

Data_Link 2000

APPLICATION NOTE AN003 Using Battery-Powered Radio Outstations

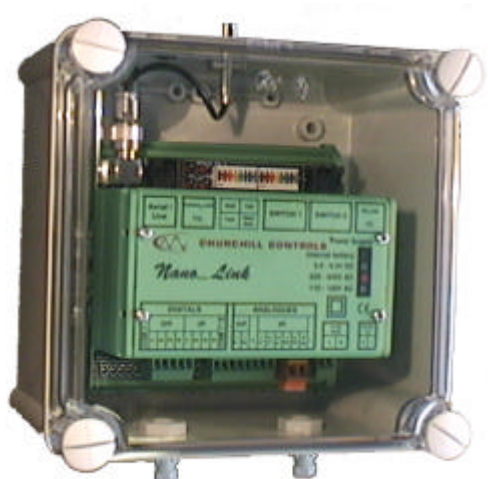
Summary

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

A *Micro_Link* base-station knows which outstations it needs to poll by recognising what data is used by internal data transfers and/or *Bus_Link*. By default it requests a complete data block from the outstation, even though only a part of this data may be used. The rate at which it polls is determined by the Scan Period programmed into *Micro_Link* by the user.

However, if the outstation response indicates that the outstation is battery-powered, the base-station will poll it again with a command which requests only the data needed, and simultaneously copies the Scan Period to the outstation.

The 'Battery-Powered Data Request' command defines the required data in the following manner:

Analogue inputs None, 1 or 1 & 2
Count inputs - None, 1, 1 & 2, 1, 2 & 3 or 1, 2, 3 & 4
Pseudo analogues None, Battery Volts or Battery Volts + RSSI
Digital inputs - None or 4 digital i/p's + Battery Low Alarm

All analogues are sent as 8-bit values. *Micro_Link* multiplies them by 16 to produce the standard format 12-bit register values. Counts are sent as 16-bit binary values.

It should be apparent that if, for example, only one count is used, it should be configured as Count 1, otherwise unnecessary data will be included in the response.

Establishing communications

When a base-station first attempts to poll a battery-powered outstation, the outstation will be in sniff mode, so there is a high probability that it will miss the command. The base-station will make a number of normal retries, which are also likely to be missed. The base-station will then use retries with extended lead-in, whereby it will switch its transmitter on for 2 seconds before sending the command. The outstation will sniff at some time during this lead-in, sense the carrier and remain on ready to receive the command.

Once the outstation has synchronised on the base-station it will always be in receive mode when the base-station sends commands to it. However, if the base-station is reset, or its scan period is changed, synchronism will be lost. The base-station will flag a communications error until sync is restored, which may not occur until the next scan.