

LI-6400 Digital Board and Software Upgrade

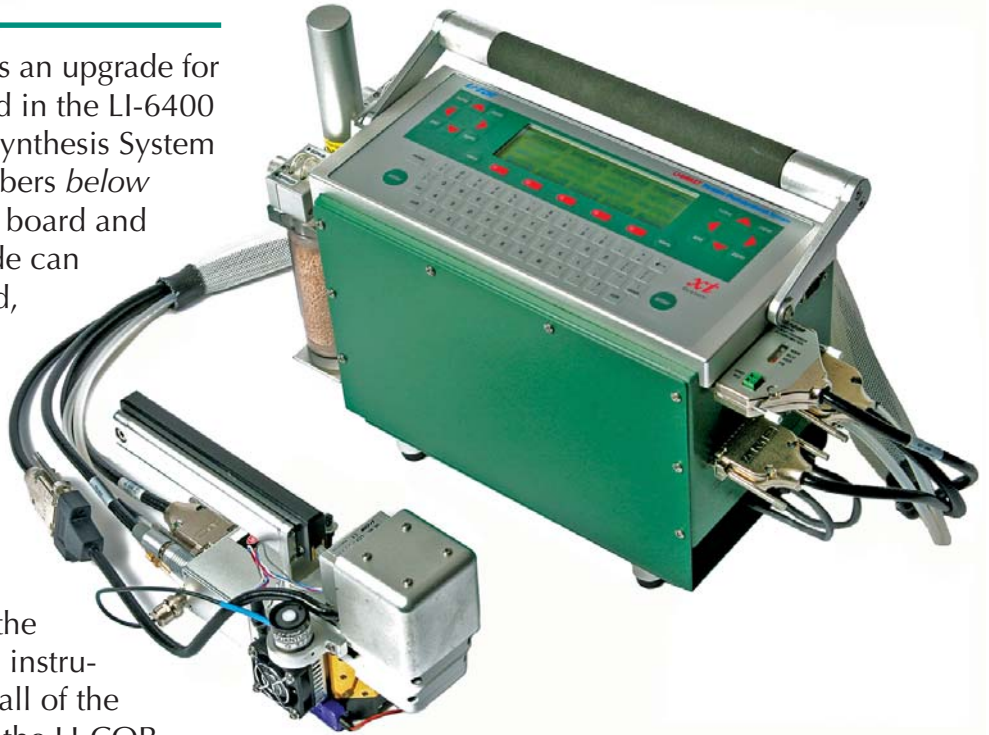
Product Bulletin

LI-6400/6400XT Portable Photosynthesis System

Description

The **6400-926** is an upgrade for the digital board in the LI-6400 Portable Photosynthesis System with serial numbers *below* PSC-2176. The board and software upgrade can be user installed, or the instrument can be returned to LI-COR or a LI-COR distributor for installation.

After installing the upgrade kit, the instrument will have all of the functionality of the LI-COR LI-6400XT System, including:



- **A new instrument case:** A “shell” with an access door for insertion of a compact flash (CF) card or an Ethernet adapter (both included)
- **Faster processor** (400 MHz)
- **OPEN Version 6 Software**
- **Comm port input:** For input devices such as a bar code reader
- **Support for Multiphase Flash (MPF) Protocol:** For calculating Φ_{PSII} for leaves that are difficult to saturate

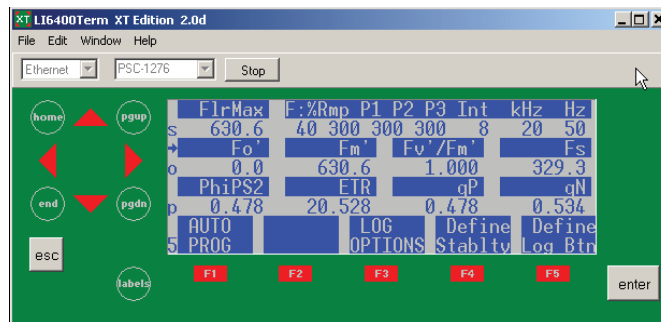
	15 MHz Board	206 MHz Board	400 MHz Board
RAM	512K	128 MB	128 MB
Flash Memory	6 MB	64 MB	64 MB
Microprocessor	Intel 15 MHz	Intel 206 MHz	Intel 400 MHz
Operating System	AMX	Linux	Linux
File Defragmentation	Required	Not required	Not required
OPEN Software	4.x or below	5.x or above	6.x or above

Ethernet Connectivity



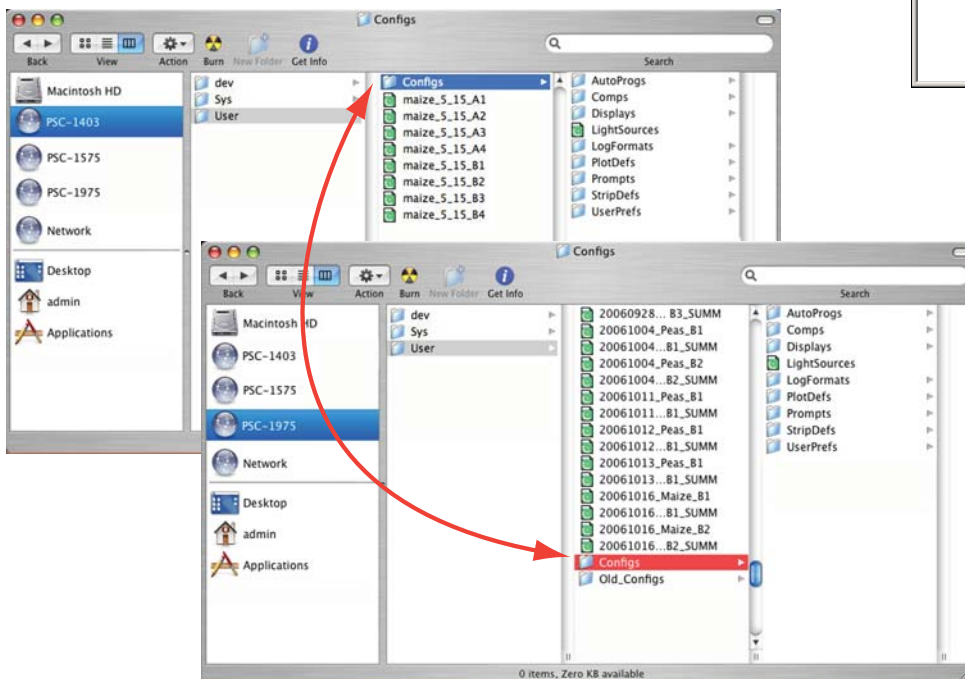
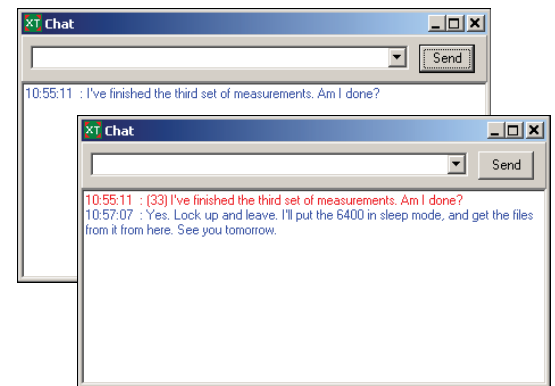
The expansion slot on the instrument back panel accepts an Ethernet adapter (p/n 6400-26, included); simply connect an Ethernet cable between the LI-6400XT and a computer (or to your LAN), and the instrument will automatically be connected. Ethernet connectivity is a powerful tool that offers fast file transfer speeds for operations such as:

- Drag and drop files between instruments or computers (PC or Mac)
- Move configuration files to set up multiple instruments in the same way
- Open LI-6400 data files directly, without the need to download files to your computer
- Use *LI6400Xterm* to control the instrument remotely
 - Connect multiple clients to a single instrument
 - Classroom training
 - Use the chat window to communicate between connected clients
 - Let LI-COR service technicians diagnose problems remotely
- Use command line operations to perform daily backups, find files, search, organize files, etc.



With *LI6400Xterm*, after connection, the display shows exactly what is on the instrument's display. This is especially useful for classroom training.

Use the Chat Window feature to communicate between connected clients.



Share files between instruments. In this example, the *Configs* folder is copied to a second instrument.

Removable Flash Memory



The expansion slot accepts either a Compact Flash card or the 6400-26 Ethernet adapter.

The expansion slot on the instrument rear panel also accepts Compact Flash cards (a 1GB card is included). Compact Flash cards provide a convenient way to:

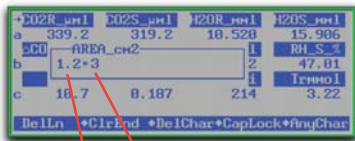
- Archive files
- Transfer files to or from the field without moving the instrument
- Transfer files to other LI-6400XTs
- Quickly view or transfer data files on your computer – no cabling required



OPEN Version 6 Software

The OPEN Version 6 Software included has a number of new features, including:

- Excel files can be created automatically as you log data. This allows equations to be embedded in the Excel file for simple recomputation, should you need to make a change to leaf area, for example (see below).
- Numeric values can be entered as expressions. When prompted for a numeric value (e.g. leaf area), you can enter a mathematical expression, if desired. This is useful, for example, when entering leaf area, as the instrument can calculate the area for you (see at left).
- Ability to pause and resume Autoprograms.



Measured Known

Obs (-35)	HMMSS (-2;FTime (-36)	EBal? (-76)	Photo (30)	Cond (23)	CI (36)	Trmmol (21)	VpdL (25)	CTleaf (221)	Area (-33)	BLC_1 (111)	StmRat (-34)	BLC out
12	1 10:06:44	34.5	0	17.146626	0.16961681	220.660578	2.80758375	1.63449871	23.7025719	1	2.51782623	1 4.5
13	2 10:06:54	45	0	8.53701214	0.08358411	220.804777	1.41615554	1.64776782	23.7882996	2	2.29826099	1 4.5
14	3 10:07:03	54	0	8.23367398	0.08505819	229.402713	1.43766445	1.64434084	23.7812309	2	2.29826099	1 4.5
15	4 10:07:11	62	0	7.05252691	0.08533667	251.365188	1.44541798	1.64783297	23.8078976	2	2.29826099	1 4.5
16	5 10:07:16	67	0	7.7672837	0.08601123	238.510222	1.45488768	1.64586047	23.8027973	2	2.29826099	1 4.5

When we change the leaf area of the first observation, the computed numbers change automatically.

Obs (-35)	HMMSS (-2;FTime (-36)	EBal? (-76)	Photo (30)	Cond (23)	CI (36)	Trmmol (21)	VpdL (25)	CTleaf (221)	Area (-33)	BLC_1 (111)	StmRat (-34)	BLC out
12	1 10:06:44	34.5	0	8.5573313	0.08353593	220.294214	1.40379188	1.63449871	23.7025719	2	2.29826099	1 4.5
13	2 10:06:54	45	0	8.53701214	0.08358411	220.804777	1.41615554	1.64776782	23.7882996	2	2.29826099	1 4.5
14	3 10:07:03	54	0	8.23367398	0.08505819	229.402713	1.43766445	1.64434084	23.7812309	2	2.29826099	1 4.5
15	4 10:07:11	62	0	7.05252691	0.08533667	251.365188	1.44541798	1.64783297	23.8078976	2	2.29826099	1 4.5
16	5 10:07:16	67	0	7.7672837	0.08601123	238.510222	1.45488768	1.64586047	23.8027973	2	2.29826099	1 4.5

New Multiphase Flash Protocol with the 6400-40 Leaf Chamber Fluorometer



Traditional methods for measuring maximal fluorescence (F_m') often result in underestimation of F_m' , particularly in plants that are difficult to fully saturate. A multiphase flash (MPF) protocol developed at LI-COR for use with the 6400-40 Leaf Chamber Fluorometer provides a rapid method for deriving true estimates of F_m' , $\Phi PSII$, and ETR in a flash duration of approximately 1 second.

This method uses a ramp of varying light intensity to generate F_m' values over a range of light intensities.

Go to http://www.licor.com/env/PDF_Files/6400_chlorophyll.pdf to download a poster presentation describing this protocol.

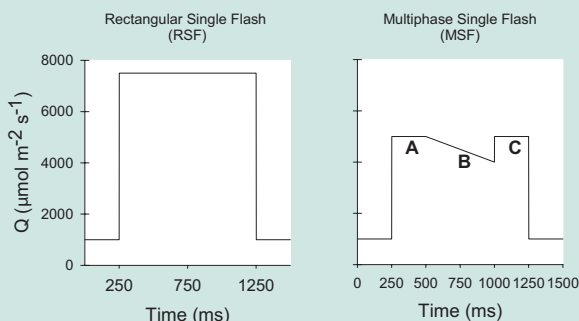


Figure 1. Typical Rectangular Single Flash, with a saturating multiturnover flash (Q) of 400-1200 ms (left). With the Multiphase Flash protocol (right), a) a high, nearly saturating flash (Q) is used for 250 ms to reduce Q_A -PQ pool; b) ramp of declining Q for 500 ms, and c) return to initial high Q for 250 ms to check for flash-induced non-photochemical quenching (q_N). The F_m' values from Phase B are regressed against $10^4/Q$ and extrapolated to estimate the maximal fluorescence at infinite flash intensity (Figure 2).

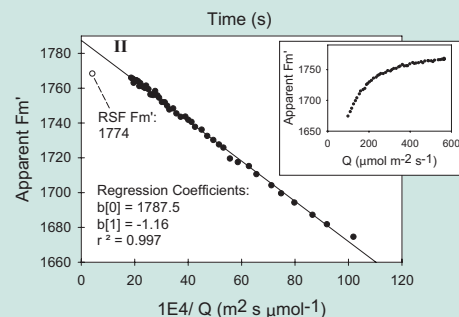


Figure 2. Linear regression of F_m' versus $10^4/Q$ obtained during Phase B in greenhouse-grown *P. sativum*. Inset shows fluorescence response to Q during the ramp. RSF F_m' is value of F_m' using Rectangular Single Flash method. At infinite flash intensity $b(0)$, $F_m' = 1787.5$.

Comm Port Input



OPEN V6 allows data from the Comm Port (RS-232) to be input as remarks or constants when prompted in New Measurements mode. This allows for devices such as bar code readers to be used. Bar code scans can be entered into the data file as separate lines (e.g. remarks) or columns (e.g. prompts); this is useful when making large scale measurements of bar-coded plant materials, as in greenhouse applications.

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OPEN 6.0
Tue Jul 30 2007 09:49:28
Unit= PSC-1529
ComputeList= /User/Configs/Comps/Default
BLCTable= /Sys/Lib/StdBLCTable
LightSource= 6400-02B 1 0.25
LogFormat= /User/Configs/LogFormats/Std Output survey
LogCodes= /User/Configs/Prompts/survey
Stability= (CO2S 15s SLP<1)(H2OS 15s SLP<1)(Flow 15s SLP<1)
9:49:30
$STARTOFDATAS
Obs HHMMSS FTime Remarks Photo Cond Ci
1 9:55:41 375 Pot1 Row1 7.98 0.0474 111
2 9:59:43 617 Pot2 Row1 7.68 0.0449 107
3 10:02:07 761 Pot3 Row1 8.06 0.0397 55.9
4 10:03:50 864 Pot4 Row1 8.24 0.0372 25.7
5 10:06:41 1035 Pot5 Row1 8.09 0.0768 210
6 10:08:56 1695 Pot6 Row1 6.73 0.0291 13
7 10:11:49 1343 Pot1 Row2 7.5 0.0316 1.63
8 10:15:10 1544 Pot2 Row2 7.06 0.0361 67.7
    
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Ordering Information

6400-926 Digital Board and Software Upgrade: Includes digital board, instrument case "shell", Compact Flash card, Ethernet adapter, software, documentation, and installation instructions.

6400-40DBX Leaf Chamber Fluorometer/Digital Board/Software Package: Special pricing package includes the 6400-40 Leaf Chamber Fluorometer and 6400-926 Digital Board and Software Upgrade. Also includes spare parts kit, documentation, and installation instructions.

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Biosciences

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