

Simple  friendly



Kawasaki

**KTools
Software Manual**

Kawasaki Robotics (USA), Inc.

V 1.9.000

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0: Preface

The Kawasaki Tools Suite (KTools) was designed as a tool to help ease the editing and development of E, F Controller programs and interfaces. This tool stemmed from using other text editors to edit programs. What text editors are lacking is context about how the file is constructed. The KTools Suite aims to change this by organizing the file's contents into an easy to navigate tree. Each section of a robot file is displayed in the tree and can be opened for editing.

KTools supports Windows 10 Operating System. It requires Microsoft Visual C++ 2015 x86 Redistributable Package. To install KTools, execute setup.exe. If the runtime package already exists, users can skip the package installation process.

License file should be placed in the installation folder. Normal uninstall or reinstall process would not remove the license file from the installation folder. If you have any license question, please contact to Kawasaki for more information.

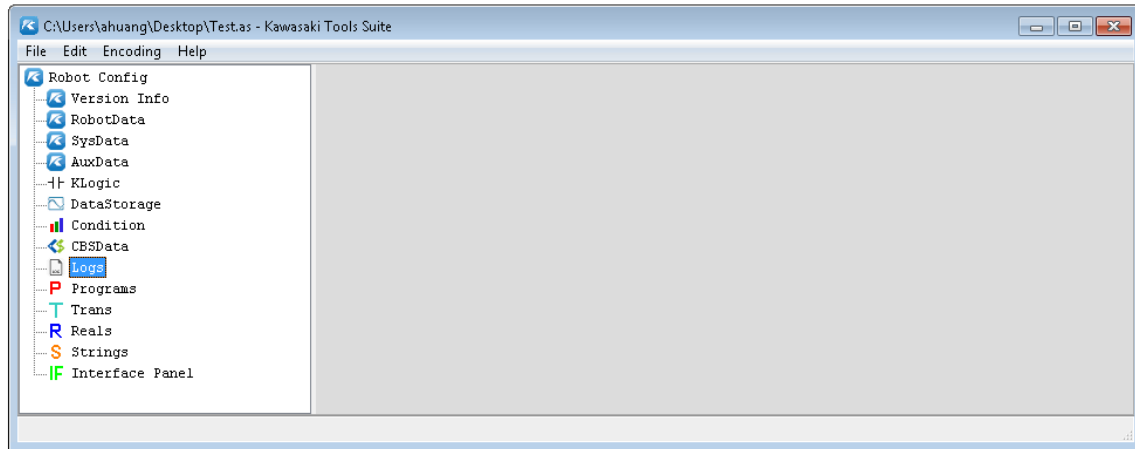
Kawasaki does not suggest users to run KTools in Virtual Machine environment.

The right side of KTools works like a notebook. Each tab contains one section that can be edited, either in a text, or in a graphical form as in the Interface Panel Editor. Tabs may be viewed one at a time or arranged side by side or top to bottom.



2: Section Concept

All data within a robot backup file belongs in a particular place. Order is not important, but many types of information belong within specific sections. The main sections are as follows:



	Version Info	Contains robot model, number of axes and AS Software. List Servo Software for regular robot. List AMP, Application, Cubic-S for duAro.
	RobotData	Contains robot specific information
	SysData	Contains many controller specific and robot specific elements
	AuxData	Contains mostly application specific or user-defined settings
	KLogic	Contains K-Logic data, programs (lsqpg and numpg) and comment section .SIG_COMMENT
	DataStorage	Contains read-only Data Storage data
	Condition	Contains .CONDITION and .OPE_INFO sections
	CBSData	Contains read-only Cubic-S data
	AWData	Contains read-only Arc Welding data
	Logs	Include all logs from all data save like the most common .ERRLOG, .FLTLOG, etc.
	Programs	Exists for each program in the robot
	Trans	Contains transformation point data

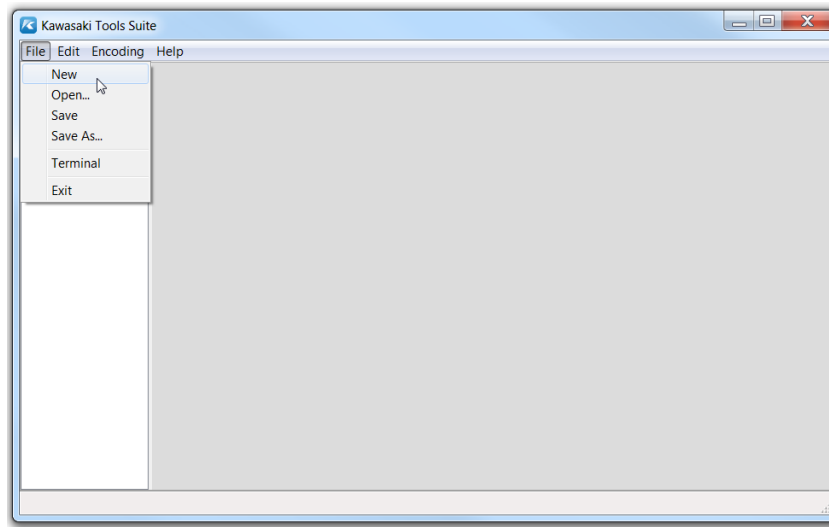
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- | | |
|---------------------------|--|
| J Joints | Contains precision point data |
| R Reals | Contains real variable data |
| S Strings | Contains string variable data |
| IF Interface Panel | Contains the soft-interface description |
| O Others | Other data that is not within the above categories |

Note: A file may contain (1) or more of these sections, in any order. A backup saved from the robot will generally contain at least the first (5) sections.

3: Working With Files

By selecting file at the top left hand side of the main window the user is presented with a drop down menu with the following option.

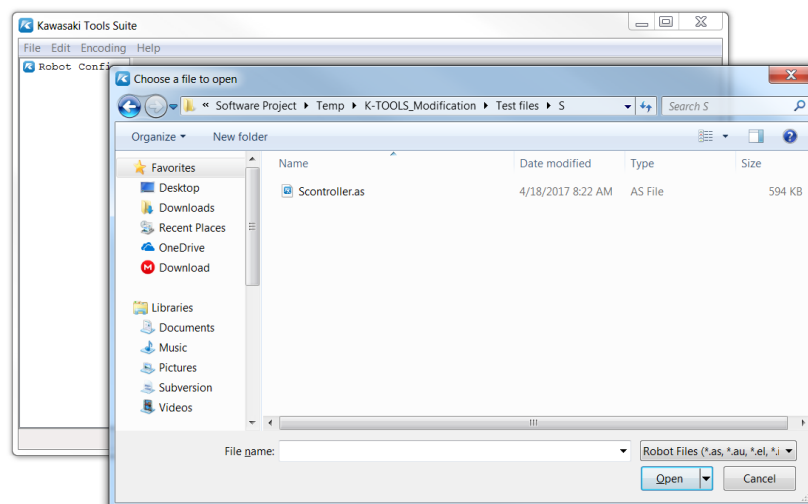


3.1 Creating a New Project

To start a new project, select new from the file drop down menu or press CTRL-N.

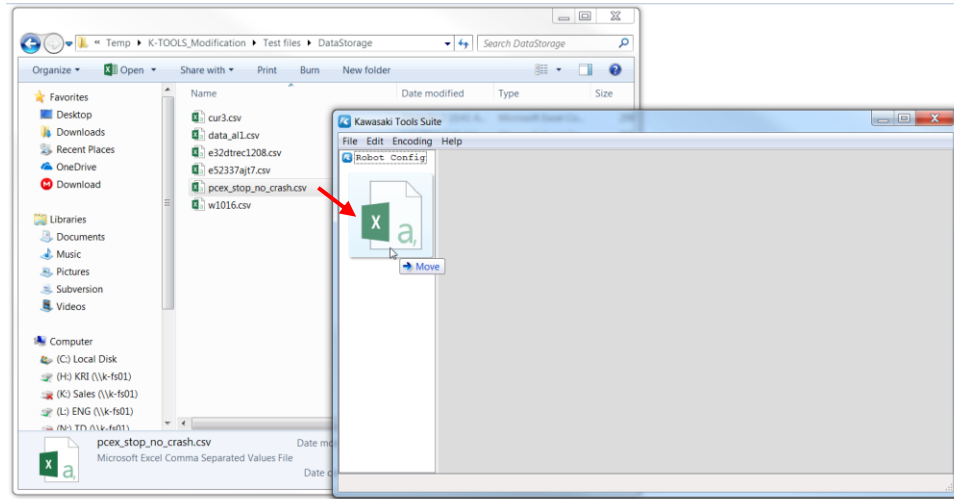
3.2 Opening a Project File

To open a file, choose Open from the File drop down menu or press CTRL-O. When a file is opened, the contents are loaded into memory and an outline is shown in the tree.



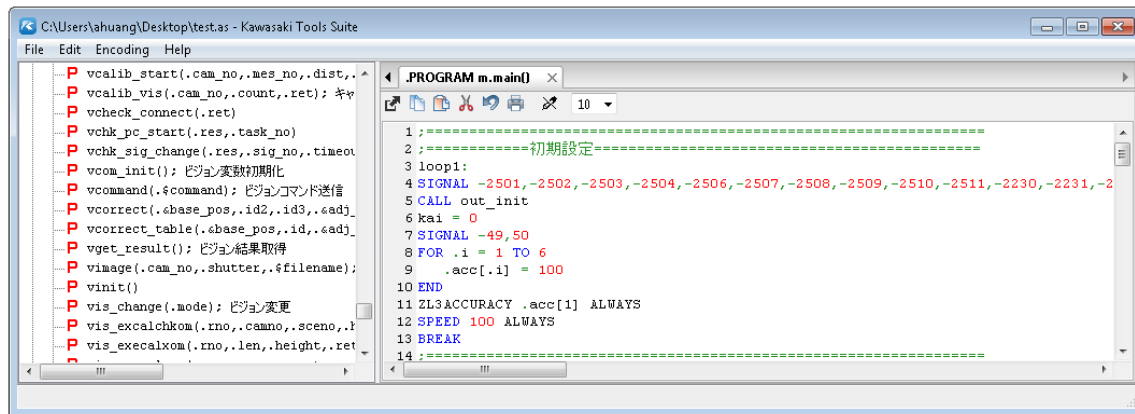
3.3 Drag-n-Drop Opening

Another way to open a file is to simply select the file you want to open by holding down the left mouse button and drag the item to the sections area of KTools and release. The selected section is then open and displayed in the file tree.

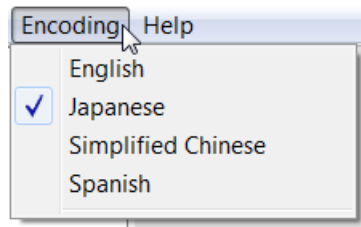


3.4 Multi-languages Support

KTools contains an option to support non-English characters including Japanese, Simplified Chinese and Spanish.

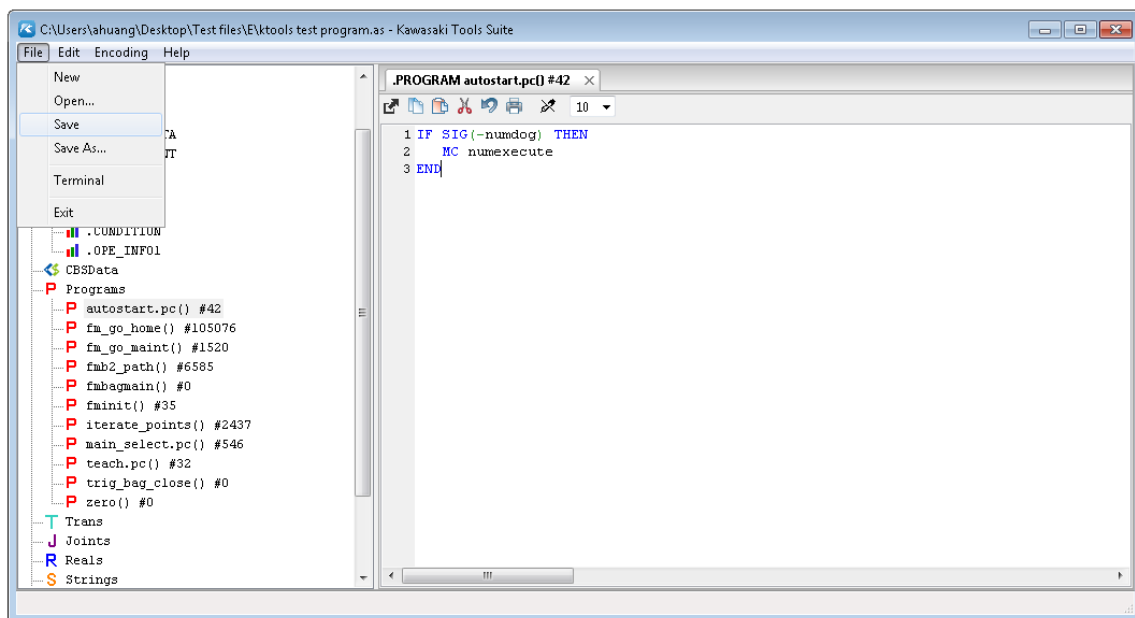


Without enabling non-English character support, functions and statements may not display while viewing a file. If Encode selection changes after file editing, a file reload warning would pop-up.



3.5 Saving a Project File

To save a file, choose Save from the File menu, or press CTRL-S. Save As is also an option on the File menu. When a file is saved, the current memory contents, are written to file. Before KTools V1.8.002, any unsaved tabs are not included when the file is saved. It is important to save each tab before saving the file. Start from KTools version (V.1.8.002+), all unsaved tabs are included when the file is saved.

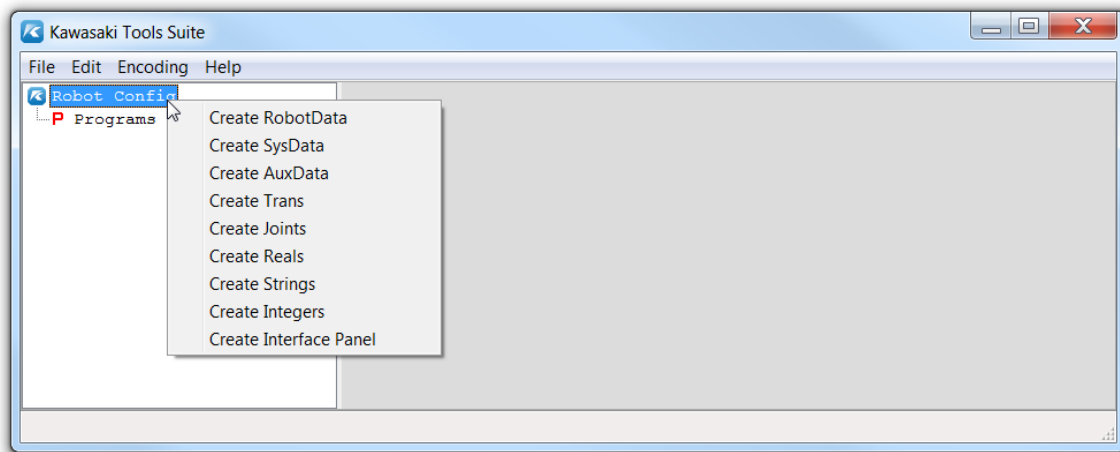


4: Creating, Deleting and Modifying Sections

When KTools starts, there is nothing in the tree. To start a new file, choose New from the File menu or press CTRL-N. This creates the skeleton of the file and allows adding sections to it or the user can open a file as described under Opening a File.

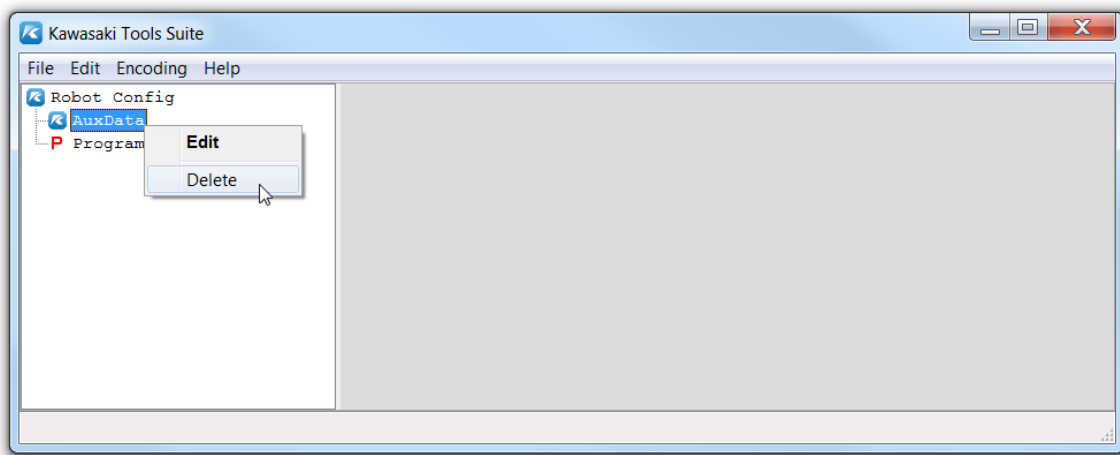
4.1 Adding a Section

To add a section, right-click on the Robot Config item in the tree and choose the appropriate option.



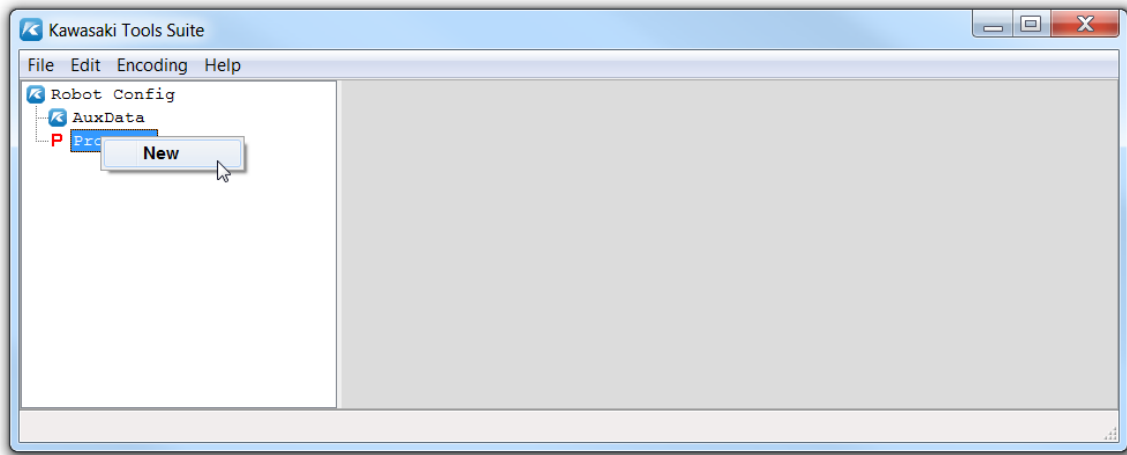
4.2 Deleting a Section

To remove a section, right-click on the item in the tree and select Delete.

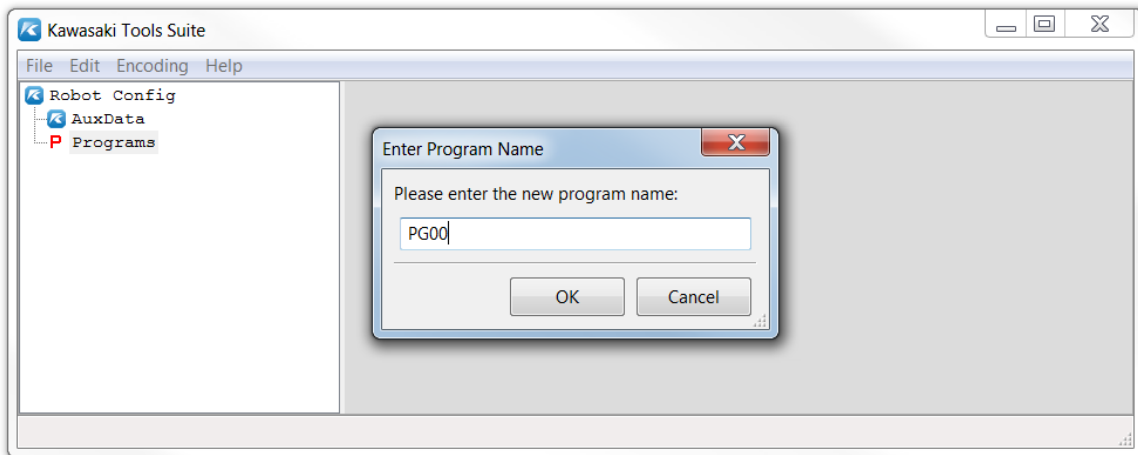


4.3 Creating a Program

To create a program, right-click on Programs in the tree and select New.

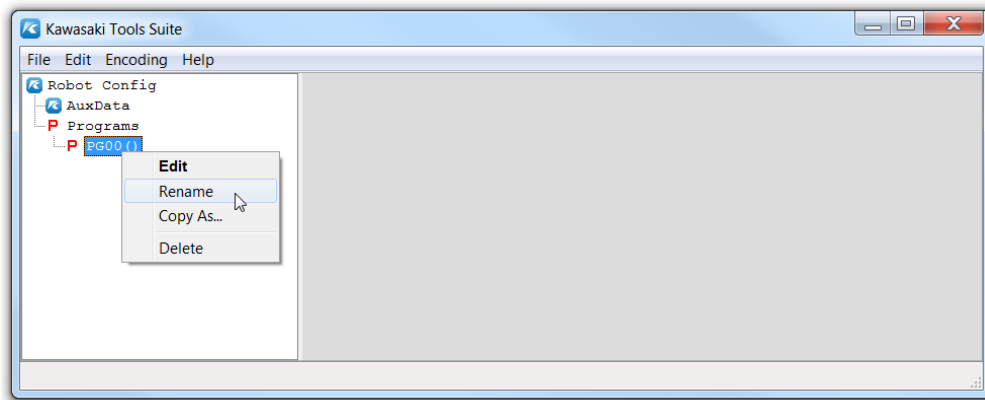


Enter the desired program name in the text box and click on OK.

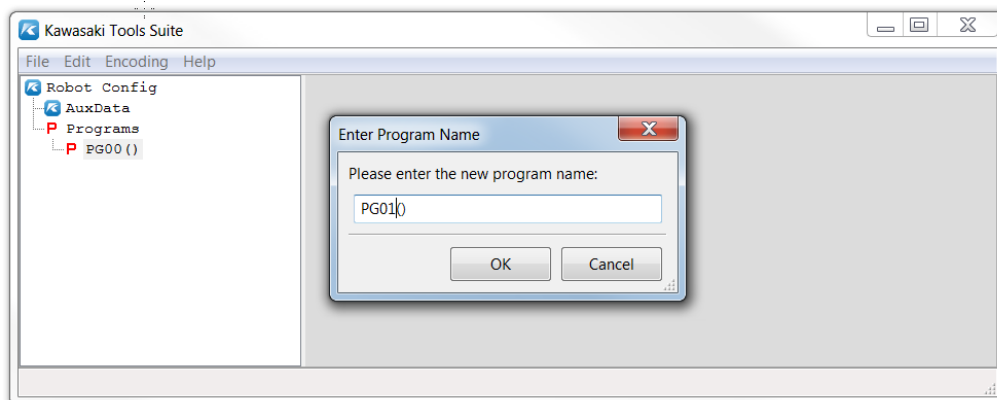


4.4 Renaming a Program

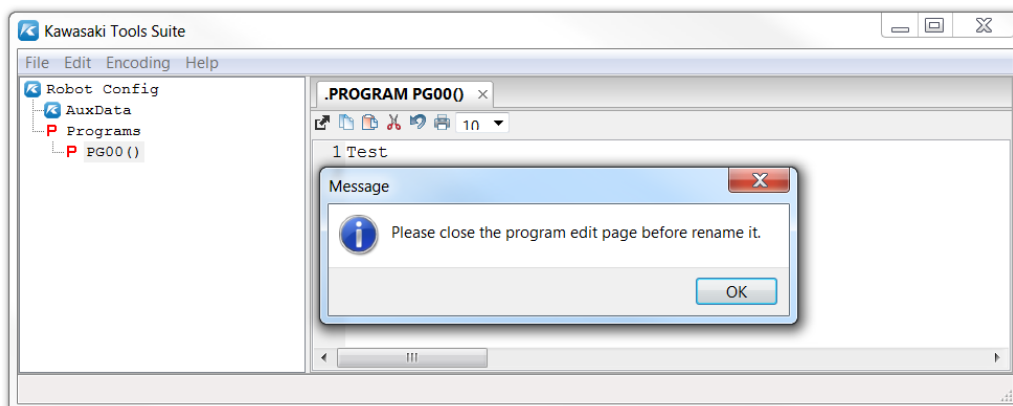
To rename a program, right-click on the desired program in the tree and choose Rename.



Enter the desired program name in the text box and click on OK.

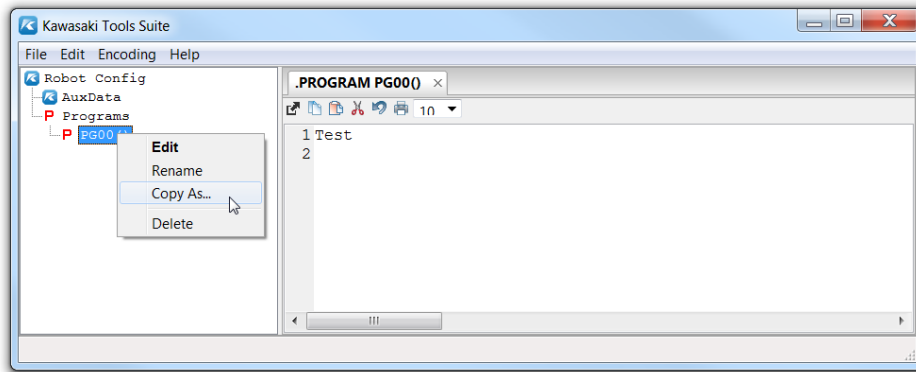


If the program is opened, a warning message windows will pop-up.

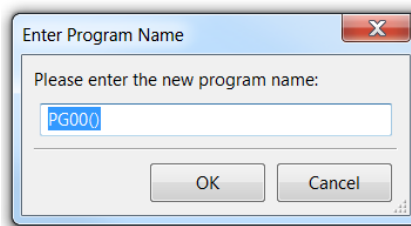


4.5 Copying a Program

To copy a program, right-click on the program in the tree and choose the Copy As option.



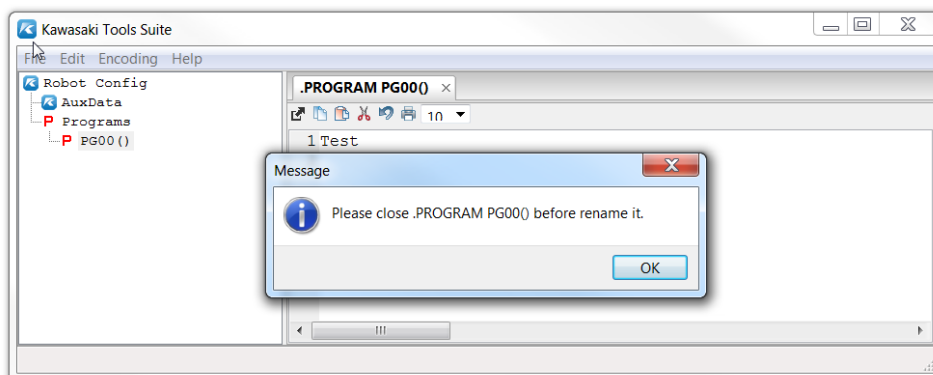
Enter the new program name and select OK.



4.6 Automatic File/Program change Detection

If a file is changed while opened in KTools, a message will appear prompting the user to reload the file or continue with the current open copy.

If programs are renamed or deleted in the tree while it is still open, a warning message windows will pop-up and block the process.

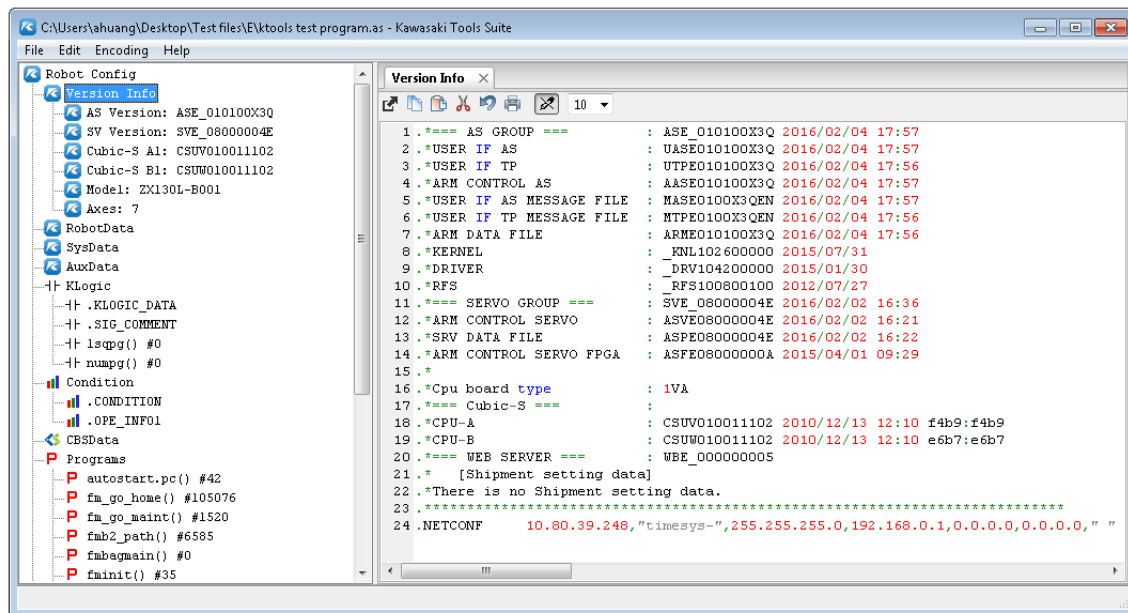


5: Tab Window

Tabs windows allow users to open and display multiple sections from the Robot Config tree.

5.1 Opening a Tab

Tabs are opened by double clicking on the desired section data or by using the mouse right click and selecting edit, edit text or simulate. The tab is populated with the contents of the particular selected section. Making changes in the tab does not immediately cause the file to change.

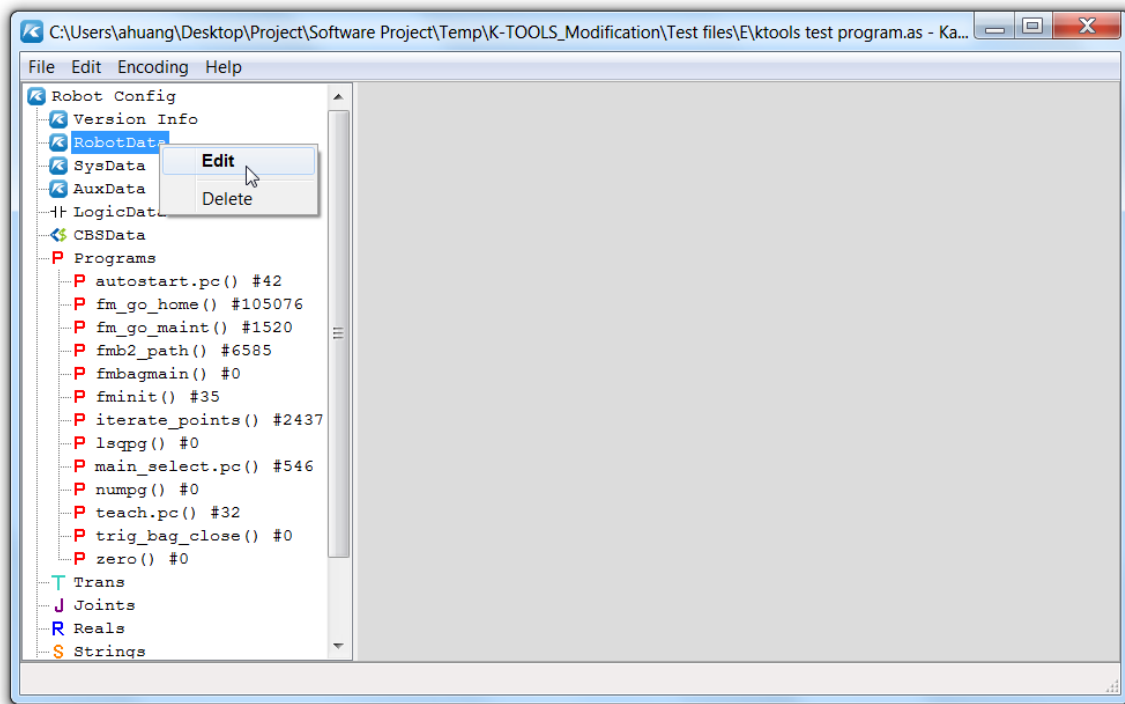


Additionally, there are various types of tabs base on the type of information selected such as text, simulation, Data Storage plot and interface builder.

5.2 Text Tab

The text editor is designed to make editing robot programs easy. It shows the program step numbers for easily locating syntax errors from robot error messages. The editor also highlights and indents robot code. The font size can be customized and standard cut/copy/paste/undo features are included. In addition to editing robot programs, the editor can be used to edit other sections, such as the Robot Data, Auxiliary Data, System Data, Strings, Reals, Joints, Trans, etc.

A text tab is opened by double clicking the left mouse button on desired data or by clicking the right mouse button and selecting edit.

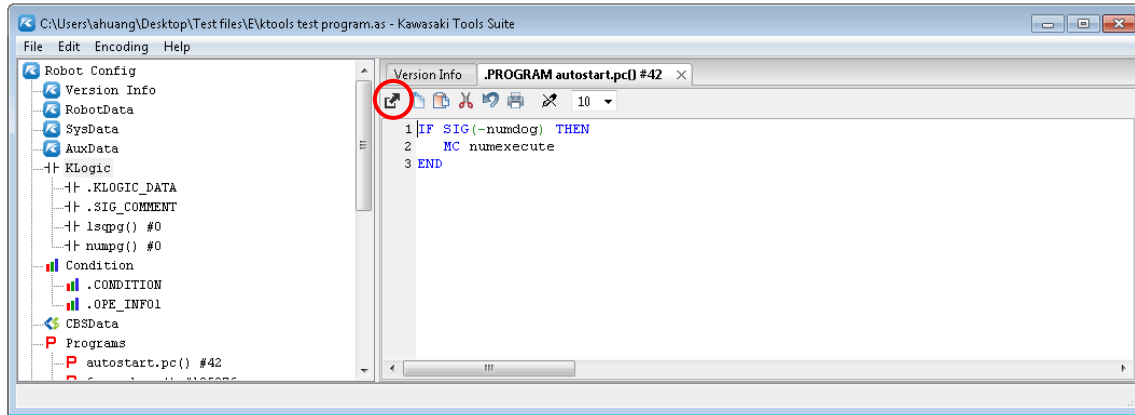


Once the text tab is opened the user can add, modify or remove lines of code for the selected set of information. There are export, copy, paste, cut, undo, edit disable and font size for each text tab.



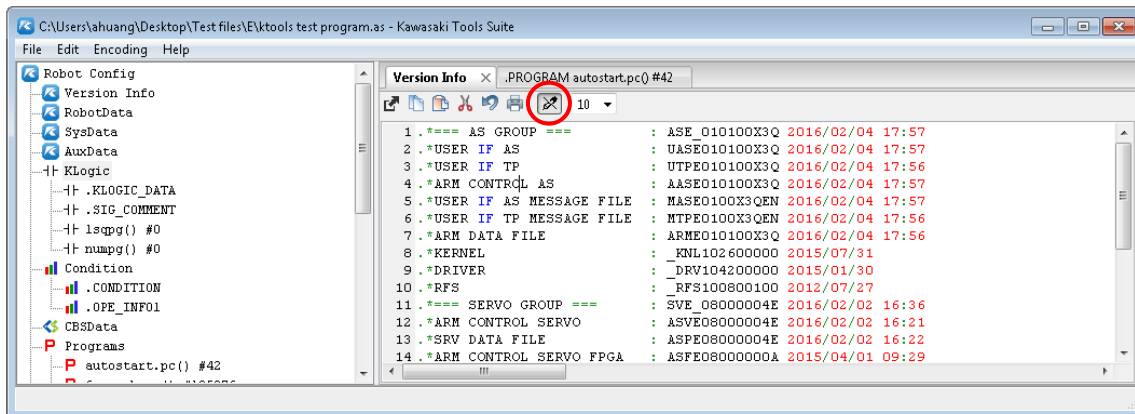
5.2.1 Export a Text Tab

To export the selected tab content to a file, click the export icon on the tab. Enter the new program name and select Save.



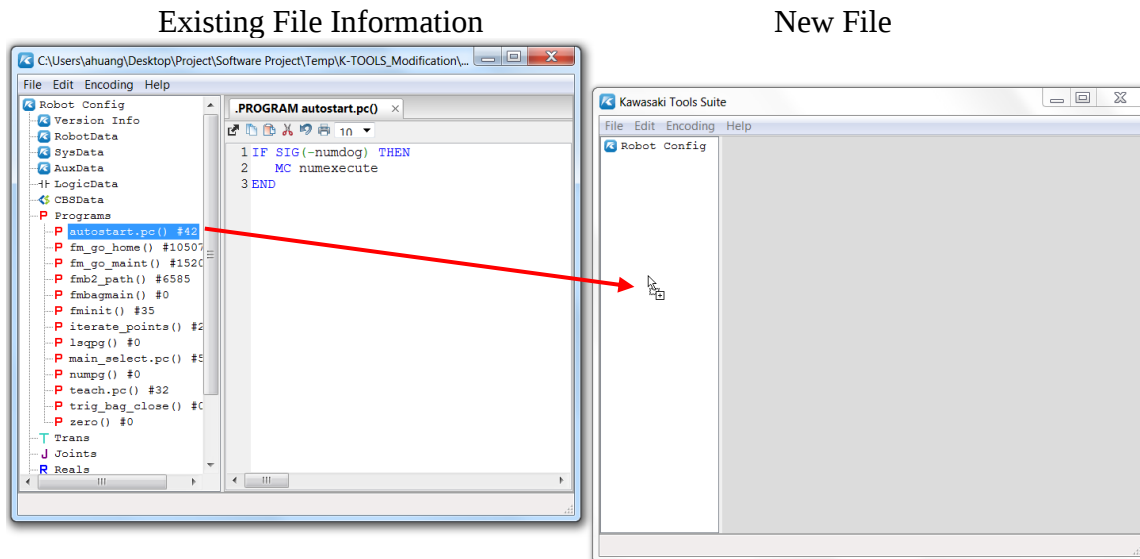
5.2.2 Edit Disable

Users can temporarily prevent unexpected text modification by clicking “Edit Disable”. Many sections are defaulted with this setting. For example, RobotData, SysData, AuxData, etc.



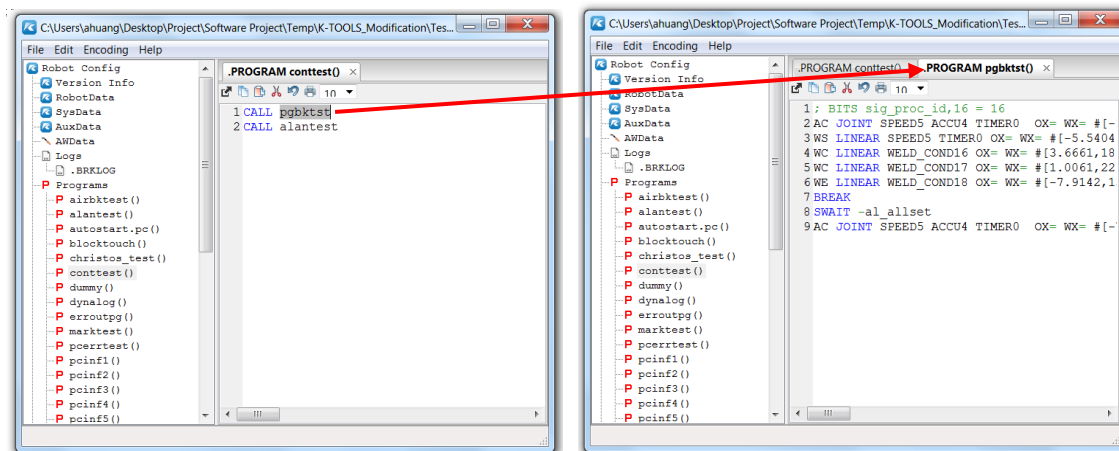
5.2.3 Drag-n-Drop Features

To make editing easier, sections may be dragged and dropped between instances of KTools. Simply select the file you want to copy by holding down the left mouse button and drag the item to the tree of the new KTools file and release. The selected section is then displayed in the new file tree. Edits can be made to this program and loaded to the robot.



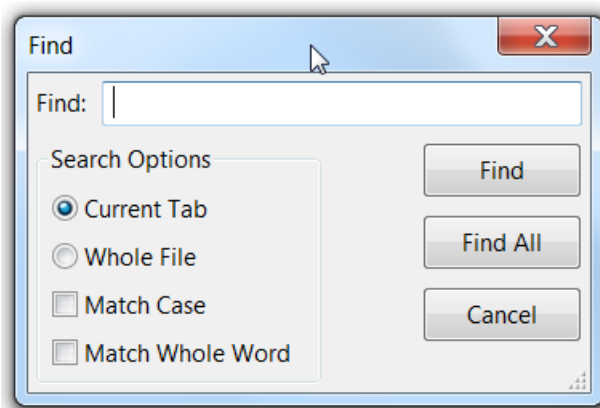
5.2.4 Program Tag Opening

To make opening easier, the program name acting as an input argument of AS functions (ex. MC PRIME, EXEC, STEP, JUMP, PCEX, etc) could be double clicked on to open a new program text tab.



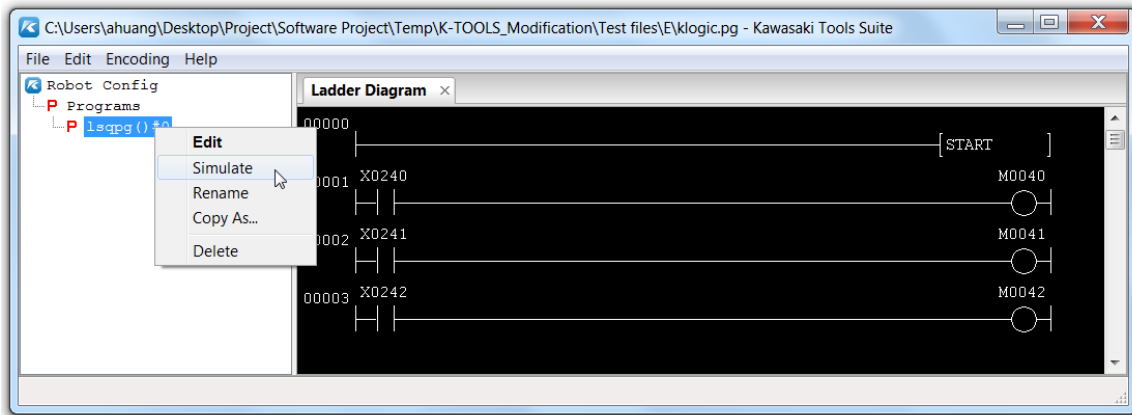
5.2.5 Find Function

The Kawasaki Tools Suite has a nicely featured find utility. To access the find function, choose Find from the Edit menu, or press CTRL-F. This function can be used to search a currently open tab, or the entire robot file. Options exist to match case and match whole word, as would be typical of most programs. The Find / Find Next button will jump to the occurrence in the file and highlight it on the screen. F3 may also be used for Find Next. The Find All button will display a list of all occurrences that can be double-clicked to jump to an occurrence in the file.

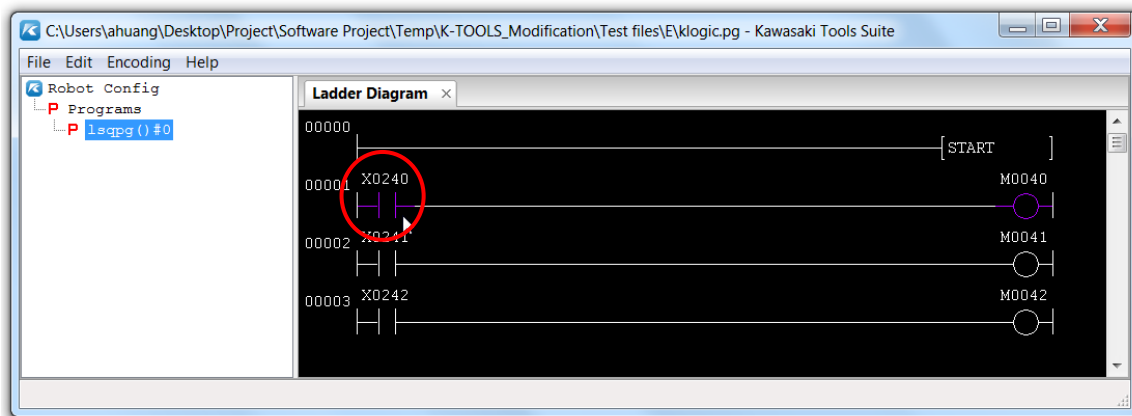


5.3 Simulation Tab

The Simulation Tab provides the user with an interface to simulate KLogic I/O. By right clicking on the program **P** lsqpg() and selecting simulate in the pop up window.



KLogic ladder diagram is displayed along with comments. The contacts highlight when the condition is met. Just like the monitor mode in KLadder. The user can toggle a desired output with a left mouse.

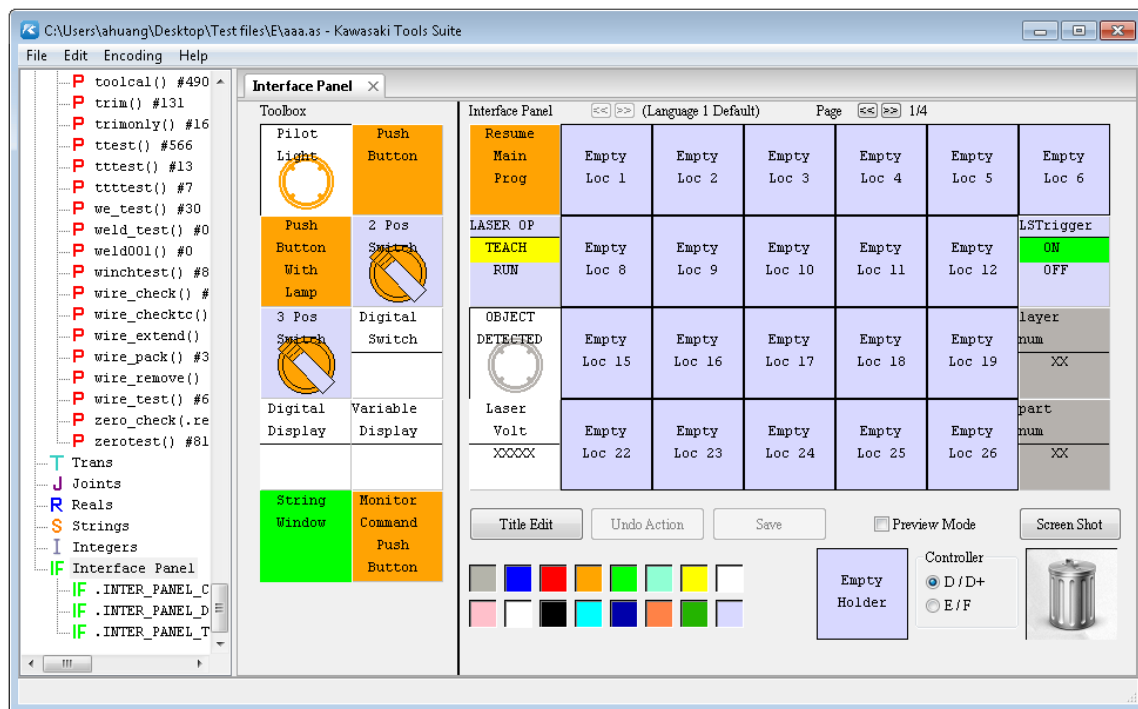


5.4 Interface Panel Tab

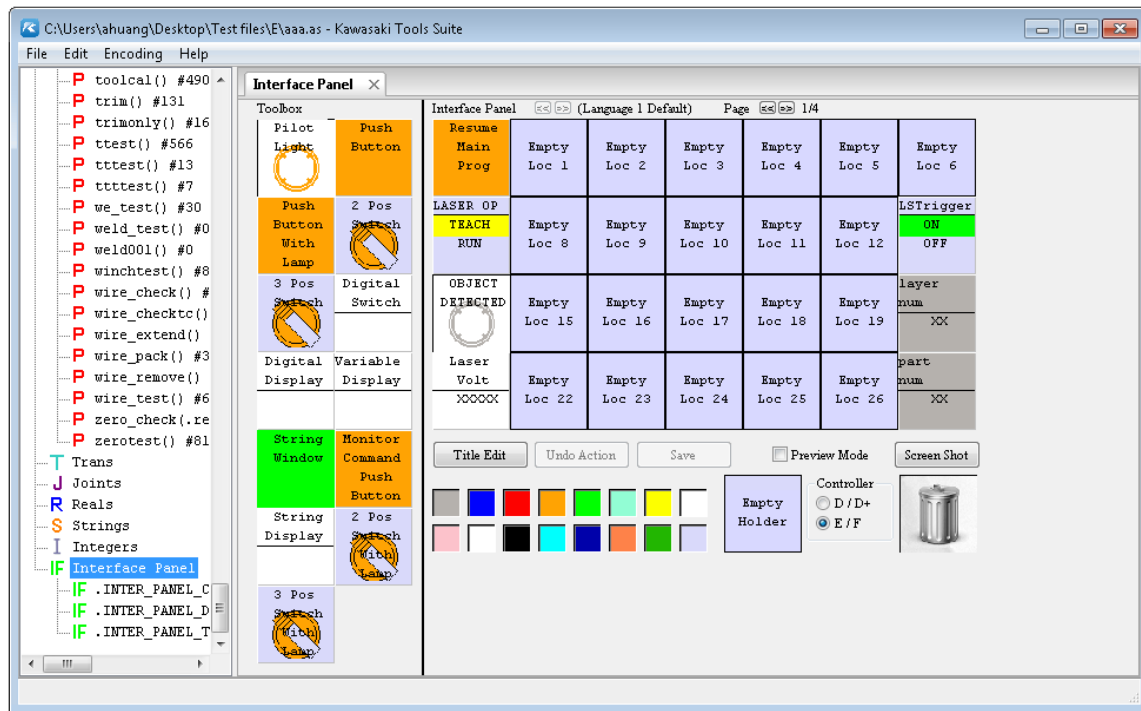
This feature allows the user to create virtual switches, buttons and indicator lights on the Teach Pendant that work just like their physical equivalents. There are also some special types of controls, including String Message Windows and Variable Display boxes. A description of all the available controls are shown in SECTION 5.4.1 Working With Controls.

The Kawasaki Interface Designer allows creating and editing of Interface Panel designs for Kawasaki D/ D+ and E/ F Controllers. New design allow users to change text directly through text editor to the Interface Panel related section programs. Please note not all E Controller AS software support Multi-language panel design.

D/D+ Controller Interface Panel

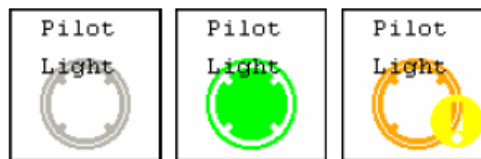


E/F Controller Interface Panel



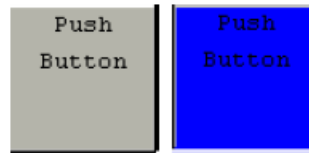
5.4.1 Working with Controls

The Interface Designer is capable of working with 10 different types of controls that Kawasaki D Controllers support. The 10 types of controls are described in the following sections.

Pilot Lamp

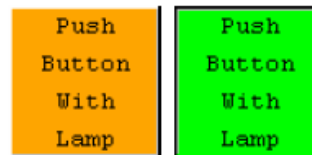
Pilot lamps may have 3 states, off, on, or off with exclamation. If the "Exclamation when off?" property is set, the exclamation will appear in the off state. This can be changed via the properties page.

Push Button



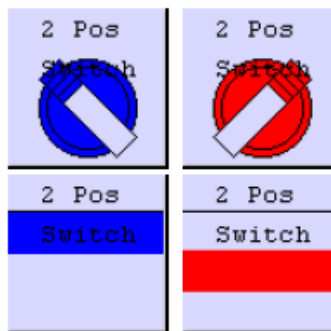
Push buttons have 2 states, on or off. The state changes momentarily when the button is pressed.

Push Button with Lamp

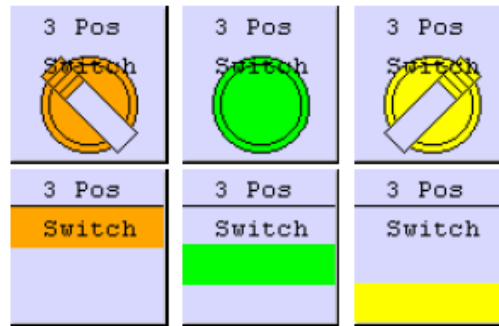


Push buttons with lamps have 2 states, but state is determined not by the push of the button, but the lamp signal.

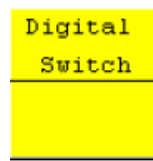
2 Position Selector Switch



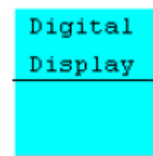
2 Position Selector Switches can be Rotary or Up/Down type. Each type has 2 possible states and each state has a color and a signal. The Rotary or Up/Down selection can be changed by changing the "Switch Type" on the properties page.

3 Position Selector Switch

3 Position Selector Switches can be Rotary or Up/Down type. Each type has 3 possible states and each state has a color and a signal. The Rotary or Up/Down selection can be changed by changing the "Switch Type" on the properties page.

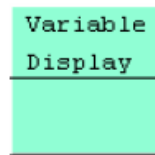
Digital Switch

Digital switches allow setting a range of signals to be the binary or BCD representation of a number. The switch will either increment the number when pressed, or display a box to input a value. This can be changed by the "Input Type" property on the properties page. Digital switches only have 1 state.

Digital Display

Digital displays are read-only versions of a digital switch. They display a binary or BCD representation of a range of signals. Digital displays only have 1 state.

Variable Display



Variable displays allow setting a robot variable to an integer or real variable. When pressed, a box will prompt for the value. The choice of Integer or Real values can be made on the properties page. Variable displays have 1 state.

String Window



String windows are useful for displaying messages to the user. A string window can be up to 4 blocks wide. String windows have 4 lines of text and 10 characters wide per box, up to 4 lines of 40 characters total. The text and color of a string window can be set using the IFPWPRINT command. Refer to the D Controller AS Language Manual for more information.

Monitor Command Push Button



Monitor command push buttons can be used to run a monitor command such as PCEXECUTE from the Interface Panel, when pressed, the command is run and the button changes to its depressed state.

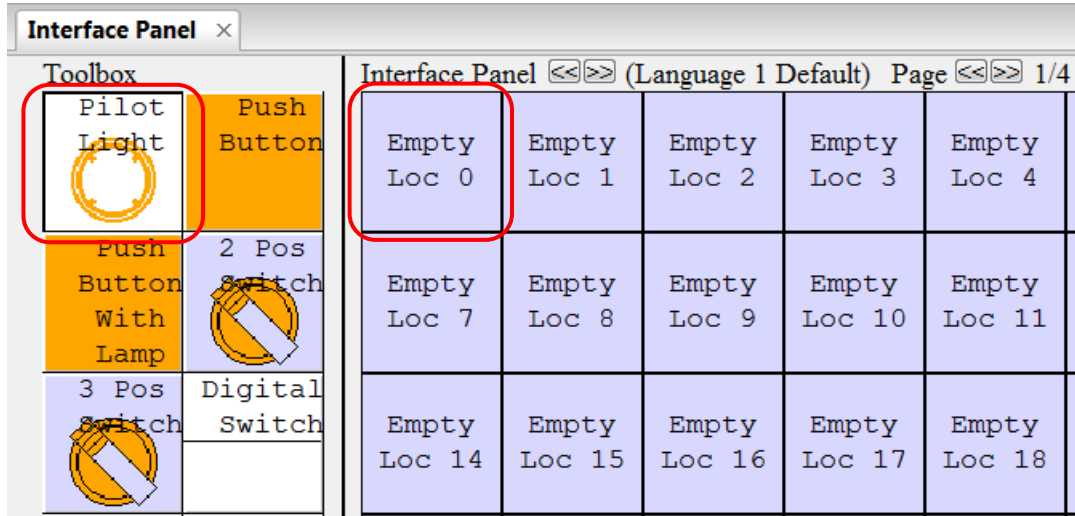
Unknown Item



Undefined items which are not currently been supported by KTools. Users can still copy, move, delete the item.

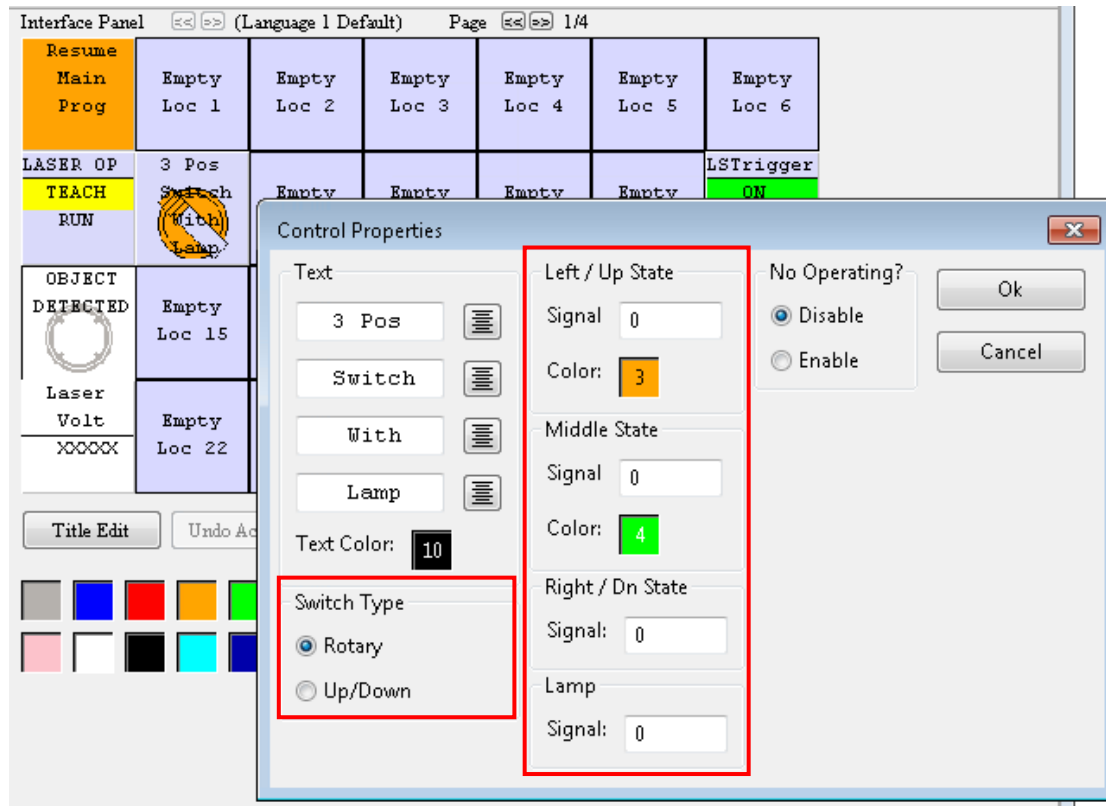
5.4.2 Adding Controls

To add a control to the design, left-click on the type of control desired in the Toolbox and drag it to an empty location in the grid.



5.4.3 Changing Control Properties

To change the properties of a control, such as the color, text, or style; right-click on the control. This will bring up the properties dialog. In the following example, a 3 position selector switch is shown. There are 3 different signals that can be associated with this type of switch, and the switch can be an Up/Down or Rotary style.

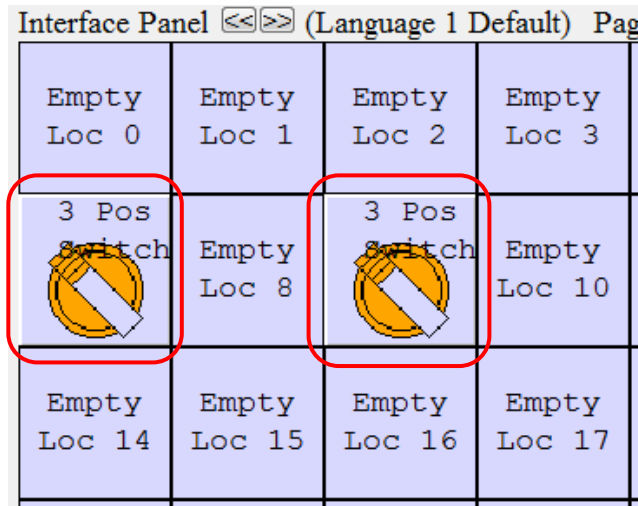


5.4.4 Previewing Other States

To change the state of a control, to see what the colors look like, left-click on the control. Each click will change the state of the control. Most controls have 2 states, but 3 position switches have 3.

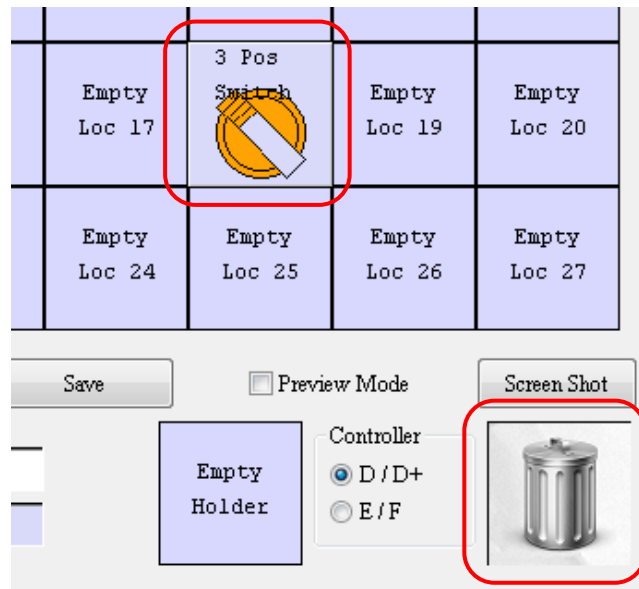
5.4.5 Moving & Copying Controls

To move a control to a different location on the grid, left-click and drag it to the new location. To copy a control, hold the CTRL key, then left-click and drag to a new location on the grid.



5.4.6 Deleting Controls

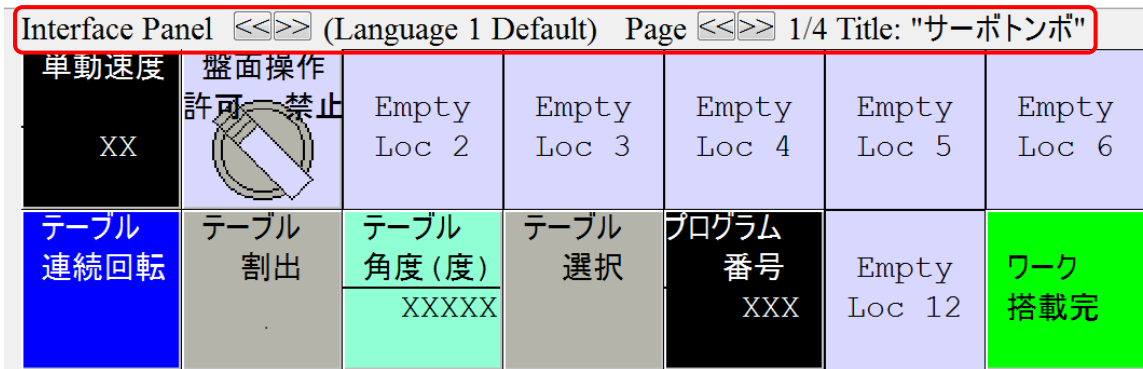
To delete a control, drag it to the Trash Can icon in the lower right portion of the screen.



5.4.7 Multi-Language Panel and Panel Pages

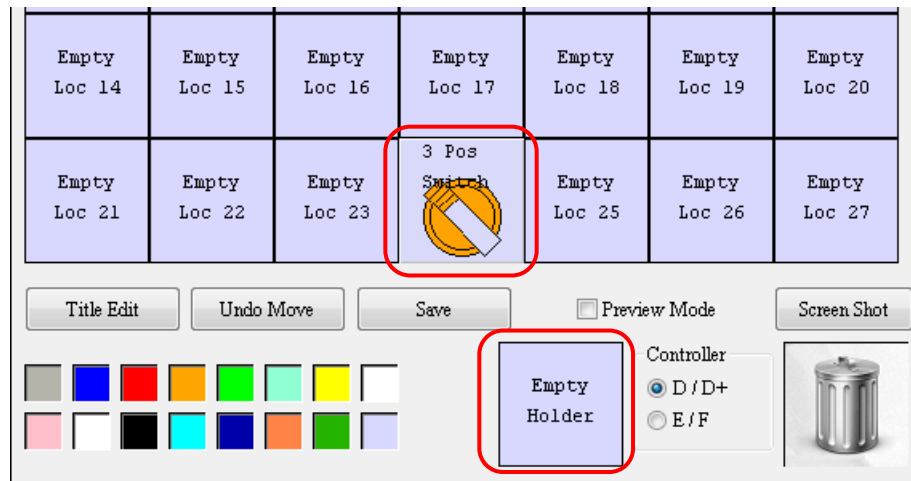
Use  and  buttons to change to the desired language panel and panel page. Panel comment and page title show at the right of the buttons.

If the current AS software supports only one language panel,  and  buttons for panel swap would be hidden.



5.4.8 Moving Controls Between Pages

To move a control to another page, left-click and drag it to the Empty Holder in the bottom center of the screen. Then, use  and  buttons to change to the desired page. Then, left-click and drag the control to the desired location in the grid.



5.4.9 Changing the Color Pallet

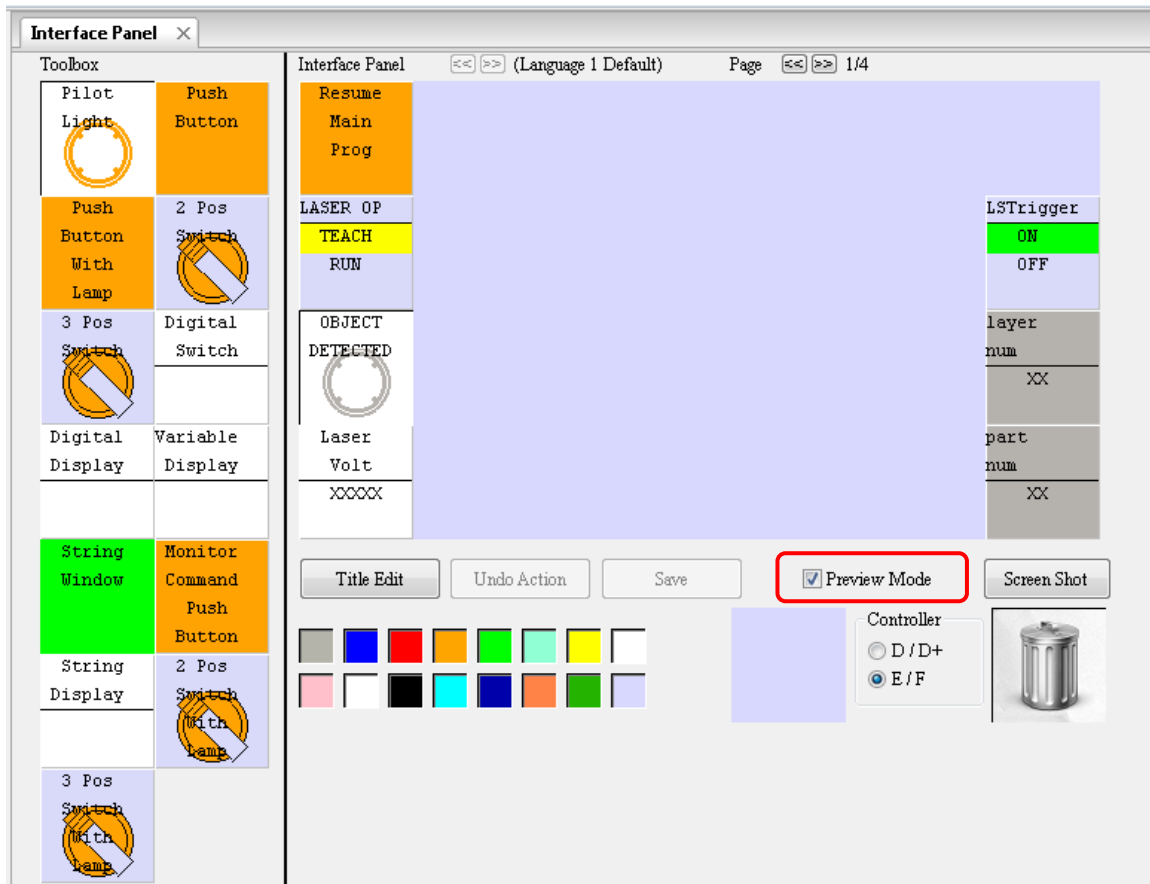
The Interface Panel on Kawasaki Robot Controllers allows 16 different colors to be displayed at one time. These 16 colors may be chosen by the user. To change the colors in the pallet, click on the colored blocks in the lower left corner of the screen. A window will popup displaying all 256 available colors.

Without changing the original selected color in the pallet, users can click on the color block again to close the popup window.



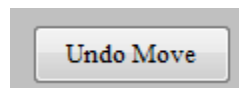
5.4.10 Using Preview Mode

The preview mode is provided to help with creating screenshots of the Interface Panel Design. When the Preview Mode check box is clicked, the background of empty locations on the grid is erased so that screenshots may be taken.



5.4.11 Using Undo Move

Many actions that can be done using the Interface Designer can also be undone. The last action can be undone using the Undo Move button located just above the Empty Holder.

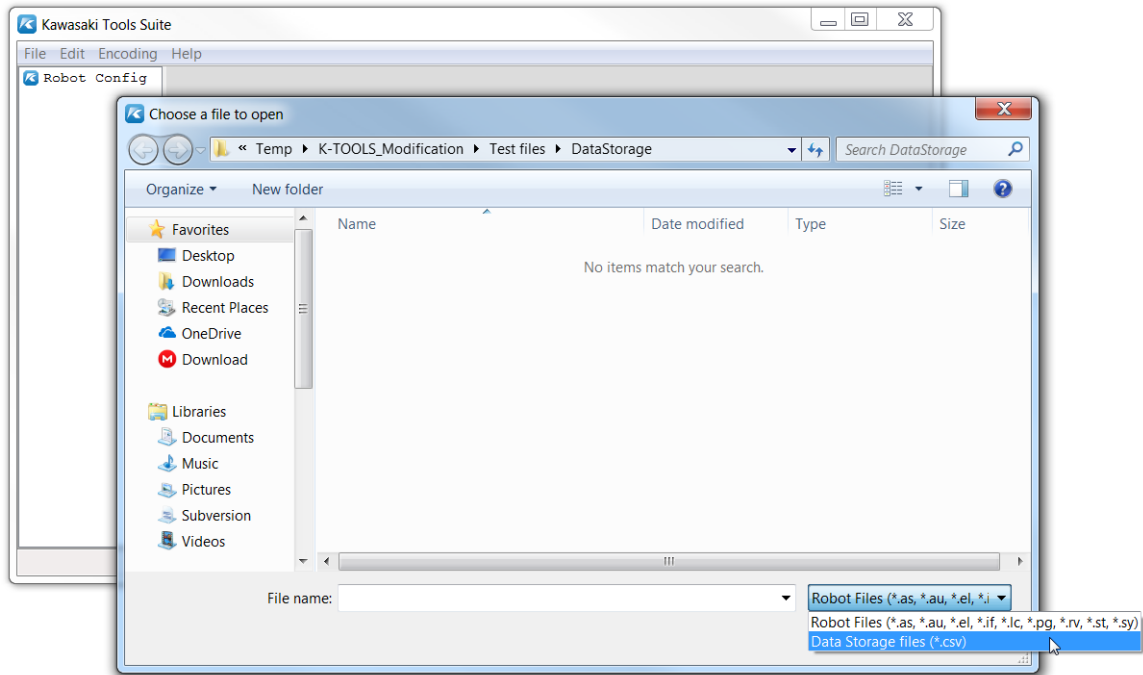


Cubic-S data is able to be viewed within KTools. In order to view the Cubic-S data select the CBSData option within the sections area. If this does not appear, then no Cubic-S data was found within the opened file. This data may be modified however, this is not advised and should be changed within CS-Configurator.

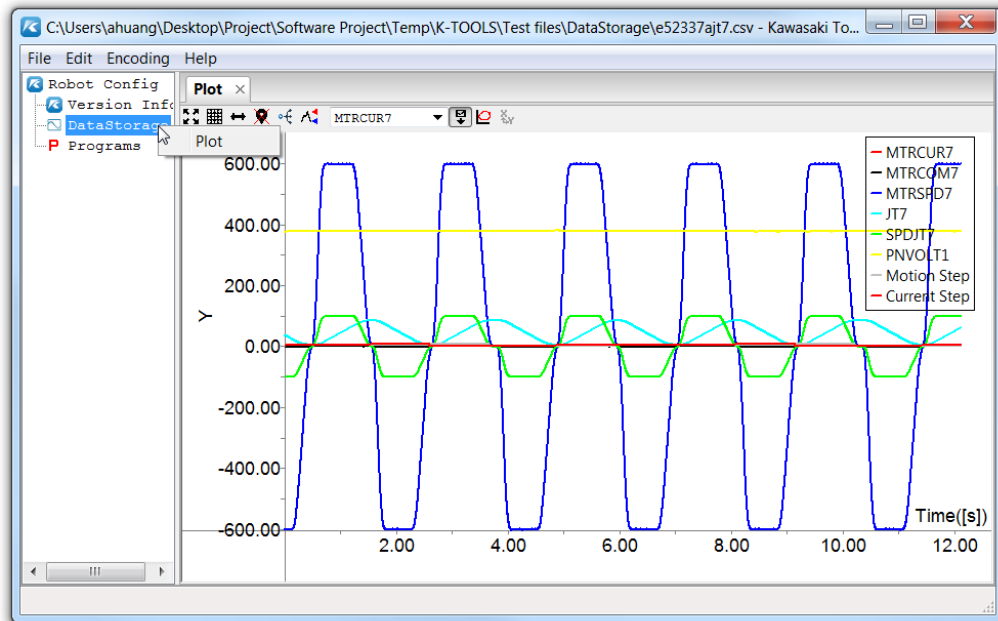


5.6 Data Storage Plot Tab

Data Storage is a function that assists users to record various types of data. The data is saved into .csv format. To open the file through drop down menu, users need to select Data Storage files (*.csv) in the extension combo box.



By right clicking on DataStorage and selecting Plot in the pop up window.

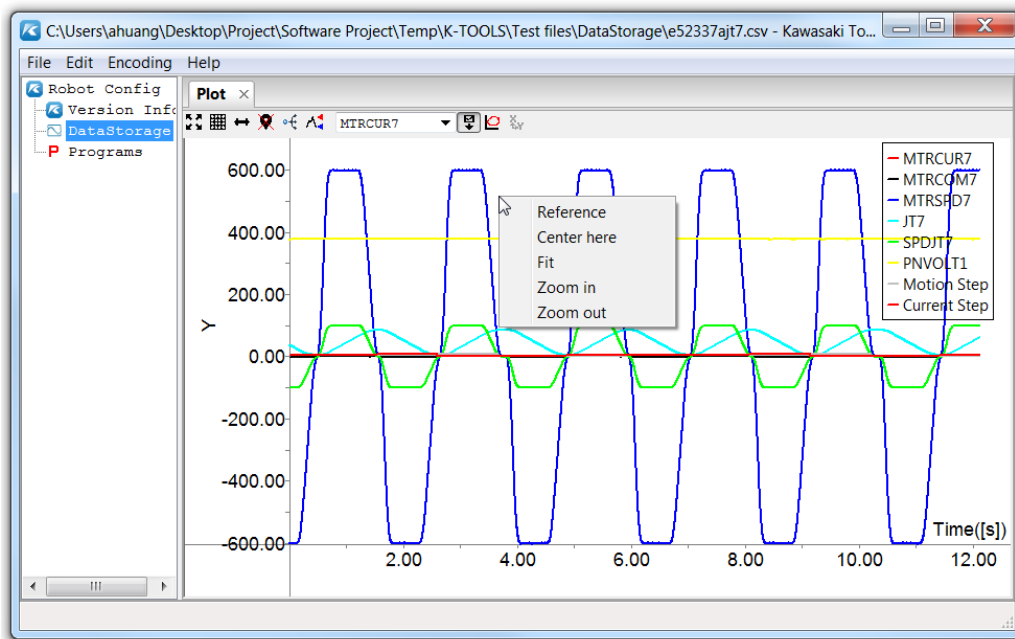


5.6.1 Data Storage Plot Basic Operation

The following operation is supported:

- Rectangular zoom: Left mouse press with mouse move
- Move Pan: Right mouse press with mouse move
- Vertical scroll: Mouse wheel
- Horizontal scroll: Mouse wheel with SHIFT
- Zoom In/Out: Mouse wheel with CTRL
- Add reference line: Left mouse double clicking
- Move reference line: Left mouse press close to the reference line then mouse move

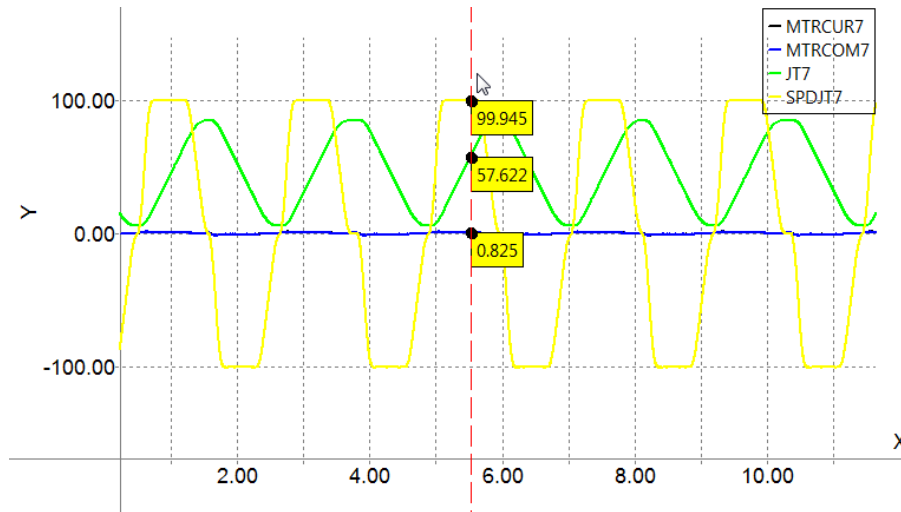
Right click on the plot shows more operation functions.



5.6.2 Signal Trace

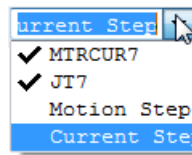
By left double clicking on the plot, or by right clicking on the plot then select “Reference”, a vertical reference line shows on the plot. All value of the signals with respect to the reference time would display in yellow boxes beside the intersection points. Users can press the left button of the mouse then drag the reference line.

More than one reference lines would be shown in the plot simultaneously.

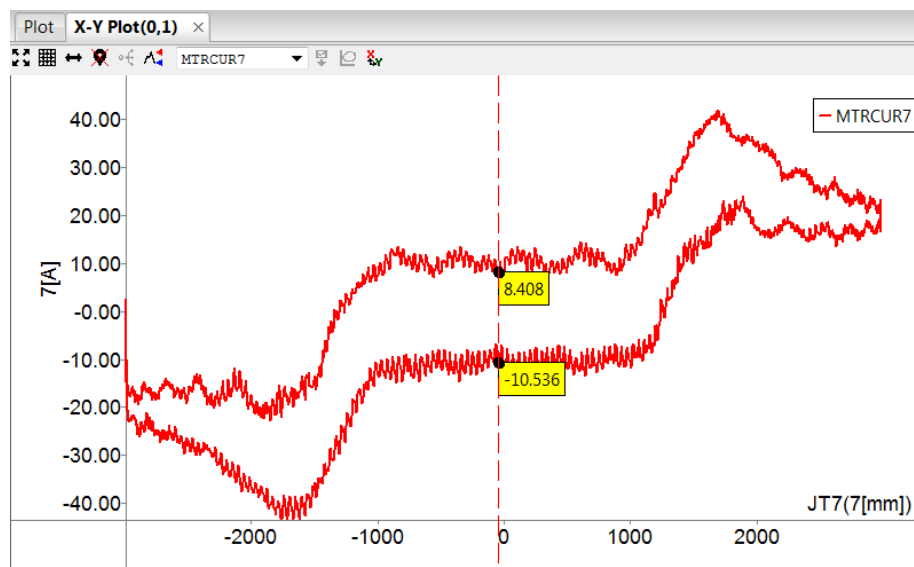


5.6.3 X-Y Plot

The X-Y plot could be generated for the convenience of comparison with user's signal selection. Uncheck the combo selection until only two signals left.



By clicking the X-Y plot button , a X-Y plot shows on the new tab. The first checked signal shown in the combo selection is the X axis, the second shown is Y axis. User can swap the X-Y axes by clicking axes swapping button . Multiple points could be traced on the vertical reference lines.



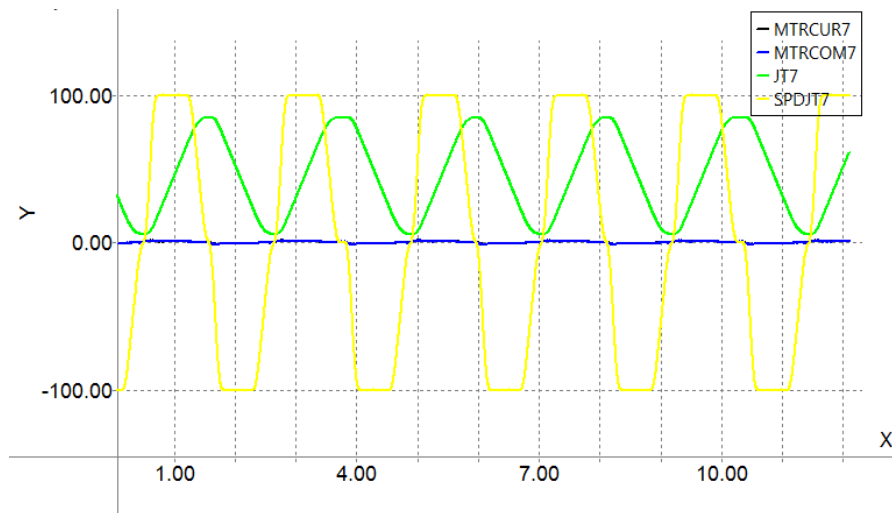
5.6.4 Data Storage Plot Tab Tools

More Plot functions are listed on the toolbar.

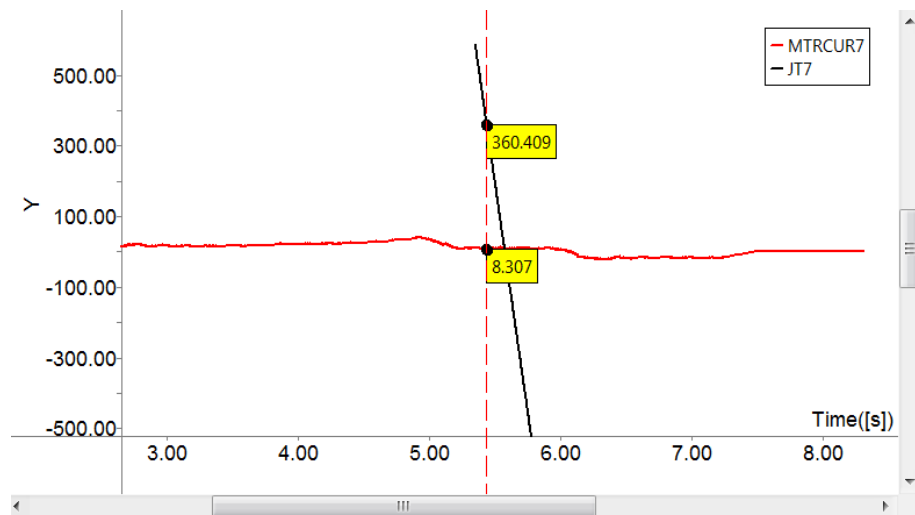
They are Fit, Grid, Show Scroll, Clear Trace, Split Plot, Show Min/Max, Signal Selection Combo, Select/Deselect All, X-Y Plot and X-Y Axes Swap.



- Fit: Fit the plot size according to the signals.
- Grid: Plot with grid.

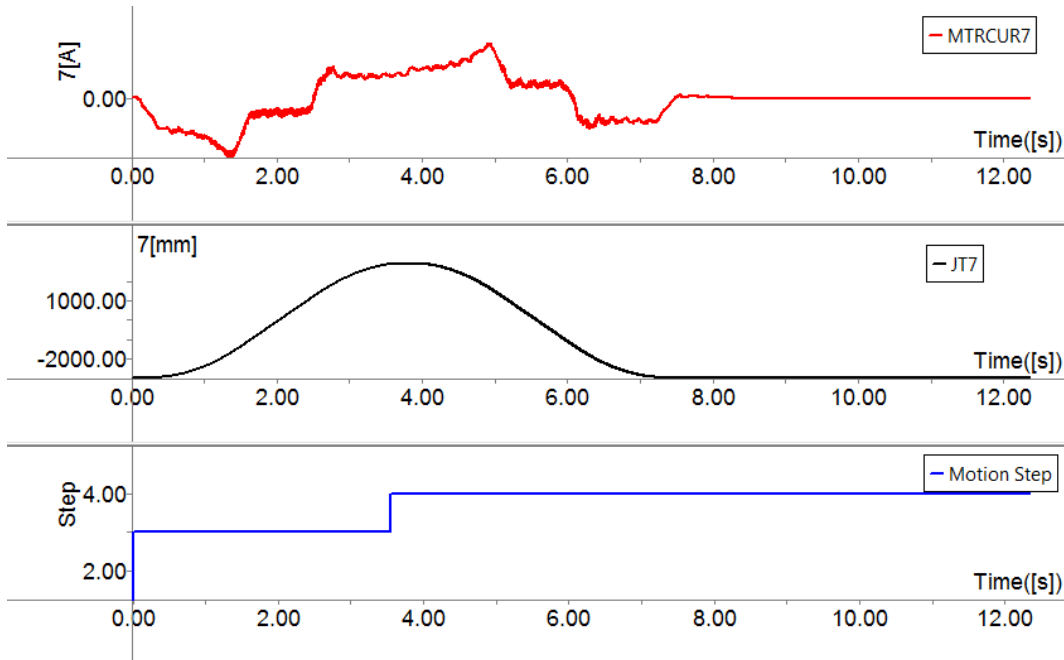


- Show scroll: Show horizontal and vertical scrolls. If a reference line is added, the line stays at the same place while the horizontal scroll is moving.

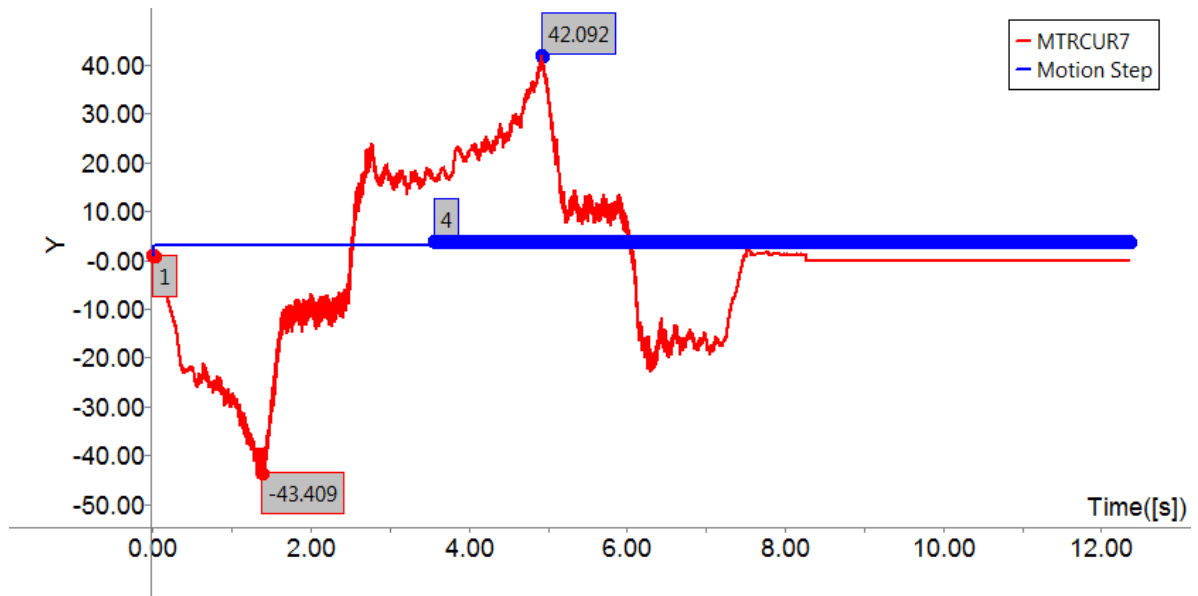


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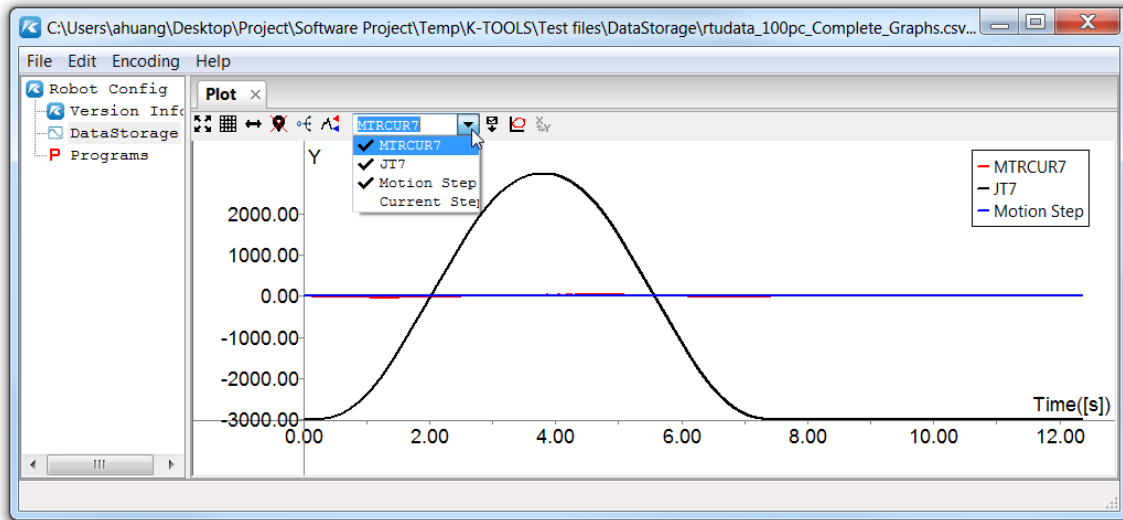
-  Clear Trace: Clear all reference lines.
-  Split Plot: Display signals in single or separate windows. The number of display signals would have influence to the quality of plot. Reduce the number of display signals if the plots are not readable.



-  Show Min/Max: Display the maximum and minimum value of the signals. If there are multiple minimum or maximum points, all of them will be dotted but only the first point has value label.



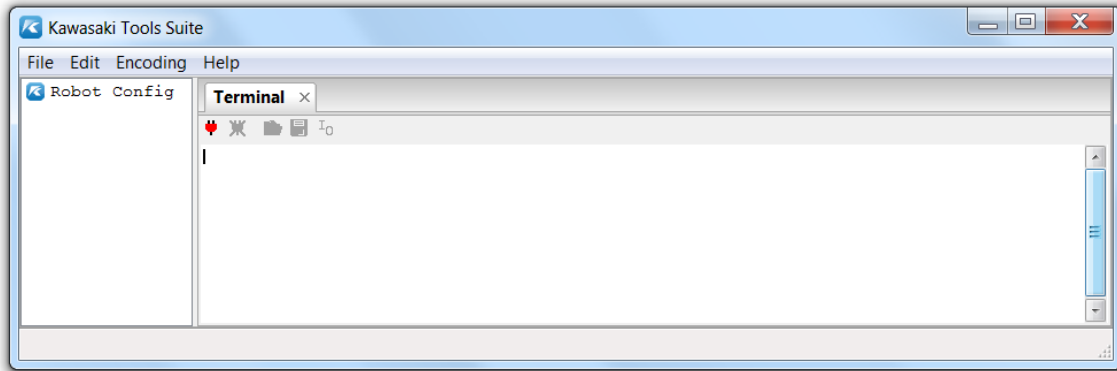
- Signal Selection Combo: Select or deselect display signals.



-  Select/Deselect All: Check or uncheck all selection combo box signals.

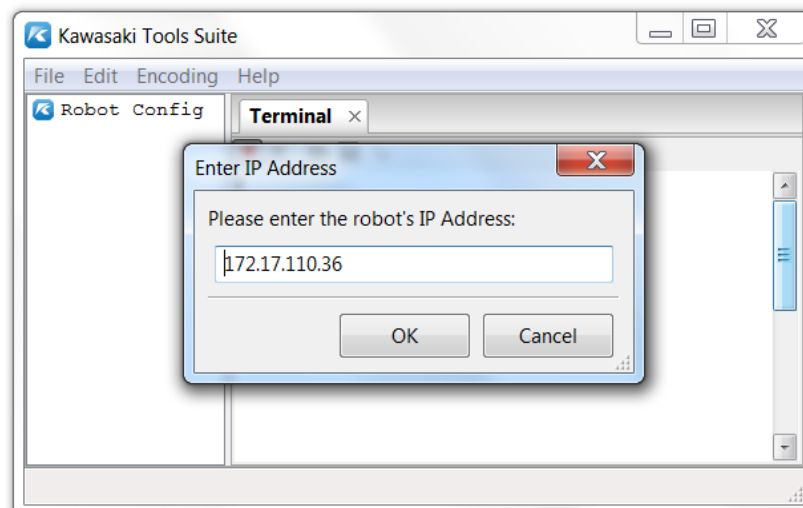
6: KTools Communication Terminal

The KTools Terminal provides the user with an interface allowing communicates between the robot controller and KTools Terminal tab.



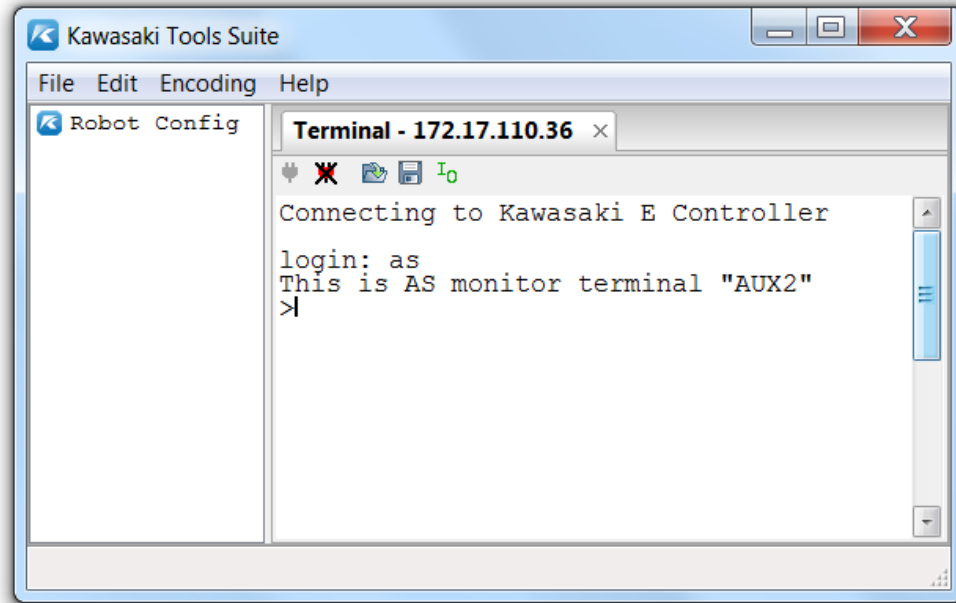
6.1 Connecting to the Robot Controller

Ensure that your computer and robot controller are connected to the same Ethernet network. Under the file drop down menu select Terminal and KTools opens a new tab labeled Terminal. Once the terminal tab is open, connection to the robot controller is establish by selecting the connect icon.  At this point the user will be prompted for a robot IP address. Enter the IP Address of the desired robot (Aux 812) and click OK.

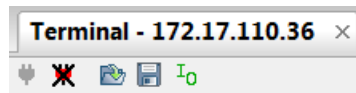


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The terminal tab title is updated with the selected robot IP Address and the controller requests a login. Enter AS and press enter to complete the connection between KTools and the robot controller. From this point forward the terminal tab functions similar to the keyboard screen on the teach pendant.

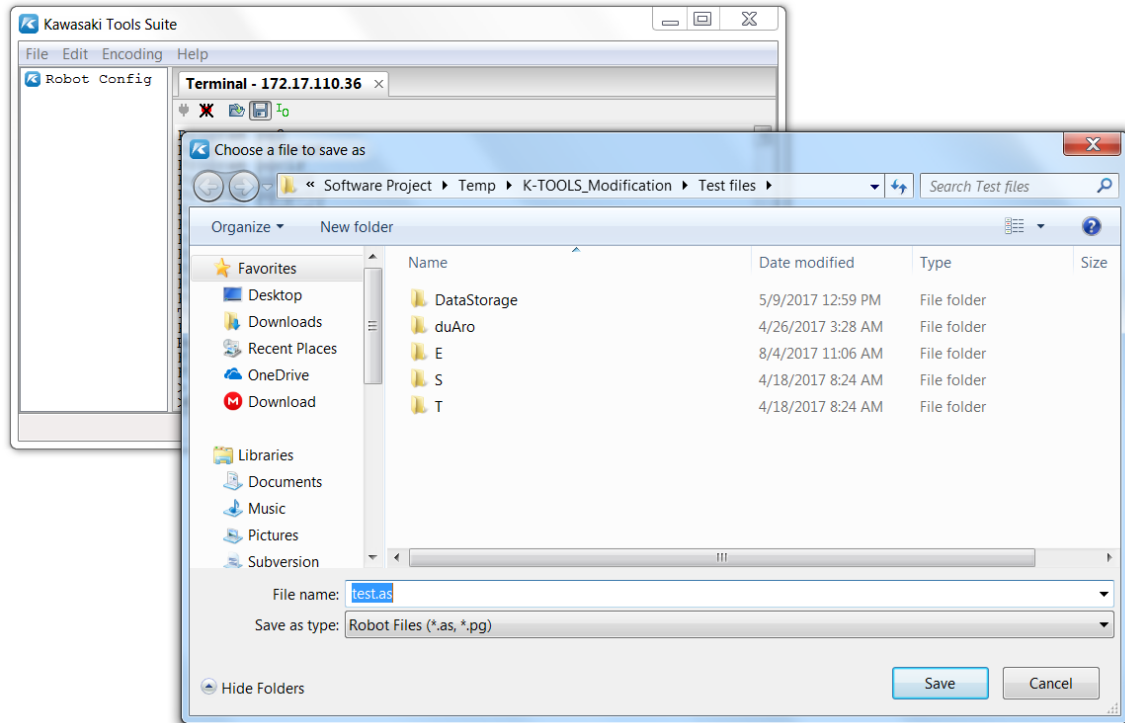


Once a connection between the KTools and the robot controller is established the user will notice the change in state of disconnect, load, save and IO icons.

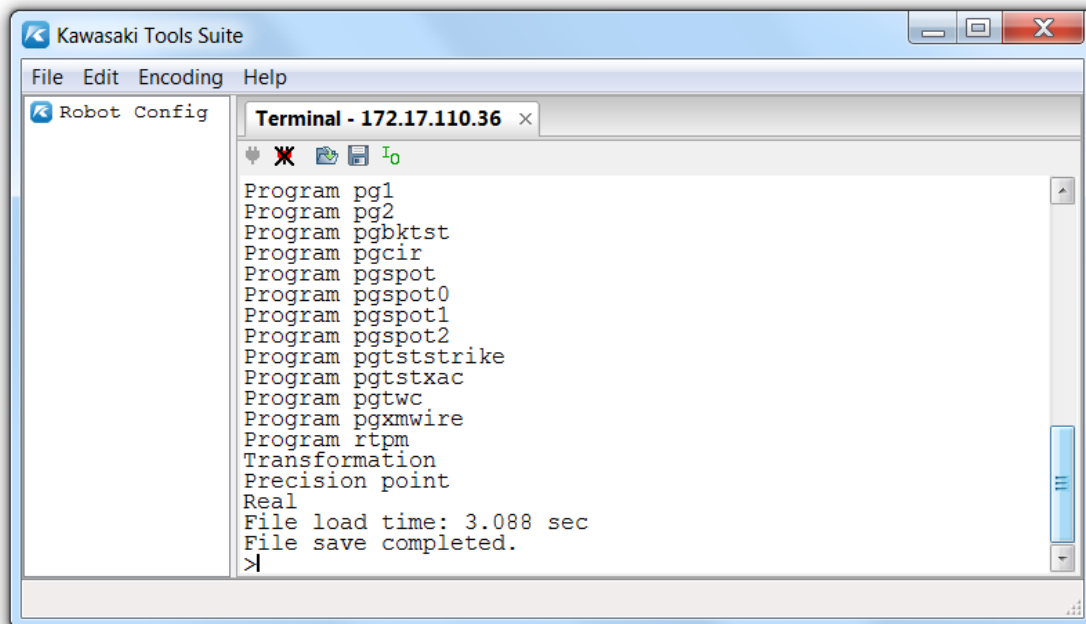


6.2 Saving All Data from the Robot Controller

To save all robot data from the controller to the computer select the diskette icon. KTools displays the "Choose a file to save as" widow. Select a file location, enter the desired name and click on the Save button.

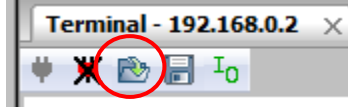


At this point data from the controller to the computer is saved. The terminal tab displays the robot information sections as they are being saved. Upon completion the terminal tab displays “File save completed”.

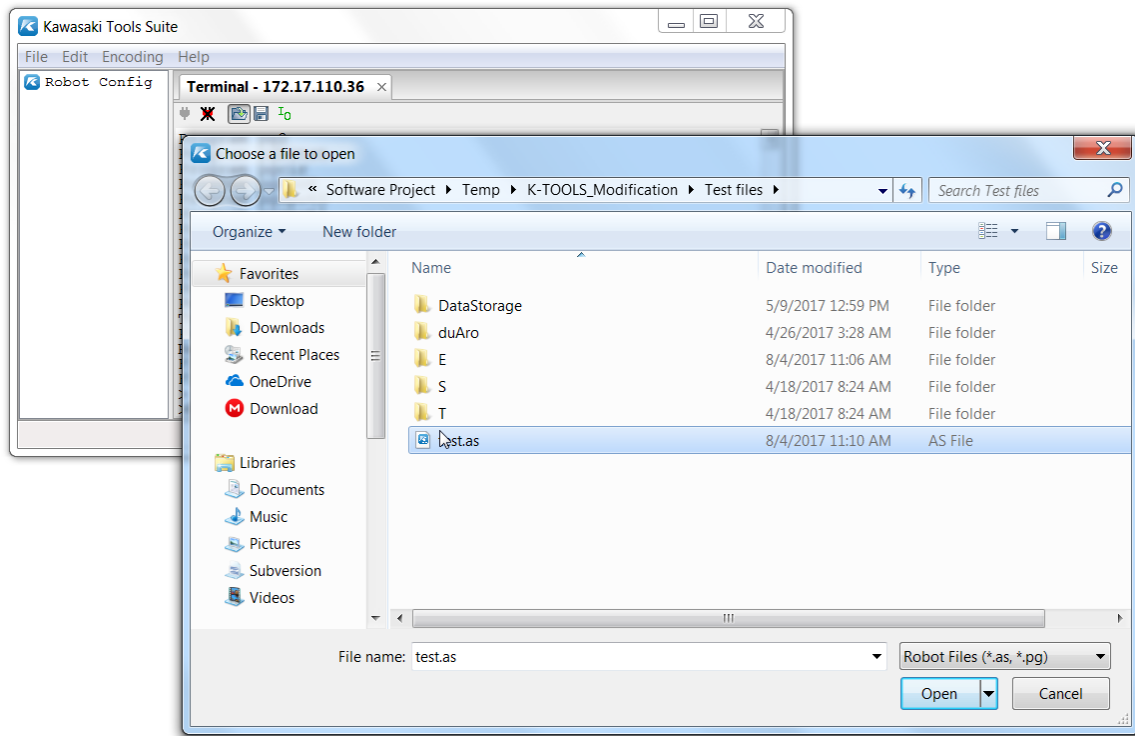


6.3 Loading All Data to the Robot Controller

To load data from the computer to the robot controller click on the open folder icon in the Terminal tab menu.



KTools displays “Choose a file to open” window. From this window select the desired file to load and click the Open button.



The terminal tab displays the backup sections as they are being loaded to the robot controller. Based on the information loading to the controller, the user may be prompted to force load information. Force load information if desired.

Note: Before loading information to the controller, active programs will need to be removed from the program stack on the controller.

6.4 IO Monitor

With the terminal open and connected to a robot controller the user can monitor the status of robot and KLogic IO with the following commands. >io (signal block number) (enter). Signals are organized sequentially in blocks of 32.

Robot IO

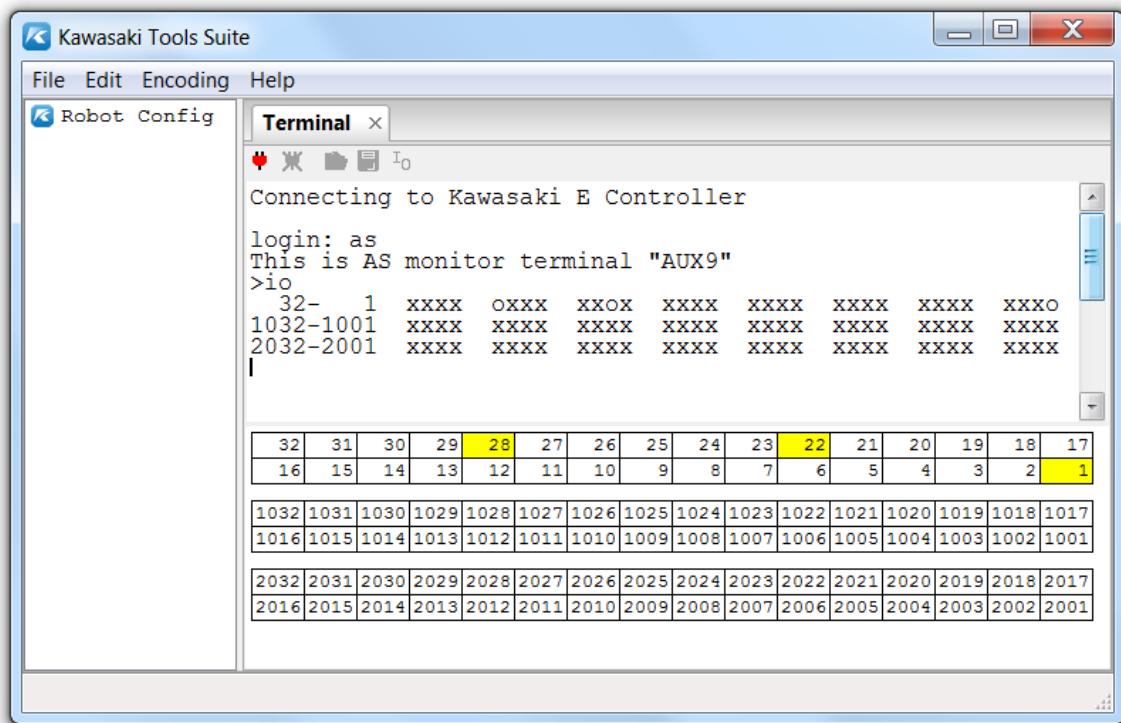
>io (enter) will display the first set of 32 robot signals.

>io 2 (enter) will display the second set of 32 robot signals.

KLogic IO

>lsqio (enter) will display the first set of 32 KLogic signals.

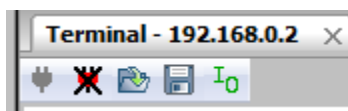
>lsqio 3 (enter) will display the third set of 32 KLogic signals.



If the signal display window does not display automatically click on the  icon. Signal status will continue to update until the user presses the enter button or closes the monitor window with the  button.

6.5 Disconnecting From the Robot Controller

To disconnect the computer from the controller click on the  icon and communication will stop.



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