

Data_Link 2000

APPLICATION NOTE AN002

Measuring Flow Rate from an Unpowered Site

Summary

A common requirement in the water industry is the measurement of flow rate from sites which have no mains power. Typical sites include DMA meters and small reservoirs. These are usually fitted with turbine flow meters which can give totalised flow measurement, but not flow rate.

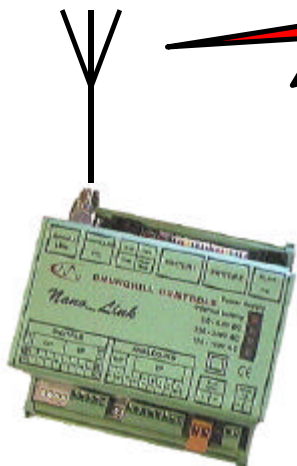
This Application Note describes how a *Micro_Link* base-station can be configured to give analogue outputs proportional to flow rate from battery-powered *Nano_Link* outstations connected to a turbine flowmeter communicating by radio.

Outline

To optimise outstation power consumption a *Micro_Link* base-station can be configured to only poll outstations infrequently (typically every 15 minutes). *Nano_Link* outstations put themselves in a low power sleep mode between polls, during which they continue to count pulses from flowmeters. The base-station can read the totalised count each poll and calculate the number of pulses accumulated since the last poll. By applying appropriate scaling factors it can calculate the average flow rate, and present it as an analogue output.

Nano_Link Outstation

- 1 Pulse count →
- 3 Digitals →
- 1 Analogue →



Micro_Link Base-station

- 1 Analogue (flow rate)
- 8 Digitals
- 1 Analogue

+ expansion modules

Outstation

A battery-powered *Nano_Link* outstation has a capacity of 4 digital inputs and 2 analogue inputs. It counts changes on all digital inputs, enabling them to be used for either monitoring digital states or totalised pulses. For this application it is assumed that the flowmeter is connected to the first digital input. The remaining inputs can be used for monitoring alarm states if required.

The analogue inputs are also available if required, so could, for example, be used to measure pressure. *Nano_Link* can energise transducers from its internal battery when it reads them, with minimal loading on the battery.

A battery-powered *Nano_Link* outstation can be in one of three modes:

Sniff Mode: 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.

Operating Mode: The radio receiver is constantly powered and able to decode messages from a remote transmitter. If it receives a valid message the radio transmitter will be energised to send the appropriate response.

Sleep Mode: The base-station can send a command requesting data from the outstation and simultaneously defining when it will next poll the outstation. The outstation will then go into a sleep mode where it keeps the radio powered down, until just before it expects the next poll. In this mode battery consumption is minimal. It will then switch to Operating Mode ready for the next command. If no message is received within a defined time period it will revert to Sniff Mode.

Base-station

Micro_Link has a capacity of 2 analogue inputs, 2 analogue outputs, 8 digital inputs and 8 digital outputs. This can be supplemented by expansion I/O modules if required. A *Micro_Link* base-station can interrogate up to 250 outstations. All features can be duplicated for any number of outstations.

Micro_Link can be configured to map any required data to/from its inputs and outputs. For this application the inputs are not used. The digital outputs are used to provide alarm indications and to copy the digital inputs from the outstation. The first analogue output will be

configured to give a flow-rate, while the second analogue output can be used to copy one of the analogue inputs from the outstation if required.

Configuration

Full details of the means of configuring *Micro_Link* are given in the *Data_Link 2000 Operator's Manual*.

Micro_Link can be configured to interrogate the outstation(s) continually or at regular timed intervals. For this application we will assume it polls every 15 minutes. It will then perform the following calculation each poll:

$$\frac{\text{New Count} - \text{Last Count}}{\text{Scaling Factor}} \times (4000 - \text{Offset}) + \text{Offset}$$

Where:

New Count = Count just read

Last Count = Count 15 minutes ago

Scaling Factor = Number of pulses in 15 minutes when at maximum flow

Offset = Required output for pulse rate of zero

This gives a result in the range 0...4000, which can be copied to an analogue output to give a current in the range 0...20mA. *Offset* can be used to set the range to 4...20mA if required.

Scaling Factor can be derived from the flow rate that is required to give a full scale output. For example, if the maximum flow rate through the meter is 4ML/day, and the meter gives one pulse for every 100L, full scale will be 40,000 pulses/day, or 1667 pulses/hour, or 417 pulses in 15 minutes.

For more detail, please refer to section 8.2 of the *Data_Link 2000 Operator's Manual*.

Power Supplies

A *Nano_Link* outstation will run for over 2 years from an internal Alkaline battery pack. It can be replaced with low cost Duracell batteries, which are widely available.

A *Micro_Link* base-station operates from a supply of nominally 12VDC. Churchill Controls offers a suitable mains power supply, in a housing identical to *Micro_Link*, which includes internal battery back-up to keep the base-station operational through mains power failures.