Metaphaser

Model # MP-LE1007

(Strobe/DC & DC-only version)

Operating Manual

V. 3.01.04

09-04-2015

Metaphase LED Light Engine

Metaphase Technologies, Inc.

Model#: MP-LE1007-**
** = "DC" Hi-Power DC or "ST" (Strobe)

Congratulations on your purchase of the new METAPHASER Ultra-high power
LED fiber illuminator. This unit will serve you well for many years.

Product Specifications:

• Super High-Output LED Engine
• Power Input -- 12VDC (Power Adaptor Included)
• Color Temp – 6000K (White LED version)
• Long Life – 75,000 hours
• Default IP Address - 172.16.1.1
• Remote Control via Windows-based MetaBOSS Software or Ethernet commands
• MetaBOSS Software (PC control program for Ethernet control of Metaphaser) available
• Ethernet/USB control command set for external control by PC/HMI/PLC included with Metaphaser

Metaphase LED Light Engine

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Model#: MP-LE1007

Unpacking:

The METAPHASER comes with the following accessories:
 • AC Power cord & Power Supply

Unit Setup and Operation

1. Place the unit on the work surface being careful not to obstruct either of the fan's intake or exhaust port. Failure to do so could cause loss of airflow in your unit causing the LED engine to overheat and shutdown.

2. Connect the power adapter to power port on rear of Metaphaser

3. Insert the fiber optic light guide into the nose piece being sure to bottom it against the stops.

4. Tighten the thumbscrew on the nose piece to secure the fiber guide in place.

5. Turn unit on by setting toggle power switch located on the rear of the Metaphaser to the ON position. Record all default values for future reference.

6. The unit will power-up to the last known state and values used. **(Observe Safety Notes)**

Safety: **Intensity of this product can cause eye damage if viewed directly. Metaphase Technologies Inc. requires the use of appropriate eye-protection when using this product.**

Disclosure: DO NOT STARE DIRECTLY INTO THE LIGHT.

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1. MENU ------------------- (Used to set IP address during setup)
                (Range: 172.16 and 192.168 subnets recommended)

2. INTENSITY DOWN -- (Decrease intensity)

3. INTENSITY UP -------- (Increase Intensity)

4. FIBER NOSE PIECE

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5. DC INPUT (+12VDC - PS-LE1007 Supply ONLY)

6. POWER ON/OFF

7. ETHERNET PORT

8. USB PORT

9. TRIGGER INPUT

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Introduction

MP-LE1007, the Metaphaser, is Metaphase Technologies' high power LED fiber optic bundle illuminator. There are currently two different versions, a high-power DC version and a high-power Strobe version with standard power DC. The hi-power DC Metaphaser utilizes the Metaphase Technologies' ULC-2 current controller and one custom hi-power DC driver. The Strobe/DC Metaphaser utilizes the Metaphase Technologies' ULC-2 current controller and one of the ULC-2 drivers. The Metaphaser is controlled by utilizing a suite of built-in menus via the front panel or accessed by Ethernet UDP or USB. Metaphase Technologies' Windows based GUI, called MetaBOSS, allows Ethernet UDP/USB control via PC. Alternatively, by utilizing the Metaphase command list, Ethernet/USB control can be achieved by using any Ethernet UDP/USB controller (PLC, HMI, etc.).

Theory of Operation

Hi-Power DC Version

The Hi-power DC version permits adjustable High-intensity illumination for the fiber optic bundle. The Hi-Power DC version uses a unique high-power Metaphase Technologies driver in conjunction with an internal ULC-2 controller and one custom hi-power DC driver. This version has two levels of internal menus. The Setup menu (supervisor level) sets the maximum values, such as % Intensity and Trigger functions, to prevent exceeding the LED component specifications or the displayed values in the Run-time menus. The Run-time menus are used for changing the real-time settings up to the limits imposed by the Setup menus. The Metaphaser is available with a universal nose piece and a variety of adaptors for different diameter fiber tips. Also available are dedicated nose pieces for the more popular fiber optic bundles that are on the market.

Strobe Version

The Strobe version allows for extremely high-intensity pulses of LED illumination. This is achieved by Power Boosting (current overdriving) for short periods of time (microseconds). In general, maximum PEAK strobe intensity is achieved by minimizing the pulse width and maximizing the trigger period and current (amperage) setting. (In other words, the shorter the strobe pulse duration and the more time between triggers, the higher the PEAK intensity output). The Strobe Metaphaser will automatically protect the LED by not allowing the LED pulse width or duty cycle to be too high. The Strobe version uses the ULC-2 controller and one of its two driver modules. This version has two levels of internal menus. The Setup menu (supervisor level) sets the maximum values, such as Max DC/Strobe currents, Max Pulse width and Trigger functions, to prevent exceeding the LED component specifications or the displayed values in the Run-time menus. The Run-time menus are used for changing the real-time settings up to the limits imposed by the Setup menus. The Metaphaser is available with a universal nose piece and a variety of adaptors for different diameter fiber tips. Also available are dedicated nose pieces for the more popular fiber optic bundles that are on the market.

NOTE: Critical values such as Max DC current, Max Strobe current and Max Pulse width should NOT be increased beyond the factory-set defaults in the Setup menus without first consulting Metaphase Technologies.

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Quick Start - Setup Menus - DC Version

Follow the steps below to quickly set up the High-Power DC Metaphaser for basic operation using the Metaphaser keypad: Press the M button on the front panel to select each Menu screen and then press the ▼ or ▲ buttons to select within each specific menu.

1. Apply 12V power to the unit by setting toggle switch on the rear of the unit to the ON position.

2. After applying power to the device, the boot-up screen will flash and display the Model name. At the bottom left you will find the current Driver Version:

> Metaphaser-1
>
> 7.4

3. When prompted, choose Yes to enter the Setup Menus.

> Enter Setup?
>   No Yes

*If setup prompt is missed at startup, the unit can be prompted to enter the setup menu at any time by pressing the **M** and ▼ ▲ buttons simultaneously. Scroll through the various menus using the **M** button located on the Metaphaser front panel.

- **Light Level Intensity Limit** – sets the maximum Light Level output level (in percent) for which the LED is rated or to limit the range in the run-time menu. Default setting is 100%.

> LightLevMax=100%

- **Trigger Polarity** – Used to define the edge of the trigger pulse the system uses to turn on the LED output. Rising edge is default, which is typical for most users. If "Trigger Polarity" is set to "RISING", then the output will be ON when a voltage is present at the trigger input. If "Trigger Polarity" is set to "FALLING", then the output will be ON when a voltage is NOT present at the trigger input. This only applies when the Metaphaser's "Trigger Controls DC = Yes".

> Trigger   Polarity
>
> Chan 1   Rising

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Quick Start - Setup Menus - DC Version (continued)

- **Trigger Controls DC** – Used to control DC LED output via trigger signal if set to YES; Default (Normal) is a setting of NO. If "Trig Controls DC" is set to YES, then the trigger input will control the DC Current output. If "Trigger Polarity" is set to "RISING", then the output will be ON when a voltage is present at the trigger input. If "Trigger Polarity" is set to "FALLING", then the output will be ON when a voltage is NOT present at the trigger input.

```
Trig  Controls   DC

Chan 1  No-Normal
```

- **IP Address** – To change the IP Address, select IP Addr Octet from the menu. Using the Up ▲ and Down ▼ arrows, scroll through each Octet 1-4 to change each segment of the IP Address. Default IP Address is 172.161.1.1.

```
IP  Addr  Octet 1:

172.161.1.1
```

```
IP  Addr  Octet 2:

172.161.1.1
```

```
IP  Addr  Octet 3:

172.161.1.1
```

```
IP  Addr  Octet 4:

172.161.1.1
```

- **Keypad Lock:** To prevent changes to the Metaphaser controls, a lock button feature is included.

- **Keypad Unlock:** When locked, press the M and ▼ ▲ buttons simultaneously and select YES to Enter the Setup menu. From there, scroll down to the Unlock Menu and select UNLOCK. A locked controller can also be unlocked via MetaBOSS. A setting of unlocked is default.

```
Keypad   Status:

Keys unlocked
```

4. Exit the Setup Menu to enter the Run-time Menu.

```
Exit Setup?

              Yes
```

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Quick Start - Runtime Menus - DC Version

These menus are shown after exiting from the Setup mode. Follow the steps below to operate the High-Power DC Metaphaser in the Run-time mode for basic operation using the Metaphaser keypad: Press the M button on the front panel to select each Menu screen and then press the ▼ or ▲ buttons to select within each specific menu.

Light Level intensity – This menu controls the Metaphaser LED output intensity up to the value limit set in the Setup Menu.

```
Light Level= 100%


```

LED Output (On/Off) – The menu controls whether the LED output is turned ON or OFF.

```
LED Output:     On


```

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Enhanced Menu Descriptions - DC Version

A. Setup Menus

The setup menus below appear only when the Metaphaser is initially powered on and selected or later accessed by simultaneously pressing the **M** and ▼▲ buttons. The menus include:

Light Level Maximum

This "Limit" menu provides the user a way to set the upper bound of the LED output DC Intensity up to 100%. For example, if the Light Intensity Limit is set to 90%, the Light Intensity can be adjusted from 0% to 90%. Such a limit assures adjustments never exceed the limits of the LED or to limit the range displayed in the Run-time menu.

Trigger Polarity (Rising or Falling)

Used to define the edge of the trigger pulse the system uses to turn on the LED output. Rising edge is default, which is typical for most users. If "Trigger Polarity" is set to "RISING", then the output will be ON when a voltage is present at the trigger input. If "Trigger Polarity" is set to "FALLING", then the output will be ON when a voltage is NOT present at the trigger input. This only applies when the Metaphaser's "Trigger Controls DC = Yes".

Trigger Controls DC

Used to control DC LED output via trigger signal if set to YES; Default (Normal) is a setting of NO. If "Trig Controls DC" is set to YES, then the trigger input will control the DC Current output. If "Trigger Polarity" is set to "RISING", then the output will be ON when a voltage is present at the trigger input. If "Trigger Polarity" is set to "FALLING", then the output will be ON when a voltage is NOT present at the trigger input.

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Quick Start - Setup Menus - Strobe Version

Follow the steps below to quickly set up the High-Power Strobe Metaphaser for basic operation using the Metaphaser keypad: Press the M button on the front panel to select each Menu screen and then press the ▼ or ▲ buttons to select within each specific menu.

1. Apply 12V power to the unit by setting toggle switch on the rear of the unit to the ON position.

2. After applying power to the device, the boot-up screen will flash and display the Model name. At the bottom left you will find the current Controller Version followed by the Driver Version:

> Metaphaser Pulse
>
> 7.4   7.2   0.0

3. When prompted, choose Yes to enter the Setup Menus.

> Enter Setup?
>   No   Yes

*If setup prompt is missed at startup, the unit can be prompted to enter the setup menu at any time by pressing the **M** and ▼ ▲ buttons simultaneously. Scroll through the various menus using the **M** button located on the Metaphaser front panel.

Though the intended operation of this type Metaphaser may be DC or Strobe, the unit should be configured to safely operate in both modes in case the run-time mode is set improperly at a later time without this safeguard.

• **DC Current Limit** – set the maximum DC current for which the LED is rated. (Typical range is 20 to 4000mA). This parameter applies only to DC Current Mode.

> MaxDCAmps:4000mA
> Chan 1

• **Strobe Current Limit** – set the maximum peak current for which the LED is rated for its associated maximum pulse width. (Typical range is 100 to 40,000mA). This parameter applies only to Strobe Mode.

> MaxPulsA:40000mA
> Chan 1

Quick Start - Setup Menus - Strobe Version (continued)

- **Pulse Width Limit** – set the maximum pulse width associated with the maximum peak current. A low value is safest, but may not be seen if set too low (Typical range is 2 to 60,000us).

```
MaxPulsW:   200us

Chan 1
```

- **Strobe Minimum Period Limit** – set the minimum period for which external trigger pulses will be allowed. A high value, ex. 60,000 microseconds, is safest (Typical range is 20 to 60,000us).

```
MinTrgPer: 1000us

Chan 1
```

- **Trigger Source** – Used to determine Internal or External trigger source. A setting of Internal is default.

```
Trigger:        Intern

Chan 1
```

- **Trigger Polarity** – Used to define the edge of the trigger pulse the system fires from. Rising edge is default, which is typical for most users.

```
Trigger        Polarity

Chan 1        Rising
```

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Quick Start - Setup Menus - Strobe Version (continued)

- **Trigger Controls DC** – Used to control DC LED output via trigger signal if set to YES; Default (Normal) is a setting of NO. If "Trig Controls DC" is set to YES, then the trigger input will control the DC Current output. If "Trigger Polarity" is set to "RISING", then the output will be ON when a voltage is present at the trigger input. If "Trigger Polarity" is set to "FALLING", then the output will be ON when a voltage is NOT present at the trigger input.

```
Trig  Controls  DC
Chan 1  No-Normal
```

- **IP Address** – To change the IP Address, select IP Addr Octet from the menu. Using the Up ▲ and Down ▼ arrows, scroll through each Octet 1-4 to change each segment of the IP Address. Default IP Address is 172.161.1.1.

```
IP  Addr  Octet 1:
172.161.1.1
```

```
IP  Addr  Octet 2:
172.161.1.1
```

```
IP  Addr  Octet 3:
172.161.1.1
```

```
IP  Addr  Octet 4:
172.161.1.1
```

- **Keypad Lock:** To prevent changes to the Metaphaser controls, a lock button feature is included.

- **Keypad Unlock:** When locked, press the **M** and ▼ ▲ buttons simultaneously and select YES to Enter the Setup menu. From there, scroll down to the Unlock Menu and select UNLOCK. A locked controller can also be unlocked via MetaBOSS. A setting of unlocked is default.

```
Keypad   Status:
Keys unlocked
```

5. Exit the Setup Menu to enter the Run-time Menu.

```
Exit Setup?
              Yes
```

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Quick Start - Runtime Menus - Strobe Version

These menus are shown after exiting from the Setup mode. Follow the steps below to operate the High-Power Strobe Metaphaser in the Run-time mode for basic operation using the Metaphaser keypad: Press the M button on the front panel to select each Menu screen and then press the ▼ or ▲ buttons to select within each specific menu.

Mode – The Mode menu controls whether the Metaphaser output is continuous DC current or Strobed.

Mode: DC Current Chan 1	Mode: Strobe Chan 1

DC Current – The DC current controls the Metaphaser output from 20mA to the Current Limit value set in the Setup menus. This menu appears only when the mode is set to DC Current.

LED Output: On 	DC Amps: 100mA Chan 1

Channel OK Chan 1	

Strobe Pulse Current – The Pulse current menu controls the Metaphaser output from 0.1 Amps to the Pulse Current Limit value set in the Setup menus. This menu appears only when the mode is set to Strobe.

LED Output: On 	PulsAmps: 500mA Chan 1

Channel OK Chan 1	

Strobe Pulsewidth – The Strobe Pulsewidth menu controls the Metaphaser output from 2 microseconds to the Strobe Pulsewidth Limit value set in the Setup menus. This menu appears only when the mode is set to Strobe.

PulWidth: 10us Chan 1

Quick Start - Runtime Menus - Strobe Version (continued)

Strobe Minimum Period – The Strobe Minimum Period menu controls the Metaphaser output from 60 milliseconds down to the minimum value set by Strobe Minimum Period Limit value set in the Setup menus. This menu appears only when the mode is set to Strobe. The Metaphaser ignores trigger inputs faster than the Strobe Minimum Period.

```
TPeriod     30000us

Chan 1
```

Strobe Trigger Delay – The Strobe Trigger Delay menu controls the delay between a trigger input and the Metaphaser's subsequent pulse output from 60 milliseconds down to the minimum. There exists a minimum delay of 6 microseconds (typical) by default. This menu appears only when the mode is set to Strobe.

```
Trig Del:          6us

Chan 1
```

One-shot Internal Trigger – This menu allows the user to simulate one cycle of strobe output triggered by the internal trigger. During setup, this feature helps the user determine the appropriate values of pulse width, period and strobe current for their specific application. This menu appears only when the mode is set to Strobe.

```
OneShot   Int  Trig

Chan 1          Yes
```

Save/Recall – This menu allows all Setup and Runtime settings to be stored.

Press ▼ to save.

```
Preset  #1

      Save   Recall
```
```
Preset   Setting   1

Saved
```

Press ▲ to recall.

```
Preset  #1

      Save   Recall
```
```
Preset   Setting   1

Recalled
```

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Enhanced Menu Descriptions - Strobe Version

A. Setup Menus

The setup menus below appear only when the Metaphaser is initially powered on and selected or later accessed by simultaneously pressing the **M** and ▼▲ buttons. The menus include:

Trigger Source (Internal or External)

This menu allows the setting of the source of trigger when in Strobe mode. In normal operation, External trigger is selected, but for setup and testing purposes, users may elect to use Internal trigger in an effort to verify settings and operation.

When set to External trigger, the Metaphaser will ignore external trigger input events received faster than what is set in Run-time menu for Strobe Minimum Period.

For Internal trigger, the frequency of the strobing output is set by Strobe Minimum Period. For both types of trigger, the output Strobe Pulsewidth is determined by the Strobe Pulsewidth parameter.

Continuous (DC) Current Limit

This "Limit" menu provides the user a way to set the upper bound of the LED output DC Current up to 4 A current found in the "Run time" menus. For example, if the DC Current Limit is set to 1.6 Amps, the DC current can be adjusted from 20mA to 1.6 Amps. Such a limit assures adjustments never exceed the limits of the LED component specification or the range of values in setup menu. This limit applies only to DC Current Mode of operation.

Strobe (Pulse) Current Limit

This "Limit" menu provides the user a way to set the upper bound of the LED output Strobe current up to 40 amps found in the "Run time" menus. For example, if the Strobe Current Limit is set to 9 Amps, the Strobe current can be adjusted from 100mA to 9 Amps. Such a limit assures adjustments never exceed the limits of the LED component specification or the range of values in setup menu.

Strobe Pulsewidth Limit

This "Limit" menu provides the user a way to set the maximum LED output Strobe Pulsewidth found in the "Run time" menus. For example, if the Strobe Pulsewidth Limit is set to 100 microseconds, the Strobe Pulsewidth can be adjusted from 2 to 100 microseconds. Such a limit assures adjustments never exceed the limit of the LED component specification or the range of values in setup menu.

Enhanced Menu Descriptions - Strobe Version (continued)

A. Setup Menus (continued)

Strobe Minimum Period Limit

This "Limit" menu provides the user a way to set the Minimum Period of the external strobe triggers found in the "Runtime" menus. For example, if the Minimum Period Limit is set to 100 microseconds, the Minimum Period can be adjusted from a maximum of 60 milliseconds down to a minimum of 100 microseconds. Such a limit assures adjustments never exceed the limits of the LED component specification or the range of values in setup menu.

Restore to Default

This allows for the device to be restored to original factory settings, but does not change the IP address. First, reboot the device until the version menu is displayed.

> Metaphaser Pulse
>
> 7.4   7.2   0.0
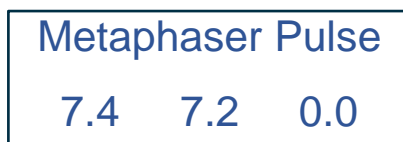
When the above is displayed, hold the Down ▼ arrow button to restore default settings.

> Loading Default
>
> Parameters

The device will briefly show the above screen and then quickly cycle through the various parameter screens. The device should now be restored to the original settings and prompt you to enter setup mode.

Resetting IP Address

In the unlikely event that the software is corrupted, preventing IP address changes within the Setup menu, the IP Address can be reset to 172.16.1.1 by pressing **M** and ▼ ▲ simultaneously immediately after power-up.
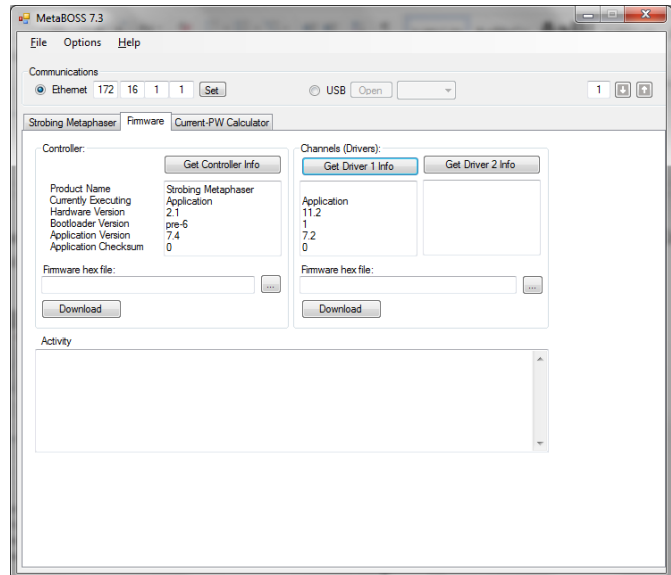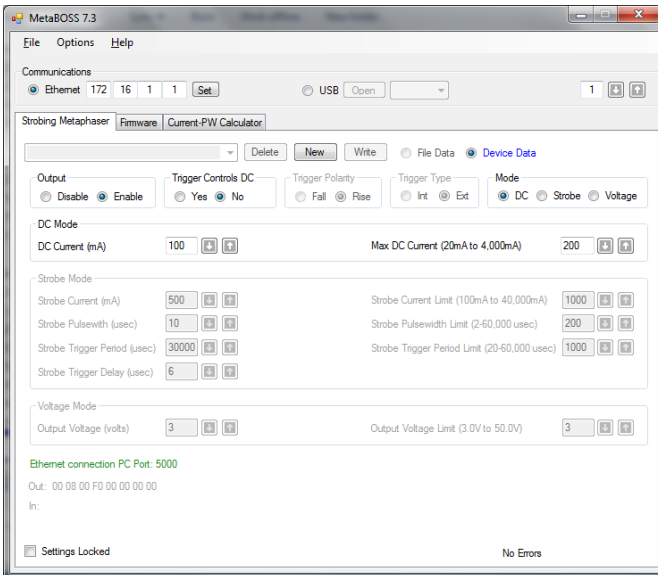
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MetaBOSS Windows Control Software

Metaphase provides Windows software to control Metaphaser controller from a remote PC. Please follow the instructions below for setting up the MetaBOSS software:


MetaBOSS Installation & Operation

•Go to http://www.metaphase-tech.com/Controllers/Controllers/ULC_2 to download a copy of the latest MetaBOSS software.

•Unzip the file into a folder of your choosing (typically c:\Metaboss)

•Microsoft .Net Framework 4.0 or later must be installed on the PC. The free upgrade may be found at http://www.microsoft.com/download/en/details.aspx?id=17851

•The Metaphaser Controller has a default IP address of 172.16.1.1. The PC running MetaBOSS must be on the same subnet. i.e. – the PC must have an address beginning with 172.16. As required, set the IP address of the host PC to a 172.16 address (such as 172.16.0.100). The subnet mask should be set to 255.255.0.0 on a 172.16 network and 255.255.255.00 on a 192.168 network.

•Connect the Metaphaser and host PC, using standard CAT-5 patch cables, to an Ethernet switch. Alternatively, connect the host PC directly to the ULC-2 using a "cross-over" CAT-5 cable.

Metaphase LED Light Engine
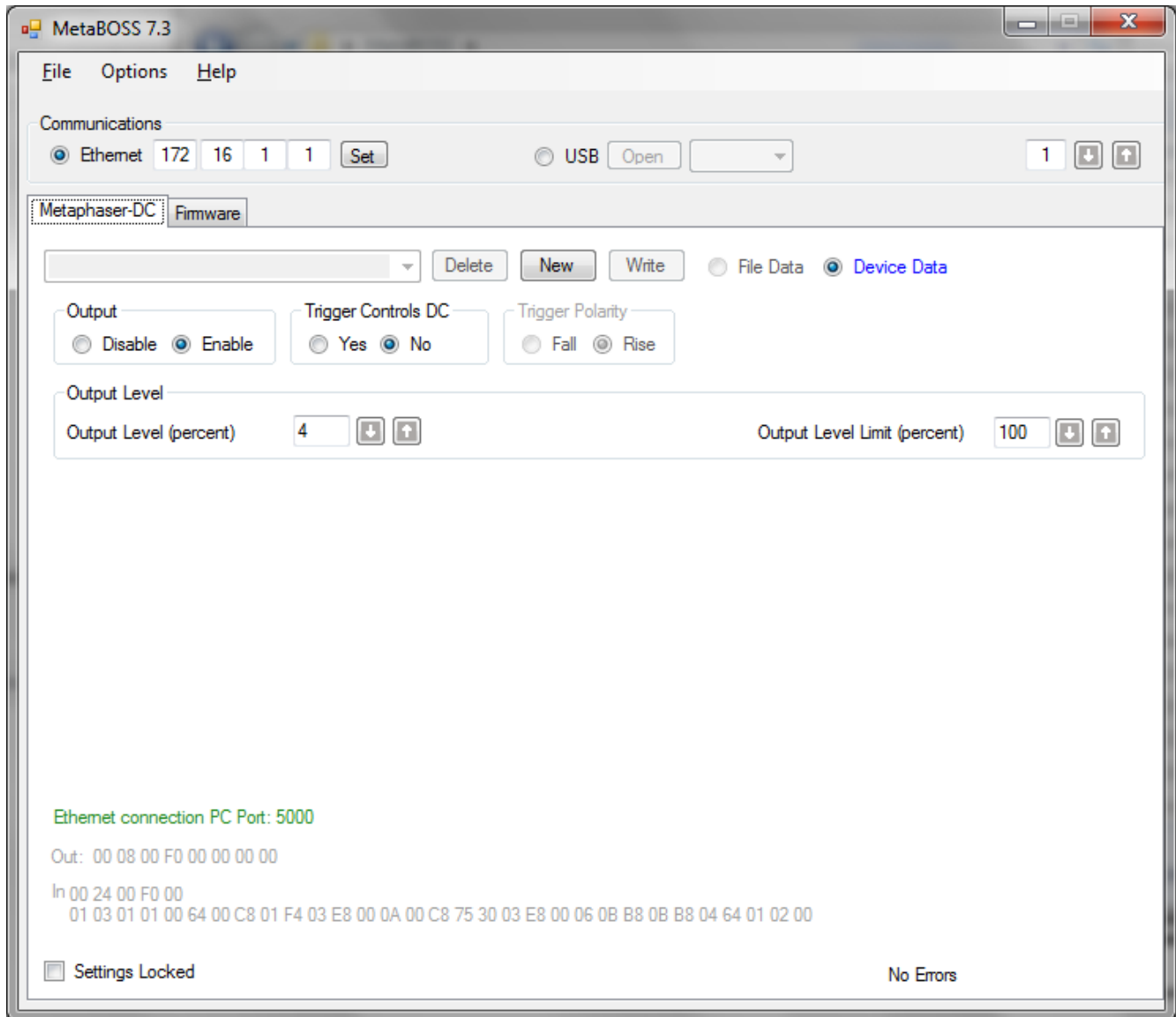
Model#: MP-LE1007

DC Version Metaphaser
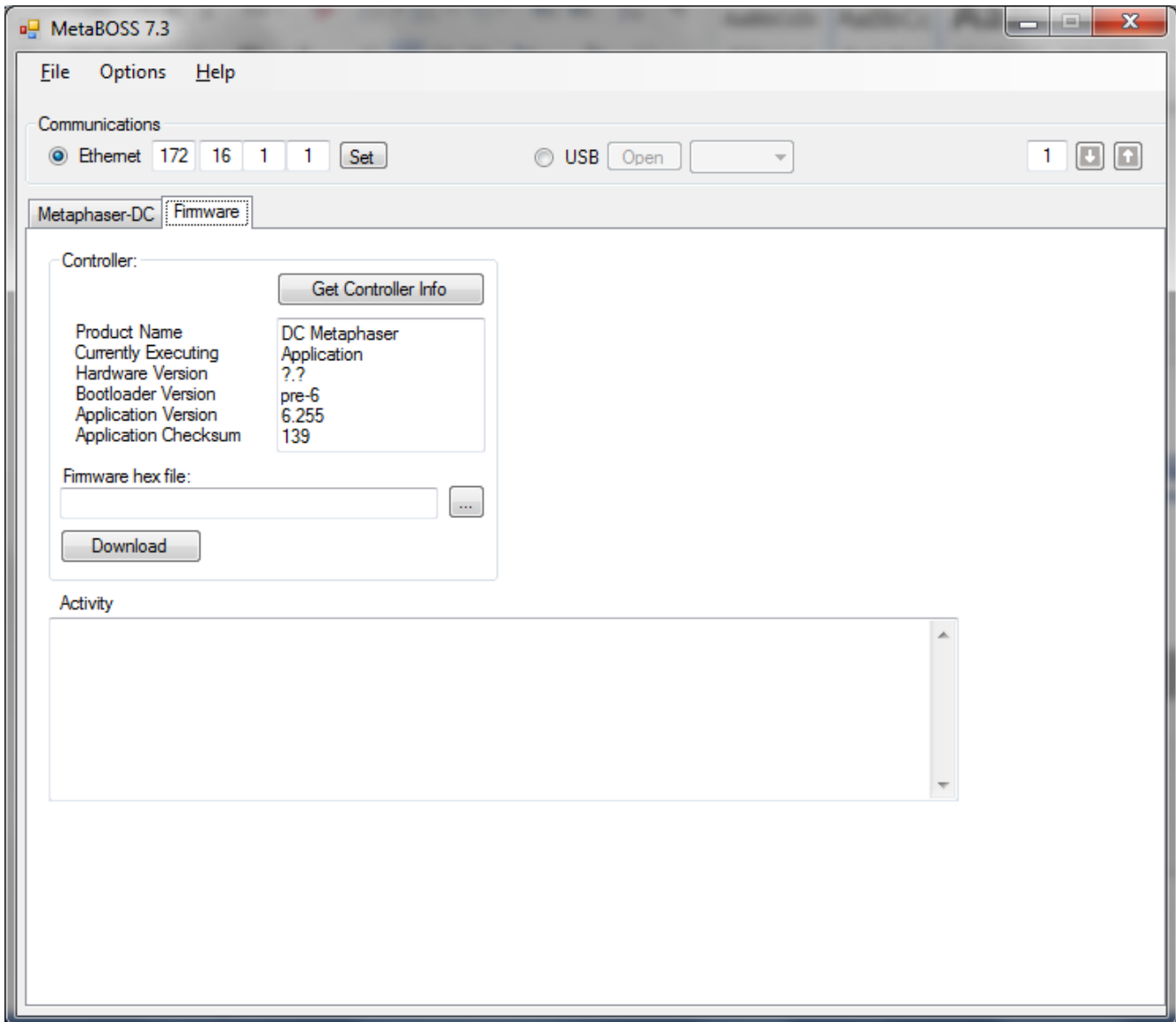
MetaBOSS DC Mode Tab

Metaphase LED Light Engine

Model#: MP-LE1007

DC Version Metaphaser
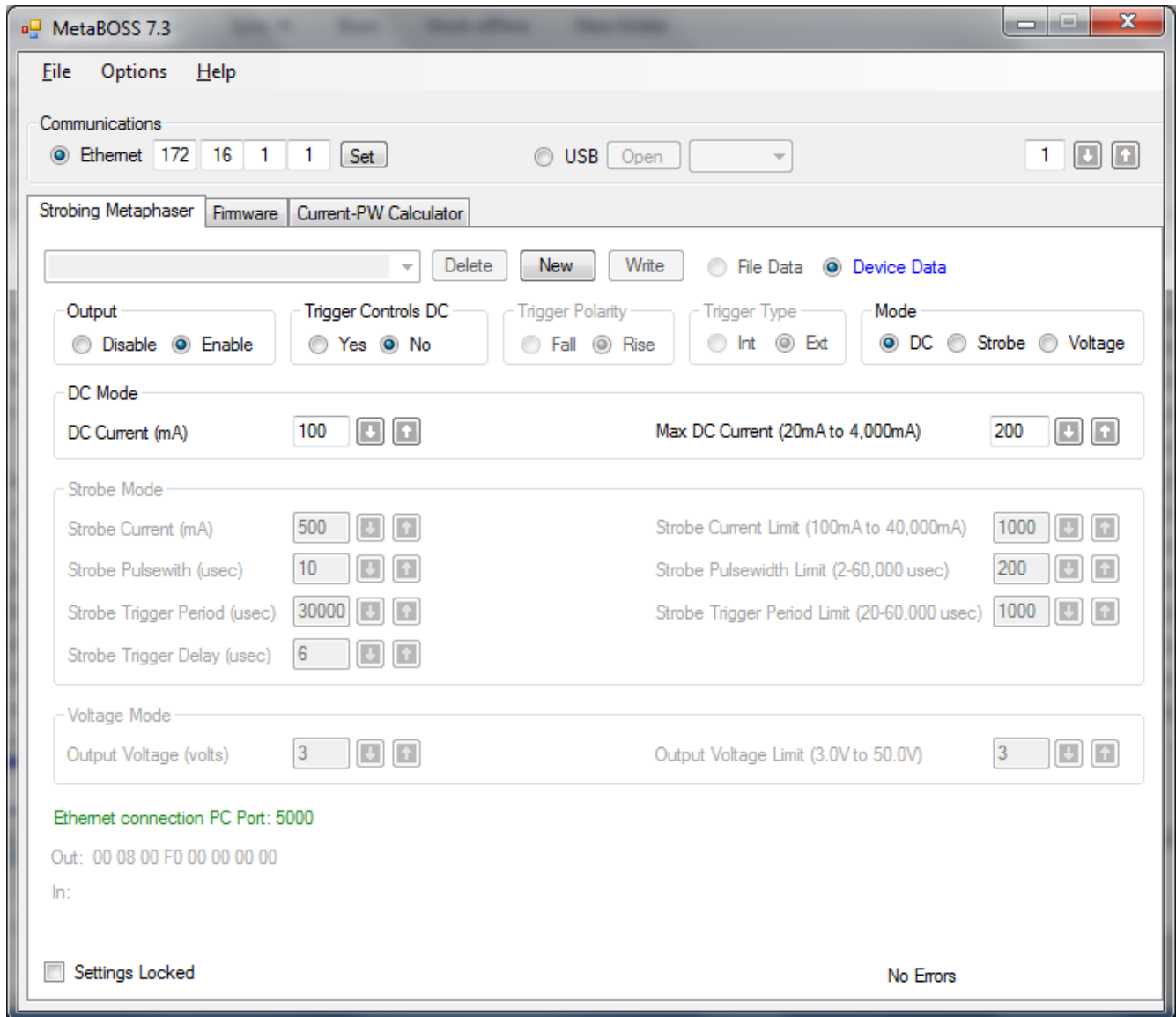
MetaBOSS Firmware Tab

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Strobe Version Metaphaser
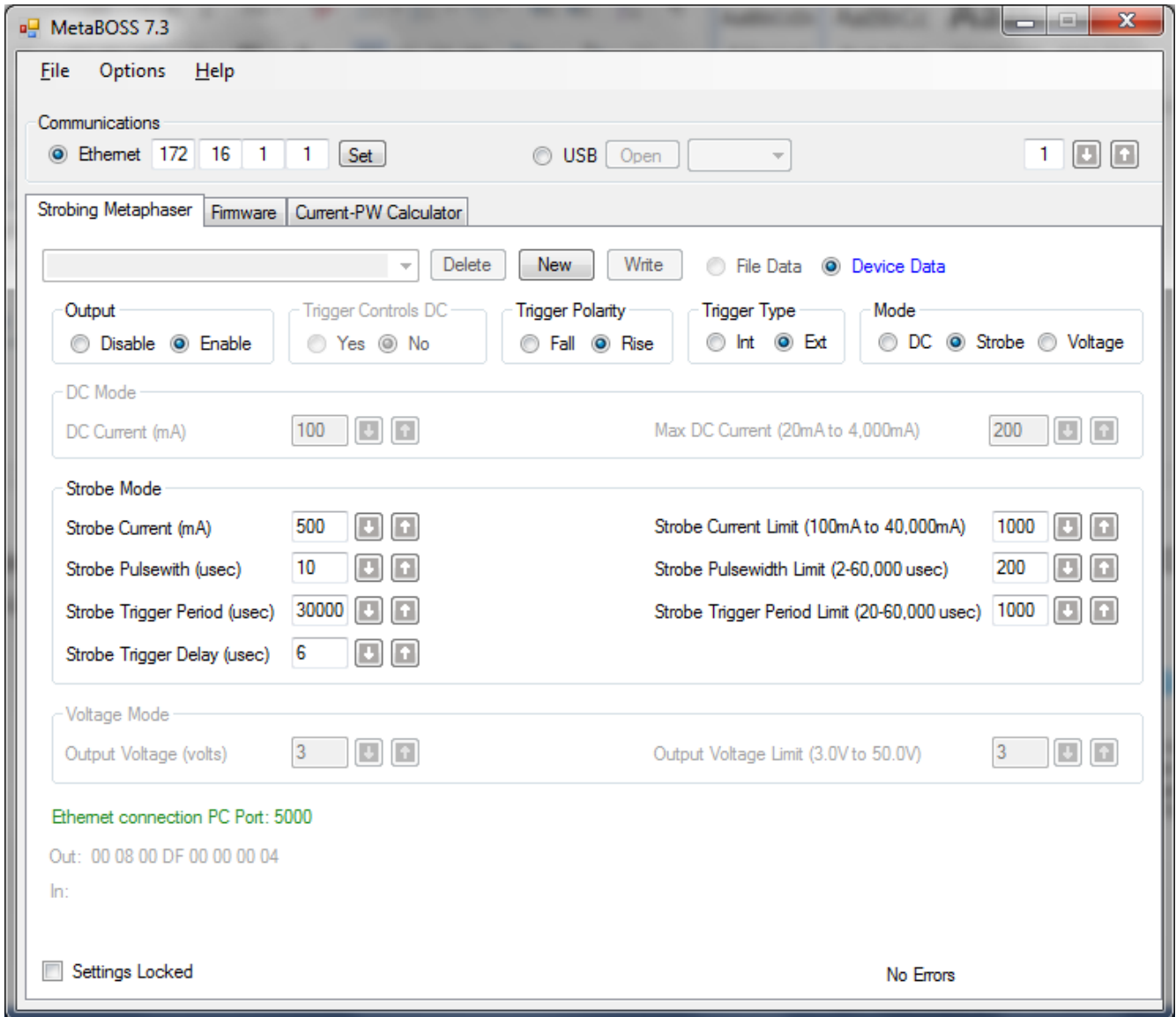
MetaBOSS DC Mode Tab

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Strobe Version Metaphaser

MetaBOSS Strobe Mode Tab

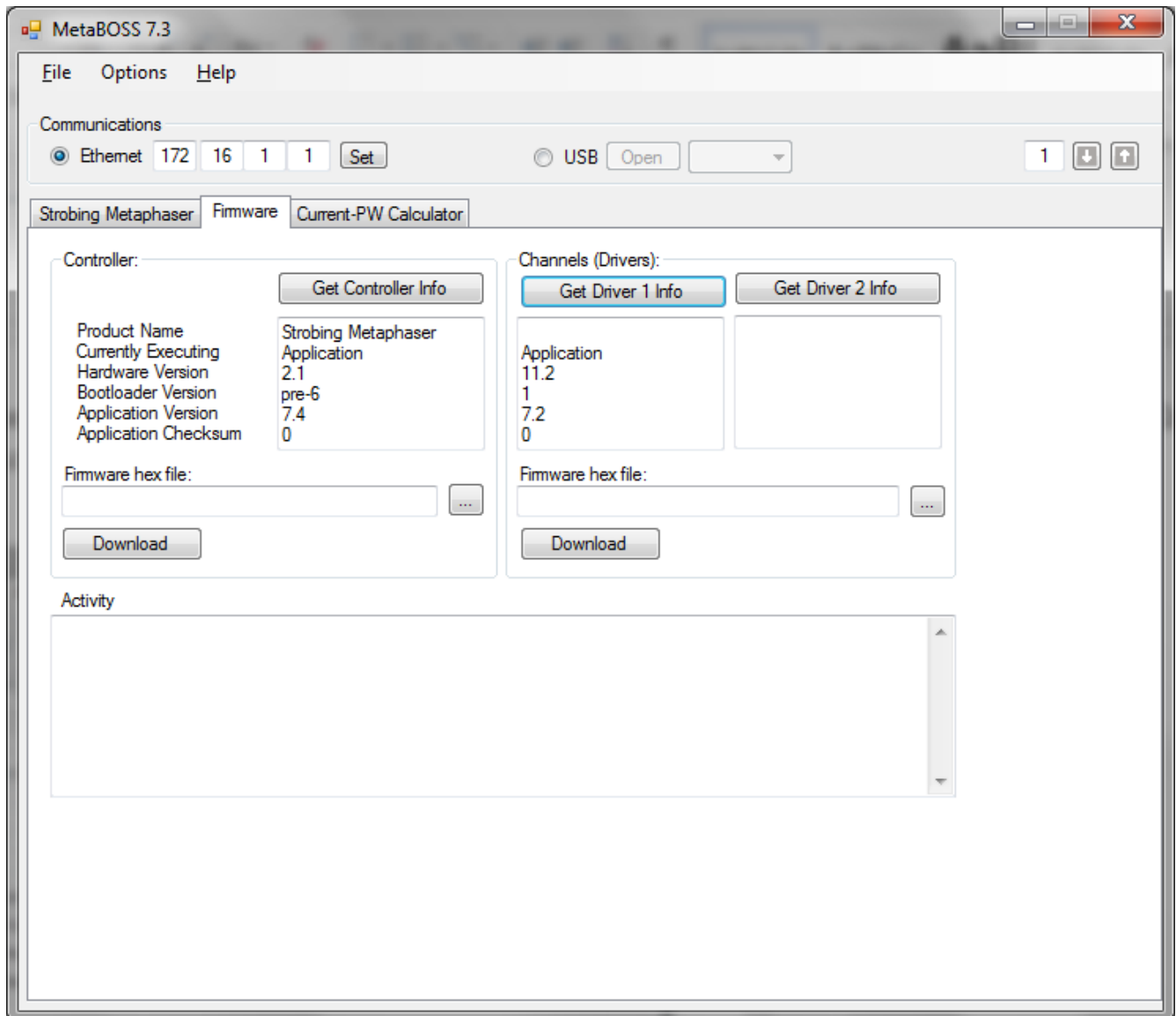# Metaphase LED Light Engine

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Strobe Version Metaphaser

MetaBOSS Firmware Tab

Metaphase LED Light Engine

Model#: MP-LE1007

Strobe Version Metaphaser

MetaBOSS Current-PW Calculator Tab
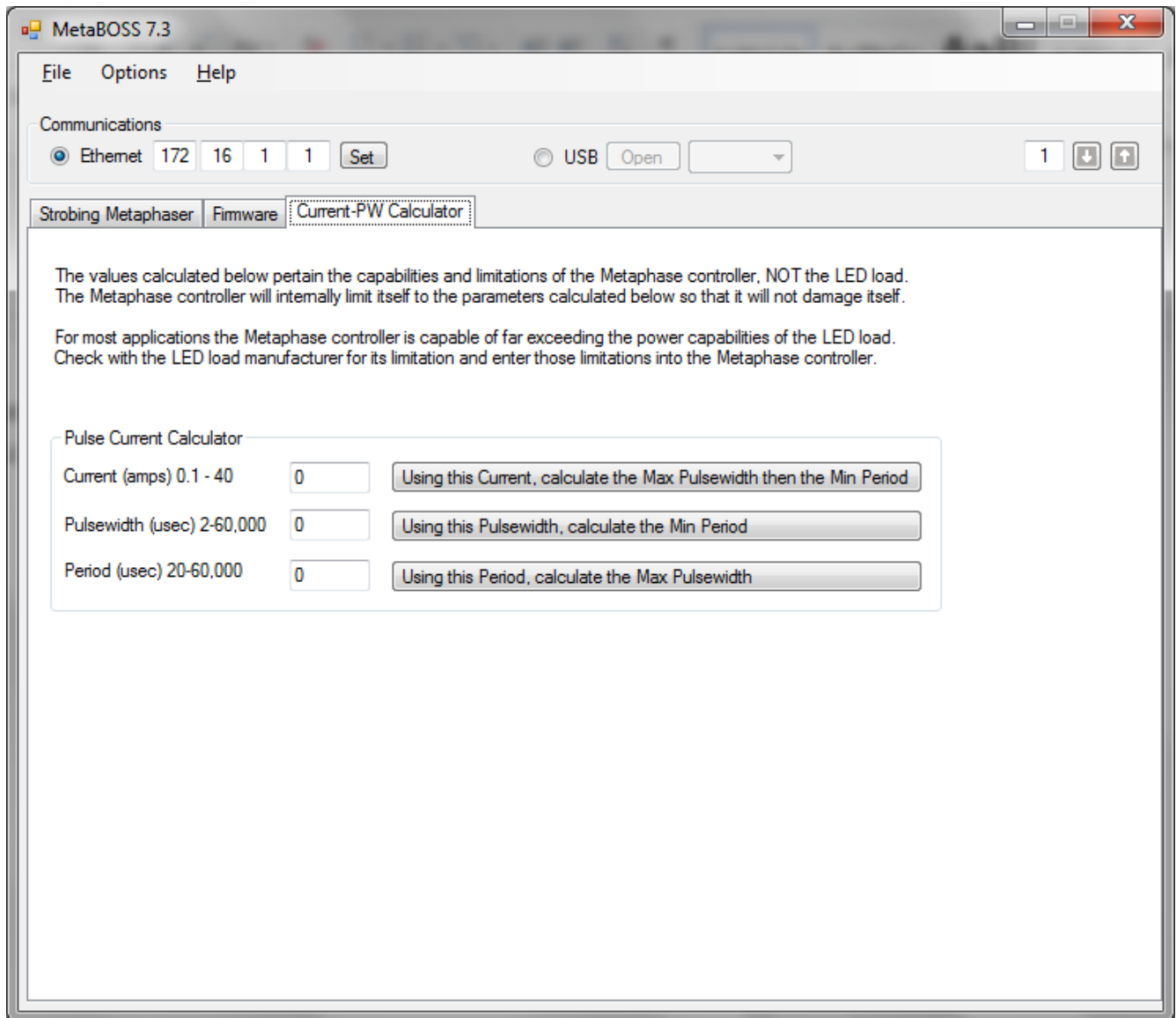
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Single Pulse Limit in Strobe (Pulse) Version

The Metaphaser works by discharging a capacitor into the load at a constant current. At 4A or less, the capacitor can be recharged as fast as it is discharged allowing the pulse width to be up to the maximum of 60ms regardless of the exact current. Above 4A, the pulse width and current are constrained by the following equation. The Metaphaser will automatically limit the pulse width or current to satisfy this equation.

pw <= 0.01 / i

where: pw = pulse width in seconds

      i = current in Amps

The relationship in this equation is shown in the following diagram:

Maximum pulse width vs current
(for currents > 4A)
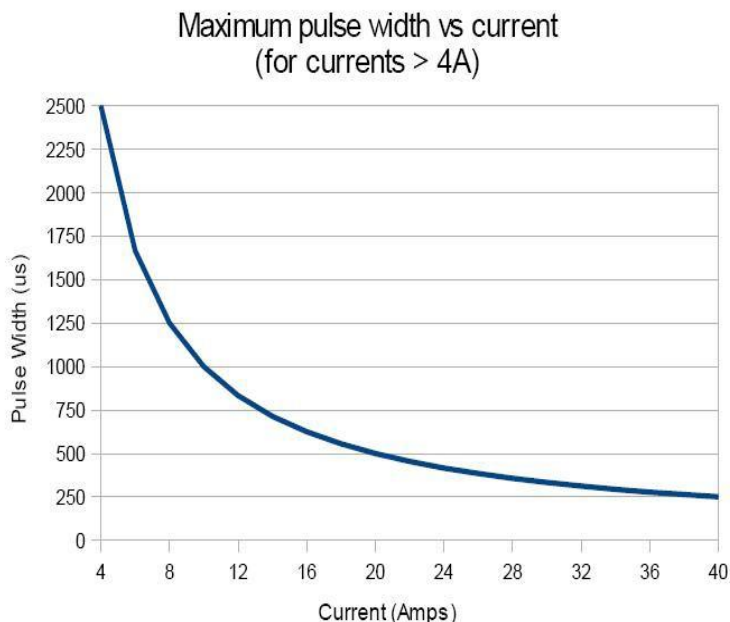
* Any pulse width is allowed with currents of 4A or less.

For example, the Metaphaser will not allow output pulse widths greater than 500 microseconds if the output pulse current is set to 20A.

Trigger Frequency Limit in Strobe (Pulse) Version

The output pulse frequency of Metaphaser is limited by the maximum allowed average power dissipation in the output FET, the minimum idle time after a pulse ends before triggering the next pulse, and an absolute maximum of 50 kHz. The equations for these limits are shown in the Strobe Mode Output Specifications on page 16. The Metaphaser will automatically limit the output frequency (trigger period) to satisfy these limits. The result of these equations are shown in the following diagram:

Frequency vs. Pulsewidth
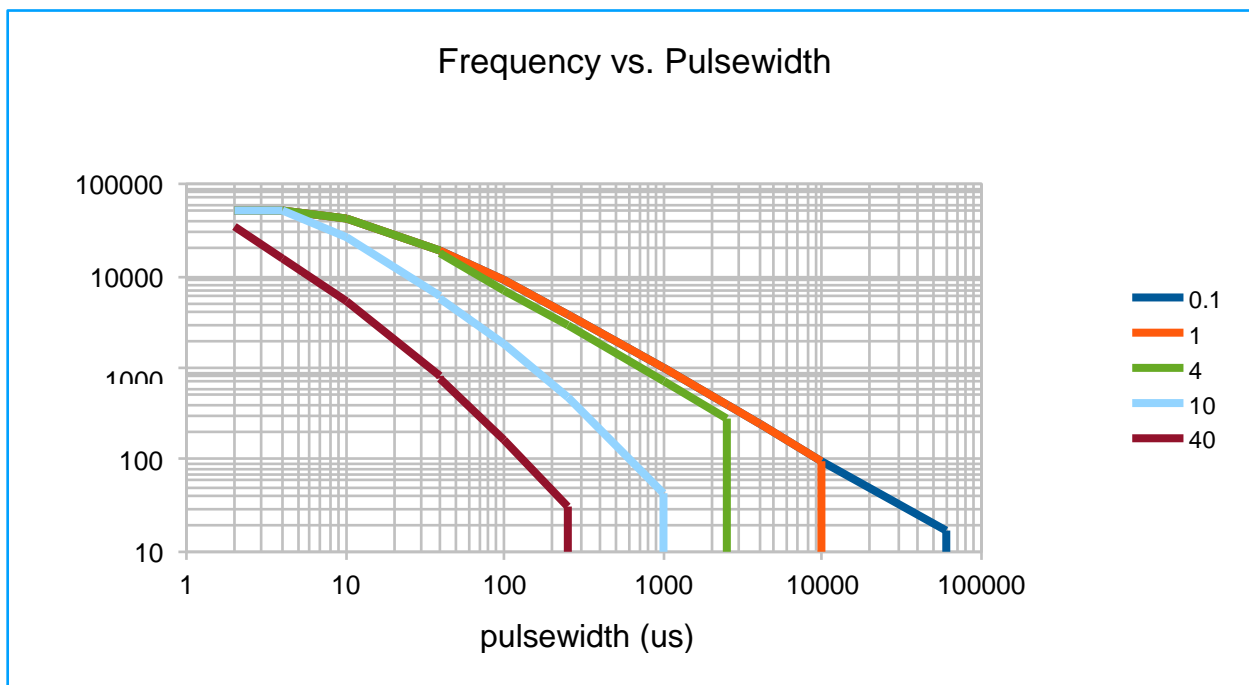
For example, with a pulse current of 10A and a pulse width of 100us, the Metaphaser will not allow a pulse frequency of more than 1.844 kHz (542us period).

Metaphaser Trigger Input Equivalent Schematic
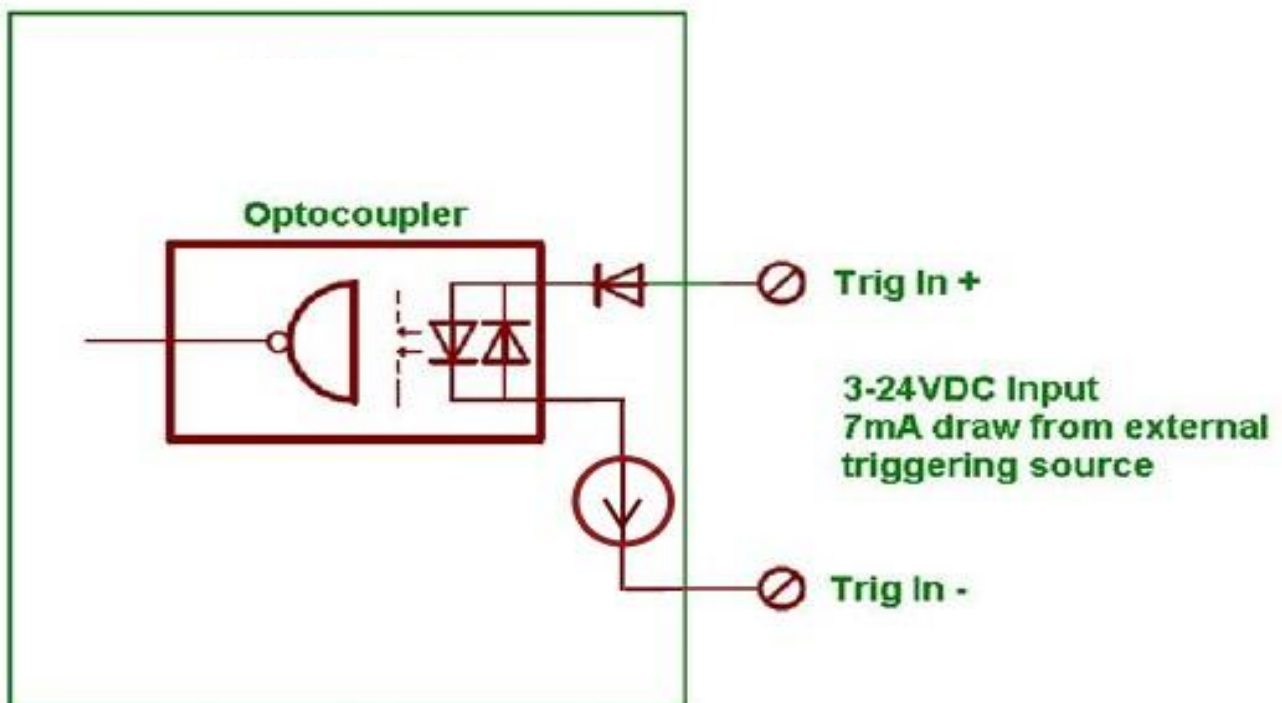
Metaphase LED Light Engine

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Specifications

General

Channels:	1 Channel
Supply Voltage:	12VDC (+/- 10% switching power supply recommended), 6 amps
Ethernet Control:	UDP messaging listening on port 5000 for any incoming source port
IP Address:	User selectable. Defaults to 172.16.1.1
Operating Modes:	DC-only version = Hi-power DC only! Strobe/DC Version = (Pulse), Standard DC Current
ROHS Compliance:	Yes
Expected Lifetime:	75,000 hours
Mounting:	DIN Rail (vertical preferred for maximum power output)
Dimensions:	10.50in x 7in x 4in (266.7mm x 177.8mm x 101.6mm)
Weight:	3.5lbs
Operating Ambient Temperature	35C (95F) maximum
Operating Humidity	0% to 90% RH non-condensing
Enclosure IP Rating	None
Trigger Input:	
Optically Isolated	Yes
Voltage:	3V to 24V
Current:	7mA typical, 10mA max
Rate:	50kHz maximum
Pulsewidth	2us minimum

Specifications [continued] – DC Version

Light Intensity Output

Light Intensity Output	0 to 100%
Continuous Power:	60W maximum

Specifications [continued] – Strobe Version

Strobe Mode Output

Voltage:	0V to 60V
Current:	100mA to 40A
Pulsewidth:	2us to 60ms
Period:	50kHz Max (20us period)
Trigger Delay (delay between trigger event and start of out- put pulse):	6µs (typical) to 60ms
Combined Current, Pulsewidth, and Period Limitations:	pw <= 0.01 / i (single pulse limit) T >= 319*(pw*i)*(pw*Max(i - 4,0)+0.0011) (FET average power limit) T > pw + 15us (retrigger time limit) T >= 20 (f<= 50kHz, trigger frequency limit) where: pw = pulsewidth in seconds i = pulse current in Amps T = pulse (or trigger) period in seconds f = pulse (or trigger) frequency in Hz

DC Current Mode Output

Current:	20mA to 4A
Voltage:	3V to 60V
Continuous Power:	60W maximum

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Ethernet Commands:

Metaphaser's Default IP Address - 172.16.1.1

Users have the option of using MetaBOSS Software or the command list to communicate with the Metaphaser via Ethernet. MetaBOSS requires a PC with Windows Operating System. The Ethernet commands can be used with any device that supports Ethernet UDP communication.

* Ethernet Cross-over cable required for Ethernet communication if the Metaphaser is controlled directly from a PC. A standard Ethernet patch cable is appropriate if connected on a network through Ethernet switches.

•The Ethernet commands are of the following format:
 <2-byte Length> <1-byte Channel number> <1-byte Command> < 1-byte reserved>
<3-bytes of Data>

• All Commands are of 8-byte length. As such the first two bytes of all messages sent to the Metaphaser should be 0x00 and 0x08

• All Data fields must be 3 bytes. It is suggested that unused data fields be filled with zeroes, though not necessary, as the controller will simply ignore them

• Checksum – a Checksum is NOT included on the actual data and are relying on the checksum included in the UDP packet. With UDP protocol the data is "wrapped" in an IP and UDP datagram, both having check-sums. This building of the checksum is transparent and is taken care of by the base UDP stack software.

The next page lists the corresponding UDP commands used in the MetaBOSS Software.

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Metaphaser Command List – DC Version – UDP

Command Name	Transmit	Unit	Metaphaser Response	Range
CMD_OUTPUT_LEVEL_READ	00 08 00 B2 00 00 00 00	%	00 08 00 B2 00 00 00 xx	00 to 64
CMD_OUTPUT_LEVEL_SET	00 08 00 B3 00 00 00 xx	%	--	00 to 64
CMD_OUTPUT_LEVEL_LIMIT_READ	00 08 00 B4 00 00 00 00	%	00 08 00 B4 00 00 00 xx	00 to 64
CMD_OUTPUT_LEVEL_LIMIT_SET	00 08 00 B5 00 00 00 xx	%	--	00 to 64

Example: (For "CMD_OUTPUT_LEVEL_READ" Response)   **00 08 00 B2 00 00 00 5A**   ****All Bytes are in HEX**
         (Or "CMD_OUTPUT_LEVEL_SET" Transmit)   **00 08 00 B3 00 00 00 5A**   ****All Bytes are in HEX**

00 08=String length   **00=Chan 1**   **B2 (or B3)=Command**   **00=Reserved**   **00 00 5A=Data (90% Output Level)**

Metaphaser Command List – Strobe Version – UDP

Command Name	Transmit	Unit	Metaphaser Response	Range
CMD_DC_AMPS_READ	00 08 00 B6 00 00 00 00	mA	00 08 01 B6 00 00 xx xx	14 to 0FA0
CMD_DC_AMPS_SET	00 08 00 B7 00 00 xx xx	mA	--	14 to 0FA0
CMD_MAX_DC_AMPS_READ	00 08 00 BA 00 00 00 00	mA	00 08 01 BA 00 00 xx xx	14 to 0FA0
CMD_MAX_DC_AMPS_SET	00 08 00 BB 00 00 xx xx	mA	--	14 to 0FA0
CMD_PULSE_AMPS_READ	00 08 00 BE 00 00 00 00	mA	00 08 01 BE 00 00 xx xx	64 to 9C40
CMD_PULSE_AMPS_SET	00 08 00 BF 00 00 xx xx	mA	--	64 to 9C40
CMD_MAX_PULSE_AMPS_READ	00 08 00 C2 00 00 00 00	mA	00 08 01 C2 00 00 xx xx	64 to 9C40
CMD_MAX_PULSE_AMPS_SET	00 08 00 C3 00 00 xx xx	mA	--	64 to 9C40
CMD_STROBE_PULSEWIDTH_READ	00 08 00 C6 00 00 00 00	uSec	00 08 01 C6 00 00 xx xx	02 to EA60
CMD_STROBE_PULSEWIDTH_SET	00 08 00 C7 00 00 xx xx	uSec	--	02 to EA60
CMD_MAX_STROBE_PULSEWIDTH_READ	00 08 00 CA 00 00 00 00	uSec	00 08 00 CA 00 00 xx xx	02 to EA60
CMD_MAX_STROBE_PULSEWIDTH_SET	00 08 00 CB 00 00 xx xx	uSec	--	02 to EA60
CMD_PULSEWIDTH_DELAY_READ	00 08 00 CE 00 00 00 00	uSec	00 08 00 CE 00 00 xx xx	06 to EA60
CMD_PULSEWIDTH_DELAY_SET	00 08 00 CF 00 00 xx xx	uSec	--	06 to EA60
CMD_STROBE_PERIOD_READ	00 08 00 D2 00 00 00 00	uSec	00 08 00 D2 00 00 xx xx	14 to EA60
CMD_STROBE_PERIOD_SET	00 08 00 D3 00 00 xx xx	uSec	--	14 to EA60
CMD_MIN_STROBE_PERIOD_READ	00 08 00 D6 00 00 00 00	uSec	00 08 00 D6 00 00 xx xx	14 to EA60
CMD_MIN_STROBE_PERIOD_SET	00 08 00 D7 00 00 xx xx	uSec	--	14 to EA60
CMD_OUTPUT_READ	00 08 00 DE 00 00 00 00	Enab/Dis	00 08 00 DE 00 00 00 xx	01 or 00
CMD_OUTPUT_SET	00 08 00 DC 00 00 00 xx	Enab/Dis	--	01 or 00
CMD_MODE_READ	00 08 00 E1 00 00 00 00	DC/Strobe	00 08 00 E1 00 00 00 xx	03 or 04
CMD_MODE_SET	00 08 00 DF 00 00 00 xx	DC/Strobe	--	03 or 04
CMD_TRIGGER_SOURCE_READ	00 08 00 E4 00 00 00 00	Int/Ext	00 08 00 E4 00 00 00 xx	01 or 00
CMD_TRIGGER_SOURCE_SET	00 08 00 E2 00 00 00 xx	Int/Ext	--	01 or 00
CMD_KEYPAD_READ	00 08 00 E7 00 00 00 00	Enab/Dis	00 08 00 E7 00 00 00 xx	01 or 00
CMD_KEYPAD_SET	00 08 00 E5 00 00 00 xx	Enab/Dis	--	01 or 00
CMD_TRIGGER_POLARITY_READ	00 08 00 EA 00 00 00 00	Rise/Fall	00 08 00 EA 00 00 00 xx	01 or 00
CMD_TRIGGER_POLARITY_SET	00 08 00 E8 00 00 00 xx	Rise/Fall	--	01 or 00

Example: (For "CMD_DC_AMPS_READ" Response)   **00 08 00 B6 00 00 0F A0**   ****All Bytes are in HEX**
         (Or "CMD_DC_AMPS_SET" Transmit)   **00 08 00 B7 00 00 0F A0**   ****All Bytes are in HEX**

00 08=String length   **00=Chan 1**   **B6 (or B7)=Command**   **00=Reserved**   **00 0F A0=Data (4000 mA DC)**

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Metaphaser Command List – DC Version – USB

Command Name	Transmit	Unit	Metaphaser Response	Range
CMD_OUTPUT_LEVEL_READ	## 08 00 B2 00 00 00 $$	%	## 08 00 B2 00 00 xx $$	00 to 64
CMD_OUTPUT_LEVEL_SET	## 08 00 B3 00 00 xx $$	%	--	00 to 64
CMD_OUTPUT_LEVEL_LIMIT_READ	## 08 00 B4 00 00 00 $$	%	## 08 00 B4 00 00 xx $$	00 to 64
CMD_OUTPUT_LEVEL_LIMIT_SET	## 08 00 B5 00 00 xx $$	%	--	00 to 64

Example: (For "CMD_OUTPUT_LEVEL_READ" Response)   **02 08 00 B2 00 00 5A D9**   ****All Bytes are in HEX**
(Or "CMD_OUTPUT_LEVEL_SET" Transmit)   **02 08 00 B3 00 00 5A D9**   ****All Bytes are in HEX**

##=STX   08=String length   00=Ch 1   B2(or B3)=Command   00 00 5A=Data (90% Output Level) $$=checksum

Metaphaser Command List – Strobe Version – USB

Command Name	Transmit	Unit	Metaphaser Response	Range
CMD_DC_AMPS_READ	## 08 00 B6 00 00 00 $$	mA	## 08 01 B6 00 xx xx $$	14 to 0FA0
CMD_DC_AMPS_SET	## 08 00 B7 00 xx xx $$	mA	--	14 to 0FA0
CMD_MAX_DC_AMPS_READ	## 08 00 BA 00 00 00 $$	mA	## 08 01 BA 00 xx xx $$	14 to 0FA0
CMD_MAX_DC_AMPS_SET	## 08 00 BB 00 xx xx $$	mA	--	14 to 0FA0
CMD_PULSE_AMPS_READ	## 08 00 BE 00 00 00 $$	mA	## 08 01 BE 00 xx xx $$	64 to 9C40
CMD_PULSE_AMPS_SET	## 08 00 BF 00 xx xx $$	mA	--	64 to 9C40
CMD_MAX_PULSE_AMPS_READ	## 08 00 C2 00 00 00 $$	mA	## 08 01 C2 00 xx xx $$	64 to 9C40
CMD_MAX_PULSE_AMPS_SET	## 08 00 C3 00 xx xx $$	mA	--	64 to 9C40
CMD_STROBE_PULSEWIDTH_READ	## 08 00 C6 00 00 00 $$	uSec	## 08 01 C6 00 xx xx $$	02 to EA60
CMD_STROBE_PULSEWIDTH_SET	## 08 00 C7 00 xx xx $$	uSec	--	02 to EA60
CMD_MAX_STROBE_PULSEWIDTH_READ	## 08 00 CA 00 00 00 $$	uSec	## 08 00 CA 00 xx xx $$	02 to EA60
CMD_MAX_STROBE_PULSEWIDTH_SET	## 08 00 CB 00 xx xx $$	uSec	--	02 to EA60
CMD_PULSEWIDTH_DELAY_READ	## 08 00 CE 00 00 00 $$	uSec	## 08 00 CE 00 xx xx $$	06 to EA60
CMD_PULSEWIDTH_DELAY_SET	## 08 00 CF 00 xx xx $$	uSec	--	06 to EA60
CMD_STROBE_PERIOD_READ	## 08 00 D2 00 00 00 $$	uSec	## 08 00 D2 00 xx xx $$	14 to EA60
CMD_STROBE_PERIOD_SET	## 08 00 D3 00 xx xx $$	uSec	--	14 to EA60
CMD_MIN_STROBE_PERIOD_READ	## 08 00 D6 00 00 00 $$	uSec	## 08 00 D6 00 xx xx $$	14 to EA60
CMD_MIN_STROBE_PERIOD_SET	## 08 00 D7 00 xx xx $$	uSec	--	14 to EA60
CMD_OUTPUT_READ	## 08 00 DE 00 00 00 $$	Enab/Dis	## 08 00 DE 00 00 xx $$	01 or 00
CMD_OUTPUT_SET	## 08 00 DC 00 00 xx $$	Enab/Dis	--	01 or 00
CMD_MODE_READ	## 08 00 E1 00 00 00 $$	DC/Strobe	## 08 00 E1 00 00 xx $$	03 or 04
CMD_MODE_SET	## 08 00 DF 00 00 xx $$	DC/Strobe	--	03 or 04
CMD_TRIGGER_SOURCE_READ	## 08 00 E4 00 00 00 $$	Int/Ext	## 08 00 E4 00 00 xx $$	01 or 00
CMD_TRIGGER_SOURCE_SET	## 08 00 E2 00 00 xx $$	Int/Ext	--	01 or 00
CMD_KEYPAD_READ	## 08 00 E7 00 00 00 $$	Enab/Dis	## 08 00 E7 00 00 xx $$	01 or 00
CMD_KEYPAD_SET	## 08 00 E5 00 00 xx $$	Enab/Dis	--	01 or 00
CMD_TRIGGER_POLARITY_READ	## 08 00 EA 00 00 00 $$	Rise/Fall	## 08 00 EA 00 00 xx $$	01 or 00
CMD_TRIGGER_POLARITY_SET	## 08 00 E8 00 00 xx $$	Rise/Fall	--	01 or 00

Example: (For "CMD_DC_AMPS_READ" Response)   **02 08 00 B6 00 0F A0 D9**   ****All Bytes are in HEX**
(Or "CMD_DC_AMPS_SET" Transmit)   **02 08 00 B7 00 0F A0 D9**   ****All Bytes are in HEX**

##=STX   08=String length   00=Chan 1   B6(or B7)=Command   00 0F A0=Data (4000 mA DC) $$=checksum

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Metaphaser – Sample Code – USB

ElseIf serialPort.IsOpen = True Then   ' rbComEthernet.Checked = False..........which means USB is selected

```
 'first, stuff the data
      tx_data(0) = STX
      For i = 0 To data.Length - 1
        tx_data(i + 4) = data(i)        'data(i) are the command and data bytes for the ULC-2
      Next

'then do the check sum
      Dim checksum As Integer = 0
      For i = 0 To tx_data.Length - 2    'the -2 is because we don't want to include through the checksum byte
        checksum -= tx_data(i)
      Next
      tx_data(i) = checksum And &HFF
       Try
        serialPort.DiscardInBuffer()       'do we need to flush the buffer?
        serialPort.Write(tx_data, 0, tx_data.Length)
      Catch ex As Exception
        MsgBox("USB Error " + ex.ToString)
      End Try
End If
```

Metaphaser – Error Codes

ERROR CODES

Description	LCD Display	LED Output Action
temperature getting hot-- above 60C	Near Temp Limit	
temperature too hot-- above 70C	OverTemp Shutoff	Disabled but will retry later
a disconnected load condition has been detected ANYTIME	No or Low Load	Disable until hard reset
driver output is disabled BECAUSE OF A FAULT	Output Disabled	
Driver folded back the PW because user set Current too high	PW Reduced	Fold back PW
Driver folded back the Current because user set PW too high	Current Reduced	Fold back Current
Driver folded back the Period because user set Current or PW too high or Period too low	Period Extended	Increase Period
3755 or VREF/Opamp error assuming supply is good	Intern Fail Vref	Disable until hard reset
Actual current < Desired. LT3755 or DAC failure, assuming good power supply and connected load	InternFail CompL	
Output voltage maxed out and current can't be reached. Probably too much series resistance or load has a driver in it.	LED/w Driver,HiZ	
temperature sensor bad assuming VREF is good	Bad Temp Sensor	
current sensor bad assuming VREF is good	Bad Current Sens	Disable until hard reset
Actual current > Desired. LT3755 or DAC failure, assuming good power supply and connected load	InternFail CompH	Disable until hard reset
startup calibration failure	Startup Failure	

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Maintenance:

The outside surface of the METAPHASER should be wiped with a suitable surface cleaner and lint-free cloth for cleaning.

• Lens: Periodically check the lens for dirt or lint and remove as necessary with clean compressed gas or a suitable lens cloth or tissue to avoid scratches

• Fan: Intake and exhaust ports should be kept free of dust and debris which would block or impede the fan's airflow. Other air flow vents may be kept clear by vacuuming.

Problem	Action
Failure of LED to Light up.	-Ensure Intensity is not set to 0% -Check power cord source -Check that the unit's power switch is 'ON'
Control buttons do not function.	-Use MetaBOSS capability to check remote control operations. -Reset Power
If MetaBOSS is not providing remote control of Metaphaser	-Check Ethernet connection / IP Address /

For all other Troubleshooting inquiries please contact Metaphase Technologies Inc.
at (215)639-8699 or Info@Metaphase-Tech.com