FWT-200 OPTI-CHROMIC READER SYSTEM

User's Manual

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HARDWARE SETUP

Install the ADC board in an IBM PC/XT/AT compatible computer according to the computer's installation procedures. NOTE: If you use other expansion boards in the computer you may need to map the ADC board to a different address. This is done by setting the DIP switches on the board as listed in Table 1. If the address is changed the configuration file FWT200.CFG should be updated to indicate this change.

With the computer turned off connect the cable to the computer and the head. The computer powers the head.

SOFTWARE SETUP

The OptiChromic Reader program is called FWT200.EXE. To run the program this file should be in the current DOS directory. The configuration file FWT200.CFG and the calibration file FWT200.CAL should also be in this directory.

Configuration file: The configuration file is an ASCII text file with the following elements:

port batch class starting_id wavelength precision use_def_bkg measure_post

where

port: ADC port address, expressed in hexadecimal notation (this may be overridden by specifying the port address on the command line).

batch: default batch of the dosimeters being read. This may be any sequence of printable characters (spaces excluded), up to ten characters long.

class: class of dosimeter (e.g. FWT-70-40M). Up to ten printable characters.

starting_id: the identification of the first dosimeter. Successive new dosimeters have their ID incremented, odometer style, for all alpha-numeric characters.

wavelength: A number indicating which wavelength to use for readings. Acceptable values are 0, 1 and 2 indicating the following: 0 for 600 nm wavelength; 1 for 656 nm; 2 for both wavelengths.

use_def_bkg: Non-zero if the default bkg should be assigned to the dosimeters.

measure_post: Non-zero if the post-irradiation optical density is to be measured.

NOTE: Entries must be separated by at least one space. Alphanumeric strings may not contain a space. The entries may be on several lines.

Table 1 - FWT-300 Computer ADC Card Base Address Selection
NOTE: Addresses 000 to 0FF hex used by internal I/O

Address		DIP Switch Settings						
Dec	Hex	9	8	7	6	5	4	3
256	100	on	on	on	on	on	off	on
264	108	off	on	on	on	on	off	on
272	110	on	off	on	on	on	off	on
280	118	off	off	on	on	on	off	on
288	120	on	on	off	on	on	off	on
296	128	off	on	off	on	on	off	on
304	130	on	off	off	on	on	off	on
312	138	off	off	off	on	on	off	on
320	140	on	on	on	off	on	off	on
328	148	off	on	on	off	on	off	on
336	150	on	off	on	off	on	off	on
344	158	off	off	on	off	on	off	on
352	160	on	on	off	off	on	off	on
360	168	off	on	off	off	on	off	on
368	170	on	off	off	off	on	off	on
376	178	off	off	off	off	on	off	on
384	180	on	on	on	on	off	off	on
392	188	off	on	on	on	off	off	on
400	190	on	off	on	on	off	off	on
408	198	off	off	on	on	off	off	on
416	1A0	on	on	off	on	off	off	on
424	1A8	off	on	off	on	off	off	on
432	1B0	on	off	off	on	off	off	on
440	1B8	off	off	off	on	off	off	on
448	1C0	on	on	on	off	off	off	on
456	1C8	off	on	on	off	off	off	on
464	1D0	on	off	on	off	off	off	on
472	1D8	off	off	on	off	off	off	on
480	1E0	on	on	off	off	off	off	on
488	1E8	off	on	off	off	off	off	on
496	1F0	on	off	off	off	off	off	on
504	1F8	off	off	off	off	off	off	on
512	200	Do not use - Reserved for system						
520	208	Do not use - Reserved for system						
528	210	on	off	on	on	on	on	off
536	218	off	off	on	on	on	on	off
544	220	on	on	off	on	on	on	off
552	228	off	on	off	on	on	on	off
560	230	on	off	off	on	on	on	off
568	238	off	off	off	on	on	on	off
576	240	on	on	on	off	on	on	off
584	248	off	on	on	off	on	on	off
592	250	on	off	on	off	on	on	off
600	258	off	off	on	off	on	on	off
608	260	on	on	off	off	on	on	off
616	268	off	on	off	off	on	on	off
624	270	on	off	off	off	on	on	off

Address		DIP Switch Settings						
Dec	Hex	9	8	7	6	5	4	3
632	278	Do not use - Reserved for system						
640	280	on	on	on	on	off	on	off
648	288	off	on	on	on	off	on	off
656	290	on	off	on	on	off	on	off
664	298	off	off	on	on	off	on	off
672	2A0	on	on	off	on	off	on	off
680	2A8	off	on	off	on	off	on	off
688	2B0	on	off	off	on	off	on	off
696	2B8	off	off	off	on	off	on	off
704	2C0	on	on	on	off	off	on	off
712	2C8	off	on	on	off	off	on	off
720	2D0	on	off	on	off	off	on	off
728	2D8	off	off	on	off	off	on	off
736	2E0	on	on	off	off	off	on	off
744	2E8	off	on	off	off	off	on	off
752	2F0	on	off	off	off	off	on	off
760	2F8	Do not use - Reserved for system						
768	300	on	on	on	on	on	off	off
776	308	off	on	on	on	on	off	off
784	310	on	off	on	on	on	off	off
792	318	off	off	on	on	on	off	off
800	320	Do not use - Reserved for system						
808	328	Do not use - Reserved for system						
816	330	on	off	off	on	on	off	off
824	338	off	off	off	on	on	off	off
832	340	on	on	on	off	on	off	off
840	348	off	on	on	off	on	off	off
848	350	on	off	on	off	on	off	off
856	358	off	off	on	off	on	off	off
864	360	on	on	off	off	on	off	off
872	368	off	on	off	off	on	off	off
880	370	on	off	off	off	on	off	off
888	378	Do not use - Reserved for system						
896	380	on	on	on	on	off	off	off
904	388	off	on	on	on	off	off	off
912	390	on	off	on	on	off	off	off
920	398	off	off	on	on	off	off	off
928	3A0	on	on	off	on	off	off	off
936	3A8	off	on	off	on	off	off	off
944	3B0	Do not use - Reserved for system						
952	3B8	Do not use - Reserved for system						
960	3C0	on	on	on	off	off	off	off
968	3C8	off	on	on	off	off	off	off
976	3D0	on	off	on	off	off	off	off
984	3D8	off	off	on	off	off	off	off
992	3E0	on	on	off	off	off	off	off
1000	3E8	Do not use - Reserved for system						
1008	3F0	Do not use - Reserved for system						
1016	3F8	Do not use - Reserved for system						

Calibration File

The calibration file FWT200.CAL contains the information for converting optical density to dose using one of the supplied formulas. Each line of this file contains the following information, in the order indicated:

CID batch wl bkg min max eqn p0 p1 p2 p3 p4 p5

CID: Calibration identification (up to ten printable characters, excluding spaces).
batch: Batch to which this calibration applies.
wl: Wavelength to which this calibration applies. Values are: 0 for 600 nm; 1 for 656 nm; 2 for both wavelengths.
bkg: Default background of this batch.
min: Minimum specific optical density to which this calibration applies.
max: Maximum specific optical density to which this calibration applies.
eqn: Type of equation the calibration uses. This is a single character. See Table 2 for a list of the equation types.
p0...p5: Parameter list for the calibration curve. Table 2 gives the meaning of these parameters for each type of curve.

NOTE: All six parameters must be specified even if the equation requires fewer parameters.

Table 2 - Equations supported by the FWT200 program.

Equation type	Single character	Algebraic Representation
Power Series	L	$p0 * SOD^{p1}$ NOTE: the parameters are typically determined from a linear regression of log(SOD) vs. log(dose)
Polynomial	P	$p0 + p1 * SOD + p2 * SOD^2 + ... + p5 * SOD^5$
Exponential	E	p0 * exp(p1 * SOD)
Interpolation(Linear)	I	$p1 + \frac{SOD - p0}{p2 - p0}(p3-p1)$, where (p0, p1) = first (SOD, dose) pair, and (p2, p3) = second (SOD, dose) pair
3-point Lagrangian Interpolation	3	$\frac{(SOD-p2)(SOD-p4)\,p1}{(p0-p2)(p0-p4)} + \frac{(SOD-p0)(SOD-p4)\,p3}{(p2-p0)(p2-p4)} + \frac{(SOD-p0)(SOD-p2)\,p5}{(p4-p0)(p4-p2)}$ where (p0, p1), (p2, p3) and (p4, p5) are three (SOD, dose) pairs

In these equations, SOD refers to the specific optical density of the detector. p0...p5 refer to parameters of the equation as they are to be specified in the calibration file FWT200.CAL.

SOFTWARE

The software is menu driven with some options having hot-keys. The options are listed below, grouped by the main menu category. Options are typically chosen by pressing the highlighted letter of that option or by moving the selection bar to the option and pressing the ENTER key.

FILE Menu

Load - Loads a previously saved file. After loading a file you are queried about the status of the file, such as what type of readings to take.

Save - Saves a file to disk.

Print - Prints the data to a file or the printer. The default file is PRN which will send the data to the printer.

OS Shell - Shells from the program to DOS while keeping the program and data loaded.

Quit - Exit the program.

OPTIONS Menu

Neutral Density Filter Check - This option guides you through an optical density check using the FWT-160 standard neutral density filter set. The results of this check are appended to the file FILTERS.LOG.

Readings - Lets you choose the type of readings to be done. They are :

Normal Background - For reading background on a set of routine dosimeters.

Normal Final - For reading the post-irradiation optical density of the OptiChromics. Choosing this option will also open a window requesting whether the background should be assigned a default value. If a calibration exists for the dosimeter then the dose will be calculated for the detector.

Calibration Background - Takes background readings for a calibration set.

Calibration Final - Takes the post-irradiation optical density for a calibration set. The dose must be entered into the computer.

SETUP Menu

Zero reader - Performs zeroing of both wavelengths. This option should be chosen only when the dosimeter well is empty and the lid is closed. Zeroing should be done when the optical density of either wavelength is frequently reading +/- 0.002 or greater. The ‘z’ key is a hot-key for this option.

Wavelength - This option lets you choose which wavelength (or both) to display.

EDIT Menu

Opens up an editing window for the current dosimeter (the entry tagged on the left side of the screen by an inverse video '>'). See Table 3 for a list of commands used in editing.

Other Hot Keys

ENTER - The ENTER key is used to accept a dosimeter's reading and to advance to the next dosimeter. If a next dosimeter has not been defined the program will define one which has the same batch name and the next sequential identity name. The alpha/numeric characters in the identity are incremented odometer style, with the letter 'z' advancing to an 'a' and a '9' advancing to a '0'. Other characters are left alone. Thus 'AZ-9.z' would become 'BA- 0.a'.

0 - The number '0' may be used to turn the filter wheel motor off. This may be used when the reader is inactive for an extended period of time but you do not wish to exit from the program. Any key will resume readings.

NOTE: The software automatically shuts the motor off after about 20 seconds of inactivity. Simply press the enter key to start to motor back up.

NOTE: The software was developed using Turbo-C ver. 2.0 by Borland International and CXL: The C Extended Function Library ver. 5.1 by Mike Smedley. The CXL files with the software are distributed as "Shareware" and are included for the purpose of adding documentation to the source code's windowing routines.

Table 3 - Input field Editing Keys

KEY	ACTION
Left Arrow	cursor left
Right Arrow	cursor right
Up Arrow	cursor up
Down Arrow	cursor down
<Ctrl> Left Arrow	word left
<Ctrl> Right Arrow	word right
Tab	field right
Shift Tab	field left
Home	beginning of field
End	end of field
<Ctrl> Home	beginning of first field
<Ctrl> End	end of last field
Ins	Toggle field insert mode
Esc	abort data entry

ROUTINE DOSE MEASUREMENTS

For routine dose measurements the following steps will normally be taken.

1. Make sure the reader head is connected to the computer and that the computer is turned on. Switch to the directory which contains the FWT200 program and related files. On the DOS command line type FWT200 and hit the carriage return. Include any options on the DOS command line, if appropriate. For example, FWT200 -x308 -iA1 -p will run the program using port 308 (hexadecimal) as the ADC base address and A1 as the first dosimeter's ID. Readings will be assigned to the post exposure optical density. The screen will blank for a few seconds while the program does some initialization routines.

2. If the dosimeters had their background optical densities read and stored, the data file may be loaded by specifying the File Load option. Simply press F and then L on the keyboard. Use the cursor keys to highlight the appropriate file and press ENTER to select it.

3. If desired, specify the wavelength by choosing the Setup Wavelength option.

4. Make sure the reader is zeroed. Close the dosimeter well lid, being sure the light path is clear. The optical density should consistently read around .000 (+ or - .001 is acceptable). If the reader needs to be zeroed use the Setup Zero option or use one of the two hot-keys, F1 or Z. (NOTE: For ease of use, after the reader is zeroed with the lid closed, open the lid and note the optical density reading. During the course of measurements continually check that this number has not changed significantly. If it has changed, close the lid and zero the reader.

5. Look at the screen and check the batch and identification of the current dosimeter, indicated by a '>' in inverse video. If the information is not correct, either edit the information or scroll to the appropriate dosimeter.

6. Place the dosimeter in the reader head and close the lid. When the optical density has stabilized, hit the ENTER key to accept the reading. The dosimeter may be removed any time after the ENTER key has been pressed.

7. Repeat steps 5 and 6 for each dosimeter, periodically checking the zero.

8. When all dosimeters have been read the data may be stored on disk and/or printed out. Both of these options are in the File menu.

9. To terminate the reading session, exit the program using the File Quit option or using the ALT-X hot-key.