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Real-time Monitoring System for LED Luminous Degradation in Thermal Aging

SOFTWARE OPERATING MANUAL

Ver.: V1.0.2.0

HKUST LED-FPD TECHNOLOGY R&D CENTERAT FOSHAN

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Preface

Thank you for using the Real-time Monitoring System for LED luminous degradation in thermal aging that self-developed by HKUST LED-FPD Technology R&D Center at Foshan. To make the benefit maximum, please read these instructions thoroughly before starting, and keep this manual properly. Any forms of economic or legal liabilities caused by improper use of the system shall not be taken by the manufacturer.

Notice

- ✧ We are under no obligation to inform the content alteration of this manual.
- ✧ We are responsible for replacement of the manual with wrong or missing pages.
- ✧ If there is an exception during use, please do relate with us.

FSLDCTR

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FSLDCTR

1 System Description

The real-time monitoring system is designed for the purpose of continuous data monitoring of LED samples in thermal aging test. This system is able to get test records in real time by performing test plans. The test data provides a solid foundation，from which the lifespan analysis reports generate.

2 Functions

- ✧ System debugging
- ✧ User information management
- ✧ Test plan setting
- ✧ Aging test monitoring
- ✧ Test records collection
- ✧ Lifespan evaluation report generation
- ✧ Hardware Detection
- ✧ Failure alarm

3 Operation Steps

The operation of this system can be divided into six steps as shown in Figure 3.1. The operation steps include user login, basic information configuration, hardware detection, test information configuration, test monitoring and report management, among which basic information configuration and hardware detection usually only have to be performed at the first time of use. Detailed operations of these steps are as described in the following sections.

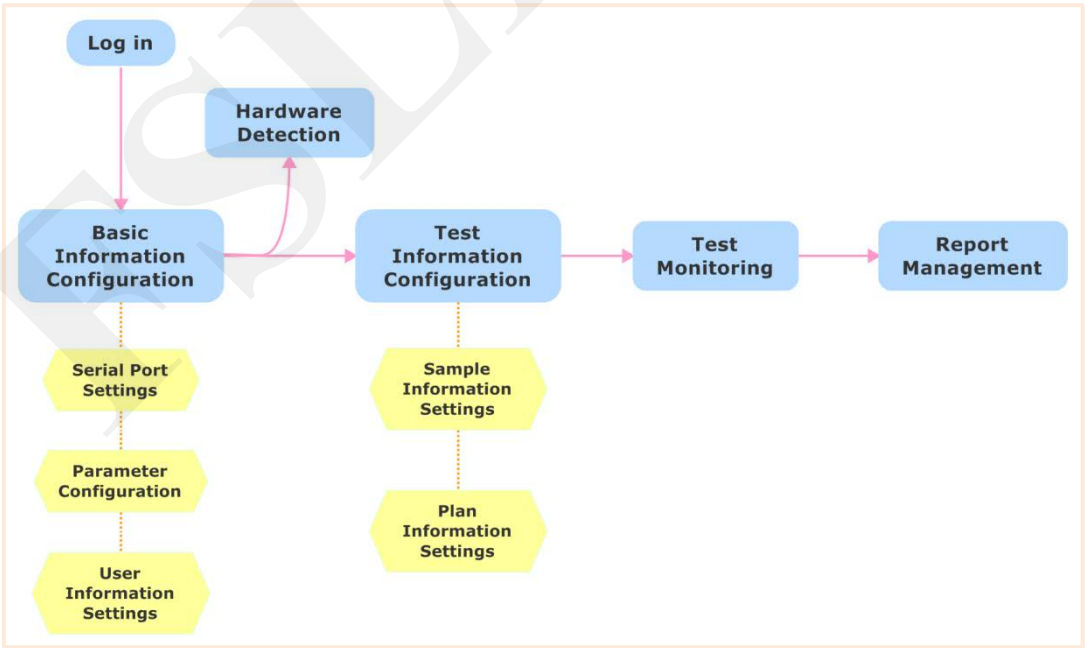


Figure 3.1 Operating Steps

4 Software Interface

4.1 Interface Components

The components of working interface as shown in Figure 4.1 include the followings: program bar, menu bar, title bar, property panel, tool bar and workbench.

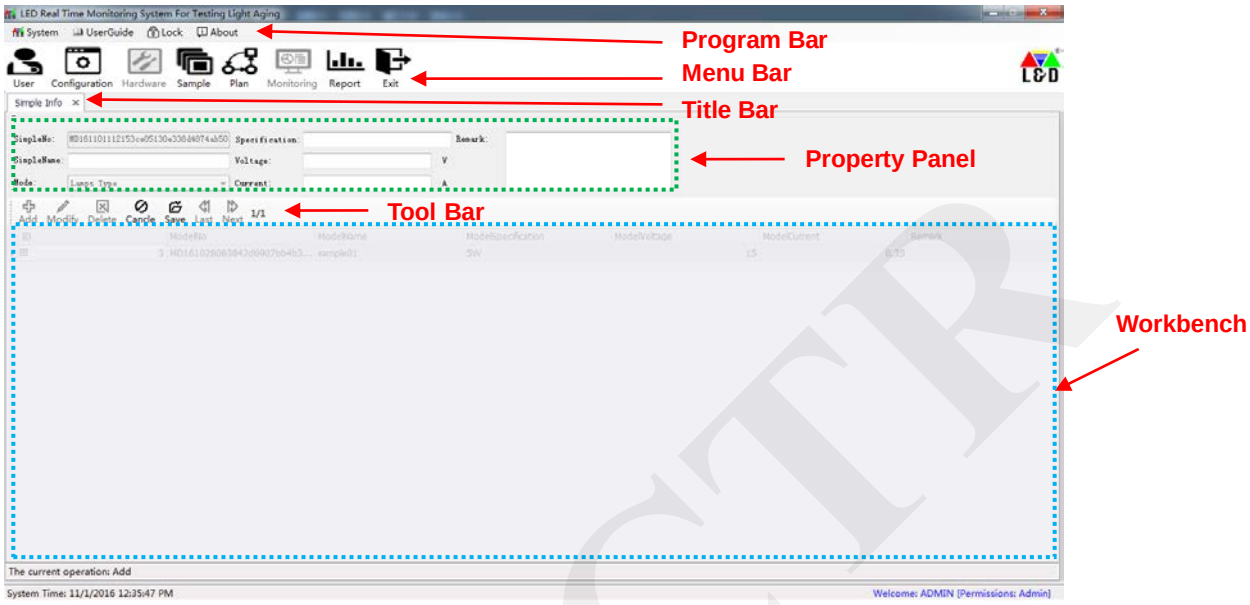


Figure 4.1 Component of Working Interface

4.2 Description of Program Bar

The program bar includes three parts, namely, System, User Guide, Lock and Abou.

【Function】

- ✧ **[System]**: You can perform the operations of system exit and account switch under the [System] option.
- ✧ **[User Guide]**: Click to review Operating Manual.
- ✧ **[Lock]**: Select to lock the interface to prevent unauthorized operations. Select the [Lock] again to cancel this function.
- ✧ **[About]**: Click to review copyright and relevant information.

4.3 Description of Tool Bar

The common tool bar as shown in Figure 4.2 appears in the menu of sample information configuration, user management, test plan configuration and reports management. The number of active buttons differs from each interface on the basis of operation requirement.

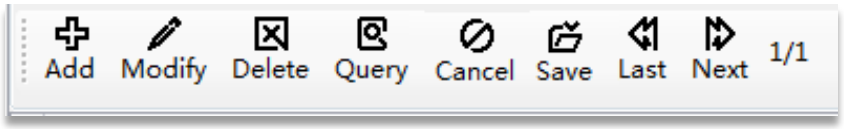


Figure 4.2 Tool Bar

【Function】

- ✧ [Add]: For creating a new record, which can be modified by [Save] and [Cancel].
- ✧ [Modify]: To modify the selected record.

- [Delete]: To delete the selected record.
  Note: The corresponding data will be deleted at the same time once a record is deleted.
- [Save]: Save the operation of addition and modification.
- [Cancel]: Cancel the operation of addition and modification.
- [Query]: Click to select one or more query criteria to search needed data in a pop-up window.
- [Last]: Click to review the last 10 records against the current page.
- [Next]: Click to review the records on the next page.

5 Initial Setup

5.1 Login

Login the system to configure system, monitor testing and review reports. Please use the Login ID of “admin” with password of “admin” to login at the first you run it. The login interface is as shown in Figure 5.1.

【Setting】

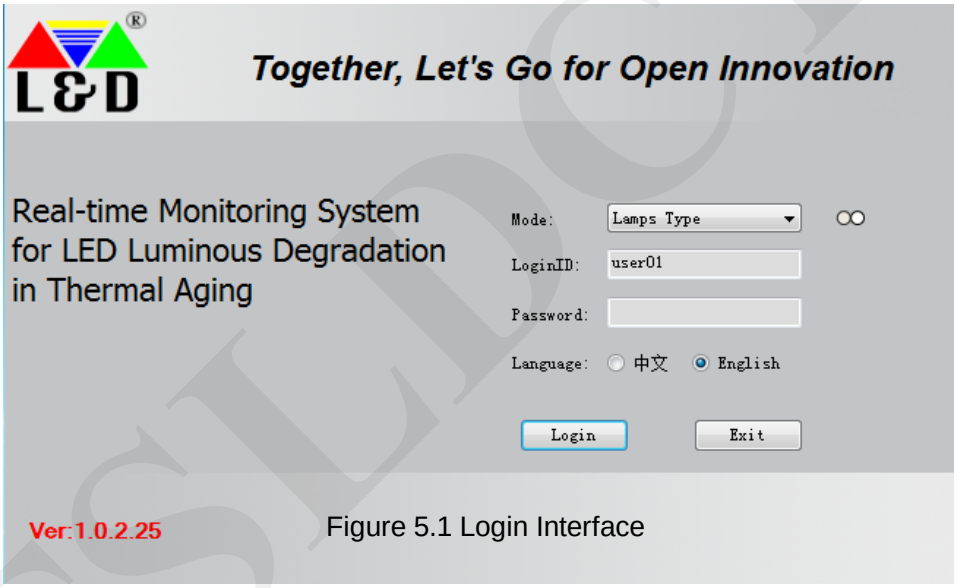


Figure 5.1 Login Interface

- **[Mode]**: Selecting the test mode. The default mode is Lamps Type.
- **[Login ID]**: Enter a login account.
- **[Password]**: Enter the login password.
- **[Language]**: Select to choose the displaying language, Chinese or English.
- Click the [Login] button to login system. Click the [Exit] button to exit the program.

5.2 Basic Information Configuration

Basic information configuration mainly includes configurations of serial ports and user information.

5.2.1 Configuration of Serial Ports

Select the corresponding parameters of serial ports referring to hardware installation. The configuration interface of serial ports is as shown in Figure 5.2. The detail parameters of each serial port are as shown in Table 5-1.

Note: The port No. should be adjusted depending on the actual connection. You can check the actual usage of each COM port by device management on the computer.

Table 5-1 Parameters for Serial Port

Parts	COM Port	Baud Rate	Data Bits	Stop Bits	Parity
On-off Controller	COM3	115200	8	1	0
Photometer	COM6	19200	8	1	0
Temperature Logger	COM7	9600	8	1	0
Power Supply	COM5	600	8	1	0

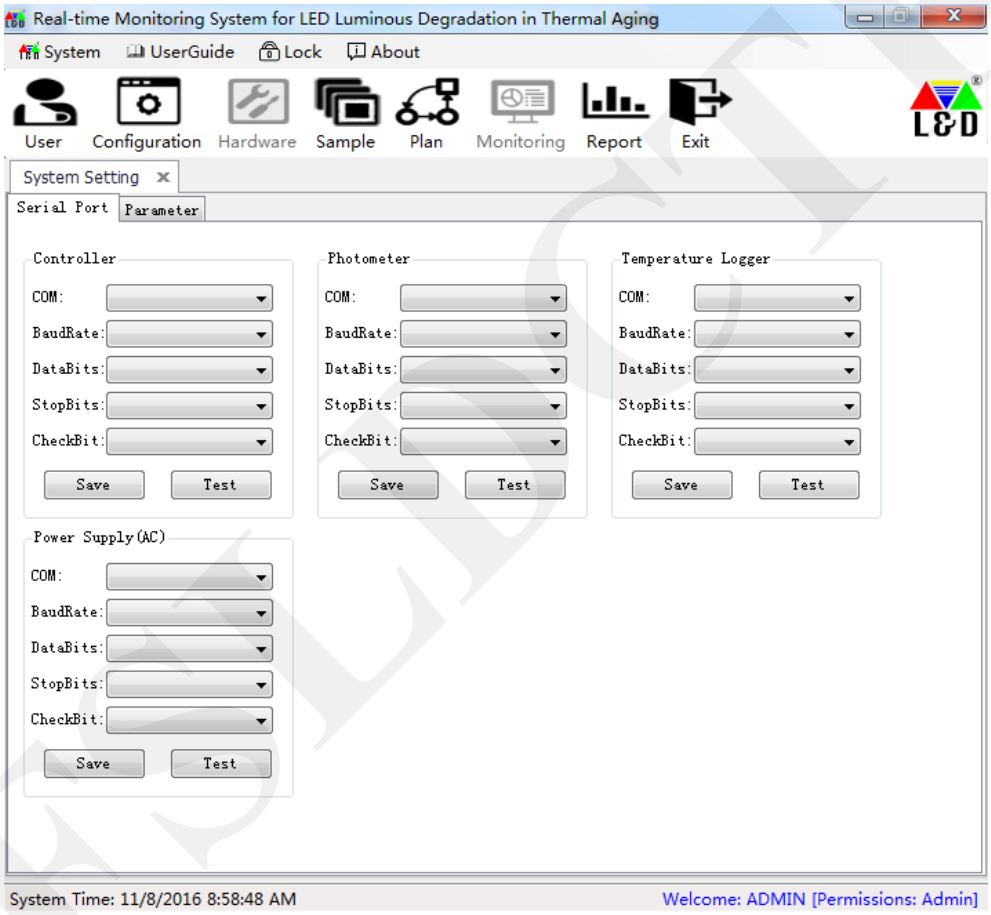


Figure 5.2 Serial Port Settings

【Setting】

- ✧ Select the corresponding parameters for each serial port referring to Table 5-1.
- ✧ Click the [Test] button of each part after serial port setting. If the serial port setting is correct, you will see a pop-up window that shows “Test success”.
- ✧ If the setting is faulted you will see a pop-up window that shows “Test failed”. The font color on interface turns red at the same time. Please check and reset serial port parameters.
- ✧ Click [Save] after testing serial port settings successfully.

5.2.2 Parameter Configuration

You can set the email information for sending alarm messages in parameter configuration interface as shown in Figure 5.3.

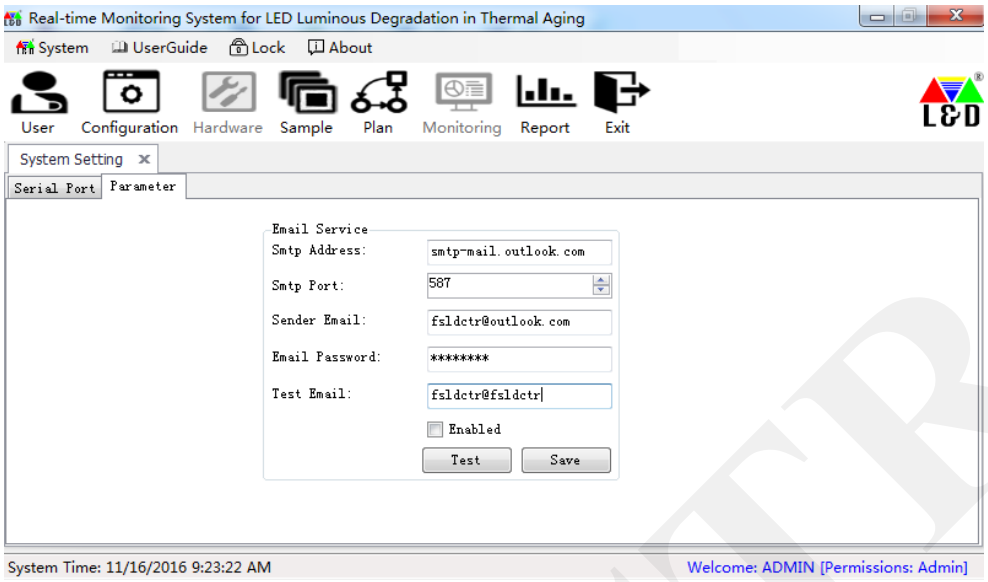


Figure 5.3 Parameter Configuration

【Setting】

- ✧ [Smtp Address]: Enter the SMTP address of mailbox for sending emails.
- ✧ [Smtp Port]: Enter the SMTP port number.
- ✧ [Sender Email]: Enter an email address for sending alarm message.
- ✧ [Email Password]: Enter the password of the above sender email.
- ✧ [Test Email]: Enter an email address for temporarily receiving validation information of sender email.
- ✧ [Enabled]: Check the box to use the above sender email to send alarm messages automatically. If the box is not checked, the sender email will not play a role. This function is only valid under networking.
- ✧ Click [Test] to check the validity of sender email setting. If the test email can receive the validation information, it means the settings of sender email are correct. Click [Save] to save the above settings. If the validation information cannot be received, please check the settings of sender email and retest it.

5.2.3 User Information

You can add or manage user information in user information interface as shown in Figure 5.5. The division of permission is as shown in Figure 5.4. The user roles of this system include administrator, workgroup and guest. The differences between these roles are as followings:

- ✧ Only the administrator has the permission of system configuration. The administrator has a right to perform all operations expect test monitoring and hardware detection.
- ✧ The workgroup is mainly operators who have rights to perform all operations expect system configuration.
- ✧ The guest only has a right to review reports.

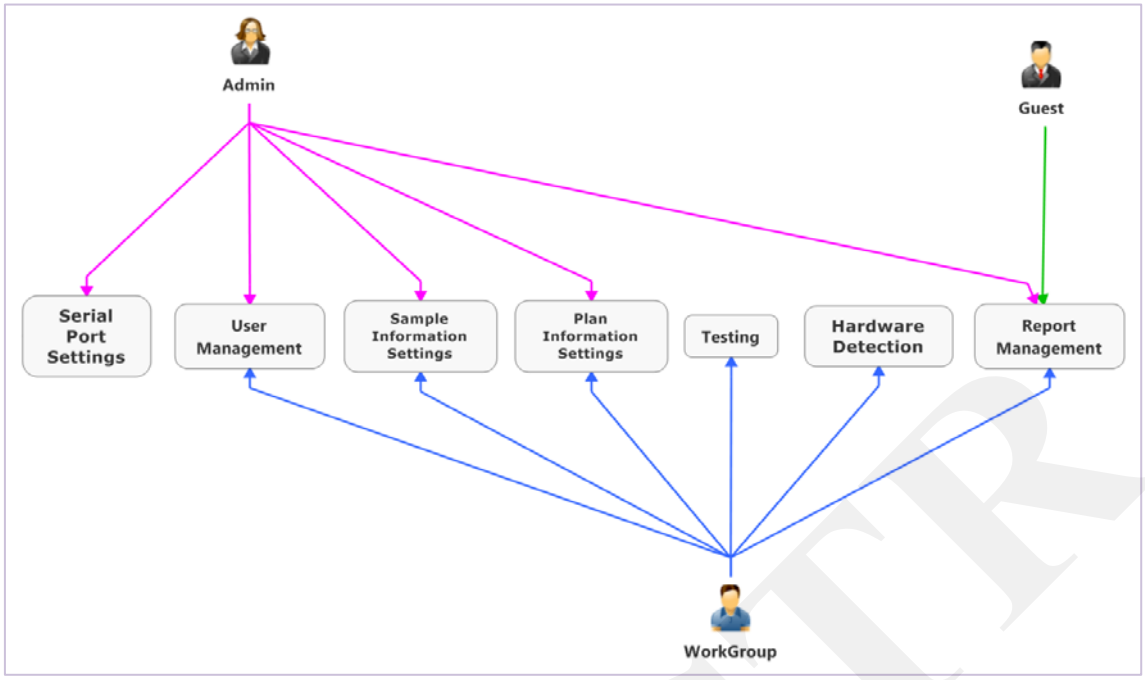
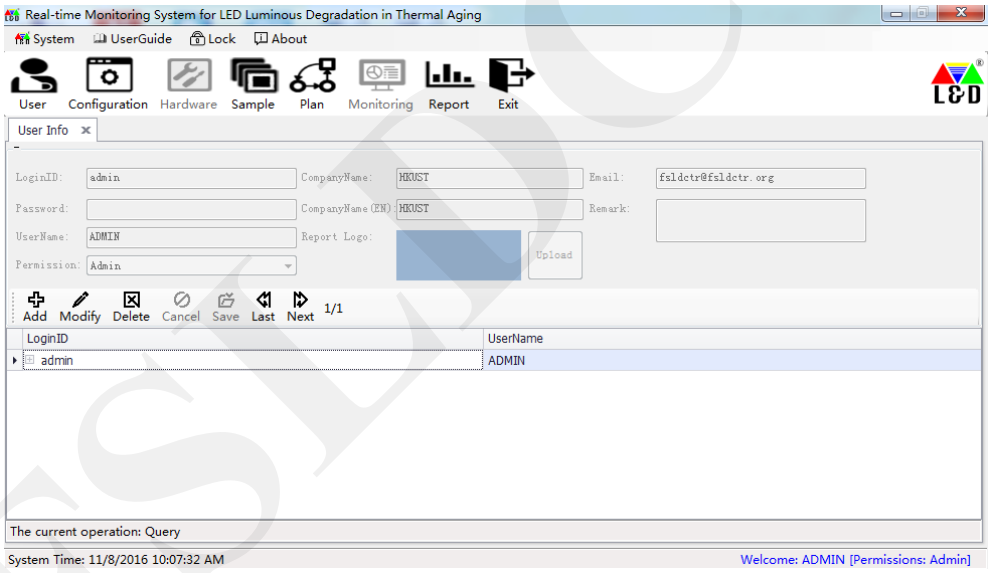


Figure 5.4 User Permission



Figue5.5 User Information

【Setting】

- ✧ **[Login ID]**: Customize a login account for identification.
- ✧ **[Password]**: Customize a login password.
- ✧ **[User Name]**: Customize a user name for this account.
- ✧ **[Permission]**: Select the permission for this account.
- ✧ **[Company Name]**: Input the company name shown in report title.
- ✧ **[Company Name (EN)]**: Input the English company name shown in report title.
- ✧ **[Report Logo]**: Upload a company logo in PNG format shown in report title.
- ✧ **[Email]**: Fill in an email address for sending warning information during test to this user.
- ✧ **[Remark]**: Add notes for this user if necessary.

5.3 Hardware Detection

Hardware detection is used for hardware running status monitoring and trouble shooting. The hardwares should be detected before testing for the first time. Besides, hardware detection can be done to verify whether there are some hardware malfunctions that cause exceptions in the process of testing. Hardware detection includes hardware running status detection, photometric probe calibration and temperature calibration.

Note: The operation of hardware detection can only be performed under the permission of Work Group.

5.3.1 Hardware Running Status

The running status of temperature logger, power supply, photometric probe and on-off controller can be detected in the [Hardware Status] interface as shown in Figure 5.6.

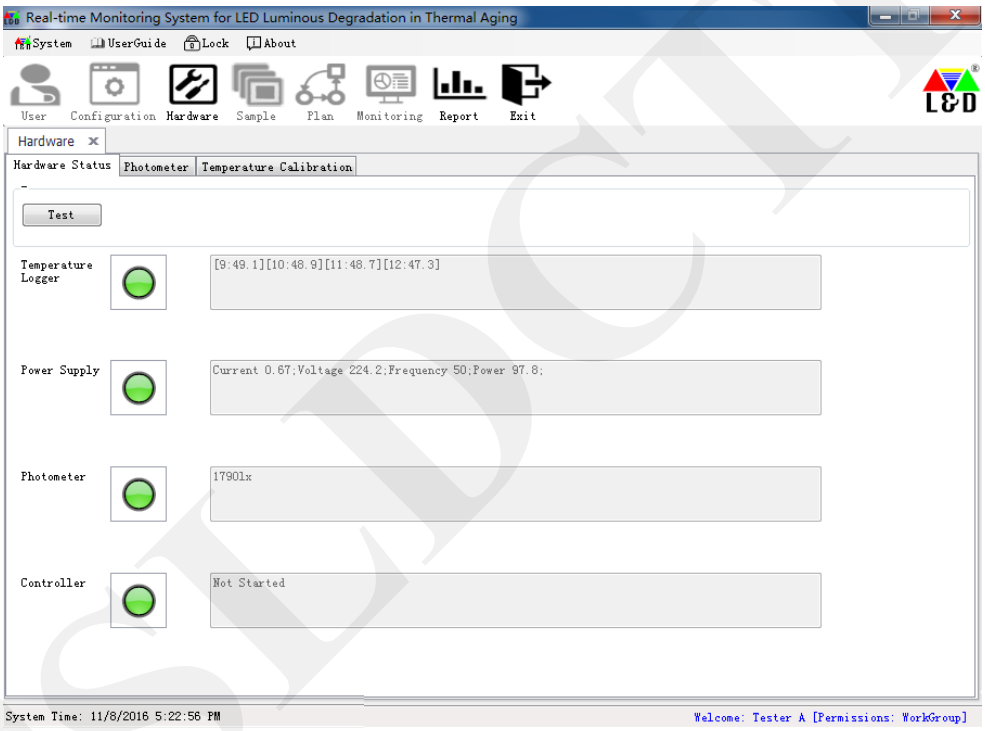


Figure 5.6 Hardware Status

【Setting】

- ✧ Enter into the [Hardware Status] tab, temperature logger, power supply and photometric probe will be detected automatically by system. The indicator shows in green with instant operational parameters if the part runs normally, or it turns red if the part performs abnormally. Please do troubleshooting according to fault prompt.
- ✧ Click [Test] to detect the on-off function of each channel. The indicator shows in green with instant operational parameters if the controller runs normally, or it turns red if it performs abnormally. Please do troubleshooting according to fault prompt.

5.3.2 Photometric Probe Standardization

You can get standard values for sample current and luminosity in the photometric probe calibration interface that includes [Current LM] tab (Figure 5.7) and [Standard LM] tab (Figure 5.8). The dynamic curves in the

tabs represent current luminosity and standard luminosity.

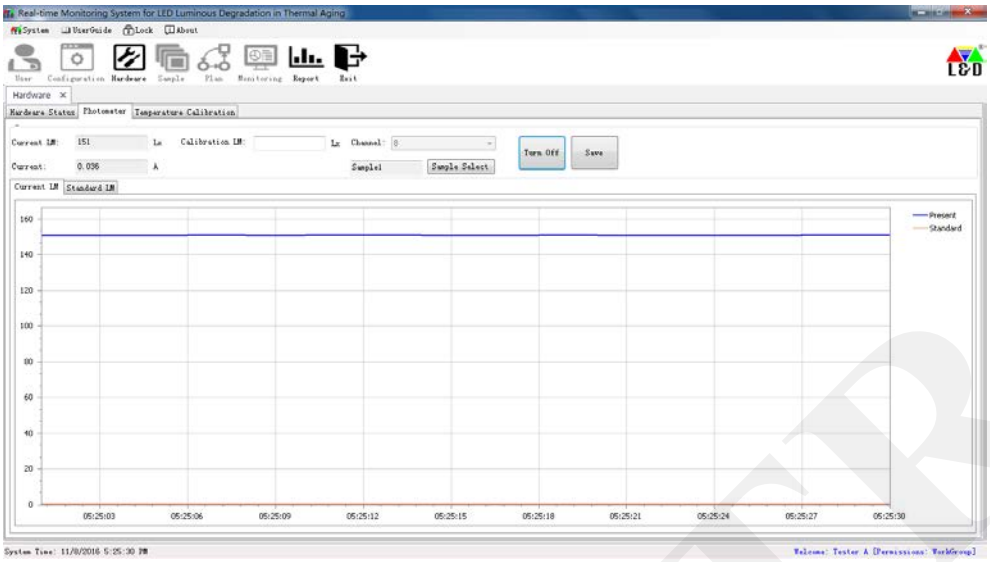


Figure 5.7 Current Reading of Photometer

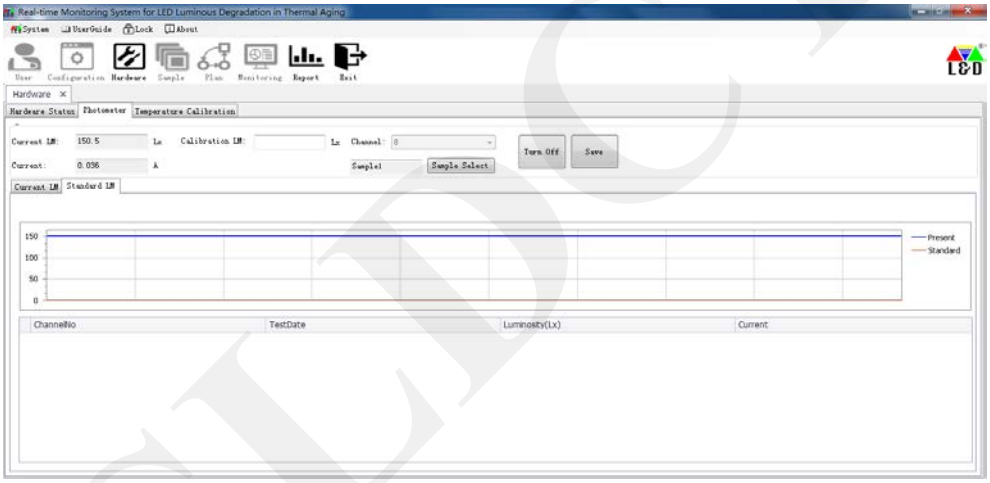


Figure 5.8 Values Reading for Photometer

【Setting】

- ✧ Select a proper channel and a proper sample and click [Light] to startup the sample in the [Photometer Calibration] interface.
- ✧ After lighting up the sample, enter a standard value in the [Calibration LM] textbox.
- ✧ After calibration, click [Save] to save the standard luminosity value and the updated standard luminosity curve.
- ✧ After saving the standard values, you should click [Turn off] to turn off the lightened sample. Otherwise, you cannot close the window.

5.3.3 Temperature Calibration

Temperature calibration is used for monitoring and adjusting temperature value. The temperature calibration interface with current temperatures of each channel is shown as Figure 5.9.

【Setting】

- ✧ **[Modify]**: If the temperature reading of one channel has relatively large difference to the standard value,

you can input the added value or reduction in the [Adjust Value] textbox, and then click [Modify] to save the adjustment.

✧ If you want to cancel the value adjustment, click [Reset] to clear modification.

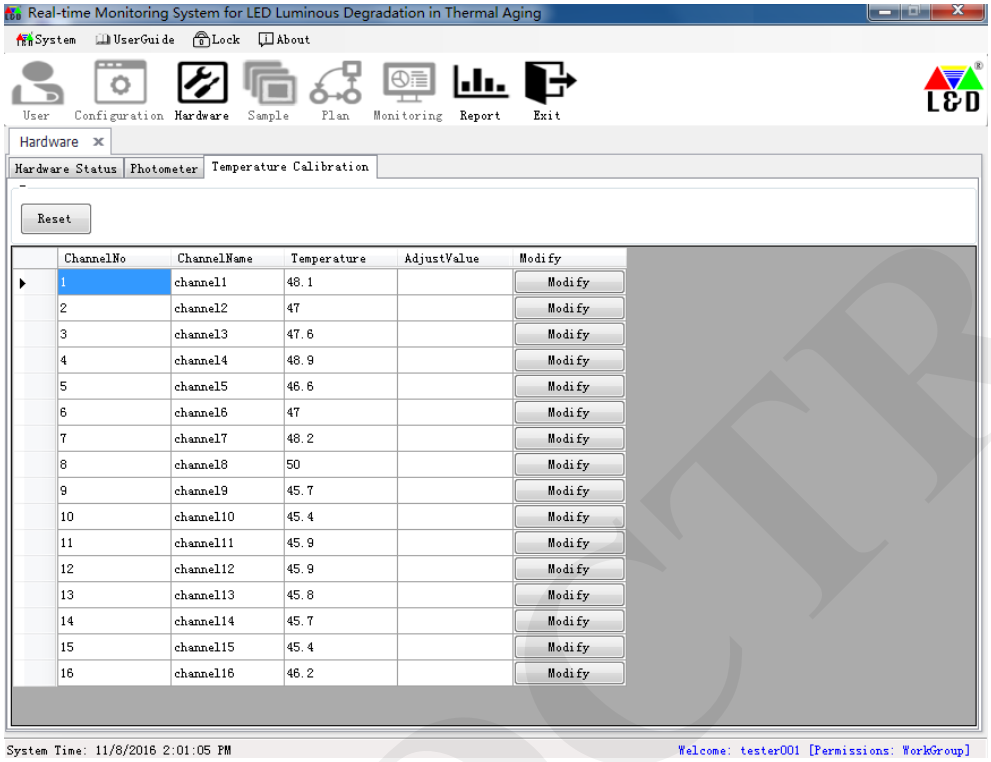


Figure 5.9 Temperature Calibration

6 Test Information Configuration

Test information configuration, which includes sample parameters configuration and test plan configuration, provides sample records and test plan for aging testing.

6.1 Sample Information

You can create and manage sample information in sample information interface. The interface is shown as Figure 6.1.

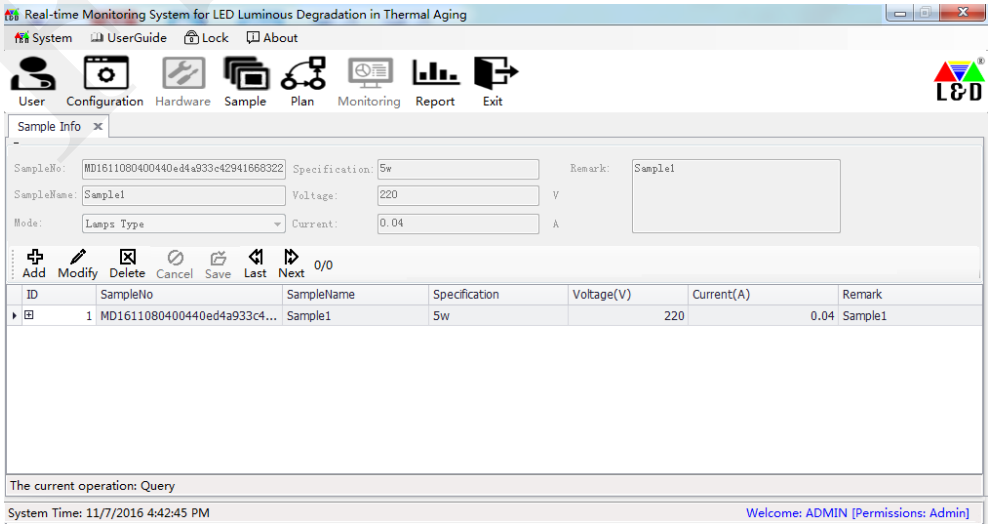


Figure 6.1 Sample Information

【Setting】

- ✧ **[Sample No]**: The system automatically generates the sample No. when adding a new sample record. This number is unique.
- ✧ **[Sample Name]**: Customize the sample name for identification.
- ✧ **[Mode]**: The system automatically imports the test mode that the same as the selected mode of login.
- ✧ **[Specification]**: Customize the sample specification information.
- ✧ **[Voltage]**: Input the voltage information of sample.
- ✧ **[Current]**: Input the current information of sample.
- ✧ **[Remark]**: Add notes for the sample if necessary.

6.2 Plan Information

You can create and manage test plan in plan information interface. The interface is shown as Figure 6.2. Plan information configuration includes three tabs: [Channel] (Figure 6.3), [Parameter] (Figure 6.4) and [Cycle] (Figure 6.5). The concrete setups are as followings.

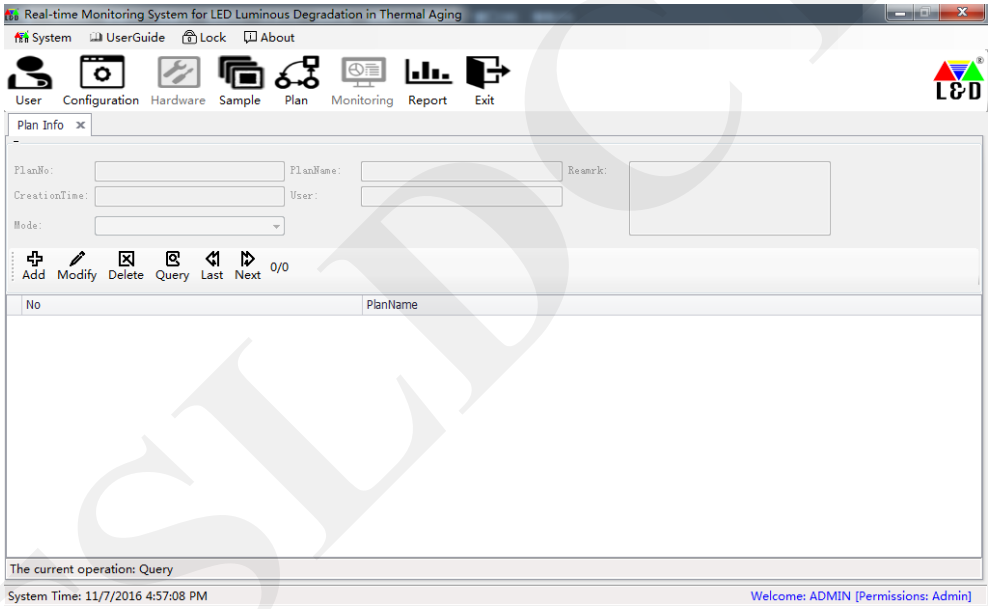


Figure 6.2 Plan Information

【Setting】

- ✧ Click [Add] or [Modify] in Plan Info interface, you will see a pop-up window of plan configuration shown as Figure 6.3-6.5.
- ✧ Click [Delete] to delete the corresponding test plan.

Note: As all test data of a designated test is subjected to one specific test plan, we suggest it's better to add a new plan than to delete an existing plan. Once a plan is deleted, all batch information and test data of this plan will be deleted at the same time.

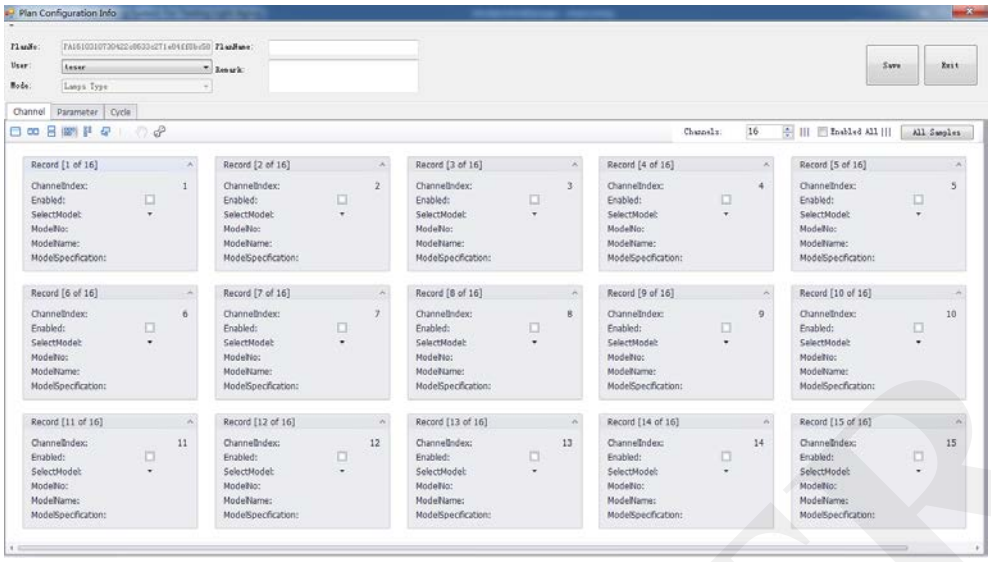


Figure 6.3 Test Channels Settings

【Setting】

- ✧ **[Plan No]**: The system automatically generates plan No. when creating a new plan. This number is unique.
- ✧ **[User]**: The system automatically imports the user name under the permission of Work Group. There is flexibility to change the user name under the permission of administrator.
- ✧ **[Mode]**: The system automatically imports the test mode that is the same as the selected mode of login.
- ✧ **[Plan Name]**: Customize the plan name.
- ✧ **[Remark]**: Add notes for the plan if necessary.
- ✧ **[Channel Tab]**: Set channel parameters according to test demands. The concrete setups are as follows.
- ✧ **[Channels]**: The default channel number is 16 channels. The channel number can be regulated according to test demands.
- ✧ **[Select Sample]**: Select the test samples from the drop-down list at right. If all channels use the same sample information, you can select the samples with one-click entry by clicking [All Samples].
- ✧ **[Enabled]**: Check [Enabled] to enable the corresponding channel. You can select all channels by checking [Enabled All] at right of [Channels].
- ✧ Click [Save] button to save settings. Click [Exit] to exit the setup section.

Note: The operation of [Save] button or [Exit] button affects the other two tabs in plan configuration interface at the same time.

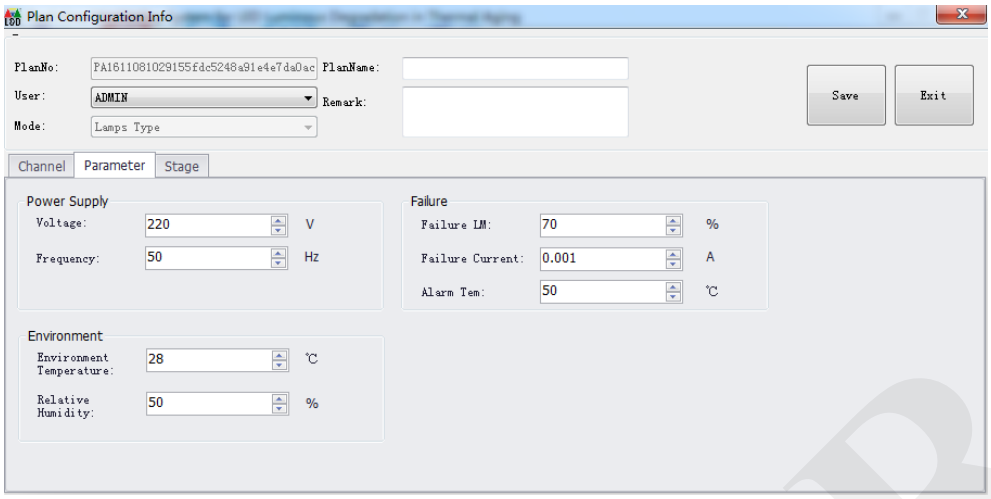


Figure 6.4 Test Parameter Settings

【Setting】

- ✧ **[Voltage]**: Set proper voltage for power supply based on sample demands. The default voltage is 220V.
- ✧ **[Frequency]**: Set the proper frequency of AC power supply according to sample demands. The default frequency is 50Hz.
- ✧ **[Failure LM]**: The failure LM is a retention rate of luminosity during test. The default value is 70%. You can adjust the predefined value according to test demands. The system will send alerts once the actual value is lower than the predefined value and email to the preset address.
- ✧ **[Failure Current]**: Set the proper failure current according to test demands. This value is usually the same as the input current of sample. The system will send alerts once the actual value is lower than the predefined value and email to the preset address.
- ✧ **[Alarm Tem]**: Set the proper alarm temperature according to test demands. The system will send alerts once the actual value is higher than the predefined value.
- ✧ **[Environment Temperature], [Relative Humidity]**: Enter the proper environment temperature and relative humidity for report reference.
- ✧ Click [Save] to save settings. Click [Exit] to exit the setup.

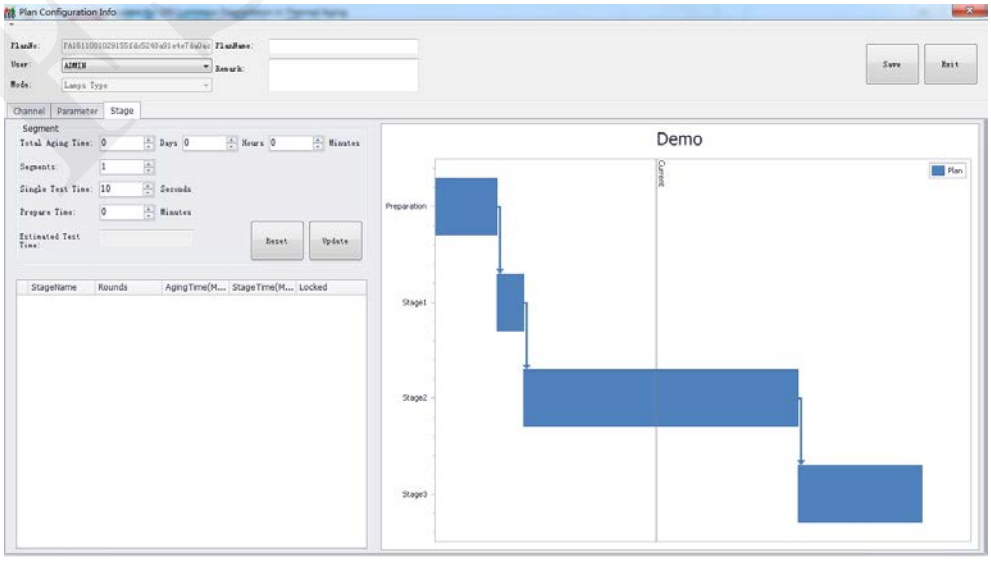


Figure 6.5 Test Cycle Settings

【Setting】

- ✧ **[Total Aging Time]**: Set the total aging time according to test demands. The total aging time must be no fewer than 2 hours.
- ✧ **[Segments]**: Segment the total time according to test demands. The segment number must be no fewer than one stage.
- ✧ **[Single Test Time]**: The single test time refers to the lighting time of one sample during sample scanning for data collection, which must be no fewer than 5 seconds.
- ✧ **[Prepare Time]**: Prepare time means the warmup time of samples before aging test starts. This value allows a null value.
- ✧ **[Estimated Test Time]**: The estimated test time will be automatically generated on the basis of the cycle parameters confirmed by clicking [Update].
- ✧ **[Update]**: With test cycle configuration complete, the Estimated Test Time and a segment list will automatically be generated on the basis of cycle parameters confirmed by clicking [Update].
- ✧ **[Reset]**: Click [Reset] to update the segment settings again.
- ✧ **[Stage Name]**: The stage number is equal to the segments value. The stage name can be self-defined.
- ✧ **[Rounds]**、**[Aging Time]**、**[Stage Time]**：With test cycle configuration complete, the total aging time will be allocated equally by system on the basis of segment number. The relationship among the three factors is Rounds* Aging Time= Stage Time. You can modify any value of the factors to adjust the settings of one segment.

Note: While modifying the cycle parameter, referring to Figure 6.6, please pay attention to the following:

- ✓ The sum of [Stage Time] must be no greater than [Total Aging Time], that is A + B + C ≤ D.
- ✓ If you want to adjust the value of [Rounds], that is “E” in Figure 6.6, to adjust the aging time allocation, the round value must be shorter than the average value.
- ✓ In a stage, as the function relation among cycle parameters is [Stage Time] = [Rounds]* [Aging Time], that is G=E*F. When the value of [Rounds] or [Aging Time] is adjusted in a stage, there may be a rounding error of [Stage Time], which causes the sum of [Stage Time] less than [Total Aging Time], i.e. sum (G) ≤ D. In this case, you may ignore this prompt and continue with saving the settings.

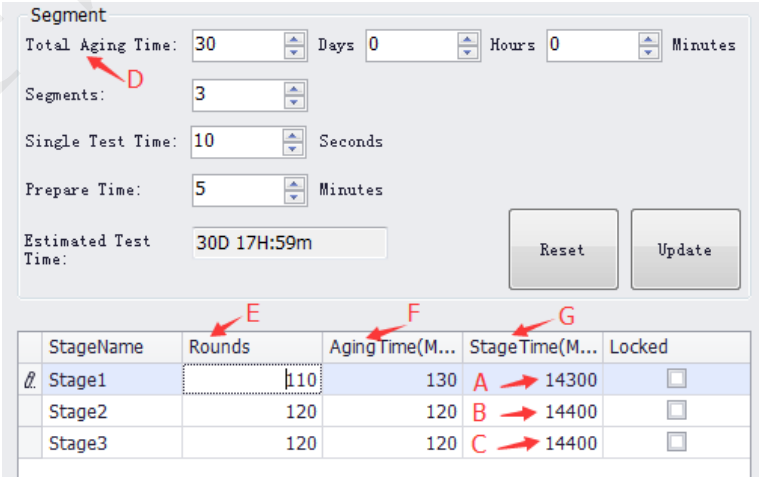


Figure 6.6 Segment Parameters Adjustment

- **[Locked]**: With the [Locked] box checked, the averaged function doesn't apply to the locked stage while performing an update of segment settings.
- **[Demo]**: The demo shows the segment bar diagram of exemplar-cycle. With test cycle configuration complete, the demo will be updated to test plan diagram.
- Click [Save] to save settings. Click [Exit] to exit the setup.

7 Test Monitoring

Test monitoring is the data gathering process for luminosity, current, temperature, voltage and so on. The test monitoring interface is shown as Figure 7.1. The interface includes three tabs: dashboard, progress and log. The functions of each tab are as followings：

- **[Dashboard]**：The indicators of hardware status are shown on the right side. The real-time values of luminosity, current and temperature are shown on the left side. The real-time curves of luminosity, current are drawn in the middle.
- **[Progress]**：An execution progress chart for the selected test plan is shown as Figure 7.2. The progress chart will update as batch execution progress after selecting a specific test batch.
- **[Log]**：Record error message during testing.

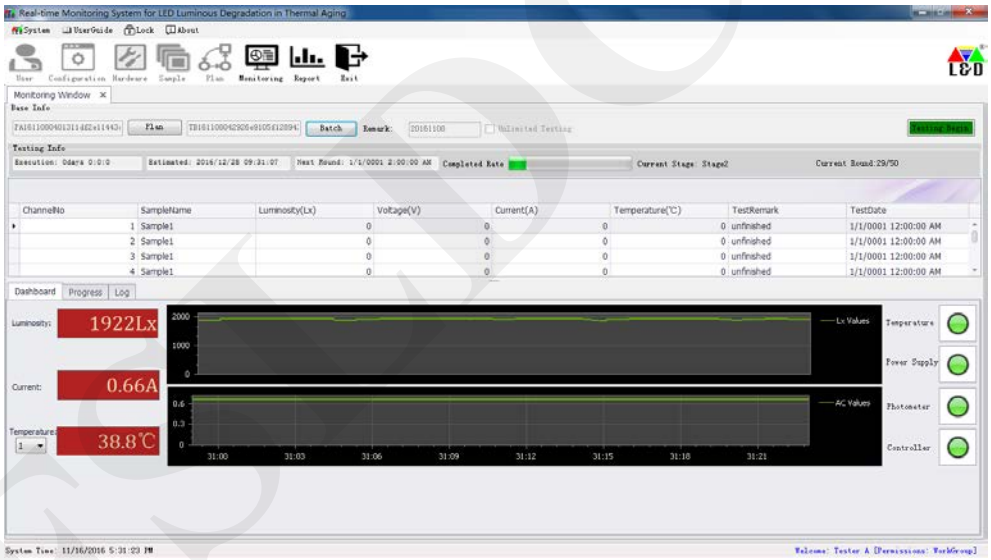


Figure7.1 Test Monitoring

【Setting】

- **[Plan]**: Select the plan you need.
- **[Batch]**: Select the plan you need from the plan list. If there is no unfinished batch, a new batch will be generated by system.
- **[Remark]**: You can add or modify notes for a batch before test begins.
- **[Unlimited Testing]**: The [Unlimited testing] box can be checked before test begins or test record exits. If this function is enabled, the test process will not be limited by test stage settings and performs testing of first stage without limit.
- **[Testing Begin] & [Testing End]**: Click [Testing Begin] to start test. Click [Testing End] to stop test. These two actions will automatically perform according to plan settings.

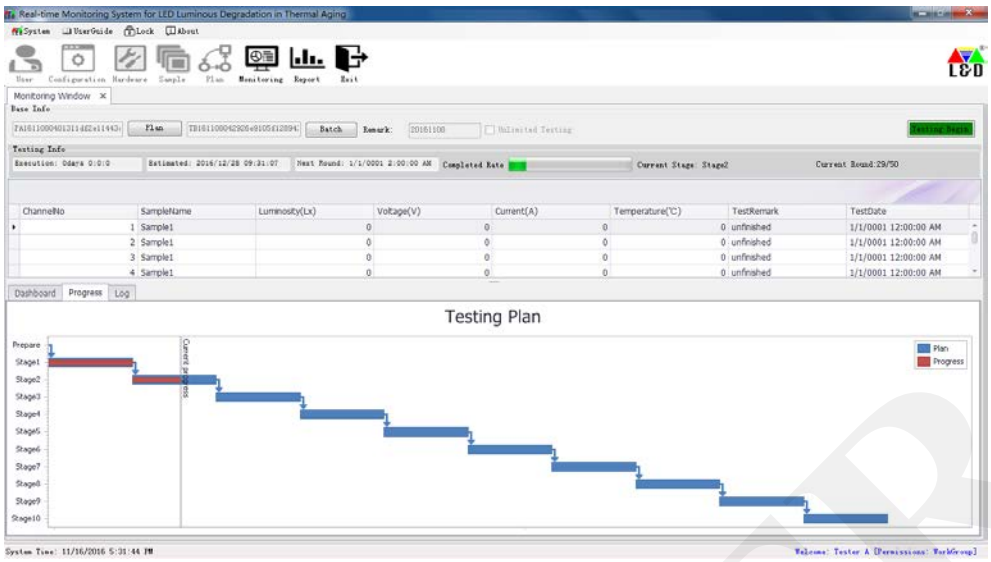


Figure7.2 Test Progress

8 Report

You can view test data and report on report interface shown as Figure 8.1.

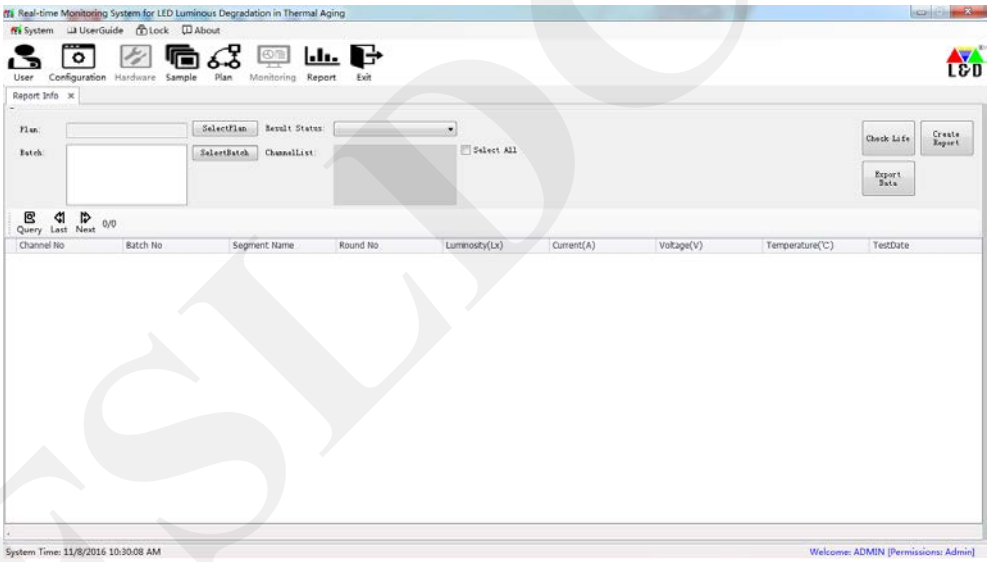


Figure 8.1 Report Information

【Setting】

- ✧ **[Select Plan]**: Click the [Select Plan] to select the plan you need to query.
- ✧ **[Select Batch]**: Click the [Select Batch] to select the batch you need to query.
- ✧ **[Result Status]**: The result status includes three kinds: “All”, “Normal” and “Abnormal”. You can filter the normal data and abnormal data by selecting result status.
- ✧ **[Channel List]**: Select the channels you need to query. You can check the [Select All] box to select all channels.
- ✧ **[Query]**: Click [Query] to search all qualified records as shown in Figure 8.2.
- ✧ **[Check Life]**: Click [Check Life], you will see a pop-up window as shown in Figure 8.3 that shows the estimated life of each sample.

- ✧ **[Create Report]**: Click [Create Report], you will see a pop-up window that shows the test report (Figure 8.4). Click [Save] to export test report.
- ✧ **[Export Data]**: Click [Export Data] to export raw data.

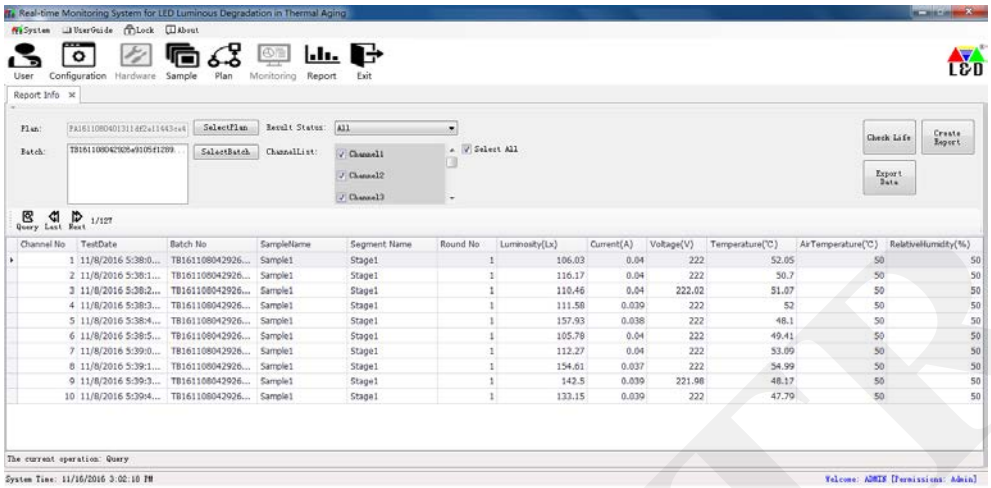


Figure 8.2 Test Record List

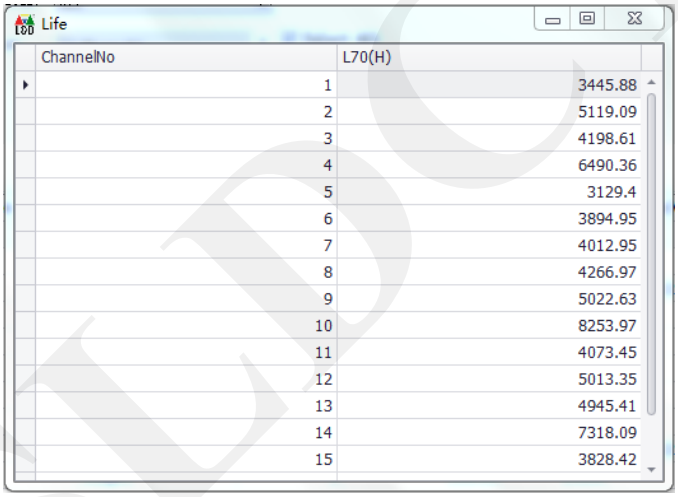


Figure 8.3 Estimated Life

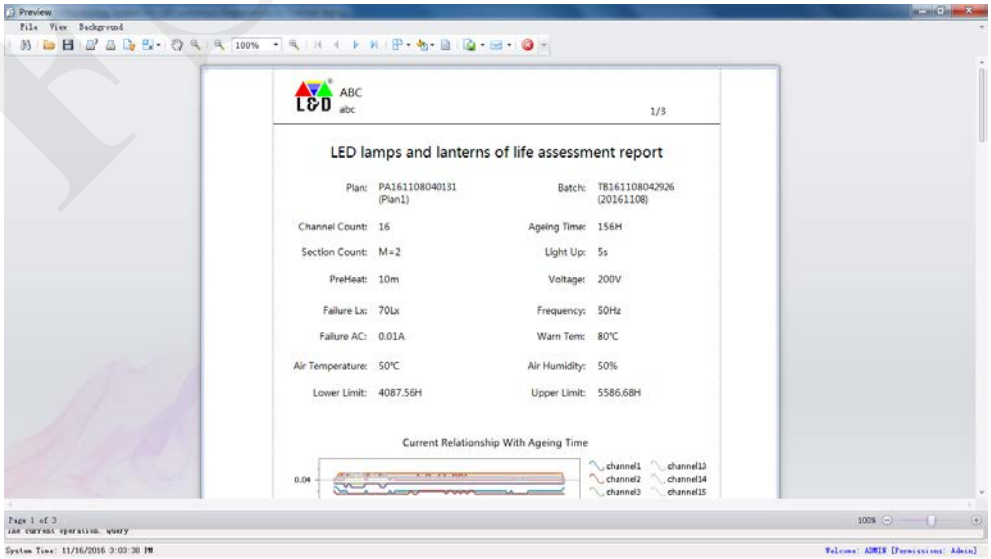


Figure 8.3 Test Report

QR Code for Website

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