1000-90
Communications Software

Support Software For:

LI-6252 CO_2 Analyzer

LI-6262 CO_2/H_2O Analyzer

LI-3000A Portable Area Meter

LI-1000 Data Logger

LI-1400 Data Logger
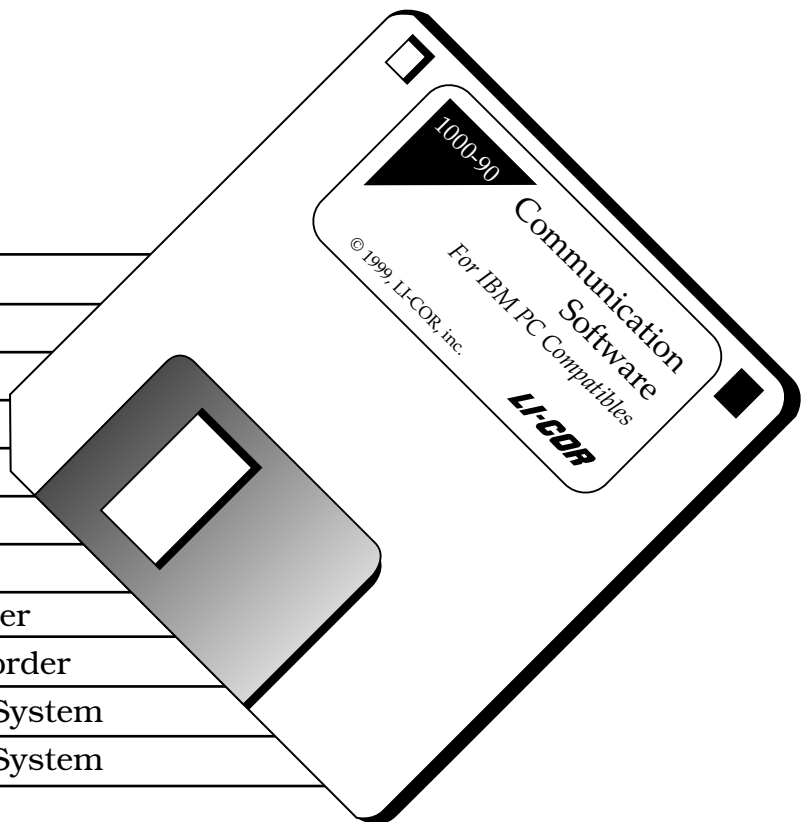
LI-1600 Steady State Porometer

LAI-2000 Plant Canopy Analyzer

LI-1800 Portable Spectroradiometer

LI-1200S Minimum Data Set Recorder

LI-6200 Portable Photosynthesis System

LI-6400 Portable Photosynthesis System

1000-90
Communication Software
For IBM PC Compatibles
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1000-90 Communication and Utility

Software for LI-COR Instruments

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LI-COR Software Product
License Agreement and Limited Warranty

License Agreement

Customer may not reverse assemble or decompile this software.

Customer may make copies of the software for archival purposes, or to facilitate its use with the mass storage media of a particular computer (e.g. copy to hard disk).

Customer may make copies of the software for use on two or more computers ONLY in the case when the data to be analyzed or manipulated is generated by the same individual LI-COR instrument.

Customer has no other rights to copy this software without express permission from LI-COR.

Limited Warranty

Software:

LI-COR warrants for a period of 90 days from the date of purchase that the product will execute its instructions when properly installed on the computer indicated in its instruction manual. LI-COR does not warrant that the software is free from errors. In the event that this product fails to execute properly during its warranty period, customer should contact LI-COR. If the problem cannot be resolved in a reasonable amount of time, the customer's recourse is to return the software and all copies to LI-COR for a refund.

Media:

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General Information

Contents   page

The 1000-90 diskette contains a collection of programs which are used to get data out of LI-COR instruments and into your computer. The COMM program accomplishes this. Also included are several programs that can operate on data files generated by COMM (or any other similar program) to reformat, recompute, or otherwise manipulate the data.

The files on the disk are:

Program Files

COMM.EXE - General purpose communications program.

EQUIP.EXE - Serial port diagnostics program.

REFORMAT.COM - Reformats LI-1000 data files (V format) into channel groupings.

R1600.EXE - Reformats LI-1600 data files (2-line format) into channel groupings.

Documentation Files

READ.ME - Recent changes.
*.HLP - Help files.
LCONFIG.LCR - List of configurations and help files.
REFORMAT.PAS - Source code for REFORMAT program.

The 1000-90 programs are approximately 243K bytes in size, and run on any IBM PC/XT/AT/PS/2 or true IBM compatible computer.

COMM.EXE
(General Purpose)

Installation

No special installation procedures are required to install the 1000-90 program. Make a backup copy of the diskette if you plan to use the 1000-90 program directly from the floppy disk, or copy the contents of the diskette onto a hard disk drive in your computer.

The 1000-90 program is a general purpose data communications program. Data incoming from the selected RS-232C port is displayed on the CRT, and optionally written to the system printer, and/or written to a disk file. Typed characters are transmitted out the selected serial port (COM1 or COM2).

To run the program, type COMM <enter>.

Softkeys

The program is controlled by the softkeys F1 thru F9:

F1 The file 'LCONFIG.LCR' is accessed, and you can select the configuration entry you wish to use. This file is simply an ASCII file that contains preset RS-232C configurations. Move the cursor using the down/up arrow keys on your computer to access the appropriate LI-COR instrument configuration, and press <Enter> to select that configuration. Notice that there is also a 'General Purpose' configuration for instruments which do not appear on the menu. If you wish to add to the file, use a text editor, and model the new entries after the existing ones. Help files for each configuration can also be specified.

When F1 is pressed, there is always a 'User Defined' entry appended to the list found in the configuration file. Selecting this entry allows you to set whatever configuration you might wish to use that is not already in one of the existing options. Simply model your entry as

they appear in the existing configuration files (i.e., Com1 or Com2:Baud Rate, Data Bits, Stop Bits, and Parity).

Any text editor can also be used to append the 'LCONFIG.LCR' file as well. Model the new entries as they appear in this file, and save the file as a Text (ASCII) file.

| F2 | | Change serial (COM) ports. If more than 1 COM port is present, this key will toggle between COM1 and COM2. |

Change serial (COM) ports. If more than 1 COM port is present, this key will toggle between COM1 and COM2.

F3 Local Echo ON or OFF. If ON, characters typed on the keyboard are echoed to the CRT, in addition to being transmitted.

F4 Clears the upper portion of the display.

F5 Printer ON or OFF. When ON, incoming data is copied to the system printer.

F6 File: Press this key to specify a file into which incoming data will be copied. Once defined, press F6 again to close the file.

F7 Help. Accesses the specified help file (see F1).

F8 CRT: ON Toggling this to OFF prevents incoming data from being displayed on the CRT. Instead, only a byte count is displayed. *If a file (F6) is not open, the incoming data is lost.*

Alt + **x** Terminates the program.

Sending Files to the Computer

LAI-2000 Plant Canopy Analyzer

The LAI-2000 is configured as a DCE device. Connect the LAI-2000 to your computer using the printer cable provided with the instrument. To send files from the LAI-2000 to a computer, use the following functions, found in the COMM execute list:

FCT 31 - Configure the I/O port for 4800 baud, 8 data bits, no parity, and xon/xoff = NO.

FCT 33 - Set the desired output format (Normal, with or without observations, or Spreadsheet format).

FCT 32 - Print the desired range of files.

LI-1000 DataLogger

The LI-1000 is configured as a DTE device. Most computers can be connected to the LI-1000 using the 1000-03 printer cable and a female-to-female gender changer. To send files from the LI-1000 to a computer, follow these steps:

1. Press **OUT** on the LI-1000.

2. Select the proper baud rate (toggle with any key except **ENTER**). "Baud = 3" is 300 baud, and "baud = 48" is 4800 baud. Press **ENTER**.

3. Select either "**V**" for vertical format or "**H**" for horizontal format. Vertical format gives one number per line, and horizontal format gives as many numbers per line as will fit in the line length specified. Press **ENTER**.

4. If "H" was chosen in step 3, the next display will be "len=". Enter the maximum number of characters in a line for your computer or printer. Press **ENTER**. The following display is "dump all=yes" (no) (LI-1000 software version 2.xx only). Toggle yes or no, and press **ENTER**. The LI-1000 display will show "dumping".

The data dump can be aborted by pressing the **OUT** key again.

LI-1400 DataLogger

The LI-1400 is configured as a DTE device. Most computers can be connected to the LI-1400 using the 1400-550 printer cable. To send files from the LI-1400 to a computer, follow these steps:

1. Use the Setup Hardware menu to set the Printing baud rate to 9600.

2. Use the Setup Logging menu to make sure that Auto Print=No.

3. Press the **Fct** key.

4. Press the right or left arrow key until 'Print Memory' is displayed. Press **Enter**.

5. Press the right or left arrow key until 'Print=All' is displayed.

6. Press the down arrow key several times until !Print Mem! is displayed. Press **Enter**. The data will be sent.

LI-1200S Minimum Data Set Recorder

The LI-1200S is configured as a DTE device. Most computers can be connected to the LI-1200S using the 1000-03 printer cable and a female-to-female gender changer. To send files from the LI-1200S to a computer, follow these steps:

1. Press **OUT** to enter *Output Mode*.

2. Choose baud rate (300 or 4800).

3. Press **ENTER** to begin data transmission.

LI-3000A Portable Area Meter

The LI-3000A is configured as a DCE device. Most computers can be connected to the LI-3000A using the 1000-04 printer cable and a female-to-female gender changer. To send files from the LI-3000A to a computer, use the following functions:

1. Press the **MENU** key to access the functions needed to transfer data. In the list of menu items are **SET I/O** and **PRINT FILES.**

2. Set the I/O parameters as follows:
   BAUD = 4800
   DATA BITS = 8
   STOP BITS = 2
   PARITY = NONE
   CHECK DTR = N (not used)
   XON/XOFF = N (not used)
   CHECK RTS = N (not used)

3. Press **Enter** at the **PRINT FILES** function. Enter the range of files to be transmitted out the RS-232C port.

LI-1600 Steady State Porometer

The LI-1600 is configured as a DTE device. To send data from the LI-1600 to a computer, follow these steps:

1. Your LI-1600 must support RS-232C communications (serial numbers SSP-275 or above).

2. Connect the cable included with the LI-1600 (2230S) to the 9-pin port on the LI-1600 console. The 2230S plugs directly into any DTE equipment.

3. Data are transferred when the **HOLD** switch on the LI-1600 Sensor Head is toggled.

LI-1800 (UW) Portable Spectroradiometers

The LI-1800 and LI-1800UW Portable Spectroradiometers are configured as DCE devices. There are two ways to connect the computer to the LI-1800 or LI-1800UW.

Terminal Port

1. Connect the computer to the terminal port on the LI-1800 using the 1000-04 printer cable, and use the COMM program as a terminal emulator.

2. Note that the LI-1800 does not recognize commands sent in lowercase letters.

Output Port

Use the 2232S cable to connect the computer to the 9-pin output port of the LI-1800. You will need another terminal to control the LI-1800; the COMM program will be used to capture data sent from the output port.

LI-6200 Portable Photosynthesis System

The LI-6200 is configured as a DTE device. To send files from the LI-6200 to a computer, use the following functions:

FCT 51 - Set the I/O parameters as follows:

    BAUD = 4800
    DATA BITS = 8
    STOP BITS = 2
    PARITY = none
    CHECK CD = N
    CHECK DSR = N
    ENQ/ACK HSHK = N (not used)
    XON/XFF HSHK = N (not used)
    XON CHAR = 11 (not used)
    XOFF CHAR = 13 (not used)
    FLAG PARITY = N (not used)
    LOCAL ECHO = N (not used)
    SOM =00 (not used)
    EOL = 0D,OA
    EOL WAIT = 0
    EOM = 00 (not used)

FCT 53 - Output a range of page files. The print format is selected by the PRN FMT (U/S) option in FCT 42. The system format is selected in FCT D8, and the user format is defined in FCT D9.

Any list can be printed by pressing **PRINT** while viewing the list.

LI-6400 Portable Photosynthesis System

The LI-6400 is configured as a DTE device.   Two cables are included with the LI-6400 for data communications: 1000-90 and 1800-04.

If your PC has a 9 pin COMM port, use BOTH cables. If your PC has a 25 pin COMM port configured as DTE with a male connector, use the 1000-09 cable.

To send files from the LI-6400 to a computer, follow these steps:

1. Set the communications parameters in the LI-6400. Select 'Configure the COMM port' from the Utility menu, and enter 9600 8 1 N. Press **Enter**.

2. Select 'Access the FILER' and change to the directory containing the file(s) to be printed. Press **f1** (Dir) and use the arrow keys to scroll to the desired directory (i.e., /User). Press **Enter**. Highlight the file(s) to be printed using the arrow keys, and tag the file(s) by pressing **Enter**.

3. Press the **labels** key, and press the **Print** function key (or press **P**). You are prompted to print header information and form feeds. The header information includes the file name as entered in the LI-6400. If you send multiple files at one time or if the file names don't follow DOS conventions you will want to include headers. The tagged file(s) are sent to the RS-232C port.

4. Press **F6** to close the capture file.

LI-6252 & LI-6262 Gas Analyzers

The LI-6252 CO_2 and LI-6262 CO_2/H_2O Analyzers are both configured as DCE devices, and can be connected to most computers using the 1000-04 printer cable. The 1800-04 printer cable will work with most computers that have a 9-pin AT-style RS-232C port.

To send data from the LI-6252 or LI-6262 to a computer, follow these steps:

1. Use **FCT 17** to set the communication parameters as follows:
    Baud Rate: 4800
    Data Bits: 8
    Stop Bits: 2
    Parity: None

2. Press **FCT 13** and designate the channels that you wish to print.

3. Press **FCT 15** to set the interval at which to print a header, if desired.

4. Press **FCT 14** to set the print interval (in seconds). If the cable connections and software configurations are set correctly, data will now be transmitted.

C20 Cassette Reader

To send files from the C20 to a computer, follow these steps:

1. Set the switches on the C20 as follows:

    10110111 (4800 baud, odd parity, default program, I. ASCII)

2. Connect the recorder and the C20 using the REMOTE and MONITOR jacks.

3. If your computer's RS-232C port is configured as DTE (the normal configuration), attach it to port A (TO TERMINAL). If it is configured as DCE, attach it to port B (TO COMPUTER).

4. Press **PLAY** on the recorder. The recorder can be stopped by pressing <CTRL>S on the computer keyboard, and restarted by

pressing <CTRL>Q. If you encounter data transmission problems, change the volume on the tape recorder and try again.

Cables

There are 2 types of RS-232C devices: DTE (Data Terminal Equipment) and DCE (Data Communications Equipment). If a DTE device is connected directly (pin-for-pin) to another DTE device then communication cannot occur because both devices are sending on line 2, and receiving on line 3. Similarly, DCE cannot be connected pin-for-pin to another DCE.

Your computer is probably a DTE device, although there is no guarantee of this. There are LI-COR instruments of both types:

DTE: LI-6000, LI-6200, LI-6400, LI-1000, LI-1400, LI-1600, LI-1200S

DCE: LI-1800 & LI-1800UW terminal ports, LAI-2000, LI-3000A, LI-6252 CO_2 Analyzer, LI-6262 CO_2/H_2O Analyzer

A cable that interchanges pins 2 and 3 (and usually 6 and 20 as well) so that DCE can talk to DCE, and DTE can talk to DTE, is known as a null modem. The printer cable that comes with the LI-6200 is a null modem cable. A flat ribbon cable is *not* a null modem cable.

> **GENERAL RULE:** IF IT DOESN'T WORK WITHOUT A NULL MODEM CABLE, TRY IT WITH A NULL MODEM CABLE.

Some computers (such as IBM AT and COMPAQ) use a 9 pin connector for the RS-232 port, in which case an adapter cable is required. Adapter cables that conform to the IBM AT 9 pin RS-232 standard are available from LI-COR, and most computer stores. You must decide how you want your cable to be configured at the 25 pin connector end. Below is a list of LI-COR equipment, and how the 25 pin end of the adapter cable should be configured (male/female, DCE/DTE):

connects directly to   **such as LI-COR**

This device	cable configured as		cable part #
LI-6200	Male	DCE	
LI-6000	Male	DCE	
LI-1000	Female	DCE	1000-09
LAI-2000	Female	DTE	2000-02
LI-3000A	Male	DTE	1800-04
LI-1800 terminal port	Male	DTE	1800-04
LI-1800UW terminal port	Male	DTE	1800-04
LI-6252 & LI-6262	Male	DTE	1800-04

The cable would then plug directly into the instrument. If you wish to build your own, here's how:

9 pin	25 pin DTE		25 pin DCE
1	CD	8	8
2	RD	3	2
3	TD	2	3
4	DTR	20	6
5	GND	7	7
6	DSR	6	20
7	RTS	4	4
8	CTS	5	5
9	RI	22	22

If you use 9-conductor cable, you can connect all 9 pins as shown. Alternatively, you can use 5 conductor cable, connect only pins 2, 3, 4, 5 and 6 of the 9 pin connector, and jumper some pins on each connector:

On Connector	Short these pins:
9 pin:	(1,6,8)
25 pin:	(5,6,8) (4,20)

EQUIP.EXE
(General Purpose)

EQUIP.EXE is a diagnostics program that is useful for determining hardware compatability problems between your computer and the instrument that is connected to it. This program indicates the status of the major modem lines on all RS-232C ports in your computer. Run the program by typing

        EQUIP

and pressing the return key. The display will show something like:

```
VIDEO EQUIP:  5003
BIOS EQUIP:   4423
```

```
=============================== COMSTAT ===============================

 PORT   ADDR   CONFIGURED  RTS (4)   CTS (5)   DSR (6)   CD (8)   DTR (20)
 ====   ====   ==========  =======   =======   =======   ======   ========
 COM1   3F8    4800,8,2,N   HIGH       LOW       LOW       LOW      HIGH
```

which will update continually until any key on the keyboard is pressed.

Communications Parameters

PORT - this indicates which serial (communications) port on your computer is connected to the instrument. If COM1 is not found, the baud rate listed under the CONFIGURED line will read -1. Restart the program by striking any key, type

        EQUIP COM2

and press the return key.

ADDR - I/O address.

CONFIGURED - lists baud rate, data bits, stop bits, and parity.

RTS (4) - Ready To Send status, transmitted on modem cable line 4.

CTS (5) - Clear To Send status, transmitted on modem cable line 5.

DSR (6) - Data Set Ready status, transmitted on modem cable line 6.

CD (8) - Carrier Detect status, transmitted on modem cable line 8.

DTR (20) - Data Terminal Ready, transmitted on modem cable line 20.

If the baud rate reads -1, check the cable to make sure that it is the proper one for your instrument (DTE or DCE). Also check to see that you are connected to the proper serial port on your computer. Lastly, check the RS-232C parameters in your instrument (baud rate, data bits, etc.) to make sure that they are set properly for the configuration set in the COMM program.

REFORMAT.COM
(LI-1000 Data)

REFORMAT.COM will reformat an LI-1000 data file that was output using "V" (vertical) format. As printed by the LI-1000, the data is sequential in time. REFORMAT creates a file that has all the channels grouped, and sorted by time within each group. For example:

Source File...

```
871013 0935
1M-2.544E-10MO
2M-6.263E-10  2H-1.222E-09  2L-1.375E-09
4T-2.034E-07
5T-8.472E-09  5H-2.746E-05  5L-2.441E-05
871013 0940
1M-5.088E-10MO
2M-6.493E-10  2H-2.444E-09  2L-1.375E-09
3M-1.177E-05  3H-2.746E-05  3L-2.441E-05
4T-2.373E-07
5T-4.195E-07  5H-2.746E-05  5L-2.441E-05
6T-8.643E-07  6H-2.746E-05  6L-2.441E-05
```

Dest. File...

```
871013 0935  1M-2.544E-10MO
871013 0940  1M-5.088E-10MO

871013 0935  2M-6.263E-10  2H-1.222E-09  2L-1.375E-09
871013 0940  2M-6.493E-10  2H-2.444E-09  2L-1.375E-09

871013 0940  3M-1.177E-05  3H-2.746E-05  3L-2.441E-05

871013 0935  4T-2.034E-07
871013 0940  4T-2.373E-07

871013 0935  5T-8.472E-09  5H-2.746E-05  5L-2.441E-05
871013 0940  5T-4.195E-07  5H-2.746E-05  5L-2.441E-05
```

```
871013 0940  6T-8.643E-07  6H-2.746E-05  6L-2.441E-05
```

To run this program, log onto the proper drive and at the DOS
prompt type

```
        REFORMAT <source file> <destination>
```

where <source> and <destination> are the appropriate file specifiers.
If these file specifiers are not entered, you will be asked the name of
the file to reformat and the name of a new file in which to put the
reformatted data.

The source code for this program, should you wish to modify it, is in
the file REFORMAT.PAS, and can be compiled using Borland's
Turbo Pascal.

R1600.EXE
(LI-1600 Data)

General Information

R1600.EXE will reformat an LI-1600 data file that was output using the 2-line format which the instrument produces. The R1600 program will also add an offset time stamp to any LI-1600 data file, if desired, which will be added to the #S (time since instrument turn on, in seconds) values to produce a real time identifier. R1600 creates a file that has all the channels listed horizontally, and sorted by time vertically. For example:

Source File...

```
#C1000E+1 #S2991E+1 DR3500E-3 CD4667E-2 TR5234E-1 QU6234E+0
HM7234E+1 LT8234E+2 CT9234E+3 FL1034E+4 PR1162E+2 AP1200E+0
```

Dest. File...

```
            #C      #S      DR       CD       TR      QU...
00:00:02  1.000   2.000  0.00035  0.004667  0.05234  0.6234
00:00:26  2.000   26.00    68.59   0.01458   0.3550   0.000
00:01:40  3.000   100.0    453.9  0.002203  0.05356   0.000
```

To run the r1600 program, log onto the proper drive and at the DOS prompt type

```
        r1600 <enter>.
```

A help file showing the proper command format automatically appears.

To reformat a LI-1600 data file, type

```
        r1600 <source file> <destination>
```

where <source> is the appropriate file specifier, and <destination> is the print destination [optional; the default destination is CON (console)].

To add an offset time to the source file, type

```
r1600 <source> <destination> <hh:mm:ss>
```

For example, typing "`r1600 corn.dat corn.prn 14:30:00`" at the DOS prompt would reformat the source file `corn.dat`, send it to the printer, and add a time offset of fourteen hours and 30 minutes to the time since instrument turn on, which would be added to the #S value in the resulting data file.

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