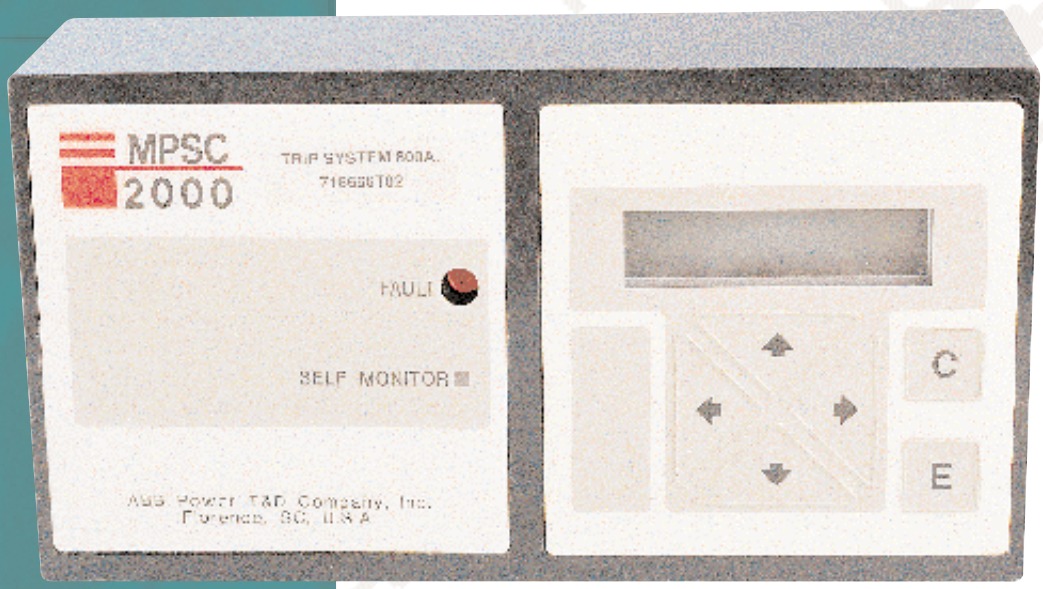
MPSC-2000

Microprocessor-based protection and metering devices for low voltage power circuit breakers



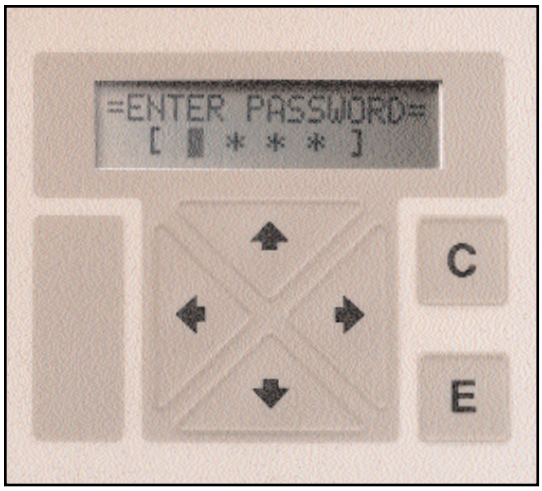
technical guide

ABB Power Distribution

For circuit breaker protection, metering and communications, the programmable MPSC-2000 offers the best value in the Industry

MPSC-2000 solves traditional problems with protection, metering and communications capabilities on low voltage power circuit breakers, while also providing the best value in the industry. As a third generation microprocessor-based device, MPSC-2000 reflects the ABB commitment to continuous improvement by building on the solid record of MPS and MPS-C trip units installed on ABB breakers for over a decade. The UL-approved MPSC-2000 also demonstrates the ABB focus on value by adding new features such as an LCD display with keypad access to protective settings and metering data, while keeping costs competitive with previous generation devices.

MPSC-2000 is extremely flexible - suitable for 3-phase systems, with or without a neutral connection, and voltages between 208 and 600 VAC_{RMS} at 50 or 60 Hz. The device may be used for continuous currents to 4200 amps, ground currents to 1200 amps, and short circuit currents to 130kA.



Local and remote access to change relay settings and curves are restricted to authorized personnel by password protection.

Protection

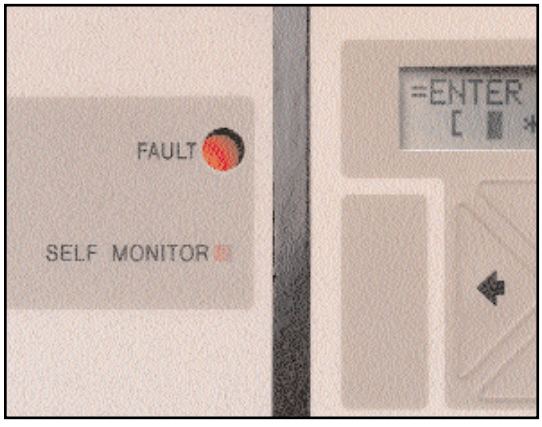
MPSC-2000 is the first device to include Long Time, Short Time, Instantaneous and Ground trip protection as standard functions, all with user-selectable settings and curves. A single catalog number provides all relay characteristics - no rating plugs are required.

MPSC-2000 protection functions are fully self-powered, taking tripping energy from current conducted through the breaker without an auxiliary supply. The main memory module is non-volatile EEPROM, which stores all protection settings and current values at the time of the last trip and eliminates the need for battery backup.

Metering and Information

MPSC-2000 adds value well beyond the primary function of circuit protection by providing a long list of breaker operational history information as well as complete metering data with breakthrough accuracy for a power circuit breaker trip device. Current and voltage measurements are within 1% of breaker rating, and power indications are within 2% of breaker rating.

A bright red mechanical target indicates circuit breaker tripping. The cause of trip can be determined by interrogation of the device using the keypad and LCD display. The target resets automatically when the unit is re-energized.



A self-monitoring feature continuously monitors the condition of the microprocessor. Normal operation is indicated by a red LED on the front panel, flashing at the rate of once per second. Any internal failure is signaled by a steady glow. The LED blinks at the rate of 5 times per second to indicate Long Time pickup, and continues to blink at this rate until reset or until the breaker is tripped.

MPSC-2000 provides user-friendly access to settings and metering data by an on-screen menu with prompts. The large, easily readable LCD display is also energy efficient. A 9-volt battery provides power for cold set-up and continuous LCD information display, even when the breaker is not closed and energized. The tactile touch keypad is impervious to contamination from dust, moisture and lubricants.

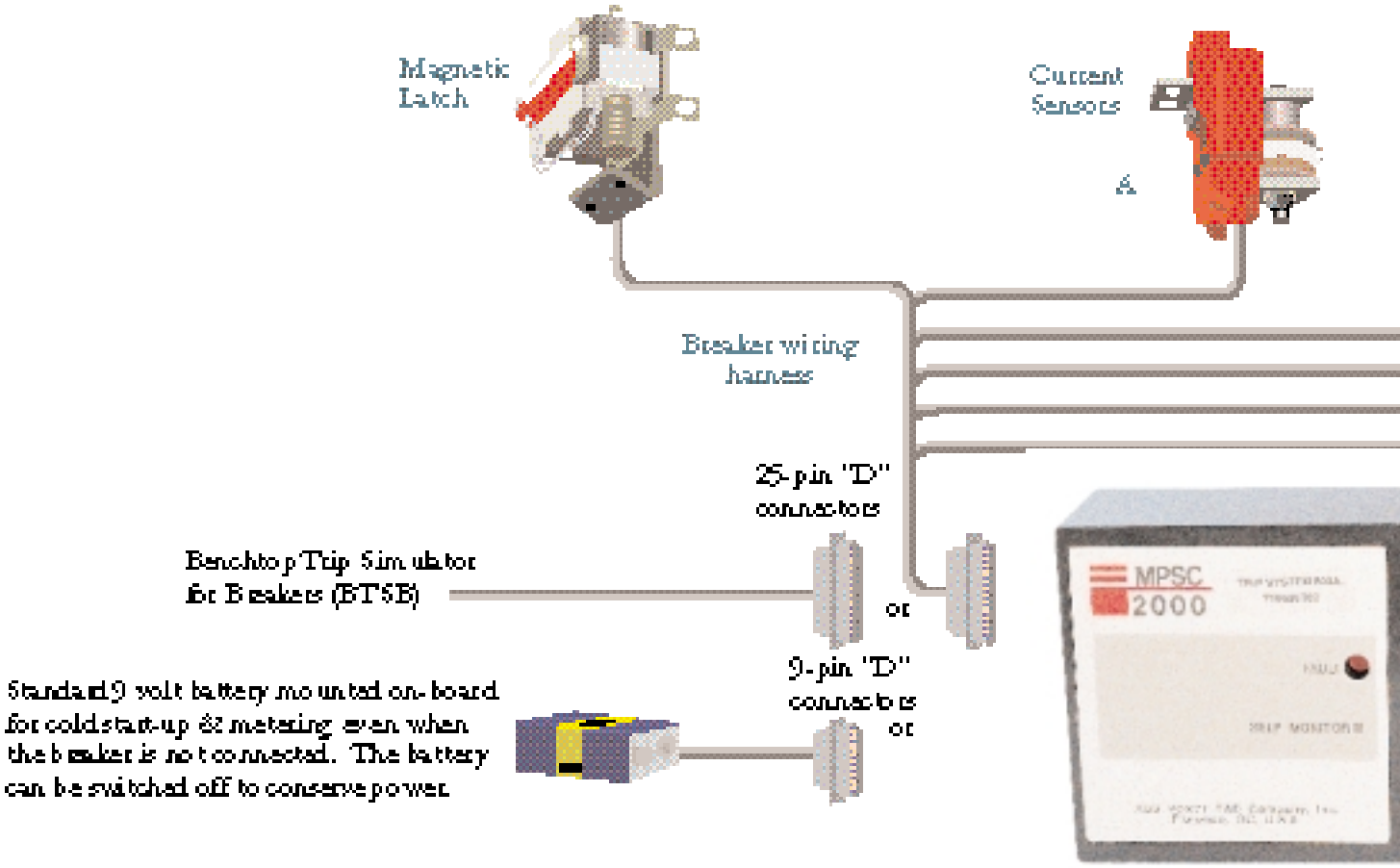
MPSC-2000 is the standard trip unit on all new K-Line power circuit breakers.

MPSC-2000 is supplied as standard equipment on all new K-Line and K-Line Plus low voltage circuit breakers...

MPSC-2000 combines all of the quality and reliability you expect from the Micro Power Shield line of protection systems with the latest generation of metering and communications capabilities. MPSC-2000 is also a member of the ABB family of field-proven, advanced microprocessor based devices that includes DPU-2000 (distribution), TPU-2000 (transformer) and GPU-2000 (generator) protection.

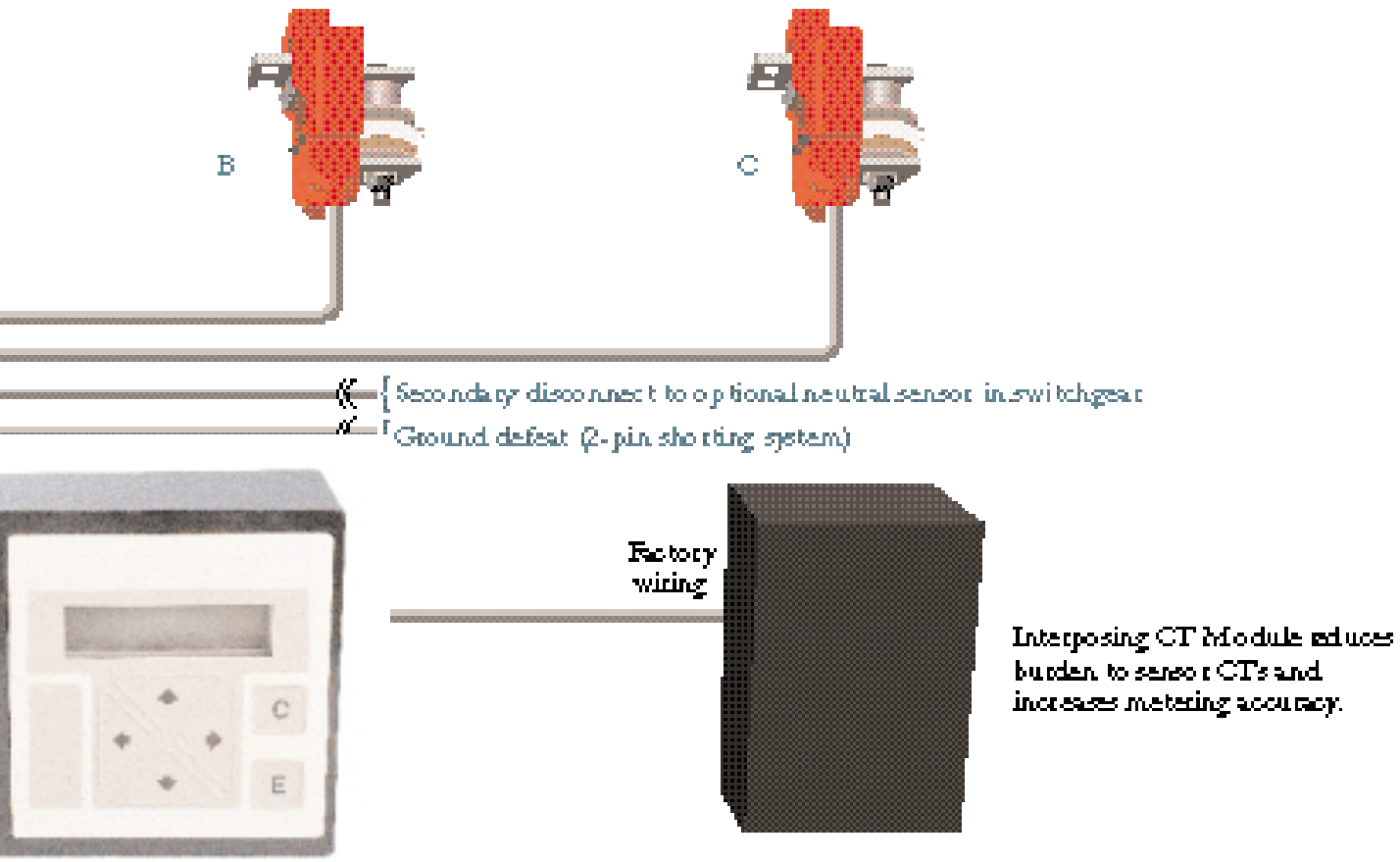
The MPSC-2000 base unit includes standard features which are commonly expensive options on other devices. MPSC-2000 also solves traditional inconveniences of field start-up. As an electronic device, MPSC-2000 has no mechanical components to lose alignment or adjustment during shipment, and only normal protective settings must be field programmed prior to placing a circuit breaker in service.

Circuit Breaker mounted components



Major components of the system include current sensors, the MPSC-2000, and a magnetic latch trip device, all of which are mounted integral to the circuit breaker to provide complete protection for overcurrent, short circuit and ground faults. A current sensor is integrally mounted on each phase of the breaker to supply a value of current flowing in the MPSC-2000 which is directly proportional to the current passing through the primary circuit. When the value of current in the primaries exceeds the trip unit setting thresholds for a given time in Long Time, Short Time and/or Ground functions, the MPSC-2000 sends a signal to actuate the magnetic latch, which trips the circuit breaker. Instantaneous function tripping occurs in the same manner without an intentional time delay. On three phase, four wire, wye systems provisions are made for input from a separately mounted sensor to obtain a residual connection of all four sensors for sensitivity to ground currents. Refer to IB 6.1.2.8-1A for available phase and ground current sensor ratings.

The MPSC-2000 Long Time trip element algorithm samples the current, calculates the root mean square (RMS) value of system current, and trips when the RMS current is above the trip threshold. Short time and instantaneous tripping remain based on peak sensing methods to avoid an unnecessary delay caused by an RMS calculation.



The MPSC-2000 K-Line retrofit kit is supplied complete with CT module, sensors, magnetic latch, mounting hardware and instructions.

MPSC-2000 is available in convenient retrofit kits for upgrading installed breakers with electro-mechanical, solid state, and earlier generation microprocessor trip devices

The compact size of the MPSC-2000 allows it to be used to retrofit virtually any low voltage power circuit breaker by any manufacturer. And the modular approach to MPSC-2000 design provides added flexibility, with a separate CT module and on-board mounting of the optional VIM.

Each K-Line retrofit kit includes the MPSC-2000, detailed instructions for operation and retrofit installation, and the following components:

- Current sensors
- Magnetic latch
- Barriers and supports
- Wiring harness
- Hardware

BTSB

The Benchtop Trip Simulator for Breakers (BTSB) is a microprocessor driven secondary current/voltage injection test set specifically designed for use with the MPS-C and MPSC-2000 microprocessor-based trip devices. The BTSB can test all facets of MPSC and MPSC-2000 operation, including the following:

- Instantaneous Threshold
- Short Time Threshold & Delay
- Long Time Threshold & Delay
- Ground Threshold & Delay
- Current Metering Accuracy
- Self-Power Level Verification

Altogether, the BTSB can perform up to 35 tests on an MPSC, and all the tests are performed by true secondary current or voltage injection. There are also built-in calibration tests which can be performed to ensure that the BTSB is providing accurate results.

MPSC-2000 technical data and specification guide

Protection: Trip settings shall be displayed on demand, and shall be user-selectable at local or remote locations. Password access is required to restrict changes by unauthorized personnel. Protective functions and settings shall consist of the following parameters: [*refer to IB 6.1.2.8-1A for values]

MPSC-2000 (current) Settings

Rating	0.5 or 1.0 X breaker rating
LT Pickup	0.5 - 1.0 X sensor rating (increments of 0.1)
LT Delay	Minimum, Intermediate, Maximum *
ST Pickup	2-12 X sensor rating (integral increments) or DISABLED
ST Delay	Minimum, Intermediate, Maximum *
ST Curve	Definite, I^2T
INST Pickup	3-12 X sensor rating (integral increments) or DISABLED if INST not blocked
Ground Pickup	See ground sensor table *
Ground Delay	Minimum, Intermediate, Maximum *
Ground Curve	Definite, I^2T
Test Curve	Long time, Short time, Instantaneous, Ground
Demand Interval	15, 30 and 60 minutes
I Unbalance	5-50% (increments of 1%)
I Unbalance Delay	0.1 - 25.0 sec (increments of 0.1%) or DISABLED

VIM (voltage) Settings

V Unbalance	5-50% (increments of 1%)
V Unbalance Delay	0.1 - 25.0 sec (increments of 0.1%) or DISABLED
UV Pickup	1 - 600 volts (increments of 1 volt)
UV Delay	0.1 - 25.0 sec (increments of 0.1%) or DISABLED
Demand Interval	15, 30 and 60 minutes

Metering: The following metering information shall be shown on demand on an easily readable LCD display with a minimum of 2x16 characters. Data selection is available by local keypad access or remote interrogation. Current and voltage measurements shall be within 1% of the circuit breaker rating and power indications within 2% of breaker rating. This information shall be available with applicable options to remote control systems through the communications features of the device.
[*displayed only if optional VIM is attached]

Load Values
Ia, Ib, Ic or In
*Van, Vbn, Vcn / Vab, Vbc, Vca / /
*KW30, KVar30, KVA30, KWHr30, KVarHr30
*Power Factor
*Frequency

Demand Values
Ia, Ib, Ic or In / / /
*KW30, KVar30, KWHr30, KVarHr30

Records Information: The trip device shall provide access to trip records on the LCD display as follows. This information shall be available to remote control systems through the communications features of the device.

MPSC-2000 (current) Trip Events
Fault ID: 1-16 (last event displayed at device; others are remote readable)
Event type: [LT, ST, INST, GRND]
Phase A, B, C or Neutral current: [readout in amps]

Breaker Operations
Counter number: [quantity]
Phase A, B or C KSI: [readout in kA]

VIM (voltage) Trip Events
Event type: [I Unbal, V Unbal, UV]
Vab, Vbc or Vca: [readout in volts]

Each low voltage power circuit breaker shall be supplied with a breaker-mounted microprocessor device with 3-phase and neutral protection, metering and communications capabilities. The device shall comply with the requirements of ANSI C37.17. Standard trip functions shall include Long Time (LT), Short Time (ST), Instantaneous (INST) and Ground (GRND) current protection.

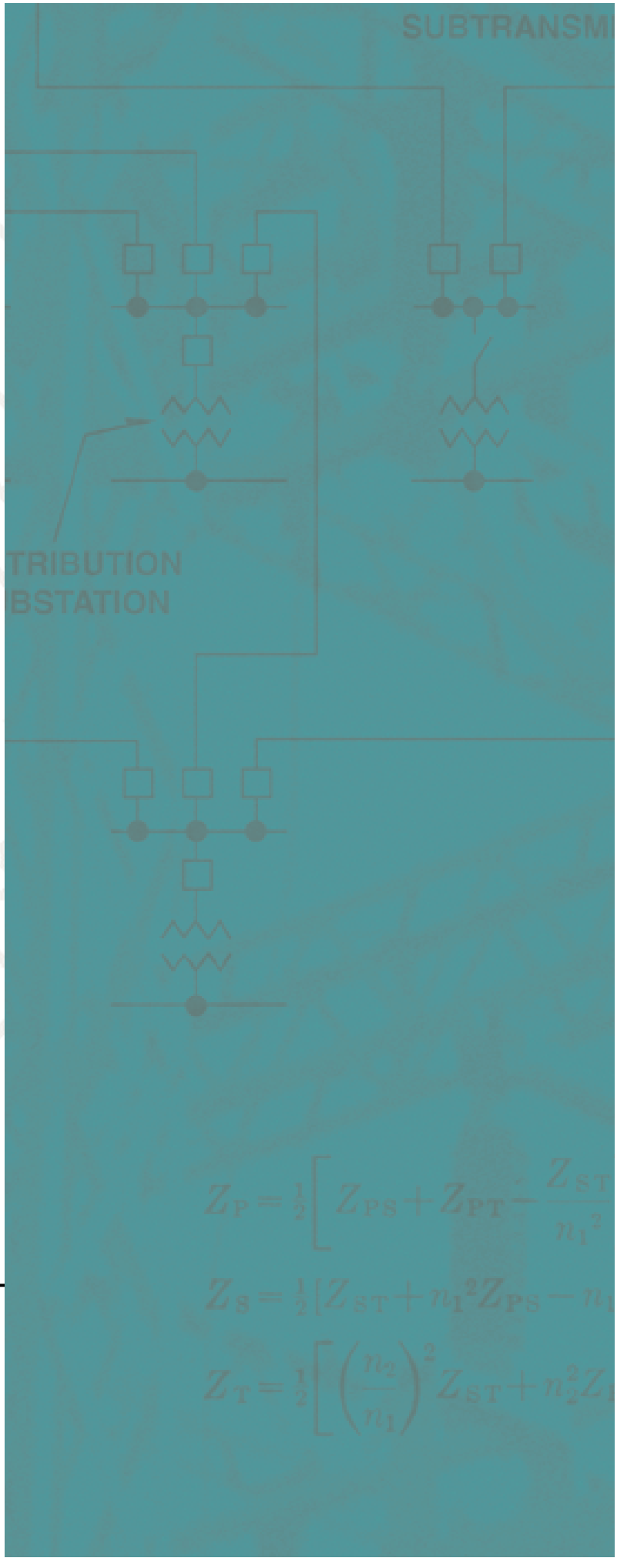
System Application: The trip unit will be suitable for 3-phase systems, with or without a neutral connection, and voltages between 208 and 600 VAC_{RMS} at 50 or 60 Hz. The device must be suitable for continuous currents up to 4200 amps, ground currents up to 1200 amps, and short circuit currents up to 130kA.

Power: Tripping functions shall be self-powered, requiring no auxiliary power source. Trip system memory shall be non-volatile and shall not require battery back-up or other control power to retain stored information. A battery or other power source must be provided for metering, interrogation and to change settings when the breaker is not energized. The battery must be a common "off the shelf" device.

Environment: The trip device shall operate in an ambient temperature range from -20°C to +55°C. The unit shall 1) employ active and passive filtering techniques, 2) be impervious to and not have false operation due to EMI or RFI from any source as demonstrated by satisfactory testing in accordance with ANSI standards C37.90.1 and C37.90.2, respectively.

Display: The device shall include the ability to view protection settings, modify protection settings with password authorization, view metering data and view operational history.

Voltage Source Requirement: Voltage information for the system and for the trip device metering displays shall be derived by direct connections to the three phases of the circuit breaker being interrogated in order to retain the correct time relationships for power calculations. Circuit breaker-mounted potential transformers (PT's) shall condition the voltage signal for use by the trip system voltage interfaces.



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