
Powerbase
automation systems inc.
Low cost,
modular
automation
and protection
from water
to wire

Introduction

Yves Grandmaitre, VP Sales and Marketing Powerbase Automation Systems Inc.

Typical small hydro station, Gatineau, PQ

Powerbase was establish in 1997 in Carleton Place Ontario. Powerbase is an offset of its sister company, Sequence Controls. Our staff of 55, is responsible for all aspects of the design, manufacturing and engineering process for both firms.

Powerbase Automation Systems Inc. designs and manufactures operation and protection equipment for small hydro power stations, typically to 20MW, which is enough to provide power to a typical mid size town.

Our system, the Powerbase Platform, uses a unique approach to hydro power generation. We use interconnected modules to operate, monitor and protect each piece of power station equipment. This modular flexibility offers:

- site-specific system design
- lower capital cost
- easy configuration and upkeep

Powerbase markets include Canada, US, China, Central America and Poland

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What Makes Us Unique?

China, Summer 2000, a typical Chinese hydro power system. Powerbase Modules work well with older Chinese technology.

A typical power station's protection/control devices use generic programmable logic controllers, (PLC), and/or a combination of control components from several manufacturers. It requires considerable system integration for each of these separate devices to communicate and operate with each other. Often the cost of developing the software for a PLC based system, exceeds the cost of the actual units.

The Powerbase Platform uses a flexible modular system of power generation control and protection which permits more site specific control features. The operating controls are separate from protection controls and provides redundant protection features. It's not unlike a software suite such as Office 2000. Each component in the suite is able to recognize and communicate with each other.

Each Powerbase Module contains a series of high speed microcomputers and fault tolerant safety circuits. Each Module is pre-coded with the necessary operation function. Station staff are able to tie new inputs into the program structure with few additional programming costs.

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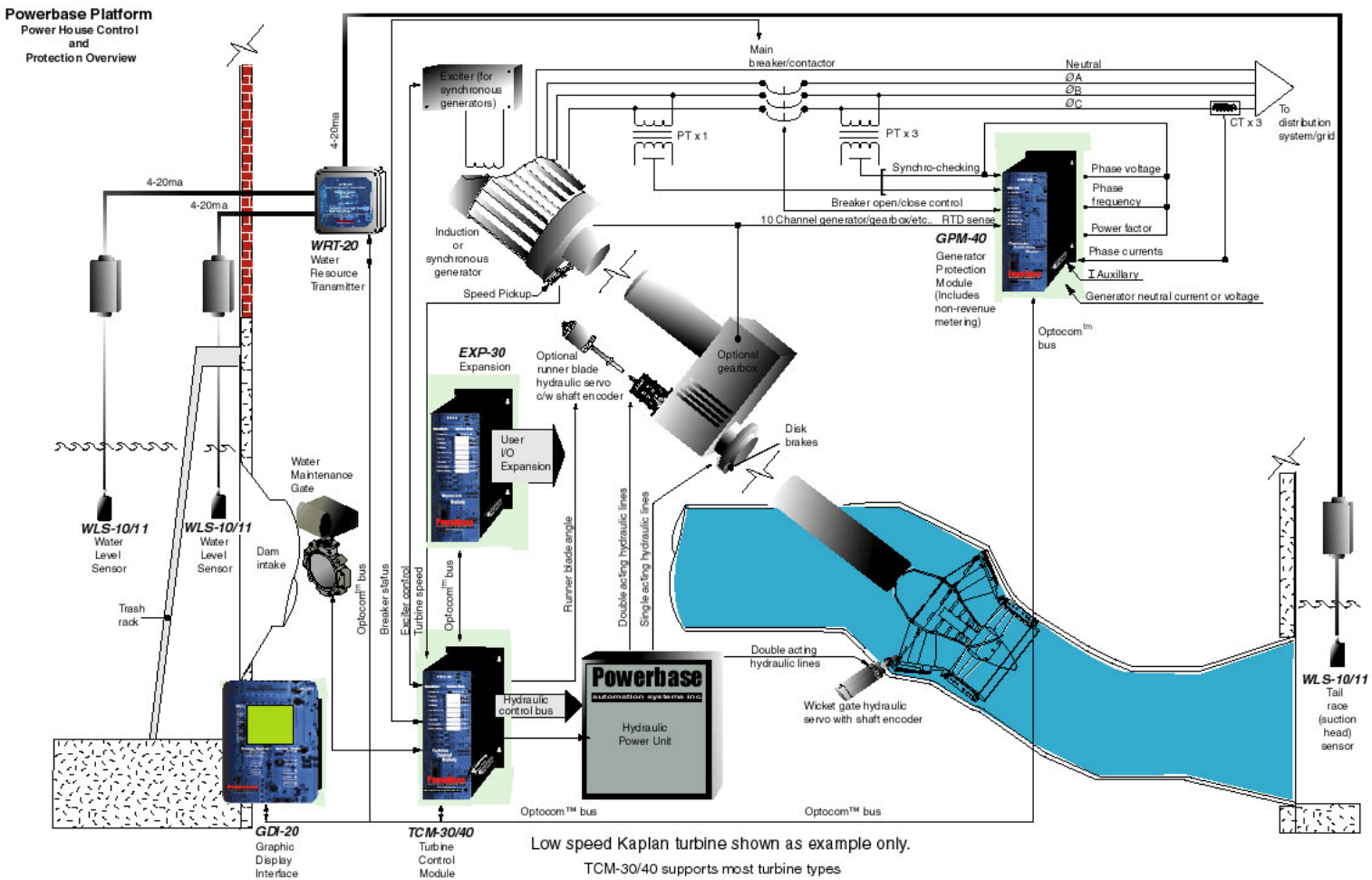
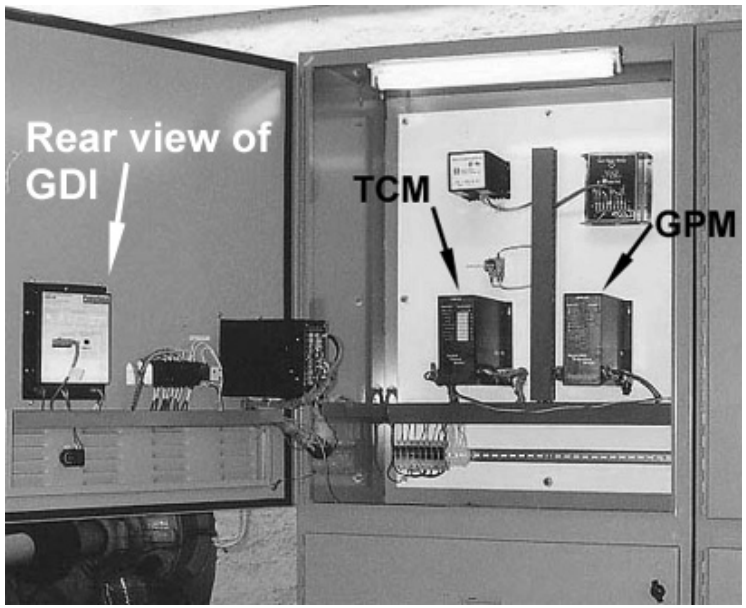
Hydro Power Generation 101



How We Got Started



All Powerbase Modules mount in a standard switchgear cabinet for each turbine/generator set.

In 1996 Sequence Controls was contracted to design an inexpensive control system for a turbine manufacturer. Our efforts produces the Turbine Control Unit (TCU-10).

The project lead to another contract, this time to design a protection device, the Quality of Power Relay (QPR-10).

As our products gained more recognition, we realized that a niche market existed for an integrated control and protection system.

To learn more about renewable energy, we created a partnership with NRCAN renewable technologies division hydraulic program.

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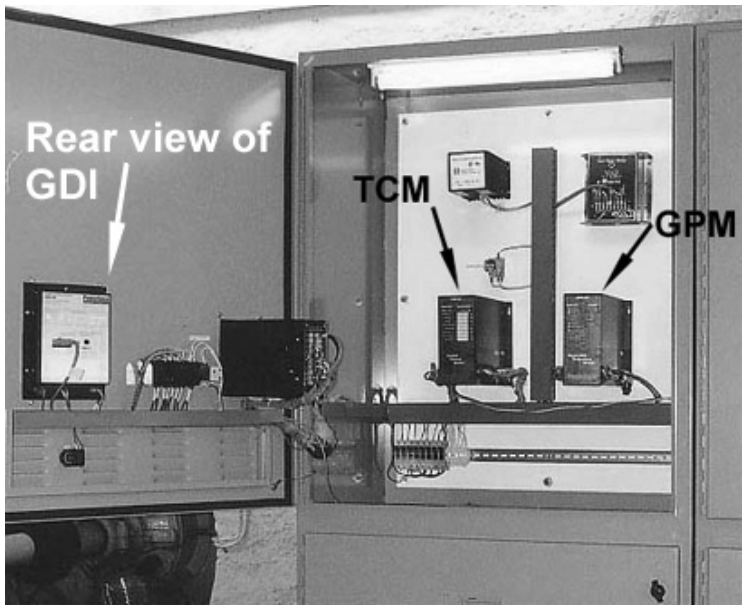
Main Powerbase Hardware



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The main hardware of the Powerbase Platform includes:

- Graphic Display Interface
- Turbine Control Module
- Generator Protection Module
- Hydraulic Power Unit

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Graphic Display Interface

The GDI-20 is a device that communicates with, and displays information from the various Powerbase Modules associated with a single turbine/generation set.

The GDI-20 gathers data from all the Powerbase Modules and displays operation, protection and metering information. The user is able to monitor and adjust all aspects of the system.

When an alarm or trip condition occurs, the GDI-20 displays the type of (operation or protection) alarm/trip and either warns the user of a potential problem or shuts down the system.

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Turbine Control Module

This Double Camelback Francis turbine/generator, built in 1903, is controlled by the TCM-30 at Galetta station near Arnprior

The TCM-30, as its name states, controls the operations of the turbine. The TCM-30 controls turbine speed, and ensures synchronization with the power grid.

Furthermore, the TCM-30 controls peripheral equipment such as water level sensors/transmitters and the hydraulic power unit.

The embedded controllers operate most types of turbines and associated peripheral equipment.

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Generator Protection Module

3 x 450 kW induction generator installation, Appleton Station, near Almonte Ontario.

The GPM-40 monitors instantaneous and time voltage, current and frequency inputs.

The GPM-40 has direct control of the main circuit breaker. When the GPM-40 software discovers any invalid parameter or setting, it immediately, opens a relay, shutting the system down.

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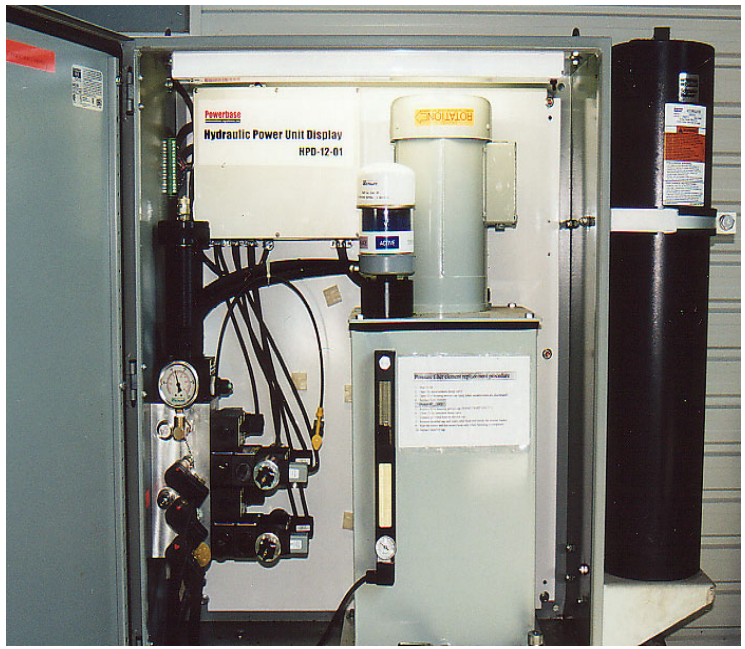
Hydraulic Power Unit



HPU Model 12. Note the neat wiring and easy access to hoses.

The HPU controls various hydraulic systems of a turbine such as:

•wicket gates position

•runner blades position

•emergency shutdown sequence

The unique high pressure manifold system is easily accessible and replaces many of the hydraulic hose connections which prevents leaky seals.

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Programming the Modules

The entire Powerbase Platform is programmed with the Powerbase Setup Guide software.

The software allows the user to enter system parameters for each function of a particular Module.

The software uses an “expert system” to prevent the user from inadvertently entering an incorrect system parameter. The software also saves a text file of each Module’s settings.

Once programmed, the data is downloaded and saved into each specific Module. In case of any changes to the parameters, the user can update and download the new information in a matter of minutes.

The Setup Guide software allows the user to program the Powerbase Expansion Module without any programming knowledge. The user enters basic English language sentences to build actions which are performed by the EXP-30.

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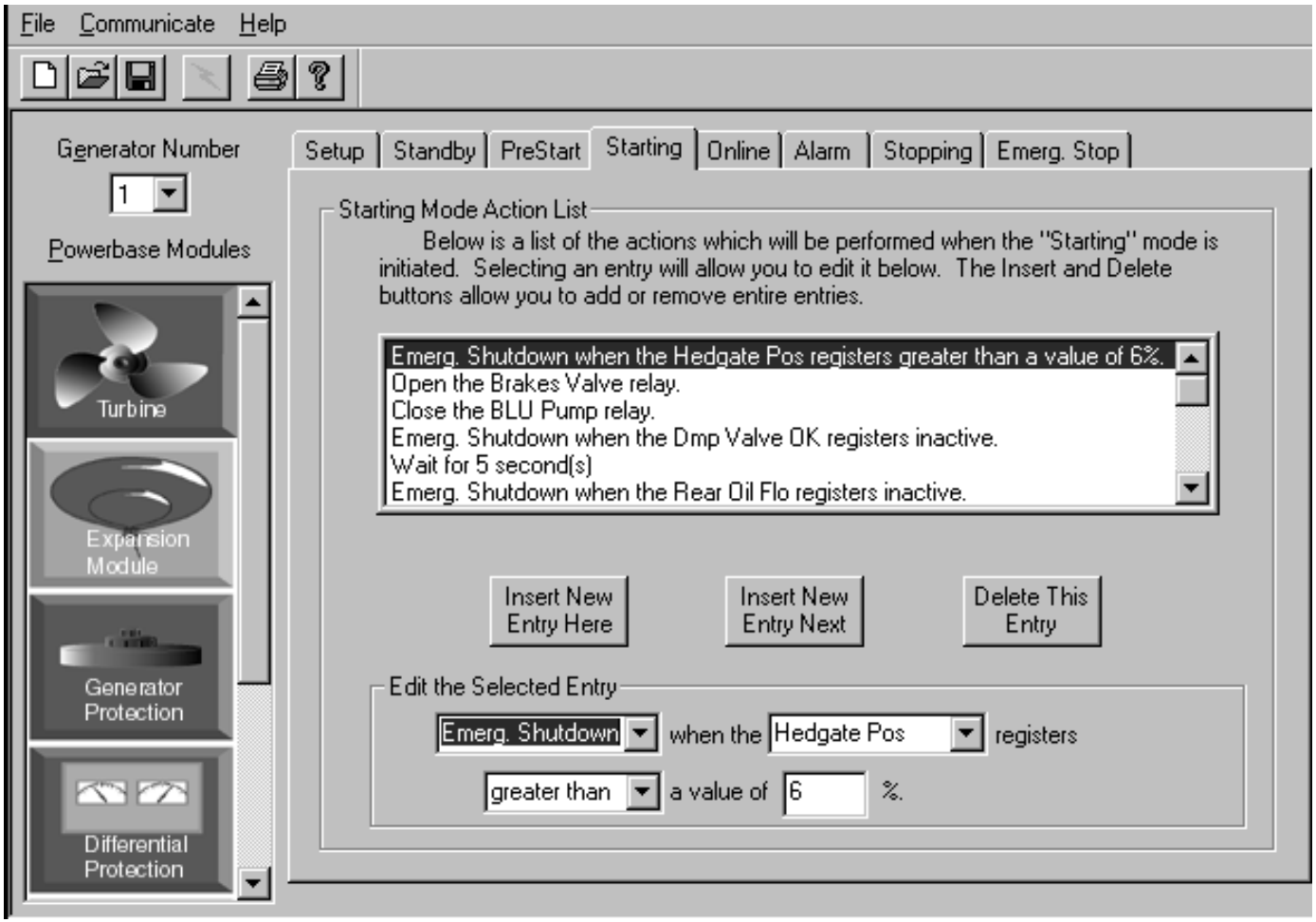
Setup Guide Example



Example of basic English language structure used to program the Expansion Module

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Powerbase ProSCADA

Can you operate and monitor the station from a remote location?

The Powerbase ProSCADA software allows the user to perform three main tasks.

•monitor real time data and operate multiple power stations from a remote location

•create comparison data in a graph or table format

•log station activity

The software automatically stores all the log information in a MS Access file on your computer's C drive.

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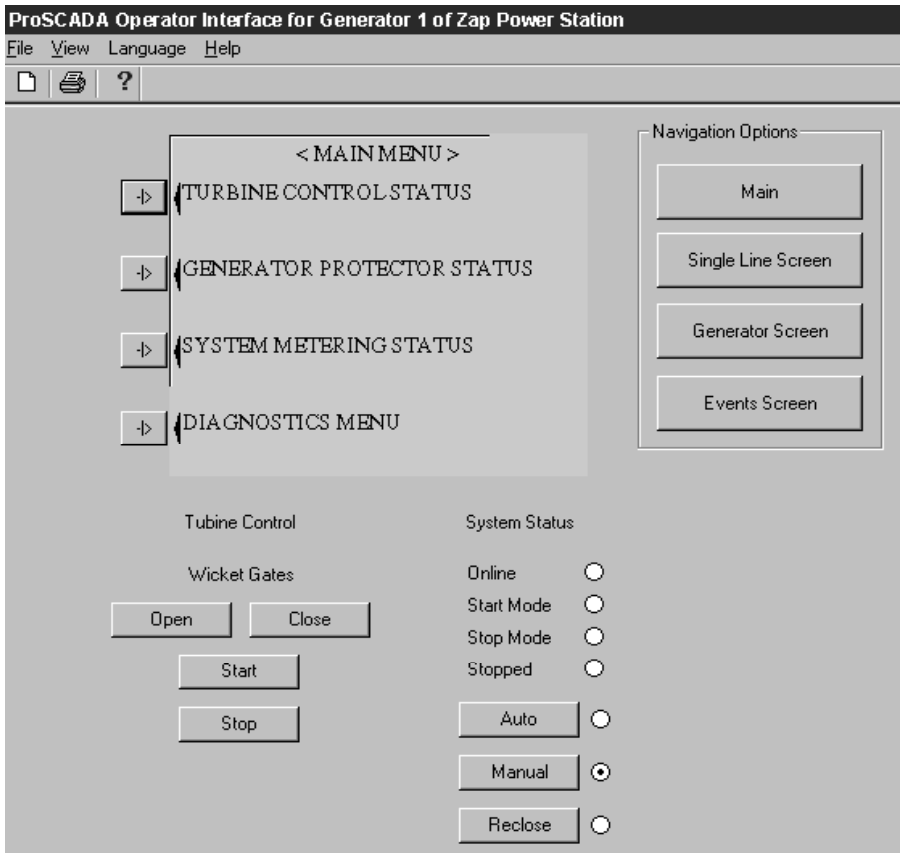
Monitoring a Station



ProSCADA's GDI-20 features. A virtual GDI-20 is displayed on the remote computer screen. All the data is real time.

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Challenges

How to best penetrate new markets?

The Powerbase Modules and engineering expertise represent only 5-10% of the cost of establishing a power station. As a result, we do not substantially influence the decision making process.

The largest cost (not including infrastructure such as construction costs) is the cost of turbine/generator sets.

The second largest cost is the electrical equipment, such as transformers and switchgear.

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Markets

China represents about 48% of the world market for small hydro station retrofit and new station development.

Other markets include:

2. Europe

3. Asia (excluding China)

4. South America

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Partnerships

Our current partners include:

- Hangzhou Regional Center for Small Hydro (state enterprise)
- Asia Power (private enterprise)
- Eastern River Power (private enterprise)
- ABB Hydro, Burlington, Ontario
- Mavel NA, Toronto, Ontario, which represents a Czech turbine manufacturer.

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Marketing Issues

Yves juggling so many things!

- financing
- product development
- servicing
- market expansion
- with limited resources, how much will this cost Sequence Controls?

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More About Powerbase

If you wish to learn more about the company or to obtain a copy of this presentation, visit us at www.powerbase.com or email info@powerbase.com

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