

Data_Link 2000

RADIO/LAND LINE TELEMETRY TELECONTROL SYSTEM WITH PLC/SCADA BUS INTERFACE

Overview

Churchill Controls *Data_Link 2000* telemetry system offers a very flexible approach to the problem of transferring signals between industrial plant on distributed sites. By utilising radio or private wires as a communication medium it offers low installation charges and minimal ongoing running costs.

Applications range from simple point to point systems to large schemes interfacing with PLC's and SCADA systems.

System Design

Data_Link 2000 configures an industrial data communications network from *Nano_Link* and *Micro_Link* modules. *Nano_Link* has been optimised for low power consumption, low cost applications with limited I/O. *Micro_Link* is a more powerful device with additional communication ports and expansion capacity.

The simplest network comprises two *Nano_Link* modules providing a point-to-point link transferring 4 digitals and 2 analogues in each direction. More complex networks are built around a *Micro_Link* basestation and any combination of *Micro_Link* and *Nano_Link* outstations.

The basestation can poll up to 250 outstations, and every outstation can be used as a repeater if required, to access more distant outstations and/or repeaters.



Nano_Link

Nano_Link is a general-purpose outstation with 4 digital inputs and 2 analogue inputs, with the option of also including 4 digital outputs and 2 analogue outputs. It is housed in a compact plastic enclosure which can be clipped onto a standard DIN rail. It can be supplied in a waterproof polycarbonate enclosure if required, or in a roadside cabinet.

The internal power supply can be either three alkaline batteries, a mains power supply with battery back-up, or a DC voltage regulator. *Nano_Link* has been optimised for low power consumption, to the extent that it will operate for at least 2 years on low-cost Duracell batteries. Battery operation has the advantage of significantly lower installation and running costs.

District Monitoring

Nano_Link has been specifically designed to address the need for district monitoring to detect leaks in water distribution networks. The total cost of ownership has been considered by addressing installation, operational and maintenance costs as well as the capital cost of the equipment. District monitoring requires remote reading of totalised and/or instantaneous flow from one or two transducers, with the option of also monitoring pressure, at numerous points around the network. In urban areas the density could be up to one outstation per square kilometre, whilst in rural areas the network could spread over many tens of square kilometres. Outstation aerials must be small and protected against vandalism, since they are likely to be in public locations. In some instances they may be under manhole covers.

Nano_Link I/O

Nano_Link has 4 digital inputs which can each be used to monitor alarm or status conditions, and also to count pulses from totalised flow transducers. In addition derived inputs provide indication of a battery low voltage, communications fail, hardware fail and main fail. Battery operation is accommodated by configuring the basestation to only poll the outstation infrequently (say every 15 minutes). However *Nano_Link* can be configured by a *Micro_Link* base station to provide exception reporting where it is important for critical data to be transmitted immediately.

Nano_Link also has 2 analogue inputs which can be used with low-cost millivolt transducers or more conventional current loop transmitters. There is also a derived analogue input which monitors the battery voltage and another which monitors the radio received signal strength.

Nano_Link can be supplied in a version that allows the use of 1 or 2 incremental shaft encoders.

Nano_Link can be fitted with expansion modules to give a maximum capacity of 20 digital inputs and/or 20 digital outputs.

Nano_Link can be configured as a basestation to provide a point-to-point link to another *Nano_Link*, transferring two analogues and four or twenty digitals in both directions. To access the derived inputs, use repeaters, or use more than one outstation, a *Micro_Link* basestation must be used.

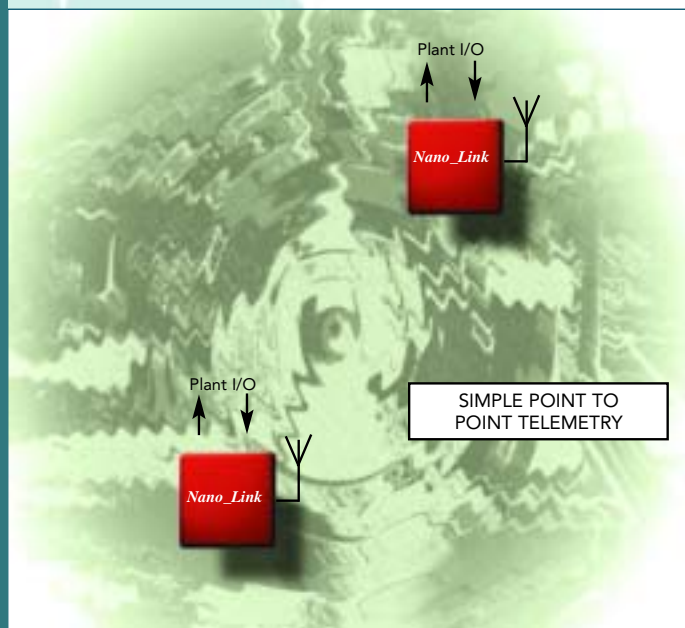


HARDWARE I/O

Small systems copy inputs at one end of the link to outputs at the other, maintaining the same electrical format. They can therefore be visualised as multi-core cables.

REPEATERS

Every outstation in a network is capable of repeating messages to/from more distant outstations. Up to 8 levels of repeating can be used to greatly extend radio range. The network is fully configurable from the base-station.





Micro_Link

Micro_Link is mechanically similar to **Nano_Link**, but has been designed to provide expansion capacity, more processing power and more communication ports at the expense of higher power consumption.

Micro_Link can support up to 32 I/O expansion modules giving up to 512 digital inputs, 512 digital outputs, 256 analogue inputs and 128 analogue outputs.

The **Bus_Link** communication port allows **Micro_Link** to be connected to a wide variety of PLC's and SCADA systems using serial protocols such as Modbus.

The **Data_Link** Configuration and Diagnostic (DCD) port can be connected to a DCD terminal for configuring the system and/or running diagnostics to analyse problems.

Micro_Link Database

A **Micro_Link** basestation includes a database of 2000 input registers, 2000 output registers, 8000 digital inputs and 8000 digital outputs, some of which are mapped to the basestation I/O. Every outstation contains a subset of the basestation database, some of which is mapped to the outstation I/O. Data is automatically copied between the basestation and outstation databases.

The contents of the database can be written and read by host equipment over the **Bus_Link** interface, to provide a seamless link between **Bus_Link** communications, hardware I/O and radio scanning.

Micro_Link includes numerous user-programmable functions to manipulate its data, such as scaling analogues providing pulse outputs and converting analogues to BCD digital outputs. **Micro_Link** has comprehensive communication alarm handling facilities which allows each parameter to be programmed individually for the action to be taken in the event of a communications failure.

Radio Communication

Both **Micro_Link** and **Nano_Link** use synthesised UHF transceivers which operate on de-regulated radio channels conforming to ETSI standard EN300 220-1. Any of 32 channels can be selected to avoid conflict with other users.

The radio range depends on the aerials used and the topology of the area, but will typically be up to 8Km in urban environments and up to 25Km with elevated aerials.

Line Communication

Micro_Link and **Nano_Link** can alternatively be fitted with modems to allow communication over private wires, leased telephone lines, or secure stream 300 circuits.

BUS_LINK

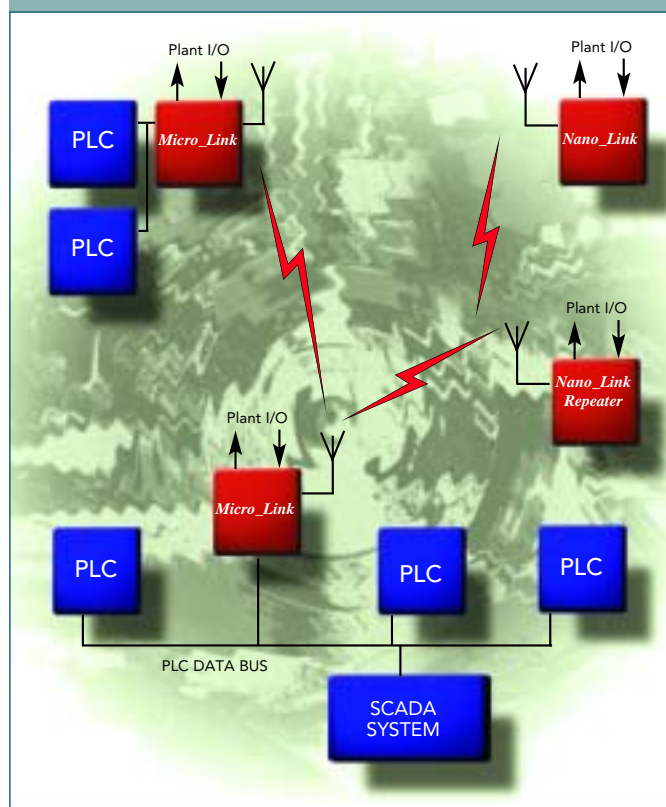
Bus_Link is Churchill Controls' terminology for a general-purpose serial interface which can be configured to use a standard PLC bus protocol. Although the industry standard is Modbus, other protocols such as Allen-Bradley can also be used.

DCD TERMINAL

The DCD terminal is a laptop computer running Windows™ software free-issued by Churchill Controls.

In configuration mode the software allows all systems, network and **Bus_Link** configurable parameters to be edited, saved to disc, downloaded to **Micro_Link** and uploaded from **Micro_Link**.

In diagnostic mode it allows the internal database to be examined and modified, and serial communications with **Bus_Link** and with the radio to be eavesdropped.



Expansion Modules and Accessories

Micro_Link can be equipped with a range of expansion modules to increase its hardware I/O capacity. Up to 32 modules can be daisy chained on **Micro_Link's I/O_Link** bus. A range of other accessories including power supplies, enclosures and antennas are also available.

16 digital input expansion module Part No. 7150-1

Provides 16 digital inputs compatible with volt free contacts.

Input	Volt free contact or voltage input. Logic 0 min -24V max +1.5. Logic 1 min +3.5V max +24V.
Energising current	50mA wetting current, 250 μ A continuous.

16 digital output expansion module Part No. 7150-2

Provides 16 volt free contact outputs.

Relay contact rating	125VAC/1A/60VA max 60VDC/1AS/30Wmax.
Isolation	500VAC.

8 Analogue input expansion module Part No. 7160-1

Provides 8 fully isolated 0-5 or 0-20mA analogue inputs.

Input sensitivity	\pm 5.0V into 500K \pm or \pm 20mA into 100 (over-range 10 102% of maximum).
Resolution	12 bits plus sign (-4096....+4095).
Overall accuracy	\pm 0.1%.
Input isolation	500VAC.

4 Analogue output expansion module Part No. 7170-1

Provides 4 fully isolated 0-20mA analogue outputs.

Output calibration	0-20.00 mA into 1K max (over-range 10 102% of maximum)
Resolution	12 bits plus sign (0-4095).
Overall accuracy	\pm 0.1%.
Input isolation	500VAC.500VAC.

Accessories

Alphanumeric Display Module	Part No. 7077-1
Numeric Display Module	Part No. 7075-2
UHF Power Meter complete with leads and dummy load (100...500MHz, 0...1W)	Part No. 7076-1
Bus_Link - PC cable (9-way D socket), 3m	Part No. 7038-1
DCD terminal cable + software	Part No. 7039-1
Leased line lightning protection unit	Part No. DP06/D
Plant I/O lightning protection unit	Part No. DP30/D
Solar regulator complete with Battery low alarm output	Part No. 7041-1





Mains Power Supply unit

Mains input supply
Output voltage

Battery capacity

Output current

Part No.7181-1

85→260VAC 250mA max
13.6VDC when mains present.
10→13VDC during mains power failure,
(dependant on battery charge state).
1.8AH (may be supplemented
by external battery).
5A.



Mains power supply unit

Mains input supply
Output voltage
Output current

Part No.7183-1

85→260VAC 250mA max.
12VDC.
1.25ADC.

Enclosures

IP68 Polycarbonate

190 x 190 x 130mm for 1 module

Part No. 7101-1

1P67 Polycarbonate

190 x 280 x 130mm for 2 modules

Part No. 7101-2

380 x 280 x 130mm for 4 modules

Part No. 7101-3

IP65 Steel

300 x 400 x 200mm for 4 modules

Part No. 7101-5

400 x 400 x 200mm for 6 modules

Part No. 7101-6

500 x 500 x 200mm for 9 modules

Part No. 7101-7

600 x 600 x 250mm for 12 modules

Part No. 7101-8

800 x 800 x 250mm for 20 modules

Part No. 7101-9

All enclosures are supplied
with bulkhead antenna connector
and pre-fitted glands



Converters

Potentiometer→100mV analogue converter

Part No. 7023-1

5V→100mV analogue converter

Part No. 7023-2

Interposing Relay Unit

Part No. 7023-3

Potentiometer→5V analogue converter

Part No. 7023-4

Flowstick→100mV analogue converter

Part No. 7023-5

24VDC→12VDC 15W power converter

Part No. 7185-1

9VDC→12VDC 15W power converter

Part No. 7185-2

48VDC→12VDC 15W power converter

Part No. 7185-3



Antennas and Fittings

Whip antenna (300mm long)

Part No. PUG/TNC

End fed dipole, (unity Gain)

Part No. ENF450

4 element yagi (gain 7.5dB)

Part No. UHF4

8 element yagi (gain 10dB)

Part No. UHF8

Crossover plate to secure yagi
to 2" pole (per set)

Part No. C0/2

6" wall stand-off channel bracket
for ENF450

Part No. CS6N

6" wall stand-off channel bracket
for pole (pair)

Part No. CS6

12" wall stand-off bracket for pole (pair)

Part No. SAB 3/12

24" wall stand-off bracket for pole (pair)

Part No. SAB 3/24

2" diameter aluminium alloy poles 2m

Part No. ALI18/2

2" diameter aluminium alloy poles 3m

Part No. ALI18/3

2" diameter aluminium alloy poles 4m

Part No. ALI18/4

Aluminium 2" Jointing Clamp

Part No. I0008A

Lightning Protection Unit

Part No. ZAPGAP



SPECIFICATIONS

Nano_Link & Micro_Link

Common features

RADIO

Operating frequency	ETS 300 220-1 458MHz telemetry band 32 channels available.
Power output	Up to 500mW.
Receiver sensitivity	-10dBµV.

LINE MODEM

Mode	V23 1200 baud.
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DIMENSIONS

125 X 125 X 110mm.

Nano_Links

DIGITALS

Inputs	4 digital / count inputs compatible with external volt free contacts.
Outputs	Optionally 4 digital volt free contact outputs rated 125VAC/0.5A/62.5VA.
Derived digital inputs	communications failed, mains failed, and battery low.

ANALOGUES

Inputs	2 analogue inputs (non isolated). 0→20mA or 0→100mV +/- 1%.
Outputs	Optionally 2 analogue outputs (non isolated). 0→20mA +/- 1%.
Derived Analogues Inputs	2 derived analogue inputs to transmit battery volts and received radio signal strength.

EXPANSION OPTIONS

16 digital input.
16 digital output.
Alphanumeric display.
Numeric display.

POWER SUPPLIES

- a) 80→260 AC with 8 hours battery backup.
 - b) 3 x alkaline D cells giving minimum 2 years operation*.
 - c) External 12V DC.
 - d) External 24 V DC.
- * Battery life based on interrogating every 15 minutes.

Micro_Link

DIGITALS

Inputs	8 digital / count inputs compatible with external volt free contacts, expandable by the use of external DIN rail mounted modules.
Derived digital inputs	Communications fail, partial communications fail, mains failed, Bus_Link fail, hardware fail and battery low.
Outputs	8 digital volt free contact outputs rated 125VAC/0.5A/62.5VA or 24VDC/1A/30W max. expandable by the use of external DIN rail mounted modules.

ANALOGUES

Inputs	2 analogue inputs (fully isolated). 0→20mA or 0→5V +/- 1% (expansion modules +/- 0.1%).
Outputs	2 analogue outputs (non isolated). 0→20mA +/- 1% (expansion modules +/- 0.1%).
Derived Analogues	Inputs: 2 derived analogue inputs to transmit battery volts and received radio signal strength.

EXPANSION OPTIONS

512 digital inputs.
512 digital outputs.
256 analogue inputs.
128 analogue outputs.

SERIAL PORTS

Bus_Link: up to 9600 baud, RS232 or RS485.
Data_Link Configuration and Diagnostic Terminal (DCD) 9600 baud RS232.

POWER REQUIREMENTS

12V DC @ 1A max (excluding expansion modules).



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