

Data_Link 2000

APPLICATION NOTE AN003

Using Battery-Powered Radio Outstations

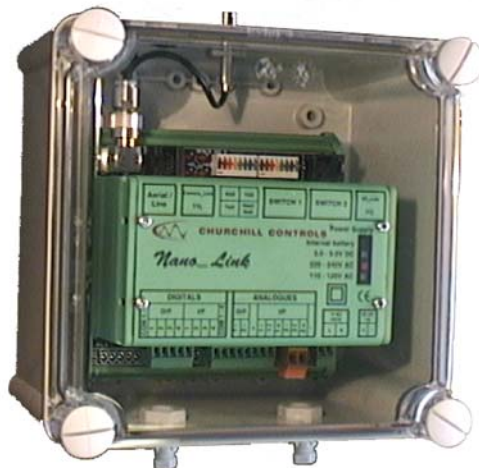
Summary

Although *Nano_Link* can be used as a conventional outstation or base-station, it has been optimised for battery operation. The user needs to be aware of the features and limitations imposed by the power-saving capability.

Outline

If a *Nano_Link* outstation is operated from a mains supply, power consumption is not critical. The radio receiver can thus be continuously enabled so it is ready to respond to any command sent to it by the base-station. For example, the base-station can request a data block comprising 32 digital states and 8 registers, most of which contain information that may or may not be used by the base-station.

However, if the outstation is battery-powered it would be wasteful to keep the radio receiver permanently enabled. Furthermore, it would be wasteful to transmit unneeded data. By configuring the *Nano_Link* outstation for battery operation both the factors are accommodated.



Battery operation is selected by setting switch 2.8 ON. The outstation will then operate in one of four modes, with the mode indicated on the four LED's:

Sniff Mode: LD2 blinks every second and TXD & RXD flash every two seconds. The radio receiver is switched on briefly every 2 seconds. If it detects a valid signal from a transmitter it will change to Operating Mode, otherwise it will immediately switch off and repeat the cycle. Battery consumption in this mode is low.

Receive Mode: LD2 flashes twice a second and RXD flickers as messages are received. The radio receiver is constantly powered and able to decode messages from a remote transmitter. If it does not receive a valid message for a period of 30 seconds it will revert to Sniff Mode. If it receives a valid message with no errors, addressed to it, then it will act on the command and progress to Transmit Mode.

Transmit Mode: LD2 flashes twice a second, LD1 is on and TXD & RXD flicker. The radio transmitter is activated for just long enough to send the response appropriate to the command. It will then revert to Receive Mode, in case the base-station fails to receive the response and re-issues the command, or sends another command.

If the command requests a data block, the outstation will respond as a normal outstation, but a flag will be set in the response that identifies it as battery-powered.

When the base-station knows that the outstation is battery-powered, it can send a command requesting only the data it needs, and simultaneously defining when it will next poll the outstation. In this case 5 seconds after receiving the command the outstation will switch from Receive Mode to Sleep Mode.

Sleep Mode: LD2 blinks every second, all other indicators are off. In this mode the radio and all unnecessary functionality are disabled, so battery consumption is minimal. The only functions that continue to operate are digital input monitoring (so pulses continue to be counted) and a timer. Five seconds before the next poll from the base-station is due, the outstation will switch to Receive Mode ready for the next command. If it fails to receive a command within 30 seconds it will revert to Sniff Mode.

Note that the base-station cannot communicate with an outstation that is asleep.

Base-station

The base-station sends modified commands to battery-powered outstations, only requesting the data that is actually used. If for example, only one analogue and one totalised count are being used, it will only ask for analogue 1 and count 1. All other inputs at the outstation will be ignored.

Battery-powered Repeaters

A battery-powered outstation can also act as a repeater to other outstations. The base-station recognises that it is a battery outstation from the system configuration. When it interrogates the outstation it appends an extra command telling it to stay awake for an extended period (derived from the Scan Window). During this period the base-station will interrogate the outstations to which it is repeating. There are a number of implications:

- 1) The addresses of the outstations to which it repeats must follow consecutively from the address of the repeater. For example, if the repeater is set to address 20, and the relevant outstations to addresses 30 and 40, there can be no other outstations on the system set to addresses between 20 and 40.
- 2) The base-station must request some data from the repeater, even if it is not actually required.
- 3) The battery life of the repeater will be significantly reduced because (a) its receiver remains on for longer and (b) each scan period it will transmit one message in response to its own interrogation, plus two messages in response to each interrogation of other outstations through it.

If one or more battery-powered repeaters are used on a system it is preferable that the Low Power Outstation Scanning Window is kept relatively short (but still long enough to allow a reasonable number of retries), say 10 seconds. As with any battery-powered system, the Low Power Outstation Scan Period should be set as long as possible, consistent with operational requirements, to minimise the frequency at which outstations are interrogated.

The extra current consumption of a repeater may shorten the battery life unacceptably. If that is the case it is worth considering using solar power.