

# TeraScan II

**Rev 2008**

Tuning, adjustment and maintenance

**PLEASE READ THIS MANUAL CAREFULLY BEFORE INSTALLATION!**

## **Introduction**

The TeraScan II is a fast and versatile galvo scan system, based on moving magnet galvanometers, with a small and rugged dual channel closed loop driver. The system runs at pretty low voltage, and can be implemented in almost any existing or new application. With it's driving speed of up to 45k with the ILDA test pattern, displayed at the ILDA standard angle of 8°.

The standard delivery package contains driver and connection cable. The driver is presetted to the included galvos and can be readjusted after a change of mirrors.

## **The cables**

High speed galvanometers demand for special cables, which are shielded and separated between motor and position detector. Cable lengths up to 100cm are allowed. We recommend a cable length of maximum 50cm.

## **Mirrors**

TeraScan II is delivered with high reflective mirror sets. The mirrors offer a high reflectivity and are suitable for wavelength from 450 – 700nm. The mirrors delivered with the galvos, offer an aperture of up to 3.5mm beam with it's 5x11mm mirrors. For larger laser beams, an optional 6x11mm mirror is available. However, using this mirror will slightly decrease scanning speed.

## **Cleaning mirrors**

TeraScan II uses high reflective dielectric coated mirrors, which are very sensitive to mechanical pressure and scratches. You should avoid contaminating these mirrors. In any case of cleaning, clean only with standard windows cleaner and a very soft paper tissue. Do not use pressure on the surface.

## **Power source**

Power source is not very critical and has minor influence on speed and quality of the complete scanner system. Even if a standard transformer with a bridge and caps will do, MediaLas recommends a stabilized or switched power supply. The TeraAmp is able to run between +/-18VDC to +/-30VDC, at 1A each. Recommended power supply is the TeraScan PSU with 2x 24VDC. From 24V to 30VDC, the speed difference is almost unnoticable.

If you use transformer and bridge, then make sure to have minimum 10,000 uF caps per voltage, better 40,000 uF, parallel with a 100uF for fast peaks. Do not use extra capacitors at switching power supplies.

**Polarity of connecting power to the driver is important. No warranty if connected incorrect.**

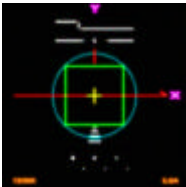
## The measuring procedure

The TeraScan was measured with Mamba Black with USB-Box, running at the desired output speed, using the standard ILDA test pattern. Laboratory power supply at +/-24VDC, room temperature. Windows PC with Mamba Black, 12/30k ILDA testframe at the desired deflection angle. It was also tested afterwards with Pangolin LD2000, running the same test pattern. 5x11x 0.6mm mirror was used during measuring period. Tests showed a slight decrease of performance at about 5% by using a larger 6x11x0.6mm mirror. The galvos were fixed in the standard mounts on an aluminum baseplate, no forced cooling.

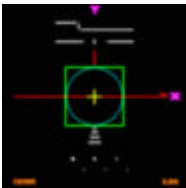
Deflection angle	Operating voltage	Speed
30° optical deflection	+/- 24V	~ 25.000 pps
20° optical deflection	+/- 24V	~ 30.000 pps
15° optical deflection	+/- 24V	~ 35.000 pps
8° optical deflection	+/- 24V	~ 45.000 pps

Preadjustment: Pls note the corresponding measurement certificate for preadjusted factory settings, which comes with any TeraScan set.

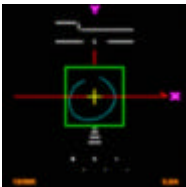
## The ILDA standard test pattern



Driver is set too fast or output speed of computer is too slow. The inner circle is larger than the green square.



Driver and output speed matches together. Inner circle must match inner square and should be round.



Driver is too slow or output speed of computer is too high. The inner circle does not match with the inner square. Readjust driver or slow down computer.

The normal test procedure takes place at a deflection angle of 8° optical angle. This can be an outer diameter of approx 7cm at 50cm projection distance or equivalent.

For more information about the ILDA test and ILDA standards, pls refer to the ILDA website at [www.laserist.org](http://www.laserist.org)

## Adjustments

Standard configuration shows 7 adjustment pots, 4 of them are necessary for the user. The small pots should not be changed in setting. These are necessary for linearity and other galvo specific settings.

## Basic adjustments

The DualMicroAmp comes already pre adjusted for 40° maximum projection angle at +/-5V input voltage and needs to be set up for the galvo only in small areas. Every galvo is different, so minor adjustments are needed. For this, the ILDA test pattern is used, also a setup of the galvos in XY with a laser. If you need to tune the driver faster to smaller angles, follow the procedure below. Also if the driver is totally deadjusted, this will be the procedure to retune it:

- Size, Servo-Gain, Damping und HF-Damping are adjusted counter clockwise to their left zero position. Now turn LFD 5 full rounds clockwise to right.
- Connect computer with ILDA test pattern, run it at approx. 20kpps.
- Power on the amplifiers.
- Slowly open the servo gain (clockwise). The mirror of the galvo should move now to its middle position. If yes, turn two rounds clockwise.
- Slowly open the size until you see the galvo moving.
- Increase servo gain until you see overshoots. Correct it with LFD.
- Decrease undershoots by opening the HFD pot slightly clockwise. Remove gain/LFD procedure and correct with HFD, until you the picture looks satisfying. Carefully fine tune the driver. The better your fine tuning is, the faster is the scanspeed.
- Increase speed of test patterns and readjust for optimized picture.

## Inverting of axis

By using the jumpers at the inputs, each driver can be inverted easily. This can be done during scanning also. Just pull out the jumpers and put them in at 90° rotated.

## Heatsinking

The DualMicroAmp is relatively insensitive to heat, since the power stage contains a overheat shutdown. To assure full function, the DualMicroAmp should be used with the attached heatsink. If you want to save space, remove the heatsink and mount the amp on a metal housing, to remove the heat from the power stage. The temperature at the heatsink should be below 70°C (170°F) The higher your operating voltage, the higher your heat generation. For best performance/heat ratio, use +/- 20VDC.

## In / Outputs

On each 8pin connector, all necessary in and outputs are available. Here is the power supply connected, the symmetric inputs and also the feedback outputs for the SAFE-GUARD boards. We recommend a ground free operation between computer and drivers.

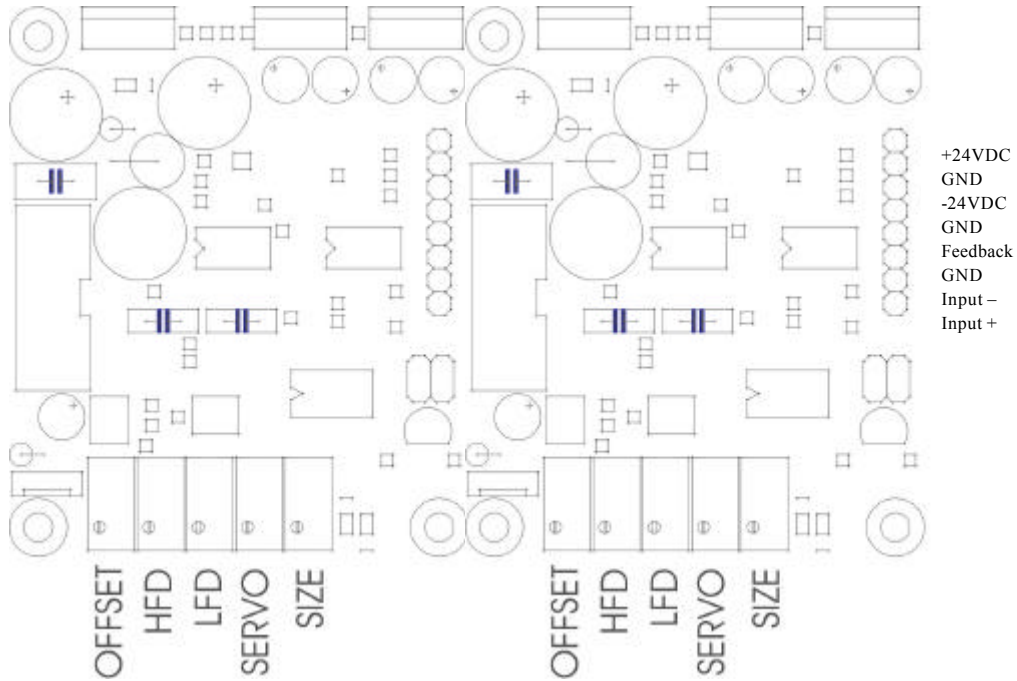
***ATTENTION! Do not use FEEDBACK as inputs. This will instantly destroy your galvanometers!***

## Important hints

- Do not remove the driver board from its mounting bracket. This additional metal plate is needed for ground and increases stability of the driver. The bracket is isolated from ground.
- Do not use cheap and unshielded cable. We recommend to use the TeraAmps only with MediaLas cables. These cables are tested and designed for this driver. We do not offer any warranty, if other cables are used.
- If the galvos gets very hot (above 45°C / 115°F), switch off the system and check for errors or problems. Use appropriate heatsink for the galvos. Do NOT run them without heatsink!!
- If the fuses blow continuously, do not replace them with a higher value. Check for possible errors.
- The maximum current per phase should be in average below 700mA. If it is higher, there can be a problem, which can result in overheating the galvos.

**Legend:**

- Offset: Electrical offset of the driver, not the galvo! Is adjusted in factory.
- HFD: HighFrequency Damping. Corrects undershoots
- LFD: LowFrequency Damping. Corrects overshoots
- Servo: Servo-Gain. Power of the feedback signal for the internal PID controller.
- Size: Increases or decreases input sensitivity of the complete driver. Does not change driver settings.



**Driver for Y-channel**

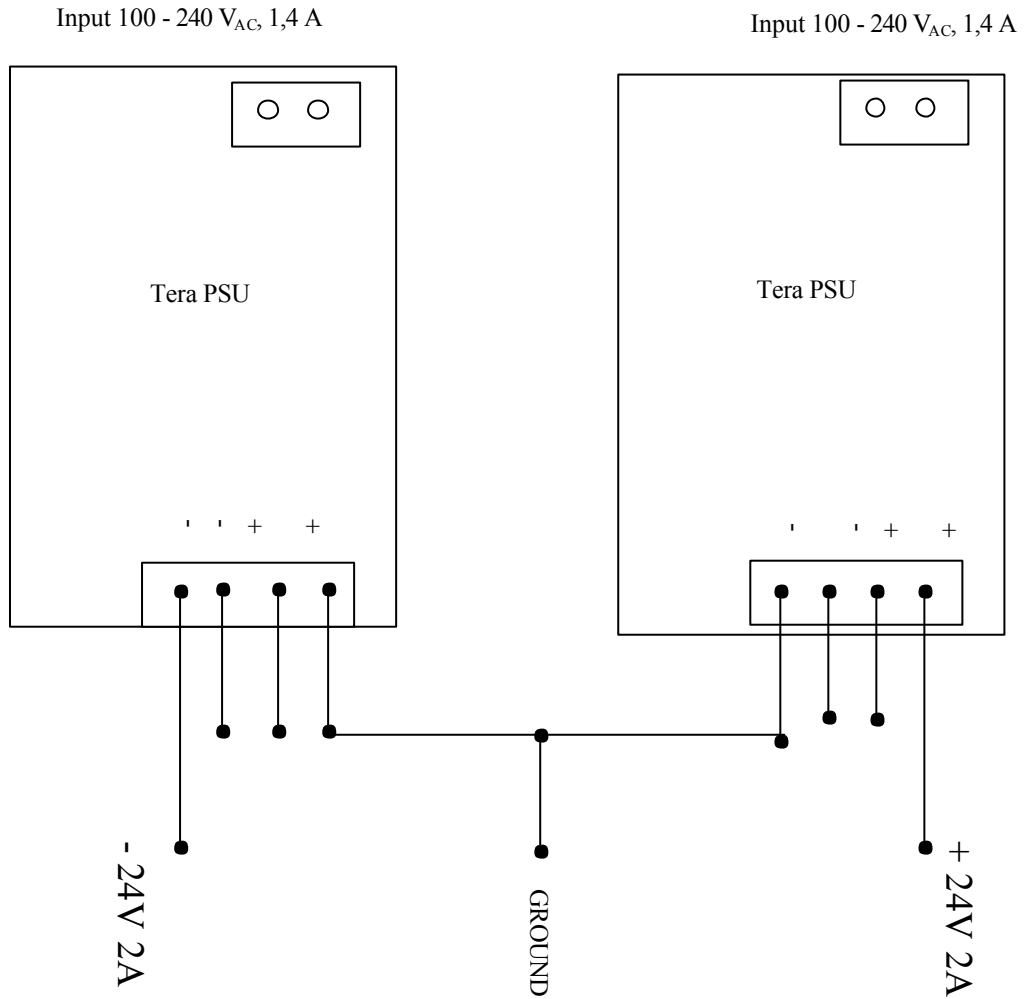
**Driver for X-channel**

**Connecting the dual channel driver**

Each channel of the driver must be connected to the power supply and to the signal source. Both 8pin connectors show equal pinning. Connect both channels +24VDC to the positive 24VDC coming from the power supply, also the -24VDC to the negative source from the power supply. Use only one ground pin of each connector to connect to the GND of power supply.

Do not connect the feedback output pins to any signal source. These pins are necessary to connect an external safety unit to the TeraAmp.

**PIN Layout TeraPSU Power Supply**



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