GloRunner™ Microplate Luminometer
Operating Manual

Dated: 09/18/2006
Version: 1.2
Part Number: 998-9005

Table of Contents

I.   Introduction

Description

The GloRunner™ is an easy-to-use, sensitive luminometer with a broad dynamic range designed to read glow luminescent reactions in 96-well plates. The instrument's small size and affordable price make it an ideal laboratory instrument. This manual is designed to guide you through the installation, setup, calibration, and operation of your instrument.

Inspection

Upon receiving your luminometer, please inspect it carefully and make sure all accessories are present (refer to the packing list shipped with the instrument).

Standard accessories:

❖ Power Cord

❖ 9-pin Serial Cable

❖ Operating Manual

❖ Quick Start Guide

❖ Software

General Precautions

❖ This instrument is intended for indoor use only.

❖ A clear, transparent adhesive film should be placed over the 96-well microplate to prevent spills or cross-contamination between wells.[1]

❖ Wipe up spills immediately. See Appendix C for cleaning instructions.

❖ The luminometer contains sensitive optical components and precision-aligned mechanical assemblies. Avoid rough handling.

---

[1] This adhesive film may be purchased at Rainin, catalog no. 96-SP-100 or any similar manufacturer.

II.   Hardware Overview

Functions and Features

This section describes the various hardware features of the GloRunner™, with Figures 1-3 as references.

- ❖ **LED Status Lights:** These lights report the status of the instrument. The green LED indicates the unit is on and ready. A solid yellow LED indicates the instrument is not communicating with the host computer. The red LED indicates a potential component failure within the instrument. See Appendix B for a detailed description of what the lights represent.

- ❖ **Sample Tray:** Sample plates are placed on the tray for reading. The plate format for this version is 96-well. No other well format can be read.

- ❖ **Drawer:** The drawer opens to receive sample plate.

- ❖ **Power Switch:** The ON/OFF switch is located on the back panel of the instrument.

- ❖ **Power Cord Connection:** The power cord connects into the rear panel of the instrument.

- ❖ **RS-232 Serial Port Connection:** The 9-pin serial port is used to connect the GloRunner™ to a computer via the RS-232 cable.

- ❖ **RS-232 Cable**

Figure 1

LED Status
Lights

Drawer

Sample Tray

Figure 2

9-pin Female Connector
(To Computer)

9-pin Male Connector
(To GloRunner™)

RS-232 Serial
Port
Connection

Power
Switch

Power Cord
Connection

Figure 3
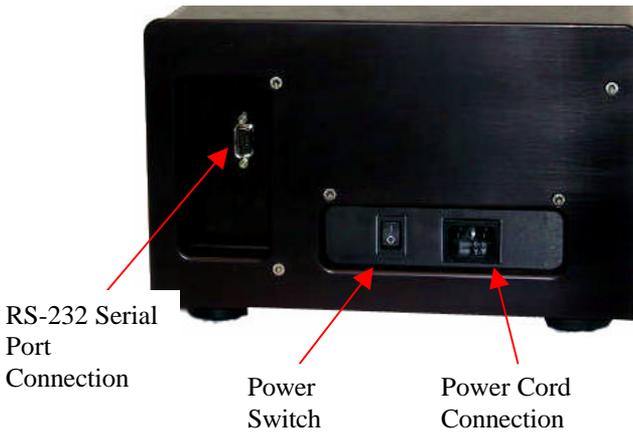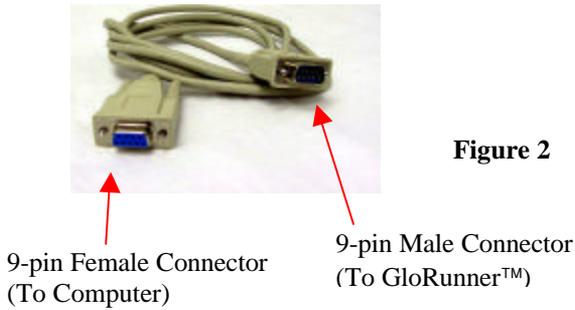
III. Setting up the GloRunner™ Microplate Luminometer

Procedure

1. Position the instrument on a flat surface. Leave enough room for the sample tray to extend in front of the unit (approximately 7 inches).
2. Plug in the unit. In some countries, the power plug provided may not match the wall connection. If this is the case, you can use the appropriate power cord if the input power is between 100 and 240 volts AC, and the nominal frequency is between 50 and 60 Hz.
3. From your own computer, install the software according to the instructions in Appendix A.
4. Connect the 9-pin serial cable between the luminometer and the computer. The male 9-pin connector attaches to the GloRunner™ and the female 9-pin connector attaches to your computer (See Figure 2).
5. Turn on the power switch (rear of unit).

   Note: The sample tray opens and closes via the software user interface. To open the sample tray, please proceed to the next section for further instructions.

IV. GloRunner™ Microplate Luminometer DXL Software

Overview

The GloRunner™ Microplate Luminometer DXL software is very easy to use. This direct-to-Excel based software is designed to give the user flexibility in data retrieval, storage, and manipulation while using the GloRunner™ Microplate Luminometer. User-defined protocols can be stored as templates for easy retrieval of stored settings. For added help while using the GloRunner™ DXL software, a tutorial is available. You will see the following dialog box after clicking on the GloRunner™ icon from your desktop (an alternate way of accessing the GloRunner™ DXL software is through the program manager):
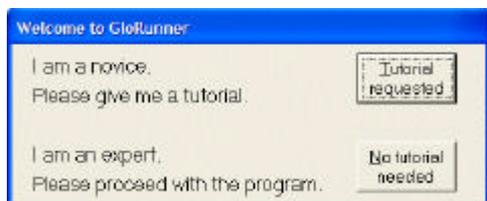
Figure 4

If you elect to review the tutorial, you will see the following tutorial window. The tutorial can be printed by clicking the "Print" button.
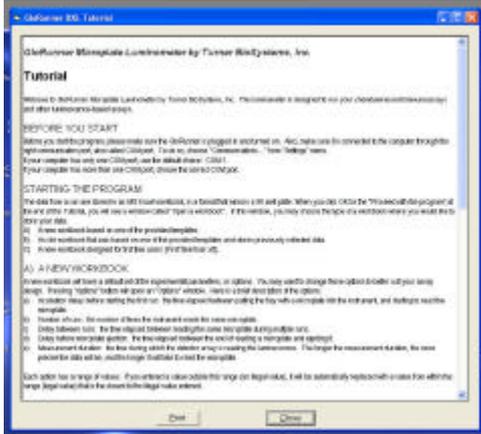
Figure 5

When you are done reviewing the tutorial, click the "Close" button to close the window.

The following dialog box will appear after closing the tutorial, or if you elect not to review the tutorial:
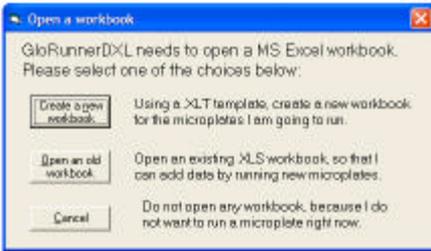
Figure 6

Software Operation

The GloRunner™ DXL software is designed to run in conjunction with Excel.™ When using the GloRunner™ Microplate Luminometer, you have two workbook options. The first option is to create a new workbook for data collection. This option should be selected when first using the GloRunner™. The second option is to use an existing workbook. This feature allows you to add data to an existing workbook. This should be selected if you would like to keep a running log of data from multiple assays.

If you are using the luminometer for the first time, select the "Create a new workbook" option. Once this is selected you will be prompted to select a data storage template format. We suggest using the "2DimensionalFormat" template. The "2DimensionalFormatWithTimes" template can also be used if you are interested in knowing well read times. Figure 7 shows the workbook selection screen.
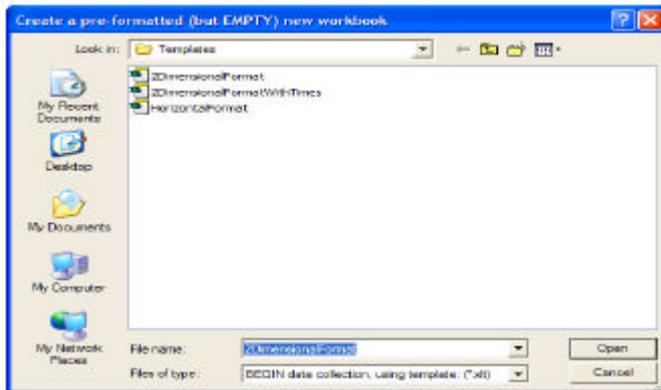
Figure 7

After selecting the data storage format, the GloRunner™ dialog box will open along with the active Excel spreadsheet. You should see the following on your screen.

Note: These are two separate windows.
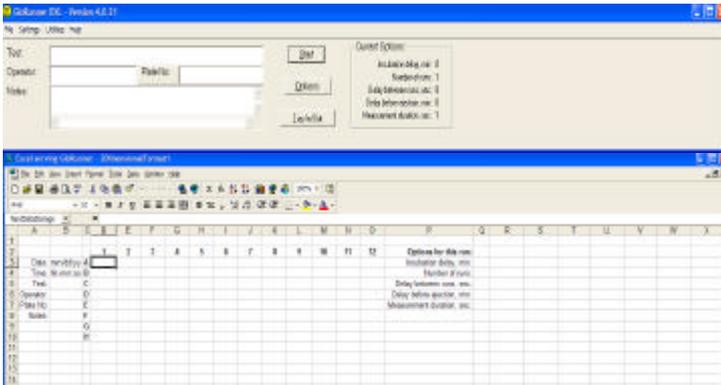
Figure 8

The top window is the GloRunner™ dialog box. The bottom window is the active Excel spreadsheet in which data the run will appear. The dialog box is used for starting runs, changing or selecting options, toggling the tray position, and establishing communication between the GloRunner™ and the computer. If communication has not already been established between the GloRunner™ and the computer, this should be done now.

Communications Settings Procedure

1. Select Communications from "Settings" on the GloRunner™ dialog box pull-down menu, and the screen in Figure 9 will be displayed.

Figure 9

2. Select the proper COM port and click on "OK". The COM port selection depends upon the computer that is connected to the instrument. If you are unsure of which COM port to select, select COM 1 and proceed to the next step.
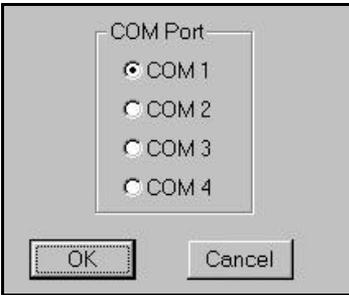
Figure 10

3. Click on the "Tray In/Out" option, see Figure 11. If an error message appears, such as the one displayed in Figure 12, go back to step 2, and select the next COM port. For most computers, the COM port selection will need to be either COM 1 or COM 2. If no error message appears, and the tray door opens this is the correct COM port. Please note the COM port selection for future reference.

Figure 11
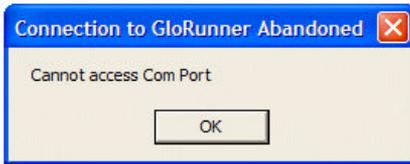
Figure 12

GloRunner™ User Interface Features

The GloRunner™ user interface has some built-in features to assist you while using the GloRunner™. The first feature is mouseover messages. These messages appear when the mouse pointer is stationary over a button for longer than 1 second. An example can be seen in Figure 13.
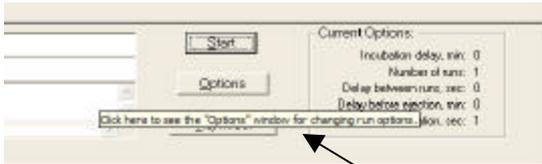
Figure 13

The status bar is another useful GloRunner™ feature. It indicates the status of the GloRunner™ during operation. For example, the following message is used to indicate that the GloRunner™ is getting ready to take readings:

Figure 14

The GloRunner™ tray detection mechanism is helpful in two ways:

- ❖ This mechanism prevents plates being unintentionally left in the GloRunner™. If you have not selected the option to have your plate stored inside the instrument after the run, the plate will be automatically ejected. This will help prevent the evaporation of fluid from the plate into the internal parts of the instrument.

- ❖ The tray detection mechanism will also detect the absence of a plate if you initiate a run without a plate in the sample tray. You will be prompted with the following message:

Figure 15

Setting the Options

Once the communications settings are properly set up, click on the "Tray In/ Out" button. If the tray door opens and closes, the proper communication has been established.

1. Click on "Options" to access the options screen as shown in Figure 17.
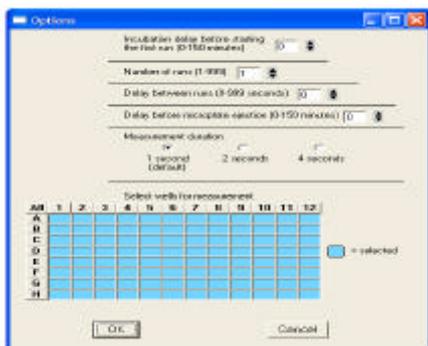
Figure 17

2. There is an option to set a delay time before the first measurement is made. The delay time can be set between 0-150 minutes.

3. The instrument can be set up for a single run of multiple runs. To read the plate once, select "1" in number of runs. To run the same plate multiple times, select a number for multiple runs. You can select up to 999 runs of the same plate with up to a 999-second delay between the end of one run and the start of the next run.

4. The GloRunner™ will automatically eject the microwell plate at the end of the run. If you prefer to temporarily store the plate within the instrument after the run, select the "Delay, before microplate ejection" option. The plate can be stored inside the instrument for up to 150 minutes after the run has been completed. Once the delay time has expired, the plate will be ejected.

5. The measurement duration may also be selected. The measurement duration is the time in which the detectors sit over the well. During this time the measurements are averaged for more accurate measurements.
    Note: A longer measurement time does not mean larger RLU values.

---

6. Select the wells you want to read. If the well is highlighted in blue, the well will be measured. Select or de-select all the wells by clicking the "All" button in the top left corner of the grid. Alternatively, individual rows and columns can be selected or de-selected by pressing the letter or number at the head of the row or column. Select or de-select individual wells by clicking on that well.

7. Once you have made your selections, click the "OK" button.

8. The Excel Spreadsheet also contains the reading parameters as seen in Figure 18.

Figure 18

V. Reading Samples

Starting a Run

The process of reading samples with the GloRunner™ is simple. The instrument will read only the wells that are selected in the Options menu. Any skipped wells are denoted with an "X" in the data. To read samples:

1. Fill in any information you would like in the Operator, Test, and Notes section.
2. Verify that the Options menu has the correct wells selected and the correct number of runs selected.
3. Open the sample tray door if it is not already open. If the tray door is closed, click the "Tray In/Out" button on the GloRunner™ Dialog Box.
4. Insert the plate in the sample tray so that well A1 is positioned to the right rear of the sample tray.
5. Click on the "Start" button in the software to close the sample tray and start the instrument.
6. The GloRunner™ will read the whole plate in approximately 30 seconds if the measurement duration is set at 1 second. Once the run is complete, results will appear in the Excel spreadsheet.

   Note: It is highly recommended that you elect to save your data at this time. Your data may be lost if you choose not to save at this time.
7. If multiple runs were selected, subsequent runs will appear on the Excel Spreadsheet in the respective run order (See Figure 19).

Figure 19

VI. Calibration of the GloRunner™

Overview

Calibration of the GloRunner™ is possible if you purchased the GloRunner Standardization Light Plate. The calibration procedure is password protected and should only be done after contacting Turner BioSystems for the password. This calibration is a process that normalizes the detectors and is not usually required. If it is determined that detector normalization is required, choose "Utilities" on the pull down menu. Next select "Calibrate Using Light Plate". You will see the following pop-up menu:
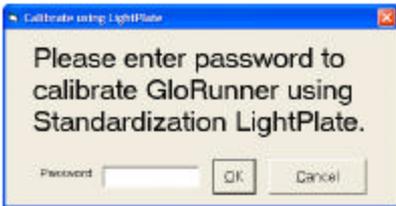
Figure 20

Procedure

1. Type in the password and click on the "Enter New Password" button. You will be prompted with the following pop-up button.
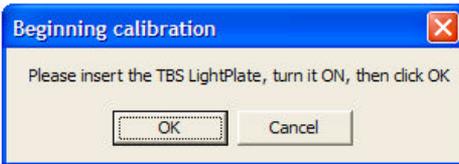
Figure 21

2. Turn on the light plate by briefly pressing on the "Start" button. Insert it into the sample tray with the proper plate placement. (Proper plate placement is the alignment notch corner of the light plate to the right rear of the sample tray. See Figure 22). Click "OK".
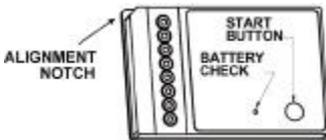
Figure 22

3. Once "OK" is clicked the plate will be drawn into the GloRunner™ and the detectors will be standardized.

4. If you see a message similar to Figure 23, and your light plate is powered on, please contact Turner BioSystems for support:

WARNING: Reading below minimum

Photo-sensor for row A reads 100.0% below minimum. Click OK to accept the reading and continue calibration.

OK   Cancel
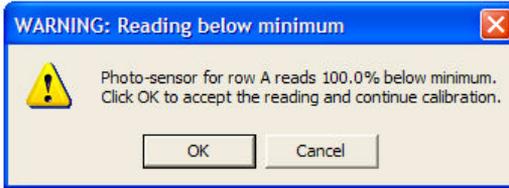
Figure 23

VII. Relative Light Units and Common Questions

Overview

The GloRunner™ Microplate Luminometer's output is in relative light units. This means that there is no absolute way to quantitate the number of photons emitted from the sample. This is true for all luminometers. All luminometers are "photon counters", but no luminometer manufacturer can claim that the unit output of the instrument is in photons. This poses a dilemma for many researchers. The next section contains some common questions and answers.

FAQs:

Q: How do I determine which luminometer is more sensitive?

A: The best way to do this is to run a side-by-side comparison between instruments with samples that are representative of your experiment. Compare the statistics of a group of replicate samples and blanks for both instruments. It is not sufficient to compare the statistics on the blanks alone because the samples give a relative scale of the light units between different instruments. If a detailed sensitivity study with multiple serial dilutions of the sample is not possible, a common tool for determining rough sensitivity is %CV. %CV is defined as the standard deviation of a group of samples divided by the average of the samples. If the blank is non-zero, the %CV should be blank-corrected. The blank-corrected version of the %CV is shown below:

$$\frac{\text{STD DEV (samples} - \text{average blank)}}{\text{Average(samples)} - \text{Average(blank)}}$$

Q: Which plates should I use with my luminometer?

A: For weakly luminescent samples, white plates give better results because they reflect more light to the instrument's detector.

Q: What luminescent assays can I run on the GloRunner™ Microplate Luminometer?

A: The instrument is designed for glow luminescent reactions, so any chemistry that has a half-life of 3 minutes or greater is appropriate.

Q: What is the purpose of the Dark Current Log?

A: The Dark Current is a measurement the detectors make in a position on the instrument that represents total darkness. These measurements are logged for technical support purposes. Logging these values can be valuable in diagnosing instrument related performance issues.

Q: Why is the calibration procedure password protected?

A: Calibration of the detectors is only needed under rare circumstances. We would like to be certain that you have spoken to a technical support person before you calibrate the detectors to be sure this will solve the problem.

APPENDIX A - Installing the Software

Overview

Installing the software on your computer is the next step once you have verified that all the components of your instrument are present. **This software requires Windows® 95 or later**. To install the software, follow the instructions below:

Procedure

1. Place the CD disk of the Turner BioSystems GloRunner™ Microplate Luminometer software in the D: drive of your computer. Most computers will automatically start the installation process once the disk is placed in the CD-ROM. If your computer automatically installs, you will see the InstallShield Wizard screen show in Figure 24.

Figure 24

2. If your computer does not automatically start the installation process, click the "Windows Start" button, and select "Run". Type in D:\setup.exe if your disk drive is drive D, or substitute D with the letter that represents your CD-ROM drive.

3. Follow the instructions given during the installation process. The default directory for installation is C:\Program Files\Turner BioSystems\GloRunner. To select an alternative directory, click on the "Change" button shown in Figure 25 and choose your directory option as seen in Figure 26. Click the "OK" button when you are ready to continue with the software installation.
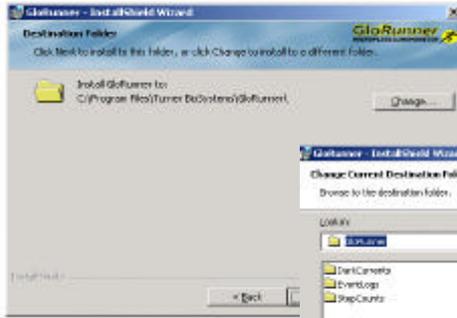
Figure 25
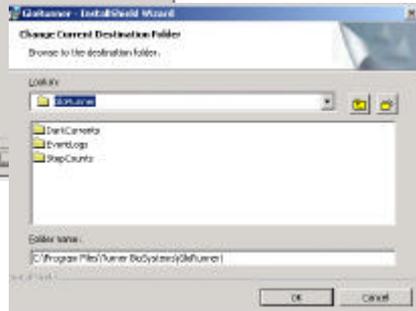
Figure 26

APPENDIX B - LED Messages and Firmware Upgrades

LED Lights

There are 3 LED status lights on the front panel of the GloRunner™.

- ❖ The green LED is the power indicator. When it is illuminated the instrument is powered and ready.

- ❖ The yellow LED indicates communication errors between the GloRunner™ and the computer. An illuminated yellow LED indicates no communication between the computer and instrument is being made. This can occur under the following circumstances:
    - The GloRunner™ is powered on and the User Interface is not open on the computer.
    - The GloRunner™ is powered on and the RS-232 is not connected to the computer.

- ❖ The red LED indicates other types of errors. When the red LED is illuminated a potentially serious error has occurred. At this point you should contact Turner BioSystems technical support for further instructions.

Firmware Upgrades

The GloRunner™ Microplate Luminometer has the capability to download new firmware to the instrument from the PC. This capability is reached through the Utilities Menu (Figure 27). This is a password protected function to prevent accidental use. The main purpose of firmware upgrades is to add new capabilities to the system. When a new version firmware is needed in the future, you will receive specific instructions on how to perform the upgrade.

Figure 27

APPENDIX C - Maintenance, Warranty, & Service

Maintenance

- ❖ If you suspect fluids may have been spilled onto the detectors, please contact Turner BioSystems for cleaning instructions.

- ❖ Periodically wipe off the outside of the instrument with a damp cloth. **Do not use solvents or abrasive cleaners to clean the instrument.**

- ❖ Avoid spilling liquids into the sample tray. If there is a spill:
  1. Unplug the instrument.
  2. Wipe up any moisture inside the sample chamber.
  3. Use a damp ChemWipe wetted with a 70% ethanol, 30% water solution to clean the tray.
  4. Plug in the unit and turn on the power. Allow it to stay on for a few minutes or until completely dry inside.

Warranty

Turner BioSystems warrants the GloRunner™ Microplate Luminometer and accessories to be free from defects in materials and workmanship under normal use and service for a period of one year from the time of initial purchase, with the following restrictions:

- ❖ The instrument and accessories must be installed, powered, and operated in compliance with the directions in this Manual and the directions accompanying the accessories.

- ❖ Damage incurred during shipping is not covered by warranty.

- ❖ Damage resulting from measurement of samples found to be incompatible with the materials used in the sample system is not covered.

- ❖ Damage resulting from reagent spills is not covered.

- ❖ Damage resulting from contact with corrosive materials or atmosphere is not covered.

- ❖ Damage caused by modification of the instrument by the customer is not covered.

Obtaining Service

Warranty Service

1. To obtain service during the warranty period, please take the following steps:
   Write or call the Turner BioSystems Service Department and describe as precisely as possible the nature of the problem.
2. Carry out minor adjustments or tests as suggested by the Service Department.
3. If proper performance is not obtained, YOU MUST OBTAIN AN RMA number BEFORE shipping the instrument to Turner BioSystems.
4. After obtaining an RMA number, pack the instrument well (damage incurred in shipping due to improper packing is not covered); insure it; write the RMA number on the outside of the carton and ship it to Turner BioSystems prepaid.

   ❖ The instrument will be repaired and returned free of charge for all customers in the United States. Turner BioSystems will pay for return shipment and include a check to reimburse you for the cost of surface shipment to us.

   ❖ If you are an international customer who purchased directly from Turner BioSystems (not from a third party distributor), contact Turner BioSystems for instructions. The instrument will be repaired at no charge if it is under warranty. Turner BioSystems cannot, however, pay shipping, duties, or documentation costs outside the continental United States.

   ❖ For customers outside of the United States, who have purchased our equipment from an authorized distributor, contact the distributor for further instructions.

   Note: Under no circumstances should the instrument or accessories be returned without prior authorization from Turner BioSystems or our authorized distributor. Prior correspondence is needed:

   - To ensure that the problem is not a minor one, easily handled in your laboratory, with consequent savings to everyone.
   - To specifically determine the nature of the problem, so that repair can be done with particular attention paid to the defect you have noted.

YOU MUST INCLUDE AN RMA NUMBER ON ALL EQUIPMENT RETURNS.

Out-of-Warranty Service

❖ Proceed exactly as for Warranty Service above. Our service department is happy to assist you by phone or correspondence at no charge.

❖ Repair service will be billed on a flat rate basis. Your invoice will include freight charges.

Address for Shipment:

Turner BioSystems
645 N. Mary Ave.
Sunnyvale, CA 94085
USA

Telephone: 408-636-2400
Toll-Free: 888-636-2401 (US & Canada)
Fax: 408-737-7919
Email: techsupport@turnerbiosystems.com

APPENDIX D – Specifications

Specifications for the GloRunnerä Microplate Luminometer

Sensitivity	$2x10^{-20}$ moles horseradish peroxidase
	$2x10^{-20}$ moles alkaline phosphatase
	$5x10^{-18}$ moles luciferase
Linear Dynamic Range	Instrument dynamic range 10^8
Cross-talk	Better than $5x10^{-4}$ at $1.5x10^6$ Relative Light Units using a white Costar plate
Detector	Proprietary eight-channel solid state array (patent pending)
Spectral Response Range	300—610 nm
Peak Wavelength	550 nm
Detection Mode	Glow luminescence
Plate Format	96-well
Reading Speed	1 second per well, less than 30 seconds per plate
Computer Interface	RS-232
User Interface	User-friendly Windows® software controls machine functions. Requires Windows® 95 or later
Power	0.5A @ 100—240V, 50—60Hz (universal)
Dimensions	16.75" D x 10.25" W x 6.75" H (42.6 cm D x26.0 cm W x 17.2 cm H) (tray closed)
Weight	20 lbs (9.1kg)
Operating Temperature	60—105°F (15—40°C)
Warranty	One-year warranty
Approvals	CE, UL, CUL (pending)