

1.0 INTRODUCTION

1.1 GENERAL

DataLink products provide communications interconnectivity solutions for industrial applications. The DataLink family of products enables industrial Local Area Networks (LANs) such as Allen-Bradley (A-B) Data Highway Plus (DH+), A-B Remote I/O Link (RIO), DeviceNet, and Modicon Modbus to be connected to a wide variety of other manufacturers' products and networks. DataLink devices incorporate a flexible hardware platform that can be used in a wide range of device and network interconnectivity applications. Existing application software with a serial driver capable of Allen-Bradley serial DF1 protocol (CH 0 / KE / KF) can be used with the DataLink family of interface products. Both freestanding serial units and computer bus interface cards are available.

This User's Guide contains information on the general features and capabilities of DataLink interface card products. DataLink serial card interfaces are available in EISA bus (PC), STD bus and PC/104 bus architectures. Additional technical literature, application notes and/or text files are on disks supplied with DataLink units and updates are available from our web site.

Other reference materials required to fully service all the various parts of your communication interface system depend on the specific protocol, serial and network interfaces, and the OEM equipment used in your application. See 'Reference Materials' in section 1.2 of this User's Guide.

Custom engineering software and hardware services are available to either modify an existing device or to create a unique application solution. Contact DataLink Technologies, Inc. for assistance on your interfacing problems or for a current list of products and applications. DataLink's flexible interface products and innovative engineering can assist you to implement the custom interfacing application needed to improve your plant's operation.

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1.2 REFERENCE MATERIALS

Reference materials required to fully service all the various parts of a communication interface system depend on the protocols, serial and network interfaces, and the specific OEM manufacturer's equipment used in the application.

This User's Guide contains information on the features and capabilities common to most standard DataLink communications interface products. Information on the features and capabilities of specific DataLink products is supplied in the form of technical literature, application notes and/or text files on disk or is available on our web site at www.dltech.net.

OEM manufacturers generally provide the necessary technical information supporting their products. Documentation is usually available to assist clients to understand and use the manufacturers' specific products and communication protocols correctly. Call the equipment manufacturer for assistance in selecting the appropriate technical literature required for a specific application.

Contact DataLink Technologies, Inc. for additional installation and start-up assistance.

Example: Communicating with Allen-Bradley Data Highway Plus

DataLink products that interface a computer to Data Highway Plus or Remote I/O networks use the A-B DF1 serial protocol to communicate with the application software. "DF1" actually refers to the D1 and F1 subset of ANSI / IEEE Standard X3.28 for communications protocol.

Most popular DH+ application programs include the A-B DF1 protocol driver. Depending on the program being used, it may also be called the "A-B serial driver" or the "full duplex protocol driver." This driver is the same as that used for serial communications to an A-B PLC-5 or SLC500 serial port Channel 0 (CH0) or to A-B's 1785-KE (KE) and 1770-KF2 (KF) communications interfaces.

The following Allen-Bradley publications contain technical data for the use of the DF1 protocol with A-B PLCs and provide information on Protocol, Commands, Messages, Diagnostics etc. The publications are usually available from A-B sales offices and distributors:

DF1 Protocol and Command

Set Reference Manual

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

1.3 PC INTERFACE CARDS

DataLink pc card interfaces (DL's) support both DH+ and RIO network protocols and use A-B's DF1 (CH 0 / KE / KF) serial driver. In DH+ mode the DL provides PCs, MMIs and computers with an interface to an A-B DH+ network. In RIO mode the DL operates as an RIO adapter and provides PCs, MMIs and computers with an interface to an A-B PLC Remote I/O (RIO) scanner. Other firmware options and custom drivers may also be available. Contact DataLink for more details.

The DataLink DL-PC is a half-size pc card designed to occupy a standard EISA bus slot and is suitable for all IBM compatible computers (PC) and for OEM equipment that has either a standard ISA or an extended ISA (EISA) bus slot.

The DataLink DL-STD is a pc card in the STD bus form factor designed to occupy a slot in an STD16/80 or STD32 bus chassis and can be used with STD products made by companies such as Ziotech, Pro-Log, and WinSystems.

The DataLink DL-PC/104 interfaces to the self-stacking (stack-through) bus connector on standard PC/104 architecture computers.

DL communication interfaces are similar to a standard computer serial port card and use the same Zilog Z80182 Intelligent Peripheral Controller (IPC) as many PC internal modem cards. The Z80182 has a Z80 CPU core, two built in USARTs and a built-in "mimic" interface that emulates a standard COM port. Data transfer rates of a DL are significantly faster than for freestanding serial interfaces such as an A-B 1770-KF2 because data is transferred to the DL in bytes over the computer's bus instead of in bits (19.2 Kbaud) via a serial cable.

DL interface cards operate quite differently than other pc card interfaces such as A-B's 1784-KT and S-S Technologies' 5136-SD cards. DL interface cards use different software drivers and do not require their operating program to be uploaded from a computer on power up.

Rather than act as an extension of the computer's mainboard, and thereby use valuable resources such as RAM and processing time, DLs are completely self-contained. They occupy a COM Port and IRQ for communication and have a built-in firmware program in flash memory, EPROM configuration memory, RAM buffer memory, and an on-board processor, etc.

DLs interface to the application software using the same serial software driver (A-B serial / DF1 / CH 0 / KE / KF) as used to connect to A-B serial devices such as the 1770-KF2, the 1785-KE, and the front serial port on A-B PLC-5s and SLC500s.

DL interface cards communicate with a computer's CPU over its I/O bus. Replacing a serial interface device with a DL pc card can boost the performance of the application software because of the higher (bus) speeds. The effective "serial" data throughput of the DataLink can exceed 115 Kbaud or can be "throttled" back to emulate typical serial link speeds. The actual throughput is dependent upon the speed of the computer hardware and on the performance of the operating system, application software, interrupt handling capabilities and serial driver running in the computer.

Configuration of DL interface cards require communication parameters such as COM port and IRQ values to be selected from menus and then transferred to the unit's EEPROM. This permits the DL to be installed in the computer and then configured or re-configured "in-place" using menu driven software. DL interface cards can be configured "internally", over the computer bus, or "externally", via the DL's 5-Pin serial connector.

The DataLink's communications network interface is very flexible as it uses programmable array logic (PAL) and programmable logic device (PLD) chips. These chips enable the DL to implement the alternative modulation strategies that may be required for use with different industrial networks.

The DL can be fitted with a CAN chip option to permit connection to (A-B) DeviceNet or Honeywell Smart Distributed System (SDS).

On standard DL pc cards the 5 pin connector can only be used for configuration (using a pc serial port). It cannot be used as a serial interface during normal on-line operation. Custom versions of the DL product could be optionally programmed to use the 5 pin connector to provide an RS232 or RS422 serial interface to OEM devices and networks.

2.0 TECHNICAL SPECIFICATIONS

2.1 INTERFACE SPECIFICATIONS

BUS INTERFACE: This is the connector interfacing the DataLink to either the PC's ISA (or EISA) bus motherboard, the STD bus chassis connector or the PC/104 stack-through connector.

NETWORK INTERFACE: Port A is a three pin Phoenix / Euro screw terminal connector located on the edge (plate) of the DataLink. This interface is sometimes referred to as the Network port or Synchronous port. It is the main high-speed industrial LAN interface used for networks such as DH+ and RIO.

Network Port:	Transformer coupled, differential signal interface
Basic modulation:	Bi-phase manchester encoded signals
Optional modulation:	Other bi-phase and ASK, FSK etc.

SERIAL INTERFACE: Port B is a five pin Phoenix / Euro screw terminal connector located on the DL pc card edge. This connection can be connected to a PC serial port and used to configure the DL. Optionally, the DL can be engineered to communicate with custom RS232 or RS422 networks and devices or Control Area Network (CAN) interfaces such as (A-B) DeviceNet and Honeywell Smart Distributed System (SDS).

2.2 PUSHBUTTON, CONNECTORS, AND INDICATORS

This section contains information on the physical position and main purpose of the components located on the edge of the DataLink DL pc card module.

Red 'STAT' LED	Indicates communications / module status
Green 'NET' LED	Indicates network communications activity
Green 'BUS' LED	Indicates ISA / STD bus communications activity
'CFG' Pushbutton	Initiates BIOS "Firmware Utilities" program
Port A	3 pin Phoenix / Euro connector for network interface
Port B	5 pin Phoenix connector for serial interface

2.3 HARDWARE SPECIFICATIONS

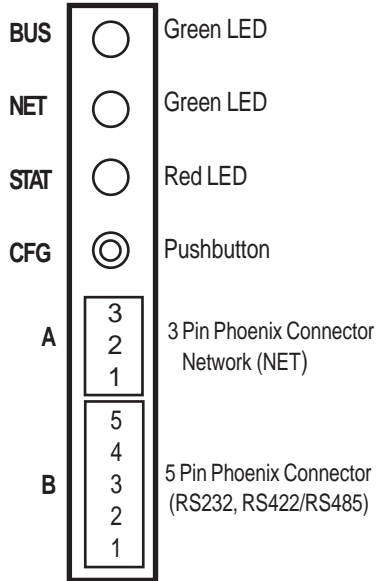
POWER:	Bus:	5 V DC; 3 Watts
INSTALLATION:	DL-PC:	Interface card for ISA and EISA bus
	DL-STD:	Module for STD16/80 and STD32 bus
	DL-PC/104	PC/104 Bus connection (stack through)
ENVIRONMENT:	Temp.:	Operating: +32 to +122 deg. F (0 to +50 deg. C)
	Storage:	-40 to +185 deg. F (-40 to +85 deg. C)
	Humidity:	5 to 95% Non-condensing
CONTROLLER:	IPC:	Zilog Z80182; 12.288 Mhz; 2 USARts + Mimic Interface
PROCESSOR:	CPU:	Enhanced Z80 CPU core
OSCILLATOR:	Standard:	14.7456 Mhz for ESCC network interface
EEPROM:	Standard:	256 bytes
FLASH PROM:	Standard:	64 Kbytes
RAM:	Standard:	32 Kbytes
PUSHBUTTON:	CFG:	Configure COM Port and IRQ Identity
INDICATORS:	BUS:	Bus activity and DL mode
	NET:	Network activity and DL mode
	STAT:	Module status, Buffer full, Errors and DL mode
INTERFACES:	Standard:	Serial COM port on I/O bus Synchronous SDLC network Asynchronous serial RS232 or RS422/RS485
PROTOCOLS:	Network:	DH+ and RIO (adapter)
	Bus:	Serial DF1 protocol
OPTIONS:	Hardware:	Options must be Factory Installed
CONFIGURATION:	Software:	PC based menu system parameters saved in EEPROM
ERROR CHECK:	Mode:	BCC or CRC 16
COMMUNICATIONS:	Bus:	Parallel transfer over I/O bus
	Network:	Synchronous serial at up to 230 Kbaud
	Serial:	Asynchronous serial at up to 38.4 Kbaud
CONNECTORS:	Bus:	ISA, STD or PC/104 bus connector
	Network:	3 pin Phoenix/Euro screw terminal connector
	Serial:	5-pin Phoenix/Euro screw terminal connector

3.0 PUSHBUTTON, CONNECTORS AND LEDS

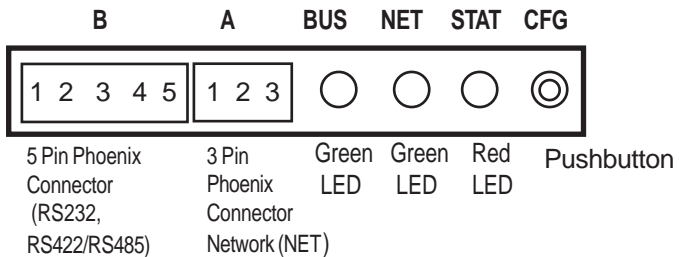
3.1 CARD EDGE LAYOUT

The diagrams below illustrate the pushbutton, connector and indicator layout for DataLink interface cards (DLs).

DL-PC and DL-STD:



DL-PC/104:






3.2 CFG PUSHBUTTON

Pressing the **CFG** pushbutton sets the DL into a special Off-line mode and initiates a firmware-based "Utilities" program and turns the DL's **STAT** and **BUS** LEDs **ON**. This mode is mainly used to configure the COM Port and IRQ number (Identity) used by the DL pc card interface on the computer's bus. This mode also enables other Off-line operations such as internal diagnostic tests, debug operations and burning new firmware into Flash memory.

3.3 LED INDICATORS

3.3.1 POWER-UP AND RESET




On computer power-up, computer reset, or after execution of a software On-Line mode command, the DL will go through a diagnostic test sequence and then enter its On-Line mode. The correct LED indicator sequence is:

LED	COLOR	POSITION	STATUS
 BUS	Green	Furthest from Pushbutton	ON last, OFF after 1 second
 NET	Green	Middle LED	ON second, OFF after 1 second
 STAT	Red	Nearest Pushbutton	ON first, OFF after 1 second

Then if the DL is receiving and responding to commands directed to it (such as on an active token passing DH+ or from an RIO scanner) the middle green NET LED will be 'ON' dimly or pulsing. If the DL is not connected to an active network, or is connected but not receiving or sending tokens or commands, all LEDs will be off.





3.3.2 ON-LINE OPERATION

The following describes the DL's LED activity during On-line operation to an active DH+:

LED	POSITION	DESCRIPTION
	BUS Farthest from Pushbutton	ON when the DataLink is transmitting or receiving messages to/from the computer over the I/O bus.
	NET Middle LED	ON when the DataLink is transmitting or receiving messages (or DH+ tokens) to/from its Network port.
	STAT Nearest Pushbutton	FLASHES about once / second for address error. FLASHES intermittently for buffer full. FLASHES for communications error. See section 3.3.4

3.3.3 CONFIGURATION, DIAGNOSTIC, DEBUG MODES

The following table shows the status of the indicators on the DL pc card when it is in its Off-Line Diagnostic and Debug modes of operation.

LED	APPEARANCE	DESCRIPTION
	NET and STAT On Steady	Off-Line Configuration / Diagnostic mode
	BUS and STAT On Steady	Flash Manager mode Configure COM and IRQ number
	All LEDs On Steady	Off-Line Debug mode
	BUS and NET Pulsing On & Off	Data is being transferred between the ISA, STD or 104 bus and the DL during configuration

3.3.4 ERROR DETECTION

The following table describes the meaning of the LEDs on DL interface cards if the internal diagnostics of the DL detect an error during power-up or during on-line operation.

	LED BEHAVIOR	PROBLEM	SOLUTION
○ ○	STAT/NET flash alternately with equal on/off times	An illegal option has been programmed for the DL	Check configuration: model and settings
○ ○	STAT flashes once per second	DL is configured for an existing network address.	Change one of the duplicated addresses
○ ○	ALL LEDs flash on and off together	RAM or FLASH memory parity error detected	Contact manufacturer. May need factory repair
● ●	ALL LEDs on steady	Firmware not installed, improperly seated or invalid.	Reload FLASH file. May need factory repair

4.0 CONNECTIONS AND JUMPERS

A diagram showing the position of the DL's connectors can be found in section 3.1.

Port A on DL interface cards is the 3 pin Phoenix / Euro screw terminal connector. It is used to connect the DL to synchronous industrial networks such as A-B's DH+ and RIO Link. This connector is also compatible with the 3 pin network connector used on A-B equipment such as PLC-5s.

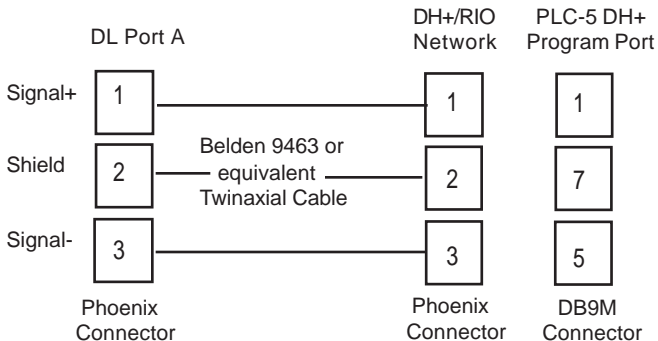
Port B is a 5 pin connector located on the card edge of DataLink cards. This connector is used for configuration only and is generally set for RS232 asynchronous serial communications but can also be jumpered for RS422 / RS485.

4.1 PORT A - NETWORK

Port 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.

Pin numbers for the DL's 3-pin Phoenix connector are 1, 2, 3 where pin 3 is closest to the pushbutton (see section 3.1). Pin numbers for an A-B PLC-5 processor's 3 pin connector are 1, 2, 3 top to bottom. Pin 2 is connected to DC ground via an internal 150k ohm resistor on the DL PC board.

PIN	DESCRIPTION
A-1	Signal +
A-2	Signal Ground (via on board 150 Kohm resistor)
A-3	Signal -



4.2 SERIAL PORT B

Port B is a 5 pin screw terminal connector located on the card edge and is normally used for configuration only. Port B is connected to the DL's various physical interfaces via jumpers that can configure the wiring for RS232, RS422/485 or the optional CAN network (DeviceNet or SDS) interface. Pin numbers for the DL's 5-pin Phoenix connector are 1, 2, 3, 4, 5 where pin 5 is next to the 3 pin connector A (see section 3.1).

4.2.1 INTERFACE SIGNAL DEFINITIONS

Input refers to the direction of data going into the DL and Output refers to data coming out of the DL.

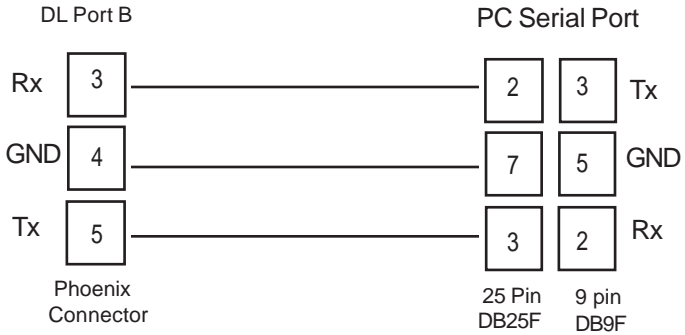
SIGNAL	INTERFACE	DESCRIPTION
GND	RS232	Ground
RX	RS232	Serialised Data Input
TX	RS232	Serialised Data Output
RX +	RS422	Differential + Serialised Data Input
RX -	RS422	Differential - Serialised Data Input
TX +	RS422	Differential + Serialised Data Output
TX -	RS422	Differential - Serialised Data Output
CAN +	CAN	Differential + Serialised Input/Output Data
CAN -	CAN	Differential - Serialised Input/Output Data
V +	CAN	DC + power
V -	CAN	DC - power
DRAIN	CAN	Drain

4.2.2 SERIAL INTERFACE WIRING

TERMINAL NUMBER	RS232 SIGNAL	RS422 SIGNAL	CAN SIGNAL
1	NC*	RX+	V -
2	NC	RX-	CAN-
3	RX	TX+	DRAIN
4	GND	GND	CAN+
5	TX	TX-	V+

*Note: On DL-STD, terminal 1 provides an additional interrupt connection to the CPU

Typical PC Cable:



4.2.3 SERIAL INTERFACE JUMPERS

DataLink interface cards are fitted with jumper pads W8 through W12, which can be found on the component side of the circuit board near the 5 pin connector. The small square at the top right of each contact block denotes pin number 1. Each jumper pad relates to a terminal on the 5-pin connector.

To set the jumpers for a specific interface consult the following chart. Jumper pads are listed across the top row, and jumper placement across the left column. For example, placement of a jumper between contacts 5 and 6 on jumper pad W8 creates a V+ connection for pin 5 on the 5-pin serial connector.

Jumper Pad:

W12		W11		W10			W9		W8		
3	1	3	1	5	3	1	3	1	5	3	1
4	2	4	2	6	4	2	4	2	6	4	2

Jumper Position:	1 - 2	RX +	RX -	RX	GND	TX-
	3 - 4	V-	CAN-	DRAIN	CAN+	TX
	5 - 6			TX+		V+

Terminal affected:	1	2	3	4	5
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5.0 CONFIGURATION AND DIAGNOSTICS SOFTWARE

5.1 OVERVIEW

The primary purpose of the DL2 and DL32 software is to configure the communication parameters on a DataLink pc card (DL). The software also permits on-line and off-line diagnostic tests and enables special DL features such as debug and flash memory (firmware) burning. The DL configuration programs run best when installed on, and run from, the hard drive.

Configuration program documentation is not provided in this User's Guide as frequent changes to accommodate program and product enhancements would make the information obsolete. To access DataLink program documentation, see the "tech_docs.zip" archive on the floppy disks shipped with all new units. The latest information is also available on-line at the DataLink website (www.dltech.net). To access the tech_docs.zip files, 'unzip' it with a program such as pkunzip, zip for windows, or a similar utility. Note that decompression "shareware" can easily be found on the internet.

The DataLink website is also available as a resource for the latest configuration and diagnostic software and for firmware and technical documentation updates. For technical assistance contact DataLink by fax, phone, or e-mail (see section 1.0 for contact information).

5.2 DL2 AND DL32 PROGRAM FUNCTIONS

The "DL2" Configuration and Diagnostic software is a DOS program designed for use with DOS or Windows 3.x operating systems. DL2 operation may be impacted by specific computer, extended/expanded memory and resident program (TSR) configurations. If the DL2 program does not operate as expected it should be run in a clean DOS system using a minimum of entries in the config.sys and autoexec.bat system files.

The "DL32" Configuration and Diagnostic software is a 32 bit program designed for Windows 95, Windows 98 and Windows NT operating systems.

Model Selection: To successfully configure a DataLink pc card (DL), the specific model type must first be selected. This selection reduces the entries needed in subsequent steps.

Com Port and IRQ Selection: Permits the user to enter specific COM port and IRQ values for the DL and to save them in the DL's EEPROM. The user's application program then uses these I/O addresses and interrupt values to communicate with the DL via the computer bus.

Configure / View communication file: This selection is used to configure or view a communications parameter file including information such as network address, network speed, BCC/CRC message check etc. The user can either create a new configuration file or can read and edit an existing file. The file may then be saved on disk or transferred to a DL.

Parameter Transfer: Configuration parameters may be downloaded from a configuration file to the DL's EEPROM or uploaded from the DL's EEPROM and saved in a disk file. Factory defaults may also be transferred in case "system data" becomes corrupted.

Mode: Enables the DL's operation to be changed between On-line and Off-line modes. Cycling DC power will also put the DL into its On-line operational mode.

On-Line Diagnostic Tests: On-line diagnostics enable the DL to run tests over an active DH+ network. Selection of On-line tests executes an application program called "Diag.exe".

Off-Line Tools: The DL's firmware has a built-in firmware utility that works with a terminal emulator program such as the included "Mon.exe" program to enable off-line diagnostic tests and software debug operations. It also permits a new operating program to be "burnt" into the DL's Flash memory from a disk file in order to change or update the DL's installed firmware.

6.0 MODES OF OPERATION

DataLink pc card interfaces (DLs) have two modes of operation: On-line and Off-line mode.

The On-line mode is the normal operational mode of the DL that permits it to communicate on an active communications network. In this mode the DL can also be used with an included test program to perform On-line diagnostic tests over an active DH+ network. The On-line mode is entered after DC power is cycled to the unit or on receipt of a mode change command.

In Off-line mode the DL is inactive on the communications network. The DL's CFG pushbutton puts the DL Off-line and initiates a program built into the DL's firmware. In conjunction with DL2 or DL32 software a newly installed DL can then be assigned a unique COM port and IRQ number. Other tools available in this mode include internal diagnostic tests, system debug commands and the ability to "burn" a new flash firmware program.

The DL's LED lights indicate on-line communications activity, the current mode of operation and error detection. A functional description of the LEDs can be found in section 3.3.

6.1 ON-LINE MODE AND HARDWARE RESET

DataLink pc card (DL) products contain one or more operational protocols to enable each device to connect to different networks and devices. For example the DL-PC-KFR product is an ISA bus card that contains two protocols enabling it to connect to either Data Highway Plus (DH+) or Remote I/O Link (RIO) networks.

In On-line mode the DL performs the normal interfacing, controlling, protocol conversion and data translation functions required to interconnect devices and networks. In this mode DataLink application software can also perform On-line tests such as Who Active and Data Loopback Diagnostics on an active DH+.

A DL unit is automatically reset to On-line mode by cycling AC or DC power to the computer in which the DL is installed, by rebooting the computer in which it is installed, or by the reception of special mode change commands from the DL2 or DL32 software.

6.2 OFF-LINE MODES

While in the Off-line mode, the DataLink pc card (DL) is inactive on the network. The DL2 and DL32 software can issue a command to put the DL into Off-line mode. In this mode the DL software can perform operations such as configuration of general communication parameters.

Pressing the recessed CFG pushbutton places the DL under control of its internal firmware program. In this mode it can configure the COM port and IRQ identity of a DL interface card, perform system debug commands, dump memory and write new firmware to flash memory.

6.2.1 COM AND IRQ IDENTITY SET MODE

When the CFG pushbutton has been pressed the DL is temporarily configured to accept a Com Port and IRQ “identity set” command. This command is generated by the DL2 or DL32 software, and may be sent to the DL over the bus to its pre-configured COM port address and IRQ value, over its 5 pin serial connector (Port B), or over one of two special bus addresses: **0320h** or **0368h** (**note: this last option is not available to users of Windows NT**).

Once a COM Port and IRQ “identity set” command has been successfully received by the DL, the configuration program will issue a command to put the unit on-line using these new parameters for communication.

6.2.2 CONFIGURATION AND DIAGNOSTIC MODES

Off-line configuration and diagnostic modes are used for the following:

- Writing and reading communications configuration parameters to/from EEPROM or restoring default values
- Hardware diagnostic checks to test the circuit board

The DL2 and DL32 configuration software is used to change the DL's operational mode to Off-line and to configure DL network communication parameters including station or rack address, network and serial port data rates, protocol selection, etc. In addition, the DL2 and DL32 software can be used to run Off-line diagnostic tests such as RAM and EEPROM memory tests, LED indicator tests, etc.

6.2.3 FIRMWARE UTILITY MODES

To use the firmware tools identified below, the DL2 and DL32 software initiates the included “Mon.exe” terminal emulator program. Then the user presses the DL’s CFG pushbutton which starts its built-in firmware utility. Using the simple software menu that appears on the terminal emulator display, the user can run built-in functions such as:

- Restoring EEPROM to Factory settings
- Writing new operating firmware in Flash memory
- Debugging aids for system and custom application software

The Off-line Debug mode permits the firmware to execute special internal DataLink operating system commands. These commands are typically used for debugging custom application software and for manually reading and writing to the DataLink’s RAM and EEPROM memory. These functions also include RAM memory dumps and capturing and displaying communications messages occurring over the synchronous network. Factory default settings can also be restored using this function.

DL’s come pre-loaded with operating firmware burnt in Flash memory. The Off-line Flash burn firmware utility permits a new operating firmware program to be loaded from a disk file into the DL’s Flash memory.

APPENDIX 1: DATA FORMATS AND ADDRESS CONVERSION

DataLink 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 especially important when trying to configure the DataLink to match a particular device's parameters.

The DataLink DL2 and DL32 Configuration and Diagnostic program use octal numbering 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.

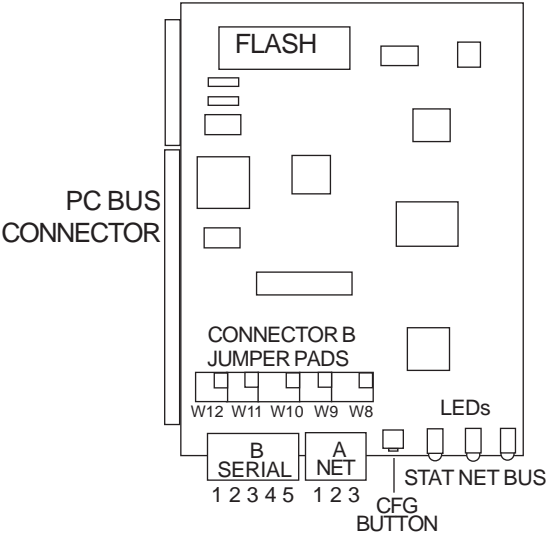
To make conversion easier among the different data types generally encountered, a cross reference table for decimal (DEC), octal (OCT) and hexadecimal (HEX) numbering systems is provided on the following page.

ADDRESS CONVERSION FOR COMMON DATA TYPES

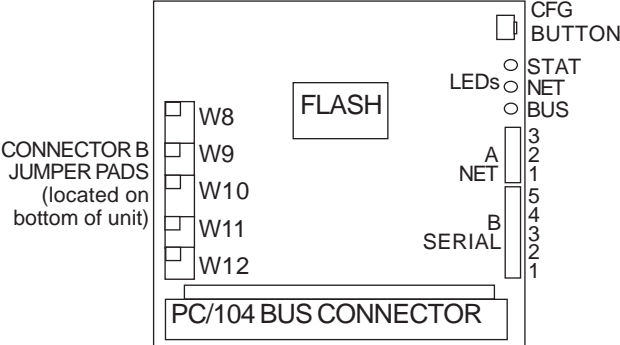
DEC	OCT	HEX	DEC	OCT	HEX
00	00	00	32	40	20
01	01	01	33	41	21
02	02	02	34	42	22
03	03	03	35	43	23
04	04	04	36	44	24
05	05	05	37	45	25
06	06	06	38	46	26
07	07	07	39	47	27
08	10	08	40	50	28
09	11	09	41	51	29
10	12	0A	42	52	2A
11	13	0B	43	53	2B
12	14	0C	44	54	2C
13	15	0D	45	55	2D
14	16	0E	46	56	2E
15	17	0F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

APPENDIX 2: CIRCUIT BOARD LAYOUTS

DL-PC:

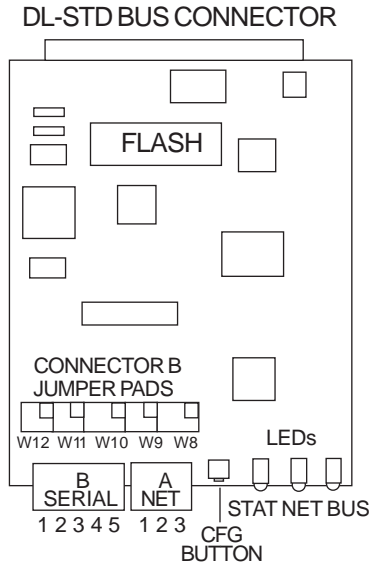


DL-PC/104:



Circuit Board layouts (cont'd):

DL-STD:



APPENDIX 3: COM PORT ADDRESSES AND IRQs

This section provides information on typical COM port address and IRQ values for a PC and also information on the interrupt architecture of a typical Ziatech STD bus CPU board. For specific details on configuring the interrupts suitable for your STD 16/80 or STD 32 bus computer use the technical manuals provided by your STD bus system vendor.

The DL bus product can be set to COM ports 1 to 4 using the normal default ISA bus I/O addresses. The selections COM5 to COM8 enable the DL to be set to other I/O addresses that are generally available.

The STD bus design uses 5 unique "INTRQ" interrupt hardware lines on the backplane of the STD chassis. These interrupts are called INTRQ, INTRQ1, INTRQ2, INTRQ3 and INTRQ4. The STD bus interrupt lines may then be jumpered to any available ISA bus IRQ (IR) line from IRQ3 to IRQ15 on the appropriate STD bus CPU module. Refer to the system vendor's configuration procedures specific to your CPU card.

IRQ USAGE

IR/IRQ #	TYPICAL FUNCTION	AVAILABILITY
0	Time of Day clock	Not available for DL
1	Keyboard Controller	Not available for DL
2	Cascade IRQ - for IRQs 8 - 15	Available if IRQs 8-15 not used
3	Serial port COM2 (or COM4)	May be available for DL
4	Serial port COM1 (or COM3)	May be available for DL
5	XT - Hard Disk, AT-LPT	May be available for DL
6	Floppy Disk	Available if no floppy installed
7	LPT Parallel Printer	Available if no printer installed
8-15	Various	Available for use by DL

NOTES:

- Application programs running under Windows 3.1, Windows 9x and Windows NT may not be able to share the same interrupt (IRQ) number.
- If default IRQs 3 and 4 are unavailable IRQ 5 may be the best alternative.

ADDRESSES AND INTERRUPTS FOR DL-PCs AND DL-PC/104s

Note:

IRQ2 is available if interrupts 8 - 15 are not being used

IRQ5 is available if not being used for a hard drive in an -XT system

IRQ6 is not available if the system has a floppy drive

IRQ7 is available if the system does not have a parallel printer

SERIAL COM PORT	ISA BUS ADDRESS	SUGGESTED IRQ # for DL-PC
COM 1	3F8 - 3FF	4, 5 or 7-15
COM 2	2F8 - 2FF	3, 5 or 7-15
COM 3	3E8 - 3EF	4, 5 or 7 -15
COM 4	2E8 - 2EF	3, 5 or 7 -15
COM 5	210 - 217	5 or 7-15
COM 6	240 - 247	5 or 7-15
COM 7	340 - 347	5 or 7-15
COM 8	360 - 367	5 or 7-15

ADDRESSES AND INTERRUPTS FOR DL-STDs

An STD bus CPU card uses the same COM1 to COM8 port I/O bus addresses as per the address table above. An STD bus chassis provides the following 5 interrupt lines across the STD bus backplane: INTRQ, INTRQ1, INTRQ2, INTRQ3 and INTRQ4.

A specific INTRQ line is programmed in the DL-STD during the configuration procedures. This can then be jumpered to one of ISA bus lines IRQ2 through IRQ15. Consult the technical manual provided with your vendor's CPU board. If more than one DL-STD is used each one would normally use a unique INTRQ #.

INTRQ SIGNAL	BACKPLANE CONNECTION	IR / IRQ DEFAULT	TYPICAL STD DEFAULTS
INTRQ	44	9	Network card
INTRQ1	37	1	Keyboard interrupt if separate keyboard/video card
INTRQ2	50	6	External floppy
INTRQ3	E67	14	External hard drive
INTRQ4	5	5	Star System (multi-processor)

Notes:

1. The above defaults are typical for Ziatech systems.
2. E67 is only available on STD32 bus.
3. Pin 1 of the DL-STD 5 pin connector provides an additional INTRQ interrupt line for the CPU.

APPENDIX 4: WARRANTY

THIS WARRANTY COVERS:

DataLink Technologies, Inc. (DLT) warrants DL-PC, DL-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 applies only to products that DLT has been paid for. If your DataLink fails to work properly during the warranty period due to a defect in materials or workmanship, DLT will either repair or replace it at no charge for labour or materials. Replacement units can be provided on an exchange basis, and will be either new or reconditioned at DLT's choice.

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 your 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, fax or e-mail us at the numbers listed in section 1.0 and request a Return Material Authorization (RMA) number and the ship-to address. We require a purchase order in case extra costs outside the coverage of this warranty are incurred to receive, test, repair or return the product.

Shipping the product: Carefully pack and send prepaid and adequately insured. Include information on the fault or complaint, proof of warranty coverage and the RMA number provided by DLT. Direct warranty service is available from the manufacturer during normal business hours.

DLT 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 DLT 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.

DLT 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 DataLink Technologies, Inc. with full details of your problem or complaint.

COSTS AND REPAIRS NOT COVERED BY WARRANTY:

DLT 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.

Shipping address in US:

DataLink Technologies, Inc.
3873-C Airport Way, P.O. Box 9754
Bellingham WA USA
98227-9754

Outside US, call for shipping instructions:

US and Canada (Toll Free) : (800) 851-7883
Other Countries: (360) 671-8731

APPENDIX 5: WARRANTY REGISTRATION FORM

Fill in the following, photocopy and then fax or mail to:

Attn: Marketing / Support Dept.
Company: DataLink Technologies, Inc.
Address: 3873-C Airport Way, P.O. Box 9754
Bellingham, WA 98227-9754
Telephone: (360) 671-8731, Fax: (360) 647-0195
Tollfree: Tel: (800) 851-7883

Reference: Registration of DataLink products:

Register the following purchase(s), and in future contact the person responsible 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: _____

Product Application:

- PC-Notebook
- Laptop
- Desktop
- HMI/GUI
- OEM Equip
- Other _____

Type of Business:

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

Comments and Suggestions: _____

Contact Name: _____ Date: _____

