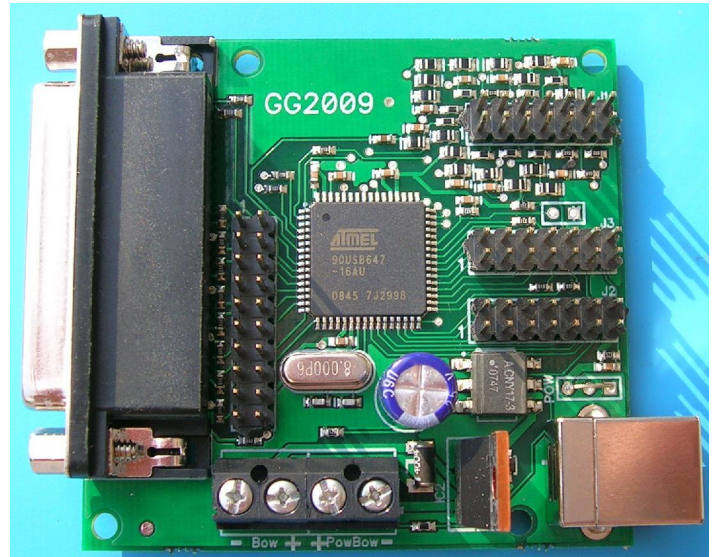# GGC V2 interface documentation

V2.40 - 18/01/2016

The GGC V2 interface is an intelligent USB converter for driving step motor interfaces. The GGC V2 is the successor of the MMUSB and is fully compatible with it. The GGC V2 drives most step/dir compatible interfaces, such as the MM2001, MDLCNC bipolar motor interfaces, and the GG6208.

1. Functionalities

The main functionalities of the GGC interface are:

- Generation of a unique GMFC license key, independent of the PC and disk formatting.
- Works under any OS that supports USB from Win98 to Windows 7.
- 10, 20, or 50 KHz internal timer for implementing smooth accelerations. The internal timer supports motor interfaces that don't have a timer.
- Compatible with most existing step/dir unipolar and bipolar motor interfaces. Fully configurable Dir/Step outputs. Motor Enable on parallel port pin 1 or 17, with High/Low active level.
- Internal wire heat circuits.
- Optional display of the heat and parameters using a LCD panel.
- Automated recognition of the interface parameters by GMFC (from version 3.89.14).
- Full compatibility with the former MMUSB interface.
- Programming of the MM2001 PIC firmware. The **V5.1** or **MM2001_GGC** versions of the MM2001 firmware are mandatory to work with the GGCV2 interface.
- Configuration through the **ggc_utilityV2** software on the PC that also allows the programming of the MM2001 PIC firmware.

Several internal parameters can be set by using **ggc_utility**: the configuration of the parallel port signals, the timings of the motor pulse command and the frequency of the internal timer. The GGC interface also possesses two functioning modes, MMUSB and GGC.

2. MMUSB Mode

In the MMUSB mode, the GGC V2 interface is legacy compatible with the former MMUSB. The LCD display is optional. The wire heat is managed by the MM2001 or any compatible interface. No switch or LED is necessary for the GGC V2 to work in this mode. When using a MM2001 with the GGC V2 in MMUSB mode, the **V5.1** firmware must be used.

In the MMUSB mode, internal parameters can't be changed and are set to the following values:
- Timer frequency: 100 microseconds (10 KHz)
- Motor step duration: 50 microseconds
- Time for data before step: 14 microseconds

At power on, when the LCD display is used, it successively displays:
"**GGC V2.40**   ", where 2.40 is the firmware version.

"**Dir 14,Stp 50,T0**", this screen gives the value of internal parameters. **Dir** is the time for the data to be set before the motor pluse command. **Stp** is the duration of the motor pulse command. **T** is the timer value: 0 means 10Khz.

"**MMUSB Mode**   ", this screen indicates that the GGC interface is operating in MMUSB mode.

"**WAITING USB**   ", this screen is shown until the GGC V2 is recognized by Windows and ready to be used.

"**MMUSB H50% MAN M**", this screen is displayed during normal functionning. **H50%** shows the current heat (here, 50%), **MAN** (or **PC**) shows the position of the PC/MAN switch of MM2001 interface. **M** (when displayed) shows that the motors are powered on by GMFC.

3. GGC Mode

In the GGC mode, the wire heat is managed by the GGC interface using the push buttons BP+, BP-, Reset (optional) and the switches HeatOn, PC/MAN and MotorOn. Buttons and switches must be connected to the J3 connector.

Although optional, the LCD display visually indicates the interface parameters.

3.1. Internal parameters

In the GGC mode, several internal parameters can be adjusted as needed:
- **Timer frequency:** 50KHz (20microseconds), 20KHz (50 microseconds) or 10KHz (100 microseconds).
- **Step pulse duration:** the step pulse is active low. Its value can be chosen with 2 microseconds increments.
- **Direction available before the step pulse:** value can be chosen with 2 microseconds increments.

- Motor enable signal on pin 17 (MM2001 compatible) or pin 1 (Chinese interfaces).
- Motor enable active low or high.
- Parallel port pinout of the step/dir signals.
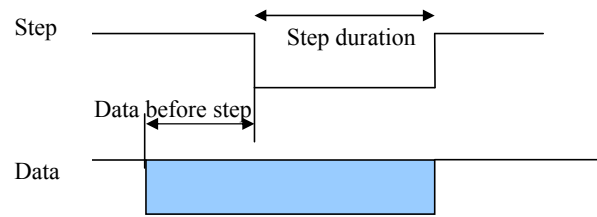
When using a MM2001 with the GGC V2 interface in GGC mode, you must use the **MM2001_GGC** firmware which is compatible with the 50 Khz of the GGC V2. With this firmware, the internal timer and heat functionalities of the MM2001 are disabled.

3.2. Behavior of buttons and switches

BP+, BP- are used to set the manual heat value on the GGC interface. A short press on BP+ increases the heat; a short press on BP- decreases the heat. Pressing on BP- and BP+ simultaneously memorizes the maximum possible heat value. This prevents breaking the wire if it does not support a heat value of 99%. To reset the maximum heat value to 99%, you must press on BP+ while plugging in the USB cable or resetting the interface.

PC/Man controls the source heat value that is set either by the PC or the GGC interface (manual mode). Even in manual mode, the heat is only activated if GMFC sends a heat command.

HeatON enables the heat. This switch is optional and is useful only for providing additional security in the addition of the GMFC heat command.

MotorOn enables motor. This switch is optional and is useful only for providing additional security. It can be used as an emergency stop switch.

Reset is used to reset the GGC interface. This button is optional.

3.3. LEDs

LEDHeat: this LED indicates that the heating circuit is functioning. Because control of the wire heat goes through the LED, **it MUST be connected for the heating circuit to work**.

LEDMotor: this optional LED indicates that there is power to the motors.

LEDOn: this optional LED indicates that there is power to the GGC interface.

3.4. LCD screens

At power on, when the LCD display is used, it successively displays:
"**GGC V2.40**   ", where 2.40 is the firmware version.

"**Dir 2,Stp 2,T1**", this message displays the value of internal parameters. **Dir** is the time for the data to be set before the motor pluse command. **Stp** is the duration of the motor pulse command. **T** is the timer value: 0 means 10KHz, 1 means 20KHz, 2 means 50KHz.

"**HMAX SECURE:99%** ", this screen indicates the maximum allowable heating current (set by the user) to suit the type of cutting wire being used.

"**WAITING USB**   ", this message is displayed until the GGC board is recognized by Windows on the PC and ready to be used by GGC.

"**GGC2: H50% Ma MH**", this message is displayed during normal functionning. **H50%** shows the current heat (here, 50%), **Ma** tells if the heat value comes from the GGC and **PC** that the heat values comes from the PC. **M** (when displayed) shows that the motors are powered on by GMFC. **H** (or **F**) shows that the motors of the GG6208 bipolar interface are used in half-step (**H**) or full-step (**F**) mode.

4. Connections

The MM-USB interface connects to the motor power interface via the parallel port, and to the PC via a 'B' type USB cable as used for printers.

The GGC V2 interface has 4 connectors-
J1 – 14 pin connector - Home and Limit Switch circuits
J2 - 14 pin connector - LCD display
J3 - 14 pin connector - LED and switch Wiring
J4 - 20 pin connector (not soldered) - GG6208 bipolar motor interface.

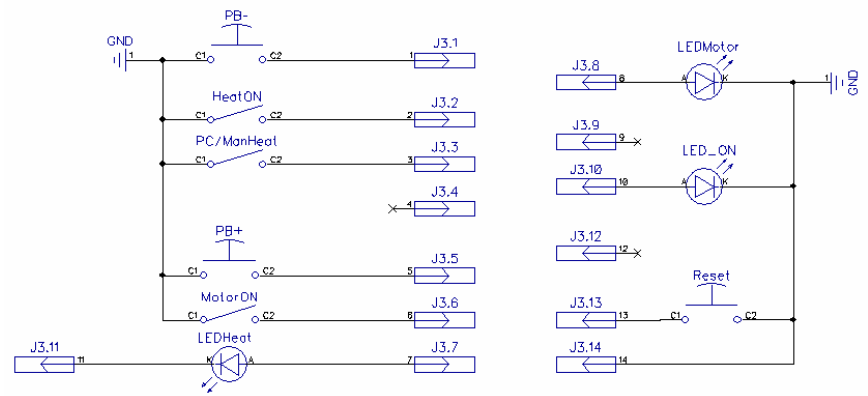The pinout of J1, J2, J3 from top is:
2 4 6 8 10 12 14
1 3 5 7 9 11 13

Pin 1 is marked on the board.

Powering the heat wire

The heat wire is powered via the **PowBow** connector in the GGC mode. The maximum voltage is 50V DC. Beware of polarities; otherwise the interface will be damaged. The heat wire must be connected on the **Bow** connector.


J3 - LED and switch Wiring

J2 - LCD wiring

J2 is used to connect the 1 line 16 character LCD Display Panel via a short length of ribbon cable wired as detailed below. All 16 character LCD are compatible.
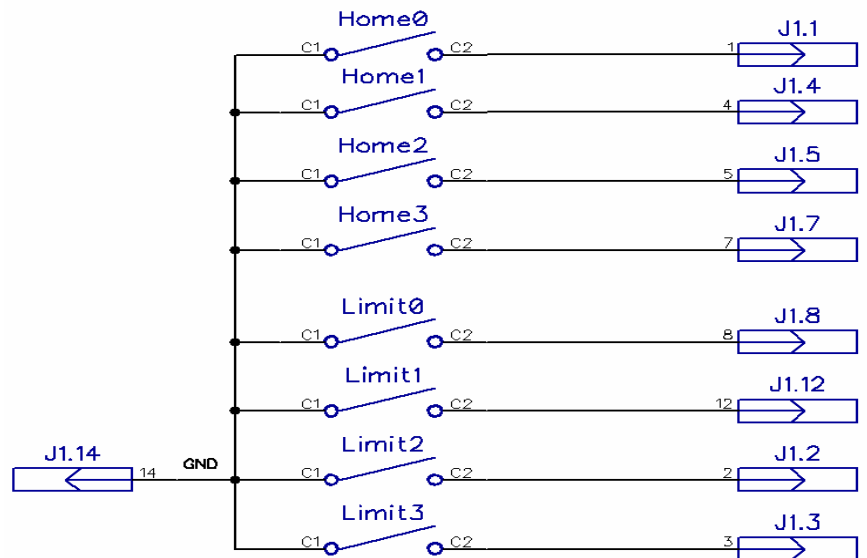
Connector Pin	Function	LCD Pin
J2.1	PD7	LCD14
J2.2	PD6	LCD13
J2.3	PD5	LCD12
J2.4	PD4	LCD11
J2.5	Non connected	
J2.6	Non connected	
J2.7	Non connected	
J2.8	Non connected	
J2.9	E	LCD6
J2.10	R/W	LCD5
J2.11	RS	LCD4
J2.12	GND	LCD3
J2.13	Vcc	LCD2
J2.14	GND	LCD1

Here is a picture of the J2 connecting cable:
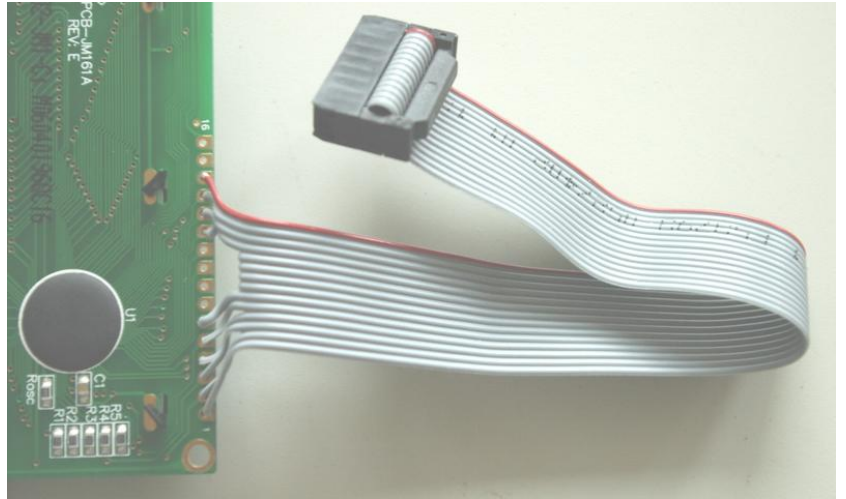
Note that the red wire is connected to pin J2.1

J1 – Home & Limit Switch Wiring

The Home switches and Limit switches are used to prevent accidental over-run beyond the physical limits of the X and Y axes. The Home and Limit switch options are only functioning when running the GMFC EXPert software. They do not function under any other version of GMFC. Home and Limit Switches must be of type "Normally Open".

Important: Limit switches are internally connected to the input signals of the parallel port (10 timer, 11 Heat acquisition, 12 Man/Auto heat). If you want to use Limit switches, the GGC V2 must be used in GGC mode, and you must be sure that these input signals are left open or not used by the motor interface. This can be done by cutting the parallel cable. If you are using an MM2001 motor interface, the **MM2001_GGC** firmware is mandatory.
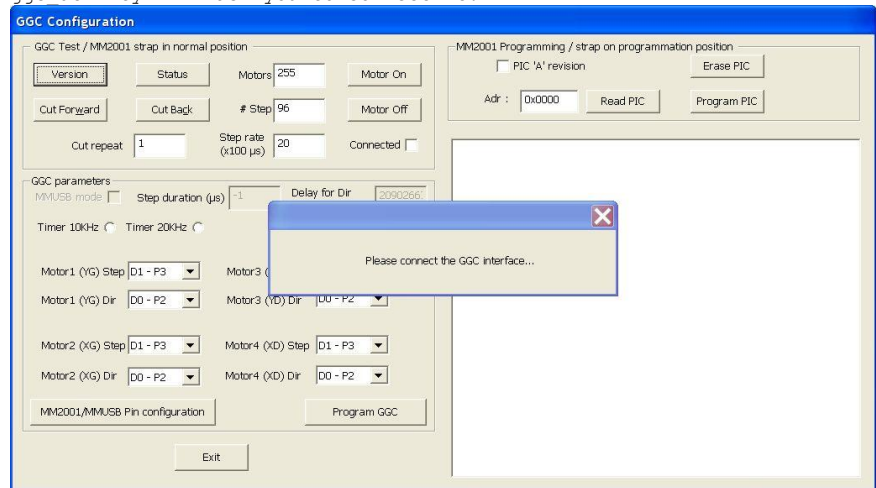
5. Configuration utility, ggc_utilityV2

The ggc_utilityV2 program allows the PC configuration of the GGC interface, testing and moving motors without GMFC. It also permits to program the PIC firmware of the MM2001.

The program ggc_utilityV2 is available from www.gmfcsoft.com in the GGC section.

5.1. Internal parameter configuration

Download the file **ggcV2.zip**, then uncompress it; run the executable file **ggcV2.exe**. If the GGC V2 interface is not yet connected, the ggc_utility will ask you to connect it.

After connecting the GGC interface, ggc_utilityV2 reads the current interface configuration and displays it.

GGC Configuration
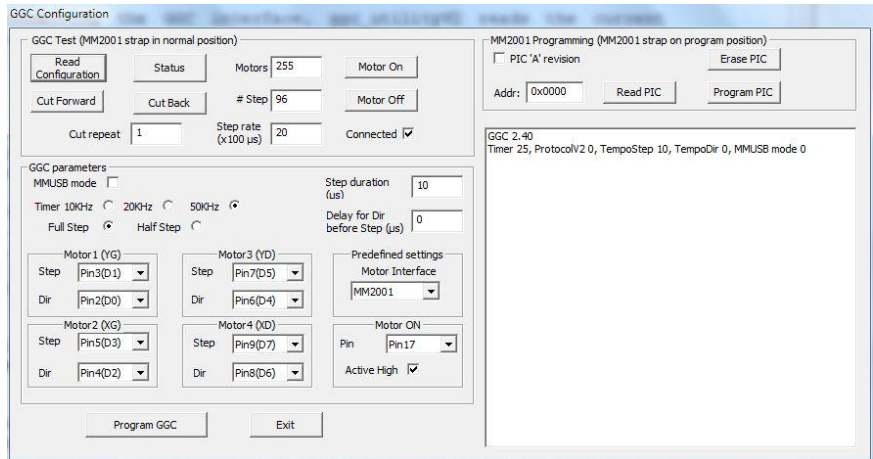
The GGC interface is shipped configured in MMUSB mode. If you want to switch to the GGC mode, you must uncheck the **'MMUSB mode'** box. Then you can modify the appropriate internal timer frequency and motor timing parameters. Additionally, to avoid rewiring motor cables, you can simply reconfigure the motor outputs. Finally, you can set the pinout for the "Motor On" signal (1 or 17) and also the active state ("Low" or "High").

The ggc_utilityV2 provides a list of predefined settings for well-known interfaces. Just select the interface in the list to set the predefined parameters. **Caution: this drop box is only for settings parameters, it does not display the type of the interface currently connected.**

To program the settings into the GGC V2 interface, you have to press the **'Program GGC'** button. Wait until "done" is printed in the message window.

Note for the Gecko G540 controller - Choose setting for the MDLCNC interface. Then set the "step duration" to 2 and "Delay for Dir before Step" to 0. Set the Timer to 50Khz. You have to disable the charge pump on the Gecko since the GGC does not provide the required signal. There is no Motor ON signal for the Gecko, by disabling the charge pump, motors are always ON.

5.2. Moving motors with the ggc_utilityV2

To move the motors, you must first press the **'Motor On'** button to power the motors. Then, you have to set several parameters:

First, you must specify which motors to move using the field **'Motors'** and the following table:

X Left	X Right	Y left	Y Right
12	192	3	48
204		51	

Sum up values to move motors simultaneously. The value 255 will move all motors.

#Step: This is the number of steps performed by a move command. The maximum value is 128.

When starting to move the motors, a good value would be to use the number of steps required to rotate the shaft a half or one full revolution.

Step rate: This sets the interval between motor steps. The value is given in hundreds of microseconds. The default value of 20 (i.e., 2 milliseconds) should work with all motors. You should decrease the value for testing a higher speed. Still, precise speed calibration should be done within GMFC.

Cut Repeat: This is the number of times that the motor move will be executed when pressing the **Cut** button.

For example: if **#Step** equals the number of steps for rotating 1 revolution, and **Cut Repeat** equals **10**, the motors will turn 10 revolutions each time **Cut** is pressed.

Pressing the **'Cut Forward'** button will move the motors forward and up, if the motors are correctly connected (X to the end of the table, and Y up).

Pressing the `**Cut Back'** button will move the motors backward and down.

The `**Motors OFF'** button switches the motors off. When the motors are off, pressing any of the **Cut** buttons will have no effect.

5.3. Programming the MM2001 PIC firmware

This section is only for the users of the MM2001 interface. It does not apply to other motor interfaces.

You must **carefully** follow instructions related to the programming jumper and the RESET button of the MM2001 interface.

If you have a PIC type 16F874A or 16F877A, check the box `**PIC "A" Revision'**. If you forget to do so, the PIC may be blocked and further programming disabled.

Press the `**Write PIC'** button and follow the instructions carefully... Use the file **MM2001-V51.HEX** or later for correct operation of the MM2001 with the GGC interface. Programming the PIC with older firmware is possible, but the MM2001 will not run properly because the GGC interface requires a faster response time.

When programming a PIC type **"A"**, it is necessary to erase it first using the `**Erase PIC'** button. If the programming fails, it is necessary to perform a further erase before each attempt to program the device.

For standard (none **"A"**) PIC, erasing is not necessary.