

EC Watch 3.0 software

Features

- CNC **Ethernet** Controller driver designed for **EC** family devices
- Working with the following file types: **G** code, **Excellon** and **Gerber**
- Intuitive visual interface, adaptable to your screen and loaded program type
- Ensure editing, testing programs and displaying their tool path
- Ensures the work with: **Parameters, expressions, functions, subroutines** and **macros**
- Provides a **wizard** to generate programs for various forms and processes
- Works on Windows XP and later

1.1 About EC Watch

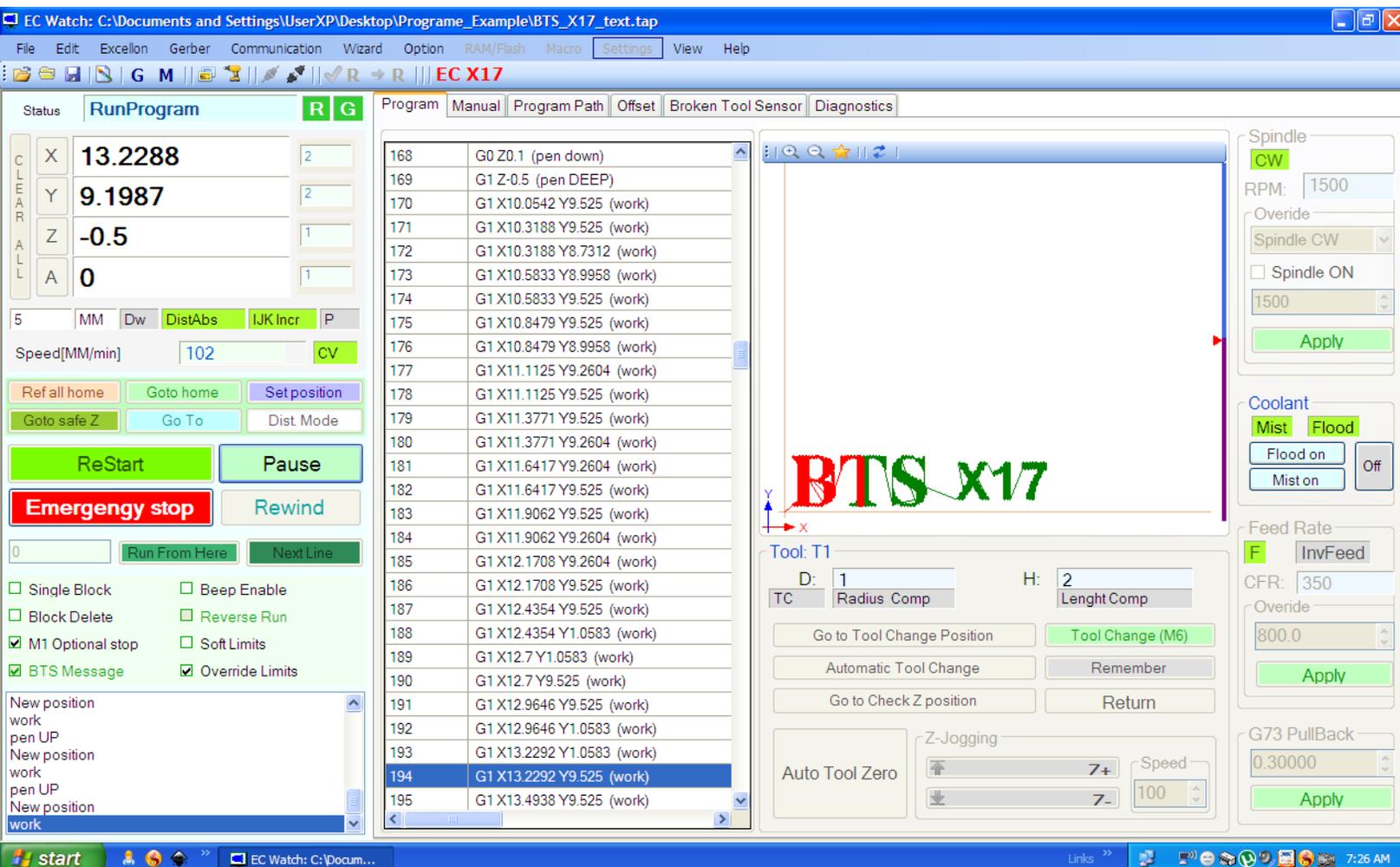
EC Watch software is designed for supervising and controlling EC controllers. The EC system can work with the following file types: G-Code, Excellon and Gerber. He also manages the following things: Settings, Macros and Broken Tool Sensor. Control and supervision of the CNC machine is made from the main form these operations are generally made by the CNC operator so the form will be called the operator form.

1.2 Operator Form

The information and commands in this form are grouped by categories and bear suggestive names. On the left side of these form there is the main **command** and **control** group called the remote control (**RC**).

The **operator** form contains the following tabs: **Program, Manual, ProgramPath, Offset, Broken Tool Sensor, Diagnostics**. Each of them hosts specific information and commands for specific operations. This form is scalable in this way by adapting to the size and resolution of your screen. At the same time, he has the modifiable dimensions and is equipped with splitters between groups to make them dimensionally customizable.

In the image below, you can see **EC Watch software** in the middle of a **text (BTS X17)** engraving operation. In the **Tool Path** you can see the already done part colored in **red** and the rest of the text colored in **green**.



1.2.1 Remote Control

This group displays the main information provided by the controller and hosts the main commands. We will name it with the word **RC**. It displays in real time the following information: Controller Status, Program Type Loaded in Controller (Excellon / G-Code), Program Location (RAM / Flash), Axis Position, Scale Factor, BTS Loading, Distance Units (INCH / MM), Distance mode, IJK mode, Cartezian / Polar coordinate type and Speed. It also contains the message box. Buttons that populate this group are divided into three categories depending on usage: Direct command, Program command and Program Running Control

1.2.1.1 Controller Status

The state of the controller is vital to tracking and controlling it. Follow the possible states: Nop, Running, FeedHold, EmergencyStop, ProgramChecking, ReverseRun, ReferenceAxes, BreakProgram, ProgramAlreadyDone.

FeedHold and **BreakProgram** both are safe stops without loss of steps and allow you to resume the program safely by pressing the ReStart button. FeedHold is an operator-generated pause. BreakProgram is a break generated by the controller due to program execution (M0, M6, etc) but also by BTS

EmergencyStop occurs in case of an immediate stop it generally leads to loss of steps and the safe program is no longer possible. It may be required by the operator or may be generated by input signal Override Limiters

We specify that **write** in the Controller and write **verification** can be done only when it is in the **Nop** (nothing to operate) state. Otherwise it will ignore your writing attempt. This applies to: Programs, Macro, Settings or Program Checking. As an exception Settings can be written in the controller even when it is in the **emergency** state

1.2.1.2 Direct Command Buttons

They are used outside the program or during the break (FeedHold/BreakProgram). These buttons provide the following operations: Deleting axes, Setting axes, Reference axes, Moving the tool home (G28) or Go to

1.2.1.3 Program Command Buttons

These Buttons provide commands to Start / Stop execution of the program. To start a program, press the **Program Start** button.

The **Pause** button is used to stop (FeedHold state) the execution of a program, stopping the program is without loss of steps and allows the program to be restarted safely. To restart a program after a pause (FeedHold / BreakProgram), press the **ReStart** button. Be careful not to restart the program in the middle of a Macro.

To stop urgently, click **Emergency stop** button. Emergency stops **lead to step loss** and can not ensure the safe restart of the program. Emergency stop can also be generated by the Emergency stop input signal or the input signal Override Limiters . Regardless of how the Emergency Stop was triggered, the Controller is removed from this state using the **Reset** button.

To **Rewind** the currently loaded program part press **Rewind** button.

These commands have the **following effects**:

- The Temporary Offset is erased (like G52 X0 Y0 Z0 A0)
- G92 Offset are set to zero (like G92.2)
- Work Offset are removed. The parameter (P#96) that contains Current Work Offset number is set to 0
- Motion Mode is set to Default (Settings>Logic>StartUp Modals)
- Distance mode is set to Default (Settings>Logic>StartUp Modals)
- Selected plane is set to Default (Settings>Logic>StartUp Modals)
- IJK** mode is set to Default (Settings>Logic>StartUp Modals)
- Feed and Seek Rate are set to Default (Settings>Logic>StartUp Modals)
- Parameters that store the scale (P#88 – P#91) factor are set to the default scale factor.
- Parameters (P#80 – P#83) containing G28 Home position are set to the default settings
- Feed rate mode is set to Units per minute mode (like G94).
- Feed and speed overrides are set to ON (like M48).
- Cutter compensation is turned off (like G40, G49).
- The spindle is stopped (like M5).
- The current motion mode is set to G1 (like G1).
- Coolant is turned off (like M9).

Run From Here performs a dummy run of the part program to establish what the modal state (G20/G21, G90/G91 etc.) should be and then prompts for a move to put the controlled point in the correct position to for the start of the line in *Line Number*. **Run From Here** must be preceded by Rewind

Set Next Line the same as like **Run from here** but without the preparatory mode setting or move. NextLine can not follow after Rewind

Set Next Line and **Run From Here** can not be started from the middle of a **subroutine**, Macro or Tool Radius Compensation

1.2.1.4 Program Running Control Buttons

Switches (check buttons) that control how the program is executed.

If **Single Block** button is checked only one block will be executed after Start or ReStart then a pause (FeedHold) will be generated

Block Delete -If this button is checked then lines of G-code which start with a slash - i.e. / - will not be executed.

Optional Stop -If the button is checked then the M01 command will be treated as M00.

Beep Enable -If the button is checked then the **buzzer** from **EC Controller** is enabled

Reverse Run -If the button is checked then the then ReStart after pause (FeedHold / BreakProgram) will cause the part program to run in reverse. This is particularly useful in recovering from a lost arc condition in plasma cutting. It can not be used in: Excellon programs, Radius compensation or in Constant velocity mode. Should be used with caution and only one **Block** in **polar coordinates** and in commands such as: Canned Cycle, Straight samples etc.

Soft Limits -Exceeding the maximum values (Settings>Soft Limits) that axes may have resulted in an **emergency** stop if this button is checked. To remove the tool from that position first uncheck the button

Override Limits -Reaching limitators results in an emergency stop if this button is checked. To remove the tool from that position first uncheck the button

BTS Enabled -This button is just a *Broken Tool Sensor* status **tag**

1.2.1.5 Message box

The display of messages sent by the Controller is done in a text box that is hosted by the Remote Control. The EC Controller sends the following types of messages: Response to commands, Error or Warning messages, Messages (this is a message) written in the program. To delete messages use the *delete* key

1.2.2 Program tab

This tab is specifically designed for working with a program, providing the information and commands needed for this task. He hosts the following groups: Program Loaded, Tool Path, Tool, Spindle and Feed. The program editor is also hosted by this tab

1.2.2.1 Program Loaded

Loaded program that may contain G-code or Excellon code is displayed as non-editable **text** but also as an **image** representing the path of the tool when the program is executed. Once loaded the program is considered executable and can be written in the controller. It can also be loaded as a macro or saved on the file system.

To **load** a program click on the **Load G Code** or **Load Excellon** button on the toolbar. After selecting the desired file and confirming the opening, the file will be **checked**, depending on the length of the file it may take time. If the file contains mistakes you will be warned and you can quit, otherwise mistaken lines will be converted into comments. The next step is loading the image with the tool path and this time the mistakes will be signaled and saved in the list of errors.

To view mistakes recorded during **Check** and **Load**, click **View** menu > Error List. If the errors in the **checking** can be ignored, the ones obtained at the **loading** result in the abandonment of the load.

Program Editor -To open the program editor click on the **Open editor** button on the toolbar. Once editing finished the program must be **reloaded**. For that, just close the editor by clicking on the **Close editor** button. The program will be reloaded, this means it will be **checked** and **loaded** again the procedure described above.

To view the effect of a particular program line, click on it in the program table. The selected line or hole will turn red from the green

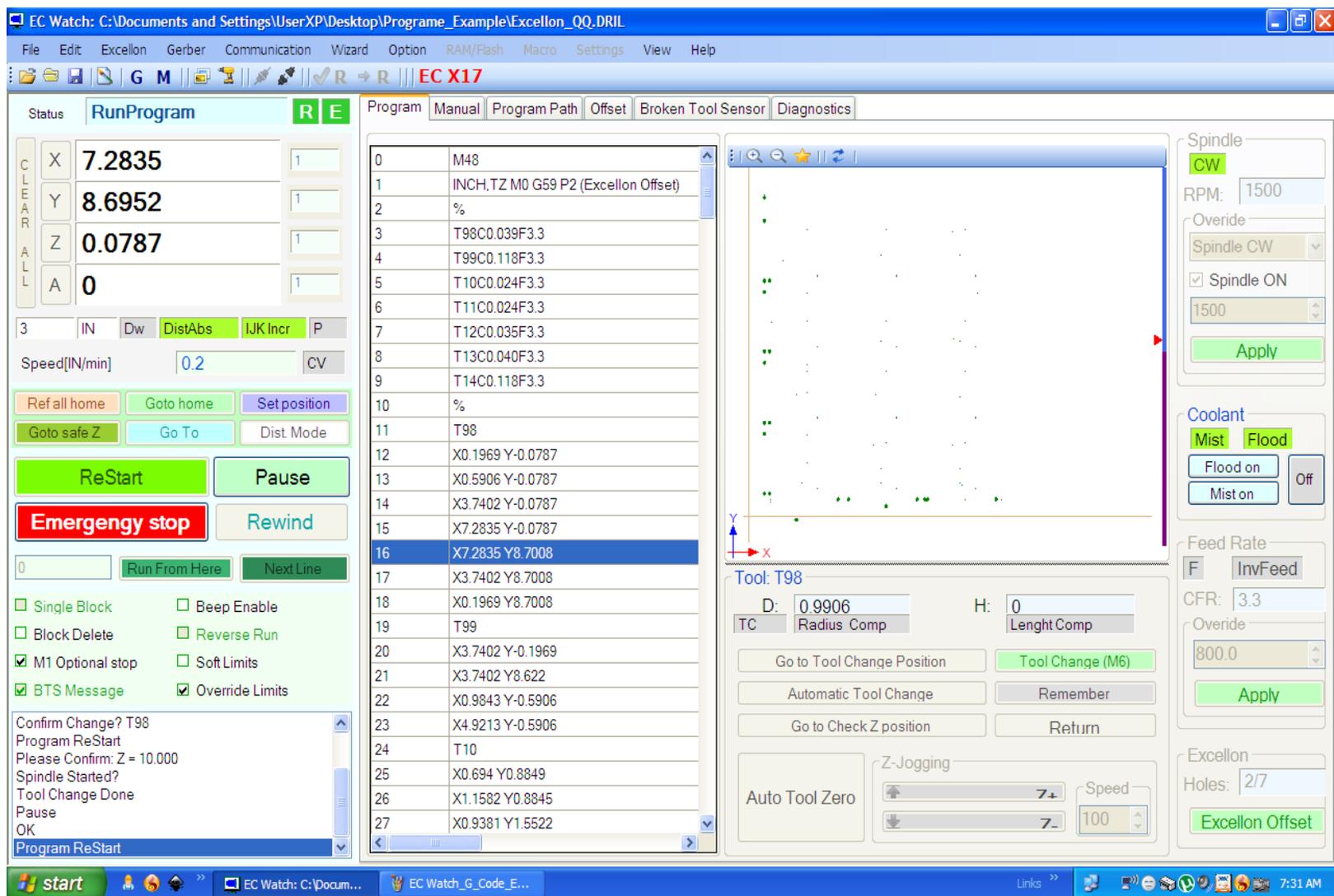
Selected Line - The program line that is in the Controller execution is selected. This is especially useful for stops such as those generated by BTS

1.2.2.2 Tool Path

This **image** is generated by the **PC simulation** of the movement performed by the tool as a result of the running of the **loaded** program by the **controller**.

On a white background it shows green lines. Thin lines represent fast movement and thick ones represent the Feed.

If the loaded program is in **Excellon** format then only the **holes** will be displayed and not the movement. In the image below you can see **EC Watch** software working directly into **Excellon** code. We can see that the **Tool Path** displays the **holes** already done in the **brown** color and those that follow in **green**



To enlarge or shrink the image (tool path), click the corresponding buttons from the current group, then use the scroll wheel of the mouse. To move the image (tool path) click the left mouse button and drag in the desired direction.

The position of the axes sent by the Controller will be displayed in the **tool path** image in **red**. In reverse mode the displayed color is **brown**

Current hole -In the Excellon work mode, the hole that is being executed is colored in **red** and the last two holes executed are colored in **orange**

This **overlaps** the original image that is green. Continuous transformation from **green to red** (orange/brown) shows the position of the tool as the program is executed.

Limitations: Tool path will ignore the following commands: Tool Change, Return Home and Straight Probe. Also, keep in mind that the parameters will be initialized before each image load. Unlike the Controller that stores the parameters and they can transmit information between programs. This may lead to program interpretation differences between EC Watch and Controller.

1.2.2.3 Tool group

This group displays information about the **active** Tool in the Controller and provides commands to replace the Tool at the operator's request.

For example, if the Tool is Broken, you will use the commands provided by this group to replace it. To initiate the tool Change, click the **Tool Change** button. This is equivalent to the controller's execution of the **M6** command. The way it is run depends on the setting in Tool> Tool Change Configuration.

If you want to activate the manual procedure, click the **Go To Tool Change Position** button. After replacing the Tool, press **Go to Tool check Z position** button

If you want to return to the same position after the end of the Tool Change procedure, press the **Remember** button before changing and the **Return** button after the change

1.2.2.4 Spindle group

This group displays information about Spindle, Flood and Mist and provides their manual command.

1.2.2.5 Feed group

This group displays **Feed** information and provides the necessary commands to overwrite it. To override the Feed select the desired value then press the **Apply** button. This operation can only be performed during the program pause

1.2.2.6 Coolant group

This group displays information about Flood and Mist and provides their manual command.

1.2.2.7 G73 Pullback

Allows you to enter the PullBack parameter see G73

1.2.2.8 Excellon group

Allows you to enter the **Excellon Work Offset**. The label (Heles) will show how many holes are to be executed with the current drill. This latter group appears alternately with the G73 Pullback group depending on the loaded code (Excellon or G code)

1.2.3 Manual tab

It contains manual commands that can apply to the controller other than those related to the program loaded into it. Such as **Jogging**, **Sending G-Code** to the controller, **Teaching** and **History**

1.2.3.1 Jogging

You can move the tool relative to any place on your work manually by using various types of Jogging. The arrow keys are set to give you jogging on the X and Y axes and PgUp/PgDn jogs the Z axis. The jogging speed that can be selected is in the native (mm/sec) units.

1.2.3.2 Sending G-Code

By pressing the **Send** button, the G code in the text box will be sent to the Controller. It is forbidden to send G-Code when the controller is running a program, however it can be sent in pause (M0, M1). *Limitations*: The code that contains the parameters (#) or expressions (=) can not be sent. If the G-Code sent to the controller is executable it will respond with the message "OK" otherwise it will send an error message

1.2.3.3 Teaching

The code that was sent to the controller can be stored and transferred to the main program editor. Click the Start/Stop Teach button to on/off the memorization process. Click the **Remeber** button to save the current position to return to the current saved position click the **Return** button

1.2.3.4 History

The information displayed in this group will help you determine where the program was stopped. This will help you restart the program from where it left off in the event of a power failure.

PC recording - When the recording is activated, the program line number that is just running is registered. Together with other information regarding the active tool, but also the time and date of registration. When the voltage goes away or the software is closed, this information is safe. When reopening the software and loading the same program, this information is available by clicking on the History Show button. This method is useful for working in connected mode. From time to time we recommend deleting History.

Controller Resume Program Line - This information is provided by the Controller and represents the program line from the moment when it was sensed by the Index_Power input pin. This is stored in the memory of the controller and can be read at any time provided *that the program loaded* in the EC watch is the same as the one loaded in the Controller at the time of recording. This is the safest method to restart a program after a power failure. For configuration, see Settings->Logic settings -> Controller Power Monitoring

1.2.4 Program Path tab

This tab is especially designed to view the **tool path** in a large format and showing the **movement limits** on each axis as a result of program execution.

1.2.5 Offset

This table contains specific methods for working with two offset types: Work Offset and Tool Offset.

You can select a certain offset then **apply** it to the Controller having the same result with the execution of the G54-G59 codes.

Also, the offset editing can be done here. Note the change will **only** be done in the Settings on your PC. Is equivalent to the edit obtained in the corresponding table (Tool Table / Work Offset).

The commands in this tab give you the option to use the touch method to determine the offset. Suppose you want to edit the length of Tool 3. Select tool 3, then click the **Apply** button. Jogging on the z-axis until the tool tip reaches the gage surface slightly, then press the Z Tool offset > **Get** button. Save by clicking the **Save Changes** button. See: Offset and Settings

1.2.6 Broken Tool Sensor tab

To order live Broken Tool Sensor device use this tab. Broken Tool Sensor and its work is described in the chapter with the same name.

1.2.8 Diagnostics tab

To debug a program use this tab. It displays live parameters and offset values in the controller. Also the state of the Input / Output signals and the Parallel Port pins

1.3 Communication with the Controller

The Controller (1) can communicate with the PC via USB or Ethernet. Selecting an option is made in the Default Connection form. Once saved, it can be used anytime in the future. Note that the connection to the controller can be opened or closed as desired.

The Ethernet Controller settings are written in Settings>Port & Pins>Port Setup there you will find the initial settings of the new **EC** Controller.

(1) Depending on the possibilities of the Controller chosen. See the technical characteristics of the Controller

1.3.1 Default Connection

To open the Default connection form, click the Communication menu> Default Connection setup. Suppose your controller is powered from your PC via a USB cable but you want to connect to it via Ethernet. Then you will need to select Default Connection to Ethernet and attach the ethernet cable.

Making sure the Ethernet settings match with those already saved in the Controller (see: Settings> Port setup) then save by pressing **Save Default Connection** button. If the controller is already connected via USB then it needs a reset before reconnecting via Ethernet.

If you want a USB connection then select USB Default Connection then save. To change Ethernet connection to USB, the controller needs a reset (power break for 2 sec).

To open the connection, click the **Default Connection Open** button in the toolbar. Before doing so, check the connection using the appropriate Ethernet or USB cable

1.3.2 Ping Controller

To check the Ethernet connection with the Controller use the Ping controller tool that you can open by pressing the Ping button on the toolbar. After opening it, type the Controller IP then press the **Send** button. If the controller answers it means you have a valid ethernet connection with it. This verification can be done independently of the default connection.

Note: Your PC's must be in the same network as the Controller. That means the first three digits of the PC's IP must match the first three digits of the Controller's IP, the fourth digit must be either differently. To check the IP of your PC, use the ipconfig (Cmd.exe > ipconfig) utility. To change the IP of your PC, see: Change TCP/IP settings

1.3.3 Work Connected / Disconnected

Once the program is turned on, the EC Controller does not need the connection to the PC to run it. This way the PC can be used for other tasks while the EC Controller runs the program. It can be reconnected when the controller expects an operator command.

Offline mode can be used even when the BTS is enabled

1.4 Controller Program Management

Program management at the Controller level is done in the dedicated Program Controller form. To open this form, click on the **RAM/Flash** menu. In order to be interpreted by the EC Controller, the program must be written in it.

The program can be stored in volatile memory (deleting power loss) called **RAM** and another non-volatile called **Flash**. The two memory locations differ in size. In **Flash** you can write a program 2.5 times longer than in **RAM**.

To check if the program you **just loaded** can be written to a specific memory location, click on **View-> Memory required for the program**.

1.4.1 Writing the program in the Controller

To write a program in RAM or Flash, press the **RAM /Flash Write** button. Before writing, make sure that the connection to the controller is open and it is in the Nop state. To make sure the program has been written correctly in the controller, click the **Verify** button.

The file name that is loaded into Flash can be obtained by clicking the **Get File Name** button.

Program writing to RAM can also be done directly from the **main window** by pressing the button **Send Program to RAM** in the toolbar

1.4.2 Which program to Run

Let's assume that both **RAM** and **Flash** contain one program. The controller can run one program at a time. Therefore, it is necessary to choose the program in RAM or the program in Flash. After selecting the desired program, press the **Save** button. After saving, the selected program becomes the **Work Program in the Controller**, it will be the one checked or executed

1.4.3 RAM/Flash Program Check

Before launching a program in the Controller execution, make sure it is interpretable. To check this, click the button **Check Program** from the main window toolbar. Before performing the check make sure the connection to the controller is open and it is not busy (Nop state).

In response to the checking command, the Controller must respond with the RAM / FLASH SUCCESSFUL message. Otherwise the program is missing or not interpretable

Note: Before the program can be checked, it should be written in the EC Controller

1.4.4 Work Connected / Disconnected

EC Watch software only provides the interface between the operator and the EC Controller that is not necessary during the program run. This way the PC can be used for other tasks while the EC Controller runs the program. It can be reconnected when the controller expects an operator command.

Offline mode can be used even when the BTS is enabled

1.5 Error List

To view the list of errors that occurred while loading and checking the program, click on View menu>Error List.

1.6 Output File

The output file is a text file used by the functions: 500, 511, 521, 531. To view this file, click View menu>Output File. In order for this file to be used, the path to it must be saved and it will be set in the Settings>Logic>Output File.

1.7 Lock/UnLock

To block modification of Macros and Settings (everyone with his password), they can be password-protected. When installing the software, passwords are missing and access is free. To block, click the Option menu> Lock> Settings/Macro. In the Password form enter the password, confirm the password, and then save. To unlock click on Option>UnLock> Settings/Macro. In the Password form, enter the password then save. After unblocking access will be free until the software is closed. If you forgot your password do not worry just enter the universal password (**Pass_QW_EC_J_9174**).

1.8 Wizard

Wizard can quickly generate code G for a specific application. To open it click on the Wizard menu on the main window. After opening it, select a specific item from the wizard list the form will be configured accordingly. Edit the right values in the open boxes then click on the **Get G Code** button. The wizard Text box will display the resulting G Code program.

To view it as a tool path image he must be sent to the main windows. For this, click on the **Send G Code to Main Editor** button. Once loaded, the wizard program can be saved on the PC's file system or saved as a Macro.

1.9 Dialog Boxes

There are two types of dialog boxes. One used to set the value of a parameter called **Input box**. The other for displaying the value of some parameters called **Output box**. These boxes are called by commands: M0.1, M0.2, M1.1 and M1.2 but also by specific functions.

2.0 ShortcutsKeys

The buttons for the main commands have ShortcutsKeys that can be seen in the View -> ShortcutsKeys menu. Also all main menus have ShortcutsKeys

For more information, see the **EC Watch** Help. Can be downloaded here: www.cncbrain.com