Technical Manual

QuantiFluor™ Handheld Fluorometers Operating Instructions

INSTRUCTIONS FOR USE OF PRODUCTS E6090, E6105 AND E6100.

8772TA

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QuantiFluor™ Handheld Fluorometers Operating Instructions

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Please contact Promega Technical Services if you have questions on the use of this product. Email: techserv@promega.com

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1. Introduction

1.A. Description

The QuantiFluor™ Handheld Fluorometer is a dual-channel fluorometer designed for fast, reliable and accurate fluorescence measurements. When properly calibrated with a known standard, the QuantiFluor™ Handheld Fluorometer can be used to determine concentrations of unknown samples.

QuantiFluor™ Handheld Fluorometer Features:

- Compliant with the following EU directives:
  - 2004/108/EC Electromagnetic Compatibility
  - 2006/95/EC Low Voltage Directive
- Comprehensive technical support

1.B. Product Components

Product	Quantity	Cat.#
QuantiFluor™-ST Handheld Fluorometer	1 each	E6090

For Research Use. E6090 Filters: Channel A UV 365nm$_{Ex}$/440–470nm$_{Em}$; Channel B Blue (460nm$_{Ex}$, 515–575nm$_{Em}$). Includes:

- 1 QuantiFluor™ Handheld Fluorometer
- 1 AC Adapter with Interchangeable Plugs
- 4 10 × 10mm Square Methacrylate Cuvettes
- 1 Internal Data Logging (IDL) Package
- 1 RS-232 Cable and Software Instructions
- 1 Spreadsheet Interface Software (1 CD)
- 1 Setup Guide
- 1 CD containing Technical Manual

Available Separately

Product	Quantity	Cat.#
QuantiFluor™-ST Minicell Adapter Kit	1 each	E6112

For measuring 50–250µl of sample. Includes 400 glass cuvettes.

Product	Quantity	Cat.#
Solid Standard (for use with QuantiFluor™-ST instrument only)	1 each	E6113
AC Adapter with Interchangeable Plugs	1 each	E6096
QuantiFluor™ PCR Tube Adapter	1 each	E6101

Product	Quantity	Cat.#
QuantiFluor™-P Handheld Fluorometer (UV/Blue)	1 each	E6105

For Research Use. E6105 Filters: Channel A UV 365nm$_{Ex}$/440–470nm$_{Em}$; Channel B Blue (460nm$_{Ex}$, 515–575nm$_{Em}$). Includes:

- 1 QuantiFluor™ Handheld Fluorometer
- 4 AAA Batteries
- 4 10 × 10mm Square Methacrylate Cuvettes
- 1 Internal Data Logging (IDL) Package
- 1 RS-232 Cable and Software Instructions
- 1 Spreadsheet Interface Software (1 CD)
- 1 Setup Guide
- 1 CD containing Technical Manual

Product	Quantity	Cat.#
QuantiFluor™-P Handheld Fluorometer (Green/Blue)	1 each	E6100

For Research Use. E6600 Filters: Channel A Green 525nm$_{Ex}$/>570nm$_{Em}$; Channel B Blue (460nm$_{Ex}$, 515–575nm$_{Em}$). Includes:

- 1 QuantiFluor™ Handheld Fluorometer
- 4 AAA Batteries
- 4 10 × 10mm Square Methacrylate Cuvettes
- 1 Internal Data Logging (IDL) Package
- 1 RS-232 Cable and Software Instructions
- 1 Spreadsheet Interface Software (1 CD)
- 1 Setup Guide
- 1 CD containing Technical Manual

Available Separately

Product	Quantity	Cat.#
QuantiFluor™-P Minicell Adapter Kit	1 each	E6111

For measuring 75–250µl of sample. Includes 400 glass cuvettes

Product	Quantity	Cat.#
QuantiFluor™ PCR Tube Adapter	1 each	E6101

See the Related Products Section at the end of this Manual for additional accessories.

1.C. QuantiFluor™ Handheld Fluorometers General Specifications

Size	QuantiFluor™-ST: 2.7″ × 5.5″ × 7.25″ (6.9 × 14 × 18.42cm) QuantiFluor™-P: 1.75″ x 3.5″ x 7.25″ (4.45 × 8.9 × 18.4 cm)
Weight	QuantiFluor™-ST: 28.8oz. (0.67kg) QuantiFluor™-P: 14oz. (0.4kg)
Linear Dynamic range	4 logs, assay dependent
Resolution	12 bits
LCD Display	2 × 16 characters
Readout	Direct concentration
Detectors	Photodiodes: measurement capability from 300–1000nm
Calibration Type	Single-point
Alarms	Low battery (QuantiFluor™-P instruments only), high blank
Cuvette Type	10 × 10mm plastic, Minicell adapter
Warm-Up Time	5 seconds
Automatic Power Down	After 3 minutes of inactivity (QuantiFluor™-P instruments only)
Power Requirements	QuantiFluor™-ST: AC Adapter: 100–240V AC, 50/60 Hz., 0.25A Instrument: 9V DC, 0.3A QuantiFluor™-P: 4 AAA Batteries

1.D. QuantiFluor™ Handheld Fluorometers Optical Specifications

Light Source	UV LED*	Blue LED	Green LED (QuantiFluor™-P Instrument, Cat.# E6100 only)
Excitation Optics	365nm	460nm	525nm
Emission Optics	440–470nm	515–575nm	>570nm
Limit of Detection	10ng/ml dsDNA using Hoechst Dye 33258	<50pM Fluorescein	<200pM Rhodamine

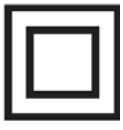
* For UV measurements, we recommend use of methacrylate cuvettes.

1.E. Inspection

Upon receiving your QuantiFluor™ Handheld Fluorometer, please inspect the package carefully to make sure all items are present and undamaged. Save original packaging in case the instrument needs to be returned for repair or service. All shipments include:

- QuantiFluor™ Fluorometer (Cat.# E6090, E6105, or E6100)
- 4 AAA Batteries (Cat.# E6105 or E6100 only)
- AC Adapter with interchangeable plugs (Cat. # E6090 only)
- 4 10 × 10mm Square Polystyrene Cuvettes (3.5ml capacity)
- Internal Data Logging (IDL) package
- RS-232 Cable
- Spreadsheet Interface Software (1 CD)
- CD containing Technical Manual

1.F. Precautions and Special Instructions

Safety Symbols and Markings		
	Danger. Hazardous voltage. Risk of electrical shock.	Danger. Tension dangereuse. Risque de choc électrique.
	Warning. Risk of personal injury to the operator or a safety hazard to the equipment or surrounding area.	Avertissement. Risque de préjudice corporel pour l'opérateur ou d'accident avec l'instrument ou l'entourage.
	It is important to understand and follow all laws regarding the safe and proper disposal of electrical instrumentation. Please contact your local Promega Representative for disposal of the instrument and power supply. Please follow your institutional requirements for disposal of the accessories.	Avertissement. Il est important de comprendre et de respecter toutes les lois relatives à la destruction sûre et correcte des appareils électriques. Veuillez contacter votre représentant Promega local concernant la destruction de l'appareil. Veuillez respecter les exigences de votre établissement concernant la destruction des accessoires.
	Equipment protected by double insulation or reinforced insulation (Cat.# E6090 AC Adapter).	Equipement protégé par une double isolation ou par une isolation renforcée (Cat.# E6090 AC Adapter).

Precautions IMPORTANT SAFETY INSTRUCTIONS. PLEASE SAVE THESE INSTRUCTIONS.		
	Do not submerge the QuantiFluor™ Fluorometer in water.	Ne pas submerger le QuantiFluor™ Fluorometer dans l'eau.
	If a liquid is accidentally spilled inside the Sample Compartment, invert the QuantiFluor™ Fluorometer to drain the excess liquid. Then wipe the inside area dry with a clean soft towel or tissue.	En cas de versement involontaire de liquide dans le compartiment de lecture, inversez le fluorimètre QuantiFluor™ pour drainer le liquide résiduel. Ensuite nettoyez et séchez l'intérieur de l'instrument avec un tissu souple.
	Always disconnect the power before cleaning or performing routine maintenance.	Il faut toujours éteindre l'instrument avant de le nettoyer ou d'effectuer de l'entretien de routine.
	Always disconnect the AC Adapter from the power outlet when not in use (Cat.# E6090).	Toujours enlever l'adaptateur AC de la prise électrique lorsqu'il n'est pas utilisé (Cat.# E6090)

Special Instructions

Note: Failure to operate, store and use the QuantiFluor™ Handheld Fluorometers as directed will invalidate the warranty.

- Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
- Do not use this device in proximity to sources of strong electromagnetic radiation (e.g., unshielded intentional RF sources), because these may interfere with the proper operation.
- Do not use this instrument for anything other than its intended use.
- If the equipment is used in a manner other than that specified by Promega, the protection provided by the equipment may be impaired.
- Do not disassemble the unit.
- The QuantiFluor™ Fluorometer readily accepts methacrylate cuvettes (Cat.# E6093) for reading in the UV channel or polystyrene (Cat.# E6092) cuvettes for reading in the BLUE or GREEN channel. Do not use glass or quartz cuvettes. Do not use the Minicell Cuvettes without the Minicell Adapter.
- The Sample Compartment cannot accept cuvettes with an outer diameter over 12mm. The 10mm size refers to the internal diameter of the cuvette, so some plastic cuvettes may be too large.
- Do not force oversized cuvettes into the Sample Compartment. This can damage the Sample Compartment. If the cuvette does not easily fit into the Sample Compartment, use a different cuvette.
- Use caution around solvents because they may corrode the plastic case of the QuantiFluor™ Fluorometer.
- If a liquid is accidentally spilled inside the Sample Compartment, invert the QuantiFluor™ Fluorometer to drain the excess liquid. Then wipe the inside area dry with a clean soft towel or tissue. Always power off the instrument before cleaning. Be sure to unplug QuantiFluor™-ST fluorometers before cleaning.
- If extra cleaning is needed, use a mild detergent to dampen the towel and wipe.
- Do not submerge the QuantiFluor™ Fluorometer in water.
- Do not expose the QuantiFluor™ Fluorometer to temperatures outside the specified range since damage to the unit may occur.
- A minimum volume of 2ml in a 10 × 10mm cuvette is required for best results.
- The Minicell Adapter requires a minimum volume of 50µl for the QuantiFluor™-ST Fluorometer and 75µl for the QuantiFluor™-P Fluorometers and accepts maximum total volume of 250µl.
- Avoid having any air bubbles in your sample because these may significantly affect the fluorescence reading.

1.G. Environmental Requirements

Shipping and Storage conditions for QuantiFluor™ Fluorometers:
5–40°C under noncondensing conditions, up to 75% humidity
Operating conditions for QuantiFluor™ Fluorometers:
15–30°C, up to 75% humidity, height above sea level: up to 2000m

2. Setting Up the QuantiFluor™ Handheld Fluorometers

QuantiFluor™-ST Fluorometer

1. Position the instrument on a flat surface.
2. Choose the appropriate AC plug for your wall outlet. If you need to remove a plug from the adapter, depress the button immediately underneath the plug and slide the plug off the AC adapter (Figure 1). Slide the desired AC plug onto the Adapter from the top until it clicks into place.

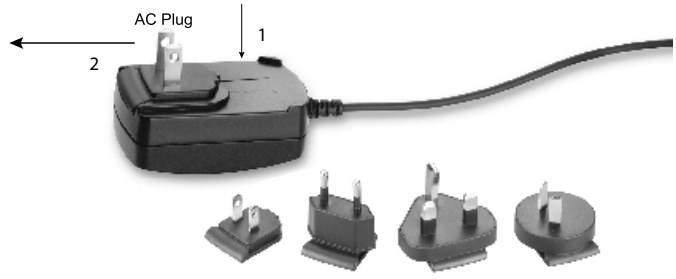


Figure 1. Placing the plug on the AC Adapter. Depress the button immediately underneath the plug (arrow 1), and slide the plug off the AC Adapter in the direction of arrow 2. Choose the appropriate plug and slide onto the AC Adapter from the top down until it clicks into place.

3. Plug the AC into the QuantiFluor™ Fluorometer (Figure 2).

Be sure to use only the AC Adapter provided with your instrument. Powering the instrument with an unapproved AC Adapter may damage the unit.

4. Plug the AC Adapter into a wall outlet.

Figure 2. Top view of the QuantiFluor™-ST Fluorometer showing the AC Adapter Input.

5. To turn on the QuantiFluor™-ST, press the **ON/OFF** button. The instrument takes 5 seconds to warm up. After the warm-up, the QuantiFluor™-ST is ready for operation.
6. To adjust the brightness of the LCD, press the **UP ARROW** or **DOWN ARROW** buttons.

QuantiFluor™-P Fluorometers

1. On the back of the instrument, loosen the screw and pull the screw up to remove the battery panel (Figure 3).
2. Install the 4 AAA batteries into the appropriate spaces. Replace the battery panel and tighten the screw. The panel has an o-ring, which creates a water-tight seal. The battery panel may be difficult to install if there is no lubrication on the o-ring. Use a silicon-based grease to lightly lubricate the o-ring, if necessary.

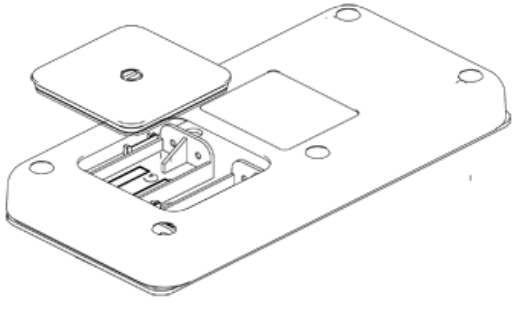


Figure 3. Back Panel of the QuantiFluor™-P Fluorometer showing the battery compartment.

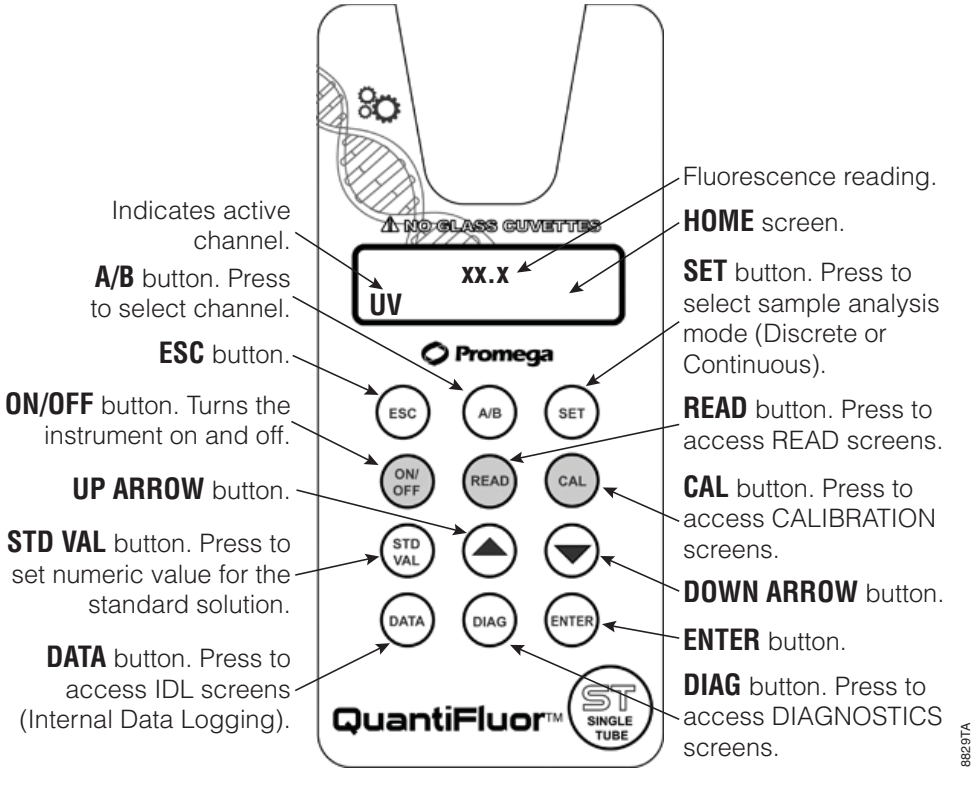


Figure 4. Front Panel of the QuantiFluor™-ST Handheld Fluorometer. The control panel of the QuantiFluor™-P instrument is identical.

3. Instrument Calibration and Operation

An instrument workflow chart is provided in Section 8.

3.A. Instrument Power Up and Shut Down

To turn on the QuantiFluor™ Fluorometer, press the **ON/OFF** button. The instrument takes five seconds to warm up. After the warm-up, the QuantiFluor™ Fluorometer is ready for use. Pressing the **ON/OFF** button again will turn off the unit.

QuantiFluor™-P units only: If left idle for three minutes, the unit will automatically turn off to save battery power.

A set of new batteries can last over 1,000 sample readings. If the batteries have low power or are not positioned properly, the following warning message will appear: "Batt Level < 20% !! Caution !!"

QuantiFluor™-ST units only: After switching off the unit, unplug the AC Adapter from the wall outlet.

3.B. LCD

The QuantiFluor™ Fluorometer has a backlit, adjustable-brightness LCD (Liquid Crystal Display) for easier viewing. The contrast may change with temperature and may get lighter as the unit gets colder. While on the HOME screen, adjust the brightness of the LCD using the **UP ARROW** and **DOWN ARROW** buttons.

3.C. Detection Channel Configuration

The QuantiFluor™ Fluorometers have two fluorescence detection channels. Identify the configuration by looking at the label on the back side of the QuantiFluor™ Fluorometer. See the Optical Specifications table in Section 1.D to confirm the correct configuration for your application.

Select the appropriate channel by pressing the **A/B** button to toggle between the two channels. The display will show a label in the lower left corner of the HOME screen to identify which channel is activated.

QuantiFluor™-ST Fluorometer (Cat.# E6090)

Channel A	UV ($365nm_{Ex}$, $440–470nm_{Em}$),
Channel B	Blue ($460nm_{Ex}$, $515–575nm_{Em}$)

QuantiFluor™-P Fluorometer (UV, Blue; Cat.# E6105)

Channel A	UV ($365\ nm_{Ex}$, $440–470nm_{Em}$),
Channel B	Blue ($460\ nm_{Ex}$, $515–575nm_{Em}$)

QuantiFluor™-P Fluorometer (Green, Blue; Cat.# E6100)

Channel A	Green ($525nm_{Ex}$, $>570nm_{Em}$)
Channel B	Blue ($460nm_{Ex}$, $515–575nm_{Em}$)

3.D. Calibration Overview

The QuantiFluor™ Fluorometer should be calibrated using a primary standard. A primary standard contains the same fluorescent material that will be measured in the unknown samples. The QuantiFluor™ Fluorometer will give an actual quantitative concentration reading when a primary standard of known concentration is used for calibration. The primary standard is either made to a known concentration, or to a known dilution factor. Ideally, the primary standard and blank samples, used for calibration, are made with the same buffer in which the tests are performed. The standard and samples must be in the linear detection range to achieve accurate quantitative results. See the General Considerations Section (Section 5) for more details about the linear range and sample quenching.

Notes:

1. The Minicell Adapter requires a minimum volume of 50µl for the QuantiFluor™-ST Fluorometer and 75µl for the QuantiFluor™-P Fluorometer and accepts maximum total volume of 250µl.
2. The 10 × 10mm square methacrylate or polystyrene cuvettes require a minimum volume of 2ml.
3. Be sure to insert the Minicell Adapter in the correct orientation when a Minicell cuvette is used. If the BLUE channel is selected, insert the Minicell Adapter into the Sample Compartment with the tab away from you and the blue label facing you. If the UV channel is selected, insert the Minicell Adapter into the Sample Compartment with the tab close to you and the UV label facing you.
4. The sample compartment lid must be closed before the instrument will read your sample.

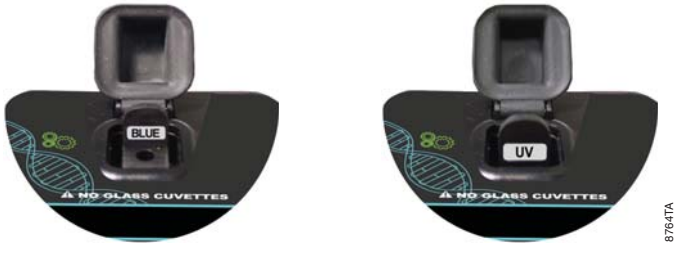


Figure 5. Inserting the Quantifluor™-ST Minicell Adapter.

5. The Minicell Adapter for the QuantiFluor™-P is multidirectional and can be inserted in any orientation.

3.E. Calibration

For best accuracy, always calibrate prior to a sample analysis. The QuantiFluor™ Fluorometer will save the calibration settings for each channel until a new calibration is performed.

If the temperature of the sample or the QuantiFluor™ Fluorometer changes significantly, the readings may show a small shift. In this case, consider recalibrating. The Solid Standard (Cat.# E6113, which is available for the QuantiFluor™-ST only) is useful for checking the reading stability over time.

Cuvette orientation and cleanliness also can affect accuracy.

3.F. Setting the Calibration Standard Value

These directions define the numeric value for the standard to be read. The units of measurement are set in µg/L. For example if a Primary Standard has a 50µg/L concentration, then set the value to 50, and the implied unit of measure will be in µg/L.

1. Press the **STD VAL** button to view the value of the standard currently set. The screen will display "Cal Val: XX.X <UP/DOWN> BLUE".

   Note: Be quick. After after 5 seconds, the display defaults to home. This standard value will apply only to the channel you have previously selected using the **A/B** button (Section 3.C).

2. Press the **UP ARROW** or **DOWN ARROW** buttons to set the standard value. Holding down either of the arrow buttons will result in faster scrolling of the value.

3. When you have set the standard value, press the **ENTER** to accept the value and return to the HOME screen.

3.G. Performing the Calibration

1. Press th**e CAL** button, the screen will display "Calib BLUE <ENT> to start".

2. Press the **ENTER** button to move to the next screen, which will display "Insert Blank then press <ENT>".

3. Insert the blank sample, and press the **ENTER** button. The QuantiFluor™ Fluorometer will average the reading for 10 seconds and set the zero (blank) point. During this time the screen will display "Reading Blank".

4. After the instrument has set the zero point, the screen will display "Insert Cal Soln then press <ENT>".

5. Insert your standard sample and press the **ENTER** button.

6. The average reading is taken for 10 seconds, and the Standard Calibration value is set. Once the value is set, the screen will display "Calib Complete press <ENT>".

   Note: If the instrument was calibrated with the highest concentration standard, and the RFU of the standard is too close to that of the blank, the instrument will register a "Standard<Blank Recalibrate" message. The RFU of the standard (RFU-STD) must be at least 3X greater than the RFU of the blank (RFU-BLK) in order to calibrate the instrument. If the "Standard<Blank Recalibrate" message appears, we recommend increasing the standard concentration by 10X or examining the blank for high fluorescence background.

7. Press the **ENTER** button to accept the calibration. If the **ENTER** button is not pressed within 10 seconds, a message will display asking if you wish to abort the calibration. Press the **UP ARROW** to abort the calibration or the **DOWN ARROW** to accept it. If you abort the calibration, the display will return tot he HOME screen, and the instrument will default to the previous calibration.

   Note: At any time during Steps 1-4, you can press the **ESC** button to stop the calibration. The display will return to the HOME screen, and the instrument will default to the previous calibration.

3.H. Sample Analysis

The QuantiFluor™ Fluorometers are capable of measuring samples in two reading modes: Discrete or Continuous. In Discrete Mode, the instrument measures and averages the fluorescence signal over a 5-second interval. In Continuous Mode, the instrument measures and averages the fluorescence signal over a user-defined interval for each sample measurement. The instrument measures the sample repeatedly for a user-defined number of samples.

Discrete Mode

1. Press the **SET** button to set the read mode.
2. Press the **UP ARROW** or the **DOWN ARROW** button to toggle between Discrete and Continuous Modes.
3. Once the screen reads "Read Mode: Discrete", press the **ENTER** button.
4. Insert the sample. Using the specified cuvette or the Minicell Adapter and Minicell Cuvette.

   Note: The sample compartment lid must be closed before the instrument will read your sample.
5. Press the **READ** button. The instrument will measure and average the fluorescence signal over a 5-second interval. During this time the instrument screen will indicate "Reading". The result will be displayed at the top center of the screen.
6. Once the "Reading" message disappears, another sample can be read.

Continuous Mode

Note: For Continuous Mode, either the Internal Data Logging function must be enabled or the instrument must be connected to an external PC or printer**.**

1. Press the **SET** button to set the read mode.
2. Press the **UP ARROW** or the **DOWN ARROW** button to toggle between Discrete and Continuous Modes.
3. Once the screen reads "Read Mode: Continuous", press the **ENTER** button.
4. The screen will read "Continuous Meas Interval: 5 sec." Use the **UP ARROW** and **DOWN ARROW** buttons to change the interval time.
5. Press the **ENTER** button when your desired interval time is displayed. (5, 10, 30 or 60 seconds)
6. The screen will display "Cont Meas Count". Use the UP ARROW and DOWN ARROW buttons to select the number of samples you want to measure. Press the ENTER button.
7. Press the READ button.
8. The screen will display "CONT: count = XX <ENT> int = x sec". Press the ENTER button.
9. The screen will display "Insert Sample Press <ENTER>". Insert your sample, close the compartment lid, and press the ENTER button again.

   Note: The sample compartment lid must be closed before the instrument will read your sample.

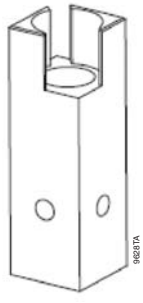
10. During reading the instrument screen will indicate "READING" or "WAITING". The result will be displayed at the top, center of the screen when all counts are measured. At this point, another sample can be read.

11. To read next sample repeat steps 7–10.

3.I. QuantiFluor™ PCR tube Adapter Operation

The QuantiFluor™ PCR tube Adapter (Cat.# E6101) allows measurement of small sample volumes in 0.5 ml PCR tubes, while still preserving the superior sensitivity of the QuantiFluor™ Fluorometer. The PCR tube Adapter is multidirectional and can be inserted into the Optical Kit sample compartment in any orientation.

Transfer the sample to a 0.5 ml PCR tube. The minimum volume required for reproducible results is 100µl. Insert the PCR tube into the PCR tube Adapter, close the lid, and measure the sample. Take care not to introduce air bubbles into the sample.



QuantiFluor™ PCR tube Adapter.

3.J. Diagnostic Information

The Diagnostic screens show the number of points available and the current values for the calibration and blank standards.

1. Press the **DIAG** button to access the diagnostic screens.

2. The first screen shows the number of available data points for internal data logging.

3. Press the **ENTER** button to toggle to the RFU (Relative Fluorescence Unit) values from the calibration blank and standard.

4. Press the **ESC** button when finished to return to the HOME screen.

   Note: If the instrument was calibrated with the highest concentration standard, and the RFU of the standard is too close to that of the blank, the instrument will register a Standard<Blank Error message.The RFU value of the Standard must be 3 times greater than the RFU value of the blank.

3.K. Solid Standard

Note: The Solid Standard (Cat.# E6113) is for use with the QuantiFluor™-ST Handheld Fluorometer (Cat.# E6090) only.

The Solid Standard (Cat.# E6113) is designed to verify the stability of the QuantiFluor™-ST Handheld Fluorometer by checking drift of the calibration. It will also verify if any instrument settings have been changed.

1. After calibration, insert the Solid Standard into the sample compartment of the QuantiFluor™-ST Fluorometer.

   Note: always insert the Solid Standard with the tab away from you.

2. Press the READ button.

3. Record the reading.

4. Check the calibration and/or the stability of the instrument by periodically reading the Solid Standard.

5. Confirm that the current measured value does not deviate from previously recorded value by 5% or more. If the value of the Solid Standard deviates by 5% or more, it is time to recalibrate the instrument (see Sections 3.D–3.G)

   Note: If you recalibrate the channel, then a new measurement for the Solid Standard must be taken and stored for future reference.

4. Internal Data Logging (IDL; additional information is available in Section 7)

4.A. Activating IDL

1. Press the **DATA** button 2 times.
2. Press the **ENTER** button to choose between logging and stop.
3. Press the **ESC** button when finished to return to the HOME screen.

Note: Once activated, the IDL is capable of storing 1000 data points

4.B. Downloading Data to a Computer

Important Note: Before you can download data that have been logged on your QuantiFluor™ Fluorometer to a computer, that computer must have the Spreadsheet Interface Software Installed. See Section 7 for computer requirements and installation instructions.

1. Connect the QuantiFluor™ Fluorometer to the computer serial port using the provided interface cable.
2. Open the Spreadsheet Interface Software.
3. Press the **DATA** button 3 times. The screen will display: "Download data: 5X<ENT> to start".
4. Press the **ENTER** button 5 times to start downloading the data.
5. Press the **ESC** button when the data have downloaded to return to the HOME screen.

   Note: If no data are logged, the screen will display the following message "Data logger has no valid data."

4.C. Erasing Data from the QuantiFluor™ Instrument

1. Press the **DATA** button 4 times. The screen will display "Erase data: 5X <ENT> to start."
2. Press the **ENTER** button 5 times to erase all logged data from the QuantiFluor™ Instrument. When the data are erased, the screen will display the following message: "Erase Data All data erased."
3. Press the **ESC** button to return to the HOME screen.

5. General Considerations

5.A. Handling Samples

1. Take care not to spill liquid into the Sample Compartment. Promptly wipe any spills.
2. The QuantiFluor™ Fluorometers are very sensitive, and even small amounts of material from a previous sample may result in errors. Use a clean cuvette for each reading. Thorough and proper cleaning of cuvettes between sample readings is essential and is especially important if the same cuvette is used for both the sample and the blank.
3. The minimum volume is 2ml for 10 × 10mm cuvette, or 50µl and 75µl for the QuantiFluor™-ST and QuantiFluor™-P Minicell Adapters, respectively.
4. Ensure that the cuvette is clean and dry on the outside when taking readings. Moisture and condensation on the outside can result in error.
5. Minute bubbles in samples will cause errors in the readings. Be sure not to introduce bubbles into samples. Particular care must be taken with the Minicell Adapter. Slight tapping on the outside cuvette wall often will help dissipate bubbles.

5.B. Linear Range and Quenching

The linear range is the concentration range in which the QuantiFluor™ Fluorometer readout is directly proportional to the concentration of the fluorophore. The linear range begins with the smallest detectable concentration and continues to an upper concentration limit that depends upon the properties of the fluorescent material, the filters used, and the path length.

A nonlinear relationship occurs at higher concentrations where the fluorescence signal increases at decreasing rates in relation to the concentration change. At even higher concentrations, readings begin to decrease despite increasing sample concentrations. This effect is known as "signal quenching."

Linearity may be checked by diluting a sample 1:1 or some other appropriate ratio (be sure to use a corresponding buffer for the dilutions). If the sample is within the linear range, the reading will decrease in direct proportion to the dilution. If the reading does not decrease in direct proportion to the dilution or if the reading increases, the sample is beyond the linear range of the fluorophore.

5.C. Temperature

Fluorescence is temperature-sensitive. As the temperature of the sample increases, the fluorescence decreases. For greatest accuracy, read the blank, standard and samples at the same temperature.

5.D. Sample Position

For low-concentration samples, cuvettes often give slightly different measurements depending upon their orientation in the sample compartment. This is due to defects in the shape of the cuvette that are not visible to the human eye. We recommend marking the cuvette at the top and positioning it in the Sample Compartment the same way each time to minimize error.

5.E. Data Quality

The QuantiFluor™ Fluorometer is only as accurate as the standards that are used to calibrate it. It is important to take care when preparing standards, samples and blank. Follow the appropriate laboratory practices when preparing all solutions and reagents.

5.F. Periodic Maintenance and Cleaning

Keep the outside of the instrument clean by wiping with a damp cloth. Remove spills or stains with a cloth dampened with a mild detergent.

If a liquid is accidentally spilled inside the Sample Compartment, invert the QuantiFluor™ Fluorometer to drain the excess liquid. Then wipe the inside area dry with a clean soft cloth. If extra cleaning is needed use a cloth dampened with a mild detergent.

Do not use solvents; they may corrode the plastic case of the QuantiFluor™ Fluorometer.

Do not submerge the QuantiFluor™ Fluorometer in water. Do not disassemble the unit.

Always power off the instrument before cleaning. Be sure to unplug the QuantiFluor™- Fluorometer before cleaning.

6. Troubleshooting

For questions not addressed here, please contact your local Promega Branch Office or Distributor. Contact information available at: **www.promega.com**. E-mail: **techserv@promega.com**

Symptoms	Possible Causes and Comments
Low or no reading	Use the Solid Standard to determine if the instrument is functioning properly (with QuantiFluor™-ST, Cat.# E6090 only; Section 3.K). If the value of the Solid Standard deviates from the previous reading by 5% or more, recalibrate the instrument.
	Check to ensure that all reagents and standards are made to specification and not expired. Make sure that dilutions were performed correctly.
	Protect sample from light. Some fluorophores are susceptible to photodegradation.
	Make sure the correct optical channel is selected.
	Make sure that the instrument is properly calibrated before reading samples.
	Ensure that the sample signal is within the linear range of detection. Perform a dilution series if necessary.
	Ensure that the sample cuvette is appropriate. Methacrylate cuvettes should be used for UV applications.
	Avoid sudden temperature fluctuations.
	Ensure that sample volume is at least 2ml for the 10 × 10mm cuvette or 50µl for the QuantiFluor™-ST Minicell cuvette or 75µl for the QuantiFluor™-P Minicell cuvette.
	If you are using a QuantiFluor™-ST Minicell Adapter, be sure that it is in the correct orientation. If the BLUE channel is selected, insert the Minicell Adapter in the Sample Compartment with the tab away from you and the BLUE label facing you. If the UV channel is selected, insert the Minicell Adapter in the Sample Compartment with the tab close to you and the UV label facing you.

Symptoms	Possible Causes and Comments
Low or no reading (continued)	Ensure that the orientation of the Minicell cuvettes is consistent.
	Make sure that the Relative Fluorescence Unit value of the calibration standard is at least 3X greater than the blank. If the values of the standard and the blank are too close, the instrument will register a *Standard*<*Blank* error message.
Readings outside the linear range of detection	Dilute samples and standards so that the signal falls within the linear range of detection.
Fluctuating results	Use the Solid Standard to determine if the instrument is functioning properly.
	Check for spills in the sample compartment. If liquid is spilled inside the sample compartment, invert the fluorometer to drain the excess liquid. Wipe the inside area with a clean soft cloth. Clean any spills with a damp cloth or a towel dampened with a mild detergent.
	Ensure that sample volume is at least 2ml for a 10 × 10mm cuvette or 50µl for the QuantiFluor™-ST or 75µl QuantiFluor™-P Fluorometer minicell cuvette, respectively.
	Ensure that the sample cuvette is appropriate. Methacrylate cuvettes should be used for UV applications.
	Avoid dramatic temperature fluctuations. Fluorescence is temperature-sensitive. As the temperature of the sample increases, the fluorescence decreases. For greatest accuracy, read the blank, standard and samples at the same temperature.

7. Internal Data Logging Package

7.A. Shipping Checklist

The Internal Data Logging (IDL) Package includes:

- RS-232 cable
- Spreadsheet Interface Software (1 CD)

Both of these items are necessary for retrieving the stored data from the QuantiFluor™ Handheld Fluorometer.

7.B. Hardware Requirements for IDL

- Computer with Windows® XP SP2 operating system or later
- Microsoft® Excel® 2003 or later
- At least 1 available RS-232 serial port

  Note: If your computer does not have a RS-232 serial port, a USB Serial adapter is required for connection to an external PC.

7.C. Installing IDL Software

1. Exit all Windows® programs.
2. Insert the CD, and run the setup program.
3. The setup wizard will install the necessary files. When the setup is complete, a SPREADSHEET INTERFACE SOFTWARE icon will appear in the PROGRAMS menu.
4. Restart the computer.

7.D. Connecting the QuantiFluor™ Fluorometer

1. Connect the RS-232 Cable into the available serial port of the computer.
2. Plug the opposite end of the cable into the base of the QuantiFluor™ Fluorometer.
3. Open the Spreadsheet Interface Software.
4. Click on the box to the right of the COM port icon to select the appropriate COM port. This is usually COM port 1.
5. Click on the **START** button. The program will open Microsoft® Excel® and should be ready for data transfer. The boxes left of the words COM port and Microsoft® Excel® should both be green.

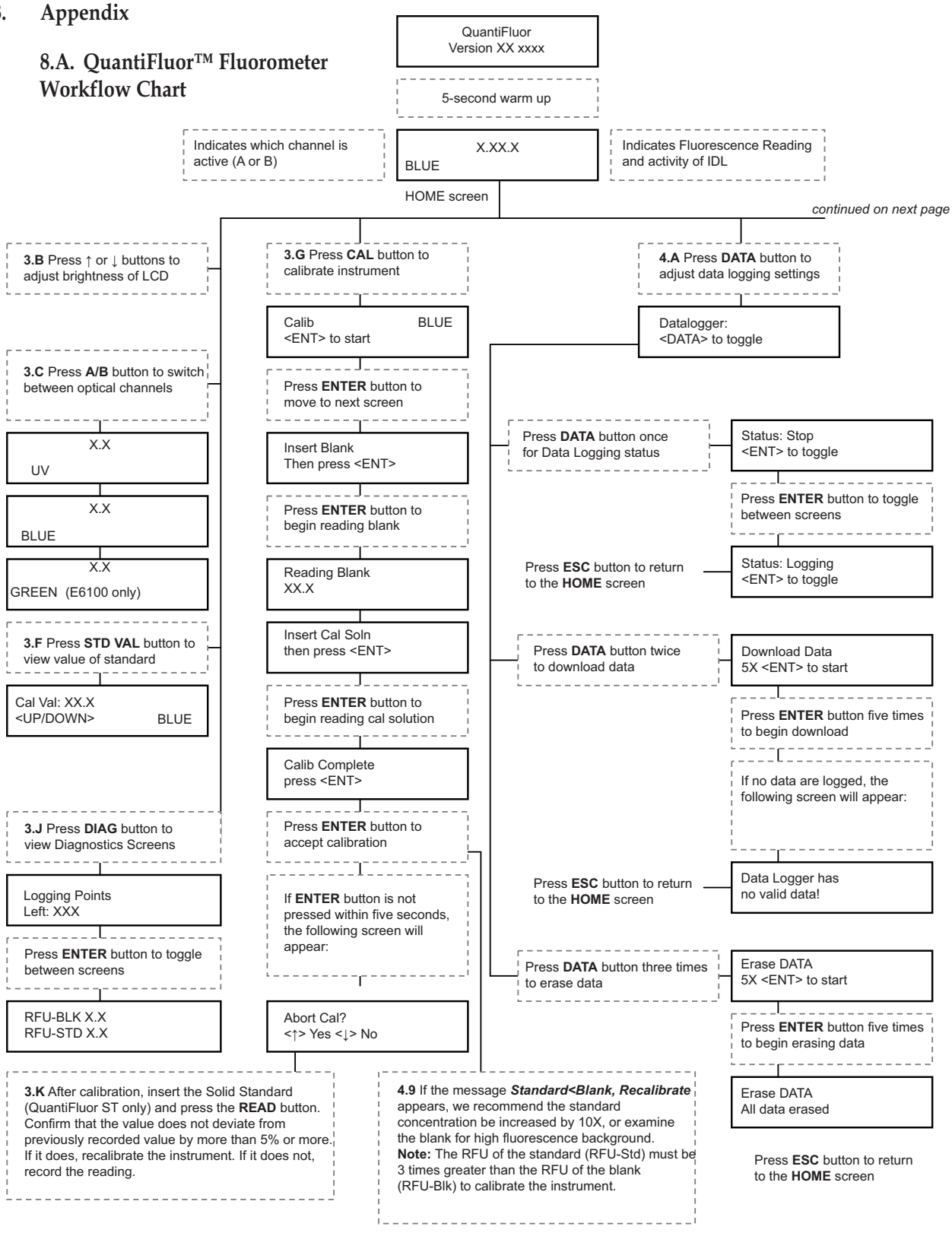
6. Follow the directions from Section 4 for collecting and downloading data from the QuantiFluor™ Fluorometer. Data will automatically populate in the Excel® spreadsheet. Be sure to save these data before closing the software.

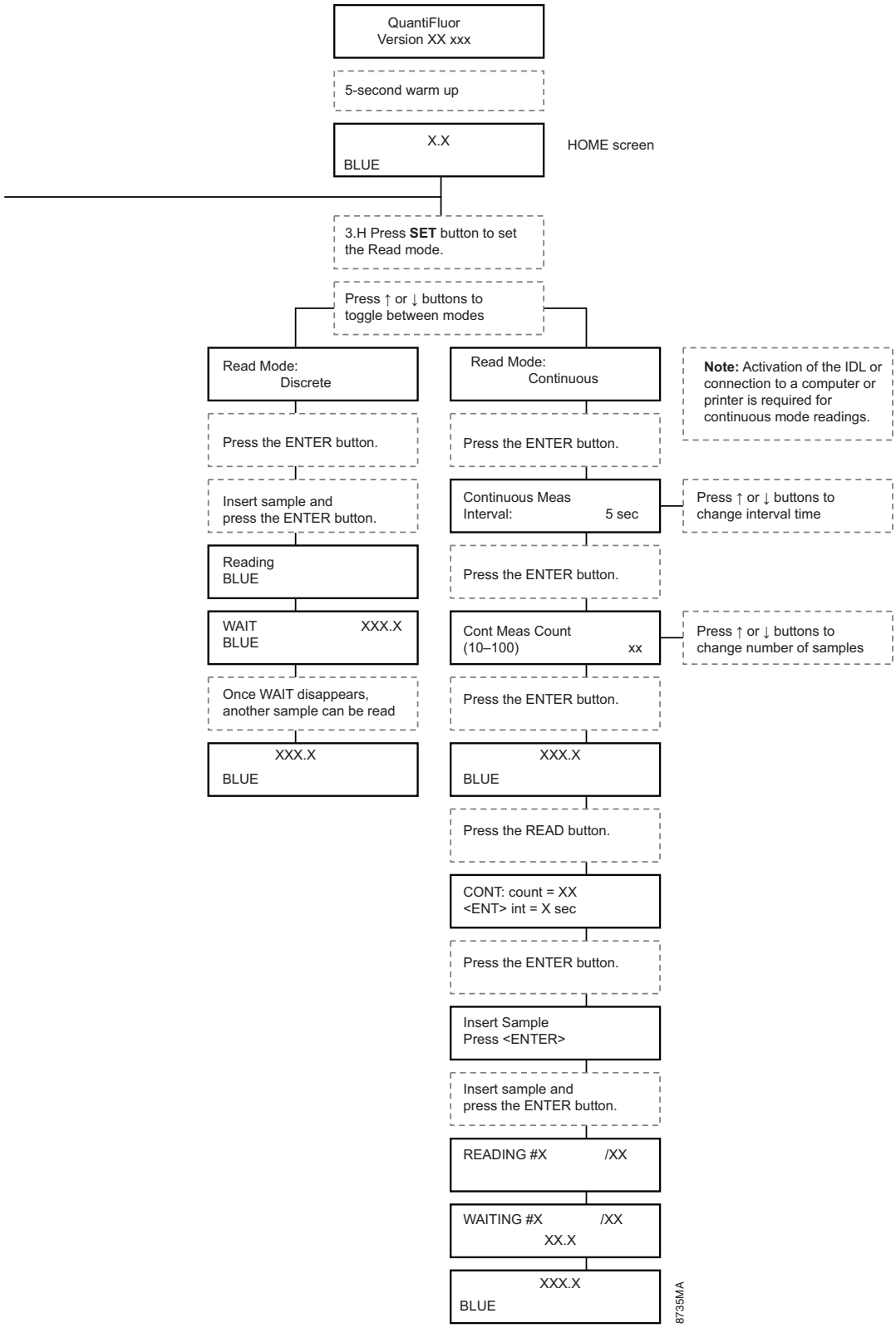
7.E. Troubleshooting Internal Data Logging

Symptoms	Possible Causes and Comments
The box to the left of the COM port is red.	This means that the COM port is not available. Another instrument or program could be occupying the port, making it unavailable. Make sure to close all programs of this type before downloading data.
	The port selected is incorrect. Click on the box to the right of the COM port icon to select the appropriate COM port.
All of the lights are green, but no data are transferred even though the , says, "All data downloaded"	The connection between the instrument and the computer is bad. Check and tighten the cable connections. Make sure both ends of the cable are plugged in tightly.
No data downloaded	IDL not activated. Refer to Section 4 for instructions.

8. Appendix

8.A. QuantiFluor™ Fluorometer Workflow Chart




QuantiFluor
Version XX xxx
5-second warm up
X.X
BLUE
HOME screen
3.H Press **SET** button to set the Read mode.
Press ↑ or ↓ buttons to toggle between modes
Read Mode:
Discrete
Press the ENTER button.
Insert sample and press the ENTER button.
Reading
BLUE
WAIT XXX.X
BLUE
Once WAIT disappears, another sample can be read
XXX.X
BLUE
Read Mode:
Continuous
Note: Activation of the IDL or connection to a computer or printer is required for continuous mode readings.
Press the ENTER button.
Continuous Meas
Interval: 5 sec
Press ↑ or ↓ buttons to change interval time
Press the ENTER button.
Cont Meas Count
(10–100) xx
Press ↑ or ↓ buttons to change number of samples
Press the ENTER button.
XXX.X
BLUE
Press the READ button.
CONT: count = XX
<ENT> int = X sec
Press the ENTER button.
Insert Sample
Press <ENTER>
Insert sample and press the ENTER button.
READING #X /XX
WAITING #X /XX
XX.X
XXX.X
BLUE
8735MA

8. Appendix (continued)

8.B. Returning the QuantiFluor™ Handheld Fluorometers

The QuantiFluor™ Handheld Fluorometers and any accessories come with a one-year warranty from Promega covering defects in materials and workmanship under normal use. For more information, contact Promega Technical Services. Contact information is available on the web at: **www. promega.com** or by e-mail at: **techserv@promega.com**

- The instrument and accessories must be installed, powered and operated in compliance with the directions in this Technical Manual and the directions accompanying the accessories.
- Damage incurred during shipping is not covered by warranty.
- Damage resulting from measuring incompatible samples is not covered by warranty.
- Damage resulting from reagent spills is not covered by warranty.
- Damage resulting from contact with corrosive materials or atmosphere is not covered by warranty.
- Damage from salts, proteins and other moderately corrosive materials that are not promptly removed from the instrument are not covered by warranty.
- Damage caused by user modification of the instrument is not covered by warranty.

If a problem arises with your instrument, please contact Promega or your local Promega representative for support. If further action is required, repair options will be presented and a return authorization number assigned if necessary. Promega is not responsible for instrumentation returned without an authorization number. When you ship the instrument for service please remember to:

1. Obtain a return authorization from Promega.
2. Decontaminate the instrument (see Section 8.D for decontamination instructions).
3. Affix a signed and dated Certificate of Decontamination to the outside of the package in which the instrument is returned (Section 8.D).
4. Use the original packaging to ensure that no damage will occur to the equipment during shipping.

8.C. Instrument Disposal

Contact your local Promega representative for disposal of the instrument. Please follow your institutional guidelines to handle disposal of accessories.

8.D. Certificate of Decontamination

Disinfection and decontamination are required prior to shipping the instrument and instrument accessories for repair. Instruments returned must be accompanied by a signed and dated Certificate of Decontamination attached to the outside packaging of the instrument.

To disinfect and decontaminate: Wipe off the outside surfaces using a cloth dampened with a mild detergent. Do not submerge the instrument in water.

Failure to confirm disinfection and decontamination will result in decontamination charges before the instrument will be serviced.

Select either (A) or (B):

A. I confirm that the returned items have not been contaminated by body fluids or by toxic, carcinogenic, radioactive, or other hazardous materials.

B. I confirm that the returned items have been decontaminated and can be handled without exposing personnel to health hazards.

Circle the type of material used in the instrument: Chemical Biological Radioactive**

Briefly describe the decontamination procedure performed:

Date:_____
Place:_____

Signature:

Name (block capital letters):

** The signature of a Radiation Safety Officer is also required if the instrument was used with radioactive materials.

This instrument is certified by the undersigned to be free of radioactive contamination.

Date:_____
Place:_____

Signature:

Name (block capital letters):

8.E. Warranty Information

Warranty Service

The Standard One Year Warranty, included with the system price, covers all parts, labor and shipping to and from our depot repair location as well as a loaner instrument upon request. The temporary replacement instrument will be shipped via standard ground shipment and will arrive in 5 to 7 working days. If you no longer have your shipping carton, we will provide you with a box for shipment of the instrument back to our service technicians. We will repair and return it to you performing to original factory specifications.

If the instrument warranty or previous agreement has expired we will offer a 45 day grace period during which the standard agreement pricing applies. After the 45 day grace period, the service agreement price is 15 percent more than list.

To obtain service during the warranty period, please take the following steps:

1. Contact Promega Technical Services at: **techserv@promega.com**
2. Carry out minor adjustments or tests as suggested by your Technical Services contact.
3. If it is determined that the instrument should be returned for repair, Promega Technical Services will arrange for service by an authorized service agent. You will be issued a Promega return authorization number.

   YOU MUST OBTAIN a Promega return authorization number before returning an instrument for service.
4. Before returning the instrument, you will be responsible for cleaning it and providing a Certificate of Decontamination. If the instrument has been exposed to any chemical, biological or radioactive hazards, contact Promega Technical Services for decontamination instructions.

Out-of-Warranty Service

Follow the same steps as for Warranty Service. Our Technical Services Department is happy to assist you by telephone or correspondence at no charge. Repair service will be billed at a flat rate. Your invoice will include freight charges.

8.F. Service Agreements and Related Products

Product	Quantity	Cat.#
Service Agreement	1 each	SA3060

After the warranty period is over, you can continue to receive the same comprehensive service and support from Promega as you did when your system was under warranty. The Service Agreement covers all parts, labor and shipping to and from our depot repair location as well as a loaner instrument upon request. If your system needs repair, we will provide a box for shipment of the instrument back to our service facility. We will repair it and return it performing to original factory specification.

Product	Quantity	Cat.#
Minicell Borosilicate Glass Cuvettes (replacement cuvettes)	1 pkg of 400	E6091
10 × 10mm square Polystyrene Cuvette (3.5ml capacity)	1 pkg of 100	E6092
10 × 10mm square Methacrylate Cuvette (3.5ml capacity)	1 pkg of 100	E6093
Thermal, Serial Printer and Cable, Universal Power Cable	1 each	E2821
Thermal Printer Paper	1 roll	E2851