CONFIGURATION GUIDE

A-B REMOTE I/O LINK ADAPTER FOR DATALINK DL-KFR PC CARDS

This configuration guide provides programming information for the DL-PC (ISA) and DL-STD (STD 80 and 32) Remote I/O Link applications. These “DL” products provide an interface between a computer running an Allen-Bradley serial driver ie. DF1 / KE / KF protocol and an A-B network either Data Highway Plus or Remote I/O Link (adapator mode). These pc cards have a built-in serial COM port emulator interface to the computer bus similar to the design used by internal modems. This interface enables DL pc cards to operate the same as an external serial device attached to a regular serial card’s COM port. The pc cards connect directly on a computer’s bus which enables them to operate at bus speeds instead of being limited to the usual serial speeds of up to 19,200 baud. This configuration guide details specific configuration information for the KFR protocol, and should be used in conjunction with the information and procedures contained in the DataLink DL-PC / DL-STD (pc card) User's Guide.

The DL-KFR products contain two selectable protocols for either of the following on-line modes:
Mode 0: Serial DF1 protocol to A-B Data Highway Plus (DH+). This mode enables a computer to be connected directly to an A-B DH+. The DL’s synchronous communications channel A (NET) connects to the DH+ using a Phoenix/Euro 3 pin terminal connector. In DH+ mode the DL can operate at network speeds of 57.6 and 115.2 Kbaud.
Mode 4: Serial DF1 protocol to A-B Remote I/O (RIO) Adapter mode. Adapter mode enables an A-B PLC scanner to communicate with the DL as if it was a virtual rack. Mode 4 enables a PLC’s RIO scanner to read and write to RAM buffers in the DL for applications such as PLC programming, HMI / GUI operator interfaces and other OEM applications. These applications are also able to read and write to the same RAM buffers in the DL over the computer’s bus. The DL’s synchronous communications channel A (NET) connects to the DH+ using a Phoenix/Euro 3 pin terminal connector, and is capable of operating at speeds of 57.6. 115.2 and 230.4 Kbaud.

Follow the procedures contained in section 4.5 of the DataLink PC Card User's Guide. to configure the DL-PC or DL-STD for Remote I/O Link. Additional literature regarding Allen-Bradley DH+, DF1 protocol and PLC products can be obtained directly from Allen-Bradley or their distributors. Suggested reference materials are identified in section 1.4 of the User's Guide.

CAUTION:

1. The DL unit that you have received can run in either DH+ or Remote I/O protocol modes. Ensure that you understand and follow the specific configuration procedures for the selected protocol and test the DL hardware and software off-line to ensure it is configured correctly.

2. Test the complete system in a safe on-line "test" environment prior to putting the DataLink on-line in a production operation to ensure there is no accidental interruption to the on-line process.

3. The DL uses a hexadecimal station addressing scheme and A-B DH+ products use an octal addressing scheme. An octal to hexadecimal conversion table is provided in section 4.5 of the User's Guide to help to ensure correct DH+ station address configuration.

Review the main DataLink PC Card User's Guide and this application note carefully before proceeding. Contact Technical Support at the numbers listed below if you require further assistance.

Technical Support Group
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1.0 GENERAL

The DataLink DL-PC-KFR, DL-STD-KFR and DL-PC/104 (DL pc card) products enable PCs, STD bus computers, HMIs and OEM equipment to communicate over A-B's Remote I/O (RIO) Link to a PLC-5. The DL is a slave device that expects to receive commands in A-B's DF1 protocol over an ISA or STD bus originating from an intelligent microprocessor computer running an application program. The DL is a slave device on RIO and acts like an A-B 1771-ASB adaptor occupying virtual rack addresses.

To use the DL-KFR pc card with an HMI or OEM computer the application program must have a DF1 protocol driver capable of issuing some of the following DF1 commands:

Read-Modify-Write command - used to read or write discrete image table data
PLC-5 Typed Read and Write - used to read or write files and words
PLC-5 Word Range Read and Write - used to read or write files and words

The above A-B DF1 protocol commands are transmitted from a computer's CPU over the bus (ISA or STD) to a DL pc card installed on the bus. Most commercial HMI software packages for A-B PLCs already have the necessary DF1protocol drivers available. Normally these drivers communicate directly with an A-B PLC-5 serial port (CH 0) or interface to DH+ networks via A-B's 1770-KF2 and 1785-KE.

To interface a computer containing a DL pc card to a PLC-5's Remote I/O Link (RIO) connect the DL's 3 pin Phoenix screw terminal connector to the PLC RIO network's "blue hose". Ladder logic including Block Transfer Reads (BTR) and Block Transfer Writes (BTW), is then required to initiate the transfer of file / word data between the PLC's RIO scanner and the virtual rack address of the DataLink.

1.1 DISCRETE I/O AND WORD DATA CAPABILITIES

The discrete I/O and word data capabilities depend on the PLC-5 model and the rack address parameters configured in the DL pc card. The DL can be configured to occupy from 1 to 7 virtual racks and all data is buffered in the DL and can be accessed using the Rack, Group, module (RGM) format. The computer with the DL installed can read or write the following:

DISCRETE I/O DATA

INPUTS: Read from 128 to 4096 discrete input image table data bits on the RIO network
Write to 128 to 896 discrete inputs within the virtual rack RGM address range
OUTPUTS: Read from 96 to 4096 discrete output image table data bits on the RIO network
(lower number than 128 is because each BT on RIO uses a discrete bit of output)

WORD / BLOCK DATA

READ: 16 to 112 blocks of data (up to 64 words/block) at the RGM address
WRITE: 16 to 112 data blocks (up to 64 words/block) at the RGM address

1.2 COMMUNICATION SPEEDS

As the DL runs on the computer's bus it is not restricted to the usual 19.2 Kbaud limitation of DF1 protocol and usually operates at bus speeds equivalent to 460.8 Kbaud. Some DF1 protocol drivers and applications are unable to handle this high speed so we provide a serial emulation feature to slow down the DL's responses to an equivalent serial rate. The data rates for the DL-KFR are:-

Channel A interface: Remote I/O at 57.6, 115.2 or 230.4 Kbaud
Channel B interface: DF1 protocol at serial equivalent rates from 2400 baud to 921.6 Kbaud

1.3 SYNCHRONOUS REMOTE I/O LINK INTERFACE

The DL pc card can “occupy” from 1 to 7 contiguous “Virtual Rack Addresses”. A rack address from 01 to 1F Hexadecimal (01 to 37 octal) must be configured using the DL2000-KFR Parameter Configuration Menu in the “Starting RIO Virtual Rack Address” field. The maximum rack number depends on the PLC-5 model and its I/O scanner. The “RIO Virtual Rack Range” can be from 1 to 7 ie. up to 6 rack addresses higher than the first rack address. The user must ensure that the contiguous range of rack addresses selected are available for use by the DataLink and that the PLC-5 model being used is capable of scanning the highest rack number. In addition all DataLink virtual rack addresses must be configured in the PLC-5 system’s automatic Remote I/O rack scan table.

The following Rack, Group and Module addresses allowed for discrete I/O image table data transfer and for BTR and BTW block data transfers:

I/O Rack Base Address:	From: Rack # 01	To: Rack # 37 (octal)
I/O Rack High Address	From: Rack # 01	To: Rack # 37 (octal)
BTR / BTW Group / Module:	From: Group 0 / Module 0	To: Group 7 / Module 1

1.4 ISA, PC/104 OR STD BUS COMMUNICATIONS INTERFACE

The DL hardware provides a bus interface compatible with ISA , PC/104 or STD 80 / 32 Bus standards. The DL emulates a serial COM port but does not use serial communications parameters such as Parity, number of Data and Stop Bits or Asynchronous Speed because it occupies an ISA bus slot and operates in byte mode at the usual bus speeds. The application software driver may need its serial parameters to be configured, but except for Message Check the DL pc cards do not make use of the serial parameters.

The following DF1 Protocol Parameters are required to be entered:

Diagnostics	:	Execute or Pass (normally set to Execute)
Embedded Responses	:	None or Execute (normally set to None)
Duplicate Messages	:	Ignore or Accept (normally set to Ignore)
Message Check	:	BCC or CRC (must match application software setting)
Configuration	:	Point to Point (Full-Duplex) or Multidrop (Half-Duplex Slave)

For general information on the DF1 protocol serial interface refer to the DL-PC / DL-STD User's Guide. Further technical information on DF1 can be found in the df1_drvr.doc file supplied on the “DL” program floppy disk or in A-B technical manuals (see reference section 1.4 of the User's Guide).

2.0 REMOTE I/O COMMUNICATIONS

The DL-KFR RIO adapter protocol is designed to respond to communications from an A-B PLC-5 Remote I/O scanner. In all cases the scanner is the master on the Remote I/O network and intiates RIO network protocol commands to the DataLink's "virtual rack address" in the same way as it would communicate with a 1771 I/O rack.

2.1 REMOTE I/O PROTOCOL

The PLC-5s Remote I/O scanner's relationship to an I/O rack adaptor (1771-ASB or DL-KFR) on RIO is one of Master to Slave. This means that only the PLC-5's scanner can initiate reads or writes commands over the RIO and the slave device(s) adaptor can only respond to these commands. The DataLink's virtual rack address(es) must be configured in the PLC's scan table before the scanner will automatically scan and update its I/O image table discrete points or before the ladder program can perform block transfers to it.

When a PLC's RIO scanner is scanning RIO racks, it continuously sends messages over the RIO network to write and read the corresponding I/O image table data for the rack addresses scanned. Discrete data packets are quite short including a few words for command, address, module groups to be updated etc. and up to eight words of discrete I/O image data.

The RIO scanner sends a command to a particular I/O rack adaptor with the appropriate output image table data. The adaptor responds with its current image table data which is an acknowledgement to the output data. If it is not received within two milliseconds the PLC's scanner will "timeout", and the scanner will then advance and attempt to update the next rack in its scan table.

A BTW write command in a PLC ladder program causes the PLC's scanner to transfer up to 64 words of data over the RIO link to a specific adaptor's Rack Group and Module (RGM). In response to a BTR read command the scanner issues a request to a specified adaptor's RGM for up to 64 words of data over the RIO link.

When a BTR or BTW command is issued by the PLC's scanner to an active rack, the command, data length required, and RGM address are sent out over the RIO link. If there is an active adaptor at that rack address it will respond with a short ACK message. A scanner receiving an ACK response to a BTW command will then send the promised data. The adaptor then ACKs the data to acknowledge receipt. A scanner receiving an ACK response to a BTR command will then follow-up with a short command to request the data, and the adaptor will return the requested data (based on the previously specified Length, Group and Module) to the PLC's RIO scanner.

2.2 DISCRETE I/O DATA TRANSFERS

Automatic Image Table Update

In addition to discrete read and writes to the DL's virtual rack address, the DataLink is able to gather and save information concerning all discrete I/O data passing over the RIO link. The DataLink automatically extracts this discrete information from the RIO communications data messages passing between other I/O racks and the PLC's RIO scanner. It then maps it to internal DataLink RAM memory buffers in a Rack Group Module (RGM) format but addressable in a similar format to the PLC-5's Input/Output image table. This allows an HMI connected to the DataLink to read information gathered by the DataLink on all connected RIO racks.

NOTE: Remote I/O link messages do not contain any discrete I/O data for a local rack(s) A local racks I/O image table data could be transferred to a DL virtual rack using a BTW command.

Virtual Rack Discrete I/O

An HMI or OEM device can read from 96 to 896 discrete outputs at the DataLink's virtual rack address dependent on the number of virtual racks selected. Another 128 to 896 discrete inputs, dependent on the virtual rack range) can also be set or reset within the Group and Module address structure of the virtual rack. These inputs are then automatically read by the PLC's scanner on an RIO update and can be used in the PLC's ladder program to modify the operation of the control system.

Virtual Racks	Virtual Rack I/O Capacity
1 Rack	128 inputs and 96 to 128 outputs
2 Racks	256 inputs and 192 to 256 outputs
3 Racks	384 inputs and 288 to 384 outputs
4 Racks	512 inputs and 384 to 512 outputs
5 Racks	640 inputs and 480 to 640 outputs
6 Racks	768 inputs and 576 to 768 outputs
7 Racks	896 inputs and 672 to 896 outputs

NOTE: One discrete input is used for every Block Transfer command (BT) to store BT status.

2.3 WORD DATA AND BLOCK TRANSFERS

Word transfers to the DataLink are done using Block Transfer commands in the PLC ladder logic to write or read up to 64 words of 16 bit data to/from the usual Rack, Group and Module (RGM) address of the virtual rack. The Remote I/O scanner does not transfer Block Transfer data for local rack(s) over RIO.

Virtual Racks	Virtual Rack I/O Capacity
1 Rack	16 BTRs and 16 BTWs
2 Racks	32 BTRs and 32 BTWs
3 Racks	48 BTRs and 48 BTWs
4 Racks	64 BTRs and 64 BTWs
5 Racks	80 BTRs and 80 BTWs
6 Racks	96 BTRs and 96 BTWs
7 Racks	112 BTRs and 112 BTWs

2.4 GETTING DATA FROM LOCAL I/O RACKS

If a device attached to the DL-KFR needs data values from a local I/O Rack's I/O discrete data table, then PLC programming is required. One possible method is to transfer the the local rack's image data to the PLC's I/O image table address corresponding to one of the DataLink virtual rack's RGM addresses. If the virtual rack is configured in the scan table the PLC scanner will then automatically transfer the output image table to the RGM addresses of the DataLink. A better method of moving local rack discrete data to the virtual rack is noted below. A better method to get local rack discrete I/O data into the DataLink virtual rack structure is to program the PLC to transfer the required local rack I/O image table data to spare file / words in the PLC and then transfer it to the DataLink's virtual rack using a Block Transfer Write (BTW) command. The scanner then automatically transmits it to the specified RGM address in the virtual rack's (DataLink) RAM. The PLC program can transfer the local I/O Rack data to another file and word location using word or file move commands. A simple program could for instance transfer the required I/O image table words for Rack 0 to a corresponding output data table address at the RGM address of the DataLink.

NOTES:

1. I/O discretes can only be written to a (virtual) rack's output image table addresses and the capacity in a single virtual rack's output image table address structure is only enough to store up to 128 of the possible 256 input and output image table I/O addresses for a local rack. This means that using this method two virtual racks would have to be used for one local rack.

2. BTRs and BTWs use bits 6 and 7 in the output image table at their respective RGM address.
3. Using the DataLink's virtual I/O image address structure to store local I/O rack data reduces the space in the virtual rack for other discrete data that may be needed by the HMI.

Recommended Method for collecting Local Rack Discrete Image Table Data

The following method is recommended for saving all the I/O data connected to local rack 0 in the virtual rack address of the DataLink to then enable an HMI or OEM application to read or display it:

(a) Transfer the Output image table data for local rack 0 to say PLC integer file N100:0
(b) Transfer the Input image table data for local rack 0 to say PLC integer file N100:10
(c) Use a single BTW with a length of 20 words to cause the PLC scanner to transfer all this data to an RGM slot in the DataLink as each RGM slot in the DataLink can hold 64 x 16 bit words.

2.5 I/O RACKS

The DL-KFR pc card can be configured as any unused I/O rack number. The DataLink can be set to a "starting" rack number from 01 to 1F hexadecimal (ie. 01 to 37 octal) and can then be configured to occupy a contiguous range of virtual I/O racks from 1 to 7.

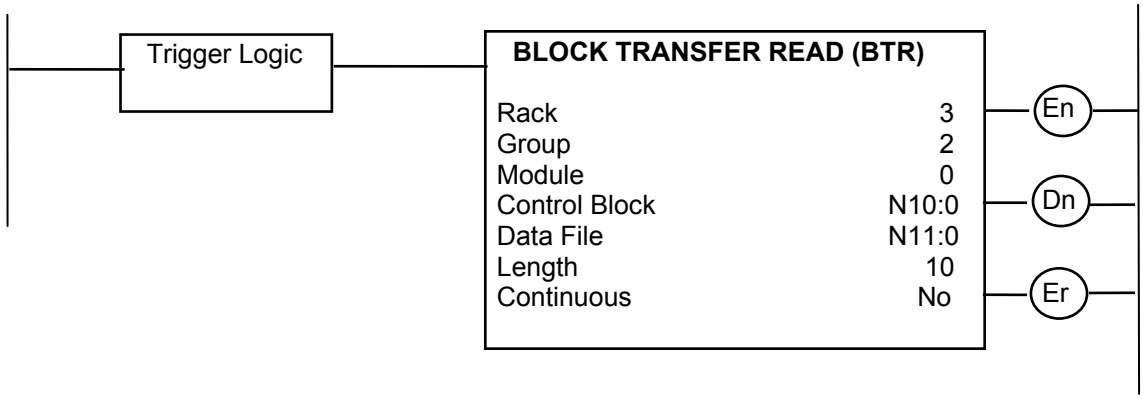
NOTE: The PLC model and scanner determine the number or racks and the maximum rack address possible.

3.0 PROGRAMMING

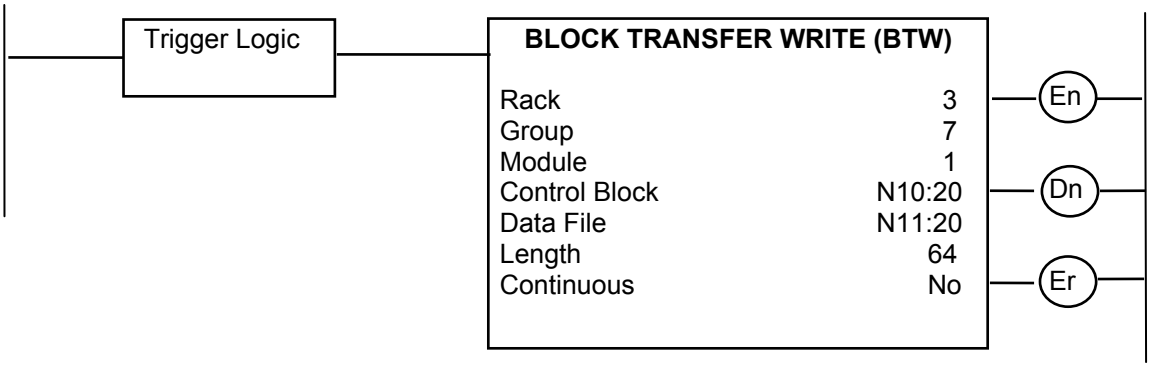
3.1 PLC PROGRAMMING

3.1.1 PLC BLOCK TRANSFER PROGRAMMING

The figure below shows a simple PLC-5 ladder logic Block Transfer Read command to read 10 words of data from Rack 03, Group 2 and Module 0 of a DataLink DL-KFR at virtual rack address 03, and put it in Integer File 11 starting at word 0.



The figure below shows a simple PLC-5 ladder logic Block Transfer Write command to write 64 words of data from Integer File 11 starting word 20 to a DataLink DL-KFR at virtual Rack 03, Group 7 and Module 1.

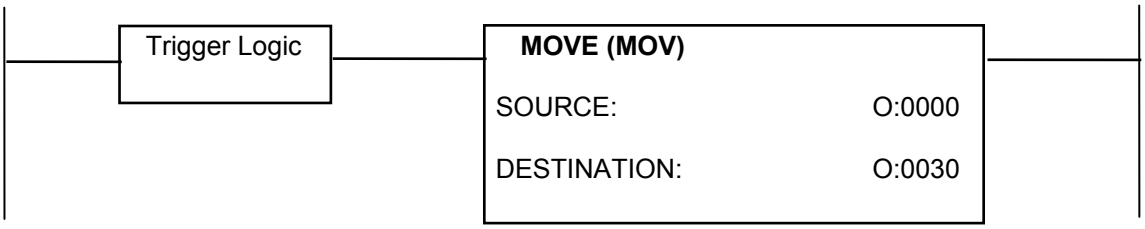


The following assumptions are made with regards to the DataLink, the PLC and the above commands:

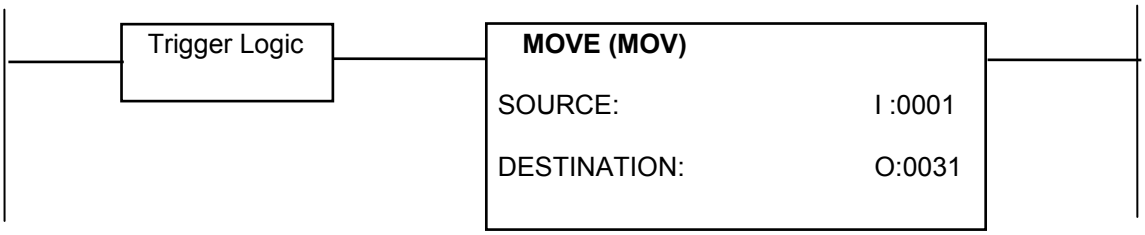
1. The DataLink is configured to virtual Rack address 03
2. The DataLink is connected to the RIO link scanner
3. The PLC port used configured for Scanner mode on a PLC-5
4. The PLC-5 has been Auto-Configured and is scanning RIO Rack 03

3.1.2 PLC LOCAL RACK DATA TRANSFER PROGRAMMING

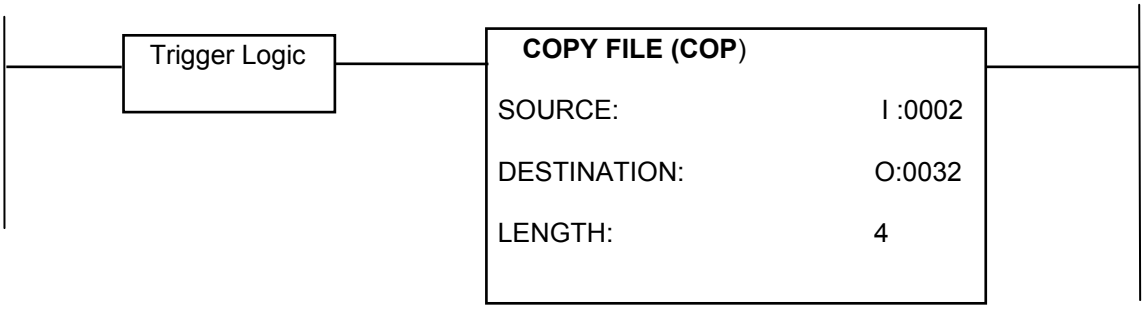
The figure below shows a simple PLC-5 ladder logic command to move I/O rack 0 group 0, ie. a **local rack's** output image table data word to the output data table address corresponding to a DataLink DL-KFR configured as rack # 3.



The figure below shows a typical PLC-5 ladder logic command to move local chassis I/O rack 0 group 0 input image table data word to the output data table address corresponding to a DataLink DL-KFR configured as rack # 3.



The figure below shows a typical PLC-5 ladder logic command to move several local chassis I/O rack 0 group 0 input image table data words to the output data table address corresponding to a DataLink DL-KFR configured as rack # 3.



The following assumptions have been made with regards to the above Move commands:

1. The DataLink virtual Rack address is configured to 03
2. The DataLink is connected to the RIO link scanner
3. The PLC port used configured for Scanner mode on a PLC-5
4. The PLC-5 has been Auto-Configured and is scanning RIO Rack 03

3.2 DF1 PROGRAMMING FOR COMPUTER OR OEM DEVICE

Any computer or microprocessor capable of issuing commands using A-B's DF1 (serial) protocol (ANSII/IEEE X3.28) and using the PLC-5 Read-Modify-Write Bit command, the PLC-5 Typed Read and Write and the PLC-5 Word Range Read and Write commands set can interface to RIO via the DL-KFR. DataLinks can recognise the following DF1 commands:

BIT:	**PLC-5 Read - Modify - Write**	Command Code = 0F, Function Code = 26
WORD:	**PLC-5 Typed Read**	Command Code = 0F, Function Code = 68
WORD:	**PLC-5 Typed Write**	Command Code = 0F, Function Code = 67
WORD:	**PLC-5 Word Range Read**	Command Code = 0F, Function Code = 01
WORD:	**PLC-5 Word Range Write**	Command Code = 0F, Function Code = 00

3.2.1 RIO ADDRESSING STRUCTURE USING DF1 PROTOCOL

DISCRETE BIT ADDRESSING

The DataLink's RAM buffer holds Remote I/O Link discrete image table data for all Remote rack addresses from 01(or 02) to 37 (octal). If Rack 1 is assigned as a local rack then the first remote rack address would be 02. The discrete data can be accessed using the RIO Link's actual Rack, Group and Module addressing structure. The HMI / computer can only write discrete data to the actual rack addresses occupied by the DataLink. The following bit addressing structure is used to gain access to I/O Image table data stored in the DataLink's RAM memory :

I/O FILE / BIT ADDRESS FORMAT: F : RR G / M B

Where: **F** = **F**ile Type - **I** for Discrete **I**nputs and **O** for Discrete **O**utputs
RR = **R**ack #, 01 to 27 **G** = Group #, 0 to 7 **/** = Delimiter
M = **M**odule #, 0 or 1 **B** = **B**it # , 0 to 7

DISCRETE Examples: O : 010 / 00 Represents Output Rack 01, Group 0, Module 0, Bit 0
I : 277 / 17 Represents Input Rack 27, Group 7, Module 7, Bit 7

OUTPUT BITS USED BY BLOCK TRANSFER COMMANDS

When a scanner performs either a BTW or a BTR to a virtual rack Group and Module address, it uses bits 6 or 7 respectively in the corresponding output image Group and Module address as a control or status bit(s). If a particular group and module are used for storing block transfer data, then the PLC and HMI programmer should be aware that discrete bits 6 or 7 will not be available at the corresponding Group and Module output image address. For example if a BTR is used at say Rack 3, Group 2 and module 1 then O : 032/17 is not available for discrete storage. If a BTW to Rack 3, Group 1 module 0 then O : 031/06 is not available for discrete storage.

WORD ADDRESSING

The DataLink holds all the Block Transfer data in its RAM memory in a "Virtual Rack" address format using from 1 to 7 virtual racks. The actual RIO address of the first virtual rack is determined by the Starting Rack that was assigned to the DataLink during its parameter configuration. Then the following addressing structure is used to gain access to the Block Transfer Read and Write register/word data stored in the DataLink's RAM memory :

File / Word address format : F RR G : M W

Where: **F** = **F**ile Type (must be **N**) **RR** = Virtual **R**ack # (01 to 27 oct) **G** = **G**roup # (0 to 7)
M = **M**odule # (0 or 1) **W** = **W**ord offset into the Block Transfer data (1 - 64 dec)

WORD Examples:

N 10 : 1	Represents Integer File N, Rack 1, Group 0, Module 0, Word 1
N 34 : 117	Represents Integer File N, Virtual Rack 3, Group 4, Module 1, Word 17
N 277 : 164	Represents Integer File N, Virtual Rack 27, Group 7, Module 1, Word 64

3.2.2 HMI CONFIGURATION EXAMPLE USING A-B CONTROLVIEW

HMI / MMI / GUI software does not have a common standard for configuring devices for A-B DF1 protocol. The following shows a very basic Allen-Bradley ControlView software configuration and is intended purely as a starting point for other HMI interfaces.

GENERAL - I/O DISCRETE CONFIGURATION

Default group/structure:	RIOS.READ
Database Name:	RIOSTEST
Point Name:	RIOS.WRITE.BIT3
Description:	WRITE TO O : 30/0
Address Type:	PLC5
Address:	ADDRESS O : 30/0
Node Name:	RIOS
Scan Class:	B
Off Label:	OFF
ON Label:	ON
Initial Value:	OFF

GENERAL - WORD CONFIGURATION

Default group/structure:	RIOS.READ
Database Name:	RIOSTEST
String Tag Name:	RIOS.READ.BTW
Description:	String of Data (Read)
Address Type:	PLC5
Starting Address:	N10:01 (ie. “Virtual” Rack 1, Group 0, Module 0, Word 1)
Node Name:	RIOS (COM1, 19,2 Kb, N, 8, 1)
Scan Class:	S1 (setup as Allen-Bradley)
Length:	20 (bytes)

CONTROLVIEW DATABASE REPORT DATABASE: RIOTEST

Tag Name	Tag Type	Tag Description
RIOS	GROUP	
RIOS.READ	GROUP	
RIOS.READ.BIT3	DIGITAL	Bit Read of Rack 3 Output Image Table (128 bits = 16 Bytes)
RIOS.READ.BTW	STRING	Read 10 words - BTW (Virtual) Rack 1, G = 0, M = 0, Starting Word 1
RIOS.WRITE.BTW2	STRING	Read 10 words - BTW (Virtual) Rack 2, G = 7, M = 1, Starting Word 20
RIOS.WRITE.BTWRITE	ANALOG	Read (Virtual) Rack 1, G = 1, M = 1
RIOS.READ.OUT3	STRING	RIO Rack 3 Output Image Table (128 bits = 16 bytes)
RIOS.WRITE	GROUP	
RIOS.WRITE.BTR	STRING	Write 10 words - BTR (Virtual) Rack 1, G = 0, M = 1, Starting Word 30

CONTROLVIEW DATABASE REPORT DIGITAL TAG LIST DATABASE: RIOTEST

Tag Name	Node: Address & Offset	On Label	Off Label	Scan Class	Access	Initial Value	Units
RIOS.READ.BIT3	RIOS::O:30/0	ON	OFF	B	*	OFF	

CONTROLVIEW DATABASE REPORT ANALOG TAG LIST DATABASE: RIOTEST

Tag Name	Node: Address & Offset	Scale	Offset	Scan Class	Access	Minimum/ Maximum	Initial Value	Type Units
RIOS.READ.BTWRITE	RIOS::N11::101	1	0	B	*	100 / 100	100	Integer

CONTROLVIEW DATABASE REPORT STRING TAG LIST DATABASE: RIOTEST

Tag Name	Node: Address & Offset Initial Value	Scan Class	Access	Length *(in bytes)*
RIOS.READ.BTW	RIOS::N10::01	S1	*	20
RIOS.READ.BTW2	RIOS::N27::120	S1	*	20
RIOS.READ.OUT3	RIOS::O:30	S1	*	16
RIOS.WRITE.BTR	RIOS::N10:130	S1	*	20

4.0 COMMUNICATIONS CONFIGURATION

This section shows a sample configuration for a DL pc card in RIO mode. The User's Guide sections referred to give general information on how to configure and save a set of communication parameters to a PC disk file and how these parameters may be transferred and saved in the DataLink's EEPROM.

General parameters required are: Bus and Network Protocol Selection (set 0 for DF1 and 1 for RIO), then Select Operational Mode (set 4 for RIO). Bus Speed Emulation Configuration parameters follow next allowing the DL to emulate slower serial data rates. The Network Port Configuration enabling the user to select the RIO (starting) Rack address, RIO Network speed (up to 230.4 Kbaud and Virtual Rack Range.

The DF1 Protocol parameters should normally be set to: Execute Diagnostics, No Embedded Responses, Ignore Duplicate Messages, BCC or CRC message check, and Point-to-point. All user parameters should be configured or verified in the DataLink before On-line operation is attempted.

Follow the User's Guide sections 4.0 to 4.7 for general information on Configuration and Transfer, and use this application note's DL2 program menu displays for current information on configuring a DataLink for Remote I/O Link and DF1 protocol operation.

The DL2 program configuration screen dumps provided with this application note show the typical parameters used to set the DataLink for a RIO Link to DF1 protocol operation using RIO rack address 03.

4.1 MAIN MENU

Section 4 of the DL User's Guide provides an overview of the general configuration process and details the use of the "DL2" PC menu program to set-up your DataLink for DF1 to DH+ operations. After following User's Guide instructions section 4.2 the main menu below will be displayed. Enter "S" to set the DL2 program for the DL model, COM port and IRQ and "M" to configure the DL's COM port, IRQ and mode and then follow the procedures below to configure a DL pc card for an RIO application.

Select "C" to Configure or View a communications file and then follow the prompts.

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MAIN MENU

(S) Set DL2 Program for Specific DataLink Model and COM Port
(M) Set Mode or Configure COM port of Installed DataLink
(C) Configure / View Configuration Disk File
(T) Transfer Configuration File (Disk File to EEPROM)
(U) Upload Configuration File (EEPROM to Disk File)
(N) On-Line Programs - DF1 to DH+ Network Diagnostic Tests
(O) Off-line Programs - Revision Level and Diagnostic Tests
(Q) Quit to DOS and End Session

Enter Function Letter: C

File Selected : EEPROM.001 Network Address : 03
Model Type : DL-PC Protocol : A-B DF1 Network Type : RIO COM: 2 IRQ: 3

4.2 REMOTE I/O LINK - CONFIGURATION

Section 4.5 of the DL-PC / DL-STD User's Guide shows how to generate and save a configuration file for the DataLink to a PC disk file for later transfer to a DataLink's EEPROM configuration memory.

After selecting the Configure/View option on the Main Menu the following menu will be displayed on the PC's screen. Select a file number between 01 and 99 and then follow the instructions and prompts on the display.

4.2.1 CONFIGURE / VIEW COMMUNICATIONS FILE

```
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CONFIGURE / VIEW COMMUNICATIONS FILE

This selection will OPEN/CREATE an EEPROM communications file
with the name EEPROM. 0xy (where 0xy is any value 001- 099)

This file can be VIEWED/MODIFIED and then transferred to the
DL2000 using the MAIN MENU selection "Transfer to EEPROM"

Enter Numeric File Extension  1

File Selected : EEPROM.001        Station Address : 03
Model Type : DL-PC  Protocol: A-B DF1  Network : RIO  COM: 2  IRQ: 3
```

4.2.2 BUS AND NETWORK PROTOCOL SELECTION

The menu below enables a user to select various manufacturers' protocols and networks dependent on the firmware. For Remote I/O Link Adaptor protocol select the **BUS PROTOCOL** to "0" for A-B DF1**,** and the **NETWORK PROTOCOL** to "1" for Remote I/O Link Adaptor mode.

```
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BUS AND NETWORK PROTOCOL SELECTION

BUS PROTOCOL                NETWORK PROTOCOL

0 = A-B DF1                 0 = A-B Data Highway Plus
1 = MODBUS                  1 = A-B Remote I/O Link

Enter Protocol Type : 0     Enter Network Type : 1

File Selected : EEPROM . 001      Network Address : 03
Model Type : DL-PC  Protocol : A-B DF1  Network : A-B RIO  COM: 2  IRQ: 3
```

4.2.3 SELECT OPERATIONAL MODE OF DATALINK BUS PRODUCT

Select the **On-Line Mode** to **"4"** for A-B DF1 to Remote I/O Link protocol**.**

SELECT OPERATIONAL MODE OF DATALINK BUS PRODUCT

0 = MODE 0 DF1 to DH+	**3 = MODE 3 Development**
1 = MODE 1 Custom	**4 = MODE 4 DF1 to RIO**
2 = MODE 2 Custom	**5 = MODE 5 Custom**

Select On-Line Mode (0-5) : 4

Enter <PgDn> to proceed the next screen

NOTE:

Mode 0 is the same DF1 to DH+ protocol as used in the DL2000-KFX and in A-B's 1770-KF2.

4..2.4 DATALINK BUS SPEED EMULATION CONFIGURATION

This is a new display screen that appears after Bus and Network Protocol Selection in Section 4.5.2 of the User's Guide. This menu enables the user to maximise the operational speed of a particular computer, the software application and the DF1 protocol driver. This screen permits the DataLinks response over the bus to emulate serial speed responses from 2400 baud to 921.6 Kbaud.

DATALINK BUS SPEED EMULATION CONFIGURATION

Enter a Decimal value for BUS SPEED EMULATION 14
Recommend setting #14 (480.6 Kbaud) for Bus Speed Emulation

6 - 2400 Baud	**9 - 19.2 Kbaud**	**12 - 115.2 Kbaud**
7 - 4800 Baud	**10 - 38.4 Kbaud**	**13 - 230.4 Kbaud**
8 - 9600 Baud	**11 - 57.6 Kbaud**	**14 - 460.8 Kbaud**

15 - 921.6 Kbaud (May Not Work on Slower Computers)

Enter <PgDn> to proceed to the next screen

4.2.5 NETWORK PORT CONFIGURATION

This menu is used to set the general communications parameters for DataLink's Remote I/O Link network interface. It is accessed at the rear 3 pin screw terminal NET connector. RIO Network Sync Speeds of 57.6, 115.2 and 230.4 Kbaud can be selected. The last parameter on the menu enables a user to set the range of Virtual Rack numbers occupied by the DataLink from 01 to 07.

NETWORK PORT CONFIGURATION
for A-B Data Highway Plus and Remote I/O Link Networks

Select Network Address (DH+ Station or RIO Rack) 03 (Hexadecimal)

Select Network SYNC SPEED decimal value for either network 9
Entering an anassigned value will default to 57.6 KBaud

8 - 57.6 KBaud 9 - 115.2 KBaud 10 - 230.4 KBaud

The following selection applies to A-B RIO networks only:

RIO Virtual Rack Range (1 to 7) 1

Enter <PgDn> to proceed to the next screen

NOTES:

1. The RIO network speed can be configured for 57.6, 115.2 or 230.4 Kbaud (DH+ network speed can be set to either 57.6 or 115.2 Kbaud).
2. The Virtual Rack Range directly affects the number of discretes and Block Transfers that can be handled by the DataLink (see the tables in sections 2.2 and 2.3 of this application note).

4.2.6 DF1 PROTOCOL PARAMETER CONFIGURATION

The DF1 Protocol Parameter Configuration menu appears next and enables the user to configure DF1 protocol parameters. The DF1 serial protocol communications parameters are mainly used when the DL is configured in Mode 0 - DF1 to DH+. Set all the parameters except Message Check to their default values then press <PgDn> to return to the Main Menu.

DF1 PROTOCOL PARAMETER CONFIGURATION
The following require a Y or N to be entered

Diagnostics	**: N = Execute**	**Y = Pass**	**(y/N)**	**N**
Embedded Responses	**: N = None**	**Y = Execute**	**(y/N)**	**N**
Duplicate Messages	**: N = Ignore**	**Y = Accept**	**(y/N)**	**N**
Message Check	**: N = BCC**	**Y = CRC**	**(y/N)**	**N**
Configuration	**: N = Point-to-Point**	**Y = Multidrop**	**(y/N)**	**N**

Enter <PgDn> to return to the Main Menu

NOTE: Set Diagnostics to Execute, Embedded Responses to None, Duplicate Messages to Ignore, Message Check to BCC or CRC (make it the same as the application driver) and Configuration to Point to Point.

4.3 TRANSFER CONFIGURATION PARAMETERS TO DATALINK EEPROM

Section 4.6 of the DataLink User's Guide shows how to transfer communications parameters from the disk file (configured as per section 2.2 above) to the DataLink's EEPROM. Transfer to EEPROM is performed using a PC connected as described in section 4.2 of the User's Guide together with the "DL2" PC program provided on floppy disk. Select the **T** option on the DL2 program main menu to enable the configuration parameters previously saved in a disk file to be Transferred to a DataLink and automatically written and saved in its EEPROM memory.

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TRANSFER CONFIGURATION PARAMETERS TO DATALINK EEPROM

Select (R) estore to Factory settings or (T) ransfer Configuration file
DATALINK is connected to computer serial port 2

The DataLink must be in Config. / Diagnostic Mode to enable file Transfer
(Use Main Menu selection (M) and followed by a (C) on sub-menu)

Enter Numeric File Extension 1

File Selected : EEPROM. 01 Network Address : 01
Model Type : DL-PC Protocol : A-B DF1 Network : A-B RIO COM: 2 IRQ: 3

NOTES:

1. Prior to executing **T**ransfer to EEPROM use Main Menu selection (M) followed by (C) to set the DataLink into its Configuration / Diagnostic mode ready to receive the configuration file.
2. To ensure that the transfer occurred correctly note the messages at the bottom of the display. Successful transfer will display ****A-OK**** or an error message if a a problem is detected.
3. If the DL2 transfer fails, reconfigure the PC to bypass its autoexec.bat and config.sys files. Suggestions on how to do this can be found in the Readmepc.txt file on the “DL2” floppy disk.

5.0 INTERFACE CONNECTIONS AND JUMPERS

Dependent on the DataLink and model the DL pc card has one or two connector sockets to connect it to external devices and networks. All DLs use the 3 pin Phoenix screw terminal connector to connect the DataLink to the A-B Remote I/O Link (blue hose) network interface (or DH+).

A second 5 pin Phoenix screw terminal connector is provided on the DL-STD, DL-PC/104 and optionally on model 2 DL-PC units. This connector provides an RS232 serial interface with limited RTS and CTS handshaking, or can be configured for RS422/RS485 operation. Internal and external jumpers required to select the desired interface type and the wiring pin-outs are shown below. This connector can also be used for the following options: to configure the DL using an external computer; to provide an external serial device with access to an A-B network; or for other custom purposes.

5.1 NETWORK PORT CONNECTIONS

This is a 3 pin screw terminal connector on the DL pc card edge and connects the DL to DH+ or RIO.

PIN	DESCRIPTION
1	Signal +
2	Signal Ground (through internal 150 K ohm resistor)
3	Signal -

NOTE: If the Remote I/O Link will not work, try reversing the wiring connections to pins 1 and 3.

5.2 SERIAL PORT CONNECTIONS

The serial port connector is a 5 pin Phoenix screw terminal connector located on the edge of model 2 DataLink pc cards. Internal jumpers configure the port for RS232, RS422 or custom applications. To configure for RS485, first configure the port for RS422 then install external wiring jumper connections.

RS232 MODE	PIN	DESCRIPTION
	1	RTSB
	2	CTSB
	3	RxDB
	4	Ground
	5	TxDB

RS232 INTERNAL JUMPERS : W10 1-2, W11 1-2, W12 1-2, W13 1-2

RS422/485 MODE	PIN	DESCRIPTION
	1	RxDB+
	2	RxDB-
	3	TxDB+
	4	Ground
	5	TxDB-

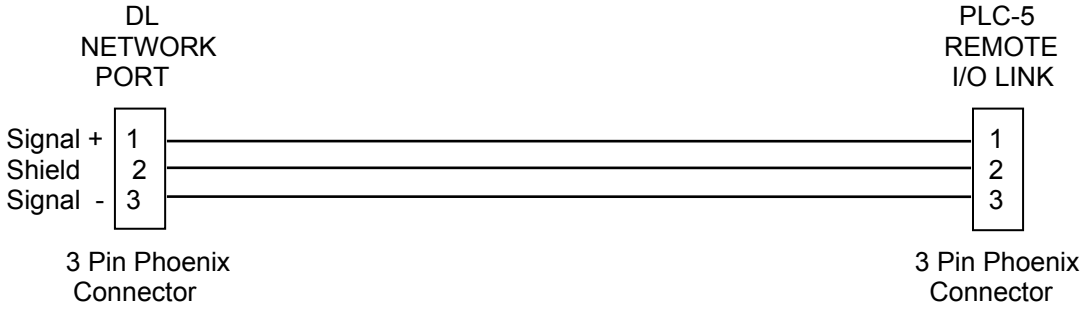
RS422/RS485 INTERNAL JUMPERS : W10 3-4, W11 3-4, W12 3-4, W13 3-4
RS485 EXTERNAL JUMPERS : Wire PORT B' pins 1-3 (LINE +) and 2-5 (LINE -)

6.0 INTERFACE CABLE WIRING

The DL-PC / DL-STD User's Guide shows the wiring connections required for A-B DH+ networks. The drawings below show typical interface wiring to connect the DL pc card 3 pin connector to a Remote I/O Link and the connections between the 5 pin serial Channel B and an external computer's serial port.

DataLinks are normally factory preconfigured for RS232C on the 5 pin serial connector (if fitted). Any other selections require jumpers to be installed as per section 5 of this application note.

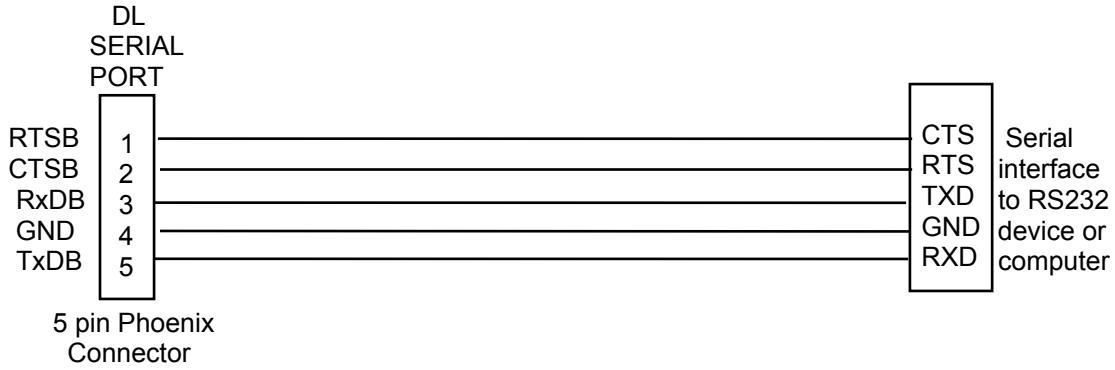
6.1 NETWORK PORT - REMOTE I/O INTERFACE WIRING



NOTES:

1. Pin numbers for the pc cards 3 pin Phoenix / Euro RIO connector are from 1 to 3 respectively, left to right, when viewed from the connector with the component side up.
2. Pin numbers for the A-B RIO scanner's 3 pin connector on the front of a PLC-5 network port are from 1 to 3 going from top to bottom.
3. The A-B RIO blue hose network cable is usually color coded differently than for DH+.

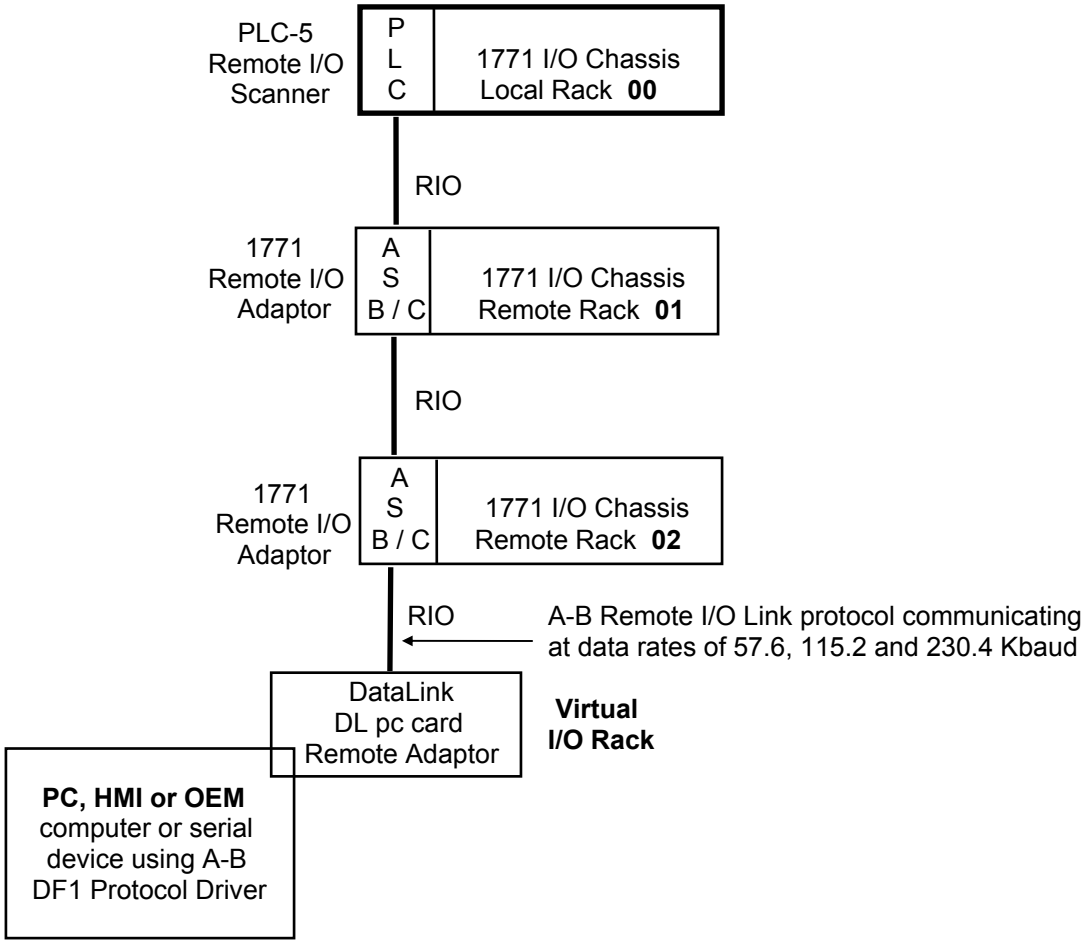
6.2 SERIAL PORT - OPTIONAL / MODEL 2 INTERFACE



NOTES:

1. Pin numbers for the DL pc card's 5 pin Phoenix / Euro screw terminal connectors are from 1 to 5, left to right, when viewed from the connector and with the component side up.
2. See section 5 of this application note and the User's Guide for RS422/485 interface connections for the serial port.

7.0 TYPICAL APPLICATION TO PCs AND OEM EQUIPMENT



In the above example the DL pc card is installed in a computer and is configured as Rack number 03. It can automatically read and capture all the discrete input and output data on the Remote I/O Link addressed to racks 1 and 2 (as well as rack 3). The DataLink will respond to all commands from the PLC-5 scanner (master) on the Remote I/O Link that are addressed to virtual Rack 03.

A PLC-5 ladder logic program can then be entered to communicate via the PLC-5's I/O scanner over RIO to the DL-KFR using Block Transfer Read and Write commands addressed to specific Group and Module addresses in virtual rack 03 where the data is stored in the DataLink's RAM memory buffers.

The PC, HMI or OEM serial device is then able to read the information written by the PLC-5 scanner to the DataLink's buffers by issuing PLC-5 Typed Read, PLC-5 Word Range Read or Read - Modify - Write commands to the Rack, Group and Module (RGM) address in its Destination address field.

The serial device is also able to write to the DataLink's RAM buffers by issuing PLC-5 Typed Write, PLC-5 Word Range Write or Read - Modify - Write commands to the Rack, Group and Module (RGM) address in its Destination address field.