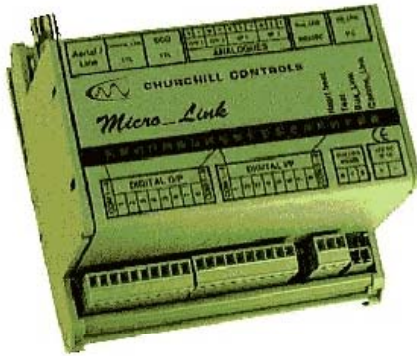


Micro_Link



Quick-Start Manual

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Introduction

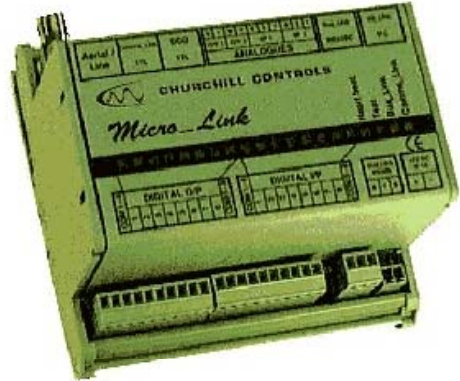
Micro Link

Micro_Link is a telemetry module, which operates as part of a larger telemetry system. It can be an outstation or a basestation and can communicate with another *Micro_Link*, or a Churchill Controls *Nano_Link* module.

It communicates either over low-power radio, over a leased-line or over a private-wire connection.

It has:

- 8 Digital Inputs (including 2 Pulse Inputs)
- 8 Digital Outputs
- 2 Analogue Inputs
- 2 Analogue Outputs
- RS232 / RS485 Serial Interface



All setting up is achieved using a PC running the DCD configuration software.

For full installation instructions, you must refer to the Technical Manuals supplied with the equipment.

IMPORTANT NOTE FOR USERS INSTALLING LEASED LINE EQUIPMENT

Products equipped with integral leased line modems comply with the TTE directive 91/263/EEC and this user installation manual forms part of the equipment approval and as such must be read before installation work is carried out.

Failure to install the equipment in accordance with this guide will invalidate the approval.

The approval will also be invalidated if the equipment is subject to modification in any way.

IMPORTANT NOTE FOR USERS INSTALLING RADIO EQUIPMENT.

Products equipped with integral radio transceivers are approved to MPT1329 and ETS 300 220-1 and are therefore permitted to be used anywhere within the UK without the need for a licence. They have been setup in accordance with application information supplied to us. The radio power has been set according to the antennas that have been specified for use on particular sites, Use of different antennas may result in the effective radiated power (ERP) exceeding 500mW and thus violation of the approval regulations.

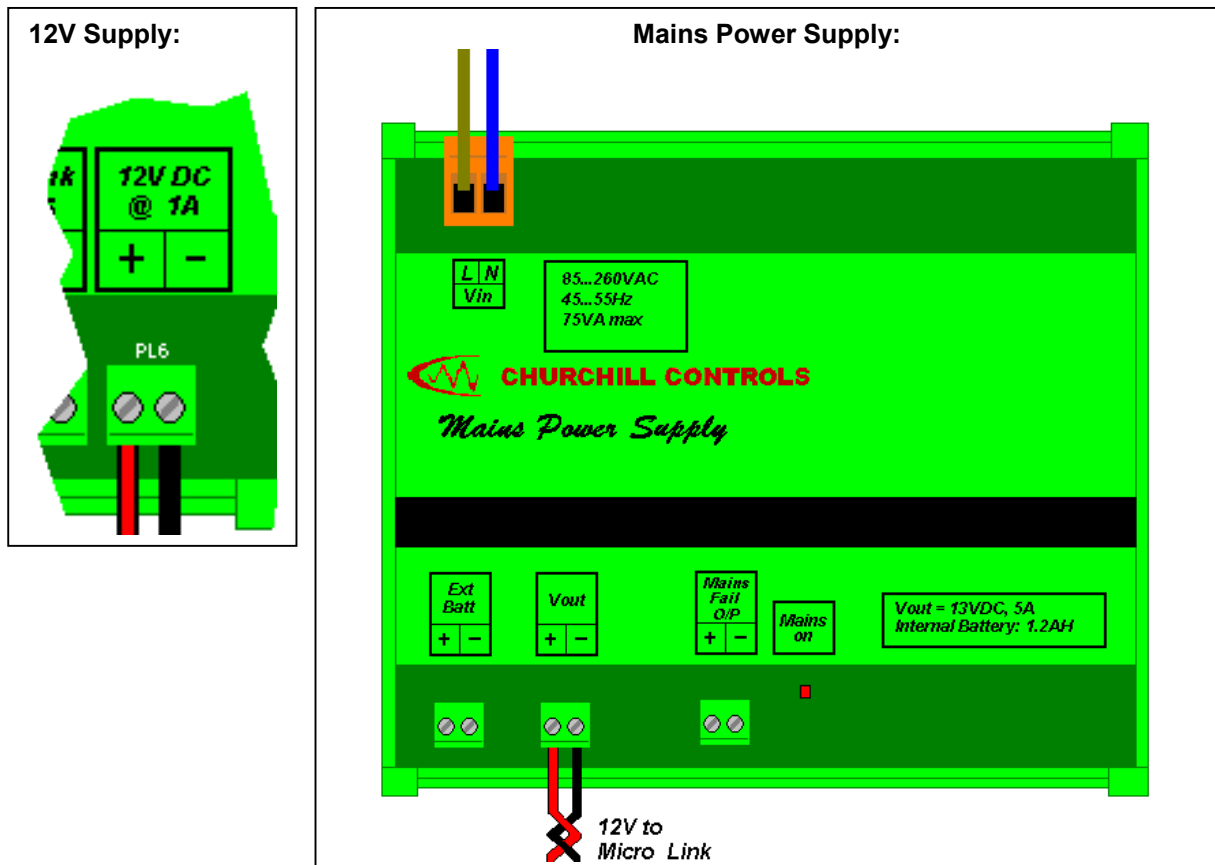
The output power should not be adjusted without the use of a power meter and due attention must be made to the calculation of ERP for the installed antenna.

For assistance in this matter please contact Churchill Controls.

Power Supply

Micro_Link has no integral power supply.

It requires a 12V DC supply capable of supplying 1A. This can either be direct from the users own supply (within control panels, cabinets etc.) or the unit can be used in conjunction with the separate Mains Power Supply Unit.



The Mains Power Supply unit will accept a 85 to 260VAC mains input.

It has an internal 1.2 Ampere-Hour battery which will keep the *Micro_Link* powered in the event of a Main Failure – however the time for which the *Micro_Link* will remain running on batteries will depend on its configuration.


There is also an auxiliary battery connection which will also trickle charge an external battery of up to 25AH. This battery can then be used to extend the time for which the unit will run if the mains fails.

The module is also equipped with a 'Mains Fail' output. This will de-energise in the event of the mains supply failing – this output can thus be fed into an input of the *Micro_Link* and can be sent across the radio link to warn that the unit has switched over to battery operation.

Communications

Micro_Link can communicate via low-power radio, leased-line or private wire. The installation requirements for each are detailed below:

Radio:




If the unit is supplied for radio operation, it will be fitted with a TNC coaxial connector as shown

The antenna (aerial) can connect directly to this connector, or can connect to it via a lightning protection unit, which is recommended where the aerial is mounted outside.

Radio regulations are such that – for most applications - it is illegal to transmit greater than 500mW from the aerial. For this reason, only the aerials specified with the system should be connected.

For more information, refer to the Technical Manual.

Leased Line:



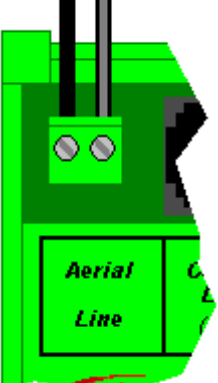
Nano_Link can be equipped for use on leased telephone lines supplied by national network providers such as BT.

The modems are capable of operating with an end-to-end loss of up to 27dB and provide correct impedance matching in line with the regulations.

Normal telephone wires have a loss of about 1.5dB per km, giving a range of typically 18km. If more than one outstation is used, the line becomes mismatched. The network provider can normally arrange for matching pads or line amplification to overcome this.

For more information, refer to the Technical Manual.

Private Wire:



Private wires are cable pairs similar to leased lines, but owned by the user. The user is thus responsible for the maintenance of the cable, but does not have to pay rental charges.

Over short distances the cable characteristics are unimportant. However for distances greater than 2km, the cable should be matched to the impedance of the modems, namely 600 Ohms.

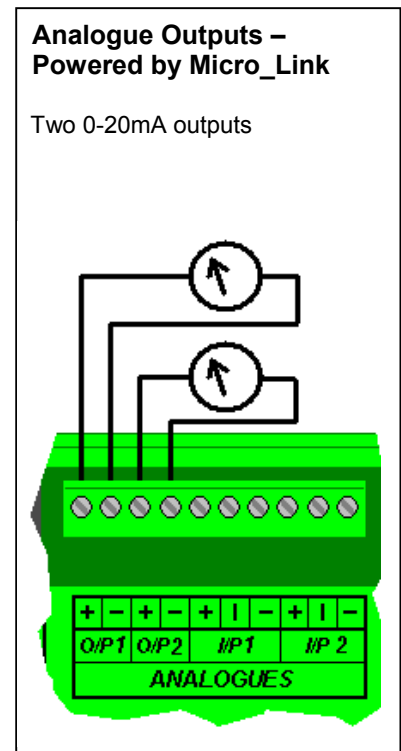
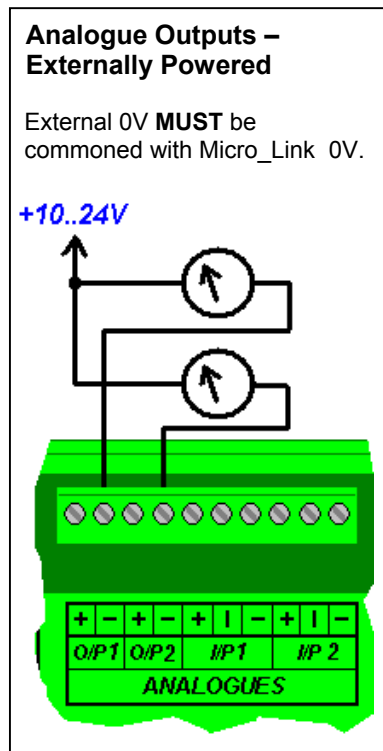
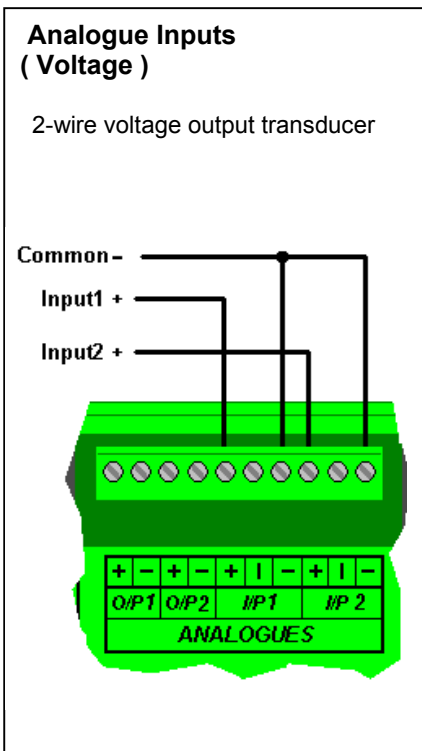
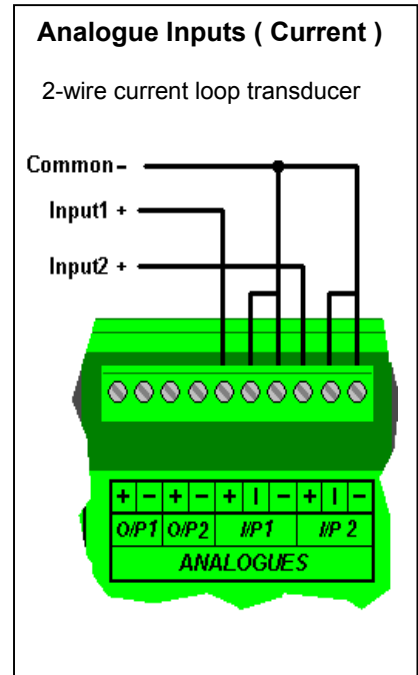
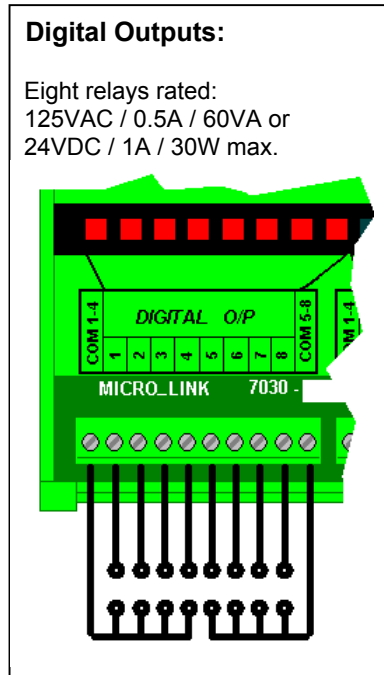
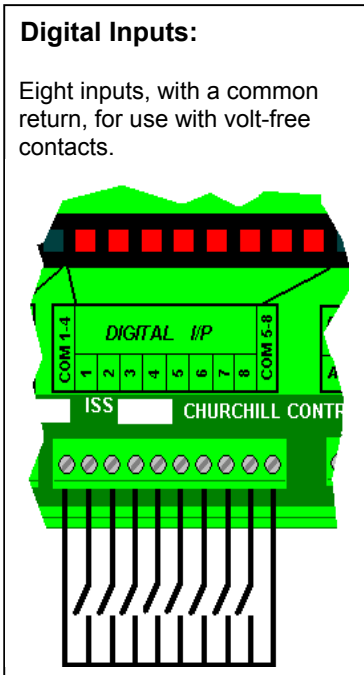
The modems are capable of operating with an end-to-end loss of up to 27dB. Normal telephone wires have a loss of about 1.5dB per km, giving a range of typically 18km. If more than one outstation is used, the line becomes mismatched. A high-impedance version of the modem is available to overcome this.

For more information, refer to the Technical Manual.

I/O

The basic Micro_Link can accept 8 digital and 2 analogue inputs, and has 8 digital and 2 analogue outputs.

The basic connection requirements for each are detailed below. For more detailed information, refer to the Technical Manual.



Configuration

All configurable parameters in Micro_Link are set using the PC programming interface. Configuration files are compiled and then downloaded to Micro_Link.

The user should connect the 'DCD' port of Micro_Link to a spare serial port on their PC or Laptop using the Programming Lead supplied by Churchill Controls.

The 'DCD' Programming Software should be installed on the User's PC from the CD-ROM supplied. Alternatively, the Software may be downloaded from the Churchill website : www.churchill-controls.co.uk

Once the software is run, a screen with the DCD toolbar across the top will be seen.

To establish communications with Micro_Link, the user must first select the correct PC communications port for the DCD software to use.

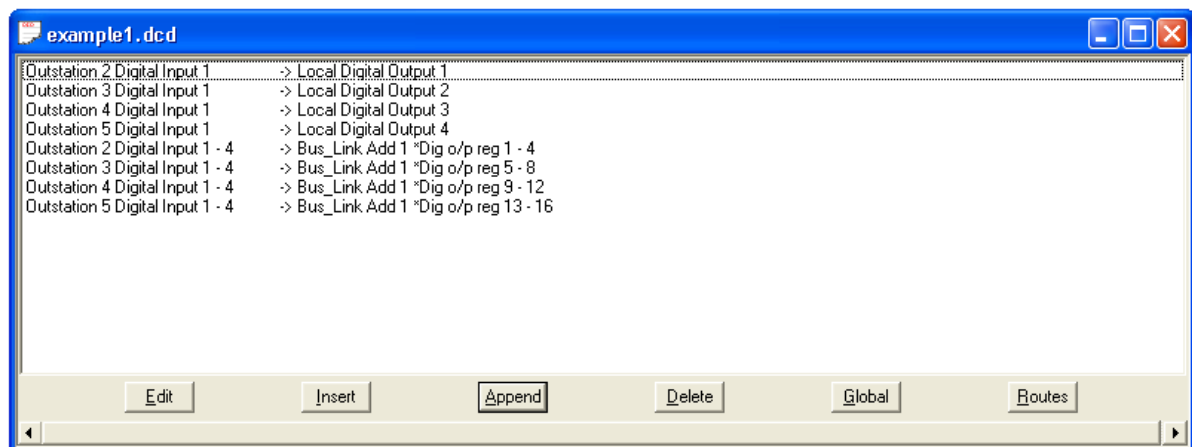
This is done from the "Comms" → "Setup" menus. The following window will appear :

The user may select the desired Comms port. No other items should be altered. Clicking on "OK" will save the new setup.

To check communications, the user may attempt to Upload the current configuration from within the Micro_Link.

This is done via the "Comms" → "Upload Configuration" menus, or clicking on 

On successful communication, the Data Routing Table for the uploaded file will be shown – for instance :



The user may then set all parameters to suit the system, as detailed in the following pages.

Data Routing

At the Basestation, the Data Routing Table contains the full list of Outstations to be scanned, and data to be sent and/or retrieved from them.

Outstations also contain a Data Routing table, although this is usually simpler, containing internal data transfers such as Comms. Failure flags etc.

Clicking on “Edit” on the first entry in the above example brings up the following:

The screenshot shows a dialog box titled "Mapping Table". It is divided into three main sections: "Source", "Destination", and "General".

- Source:** Contains radio buttons for "Bus_Link" (unselected) and "Data_Link" (selected). It has an "Address" field with the value "2" and a "Type" dropdown menu set to "Digital Input". A "Number" field next to it contains the value "1".
- Destination:** Contains radio buttons for "Bus_Link" (unselected) and "Data_Link" (selected). It has an "Address" field with the value "0" and a "Type" dropdown menu set to "Digital Output". A "Number" field next to it contains the value "1".
- General:** Contains a "Quantity" field with the value "1".

On the right side of the dialog, there are "OK" and "Cancel" buttons. At the bottom, there is a "Description" text area.

The “Source” panel, refers to the Outstation. Its Address may be specified, together with the type of the I/O point required to access, and the number of that point.

The “Destination” panel refers to the place where the Source I/o point is to be reproduced.

In the above example, Outstation 2, Digital Input 1 will be reproduced at the Basestation (as Address 0 is specified), local Digital Output 1.

Note that the Destination does not have to be the local Basestation outputs. If the Destination Address had been set at 3, the Basestation would scan Outstation 2, retrieve the status of Digital Input 1 and send it onto Outstation 3 to be output there.

The Source and Destination can also be set to refer to internal registers as opposed to actual I/O. This is primarily for when there is no hard-wired discrete I/O and the system data is accessed via the Bus_Link RS232 port by a PC or PLC.

Network Routing

To enable data to be passed around obstacles which may block the radio path, the user can specify the route from one Micro_Link to any other.

Clicking on the “Routes” button below the Data Routing Table brings up the following screen :



Address	Route
3	2
4	3 2

Selected entry

To reach address the final repeater has address

In this example :

There is no Network Routing for Outstation 2 : therefore it can be reached directly.

Outstation 3 is reached by using Outstation 2 as a Repeater.

Outstation 4 is reached by using Outstation 3 as a Repeater. (Note that the fact that to reach Outstation 4, the Repeater at Outstation 2 must also be used is automatically filled in on the list.)

Global Settings

Clicking on the “Global” button will bring up the following screen.

This contains all the common parameters without reference to individual data points.

Global Configuration

Bus_Link settings:

Protocol: ModBus RTU

7 data 8 data

1 stop 2 stop

Data Rate: 1200 bps

No parity Even Odd

RS232 RS485

RTS on delay: 0 ms

RTS off delay: 0 ms

Data_Link options:

Data Rate: 1200 bps

Station address: 0

Bus_Link scanning options:

Master Slave

Scanning interval: 30 secs

Error back-off delay: 10 scans

Receive timeout: 2000 ms

Maximum retries: 5

Slave address: 0

Base-Station:

Normal Outstation:

Scanning window: 0 secs

Retries: 40

Error back-off: 0

Low Power Outstation:

Scan Rate: 15 mins

Scanning window: 20 secs

Radio:

Channel No: 0

External Modem:

RTS/CTS on delay: 0 ms

Transmission delay: 0 x100ms

Default OK Cancel

The left-hand side of the screen refers to the Bus_Link, serial interface, designed to connect directly to PLC's or PC's running Scada software.

The right-hand side of the screen deals with the Data_Link radio (or line) system.

The user should not usually be required to change any settings except those detailed below. For more in-depth explanation of these parameters, refer to the Data_Link Technical Manual.

Unit Address

In order for the system to be able to send and receive data between units, each unit must have a unique address. This is set in the 'Global' settings as shown above. Refer to the Technical Manual for more information

Basestations are always Address 0.

A Basestation will scan all the outstations detailed in the Data Routing Table. In the above example, Outstations 2,3,4 and 5 will be scanned.

Outstations may be Micro_Links OR Nano_Links, and may have Address 1-223. If there is more than one Outstation on a system, It is recommended that subsequent Outstations are given Addresses 10, 20, 30 etc. to allow for outstation expansion – which can then occupy the gaps in between.

Radio Frequency

For a radio link to work correctly, all units must be on the same frequency. ETS 300-220 regulations allow the use of 32 channels within the frequency range 458.5 to 458.925 MHz inclusive.

The user may select the radio channel from the drop-down list in the Global settings



Selected channel settings are below – the full list is in the Technical Manual.

Channel Selected	Frequency (MHz)
0	458.50
4	458.55
8	458.60
12	458.65

Channel Selected	Frequency (MHz)
16	458.70
20	458.75
24	458.80

Uploading

Once the Configuration file has been setup as required, the user should save the file, and must then download it into the MicroLink.

This is done via the "Comms" → "Upload Configuration" menus, or clicking on



Note that – if DCD Diagnostics is running (see below) - the user will not be able to upload or download to/from the Micro_Link, and will encounter an error such as "COM port is already open ". To remedy this, simply close the DCD Diagnostics window and retry the operation.

Diagnostics

Micro_Link contains full diagnostic software to allow the user to perform full fault-finding and maintenance on an installed system.

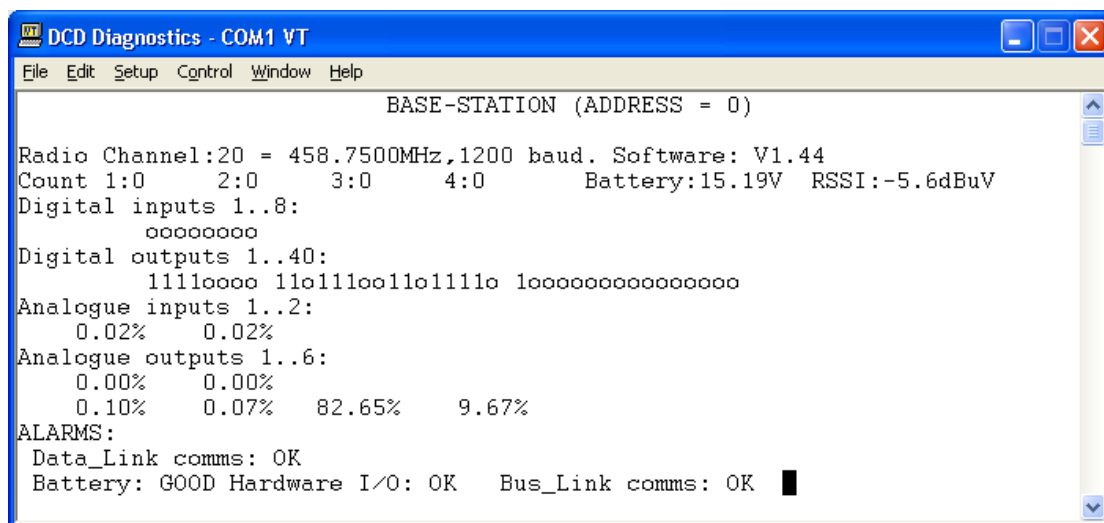
This is done by invoking the Terminal Emulator which is also shipped on the DCD installation CD, by clicking on the icon



(For DCD Versions 2.13 and before, this will be Windows Hyperterminal. For subsequent versions, this will be TeraTerm.)

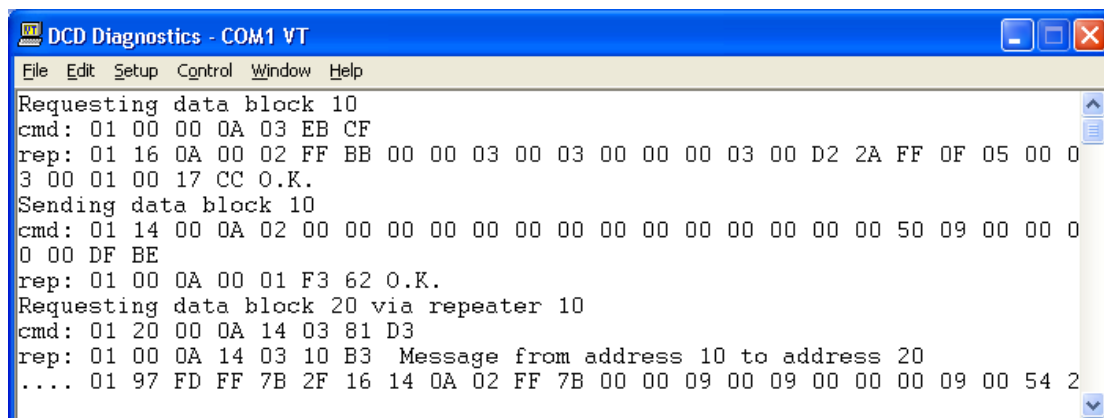
By typing 'S' (followed by <Enter> or <Return>), the Micro_Link status can be seen.

The RSSI should be noted (25.9dbuV = full strength signal, -15.9dbuV = no signal.)
The "Data_Link Comms" entry will also show the status of the link



```
DCD Diagnostics - COM1 VT
File Edit Setup Control Window Help
BASE-STATION (ADDRESS = 0)
Radio Channel:20 = 458.7500MHz,1200 baud. Software: V1.44
Count 1:0 2:0 3:0 4:0 Battery:15.19V RSSI:-5.6dBuV
Digital inputs 1..8:
    00000000
Digital outputs 1..40:
    11110000 1101110011011110 1000000000000000
Analogue inputs 1..2:
    0.02% 0.02%
Analogue outputs 1..6:
    0.00% 0.00%
    0.10% 0.07% 82.65% 9.67%
ALARMS:
Data_Link comms: OK
Battery: GOOD Hardware I/O: OK Bus_Link comms: OK
```

By typing 'D', the Data_Link comms. between units can be monitored :



```
DCD Diagnostics - COM1 VT
File Edit Setup Control Window Help
Requesting data block 10
cmd: 01 00 00 0A 03 EB CF
rep: 01 16 0A 00 02 FF BB 00 00 03 00 03 00 00 00 03 00 D2 2A FF 0F 05 00 0
3 00 01 00 17 CC O.K.
Sending data block 10
cmd: 01 14 00 0A 02 00 00 00 00 00 00 00 00 00 00 00 00 50 09 00 00 0
0 00 DF BE
rep: 01 00 0A 00 01 F3 62 O.K.
Requesting data block 20 via repeater 10
cmd: 01 20 00 0A 14 03 81 D3
rep: 01 00 0A 14 03 10 B3 Message from address 10 to address 20
.... 01 97 FD FF 7B 2F 16 14 0A 02 FF 7B 00 00 09 00 09 00 00 00 09 00 54 2
```

These two functions form the major tool for setting up and fault-finding installed links. Other mnemonics can be typed in to show different diagnostic screens – a list of these is contained in the Data_Link Technical manual.

Operation

Point to Point link using a *Micro Link* basestation and *Micro Link* and/or *Nano Link* outstation

Install the *Micro_Link* outstation(s) in accordance with the relevant installation guide (refer to the labels and signal list to identify the equipment for each site). The basestation will always be set to station address zero.

Before proceeding please ensure that *Nano_Link* outstations are installed, configured and powered up in accordance with the *Nano_Link* Installation guide.

If the basestation or any of the *Micro_Link* outstations are using expanded I/O modules please refer to the relevant documentation for instructions on installation.

You will need to be at the base station (*Micro_Link*) to check if communication between the sites is satisfactory. It is a good idea to set up known input conditions at the outstation, e.g. close digital input three and apply a known current to analogue input 1.

Run the DCD configuration program as detailed above, upload the configuration from the outstation and set the scanning interval in the global parameters to 10 seconds. Download the configuration to the outstation.

Referring to the signal list, identify which digital output has been configured to display the communications fail signal.

If communications between the basestation and the outstation are satisfactory the communications fail output will be turned on, the corresponding LED illuminated and the *Micro_Link* outputs will copy the outstation inputs.

Connect up the site inputs/outputs as necessary. Using DCD change the scanning interval to the required setting. When using a battery powered outstation the scanning interval should be set to no less than 900 seconds in order to achieve the advertised battery life.

Return to the outstation, remove the test sensors and complete the wiring of site sensors.

If the communication fail LED is not illuminated then a fault is indicated. Re-check the settings of the dual in line switches at the *Nano_Link* outstation and check antennas or line connections as applicable. If you are sure that all is correct please call us on 0118 9892200 for assistance.

Exception Reporting

This permits critical changes to be reported without having to wait for the relevant outstation to be polled.

This allows battery-powered outstations to be polled less frequently – thus extending battery life, and allows digital input alarms and limit alarms on analogue and count inputs to be reported immediately.

Full details of this feature are given in the Technical Manual.

I/O Expansion

Micro_Link includes an 'I/O Link' port which can be used to connect expansion modules from the Data_Link range.

Micro_Link can be fitted with up to 32 expansion modules by 'daisy chaining' them using the I/O_Link bus.

Available modules are:

16 Digital Input Module	16 Digital Output Module
8 Analogue Input Module	4 Analogue Output Module

Full details of expansion configuration is in the Technical Manual.



Bus Link Interface

Micro_Link includes an 'Bus_Link' interface which can be used to communicate with PLCs, PCs or other intelligent devices using industry standard protocols such as Modbus.

Two versions of the port are presented on Micro_Link

- An RS232 interface, using an 8-way RJ45 socket, for one-to one connection.
- An RS485 interface, using a 3-way terminal, for applications where two or more instruments are multi-dropped on the same comms. network.

'Bus_Link' Serial comms. parameters are configured using the DCD configuration software – as detailed above – and are located in the 'Global' section of the software.

In order for the user to program the PLC or PC end of the Bus_Link interface, they must be familiar with the way registers are mapped within the Micro_Link data table.

Full details of this mapping together with further information on the Bus_Link interface can be found in the Technical Manual.

