

Mega_Link

Telemetry Communication System

Quick Start Manual - Issue 2.



Issue	Date	Revision
1	22/02/13	
2	06/04/16	

© Churchill Controls Ltd 2016

The contents of this document must not be disclosed to any third party without the written consent of Churchill Controls Limited, nor are they to be used for any purpose other than to configure and maintain equipment supplied by Churchill Controls Limited.

No part of this document can be reproduced, transmitted, transcribed, stored in a retrieval system or translated in any way without the prior written consent of Churchill Controls Limited.

Whilst every attempt has been made to ensure the accuracy of this document, Churchill Controls Limited will not be held liable for any errors or omissions.

As part of our policy of continuous improvement we would welcome any suggestions for changes to the document.

Churchill Controls Ltd
Unit 30 Wellington Business Park, Dukes Ride, Crowthorne, Berkshire, RG45 6LS
Tel: +44 (0) 1344 750233 Fax: +44 (0) 1344 752304
e-mail: sales@churchill-controls.co.uk

Table of Contents

1	PART NUMBERING SYSTEM.....	7
2	QUICK START.....	8
2.1	System configuration	8
2.1.1	Hardware Configuration Summary	8
2.1.1.1	Power Supply	8
2.1.1.2	Display	8
2.1.1.3	Communication Interfaces	8
2.1.1.4	Expansion Modules	8
2.1.2	Software Configuration Summary	8
2.1.2.1	Base-station Mode	8
2.1.2.2	Fieldbus Master Mode	8
2.1.2.3	PowerSave Mode	9
2.1.2.4	System, Station and Fieldbus addresses, Communication interface module settings	9
2.2	Diagnostics	9
2.2.1	Indicator LED's	9
2.2.1.1	COM Port Monitor LEDs	9
2.2.1.2	Heartbeat/Test LED	9
2.2.1.3	12V Monitor LED	9
2.2.1.4	Digital Input/Output Monitor LEDs	9
2.2.2	LCD Display	9
2.2.3	DUCX Diagnostics	9
2.2.4	Diagnostics in PowerSave Mode	10
2.3	I/O Connections	10
2.3.1	Power	10
2.3.2	Digital I/O	10
2.3.2.1	Digital Inputs	11
2.3.2.2	Digital Outputs	11
2.3.3	Analogue I/O	12
2.3.3.1	Analogue Inputs	12
2.3.3.2	Analogue Outputs	12
2.3.3.3	Expansion Analogue Inputs	13
2.3.3.4	Expansion Analogue Outputs	13
2.3.4	Aerial	13
2.4	System Configuration	14
2.4.1	DUCX Configuration	14
2.4.2	DUCX Diagnostics	14
	APPENDIX 1 - DUCX & USB DRIVER INSTALLATION.....	15

SAFETY CONSIDERATIONS

Mega_Link and all associated parts conform with EC Directive 2006/95/EC (LVD Directive) and are certified to comply with BS EN 60950-1:2006 + A12:2011. However, the performance is dependent on some aspects of the way in which it is installed and operated:

1. If a variant incorporating a mains power supply is used the orange connector is the power input and carries potentially lethal voltages. It is therefore imperative that this connector is protected from accidental contact by housing the equipment within an enclosure that protects the user from accidental contact. Maintenance and service personnel are expected to use their training and skill to avoid possible injury to themselves and others due to obvious hazards that exist.
2. If a variant incorporating a mains power supply is used the supply should be derived from a switched spur incorporating a 3A fuse.
3. If a variant incorporating a leased line modem is used it should be realised that, while the line connection is normally safe it should be treated as a possible source of unsafe voltages.
4. All plant I/O is from unknown sources so could potentially be a source of unsafe voltages.

EMC CONSIDERATIONS

Mega_Link and all associated parts conform with EC Directive 1999/5/EC (R&TTE Directive) and are certified to comply with ETSI EN 300 220-2 V2.4.1 (2012-05), ERC/REC 70-03, ERC/DEC/(01)04, IR 2030 (UK Interface Requirements 2030) and 02/71R5 (Permitted Short Range Devices in Ireland).

Mega_Link may incorporate one or more radio transmitters which, while complying with all relevant standards, could cause interference to other equipment. Furthermore, while it has a high degree of immunity to external interference, interfering signals above the levels specified in the relevant standards could cause it to malfunction. The following points should therefore be considered:

1. **Mega_Link** should not be configured to operate on the same radio channel as any other nearby equipment.
2. Any equipment that is susceptible to electrical interference should not be located near to the aerials.
3. Any equipment that could be a source of high level electrical interference should not be located near to **Mega_Link**. Examples include high power switchgear, switched mode power supplies and even camera a used for flash photography.
4. If digital outputs are used to control inductive loads there is the potential for them to generate high levels of interference when switching. **Mega_Link** Incorporates a high degree of surge suppression on the digital outputs, but high voltage high inductance loads may cause the equipment to malfunction.

1 Part Numbering System

Mega_Link can be configured with a variety of communication interfaces and power supplies, and although highly recommended, the display is optional. The part number defines the build variant.

The basis part number is 7600, and this is followed by a suffix of 4 characters to define the options.

The complete part number is thus 7600-abcd:

a	Power Supply	A	AC mains
		B	Alkaline Battery
		S	Solar
		1	12V
		2	24V
b c	COM1 Interface COM2 Interface	4	458MHz Digital UHF Radio
		8	868MHz Digital UHF Radio
		G	GPRS
		L	Leased line modem
d	Display	D	Display fitted
		0	No display

2 Quick Start

2.1 System configuration

The system configuration is a combination of the hardware and software:

2.1.1 Hardware Configuration Summary

2.1.1.1 Power Supply

Mega_Link incorporates an internal power supply. The type of power supply is indicated by a marker on the cover. Note that there is an ON/OFF switch between the output of the power supply and the internal circuitry.

Power supplies generally include battery back-up so the system can continue operation through power failures.

The output of the power supply is fed internally to the **Mega_Link** motherboard, via an ON/OFF switch. The motherboard will operate from any supply in the range 4...16VDC, and derives from this its internal power rails and a switched 12V supply which powers the analogues and the digital outputs. This supply is also capable of powering external transducers.

2.1.1.2 Display

Mega_Link incorporates various LED's and an optional LCD (Liquid Crystal Display). Note that if the system is in PowerSave mode the display will blank 20 seconds after the last movement of the joystick. It can be re-activated by moving the joystick.

2.1.1.3 Communication Interfaces

One or two communication interfaces can be fitted inside **Mega_Link**. The type and status of communication interfaces can be viewed via the LCD display user interface.

2.1.1.4 Expansion Modules

Mega_Link can be expanded by adding I/O expansion modules. These connect to it through short jumper leads. Each expansion module has two rotary switches that define its address in the range 00 to 99. Each module must be set to a unique address and the addresses must be contiguous, starting from 00.

2.1.2 Software Configuration Summary

Mega_Link is configured from a PC running DUCX software. This is provided on a disc supplied with each system, or can be downloaded from our website at www.churchill-controls.co.uk. The method of installing it is described in Appendix A .

DUCX allows numerous features to be configured including:

2.1.2.1 Base-station Mode

In Base-station Mode **Mega_Link** will instigate communications with outstations via a defined COM port and respond to replies from them.

In Base-station Mode the user must define which outstations are in use, and the data to be passed between them.

Mega_Link will always inherently function as an outstation, so will respond to any commands received from a base-station on any COM port.

2.1.2.2 Fieldbus Master Mode

In Fieldbus Master Mode **Mega_Link** will instigate communications with Fieldbus slave devices via a defined COM port and respond to replies from them. Part of the configuration is to define the protocol to be used.

In Fieldbus Master Mode the user must define which slave devices are in use, and the data to be passed between them.

Mega_Link will always inherently function as a Fieldbus slave, so will respond to any commands received from a Fieldbus master on any COM port, in any protocol.

2.1.2.3 PowerSave Mode

If **Mega_Link** is not configured as a base-station or a Fieldbus master it can be configured in PowerSave mode. It will minimise power consumption by switching off all hardware that is not used. After it has synchronised with a base-station it will power itself down, but wake every 2 seconds to sense the presence of a radio carrier. In this Sniff mode the power consumption is low (but not as when **Mega_Link** is asleep). If it detects a carrier it will remain awake until it receives a command from the base-station. The base-station will recognise that the outstation is in PowerSave mode and send it a command indicating when it will next call. The outstation will then go to sleep, minimising its power consumption, until it is next due to be called.

2.1.2.4 System, Station and Fieldbus addresses, Communication interface module settings

Numerous other parameters need to be configured, such as radio channel, baud rate and GPRS IP addresses etc.

2.2 Diagnostics

2.2.1 Indicator LED's

Mega_Link has a number of LED indicators to show its functional state:

2.2.1.1 COM Port Monitor LEDs

There are two LED's adjacent to each COM port (COM1, COM2 and COM3). One lights red when the port is receiving data and green when it is sending data. The other lights yellow when the transmitter is active.

2.2.1.2 Heartbeat/Test LED

This LED is adjacent to the power input connector and serves several functions:

- When power is supplied to the COM port interfaces this LED lights green. If the system is not set in PowerSave mode it should continually show green.
- If the system is not set in PowerSave mode it flashes red every second to indicate that the system is functional.
- If the system is set in PowerSave mode it very briefly flashes red and green alternately every second

2.2.1.3 12V Monitor LED

This LED is adjacent to the analogue outputs, and lights yellow when the internal 12V rail is active. Analogue inputs and outputs, and digital outputs, can only be used when this rail is active. The power output is provided on the analogue connector for powering external transducers if required.

2.2.1.4 Digital Input/Output Monitor LEDs

An array of 16 LEDs in the top cover displays the state of each of the digital inputs and outputs.

2.2.2 LCD Display

The LCD Display works in conjunction with the joystick. Clicking up or down generally navigates through menus while clicking right selects the highlighted item. Clicking left reverts back to the previous menu.

2.2.3 DUCX Diagnostics

When a PC is plugged into the USB port and DUCX is opened on it, selecting Diagnostic Terminal on it will open a new window that allows the user to select various diagnostic modes. Pressing Return shows a list of the available commands.

2.2.4 Diagnostics in PowerSave Mode

If **Mega_Link** is configured in PowerSave mode, power to the COM port interfaces will be switched off when they are not needed, and the COM port monitoring LED's will be extinguished. The display will continue to function until 20 seconds after the last movement of the joystick. It will then be blanked and the Digital I/O monitor LEDs will be switched off. The Heartbeat LED will briefly flash alternately red and green.

Any movement of the joystick will wake the system, re-activating the display and the Digital I/O LEDs. The Heartbeat LED will indicate that it is no longer asleep, but the power rails and COM ports will still only be activated when needed.

When a PC is plugged into the USB port **Mega_Link** partially wakes, as indicated by the Heartbeat LED, but the COM ports will still only be switched on as required, and the LCD display will still be blanked.

2.3 I/O Connections

All I/O connections are via two-part connectors, so the equipment can be readily removed or replaced without exposing the wiring.

2.3.1 Power

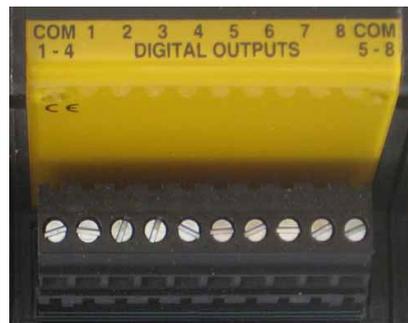
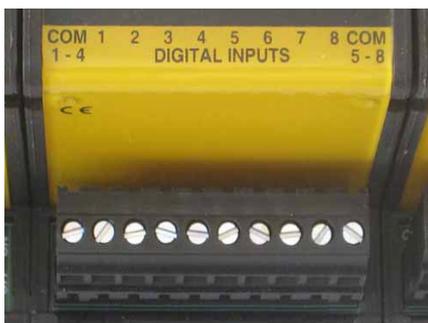
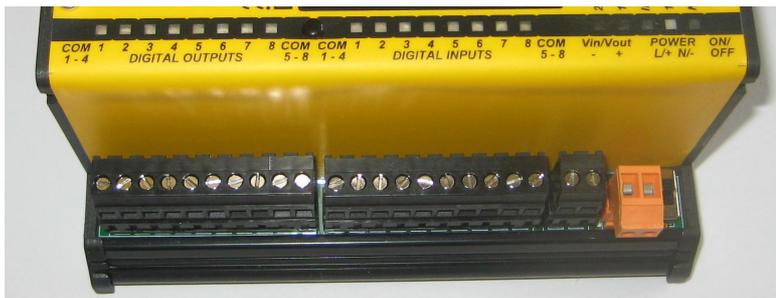
The supply used must match the marker in the top cover. Power is connected via the orange connector. The output of the internal power supply is fed through the ON/OFF switch to the internal circuitry and to the Vin/Vout connector. The voltage on this connector could be anywhere in the range 4.0V...16.0V. If using a solar regulator an external 12V lead acid battery should be connected to the Vin/Vout connector.

If a mains power supply is fitted it should be connected via a switched fused spur, so the equipment can be easily isolated for maintenance. The fuse should be rated at 3A.



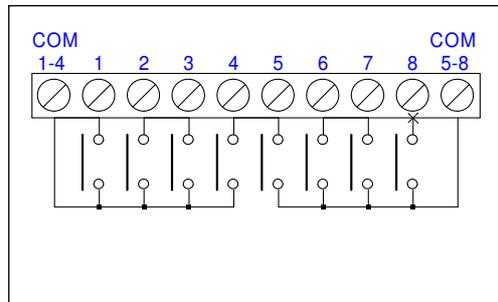
2.3.2 Digital I/O

The digital inputs and outputs are identical on **Mega_Link** and expansion modules:



2.3.2.1 Digital Inputs

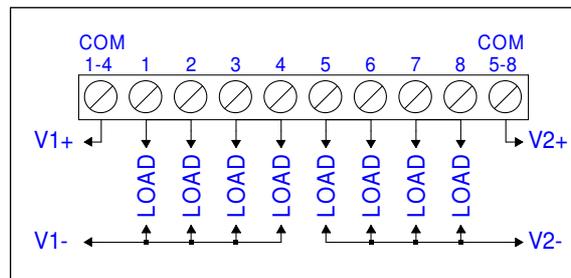
There are eight digital inputs, in two groups of four. Each group shares a common return terminal which is connected to the system 0V rail. The inputs are designed for operation from volt-free contacts



2.3.2.2 Digital Outputs

There are eight digital outputs, in two groups of four. Each group shares a common return terminal which is floating. In the illustration V1 and V2 can be either polarity, AC or DC.

All outputs are volt-free relay contacts rated 125VAC @ 0.3A, 24VDC @ 1A. All contacts include surge protection devices which clamp the maximum voltage across open contacts to 170V to prevent arcing when switching inductive loads. However, it is recommended that any DC inductive loads (e.g. interposing relays) are fitted with catching diodes.

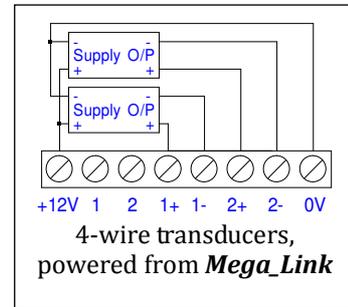
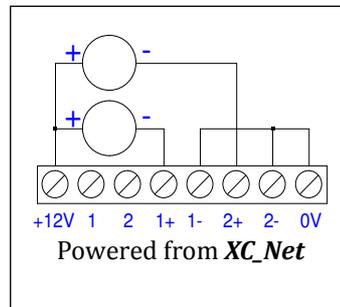
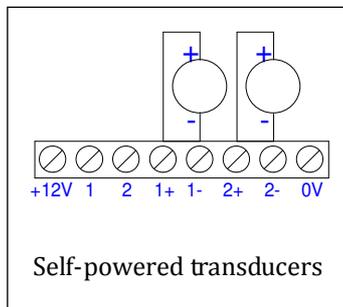


2.3.3 Analogue I/O

2.3.3.1 Analogue Inputs



There are two analogue inputs, each with an input resistance of 10Ω , calibrated 0...20mA. Both inputs are fully isolated and can withstand common-mode signals of up to $\pm 240V$. Note that high common mode AC voltages may give reading errors so should be avoided by ensuring that current loops are referenced to 0V.

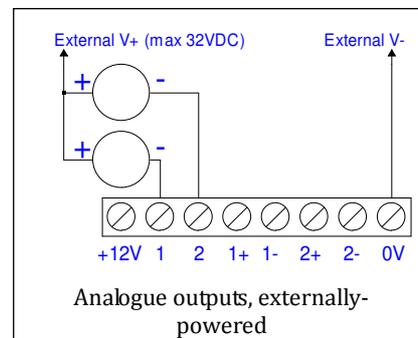
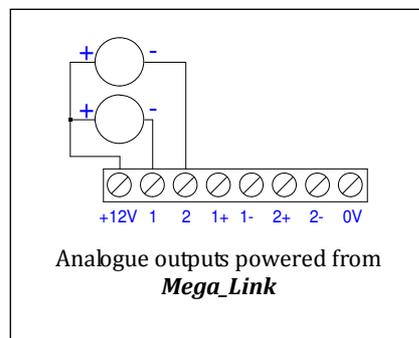


The 12VDC output can be used for powering external transducers, if required.

An LED adjacent to the connector shows when 12V is available.

2.3.3.2 Analogue Outputs

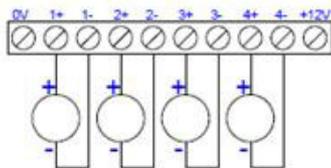
There are two analogue outputs, each calibrated 0...20mA into loads of up to 500Ω . Both outputs sink current to the internal 0V rail, so the external loads must be commoned to a positive supply (normally the system's 12VDC supply, but an external voltage source can be used if required).



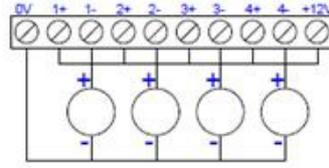
2.3.3.3 Expansion Analogue Inputs

All analogue inputs are fully isolated both from each other and from the power supply. Note that high common mode AC voltages may give reading errors so should be avoided by ensuring that current loops are referenced to 0V. The analogue input module incorporates a power regulator that provides a stable 12VDC supply capable of sourcing 200mA that can be used to power transducers.

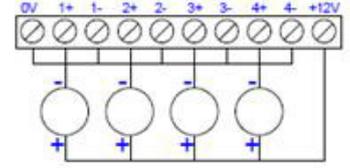
Any combination of the following diagrams can be used:



Self-powered transducers



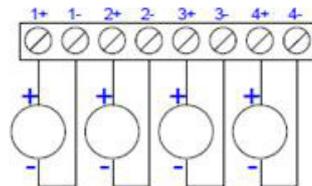
Powered from *Mega_Link*
(Common Negative)



Powered from *Mega_Link*
(Common Positive)

2.3.3.4 Expansion Analogue Outputs

All analogue outputs are fully isolated both from each other and from the power supply. Each is capable of sourcing 0...20mA into an external load of up to 500Ω. They can thus each be connected to passive loads.



Powered from *Mega_Link*

2.3.4 Aerial

If *Mega_Link* is fitted with one or more radio interface then an aerial must be connected to the relevant TNC socket. If an external aerial is used it is strongly recommended that a lightning protection unit is included. The LPU must be earthed to the same reference earth point as *Mega_Link* using the largest practical cable size. A lightning strike can result in currents of several thousand amps flowing through this cable, so the earth terminal may rise to a significant potential. However, no damage will be done, provided all equipment and instruments are earthed to the same point.

2.4 System Configuration

Any given system will comprise one base-station and at least one outstation. Each is physically identical, but its mode of operation is defined by a System Configuration file downloaded to it from a PC running DUCX software.

2.4.1 DUCX Configuration

DUCX can be used to create configuration files, save them to disc, download them to a **Mega_Link** or upload them from **Mega_Link**. It can also be used for diagnostics, as outlined above.

For convenience it is often practical to use DUCX to create configurations in the office, then save them to disc before going to site to download them into **Mega_Link**. The method of creating configuration files is outside the scope of this Quick Start document, so the user should familiarise himself with the relevant chapter in the Technical Manual.

2.4.2 DUCX Diagnostics

DUCX Diagnostics are relatively easy to use, and can be used to confirm the correct operation of a system and to pinpoint faults. Enter diagnostics mode by selecting Tools:Diagnostic Terminal, clicking on the Diagnostic Terminal icon or typing Ctrl/D.

Pressing Return will terminate the existing diagnostics mode and display a list of available commands.

Useful commands include:

- **EX** is for monitoring all XTP communications between a base-station and outstation. It will display any message originating from the **Mega_Link** or received by it. It will also indicate the port on which the message is sent/received.
- **EF** is a similar command to monitor all Fieldbus messages.
- **SC** produces a summary of the system configuration, defining the type of interfaces fitted in each COM port, the power supply fitted and details of any expansion modules
- **SS** shows a continually-updated list of the status of all hardware I/O ports.

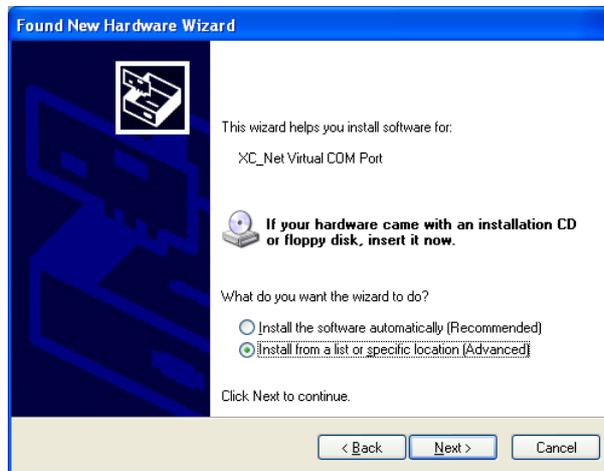
Appendix 1 - DUCX & USB Driver Installation

The following instructions include illustrations from Windows XP, other versions will give slightly different displays:

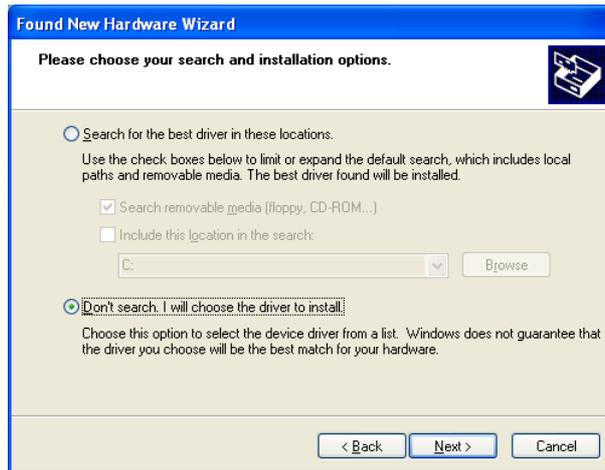
1. Install the CD, or download the software to a known directory and navigate to it.
2. Run setup.exe to install DUCX. During the installation process you will be prompted to select the folder in which you wish to install DUCX. Select the default (Churchill Controls/DUCX) unless there is a reason for installing it elsewhere. When the installation is complete there will be a DUCX short-cut icon on the desktop and an appropriate entry in Start/Programs.
3. Power a **Mega_Link** and connect it to the PC via an USB cable. Windows will recognise it and open the following window:



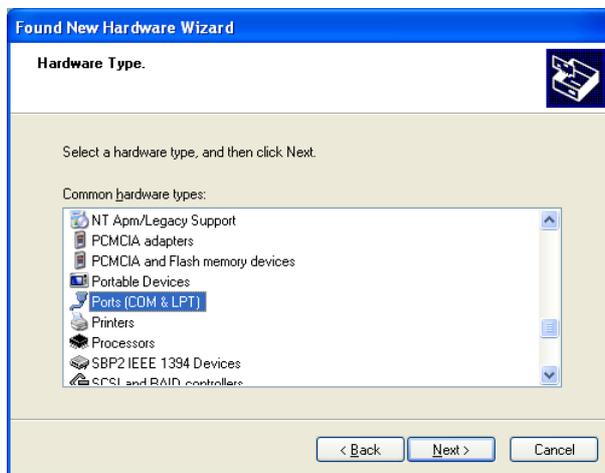
Select “No, not this time”. Click Next.



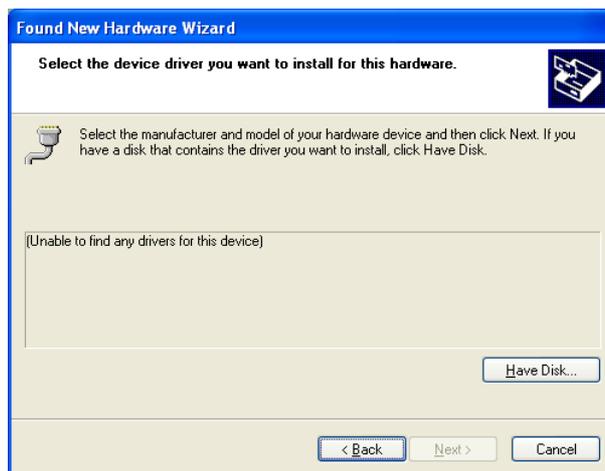
4. Select “Install from a list or specific location”. Click Next.



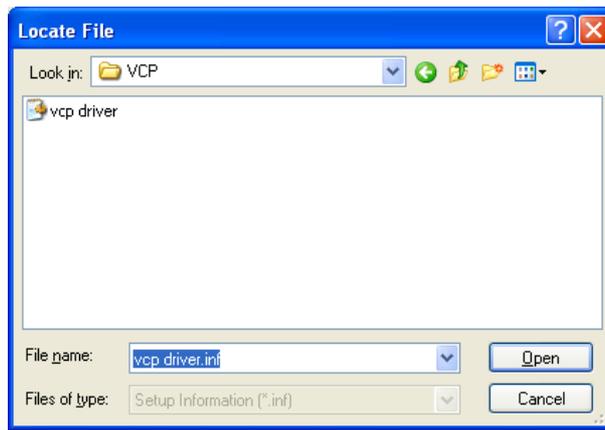
5. Select "Don't search. I will choose the driver to install". Click Next.



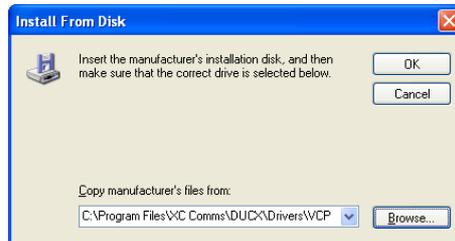
6. Select Ports (COM & LPT). Click next.



7. Click "Have Disk..." then browse to the Drivers folder within the folder in which DUCX was installed.



8. Select vcp driver and click Open



9. Click "OK"

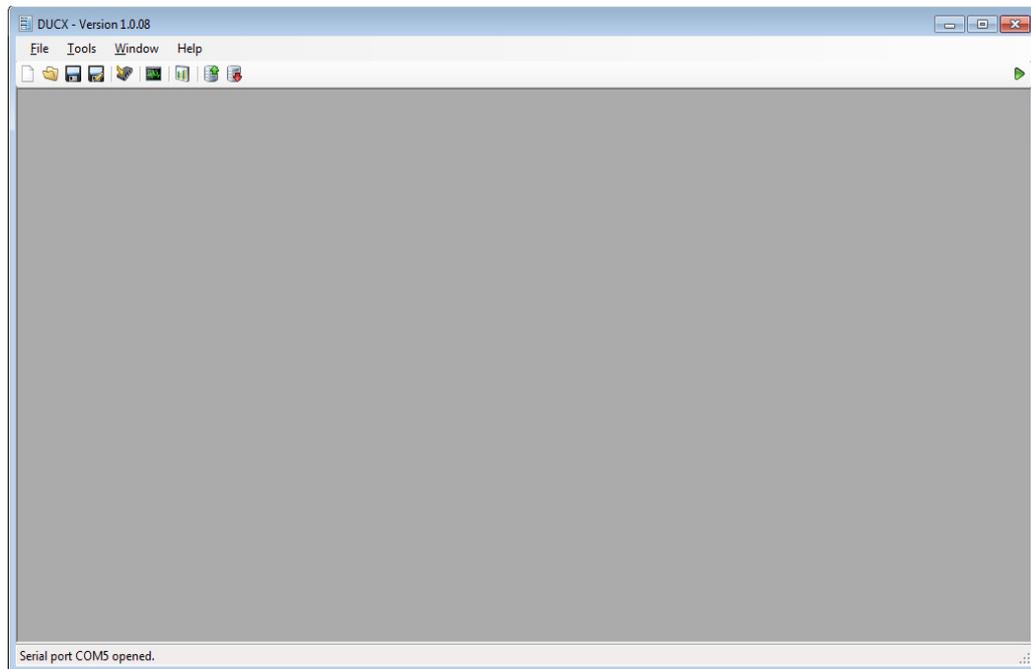


10. Click "Next". A warning will appear stating that the driver is not digitally signed. Click "Continue anyway"



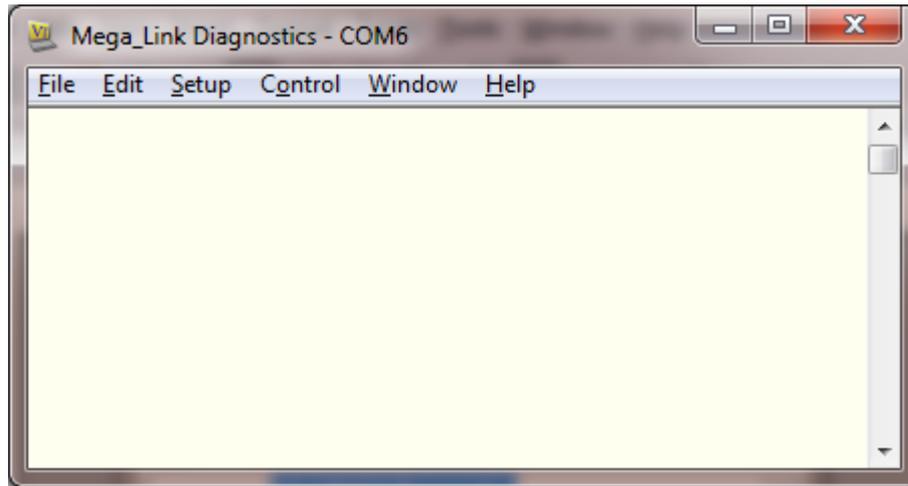


11. Click "Finish"
12. Repeat steps 3 to 11 for the second Virtual COM port driver.
13. Run the DUCX application. The opening screen will be like this:

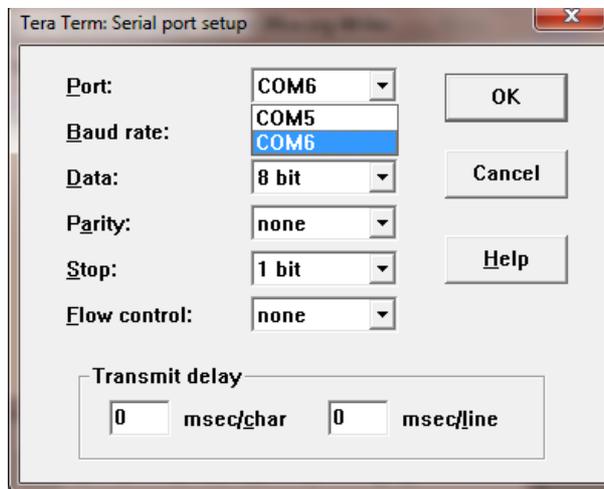


14. Note that the triangle in the top right corner of the screen is green if DUCX has established connection with a **Mega_Link**, otherwise it will be red. If DUCX has difficulty connecting it may be necessary to click on the triangle to re-establish connection.

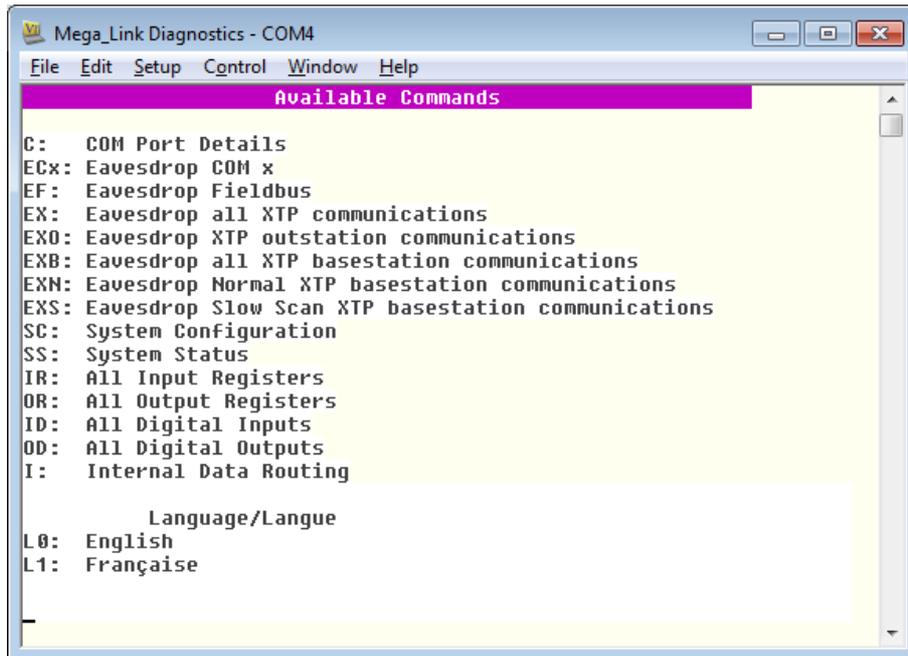
15. Click on the Diagnostic Terminal icon (as illustrated by the red arrow). The following window will open:



Note that the title bar indicates the default COM port that has been chosen. Click Setup/Serial Port, then click on the Port box and note that two COM ports are offered:



16. Select the second COM port offered, then OK to return to the main window. Press the Return key and note a display similar to this:



17. If this display is not shown, repeat step 19 and select the other COM port. If the display is shown, select Setup/Save setup.. and save the configuration to the default location (TERATERM.INI).

The USB drivers and the software are now fully installed and ready for use.