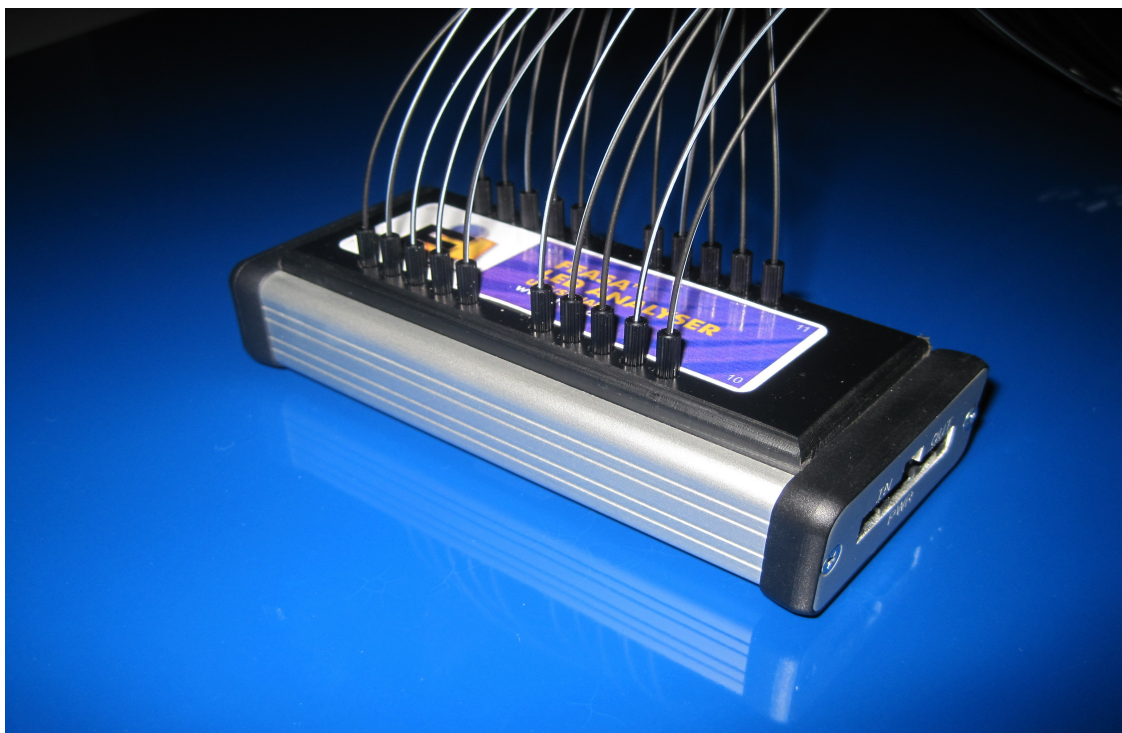


FEASA LED ANALYSER FUNCTIONAL VERSION



User Manual for Feasa Functional Models



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**Rev. 4.3 Functional Version
Date: Oct, 2012**

FEASA LED ANALYSER FUNCTIONAL VERSION



About this Manual

Feasa operates a policy of continuous development. Feasa reserves the right to make changes and improvements to any of the products described in this document without prior notice.

Feasa reserves the right to revise this document or withdraw it at any time without prior notice.

This manual is written for models Feasa Functional Led Analysers. The model numbers are Feasa x-F (where x is the number of fibers either 2,3,5,6,10,20).

The Feasa 20-F model is a 20 channel unit which will test up to 20 LED's while the Feasa 2-F is a 2 channel unit testing up to 2 LED's.

The interface on these units is USB or Serial.

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Introduction

The Feasa LED Analyser is an instrument that tests the Color and Intensity of Light Emitting Diodes (LEDs) in a test process. The Analyser has up to 20 flexible Fiber-Optic Light Guides which are mounted individually over the LEDs to be tested.

Emitted Light from the LEDs is guided through these Fiber-Optic Light Guides to the Analyser where the Color, Saturation and Intensity are tested. The test results can then read out of the Analyser through the Serial or USB Interfaces.

The USB Interface is 2.0 compatible and the Serial Interface is RS-232C compatible.

Color, Saturation and Intensity values are output as ASCII strings through the USB and Serial Interfaces.

All colors are derived from the three primary colors, Red, Green and Blue (RGB). The RGB values are used to identify different color LEDs.

Every LED tested by the LED Analyser will have a set of RGB values generated for analysis. The RGB results for each LED tested can be read out through the Serial or USB Port.

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Colour and Saturation

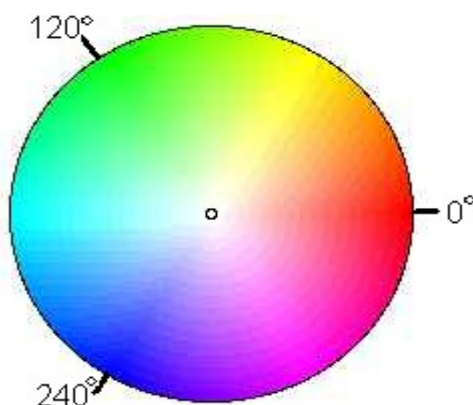


Figure 1: Hue (Color) Wheel

RED	=	0°
GREEN	=	120°
BLUE	=	240°

Colours can be represented by a 360° degree circular Colour wheel. The three Primary RGB values can also be represented as a single value called *Hue*.

Hue is a measured location on a Colour wheel and is expressed in degrees.

For example, Red will have a Hue value near 0°, Green will have a Hue value near 120° and Blue will have a value near 240°.

A pure Colour will be represented on the Colour wheel as a point near the outer edge. White will be represented by a point near the center of the wheel.

The degree of whiteness in a LED will affect its position on the wheel – the greater the amount of white the closer it will be to the center.

The degree of whiteness emitted by the LED is represented by the term **Saturation**. A Saturation value of 0% represents pure White. A Saturation value of 100% represents a pure Colour such as Red, Blue, Green, etc.

Usually the user must determine the Hue and Saturation values by testing a number of LED's and recording the results.

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The RGB and Hue values in *Figure 2* show how different Colour LEDs can be identified.

<i>LED</i>	<i>R</i>	<i>G</i>	<i>B</i>	<i>HUE</i>	<i>SATURATION</i>
Red	253	1	1	0	100%
Green	24	208	23	120	89%
Blue	2	13	240	238	99%
Yellow	76	171	8	95	96%
Orange	224	28	2	7	99%
White	71	72	112	See Page 9	37%

Figure 2.

The RGB or Hue values are used to identify different Colour LEDs.

Every LED tested by the LED Analyser will have a set of RGB values generated for analysis. These values are converted automatically to Hue and Saturation (whiteness) and can be read out through the Serial or USB ports.

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Intensity

Intensity is a measure of the amount of light being emitted by the LED. The Analyser tests the Intensity of each LED and outputs this value to the Test System. The value is output as a number in the range 0-99,999. The Analyser is calibrated to a fixed standard and all measurements are relative.

The Analyser can be set in either Linear mode or Logarithmic modes to measure Intensity of the LED. The units are shipped from the factory in Logarithmic mode. See [setlog](#) and [setlin](#) commands to determine how to set the mode of the analyser. Use the [getinfo](#) command to determine which intensity measure mode the Analyser is set to

Factors that influence Intensity Measurement:

- ② The position of the Fiber in relation to the LED.
- ② Offset from the Optical Centre of the LED.
- ② The Gap between the end of the Fiber Light Guide and LED to be measured.
- ② The condition of the Fiber end. It must be kept clean with a 90° Cleave.
- ② Is the LED Static or Flashing ?
- ② External Influences – Other LEDs in close proximity, Ambient Lighting.
- ② Is an Optical Head being used.

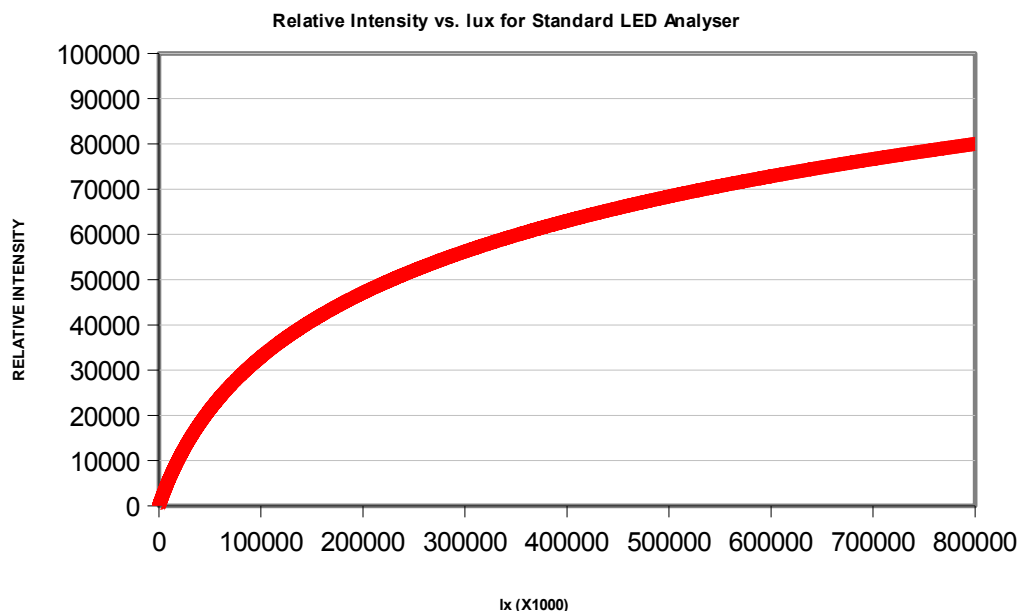


Figure 3a. Relative Intensity vs LUX for the LED Analyser in *LOGARITHMIC* Mode

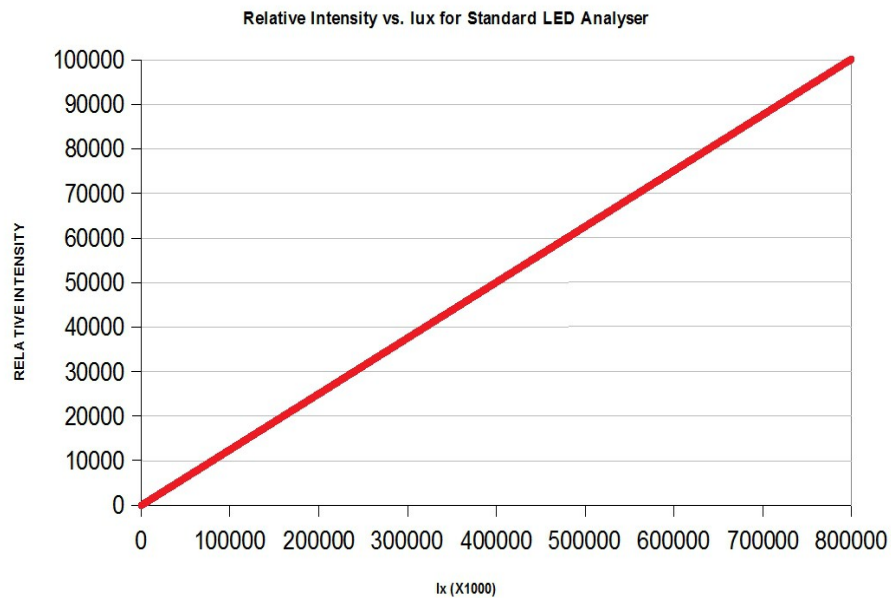


Figure 3b. Relative Intensity vs LUX for the LED Analyser in *LINEAR* mode

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White LED's

White LED's must be treated differently to coloured LED's when being tested. White is not a colour – it is a mix of all other colours. The three Primary colours Red, Green and Blue will be mixed in approximately equal proportions to display a White colour. The Saturation values must be used when testing White LED's. The Saturation is a value between 0% and 100%. A value of 0% indicates a pure white and a value of 100% indicates a pure Colour.

In reality, the Saturation value of white LED's vary significantly with values of 30% being typical. Remember, the Saturation value is an indication of how white the LED is. The correct values must be determined experimentally with the particular LED's to be tested.

Most LED manufacturers will specify their White LED's using Chromaticity co-ordinates xy . This is a two-dimensional Chart with x on the horizontal axis and y on the vertical axis. The range of x and y lies between 0 and 1.

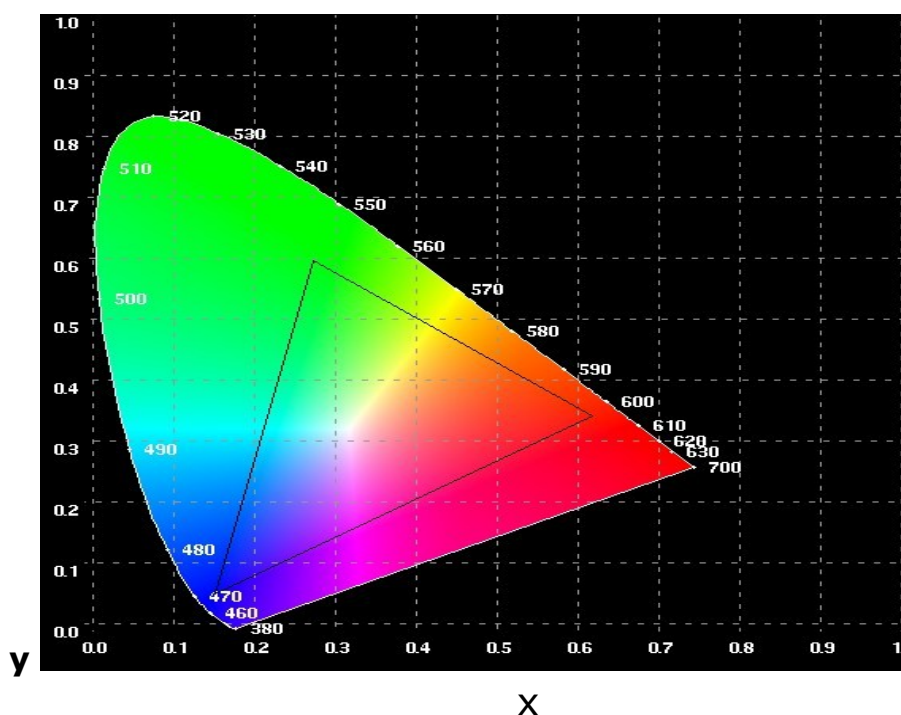


Figure 4. CIE 1931 Chromaticity Co-Ordinates

White LED's will have approximate co-ordinates of 0.33, 0.33. This may vary depending on the manufacturer of the LED where some LED's will have a Blue tint (cool white) and the other LED's will have a Red tint (Warm White).

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Setting Tolerance Limits for Color and Intensity

The test procedure requires the user to set the Pass/Fail limits for Color and Intensity for each LED which then become the standard against which LEDs to be tested are compared.

The Pass/Fail limits for Color are chosen, in conjunction with manufacturer's specifications, from measurements taken from a sample number of typical LEDs.

Because Hue is expressed as a single number it is more convenient to set the limits for the color in terms of their Hue value.

Sample Hue Pass/Fail Limits

LED	Minimum	Maximum
Red	0	2
Green	110	130
Blue	220	250
Amber	2	10
Yellow	60	80
Orange	10	20

Figure 5a.

White LED's should be identified in RGB, XY Chromaticity co-ordinates or CCT. The Red, Green and Blue values should all lie between 70-90 for a white LED and approximately 0.3,0.3 in XY. The *Saturation* value should be determined experimentally and should be less than 60%.

The Pass/Fail limits for intensity are chosen from the average intensity values from a number of sample LEDs.

Sample Intensity Pass/Fail Limits

Intensity Value	Upper Limit	Lower Limit	Comments
125	150	100	Dim LED
25000	28000	22000	Average LED
60000	64000	56000	Bright LED

Figure 5b.

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Physical Layout

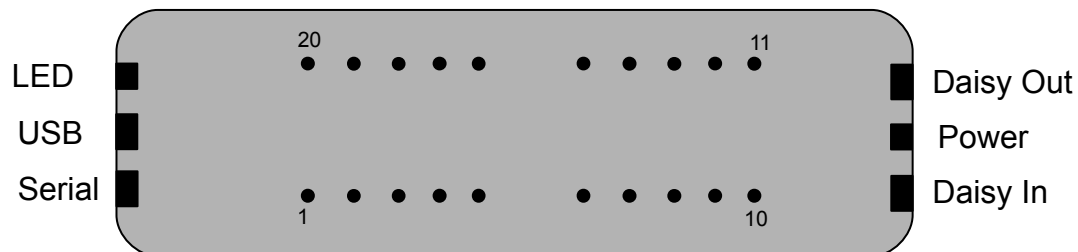


Figure 6a.

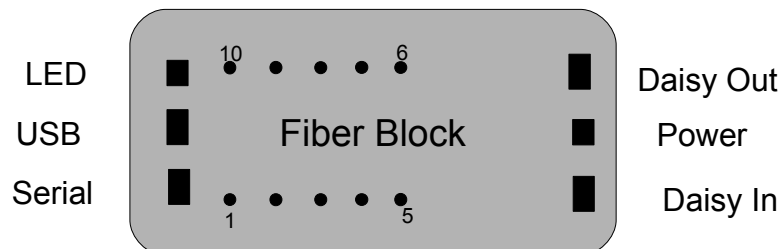


Figure 6b.

Figure 6a shows the physical layout of the Feasa 20-F Analyser. The fibers are labeled 1-20.

Figure 6b shows the physical layout of the Feasa 10-F analyser. The fibers are labeled 1-10. Options include Feasa 2-F ,Feasa 3-F, Feasa 5-F, Feasa 6-F.

These units are enclosed in an Aluminium Case. The Serial port is a 3 pin connector with the cables supplied and the USB connector is the mini usb again the cable is supplied with the unit.

Please refer to the fixturing Guidelines Manual for connector pin out details.

USB Port Control

Connect the LED Analyser to the PC using the supplied USB cable.

Power is supplied through the USB Cable so there is no need to plug in the Power cable.

The installed Software Driver will configure the USB Port automatically.

The USB Port is configured as a Virtual Com Port and will be designated a name such as COM5, COM6, etc.

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Serial Port Control

For serial communications the LED Analyser must be connected from the 3-pin Serial Connector to the PC or Controller using the supplied serial cable.

5V DC @ 180mA must be supplied to the 2-pin Power Connector using the Power Cable provided. The Green LED should turn on to indicate the Analyser is ready for use.

The default serial communications settings are **57,600 Baud, 8 Data bits, 1 Stop bit and No Parity.**

The baud rate can be changed to any of the following:- 9600, 19200, 38400, 57600, 115200. These can be selected using the [setbaud](#) command.

Serial Connector (RS232C)

<i>Pin</i>	<i>Signal</i>	<i>Pin on 9-Pin D-type</i>
1	Tx from LED Analyser	2
2	Rx from LED Analyser	3
3	GND	5

Power Connector

<i>Pin No</i>	<i>Signal</i>
1	Power (5V DC)
2	GND

Figure 7.

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Capture Commands

The Capture commands are used to capture the parameters (color, intensity, xy, uv, wavelength, cct) of the LED's to be tested and store the results in the memory of the Analyser.

These results can be read out later using the **GET DATA** commands.

Commands are transmitted and received using ASCII characters and are **NOT case-sensitive**. All commands must be terminated with a **<CR>** or **<LF>** character.

The Terminal Program supplied on the CD is used to send/receive commands to/from the Analyser. This program is also available as a drop down function of the **USER** and **Test** Software programs.

The **Feasa LED Analyser User** Program is a graphical tool that can be used to send commands and receive results from the Analyser. It allows one LED to be tested at a time. This Program also allows a Terminal Window to be opened so that the User can type the commands directly and send them to the Analyser. The responses from the Analyser can be observed in the Window.

The **Feasa LED Analyser Test** Program allows the User to test all the LED's together. Pass and Fail limits can be set and results can be printed and logged.

Alternately, the User may generate a customised Program that sends commands and receives data through the virtual USB Com Port.

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Capture Mode

CAPTURE - Store LED Data

Transmit	Receive
capture	OK

Description

This command instructs the LED Analyser to capture and store the Color and Intensity of all the LED's positioned under the fibers. The Analyser automatically determines the correct settings to capture the LED data. In the case of a 20 channel unit the data for all 20 LED's is captured simultaneously and stored in internal memory of the LED Analyser. The data is stored until the power is removed or another **capture** command is issued. When completed the Analyser will transmit the character **OK** on the receive line to the transmitting device (i.e. the PC).

This command uses a wide Intensity range to be able to test dim and bright LED's simultaneously. However, if the LED's to be tested are of similar Intensity then better results will be obtained by using the [Capture](#) command described on the next page.

Example:

The PC transmits **capture** to the LED Analyser and the LED Analyser sends **OK** to the PC to acknowledge that the command is completed.

Capture

or

c

OK

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FEASA LED ANALYSER FUNCTIONAL VERSION



Capture Mode

CAPTURE# - Store LED Data

Transmit	Receive
capture#	OK

Where:

represents the ranges 1, 2, 3, 4, 5.

The LED brightness level for each range is as follows:-

Range 1 = Low
Range 2 = Medium
Range 3 = High
Range 4 = Super
Range 5 = Ultra

Description

This command uses a pre-selected exposure time designated Range1, Range2 etc. For low light or dim LED's use Range 1 and for brighter LED's use higher ranges. The higher ranges lead to faster test times because the exposure time is shorter.

This command instructs the LED Analyser to read and store the Color and Intensity of all the LED's positioned under the fibers using a fixed range.

The range setting must be specified. The data is stored until the power is removed or another **capture** command is issued. When completed the Analyser will transmit the character **OK** on the receive line to the transmitting device (i.e. the PC).

Example:

The PC transmits **capture** to the LED Analyser and the LED Analyser sends **OK** to the PC to acknowledge that the command is completed.

Capture2

or

c2

OK

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Capture Mode

CAPTUREPWM - *Capture PWM LED Data*

Transmit	Receive
capturepwm	OK

Description

Pulse-Width-Modulated(PWM) LED's are switched on and off rapidly to save power and to control Intensity. The Analyser automatically determines the correct settings required to execute the test.

This command uses the *auto-ranging* feature and a pre-set *averaging factor* to capture the LED data. This command is useful if it is required to test very dim and very bright PWM LED's together.

The command instructs the LED Analyser to read and store the Color and Intensity of all the LED's positioned under the fibers. The data is stored until the power is removed or another **capture** command is issued. When completed the Analyser will transmit the character **OK** on the receive line to the transmitting device (i.e. the PC).

Example:

The PC transmits **capturepwm** to the LED Analyser. The Analyser sends **OK** to the PC to acknowledge that the command is completed.

Capturepwm

OK

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Capture Mode

CAPTURE#PWM@@ - Capture PWM LED Data for a specific Range

Transmit	Receive
capture#pwm@@	OK

Where:

represents the exposure Range 1 – 5.

@@ represents an averaging factor in the range 1 - 15.

Description

This command allows the User to specify the *exposure range* and an *averaging factor* when testing PWM LED's. Select the *exposure range (1-5)* to match the *Intensity of the LED's*. The Analyser tests these LED's by taking a number of readings and averaging the results. A larger factor will lead to more stable results. The *averaging factor* is a number in the range 1-15.

This command instructs the LED Analyser to read and store the Color and Intensity of all the LED's positioned under the fibers. The data is stored until the power is removed or another **capture** command is issued. When completed the Analyser will transmit the character **OK** on the receive line to the transmitting device (i.e. the PC).

capture1pwm05

OK

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Get Data Commands

The *get data* commands are used to read out the Color, Saturation and Intensity data stored by the *capture* commands.

The data from the last *capture* command remains in memory until a new *capture* command is issued or the power is removed from the Analyser.

Commands are transmitted and received using ASCII characters and are **NOT case-sensitive**. All commands must be terminated with a **<CR>** or **<LF>** character.

Under Range Condition

An under range condition will occur when insufficient light from the LED reaches the sensor for the range selected. This will be indicated by **999.99 999 00000** for **HSI**, **000 000 000 00000** for **RGBI** and **0.0000 0.0000** for xy and uv.

If this condition occurs select the next **lower** range and test again.

Over Range Condition

An over range condition will occur when too much light from the LED reaches the sensor for the range selected by the switch. This will be indicated by **999.99 999 99999** for **HSI**, **255 255 255 99999** for **RGBI** and **0.0000 0.0000** for xy and uv.

If this condition occurs select the next **higher** range and test again.

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Get Data Mode

getRGBI## - Get RGB and Intensity for a LED

Transmit	Receive
getrgbi##	Rrr ggg bbb iiii

Where:

represents the Fiber Number and is a number in the range 01 – 20.

rrr , **ggg** and **bbb** are the **red**, **green** and **blue** components of the LED color. These values are normalized and are in the range 0 – 255.

iiii represents the intensity value of the LED under Fiber xx. This 5-digit number is in the range 0000 – 99999. 0000 represents no Intensity or under range(i.e. the LED is off) and 99999 will represent over range or the LED is too bright.

Description

This command instructs the LED Analyser to return RGB and Intensity data for fiber ## (01-20) in format **rrr ggg bbb iiii** where **rrr**, **ggg** and **bbb** are the **red**, **green** and **blue** components of the color. The **iiii** value indicates the intensity value.

This command should be preceded by a **capture** command to ensure valid LED data is stored in the memory of the LED Analyser. The data for each LED can only be read out one-at-the-time, in any order. Note: it is important for the PC to use 01, 02, 03, etc to indicate Fibers 1, 2 and 3, etc.

Example:

The PC transmits **getrgbi05** to the LED Analyser to instruct it to send the stored Color and Intensity data for the LED positioned under Fiber No 5. The LED Analyser will return a string **rrr ggg bbb iiii** to the PC.

Getrgbi05
006 230 018 06383

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Get Data Mode

getHSI## - Get Hue, Saturation and Intensity

Transmit	Receive
gethsi##	Hhh.hh sss iiii

Where:

represents the Fiber Number and is a number in the range 01 – 20.

hhh.hh represents the Hue (color) and is a number in the range 0.00 – 360.00.

sss represents the Saturation (whiteness) and is a number in the range 0–100.

iiii represents the intensity value of the LED under fiber **##**. This 5-digit number is in the range 0000 – 99999. 0000 represents no Intensity or under range(i.e. the LED is off) and 99999 will represent over range or the LED is too bright.

Description

This command instructs the LED Analyser to return Hue, Saturation and Intensity data for fiber **##** (01-20) in format **hhh.hh sss iiii** where **hhh.hh** represents the Hue(Color), **sss** represents the Saturation(whiteness) of the LED under Fiber **##**. The **iiii** value indicates the intensity value.

This command should be preceded by a **capture** command to ensure valid LED data is stored in the memory of the LED Analyser. The data for each LED can only be read out one-at-the-time, in any order. Note: it is important for the PC to use 01, 02, 03, etc to indicate Fibers 1, 2 and 3, etc.

Example:

The PC transmits **gethsi05** to the LED Analyser to instruct it to send the stored Color and Intensity data for the LED positioned under Fiber No 5. The LED Analyser will return a string **hhh.hh sss iiii** to the PC.

gethsi05
123.47 098 06383

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Get Data Mode

getXY##- Return the xy Chromaticity values

Transmit	Receive
getxy##	0.xxxx 0.yyyy

Where:

represents the Fiber Number and is a number in the range 01 – 20.

0.xxxx represents the x Chromaticity value

0.yyyy represents the y Chromaticity value

Description

This command is used to return the xy Chromaticity value for the LED under the Fiber number ##. This command is used for testing White LED's.

This command should be preceded by a **capture** command to ensure valid LED data is stored in the memory of the LED Analyser. The data for each LED can only be read out one-at-the-time, in any order. Note: it is important for the PC to use 01, 02, 03, etc to indicate Fibers 1, 2 and 3, etc.

Example:

The PC transmits **getxy01** to the LED Analyser to instruct it to send the stored xy Chromaticity data for the LED positioned under Fiber No 1. The LED Analyser will return a string **0.xxxx 0.yyyy** to the PC.

getxy01
0.6461 0.3436

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Get Data Mode

getXOFFSET## - Return the x Chromaticity offset

Transmit	Receive
getxoffset##	±0.xxx

Where:

represents the Fiber Number and is a number in the range 01 – 20.

±0.xxx represents the x Chromaticity offset

Description

This command is used to return the x Chromaticity offset for the LED under the Fiber number ##. The value of this offset must be set by the [setxoffset##](#) command. The default value is 0.000.

Example:

The PC transmits **getxoffset01** to the LED Analyser to instruct it to send the stored x Chromaticity offset for the LED positioned under Fiber No 1. The LED Analyser will return a string **±0.xxx** to the PC.

getxoffset01
+0.155

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Get Data Mode

getYOFFSET## - Return the y Chromaticity offset

Transmit	Receive
getyoffset##	±0.yyy

Where:

represents the Fiber Number and is a number in the range 01 – 20.
±0.yyy represents the y Chromaticity offset

Description

This command is used to return the y Chromaticity offset for the LED under the Fiber number ##. The value of this offset must be set by the [setyoffset##](#) command. The default value is 0.000.

Example:

The PC transmits **getyoffset01** to the LED Analyser to instruct it to send the stored y Chromaticity offset for the LED positioned under Fiber No 1. The LED Analyser will return a string **±0.yyy** to the PC.

getyoffset01
-0.025

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Get Data Mode

getUV## - Return the u'v' Chromaticity values

Transmit	Receive
getuv##	0.uuuu 0.vvvv

Where:

represents the Fiber Number and is a number in the range 01 – 20.
0.uuuu represents the u Chromaticity value
0.vvvv represents the v Chromaticity value

Description

This command is used to return the u'v' Chromaticity value for the LED under the Fiber number #. This command is used for testing White LED's.

The u'v' values are derived from the xy Chromaticity co-ordinates including any xy offsets that may be applied.

This command should be preceded by a **capture** command to ensure valid LED data is stored in the memory of the LED Analyser. The data for each LED can only be read out one-at-the-time, in any order. Note: it is important for the PC to use 01, 02, 03, etc to indicate Fibers 1, 2 and 3, etc.

Example:

The PC transmits **getuv01** to the LED Analyser to instruct it to send the stored XY Chromaticity data for the LED positioned under Fiber No 1. The LED Analyser will return a string **0.0000 0.0000** to the PC.

getuv01
0.1809 0.4414

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Get Data Mode

getWAVELENGTH## - Get the Dominant Wavelength

Transmit	Receive
getwavelength##	XXX

Where:

represents the Fiber Number and is a number in the range 1 – 20.

xxx represents the dominant wavelength of the LED in nanometers.

Description

This command is used to get the value of the Dominant Wavelength for the LED under the Fiber number **##**.

This command should be preceded by the **capture C** command to ensure valid LED data is stored in the memory of the LED Analyser. The **C1-C5** commands are available but are not as accurate. The data for each LED can only be read out one-at-the-time, in any order.

Example:

The PC transmits **getwavelength01** to the LED Analyser to instruct it to send the stored dominant wavelength for the LED positioned under Fiber No 1. The LED Analyser will return a string **xxx** to the PC.

getwavelength01
513

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Get Data Mode

getINTENSITY## - Get the Intensity

Transmit	Receive
getintensity##	IIIII

Where:

represents the Fiber Number and is a number in the range 01 – 20.

IIIII represents the Intensity value.

Description

This command is used to get the Intensity value for the LED under the Fiber number **##**.

This command should be preceded by a **capture** command to ensure valid LED data is stored in the memory of the LED Analyser. The data for each LED can only be read out one-at-the-time, in any order. Note: it is important for the PC to use 01, 02, 03, etc to indicate Fibers 1, 2 and 3, etc.

Example:

The PC transmits **getintensity01** to the LED Analyser to instruct it to send the stored XY Chromaticity data for the LED positioned under Fiber No 1. The LED Analyser will return a string **IIIII** to the PC.

getintensity01
06734

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Get Data Mode

getWI## - Get the Dominant Wavelength & Intensity

Transmit	Receive
getwi##	XXX YYYYY

Where:

represents the Fiber Number and is a number in the range 1 – 20.
xxx represents the dominant wavelength of the LED in nanometers.
YYYYY represents the intensity of the LED.

Description

This command is used to get the value of the Dominant Wavelength for the LED under the Fiber number **##**.

This command should be preceded by the **capture C** command to ensure valid LED data is stored in the memory of the LED Analyser. The **C1-C5** commands are available but are not as accurate. The data for each LED can only be read out one-at-the-time, in any order.

Example:

The PC transmits **getwi01** to the LED Analyser to instruct it to send the stored dominant wavelength & Intensity for the LED positioned under Fiber No 1. The LED Analyser will return a string **xxx yyyy** to the PC.

getwi01
513 12345

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Get Data Mode

getINTGAIN - Get the Intensity Gain Factor

Transmit	Receive
getintgain##	xxx

Where:

represents the Fiber Number and is a number in the range 01 – 20.
xxx represents the Intensity gain value (50 - 200). Default is set at 100

Description

This command is used to get the Intensity gain value for each Fiber.
The default values set at the factory are 100 i.e. 100% of nominal. The values can be adjusted by the [SetIntGain](#) command.

Example:

The PC transmits **getintgain01** to the LED Analyser to instruct it to send the stored intensity gain data for Fiber No 1.

getintgain01
100

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Get Data Mode

getFACTOR - *Get the exposure Factor*

Transmit	Receive
getfactor	xx

Where:

xx represents the exposure factor value. The default value is 01.

Description

This command is used to get the exposure factor value for all Fibers.
The default value set at the factory are 01. The values can be adjusted by the [SetFactor](#) command.

Example:

The PC transmits **getfactor** to the LED Analyser to instruct it to send the stored exposure factor for all Fibers. The default value is 01.

getfactor
01

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Get Data Mode

get7SEG# - Get the value of a 7 Segment Display

Transmit	Receive
get7seg#	x

Where:

represents the Number 1 or 2
x represents the value of the display 0 - 9

Description

The LED Analyser can be used to test LED-based 7-Segment displays. To set up the LED Analyser to interrogate a single 7-Segment display, fit fibers labeled 1 to 7 over segments a-g on the 7-Segment display. See Figure 8.

To set up the LED Analyser to interrogate an additional 7-Segment display, fit fibers labeled 11 to 17 over segments a-g on the additional display.

To interrogate the digit displayed on the first 7-Segment Display send the command **get7seg1** to the LED Analyser. The LED Analyser will return the digit displayed. The LED Analyser will return the character **X** when the displayed value is not recognized (**0 to 9**).

To interrogate the digit displayed on the second 7-Segment display send the command **get7seg2** to the LED Analyser. The LED Analyser will return the digit displayed. Again, the LED Analyser will return the character **X** when the displayed value is not recognized (**0 to 9**).

Note:- it is not necessary to send any *capture* commands prior to using the **get7seg1** or **get7seg2** commands.

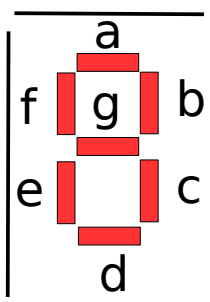


Figure 8.

Example:

The PC transmits **get7seg1** to the LED Analyser and the Analyser will return the value of the display.

get7seg1
6

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Get Data Mode

getCCT - Get Correlated Color temperature

Transmit	Receive
getcct##	XXXXX +/-0.yyyy

Where:

represents the Fiber Number and is a number in the range 01 – 20.
xxxxx represents the correlated color temperature of the LED.
+/- 0.yyyy represents the distance the LED is from the Plankian locus (Delta E)

Description

This command is used to get the Correlated Color Temperature (cct) for each Fiber ##. The command must be preceded by a capture **C** command to ensure valid LED data is stored in the memory of the Led Analyser. Commands C1-C5 are available but are not as accurate. The Cct value is only valid for white Leds's and the maximum value allowed for Delta E is +/- 0.0500.

Example:

The PC transmits **getcct01** to the LED Analyser to instruct it to send the stored cct data for Fiber No 1.

getcct01
04621 +0.0340

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Get Data Mode

getWAVELENGTHOFFSET@@ - Get the Dominant Wavelength Offset

Transmit	Receive
getwavelengthoffset@@	+/-XX

Where:

@@ represents the Fiber Number and is a number in the range 1 – 20.

+/- xx represents the wavelength offset set of the LED in nanometers.

Description

This command is used to get the value of the Dominant Wavelength Offset set for Fiber number @@.

The range of value that can be programmed is +/-99, however setting a value of greater than +/-10 would probably indicate an error in your measurement setup

Example:

The PC transmits **getwavelengthoffset01** to the LED Analyser to instruct it to send the programmed dominant wavelength offset for the LED positioned under Fiber No 1. The LED Analyser will return a string **+/- xx** to the PC.

getwavelengthoffset01
+07

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Get Data Mode

getxxxALL Get the data for ALL leds on the Analyser

getRGBIall	Get Red Green Blue and Intensity for all LEDs
getHSIall	Get Hue Saturation & Intensity for all LED's
getXYall	Get the X,Y for all LED's
getUVall	Get the UV for all LED's
getWlall	Get Wavelength & Intensity for all LED's
getWAVELENGTHall	Get the Wavelength for all LED's
getINTENSITYall	Get the Intensity for all LED's
getCCTall	Get the CCT for for all LED's

Description:

This command will allow the user to interrogate the data stored on the Analyser from the last capture for all the fibers simultaneously. For example when using a Feasa 20F the getxxxALL command will report 20 results, for a Feasa 3F the getxxxALL command will return 3 results.

Example:

Using a Feasa-3F testing 3 similar leds.

The PC transmits **gethsiall** to the LED Analyser to instruct it to send the stored Color and Intensity data for the LED positioned under Fiber No's 1,2,3. The LED Analyser will return a string **xx hhh.hh sss iiii** to the PC for all three fibers (Fiber No., Hue, Saturation, Intensity)

gethsiall

01 123.47 098 06383
02 123.47 098 06383
03 123.47 098 06383

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Set Commands

The *Set* commands are used to adjust various settings in the LED Analyser such as Intensity and Exposure.

These settings remain programmed in the Analyser even when the power is removed.

Commands are transmitted and received using ASCII characters and are **NOT case-sensitive**. All commands must be terminated with a **<CR>** or **<LF>** character.

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Set Data Mode

SetINTGAIN - Set the Intensity GainFactor

Transmit	Receive
Setintgain##xxx	OK

Where:

represents the Fiber Number and is a number in the range 01 – 20.
xxx represents a 3 digit gain factor, default 100.

Description

This command allows the user to adjust the Intensity Gain Factor for each Fiber. This is useful when it is required to balance all or some of the Fibers to give the same Intensity when Testing similar LED's. The Factory default setting is 100. The value for each Fiber can be adjusted from 050 – 200.

These values are stored permanently in memory and can only be changed by using the *setIntGain* command again.

The command [getIntGain](#) will display the current stored gain setting.

Example:

Set the Intensity gain for Fiber 1 to 095.

setintgain01095
OK

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FEASA LED ANALYSER FUNCTIONAL VERSION



Set Data Mode

SetFACTOR## - Set the Exposure Factor

Transmit	Receive
Setfactor##	OK

Where:

represents the Factor Number and is in the range 01 – 15 (default 01).

Description

This command allows the user to adjust the *Exposure Factor* for **all** Fibers. This is useful when it is required to test very dim LED's. The Factory default setting is 01. The value can be adjusted from 01 to 15. The exposure time will be increased when the factor is increased which will lead to longer test times i.e. Factor 02 will double the test time, factor 03 will treble the test time etc.

Try the low range(*capture1*) first before adjusting the Exposure Factor.

These values are stored permanently in memory and can only be changed by using the *setFactor* command again, power on/off will NOT effect the set Factor.

The current value can be read out using the [getfactor](#) command.

Example:

Set the Factor Number for all Fibers to 05.

setfactor05
OK

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Set Data Mode

setXOFFSET##0.xxx - Set the x Chromaticity Offset

Transmit	Receive
Setxoffset##±0.xxx	OK

Where:

represents the Fiber Number and is a number in the range 01 – 20.
0.xxx represents the x Chromaticity offset value ± (0.000 to 0.300).

Description

This command is used to set an offset to the displayed x Chromaticity value. The limit of the offset is ±0.300 which means values must be in the range -0.300 to 0.000 to 0.300. This command is useful when the user wishes to set the x Chromaticity to be the same as that specified by the LED Manufacturer. The default value of the offset is 0.000. The offset is stored in non-volatile memory and will remain at the programmed setting until changed by a new *Setxoffset* command.

Example:

The PC transmits **setxoffset01+0.050** to the LED Analyser to instruct it to set the X offset on Fiber 1 to +0.050.

setxoffset01+0.050
OK

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Set Data Mode

setYOFFSET##0.yyy - Set the y Chromaticity Offset

Transmit	Receive
Setyoffset##±0.yyy	OK

Where:

represents the Fiber Number and is a number in the range 01 – 20.
0.yyy represents the y Chromaticity offset value ±(0.000 – 0.300).

Description

This command is used to set an offset to the displayed y Chromaticity value. The limit of the offset is ±0.300 which means values must be in the range -0.300 to 0.000 to 0.300. This command is useful when the user wishes to set the y Chromaticity to be the same as that specified by the LED Manufacturer. The default value of the offset is 0.000. The offset is stored in non-volatile memory and will remain at the programmed setting until changed by a new *Setyoffset* command.

Example:

The PC transmits **setyoffset01-0.050** to the LED Analyser to instruct it to set the y offset on Fiber 01 to -0.050.

setyoffset01-0.050
OK

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General Commands

SetLOG - Change the Intensity Response of the Analyser to Logarithmic mode

Transmit	Receive
Setlog	OK

Description

This command will change the Intensity Response of the Analyser to measure in Logarithmic mode. All Analysers shipped from the factory are set in Log mode.

Please refer to the Intensity Section of this document [Intensity](#)

setlog
OK

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General Commands

SetLIN- Change the Intensity response of the Analyser to Linear Mode

Transmit	Receive
Setlin	OK

Description

This command will change the Intensity Response of the Analyser to measure in Linear mode. All Analysers shipped from the factory are set in Log mode.

Please refer to the Intensity Section of this document [Intensity](#)

setlin
OK

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Set Data Mode

setWAVELENGTHOFFSET@@±## - Set the wavelength Offset

Transmit	Receive
setwavelengthoffset##±xx	OK

Where:

@@ represents the Fiber Number and is a number in the range 01 – 20.
xx represents the wavelength offset value (±99).

Description

This command is used to set an offset to the wavelength value. The limit of the offset is ±99. This command is useful when the user wishes to set the wavelength to be the same as that specified by the LED Manufacturer. The default value of the offset is 00. The offset is stored in non-volatile memory and will remain at the programmed setting until changed by a new *setwavelengthoffset* command.

Example:

The PC transmits **setwavelengthoffset01-05** to the LED Analyser to instruct it to set the wavelength offset on Fiber 01 to -05.

setwavelengthoffset01-05
OK

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Daisy Chain Mode

Daisy Chain USB Method:

The Daisy chain is a method used to communicate with multiple Led Analyser units to save connections and simplify the wiring.

The 1st Led analyser in the chain is connected to the computer using the USB cable supplied. The remaining LED Analysers are interconnected in a Daisy Chain Bus using the cables provided. The Daisy Chain OUT connector on Led Analyser No1 is connected to the Daisy Chain IN Connector on Led Analyser No2 and so on.(See Fig 9a below). Each Analyser except for No1 must be powered to 5V @180mA. This completes your wiring requirements.

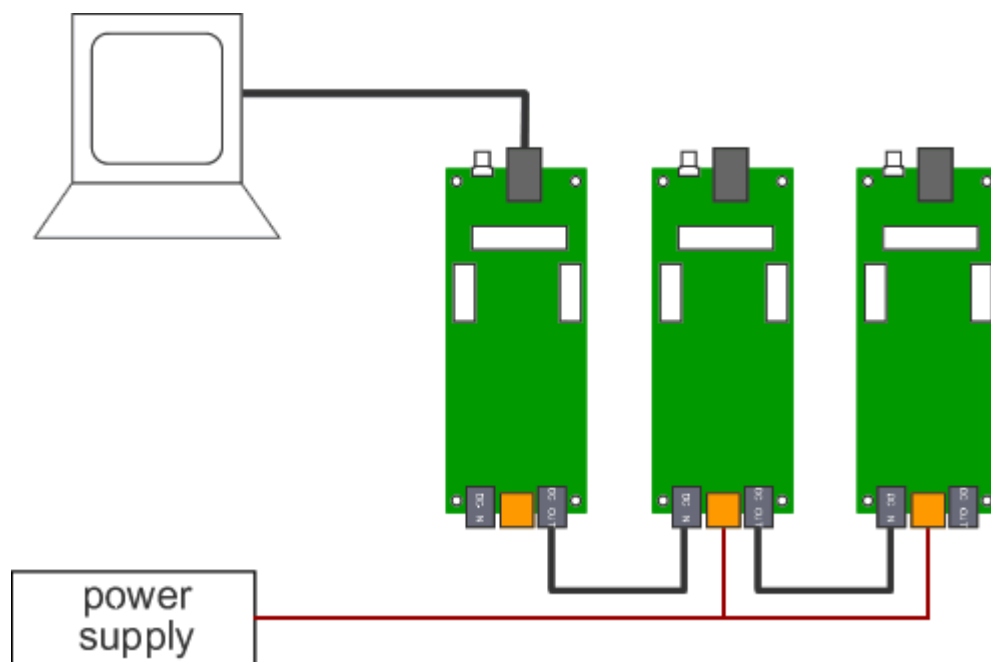


Figure 9a USB Setup

Daisy Chain Mode

Daisy Chain Serial Method:

The Daisy chain is a method used to communicate with multiple Led Analyser units to save connections and simplify the wiring.

The 1st Led analyser in the chain is connected to the computer using the Serial cable supplied. The remaining LED Analysers are interconnected in a Daisy Chain Bus using the cables provided. The Daisy Chain OUT connector on Led Analyser No1 is connected to the Daisy Chain IN Connector on Led Analyser No2 and so on.(See Fig 9a below). Each Analyser must be powered to 5V @180mA. This completes your wiring requirements.

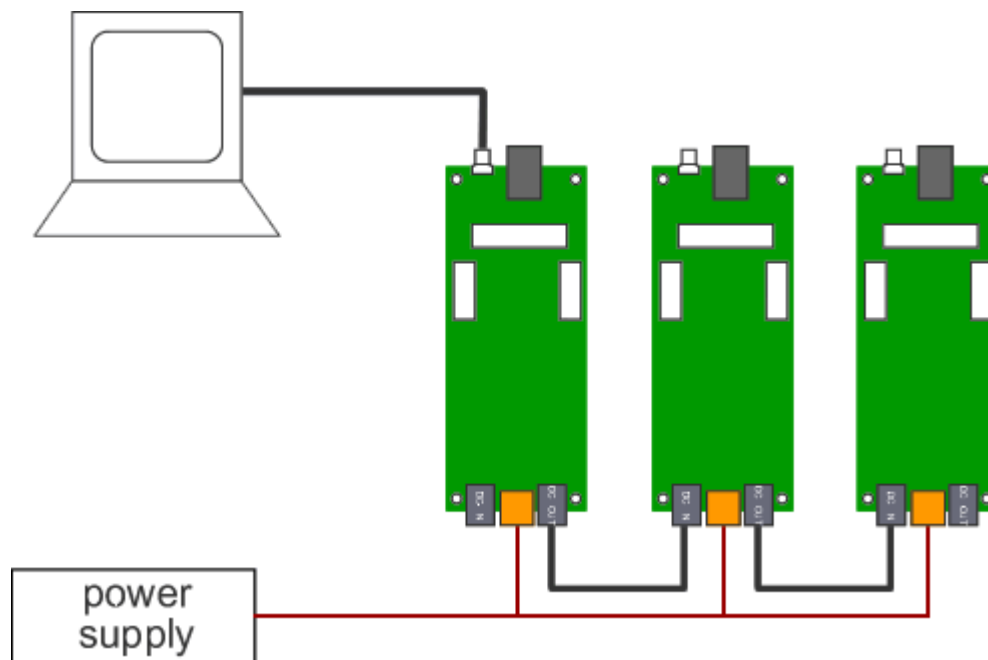


Figure 9b Serial Setup



Daisy Chain Mode

The LED Analyser connected to the computer receives a command and this command is received by all the other LED Analysers through the Daisy Chain Bus. All Analysers in the chain are active but only the selected LED Analyser is active to give result Data. All responses received by the Computer will be from this active LED Analyser.

Each LED Analyser is identified using a unique 4-character *Serial Number*. This *Serial Number* is fixed to each Analyser or can be read out using the [getSerial](#) command.

Feasa provides a **Terminal Program** on the CD for the customers use. When you connect your 1st analyser the terminal program will detect which port you are connected to. At this time you have the option of connecting to the Standalone option or the Daisy Chain option from the drop down box. If you select the Daisy Chain option you will be asked for the serial Number of the 1st analyser in your chain.

There are a number of commands which are used to control the Analysers in the Daisy Chain. These commands are described on the following pages.

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Daisy Chain Mode

BusFree - Deactivate any active Analysers

Transmit	Receive
busfree	OK

Description

This command is used to deactivate any active Analysers on the Daisy Chain Bus. This will free the Bus to allow an Analyser to be made active. This command should be issued at the start of a sequence. It is the responsibility of the Controlling Computer to issue commands and monitor the responses. If an Analyser does not respond within 500mSec then the Controlling Computer should issue a new BusFree command and report an error.

The Analyser connected to the computer will operate as a standalone unit after the command is issued.

Example:

The PC transmits **busfree** to free up the Daisy Chain Bus.

busfree
OK

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Daisy Chain Mode

BusGet#### - Activate a LED Analyser

Transmit	Receive
busget####	OK

Where:

represents the Serial Number of the Analyser.

Description

This command will activate the LED Analyser with the specified Serial Number.

This command should be preceded by a *BusFree* command. All the *Capture*, *Set*, *Get*, etc commands can now be used with the active Analyser in the chain.

It is the responsibility of the Controlling Computer to issue commands and monitor the responses. If an Analyser does not respond within 500mSec then the Controlling Computer should issue a new *BusFree* command and report an error.

Example:

The PC transmits **BusGet####** to the Master LED Analyser to instruct it to activate the LED Analyser with Serial Number ####.

busgetF044
OK

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Daisy Chain Mode

BusC - Initiate Capture for all LED Analyser's

Transmit	Receive
busc	OK

Description

This command will cause all LED Analysers in the Daisy Chain to initiate a capture sequence using the Automatic Range Mode. To specify a Range manually see the command *BusC#* on the next page.

After the capture cycle use the the command [BusGet####](#) to activate a specific LED Analyser. All the standard commands can then be used to read back the LED Test data.

Example:

The PC transmits **busc** to instruct all LED Analysers in the Daisy Chain to initiate a Capture cycle.

busc
OK

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Daisy Chain Mode

BusC# - Initiate Capture for all LED Analyser's

Transmit	Receive
busc#	OK

Where:

represents the ranges 1, 2, 3, 4, 5.

The LED brightness level for each range is as follows:-

Range 1 = Low
Range 2 = Medium
Range 3 = High
Range 4 = Super
Range 5 = Ultra

Description

This command uses a pre-selected exposure time designated Range1, Range2 etc. For low light or dim LED's use Range 1 and for brighter LED's use higher ranges. The higher ranges lead to faster test times because the exposure time is shorter.

This command should be preceded by a [BusFree](#) command.

This command instructs all LED Analyser's in the Daisy Chain to capture and store the Color and Intensity of all the LED's positioned under the fibers using a fixed range.

The range setting must be specified. The data is stored until the power is removed or another capture command is issued. When completed the Analyser will transmit the character OK on the receive line to the transmitting device (i.e. the PC).Example:

The PC transmits **busc#** to instruct all LED Analysers in the Daisy Chain to initiate a Capture cycle.

busc2
OK

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Daisy Chain Mode

BusCE#### - Poll each LED Analyser to verify a capture is complete

Transmit	Receive
busce####	0 or 1

Where:

represents the Serial Number of the Led Analyser.

If reply is 1 Then Capture is complete

If reply is 0 No Capture

No reply Led Analyser is busy - Timeout 10mS

Description

This command is used to verify that after a [busc](#) (global capture) each Analyser in the chain has complete its capture.

The PC transmits **busce####** to chech each LED Analysers in the Daisy Chain has complete a Capture cycle.

BusceF123 (Where F123 is the s/n of the Analyser)

1

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Daisy Chain Mode

Ports Description and Wiring.



Figure 10

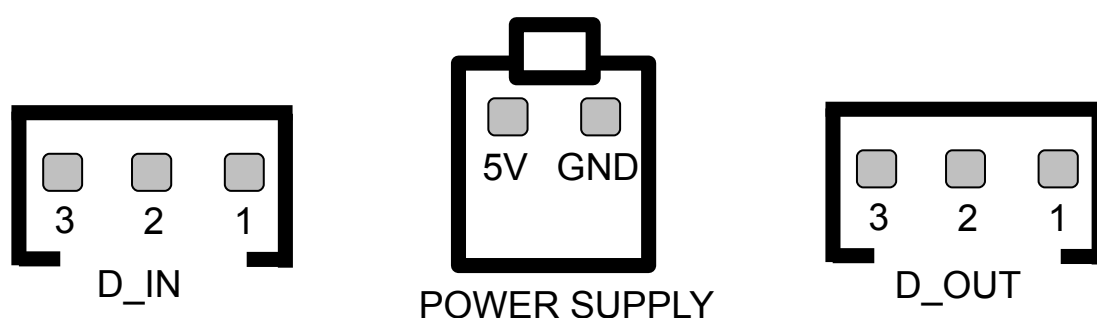
The Daisy Chain Connectors are shown on the right-hand side of figure 10.
The D_OUT connector is connected to the D_IN connector of the next Analyser in the chain.

The Power Connector is used to supply +5V DC to each Analyser in the chain.
Allow 180mA @5V for each Analyser and ensure the wiring is adequate to supply the current without incurring large voltage drops. **For reliable operation it is necessary to have 5V at the Power Connector of each Analyser.**

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Daisy Chain Mode

Daisy Chain Pinout



PIN	D_IN	D_OUT
1	RX_in	RX_out
2	TX_out	TX_in
3	GND	GND

Figure 11

Figure 11 shows the layout of the Connectors viewed from the edge of the board. The *GND* line of *D_OUT* is connected with the *GND* line of *D_IN*, the *RX_out* of *D_OUT* is connected to *RX_in* of *D_IN* and the line *TX_in* of *D_OUT* is connected to the line *TX_out* of *D_IN*.

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Daisy Chain Mode

Step-by-Step method for Daisy Chaining

To successfully implement Daisy chaining the following steps are recommended:-

1. Decide how many Analysers are to be daisy chained.
2. Make a list of the Serial Numbers of the Analysers and note the order in which they will be interconnected. For example we have 4 analysers as follows:

Chain Order	Serial No	Comments
1	F304	Tests D40 – D59 Connected to PC
2	F461	Tests D60 - D69
3	F201	Tests LED01 – LED20 All White
4	F006	Tests LED21 – LED40 All Red

3. Locate the Daisy Chain cables and connect the Daisy_Out of s/n F304 to the Daisy_In of s/n F461. Connect Daisy_Out of s/n F461 to Daisy_In of s/n F201. Connect Daisy_Out of s/n F201 to Daisy_In of s/n F006.
4. Next locate the 2-pin Power cable supplied to s/n F461, s/n F201 and s/n F006 Analysers. It is necessary to apply 5V @180mA to each of these Analysers in the chain. The green power Led should be visible on these 3 analysers.
5. Connect s/n F304 to the PC using the usb cable. The green power led should come on. If you don't have a usb port available and only a Serial port please connect the s/n F304 to the PC using the Serial Cable provided **AND** connect the 2 pin power connector to the 5V 180mA supply.
6. The supplied Terminal Program can be used to verify the operation of the Daisy Chain. Connect to the port on which the 1st Analyser is installed. See [USB Port Control](#)
7. Send **capture** to verify the communications with the 1st Analyser. The response should be **OK**.
8. Send **getserial** and the response should be **F304**.

Daisy Chain Mode

9. To connect to Analyser 2 (s/n F461) send:-

busfree

OK

Response from the Analyser

busgetF461

OK

Response from the Analyser

The host computer is now connected to Analyser 2 (s/n F461).
This can be verified by requesting the Serial Number:-

getserial

F461

Response from the Analyser

All the LED Analyser commands can now be directed to Analyser 2.

10. To connect to Analyser 3 (s/n F201) send the following:-

busfree

OK

Response from the Analyser

busgetF201

OK

Response from the Analyser

11. It is possible to instruct all Analysers in the chain to capture LED data simultaneously. This makes programming easier and saves time. There are six capture commands in total but only one can be used at a time. The commands are **busc**, **busc1**, **busc2**, **busc3**, **busc4** and **busc5**. **Busc** uses the automatic capture range whereas **busc1** – **busc5** use pre-selected manual ranges.
12. If you are have difficulty reading from Analysers at the end of your chain please verify your voltage to each of these units is 5V.

FEASA LED ANALYSER FUNCTIONAL VERSION



Daisy Chain Mode

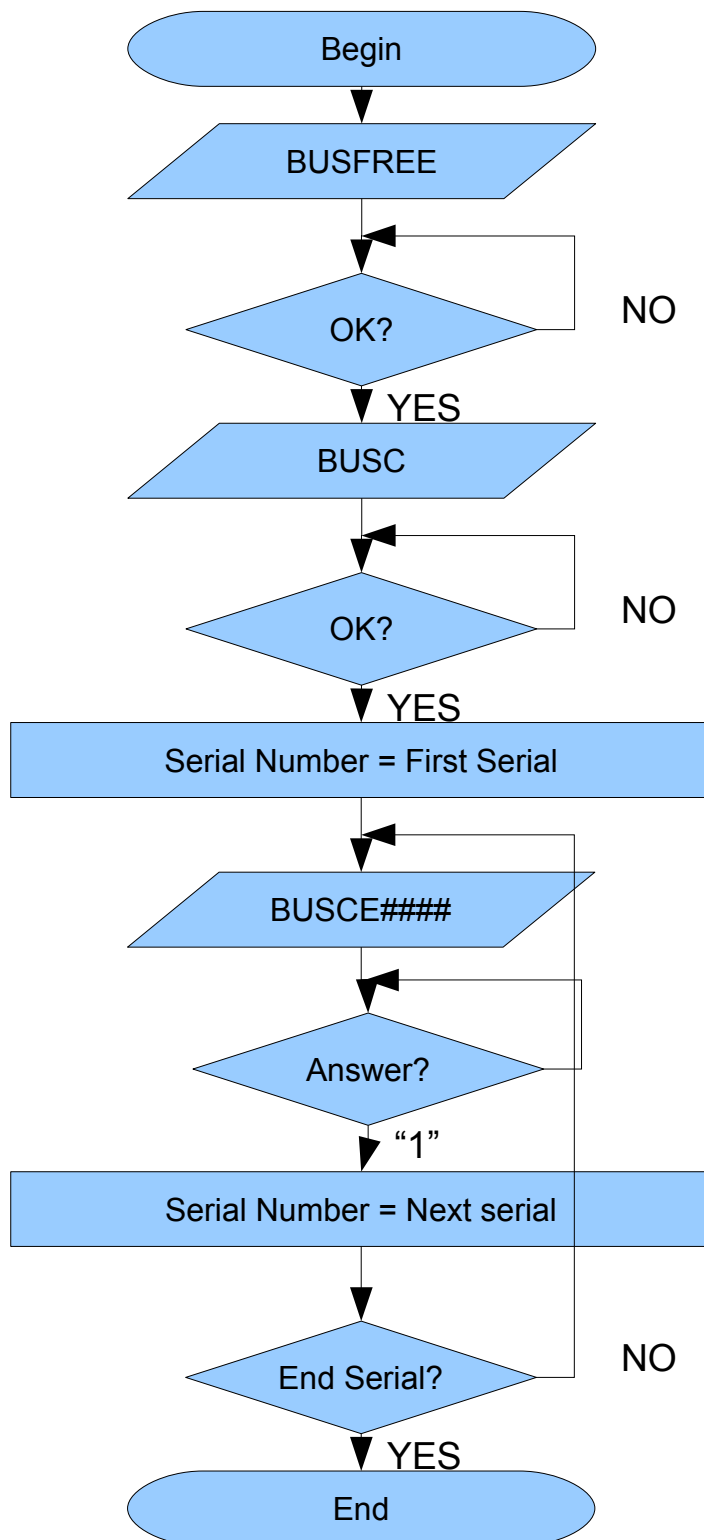
Example

Busfree	'free the bus
OK	
busc3	'All Analysers capture using range 3 High
OK	
busceF304	'poll the analyser F304
1	
busgetF304	'Connect to the Analyser F304
OK	
getserial	'Confirm s/n of the Analyser
F3041	
gethsi01	'Get the Data for Fiber 1
000.51 100 36491	
gethsi02	
.	
.	
gethsi20	
120.51 100 66542	'Data for Fiber 20
busfree	
OK	
busceF461	
1	
busgetF461	'Connect to the next Analyser F461
OK	
getserial	'Confirm to Analyser
F4611	
gethsi01	'Get the Data for Fiber 1
000.51 100 36491	
gethsi02	
.	
gethsi20	'Get the Data for Fiber 20

Repeat this sequence for all Analysers in the chain.

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FEASA LED ANALYSER FUNCTIONAL VERSION



General Commands

GetSERIAL - *Get the Serial Number of the Analyser*

Transmit	Receive
getserial	xxxx

Where: xxxx is an alphanumeric value.

Description

This command will return the Serial Number of the Analyser. This is a unique number and is useful if multiple LED Analysers are used in a System. The Controlling Software can query each LED Analyser for it's Serial Number to ensure the correct Analyser is being controlled.

Example:

The PC transmits **getserial** to the LED Analyser and it will return **xxxx** to the PC.

getserial
75A6

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General Commands

getVERSION - Get the Firmware Version

Transmit	Receive
getversion	xxxx

Where: xxxx is an alphanumeric value.

Description

This command will return the Version Number of the firmware in the Analyser.

Example:

The PC transmits **getversion** to the LED Analyser and it will return **xxxx** to the PC.

getversion
F002

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General Commands

getHW - *Get the Hardware Version*

Transmit	Receive
gethw	xxxxxxxxxx

Where: xxxxxxxxxxxx is an alphanumeric value.

Description

This command will return the hardware version of the Analyser.

Example:

The PC transmits **gethw** to the LED Analyser and it will return **xxxxxxxxxx** to the PC.

gethw
Feasa 20-F

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General Commands

GetINFO - Get a summary of the Led Analyser details

Transmit	Receive
Getinfo	See details below

Information Received back from the Analyser:

Serial Number : Xyyy
Firmware Version : Iyyy
Intensity Mode : Logarithmic
Last Capture : Capture
Number of Fibers : 006
Exposure Factor : 001

Description

This command will return a summary of the Led Analyser details.

Example:

The PC transmits **getinfo** to the LED Analyser and it will return to the PC.

Serial Number : E123
Firmware Version : I116
Intensity Mode : Logarithmic
Last Capture : Capture
Number of Fibers : 006
Exposure Factor : 001

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General Commands

SetBAUD- Change the baud rate

Transmit	Receive
SetbaudX	OK

Where: **X** = 9600,19200,38400,57600,115200,230400,460800

Description

This command will change the baud rate of the Serial and USB Port's in the Analyser.

The default Port settings of the Analyser are 57,600, 8 Data bits, 1 Stop bit and No Parity.

The maximum allowed baud rate for Serial Port is 115200 and the USB Port is 460800.

Example:

To change the baud rate to 9600 transmit the command **setbaud9600** to the Analyser .

Setbaud9600

OK

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General Commands

HELP - Command Summary Listing

Transmit	Receive
help	Command listing

Description

This command will generate a summary listing of all the LED Analyser commands. This is useful when using a terminal program such as HyperTerminal.

Example:

To generate the listing transmit **help** to the Analyser .

help

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Step-by-Step approach to Testing a LED

Standard Capture Mode

To Test the Color and Intensity of up to 20 LEDs simultaneously carry out the following:

1. Ensure that the LEDs to be Tested are turned on and that the fibers are centered over the LEDs.
2. To Test the Color and Intensity in **RGB** first send the command **capture** to the LED Analyser. The LED Analyser will return the characters **OK** indicating that the Color and Intensity data for the LEDs has been stored in the internal memory.
3. Transmit the command **getrgbi01** to retrieve the results for Fiber 1. Any fiber can be queried by sending the command **getrgbi##** to the LED Analyser, where **##** is the fiber number in the range **01 to 20**. The LED Analyser will return the results in the format **rrr ggg bbb iiiiiE** where **rrr**, **ggg** and **bbb** are the **red**, **green** and **blue** components of the light in decimal format in the range **000 to 255**. The **iiii** value indicates the intensity value of the light in the range **00000 to 99999**.
4. Alternatively, the Led Analyser may also be queried to retrieve the Hue, Saturation and Intensity results for the LEDs under test. After step 2 send the command **gethsi##** to the LED Analyser where **##** is the fiber number. The LED Analyser will return the results for that fiber in the format **hhh.hh sss iiiiiE** where **hhh.hh** is the Hue, **sss** is the Saturation(whiteness) and **iiii** are the Intensity results for that Fiber.
5. When using the Capture or C command an Intensity value of 0000 will indicate that the LED under test is not bright enough. An Intensity value of 99999 will indicate that the LED is too bright and the LED Analyser has an over-range condition. Either increase the or decrease the distance of the LED to the Fiber or increase/decrease the LED Intensity.
6. In general, try to keep the Intensity less than 80,000 and greater than 20,000.

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PWM LED Mode

Effect of PWM on Intensity Testing

The effect of Pulse Width Modulation (PWM) of a typical LED on the Analyser Intensity can be seen in Figure 12. In this graph the LED will always be on at 100% modulation. When the modulation has been reduced to 50% (i.e. the LED is off 50% of the time) the relative Intensity drops to approximately 90%.

At 20% modulation (the LED is off 80% to the time) the relative Intensity drops to approximately 50%.

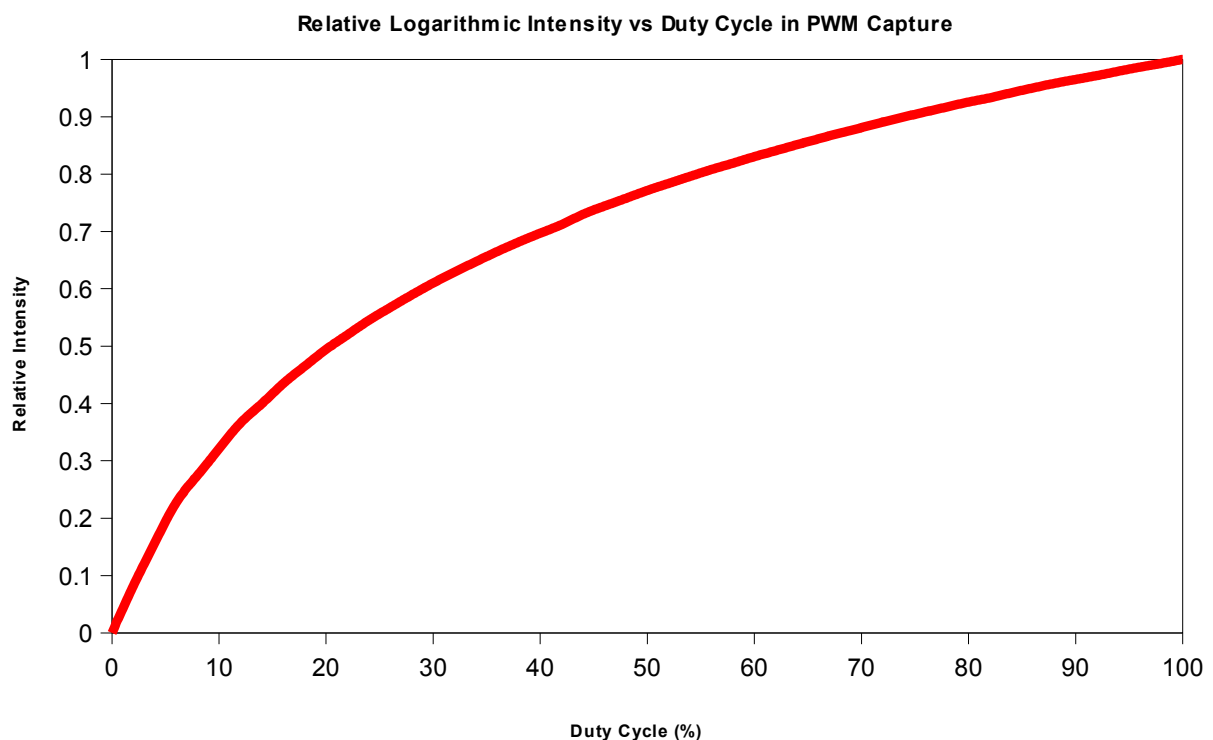


Figure 12: Relative Intensity versus Modulation

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Step-by-Step approach to Testing a PWM LED

PWM LED Mode *

To test PWM LEDs use the following commands on the LED Analyser for Fiber 1:

1. Decide how many readings are required to test the PWM LED's. The Analyser can be programmed to take between 1 and 15 readings. The more readings that are taken the greater the stability of the results.
2. Send the command **CAPTURE#PWM@@**, where @@ is the number of readings to take and # is the Intensity range. The LED Analyser will capture and store the Color, Saturation and Intensity data for all fibers. The LED Analyser will respond with the Characters **OK** indicating that the command has been completed.
3. To read back the RGB and Intensity of the LED under fiber ## send the command **GETRGBI##** to the LED Analyser. The LED Analyser will return the data in the format **rrr ggg bbb iiii** where **rrr**, **ggg** and **bbb** are the **red**, **green** and **blue** components of the color. The **iiii** value indicates the intensity value.
4. To read back the Hue and Intensity of the LED under fiber **xx** send the command **GETHSI##** to the LED Analyser. The LED Analyser will return the data in the format **hhh.hh sss iiii** where **hhh.hh** represents the Hue value, **sss** represents the Saturation(whiteness) and **iiii** indicates the intensity value.

* If the switching frequency for the LED > 150Hz then stable results can be obtained using the capture# commands. These commands are quicker to execute and will save test time.

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FEASA LED ANALYSER FUNCTIONAL VERSION



Command Summary

COMMAND	DESCRIPTION
Busfree	Free the Daisy Chain Bus of the active Analyser
Busget####	Make Analyser #### active on the Daisy Chain Bus
BusC	All Analysers on the Daisy Chain to Auto Capture
BusC#	All Analysers on the Daisy Chain to Manual Capture
Capture	Capture LED Data - Auto Range
Capture#	Capture LED Data - Manual Range
Capture#PWM@@	Capture PWM LED Data – Manual Range
CapturePWM	Capture PWM LED Data – Auto Range
getRGBI##	Get RGB, Saturation and Intensity for a LED
getHSI##	Get Hue, Saturation and Intensity for a LED
getxy##	Get the xy Chromaticity values
getxoffset##	Get x chromaticity offset
getyoffset##	Get y chromaticity offset
getuv##	Get the u'v' Chromaticity values
getwavelength##	Get Dominant Wavelength for LED
Getwavelengthoffset@@	Get Wavelength offset for Fiber
getwi##	Get Dominant Wavelength & Intensity for LED
getcct##	Get Color Temperature for LED
getIntensity##	Get the Intensity for a LED
get7seg#	Read a 7 Segment Display
getSerial	Get the Serial Number of the Analyser
getVersion	Get the Firmware Revision of the Analyser
getHW	Get the Hardware Version of the Analyser
Setbaud	Set the baud rate of the Serial and USB Port
help	Command Summary Listing

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FEASA LED ANALYSER FUNCTIONAL VERSION



Specifications

Part Number(s)

Feasa 20-F	LED Analyser with 20 Fibers
Feasa 10-F	LED Analyser with 10 Fibers
Feasa 6-F	LED Analyser with 6 Fibers
Feasa 5-F	LED Analyser with 5 Fibers
Feasa 3-F	LED Analyser with 3 Fibers
Feasa 2-F	LED Analyser with 2 Fibers

Physical

Dimensions 127mm x 57mm x 55mm (L x W x H) – Feasa 20-F, 10-F, 6-F
Dimensions 86mm x 57mm x 55mm (L x W x H) - Feasa 10-F, 5-F, 3-F, 2-F
Fiber Length 0.6m
Fiber Diameter 1.0mm
Fiber Core Diameter 0.5mm
Number of Fibers 2, 3, 5, 6, 10, 20
Operating Temperature Range 0°C to +50°C

Electrical

Supply Voltage 5.0V
Supply Current 180 mA
USB 2.0 Interface, Serial RS232 Interface
Output Data Format RGB, HSI, XY, UV, Wavelength, CCT

Optical

Red Peak Efficiency Wavelength	615 nm
Green Peak Efficiency Wavelength	540 nm
Blue Peak Efficiency Wavelength	465 nm
Total Operating Wavelength Range	450 nm to 650 nm

Accuracy

White	$X = \pm 0.0015, Y = \pm 0.0015$
Red (630nm)	$\pm 3\text{nm}$
Green (540nm)	$\pm 4\text{nm}$
Blue (630nm)	$\pm 3\text{nm}$

Capture Test Times

Auto Range	350ms
Range 1 (Low Intensity)	650ms
Range 2 (Medium Intensity)	200ms
Range 3 (High Intensity)	22ms
Range 4 (Super Intensity)	4ms
Range 5 (Ultra Intensity)	2ms

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FEASA LED ANALYSER FUNCTIONAL VERSION



Warranty

1. Feasa Enterprises Limited (herein referred to as Feasa) warrants Feasa hardware, accessories and supplies against defects in materials and workmanship for the period of one year. If Feasa receives notice of such defects during the warranty period, Feasa will, at its option, either repair or replace products which prove to be defective. Replacement products may be either new or like-new.
2. Feasa warrants that Feasa software will not fail to execute its programming instructions, for the period of one year, due to defects in material or workmanship when properly installed and used. If Feasa receives notice of defects during the warranty period, Feasa will replace software media which does not execute its programming instructions due to such defects.
3. Feasa does not warrant that the operation of Feasa products will be uninterrupted or error free. If Feasa is unable, within a reasonable time, to repair or replace any product to a condition as warranted, customer will be entitled to a refund of the purchase price upon prompt return of the product to Feasa.
4. Feasa products may contain re-manufactured parts equivalent to new in performance or may have been subject to incidental use
5. The warranty period begins on the date of deliver
6. Warranty does not apply to defects resulting from:
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 - (b) software, interfacing, parts or supplies not supplied by Feasa,
 - (c) unauthorized modification or misuse,
 - (d) operation outside the published environmental specifications for the product, or
 - (e) improper site preparation or maintenance.
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