



# 489 Generator Management Relay

## Chapter 2: Introduction

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### 2.1 Overview

#### 2.1.1 Description

The 489 Generator Management Relay is a microprocessor-based relay designed for the protection and management of synchronous and induction generators. The 489 is equipped with 6 output relays for trips and alarms. Generator protection, fault diagnostics, power metering, and RTU functions are integrated into one economical drawout package. The single line diagram illustrates the 489 functionality using ANSI (American National Standards Institute) device numbers.

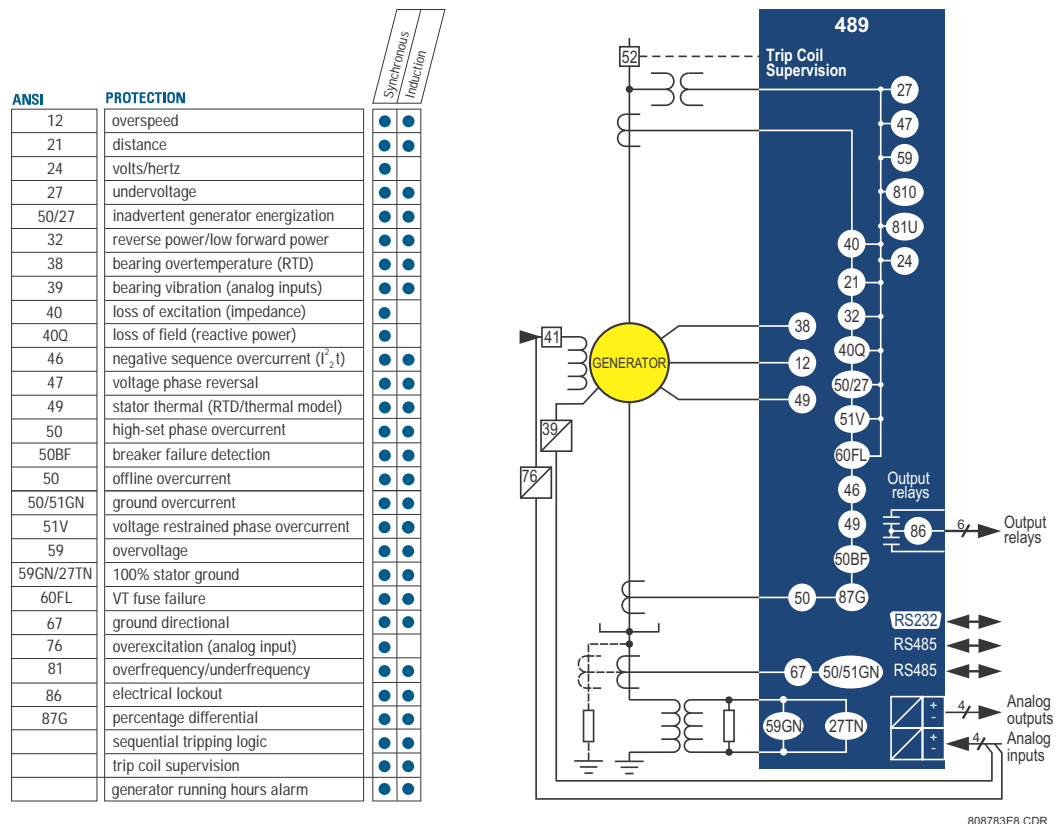


FIGURE 2-1: Single Line Diagram

Fault diagnostics are provided through pretrip data, event record, waveform capture, and statistics. Prior to issuing a trip, the 489 takes a snapshot of the measured parameters and stores them in a record with the cause of the trip. This pre-trip data may be viewed using the NEXT key before the trip is reset, or by accessing the last trip data in actual values page 1. The event recorder stores a maximum of 256 time and date stamped events including the pre-trip data. Every time a trip occurs, the 489 stores a 16 cycle trace for all measured AC quantities. Trip counters record the number of occurrences of each type of trip. Minimum and maximum values for RTDs and analog inputs are also recorded. These features allow the operator to pinpoint a problem quickly and with certainty.

A complete list protection features is shown below:

Table 2-1: Trip and Alarm Protection Features

Trip Protection	Alarm Protection
Seven (7) Assignable Digital Inputs: General Input, Sequential Trip (low forward power or reverse power), Field-Breaker discrepancy, and Tachometer	7 assignable digital inputs: general input and tachometer
Offline Overcurrent (protection during startup)	Overload
Inadvertent Energization	Negative Sequence
Phase Overcurrent with Voltage Restraint	Ground Overcurrent
Negative-Sequence Overcurrent	Ground Directional
Ground Overcurrent	Undervoltage
Percentage Phase Differential	Overvoltage
Ground Directional	Volts Per Hertz
High-Set Phase Overcurrent	Underfrequency
Undervoltage	Overfrequency
Overvoltage	Neutral Overvoltage (Fundamental)
Volts Per Hertz	Neutral Undervoltage (3rd Harmonic)
Voltage Phase Reversal	Reactive Power (kvar)
Underfrequency (two step)	Reverse Power
Overfrequency (two step)	Low Forward Power
Neutral Overvoltage (Fundamental)	RTD: Stator, Bearing, Ambient, Other
Neutral Undervoltage (3rd Harmonic)	Short/Low RTD
Loss of Excitation (2 impedance circles)	Open RTD
Distance Element (2 zones of protection)	Thermal Overload
Reactive Power (kvar) for loss of field	Trip Counter
Reverse Power for anti-motoring	Breaker Failure
Low Forward Power	Trip Coil Monitor
RTDs: Stator, Bearing, Ambient, Other	VT Fuse Failure
Thermal Overload	Demand: Current, MW, Mvar, MVA
Analog Inputs 1 to 4	Generator Running Hours
Electrical Lockout	Analog Inputs 1 to 4
	Service (Self-Test Failure)
	IRIG-B Failure



NOTE

The following protection elements require neutral-end current inputs.

- Distance Element
- Offline Overcurrent
- Phase Differential