



Centralite[®] CT

**Moving Laser
Patient Positioning System**

CML-PC Setup Program

User Guide



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1.0 Overview

The Diacor Centralite CT Moving Laser Systems with embedded PC (Models CML-1PC and CML-3PC) are designed to allow laser position coordinates to be read directly into the system controller, by means of a network connection. In a typical CT simulation application, a treatment planning system (TPS) is used to evaluate the location of a treatment volume in a patient and to then generate a set of offset coordinates which indicate how far the laser lines must be moved in order to mark the patient correctly. In the CML-1 and CML-3 systems, the technician enters these offset coordinates in the hand held terminal in order to move the laser lines to the correct position. In the CML-1PC and CML-3PC systems, these offset values can be transferred directly to the moving laser controller, by-passing the data entry step through the hand held terminal.

The CML PC Setup program is designed to allow the embedded PC's in the CML-1PC and CML-3PC systems to be configured correctly to allow transfer of the file containing the offset coordinates over the network.

2.0 CML-1PC and CML-3PC System Configurations

Figure 1 illustrates in block diagram form, the configuration of the CML-xPC systems. The moving laser system controller provides the interface to the other system components:

- To either one or three moving lasers, depending on the system configuration. The controller provides power and control signals to each of the moving lasers to move the lasers, verify current position, turn on the lasers, etc.
- To the hand held terminal. The hand held terminal runs the operator interface software to allow the operator to communicate with the moving laser system. The communication between the hand held terminal and the controller is by means of a serial interface.
- To the network where the file containing the offset coordinates generated by the TPS is available.
- The controller also provides connections for a keyboard and a monitor for connection to the embedded PC to allow direct interface with the embedded single board computer (SBC). The purpose of the CML PC Setup program is to eliminate the need for this keyboard and monitor and to provide a single, user-friendly interface to configure the embedded PC.

Figure 1 also shows the basic components that make up the controller in the CML-xPC systems:

- Power supply. Provides power to the embedded PC (SBC).
- Motion control board. Runs the system control software to provide closed loop control of moving laser position and maintain other system status parameters.
- Interface board. Provides the physical connections to the moving laser cables.
- SBC. Runs the remote communications software that allows the controller to communicate with the network, and controls communication between the hand held terminal and the motion control board.

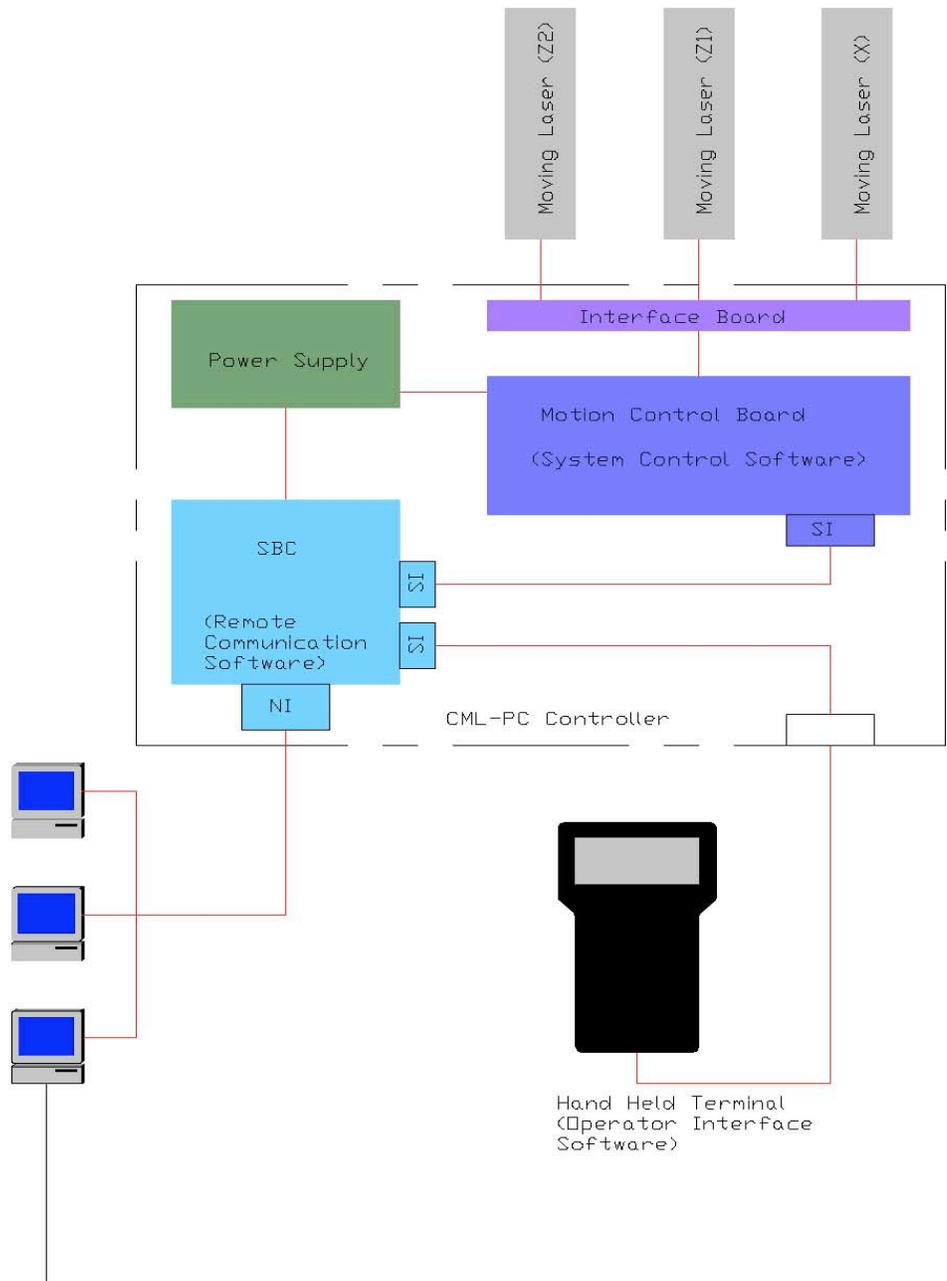


Figure 1 - Schematic representation of CML-PC system

3.0 File Configuration Scheme

The offset coordinates generated by the TPS are written to an ASCII file. This file must always have the same name and the same file location in the network. There are a number of file formats that have been used for this offset coordinate file or laser export file. These file formats have typically been defined by the manufacturers of the various moving laser systems. Some TPS systems have the ability to write files in more than one format. The Diacor CML-xPC systems have the ability to read file formats written for any of the major moving laser systems, as well as for some file formats unique to a particular TPS system.

The fact that the CML-xPC systems always read the same file in the same file location provides a number of advantages in system security and accuracy.

- It avoids the possibility of the technician selecting the wrong file name or path.
- It leaves control of updating the file to the TPS, the originator of the file and its contents.
- It allows files from multiple sources to provide offset coordinate files to the moving laser system. Any one of a number of devices on the network can write the offset coordinate file that will be read by the CML-xPC system. In the case that the different devices write in a different file format, the CML-xPC system can be configured to auto detect the file type, and read the current file type correctly.

Final control of the moving laser is always in the hands of the technician. When an offset coordinate file is read into the moving laser system, the patient name and other identifying information are displayed on the hand held terminal to allow the technician to determine if the information is correct before proceeding to move the lasers and mark the patient. The CML-xPC also monitors the time stamp on the offset coordinate file that it has read, so that it knows if the file has been updated or not.

4.0 Mounting the offset coordinate file system

In the CML-xPC controller, the SBC acts as a client. Each time it is powered up, the SBC mounts a file system on the disk on the network that contains the offset coordinate file. Once mounted, the file system containing the offset coordinate file looks like a local file system to the SBC. Then, knowing the path and file name of the offset coordinate file in this mounted file system, the SBC can access and read the file and extract the required offset coordinates.

5.0 Connecting the CML-xPC to the network

The operating system for the CML-xPC SBC is Linux, thus standard Unix commands and conventions apply. (For example “/” is used as the file separator rather than “\” as is the Windows convention.) The network port on the CML-xPC operates at 10 Mbs, thus it must be connected to a hub that has that capability (i.e. either 10 Mbs or 10/100 Mbs). The CML-xPC controllers offer two network file system options, NFS (generally used when networking with other Unix-based systems) or Samba (used to allow Unix-based systems to interface with Windows or OS/2-based systems).

Depending on the network to which the CML-xPC is to be connected, there are a number of different parameters that must be set correctly in the SBC. The purpose of the CML-PC Setup program is to communicate with the CML-xPC and setup the required parameters to enable the CML-xPC to connect to the network and access the offset coordinate file.

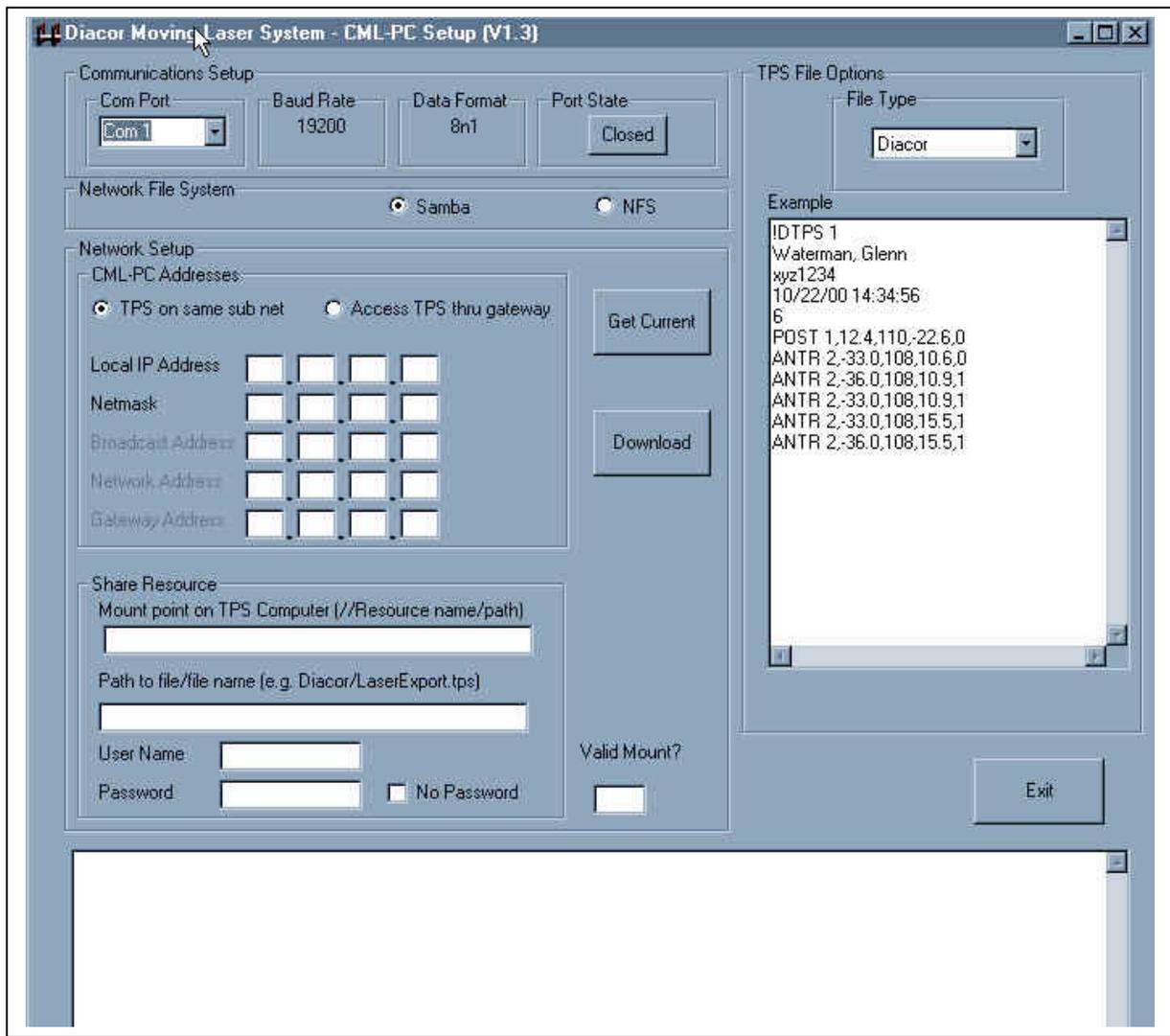


Figure 2 - CML-PC Setup program operator interface screen

6.0 CML-PC Setup Options

The CML-PC Setup program can be run on any Windows-based PC. Communication to the CML-xPC controller is by means of a serial cable connected between a serial port on the PC and the connector on the CML-xPC controller where the hand held terminal cable is normally connected. The serial cable must be a standard serial cable (i.e. no null modem is required).

The operator interface screen for the CML PC Setup program is shown in figure 2. The controls on the operator interface are grouped into related subsets of the interface. The purpose of each of these groups and the controls within the group is explained in the following paragraphs.

6.1 Communications Setup

The Communications Setup group allows parameters relative to the serial communications with the CML-xPC during the setup process to be configured. The drop down box labeled “Com Port” allows the com port on which the CML PC Setup program is running to be identified. Com 1 is the correct selection for most PC’s. The panels labeled “Baud Rate” and “Data Format” simply indicate the baud rate and data format that must be used to communicate with the CML-xPC controller. These cannot be set by the user. The panel labeled “Port State” indicates the state of the serial port (Open or Closed). Pressing the button in this panel toggles the port state. In general, the program opens the port automatically whenever communications with the CML-xPC are to be initiated.

6.2 Network File System

This panel indicates the network file system that will be used to mount the file system on the network that contains the offset coordinate file. The choices are Samba or NFS. The correct choice depends on which of the two are installed on the system where the file system will be mounted.

6.3 Network Setup

This group of controls indicates IP addresses assigned to the CML-xPC controller on the network. These addresses must be assigned by the system administrator of the network to which the CML-xPC will be connected. If the CML-xPC is to be installed on the same subnet as the TPS, or the drive on which the offset coordinate file will be located, then only a local IP address and a netmask are required. If the drive which contains the offset coordinate file is located on a different subnet, then access to the offset coordinate file location will be through a gateway, and a gateway address is required as well. Broadcast and network addresses can be specified for this case as well if required.

6.4 Share Resource

This group is labeled Share Resource for lack of a more comprehensive name. The panel contains controls relating to gaining access to the offset coordinates file over the network. Although “Share” is a term that applies specifically to Windows, this group of controls deals with the location of the mount point for the file system containing the offset coordinates file, the path to and name of the offset coordinates file, and any user name and password that the network may require to provide access to the offset coordinates file. The requirements for these files vary depending on whether Samba or NFS is being used as the network file system. Thus, the instructions are separated into these two cases.

6.4.1 Samba

Typically Samba will be used for connecting to systems with Windows or OS/2 operating systems. Thus the nomenclature matches Windows terminology. Note, however, that conventions such as using “/” as a file separator still follow the Unix format.

6.4.1.1 Mount Point

The mount point is the location of the file system that contains the offset coordinate file that is to be accessed by the CML-xPC system. Note that this mount point must be a shared resource, and that permissions for access to this resource must be consistent with the User Name and Password that are entered in fields below. The mount point string must be entered in the format indicated below:

`//Resource name/Resource path`

In a Windows-based system, the resource name is generally the computer name that is setup for the computer, and is the name that identifies the computer to the network. The resource path is the name (with path if appropriate) of the shared resource that will be mounted as a local file system on the CML-xPC.

For example:

`//TPS1100/LaserExport`

Where “TPS1100” is the name of the computer, and “LaserExport” is the name of the shared folder where the offset coordinate file is saved.

6.4.1.2 Path to File/File Name

This text box indicates the path from the mount point to the offset coordinate file, including the file name and extension. For example:

`Diacor/Offsetcoords.tps`

Where “Diacor” is the folder in the “LaserExport” folder, and “Offsetcoords.tps” is the name of the file in that folder that contains the offset coordinates.

6.4.1.3 User Name

User name is the user name that has permission to access the “LaserExport” folder (the shared resource that is the mount point).

6.4.1.4 Password

Password is the password associated with the user name above as in any networking application.

6.4.2 NFS

Typically NFS is used for connecting to systems with Unix operating systems.

6.4.2.1 Mount Point

The mount point has the same definition as described under the Samba file system above, but the format for the string is different. In this case, the text should be in the following format:

IP address:/path

The IP address is the IP address of the computer where the file system which contains the offset coordinates file is located. The IP address must be followed by a colon (:), and then by a forward slash (/), and then the path to the mount point. Unix does not use the term “share” for this resource, but permissions must be set up by the network system administrator to allow access to this file from the CML-xPC.

For example

168.92.3.10:/LaserExport

6.4.2.2 Path to File/File Name

This text box indicates the path from the mount point to the offset coordinate file, including the file name and extension. For example:

Diacor/Offsetcoords.tps

Where “Diacor” is the folder in the “LaserExport” folder, and “Offsetcoords.tps” is the name of the file in that folder that contains the offset coordinates.

6.5 TPS File Options

This panel indicates the file format of the offset coordinate file to be read by the CML-xPC. An example of the file type indicated in the drop down box is shown in the window labeled "Example."

7.0 Typical CML-PC Setup Operation

This section describes a typical procedure to use the CML-PC Setup program to configure the CML-xPC to interface to an offset coordinate file generated by a TPS on the network.

7.1 Obtain Preliminary Information

The first task is to obtain the necessary information about the network to which the CML-xPC is to be connected. In general, this information can be obtained from the network system administrator. Some of the information may need to be obtained from the supplier of the TPS. As an example, we will assume that the system administrator has provided the following information:

IP address to be assigned to the moving laser system:	168.92.3.10
Netmask:	255.255.255.0
IP address of the TPS computer:	168.92.3.12
(TPS computer and the moving laser system are on the same subnet, therefore, no gateway address is required.)	
Operating system on the TPS computer:	Windows
Samba is installed on the TPS computer.	
TPS computer name:	TPS1100
Shared resource that contains the offset coordinates file:	LaserExport
Path and file name of the offset coordinates file:	LaserExport\Diacor\Offsetcoords.tps
File type:	Diacor
User name to access LaserExport:	Diacor
Password:	diacor

7.2 Connection to the CML-xPC Controller

It is assumed that the controller has already been installed, connected to the hand held terminal and moving laser(s), and that the hand held terminal has been used to move the laser lines. It is also assumed that the network cable (CAT5) has been connected to the controller.

- 1) Turn power off to the CML-xPC controller.
- 2) Disconnect the hand held terminal from the controller.
- 3) Connect a serial cable from the serial port on the PC running the CML-PC Setup program to the connector on the controller where the hand held terminal was connected.
- 4) Turn on the power switch to the CML-xPC controller. Wait approximately two minutes to be sure that the SBC has fully booted.
- 5) On the CML-PC Setup operator interface screen, make sure that the proper serial port is selected in the Communications Setup panel.
- 6) Press the "Get Current" button. This will initiate a process where the program will query the CML-xPC controller for the current settings. When the configuration

information is returned to the CML-PC Setup program, the information is displayed in the appropriate panels on the operator interface screen.

- 7) Compare the current configuration with the information gathered from the system administrator, and modify any panels that do not contain the correct information. For the information indicated in the previous section, the panels on the operator interface screen would need to be changed to read as follows:
 - a) Select “Samba” in the Network File System panel.
 - b) Select “TPS on same sub net” in the Network Setup panel.
 - c) Enter “168”, “92”, “3”, “10” in the boxes labeled Local IP address.
 - d) Enter “255”, “255”, “255”, “0” in the boxes labeled Netmask.
 - e) Enter “//TPS1100/LaserExport” as the Mount point.
 - f) Enter “Diacor/Offsetcoords.tps” as the Path to file/file name.
 - g) Enter “Diacor” as the User Name.
 - h) Enter “diacor” as the Password.
 - i) Select “Diacor” as the File Type in the TPS File Options panel.
- 8) Once the correct information is entered in the operator interface panel, press the “Download” button. This initiates a process where the configuration parameters on the operator interface panel are downloaded to the CML-xPC controller.
- 9) When the down load process is complete, the “Get Current” button will be re-enabled. Press the “Get Current” button to verify that the desired configuration parameters were set properly. When the current configuration parameters are re-displayed on the operator interface panel, look at the box labeled “Valid Mount?”.
 - a) If the text in the box is “YES”, then the CML-xPC has been properly configured and a connection with the network has been established. The serial cable can be disconnected from the CML-xPC controller, and the hand held terminal reconnected. The hand held terminal can be used to retrieve a file written by the TPS and move the lasers accordingly.
 - b) If the text in the box is “NO” then a network connection has not been made. If any of the parameters entered in step 7 above (except File Type) are incorrect, this would cause an invalid mount. A “NO” would also be displayed if any of the network components are not connected or operating properly (Network cable not connected at one end, hub not operating, TPS computer not operating, wrong type of network cable, etc.) The troubleshooting section of this document provides some guidance if the reason for the invalid mount is not immediately obvious.
- 10) When a valid mount is obtained, use the hand held terminal to down load a file from the TPS. Verify that the file is correct, that the lasers move the correct distance, and in the correct direction.

8.0 Troubleshooting

Possible solutions to errors that might be encountered in using the CML-PC Setup program are discussed in the following paragraphs.

8.1 Com Error – No ACK from SBC

This indicates that the program did not receive an acknowledgement from the CML-xPC. Make sure that the serial cable is connected at both ends (to the computer running the

program and to the serial port on the CML-xPC where the hand held terminal is usually connected). Make sure that the CML-xPC is powered on. If all of the above are already correct, power the CML-xPC off and on again, restart the CML-PC Setup program again, and try again.

8.2 Valid Mount = YES, but hand held terminal cannot read file.

Check to be sure that the File Type specified matches the file format written by the TPS. Changing the file type to “Auto” will allow the CML-xPC to read Gammex, LAP, or Diacor file types. (The TheraPlan file type cannot be read with the Auto file type.) If the file still cannot be read by the CML-xPC, print a copy of the file that was generated by the TPS and compare it to the examples shown in the CML-PC Setup operator interface screens. For files that do not match the current acceptable file formats, a copy of the file may be sent to Diacor to evaluate where or not a reader could be developed for this format.

8.3 Valid Mount = NO

There are many possible reasons that a “NO” could be returned. The first place to start is to determine whether or not there is a valid network connection.

8.3.1 Verify Network Connection

From the TPS computer, attempt to ping the moving laser controller. (One can also attempt to ping from the moving laser controller to the TPS computer, but describing this process is beyond the scope of this document.) If one cannot ping successfully between the two machines, verify first of all that the CML-xPC has the correct IP address and netmask, and contact the network system administrator to track down a connection problem on the network. (Make sure he knows that the CML-xPC operates at 10 Mbs.) If the two devices are not on the same subnet, make sure that the Gateway address on the moving laser controller is set correctly as well.

8.3.2 Ping OK

Once one can ping between the two devices, obtaining a valid mount should just be a matter of making sure that the set up parameters for the Mount point, file path/file name, User Name, and Password are correct. Here, one mistyped character can result in an invalid mount.