Pre-configured Matching Unit (PCMU)
Retrofit solution for Microshield Overcurrent relay (MSOC)

The PCMU MSOC is a dedicated feeder protection and control relay perfectly aligned for the protection, control, measurement, and supervision of utility substations and industrial power systems, designed to replace the ABB legacy Microshield overcurrent (MSOC) relay. The relay provides exact wire-alike matching rear terminals as the existing MSOC relay, saving time and engineering. This wire-alike feature makes the PCMU MSOC the ideal solution for upgrading to the industry's latest technologies. The PCMU MSOC is a retrofit solution based on REF615 relay from the proven Relion® family. The 615 series relays are characterized by their compact and withdrawable design.

Application
The PCMU MSOC solution 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.

Unique REF615 features
Major ease of replacement benefits for ANSI and IEC PCMU MSOC users:
– 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)
– Field selectable 1A or 5A CT inputs
– Advanced user programmable function blocks
– 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 configuration are included at no additional charge in PCM600

– High-speed (< 1 ms) outputs - optional
– High impedance (HIZ) fault detection - optional
– Arc flash detection (AFD) - optional

Protection and control
The PCMU MSOC 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.

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ABB

The PCMU MSOC 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, PCMU MSOC supports the IEC 61850 standard for communication between devices within the substations along with the industry standards DNP 3.0 and Modbus protocols. The implementation of the IEC 61850 substation communication standard in PCMU MSOC 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 PCMU MSOC 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 PCMU MSOC includes fast peer-to-peer communication, over the substation bus. Use GOOSE communication between PCMU MSOC relays 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 relays and the operational availability of the protection is assured by continuous supervision of the protection devices and their GOOSE messaging over the station bus. No separate hard-wiring is needed for the horizontal communication between the switchgear cubicles.

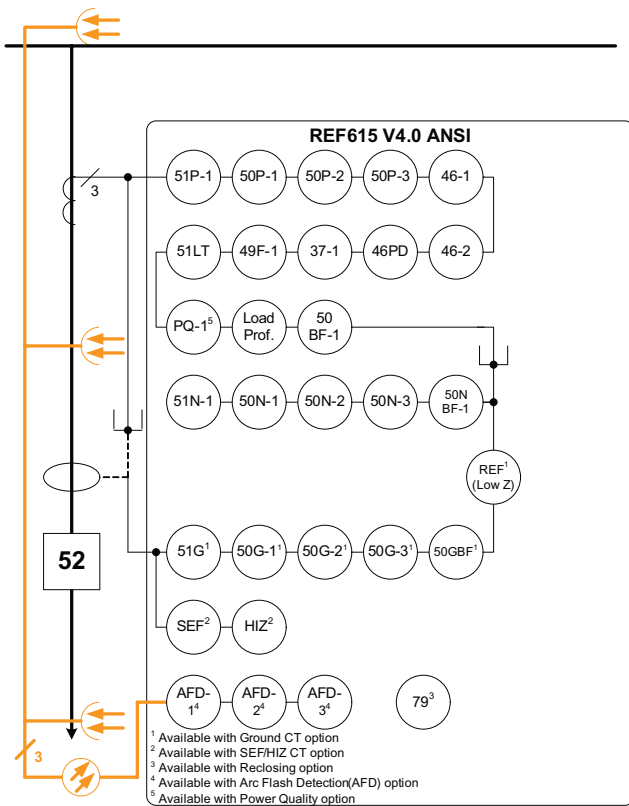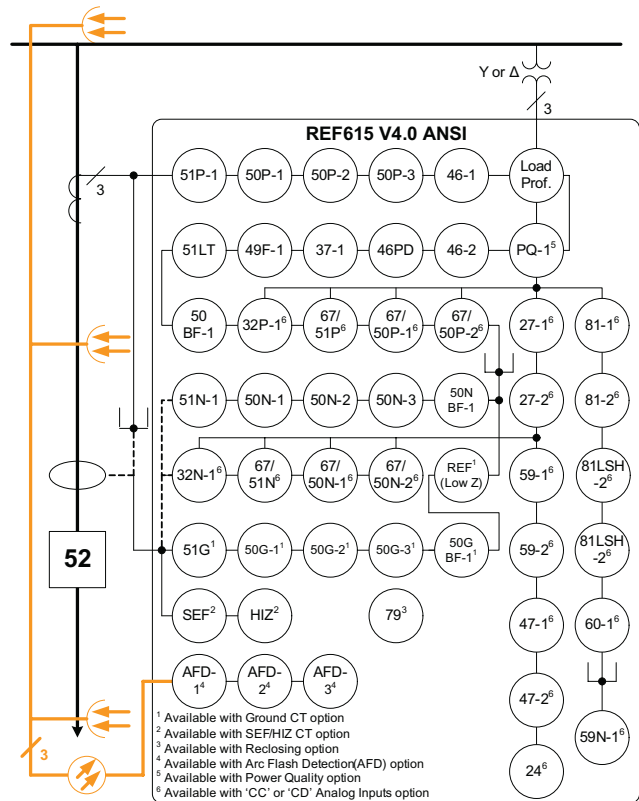**Figure 1. Protection functions overview for standard configuration A**

Figure 2. Protection functions overview for standard configuration C

Functions and Features		Functional Application	
Included = •, Optional = O		A	C
Protection	ANSI Function Name		
Phase overcurrents	51P, 50P	•	•
Phase long time overcurrent	51LT	•	•
Directional phase overcurrents	67P	-	O
Phase power directional	32P	-	O
Neutral overcurrents	51N, 50N	•	•
Ground overcurrents	51G, 50G	O	O
Directional neutral overcurrents	67N	-	O
Neutral power directional	32N	-	O
Sensitive earth fault	50SEF	O	O
Negative sequence overcurrents	46	•	•
Load sheds and restorations	81LSH	-	O
Underfrequencies, overfrequencies, rate-of-changes	81	-	O
High impedance fault (HIZ)	HIZ	O	O
Thermal overload	49F	•	•
Phase discontinuity	46PD	•	•
Cold load inrush detection (seconds, minutes)	62LCD	•	•
Undercurrent	37	•	•
Restricted earth fault (REF), low impedance	87LOZREF	O	O
Phase undervoltages	27	-	O
Phase overvoltages	59	-	O
Phase sequence overvoltages	47	-	O
Ground overvoltage	59G	-	-
Neutral overvoltage	59N	-	O
Circuit breaker failure	50BF, 50NBF	•	•
Electrically latched/self-resetting trip digital outputs	86/94-1, 84/94-2	•	•
Arc flash detection via three lens sensors	AFD-1, AFD-2, AFD-3	O	O
Control			
Circuit breaker control	52	•	•
Autoreclose	79	O	O
Synchronism check	25	-	-
Monitoring and Supervision			
Trip circuit monitoring	TCM	•	•
Breaker condition monitoring	52CM	•	•
Fuse failure	60	-	O
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, PF	-	•
Fault location	FLO	-	•
Power quality	PQ	•	•
Automation & Communications			
Rear 100Base-TX Ethernet(RJ45) + RS-485(1x4-wire or 2x2-wire) + IRIG-B ports		O	O

Records	ANSI Function Name	Functional Application	
Included = •, Optional = O		A	C
Sequence of events recorder	SER	•	•
Fault recorder	FLR	•	•
Digital fault (waveform) recorder	DFR	•	•
Load profile	LoadProf	•	•

Ordering code

Analog Inputs	Arc flash detection (AFD)	Power Supply (Nominal)	MSOC Catalog #	PCMU MSOC order code	REF615 4.0 ANSI order code
Current-only	No	24/48 V DC	474Mx31x-xxxx	R474A12XE	HAFAABAAABE1BCA2XE
		48/125/250 V DC	474Mx41x-xxxx, or 474Mx51x-xxxx	R474A11XE	HAFAABAAABE1BCA1XE
	Yes	24/48 V DC	474Mx31x-xxxx	R474A22XE	HAFAABAAFGE1BCA2XE
		48/125/250 V DC	474Mx41x-xxxx, or 474Mx51x-xxxx	R474A21XE	HAFAABAAFGE1BCA1XE
Current & Voltage	No	24/48 V DC	474Mx32x-xxxx	R474C12XE	HAFCCCCAABE1BCA2XE
		48/125/250 V DC	474Mx42x-xxxx, or 474Mx52x-xxxx	R474C11XE	HAFCCCCAABE1BCA1XE
		24/48 V DC	474Mx32x-xxxx	R474C22XE	HAFCCCCAFGE1BCA2XE
		48/125/250 V DC	474Mx42x-xxxx, or 474Mx52x-xxxx	R474C21XE	HAFCCCCAFGE1BCA1XE

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
– Two binary inputs standard
– Three to seven programmable outputs
– One self-check alarm output

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: 6.46" (164 mm) x 6.97" (177 mm) H x 8.68" (221 mm) D
– Product Weight: 10 lb. (4.54 kg)

The PCMU MSOC is installed by using modern cutting tools for fast and clean retrofit. The tool enables a precise quality cut each and every time.

Tools
– PCM600 2.6 or higher for setting, configuration and data retrieval
– Web browser based user interface (IE 7.0 or later)

Certificates
– UL Listed product, File E103204

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