NAPS Power of Light

NSCi is a powerful programmable system controller that provides an efficient and sophisticated control system to prolong battery life and performance. Its design is based on our field experience, battery testing and controller development over a period of more than 15 years.

The control functions include:

- Control of up to six photovoltaic (PV) arrays.
- Prioritised two load disconnect/reconnect scheme.
- Control of up to two backup generators.
- Control of heating / cooling of battery shelter.
- Timed boost charging.
- Backup generator exercise cycles.

The NSCi's functions are set for individual system requirements by software, either through a PC link or by using the integral keyboard and LCD display. A modem allows remote data transfer, automatic alarm indication and remote system control. Other features include: reserve controller (optional), independent onboard battery for maintaining memory and clock, and extensive data logging facilities for array, battery, load (and solar irradiation with suitable external sensor).

NSCi System Controller

The NSCi microprocessor controller is our top of the range control system for remote stand-alone photovoltaic or hybrid power systems. It is ideal for larger power systems where extensive data logging and flexible system control are required, e.g remote telecommunications sites, village power supplies,etc. NSCi system hardware is configured for individual system requirements.

Charge control modes (Battery charge control)

Charging regimes (control sets) are factory defined, and are available for different battery types, such as vented or sealed lead-acid batteries, or flooded nickel-cadmium batteries.

The NSCi has three basic modes of charging:

Normal or bulk charging. In this mode all available battery charging current is used for charging. This can be provided by the photovoltaic array or a combination of power sources.

Float charging. This is used to finish the charging cycle efficiently and then maintain the battery in this charged state.

Periodic boost charging. This is a time dependent overcharge, which provides controlled gassing to mix electrolyte and remove stratification. It also compensates for the decrease in charging efficiency near 100% SOC (State Of Charge).

Solar charge control (photovoltaic arrays)

In a typical NSCi-controlled power plant, photovoltaic arrays are the main source of energy. Up to six subarrays can be used. NSCi uses these all subarrays for main charging and then "fine tunes" the current when batteries are reaching full charge by altering the number of connected subarrays. This allows for smooth charging control, especially when the subarrays are of different sizes.

Generator control (Diesel generators)

If the system is equipped with one or two backup generators, NSCi allows optimum compromise between the annual operational time of the generator and the allowable depth-of-discharge of the batteries. If two generators are used, NSCi automatically starts them alternately to keep their operating hours equal. NSCi has separate alarm inputs for the two generators, and if one of the generators gives an alarm signal, NSCi will automatically switch over to the other generator.

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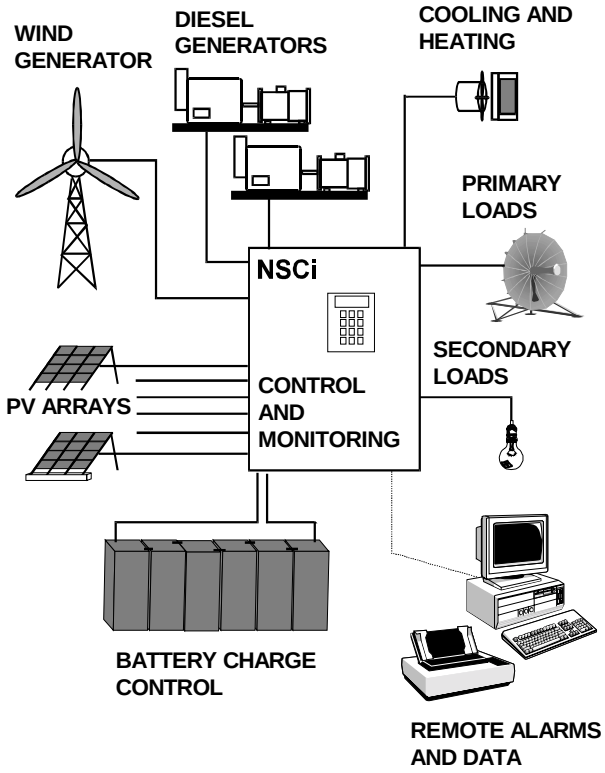
Provision is made for automatic periodic diesel exercise runs. A diesel start/stop log is kept for performance analysis purposes.

NSCi controls



Auxiliary generator control

An auxiliary generator, such as a self-controlling wind generator may also be included in the system as another power source. NSCi will include generator output in data logging and state of charge calculations.

Shelter temperature control (Cooling and heating)

In very hot or cold climates it may be necessary to use cooling or heating systems to keep the equipment shelter within acceptable temperature limits. The NSCi has two optional relay outputs for controlling such systems, using the battery temperature as the control signal. If predefined limits are exceeded, an alarm signal is also activated.

Load management control (Primary and secondary loads)

Load management control protects the battery bank from undergoing deep discharges. As flooded batteries may have higher capacities at low rates of discharge, the NSCi uses both S.O.C. calculations and battery voltages to assess remaining battery capacity.

Load management is based on two load circuits. The secondary (less important) load circuit can be switched off if the battery becomes deeply disharged, in an attempt to maintain the primary (most important) load circuit active. Reconnection will take place when the battery is sufficiently recharged.

Operation

A PC link is the main user interface, but a 12-key membrane keyboard is also available for on-site interrogation. A back-lit 4-row LCD display is used as a local display.

Communications & remote supervision

NSCi has one fully-isolated RS232-compatible serial communications channel for remote supervision purposes.

Remote communications enables:

- Supervision of plant operation.
- Automatic sending of alarms to remote supervision sites.
- Long term plant performance logging.
- Control and excercise runs of back-up generators.

NSCi supports both point-to-point or networked system operation.

Communications to and from NSCi and supervision can be made in various ways, e.g:

1. Direct NSCi to PC link with RS232 cable
2. Telecommunications service channel connecting a network of NSCi's with V11/RS485 converters (e.g. in a chain of repeater stations).
3. V32 external modem (for public telephone or high speed analog service channel)
4. V22 external modem (for low speed analog service channel)
5. FM wireless radio modem
6. GSM cellular phone direct connection
5. V11/RS485 compatible modem or converter (for digital service channels)

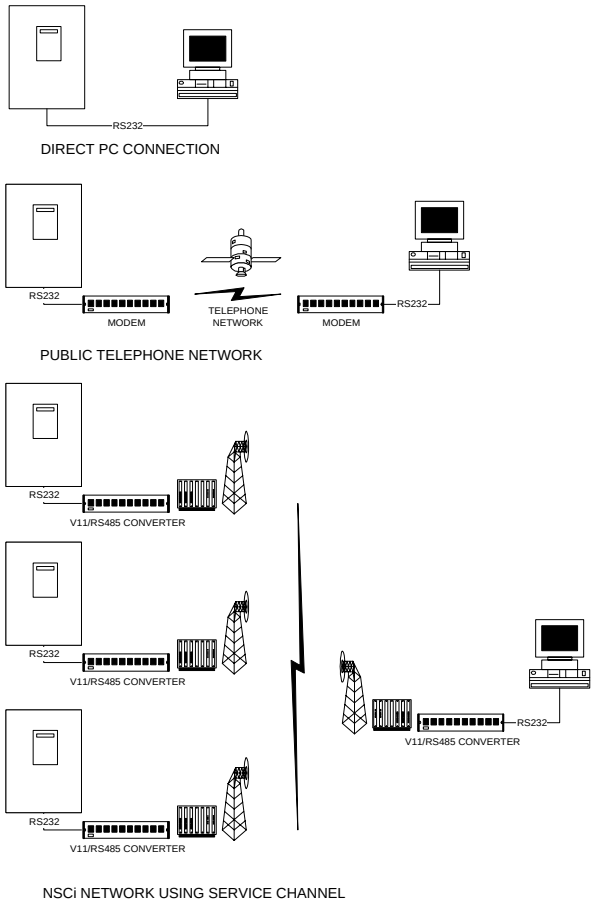
Please consult us for the most suitable communications equipment for your application.

Alarms

The NSCi has several alarm functions to warn the plant supervisor about abnormalities in the operation of plant or controller. These alarms can be based on measured and calculated values, signals from external transducers (e.g. electrolyte level) or controller self-diagnostics.

If the remote communications option is used, alarms can be automatically transmitted by to a supervision site.

NSCi keeps an alarm log which records the most recent alarms with the date and time when the alarm condition started, type of alarm and, once the fault condition has been cleared, date and time of the end of the alarm condition. This alarm log can also be studied remotely.



NSCi NETWORK USING SERVICE CHANNEL

Data logging

The NSCi has data logging functions which are indispensible in analysis of power plant performance. It keeps track of minimum and maximum values of battery voltage, state-of-charge, temperature, PV array current, battery current and load current. If a suitable external sensor is used, it will also record the solar radiation. These values can be downloaded either locally to a PC or remotely using a modem through the serial communications channel.

Hardware

A NSCi-based system controller is supplied in an IP55 painted steel enclosure. In addition to the NSCi itself, it also includes sub-array and load power relays, circuit breakers and electrical connectors.

NSCi controllers are configured for specific projects. Basic options to be considered when specifying are:

- type and current rating of the power relays
- power supply range (nominal system voltage)
- remote communications method

Typical specifications and power supply options

1. 12 V nominal (8-20 V dc)
2. 24-60 V nominal (18-100 V dc)
3. Other voltages to special order (e.g. 120 V)

NSCi controllers are compatible both with positive- and negative-gounded systems.

Power relay options (6xPV, 2x load relays)

1. 60 A mercury-wetted (24/48 V) (10 W drain)
2. 30 A (12/24 V) (1.5 W drain)
3. Larger relay options to special order

Analog inputs (measurements)

Total battery, PV, wind generator, backup generator currents

Irradiance (0 to 1.2 kW/sq m)

Battery voltage (0 to +100 V dc standard)

Battery and ambient temperatures

Digital outputs (controls)

Via power relays: 6 PV subarrays, 2 load circuits

Other output relays (relay on unless specified):

Alarm active (relay off), Inhibit reserve controller, Generator 1 run, Generator 2 run, Heating on, Cooling on, Wind generator high voltage output, Modem reset.

Digital inputs (external alarms)

Normal uses for these are: blown fuse, battery electrolyte low level, Generator 1 fault, Generator 2 fault.

Typical enclosure (mm):
760 H x 600 W x 210D, 42 kg

Operating temperature range: -25 to +55° C

Storage temperature range: -40 to +85° C

Power consumption: < 6 W quiescent (typical night-time or during full charging). Power relays add to consumption when arrays or loads disconnected.

Options: Rserve controller, blown fuse indicator switches, battery electroloyte level sensor and irradiance sensor.

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