

DL2000



User's Guide

V1.30

CONTENTS

| | |
|--|-----------|
| 1.0 Introduction to the DL2000 | 1 |
| 1.1 Overview of DL2000 Products | 2 |
| 1.2 Technical Specifications | 4 |
| 1.2.1 Serial Interface Specifications | 5 |
| 1.3 Modes Of Operation | 6 |
| 1.3.1 On-Line "Operational" Mode | 6 |
| 1.3.2 Off-Line "Configuration, Diagnostic and Debug" Modes | 6 |
| 1.3.3 Off-Line "Development" Mode | 6 |
| 1.4 Reference Materials | 7 |
| 2.0 Switch and Indicator Functions | 8 |
| 2.1 Switch Functions | 8 |
| 2.2 Indicator Functions | 8 |
| 2.2.1 Power-Up and Reset Sequence | 8 |
| 2.2.2 On-Line Operation | 8 |
| 2.2.3 On-Line, Power-Up and Reset Errors | 9 |
| 2.2.4 Off-Line Configuration, Diagnostic and Debug | 9 |
| 3.0 Configuration and Documentation | 10 |
| 3.1 DL2 and DL'97 Program Functions | 10 |
| 3.2 Data Formats | 11 |
| 3.3 Address Conversion Table for Common Data Types | 11 |
| 4.0 Interface Connections | 12 |
| 4.1 Rear connector Port A – Synchronous Network Wiring | 12 |
| 4.2 Front connector Port B – Channel B serial interface wiring | 13 |
| 4.2.1 To PC or other devices (no handshaking) | 13 |
| 4.2.2 To PC or other devices (using handshaking) | 13 |
| 4.2.3 To Modem (with or without handshaking) | 13 |
| 4.2.4 Four wire RS422 connections | 13 |
| 4.2.5 Two wire RS485 connections | 13 |
| 4.3 Front connector Port B – Channel C serial Interface wiring | 14 |
| 4.3.1 RS232 Connections | 14 |
| 4.3.2 Four wire RS422 Connections | 14 |
| 4.4 Rear connector Port B' – Channel B serial interface wiring | 14 |
| 4.4.1 RS232 with RTS and CTS Control | 14 |
| 4.5 RS232C Interface definitions for Port B – Channel B | 15 |
| 5.0 Warranty | 16 |
| 5.1 Warranty Registration Form | 17 |
| 6.0 System and Configuration information | 18 |

1.0 INTRODUCTION TO THE DL2000

The DL2000 Communications Controller is a freestanding microprocessor controlled protocol converter and communication interface designed to interconnect different manufacturers' devices and networks in industrial applications. DL2000s enable industrial Local Area Networks (LANs) such as Allen-Bradley (A-B) Data Highway Plus (DH+), A-B Remote I/O Link (RIO), and Modicon Modbus to be connected to a wide variety of other manufacturers' products and networks.

DataLink units have the following hardware interface capabilities:

- Standard: RSC232C, RS422 / RS485 and Bi-phase encoded signals
- Optional: Custom interfaces to ASK, FSK etc.

The multi-purpose DL2000 uses a high performance hardware platform together with communication software and drivers loaded in Programmable Read Only Memory (PROM). The hardware permits direct connection of the LAN to RS232, RS422, and RS485 asynchronous serial ports on computers, PCs, programmable controllers (PLCs) and human-machine interfaces (HMIs). The DL2000 platform will also connect OEM equipment, slave devices such as printers, message displays and variable speed drives etc. to industrial networks such as DH+, RIO and Modbus.

Standard DL2000 products can be used directly in applications that already have a software driver for Allen-Bradley DF1 protocol i.e. IEEE / ANSI X3.28 protocol (D1 and F1 subset). Custom DL2000 products can be designed to work with the client's native protocol.

This unit is designed for Supervisory Control and Data Acquisition (SCADA) applications requiring point-to-point or multi-drop modem communications to interconnect a local LAN to single or multiple remote LANs.

In addition, the multi-functional hardware design of the DL2000 forms the basis of a complete family of flexible communication devices and protocol converters suitable for a wide range of device and network interconnectivity applications.

VoxTechnologies Corp.
301 S Sherman, Suite 117
Richardson, TX 75081
Telephone: 972-234-4343
Facsimile: 972-234-4295
E-mail: info@voxttechnologies.com

1.1 OVERVIEW OF DL2000 PRODUCTS

DF1 to DH+ protocol is a standard serial mode that can be selected on many DataLink units. In Mode 0 the DataLink provides an economical, compact alternative to Allen-Bradley's 1770-KF2. This protocol converts A-B DF1 serial protocol to DH+ network protocol and provides a serial interface to DH+ for computers, modems and OEM equipment. Applications include PLC programming and graphical user / human-machine interfaces (GUIs / HMIs). As the DL2000 is a serial device it can be used to interface all PCs, and Macintosh computers to DH+. The size and portability of the DL2000 makes it especially convenient for use with notebook computers.

If one of our existing interfaces does not meet your requirements, it can usually be modified or a custom solution can be created for unique applications.

DL2000-KFX

The DL2000-KFX is a basic DataLink model that contains two serial protocols and can be software configured for either standard DF1 to DH+ or DH+ to DH+ network Bridging modes. Standard DF1 mode is used to provide a serial interface to DH+ and may be used as an alternative to A-B's serial interfaces to DH+ such as the 1770-KF2. When selected to Bridging (Mode 1), pairs or multiple DL2000-KFXs will bridge local DH+ networks directly or remote DH+ networks via modems. Asynchronous serial communications speeds up to 57.6 Kb and DH+ network speeds up to 115.2 Kb are currently supported.

DL2000-KFR

This unit contains two network protocols, software configurable for A-B Data Highway Plus (DH+) or Remote I/O Link (RIO) networks. The DF1 to DH+ mode is the same as the DL2000-KFX above. In DF1 to RIO mode the DataLink connects any serial device capable of A-B serial DF1 protocol to A-B's RIO Link. Asynchronous serial communications speeds up to 57.6 Kb and RIO network speeds up to 230.4 Kb are supported.

When the DL2000-KFR is configured for RIO mode the network interface of the DataLink is a virtual rack and looks like an adaptor to the PLC scanner that is controlling the RIO Link. The serial interface of the DataLink responds to DF1 protocol commands initiated by devices such as PCs, computers and OEM equipment. Applications for this unit include Operator Interfaces (HMIs), SCADA, Data Acquisition, Variable Speed Drives and Process Control equipment.

DL2000-CMX

The DL2000-CMX provides high-speed interconnectivity between an Allen-Bradley DH+ and a Modbus network. DH+ to Modbus Plus communications can be achieved when the DL2000-CMX is coupled to a Modicon BM85 Bridge Multiplexer. The DL2000-CMX can be any station on DH+ and can be configured for either Modbus Master or Modbus Slave in Ascii or RTU mode. Dependent on the A-B message command used up to 1600 coils or 100 registers (per message) can be transferred between bit or integer files in any PLC-5 or SLC-5/04 station on DH+ (except 0) and Modbus coils, inputs, holding and input registers. Modbus commands to address 0 can be "broadcast" to a selected range of DH+ stations. Modbus and DH+ speeds up to 115.2 Kb are currently supported

DL2000-ASC

The DL2000-ASC enables ASCII messages stored in PLC-5 data tables to be transferred over the DH+ to a serial printer or message display. The -ASC protocol is particularly suitable for buffering DH+ message commands sent to its station address from any PLC-5. The ASCII bytes are then flipped to produce intelligible messages on the printer in the same order as the ASCII data is entered and displayed in the PLC. Printers and message displays located anywhere on a DH+ can receive messages from PLC-5 or other stations in other locations. Asynchronous serial communications speeds up to 57.6 Kb and DH+ network speeds up to 115.2.4 Kb are supported.

DL2000-K2F

The DL2000-K2F connects two serial devices using A-B serial DF1 Protocol to a single Allen-Bradley Data Highway Plus. This unit is similar to having two A-B 1770-KF2s or two DL2000-KFXs in a single enclosure. Each serial port has its own DH+ station address. DH+ network speeds up to 115.2 Kb are currently supported.

The primary serial port may be set to any DH+ station number while the second serial channel is automatically configured at the next higher DH+ station address. The first serial port is capable of serial communications at up to 115.2 Kb, RS232 or RS422/RS485, Point-to-Point (full-duplex) or Multi-drop (half-duplex), with or without handshaking. The secondary serial port is capable of serial communications at up to 38.4 Kb, RS232 or RS422, Point-to-Point only and no Handshaking. Both serial ports must use the same message check method: either BCC or CRC and share common DF1 protocol parameters such as Pass / Execute Diagnostics.

DL2000-KXM

This unit is a half-duplex master that interfaces serial devices using A-B DF1 half-duplex slave (multi-drop) protocol to A-B DH+ networks. The -KXM receives messages from DH+ nodes such as PLCs, converts them to A-B half-duplex master (multi-drop) protocol and retransmits them to devices such as A-B's 1747-KE. This product enables remote communications to A-B serial devices that must be set to half-duplex in order to control RTS/CTS handshaking to devices needing it (i.e. single channel radio modems). Asynchronous serial communications speeds up to 57.6 Kb and DH+ network speeds up to 115.2.4 Kb are currently supported.

DL2000-CUSTOM

This unit is produced for use with custom and OEM applications. Various hardware options such as Flash memory, additional serial ports, special crystals etc. are available at extra cost. Typical examples of custom applications include:

- DL2000-SCIPU - Interfaces up to 31 Siemens VS/VF drives to A-B DH+, RIO and Modbus.
- DL2000-INV2 - Interfaces up to 31 Toshiba G2 and G3 inverters to A-B DH+, RIO and Modbus.
- DL2000-PML - Interfaces up to 10 Power Measurements 3720 ACM meters to A-B RIO.

1.2 TECHNICAL SPECIFICATIONS

| | |
|-------------------|---|
| SIZE : | 7.5"D x 5.5"W x 1.5"H (191mm x 140mm x 38mm) |
| WEIGHT : | 2.2lbs (1kg.) |
| POWER : | AC: 110/220 VAC (+/- 25%); 50/60 Hz; 5 Watts DC: 10 - 35 VDC; 3 Watts |
| INSTALLATION : | Freestanding - Grounded metal enclosure |
| ENVIRONMENT : | Operating: +32 F to 122 F (0 C to +50 C) Storage: -40 F to +185 F (-40 C to +85 C) Humidity: 5% to 95% non-condensing |
| PROCESSOR : | Enhanced Z80 11.0592 MHz CPU |
| OSCILLATOR : | Standard: 14.7456 MHz for network interface Optional: Crystal for asynchronous interface |
| PROM : | 32 Kbyte socketed EPROM or 32 Kbyte Flash PROM |
| EEPROM : | Standard: 32 byte Optional: Up to 512 bytes |
| RAM : | Standard: 32 Kbytes Optional: Up to 512 Kbytes Optional: NVRAM for battery backup applications |
| SWITCHES : | Hardware RESET pushbutton Recessed CFG configure pushbutton |
| INDICATORS : | 1 LED for POWER-ON; 5 LEDs for communications status |
| ERROR DETECTION : | Channel A: CRC Channels B and C: BCC or CRC |
| CONFIGURATION : | Software configurable communications parameters |
| INTERFACES : | Channel A: Synchronous; SDLC Transformer-coupled Channel B: Asynchronous; RS232C, RS422 or RS485 Channel C: Asynchronous: RS232 or RS422 |
| PROTECTION : | Transorbs fitted on Channel B's RS422 lines |
| CONNECTORS : | Port A: 3 pin Phoenix/Euro screw terminal connector Port B: DB25M (standard 25 pin) male connector Port B': 5-pin Phoenix/Euro screw terminal connector |

1.2.1 SERIAL INTERFACE SPECIFICATIONS

The DL2000's CPU has four I/O channels A, B, C and D. Channel A is only accessible on the rear panel's 3 pin connector. Channels B, C and D are accessible on the front panel DB25 connector. A limited handshaking version of Channel B is also accessible on the rear panel's 5 pin connector.

CHANNEL A

Channel A is accessed via PORT A, a three pin screw terminal connector located on the rear of the DL2000. This port is the Synchronous network port, and is the main high-speed industrial LAN port typically used for industrial networks such as A-B DH+ and RIO.

CHANNEL A SPECIFICATIONS:

- Transformer coupled differential signal interface
- Basic Modulation: All Bi-phased encoded signals such as Manchester, etc.
- Optional Modulation: ASK, FSK, and others
- Output signal levels can be varied
- Input sensitivity: 80 dB
- High performance hardware clock recovery circuit
- High performance RS485 can drive more than 32 stations
- Highly resistant to transients due to saturated transformer coupling and diode protection
- Synchronous communications 57.6, 115.2 and 230.4 Kbaud
- Optional: Synchronous speeds to 1 Mbaud
- Optional: Asynchronous communications option at speeds up to 250 Kbaud.

CHANNELS B, C, AND D

Channels B, C and D are accessed via PORT B, a DB25M connector located on the front of the DL2000. This connector is used to gain access to the RS232C, RS232, and RS422/RS485 interfaces for serial Channels B, C and D. Access to a handshaking limited connection to Channel B is also available through the 5 pin connector PORT B' on the rear of the DL2000.

CHANNEL B SPECIFICATIONS:

- RS232C and RS422/RS485 interfaces
- Transorb protection on RS422 lines
- Software switch for RS485 interface direction control
- Handles Synchronous or Asynchronous communications
- Standard product data rates from 150 baud to 19.2 Kbaud and 57.6 Kbaud
- Custom and model 2 units include additional data rates of 38.4 and 115.2 Kbaud
- Optional: Custom data rates to 250Kbaud asynchronous and 1 Mbaud synchronous
- Optional: Differential interface similar to Channel A for synchronous network bridging applications

CHANNEL C SPECIFICATIONS:

- RS232 Asynchronous and BITBUS Communications
- RS422 Asynchronous and BITBUS Communications
- Custom product data rates up to 38.4 Kbaud

CHANNEL D SPECIFICATIONS:

- RS422 Asynchronous and BITBUS Communications
- Custom product data rates up to 38.4 Kbaud

1.3 MODES OF OPERATION:

1.3.1 ON-LINE “OPERATIONAL” MODE

This is the normal operational mode of the DL2000. In On-line mode the this mode the DataLink performs the normal interfacing, controlling, protocol conversion and data translation functions required to interconnect devices and networks.

This mode executes the functions, options and parameters selected by the user during the communications configuration and transfer process. It performs the communications functions selected dependent upon the installed hardware capabilities and on the application software loaded in the DataLink's firmware. Most DataLink models contain two or more selectable protocols.

Before operating a new DL2000 On-line it is necessary to configure its communication parameters. This is accomplished by using the DataLink (DL) configuration software. A DL2000 can be set to its On-line mode by pressing the RESET pushbutton on the rear of the unit or by cycling its AC power.

1.3.2 OFF-LINE “CONFIGURATION, DIAGNOSTIC AND DEBUG” MODES

While in the Off-line mode, the DataLink will not perform On-line operations. Offline-mode is used for the following:

- Writing and reading configuration parameters to/from EEPROM, or restoring default values
- Hardware diagnostic checks to test the circuit board
- Debugging aids for system and custom application software

The above functions require the DataLink DL2 (DOS) or DL'97 (Windows 95/NT) software program supplied with the DataLink. This program can configure all communication parameters (including addressing, network and serial port data rates and protocol selection, etc.), run diagnostic test programs and change the operational mode of the DL2000.

Typical off-line and on-line tests that can be run include WHO active, memory tests of the RAM and EEPROM, LED indicator tests etc.

The Off-line Debug mode permits the firmware to respond to and execute special internal DataLink operating system commands. These commands are typically used for debugging custom application software and for manually reading and writing the DataLink's RAM and EEPROM, as well as capturing and displaying communications messages occurring over the synchronous network.

1.3.3 OFF-LINE “DEVELOPMENT” MODE

Development of custom protocol firmware is achieved using DL2000-CHW custom run-time hardware. Various PC DOS based development software products such as Compilers, Assembler and 'C' Programming tools and factory training may also be required to enable custom protocol development. The firmware used in the DataLink development environment also permits application test programs generated in the PC to be loaded directly into the DataLink's RAM and then operated and tested On-line from RAM rather than from EPROM (units with Flash PROM do not require this capability).

1.4 REFERENCE MATERIALS

This User's Guide contains information on the general features and capabilities of all DL2000 models. When necessary, additional information on the features and capabilities of specific models is supplied at the time of order in the form of additional technical literature, application notes and/or text files on disk. The latest technical information can also be found in the "Download" section of our web site.

Other reference materials required to fully service all the various parts of your communication interface system depend on the specific protocols, serial and network interfaces being used, and the make and models of other manufacturer's equipment being used in your application.

Most equipment suppliers can provide a list of the technical documentation available for their products. The documentation is usually provided free or at nominal cost to enable clients to understand and use the manufacturers' specific products and protocols correctly. Consult these lists, or call the manufacturer or their Distributor for assistance in selecting the appropriate technical literature required for the specific application.

Example :

Allen-Bradley protocol - Serial DF1 used on A-B PLC CH0, 1770-KF2 and 1785-KE

The A-B publications below provide technical data on Protocol, Commands, Messages, Diagnostic Counters, Communications parameter configuration, and other details on network communications using when using A-B DF1 protocol with Data Highway Plus.

For DataLink applications using Allen-Bradley DF1 protocol in Data Highway Plus or Remote I/O Link applications, these publications will provide an understanding of A-B's use of the ANSI / IEEE protocol standard called X3.28 (D1 and F1 subset), typically referred to by A-B as "DF1" protocol.

The publications listed below are available at nominal cost from A-B sales offices or distributors:

- DH / DH+ / DH485 Communication Protocol and Command Set: A-B Publication 1770-6.5.16
- Communication Interface Module (1770-KF2): A-B Publication 1770-6.5.13
- Communication Interface Module (1785-KE): A-B Publication 1785-6.5.2

2.0 SWITCH AND INDICATOR FUNCTIONS

2.1 SWITCH FUNCTIONS:

Two pushbutton switches are present on the rear of the DataLink:

The RESET pushbutton performs a complete hardware reset of the unit. This is similar to a complete power cycle and causes the unit to go through the same LED initiation sequence as described in section 2.2.1. The reset pushbutton puts the unit into On-line mode without disconnection from the power supply.

The CFG (configure) pushbutton is recessed to prevent accidental operation. This pushbutton puts the DataLink into Off-line mode. To put the unit back On-line, either press the reset pushbutton, cycle AC power, or use the DL2 (DOS) or DL'97 (windows 95/NT) software supplied.

2.2 INDICATOR FUNCTIONS:

2.2.1 POWER-UP AND RESET SEQUENCE:

On computer power-up, or after pressing RESET, the DataLink will go through a complete hardware reset sequence including execution of a diagnostic test sequence. If the unit is functioning correctly the LED indicator sequence will be as follows:

| LED | STATUS |
|--------------|---------------------------|
| ▪ PWR | ON continuously |
| ▪ ERR | ON for approx. 0.5 second |
| ▪ CHAN 2 OUT | ON for approx. 1.0 second |
| ▪ CHAN 2 IN | ON for approx. 1.0 second |
| ▪ CHAN 1 OUT | ON for approx. 1.0 second |
| ▪ CHAN 1 IN | ON for approx. 1.0 second |

After a power cycle, reset or On-line mode command, the unit then enters its On-line mode of operation.

If PORT A of the DataLink is connected to an active DH+ the CHAN 1 IN LED will illuminate (faintly) with some level of pulsing dependent on the number of stations and level of communications activity. If the DataLink is not connected to a network, or is connected to a network but is not receiving or sending commands on it, all LED's except power (PWR) will be off at this time.

2.2.2 ON-LINE OPERATION

The following table describes the function of each LED on the front panel of the DataLink during normal On-line operation:

| LED | DESCRIPTION OF OPERATION |
|--------------|--|
| CHAN 1 IN | ON when PORT A receives a valid message with the right station address. |
| CHAN 1 OUT | ON when the unit is transmitting messages other than tokens out of PORT A. |
| CHAN 2 IN | ON when the unit is receiving serial Channel B data into PORT B or PORT B' |
| CHAN 2 OUT | ON when the unit is transmitting Channel B data from PORT B or PORT B' |
| ERR / STATUS | FLASHES for approximately half a second every time the unit transmits or receives a Negative Acknowledgement (NAK) protocol sequence on PORT B or PORT B'. FLASHES at approximately 1 Hz when two stations with the same address) is detected on PORT A. FLASHES intermittently when the DataLink buffers are full (software overrun). |
| PWR | ON when the unit's power (AC or DC) is connected. |

2.2.3 ON-LINE, POWER-UP AND RESET ERRORS

The following table describes the function of each LED on the front panel of the DataLink if the internal diagnostics of the unit detects an internal hardware failure during a power-up / reset sequence or during on-line operation:

| LED | DESCRIPTION OF OPERATION |
|---------------------------|--|
| ERR and CHAN 2 OUT | FLASH alternately. An illegal option has been programmed. Check configuration settings. |
| ALL LED's (except PWR) | FLASH ON and OFF together. A RAM, EPROM or FLASH memory error has occurred. The unit will disconnect from a DH+ token passing network. |
| ALL LED's | ON continuously. The firmware is not installed or is invalid. |

NOTES:

- If all LED's are ON or flashing (except PWR) it may be necessary to return the unit for repair.
- All LED's will light continuously if the reset button is pressed continuously.
- The PWR LED will be ON continuously when AC (or DC) power is connected to the DataLink.

2.2.4 OFF-LINE CONFIGURATION, DIAGNOSTIC, AND DEBUG

The following table describes the function of the front panel LEDs when Off-line modes Diagnostic, Configuration, or Debug are entered:

| LED | DESCRIPTION OF OPERATION |
|-----------------------------|--|
| ERR & CHAN 2 OUT | Continuously ON – Mode is Off-line Configuration/Diagnostic |
| ERR, CHAN 2 IN & CHAN 2 OUT | Continuously ON – Mode is Off-line Debug |
| CHAN 1 IN & CHAN 2 OUT | FLASH ON briefly – Data transfer through serial Channel B during Transfer, Upload, or Restore. |

NOTE:

- The PWR indicator will be continuously ON when AC (or DC) power is connected to the unit.

3.0 CONFIGURATION AND DOCUMENTATION

Program and documentation files are provided on floppy disk with each new DL2000 product. One disk contains the "DL2" Configuration and Diagnostic program which should be used by DOS and Windows 3.0 users. The other disks contain the "DL'97" Configuration and Diagnostic program which should be used by Windows 95 and NT users.

Technical documentation files may also be found in a Tech.doc directory on the DL2 program disk. Program documentation is not supplied in this manual due to frequent updates. DL2 DOS version program documentation is supplied on the same floppy disk in a file called "fs_progs.rtf". To access this file it is first necessary to unzip program "tech-docs.zip". The DL'97 Windows version is more user friendly and has operating instructions built-in to the screen displays.

Program and documentation updates may be obtained by visiting the web site at: and selecting "Downloads".

3.1 DL2 AND DL'97 PROGRAM FUNCTIONS

The main functions of the configuration software are as follows:

Model Selection: To successfully configure the DataLink, the DL2000 model type must first be selected. This choice affects the options available to the user in subsequent configuration options.

Com Port Selection: The COM port and IRQ settings of the computer serial port connected to the DL2000 must be selected before a specific configuration file can be transferred to the DataLink.

Communication settings: A configuration file is created or read and edited and saved on disk. This file contains such parameters as serial and network speed, handshaking and addressing etc.

Parameter Transfer: The configuration parameters may be transferred to or from the DataLink's EEPROM. Factory defaults may also be transferred if EEPROM system data becomes corrupted.

Mode: Enables the DL2000 operational mode to be changed from Off-line Configuration and Diagnostics to Off-line Debug and to On-line. As previously discussed a power cycle or pushbutton reset operation will also put the DataLink into its On-line mode of operation.

Diagnostic Tests: Typical Off-line tests include WHO active, memory tests of the RAM or EEPROM, LED indicator tests etc. Typical On-line tests enable determination of DataLink communication settings (like Find Baud and Parity) as well as tests such as WHO active and Loopback Diagnostics.

NOTES:

- The DL2 program and DL'97 programs are best run from hard drive.
- To reset the DataLink hardware either press its reset pushbutton or cycle power to it.
- DL2 "DOS" operation may be impacted by specific computer, memory and TSR configurations. If the DL2 program does not load, will not transfer configuration files properly or displays any other peculiar behaviour then it may be necessary to run it in a clean DOS system using minimum (or blank) config.sys and autoexec.bat files.
- Windows 95 and NT users should use the DL'97 program although the DL2 DOS configuration program may also be used. If problems are experienced on Windows 95, re-boot the computer and press the F8 key at the "Starting Windows 95" message. This will display a basic menu. Select <Shift + F5> to startup in simple DOS mode. Then, change to the directory containing the DL2 . EXE program and re-start the program by typing <DL2> <Enter>.

3.2 DATA FORMATS

DataLink (DL) products are designed to handle multiple protocols using different data types for address, station number, message length etc.

Examples:

A-B PLC-5: Uses octal for I/O and DH+ station addressing, and decimal for file / word addressing and length etc. PLC programming software generally follows the same convention as for the specific PLC family.

A-B SLC 5/04: SLCs and the A-B programming software uses decimal DH+ station number addressing.

Modbus: Modbus protocol uses decimal addressing throughout.

Different data types (radixes) are often used even within the same PLC, which makes it critical to determine which radix is being used at a particular time and is specially important when trying to configure the DataLink to match a particular device's parameters.

The DataLink product DL2 and DL'97 Configuration and Diagnostic program uses octal for parameters such as DH+ station number and RIO rack number address. Off-line and On-line Diagnostics generally use hexadecimal for addressing and data message lengths.

To make conversion easier between the different data types generally encountered, a cross reference table for decimal (DEC), octal (OCT) and hexadecimal (HEX) numbering systems is provided below.

3.3 ADDRESS CONVERSION TABLE FOR COMMON DATA TYPES

| DEC | OCT | HEX | DEC | OCT | HEX | DEC | OCT | HEX | DEC | OCT | HEX |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 00 | 00 | 00 | 16 | 20 | 10 | 32 | 40 | 20 | 48 | 60 | 30 |
| 01 | 01 | 01 | 17 | 21 | 11 | 33 | 41 | 21 | 49 | 61 | 31 |
| 02 | 02 | 02 | 18 | 22 | 12 | 34 | 42 | 22 | 50 | 62 | 32 |
| 03 | 03 | 03 | 19 | 23 | 13 | 35 | 43 | 23 | 51 | 63 | 33 |
| 04 | 04 | 04 | 20 | 24 | 14 | 36 | 44 | 24 | 52 | 64 | 34 |
| 05 | 05 | 05 | 21 | 25 | 15 | 37 | 45 | 25 | 53 | 65 | 35 |
| 06 | 06 | 06 | 22 | 26 | 16 | 38 | 46 | 26 | 54 | 66 | 36 |
| 07 | 07 | 07 | 23 | 27 | 17 | 39 | 47 | 27 | 55 | 67 | 37 |
| 08 | 10 | 08 | 24 | 30 | 18 | 40 | 50 | 28 | 56 | 70 | 38 |
| 09 | 11 | 09 | 25 | 31 | 19 | 41 | 51 | 29 | 57 | 71 | 39 |
| 10 | 12 | 0A | 26 | 32 | 1A | 42 | 52 | 2A | 58 | 72 | 3A |
| 11 | 13 | 0B | 27 | 33 | 1B | 43 | 53 | 2B | 59 | 73 | 3B |
| 12 | 14 | 0C | 28 | 34 | 1C | 44 | 54 | 2C | 60 | 74 | 3C |
| 13 | 15 | 0D | 29 | 35 | 1D | 45 | 55 | 2D | 61 | 75 | 3D |
| 14 | 16 | 0E | 30 | 36 | 1E | 46 | 56 | 2E | 62 | 76 | 3E |
| 15 | 17 | 0F | 31 | 37 | 1F | 47 | 57 | 2F | 63 | 77 | 3F |

4.0 INTERFACE CONNECTIONS AND JUMPERS

Port A: 3 pin Phoenix / Euro screw terminal connector located on the back of the DataLink. Used to connect the DL to synchronous industrial networks such as A-B's DH+ and RIO Link. The 3 pin plug-in connector on the DataLink is compatible with the 3-pin connector used on A-B equipment.

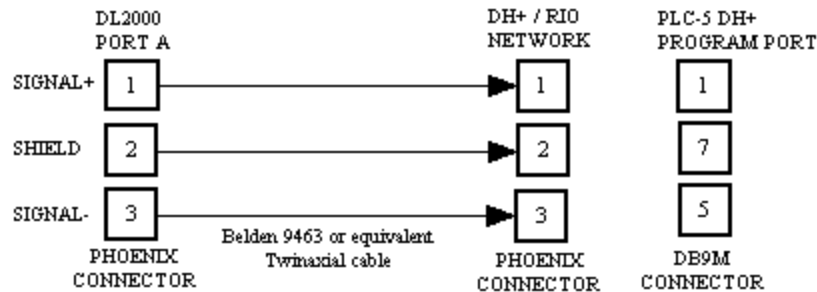
Port B: DB25M connector located on the front of the DataLink. This port provides complete access to channels B and C. Port B must be used for any application requiring all the handshaking lines. Standard DataLinks are normally delivered with the rear port preset to RS232 asynchronous serial communications. Internal jumpers can set it to RS422 (or RS485) mode.

Port B': 5-pin Phoenix / Euro screw terminal located on the back of the DataLink. Provides additional access to channel B. Port B' provides an RS232 interface with RTS and CTS handshaking lines, or an RS422 / RS485 Interface.

| SIGNAL | INTERFACE | DESCRIPTION |
|--------|-----------|---------------------------------------|
| GND | RS232 | Ground |
| RX | RS232 | Serialized Data Input |
| TX | RS232 | Serialized Data Output |
| RX + | RS422 | Differential + Serialized Data Input |
| RX - | RS422 | Differential - Serialized Data Input |
| TX + | RS422 | Differential + Serialized Data Output |
| TX - | RS422 | Differential - Serialized Data Output |

4.1 REAR CONNECTOR PORT A - SYNCHRONOUS NETWORK

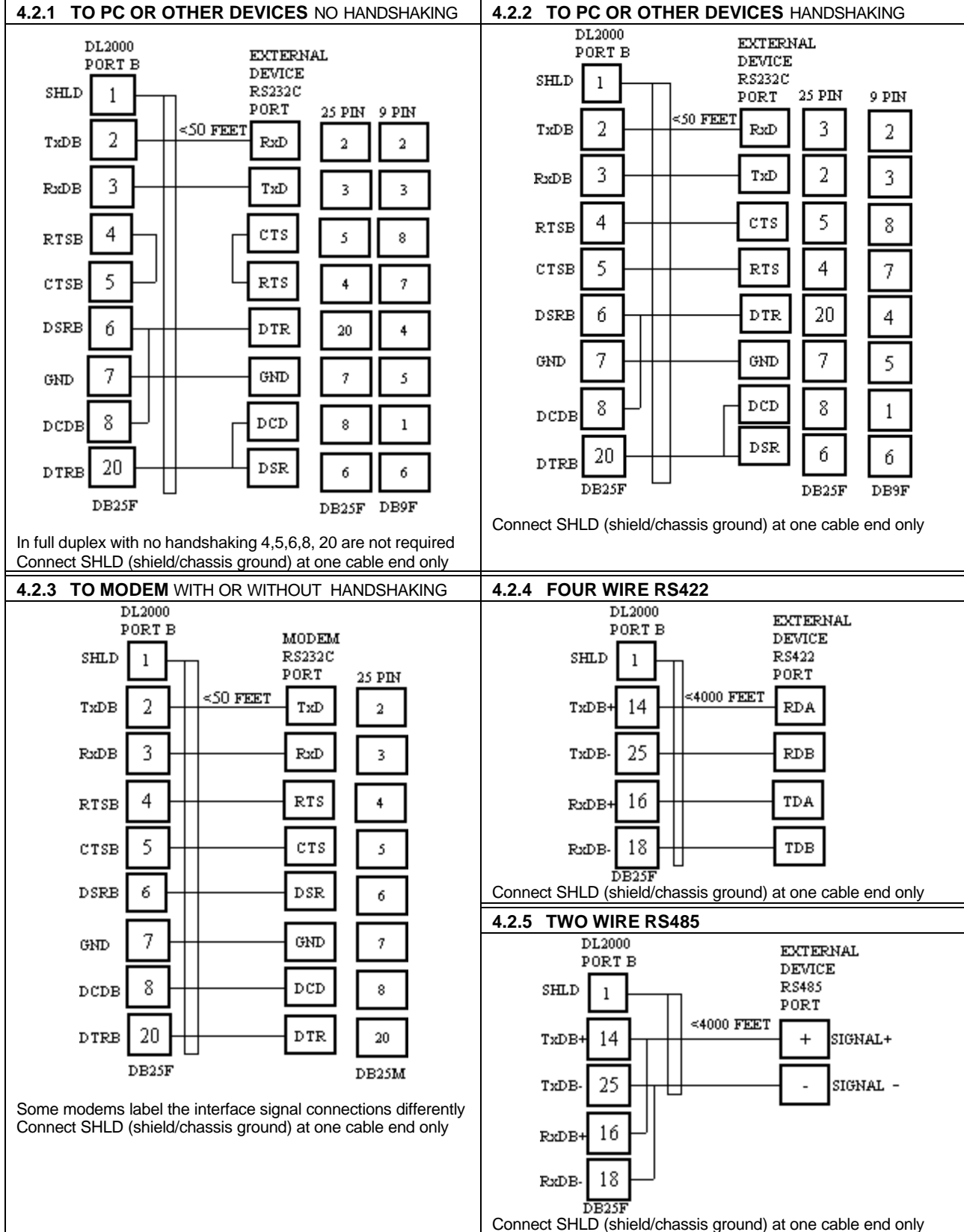
Connector A (NET) is pre-configured as a transformer coupled differential interface used for synchronous serial communications to Allen-Bradley Data Highway Plus and Remote I/O Link networks.



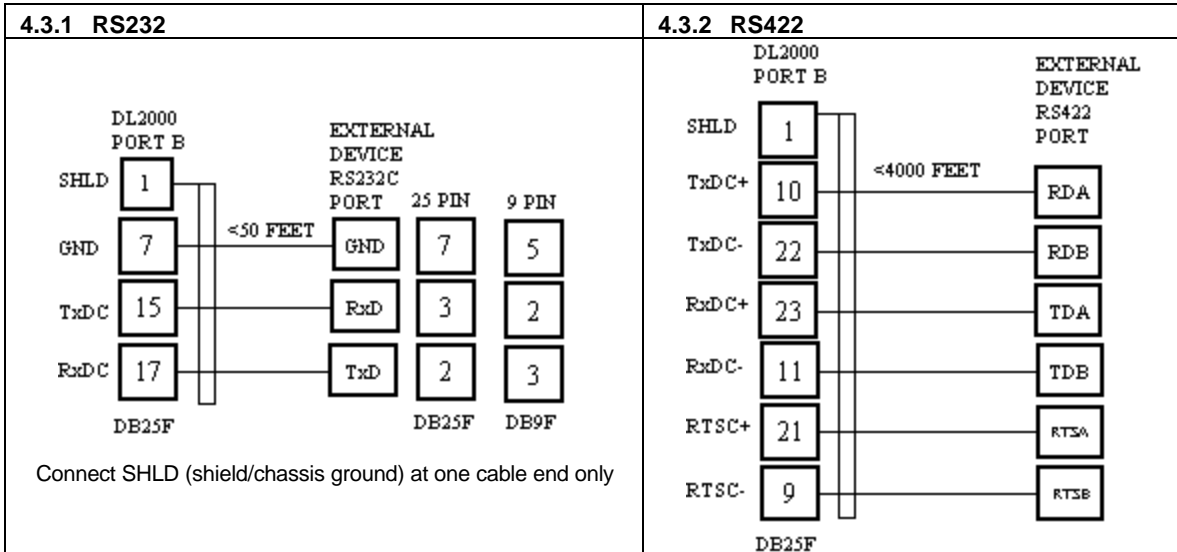
NOTES:

- Pin numbers for the DL connector are 1, 2, 3 from left to right when viewed from the rear.
- Pin numbers for an A-B PLC-5 processor's 3 pin connector are 1, 2, 3 top to bottom.
- Network connector A pin 2 is connected to DC ground on the DataLink via an internal 150k ohm resistor located on the DataLink's pc board.

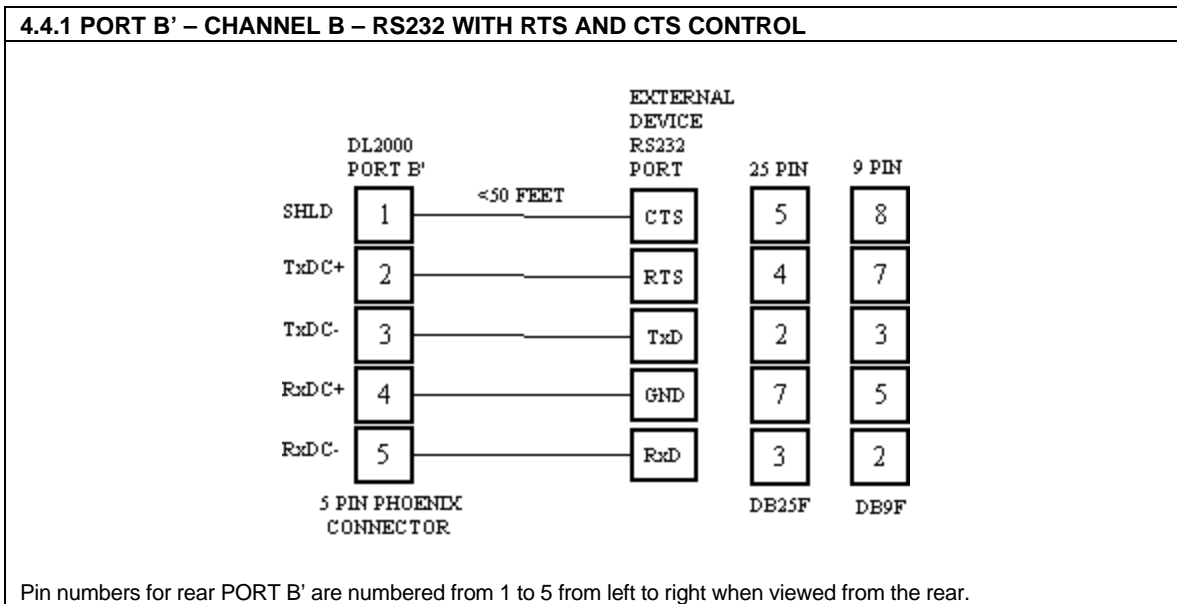
4.2 FRONT CONNECTOR PORT B – CHANNEL B SERIAL INTERFACE



4.3 FRONT CONNECTOR PORT B – CHANNEL C SERIAL INTERFACE



4.4 REAR CONNECTOR PORT B' – CHANNEL B SERIAL INTERFACE



NOTE: Channel B cannot be accessed on front port B and rear port B' simultaneously. Only one of these ports should be connected at any one time.

4.5 RS232C INTERFACE DEFINITIONS FOR FRONT PORT B

| SIGNAL NAME | PIN | DESCRIPTION OF OPERATION |
|---|-----|--|
| TXDB Transmit Data | 2 | Serialized data output from the DL2000 |
| RXDB Receive Data | 3 | Serialized data input to the DL2000 |
| RTSB Request to Send (if handshaking enabled) | 4 | Request from the DL2000 to the external device to prepare it to receive a message from the DL2000. When the DL2000 is configured for Multidrop (A-B Half-Duplex) protocol, or when handshaking is enabled, RTS goes ON when the DL2000 has a message to transmit, otherwise it is OFF. |
| CTSB Clear to Send (if handshaking enabled) | 5 | Signal from an external device to the DL2000 that indicates that the device is ready to receive data from the DL2000. The DL2000 will not transmit until CTS is turned ON. If CTS turns off during transmission, the DL2000 will stop transmitting until CTS is restored. |
| DTRB Data Terminal Ready | 20 | Signal from the DL2000 to an external device to indicate that the DL2000 is operational and ready for communication. |
| | 6 | Signal from an external device to the DL2000 to indicate that the device is operational and ready for communication. The DL2000 requires the DSR signal to communicate if it is in Multidrop (A-B Half-Duplex) mode, or in Point to Point (A-B Full-Duplex) mode with Handshaking enabled. i.e.the DL2000 will not transmit or receive messages unless DSR is on. This signal is typically continuously asserted by a modem. If a modem does not properly control DSR, or if no modem is used, DSR must be jumpered to a high signal at the DL2000's RS232C connector. Since DTR is held high by the DL2000, DSR can be jumpered to DTR. In auto-answer applications, DSR is a signal from the modem to the DL2000 that the phone is off-hook. |
| DCDB Data Carrier Detect (if handshaking enabled) | 8 | Signal from a modem to the DL2000 to indicate that the carrier from another modem is being sensed on the link. The DL2000 requires the DCD signal to communicate if it is configured for Multidrop (A-B Half-Duplex), or in Point to Point (A-B Full-Duplex) with Handshaking enabled. Data will not be received in the DL2000 unless DCD is ON. If a modem is not being used, DCD can be jumpered to DTR at the DL2000. |

5.0 WARRANTY

THIS WARRANTY COVERS:

VoxTechnologies Corp. (VTC) warrants DL2000, DL-PC, DI-PC/104 and DL-STD (DataLink) Communication Controller products against defects in materials and workmanship for one (1) year from the date of purchase. This offer only applies to the first end-user and provided the product is purchased and paid-for. If your DataLink fails to work properly during the warranty period due to a defect in materials or workmanship, VTC will either repair or replace it at no charge for labour or materials. Repair parts or replacement units will be provided on an exchange basis, and will be either new or reconditioned at the choice of the manufacturer.

PROOF OF PURCHASE:

To obtain warranty service, proof of purchase and payment may be required. If you have to make a warranty claim, include a copy of the original receipt or bill of sale showing the date of purchase, and name of the Dealer, Distributor or O.E.M. from whom you purchased the product.

TO OBTAIN WARRANTY SERVICE:

Warranty service may be obtained by returning or shipping your faulty unit prepaid direct to our nearest repair or manufacturing facility. Telephone (972) 234-4343 or fax (972) 234-4343 for a Return Material Authorization (RMA) number and the ship-to address. DLT will require a purchase order before proceeding in case extra costs outside warranty coverage are incurred to receive, test, repair or return the product.

Shipping the product: Carefully pack and send pre-paid and adequately insured. Include information on the fault or complaint, proof of warranty coverage and the RMA number provided by VTC. Direct warranty service is available from the manufacturer during normal business hours (8 am to 4.30 pm Pacific Standard Time).

VTC will prepay regular freight charges for returns within the Continental USA and Canada to return the product to the client for repairs covered by the warranty terms. For returns outside these territories the least expensive shipping method will be used and the costs will be billed to the client. Clients may authorize the use of another shipping method to facilitate delivery and the additional costs will be billed against the purchase order.

WARRANTY LIMITATIONS:

This warranty covers only defects in materials and workmanship on products purchased from VTC and does not cover defects caused by improper use, abuse, accident, acts-of-God, or alteration, modification, and upgrade by unauthorized personnel, or improper return shipping, inadequate packing or shipping damage.

REPAIR OR REPLACEMENT IS YOUR ONLY REMEDY:

Your only remedy under this warranty is the repair or replacement of your DataLink product as described above.

VTC will not be liable for any incidental or consequential damages resulting from your use of, or inability to use your DataLink Communications Controller.

IMPORTANT: **This warranty gives you specific legal rights. You may also have other legal rights which may vary from place to place.**

If a warranty problem is not handled to your satisfaction please call, fax or write to the Technical Support Manager at VoxTechnologies, Inc. with full details of your problem or complaint.

COSTS AND REPAIRS NOT COVERED BY WARRANTY:

VTC requires a purchase order to cover any extra charges incurred that are not covered by the above warranty. This may include items such as: labour, materials, handling, insurance, customs duties, shipping and receiving charges etc.

5.1 WARRANTY REGISTRATION FORM

Complete the following, photocopy and then fax or mail to:

Attn: Marketing / Support Dept.
Company: VoxTechnologies, Corp.
Address: 301 S Sherman, Suite 117
Richardson, TX 75081 USA
Toll-Free: Tel: (972) 234-4343, Fax: (972)234-4295

Reference: Registration of DataLink products:

Register the following purchase(s), and in future contact the person below with any technical information, revisions and updates etc.

Model(s): _____ **Serial Number(s):** _____

Purchased from:

Dealer Name: _____ City: _____

Client Information:

Name: _____ Title: _____

Company: _____ Dept: _____

Address: _____

City: _____ State: _____

Zip/Code: _____ Country: _____

Telephone: _____ Fax: _____

Other Contact Name: _____ Date: _____

Optional Information:

The following information is optional and is requested to help to determine your potential future needs better.

Product Application:

- PC
- Notebook
- Desktop
- HMI / GUI
- OEM Equipment
- Other _____

Type of Business:

- End-User
- Control Systems Integrator
- Dealer / Reseller
- Distributor
- O.E.M. Manufacturer
- Other _____

Comments and Suggestions: _____

6.0 SYSTEM AND CONFIGURATION INFORMATION

This section is provided for users to record their system and configuration details.

The following information about your products may be requested to enable the manufacturer to provide more effective technical assistance:

SYSTEM DETAILS:

DataLink Model(s): _____

DataLink Serial number(s): _____

Firmware Revision: _____

Hardware Revision: _____

DL2 / DL97 / DL32 Program Revision: _____

CLIENT AND PURCHASE INFORMATION:

Date of Purchase: _____

Purchased From: _____

Technical Contact Name: _____

Company: _____

Address: _____

City, State, Zip: _____

Telephone / Facsimile: Tel: _____

Fax: _____

CONFIGURATION DETAILS: