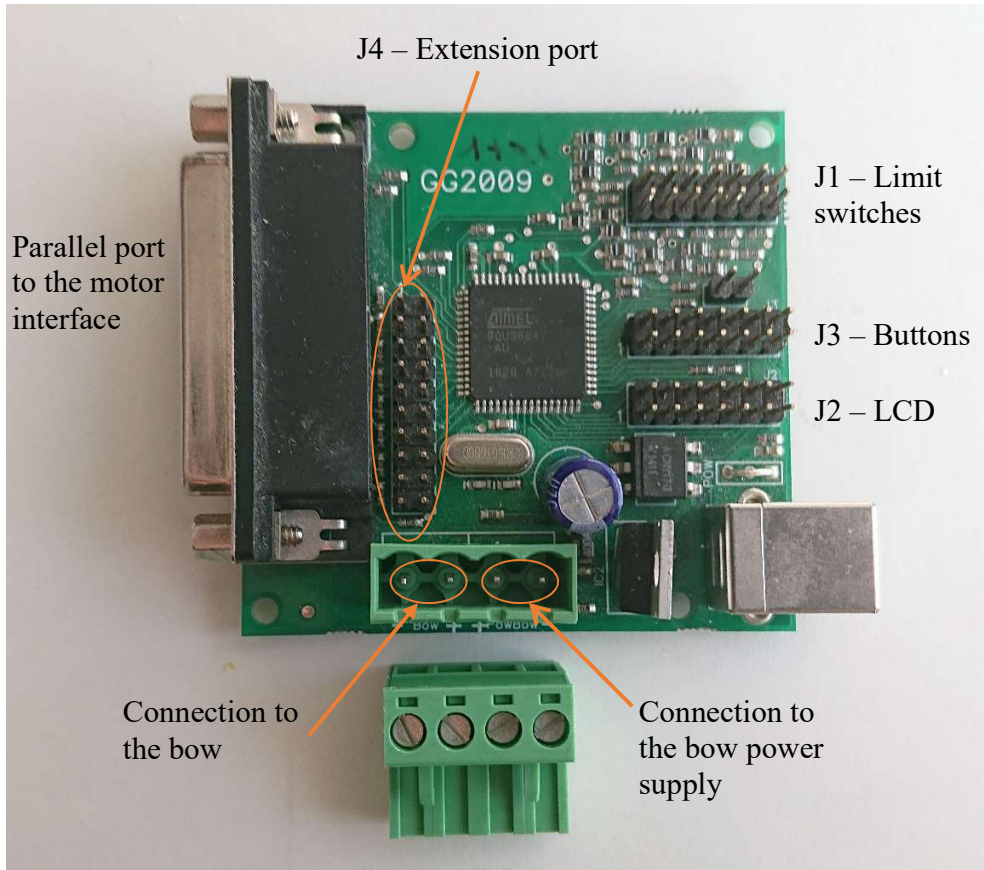


GGC V4 documentation

V4.01 - 06/08/2021

The GGC V4 adapter is an intelligent USB converter for driving a step motor interface. The GGC drives most step/dir compatible motor interfaces, such as the MM2001, TB66600, and the MDLCNC bipolar motor controller.



1. Functionalities

The functionalities of the GGC V4 adapter are:

- Generation of a unique GMFC license key, independent of the PC and disk formatting.
- Support any Windows version from Win98 to Windows 10.
- 50 KHz internal timer for implementing smooth accelerations. The internal timer supports motor interfaces that do not have a timer.
- Compatible with most existing step/dir unipolar and bipolar motor interfaces.
- Internal wire heat circuits.
- Optional LCD display. The GGC V4 support LCDs with 1 or 2 lines of 16 characters and the RepRap LCD with 4 lines of 20 characters.
- Automated recognition of the GGC parameters by GMFC (from version 3.89.14).
- Programming of the MM2001 PIC firmware. The **V5.1** or **MM2001_GGC** versions of the MM2001 firmware are mandatory to work with the GGC V4 adapter.

- Configuration through the **ggc_utility V4** software on the PC.
- Configuration of the parallel port pinout. Fully configurable Dir/Step outputs. Motor Enable on parallel port pin 1 or 17, with High/Low active level.
- Configuration of the polarity (positive/negative) of the step signals. Negative step is the standard mode. Positive pulse is required for Chinese motor interfaces.

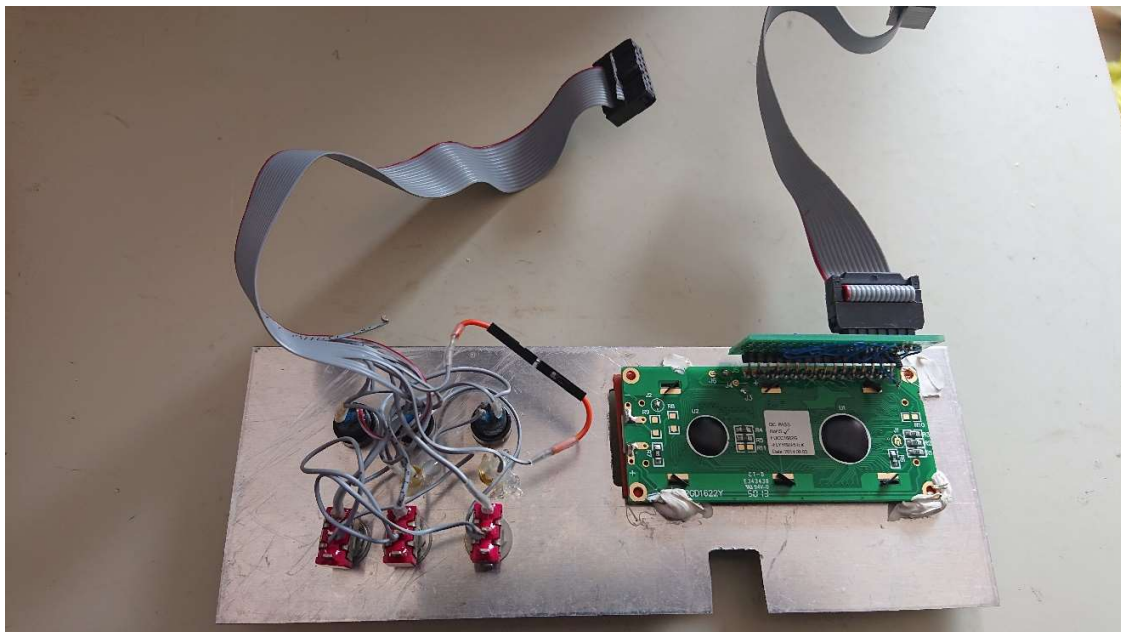
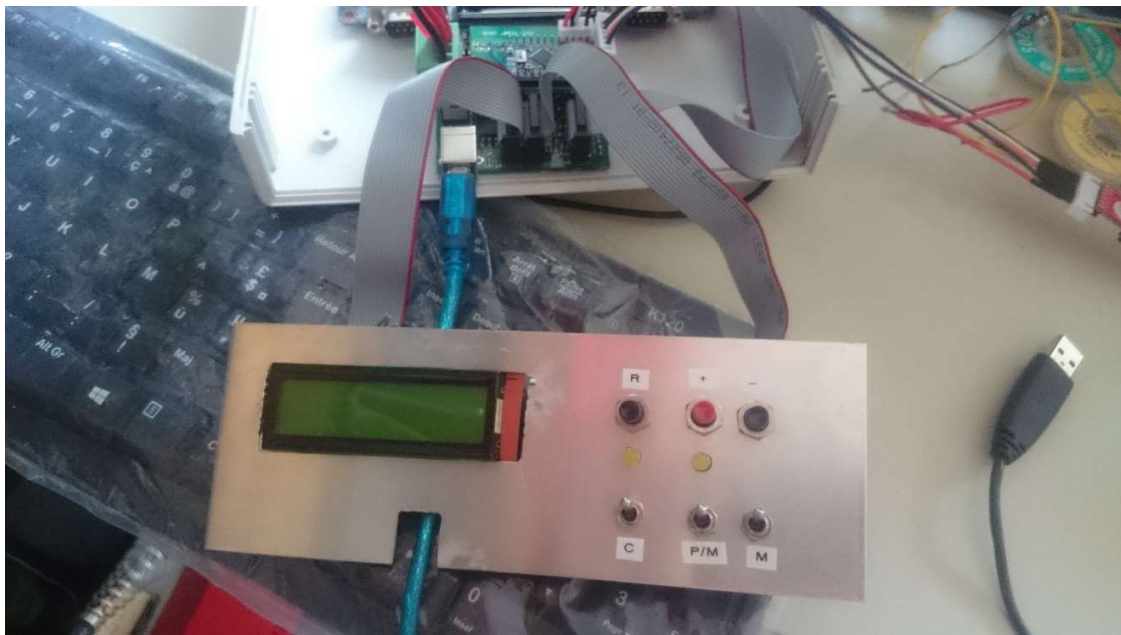
2. Command panels

Two different command panels are supported: the BP button and the RepRap panel.

2.1. The BP Button panel

The user must make the BP panel. The BP panel relies on three push buttons **BP+**, **BP-**, **Reset**, the **LEDHeat** led and 3 switches **HeatOn**, **PC/MAN** and **MotorOn**.

The **LEDHeat** led is mandatory for the heat circuit to work. Buttons and switches are optional. When used, buttons and switches are connected through the J3 connector. The LCD is connected to J2. Both 1 line and 2 line 16 character LCDs can be used.



2.1.1 Buttons and switches

BP+, **BP-** are used to set the heat value when the heat value is controlled by the GGC. A short press on **BP+** increases the heat; a short press on **BP-** decreases the heat.

Pressing on **BP-** and **BP+** simultaneously enters a menu for setting the maximum possible heat value. The maximum heat prevents breaking the wire if it does not support a heat value of 100%. Pressing on **BP-** and **BP+** again will exit this menu. Note, that with versions of GMFC above 4.0, the maximum heat value is specified in the table configuration dialog of GMFC and overrides the maximum value in the GGC.

The optional **PC/GGC** switch controls the source heat value that is set either by the PC or the GGC adapter. Even in the GGC position, the heat is only activated when GMFC sends a heat command.

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

The optional **MotorOn** switch enables the motors. This switch is useful only for providing additional security. It can be used as an emergency stop switch.

The optional **Reset** button is used to reset the GGC adapter.

2.1.2 LEDs

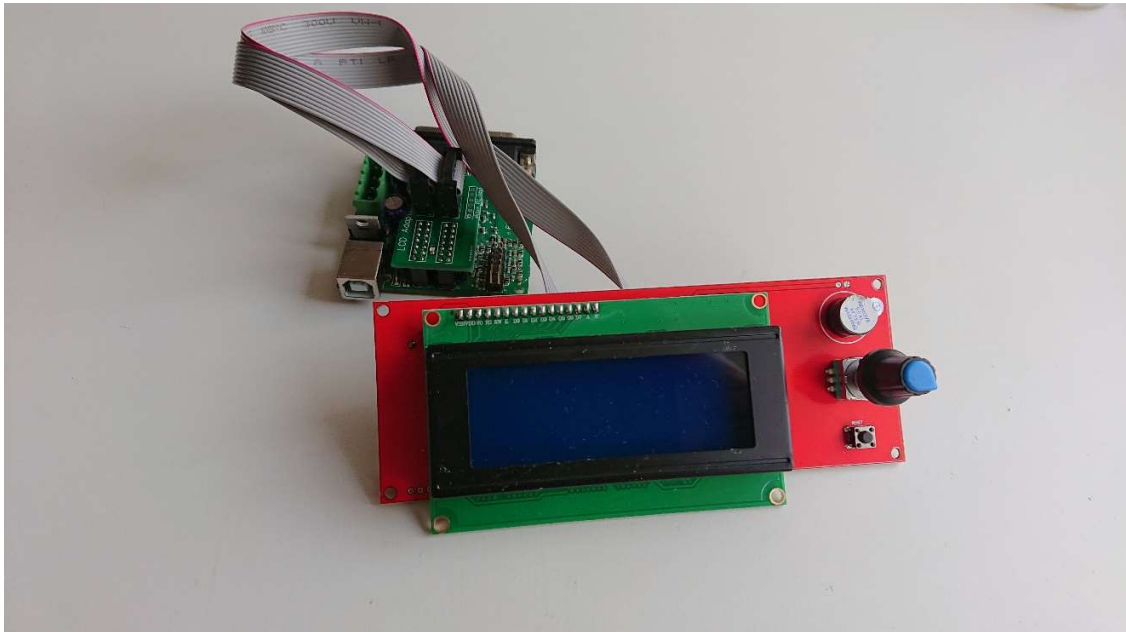
LEDHeat: this LED indicates that the heating circuit is functioning. Because control of the wire heat goes through the LED, **it MUST be connected for the heat circuit to work.**

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

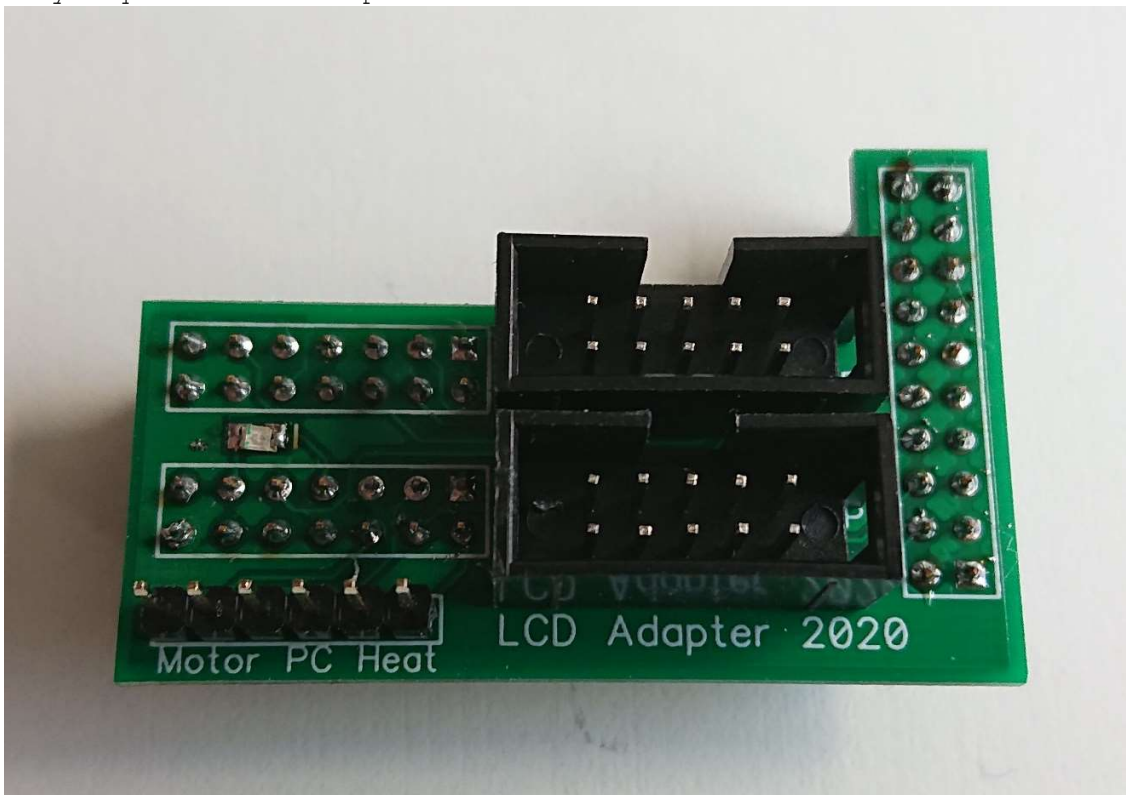
LEDOn: this optional LED indicates that there is power to the GGC.

2.2. The RepRap panel

The RepRap panel contains a 4 line LCD, a rotary selector with a press button, and a reset button.



The RepRap panel must be connected to the GGC through the GGC LCD adapter that has to be bought in addition to the GGC. The adapter provides the **LEDHeat led**. Therefore, wire heat is directly operational. Soldering is only required for the optional switches.



2.2.1 Buttons and switches

The rotary selector is used to set the heat value when the heat value is controlled by the GGC.

Pressing on the selector enters a menu for setting the maximum possible heat value. The maximum heat prevents breaking the wire if it does not support a heat value of 100%. Pressing on the selector again will exit this menu. Note, that with versions of GMFC above 4.0, the maximum heat value is specified in the table configuration dialog of GMFC and overrides the maximum value in the GGC.

The optional **PC/GGC** switch controls the source heat value that is set either by the PC or the GGC adapter. Even in the GGC position, the heat is only activated when GMFC sends a heat command.

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

The optional **MotorOn** switch enables the motors. This switch is useful only for providing additional security. This switch can be used as an emergency stop.

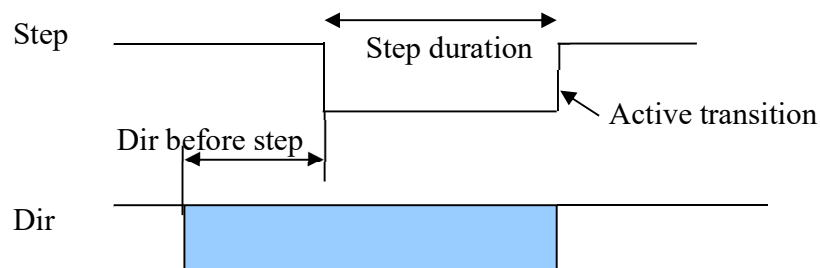
2.3. Motor interface parameters

Some parameters are fixed:

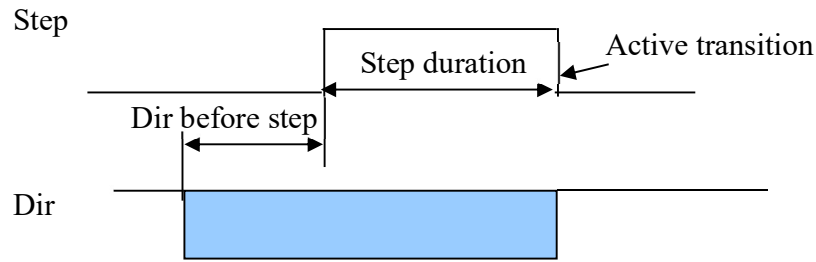
- **Internal timer frequency:** 50KHz (20 microseconds).
- **Minimum time between two step pulses:** 60 microseconds.
- **Direction before the step pulse:** at least 20 microseconds.

Parameters that can be modified by the GGC_utility:

- Parallel port pinout of the step/dir signals.
- Step pulse polarity. The step pulse is active on the low to high transition (standard mode), or the high to low transition (Chinese interfaces).
- Motor enable signal on pin 17 (MM2001 compatible) or pin 1 (Chinese interfaces).
- Motor enable active low or high.



Negative pulse step (standard mode)



Positive pulse step (Chinese interface mode)

2.4. LCD screens

2.4.1 Initialization

If the LCD display is used, it successively displays after reset:
"GGC V4.01", where 4.01 is the GGC 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 heat value to suit the type of cutting wire being used.

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

2.4.2 Main display

If using a one or two line LCD display:

"H:050% PC M* H*", this message is displayed during normal functioning. **H050%** shows the current heat value (here, 50%), **PC/GGC** tells that the heat value is given by the GGC or by the PC (GMFC). In GCC heat mode, the value can be adjusted by the **BP+** and **BP-** buttons. **M*** shows that the motors are powered on. This means that GMFC is running a heat command. **M** (without *) is shown when motors are off. **H*** shows that the heat is on. The LEDHeat is also on. **H** (without *) is shown when the heat is off.

If using a four line RepRap LCD display:

"Heat: 50% Max: 100%"

"PC Motor* Heat*"

Heat: 50% shows the current heat value (here 50%). **Max: 100%** shows the maximum heat value (here 100%),

PC/GGC tells that the heat value is given by the GGC or by the PC (GMFC). In GCC heat mode, the value can be adjusted by the rotary button.

Motor* shows that the motors are powered on. This means that GMFC is running a heat command. **Motor** (without *) is shown when motors are off.

Heat* shows that the heat is on. The LEDHeat is also on. **Heat** (without *) is shown when the heat is off.

2.4.2 Maximum Heat display

If using a one or two line LCD display:

"Heat Max: 100%"

This is the value of the maximum heat value. It is adjusted by the **BP+** and **BP-** buttons. Pressing both buttons simultaneously will return to the main display.

If using a four line RepRap LCD display:

"Max Heat Setting"

"Max: 100%"

This is the value of the maximum heat value. It is adjusted by the rotary buttons. Pressing the button will return to the main display.

3. GGC Connections

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

On board connectors:

J1 - 14 pin connector - Home and Limit switches

J2 - 14 pin connector - LCD display

J3 - 14 pin connector - LED, buttons and switches

J4 - 20 pin connector - Extension port.

The pinout of J1, J2, J3 from top is:

2 4 6 8 10 12 14

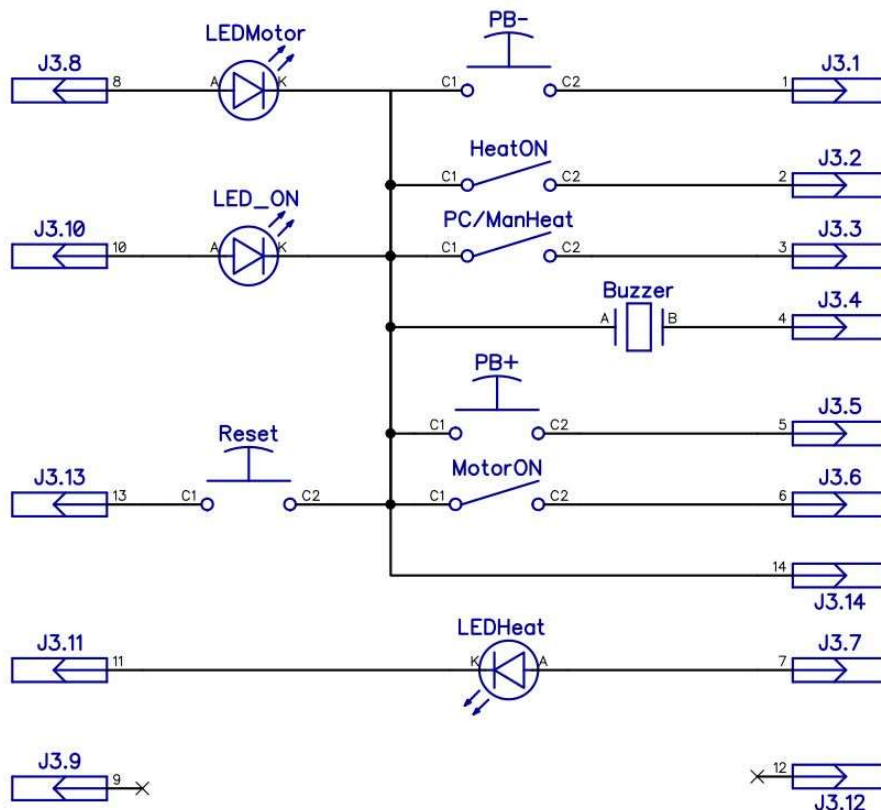
1 3 5 7 9 11 13

Pin 1 is marked on the board.

Powering the heat wire

The wire power supply is connected to the GGC via the **PowBow** connector. The maximum voltage is 50V DC. **Beware of polarities; wrong connection will damage the GGC.** The bow must be connected to the **Bow** connector.

J3 - LEDs and switches wiring



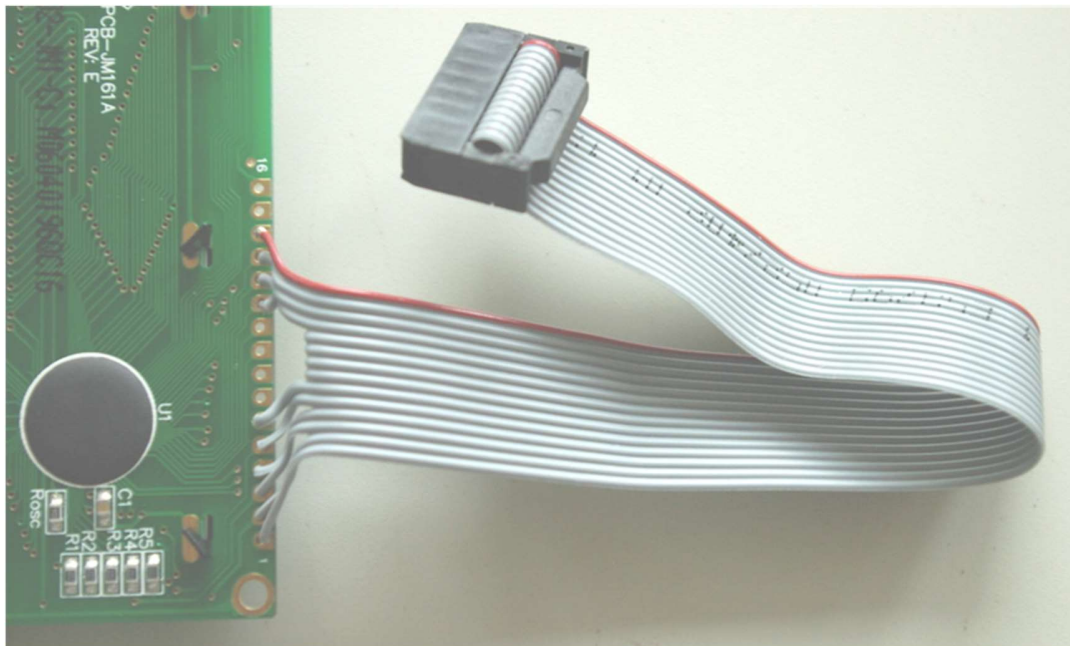
Buttons and switches are connected to GND through J3.14. **Do not connect J3.14 to power supply ground.**

J2 - LCD wiring

J2 is used to connect the one or two lines 16 character LCD Display Panel via a short length of ribbon cable wired as detailed below. All 16 character LCDs should be compatible.

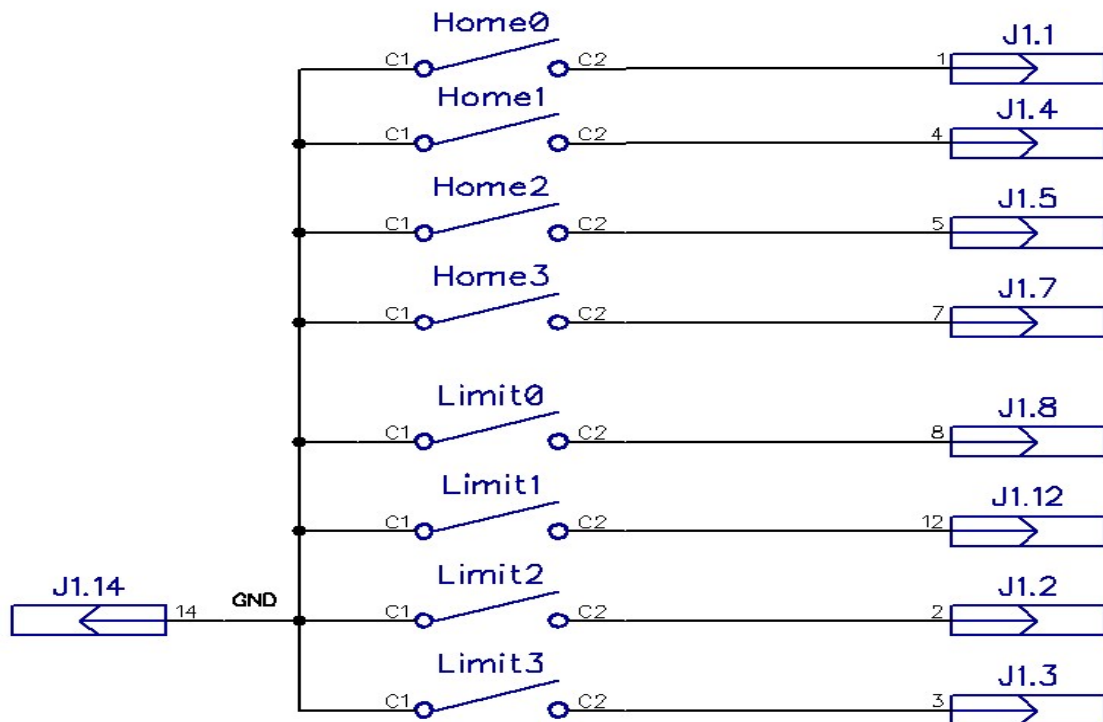
Connector Pin	Function	LCD Pin
J2.1	PD7	LCD14
J2.2	PD6	LCD13
J2.3	PD5	LCD12
J2.4	PD4	LCD11
J2.5	Non connected	
J2.6	Non connected	
J2.7	Non connected	
J2.8	Non connected	
J2.9	E	LCD6
J2.10	R/W	LCD5
J2.11	RS	LCD4
J2.12	GND	LCD3
J2.13	Vcc	LCD2
J2.14	GND	LCD1

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, 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.

J4 - Extension port

Most DB 25 outputs are available J4.

- DB.17 (Motor Enable) -> J4.2
- DB.2 (step Motor1) -> J4.13
- DB.3 (data Motor1) -> J4.15
- DB.4 (step Motor2) -> J4.9
- DB.5 (data Motor2) -> J4.11
- DB.6 (step Motor3) -> J4.5
- DB.7 (data Motor3) -> J4.7
- DB.8 (step Motor4) -> J4.1
- DB.9 (data Motor4) -> J4.3

If you use J4, you must chose Pin17 (J4.2) as the Motor Enable signal, since DB.1 is not available on J4. GND must be used from J1, J2 or J3.

The pinout of J4 from top is:

2	4	6	8	10	12	14	16	18	20
1	3	5	7	9	11	13	15	17	19

4. Configuration utility, ggc_utilityV4

The ggc_utilityV4 program allows the configuration of the GGC adapter by the PC. It also permits to program the PIC firmware of the MM2001.

The ggc_utility is available from <https://gmfcsoft.fr/shop/en/usb-support-for-gmfc-with-the-ggc-adapter/>.

4.1. Parameter configuration

Download the file **ggcV4.zip**, then uncompress it; run the executable file **ggcV4.exe**.

The screenshot shows the 'GGC Utility V4.0' window. The 'GGC Test' section includes buttons for 'Connect GGC', 'Status', 'Motor On', 'Motor Off', 'Cut Forward', 'Cut Back', and a 'Cut repeat' field set to 1. The 'Motors' field is set to 255 and the '# Step' field is set to 96. The 'Step rate (x100 µs)' is set to 20. The 'Connected' checkbox is unchecked. The 'Motor Interface' dropdown is set to 'MM2001'. The 'GGC parameters' section shows 'MMUSB mode' checked, 'Timer' set to 10KHz, and 'LCD' settings for 1 line, 2 lines, and RepRap. Motor configurations for Motor1 (YL), Motor2 (XL), Motor3 (YR), and Motor4 (XR) are shown with step and direction dropdowns. The 'Motor ON' section has 'Pin' set to Pin1 and 'Active High' checked. The 'Pulse' dropdown is set to 'Negative'. The 'MM2001 Programming' section has 'PIC 'A' revision' unchecked, 'Addr' set to 0x0000, and buttons for 'Read PIC', 'Program PIC', and 'Erase PIC'. The 'Program GGC' and 'Exit' buttons are at the bottom.

Connect the GGC, then press the "Connect GGC" button so that the ggc_utilityV4 displays the configuration of the GGC adaptor.

The screenshot shows the 'GGC Utility V4.0' window after connecting the GGC. The 'Connect GGC' button is highlighted with a dashed border, and the 'Connected' checkbox is checked. The 'Motor Interface' dropdown is now set to 'MDLCNC'. The 'GGC parameters' section shows 'MMUSB mode' unchecked, 'Timer' set to 50KHz, and 'LCD' settings for 1 line, 2 lines, and RepRap. Motor configurations for Motor1 (YL), Motor2 (XL), Motor3 (YR), and Motor4 (XR) are shown with step and direction dropdowns. The 'Motor ON' section has 'Pin' set to Pin1 and 'Active High' checked. The 'Pulse' dropdown is set to 'Positive'. The 'MM2001 Programming' section remains the same. The 'Program GGC' and 'Exit' buttons are at the bottom. The status bar at the bottom right displays 'GGC 4.01' and 'Timer 20, ProtocolV2 0, TempoStep 2, TempoDir 0, MMUSB mode 0'.

To avoid rewiring motor cables, you can reconfigure the motor outputs. You can set the pinout for the "Motor On" signal (1 or 17) and also the active state ("Low" or "High"). Finally, you can chose the polarity of the step pulse: negative (standard) or positive (chinese motor interfaces).

The ggc_utilityV4 provides a list of predefined settings for well-known motor interfaces. Just select the interface in the list to set the predefined parameters.

Finally, to program the settings into the GGC, 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. 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.

4.2. Programming the MM2001 PIC firmware

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

When using a MM2001 motor interface with the GGC, you must program the MM2001 with the **MM2001_GGC** firmware that is compatible with a 50 Khz timer. Using the **MM2001_GGC** firmware, the MM2001 internal timer and heat functionalities are disabled.

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 adapter. Programming the PIC with older firmware is possible, but the MM2001 will not run properly because the GGC adapter 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.