LCAM LUMINANCE Photometer

LCAM – Luminance Photometer

User Manuel V1.4

NYX HEMERA Technologies Inc.

Intelligent Tunnel Lighting Control

NYX HEMERA Technologies Inc.
Intelligent Tunnel Lighting Control

109 Saint-Vallier Est, suite 100
Québec, QC, G1K 3N9, Canada

Phone : +1 418-977-7788 ou +1 844 997-7788
Fax : 418 977-7788
Web : www.nyx-hemera.com
Email: support@nyx-hemera.com

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Glossary

ESD	Electrostatic discharge
LCAM	Luminance Photometer
RFI	Radio Frequency Interference
TLACS	Tunnel Lighting Addressable Control System

Introduction

Product Overview

The LCAM measures the level of luminance, or brightness, created by natural light at the tunnel entrance / exit to ensure that the visual perception of drivers will be maintained, both day and night, by avoiding sudden variations in lighting levels and potential “black hole effect” when entering and exiting a tunnel.

The LCAM uses a specially designed, highly light-sensitive photocell, filtered to provide a spectral response close to that of the average human eye, to react to changes in light levels at the entrance and exit to, as well as within, the tunnel environment. This reaction is virtually instantaneous.

The light receptor measures the average luminance within a fixed viewing angle that can be preset to be anywhere in the range 10 to 40º. The standard instrument has a viewing angle of 20º, (L20, as recommended by Commission Internationale de l´Eclairage, (C.I.E.), publication 88, 1990). The luminance measurement range is 0 to 10,000 cd/m^2, which can be scaled to suit customer requirements.

The LCAM is a self-contained intelligent analyser and the measurements are converted into an output signal of 0/2/4-20mA (directly proportional to the luminance measurement) for hard wire connection and signal transmission to a host controller. The LCAM has alarm relay contacts and supports the Modbus serial communications protocol.

The LCAM has been designed to enable it to withstand extremes of weather conditions. The complete electronic system is contained within a water-proof, heated housing of powder coated stainless steel with an IP66 protection rating.

The LCAM has an operating temperature range from -40ºC to +50ºC which ensures stable readings across all prevailing ambient temperature conditions.

Various optional extras are available such as, mounting brackets and wash-wipe systems, providing a solution for the most demanding specifications.

The integrated image camera allows remote verification of the LCAM alignment. See the TLACS documentation for more information on how the images are stored. The required configuration is described in the Using the CMI Software section.

Installing the IOS Utility Software and Configuring USB

Warning: The Utility Software and the USB Driver MUST BE INSTALLED ON THE PC FIRST i.e. before connecting the LCAM to a PC. Connecting the PC to a LCAM before installing the Utility Software and the USB Driver will cause problems with installation and may even cause the installation to fail.

Minimum hardware/software specification for host PC

The LCAM Utility Software is not a large or particularly complex program, and therefore has no requirement for a high performance host PC. Any reasonably modern PC/laptop will be suitable. The only "must have" requirements are:

- Windows XP, or newer operating system
- All recent operating system Service Packs and upgrades (visit the Microsoft website) must have been installed
- At least one free USB slot (assigned to a COM Port between COM1 and COM8 – see later section on Assigning a Valid COM Port).

Installing the USB Driver

The LCAM USB Driver software is supplied on a CD that is shipped with your instrument.

1. Ensure that you are logged onto your PC with Administrative rights, so that you have the necessary permission to install software.

2. Copy the "**DSL USB DRIVER (CDMxxxxx).exe**" file from the CD to any suitable location on the host PC ("**My Documents**" is a good location), then **double click it.**

Caution; care must be taken

3. Having double clicked the .exe file a DOS Prompt window will open and the USB driver will be automatically installed. See the following screenshot. It may take up to 1 minute to install the driver, so *please be patient* and wait for the DOS Prompt window to disappear before performing any other actions on your PC.

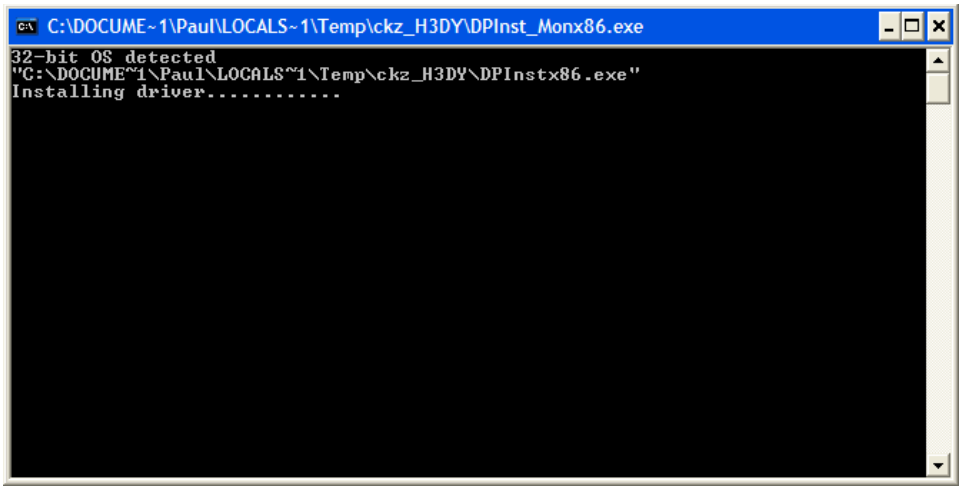


Figure 1 – USB Driver Installation screenshot

Installing the IOS Utility Software

The LCAM Utility Software is called IOS and is supplied on a CD that is shipped with the instrument.

1. Ensure that you are logged onto your PC with Administrative rights, so that you have the necessary permission to install software.

2. Copy the "**IOS Utility Install V*.*.*.zip**" from the CD to any suitable location on the host PC ("**My Documents**" is a good location).

3. Extract the contents of the zip file (right click on the zip file and click "**Extract All**") to a local directory ("**My Documents**" is a good location again).

4. Navigate to the extracted files and double click "**setup.exe**".

5. Follow the onscreen installation prompts.

Note: *If you encounter any warning messages about replacing existing .dll files, always choose NOT to replace the existing files.*

The software should now be installed and should appear in the "All Programs" list as "IOS UTILITY".

Updating the IOS Utility Software

From time to time the manufacturer may release updated versions of the IOS Utility Software. If an updated version is issued, it is essential that any existing version is removed from the PC prior to installing the new one.

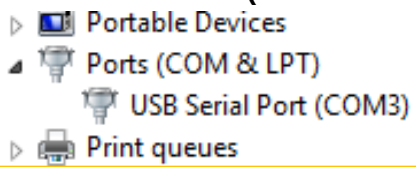
To remove the existing Utility Software use the Windows "**Add or Remove Programs**" option from the Windows "**Control Panel**".

Assigning a valid COM Port

When you first connect a PC to the LCAM, it is very likely that the PC will assign the USB connection to a COM Port number outside the acceptable range of COM1 to COM8, in which case the IOS Utility Software will be unable to communicate with the instrument.

It is possible to check which COM Port your PC has assigned to the LCAM by opening Windows "Device Manager" before connecting your LCAM. To open "Device Manager":

1. Right click on "**My Computer**"
2. Click on "**Manage**"
3. Click on "**Device Manager**"
4. Scroll down to "**Ports (COM & LPT)**", then click the "**+**" symbol to look at the list of COM Ports



When the list of current COM Ports is visible on the PC, connect your PC to a LCAM by plugging the USB cable from your PC into the USB connection.

At this point, the PC should indicate that it has "Found New Hardware" and a new COM Port number should appear in the "Ports (COM & LPT)" list.

If the new COM Port is between **COM1** and **COM8** then the PC has allocated a valid **COM Port** and no further action is required.

However, if the COM Port number that was assigned to the connection is outside the acceptable range then it will be necessary to change the assigned COM Port to a number between COM1 and COM8. Follow the procedure below to assign a valid COM Port:

1. Right click on the **COM Port** (in the "**Ports (COM & LPT**)" list) that appeared when you connected to the LCAM
2. Click "**Properties**"
3. Select the "**Port Settings**" tab
4. Click on the "**Advanced**" button
5. Click the "**COM Port**" and select a new "**COM Port Number**" between COM1 and COM8 (avoiding any COM Ports which are marked as in use) from the drop down list

Once a valid COM Port number has been assigned to the LCAM USB connection, the PC will remember this COM Port assignment and it will not be necessary to repeat the process again when connecting the same PC to the instrument, provided that the LCAM is always connected via the same USB slot in the PC.

Note: If the LCAM is connected to a different PC, it will be necessary to repeat the process above and assign a valid COM Port.

Note: Always connect to the LCAM using the same USB slot on the PC. If the instrument is connected via a different USB slot, it will be necessary to repeat the process above and assign a valid COM Port, because the PC sees each USB slot as a separate entity.

Using the IOS utility Software

Warning: The Utility Software and the USB Driver MUST BE INSTALLED ON THE PC FIRST i.e. before connecting the LCAM to a PC. Connecting the PC to a LCAM before installing the Utility Software and the USB Driver will cause problems with installation and may even cause the installation to fail.

Connecting a PC to the LCAM

Before connecting a PC to the LCAM it is essential to ensure the USB Driver has been installed, and that a valid COM Port has been assigned – see the previous section on installing software for details.

With the driver installed and com port assigned, connect the PC to the LCAM using a standard USB cable (type A to Type B). The USB header can be found inside the camera on top off the vertical PCB as seen on the picture underneath.

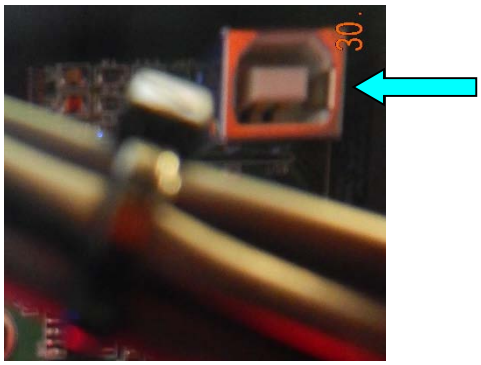


Figure 2 – USB header's location

The Comms tab

When the software is first run, the Comms tab is the only tab that will be available. See the following screenshot.

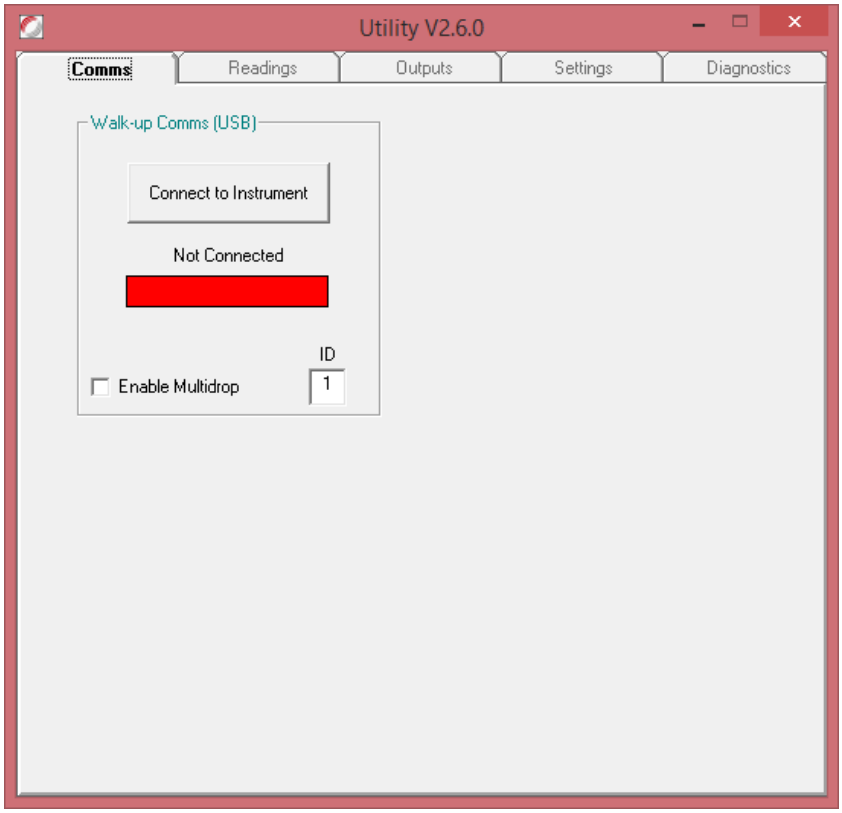


Figure 3 – Comms tab screenshot

The Comms tab allows a connection with the LCAM to be established. When the program is first run, there will be no connection, so the status bar will always be red (indicating no connection). The other tabs will be unavailable until a comms connection has been established.

Connect to the LCAM

To establish a connection with the LCAM click the "**Connect to Instrument**" button. The software will scan Com Ports 1 to 8 looking for any LCAM monitors that may be connected. More than one Com Port may exist, so more than one LCAM may be connected.

When the scan is complete the software will report the status of any Com Ports found and any LCAM connected on a separate pop-up window. See the following screenshot.

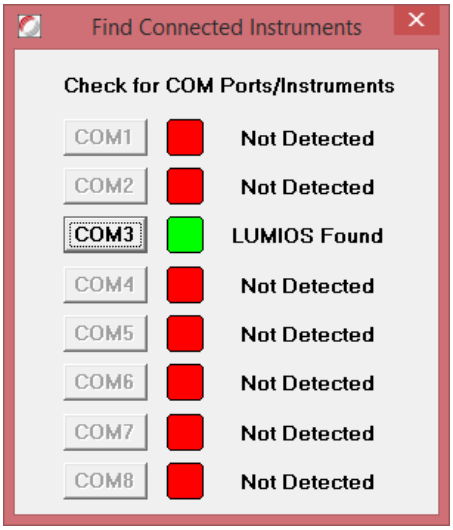


Figure 4 – LCAM connection to COM ports screenshot

Select a Com Port with "LUMIOS Found" alongside it (it will have a green status indicator); at this point the com port window will collapse. The status indicator bar will now be green (indicating a positive connection). See the following screen shot. Once a communication connection is established you will able to select any of the other tabs.

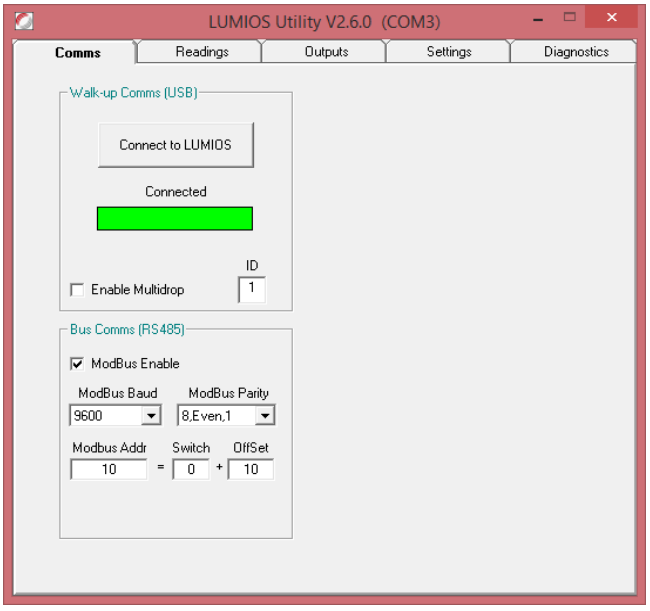


Figure 5 – Connecting COM to LCAM process screenshot

Bus Comms (RS485)

Checking the 'ModBus Enable' tick box allows communication with the instrument via Modbus. Within the TLAC system the following settings must be applied:

- ModBus Baud: 9600
- ModBus Parity: 8, Even, 1

The Modbus Addr is the combination of the ID switch within the LCAM and the configured Offset. Within the TLACS, it is recommended to use Offset 10 for the LCAM modules.

For further information please contact Nyx Hemera Technologies.

The Readings tab

The Readings tab shows the current luminance reading and the damping time applied to the reading. This tab also has a number of checkboxes for activating and controlling automatic data logging; saving data directly to the PC hard drive. See the following screen shots.

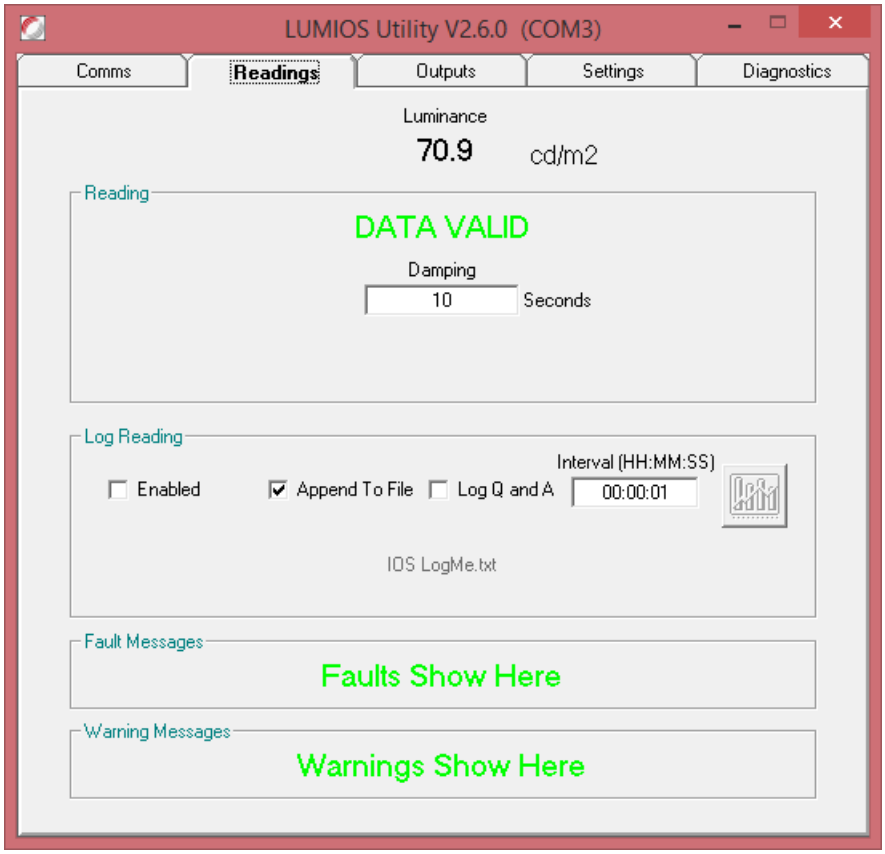


Figure 6 – Reading tab screenshot

Luminance

This box shows the current luminance reading, after damping. This is the value on which all outputs act.

Data Valid

The LCAM continually performs a number of self-diagnostic checks. All the time these checks show the instrument to be functioning correctly, the DATA VALID text will appear in green above the damping value.

If at any point, the instrument fails one of these checks, Data Valid status will change and the text DATA INVALID will appear in red above the damping value instead. In this situation the luminance reading value will also turn red.

If the instrument is fitted with a wash/wipe system, Data Valid status will also change whenever the wiper and/or the washer are in operation. Both the washer and the wiper act on the window of the instrument and can therefore artificially reduce luminance whilst operating.

Damping

This value (in seconds) determines the level of damping applied to the luminance reading. The default damping for this instrument is 10 seconds. The response time of the instrument to a step change in the reading is approximately three times the damping time.

Log Reading - Enabled

When checked, the following parameters will be logged in a CSV file, stored in the location C:\IOS READINGS LOGS on the PC; the luminance measurement; calculated mA output; Data Valid status; and the relay status (as a hex number). The logs will be created at intervals defined by the Interval setting.

Log Reading – Append to File

This box checked by default. The log file created will be a single file using the electronic serial number of the instrument as reference in the filename, and each new log is appended within that file. A new file is created each day with the date forming part of the filename.

When Append to file is unchecked, the logging will generate a new file at each logging interval, using the time, date and electronic serial number of the LCAM as the file name.

The log file(s) can be opened in a text editor or spreadsheet and can be used for data logging, trend graphing or for diagnostics.

Log Reading – Log Q and A

The logging function uses a “question and answer” system to retrieve data for the log. In this system, the IOS Utility Software sends a question (being an ASCII text string) to the LCAM, which responds with an answer (usually being a number).

By default the question that is asked relates to the luminance reading and general status of the instrument only. However, with advice from Nyx Hemera Technologies, advanced users may modify the question so that the log file records additional or alternative data; for example relay thresholds or analogue output scaling values.

In these circumstances it is beneficial to log both the question and the answer, so that the log file is more easily interpreted.

When this checkbox is un-checked, the log file (in whichever format) only includes the answer, but when this box is checked the log file includes both the question and answer.

Log Reading - Interval

The time interval between the creation/update of log files is determined here.

Graph Button

As well as a log file being created, the data can be viewed using the graphing feature. While logging click on the ‘**Graph Icon**’ (see screenshots below).

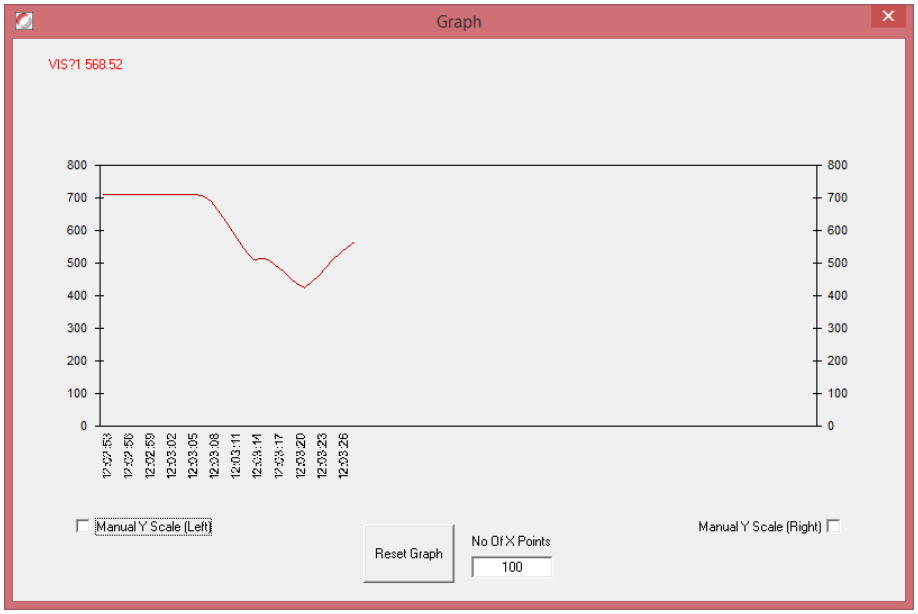


Figure 7 – Log creation screenshot

Only the first four lines of the “LogMe.txt” file are viewable on the graph. There are two ‘Y’ axis, and by clicking on the coloured text at the top “VIS?”, the axis that this data is plotted against can be changed; Left-Left Y-Axis, Centre-Not displayed and Right-Right Y-Axis.

The Y-Axis scales are automatic but can be manually changed by checking the “Manual Y Scale” and then entering the minimum and maximum values.

The number of X coordinates can be changed (between 100 and 3600) by entering the value in the ‘No of X Points’ box and pressing **enter**.

The ‘Reset Graph’ button clears the currently displayed data.

To exit the graphing feature, close the window using the cross at the top right hand corner of the window to return to the main Portal. Click the enabled **checkbox** to stop logging data.

Fault Messages

If the instrument self-detects a fault, it will display a brief message, describing the fault, on this tab. Most fault messages will continue to be displayed on this tab until an operator clicks **on the message to acknowledge it**. If the fault is no longer active the message will disappear, but if the fault status is still active the message will re-appear immediately.

See the section on “Fault Messages and Troubleshooting” later in this manual for more information.

Warning Messages

If the instrument self-detects a parameter that is close to or out of range that needs investigating, a brief warning message will be displayed describing the problem. The warning message will continue to be displayed on this tab until an operator clicks **on the message to acknowledge it**. If the warning is no longer active the message will disappear, but if the problem causing the warning is still active the message will re-appear immediately.

See the section on “Fault Messages and Troubleshooting” later in this manual for more information.

The Outputs tab

The Outputs tab allows for configuration of electrical interface outputs, such as the 0/2/4-20mA current loop and relay contacts. See the following screenshots.

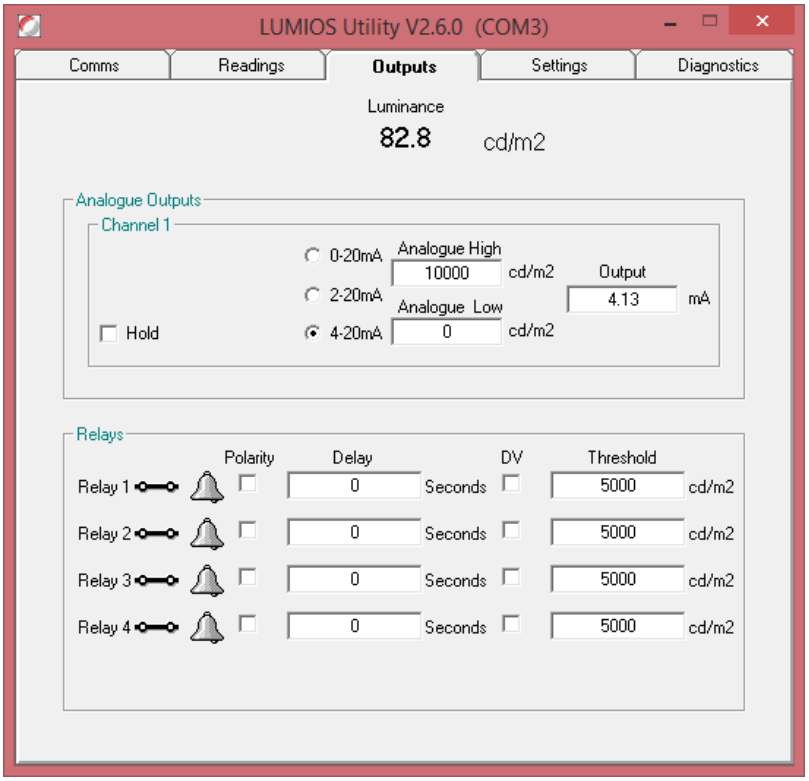


Figure 8 – Outputs tab screenshot

0-20mA / 2-20mA / 4-20mA

The current loop analogue output used on the LCAM can be configured to operate across any one of three scales: 0-20mA, 2-20mA or 4-20mA. Select the required scale using these radio buttons.

Analogue Low and Analogue High

These two parameters define the upper and lower scaling points of the 0/2/4-20mA output.

Set the analogue low value to the reading at which the analogue output should generate 0mA, 2mA or 4mA (dependant on selection above).

Set the analogue high value to the reading at which the analogue output should generate 20mA.

Output

The output value is a calculated indication of the expected current output in mA - taking into account the analogue low/high settings and also the 0/2/4mA scale selection.

The value shown here is a calculated value only, it is not an electronically measured value from the analogue output circuit. There is no direct connection between the calculated value shown here and the actual output. However, unless there is a fault with the instrument, the correlation between the calculated value and the electrical output should be very good.

Hold

When checked, a data invalid status will cause the analogue output (both the calculated reading shown here in the software and also the actual electrical output) to be frozen at the last known output current.

The analogue output will continue to be held at this value for the duration of the data invalid period.

When the data valid status is returned, the output will continue to be held for the delay period defined by the time setting alongside. The time setting box is only visible when the 'Hold' checkbox is ticked.

Once the analogue output is released from Hold, the output will return instantaneously to tracking the current luminance reading.

There is one exception to the rules outlined above for the Hold feature: if the LCAM is used in conjunction with a washer system which is fitted with a float switch (for low washer fluid detection), the Data Valid alarm will be tripped when the washer fluid becomes low, so the Data Valid relay will change status and the Data Not Valid message will be displayed etc., however the Hold function will NOT act, and the analogue output will continue to track the reading as normal.

Relays

This section shows the current status of the four (4) relays. The graphical image associated with each relay indicates whether the relay contact is currently open or closed. Contacts are open in a de-energised state (i.e. N/O), so contacts fall open naturally in the event of a power loss.

The relays fitted to the LCAM are solid state devices. They serve the same function as electromechanical relays, but have no moving parts; therefore the relays are silent in operation.

Relay Polarity checkbox

Checking this box changes the default state of the associated relay.

With the checkbox UNCHECKED, the associated relay will be energised in a below threshold condition, and the relay status indicator will show a closed contact in the same below threshold condition. In this polarity the relay will de-energise when the reading exceeds the threshold.

With the checkbox CHECKED, the associated relay will be de-energised in a below threshold condition, and the relay status indicator will show an open contact in the same below threshold condition. In this polarity the relay will be energised when the reading exceeds the threshold.

Delay

When the associated relay is used as a level indicator (see DV details below), this value determines the continuous length of time (in seconds) for which the luminance reading must have crossed the associated threshold value, before the relay will change state.

Delaying the activation of the relay in this way can prevent borderline level changes from “dithering” the relay state. Only genuine, sustained readings that cross the threshold will actually trigger the relay.

However, when the associated relay is used as a Data Valid indicator (see DV details below), this value determines the length of time (in seconds) that the Data Valid relay will remain in its alarm state after the completion of a wash/wipe cycle.

DV (Data Valid)

Checking this box changes the function of the associated relay.

With the DV checkbox UNCHECKED, the associated relay acts as a level indicator; changing state when the luminance reading crosses the Threshold value for a continuous period of time greater than the Delay time.

With the checkbox CHECKED, the associated relay will act as a “Data Valid” indicator. The instrument performs a certain level of self-analysis, and if this analysis identifies fault: the relay will change state. Likewise, if the washer/wiper is active: the relay will change state.

The associated Delay value will have no effect when the Data Valid status changes from valid to invalid, however the delay period will be applied when changing from invalid to valid status.

Checking the DV box will make the Threshold box disappear as it is not required for Data Valid function, and the lack of the Threshold box further highlights the change in function of the relay.

With the Polarity checkbox UNCHECKED, the associated relay will be de-energised in a Data Valid condition and the relay status indicator will show an open contact in the same below threshold condition. In this polarity mode the relay will be energised when the reading exceeds the threshold.

With the Polarity checkbox CHECKED, the relays will be energised in a Data Valid condition, and the relay status indicator will show a closed contact in the same below threshold condition. In this polarity mode the relay will be de-energise when the reading exceeds the threshold. This condition represents the recommended failsafe operation.

Threshold

When used as a level indicator (see DV details above), this value determines the luminance reading at which the associated relay will change state.

The Settings tab

Warning: The Settings tab should only be used by a trained instrument engineer who has read and understood the later section on "Setup, Commissioning and Service", as the settings and controls on this tab determine the calibration of the instrument and the measurement reading that it generates.

The Settings tab has a small amount of diagnostics information and also the settings for control of any wash/wipe system installed with the LCAM

See the following screenshots for appearances of the Settings tab.

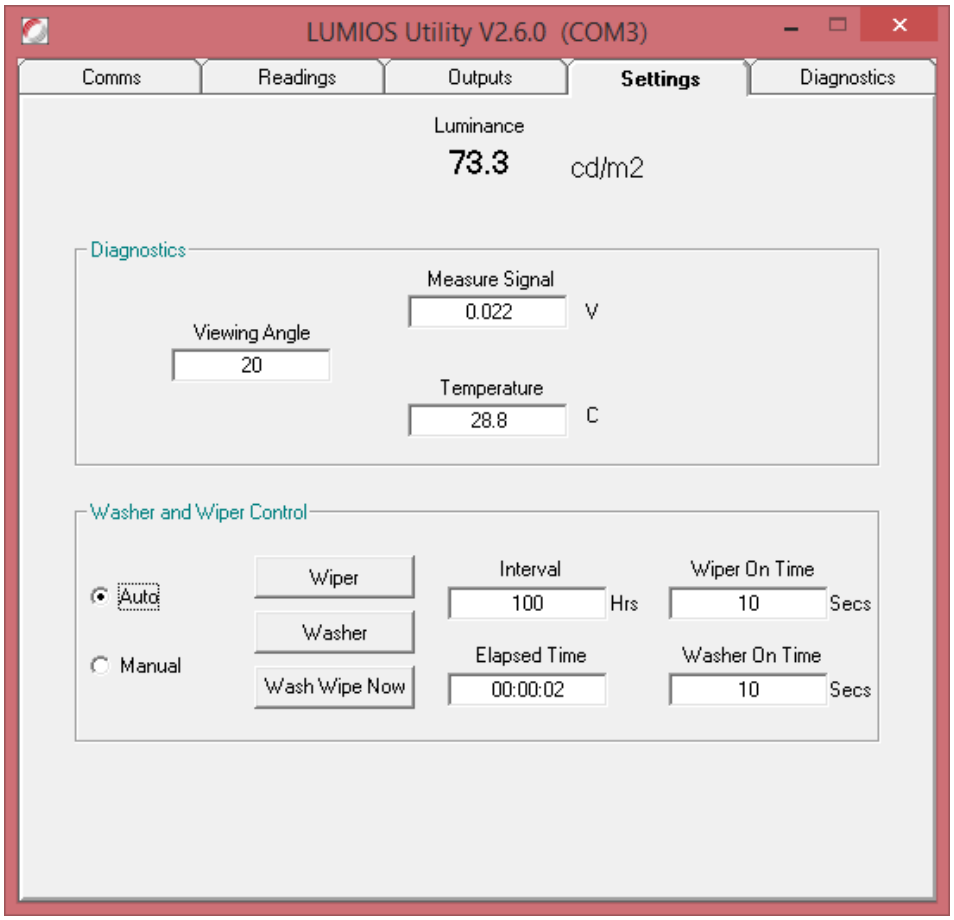


Figure 9 – Settings tab screenshot

Measure Signal

This value indicates the actual voltage measured on the photo detection circuit.

Temperature

The LCAM has on-board temperature measuring. This parameter shows the current temperature measured inside the heated LCAM enclosure.

Washer and Wiper Control

Warning: Do not operate the wiper when the screen is dry. Ensure that the screen is wet prior to initiating the wiper. Failure to do so can result in damage to the wiper unit and/or permanent contamination of the screen.

Warning: The washer unit must not be operated without the minimum fluid level marked on the reservoir. When re-filling the reservoir, always fill to the fill level marked on the reservoir. Failure to observe these precautions may result in damage to the washer unit.

The LCAM can be supplied with an optional wiper unit fitted, and a washer unit is also available as a separate accessory. These items are designed to work cooperatively and neither should be deployed independently – they should always be used in conjunction with each other.

The wash / wipe units have been designed specifically for use with the LCAM and use of alternative aftermarket wash / wipe systems is not recommended and may invalidate the warranty.

The wash / wipe controls described in this section are always visible in the Utility software, irrespective of whether a wash / wipe system is fitted or not. However, these controls will have no effect if an appropriate wash / wipe system is not fitted.

This section assumes that the wash / wipe system has been properly installed and connected, in accordance with the Installation Manual.

Note: *The washer unit employs a float switch to indicate a low fluid level. If the float switch detects a low fluid level, the washer pump will be disabled and a warning message will be displayed.*

Auto/Manual

These radio buttons allow the wash/wipe system to be set for manual or automatic operation.

The screenshots below show how the options change when Auto/Manual are selected.

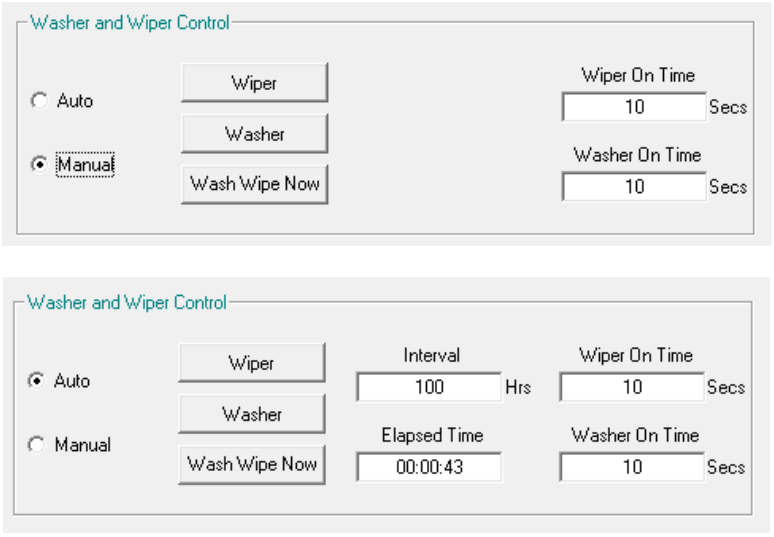


Figure 10 – Wiper / Washer configuration setting tab screenshot

Wiper

Clicking this button will activate the wiper. The button will turn green, to indicate that the wiper is active, and the wiper will operate continuously until the expiration of the “Wiper On Time” (displayed to the right), at which point the button will return to a grey colour and the wiper will stop.

Washer

Clicking this button will activate the washer. The button will turn green, to indicate that the washer is active, and the washer will operate continuously until the expiration of the “Washer On Time” (displayed to the right), at which point the button will return to a grey colour and the washer will stop.

Wash/Wipe Now

Clicking this button will immediately activate a wash/wipe routine, as defined by the settings for automatic wash/wipe.

Interval

This parameter defines the time interval between the automatic operation of the wash/wipe function.

Elapsed Time

This parameter displays the time elapsed since the last automatic wash/wipe. The elapsed time can be edited so that the scheduled operation of the next automatic wash/wipe function can be adjusted as required.

Wiper On Time

This parameter defines the length of time for which the wiper will operate continuously during either automatic or manual wash/wipe.

Washer On Time

This parameter defines the length of time for which the washer will operate continuously during either automatic or manual wash/wipe.

The Diagnostics tab

The Diagnostics tab has a number of read-only boxes, and buttons for backup and restore. See the following screenshot.

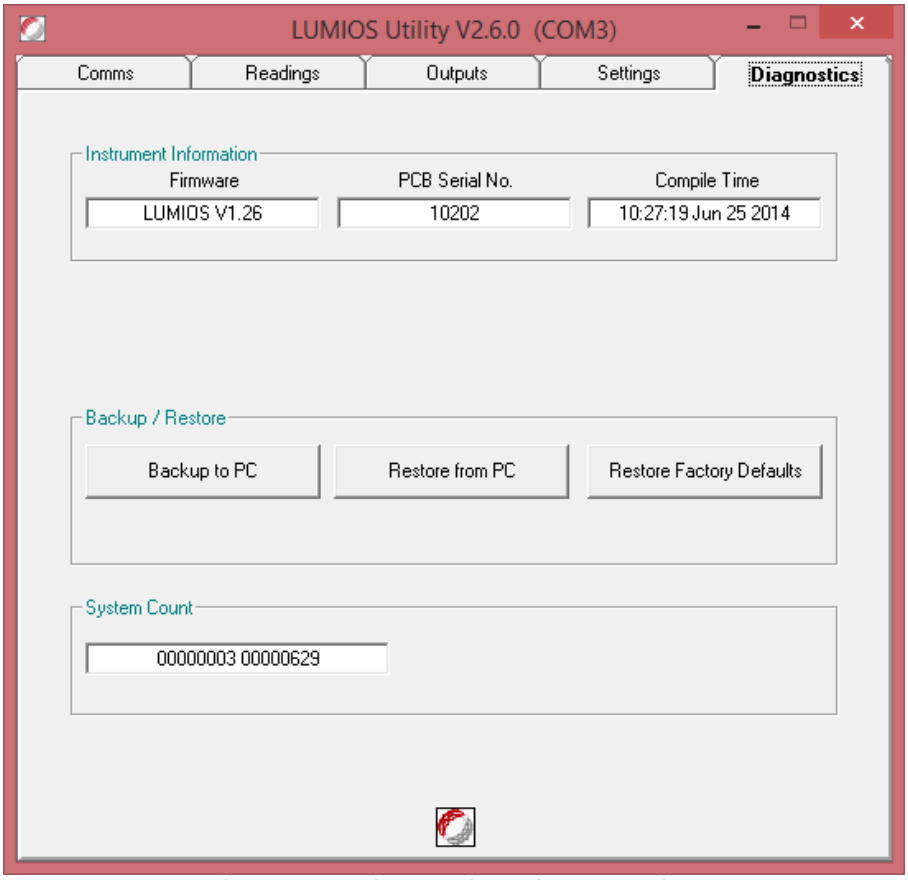


Figure 11 – Diagnostics tab screenshot

Firmware

Displays the current firmware version installed in the instrument.

PCB Serial No.

Displays the current electronic serial number stored in the LCAM PCB.

Compile Time

Displays the compile time of the firmware installed in the instrument.

Backup to PC

Clicking this button will cause the current instrument settings to be saved in a backup file in the location: C:\IOS BACKUPS. The filename of the backup file will incorporate the date, time and electronic serial number of the instrument at time of backup.

It is highly recommended that you use this button to take a backup of your instrument settings after successfully completing installation and commissioning.

Restore from PC

Clicking this button will allow the selection of a log file from which to restore your instrument settings.

The restore process will cause all settings to be overwritten, so it is essential that you have confidence in the log file from which you restore.

Warning: It is highly recommended that you take a backup prior to restoring, so that in the event that you restore from a bad file or unusable settings, you can always restore back to a known good point.

Warning: Restoring from a log file will overwrite ALL settings, parameters and variables, including those that define the zero point and calibration. Restoring from a log file could change the calibration of your instrument.

Restore Factory Defaults

Clicking this button will restore all settings and parameters to default values as determined at the factory.

Warning: This action will overwrite all existing settings and parameters with default values, so your set-up and calibration will be lost, as will any alarm points, scaling factors, and drift values.

CMI Utility SoftWare

Warning: The Utility Software and the USB Driver MUST BE INSTALLED ON THE PC FIRST i.e. before connecting the LCAM to a PC. Connecting the PC to a LCAM before installing the Utility Software and the USB Driver will cause problems with installation and may even cause the installation to fail.

Connecting a PC to the LCAM Photometer USB interface

Before connecting a PC to the LCAM Photometer's USB interface. It is essential to ensure the USB Driver has been installed, and that a valid COM Port has been assigned – see the previous section on installing software for more details.

With the driver installed and com port assigned, connect the PC to the LCAM using a standard USB cable (type A to Type B). The weatherproof USB header can be found on the right hand side of the LCAM enclosure.

The Comms tab

The Comms tab is the default tab. On program start, a connection is established if possible. If no connection is available on start-up, pressing **SCAN** allows to manually initiate a connection with the LCAM to be established.

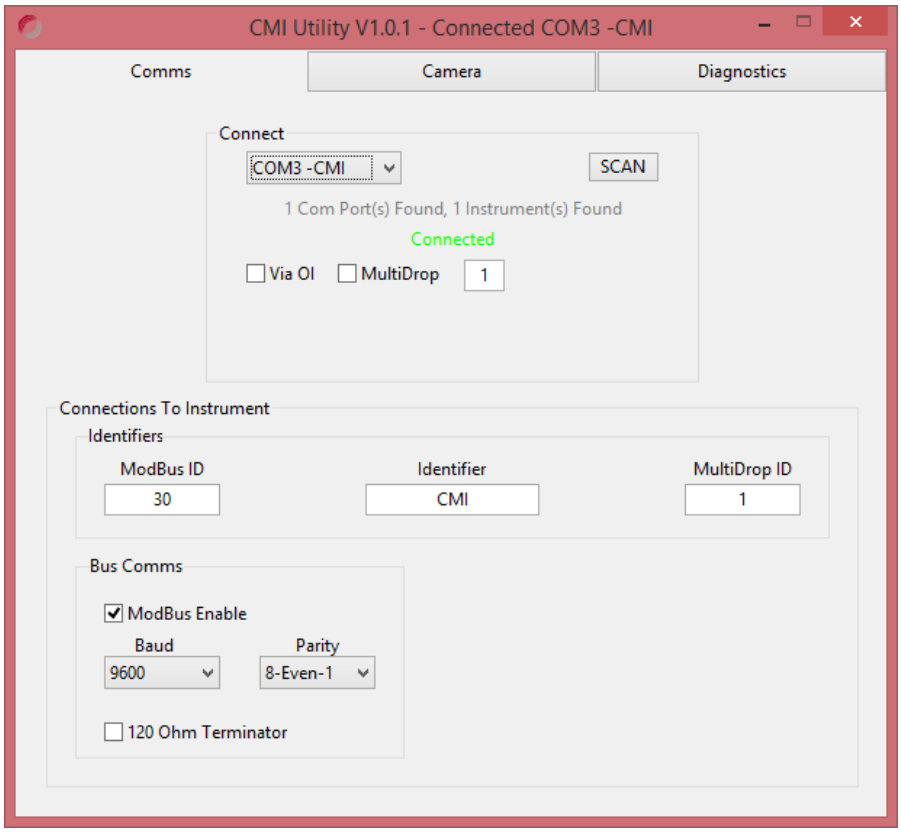


Figure 12 – Comms tab screenshot

Identifiers

Here, the basic communication information must be entered. To have the image interface working with the TLAC system, the ModBus ID must be set to 30 (factory default when shipped from Nyx Hemera Technologies).

Bus Comms (RS485)

Checking the 'ModBus Enable' tick box allows communication with the instrument via Modbus. Within the TLACS, the following settings must be applied

Baud: 9600

Parity: 8-Even-1

120 Ohm Terminator: leave unchecked as the LCAM luminance has a terminator resistor installed.

For further information please contact Nyx Hemera Technologies.

The Camera tab

The Camera tab is used to verify the LCAM photometer alignment on tunnel portal. Click **Upload Image** to read the last image capture by the camera. See the following screenshot.

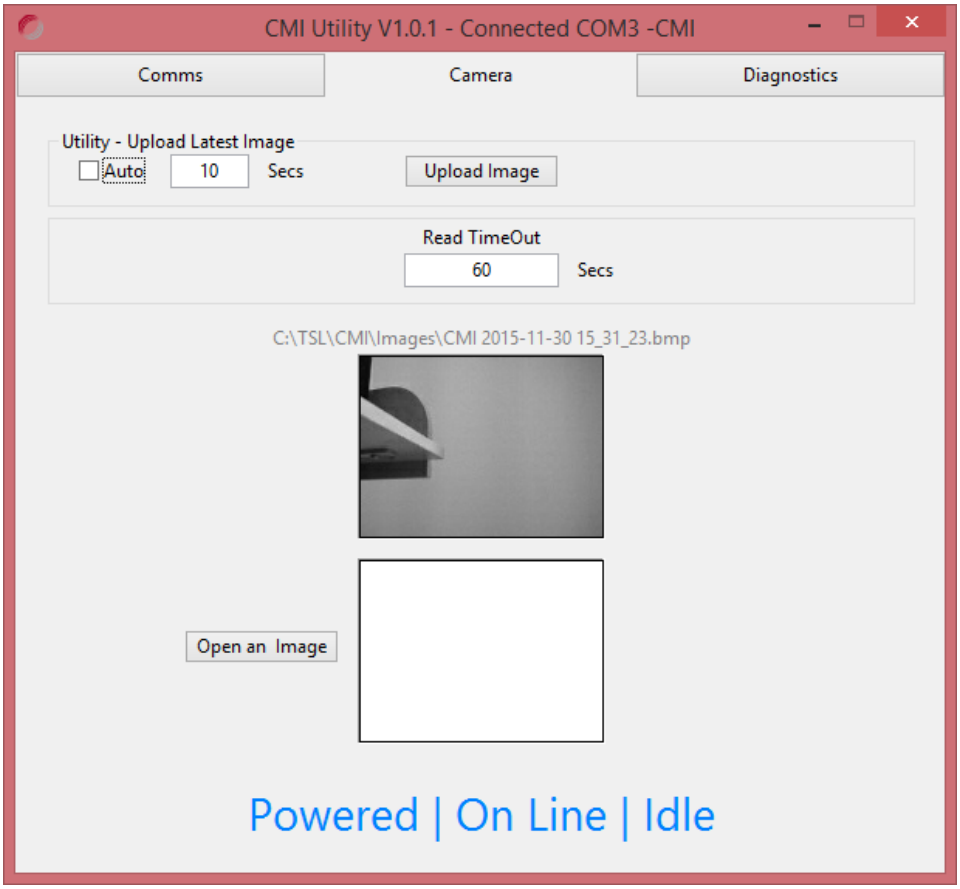


Figure 13 – Camera tab screenshot

The Diagnostics tab

The Diagnostics tab has a number of read-only boxes and buttons for backup and restore. See the following screenshot.

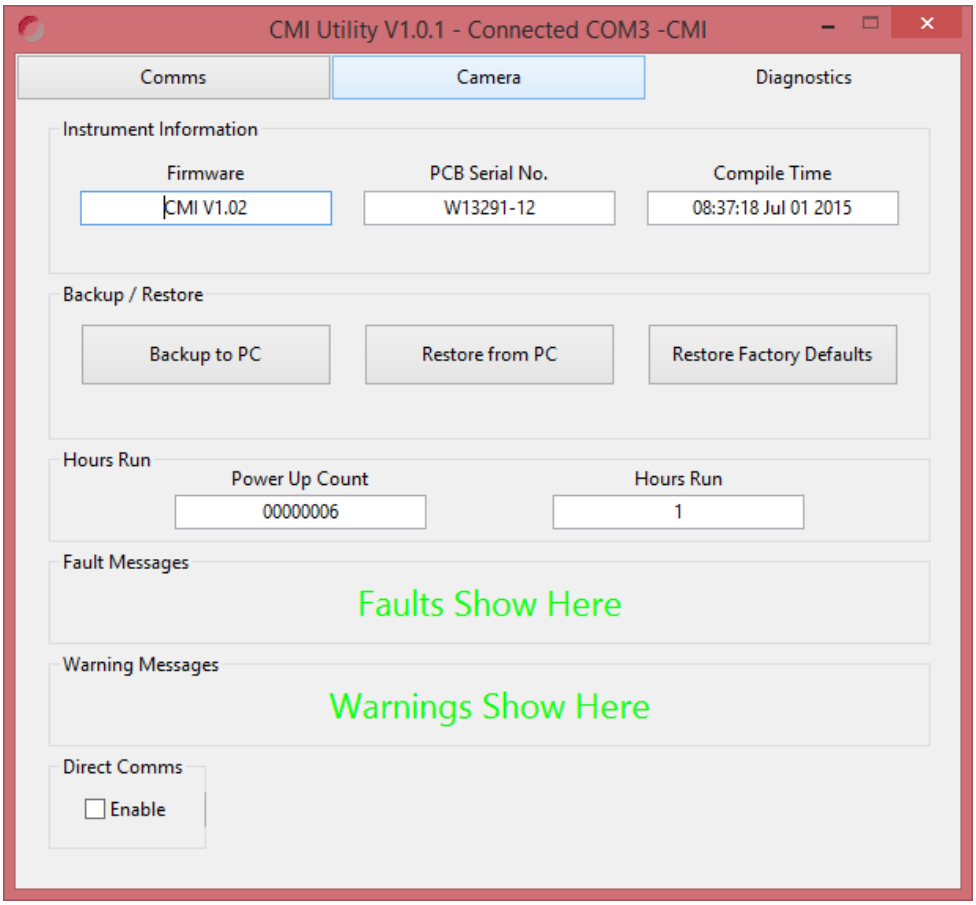


Figure 14 – Diagnostics tab screenshot

Firmware

Displays the current firmware version installed in the LCAM

PCB Serial No.

Displays the current electronic serial number stored in the LCAM PCB.

Compile Time

Displays the compile time of the firmware installed in the LCAM.

Power Up Count

Displays the number of times the unit has started.

Hours Run.

Displays the number of hours the unit has been active.

Fault Messages

If the LCAM self-detects a fault, it will display a brief message describing the fault, on this tab. Most fault messages will continue to be displayed on this tab until an operator clicks on the **message** to acknowledge it. If the fault is no longer active, the message will disappear but if the fault status is still active, the message will re-appear immediately.

See the section on “Fault Messages and Troubleshooting” further in this manual for more information.

Warning Messages

If the LCAM self-detects a parameter that is close to or out of range that needs investigating, a brief warning message will be displayed describing the problem. The warning message will continue to be displayed on this tab until an operator clicks on the message to acknowledge it. If the warning is no longer active the message will disappear, but if the problem causing the warning is still active, the message will re-appear immediately.

See the section on “Fault Messages and Troubleshooting” further in this manual for more information.

Direct Comms

Checking the Enable option allows to send direct messages to the camera. This is not used in the TLACS.

Backup to PC

Clicking this button will cause the current LCAM settings to be saved in a backup file in the location: C:\IOS BACKUPS. The filename of the backup file will incorporate the date, time and electronic serial number of the LCAM at time of backup.

It is highly recommended that you use this button to make a backup of your LCAM settings after successfully completing installation and commissioning.

Restore from PC

Clicking this button will allow the selection of a setting file to restore your LCAM settings as saved using the backup to PC option.

The restore process will cause all settings to be overwritten, so it is essential that you have confidence in the setting file from which you restore.

Caution; care must be taken

Warning: It is highly recommended that you take a backup prior to restoring, so that in the event that you restore from a bad file or unusable settings, you can always restore back to a known good point.

Warning: Restoring from a log file will overwrite ALL settings, parameters and variables, including those that define the zero point and calibration. Restoring from a log file could change the calibration of your instrument.

Restore Factory Defaults

Clicking this button will restore all settings and parameters to default values as determined at the factory.

Warning: This action will overwrite all existing settings and parameters with default values, so your set-up and calibration will be lost, as will any alarm points, scaling factors, and drift values.

Set-Up, Commissioning and Servicing

Warning: It is essential that all components of the instrument have been properly installed, both physically and electrically, before proceeding with set-up, calibration and commissioning. See the separate Installation Manual for full details of installation requirements.

Warning: This manual assumes a basic knowledge of industrial instrumentation and its associated terminology. It is therefore highly recommended that only engineers with instrumentation experiences perform any of the set-up, commissioning and servicing routines.

Caution; care must be taken

Warning: Never lift or carry the instrument by the sunshield cover, as it the main enclosure may fall and be damaged if the sunshield fixing screws are not completely tight.

Calibration

The LCAM is pre-calibrated and does not require on-site calibration. Furthermore, the measurement principle used, and the components employed, are very reliable and exhibit no drift characteristics, so there is no on-going need for re-calibration at regular intervals.

Set-up

The LCAM should have been aligned during the installation phase, but it is recommended that the alignment is re-checked on commissioning and if necessary, adjusted. It should be angled (using the pan/tilt arrangement) in both horizontal and vertical planes such that it points directly at the tunnel portal, centring on a point ~1.5m above the surface of the carriageway.

A line of sight taken through the gap between the top of the enclosure and the inside of the sunshield should be sufficiently accurate to achieve alignment in the vertical; whilst the same technique between the side of the enclosure and the sunshield will achieve the horizontal alignment.

All nuts/bolts (including those of the pan/tilt assembly) must be fastened securely prior to operation.

If a washer unit is fitted, it must be filled to the fill level marked on the reservoir prior to first operation. Failure to fill the reservoir to this level may result in the pump being unable to prime itself and it may then be damaged by running dry.

Commissioning

Before connecting power to the instrument, check all the wiring connections have been made correctly and that there is no obvious damage or fault with the LCAM.

Once power has been connected, use the Utility Software running on a PC to connect with the LCAM via USB and configure the outputs, such as 0/2/4-20mA loop, relay contacts and Modbus comms.

If a wash wipe system is fitted, it should be tested to ensure it is operating correctly. See the earlier section for details and precautions when using a wash / wipe system.

Servicing

The front window of the LCAM should be kept clean at all times, as a build up of dirt or dust will affect the luminance reading. Regular inspection of the window, and cleaning as required, is recommended at 3 month intervals, although individual installations may require longer or shorter intervals based on experience. In all cases, common sense should be applied to determine a suitable inspection interval.

A wash/wipe system may prolong the interval between window cleaning, but regular inspections should still be made in case of failure or poor performance of the wash wipe system.

Where a wash wipe system is employed, the washer fluid should be kept topped up at all times, and the wiper blade inspected at regular intervals with the window. If the wiper blade becomes worn or perished it should be replaced.

Both the wash and wipe functions should be tested at this same service interval to ensure that they are operating correctly.

The wash/wipe system must be in good order and operation of the system should leave the window in a good clean state, without streaks and lines. If the wash/wipe system is not performing to this standard, it should be adjusted as necessary to operate properly.

Fault Messages and Trouble Shooting

Fault and Warning messages appear on the Readings tab of the Utility software.

Fault / Warning messages will remain permanently displayed on the Readings tab until the fault has been cleared and the operator has clicked on the text to acknowledge the fault. This means that even if a fault occurs only temporarily and has been resolved before the operator views the Utility Software, the fault message will remain visible until the operator has clicked on the text to acknowledge it. Fault message text can only be cleared if the fault has been resolved.

Fault messages indicate there is a fault with the LCAM and that the readings are not valid. Warning messages indicate that there may be a problem, and the warning should be investigated.

The following section describes each fault and warning message, outlines potential causes and highlights actions that can be taken to try and resolve the issue. If the actions described do not solve the problem, then further advice should be sought from your Nyx Hemera Technologies' representative.

Fault Messages

OVERRIDE ACTIVE (self-clearing error message)

During set-up and commissioning of the instrument it is possible to set the LCAM into reading override mode. This can be used to confirm the correct operation of the SCADA or data logging system. When in this mode, the fault relay is triggered and this fault message is displayed. The message disappears when the unit returns to normal reading mode.

If this message appears during normal operation, the instrument has been accidentally switched into reading override mode. It will turn itself back into normal mode after 5 minutes.

SIGNAL SATURATED

This fault message appears if the detector circuit is saturated (over 4.95V), i.e. the measured light signal is too high.

WASH WIPE ACTIVE

When the LCAM enters a wash wipe cycle, this fault message appears as the readings are not valid during this time.

MEMORY FAULT

The LCAM employs CRC checking on the EEPROM memory. Each time the instrument is powered up, the CRC checking compares the state of EEPROM that it last knew, against the state of the EEPROM memory on power up.

If the instrument finds a discrepancy between the two EEPROM memory states, a MEM fault is registered.

On registering the MEM fault, the instrument performs a self-checking routine which analyses each byte of memory and ensures that the values stored there are within an acceptable range. Values outside the acceptable range are considered to be corrupted values and the memory byte is replaced with a default value form FLASH memory. Essentially, the instrument heals itself.

Memory corruption is rare, but can occur in certain circumstances, for example, if the instrument suffers a power loss whilst writing to its EEPROM memory.

Discrepancies can also be caused by a software upgrade (in the LCAM - not the Utility software), so they can be an expected result of such actions.

On encountering a MEM fault, operators should always power cycle the instrument, i.e. switch it OFF, then ON again. This action should clear the fault because self-healing process will have installed a new value in the corrupted memory byte, and the compared states of the power OFF memory and the power ON memory should now match.

If a power cycle does not clear, the fault it is likely that there is a more serious problem and you should contact Nyx Hemera Technologies for further assistance.

Please note that when the instrument self-heals by replacing corrupted data with default data from FLASH memory, operational settings and values may have been overwritten. It is therefore essential that all parameters, settings, and values are checked for validity by the operator immediately after resolving a MEM fault.

Please contact Tunnel Sensors for more information.

Warning Messages

LOW WATER FAULT (only when a washer unit is installed)

The washer unit (if installed) includes a float switch to detect a low fluid level. A low fluid level will disable the pump and cause this warning message to be displayed. The washer fluid should be refilled immediately to the fill level marked on the washer reservoir.

TEMPERATURE FAULT

The LCAM contains an internal temperature sensor. This fault will be triggered if the temperature sensor reading is out of range (the internal operating range is -20 to +80 degrees C).

This fault message can be an indication that the head has been subjected to excessive heat outside of the recommended operating range.

The fault could also be caused by a failure of the temperature sensor or the surrounding circuitry. Contact Nyx Hemera Technologies for further advice.

ALARM ACTIVE (self-clearing warning message)

This warning indicates that an alarm threshold has been passed.

HIGH READING

The warning message appears when the measured Luminance goes above the specified maximum range - 10,000 cd/m2. Above this level, the LCAM will continue to measure but the reading is not calibrated.