

**User manual use of MGV145 / GCA145
with Fiddle yard and Turntables.**



Hardware remarks.

- 1) A fiddle yard needs two limit switches. One at each side. This could be microswitches, hallsensors or reed switches. These switches are used for three reasons.

To be able to have an automatic adjustment after the first set-up, for adjustment when the FY is out of position for any reason, and as safety limit switch.

Switches are situated at both ends, beyond the the positions where the first and last rails are in line.

Switches can be connected according Appendix 1

Both limit switches are connected to ICSP1

- 2) Turntables need only one switch, to detect the zero point.

Switches can be connected according Appendix 1

Position of this switch should be between position 1 and the maximum position.

This switch should be mounted in a way that TT can pass this switch in both directions.

Software settings.

After startup, there are just a few settings preset in the Firmware.

To avoid that adjustment will be a lot of work, the processor can do the important issues automatically.

For further info about the menus, please refer to chapter MENU.

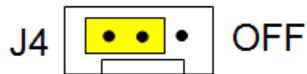
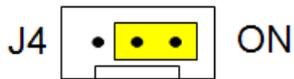
Each position of a rail has to be determined. And because there is no onfo yet how many steps are needed, the processor needs to find out.

This is done in the following way.

It can only be done if two switches are up and working.

Calculation of all exact positions settings.

- Activate menu-settings and select menu 1. Select the maximum positions you need.
- The first rail position is always 1. Select menu 9 and change setting to desired control type (see Appendix 2).
- Cancel menu settings .



- Set jumper J4 to ON
- Choose position 62 on GCA146 and press the selector.
- The motor starts moving backwards to zero switch.
- If it runs in the wrong direction, switch off power immediately, and swap wires 1 & 2 of the motor in connector J2, and select pos 62 again, it should now be running in the right direction, towards zero switch.
- The motor will stop when the zero-switch is activated.
- If control type 1, 2 or 3 is selected, the motor will make another full round, to calculate the amount of steps for a full circle.
- Next, the motor starts running on slow speed towards first rail connection.
- On the right moment , when rails are nicely inline, press selector.
- This position will be stored, display will show 1 and motor continues. Remember that fine adjustments can be made later.
- Again, when rails are in line, press selector.
- Repeat this until all positions are acknowledged.
- Motor will run back to zero switch and after that returns to position 1.
- After finishing put jumper J4 in OFF position.

Hardware differences between boards MG145 and GCA145..

Based on experiences and feed-back from many satisfied users (thanks folks !) some minor changes were obsolete at the new batch of PC-boards.

Basically, everything is made in such a way that Firmware is 100% adapted to both PC-boards.

There are no differences on that issue.

But a few improvements have been made on the GCA145 board :

1. +5v and ground on ICSP1 were not compatible with ICSP connectors on boards like GCA50, GCA136 etc. It is important to realise that it makes a different connection for Hall-sensors or switches for zero and max-limit detection. In this manual a drawing is available for both situations.
2. P2 is adapted for setting to maximum current for the motor. More about that in Appendix 3.
3. A few resistors were to be soldered at the bottom of MG145. They are on-board now on GCA145.
4. The value of the used relays was rather critical, to make them work. This was mainly because the specification of the PIC is sometimes a little bit less powerful than given. Relays are now driven by transistors, taking away the load from the PIC.
5. Eep1.
On MG145 it should always be in "ON" position.
On GCA145 it is no longer in use, do NOT assemble it.
6. J4 is a jumper now. It is used to enable (if set to ON) the calculation of all positions.
7. A number of leds are provided, to be able to watch several functions.
8. Power supply can now go as high as 24 Volt. This of course if suitable transformer is used. But with 24 V, the power over C1, and thus at the input of VR2 is way too high. In that case jumper JP2 can be set , so that VR2 gets power from 24V (pos 1) . Basically it is OK to leave jumper JP2 on pos 1, when you are running on 12V, but the minimum should be 10V. Any lower, jumper JP2 must be set to pos 2.

Led functions.

MGV145 board only has 1 led, which simply shows power on.

GCA145 board has 6 Leds.

- Led1 Power on
- Led2 Bridge power on
- Led3 Reverse bridge power on
- Led4 Motor running forward
- Led5 Motor running reverse
- Led6 System ready

Fine adjustment of positions

Fine adjustment can be made for each position by activating the menu settings, then select menu 0 , which will display after 1 second the actual position where the FY/TT is on.

Now , with the selector you can fine tune the position, to make the rails perfect in-line.

Cancel the program mode, run the FY /TT to the next position and redo the same procedure for fine adjustment adjust of positions.

Menu.

The program switch, located below the position selector on GCA146, has two positions:

- 1) The normal running mode (switch OFF)
- 2) The programming mode (switch ON)

The ON position is indicated in display with a dot between the two digits. This counts for MG146 pcb, the GCA146 pcb has an additional Led for this indication.

In normal running mode only the actual position of the FY/TT can be selected.

Turn the selector to get a position, and press the selector. FY/TT will start moving according to that.

When a higher position is selected, the motor will stop a little bit further the desired , and then will run backwards after one second. The amount of steps, of the runback is to be set in menu 5.

This is done to correct the free space in gearing, if applicable. Value can also be set to 0.

If the program switch is set to ON, the display show the menu number for 1 second, and after that the display will show the value of that menu. Changing this value can be done with the selector. No need for confirmation.

Pressing the selector will put you into the next menu, again showing the menu number first and then the value of it.

List of menus.

The available menus are:

- 0) Adjust the actual position of the fiddle yard. When turning the selector, the motor will turn backwards or forward step by step, making a very fine adjustment possible.

All changes are stored in internal eeprom.

Please remind not to leave this menu 0 active for a longer time, because the motor is constantly powered on, and will be getting rather warm after some time.

When selecting a next menu, or deactivating the menus, the power to motor will be off.

- 1) Total amount of railpositions.

Positions are counting from 1.

- 2) The minimum speed.

Two speed limits are used for the motor., making it possible to make a slow or fast ramp up and ramp down when start en stop moving. A higher number means longer interval between the motor steps, so a slower movement.

- 3) The maximum speed. Same as point 2. A higher number means a longer interval of timing, so that makes a slower movement. Depending on motor type and power consumption, mostly the lowest speed setting you can have is 4 or 5, If the motor makes strange reactions, try a larger number for this speed. Maximum speed can not be set to a higher value than minimum speed

- 4) Delay of speed change.

The actual speed from low to high or v.v. is incremented (in microseconds) with this number.

A higher number means faster change.

When minimum and maximum speed are set equal, there will be no change at all.

- 5) Correction steps.

When FY is running to a higher position, it will make this amount of steps further, and after that run the same steps back. That option can reduce the influence of any 'slack' in the gear system. If you do not need it, just the better, just set it to zero.

- 6) Rail power reverse position.

This only applies to turntables, control type 1..3, where the power of the bridge should be reversed in certain positions, to match the connecting rails.

The setting you do here is the first position, counting from 1, where power should be reversed.

This setting is of no influence in control type 4. It is also possible to disable this function by setting to zero.

- 7) Rail power off at movement.

The rails can be powered off while moving the bridge. This is usually an extra safety precaution, specially for Fiddle yards. But on turntables, where only one train is involved, it might be not so nice to shut off lights of the loc, while moving. Setting menu 7 to zero,

disable the power while moving, setting to 1 will leave power enabled. If reversing power is obsolete, it will be activated after the bridge has come to halt.

8) Position match delay.

After the bridge has reached its position, this will give an extra delay before the indication "system ready" is given to pt 10 of J5. Also, only after that time, the selector is active again. It is used if signals are fixed on or besides the FY/TT. They will have an extra delay before they will be on. The number is in 10th of second, so 50 will be 5 seconds.

9) Control type. This is the menu to select the way control is made. See also page 11

Possible settings are:

- 1 : turntable control with no shortest way option.
- 2 : turntable control with shortest way option. Amount of zero crossings are limited.
- 3 : turntable control with shortest way option. No limits in zero crossing.
- 4 : Fiddle yard version.

Manual operating mode

If program switch is off, only the current position can be selected with selector on control panel.

Apart from pos 1 to xx (the max amount of rails) there are two more positions to select.

1) Position 63.

This position will move the FY/TT to the zero-limit switch and after that the will run to position 1. Now FY/TT is synchronised to position 1.

Display will show position 1 when finished.

2) Positon 62.

This position can only be activated if J4 jumper is set to ON.

See for further instructions: Calculation of all exact position settings.

Computer controlled mode

There is no setting to get in this mode.

GCA145 simply reacts when new positions are given trough connector J5 (Position cmd).

On <http://wiki.rocrail.net/doku.php?id=gca145-en> page, you will find more info about how settings should be made to get this computer control settled.

Rocrail included a complete controlsetup for either Turntable or Fiddle yard.

This setup includes control vie LocoNet, CANBUS, DCC or Motorola.

For the last two a special function decoder GCA174 is available, to be fitted as a piggy back to J5 on GCA145/MGV145.

Imergency / safety switch

Using GCA145 controller on larger setups with fiddle yard, specially if public is able to approach it, there might be a reason to have some way of emergency stop.

The max limit switch can be used for that.

Numerous ways are available to make some kind of emergency or safety switch.

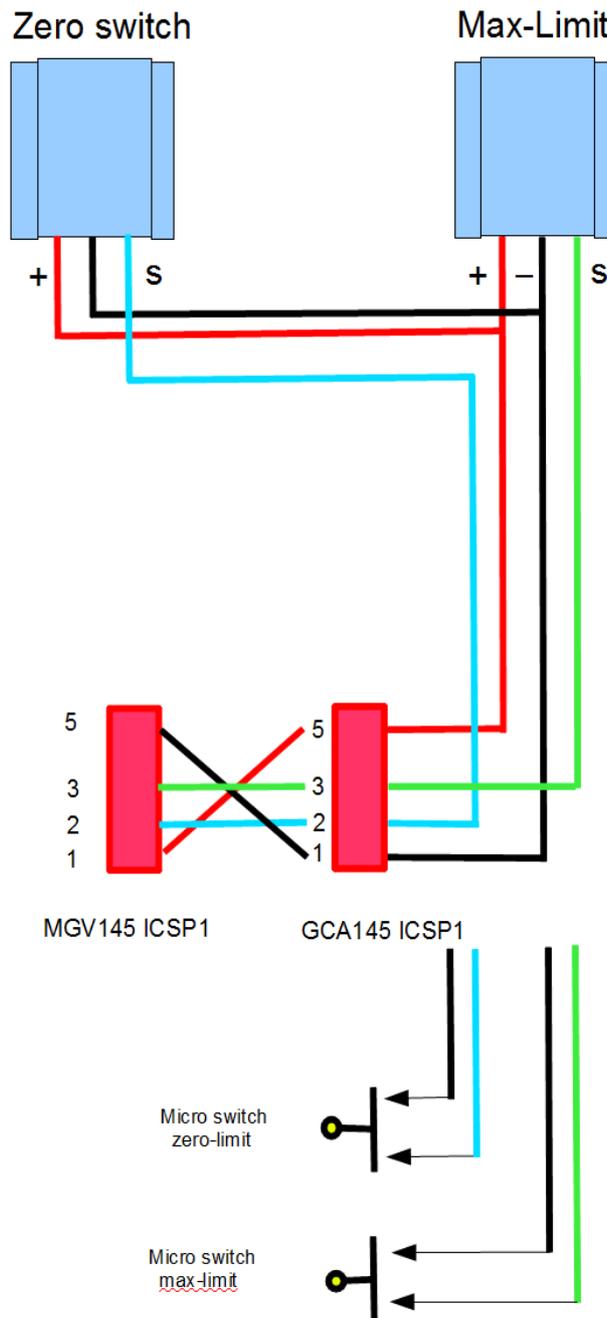
If you need any advice on that issue, please ask peter@phgiling.net.

Appendix 1:

Connection of limit switches.

Limit switches for GCA145 / MGV145

Hallsensor TLE 4095



Appendix 2:

Control types.

Control type setting is important to get the right control for the task.

There are small differences for turntable or fiddle yard control.

Control type 1 ,2 and 3 are made for turntables.

Control type 4 is made for fiddle yard.

Control type 1: turntable control , no shortest way possible

Turntable will never take shortest way.

It will never pass zero.

Control type 2:

Turntable will take shortest way, but this is restricted to a maximum of 3 times consistently in one direction.

It is very useful when cables are connected to the bridge.

Control type 3:

Turntable will take shortest way, without any restriction.

When the bridge is having contact rings for connection of power, there is no need to limit the turns in either direction.

Control type 4:

Fiddle yard control.

This is to control one linear movement.

Two limit switches are needed. This is special important at first initialisation. Because all kind of settings have to be made, it can be harmful for your construction if motor runs out of its limits.

These switches will at least stop the motor before that happens.

Appendix 3 :

Motor voltage :

Setting correct motor voltage.

Any voltage output from 5 to 24V is possible with this board. To be able to adapt to the required voltage, the used transformer should also be able to give the correct voltage and current. Here are some demands for the used transformer:

Output	Transformer
5V	9V minimal
12V	14 V minimal
18 V	20 V minimal
24V	24V minimal

It is , by all means, allowed to use DC Power supplies.

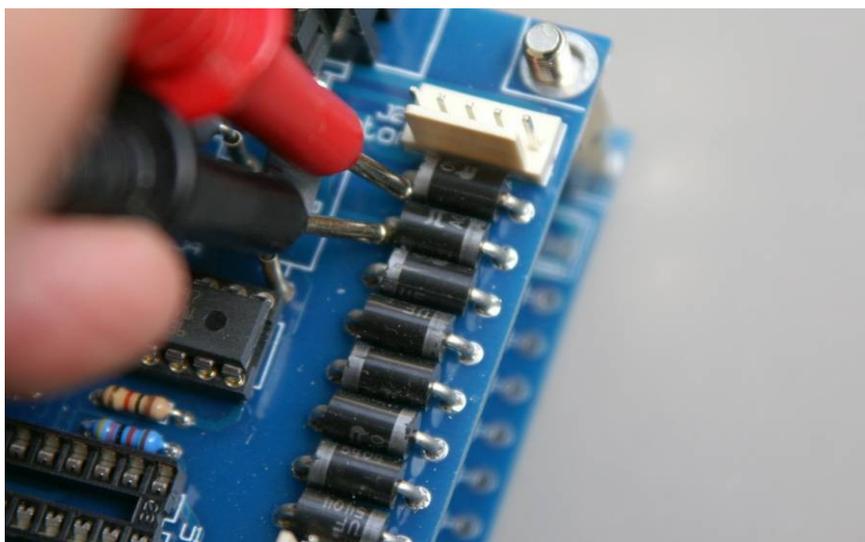
But please remind different minimal limits:

Output	DC Power supply
5V	10 Volt minimal
12V	16 Volt minimal
18V	24 Volt minimal
24V	30 Volt minimal

For max power options, a transformer of minimum 50 VA will be sufficient in all cases.

P1 is able to adjust output voltage for the stepper-motor.

This voltage can be measured like on this picture.:



10% higher than needed is no problem.

Appendix 4:

Output current:

1. Current stepmotor unknown:

The setting should be done in an experimental way.

Simply turn P2 clockwise until you can hear soft clicking inside the trimmer.

It is now set to maximum current.

Now, slowly during the times that motor is running, turn the trimmer counterclockwise 1 turn at the time. Once found that the stepmotor suddenly does not have enough power left to move, you have gone too far, turn trimmer a few turns clockwise and that is the approximate setting.

1. Current stepmotor known:

If the output current of the motor is known, it can be adjusted .

It is done by setting the right voltage on pin 15 of U2, according to this formula :

$$V (U2 \text{ pin15}) = I(\text{stepmotor}) / 2$$

So if motor needs 0,5 A, this voltage should be 0,25V.