

The GPM-40 is the Generator Protection Module of the Powerbase Platform. The GPM's multiple input measurement functions and high speed trip capabilities make it a flexible and low cost protection system. The Module is designed for 3 phase electrical power generation systems and is combined with the TCM-30/40 Turbine Control Modules, in a turbine/generator set.

The GPM-40 monitors instantaneous and timed voltage (4 channels), current (8 channels) and frequency inputs. There are 10 channels of RTD temperature sensing, 4 user-defined alarm inputs and 4 user-defined trip/lockout inputs. A fixed setpoint, synchrocheck relay is included as a backup to the TCM's programmable relay. The GPM provides dry contact relay control of protection closure and release. Simultaneously, an error/status message is transmitted to the TCM-30/40 and Powerbase SCADA Modules.

The GPM-40 does not allow breaker re-closure until all protection parameters, and reclose timer are within their defined range. It also allows trip/lockout relaying for each protection function.

The GPM-40 meets protective functions of IEEE Std 37.102-1995 and environmental testing to IEC requirements.

The GPM-40 is programmed with the Powerbase Setup Guide. The guide is Windows compatible and features step-by-step programming instructions, on-line help and rule checks. The rule checks prevent the user from inadvertently entering the incorrect setpoint values.

All Powerbase Modules mount in the standard switchgear cabinet for each turbine/generator set. Wiring terminates to plug sets on the module which creates neat and easy wiring and maintenance.

CT inputs have plug sets with a screw in flange for securing connectors to prevent inadvertently disconnecting the units.

Real Time Protection and Monitoring	Electrical Protection Functions
 RMS Voltage (3 phases) RMS current (phase and differential) neutral current (low/medium & high impedance grounding) exciter/optional current (1 channel) kWatts, kVA and kVars displays non-revenue energy metering frequency power factor reverse power temperature alarm and trip/lockout (10 channels) user defined protection inputs (4 alarm, 4 trip/lockout channels) over/under setpoints instantaneous or timed protection synchrocheck relay trip or lockout relaying 	 rotor ground fault (64R) underexcitation (40) breaker Fail (50BF) Stator Neutral Point Voltage Define Time (59N) Stator Neutral Point Current (50N & 51N) Stator Neutral Point 3rd Harmonic (27TN) differential Stator-Transformer current (87G) under impedance (21) terminal over-voltage (59) and under-voltage (27), Terminal Voltage Imbalance (60) terminal over-current: Instantaneous (50) and timed (51, 51T) auxiliary over-current: Instantaneous (50) and timed (51) current Imbalance Definite Time (46) over frequency (81O) and under-frequency (81U) reverse power (32) phase rotation test
 failsafe WATCHDOG monitor 	

GPM-40 Features

GPM-40 Features (continued)

GPM Left Panel Connections	GPM Right Panel Connections
 •power supply input (connection #1) •phase A current input (connection #2) •phase B current input (connection #3) •phase C current input (connection #4) •phase A' current input (connection #5) •phase B' current input (connection #6) •phase C' current input (connection #7) •stator neutral current input (connection #8) •auxiliary current input (connection #9) •phase A/B/C/ to stator neutral point VTs (Wye or Delta) (connection #10) •rotor ground detection (connection #11) •GPM sync check relay N.O. (connection #12) •system I/O (RS-485) bus loop in (connection #13) •system I/O (RS-485) bus loop out (connection #14) •protection OIC relay N.O. (connection #15) •breaker status input (connection #16) 	 power supply input (connection #1) RTD # 1 (connection #1) RTD # 2 (connection #2) RTD # 3 (connection #3) RTD # 4 (connection #4) RTD # 5 (connection #5) RTD # 6 (connection #6) RTD # 7 (connection #7) RTD # 8 (connection #8) RTD # 9 (connection #9) RTD # 10 (connection #10) trip input #1 (connection #11) trip input #2 (connection #13) trip input #3 (connection #13) trip input #1 (connection #15) alarm input #3 (connection #16) alarm input #4 (connection #17) alarm input #4 (connection #18) high speed serial (RS-232) data capture bus (connection #19)

Figure 1 GPM-40 Connections and Protection Functions



GPM-40 Technical Specifications

Input/Output			
voltage input	•120 VAC nominal maximum		
overvoltage	•3 x Vmax		
current	•5A nominal maximum		
overload	•15A continuous, 150A 1second		
user auxiliary protection	•dry contact S.P.S.T., N.O. to trip, 277 VAC/30 VDC @ 10A resistive		
control relays	•dry contact form "C", 277 VAC/30 VDC @ 10A resistive		
Monitor Specifications	Resolution	Range	
voltage	0.1%	0-9,999 V	
current	0.1%	0-9,999 A	
power factor	0.1%	+0.6 to -0.6	
frequency	0.01Hz	5-199Hz	
active power (kWatts)	0.1%	100MW	
reactive power (kVAR)	0.1%	100MVAR	
apparent power (kVA)	0.1%	100MVA	
RTD temperature sensing	1°C	0-201°C	
Setpoint trip timing	1 cycle	0-9,999 cycles	
Communication			
intermodule	•proprietary high voltage Optocom (RS 485) "system" bus		
intergenerator/switchgear	•proprietary high voltage Optocom (RS 485) "global" bus		
Isolation/Communications			
 high voltage, optically coupled proprietary Optocom (RS-485) communication interface between Powerbase Modules, 1500 VAC high potential test isolation between bus and module all logic circuits are ground potential 			
General			
power supply voltage	•world universal;100 to 240 VAC, 50/60 Hz. or 110 VDC to 340 VDC		
power supply current	•power supply current 0.4 amperes, AC or DC		
temperature	•operating temperature -10°C to 50°C, ambient air, storage temperature -20°C to 75°C		
humidity	•0 to 95%, non-condensing, conformally coated circuits		
EMC/transient protection	 meets European EMC Directive 1997, including radiated, conducted and immunity to EMC and electrical fast transients (IEC 801 and CISPR 11 and 14) 		
shipping weight	•less than 5 kg		