Turner® Quantech™ Digital Filter Fluorometer

Operation Manual

Model #	Description	Voltage	Series
FM109515	Base Model, Wavelength Range 340 - 650 nm	120 Volts	1095
FM109514	Base Model, Wavelength Range 340 - 650 nm	100 Volts	1095
FM109510-33	Base Model, Wavelength Range 340 - 650 nm	230 Volts	1095
FM109525	IR Model, Wavelength Range 340 - 870 nm	120 Volts	1095
FM109524	IR Model, Wavelength Range 340 - 870 nm	100 Volts	1095
FM109520-33	IR Model, Wavelength Range 340 - 870 nm	230 Volts	1095
FM109535	Wide Band Model, Wavelength Range 254* - 870 nm	120 Volts	1095
FM109534	Wide Band Model, Wavelength Range 254* - 870 nm	100 Volts	1095
FM109530-33	Wide Band Model, Wavelength Range 254* - 870 nm	230 Volts	1095

* Wide band model contains a mercury line lamp that provides major emission lines at 254, 313, 360, 405, 436, 546 and 578 nm.

LT1095X1 • 5/18/99

Table of Contents

Introduction

Note
Please read this instruction manual carefully to ensure optimal operation of the unit.

The Turner Quantech Digital Filter Fluorometer is a highly sensitive, microprocessor-controlled instrument utilizing integrated circuit analog and digital signal processing. Excitation energy is provided by a quartz-halogen lamp and detection of the emission light is provided by a high gain, low noise photomultiplier tube. The operating wavelength range of the fluorometer depends on the model purchased. Excitation and emission wavelength selection is accomplished by filters.

Menu-driven software guides the user through setting up a multipoint (9 points maximum) standard curve for any given “Method.” Unit will store standard curve data (2 points to 9 points) for up to 9 “Methods.” Gain selection is performed automatically by the fluorometer software.

Note
The Turner Quantech Digital Filter Fluorometer is intended for research purposes only.

The Turner Quantech Digital Filter Fluorometer is designed to perform analytical quantitative fluorescence measurements on various fluorescent materials including chlorophyll, fluorescein, histamine, vitamins, rhodamine, DNA/RNA dye complexes and other fluorescent compounds.

The Turner Quantech Digital Filter Fluorometer will automatically set optimal sensitivity and range for your compounds/samples and display a readout of the actual concentration of an unknown sample.

Safety Information

Warning
Warnings alert you to a possibility of personal injury.

Caution
Cautions alert you to a possibility of damage to the equipment.

Note
Notes alert you to pertinent facts and conditions.

Your Turner Quantech Digital Filter Fluorometer has been designed with function, reliability and safety in mind. It is the user's responsibility to install it in conformance with local electrical codes. For safe operation, please observe the alert signals throughout this manual.

Intended Use

Do not use this product for anything other than its intended use.

Warnings

To avoid electrical shock, always:

1. Use a properly grounded electrical outlet of correct voltage and current handling capacity.

2. Disconnect from the power supply before maintenance and servicing.

To avoid personal injury:

1. Refer servicing to qualified personnel.

Unpacking

After the Turner Quantech Digital Filter Fluorometer is unpacked, inspect it for physical damage. Report any observed damage immediately to the Freight Carrier and your dealer.

Standard Equipment:

1 Turner Quantech Digital Filter Fluorometer

1 Power Cord

1 Excitation Filter (NB360, part no. LE1095X30)

1 Emission Filter (SC415, part no. LE1095X18)

1 Blocking Filter (Included with Wide Band models only; for use in blocking out one of two light sources.)

1 Operation Manual (part no. LT1095X1)

Installation

Note
The power entry module also houses the fuse drawer/holder. The fuse drawer/holder is located to the right of the main power switch when viewing the back panel of the unit. Two fuses are provided with the unit.

The Turner Quantech Digital Filter Fluorometer requires a properly wired and grounded electrical outlet of correct voltage and current handling capacity.

1. Position the instrument on a dry, vibration-free laboratory surface. Allow for at least 2” of open space behind the back of the unit for air circulation and the power cord.

2. Locate the power entry module on the back panel of the unit and connect the power cord. (Refer to Figure 1.)

3. Plug the power cord into the proper electrical outlet.

4. Refer to the **Operation** section of this manual before powering up the fluorometer.

Specifications

Part Number:	**FM109514 (Base Model)**
Configuration:	Filter Fluorometer (Filters sold separately)
Display:	2 x 24 LCD
Wavelength Range:	Excitation: 340 - 750 nm
Light Source:	Quartz Halogen Lamp 6V, 20W (Lamp life: 10,000 hours)
Emission:	300 - 650 nm
Detector:	931B PMT
Wavelength Accuracy:	1.5 - 10 nm (Depends on filters selected)
Bandwidth:	5 - 200 nm (Depends on filters selected)
Linearity:	1.00%
Sensitivity:	25 pg/mL dsDNA w/ PicoGreen Reagent, 30 ppt QSO4, 20 ppt FITC, 30 pg/uL ATP Luminescence
Concentration Range:	0.00 - 9999.99 (ppt, ppm, ppb, ug/dL, ug/mL, ng/mL, pg/mL, ng/uL)
Gain & Range Select:	Automatic, 6 Orders
Menu Driven Software:	Std. Curve Storage, 2 to 9 point Std. Curves, Store up to 9 Curves, Blank / Zero Set, Raw Fluorescence, Discrete Signal Averaging, Diagnostics Menus, Injector Option
Languages (Selectable):	English/Spanish/French/German
Data Output:	RS-232 Serial Interface for Printer or Computer (9 pin), Optional Analog (0 - 1 VDC)
Sample Holders:	12.5x12.5x45 mm sq.cuvettes (adj. z dim. 8.5 or 15 mm), 12 x 75 mm round, Capillary Tube Option, Flow Cell Option
Operating Temp. Range:	20° to 38°C
Power:	100 V, 50/60 Hz
Dimensions:	27 cm W X 38 cm D X 16 cm H
Product Approval:	CSA/NRTL/C
Optional Accessories:	Epson™ Printer
Weight:	5.9 kg

QSO4 = Quinine Sulfate & FITC = Fluorescein Isothiocyanate • PicoGreen is a trademark of Molecular Probes, Inc.

Part Number:	**FM109524 (IR Model)**
Configuration:	Filter Fluorometer (Filters sold separately)
Display:	2 x 24 LCD
Wavelength Range:	Excitation: 340 - 750 nm
Light Source:	Quartz Halogen Lamp 6V, 20W (Lamp life: 10,000 hours)
Emission:	185 - 870 nm
Detector:	931B PMT
Wavelength Accuracy:	1.5 - 10 nm (Depends on filters selected)
Bandwidth:	5 - 200 nm (Depends on filters selected)
Linearity:	1.00%
Sensitivity:	25 pg/mL dsDNA w/ PicoGreen Reagent, 30 ppt QSO4, 20 ppt FITC, 30 pg/uL ATP Luminescence
Concentration Range:	0.00 - 9999.99 (ppt, ppm, ppb, ug/dL, ug/mL, ng/mL, pg/mL, ng/uL)
Gain & Range Select:	Automatic, 6 Orders
Menu Driven Software:	Std. Curve Storage, 2 to 9 point Std. Curves, Store up to 9 Curves, Blank / Zero Set, Raw Fluorescence, Discrete Signal Averaging, Diagnostics Menus, Injector Option
Languages (Selectable):	English/Spanish/French/German
Data Output:	RS-232 Serial Interface for Printer or Computer (9 pin), Optional Analog (0 - 1 VDC)
Sample Holders:	12.5x12.5x45 mm sq.cuvettes (adj. z dim. 8.5 or 15 mm), 12 x 75 mm round, Capillary Tube Option, Flow Cell Option
Operating Temp. Range:	20° to 38°C
Power:	100 V, 50/60 Hz
Dimensions:	27 cm W X 38 cm D X 16 cm H
Product Approval:	CSA/NRTL/C
Optional Accessories:	Epson™ Printer
Weight:	5.9 kg

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SPECIFICATIONS

Part Number:	**FM109534 (Wide Band Model)**
Configuration:	Filter Fluorometer (Filters sold separately)
Display:	2 x 24 LCD
Wavelength Range:	Excitation: 254 - 750 nm
Light Source:	Quartz Halogen Lamp 6V, 20W (Lamp life: 10,000 hours)
Emission:	185 - 870 nm
Detector:	931B PMT
Wavelength Accuracy:	1.5 - 10 nm (Depends on filters selected)
Bandwidth:	5 - 200 nm (Depends on filters selected)
Linearity:	1.00%
Sensitivity:	25 pg/mL dsDNA w/ PicoGreen Reagent, 30 ppt QSO4, 20 ppt FITC, 30 pg/uL ATP Luminescence
Concentration Range:	0.00 - 9999.99 (ppt, ppm, ppb, ug/dL, ug/mL, ng/mL, pg/mL, ng/uL)
Gain & Range Select:	Automatic, 6 Orders
Menu Driven Software:	Std. Curve Storage, 2 to 9 point Std. Curves, Store up to 9 Curves, Blank / Zero Set, Raw Fluorescence, Discrete Signal Averaging, Diagnostics Menus, Injector Option
Languages (Selectable):	English/Spanish/French/German
Data Output:	RS-232 Serial Interface for Printer or Computer (9 pin), Optional Analog (0 - 1 VDC)
Sample Holders:	12.5x12.5x45 mm sq.cuvettes (adj. z dim. 8.5 or 15 mm), 12 x 75 mm round, Capillary Tube Option, Flow Cell Option
Operating Temp. Range:	20° to 38°C
Power:	100 V, 50/60 Hz
Dimensions:	27 cm W X 38 cm D X 16 cm H
Product Approval:	CSA/NRTL/C
Optional Accessories:	Epson™ Printer
Weight:	5.9 kg

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Part Number:	**FM109515 (Base Model)**
Configuration:	Filter Fluorometer (Filters sold separately)
Display:	2 x 24 LCD
Wavelength Range:	Excitation: 340 - 750 nm
Light Source:	Quartz Halogen Lamp 6V, 20W (Lamp life: 10,000 hours)
Emission:	300 - 650 nm
Detector:	931B PMT
Wavelength Accuracy:	1.5 - 10 nm (Depends on filters selected)
Bandwidth:	5 - 200 nm (Depends on filters selected)
Linearity:	1.00%
Sensitivity:	25 pg/mL dsDNA w/ PicoGreen Reagent, 30 ppt QSO4, 20 ppt FITC, 30 pg/uL ATP Luminescence
Concentration Range:	0.00 - 9999.99 (ppt, ppm, ppb, ug/dL, ug/mL, ng/mL, pg/mL, ng/uL)
Gain & Range Select:	Automatic, 6 Orders
Menu Driven Software:	Std. Curve Storage, 2 to 9 point Std. Curves, Store up to 9 Curves, Blank / Zero Set, Raw Fluorescence, Discrete Signal Averaging, Diagnostics Menus, Injector Option
Languages (Selectable):	English/Spanish/French/German
Data Output:	RS-232 Serial Interface for Printer or Computer (9 pin), Optional Analog (0 - 1 VDC)
Sample Holders:	12.5x12.5x45 mm sq.cuvettes (adj. z dim. 8.5 or 15 mm), 12 x 75 mm round, Capillary Tube Option, Flow Cell Option
Operating Temp. Range:	20° to 38°C
Power:	120 V, 50/60 Hz
Dimensions:	27 cm W X 38 cm D X 16 cm H
Product Approval:	CSA/NRTL/C
Optional Accessories:	Epson™ Printer
Weight:	5.9 kg

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Part Number:	**FM109525 (IR Model)**
Configuration:	Filter Fluorometer (Filters sold separately)
Display:	2 x 24 LCD
Wavelength Range:	Excitation: 340 - 750 nm
Light Source:	Quartz Halogen Lamp 6V, 20W (Lamp life: 10,000 hours)
Emission:	185 - 870 nm
Detector:	931B PMT
Wavelength Accuracy:	1.5 - 10 nm (Depends on filters selected)
Bandwidth:	5 - 200 nm (Depends on filters selected)
Linearity:	1.00%
Sensitivity:	25 pg/mL dsDNA w/ PicoGreen Reagent, 30 ppt QSO4, 20 ppt FITC, 30 pg/uL ATP Luminescence
Concentration Range:	0.00 - 9999.99 (ppt, ppm, ppb, ug/dL, ug/mL, ng/mL, pg/mL, ng/uL)
Gain & Range Select:	Automatic, 6 Orders
Menu Driven Software:	Std. Curve Storage, 2 to 9 point Std. Curves, Store up to 9 Curves, Blank / Zero Set, Raw Fluorescence, Discrete Signal Averaging, Diagnostics Menus, Injector Option
Languages (Selectable):	English/Spanish/French/German
Data Output:	RS-232 Serial Interface for Printer or Computer (9 pin), Optional Analog (0 - 1 VDC)
Sample Holders:	12.5x12.5x45 mm sq.cuvettes (adj. z dim. 8.5 or 15 mm), 12 x 75 mm round, Capillary Tube Option, Flow Cell Option
Operating Temp. Range:	20° to 38°C
Power:	120 V, 50/60 Hz
Dimensions:	27 cm W X 38 cm D X 16 cm H
Product Approval:	CSA/NRTL/C
Optional Accessories:	Epson™ Printer
Weight:	5.9 kg

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Part Number:	**FM109535 (Wide Band Model)**
Configuration:	Filter Fluorometer (Filters sold separately)
Display:	2 x 24 LCD
Wavelength Range:	Excitation: 254 - 750 nm
Light Source:	Quartz Halogen Lamp 6V, 20W (Lamp life: 10,000 hours)
Emission:	185 - 870 nm
Detector:	931B PMT
Wavelength Accuracy:	1.5 - 10 nm (Depends on filters selected)
Bandwidth:	5 - 200 nm (Depends on filters selected)
Linearity:	1.00%
Sensitivity:	25 pg/mL dsDNA w/ PicoGreen Reagent, 30 ppt QSO4, 20 ppt FITC, 30 pg/uL ATP Luminescence
Concentration Range:	0.00 - 9999.99 (ppt, ppm, ppb, ug/dL, ug/mL, ng/mL, pg/mL, ng/uL)
Gain & Range Select:	Automatic, 6 Orders
Menu Driven Software:	Std. Curve Storage, 2 to 9 point Std. Curves, Store up to 9 Curves, Blank / Zero Set, Raw Fluorescence, Discrete Signal Averaging, Diagnostics Menus, Injector Option
Languages (Selectable):	English/Spanish/French/German
Data Output:	RS-232 Serial Interface for Printer or Computer (9 pin), Optional Analog (0 - 1 VDC)
Sample Holders:	12.5x12.5x45 mm sq.cuvettes (adj. z dim. 8.5 or 15 mm), 12 x 75 mm round, Capillary Tube Option, Flow Cell Option
Operating Temp. Range:	20° to 38°C
Power:	120 V, 50/60 Hz
Dimensions:	27 cm W X 38 cm D X 16 cm H
Product Approval:	CSA/NRTL/C
Optional Accessories:	Epson™ Printer
Weight:	5.9 kg

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SPECIFICATIONS

Part Number:	**FM109510-33 (Base Model)**
Configuration:	Filter Fluorometer (Filters sold separately)
Display:	2 x 24 LCD
Wavelength Range:	Excitation: 340 - 750 nm
Light Source:	Quartz Halogen Lamp 6V, 20W (Lamp life: 10,000 hours)
Emission:	300 - 650 nm
Detector:	931B PMT
Wavelength Accuracy:	1.5 - 10 nm (Depends on filters selected)
Bandwidth:	5 - 200 nm (Depends on filters selected)
Linearity:	1.00%
Sensitivity:	25 pg/mL dsDNA w/ PicoGreen Reagent, 30 ppt QSO4, 20 ppt FITC, 30 pg/uL ATP Luminescence
Concentration Range:	0.00 - 9999.99 (ppt, ppm, ppb, ug/dL, ug/mL, ng/mL, pg/mL, ng/uL)
Gain & Range Select:	Automatic, 6 Orders
Menu Driven Software:	Std. Curve Storage, 2 to 9 point Std. Curves, Store up to 9 Curves, Blank / Zero Set, Raw Fluorescence, Discrete Signal Averaging, Diagnostics Menus, Injector Option
Languages (Selectable):	English/Spanish/French/German
Data Output:	RS-232 Serial Interface for Printer or Computer (9 pin), Optional Analog (0 - 1 VDC)
Sample Holders:	12.5x12.5x45 mm sq.cuvettes (adj. z dim. 8.5 or 15 mm), 12 x 75 mm round, Capillary Tube Option, Flow Cell Option
Operating Temp. Range:	20° to 38°C
Power:	230 V, 50/60 Hz
Dimensions:	27 cm W X 38 cm D X 16 cm H
Product Approval:	CSA/NRTL/C, CE
Optional Accessories:	Epson™ Printer
Weight:	5.9 kg

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Part Number:	**FM109520-33 (IR Model)**
Configuration:	Filter Fluorometer (Filters sold separately)
Display:	2 x 24 LCD
Wavelength Range:	Excitation: 340 - 750 nm
Light Source:	Quartz Halogen Lamp 6V, 20W (Lamp life: 10,000 hours)
Emission:	185 - 870 nm
Detector:	931B PMT
Wavelength Accuracy:	1.5 - 10 nm (Depends on filters selected)
Bandwidth:	5 - 200 nm (Depends on filters selected)
Linearity:	1.00%
Sensitivity:	25 pg/mL dsDNA w/ PicoGreen Reagent, 30 ppt QSO4, 20 ppt FITC, 30 pg/uL ATP Luminescence
Concentration Range:	0.00 - 9999.99 (ppt, ppm, ppb, ug/dL, ug/mL, ng/mL, pg/mL, ng/uL)
Gain & Range Select:	Automatic, 6 Orders
Menu Driven Software:	Std. Curve Storage, 2 to 9 point Std. Curves, Store up to 9 Curves, Blank / Zero Set, Raw Fluorescence, Discrete Signal Averaging, Diagnostics Menus, Injector Option
Languages (Selectable):	English/Spanish/French/German
Data Output:	RS-232 Serial Interface for Printer or Computer (9 pin), Optional Analog (0 - 1 VDC)
Sample Holders:	12.5x12.5x45 mm sq.cuvettes (adj. z dim. 8.5 or 15 mm), 12 x 75 mm round, Capillary Tube Option, Flow Cell Option
Operating Temp. Range:	20° to 38°C
Power:	230 V, 50/60 Hz
Dimensions:	27 cm W X 38 cm D X 16 cm H
Product Approval:	CSA/NRTL/C, CE
Optional Accessories:	Epson™ Printer
Weight:	5.9 kg

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Part Number:	**FM109530-33 (Wide Band Model)**
Configuration:	Filter Fluorometer (Filters sold separately)
Display:	2 x 24 LCD
Wavelength Range:	Excitation: 254 - 750 nm
Light Source:	Quartz Halogen Lamp 6V, 20W (Lamp life: 10,000 hours)
Emission:	185 - 870 nm
Detector:	931B PMT
Wavelength Accuracy:	1.5 - 10 nm (Depends on filters selected)
Bandwidth:	5 - 200 nm (Depends on filters selected)
Linearity:	1.00%
Sensitivity:	25 pg/mL dsDNA w/ PicoGreen Reagent, 30 ppt QSO4, 20 ppt FITC, 30 pg/uL ATP Luminescence
Concentration Range:	0.00 - 9999.99 (ppt, ppm, ppb, ug/dL, ug/mL, ng/mL, pg/mL, ng/uL)
Gain & Range Select:	Automatic, 6 Orders
Menu Driven Software:	Std. Curve Storage, 2 to 9 point Std. Curves, Store up to 9 Curves, Blank / Zero Set, Raw Fluorescence, Discrete Signal Averaging, Diagnostics Menus, Injector Option
Languages (Selectable):	English/Spanish/French/German
Data Output:	RS-232 Serial Interface for Printer or Computer (9 pin), Optional Analog (0 - 1 VDC)
Sample Holders:	12.5x12.5x45 mm sq.cuvettes (adj. z dim. 8.5 or 15 mm), 12 x 75 mm round, Capillary Tube Option, Flow Cell Option
Operating Temp. Range:	20° to 38°C
Power:	230 V, 50/60 Hz
Dimensions:	27 cm W X 38 cm D X 16 cm H
Product Approval:	CSA/NRTL/C, CE
Optional Accessories:	Epson™ Printer
Weight:	5.9 kg

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Environmental Conditions

Operating: 20°C to 38°C; 20% to 80% relative humidity, non-condensing. Installation category II (overvoltage) in accordance with IEC 664. Pollution degree in accordance with IEC 664.
Altitude Limit: 2,000 meters.

Storage: -25°C to 65°C
10% to 85% relative humidity

Declaration of Conformity

Barnstead/Thermolyne hereby declares under its sole responsibility that this product conforms with the technical requirements of the following standards (230 volt/ -33 models only):

EMC:	EN 61000-3-2	Limits for Harmonic Current Emissions
	EN 61000-3-3	Limits for Voltage Fluctuations and Flicker
	EN 61326	Electrical Equipment for Measurement, Control and Laboratory Use; Part I: General Requirements
Safety:	EN 61010-1	Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use, Part I: General Requirements

per the provisions of the Low Voltage Directive 73/23/EEC, as amended by 93/68/EEC.

The authorized representative located within the European Community is:

Electrothermal Engineering Ltd.
419 Sutton Road
Southend On Sea
Essex SS2 5PH
United Kingdom

Copies of the Declaration of Conformity are available upon request.

General Description

Note
The Spring clip in the cuvette holder is adjustable and can be pushed inward to accommodate 10 mm diameter tubes or outward to accommodate 16 mm diameter tubes. (Maximum tube height is 130 mm 13 cm).

Caution
Do not touch the curved mirror located in the cuvette holder.

Note
The z dimension of the sample chamber is 15 mm when the black cylinder is in the “normal” down position. When the black cylinder is in the up position, the sample chamber z dimension is 8.5 mm.

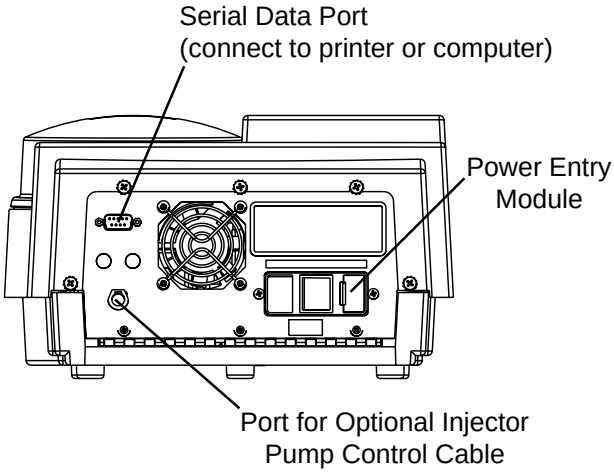


Figure 1: Back View

Components

Display: 2 x 24 character LCD display to indicate software menus and fluorescence values.

Power Switch: rocker switch located on back panel. (Refer to Figure 1.)

Sample Chamber and Cuvette Holder: the large sample chamber will accommodate nonstandard size cuvettes and up to four flow tubes. The standard cuvette holder supplied with the units accepts 12 x 75 mm round cuvettes and 12.5 x 12.5 x 45 mm square cuvettes. To insert the cuvette in the holder, open the chamber cover and carefully insert the cuvette by positioning it between the spring clip and the angular sides of the holder. Two flat, clear faces of a square cuvette should oppose the circular openings that form the light paths. Take care not to touch the curved mirror which is located next to the spring clip (refer to Figure 2).

To Accommodate Small Sample Volumes (2ml or less) in Standard Cuvettes: Remove the two Phillips head screws holding the cuvette holder in place, carefully lift the holder out of the sample chamber (avoid touching the curved mirror) and press up on the round, black cylinder located on the bottom of the holder. Carefully reinsert the cuvette holder into the sample chamber using the two mounting screws.

Filter Block and Filter Slides: The filter block lines the perimeter of the sample and serves as a holder for the Excitation and Emission filter slides. The Visible Range Excitation filter slide

is placed in the trapezoidal-shaped holder located on the back side of the sample chamber (refer to Figure 2). The Emission filter slide is placed in the trapezoidal-shaped holder located on the left side of the sample chamber (refer to Figure 2).

To Change the Filter Slide: Open the chamber cover and grip the top of the filter slide with your thumb and index finger so you can lift the slide up and out of the filter slide holder. When replacing a filter slide be sure that the circular filter is properly aligned with the light path opening in the bottom of the filter holder.

Keypad and Function Keys

(See Figure 3.)

UP ARROW (ON/YES) key: Allows operator to scroll through “Method” parameters in an incremental manner and select an option or select the “ON/YES” option in response to a question posed by the fluorometer software user interface.

Caution
Use finger pressure only when depressing keys on keypad; depressing keys with pens or other utensils may cause permanent damage to the keypad.

DOWN ARROW (OFF/NO) key: Allows operator to scroll through “Method” parameters in descending order and select an option or select the “OFF/NO” option in response to a question posed by the fluorometer software user interface.

LEFT ARROW key: Allows operator to scroll between “Menu,” “Method” and “Function” options and select an option, or scroll across the display.

RIGHT ARROW key: Allows operator to scroll between “Menu,” “Method” and “Function” options and select an option, or scroll across the display.

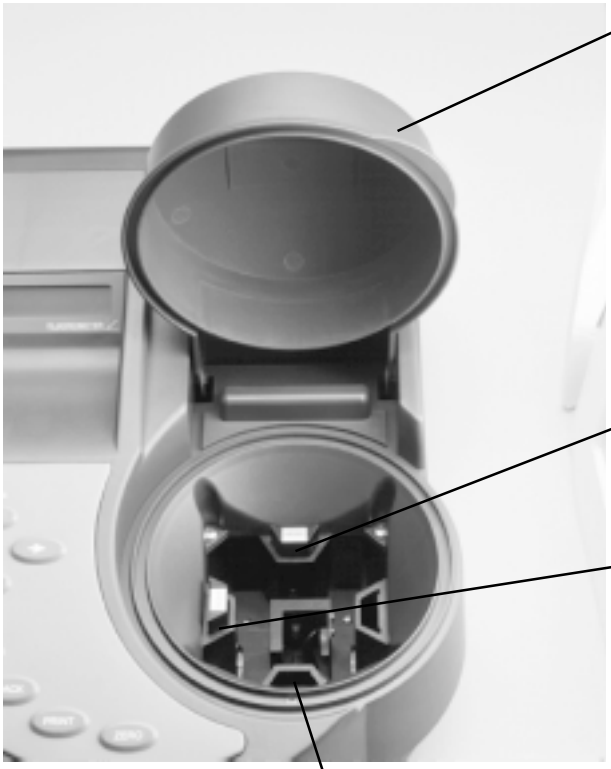
ENTER key: Allows operator to activate or proceed with a selected option visible on the display screen.

MENU key: Serves as a home key to allow operator to immediately return to the “Main Menu.”

BACK key: Allows operator to go back one step within a “Method,” “Menu” or “Function.”

PRINT key: Initiates the signal to send standard curve data, sample concentration data and method settings to a printer or computer.

ZERO KEY: Sets fluorescence value to zero when blank solution is in the cuvette holder.


Chamber Cover
Insert Visible Range Excitation Filter Here
An Excitation filter placed in this position filters the quartz-halogen light source in all Quantech fluorometer models.
Insert Emission Filter Here
The Emission filter passes desired fluorescence wavelengths to be detected by the photomultiplier tube (PMT).
Insert UV Range Excitation Filter Here
An Excitation filter placed in this holder filters the mercury line lamp (Light source) in the Wide Band model of the Quantech fluorometer.
Sample Chamber/Cuvette Holder
Spring Clip

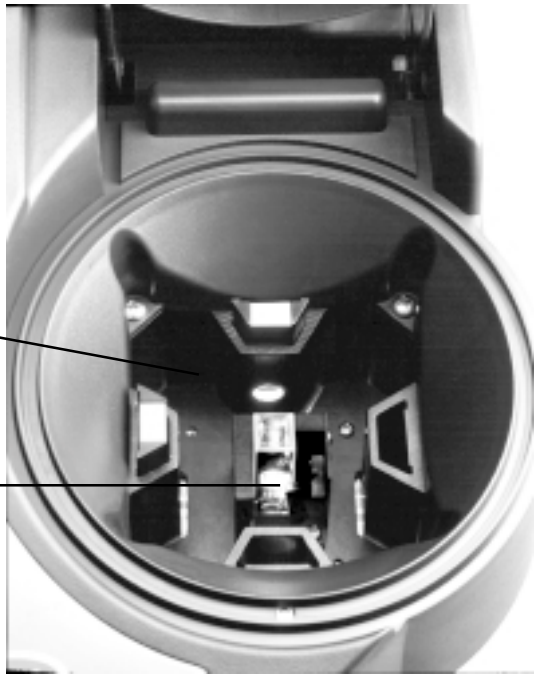


Figure 2

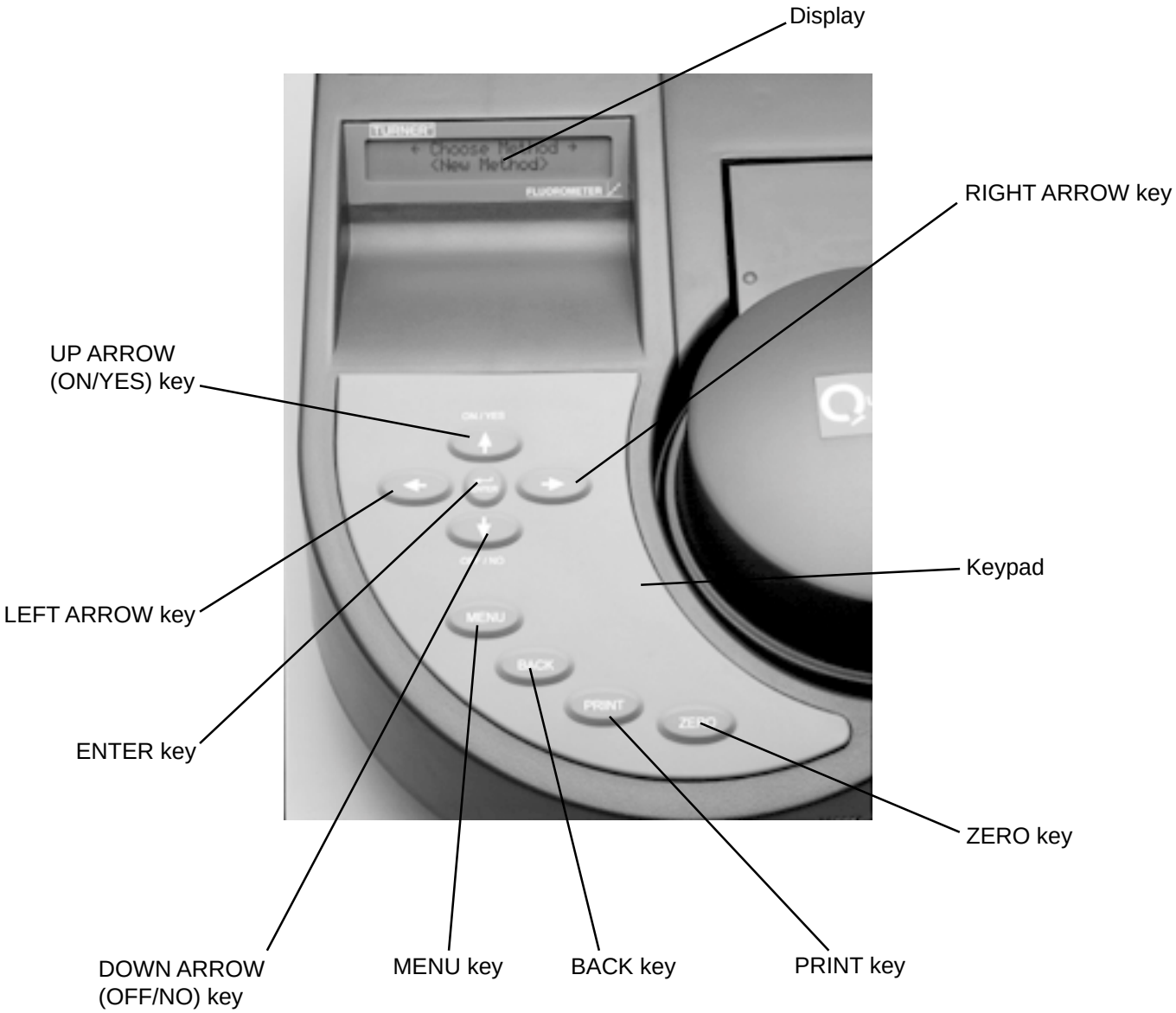

Display
RIGHT ARROW key
UP ARROW
(ON/YES) key
Keypad
LEFT ARROW key
ENTER key
ZERO key
DOWN ARROW
(OFF/NO) key
MENU key
BACK key
PRINT key

Figure 3

Operation

Note
The English language option is the default language. Operator may select Espanol, French or Deutsch.

Unit Power-Up

1. Turn main power switch located on back of unit ON.

2. Display reads, “Turner Quantech Fluorometer Manufactured by Barnstead/ Thermolyne Fluorometer, Software Version 1.00.03.”

3. Display proceeds to the Language selection option. The default language is “English.” To select another language (Espanol, French, Deutsch), press the LEFT or RIGHT ARROW key.

4. Press ENTER to continue operation of the fluorometer.

5. Display reads, “Unit Initializing, Please Wait;” “Auto-Calibrating (Please Wait);” “Unit Initializing, “15 Minutes Remain.”

6. The unit will perform a 15 minute warm-up countdown to ensure the stability of the fluorometer electronics. The count-down timer on the display allows you to monitor the time remaining before the warm-up period is complete.

Note
Before performing fluorescence analysis, please consult the **Appendix** of this manual for information on cuvettes, filter selection and the theory of fluorescence.

Performing Fluorescence Analysis

After the unit completes its warm-up, the display will rest at the “Main Menu”. At this point the user can perform “Advanced Functions” or choose a method of analysis.

The operation of the Base, IR and Wide Band models of the Quantech fluorometers are identical with the exception of the option to activate the UV lamp (mercury line lamp) for applications requiring excitation wavelengths below 340 nm.

Note
Please refer to the **Advanced Functions** section of this manual and the flowchart located in the **Appendix** for directions on how to operate and utilize these options.

Advanced Functions

Press the LEFT or RIGHT ARROW key to select the desired option:

- Date and Time
- View Stored Data
- Reset System to Default
- View Diagnostic Information
- Set Printer and Print Options
- UV Lamp Options
- Manually Set Gain and PMT Voltages
- Injector Pump Options.

Note
Manual settings will be overridden if you choose a stored curve.

Note
The Aflatoxin, DNA, Histamine and Rhodamine methods serve as memory location holders. New Quantech fluorometers do not include standard curves for these methods. These methods were chosen as memory location holders because they are common fluorescence methods.

Choosing a Method of Analysis

1. Starting from the “Main Menu,” press the ENTER key until display reads, “Choose Method.”

2. Press the LEFT or RIGHT ARROW key to choose from the following methods:

   - Aflatoxin
   - DNA
   - Histamine
   - Rhodamine
   - New Program
   - Raw Fluorescence

3. Select the desired method and press ENTER.

Note
Pressing the MENU key will return you to the “Main Menu” home setting. Pressing the BACK key will allow you to go back one step.

Note

If your method of fluorescence analysis requires the mercury line lamp as a light source (Wide Band model only) activate the UV lamp in the “Advanced Functions” (UV Lamp Options) before proceeding with your method of analysis. Remember to place the blocking filter included with the Quantech Wide Band model in the Visible Range Excitation Filter holder (see Figure 1).

To use your Wide Band model over 340 nm, place the blocking filter in the UV Range Excitation filter holder and deactivate the UV lamp in “Advanced Functions.”

Note

Changing a program name will automatically delete the data from the previous method.

Follow the proceeding steps according to the method selected.

Aflatoxin, DNA, Rhodamine and Histamine Methods

Refer to the flowchart in the **Appendix** for further information.

After choosing either the Aflatoxin, DNA, Rhodamine or Histamine method, proceed with the following steps:

1. Display reads, “Change Name? (Y/N?).”

    a. Press ENTER to select “No.” (System will automatically default to “No.”) Proceed to step 2.

    b. If you wish to change the “Method” name, press the UP ARROW key to select the “Yes” option and press ENTER. See the **New Method** section for instructions on how to change the method name.

2. Display reads, “Proper Filters in Unit?” “Yes.” (System defaults to “Yes.”)

    a. If you are satisfied with the filters that you have in the unit for your method of choice, press the ENTER to select “Yes” and proceed to step 3.

    b. If you need help choosing the correct Excitation and Emission filter slides for your method, press the DOWN ARROW key to select the “No” option and press ENTER. Display will first indicate a method option. To scroll between the methods for which selection information

Note
The Turner Quantech Digital Filter Fluorometer will store your standard curve data in memory permanently. Memory capacity will allow a total of 9 methods with 9 points.

Note
New fluorometers do not contain stored standard curve data for any methods.

Note
The blank solution should not be included as a point in the standard curve.

Note
Remember to input the correct value and units for the standard with the **maximum** concentration first. For any given standard curve, only one unit of measure can be used and is set when the unit of measure for the first standard is entered.

Note
<FIU> indicates a generic unit of measure or fluorescence Intensity units.

is available, press the LEFT and RIGHT ARROW keys. When the display indicates the desired method option, press the UP ARROW key to obtain a recommendation for the "Primary Excitation Filter" and then press the DOWN ARROW key to obtain a recommendation for the "Secondary Emission Filter." To return to setting up your method, press ENTER.

3. Display reads, "Std Curve from Memory (Y/N?); No." (System will automatically default to "No.")

   a. If no, press ENTER and proceed to step 4.

   b. If yes, press the UP ARROW to select "Yes" and press ENTER. Proceed to step 8.

4. Display reads, "Enter Number of Points;" "2." The default setting for the number of points in a standard curve is 2. Enter a value for the number of standards of known concentration that you will be working with by pressing the UP and DOWN ARROW keys to scroll between numbers in positive and negative increments, respectively. Press ENTER.

5. Display reads, "Enter Concentration;" "0000.000 <FIU>." Press LEFT or RIGHT ARROW key to scroll horizontally across the display and select a character. Each "0" represents a numerical character field that can be

changed. The <FIU> field can also be changed when the “>” is highlighted. In order to select a concentration value and unit of measure, press the UP and DOWN ARROW keys to scroll between numbers and concentration units (ppm, ppb, ppt, µg/ml, µg/dl, ng/ml, pg/ml or ng/µl). When the display reflects the correct numerical value and units for the first standard (known sample), Press ENTER.

Note
After known sample #1, the maximum concentration is measured, the remaining known samples can be inserted in any order to complete the standard curve for your method. It is recommended to insert known samples in decreasing order of concentration.

6. Display reads, “Insert Known Sample #1.” Open the chamber cover, insert sample and close cover. Press ENTER. Display then reads, “Auto Gain Setting;” Please Wait” and runs through consecutive gain settings before showing, “Taking Reading.”

   Next the display reads, “Enter Concentration;” “0000.00 <FIU>.” Select a new concentration value and press ENTER. Display reads, “Insert Known Sample 2.” Open the chamber cover, insert known sample #2 and close the cover. Press ENTER. Display will read, “Taking Reading.” Repeat these steps for each known sample in the standard curve.

Note
IMPORTANT: Pressing BACK after the unit has taken a reading for a known sample in the standard curve will take you back to “Enter Number of Points; “2” and you will need to repeat the process of measuring known samples from #1 on. The BACK key can be used when a correction to a concentration value is needed provided that ENTER has not been pressed.

7. Display reads, “Insert Blank.” Open chamber cover and insert cuvette with blank solution in the cuvette holder. Close chamber cover and press ZERO. The display will read, “Taking Reading” and then show the “Coefficient of Determination;” “1.00” (example value). Proceed to step 8.

Note

If you are using a standard curve from the memory of the Quantech unit, the display will first indicate the age of the standard curve data and the coefficient of determination for the curve. The display will then read, “Insert Unknown Sample.”

Note

The standard curve data that you have just obtained can be utilized for future analyses. However, please note that it is good laboratory practice to perform new standard curves at least once a week. The Quantech fluorometer will keep track of the age of your standard curve data. After 5 days the unit will indicate that the curve should be considered marginal by prompting you on whether or not (YES or NO) to use the data before proceeding with analysis.

Note

The blank for a stored standard curve may be reset to zero. When resetting the blank to zero using the ZERO key, you are replacing the last blank setting with the new blank setting. This reset procedure will not compensate for errors in sample readings due to instrument drift. For maximum accuracy it is best to redo your curve.

If an unacceptable coefficient (<0.75) is obtained, the unit will display the value and indicate “Curve Unacceptable;” Press Enter.” After you press ENTER, the display will indicate “Enter Number of Points;” “2.” Please check the concentrations of your standard samples before repeating the steps of the standard curve procedure.

8. If an acceptable “Coefficient of Determination” is obtained, the display will read “Insert Unknown Sample.” After inserting the cuvette containing the unknown sample into the cuvette holder and closing the chamber cover press ENTER. The display will read, “Taking Reading” and the concentration value of the unknown sample is displayed. The standard curve data for your method is now stored in memory. A concentration reading of the first unknown sample is required to store the standard curve data.

To continue fluorescence analysis of unknown samples, remove the previous sample for which the concentration value was determined and insert the next unknown sample. After closing the chamber cover, press ENTER to obtain the concentration value of the sample. Repeat these steps for all unknown samples.

If the concentration of an unknown sample does not fall within the range of your standard curve, the unit will display an “errant value” or indicate “range error.” A new standard curve will need to be set up in order to correctly analyze an over or under range sample. Alternatively, the unknown sample can be diluted by a given factor and the dilute sample analyzed.

Note
New Method offers the option to customize the methods that are stored in the Quantech Fluorometer.

Note
If you select a character in error, you can backspace or delete the character by pressing the DOWN ARROW key. After deleting a character, select a new character by pressing the LEFT or RIGHT ARROW key.

New Method

1. Display reads, “New Method (Y/N?); No.” (System will automatically default to “No.”) and provides an alphabetical/character listing. Alternatively, the display will read “New Program” and provide the same options as “New Method.”

2. To change the method name, press the LEFT and RIGHT ARROW keys to select a letter or character from the alphabetical/character listing on the display. Each time an ARROW key is manually depressed, the display cursor will advance or step back one character. After selecting a character (cursor highlights the character), press the UP ARROW key. The letter you have selected will appear at the top of the display window. Continue selecting letters in this manner until you have entered the desired program name, then press ENTER.

3. Display reads, “Proper Filters in Unit?”; “Yes” (System defaults to “Yes.”)

    a. If you are satisfied with the filters that you have in the unit for your method of choice, press ENTER to select “Yes” and proceed to step 3.

    b. If you need help choosing the correct Excitation and Emission filter slides for your method, press the DOWN ARROW key to select “No” and press

ENTER. Display will first indicate a method option. To scroll between the methods for which selection information is available, press the LEFT and RIGHT ARROW keys. When the display indicates the desired method option, press the UP ARROW key to obtain a recommendation for the "Primary Excitation Filter" and then press the DOWN ARROW key to obtain a recommendation for the "Secondary Emission Filter." To return to setting up your method, press ENTER.

4. Display reads, "Std Curve from Memory (Y/N?); No." (System will automatically default to "No.")

   a. If no, press ENTER and proceed to step 5.

   b. If yes, press the UP ARROW to select "Yes" and press ENTER. Proceed to step 9.

5. Display reads, "Enter Number of Points;" "2." The default setting for the number of points in a standard curve is 2. Enter a value for the number of standards of known concentration that you will be working with by pressing the UP and DOWN ARROW keys to scroll between numbers in positive and negative increments, respectively. Press ENTER.

6. Display reads, "Enter Concentration;" "0000.000 <FIU>." Press the LEFT or RIGHT ARROW key to scroll horizontally across the display and select a character that is to be changed. Each "0" represents

Note
The Turner Quantech Digital Filter Fluorometer will store your standard curve data in memory permanently. Memory capacity will allow a total of 9 methods with 9 points.

Note
New fluorometers do not contain stored standard curve data for any methods.

Note
The blank solution should not be included as a point in the standard curve.

Note
Remember to input the correct value and units for the standard with the **maximum** concentration first. For any given standard curve, only one unit of measure can be used and is set when the unit of measure for the first standard is entered. <FIU> indicates a generic unit of measure or Fluorescence Intensity Units.

Note
Remember to input the correct value and units for the standard with the maximum concentration first. For any given standard curve, only one unit of measure can be used and is set when the unit of measure for the first standard is entered.

Note
After known sample #1, the maximum concentration is measured, the remaining known samples can be inserted in any order to complete the standard curve for your method. It is recommended to insert known samples in decreasing order of concentration.

Note
IMPORTANT: Pressing BACK after the unit has taken a reading for a known sample in the standard curve will take you back to “Enter Number of Points; “2” and you will need to repeat the process of measuring known samples from #1 on. The BACK key can be used when a correction to a concentration value is needed provided that ENTER has not been pressed.

a numerical character field that can be changed. The <FIU> field can also be changed when the “>” is highlighted. In order to select a concentration value and unit of measure, press the UP and DOWN ARROW key to scroll between numbers and concentration units (ppm, ppb, ppt, µg/dl, µg/ml, ng/ml, pg/ml or ng/µl). When the display reflects the correct numerical value and units for the first standard (known sample), Press ENTER.

7. Display reads, “Insert Known Sample #1.” Open the chamber cover, insert sample and close cover. Press ENTER. Display then reads, “Auto Gain Setting;” “Please Wait” and runs through consecutive gain settings before showing “Taking Reading.”

   Next the display reads, “Enter Concentration;” “0000.00 <FIU>.” Select a new concentration value and press ENTER. Display reads, “Insert Known Sample 2.” Open the chamber cover, insert known sample #2, and close the cover. Press ENTER. Display will read, “Taking Reading.” Repeat these steps for each known sample in the standard curve.

8. Display reads, “Insert Blank.” Open chamber cover and insert cuvette with blank solution in the cuvette holder. Close chamber cover and press ZERO. The display will indicate “Taking Reading” and then show the “Coefficient of Determination;” “1.00” (example value). Proceed to step 9.

Note

If you are using a standard curve from the memory of the Quantech unit, the display will indicate the age of the standard curve data and the coefficient of determination for the curve. The display will then read, “Insert Unknown Sample.”

Note

The standard curve data that you have just obtained can be utilized for future analyses. However, please note that it is good laboratory practice to perform new standard curves at least once a week.

Note

The blank for a stored standard curve may be reset to zero. When resetting the blank to zero using the ZERO key, you are replacing the last blank setting with the new blank setting. This reset procedure will not compensate for errors in sample readings due to instrument drift. For maximum accuracy it is best to redo your curve.

If an unacceptable coefficient (<0.75) is obtained, the unit will display the value and indicate “Curve Unacceptable;” “Press Enter.” After you press ENTER, the display will indicate “Enter Number of Points;” “2.” Please check the concentrations of your standard samples before repeating the steps of the standard curve procedure.

9. If an acceptable “Coefficient of Determination” is obtained, the display will read “Insert Unknown Sample.” After inserting the cuvette containing the unknown sample into the cuvette holder and closing the cover press ENTER. The display will read, “Taking Reading” and the concentration value of the unknown sample will be displayed. The standard curve data for your method is now stored in memory. A concentration reading of the first unknown sample is required to store the standard curve data.

   To continue fluorescence analysis of unknown samples, remove the previous sample for which the concentration value was determined and insert the next unknown sample. After closing the chamber cover, press ENTER to obtain the concentration value of the sample. Repeat these steps for all unknown samples.

   If the concentration of an unknown sample does not fall within the range of your standard curve, the unit will display an “errant value” or indicate “range error.” A new standard curve will need to be set up in order to correctly analyze an over or under range sample. Alternatively, the unknown sample can be diluted by a given factor and the diluted sample analyzed.

Note
<FIU> indicates a generic unit of measure or Fluorescence Intensity Units.

Note
Raw Fluorescence (Mode I) is designed for applications that do not require 2 - 9 point standard curves. This mode essentially provides a 1 point standard curve in reference to zero concentration of a compound. This 1 point is only stored in memory for the duration of your raw fluorescence analysis.

Note
A reference sample is generally of the highest concentration you would expect to analyze for the compound of interest. An arbitrary numerical value is usually assigned as the concentration of this reference sample (e.g. 1000.000 <FIU> or 1000.000 ppb.

Raw Fluorescence (Mode I)

1. Display reads, “Enter Concentration;” “000.000 <FIU>.” Press the LEFT or Right ARROW key to scroll horizontally across the display and select a character field that is to be changed. Each “0” represents a numerical character field that can be changed. The <FIU> field can also be changed when the “>” is highlighted. In order to select a concentration value and unit of measure for your reference sample, press the UP or DOWN ARROW key to scroll between numbers and concentration units (ppm, ppb, ppt, µg/ml, µg/dl, ng/ml, pg/ml, or ng/µl). When the display reflects the correct value and units for the reference sample, press ENTER.

2. Display reads, “Insert Known Sample;” Open the chamber cover, insert reference sample and close the cover. Press ENTER. Display then reads, “Auto Gain Setting;” Please Wait” and runs through consecutive gain settings before showing “Taking Reading.”

3. Display reads, “Insert Blank;” “No” System defaults to “No.”

   If you choose to use a blank sample in “Raw Fluorescence,” press the UP ARROW key to select “Yes.” Display reads, “Insert Blank Sample.” Open the chamber cover, insert blank sample and close the cover. Press ZERO. Display then reads, “Taking Reading.” Proceed to step 4.

If you do not want to use a blank sample, press the ENTER key to select “No” and proceed to step 4.

4. Display reads “Insert Unknown Sample.” Open the chamber cover, insert unknown sample, close cover and press ENTER. The display will show the “Raw Concentration” value of the sample per the reference sample unit of measure.

5 To continue determination of “Raw Concentration” values for subsequent unknown samples, open the chamber cover, insert next unknown sample and close cover. The display will show the “Raw Concentration” of the unknown sample within approximately two seconds.

6. If the unknown sample is significantly more fluorescent than the reference sample, the display will indicate an over-range error. The unknown sample can be diluted by a given factor and read again or the unknown can serve as the new reference sample in a raw fluorescence analysis.

Note
<FIU> indicates a generic unit of measure or Fluorescence Intensity Units.

Raw Fluorescence (Mode II)

1. Display reads, “Enter Concentration;” “0000.000 <FIU>.” Press ENTER.

2. Display reads, “Insert Known Sample.” Open the chamber cover, insert reference sample and close the cover. Press ENTER. Display then reads, “Auto Gain Setting;” Please Wait” and runs through consecutive gain settings before showing “Taking Reading.”

Note

Raw Fluorescence (Mode II) is designed for basic research applications in which a reference standard of “known” concentration is not available. The Turner Quantech fluorometer assigns a value to a reference sample based upon the auto gain function response. In general, the reference sample would be chosen such that it represents the maximum fluorescence response expected in the range of unknown samples that are to be analyzed. The “Raw Fluorescence” of the unknown samples is determined relative to the reference sample. The fluorescence response for the reference sample is only stored in memory for the duration of your “Raw Fluorescence” analysis.

3. Display reads, “Insert Blank;” “No.” (System defaults to “No.”)

   If you choose to use a blank sample in “Raw Fluorescence,” press the UP ARROW key to select “Yes.” Display reads, “Insert Blank Sample.” Open the chamber cover, insert reference sample and close the cover. Press ZERO. Display then reads, “Taking Reading.” Proceed to step 4.

   If you do not want to use a blank sample, press the ENTER key to select “No” and proceed to step 4.

4. Display reads “Insert Unknown Sample.” Open the chamber cover, insert unknown sample, close cover and press ENTER. The display will indicate the “Raw Concentration” value of the sample per the reference sample unit of measure.

5 To continue determination of “Raw Concentration” values for subsequent unknown samples, open the chamber cover, insert next unknown sample and close cover. The display will show the “Raw Concentration” of the unknown sample within approximately two seconds.

6. If the unknown sample is significantly more fluorescent than the reference sample, the display will indicate an overrange error. The unknown sample can be diluted by a given factor and read again or the unknown can serve as the new reference sample in a raw fluorescence analysis.

Note
Resetting the system will result in loss of all standard curves.

Advanced Functions

To access the “Advanced Functions” parameter from the “Main Menu,” press the LEFT or RIGHT ARROW key until the display reads, “Advanced Functions,” then press ENTER. Press the LEFT or RIGHT ARROW key to step through the following options:

- **Set Date and Time:** User can define month, day, year, hour, minutes and seconds.
- **View Stored Data:** User can view standard curve data for defined methods.
- **Reset System to Default:** User can reset the system to default settings in the rare event that the RAM is corrupted.
- **View Diagnostic Information:** User can perform a status check on fluorometer component functions to aid in troubleshooting.
- **Set Printer and Print Options:** User can set data output configurations for optional printer or computer communication.
- **UV Lamp Options:** User can activate the UV lamp (mercury line lamp) on the Wide Band model of the Quantech.
- **Manually Set Gain and PMT Voltages: User** can turn off the auto gain function and manually select gain and PMT Voltage.
- **Injector Pump Options:** User can activate optional injector pump for kinetics studies.

Please refer to the flowchart in the **Appendix** for additional navigational information.

Note
The left and right hand arrows visible in the display indicate that navigation options are available upon pressing the LEFT or RIGHT ARROW key.

Diagnostic Menu

The diagnostic menu within “Advanced Functions” is designed to help the operator of the Quantech fluorometer perform status checks on the components and systems of the unit. In the event that the unit malfunctions, the values indicated for the PMT, lamps, and power supply will provide you and/or a Barnstead/ Thermolyne technical representative with the information necessary to troubleshoot the repair of the unit.

To access the diagnostic menu from the “Main Menu,” press the LEFT or RIGHT ARROW key until display reads, “Advanced Functions.” Press ENTER. Press the LEFT or RIGHT ARROW key until the display reads, “View Diagnostic Information.” Press ENTER. Press the LEFT ARROW key to check on the status of the PMT (e.g. raw PMT counts and A to D counts for the PMT at each Gain setting). Press the RIGHT ARROW key to view the “Hardware” e.g. Halogen lamp ON/OFF status and cover OPEN/CLOSED status). Press the ARROW keys to step through the menu options. Please refer to the flowchart in the **Appendix** for additional navigational information for these menus.

Set Printer and Print Options

External devices such as a serial printer or a computer can be connected to the Quantech fluorometer via the RS-232 port on the back of the unit. Please refer to the printer section of the **Appendix** for instructions on obtaining a printout with a printer or computer.

Unit Power-Down

Upon completing all fluorescence analyses with the Turner Quantech Digital Filter Fluorometer, power down the unit by pressing the MENU key to return to the “Main Menu.” Turn the main power switch located on the back panel of the unit OFF.

Standard Curve – Linear Regression

Calculation of Sample Concentrations

When you set up a standard curve using 2 to 9 points, the Quantech software utilizes a linear regression routine that fits the concentration vs. fluorescence intensity response to the equation: $y = mx + b$.

Where: y = fluorescence intensity
x = concentration
m = slope of the straight line
b = y axis intercept

Assuming that all standards utilized in a given “Method” are within the linear range of the fluorometer, a plot of standard concentration vs. fluorescence intensity will result in a straight line.

The Quantech Fluorometer linear regression does not utilize the blank sample as a point. Instead, because the unit allows the operator to reset the zero point for a given set of data associated with a specific method if they so choose, the fluorescence intensity of the blank sample is subtracted from the fluorescence intensity values that define the standard curve in a separate operation. The Quantech fluorometer calculates

the concentration of an unknown after subtracting the fluorescence contributed by the blank sample from the fluorescence associated with the unknown sample.

Viewing Data

An operator can examine the data used to define the standard curve constructed for a given “Method.” In the “Advanced Functions” menu (see flowcharts located in the **Appendix**), you can enter the “View Stored Data” option. The Quantech fluorometer stores the gain code determined by the auto gain function of the unit, the individual concentrations of all standards used to construct a standard curve, the A to D readings for each standard which represent the photomultiplier tube response to the standard concentrations, the regression slope, regression intercept, and R-squared value or coefficient of determination.

The data provided for each stored standard curve allows the operator to determine the quality of the data immediately without having to manually construct a concentration vs. fluorescence plot. This data is also stored in memory for subsequent use until it is replaced.

The gain code indicated in the “View Stored Data” option is designed to help the operator gauge variations in standard and sample concentrations. The Gain Code of the Quantech fluorometer indicates the relative sensitivity of the response of the unit to the compound under test (refer to Gain Code Table).

Gain Code Table

Turner Quantech Fluorometer Autogain Function

GAIN CODE 1 = HIGHEST SENSITIVITY
GAIN CODE 17 = LOWEST SENSITIVITY

GAIN CODE	LAMP LEVEL	SENSITIVITY	PMT LEVEL
1	HALOGEN 1	GAIN 1000	HV4 = HI
2	HALOGEN 1	GAIN 1000	HV3 = MH
3	HALOGEN 1	GAIN 100	HV4 = HI
4	HALOGEN 1	GAIN 100	HV3 = MH
5	HALOGEN 1	GAIN 10	HV4 = HI
6	HALOGEN 1	GAIN 1000	HV2 = ML
7	HALOGEN 1	GAIN 10	HV3 = MH
8	HALOGEN 1	GAIN 1	HV4 = HI
9	HALOGEN 1	GAIN 100	HV2 = ML
10	HALOGEN 1	GAIN 1	HV3 = MH
11	HALOGEN 1	GAIN 10	HV2 = ML
12	HALOGEN 1	GAIN 1000	HV1 = LO
13	HALOGEN 1	GAIN 1	HV2 = ML
14	HALOGEN 1	GAIN 100	HV1 = LO
15	HALOGEN 1	GAIN 10	HV1 = LO
16	HALOGEN 1	GAIN 1	HV1 = LO
17	HALOGEN 0	GAIN 1	HV1 = LO

Key for PMT Level Codes

HI	HIGH
MH	MEDIUM HIGH
ML	MEDIUM LOW
LO	LOW

Verification of Linearity

The linear range is the concentration range in which the LCD reading of the Quantech unit is directly proportional to the compound concentration. The linear range begins with the smallest measurable concentration and spans to a maximum concentration limit that is dependent upon the chemical properties of the fluorescent compound under study, the filters used, and the path length of the sample cuvette. Above the maximum concentration limit, the fluorescence readings level off or do not increase to the extent expected. Under these circumstances the linear response limit of the compound has been reached. A new standard curve is required for accurate readings. At even higher concentrations above the maximum concentration limit, the fluorescent response of the fluorometer will actually begin to decrease even though the sample concentration is increasing. This phenomenon is known as “quenching.”

Performance Verification

In the event that you are experiencing nonlinear results with the compound that you are analyzing and you want to verify the performance of the Quantech unit, we suggest you try a standard curve determination for Quinine Sulfate.

Quinine Sulfate Standard Reference Material (SRM) 936a may be obtained from the National Institute for Standards and Technology (NIST), Standard Reference Material Program, Room 204, Building 202, Gaithersburg, MD, 20899. Phone: 301-975-6776

Prepare a set of standard solutions of Quinine Sulfate in 0.1 N Sulfuric Acid. A concentration range of 1 ppb to 100 ppb can be used. Using the NB360 filter for excitation and the SC415 filter for emission, set up a 5 point standard curve with the Quantech unit. A typical response is shown in Figure 4. Please note that it is critical to observe good laboratory practice when preparing standard solutions. All glassware should be cleaned and dried.

Linear Regression

slope	5.684574976
intercept	23.4343362
R-squared	0.999951429

Concentration (ppb)	A/D Reading	A/D Blank
100	594	569
80	476	451
50	307	282
20	137	112
1	30	5
0	25	0

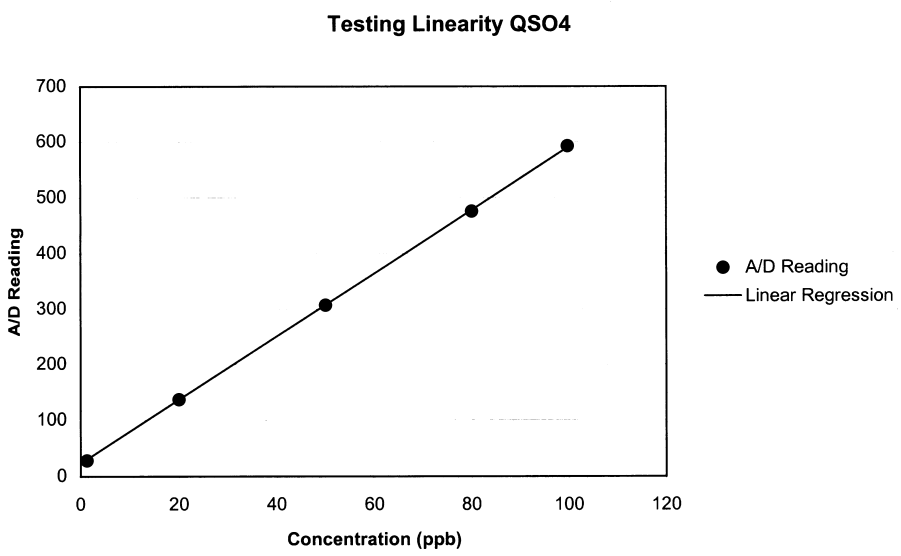


Figure 4

Printout Capability/ Computer Connection

Connecting Quantech Filter Fluorometer to Computer and Communicating Though the RS-232 Port Using Hyperterminal or Procomm

Hyperterminal

RS-232 Capture Instructions

1. Connect the 9 pin serial cable (part no. WHX18) from the Quantech fluorometer RS-232 port to COM2: port or (COM1: port) on back of computer

2. Access “Set Printer and Print Options” in the “Advanced Functions” menu (see flowchart in **Appendix**). You may set your print interval to a predetermined time setting for data output (e.g. kinetics monitoring in “Raw Fluorescence”) or leave the interval at 00:00:00 so that you receive a printout of data every time the PRINT key is pressed (e.g. analysis of unknown samples using a given method).

3. Run your Microsoft Windows program. Open Hyperterminal (located in the accessories directory), give your setting a name and choose a symbol.

4. In the “Connect Using:” box, select “direct to” COM2: or (COM1:) as port (depending on your computer), and click OK.

5. Using the selection boxes in the next screen, configure the options as 9600 baud, 8-bit, No parity, 1 stop bit, Flow Control: None.

6. To receive data to a file, select Transfer and capture text. Accepting default will put the file which you name in the c:\windows directory called capture.txt and the file will be an ASCII text file.

7. Operate the Quantech fluorometer using either a “Method” or “Raw Flores-cence.” Pressing the PRINT key on the fluorometer will initiate the transfer of data to the computer. You should see the data on the computer screen.

8. When you are finished operating the Quantech fluorometer, save your file. You can exit Hyperterminal or set up a new experiment.

9. Hyperterminal data can be manipulated and graphed in Excel®.

Procomm

1. Connect the 9 pin serial cable from the fluorometer RS-232 port to COM2: port or (COM1: port) on back of computer.

2. * Access “Set Printer and Print Options” in the “Advanced Functions” menu (see flowchart). You may set your print interval to a predetermined time setting for data output (e.g. kinetics monitoring in “Raw Fluorescence”) or leave the interval at 00:00:00 so that you receive

a printout of data every time the PRINT key is pressed (e.g. analysis of unknown samples using a given method).

3. Open DOS window and change directory to procomm directory.

4. Open procomm executable.

5. Press ALT-F10 for configuration screen.

6. Enter into Line Settings screen by typing ALT-P.

7. Type in 11 <Enter>, sets parameters as 9600, 8, N, 1.

8. Type in 21 <Enter>, sets to COM2: or (Type in 20 <Enter>, sets to COM1:), depending on your computer.

9. Type in 24 <Enter>, saves settings.

10. Type ESC to exit setup menu.

11. Procomm is now ready to accept input from the Quantech fluorometer when the PRINT key on the unit is pressed.

12. To begin downloading a file, Type ALT-F1, and give the file an appropriate name when prompted.

Note
See the **Appendix** of this manual for printer setup instructions.

The optional Epson™ printer (part no. AY1095X1) provides a paper tape record for future reference and verifies fluorometer performance and fluorescence analysis.

During fluorescence analysis, the printer prints a record of the method of analysis, sample number, concentration and fluorescence intensity units at a preset time interval.

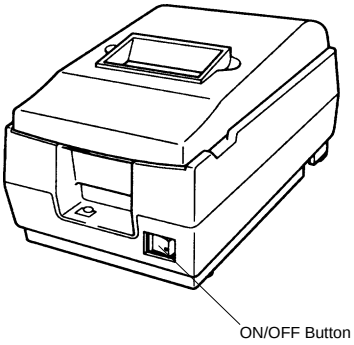


Figure A: Printer

Connecting and Starting the Printer

1. Make sure the printer and Quantech fluorometer are turned OFF.

2. Connect the Quantech fluorometer to the printer via the RS232 port on the fluorometer. Use the tan printer cable included with the Epson printer. Plug the printer power cord into an electrical outlet.

3. Turn the Quantech fluorometer ON.

4. Turn the printer ON.

5. Access “Set Printer and Print Options” in the “Advanced Functions” menu of the Quantech fluorometer (see flowchart located in the **Appendix**). You may set the print interval to a predetermined time setting for data output (e.g. kinetics monitoring in “Raw Fluorescence) or leave the interval at 00:00:000 so you receive a printout of data each time the PRINT key is pressed (e.g. analysis of unknown samples using a given “Method.”

6. Operate the Quantech fluorometer using either a “Method” or “Raw Fluorescence.” Pressing the PRINT key on the fluorometer will initiate the transfer of data to the printer to provide a printout similar to the sample shown.

7. Printing can be terminated by exiting the “Method” or “Raw Fluorescence” analysis that you performed.

Barnstead/Thermolyne
Turner Quantech Fluorometer

Date: 9/16/1998
Time: 11:39:16

Method Name: Aflatoxin
The Aflatoxin method is 0 days old.

Sign	Sample Number	Conc. (ug/ml)	Intensity Units	Time
------	1	1085.55	455	11:39:18
------	1	1085.55	455	11:39:19
------	1	1088.11	456	11:39:20
------	1	1085.55	455	11:39:21
------	1	1085.55	455	11:39:22
------	1	1080.43	453	11:39:23
------	1	1077.88	452	11:39:24
------	1	1077.88	452	11:39:25
------	1	1075.32	451	11:39:26
------	1	1077.88	452	11:39:27
------	2	1082.99	454	11:39:35
------	2	1085.55	455	11:39:36
------	2	1085.55	455	11:39:37
------	2	1085.55	455	11:39:38
------	3	1085.55	455	11:39:46
------	3	1085.55	455	11:39:47
------	3	1085.55	455	11:39:48
------	3	1085.55	455	11:39:49
------	3	1085.55	455	11:39:50
------	3	1080.43	453	11:39:51
------	3	1080.43	453	11:39:52

Printing Completed at: 11:39:54

Sample printout

Maintenance

The Quantech Digital Filter fluorometer requires minimal preventive maintenance. It should be kept clean and away from dusty environments or environments with temperature and humidity extremes.

Excitation and Emission Filters

Three different types of filters may be used in your Turner Quantech Digital Filter Fluorometer:

- Solid Glass Filters
- Gelatin Filters
- Interference Coated Filters

Note

Disassembly of excitation and emission filters is not recommended. Damage of the filters during disassembly is likely and is not covered under warranty.

Gelatin and Interference Coated Filters

Gelatin and Interference Coated filters are most susceptible to environmental conditions (e.g. temperature above 50°C, humidity and improper storage and handling. Care should be taken when cleaning, handling and storing all filters to prevent damage or scratching. Scratching of the filter may result in the transmittance of light of an undesired wavelength to the photomultiplier tube. Carefully inspect the filters for cracks, scratches or other damage. Replace filters if necessary.

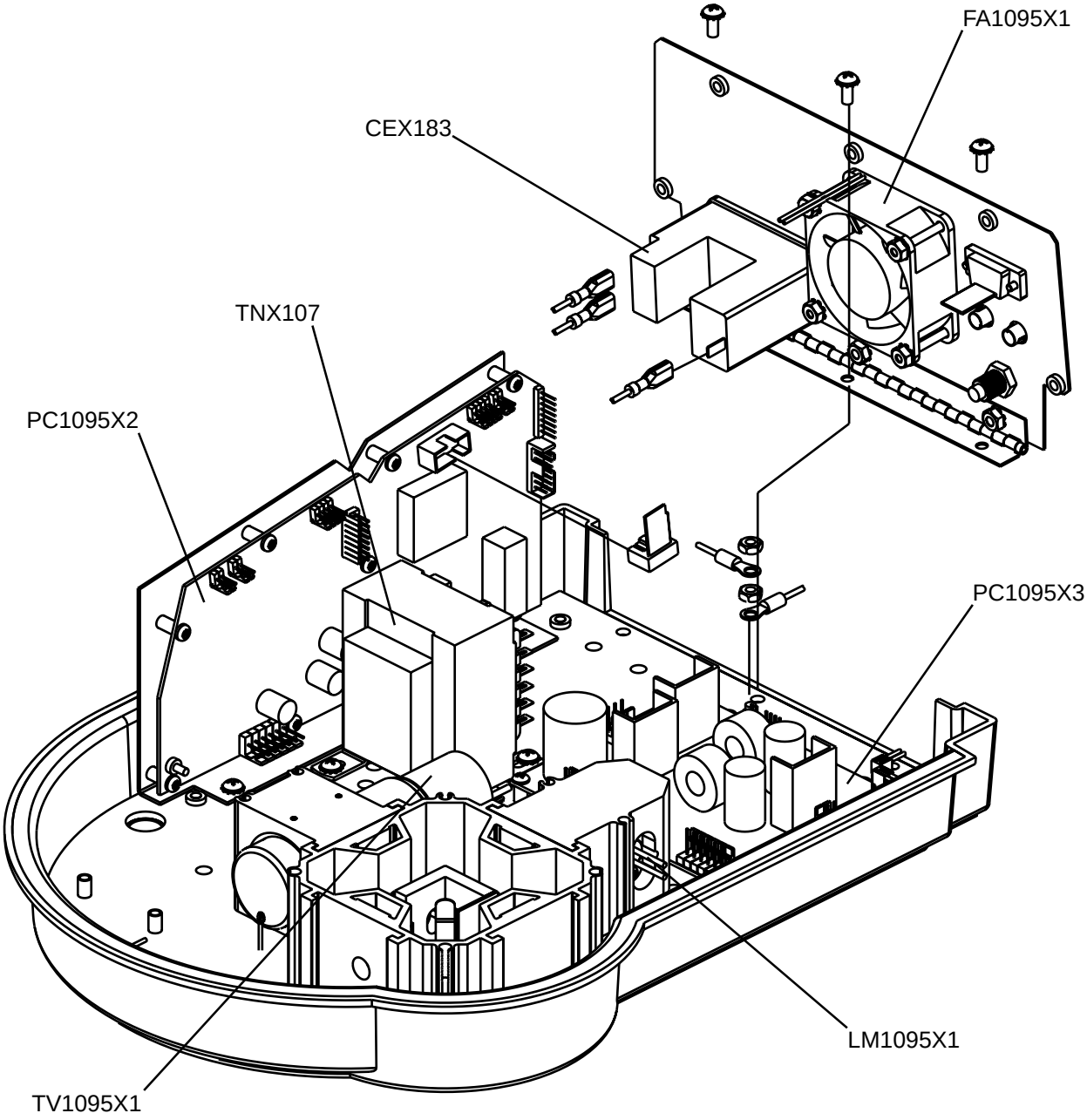
Dust particles may be removed from Gelatin and Interference Coated filters by brushing filter surface lightly with a clean, dry camel's hair brush or by gently blowing clean, dry air across the surface. Glass filters are the most durable and may be cleaned with lens paper, however, make sure that the filter surface are not scratched in the process.

Note
Please do not remove the top case to expose the interior components of the units unless specifically authorized by Barnstead/Thermolyne. There are few user serviceable parts in the Quantech fluorometer.

Sample Chamber & Cuvette Holder Cleaning

Open the chamber cover and view the chamber from the top. Remove the Excitation and Emission Filters and store them in a clean, dry place. Remove the two Phillips head screws holding the cuvette holder in place. Carefully remove the cuvette holder so as to avoid scratching the curved surface mirror or damaging the spring clip on the holder. Carefully clean the cuvette holder with a water dampened cotton swab and sample chamber with a water dampened soft cloth. Allow components to dry thoroughly before reassembly.

Exploded View



Base Model Exploded View

Replacement Parts

Caution
Service must only be attempted by trained and qualified personnel.

(See Exploded View.)

Part No.	Description
CEX183	Power Entry Module
FZX58	Fuse Holder, Drawer
FA1095X1	Fan Assembly
LM1095X1	Quartz-Halogen lamp assembly
ME1095X1	2 x 24 LCD assembly
PC1095X2	Control PCB
PC1095X3	Power Supply PCB
SWX172	Keypad PCB and cover
TNX107	Transformer
TV1095X1	Photomultiplier tube, 931B
TV1095X2	Photomultiplier tube, R928B IR & WB
FZX35	Fuses: 5 x 20, 500MA, 250V (2 required), 100V & 120V
FZX51	Fuses: 5x20,.315A, 250V (2 required)

Gaining Access to Replacement Parts

Opening the Top Case

In order to gain access to most of the replacement parts listed, the top case of the unit must be opened.

1. Make sure the unit is OFF and the power cord is unplugged from the electrical outlet and the unit power entry module.

2. Using a Phillips head screwdriver, remove the four screws located inside the sample chamber. These four screws secure the top case to the sample chamber/filter block (see Figure 2).

3. Slide the unit forward off the edge of the bench or tabletop surface on which it is resting just enough to allow you to see two silver Phillips head screws on the bottom of the unit. One screw is located on the bottom front of the unit and the other is located by the left front “foot” (black rubber vibration suppression pad) of the unit. Remove these two screws. The top case of the instrument will now lift up and back via the rear panel hinge.

4. Reverse the order of the above steps to replace and secure the top case of the instrument.

Appendix

Theory of Fluorescence

When a molecule absorbs radiation, an electron is promoted from one energy level in the molecule to a higher energy level within the molecule, absorbing the energy. The molecule may release the absorbed energy and return the electron to its ground state by converting this energy to vibrational energy or releasing the energy in the form of light emitted by the molecule. If part of this energy is converted to vibrational energy the reminder (if radiated within 10^{-8} seconds), is emitted as light of lower energy (longer wavelength) than the absorbed energy. This property is called fluorescence. Atoms or molecules which fluoresce have well-defined excitation and emission spectra which allow both qualitative and quantitative analysis of the material.

The shape of the excitation spectrum is that of the absorbance curve of the molecule and is independent of the wavelength at which fluorescence is measured. Each molecule also has a characteristic number called the quantum efficiency, which is the ratio of the total number of emitted photons to the total number of absorbed photons. A non-fluorescent molecule is one whose quantum efficiency is zero or so close to zero that the fluorescence is not measurable. Both the quantum efficiency and the shape of the emission spectrum are independent of the wavelength of the exciting light. If the exciting light used is of a wavelength which is different from that of the absorption peak, a smallest portion of the light will be absorbed and proportionately less light will be emitted, illustrating the constancy of the quantum efficiency. However, the shape and location of the emission spectrum will not change.

Fluorescence/Concentration Relationships

Fluorescence is related to and dependent on concentration according to the following equation:

$F=KI\phi C\ell$

Where;

F = Fluorescence reading observed on the instrument.

K = A constant which accounts for instrumental factors, pH, T, electronics.

I = The intensity of the exciting light at a wavelength.

C = The concentration of the fluorescing molecule.

ℓ = The path length of the solution or solid being measured.

ø = The quantum efficiency of the molecule.

An examination of this equation shows that for a given molecule, at a constant concentration, the amount of fluorescence observed can be affected by:

- I, the intensity of the exciting wavelength.
- D, the path length of the molecules.

As a practical matter, this means that the only limits on the sensitivity of fluorescence measurements are the electrical noise in the instrument, competing radiations, physical

limitations, i.e. sample volume available, maximum energy available and maximum acceptable cell size.

The accuracy of measurement is excellent because the technique is a direct measure of the radiant energy being made.

Considerations

Blank Fluorescence

One of the most common limits on sensitivity is set by blank fluorescence. Blank fluorescence arises from the reagents or other sources separate from the compound of interest. Ideally, the fluorescence of the “blank” should be 000, relative to the fluorescence of the material being analyzed.

Reagents

Usually, little difficulty will be encountered with commercially available reagent-grade chemicals. This is particularly true in laboratories utilizing procedures where the majority of assays are done with visible light activating the fluorescence of the sample.

If the samples are under ultraviolet excitation, or at a high instrument sensitivity, then high “reagent blank” fluorescence may be encountered. Even spectro-quality solvents sometimes contain traces of impurities which may fluoresce under ultraviolet light. Simple distillation in an all glass apparatus frequently remedies this problem.

There are also several companies marketing fluorescent-grade reagents for those who must work at very low concentration.

A frequent source of contaminants are the plasticizers in some plastics and rubber. For dispensing distilled water, an all polyethylene or glass system is recommended. Water standing in rubber tubing may develop high fluorescence from moieties contained in the tubing during manufacture.

Standards

Standards should always be stored as concentrated solutions, out of the light and at low temperature. Standard solutions of low concentrations may degrade with time. Dilutions to working concentrations should always be prepared as required using appropriate diluent since fluorescence is usually pH dependent.

Glassware

Borosilicate glassware is recommended for general storage of reagents. Test tube or flasks may be capped with parafilm for mixing and storage, however, care should be taken when using this material. For work at very low levels of fluorescence, it may be necessary to rinse all glassware with an appropriate solvent. See the **Operation** section.

Temperature

Fluorescence is usually more temperature sensitive than absorption. Although not all fluorescent material exhibit marked sensitivity, there are instances where as much as a 2% reduction in

fluorescence is observed for every degree centigrade temperature rise. Standards, reagent blanks and sample should be at the same temperature prior to measurement of fluorescence. Sometimes drifting of fluorometer readings may be observed due to a change in the temperature of the sample while in the sample chamber.

pH

The pH of the solution may affect the fluorescent species being tested. Protonation changes the resonance structures of the molecule, the equilibrium of these species and consequently, the concentration of the fluorescent molecule. Check your applications carefully for the possibility of this problem. The pH of standard solutions may change over time due to the acidic nature of storage container materials such as glass. Similarly, the fluorescent compound may decompose under a variety of pH ranges.

Miscellaneous

Some materials are photosensitive; that is, they decompose when exposed to wavelengths they absorb. This property can be determined by inserting a sample solution into the instrument and observing its change in fluorescence over a period of time.

A few materials exhibit delayed fluorescence. This property can be verified by placing the solution in the instrument and observing a rise in the fluorescence reading after a period of time.

Note
When using excitation wavelengths below 340 nm, use quartz cuvettes.

Note
For best results use quartz cuvettes for all your visible and ultraviolet applications.

Note
When using round cuvettes, align them the same way in the instrument every time. Variations in glass thickness and properties can affect your results.

Cuvette Matching Procedure

Cuvettes can affect results and are important to the performance characteristics of the instrument. The cuvettes for any given determination should be matched so that their fluorometric response is identical in the instrument.

When using the Mercury Vapor Line Lamp for the UV excitation source below 340 nm, you must use quartz cuvettes.

Cuvettes may be matched as follows:

1. Install the excitation and emission filters for the appropriate analytical procedure. (Usually cuvettes are matched for use with a specific analysis.)

2. Fill each cuvette to be checked with the fluorescent substance to be analyzed.

3. Set zero fluorescence with the blank reference solution cuvette and then observe the fluorescence of each of the individual cuvettes, which have been inserted into the cuvette holder and aligned according to any orientation indicators.

4. Observe the fluorescence for each cuvette and select those whose fluorescence agree closely.

Excitation Sources

The Quartz-Halogen lamp in the Base, IR and Wide Band models of the Quantech Digital Filter Fluorometer provides light in the wavelength range or 340-750 nm. The Mercury Line Lamp (UV Lamp) in the Wide Band model is not a continuous lamp.

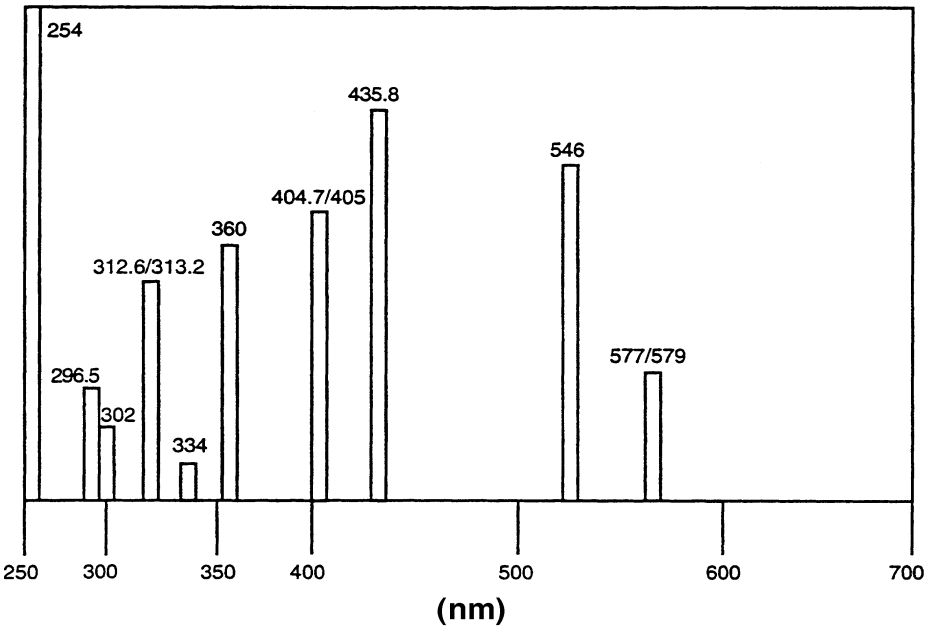


Figure 5: Distribution of Mercury Line Lamp Emission Lines

Filters

The filters in your Turner Quantech Digital Filter Fluorometer are used to perform two functions. The first is to allow only light of a specific wavelength to pass into the sample cell and excite a specific molecule. The excitation filters are always Narrow Band (NB) filters and are specific for the compound of interest. The emission filters are generally Sharp-Cut (SC) filters that allow only emitted light above a specific wavelength to pass into the photomultiplier tube. Since the photomultiplier tube is sensitive to a wide range of wavelengths, a filter allows the user to choose the wavelength range detected by the photomultiplier tube to reduce background noise and increase sensitivity.

Selection

For nearly all fluorescent determinations, the required filters are recommended by B/T. In the event that a new procedure is being developed, the following considerations should be applied in selecting the proper filters:

1. Some compounds have the ability to discharge some of the energy obtained when they absorb light by emitting light of a longer wavelength. These compounds are fluorescent. The efficiency of this process may be anywhere from a fraction of a percent to almost 100 percent. A portion of the absorbed energy is released in heat.

2. The intensity of the light emitted is proportional to the amount of exciting light absorbed. At low concentrations, the emitted light may be considered proportional to the concentration. In practice, the

meter reading of the fluorometer is linear with concentration of the fluorescent molecule involved. The range between the lowest detectable sample and the point where significant non-linearity occurs is normally a factor of 10^4 to 10^5 in concentration of the fluorescent molecule.

3. If a compound is fluorescent, a wide range of energy which it absorbs causes it to fluoresce. The spectrum of the emitted light is normally quite broad and its shape and peak are independent of the wavelength of the exciting light. The only variation is in intensity; where less light (energy) is absorbed, less light will be emitted. Proportionality of fluorescence and concentration are maintained even when the exciting light and measured fluorescence are far removed from the peaks.

Narrow Bandpass Filter (NB)

This filter is used when the excitation and emission wavelengths are close together. Typical bandwidths are in the 8 to 10 nm range. They require precision manufacturing techniques and cost more than the other types of filters. The filter consists of a miniature interferometer in conjunction with blocking glasses. For the filter designated NB390 the range of wavelength passed by the filter is 385-395 nm. These filters are constructed with a thin coating of material and are susceptible to scratching. Extreme care should be taken when handling these filters. See the **Preventive Maintenance** section for maintenance.

Some Narrow Bandpass Filters are comprised of special optical glasses or a combination of glass or gelatin materials, and have bandwidths of 50 to 100 nm. Examples of these excitation filters are the NB360 (bandpass 40 nm) and the NB430 (bandpass 90 nm). These filters are particularly useful where high sensitivity is required, and lower resolution is not a factor in distinguishing between different fluorescent moieties present in the solution. By allowing more light to pass to the sample, a greater number of the fluorescence molecules are excited and more emission light is produced per sample volume.

Narrow Band Filters can also be used in the emission side filter holder when specific emitted wavelengths need to be distinguished among many emitting fluorescence present in solution.

Sharp-Cut Filters (SC)

This type of filter passes all light of a longer wavelength than a given value and blocks all light of shorter wavelengths. The transition from zero to full transmittance (approximately 80-90 percent) usually takes place over a region of about 40 nm. The characteristic wavelength of a Sharp-Cut Filter is defined as the wavelength at which the filter has a transmittance of 37 %. With most filter manufacturers, there is about a 10 nm tolerance in the location of the longest wavelengths of emitted light which can be measured.

Note
It is important that the band passes of the excitation and emission filters do not overlap as this will affect the measurement of the fluorescence emission by the PMT.

Photomultiplier Tube (PMT)

The photomultiplier tube in the Base Model Quantech Digital Filter Fluorometer is sensitive to wavelengths of 300-650 nm but falls off rapidly above 650 nm. The photomultiplier tube in the IR and Wide Band Quantech Units are red-sensitive to wavelengths of 185-870 nm.

The PMT detector in all fluorescence measures all the light reaching it from the cuvette. By using a NB or SC filter, certain wavelengths of light are permitted to be passed to the PMT and subsequently detected. Unwanted wavelengths are not allowed to pass to the PMT, and do not affect the fluorescence measurement. The NB and SC filters select a part of the PMT response curve to measure.

Compatibility of Filters

Two filters are compatible and may be used as excitation and emission filters if the wavelengths of the light they transmit do not overlap significantly. If such an overlap is present, scattered light from an even slightly turbid sample or from an optical defect in the cuvette will reach the photomultiplier and be registered as fluorescence.

The steps involved in selecting the best combination of excitation and emission filters for a given compound are as follows:

1. Ideally the fluorescence spectra of the compound will be available. Look for the excitation and emission filters required in Tables I and II. If the name of the compound is known, the user may consult the manufacturer of the fluorescent compound to obtain the

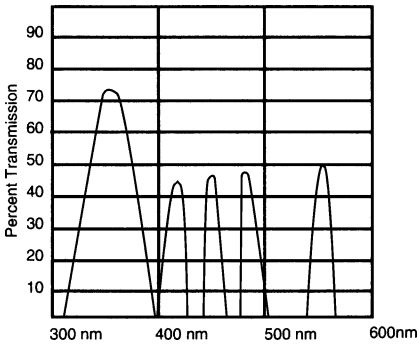
absorbance maxima for the compound and the fluorescent spectrum maxima for the compound. Direct the inquiries to the technical service department of the chemical manufacturer.

2. If the fluorescence spectra are not available, then proceed as follows:

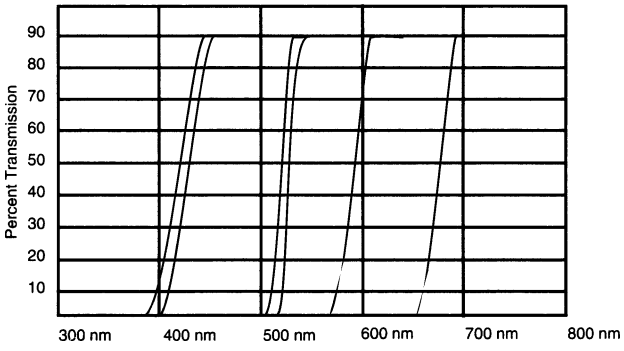
   Refer to the transmittance curves for this discussion.

a. Determine the maximum absorption wavelength of the compound with a spectrometer. Choose a filter which is closest to the peak from Table I and use this for excitation.

b. Having chosen a tentative excitation filter, it requires but a few minutes to insert a series of Sharp-Cut (SC) emission filters compatible with the excitation filter, comparing the ratio of sample reading to reagent blank. If the data obtained indicates a fairly sharp-peaked emission curve, the possibility of using a Narrow Pass Emission filter may be considered. Usually there is little advantage to a Narrow-Pass Emission filter, though they are occasionally of the value where the emission peak falls close to the excitation bandpass.



Bandpass Filter Transmittance Curves



Sharp Cut Filter Transmittance Curves

Filter Selection Chart

(See Table I, Table II and Filter Transmittance Curves)

All filters are mounted in filter holders specifically designed for simple wavelength selection in the Quantech Digital Filter Fluorometer. With the exception of the NB360(40 nm) and the NB430 (90 nm), all narrow band filters designated by the center wavelength in nanometers have a 10nm nominal bandpass curve. Sharp-Cut Filters (SC) are long pass filters. The number following the SC is wavelength, in nanometers, at which they exhibit a transmission of 37%. They typically have a transmission of less than 1% at a wavelength 10 nm less than the rated wavelength. The NB excitation filters may be used as emission filters where wavelengths are close together but sensitivity will be reduced.

Table I - Quantech Excitation and Emission Filters

B/T PART #	DESCRIPTION
Narrow Band (NB) Filters May Be Used As Excitation or Emission Filters	
LE1095X1	NB254 Filter
LE1095X3	NB297 Filter
LE1095X4	NB313 Filter
LE1095X30	NB360 Filter
LE1095X6	NB365 Filter
LE1095X7	NB390 Filter
LE1095X8	NB405 Filter
LE1095X9	NB420 Filter
LE1095X31	NB430 Filter
LE1095X10	NB440 Filter
LE1095X11	NB450 Filter
LE1095X12	NB460 Filter
LE1095X13	NB490 Filter
LE1095X14	NB520 Filter
LE1095X15	NB540 Filter
LE1095X16	NB590 Filter
LE1095X17	NB680 Filter
Sharp Cut (SC) Filters Are Only Used As Emission Filters	
LE1095X18	SC415 Filter
LE1095X19	SC430 Filter
LE1095X20	SC450 Filter
LE1095X21	SC475 Filter
LE1095X22	SC500 Filter
LE1095X23	SC515 Filter
LE1095X24	SC535 Filter
LE1095X25	SC550 Filter
LE1095X26	SC585 Filter
LE1095X27	SC605 Filter
LE1095X28	SC635 Filter
LE1095X29	SC665 Filter

Table II - Filter Requirements for Common Applications

Filters and Wavelengths

Application	Method	Primary Excitation	Secondary Emission
Fluorescein		NB490	SC515
Chlorophyll		NB440	SC665
Quinine Sulfate		NB360	SC415
Thiamine		NB360	SC430
Riboflavin		NB440	SC535
Tocopherols		NB360	SC515
Catecholamines		NB405	SC515
Rhodamine		NB540	SC585
Protoporphyrin		NB405	SC585
Niacin	condensation	NB360	NB440
Niacin	cyanogen bromide	NB440	SC515
Vitamin A		NB360	NB490
Vitamin B1		NB360	SC430
Vitamin B2		NB440	SC535
Vitamin B6	condensation	NB360	NB440
Vitamin B6	CN:pyridoxal	NB360	NB440
Vitamin B12		NB440	SC515
Ascorbic Acid (Vitamin C)	Deutsch	NB360	SC440
Vitamin E	Kofler	NB360	SC515
Vitamin K	Kofler	NB360	SC430
Vitamin K	Jansson	NB360	SC415
DNA	DABA	NB405	SC515
DNA	thymine	NB360	NB440
DNA	ethidium bromide	NB360	SC585
DNA	Hoechst 33258	NB360	SC430 or SC415
DNA	Thiazole orange	NB490	SC515
DNA	Oxazole yellow	NB460	SC500
DNA	PicoGreen	NB490	SC515
Protein	NanoOrange	NB490	SC585
Aflatoxin	Methanol Extraction	NB360	SC430
Beta-Galactosidase		NB360	NB460
Histamine	OPT	NB360	SC450 or NB450
RNA	RiboGreen	NB490	SC515
ssDNA/Oligos	OliGreen	NB490	SC515

NB versus SC Filter Use

The previous discussions detail which filters to use for an individual application, however there are times when the results of the fluorescent measurements are not linear, or are affected by undesired fluorescent moieties. In these instances using a Narrow Bandpass Filter (NB) in the emission side of the filter holder may give more accurate results.

In some instances more than one compound is present which can absorb the excitation light. If the undesired molecule subsequently does not fluoresce, then the undesired molecule will have no effect on the reading of the fluorometer. If however the undesired molecule does fluoresce then the proper choice of emission filter is important. The SC filter allows light of a specific wavelength and longer to be passed through to the photomultiplier tube. In the case when this light is the result of emissions from two or more different compounds in the sample, then a choice of using a Narrow Bandpass versus Sharp-Cut filter must be made. This is where fluorometry has a distinct advantage over absorption spectroscopy.

If the fluorescence maximum of the desired compound is greater than the undesired moiety, choose a Sharp-Cut (SC) filter with a longer wavelength cutoff, above the fluorescence maximum of the moiety. In the case where the undesired moiety fluoresces at a wavelength longer than the compound of interest, choose a Narrow Bandpass (NB) filter closest to the fluorescence maximum of the compound of interest.

If the fluorescent wavelengths of two compounds overlap, then careful choice of the excitation bandpass filter can decrease the contribution to the fluorescent light emitted by the undesired moiety. Choose the excitation range for the desired compound using an NB filter at wavelength where there is significant absorption of light by the desired compound while there is little or no absorbance of light by the undesired compound.

Compromises Between NB and SC Filters

Use of an NB filter in the Excitation side of the filter holder allows light of a specific wavelength to excite a molecule. The intensity of the light passed through to the sample depends on the light source and the bandpass filter. Choosing an NB filter with a larger bandpass, like for the NB360 and NB430 filters, will allow for a larger spectral distribution of light to pass to the sample and excite more molecules. This may increase sensitivity of the rest. Care should be taken when using these filters. Use of an NB filter on the emission side of the filter holder passes less of the fluorescent light produced by the sample to the photomultiplier tube. While being more specific for a wavelength range, the sensitivity of the test may be reduced.

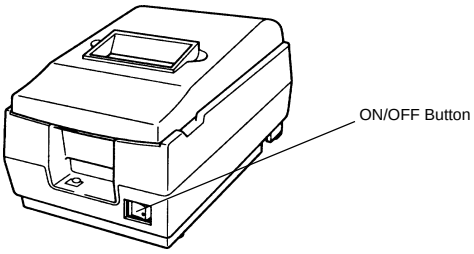


Figure A: Printer

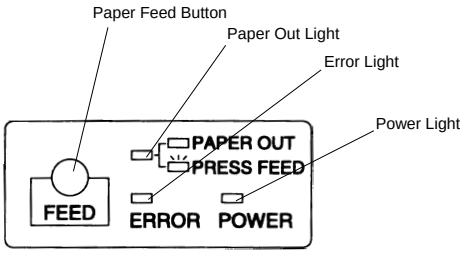


Figure B: Control Panel

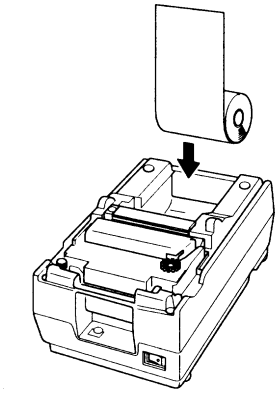


Figure C: Inserting the Paper Roll

Note

A colored stripe along the edge of the paper indicates that you are approaching the end of the tape. When the stripe appears, approximately 23 inches of paper remain, enough for 2-3 cycles. Replace the tape before it is completely exhausted to ensure a complete record of your analyses.

Printer Setup

Power Switch

Located on the front of the printer (AY1095X1), this switch turns power to the printer ON and OFF. (See Figure A.) The green POWER light will illuminate when the printer is ON.

Paper Feed Button

Press this button once to advance the tape one line, or hold the button down to advance paper continuously. When the paper roll nears the end, the red PAPER OUT light will illuminate.

If the red ERROR light illuminates, the printer is off line. This could be a result of the print head being too hot, in which case the printer will resume printing once it cools down; or—the paper may be jammed in the printer. Turn the printer OFF before checking for jammed paper. Remove the paper jam and turn the printer back ON. If the printer still will not print, unplug it and refer servicing to qualified personnel.

Installing the Paper Roll

When the red PAPER OUT light illuminates, it is time to replace the paper roll. Replace the paper roll as follows:

1. Turn the printer ON and open the chamber cover.
2. Make sure the edge of the paper roll is straight.
3. Insert the paper roll into the printer. (See Figure C.)

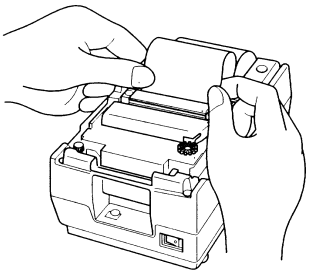


Figure D: Inserting the Paper Into the Paper Slot

4. Insert the paper straight into the paper slot (see Figure D). The paper will feed automatically.

5. Tear off a strip of paper and close the cover. (The red PAPER OUT light will be OFF if paper roll installation is successful.)

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Barnstead/Thermolyne
Turner Quantech Fluorometer

Date:  9/16/1998
Time: 11:39:16

Method Name: Aflatoxin
The Aflatoxin method is 0 days old.

=======================================
       Sample   Conc. Intensity
 Sign  Number ( ug/ml)  Units   Time
=======================================
______     1    1085.55   455  11:39:18
______     1    1085.55   455  11:39:19
______     1    1088.11   456  11:39:20
______     1    1085.55   455  11:39:21
______     1    1085.55   455  11:39:22
______     1    1080.43   453  11:39:23
______     1    1077.88   452  11:39:24
______     1    1077.88   452  11:39:25
______     1    1075.32   451  11:39:26
______     1    1077.88   452  11:39:27
______     2    1082.99   454  11:39:35
______     2    1085.55   455  11:39:36
______     2    1085.55   455  11:39:37
______     2    1085.55   455  11:39:38
______     3    1085.55   455  11:39:46
______     3    1085.55   455  11:39:47
______     3    1085.55   455  11:39:48
______     3    1085.55   455  11:39:49
______     3    1085.55   455  11:39:50
______     3    1080.43   453  11:39:51
______     3    1080.43   453  11:39:52


Printing Completed at: 11:39:54
```

Sample Printout

Quantech Accessories

Quantech Excitation and Emission Filters

B/T PART #	DESCRIPTION

Narrow Band (NB) Filters May Be Used As Excitation or Emission Filters

LE1095X1	NB254 Filter
LE1095X3	NB297 Filter
LE1095X4	NB313 Filter
LE1095X30	NB360 Filter
LE1095X6	NB365 Filter
LE1095X7	NB390 Filter
LE1095X8	NB405 Filter
LE1095X9	NB420 Filter
LE1095X31	NB430 Filter
LE1095X10	NB440 Filter
LE1095X11	NB450 Filter
LE1095X12	NB460 Filter
LE1095X13	NB490 Filter
LE1095X14	NB520 Filter
LE1095X15	NB540 Filter
LE1095X16	NB590 Filter
LE1095X17	NB680 Filter

Sharp Cut (SC) Filters Are Only Used As Emission Filters

LE1095X18	SC415 Filter
LE1095X19	SC430 Filter
LE1095X20	SC450 Filter
LE1095X21	SC475 Filter
LE1095X22	SC500 Filter
LE1095X23	SC515 Filter
LE1095X24	SC535 Filter
LE1095X25	SC550 Filter

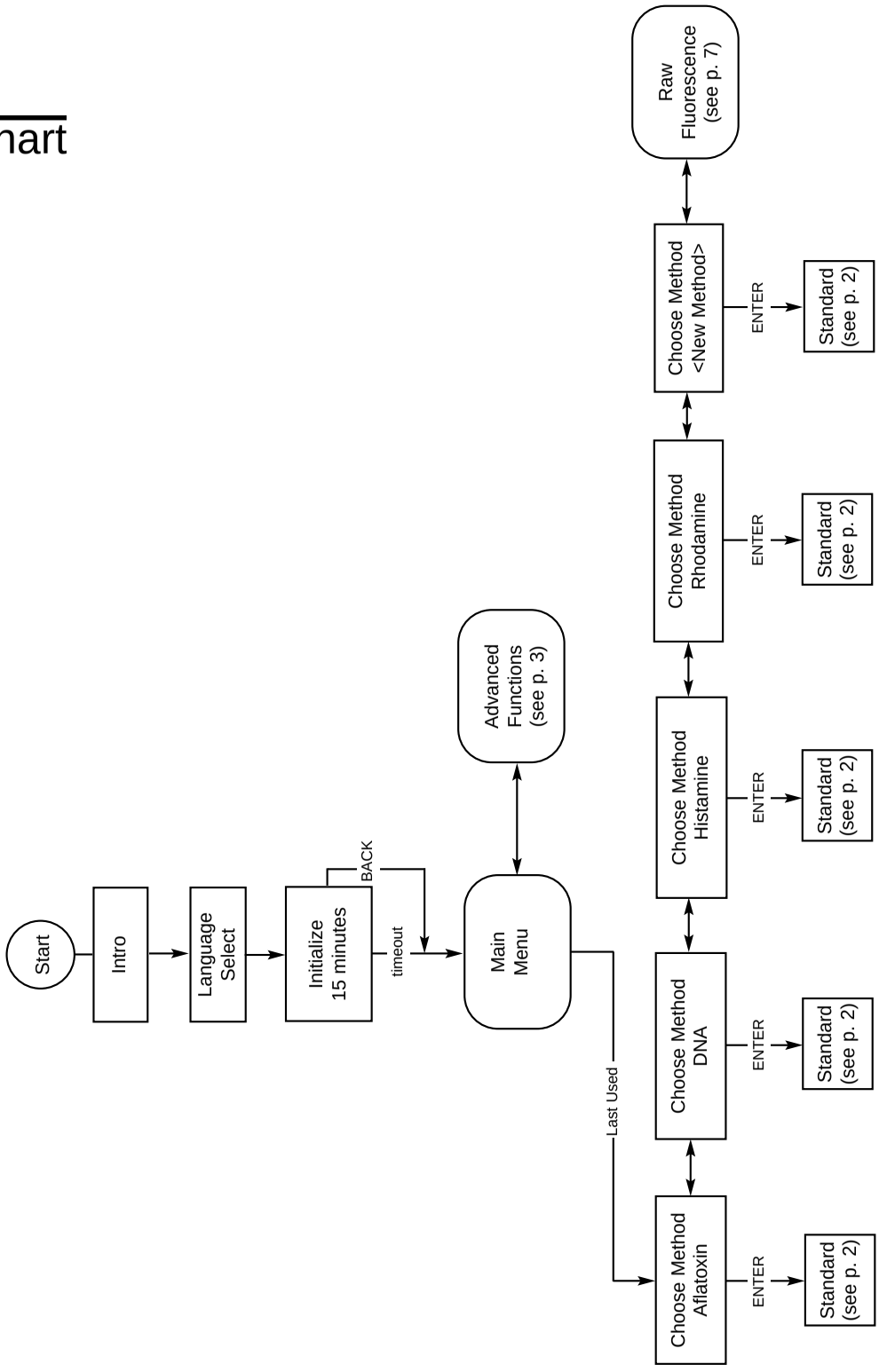
Sharp Cut (SC) Filters Cont.

LE1095X26	SC585 Filter
LE1095X27	SC605 Filter
LE1095X28	SC635 Filter
LE1095X29	SC665 Filter

AY1095X1	Epson Printer
WHX18	Serial Cable for Communication w/ Computer

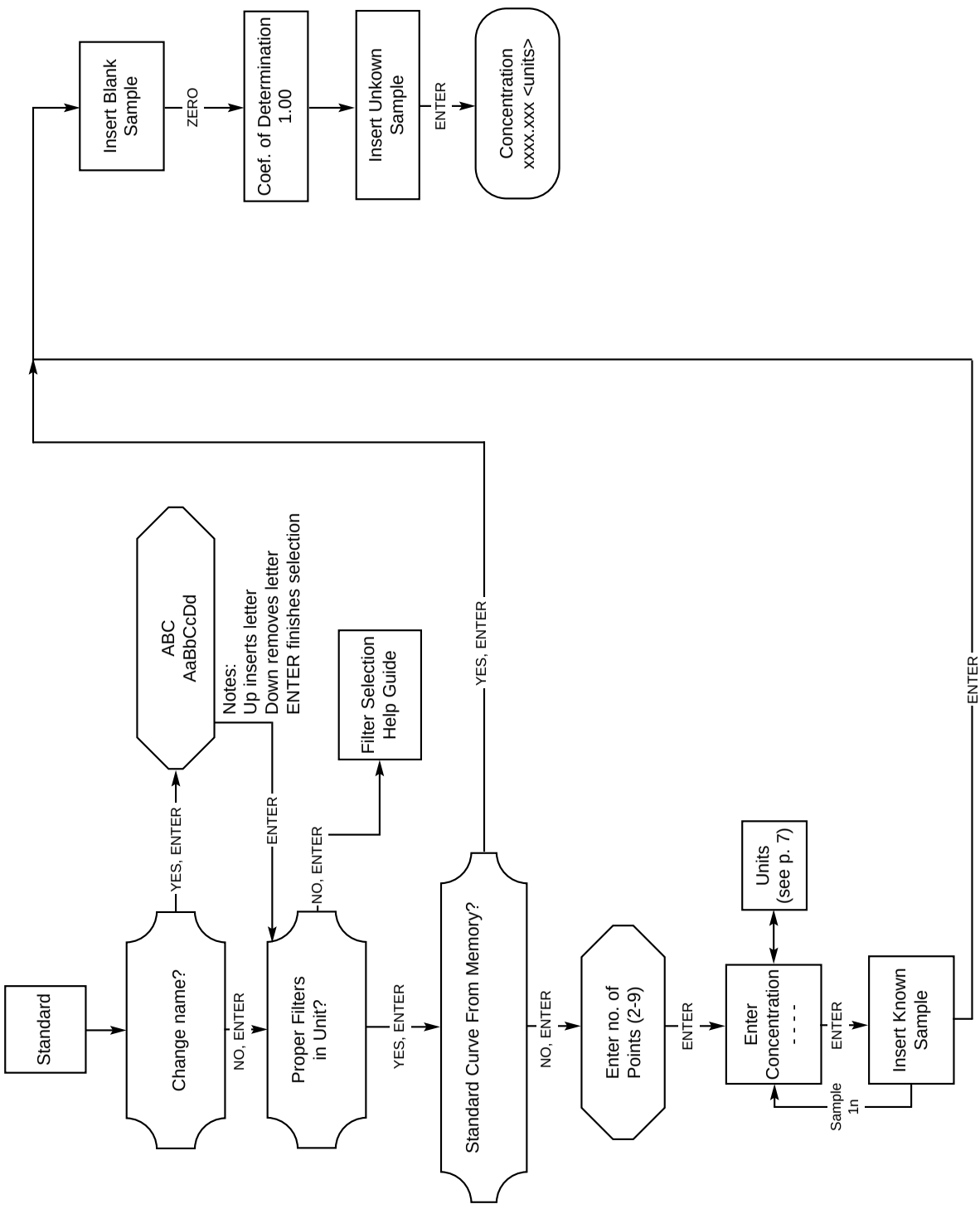
43F00-42	UV Suprasil Quartz, Square Cuvettes, 3 - 5 ml, matched pair
11F06-07	Cuvette, 12 x 75 mm Round Borosilicate, 1-5 ml, pkg. of 12
11F08-01	Cuvette, 12 x 75 mm Round Borosilicate, 1-5 ml, pkg. of 5

Flowchart

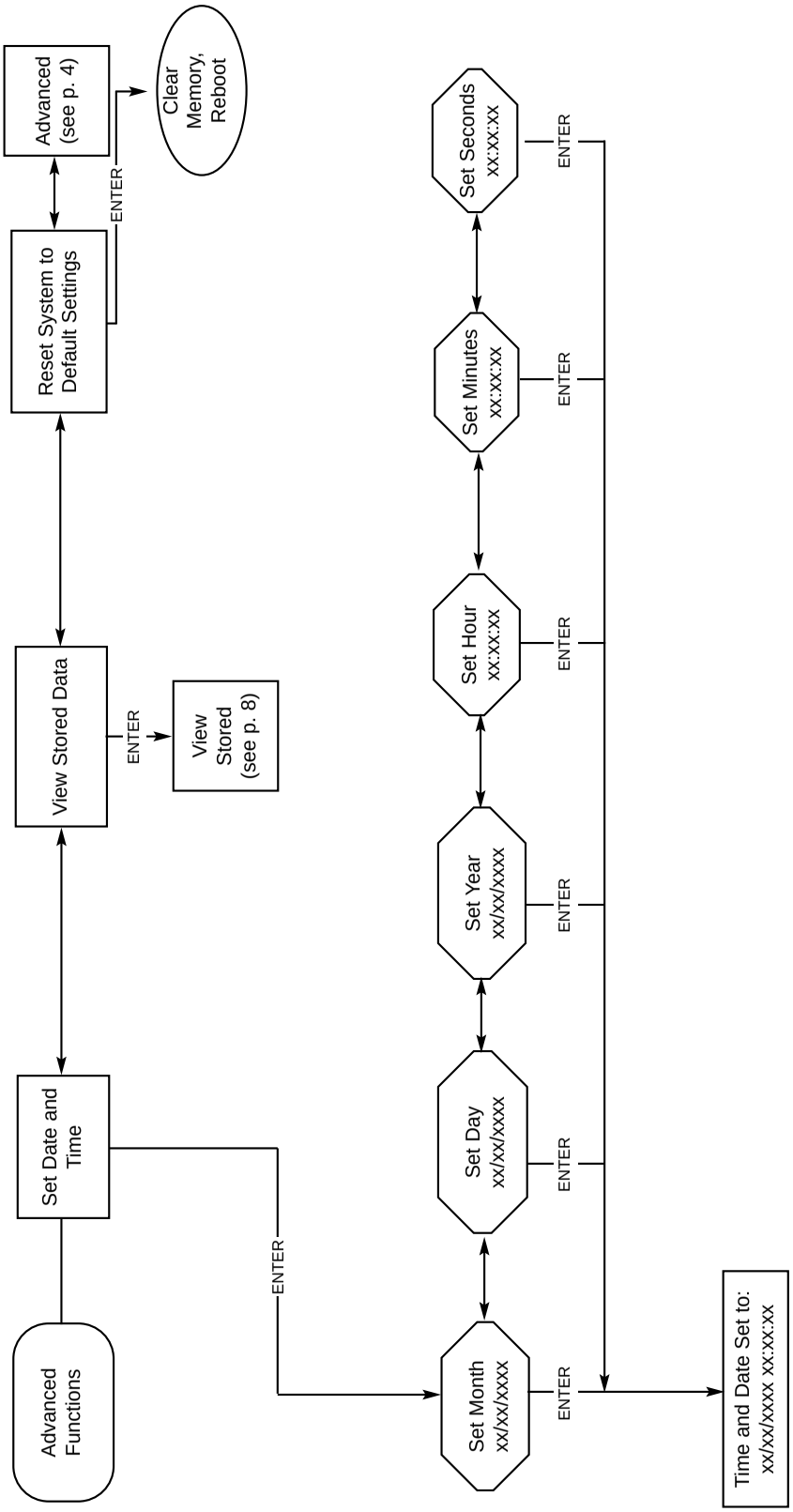


Flowchart : page 1

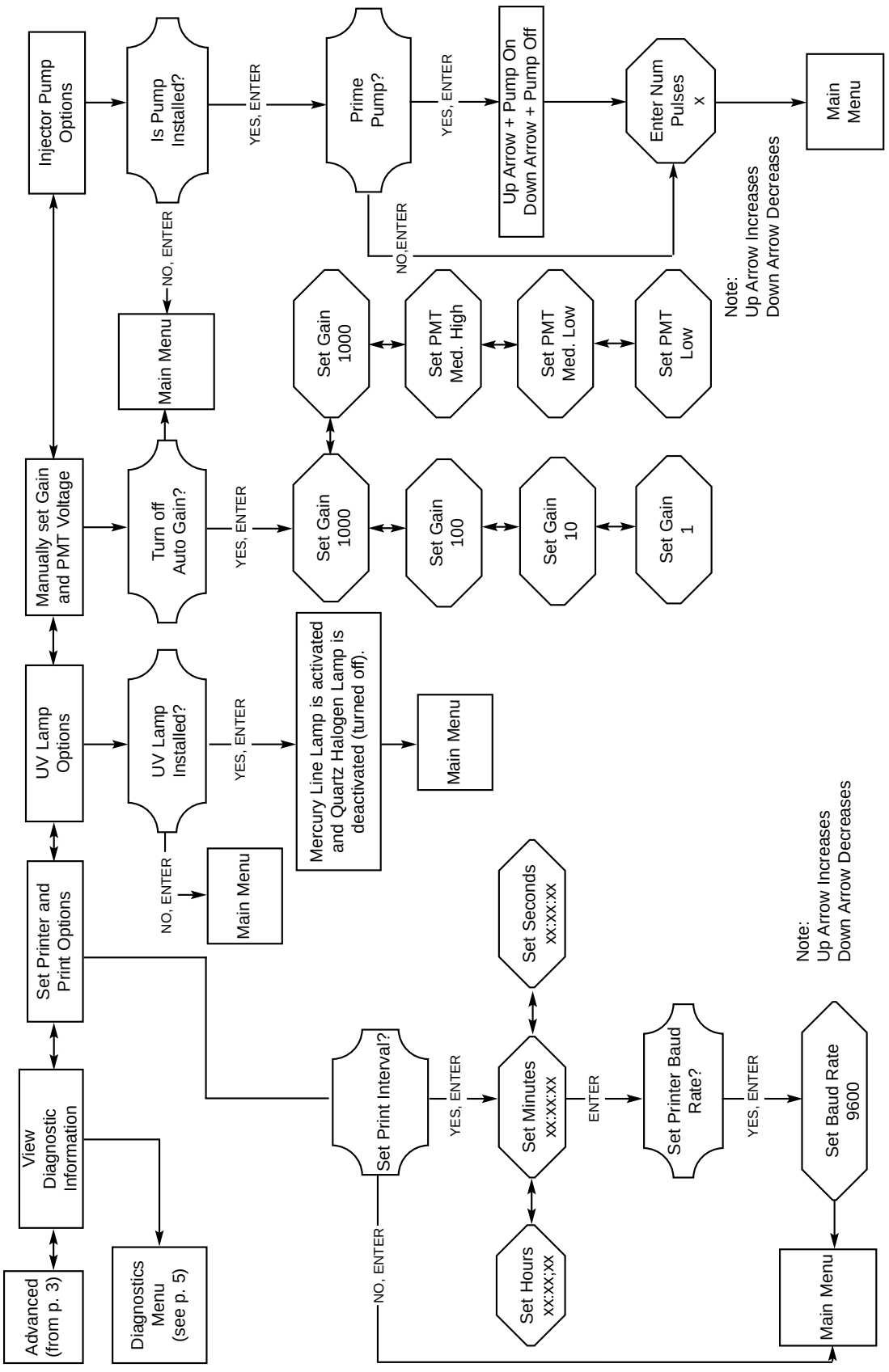
APPENDIX



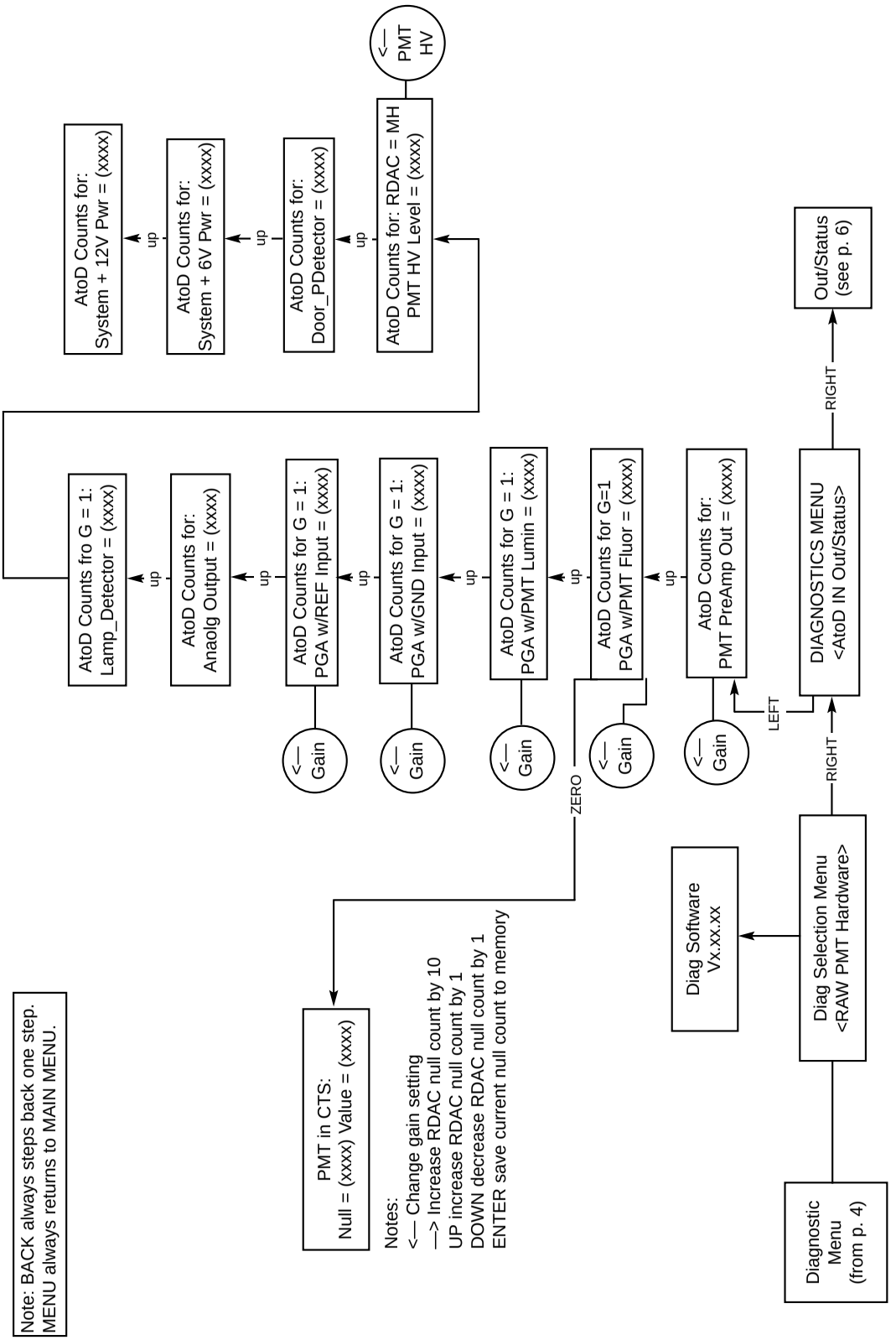
Flowchart: page 2



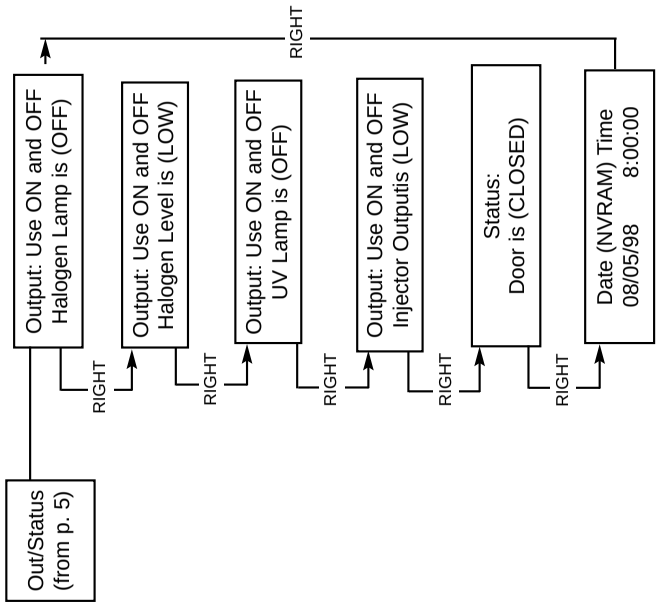
Flowchart: page 3



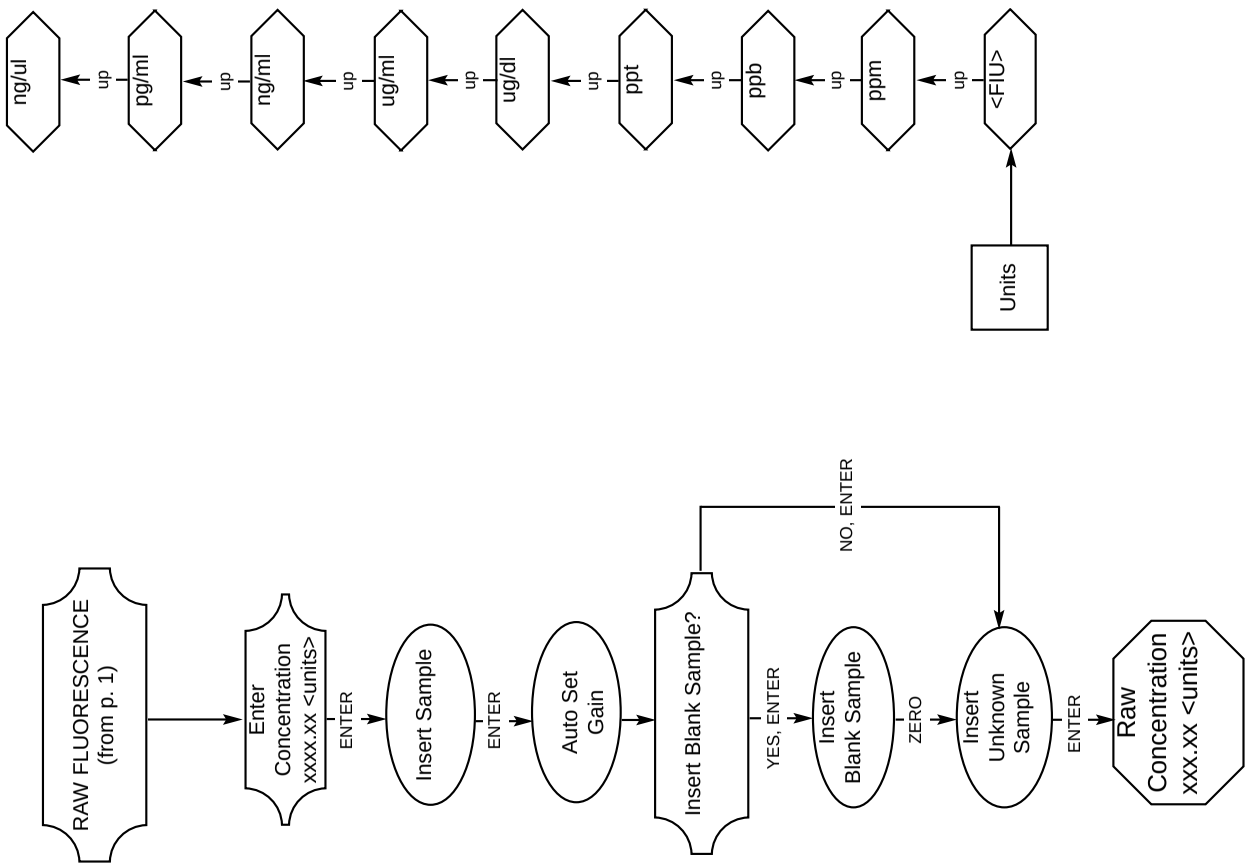
Flowchart: page 4



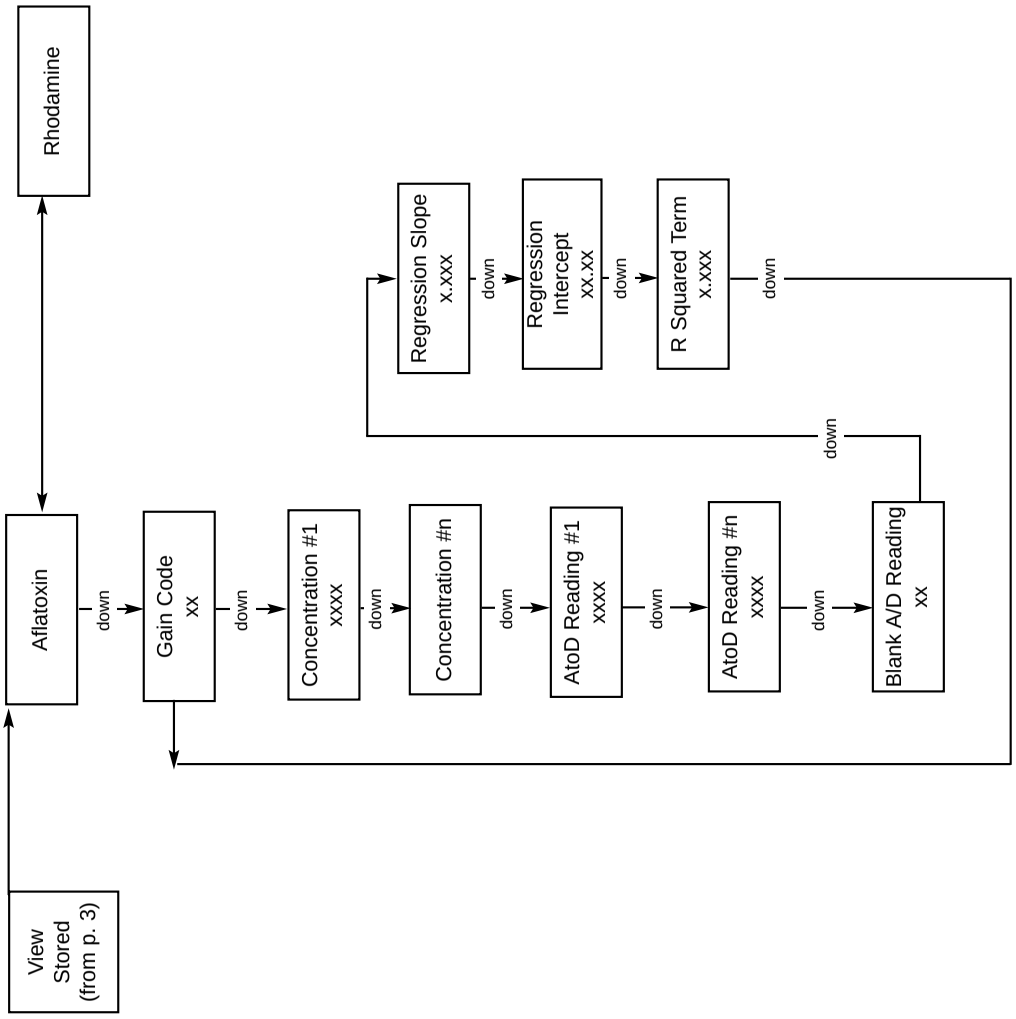
Flowchart: page 5



Flowchart: page 6



Flowchart: page 7



Flowchart: page 8

Ordering Procedures

Please refer to the Specification Plate for the complete model number, serial number, and series number when requesting service, replacement parts or in any correspondence concerning this unit.

All parts listed herein may be ordered from the **Barnstead|Thermolyne** dealer from whom you purchased this unit or can be obtained promptly from the factory. When service or replacement parts are needed we ask that you check first with your dealer. If the dealer cannot handle your request, then contact our Customer Service Department at 319-556-2241 or 800-553-0039.

Prior to returning any materials to **Barnstead|Thermolyne Corp.**, please contact our Customer Service Department for a “Return Goods Authorization” number (RGA). Material Returned without an RGA number will be returned.

Two Year Limited Warranty

Barnstead|Thermolyne Corporation warrants that if a product manufactured by **Barnstead|Thermolyne** and sold by it within the continental United States or Canada proves to be defective in material or construction, it will provide you, without charge, for a period of ninety (90) days, the labor, and a period of two (2) years, the parts, necessary to remedy any such defect. Outside the continental United States and Canada, the warranty provides, for two (2) years, the parts necessary to remedy any such defect. The warranty period shall commence either six (6) months following the date the product is sold by **Barnstead|Thermolyne** or on the date it is purchased by the original retail consumer, whichever date occurs first.

All warranty inspections and repairs must be performed by and parts obtained from an authorized **Barnstead|Thermolyne** dealer or **Barnstead|Thermolyne** (at its own discretion). Heating elements, however, because of their susceptibility to overheating and contamination, must be returned to our factory, and if, upon inspection, it is concluded that failure is not due to excessive high temperature or contamination, warranty replacement will be provided by **Barnstead|Thermolyne**. The name of the authorized **Barnstead|Thermolyne** dealer nearest you may be obtained by calling 1-800-446-6060 (319-556-2241) or writing to:

Barnstead|Thermolyne
P.O. Box 797
2555 Kerper Boulevard
Dubuque, IA 52004-0797
USA
FAX: (319) 589-0516
E-MAIL ADDRESS: mkt@barnstead.com

Barnstead|Thermolyne's sole obligation with respect to its product shall be to repair or (at its own discretion) replace the product. Under no circumstances shall it be liable for incidental or consequential damage.

THE WARRANTY STATED HEREIN IS THE SOLE WARRANTY APPLICABLE TO **Barnstead|Thermolyne** PRODUCTS. **Barnstead|Thermolyne** EXPRESSLY DISCLAIMS ANY AND ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS FOR USE.

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