latched/self-resetting trip digital outputs	86/94-1, 86/94-2	●	●	●
Phase current sets summing function	CSUM		●	●
Three phase measurement switching	VSWI		●	●
Arc flash detection via three lens sensors	AFD-1, AFD-2, AFD-3	O	O	O
Control				
Circuit breaker control	52	●	●	●
Autoreclose	79	●	●	●
Synchronism check	25	●	●	●
Monitoring and Supervision				
Trip circuit monitoring	TCM	●	●	●
Breaker condition monitoring	52CM	●	●	●
Fuse failure	60	●	●	●
Current circuit supervision	CCM	●		●
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	●	●	●
Frequency	f	●	●	●
Power quality	PQ	O	O	O

Functions and Features (continued)

Included = ●, Optional = O

Automation & Communications		Functional Application Firmware version 2.0		
		A	B	C
Max number of Digital Inputs		32	24	24
Max number of Digital Outputs		18	18	18
Max number of High-Speed Outputs (HSO's are optional and take the place of some digital outputs)		3	6	6
100Base-TX Ethernet (RJ45) port[2]		●	●	●
Rear 100Base-FX Ethernet (LC)		O	O	O
Rear 100Base-TX Ethernet(RJ45) + RS-485(1x4-wire or 2x2-wire) + IRIG-B		O	O	O
Rear 100Base-FX Ethernet(LC) + RS-485(1x4-wire or 2x2-wire) + IRIG-B		O	O	O
Rear 100Base-TX and -FX Ethernet (1 * LC, 2 * RJ45) + serial glass fiber (ST)		O	O	O
Rear 100Base-TX Ethernet (3 * RJ45) + serial glass fiber (ST)		O	O	O
Ethernet 100Base-TX (RJ45) + confi gurable RS232/RS485 + [RS485 or serial glass fiber (ST) + IRIG-B][1]		O	O	O
All three DNP 3.0, Modbus, and IEC61850 communication protocols		●	●	●
Records				
Sequence of events recorder	SER	●	●	●
Fault recorder	FLR	●	●	●
Digital fault (waveform) recorder	DFR	●	●	●
Load profile	LoadProf	●	●	●
Digital Fault Recorder signal channels (Analog/Digital)		12/64	12/64	12/64
Events recorder (FIFO), 1ms resolution		1024	1024	1024
Fault records		128	128	128

[1] May not be combined with Arc Flash Detection (AFD) option
[2] Front port included, rear port optional

Analog inputs
– Three phase currents: 5/1 A programmable
– Ground current: 5/1 A programmable or 1/0.2 A
– Rated frequency: 60/50 Hz programmable
– Three-phase and ground voltages: programmable nominal secondary voltage
– Phase voltage available for synch check

Binary inputs and outputs
– Sixteen binary inputs standard
– Ten binary outputs available as standard
– One Form C self-check alarm output as standard
– Optional High Speed Outputs (HSO) available
– Additional binary inputs and outputs available as options

Communication
– IEC 61850-8-1 with GOOSE messaging
– DNP3 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 Level 2+ or Modbus RTU
– Optional IRIG-B time synchronization

Product dimensions and weights
– Frame: 10.32" (262.6 mm) W x 6.97" (177 mm) H
– Case: 9.69" (246 mm) W x 6.30" (160 mm) H x 7.91" (201 mm) D
– Weight: Complete IED – 10.5 lbs. (4.8 kg); Plug-in unit only - 6.0 lbs.(2.8 kg)

Tools
– PCM600 V2.4.1 or later for setting, configuration and data retrieval
– COM600 Station Automation series products V3.5 or later
– Web browser based user interface (IE 7.0 or later)

Control voltage
– Option 1: 48 ... 250 V dc, 100 … 240 V ac
– Option 2: 24 ... 60 V dc

Certificates
– UL Listed product, File E103204

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