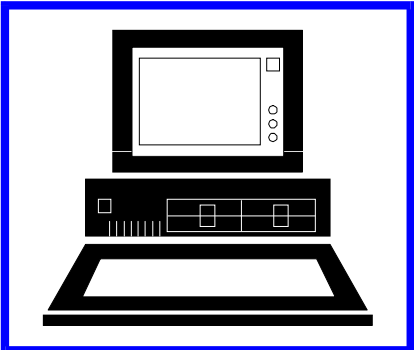
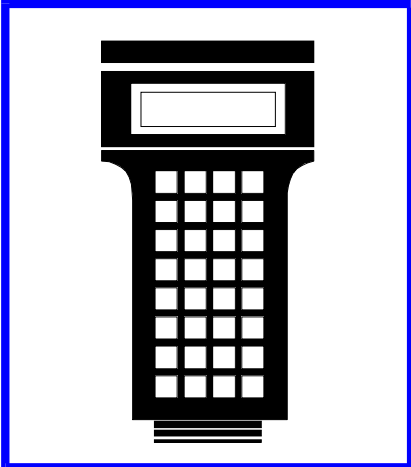
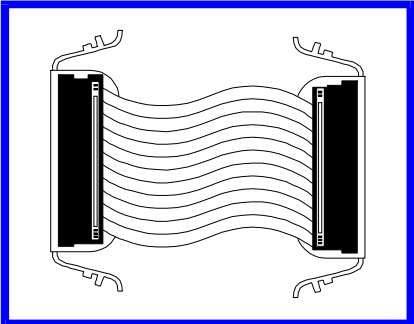
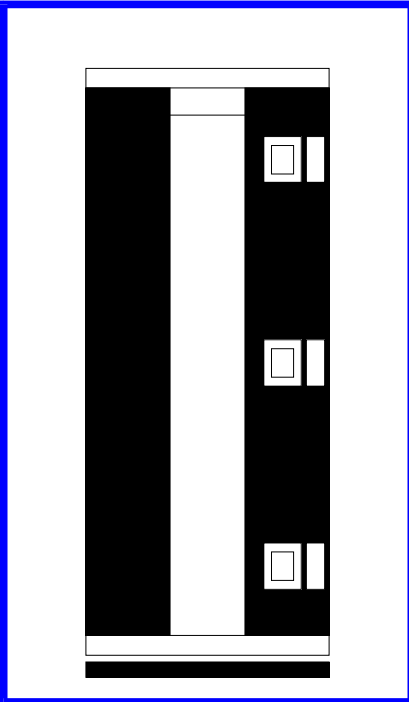
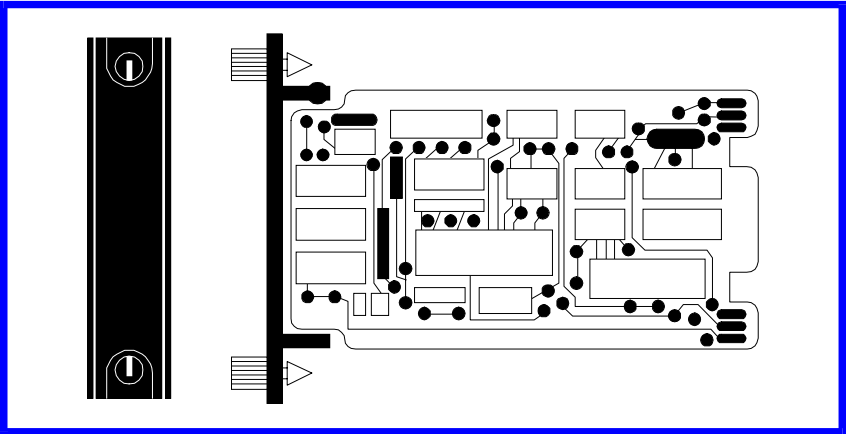
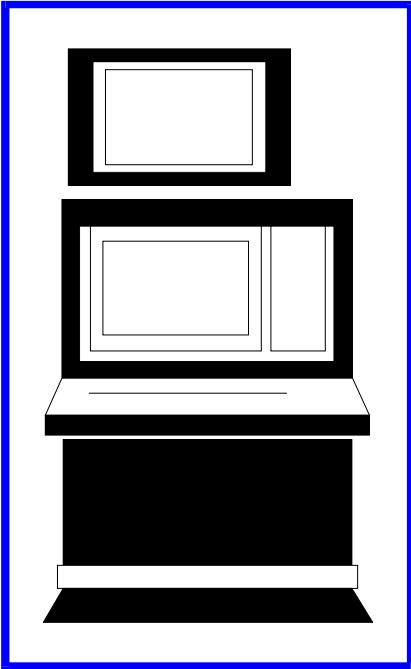


E97-811-21

Instruction

LAN-90[®] Process Control View (PCV[®]) Harmony/MICRO-DCI Protocol Specific Driver (PSD) (Software Release 5.2)



WARNING notices as used in this instruction apply to hazards or unsafe practices that could result in personal injury or death.

CAUTION notices apply to hazards or unsafe practices that could result in property damage.

NOTES highlight procedures and contain information that assists the operator in understanding the information contained in this instruction.

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Preface

This manual provides general information and guidance with respect to:

- The Harmony MICRO-DCI Protocol Specific Driver (PSD).
- Hardware requirement and cable connections.
- PSD start-up requirements.
- Device and data addressing during configuration of the interface.

List of Effective Pages

Total number of pages in this instruction is 20, consisting of the following:

Page No.	Change Date
Preface	Original
List of Effective Pages	Original
iii through v	Original
1-1 through 1-3	Original
2-1 through 2-2	Original
3-1 through 3-3	Original
4-1 through 4-3	Original
A-1	Original
B-1 through B-2	Original
C-1	Original

When an update is received, insert the latest changed pages and dispose of the superseded pages.

NOTE: On an update page, the changed text or table is indicated by a vertical bar in the outer margin of the page adjacent to the changed area. A changed figure is indicated by a vertical bar in the outer margin next to the figure caption. The date the update was prepared will appear beside the page number.

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SECTION 1 - INTRODUCTION

OVERVIEW

This document describes the LAN-90 PCV Harmony Protocol Specific Driver (PSD) for data communication with the Bailey-Fischer & Porter MICRO-DCI controllers.

This PSD contains all device specific descriptives for addressing the various MICRO-DCI devices for data communication.

The PSD initiates all communication transactions for the interface. It prompts the Harmony Executive for requests to perform any and all data transactions with the MICRO-DCI devices.

Specifically, the MICRO-DCI driver supports the MICRO-DCI host to instrument commands for reading and writing data.

The PSD processes Harmony Executive requests to:

- Parse and evaluate text strings entered via the Harmony Editor for the device specific parameters: MICRO-DCI device type and address, data point address, group data point range.
- Construct protocol specific transaction command messages.
- Initiate communication with devices, monitor completion of transactions, send responses back to the Harmony Executive.
- Return status information regarding itself and device communication to the Harmony Executive.

The PSD converts data between the MICRO-DCI controller format and the Harmony data type format associated with the data group being processed. Tag parameters inherit the Harmony data type of the data group. The MICRO-DCI data type associated with a data group is determined from the group address.

REQUIREMENTS

Hardware Requirements

The communication port on the MICRO-DCI controllers is an RS-485 four-wire port. Multiple MICRO-DCI controllers may be networked as multidropped nodes. LAN-90 PCV connects to

this network as the master node. Normal serial port limitations apply as described in the PCV manual instructions to set up the CIU.

The LAN-90 PCV computer requires the use of an external RS-232-C to RS-485 adapter in order to communicate with the MICRO-DCI controllers. The RS-232-C to RS-485 converter which was used in testing the PSD, was supplied by Inmac Inc. (part number 800052).

The Bailey-Fischer & Porter SCADA adapter was used in the development of this PSD. If a SCADA adapter is in use, it need not be replaced.

The provided setup information should be verified with the documentation included with the adapter.

Software Requirements

The PSD needs the Harmony Executive and Editor to form a Harmony interface for LAN-90 PCV. To make the Harmony Executive available, the Harmony option must be enabled under the LAN-90 PCV System Options menu.

GLOSSARY

B-Type	An eight-bit unsigned integer data variable in a MICRO-DCI controller. A B-Type variable can be read or written.
CIU (Computer Interface Unit)	A device used to connect a host computer system to the Eltag Bailey INFI-NET [®] data highway.
C-Type	A three-byte float data variable in a MICRO-DCI controller. A C-Type variable can be read or written.
Harmony	The LAN-90 PCV external device interface.
H-Type	A five-byte float data variable in a MICRO-DCI controller. An H-Type variable can be read or written.
LAN (Local Area Network)	A network whose nodes are connected in relatively close proximity to each other.
LAN-90 PCV (LAN-90 Process Control View)	The software package comprising the operators' console, data acquisition and local area network software developed and manufactured by Eltag Bailey Inc. running under the QNX [®] operating system.
L-Type	A digital or boolean data variable (bit) in a MICRO-DCI controller. A L-Type variable can be read or written.
MICRO-DCI	The Bailey-Fischer & Porter control station family. The communication protocol over the multidrop RS-485 network is a

single master/multiple slave protocol for which the LAN-90 PCV is installed as the master drop.

PSD
(Protocol Specific Driver)

This acronym refers to device and protocol specific interfaces developed for the LAN-90 PCV Harmony optional software.

RTDB
(Real-Time DataBase)

The LAN-90 PCV database comprising a set of console tags whose values, states and other information are maintained in real-time.

REFERENCES

- LAN-90 PCV Software Release 5.2 Installation manual, **I-E97-811-1**.
- LAN-90 PCV Software Release 5.2 Configuration and Operation manuals, **I-E97-811-2.1** and **I-E97-811-2.2**.
- PCV Subsystem Interface Communications Driver API Reference manual, **I-E97-807-16**, Rev. 1.1.
- LAN-90 PCV Process Control View (PCV), Harmony - External Device Interface, **I-E97-808-19**.
- MICRO-DCI MODULAR CONTROLLER, Instruction Bulletin Control Room Products, **53MC5000**, Revision 1.

SECTION 2 - INSTALLATION

SETUP DETAILS FOR RS-232-C/485 CONVERTERS

Setup details for the Inmac converter:

1. Set the PSD's start-up file to use even parity, eight data bits.
2. Set converter to DCE, SIMU, t-on/r-on.
3. Use a straight cable. (No loop backs or cross overs required).
4. Remove any other master - only one master is allowed.
5. Wiring - the master transmits on the slave's receive lines:

	F&P		Inmac	
Tx+	19	-	3	
Tx-	20	-	4	
Rx+	21	-	1	
Rx-	22	-	2	

NOTE: The RS-485 Txd may not rest in the tri-state condition but must instead rest in the maximum (+12 VDC) or minimum voltage (-12 VDC) state. Therefore, these converters are used in the RS-422 mode to disable the tri-state mode on the master.

The Bailey-Fischer & Porter SCADA adapter was used in the development of this PSD. However, a third party SCADA adapter may be used.

The following information, provided for setup purposes, should be verified with the documentation provided by Bailey-Fischer & Porter. Use NO parity in the start-up file.

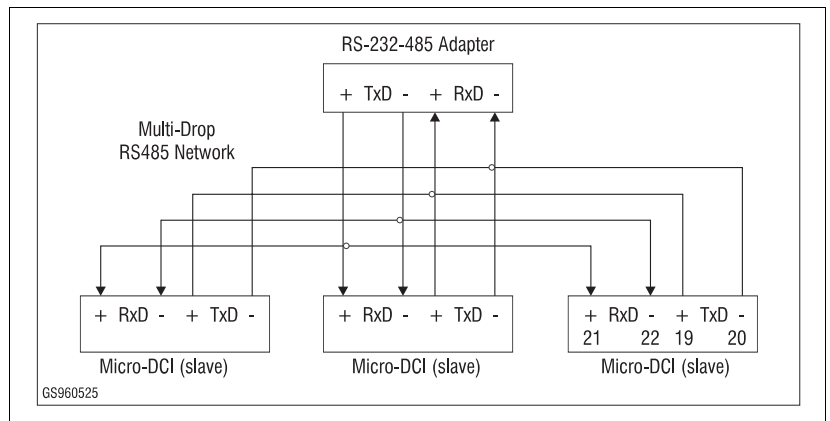


Figure 2-1. MICRO-DCI RS-485 Physical Interconnections

Table 2-1. Hardware Requirements

Interface Port	Adapter
RS-232-C (Basic port or Intellicon Multiport ISA add-on card)	Bailey-Fischer & Porter SCADA ADAPTER (RS-232-C to host, RS-485 to MICRO-DCI controllers) Requires a 24 VDC power supply to power the SCADA ADAPTER.
	External in-line RS-232-C/RS-485 adapter NOTE: The RS-485 Txd may not rest in the tri-state condition but must instead rest in the maximum (+12 VDC) or minimum voltage (-12 VDC) state.

PSD ASSOCIATED FILES DIRECTORY ASSIGNMENTS

The Bailey-Fischer & Porter MICRO-DCI PSD task name is “microdci”. The driver is stored in directory:

“/bci/pcv/bin/”

Support files for the MICRO-DCI PSD task reside in the directory:

“/bci/pcv/etc/win/psd/microdci/”

Support files include:

- “error.msg” This file contains error messages used by the Harmony Editor for the protocol specific configuration data fields.
- “.ttl” Help title file. This file contains the single text line in upper case: “MICRO-DCI PSD HELP FILE”.

The help file for the MICRO-DCI PSD is stored in directory:

“/bci/pcv/etc/win/help/config/psd/microdci/”

The help file name is:

- microdci.help This file is used by the Harmony Editor for help with respect to the MICRO-DCI device and data addressing configuration data fields. It contains at the beginning of the file the title text of the “.ttl” file in the form: <ESC> TITLE “MICRO-DCI PSD HELP FILE”.

For the actual installation of the PSD, see Eltag Bailey document **I-E97-808-19** where the steps are described in **SECTION 2** and **APPENDIX A**.

SECTION 3 - CONFIGURATION

PSD START-UP FILE

The PSD task is started by the Harmony Executive which assigns a task ID and priority and passes a start-up file name. (See the following example format descriptions.) The start-up file is an ASCII text file in which text lines of the following format contain the start-up arguments:

p:XXXXXXXXXX i:X b:BBBB d:N s:N a:XXX

p: Specifies a port identification name, *XXXXXXXXXX*, in ASCII string. e.g., “/dev/ser1”

i: Specifies the port redundancy mode as:

N Non-redundant.

P Primary port.

S Secondary port for the primary port on the preceding line.

b: Specifies the port baud rate, *BBBB*. e.g., “9600”.

d: Specifies the number of data bits, *N*.

s: Specifies the number of stop bits, *N*.

a: Specifies parity, *XXXX*, ODD, EVEN or NONE. For RS-422 use EVEN. For SCADA adapter use NONE.

The port and all its parameters are specified on one line.

NOTE: Redundant ports require two independent connections to the same MICRO-DCI controllers. LAN-90 PCV connects, as host, to MICRO-DCI controllers, as slaves, on the same multidrop RS-485 network. Since just one host can be accommodated on the RS-485 multidrop network, redundant ports cannot be implemented.

r: N

r Specifies the Executive/PSD message exchange mode to be Reply Blocked, 1, or Not Reply Blocked, 0. When this parameter is not specified in the start up parameters, the default Reply Blocked, 1, will be implemented.

The overall interface performance may be somewhat faster in the Not Reply Blocked mode, therefore, this parameter should always be set to Not Reply Blocked.

w: NNN

w: Specifies delay time *NNN* when the Executive message exchange mode is Not Reply Blocked. When Reply Blocked is specified, the delay time is ignored. The delay (sleep) time is invoked when the Harmony Executive requires no action from the PSD.

v: N

v: Specifies the number of retries, *N*, that should be performed when a port communication transaction fails.

u: NNNN

u: Specifies the time interval, *NNNN*, within which a port communication transaction reply must be received and after which the transaction is set complete with time-out. Timed out transactions on a port will be retried per the retry specification when the current status of the port is normal.

Start-up file example: *p:dev/ser1 i:P b:9600 d:8 s:1 a:EVEN* Primary port

r: N Not reply blocked

w: 100 No action sleep time

v: 2 Number of retries

u: 2000 Transaction time-out

The PSD task will read the start-up file parameters only at start-up or restart.

PSD DATA TYPE ASSOCIATION WITH HARMONY DATA TYPES

When assigning a data type to a group in the Group Definition dialogue box, use the following information to complete the Harmony data type field.

Table 3-1. Harmony/MICRO-DCI Data Types

Data Type	Data Type Descriptor
0 (B-Type)	Unsigned Integer (0 - 255)
4 (C-Type)	Float
5 (H-Type)	Double
8 (L-Type)	Digital Data
12 (A&F-Types)	ASCII Text

Harmony Data Type 0, Unsigned Integer

A Harmony data type 0 (Unsigned Integer) is associated with MICRO-DCI B-Type variables only. B-Type values have a range 0 to 255. The maximum number of B-Type variables that may be assigned to a Harmony data group is 50.

Harmony Data Type 4, Float

Harmony data type four (Float) is associated with MICRO-DCI C-Type values. The maximum number of C-Type variables that may be assigned to a Harmony data group is 16.

Harmony Data Type 5, Double

Harmony data type five (Double) is associated with MICRO-DCI H-Type values. The maximum number of H-Type variables that may be assigned to a Harmony data group is ten.

Harmony Data Type 8, Byte Oriented Digital

Harmony data type eight (Byte Oriented Digital Data) is associated with L-Type MICRO-DCI bit variables. The maximum number of L-Type variables that may be assigned to a Harmony data group is 400.

The first data point of the group must be evenly divisible by eight.

Harmony Data Type 12, ASCII Text

Harmony data type 12 (ASCII Text) may be associated with MICRO-DCI controller A-Type and F-Type data. Only one A-Type or F-Type variable may be assigned to a Harmony data group. For A-Type the text string length is ten characters. For F-Type it is five characters.

SECTION 4 - OPERATION

OVERVIEW

The PSD software works in tandem with the Harmony 90 system option to provide an interface between LAN-90 PCV and the MICRO-DCI system.

The LAN-90 PCV hardware link up to the RS-485 multidrop network of MICRO-DCI controllers is through an RS-232-C port to an external RS-232-C/RS-485 adapter.

PSD AND EXECUTIVE INTERDEPENDENCE

The PSD provides Protocol/Device Specific configuration reference information and data communication.

The reference information is used by the PSD to evaluate the device data group and data point definitions entered via Harmony. These definitions are entered as text strings that are parsed and evaluated by the PSD before they are accepted into the device configuration file. If the data is incorrect, a message will appear in the error log.

The PSD task performs communication transactions with the controllers. For each transaction, the PSD:

- Sends a MICRO-DCI command message to the specified controller.
- Waits for a reply to the command message.
- Processes the reply message.

Each MICRO-DCI communication data transaction is performed in direct response to a request from the Harmony Executive.

THE PSD START-UP SEQUENCE

After the PSD has been started by the Executive and has accepted the start-up parameters, it initializes its communication port. It initiates a message exchange with the Executive to obtain all data group definitions, in order of group number, to record the protocol or device specific components of each group's definition. This serves to associate group numbers with group definitions which include port identification and device addresses. It further serves to track the status of each port, device and data group.

PSD PRIMARY FUNCTIONS

The primary role of the PSD is to provide protocol specific communication for exchanging data between the LAN-90 PCV Harmony Executive and the MICRO-DCI controllers that are addressable via the specified ports.

Only the driver contains external device and communication protocol specific data. The PSD provides all protocol and device specific definitions and algorithms. This includes logic to:

- Evaluate device and protocol specific configuration parameters entered via the Harmony editor.
- Build protocol messages for supported transactions.
- Recognize data addressing conventions and restrictions with respect to the supported devices.
- Adhere to the protocol specific transaction handling sequences for both normal and error replies.
- Perform data format conversion for all supported device data types.
- Perform appropriate extraction/insertion of data from/to transaction messages with respect to device data type.

The PSD task receives a request from Harmony for each data transaction that it performs. Once a request has been received, the PSD performs the action independently and on completion returns a reply message to Harmony.

The PSD monitors completion of each device transaction that it has initiated. If the device does not respond within a preset time interval, the transaction is retried a number of times according to the retry count set in the start-up file. After retries have been exhausted, the PSD task returns an error message which is printed in the error log.

PROTOCOL/DEVICE SPECIFIC ADDRESSING VALIDATION

The MICRO-DCI PSD evaluates all user entered port, device, group and controller point address parameters.

The port serviced by the PSD is defined in the start up file. The port referenced in a device definition must be the primary port as defined in the start up file.

Groups created for a specific Harmony data type, must associate with (map to) an appropriate MICRO-DCI controller data type (Table 4-1). The group address entered in the group definition will contain the data type and the starting address.

For example, L800 would indicate to the driver that the group contains digital elements and that the first element of the group is 800 in the controller. A tag could be assigned to any of the elements up to, but not including, the limit of the group size plus the starting address. If the group size in this case was 240, L1039 would be valid for a tag assignment, as would L800 or any number in between.

Harmony limits the data group size by Harmony data type. The MICRO-DCI PSD further limits data group size by related MICRO-DCI controller model and data type (Table 4-1).

Table 4-1. Group Size, Generic versus MICRO-DCI Data Type

Harmony Data Type	MICRO-DCI Data Type	Harmony Data Type Descriptor	Maximum MICRO-DCI Group Size
0	B-Type (8 bit unsigned integer)	Unsigned Short Integer (high byte set to 0)	50
4	C-Type	IEEE Float (Real 4 - Intel® format)	16
5	H-Type	IEEE Double (Real 8 - Intel format)	10
8	L-Type (1 bit boolean)	Byte oriented Digital Data (bit boolean data)	400
12	A -Type (10 character text string) F-Type (5 character text string)	ASCII text	1 (Harmony limitation)

APPENDIX A - MICRO-DCI CONTROLLER DATA ADDRESSING

MICRO-DCI CONTROLLER DATA ADDRESSING

Table A-1. Legal MICRO-DCI Controller Data Addressing

Controller Type	Data Type	Data File Size	Addressing Range
53MC5000	L-Type	2048	L0000 through L2047
	B-Type	768	B000 through B767
	C-Type	768	C000 through C767
	H-Type	128	H000 through H127
	A-Type	320	A000 through A319
	F-Type	640	F000 through F639
53SL5100	L-Type	2048	L0000 through L2047
	B-Type	768	B000 through B767
	C-Type	768	C000 through C767
	H-Type	128	H000 through H127
	A-Type	320	A000 through A319
	F-Type	640	F000 through F639
53IT5100	L-Type	2048	L0000 through L2047
	B-Type	768	B000 through B767
	C-Type	768	C000 through C767
	H-Type	128	H000 through H127
	A-Type	320	A000 through A319
	F-Type	640	F000 through F639
MC2000	L-Type	2048	L0000 through L2047
	B-Type	768	B000 through B767
	C-Type	768	C000 through C767
	H-Type	128	H000 through H127
	A-Type	320	A000 through A319
	F-Type	640	F000 through F639

APPENDIX B - ERROR MESSAGE TABLE

ERROR MESSAGE TABLE

Table B-1. Error Message Table

Number	Message
01	Transaction failed to complete - miscellaneous reason.
02	Timeout error on communication.
03	Error reply from host device.
04	Corrupt reply - unrecognizable reply.
05	Communication error with port device.
06	Address error.
07	Mode error.
08	Mode error.
09	Data type error.
10	Unsupported request.
11	Port selection invalid.
12	Device address invalid.
13	Group definition invalid.
14	Illegal data type selected for group.
15	Illegal port.
16	Port queue full.
17	Too many devices.
18	Illegal device address.
19	Group too large.
20	Device reply data field size error.
21	Harmony/Driver internal error.
22	Group defn changed, data rejected.
23	Cannot open startup file.
24	No port defined in start-up file.
25	Too many ports specified in start-up file.
26	Illegal baud rate specified.
27	For MICRO-DCI, RS-232-C no. of data bits must be eight.
28	For MICRO-DCI, RS-232-C no. of stop bits must be one or two.
29	For MICRO-DCI, RS-232-C parity must be NO, ODD or EVEN.
30	Invalid port parameter specified.
31	Port initialization error.
32	Receive message LRC error.
33	Startup file read error.
34	Screen entry format error.

Table B-1. Error Message Table (continued)

Number	Message
35	No write access allowed.
36	Group point reference out of range.
37	No device types defined in start-up file.
38	Message too long.
39	Selected port must be primary.
40	Size equal to zero.
41	Group undefined.
42	Illegal PLC data address.

APPENDIX C - MODBUS CABLE CONNECTIONS

MICRO-DCI CABLE CONNECTIONS

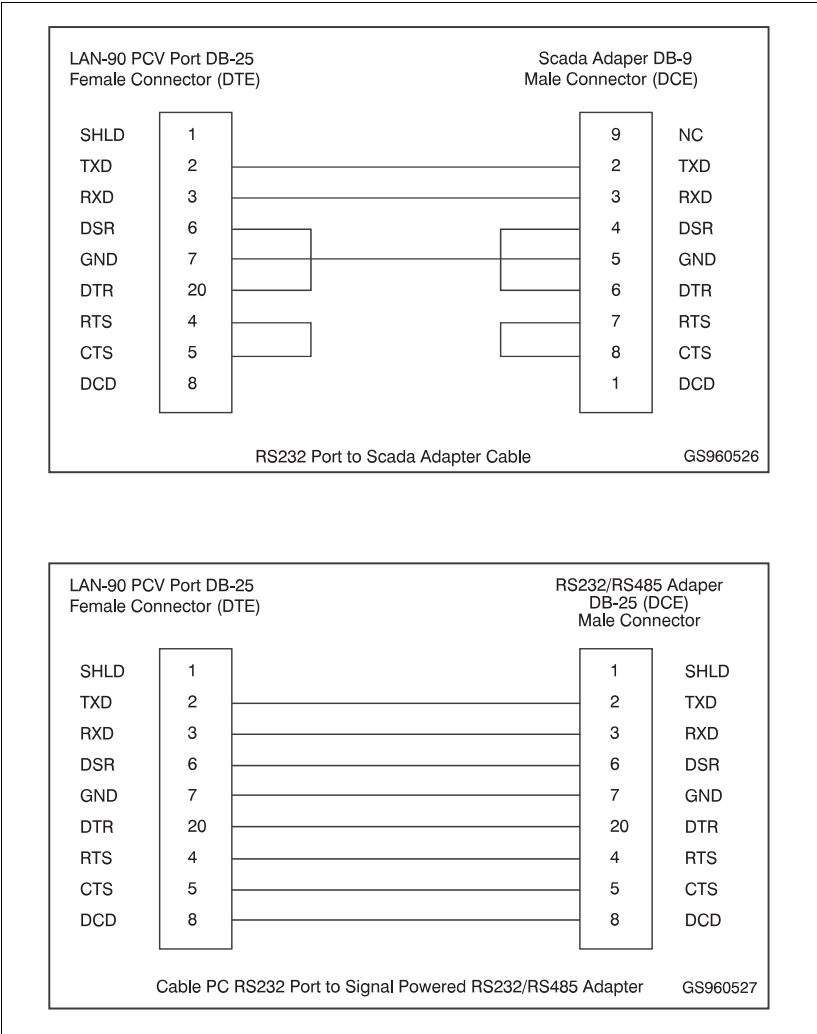


Figure C-1. MICRO-DCI Interface Cable Layouts

NOTE: An Inmac converter must be set to DCE because the PC is DTE and they must be a complementary set.

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