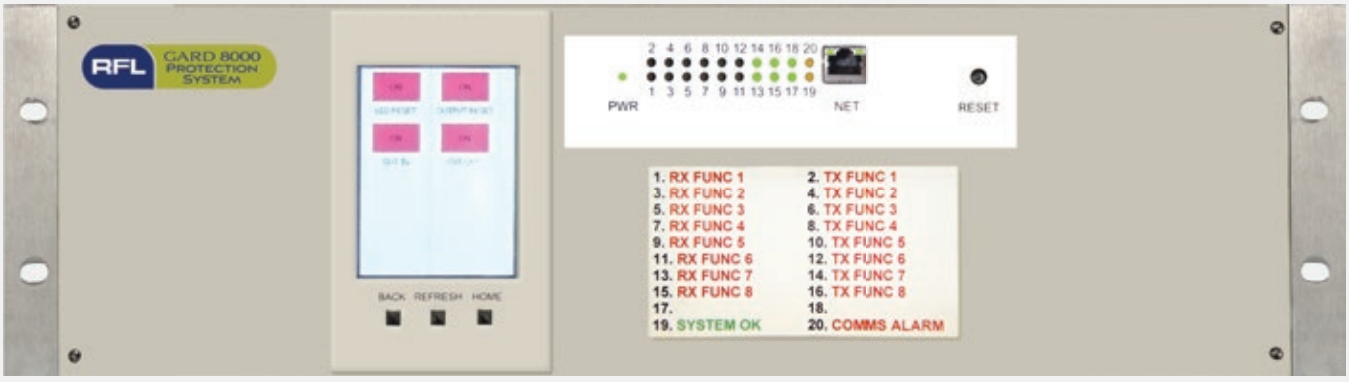
SOLUTIONS FOR AN EVOLVING WORLD

RFL GARD RAS

Remedial Action Scheme (RAS) Module



Your world is changing and so are we.

At RFL, we know your needs change much faster than your infrastructure. Our comprehensive line of solutions meets you wherever you are to help you bridge the gap from yesterday to tomorrow.

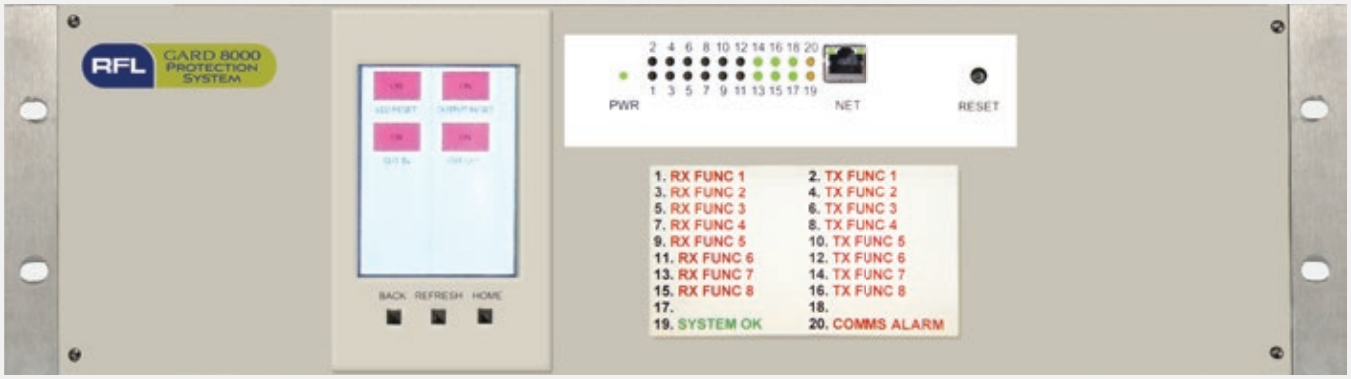
We aren't just engineering products. We are continuously innovating to give legacy equipment the advantage of today's technologies. Our highly adaptable solutions offer more features for more flexibility and a custom fit for your specific needs.

When we deliver, we also deliver our reputation. So when you open that box, you're opening a custom-engineered solution, factory-tested and ready for deployment.

And as long as you own that equipment, you own the attention of RFL. We see you as our partner and we want to ensure that our solution is working for you – now and over the long haul. RFL – delivering solutions that work. Period.

GARD 8000

Remedial Action Scheme (RAS) Module



System Features

Each RAS module processes four voltages and five currents from 5 A, 120 V rated input transformers

Alternatively, the RAS telemetry module can be used for +/- 20 mV transducer inputs

Watts, VArs, RMS currents, RMS voltages and frequency

- RAS telemetry module can be used for +/- 20 mV transducer inputs
- Settable thresholds
- Programmable math functions include scaling, offset, adding, subtracting and multiplying

Analog values are sent via DNP 3.0 over TCP/IP

High capacity status transfer unit sends 96 binary states over a single 64 kbps channel slot

Install up to eight RAS Modules in one chassis

Use for different circuits or in redundant configuration

Supports NERC/FERC security standards

DNP3, Level 2 compliant•

A wide range of communication interfaces to choose from:

- T1/E1
- RS-449, 56 -768 kbps
- X.21, 64-768 kbps
- V.35, 64-768 kbps
- G.703, co-directional, 64 kbps
- ANSI C37.94 fiber
- Fiber, multi-mode or single-mode; up to 100 km
- Audio Tone, 2 wire or 4 wire

Install up to ten communications interfaces in one chassis

One GARD 8000 supports up to 24 64 kbps communication channels

Selectable type and number of inputs and outputs

Opto-coupler inputs

Solid state, relay, or latching outputs

Applications

Remedial Action Schemes (RAS) are designed to monitor and protect electrical systems by automatically performing switching operations in response to adverse network conditions to ensure the integrity of the electrical system and avoid network collapse.

Typical automatic remedial actions include:

- Generator tripping for reduction of energy input to the system
- Tripping of load, insertion of braking resistors, series capacitors, opening of interconnecting lines and system islanding

Remedial Action Schemes (RAS) are often applied to large power systems for control of the system during severe abnormal conditions when traditional localized control is inadequate. Recent events such as 9/11, Hurricane Katrina, Tsunamis, and others have shown that now more than ever, complete backup RAS control centers are essential to disaster recovery.

RAS systems are typified by large numbers of diverse communication paths providing real time information from a wide geographic area. The communications paths are usually a mix of every media available from lease circuits, to audio circuits, to dark fiber, and recently, IP networks. These communication systems are all designed to transport data from substations and deliver it in real time to a single site for use by the RAS control computers. Traffic from the control centers to the substations allows control of the power network.

In planning a second control center, the issue of delivering the same information to two geographically separated sites at the same time becomes paramount. Today technology allows the users to meet the challenge to accomplish this with a minimum of impact on field equipment while using the existing communications paths. The use of modern IEDs can minimize the equipment needed to collect the field data and to transport the variety of processed or raw information needed for operation of RAS.

The amount of raw data available in a power system can easily overwhelm the bandwidth available to communicate it back to the control center. The GARD 8000 RAS module provide ways to reduce the amount of raw data by pre-processing it prior to transmission. It can prove to be very inefficient to transport all of the raw data only to combine the various values after the data arrives at the control center. If the mathematical combination and simplification can be done at remote sites, the required communication bandwidth is reduced.

Once mathematical capabilities are introduced at the measurement sites or substation level, data can be normalized so that all of the variability in collection methods and sensors is isolated from the control center. Localized changes only need to be normalized to the previously expected values, thereby eliminating any impact on the control center programming.

The RAS action is generally performed by a central controller. The controller needs data collected by field units; the GARD 8000 RAS Module. The field units are capable of measuring currents and voltages and/or transducer quantities (W, VAr) and deliver these to the central unit for evaluation and comparison with data from other points in the power system. The GARD 8000 also acts as a remote controller, such as performing breaker operations via programmable logic and inputs/outputs when a command is received from the central unit.

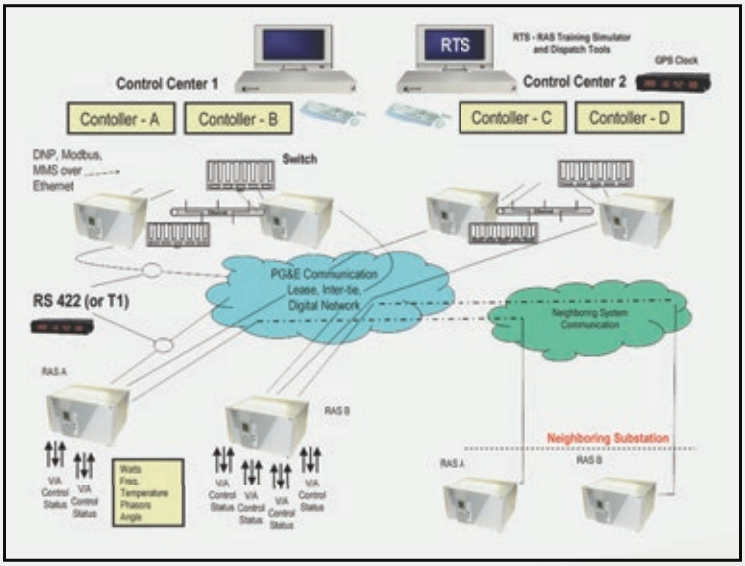


Figure 1. Typical RAS Application

Technical Specifications

Metering Module

The Metering Module measures/calculates floating point values and sends them via a control bus to a Status Webpage. Each of the measured values has a settable lower and upper threshold. For all of the thresholds, multiple units can be set with different pickup values and time delays. The following 32 bit values are measured.

The result of these threshold measurements are web page status indications and logic bit outputs that can be sent via the teleprotection system function. The analog values can be displayed on a web page and eventually combined with other values mathematically and sent via DNP over an IP link to a control center.

Phase A current	Positive sequence current
	Reactive power
Phase B current	Negative sequence current
	Apparent power
Phase C current	Zero sequence current Power Factor
Neutral current	Positive sequence voltage
	Frequency
Phase A voltage	Negative sequence voltage
	Rate of Change of frequency
Phase B voltage	Zero sequence voltage
Phase C voltage	Real power

Ratings

AC Current Inputs

Nominal	5 Amps rms
Coninuous rating	20 Amps rms
One second rating	500 Amps rms
Max reading	160 Amps peak
Accuracy	+/- 0.1% or +/- 2 ma (whichever is greater)

AC Voltage Inputs

Nominal	110/120 Vac
Continuous rating	220 Vac
Max reading	300V Peak
Accuracy	+/- 0.1% (60 to 300V)

Frequency

Range	45-65 Hz
Accuracy	+/-0.001 Hz (15 ppm)

Power Accuracy (>1 Amp load current)

Watts	(0 o,180o)	+/- 0.3%
	(15 o,165o)	+/- 0.5%
	(45 o,135o)	+/- 1%
	(74 o,105o)	+/- 5%
Vars	(15 o,165o)	+/- 5%
	(45 o,135o)	+/- 1%
	(74 o,105o)	+/- 0.5%
	(90o,- 90o)	+/- 0.3%

Settings

Phase A-C Voltage Inputs

- Nominal Level
- Input Scaling
- Lower Threshold
- Upper Threshold
- All thresholds are provided with hysteresis

Phase A-C Current Inputs

- Nominal Level
- Input Scaling
- Lower Threshold
- Upper Threshold

Frequency

- Phase to be used for frequency measurement
- Lower Threshold
- Upper Threshold

General

- Station Label
- Watts Lower Threshold
- Watts Upper Threshold
- Vars Lower Threshold
- Vars Upper Threshold
- DNP Slave Address

Status Reported

- Phase A-C
- RMS Voltage
- Lower Voltage threshold not exceeded
- Upper Voltage threshold not exceeded
- RMS Current
- Lower Current threshold not exceeded
- Upper Current threshold not exceeded
- Megawatts
- Mvars
- Frequency
- Frequency Lock achieved
- Station Label

Technical Specifications (continued)

Telemetry Module

The telemetry module has 8 analog -10V to +10V signal inputs.

Precision resistors on the board will be jumper selectable to allow ranges of

-20 to +20 ma (250 ohms)
-50 to +50 ma (100 ohms)
-5 to +5 ma (1000 ohms)

Programmable gain stages will allow the fine tuning of these ranges into 4 to 20 ma. The programmable offsets and gains will allow scaling of the input to any value.

Analog Inputs

-10V to + 10V

Input Impedance

Greater than 5.0 M Ohms for both differential and common mode

Calibration Input

-10V to + 10V

Accuracy

@ +25 o C +/- 0.05% of full scale

Drift 0.003% /ºC over operating temperature range. Six-month drift for identical input value and identical temperature is 0.01 % maximum.

Resolution

16-Bit

96-bit Digital Teleprotection System Module

The GARD 96-Bit Digital TPS Module consists of a single teleprotection (TPS) channel. The TPS channel is capable of transmitting and receiving up to 96 independent and simultaneous bidirectional commands over a single communications interface. The TPS channel utilizes its own addressing and channel delay measurements. Addressing and Channel Delay measurements are sent and received with each message.

Rating	No Operation	Operates	Max Input Voltage
24	<14	>19	36
48	<28	>37	68
125	<70	>94	150
250	<140	>189	300

I/O Specification

Optically Isolated Inputs

Quantity: Six per module
Jumper selectable
Input Voltage: 24/48/125/250 Vdc
Input current: minimum 1.5mA
Minimum Pulse Width: 0.03 ms, additional debounce timeset with logic time settings

Solid-State Outputs (dry contacts)

Quantity: Six per module
Output Current: Maximum 1 A continuous, 2 A for one minute, or 10 A for 100 msec
Open-Circuit Voltage: 300 Vdc maximum
Pick-up Time: 0 msec

Relay Outputs (dry contacts)

Quantity: Six per module
Relay Pick-up Time: 4 msec
Output Current Rating: 6 A continuous
Surge: 30 A for 200 msec

Environmental Requirements

Operating Temperature
Full performance
{-20° C to + 70° C (-4 F to 158° F)}
Humidity 0 to 90%

Notes

RFL Electronics Inc.
353 Powerville Road
Boonton, NJ 07005, USA

Tel: 973.334.3100
Fax:973.334.3863
www.rflelect.com