A state-of-the-art solution...

The REF Feeder Terminals designed for medium-voltage networks provide you cost-effective solutions for different protection, monitoring and control applications. These terminals support both utility and industrial applications through the different switchgear configurations and various types of networks.

One product – many possibilities...

The technology used in REF terminals provides solutions for such application areas as feeders, capacitor banks and motors. Our terminals not only offer a complete solution with a wide range of protection functions, but also solutions even when only control functions are needed. Terminal technology enables the use of accurate and reliable current and voltage sensors as well as conventional CTs and VTs.

The REF terminals are designed to integrate into your substation automation system or intelligent switchgear, or they can function as a stand-alone multifunction unit. They also offer you freely configurable blocking logics over the interbay-bus. The external display module of REF terminals allows easy installation and eliminates cabling tension.

Application-specific solution...

Application-specific configurations and MIMICs can be easily created to display the object status, measurements, events and application-specific alarms. Thus, REF terminals adapt to your process, not vice versa.
Take the step towards Industrial IT

Configuration Solutions save time...
ABB has also developed, tested and documented Configuration Solutions for a number of protection applications. The documentation supports you all the way from engineering and commissioning to maintenance and use. Configuration Solutions can serve you as a ready-made configuration or as a template for your further modifications.

REF 541/543/545 feeder terminals utilise the same RED 500 terminal technology as used in machine terminals and remote monitoring and control terminals. Consequently the configuration, setting and monitoring tools are common for all terminals in RED 500 series.

ABB Substation Automation Oy
P.O. Box 699
FIN-65101 VAASA
Finland
Phone: +358 10 22 4000
Fax +358 10 22 41094
www.abb.com/substationautomation

REF 541, 543 and 545 Protection Functions:
- 3I>, 3I>>, 3I>>>
- 3-phase non-directional overcurrent protection, 3 stages
- 3I> –>, 3I>> –>, 3I>>> –>
- 3-phase directional overcurrent protection, 3 stages
- Io> –>, Io>> –>, Io>>> –>
- Non-directional earth-fault protection, 3 stages
- Io> –>, Io>> –>, Io>>> –>
- Directional earth-fault protection, 3 stages
- Uo>, Uo>>, Uo>>> –>
- Residual overvoltage protection, 3 stages
- 3 f
- 3-phase thermal overload (feeders & cables)
- 3I>, 3I>>
- 3-phase overvoltage protection, 2 stages
- 3U<, 3U<<
- 3-phase undervoltage, 2 stages
- f <, f >, ∆f/∆t
- Under- or overfrequency inc. rate of change, 5 stages
- O –>I
- Auto-reclosure
- SYNC
  Syncro-check/voltage check, 2 stages
- 3I2f>
- 3-phase inrush detector
- ∆I>
- Phase discontinuity
- CBFP
  Circuit breaker failure
- 3 f
- 3-phase thermal overload protection for devices
- Is’t, nc
- Start-up supervision for motors
- U1<, U2>, U1>
- 3-phase sequence voltage protection, 2 stages

Optional functionality
- Capacitor bank protection
- 3-phase overload protection
- Current unbalance protection
- Capacitor bank control
- Power factor controller
- Power quality
- Current waveform distortion measurement
- Voltage waveform distortion measurement

Measurement functions
- 3I
- 3-phase current, 2 stages
- Io
- Neutral current, 2 stages
- 3U
- 3-phase voltage, 2 stages
- Uo
- Residual voltage, 2 stages
- E/P/Q/\(\cos\phi\)
- 3-phase power and energy
- System frequency
  - 1-system frequency
  - Measurement of RTD/analog inputs, general measurement
  - Measurement of analog outputs
  - Advanced condition monitoring
  - Fixed display/External display module
  - Up to 34 digital inputs
  - Up to 26 digital outputs including 2 outputs with trip circuit supervision
  - Energizing inputs
    - 4 current transformers for 1A and 5A connection
    - 1 current transformer for 0.2A and 1A connection
    - 4 voltage transformers for 100V-120V connection
    - 9 sensor inputs for current or voltage measurements
  - Galvanic isolated general purpose inputs/outputs
    - 8 RTD/analog inputs (mA, U, ohm, Pt) enable measurements such as temperature
    - 4 analog outputs (mA) enable the use of conventional panel meters as well as RTU connections
- Configuration and relay setting tool
  - CAP 505 / CAP 501 based on IEC-61131-3 standard