



KOHLER DESIGN MOTION Software 3.3.2.0

User guide
2022

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IMPORTANT SAFETY CONCERNS

BEFORE ATTEMPTING TO START UP THE LASER

PLEASE MAKE SURE YOU HAVE **READ AND UNDERSTAND**
THE **LASER MANUAL** THAT CAME WITH YOUR SYSTEM !

ESPECIALLY MAKE SURE YOU HAVE READ AND **UNDERSTAND**
ALL SAFETY RELATED CHAPTERS IN THE LASER MANUAL !

IF YOU ARE UNCLEAR ABOUT ANY OF THE SAFETY RELATED CHAPTERS
PLEASE CONTACT COHERENT OR Kohler Design Corp BEFORE PROCEEDING !

***** DO NOT TURN ON THE LASER UNLESS INSTRUCTED
BY THE COHERENT SERVICE PERSONAL *****

Not all systems built by Kohler Design Corp are Class 1 Laser systems !

Some special applications do require a class 4 system

**Please make sure you understand the LASER CLASSIFICATION
of your particular system and operate them accordingly !**

**If you are unclear about the classification of your system please contact
COHERENT or Kohler Design Corp before operating the system !**

While it is the manufacturer's responsibility to deliver a
system according to the current Laser safety standards,
it is important to understand that it is the **customers
responsibility to maintain the class 1 classification**
after the installation, by checking the following
items on a regular basis (below are minimum requirements)

**** ARE ALL SAFETY RELATED SENSORS
AND SWITCHES IN WORKING ORDER ? ****

**** ARE ALL SAFETY RELATED LABELS PRESENT ? ****

**** ARE ALL OPERATORS USING THE
EQUIPMENT PROPERLY TRAINED ? ****

Introduction

KOHLER DESIGN MOTION is a G-Code based motion software specifically written (but no limited) to control various Laser Systems built by Kohler Design Corp in Corvallis Oregon.

The Software uses "standard" G-Code to allow the end user to program complex welding or cutting processes. While the software relies heavy on the existing G-Code standards it does not claim to conform 100% to those standards.

While some G-Code commands are explained in this manual , the main purpose of this manual is not to explain how to write G-Code

Getting Started

KDM Hardware Requirements

Supported Class 1 Laser System built by Kohler Design

- Mini-Prolas MPS-36, 36A, 38
- Prolas-2000, 2000A, 3000, 4000
- Micro Prolas MCP-10
- DC-12 (Diamond Cutter)
- GB-13 (Glove Box Welder)

Supported Laser Sources

- Lasag -Rofin NLS based Laser source
- Rofin RCU-Based Laser Source

Supported MotionCards

- Baldor PCI2 Motion Crad

Minimal PC Requirements

- Microsoft Windows 7 -32 bit (Limitation of the Baldor Motion card)
- True Color Display
- 1.2 MHz processor G3 or better
- 2 GB RAM
- 50 MB free hard drive space

Upgrading from Prolas Software

- In general upgrading from the Prolas software should be straight forward but there are some major differences.
- The KDM software uses a different setup file therefore all custom settings (I/O) need to be recreated within the KDM setup window.
- While most Prolas code will run with small modifications there are a few shortcomings to the KDM G-Code parser.
 - Cutter compensation is not available
 - Modal codes might not work 100%
 - Order of G / M commands that can be located on one line might not adhere to standard

Some Example:

N1 G2 **G1** X0.01Y 0.01 J0.01 .. is not supported = G1 / G00 commands can not be between the G2 and the actual coordinate values

N2 **G1 G2** X0.01Y 0.01 J0.01 .. is the correct way of writing it

While Modal code should work with G2/G3 /G1 G00 it's recommended to specify G2/G3 one each line !

N1 G2 X0.01Y 0.01 J0.01 ..

N2 X0.01Y 0.01 J0.01

Above code should work - but rather use:

N1 G2 X0.01Y 0.01 J0.01 ..

N2 **G2**X0.01Y 0.01 J0.01

.. There is more .. and I will fill it in, as it shows up ...

There are also some advantages with the KDM software over the Prolas Software

- The CNC code can be syntax colored = [F2] will syntax color the full code
 - Syntax coloring is always active during typing
- For syntax coloring to recognize a code segment , individual segments need to be separated by a white space

G90G4F2 ... is valid code - but syntax coloring won't pick it up

G90 G4 F2 will be syntax colored

- Custom variables are not limited to numeric names anymore (No spaces allowed)

#MY_SPECIAL_VARIABLE = 5 is a valid variable with the KDM software

- Use of custom names in calculations is possible


```
IF [ #MY_SPECIAL_VARIABLE = 15] then
    ... code to execute
ELSE
    ...code to execute
ENDIF
```

- Custom I/O Names can also be used instead of the usual H Numbers

M25 [**OUTPUT_GAS1**] is a valid command

- Insert code or variables just right click inside the code window and select [Insert G-Code] from the drop down

This will open the [SELECT CODE](#) Window. Double click the item you wish to insert

- Highlight G-Code in the edit window and the right click with the mouse - At the bottom of the drop down it will display the help text related to the G-Code

Installing KDM

Currently there is no Installer available for the KDM software

- All files related to the actual KDM software are supplied in a single folder
Copy the folder to your C-Drive

Required system files & Installed applications

1. Baldor Motion Card
 - Install the latest Baldor Workbench - this will automatically install the driver for the Motion card
2. Video Window
 - Copy the included [TVideoGrabber_8.6.1.2.dll] file to the system32 folder on your computer

Optional System files & Installations

1. Cognex
 - Install the included [Cognex In-Sight Software 4.4.3.exe] onto you're system
Regardless of what other version of Cognex Insight software you have installed , this will guarantee that you have the correct DLL on you're system
2. Copley Motion
 - Install the Copley Com library [CMOV5.zip]

Updating KDM Software

Currently there is no installer package for the KDM software available

KDM updates will be available as compressed folders containing the files required for the upgrade

Usually the following files are required for all upgrades

- Kohler Motion Control.exe
- KDM_CONTRACTS.dll
- MC_COPLEY.dll (Canopen Motion) --- or --- MC_BALDOR_PCI.dll (Baldor PCI Motion)

...

...additional DLL's or setup files depending on you're application requirements

...

*It is important to make sure the Zip file is **unblocked** before you unzip it !*

For security reasons, Windows will prevent all downloaded DLL's from working if they are not unblocked

Usually this can easily be done by right clicking the Zip file and then select properties from the file dropdown

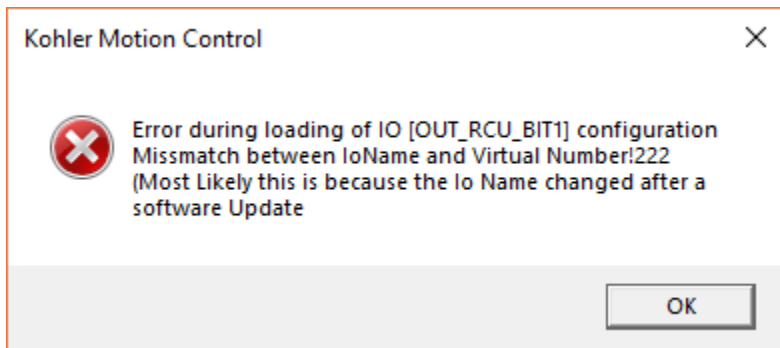
-The unblock checkbox can usually be found under the general tab of the properties window

Once unblocked - just drop all Included update files into you're existing KDM folder

- It is strongly advised to make a copy of you're existing KDM folder prior to the upgrade (or you can use the built in [backup function](#) of the KDM Software to create a new backup)

Most likely this is all that's needed for the update .

If you haven't updated the KDM for a while it is possible that you will get some warnings at startup about mismatching function or I/O names
see below example



These miss matched definitions need to be fixed ..

Click OK for all warnings until the KDM main window is open

- Open the [[Edit I/O](#) - [Edit Gcode](#)] window from within the KDM setup window

Both [Edit IO] and [Edit G-code] are handled by the same window and they behave very similar as far as displaying and editing of the individual entries goes ..

setup the list to display only the "Invalid_Entries" by

A) Deselect [ALL]

B) selecting [INVALID_ENTRIES]

After that only Items with Invalid Entries should show up in the list

- Click on the desired item and from the IO NAME dropdown pick the desired new name
- Click [Save] to update the database and close
- Restart KDM
- The warnings should have disappeared now

... Most likely the new name will be obvious based on the old name but sometimes it's not and you might need to contact Kohler Design on how to update you're invalid definitions

- Below example is how to update the **OLD** [OUT_RCU_BIT1...3] I/O Name

In the early days of the KDM only the RCU used an Output Bit pattern to select a pulse or burst program

These days different laser sources are using these outputs as well, therefore the name(s) for these outputs where changed to **NEW** [OUT_PRGSELECT_BIT1..5]

If you should get warnings at startup, but the items will not show up in the list, it's most likely because the I/O (or Gcode) item is suppressed because it's not needed in the current configuration

You will need admin level enabled at startup for the [Show Suppressed] checkbox to be enabled - see ([Startup Option Window](#))

Once enabled you can display all suppressed IO (GCode) items - most likely you can delete all those entries as they are leftovers from original configurations that are not used with you're machine anyway.

At the same time if they don't create any warnings at startup then leaving them in the database will make no difference as they are inactive items

The screenshot displays the 'Edit Gcode I/O Setup' dialog box on the left and a list of IO names on the right. The dialog box has tabs for 'G-Code' and 'I/O'. The 'I/O' tab is active, showing fields for 'IO NAME' (OUT_RCU_BIT1), 'MAP TO' (PCI2_Out/8), '#COMMS' (0), 'DESCRIPTION' (Out_RCU BIT1 [H222]), 'TOOLTIP', 'BITMAP', 'VIRTUAL NUMBER' (222), 'TOOLBAR' (MAIN), 'POSITION' (206), and 'USER LEVEL' (0). The 'IO NAME' dropdown is open, showing a list of IO names including IN_LASERPROCESSING, IN_AIRPRESSURE, IN_PAUSEBTN, IN_MACHINEPOWERON, IN_DOORINPUT, IN_RESETBUTTON, IN_COLLETPUT, IN_LIMIT0POS, IN_LIMIT0NEG, IN_LIMIT1POS, IN_LIMIT1NEG, IN_LIMIT2POS, IN_LIMIT2NEG, IN_LIMIT3POS, IN_LIMIT3NEG, IN_LIMIT4POS, IN_LIMIT4NEG, IN_LIMIT5POS, IN_LIMIT5NEG, IN_RCU_ERROR, IN_RCU_BUSY, IN_RCU_READY, IN_SHIELD_GAS1, IN_SHIELD_GAS2, IN_TOOLINGID_0, IN_TOOLINGID_1, IN_TOOLINGID_2, IN_TOOLINGID_3, IN_MB_FNCT_TRIGGER, OUT_ENABLE, OUT_GAS1, OUT_GAS2, OUT_ROTARYCOLLET, OUT_AUTOMATICDOOR, OUT_RINGLIGHTAIR, OUT_LED_AWAKE, OUT_ROTARYCOLLET2, OUT_RCU_START, OUT_RCU_SELECT, and OUT_PRGSELECT_BIT1. The 'IO NAME' dropdown is currently set to 'OUT_RCU_BIT1'. The 'MAP TO' dropdown is set to 'PCI2_Out/8'. The '#COMMS' field is set to '0'. The 'DESCRIPTION' field is set to 'Out_RCU BIT1 [H222]'. The 'TOOLTIP' field is empty. The 'BITMAP' field is set to 'KDMotionIcons.bmp@35'. The 'VIRTUAL NUMBER' field is set to '222'. The 'TOOLBAR' dropdown is set to 'MAIN'. The 'POSITION' field is set to '206'. The 'USER LEVEL' field is set to '0'.

IO NAME	SHOW	MAP TO	DESCRIPTION
OUT_RCU_BIT1	X	PCI2_Out/8	Out_RCU BIT1 [H222]
OUT_RCU_BIT2	X	PCI2_Out/9	Out_RCU BIT2 [H223]
OUT_RCU_BIT3	X	PCI2_Out/10	Out_RCU BIT3 [H224]

On the right side of the screenshot, there is a list of IO names with checkboxes for 'ALL' and 'SUPPRESSED'. The 'INVALID_ENTRY' checkbox is checked.

Laser Class 4

In general most of our system are built as Class 1 systems -
In some occasions a customer will require a class 4 system

While it is still the manufacturers responsibility to deliver a
CLASS 4 system according to the current Laser safety standards
It is the customers responsibility to grantee a save operating environment

*It is the customers responsibility to provide the required
environment to operate a class 4 system according
to the current safety regulations*

**Operating a class4 system might require to
satisfy one or all of the following conditions**

(Below list is by no means comprehensive or should
be used to decide if all regulatory aspects have been
covered by the customer setup)

Closed up room with no windows or Laser safety windows

Controlled access to the Laser room

Wearing of protective eyewear at all times

Redundant warning signs about the the possible radiation risks

Proper training of all personal about the possible risks

Class 4 Sytem

All Class 4 systems ship without a enclosure - System with an enclosure are considered class 1 !

**** There is NO way of running a class 1 system as Class 4 without rewiring ****

The only exception to this are Lasag NLS flash pumped YAG Lasers - These systems do ship with a class 4 laser key on the laser

Once the class 4 key is active on these Lasers, it is possible to open the shutter trough either the PCT2 Software or the handheld (if equipped)

The only protection against accidental running of cnc code in class 4 is done on the software side within the KDM laser safety logic

If the laser interface is wired properly the KDM will not activate the laser outputs until the class4 password has been entered

****** REGARDLESS OF ABOVE, ALL NLS BASED LASER(S) CAN **MANUALLY BE FIRED ANYTIME THE LASER CLASS 4 KEY IS ACTIVE** ******

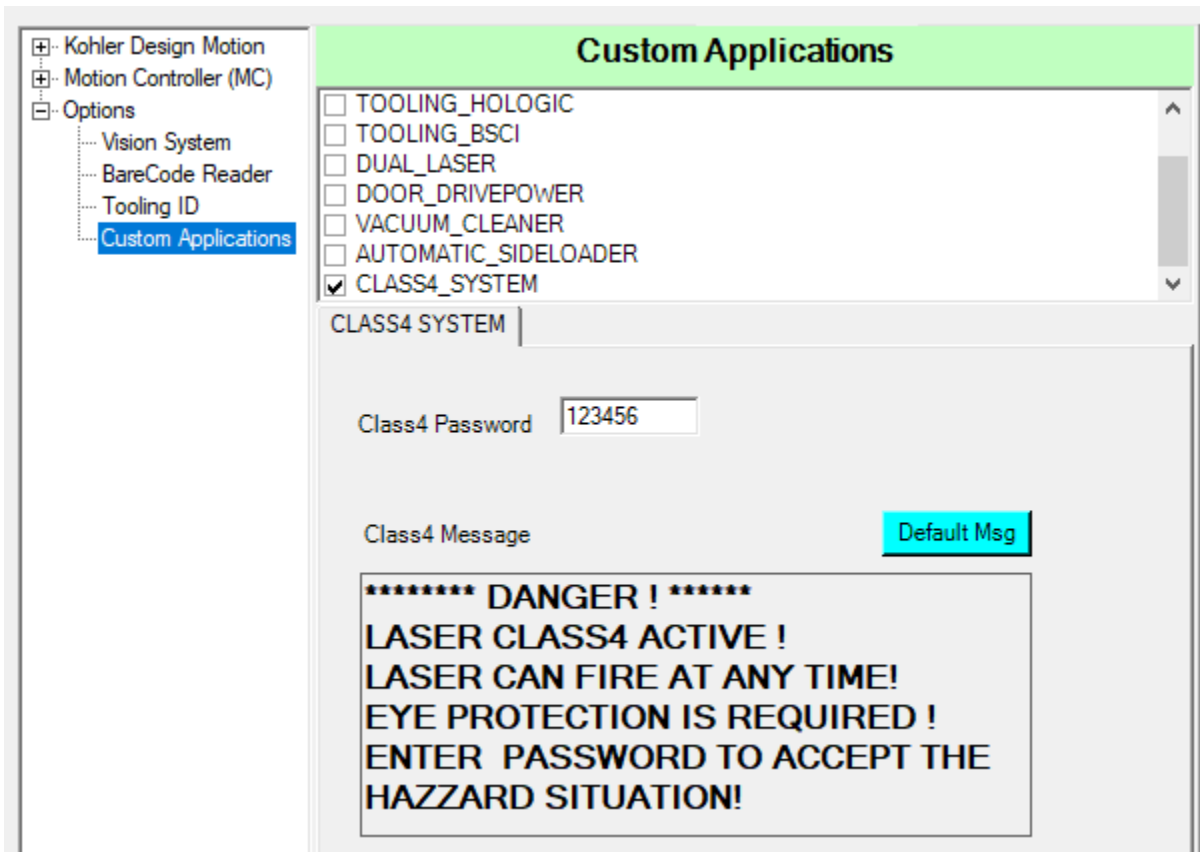
Description of the class 4 system setup (systems without enclosures)

****** BELOW STATEMENTS ARE ONLY VALID FOR SYSTEMS SOLD
AFTER DEC 2019 RUNNING KDM SOFTWARE VERSION > 3.2.5.2 ******

To enable the Class 4 setup the following conditions have to be satisfied on the I/O and software side

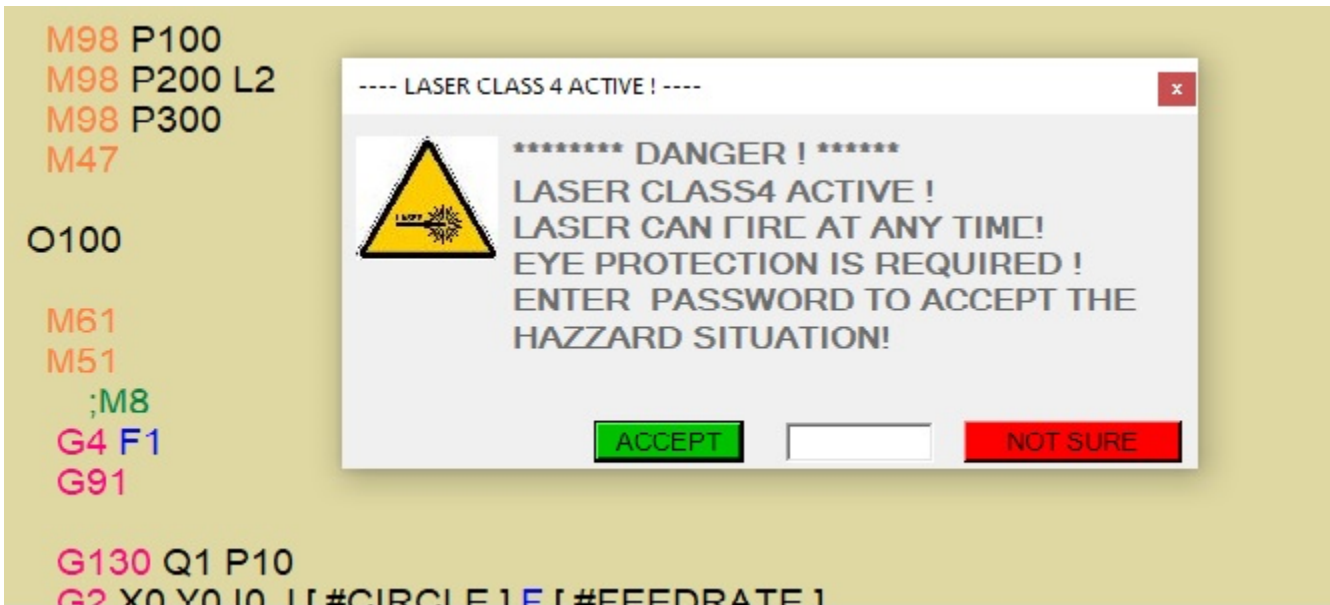
- Hardwire (Jumper) the 4 Door Inputs usually reserved for the door switch (simulating a door closed situation)
- Hardwire a dedicated Input to +24V (Standard Input used = User Input 10 // CanOpen IN # 3)
- Re- assign the Door Input Function to above Input (KDM - SETUP -I/O SETUP)
- Assign the Class4 Input Function to above Input (KDM - SETUP -I/O SETUP)

- Enable the Class 4 custom application (KDM - SETUP - Custom Applications)
- Define a Class 4 Password (can not be empty)
- Modify the class 4 message if needed



Operating the Class 4 system

- The system will only allow you to operate with the door key in the [OFF] position / Removing the Door key will lock out the system
- The first time Laser processing is activated the software will require you to enter a Class 4 password (This is only required once after each software restart)



NLS Class 4 Key

The NLS based lasers are equipped with a class 4 key that will allow the laser to fire while the door is open

*This particular setup is not to be interpreted as a **Class 4 system** that has no door or enclosure !*

Please carefully read the Lasag specifications / regulations about using the class 4 key

*Below setup is **unrelated** to the CDRH classification for the laser with a class1 work station - it does only provide **additional protection** against accidental firing of the laser if the laser class 4 key is used
(Lasag NLS class 4keys are supposed to be stored and locked away from the laser source- They should only be made available to trained maintenance personal)*

If properly connected / wired up the KDM software will provide limited **software** protection when using the **NLS Class 4 key** within a Class 1 environment

For this to work the NLS Class 4 key output needs to be connected to the class4 Input on the KDC-200 controller

- Usually this is User Input 10 - CanInput #3

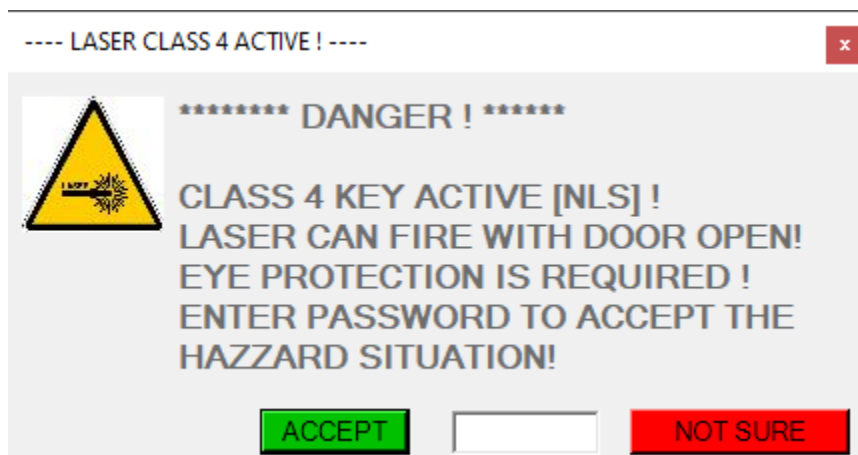
- The Class4 Input on the KDM software needs to mapped to CanInput #3

- DO NOT ENABLE THE **SYSTEM CLASS4** KDM APPLICATION FOR THIS SETUP!

If wired up properly when turning the class4 key the KDM software will request the system password to enable the Laser outputs

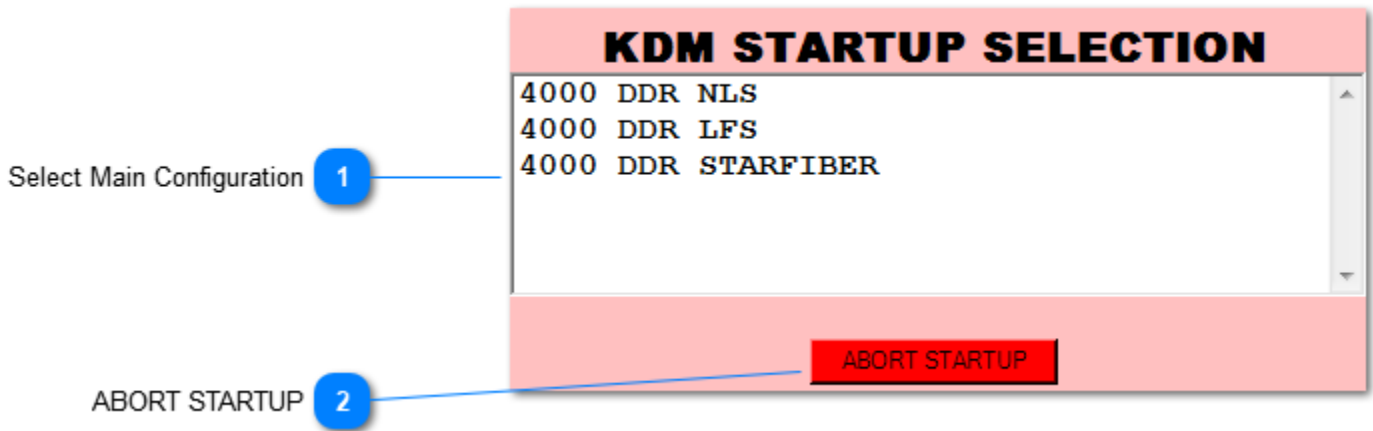
Without the password, all laser outputs are disabled at the software level

The warn window will look similar to the KDM system class4 warn window but the passwords are different - please contact Kohler Design for detailed information about this specific setup



Above is **not** a common setup - very few systems in the field are wired up like this

Select Main Configuration

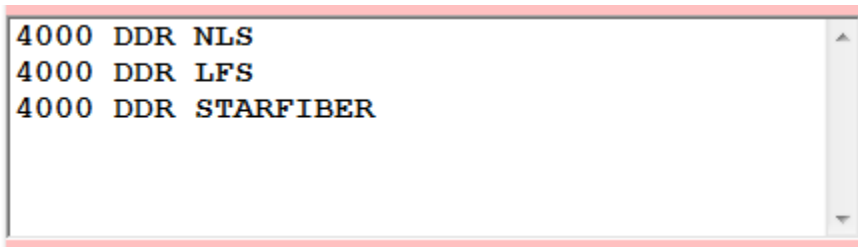


**** This Window will only show if it is enabled in the [Startup Option](#) Window ****

It allows to select the startup configuration from the list of available [main configuration](#) files

- Mostly it will be used if different types or Rotaries , Lasers or tooling are used on the same machine

1 Select Main Configuration

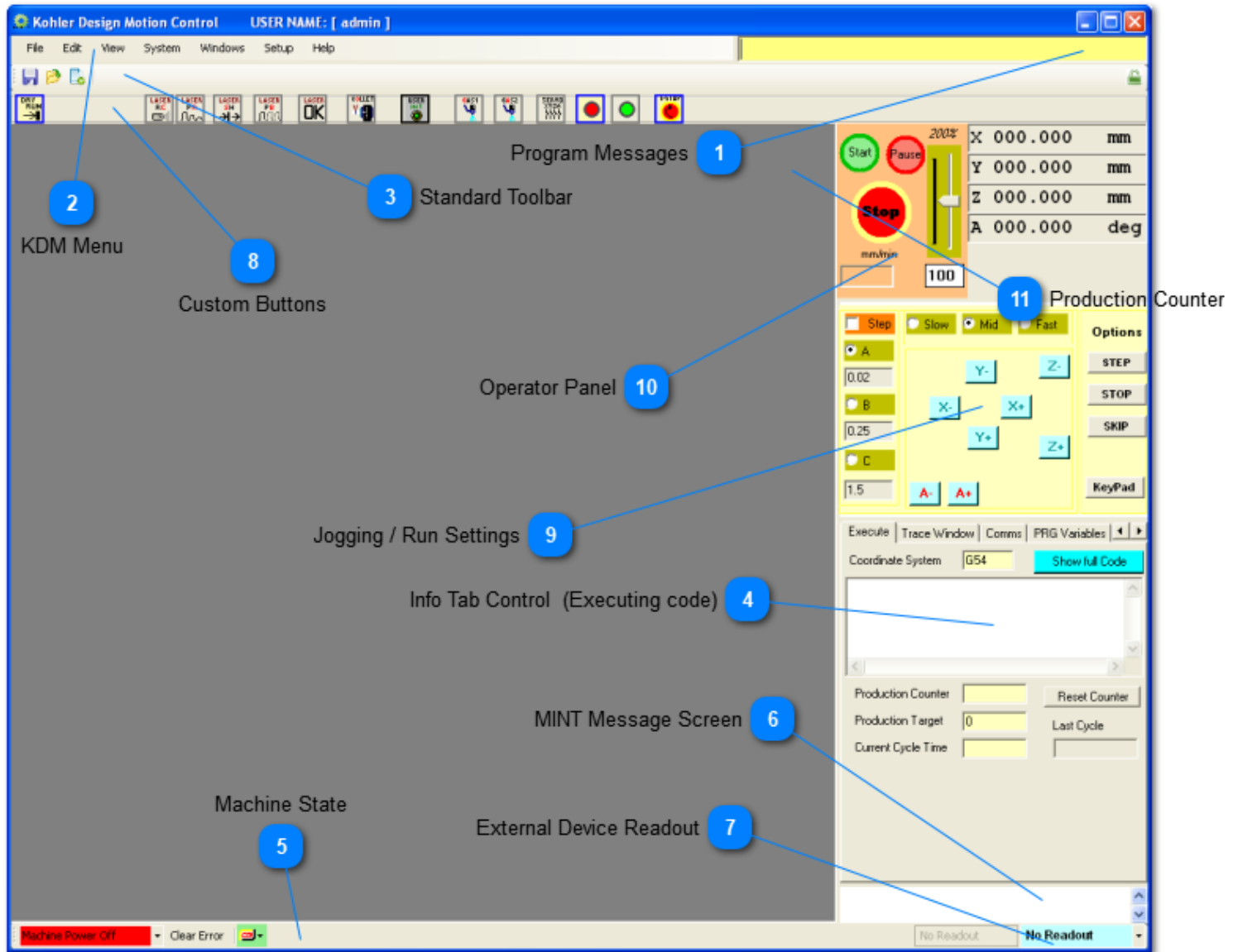


Select the Main Configuration based on the Nickname (Move the mouse over the Nickname to reveal the actual file name)

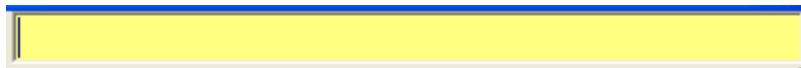
2 ABORT STARTUP



Main Window KOHLEK DESIGN MOTION

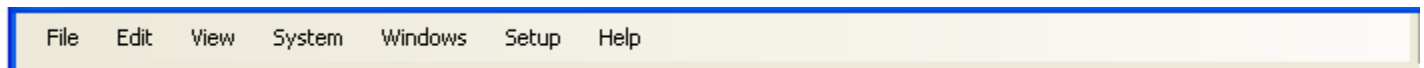


1 Program Messages



- CNC Program messages

2 KDM Menu



3 Standard Toolbar

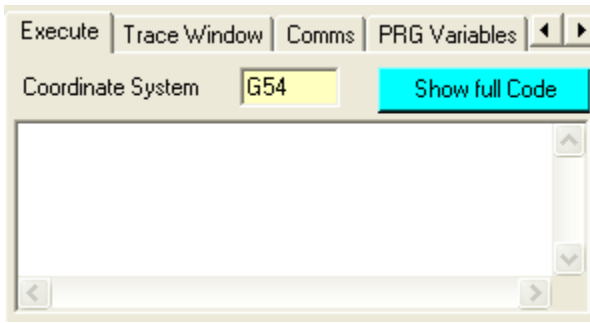


- Standard buttons for Open ,Save , New File
- Optional Job buttons

- Optional Laser status buttons

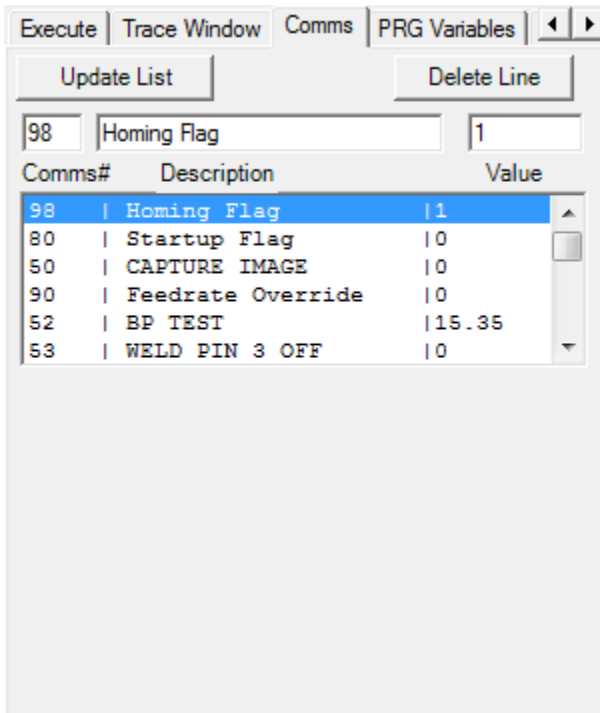
4

Info Tab Control (Executing code)



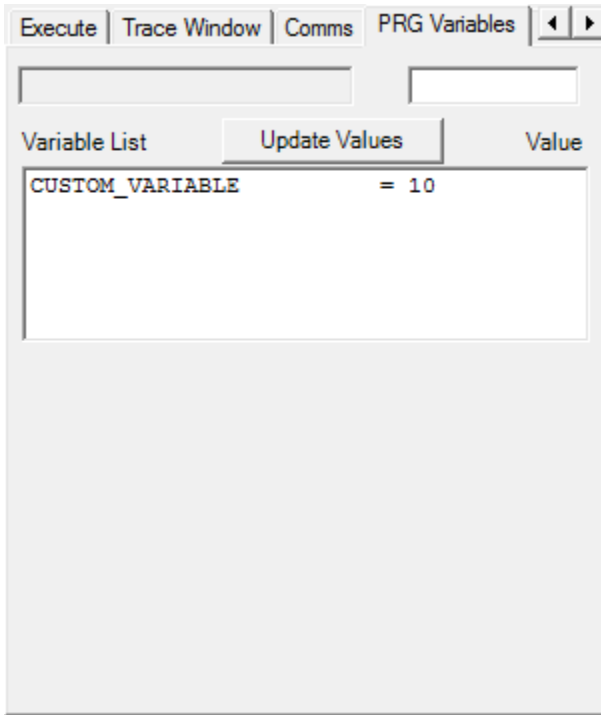
Execute Tab

- Display of current code line
- Current Coordinate system
- [Full code] = This will display the full code including inserted external sub programs



Comms Tab

- Displays the Comm Variables and their respective value
- The Comms values can be manually overridden. For example: To bypass homing, click on Comms 98, type "1" in the box, and hit the "enter" key.
- In the same method, descriptions can be modified.
- Scroll down and pick an empty slot, to create a new Comms variable
- To see the current value of a Comms variable, either click on the "Update List" button, or run the program containing that variable.



PRG Variables Tab

- Displays the program variables used in a program and their respective value.
- The PRG Variable values can be manually overridden. Click on PRG Variable, and type the new value in the box, and hit the "enter" key.
- Hit the "Update Values" button, to refresh the current value.

5

Machine State



- Machine state
- Error Lists
- External Device states (Green = OK / Red = not active)
- Click on external device icon to try to reset or restart the device

6

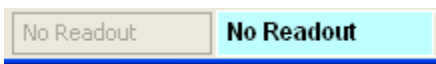
MINT Message Screen



- Mint message screen

7

External Device Readout



- Select Readout from dropdown
- Readouts are loaded from external device setup.cod file

8

Custom Buttons

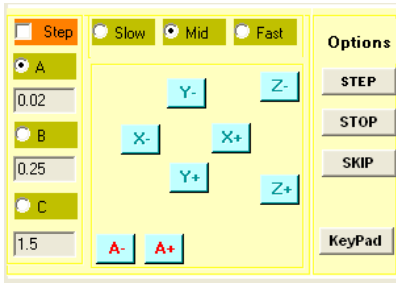


Custom Buttons - use the [I/O setup](#) screen to setup new buttons

Right click in the toolbar , then select [Arrange buttons] from the drop down menu - unselect [Arrange buttons]

9

Jogging / Run Settings



-Run settings

- Optional step (\)
- Optional Stop (M1)
- Optional Skip (/)
- Enable Keyboard Jogging (See setup window for assigning Keyboard keys)

- Axis Jog Buttons

- Select jog distance & speed
- Select continuous or step mode
- Double click in between radio buttons to change feed rate /step values
- Right click inside jog panel to rearrange the job buttons (requires login as administrator)

Jogging Keyboard shortcuts

F4 = Activates Jog Panel and enables Keyboard Shortcuts

S - Slow

M - Medium

F - Fast

A - step A

B - step B

C - step C

O - continuous / step (TOGGLE)

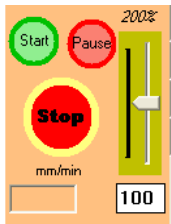
Keypad Button

Enables Keyboard Jogging

Keystrokes depend on KDM SETUP - [OPTIONS](#)

10

Operator Panel



- Start /Stop / Feed hold Button
- Feed rate Override (max value for % can be set in the [setup window](#))
- Display of current feed rate

11

Production Counter

Production Counter	<input type="text"/>	Reset Counter	<input type="button"/>
Production Target	<input type="text" value="0"/>	Last Cycle	<input type="text"/>
Current Cycle Time	<input type="text"/>		

KDM Software Manual

- Production counter
- Cycle Time
- Target Production (Program will stop once target is reached - see Run Settings to settings)

Machine Status Toolbar



1 Error List

Machine Power Off

Drop down list of current errors

Selecting the error from the list will display additional details of the error

Hint:

Axis errors will usually create a number of individual errors = therefore it might be necessary to look at older errors in the list to determin what caused the actual error.

2 Clear Error button

Clear Error

Tries to clear all existing errors

3 External Device Icons



Shows the status of the external device

Green background = running

Red background = not running

Each Icon has also a drop down allowing to reset /initialize the device

4 Display Readout Value

No Readout

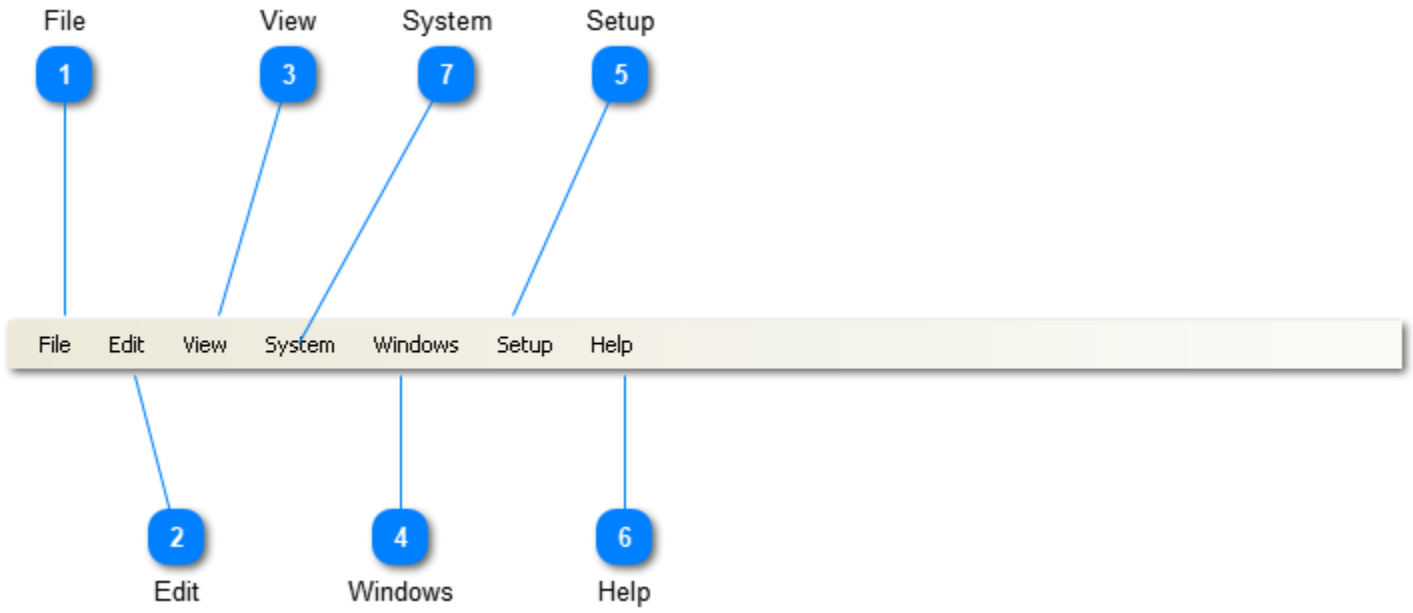
Display for the currently selected readout

5 Drop down Readout

No Readout

Drop down displaying the available readouts from external devices (only one can be active)

Menu Bar



1 File
File

2 Edit
Edit

3 View
View
Window Display

4 Windows
Windows
List of open CNC edit windows

5 Setup
Setup
CNC / Run Settings

6 Help
Help

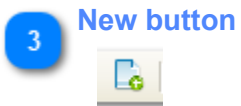
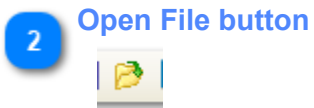
7

System

System

System Setup /configurations

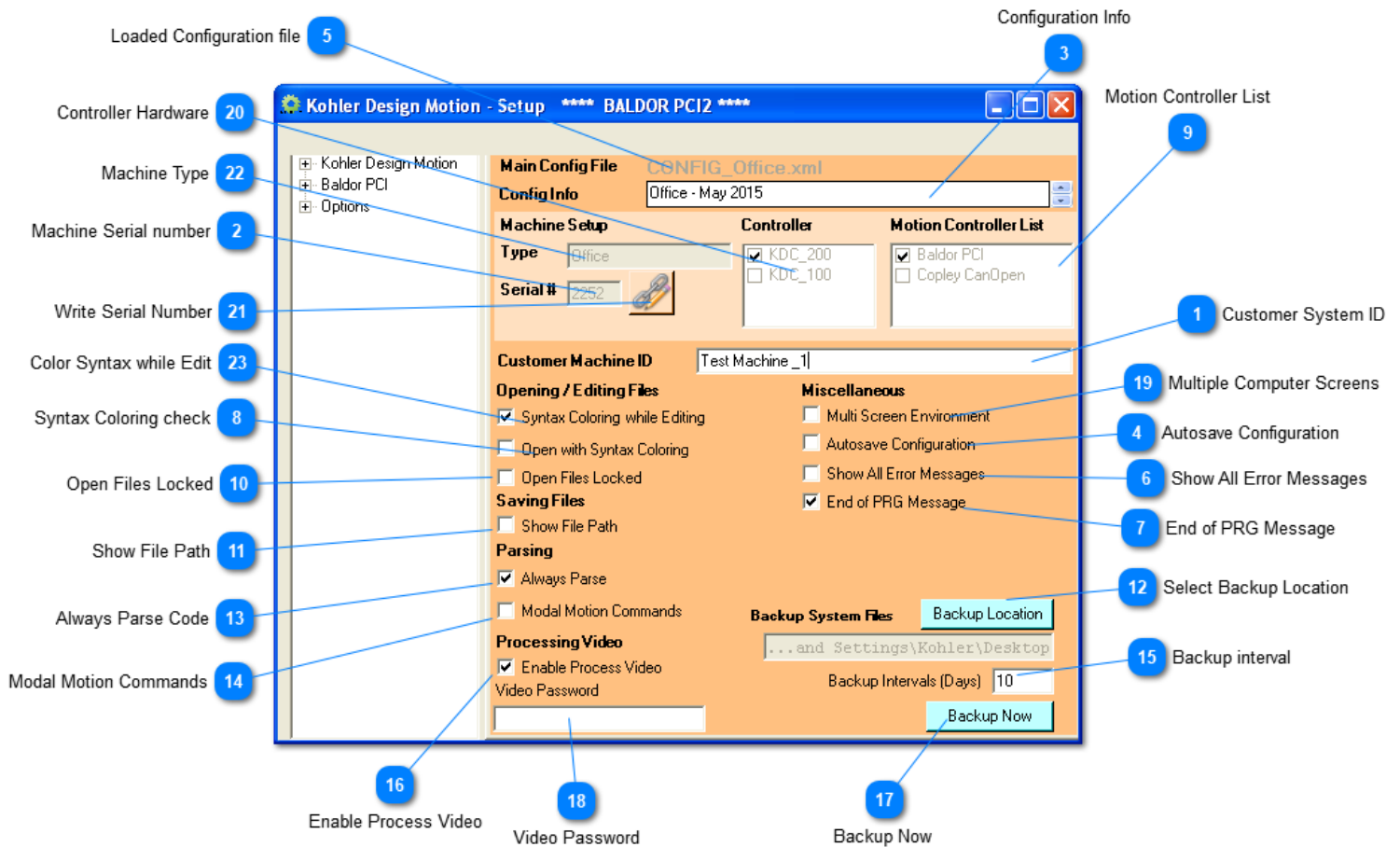
Standard Toolbar



Locks / unlocks current window positions.

KDM Software Manual

Setup KDM Window



1 Customer System ID

Test Machine _1

Custom System definition (Used with DataLogging)

2 Machine Serial number

Serial # 2252

Work Station Serial Number (assigned by Kohler Design Corp)

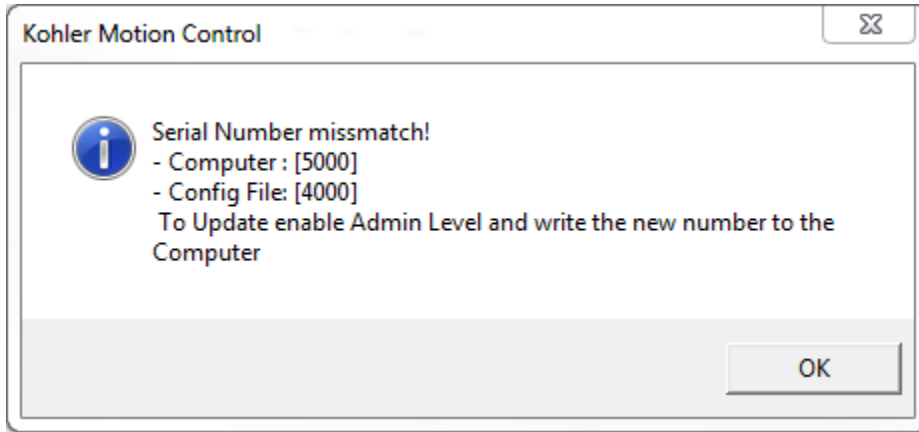
- Admin Level is required to set this option

Machine Setup	Controller Hardware
Type: PROLAS_4000	<input checked="" type="checkbox"/> KDC_200
Serial #: 5000	<input type="checkbox"/> KDC_100

-Assign the machine type, controller, and serial number

-Upon starting the KDM, the software will compare if the serial number of the machine and computer match.

-If in Admin Level, no error will be displayed if there is a mismatch.

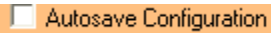


3 Configuration Info



This is a multi line Info Field that expands once you click with cursor into it. The Idea is to provide some additional Info about the active configuration file.

4 Autosave Configuration



If enabled this will automatically save the configuration at shut down (regardless of changes made)
Hint:

Some configuration entries will be saved regardless of this setting= this checkbox will not effect these settings

- Window position
- Coordinate systems
-

5 Loaded Configuration file

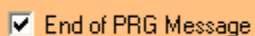


6 Show All Error Messages



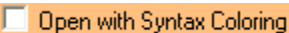
This will display all error messages recorded in a pop up window.

7 End of PRG Message



Determines if the end of program message will be displayed once the program finished

8 Syntax Coloring check

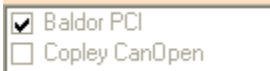


Determines if the the program opens with syntax coloring
Currently this should be turned off, as it will introduce flickering during coloring of the code at startup

Use the [F2] key instead once the program is opened to run the color syntax

9

Motion Controller List



Select the Available Motion controllers

- Admin Level is required to set this option

10

Open Files Locked



11

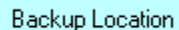
Show File Path



If checked this will display the full path when saving a file

12

Select Backup Location



13

Always Parse Code




This will force the software to parse the code at every start regardless if any changes have been made or not

(Usually the software will only reparse the code if changes have been made in the edit window)

14

Modal Motion Commands



Enable modal commands.

This currently effects only G2/G3 commands

15

Backup interval



Automatic backup interval (0 days disables automatic backup)

This will create a backup (Zip) file every xx days of the complete KDM Software Folder

16


Enable Process Video



Enable/ disable the video display trough the KOHLER DESIGN MOTION software.

17

Backup Now



This will allow to select a folder location and create a Backup copy of the KDM folder

18 Video Password

Enter a password if you'd like to protect the video settings (Cross hair / focal point settings)
 Leave blank for no protection
 The password is required to access the [Video setup](#) or move the Video cross hair

19 Multiple Computer Screens
☐ Multi Screen Environment

<TODO>: Insert description text here...

20 Controller Hardware
☒ KDC_200
☐ KDC_100

Select the connected controller hardware
 - Admin Level is required to set this option

21 Write Serial Number

This will write the Serial Number of the Machine to the Computer Registry
 During startup the software compares the serial number from the Config file to the registry and will display a warning if they don't match
 (The functionality of the software is not affected by miss matched serial number)
 - Admin Level is required to set this option

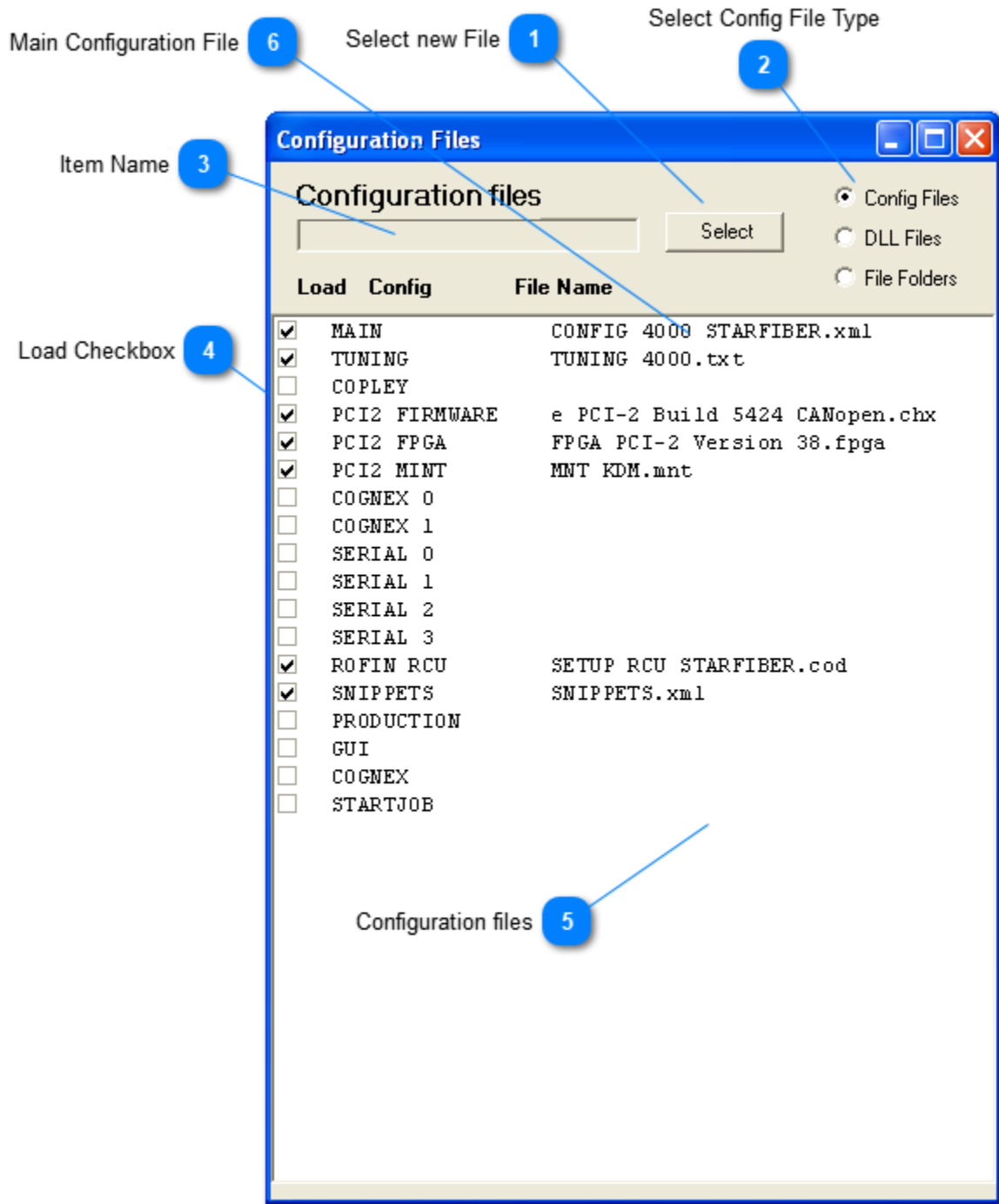
22 Machine Type
Type

Machine Type (assigned by Kohler Design Corp)
 - Admin Level is required to set this option

23 Color Syntax while Edit
☒ Syntax Coloring while Editing

Once checked, Color syntax will happen automatically while editing the CNC code
 To color syntax the complete document ,use [F2]

KDM Configuration Files



1 Select new File

Select

2 Select Config File Type

- ☒ Config Files
- ☐ DLL Files
- ☐ File Folders

Select the type of Config file you like to change

- DLL files will also require a Config file to be loaded

3 Item Name

Current selected Item in the list

4 Load Checkbox

☒

The [Load] checkbox needs to be checked , otherwise the file will not get loaded

5 Configuration files

<input checked="" type="checkbox"/>	MAIN	CONFIG 4000 STARFIBER.xml
<input checked="" type="checkbox"/>	TUNING	TUNING 4000.txt
<input type="checkbox"/>	COPLEY	
<input checked="" type="checkbox"/>	PCI2 FIRMWARE	e PCI-2 Build 5424 CANopen.chx
<input checked="" type="checkbox"/>	PCI2 FPGA	FPGA PCI-2 Version 38.fpga
<input checked="" type="checkbox"/>	PCI2 MINT	MNT KDM.mnt
<input type="checkbox"/>	COGNEX 0	
<input type="checkbox"/>	COGNEX 1	
<input type="checkbox"/>	SERIAL 0	
<input type="checkbox"/>	SERIAL 1	
<input type="checkbox"/>	SERIAL 2	
<input type="checkbox"/>	SERIAL 3	
<input checked="" type="checkbox"/>	ROFIN RCU	SETUP RCU STARFIBER.cod
<input checked="" type="checkbox"/>	SNIPPETS	SNIPPETS.xml
<input type="checkbox"/>	PRODUCTION	
<input type="checkbox"/>	GUI	
<input type="checkbox"/>	COGNEX	
<input type="checkbox"/>	STARTJOB	

Select the line item to update the file name or enabled / disable loading of the item

6 Main Configuration File

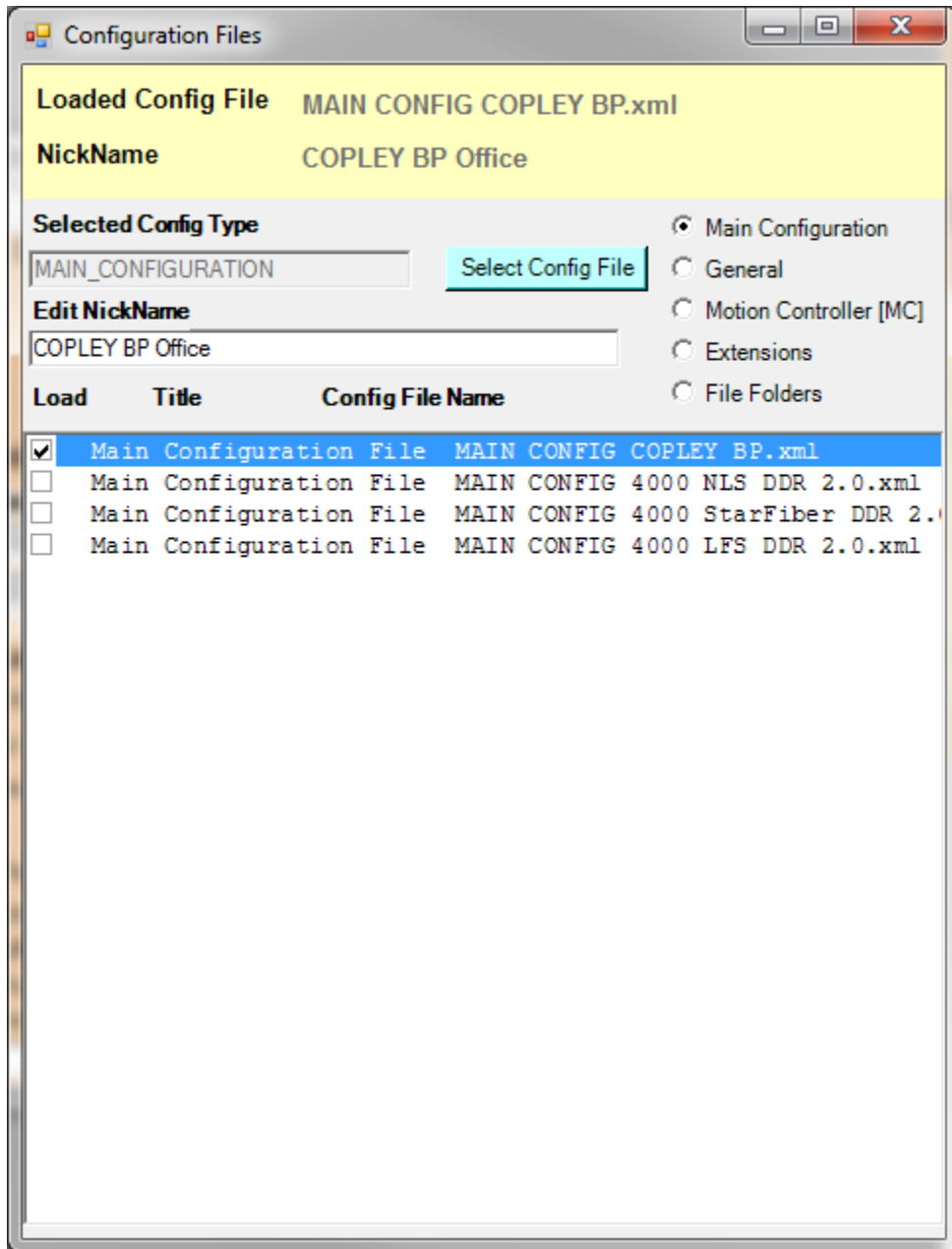
<input checked="" type="checkbox"/>	MAIN	CONFIG 4000 STARFIBER.xml
-------------------------------------	------	---------------------------

If you are planning to select a different Main Configuration, remember that all configuration file entries are stored in this file

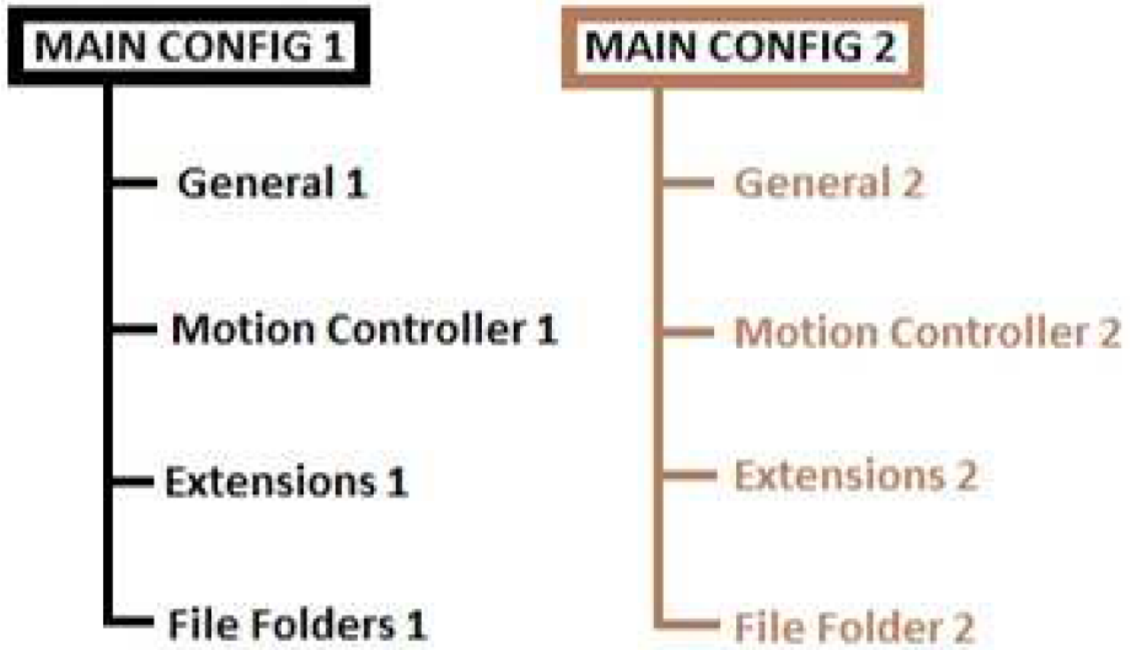
* UPDATE THE MAIN CONFIGURATION FIRST *

This will force a restart with the newly selected Main Configuration

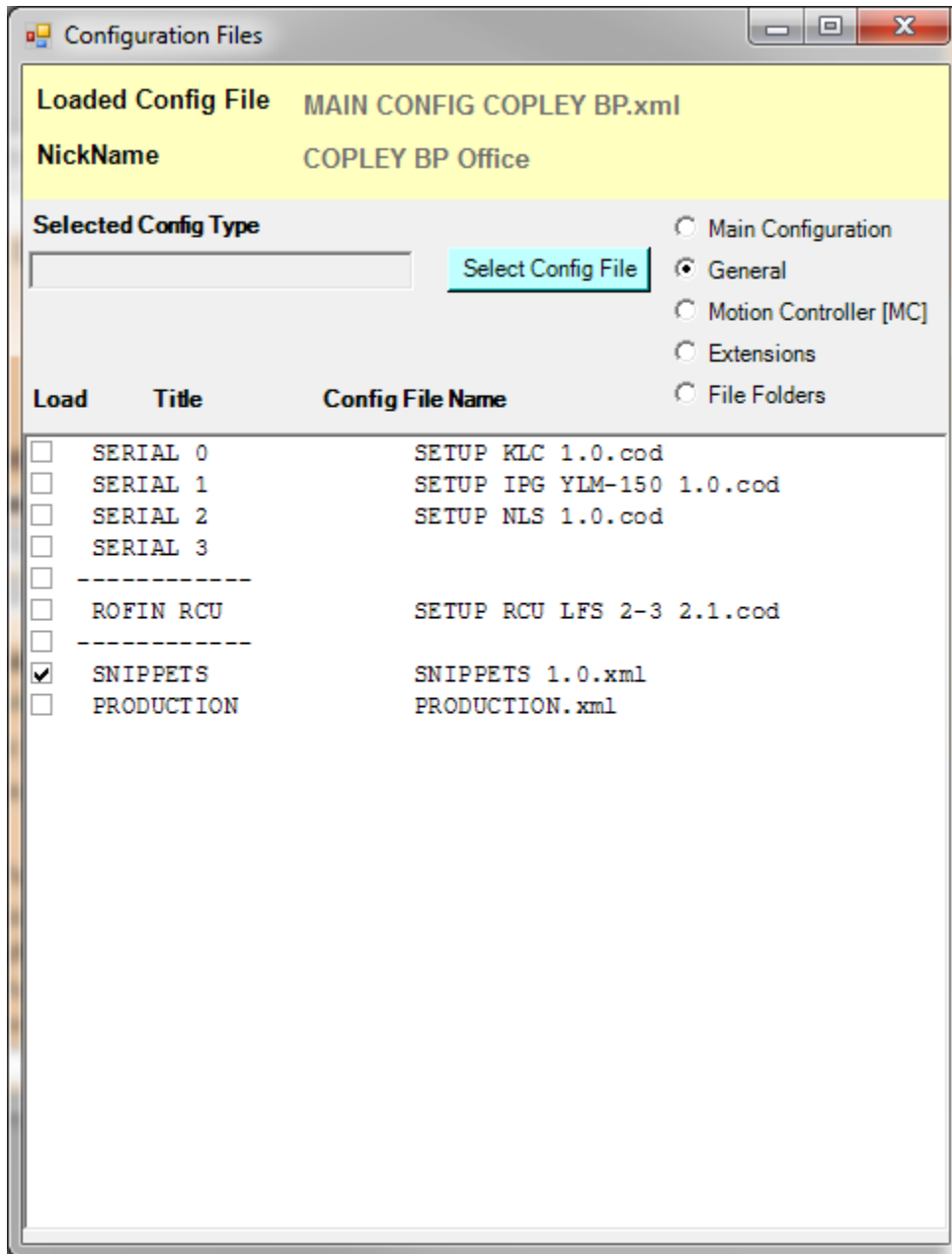
After that you can change the remaining configuration files



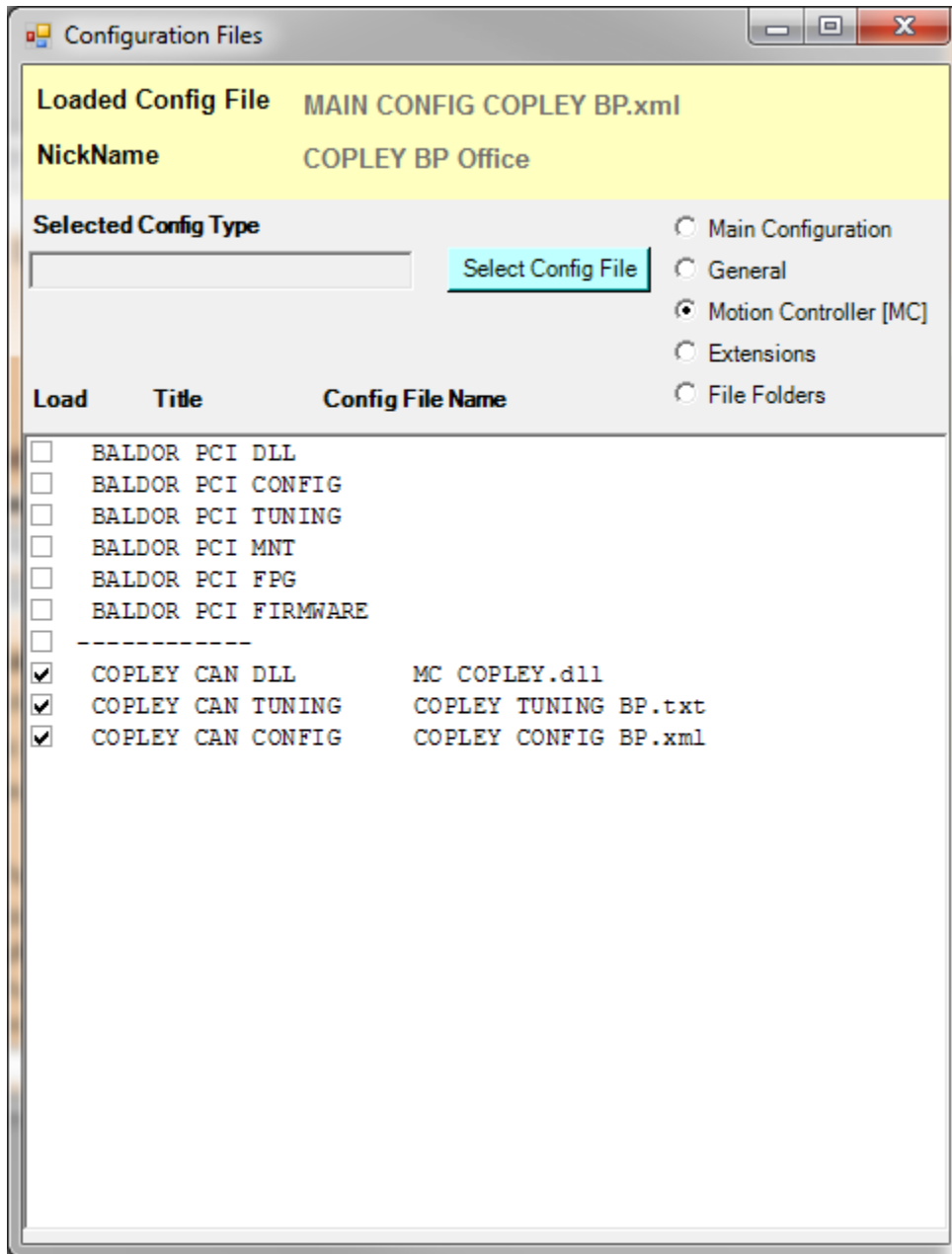
Each Main Configuration contains unique values that are independent of the other Main Configurations.



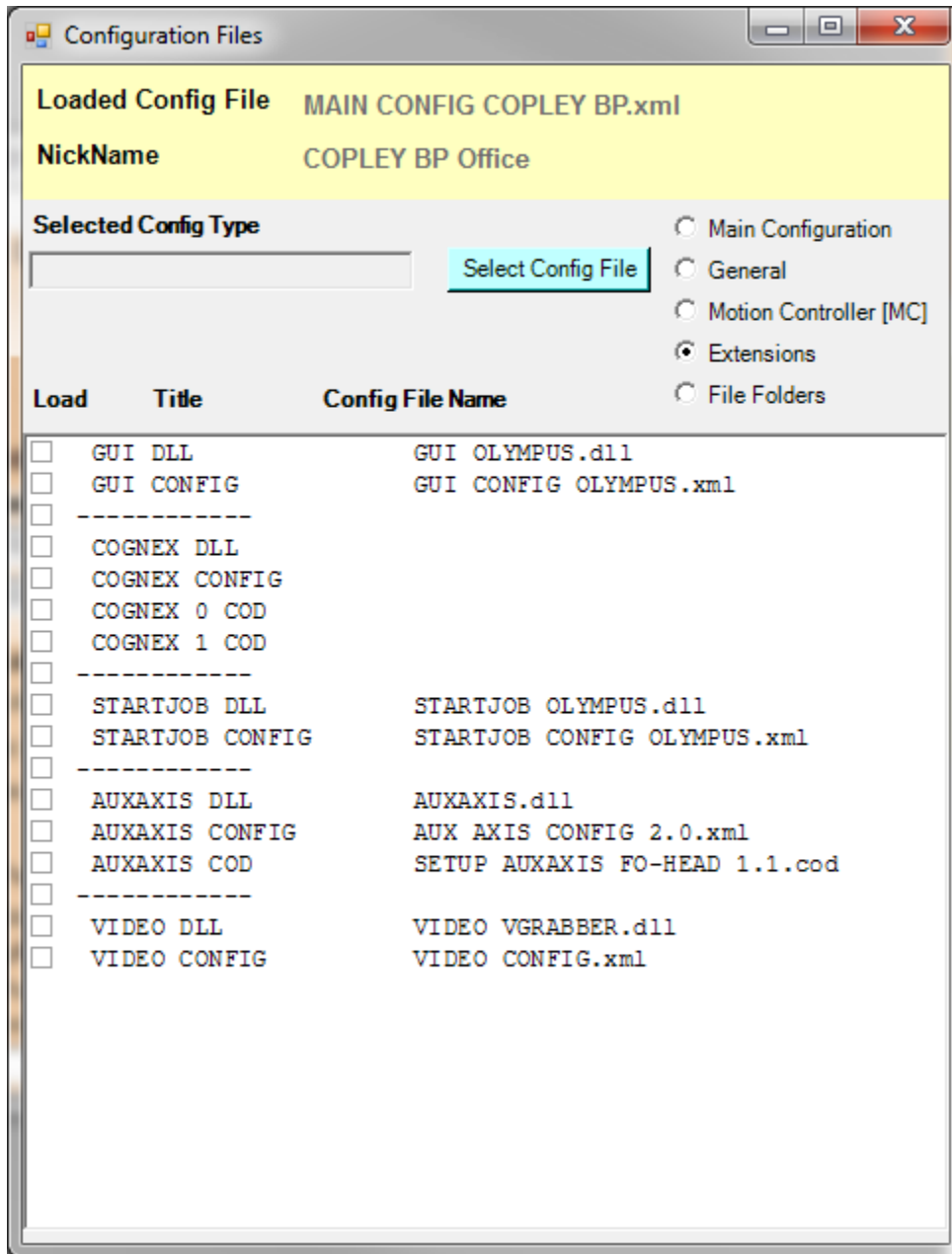
GENERAL



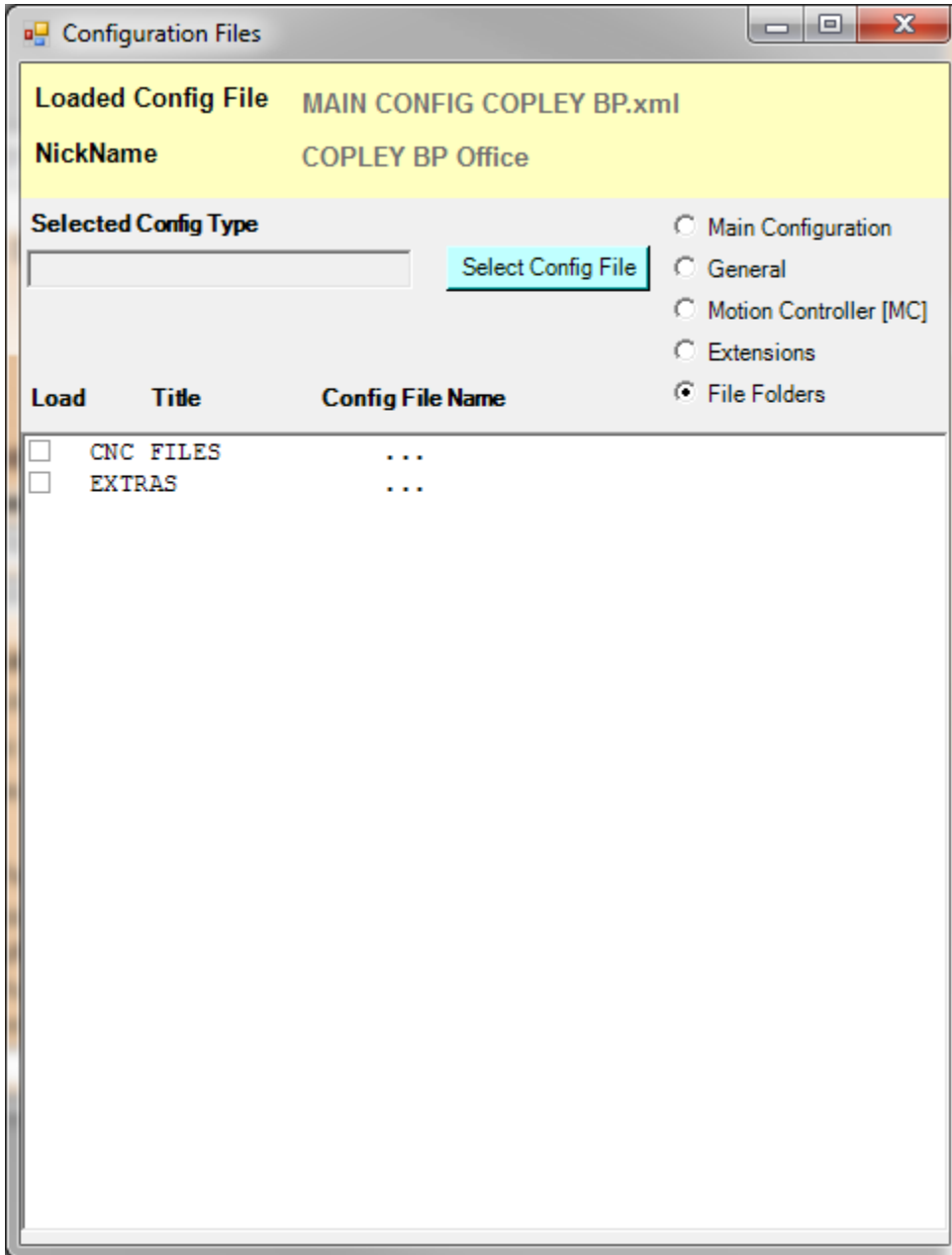
MOTION CONTROLLER



EXTENSIONS



FILE FOLDERS



CREATING A CUSTOM MAIN CONFIGURATION

A custom Main Configuration can be created if there is a special need for it.

First determine if your machine is running a Baldor PCI Motion Card, or if it using CanOpen. Open up the main file folder on the root C:\.

You need to copy the following files for a Baldor PCI motion controller:

1. MAIN CONFIG.xml (pick the one most similar to the new application)
2. BALDOR CONFIG.xml
3. BALDOR TUNING.txt

You need to copy the following files for a CanOpen motion controller:

1. MAIN CONFIG.xml (pick the one most similar to the new application)
2. COPLEY CONFIG.xml

3. COPLEY TUNING.txt

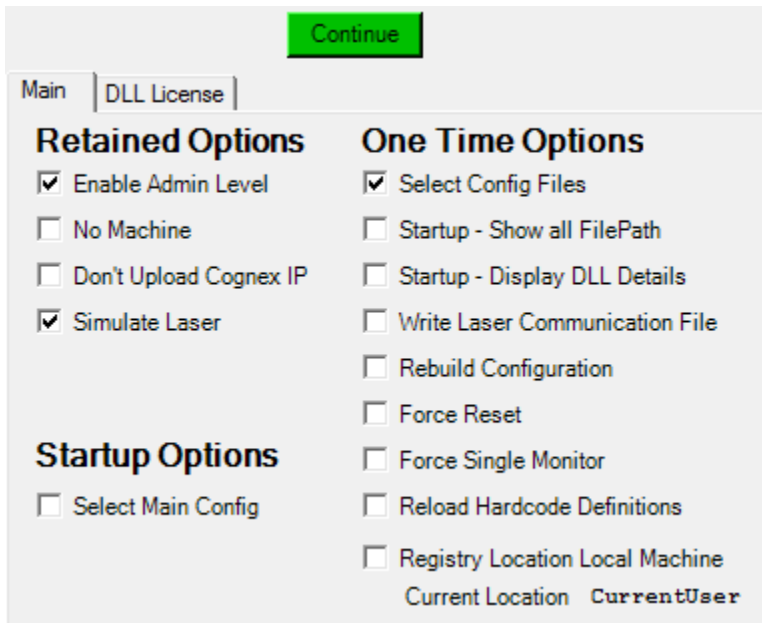
Rename the copied files with the same naming convention that are already in the file folder. It's important that the names be different than the other files in the folder if you are going to change the values!

Otherwise, you will mess with the other Main Configurations!

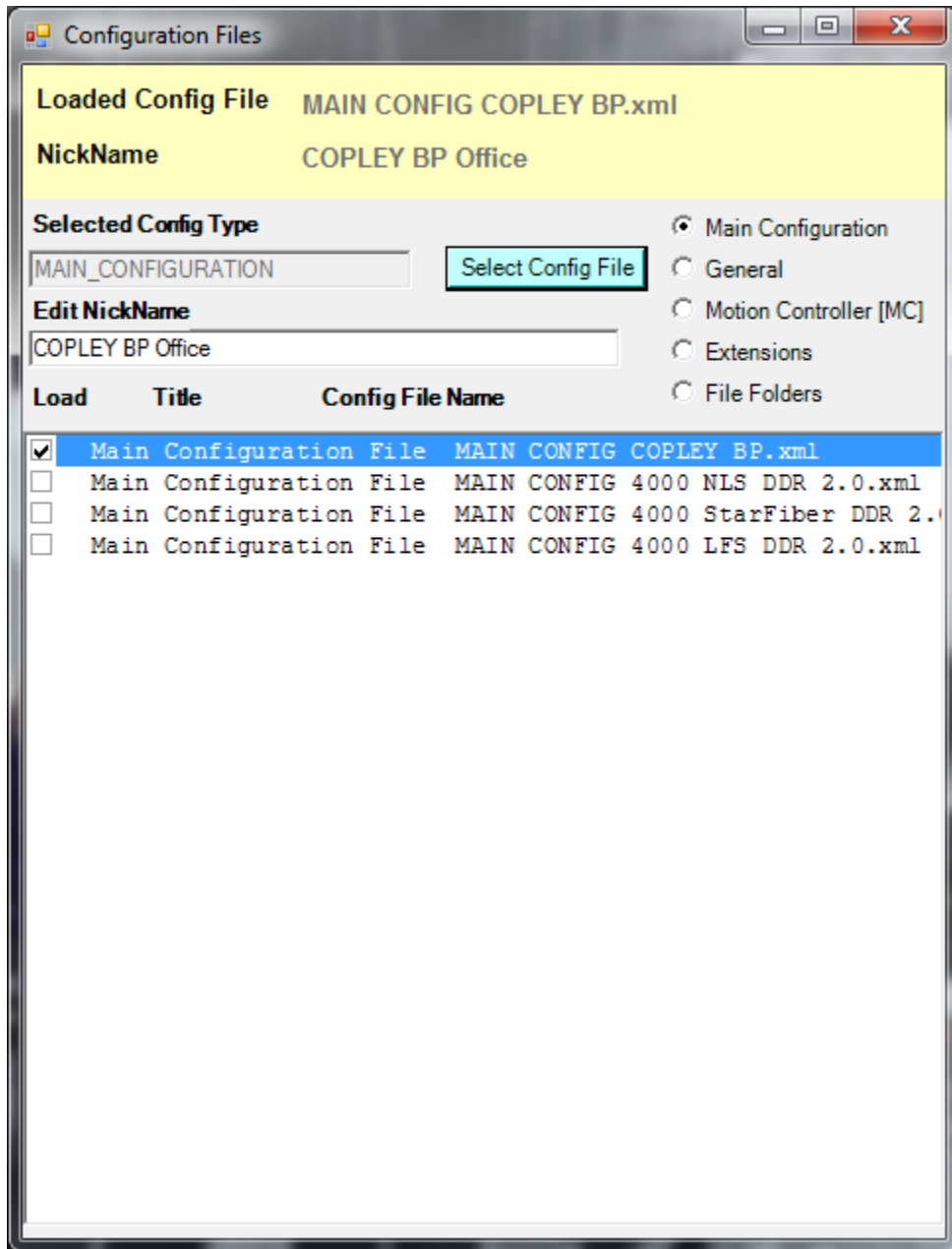
For example:

1. MAIN CONFIG 4000_LFS_COPLEY_DDR (tells you the machine type, laser typ, motion controller, DDR)
2. COPLEY CONFIG 4000 (tells you its a Copley MC, for a 4000 system)
3. COPLEY TUNNING 4000 (tells you its a Copley MC, for a 4000 system)

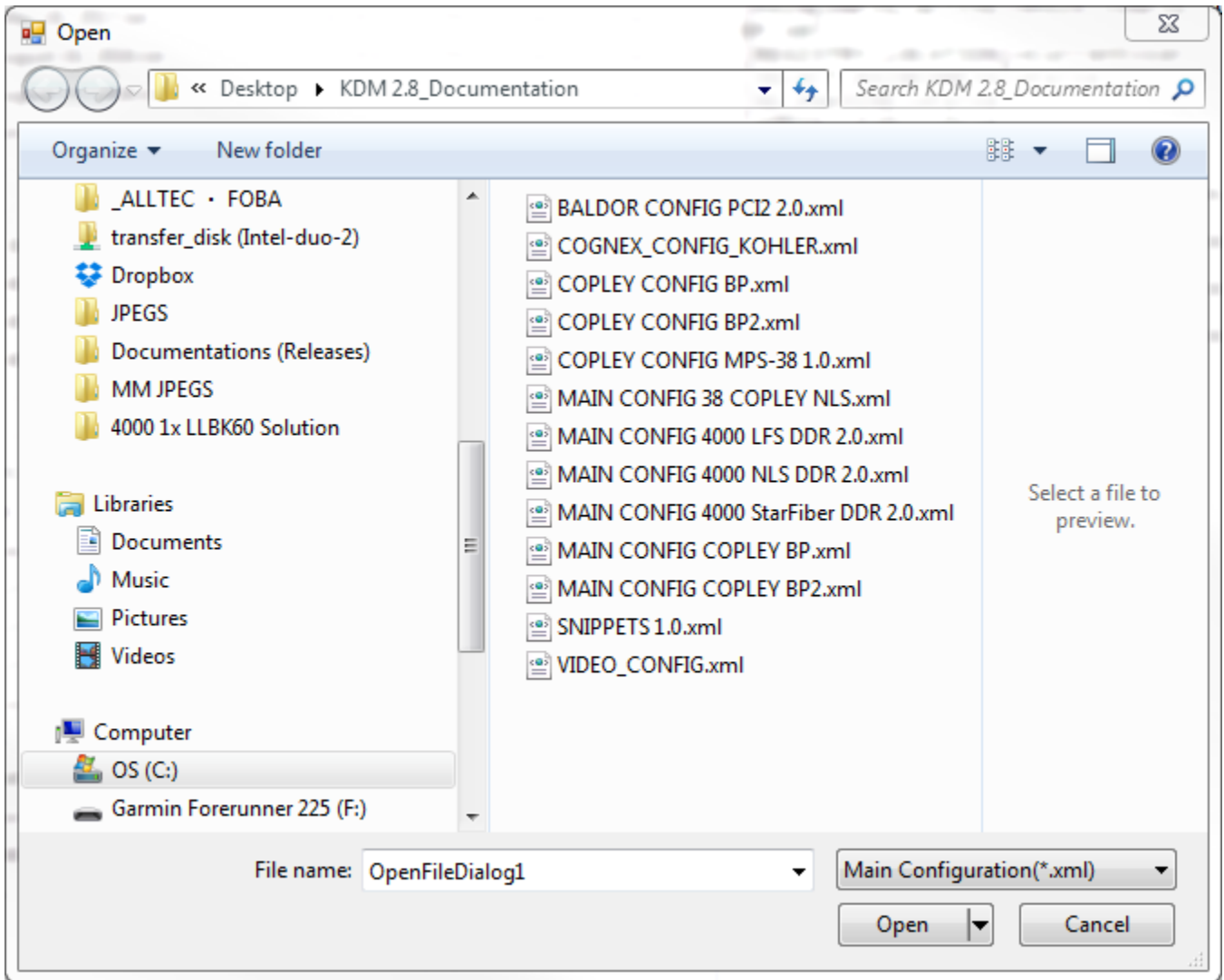
Start the KDM Software (hold down the shift key if you are not in Admin Level)



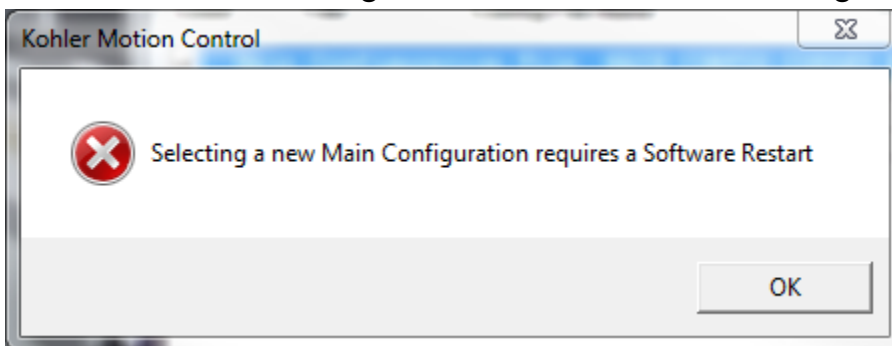
Click the "Select Config Files" box, and hit the green "Continue" button.



If you don't see the Main Config in the list, then click the blue "Select Config File" button.

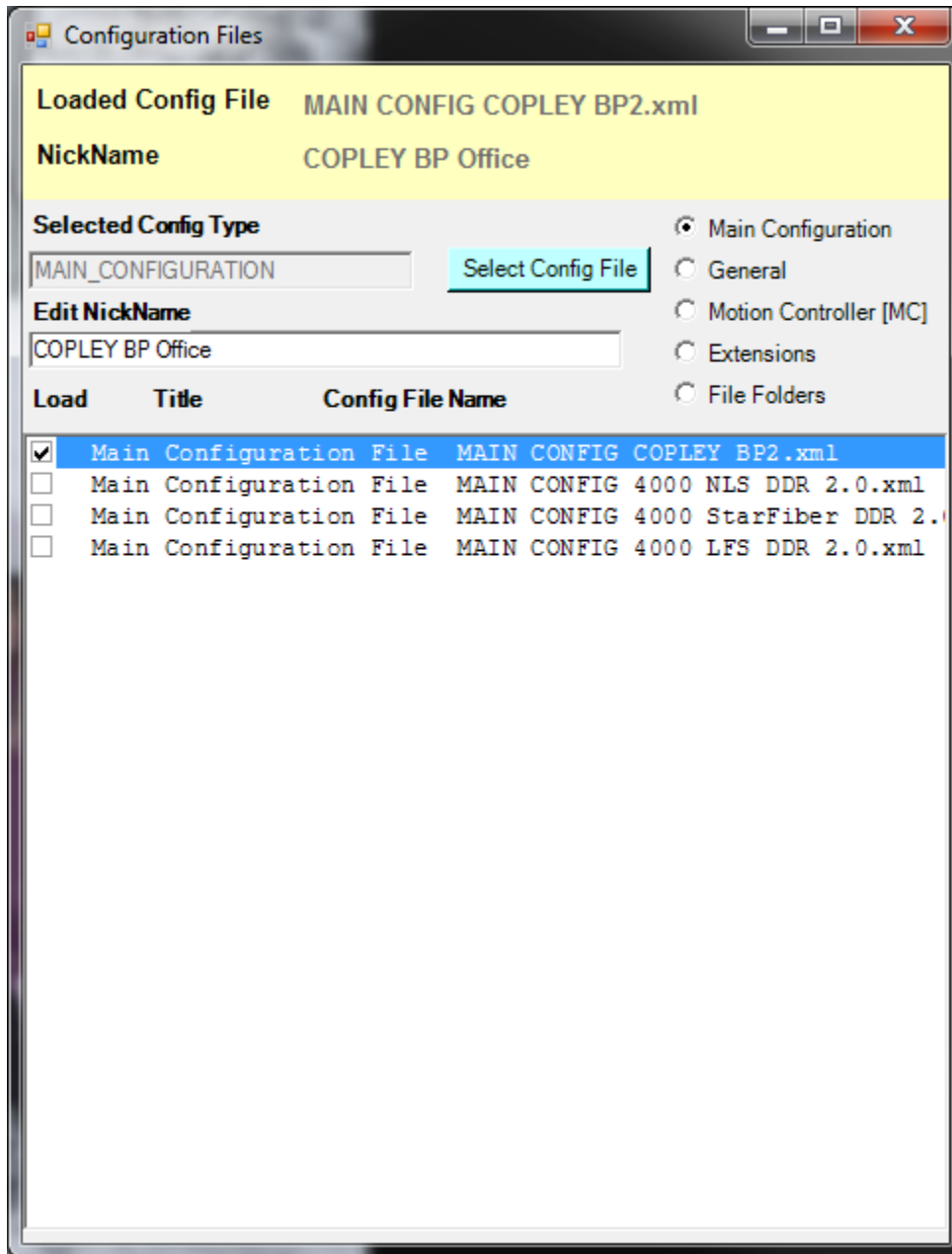


Select the Main Config from the list. You will then get this message:

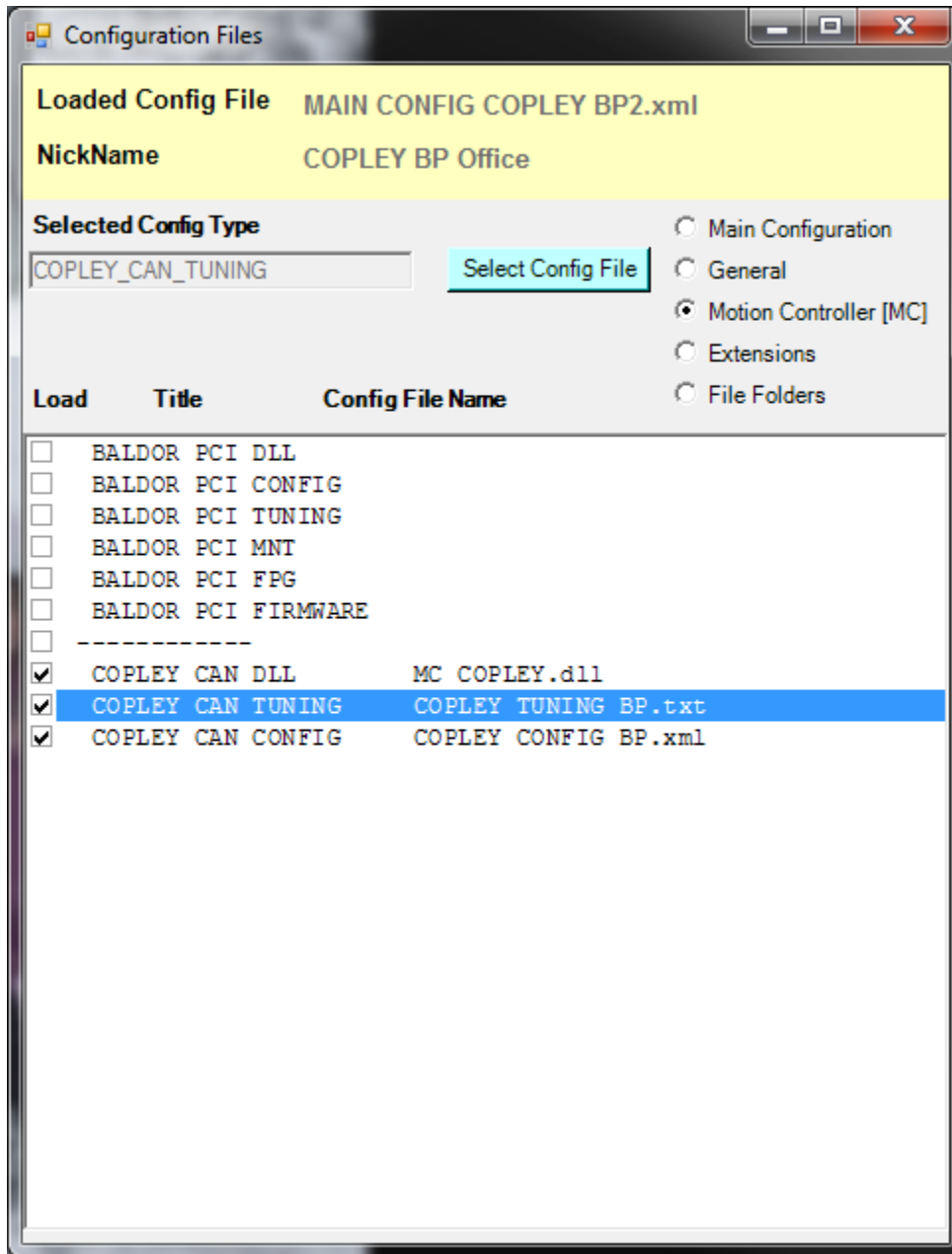


Click OK.

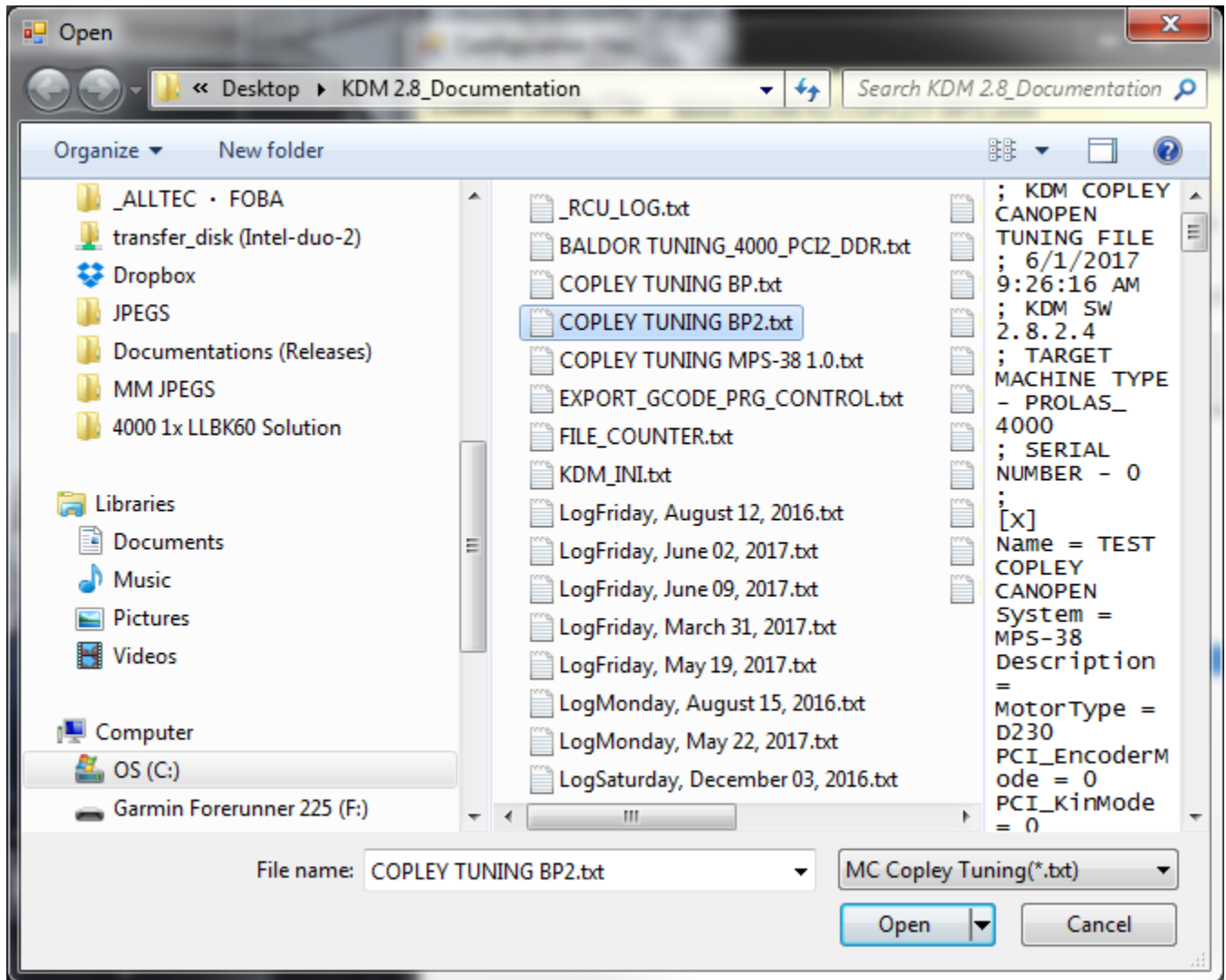
Start the KDM Software (hold down the shift key if you are not in Admin Level)
Click the "Select Config Files" box, and hit the green "Continue" button.
It should now display the Loaded Config File.



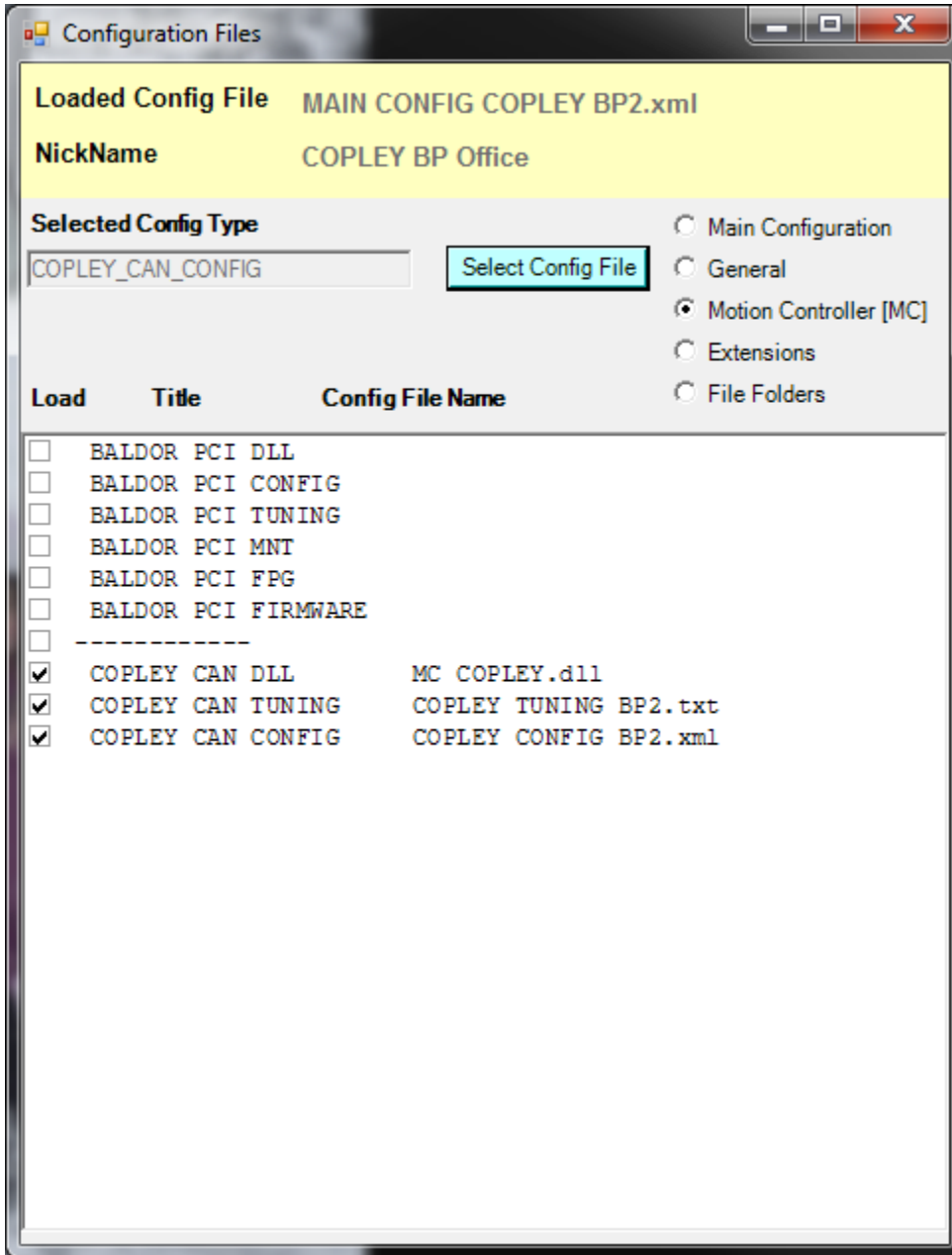
Next click the box for "Motion Controller [MC]"
Select either the Baldor PCI tuning or Copley Can Tuning and hit the blue "Select Config File"



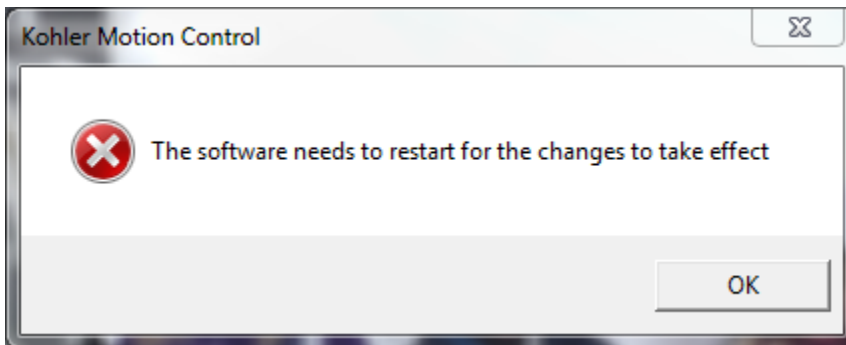
Select your renamed tuning file from the list



Repeat the same process but for either the Baldor PCI Config or Copley Can Config.xml



Once completed, close the window and restart the KDM software again.



The KDM software should automatically load your Main Configuration and open to the main window (if in Admin mode, just click the green "Continue" button).

Changes can now be made to your custom Main Configuration without making any changes to the other Main Configurations. Most changes can be made in the System \ Setup KDM toolbar.

Kohler Design Motion - Setup [COPLEY BP Office]

ACTIVE CONFIGURATION

FileName MAIN CONFIG COPLEY BP2.xml

NickName COPLEY BP Office

Info 0

Equipment ID #

Machine Setup

Type PROLAS_4000

Serial # 4000

Controller Hardware

☒ KDC_200

☐ KDC_100

Opening / Editing Files

☒ Syntax Coloring while Editing

☒ Open with Syntax Coloring

☐ Open Files Locked

Parsing

☐ Always Parse

☐ Modal Motion Commands

Processing Video

☐ Enable Process Video

Video Password

Miscellaneous

☐ Multi Screen Environment

☐ Autosave Configuration

☐ Show All Error Messages

☒ End of PRG Message

☐ Show File Path when Saving

Backup System Files **Backup Location**

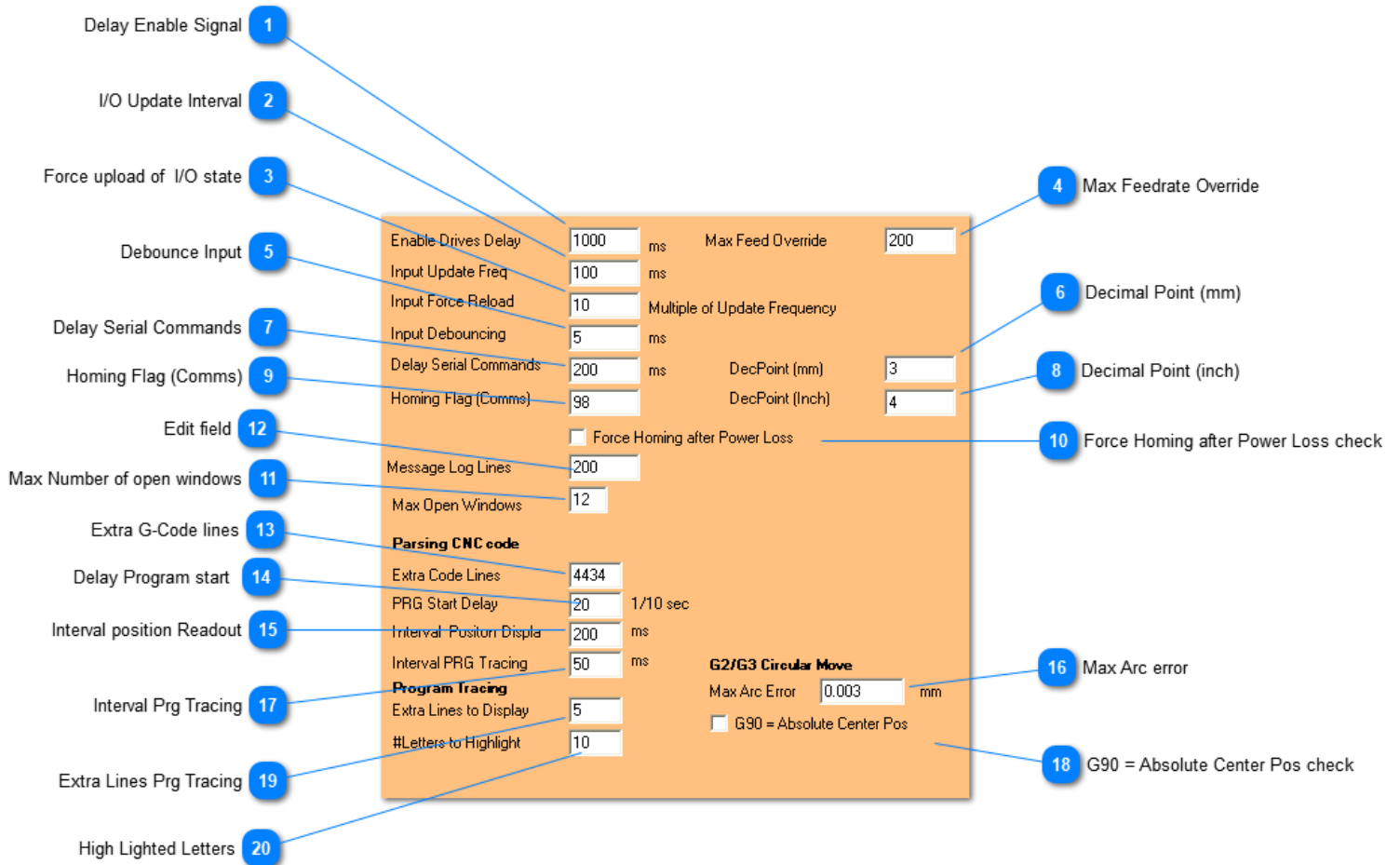
...sktop\KDM 2.8_Documentation

Backup Intervals (Days) 10

Backup Now

KDM Software Manual

KDM Advanced Setup



1 Delay Enable Signal

1000

Max Delay allowed for the Amps to turn on and send the Amp enable signal

2 I/O Update Interval

100

3 Force upload of I/O state

10

Updating the I/O states is currently not event driven, instead to update the I/O's the software uses a 2 step system

- On a set Interval (I/O Update) the software compares the returned I/O bit state against the last recoded Bit state

If it has changed, it will upload the changed I/O states

- after (Input force Reload) amount of Loops have passed, the software force the upload of ALL I/O states

4 Max Feedrate Override

200

Set's the % of feed rate that can be used to override the programmed feed rate

Freed rate override can be enabled /disabled for individual sections of code in the Program

5 Debounce Input

5

This value will be downloaded to the Motion controller as the requested debounce time for reading inputs

6 Decimal Point (mm)

3

7 Delay Serial Commands

200

This will add a delay between sending multiple serial commands.

8 Decimal Point (inch)

4

9 Homing Flag (Comms)

98

This the (persistent) memory location for the homing flag on the motion Controller

10 Force Homing after Power Loss check

☐ Force Homing after Power Loss

As the state of Homing flag is stored on the Motion card, this will determine if a power cycle on the Work Station will force homing the machine or not

On systems with Linear motors this flag should be checked , as the Encoder position will be lost once you depower the work station

11 Max Number of open windows

12

12 Edit field

200

13 Extra G-Code lines

4434

Currently the parsed structure has a fixed size.

Before parsing, the software checks if the current CNC code will fit - if not the software we reset the structure and increase the size by 500 lines.

If you are running rather short programs but this number shows up high - reset it by starting with 200-300 lines ..

This will automatically adjust the structure to a more reasonable size

14 Delay Program start

20

There is one significant difference between starting a program from the GUI or the [Operator panel](#)

- Starting from the GUI will start the most upfront program **without** delay
- Starting from the Operator panel will start the most upfront program **with** a delay
- The same goes for the Duo Buttons when operating systems equipped with automatic door

You need to stay on the button until the program starts !

- Once the program is running , both GUI and OP panel start button will act the same

15 Interval position Readout

200

Determines the interval for reading out the axis position and displaying it in the GUI

16 Max Arc error

0.003

Maximum allowed difference between the two Arc radius (Start Point - Center / End Point - Center) during Arc calculation

17 Interval Prg Tracing

50

This will determine how often the software will update the current line display in the edit window

18 G90 = Absolute Center Pos check

☐ G90 = Absolute Center Pos

19 Extra Lines Prg Tracing

5

This set's the number of code lines displayed in the Info Window

20 High Lighted Letters

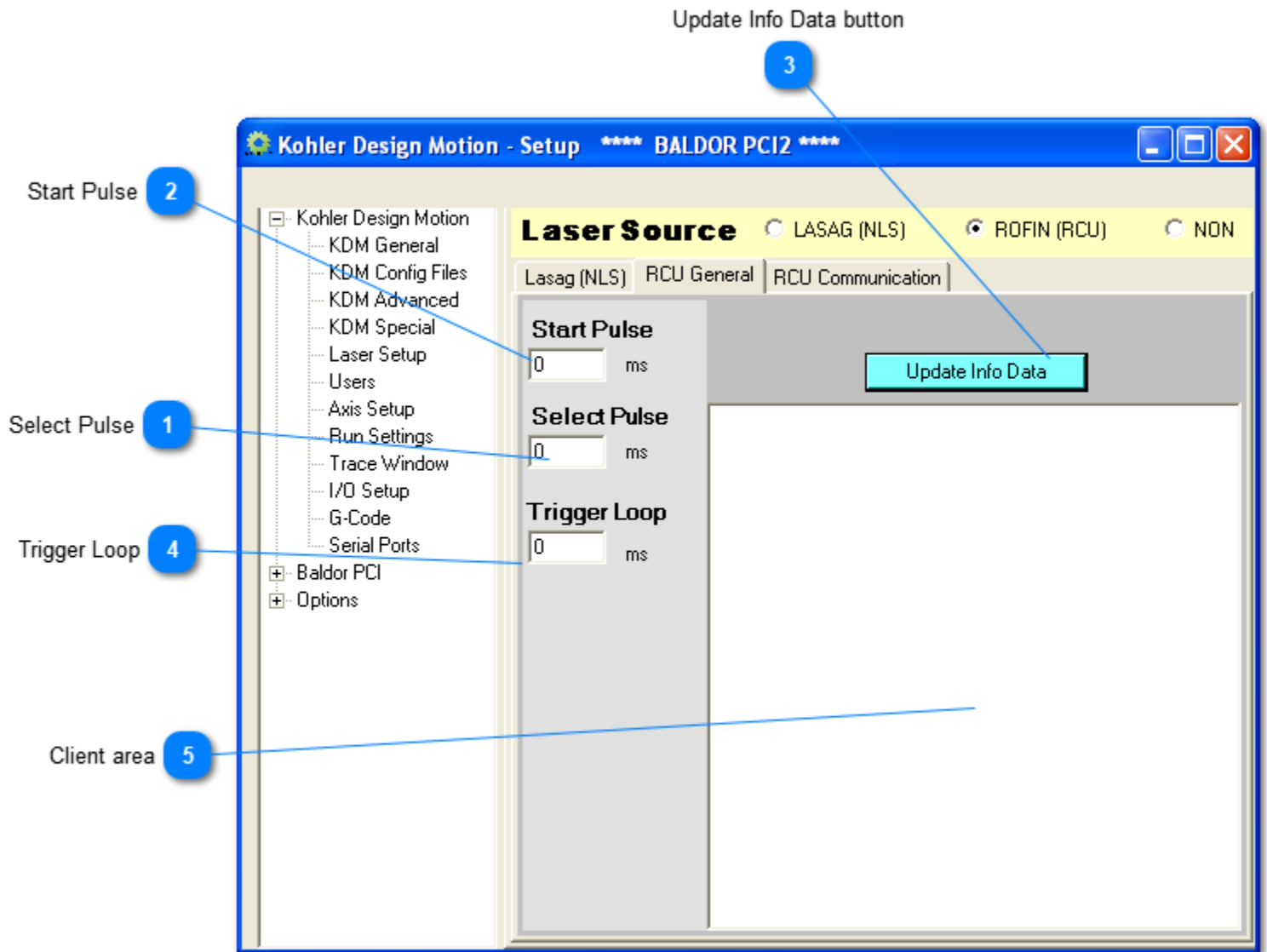
10

This determines how many letters will be highlighted in the edit window

Tracing needs to be enabled in the run setup menu

Laser Setup

Laser Setup RCU



1 Select Pulse

0

Length of Select Pulse to the RCU

2 Start Pulse

0

Length of Start Pulse to RCU

3 Update Info Data button

Update Info Data

4

Trigger Loop

The trigger allows the start pulse to be loaded onto the move buffer - allowing turning on of the start signal on the fly

- If the trigger is active, the trigger loop is constantly looking for the start signal to go high
- Once it detects the Start signal to go high it will automatically reset the start signal after the Start Pulse duration
- This function is meant to be used with short pulse bursts signals (M74) that need to be fired without stopping the motion

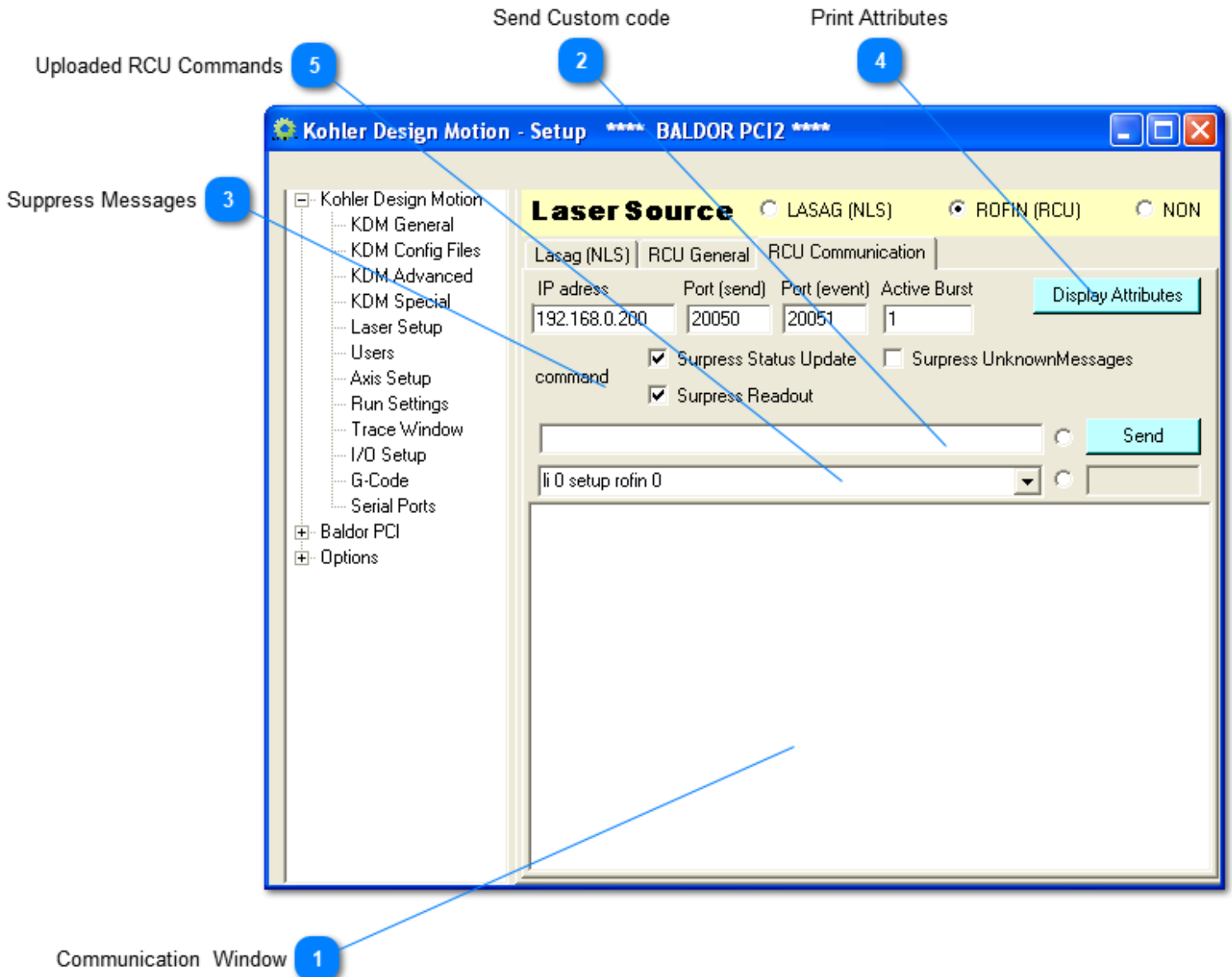
Setting the trigger loop Interval to small, will use up lot's of computer processing power - preset is 15 ms

5

RCU Info

This will display any attribute that has uploaded as `DEVICE_INFO` command from the .cod file

Laser Communication (RCU)



1 Communication Window

Right click with the mouse to clear the window

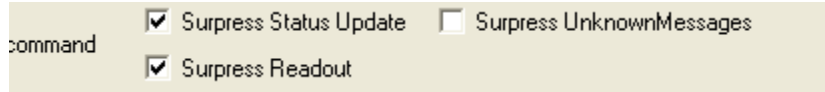
2 Send Custom code

Create custom codes and send them to the RCU

(Use a Cookie > 500 to make the message unique)

The communication window will display the respond from the RCU & a warning message that it received a message with an unknown cookie - that's normal)

3 Suppress Messages

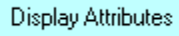


command ☒ Surpress Status Update ☐ Surpress UnknownMessages
☒ Surpress Readout

Suppress or display standard commands (status update requests) sent to the RCU

4

Print Attributes



Display Attributes

This will display all uploaded attributes for the selected command in the dropdown List

5

Uploaded RCU Commands



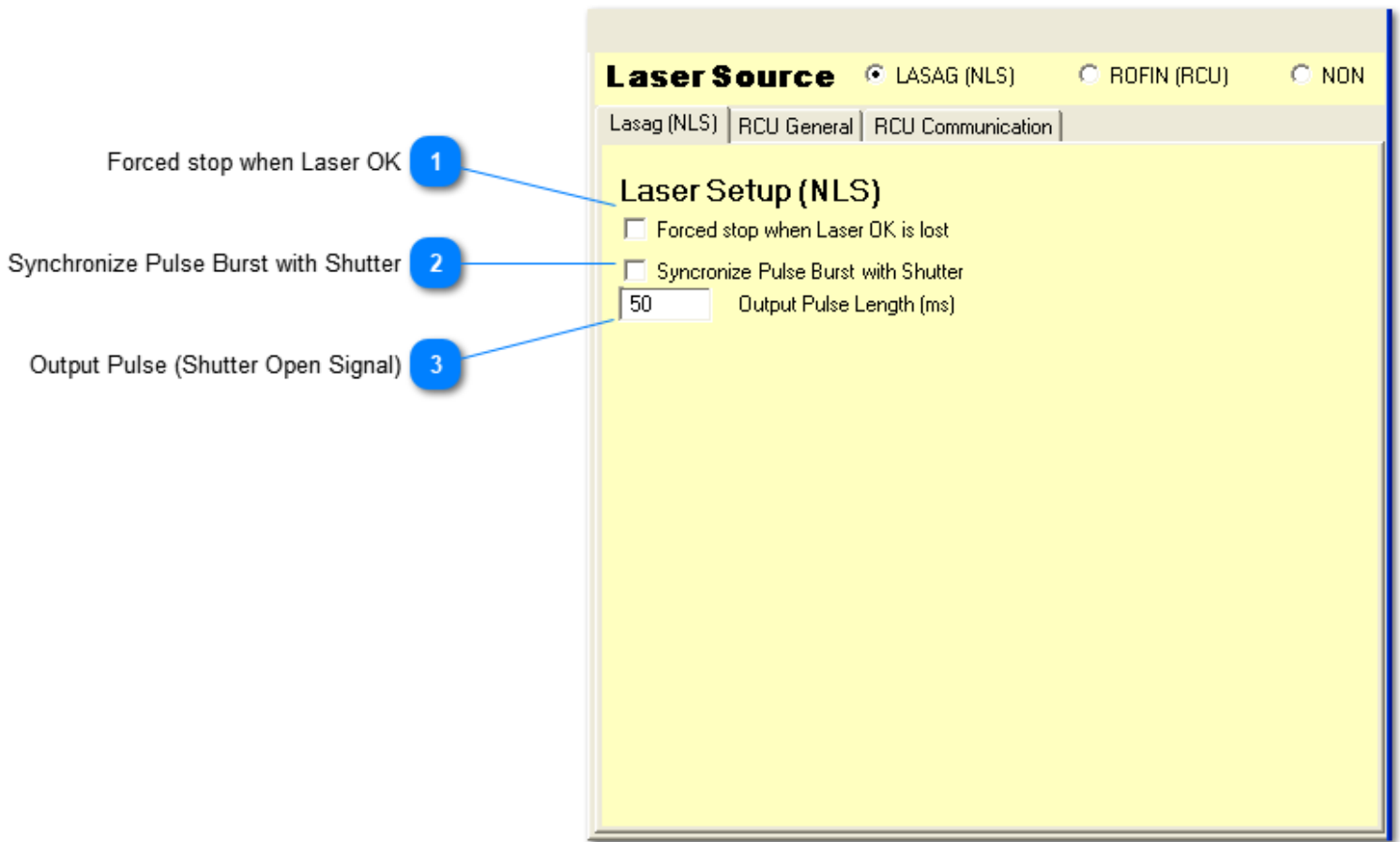
li 0 setup rofin 0

List of all uploaded RCU Commands

Select a command from the List (make sure the radio Button next to the drop down is selected)

Push [Send] to send the command to the RCU

Both sent & received commands will be displayed in the communication window

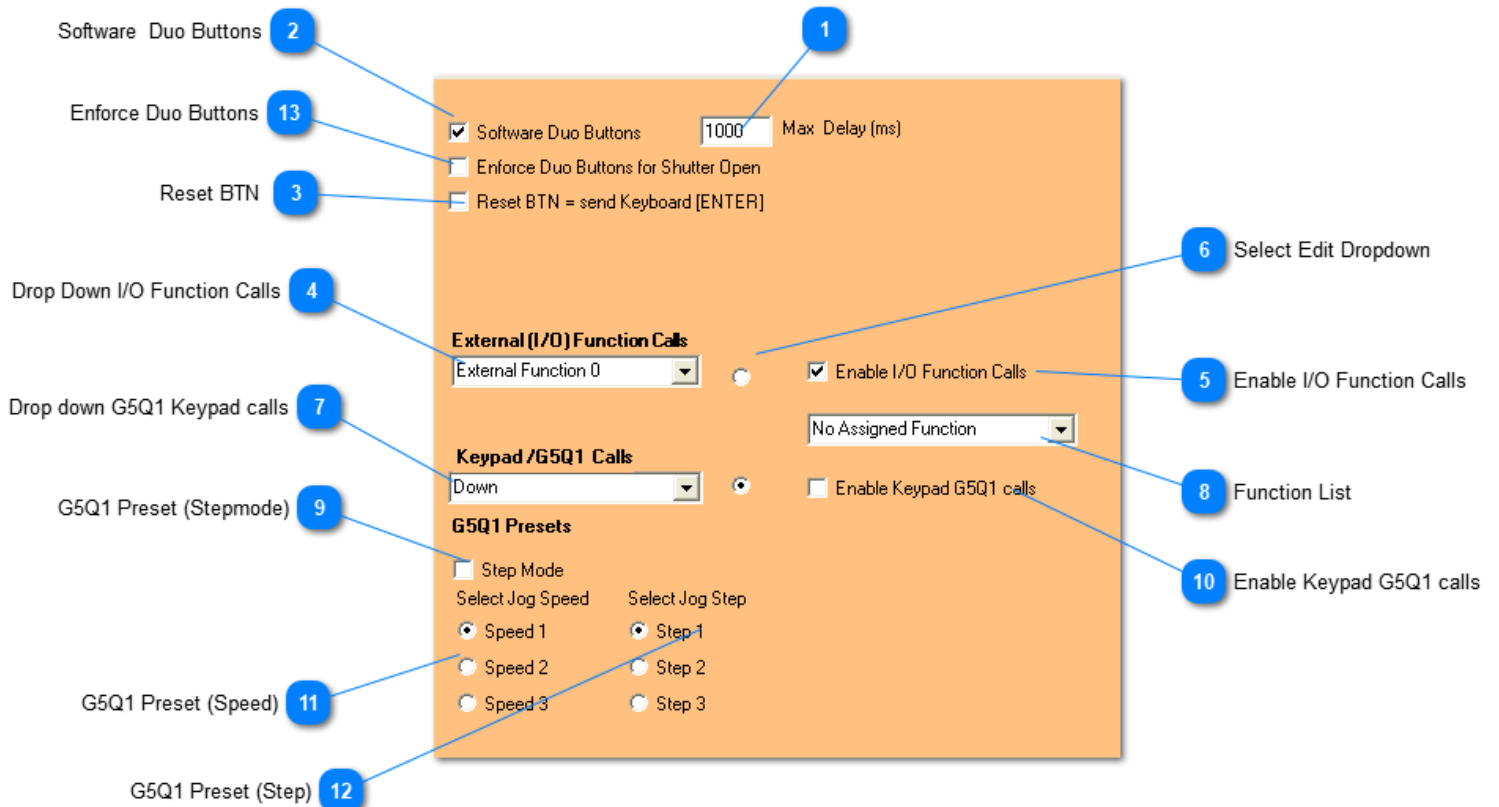
Laser Setup NLS**1 Forced stop when Laser OK**☐ Forced stop when Laser OK is lost**2 Synchronize Pulse Burst with Shutter**☐ Synchronize Pulse Burst with Shutter

This will force the Software to wait until the first rising edge of the pulse is received

3 Output Pulse (Shutter Open Signal)

KDM CONTROLS

Delay Software Duo Buttons



1 Delay Software Duo Buttons

1000

Determine the maximum allowed time between activating both duo sensors

2 Software Duo Buttons

☒ Software Duo Buttons

Glove Box Special function

- For systems without door Only
- This is used in the glove box to allow starting code with the duo buttons from inside the unit

3 Reset BTN

☐ Reset BTN = send Keyboard [ENTER]

This will send the [RESET] keystroke to the computer every time the reset button is pressed

4 Drop Down I/O Function Calls

External Function 0

5 Enable I/O Function Calls☒ Enable I/O Function Calls**6 Select Edit Dropdown**

Both External I/O and G5Q1 Keyboard calls can be assigned to the same function
Please select which ground you'd like to edit or assigned functions too

7 Drop down G5Q1 Keypad calls**8 Function List****9 G5Q1 Preset (Stepmode)**☐ Step Mode**10 Enable Keypad G5Q1 calls**☐ Enable Keypad G5Q1 calls**11 G5Q1 Preset (Speed)**

☒ Speed 1
☐ Speed 2
☐ Speed 3

12 G5Q1 Preset (Step)

☒ Step 1
☐ Step 2
☐ Step 3

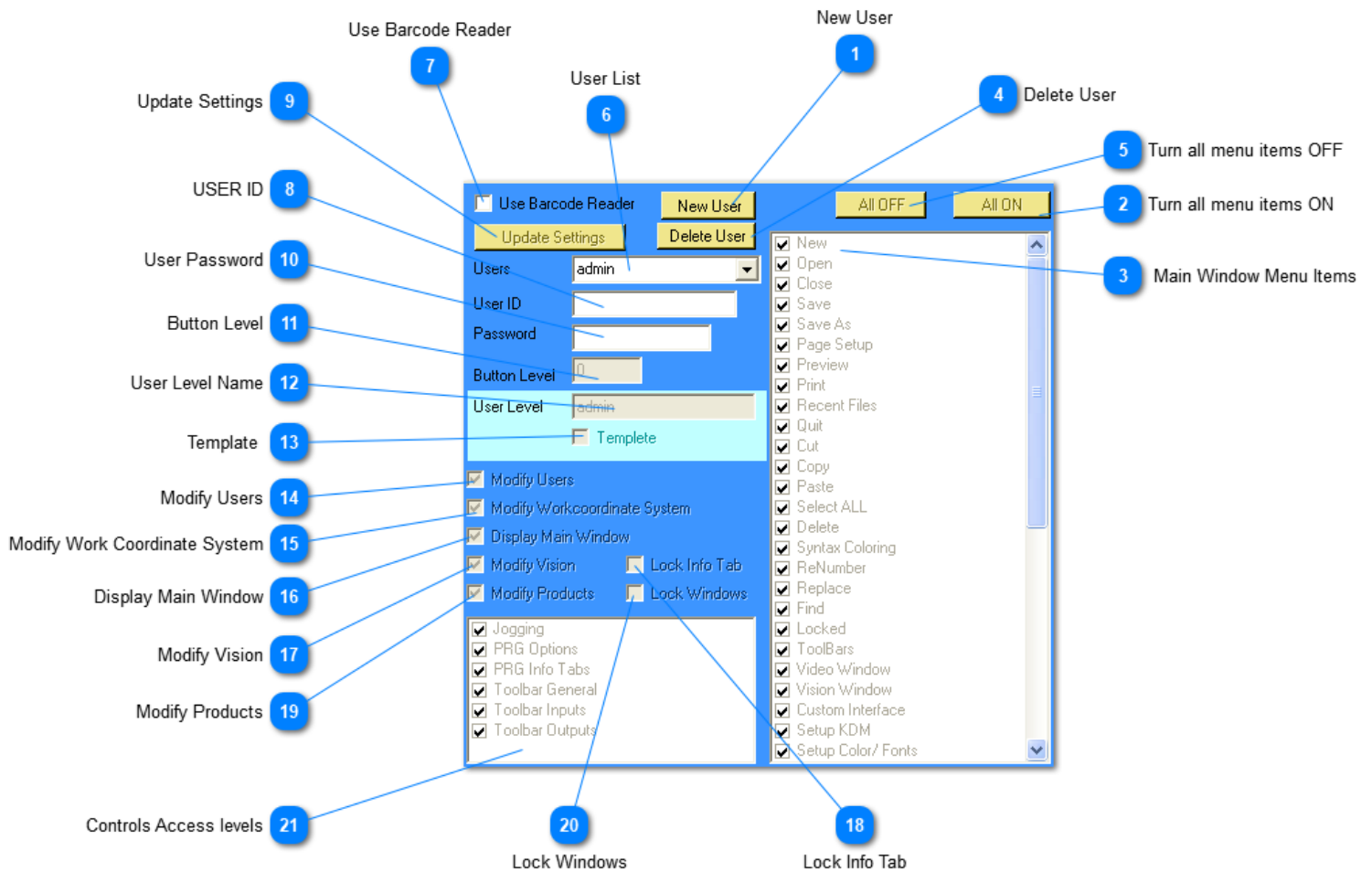
13

Enforce Duo Buttons

☐ Enforce Duo Buttons for Shutter Open

This can be used to force the operator to have both hands in the switches in order for the shutter to open

User Setup



1 New User

New User

Create a new user

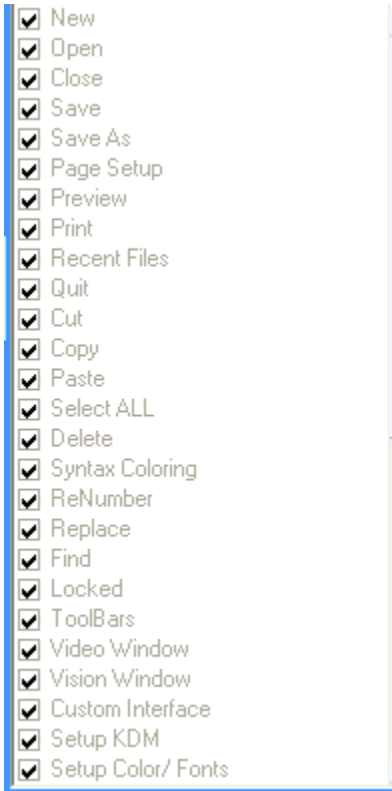
If you'd like to make a copy of an existing user make sure it's selected at this time

- Enter a new (Unique) name for the user
- Select if the User should be a copy of the currently displayed user

2 Turn all menu items ON

All ON

3 Main Window Menu Items



This list's all menu items found on the main window of the software
Uncheck the items you'd like to disable for this user

4

Delete User

Delete User

5

Turn all menu items OFF

All OFF

6

User List

admin

7

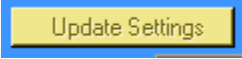
Use Barcode Reader

☐ Use Barcode Reader

Check this if you like to use a barcode reader to scan a user ID (Users can always be selected manually from a dropdown)

8

USER ID

9 Update Settings


Update changes made to the user settings

10 User Password

11 Button Level

This will allow to fine tune access to custom buttons - for it to work properly you need to assign different levels to all custom buttons

The lower number will allow access to all buttons will higher levels (3 will give access to all buttons assigned levels 3 and higher but not to levels 0 to 2)

12 User Level Name

This allows to assign a custom name indicating the user Level

You could Use "OP" for all operators or "Operator" - when uploading users from file this will allow matching users with a desired user level

13 Template
☐ Template

Templates can not be used to operate the work station - they do allow you to create a preset of user settings that can be easily applied to new users

14 Modify Users
☒ Modify Users

Allows to change settings to users

15 Modify Work Coordinate System
☒ Modify Workcoordinate System

Allows to make changes to the coordinate system

16 Display Main Window
☒ Display Main Window

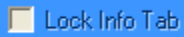
Used with the Custom GUI - this will determine if the software will give the user access to the main window

If access is allowed , closing the Custom GUI will show the main window

If access is denied, closing the Custom GUI will shut down the application

17 Modify Vision
☒ Modify Vision

18 Lock Info Tab



Determines if you can select one of the various taps in the Info Panel

19 Modify Products



20 Lock Windows



If checked this will open the windows in a locked state (can not be moved or minimized)

21 Controls Access levels



Enabled disables access to various controls on the main window

Setup Axis

Enable Limits 1 Enable Homing 2 Home In Negative direction 5

Axis ID 3 Enable Axis 4

Axis ID	Enable	ID	Limits	Enable	Homing	Feed In / Feed O	Home Negative
Axis # 0	<input checked="" type="checkbox"/>	X	<input type="checkbox"/>	<input checked="" type="checkbox"/>	100 / 10 (mm/min)	<input type="checkbox"/>	
Axis # 1	<input checked="" type="checkbox"/>	Y	<input type="checkbox"/>	<input checked="" type="checkbox"/>	100 / 10 (mm/min)	<input checked="" type="checkbox"/>	
Axis # 2	<input checked="" type="checkbox"/>	Z	<input type="checkbox"/>	<input checked="" type="checkbox"/>	100 / 10 (mm/min)	<input type="checkbox"/>	
Axis # 3	<input checked="" type="checkbox"/>	A	<input type="checkbox"/>	<input checked="" type="checkbox"/>	10 / 2 (mm/min)	<input type="checkbox"/>	
Axis # 4	<input type="checkbox"/>	B	<input type="checkbox"/>	<input type="checkbox"/>	0 / 0 (mm/min)	<input type="checkbox"/>	
Axis # 5	<input type="checkbox"/>	C	<input type="checkbox"/>	<input type="checkbox"/>	0 / 0 (mm/min)	<input type="checkbox"/>	

Limit mode 6

Max Feedrate 7

G00 Feedrate 8

Minimum Feed rate 10

Master Axis 12

Geared Axis 14

Limit Mode 1

Max Feedrate 15000 mm/min

Rapid Feed (G00) 500 mm/min

Min Feedrate 1 mm/min

Enable Gearing 11

Enable Gearing ☒

Compensate Position ☐

Master Axis # 0

Slave Axis # 0

Gear Ratio 0

Compensate Master Position 13

Gearing ratio 9

1 Enable Limits



2 Enable Homing



3 Axis ID



Axis ID Letter assigned to a particular axis number
Standard axis ID's are (but not limited) : X,Y,Z,A,B,C

Be careful not to pick an already defined letter in G-Code (Don't use F,J,K,I)

*X,Y,Z are used for standard linear axis
A,B are usually Rotational Axis*

4 Enable Axis

☒ Axis # 0

5 Home In Negative direction

☐

6 Limit mode

Indicates how the motion controller should react to limit hit

Currently two options are available (Options are Motion Controller dependent)

- Ignore
- Crash Stop -disable drive [Preset]

7 Max Feedrate

This will limit the feed rate for ALL axis

8 G00 Feedrate

G00 Feed rate unless one of the axis involved is not supporting the programmed feed rate.

9 Gearing ratio

10 Minimum Feed rate

11 Enable Gearing

☐

12 Master Axis

13

Compensate Master Position



This will allow compensating the display of the master axis based on the slave position

14

Geared Axis



KDM Software Manual

Motion Controller PCI2

PCI2 Main Setup

The screenshot shows the 'PCI(2) Main Board' configuration window. It includes fields for 'Move Buffer Size' (100), 'Buffer Low Signal' (35), 'Firmware File' (NextMove PCI-2 Build 5424 CANopen.chx), 'FPGA File Name' (FPGA PCI-2 Version 38.fpga), and 'MNT File Name' (MNT_KDM.mnt). There is a checkbox for 'Use Compiled MNT File'. Below these are fields for '# Inputs' (20) and '# Outputs' (12). A sub-window titled 'I/O Level' is open, showing 'Type' as 'Input Level', 'Display' as 'Decimal', and a value of '879631'. An 'Apply Changes' button is next to the 'I/O Level' sub-window. At the bottom, there is a 'Client area'.

Numbered callouts (1-15) point to the following elements:

- 1: Loaded Firmware Version
- 2: Move buffer size
- 3: Firmware File Name
- 4: Move Buffer Low Limit
- 5: FPGA File Name
- 6: Use Compiled MNT File
- 7: MNT File Name
- 8: Available Inputs
- 9: Available Outputs
- 10: Update Active Level
- 11: Dropdown I/O type
- 12: Tab Page I/O Level
- 13: Display format Active Level
- 14: Current Active Level
- 15: Client area

1 Loaded Firmware Version

NextMove PCI-2 Build 5424 CANopen

- to change file, see [selecting configuration](#) files

2 Move buffer size

100

3 Firmware File Name

NextMove PCI-2 Build 5424 CANopen.chx

- to change file, see [selecting configuration](#) files

4 Move Buffer Low Limit

35

5 FPGA File Name

FPGA PCI-2 Version 38.fpga

- to change file, see [selecting configuration](#) files

6 Use Compiled MNT File

☐ Use Compiled MNT File

If unchecked the

7 MNT File Name

MNT_KDM.mnt

- to change file, see [selecting configuration](#) files
- .mnt file to be loaded (compiled / or not compiled)

The selected file needs to match the checkbox for loading compiled file

8 Available Inputs

20

9 Available Outputs

12

10 Update Active Level

Apply Changes

11 Dropdown I/O type

Input Level

Select Input or output

12 Tab Page I/O Level

Main Card | Contour Mode | Error Handling |

I/O Level Apply Changes

Type: Input Level

Display: Decimal

879631

0

13 Display format Active Level

Decimal

The active levels can be displayed in 3 different formats

- Decimal,
- Hex
- Binary

14 Current Active Level

879631

15

Client area

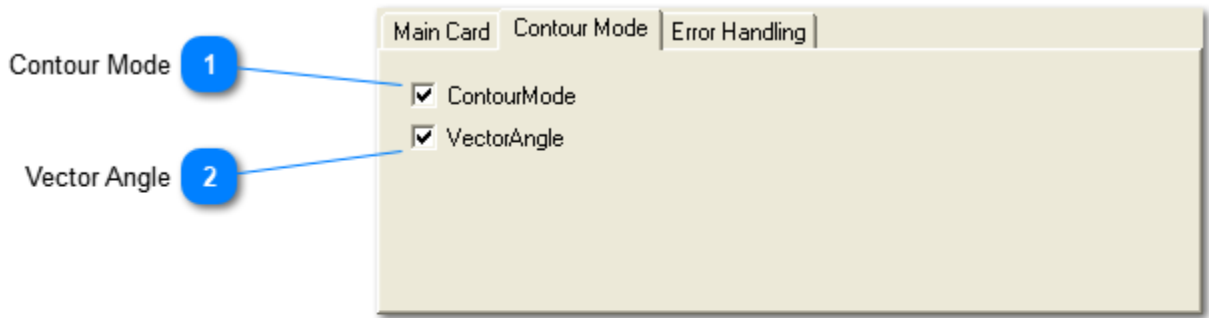
I/O Level Apply Changes

Type

Display

0

TabPage Contour Mode



Kmove_Function.PCI_BLENDMODE 3

Kmove_Function.PCI_BLENDDISTANCE 4

The KOHLER DESIGN MOTION offers two additional ways of setting up how consecutive moves will be executed. The following Functions are currently available to fine tune blending from within the CNC code

`Kmove_Function.PCI_BLENDMODE`
`Kmove_Function.PCI_BLENDDISTANCE`

1 Contour Mode

☒ ContourMode

Part of the ContourMode setup on the PCI(2) - Should be turned ON

2 Vector Angle

☒ VectorAngle

Part of the ContourMode setup on the PCI(2) - Should be turned ON

- Preset stop angle is 15 Degrees (any moves > 15 deg can not be blended together)

Currently this value can not be changed during run time

3 Kmove_Function.PCI_BLENDMODE

Description:

BLENDMODE controls how blending between interpolated moves should occur. It is loaded with each move, allowing a sequence of moves to be loaded each with a different BLENDMODE. Valid modes are:

Mode	Predefined constant	Description
0	_bmMANUAL	Do not perform any automatic blending of moves; even if a BLENDDISTANCE has been loaded it will be ignored. Blending will only take place when the BLEND command is issued.
1	_bmAUTOMATIC	Use the BLENDDISTANCE to blend consecutive moves together. The BLEND keyword can still be used in this move to manually start a blend

		before the specified BLENDDISTANCE has been achieved.
2	_bmADJUST_ACCEL	(Acceleration adjustment) On commencement of blending, the current move is made to decelerate immediately at a rate that will bring it to rest at the end of the move, and the next move will be made to accelerate at the same rate. If acceleration adjustment is not used, each move will follow its normal velocity profile. This can lead to an angular rather than a smooth blend, if blending starts a significant distance ahead of the deceleration point
3	_bmAUTOMATIC Or _bmADJUST_ACCEL	The combination of modes 1 and 2.
4	_bmBLEND_ON_DECEL	Blending of the next move commences when the first move starts to decelerate. The first move decelerates in the same period as would be required if blending had not been used. If acceleration adjustment (bit 2) is used, the next move accelerates in the same period as the first move's deceleration. If acceleration adjustment (bit 2) is used, the next move accelerates at its normal rate.

4

Kmove_Function.PCI_BLENDDISTANCE

BLENDDISTANCE is the distance before the end point of the vector path where the blend will begin. It is loaded with each move, allowing a sequence of moves to be loaded, each with a different BLENDDISTANCE.

Example:

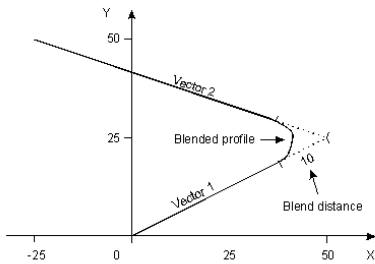
In the following example, at a blend distance of 10 user units from the end point of the first vector, the second vector move begins and the two are profiled in parallel to blend the corner of the move.

BLENDMODE(0) = _bmAUTOMATIC

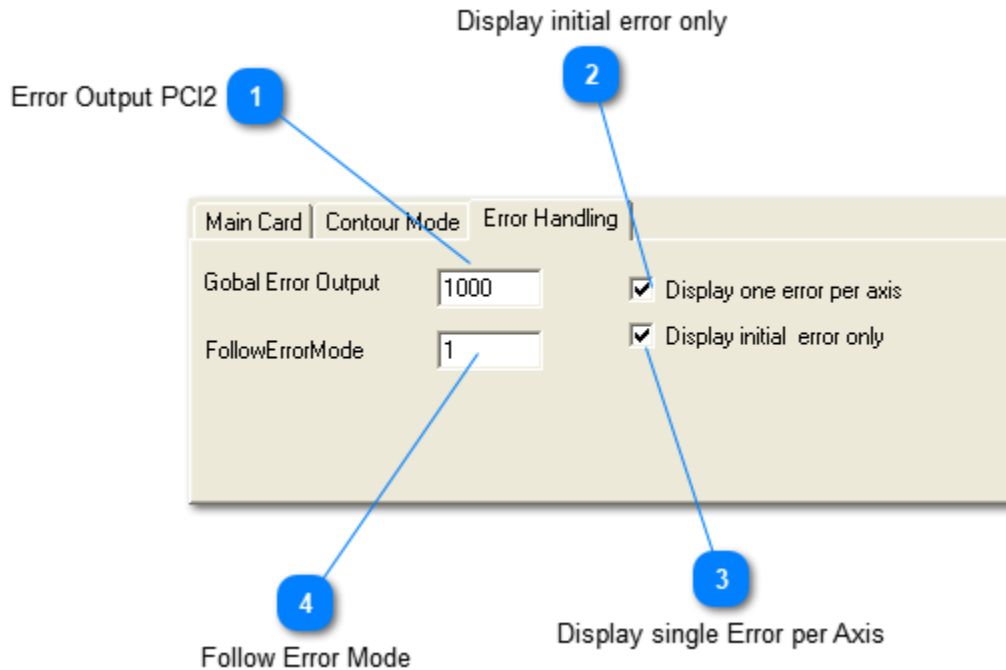
BLENDDISTANCE(0) = 10

VECTERR(0, 1) = 50,25:GO(0)

VECTERR(0, 1) = -25,50:GO(0)



TabPage Error Handling



1 Error Output PCI2

1000

The PCI allows to use any of its digital outputs or one of the two relays to be used for this use:

- 0...11 for digital outputs
- **1000 for relay # 1 [REQUIRED FOR KDM-100 CONTROLLER]**
- 1001 for relay #2

2 Display initial error only

☒ Display initial error only

This will suppress the display of all errors after an initial error has been received from the PCI2

3 Display single Error per Axis

☒ Display one error per axis

Axis error in general will generate a number of errors

Checking this box will only display the first error and suppress all following errors on that axis

Hitting a limit might trigger one or all of the following error being generated (It will defiantly trigger the Limit Hit error)

- Limit Hit
- Abort
- Following error

The first error triggered might not be [Limit Hit] - It therefore might be necessary to lock up all errors listed in the [Error List](#) Dropdown

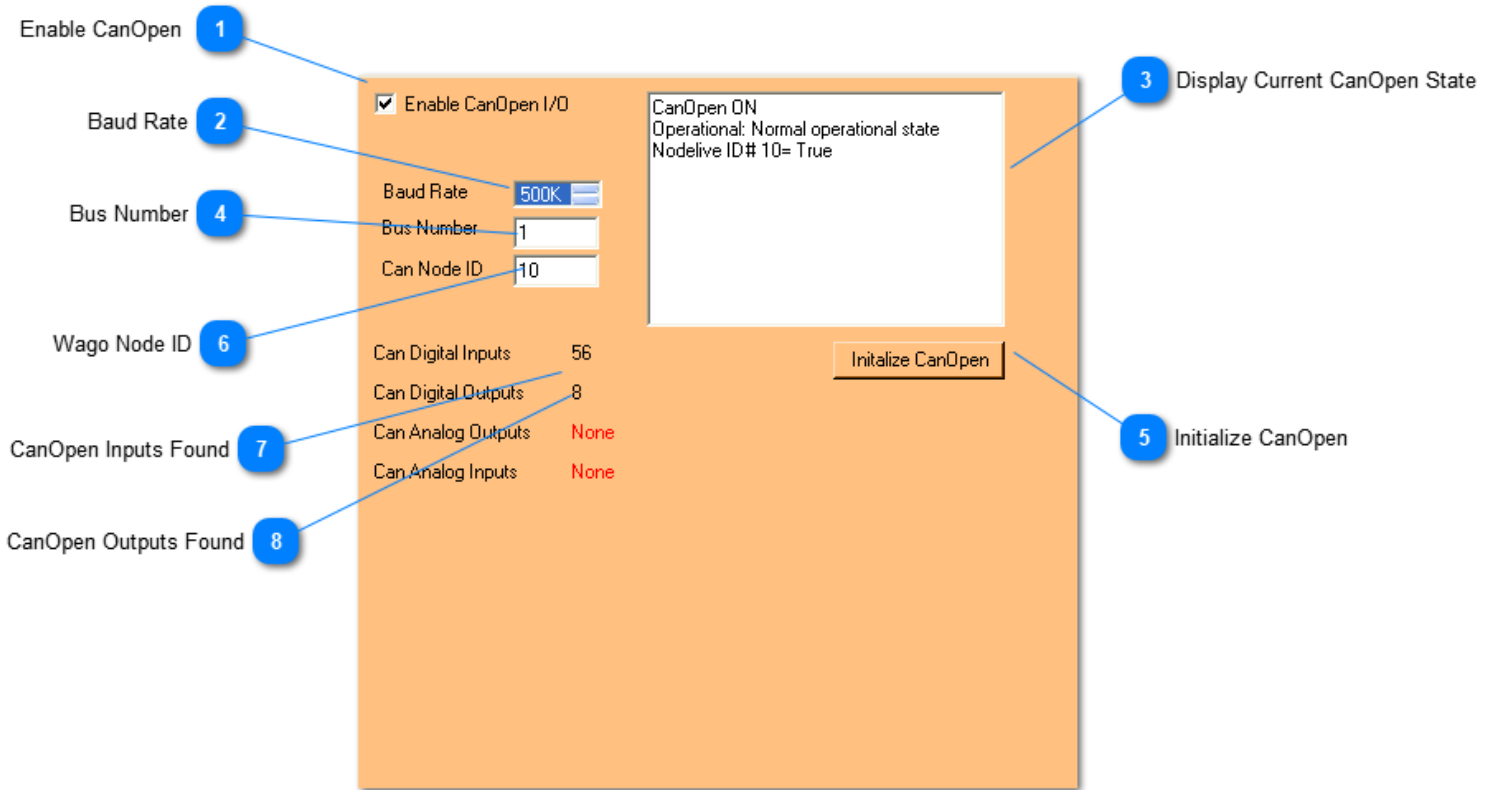
4 Follow Error Mode

1

Currently two options are available (Options are Motion Controller dependent)

- Ignore
- Crash Stop -disable drive [Preset]

PCI2 CanOpen



Currently only the WAGO 750 series CanOpen modules are supported

You will need at least the following Components:

- 1x WAGO Series 750 Interface unit (750-348 or similar)
- 1x Input Module (750-430 or similar)
- 1x Output Module (750-530 or similar)

1 Enable CanOpen

☒ Enable CanOpen I/O

2 Baud Rate

500K

To connect to WAGO I/O Module, set to 500K

3 Display Current CanOpen State

CanOpen ON
Operational: Normal operational state
Nodelive ID# 10= True

4

Bus Number

1

To connect to WAGO I/O Module, set to 1

5

Initialize CanOpen

Initialize CanOpen

6

Wago Node ID

10

To connect to WAGO I/O Module, set to 10

7

CanOpen Inputs Found

56

The KOHLER DESIGN MOTION will gather the available I/O's during the initialization Process

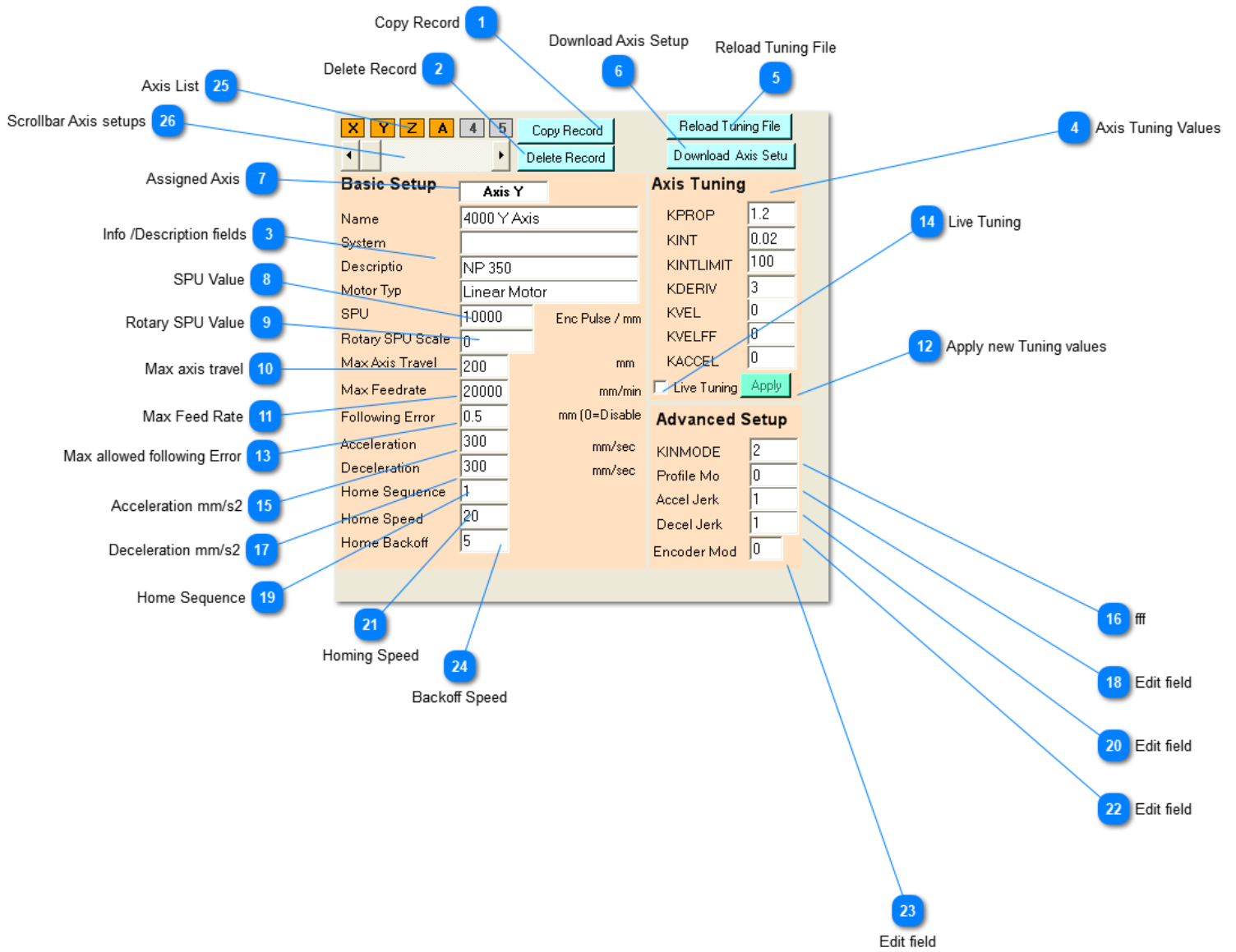
8

CanOpen Outputs Found

8

The KOHLER DESIGN MOTION will gather the available I/O's during the initialization Process

PCI2 Tuning



1 Copy Record

Copy Record

Copy the currently displayed axis setup

2 Delete Record

Delete Record

Delete the currently displayed axis setup

3 Info /Description fields

Name	4000 Y Axis
System	
Description	NP 350
Motor Typ	Linear Motor

As the tuning file can hold many different axis setups, add some meaningful description to identify each setup

4 Axis Tuning Values

Axis Tuning	
KPROP	1.2
KINT	0.02
KINTLIMIT	100
KDERIV	3
KVEL	0
KVELFF	0
KACCEL	0
<input type="checkbox"/> Live Tuning <input type="button" value="Apply"/>	

5 Reload Tuning File

<input type="button" value="Reload Tuning File"/>

6 Download Axis Setup

<input type="button" value="Download Axis Setu"/>

After you made changes to the axis setup or the axis tuning you will need to download the new values for the changes to take effect

Closing the software - saving the changes will also apply the new settings at the restart of the software

7 Assigned Axis

Axis Y

8 SPU Value

10000

Encoder signals per MM or travel

9 Rotary SPU Value

0

Any value greater the 0 will identify the axis as a rotary axis.

Standard value for KDM-100 based Systems is 72

10 Max axis travel**11 Max Feed Rate****12 Apply new Tuning values****13 Max allowed following Error**

This value will determine how much the axis is allowed to lag behind.

This has nothing to do with axis accuracy !

It simply set's a max value for the axis to be allowed to fall behind during acceleration /deceleration

Care should be taken to not set this value to big, as it would also allow the axis to hit a mechanical stop, therefore never reaching it's final destination, but without any notification to the operator

14 Live Tuning☐ Live Tuning

KOHLER DESIGN MOTION allows to fine tune tuning while the machine is running. (only one axis)

To use this run a test program and then apply new tuning values to the axis while it's moving.

For advanced tuning you will have to use the Workbench

15 Acceleration mm/s²**16 fff****17 Deceleration mm/s²**

18 Edit field

19 Home Sequence

The following Sequences are available:

- Limit -Index
 - *Find Limit - locate next Index*
- Index Only
 - *Locate next Index*
- Rotate off limit - index
 - *Move off Limit - locate next Index (used with rotary axis that can not rotate through 360 Deg - Motor Driven FO Head - requires Limit to cover 180 Deg of travel)*

20 Edit field

21 Homing Speed

Feed rate to be used when looking for the Limit

22 Edit field

23 Edit field

24 Backoff Speed

Feed rate to be used when searching for the Index

If this is set to high, the axis might never find the Index or it's unreliable

25 Axis List

X	Y	Z	A	4	5
---	---	---	---	---	---

Click on a Axis Icon to assign the displayed axis setup to the axis

The [Assigned Axis] field will be updated with the newly assigned Axis ID

26 Scrollbar Axis setups



This allows to scroll through all available Axis setups in the tuning file

Standard systems will only have one axis setup per axis, but you can have many axis setups in you're tuning file (Only one setup can be assigned to each individual axis)

Motion Controller CanOpen (Copley)

CanOpen Motion based On Copley CMO DLL

This is substantial different from the PCI Motion Controller in that the KDM has to calculate all the path points and provide them to the Linkage function of the Copley DLL

The Copley DLL is using "standard" CanOpen functions based on (DS402) to control the drives

Eventually the KDM will be able to use standard CanOpen commands to directly communicate to any CanOpen drive supporting DS 402

The CanOpen standard is also used to communicate with the I/O board

At this point both the drives and the I/O board have to be Copley products

Main Window (NETWORKS)

The Copley CanOpen Setup Window has numerous tabs that will help with the setup and trouble shooting of the motion portion

Some of the tabs and info fields won't be visible if the option login level is not set to debug or admin

The screenshot shows the 'SETUP COPLEY CANOPEN [COPLEY CONFIG 5000 LM.xml]' window. The 'Networks' tab is active. The 'Network Cards' section shows 'Network 0' selected with hardware 'copley0' and bus speed '_1000Kbs'. The 'Network Node ID's' section shows 'Axis 0' with Node ID '1' and Type 'AccelNet'. The 'I/O Board' and 'Remote I/O' sections show Node IDs '15'. The 'AXIS DEVICES' table lists four axes (X, Y, Z, A) connected to Network 0. The 'IO DEVICES' table lists 'I/O Board' and 'REMOTE I/O' connected to Network 0.

AXIS DEVICES	NODE#	Network
Axis 0[X]	1	Network 0
Axis 1[Y]	2	Network 0
Axis 2[Z]	3	Network 0
Axis 3[A]	4	Network 0

IO DEVICES	NODE#	Network	True/False
I/O Board	15	Network 0	True
REMOTE I/O	15	Network 0	False

Numbered callouts in the image:

- 1: CanOpen Channels (Network 0)
- 2: CanOpen Master Hardware (copley0)
- 3: Bus Speed (_1000Kbs)
- 4: Axis Count (4)
- 5: Network Node list (Axis 0)
- 6: Axis Can ID (Node ID 1)
- 7: I/O Board Can Node ID (Node ID 15)
- 8: Remote I/O Can Node ID (Node ID 15)
- 9: Amplifier Type (AccelNet)

1 CanOpen Channels

Network 0

2 CanOpen Master Hardware

copley0

3 Bus Speed

_1000Kbs

4 Axis Count

4

5 Network Node list

Axis 0

6

Axis Can ID

1

7

I/O Board Can Node ID

15

8

Remote I/O Can Node ID

15

9

Amplifyer Type

AccelNet

General

Most settings related to Contouring are on this page

Us the Load Linkage defaults button to load the recommended defaults

*All entries are based on **metric units** and will be recalculated if the system is running inch units*

Below are a few items that can be changed if needed

A) Time slice (ms)

Copley does not recommend using a time slice < 10~15ms

The time slice value on this page will be used as the preset during contouring (Default value is 15ms)

The time slice can be adjusted when [enabling contouring](#) (using the P Modifier)

Unless you are logged as Admin in the Option Window the min timeslice that can be set is 10ms

B) Contour Min Slices

This together with the Slice threshold will determine how many slices will be used during a circular move

Example:

Setting the Contour slices to 20 will **try** to create at least 20 slices for a given circular move at the requested feed rate

If there is enough distance in the circular move to create **at least** 20 slices at the requested federate then no change is needed

If there is not enough distance at the given feed rate the speed will be reduced so can get the required 20 slices

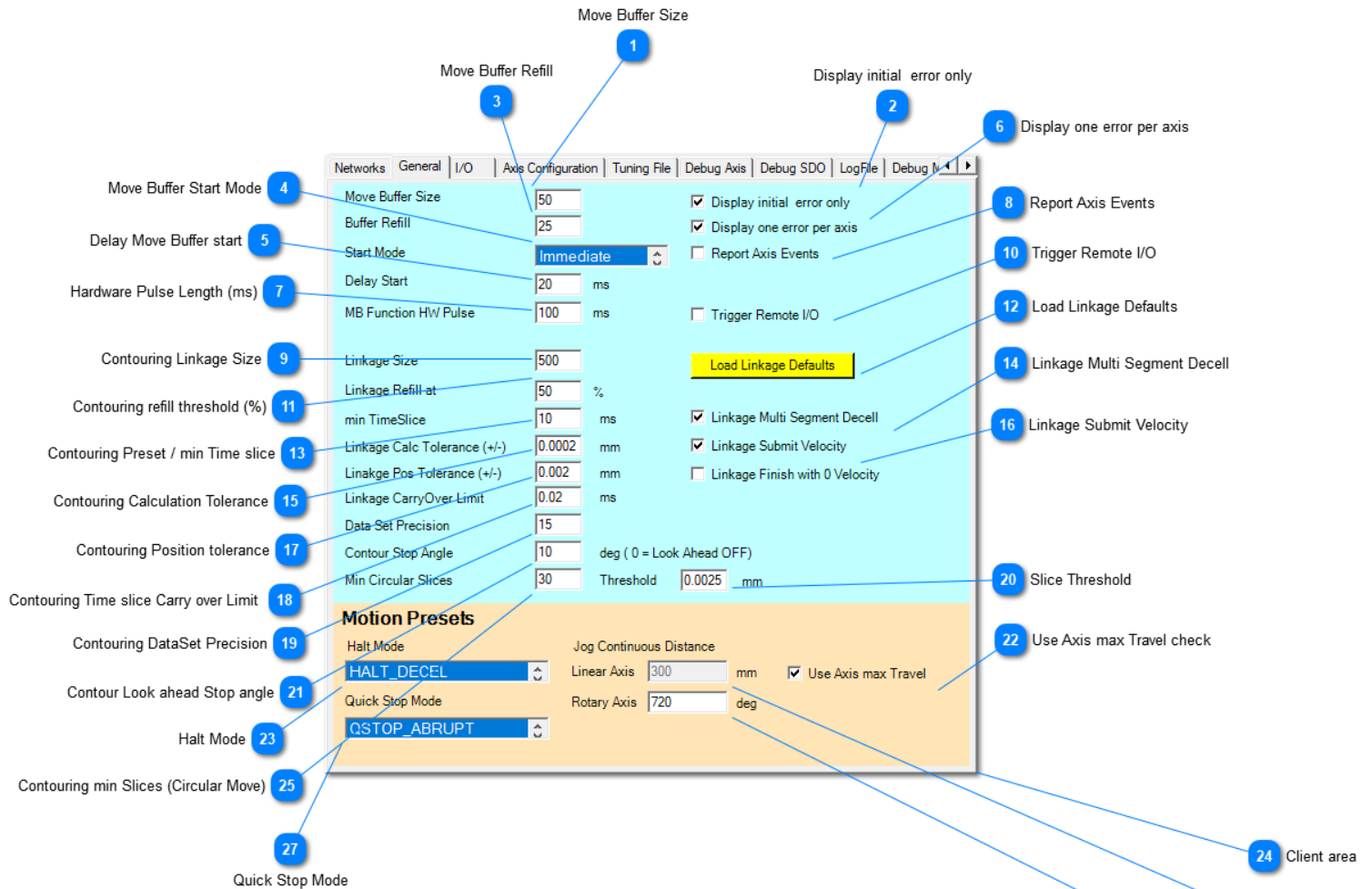
On a very short circular segment (a few degrees with a small radius) we might undercut the slice threshold - in that case the number of slices will be reduced based on the slice threshold limit

C) Contour stop angle

During a contour move this will determine if we can bind moves together or if a stop is required (10 deg is the default and should grantee that the cuts will reach each corner)

For system used strictly for welding this value could probably be bigger

KDM Software Manual



1 Move Buffer Size

50

2 Display initial error only

☒ Display initial error only

3 Move Buffer Refill

25

4 Move Buffer Start Mode

Immediate

- 5 Delay Move Buffer start
- 6 Display one error per axis
☒ Display one error per axis
- 7 Hardware Pulse Length (ms)
- 8 Report Axis Events
☐ Report Axis Events
- 9 Contouring Linkage Size
- 10 Trigger Remote I/O
☐ Trigger Remote I/O
- 11 Contouring refill threshold (%)
- 12 Load Linkage Defaults
- 13 Contouring Preset / min Time slice
- 14 Linkage Multi Segment Decell
☒ Linkage Multi Segment Decell

15 Contouring Calculation Tolerance

0.0002

16 Linkage Submit Velocity

☒ Linkage Submit Velocity

17 Contouring Position tolerance

0.002

18 Contouring Time slice Carry over Limit

0.02

19 Contouring DataSet Precision

15

20 Slice Threshold

0.0025

21 Contour Look ahead Stop angle

10

22 Use Axis max Travel check

☒ Use Axis max Travel

23 Halt Mode

HALT_DECEL

24 Client area

Motion Presets

Halt Mode	Jog Continuous Distance		
HALT_DECEL	Linear Axis	<input type="text" value="300"/>	mm <input checked="" type="checkbox"/> Use Axis max Travel
Quick Stop Mode	Rotary Axis	<input type="text" value="720"/>	deg
QSTOP_ABRUPT			

25 Contouring min Slices (Circular Move)

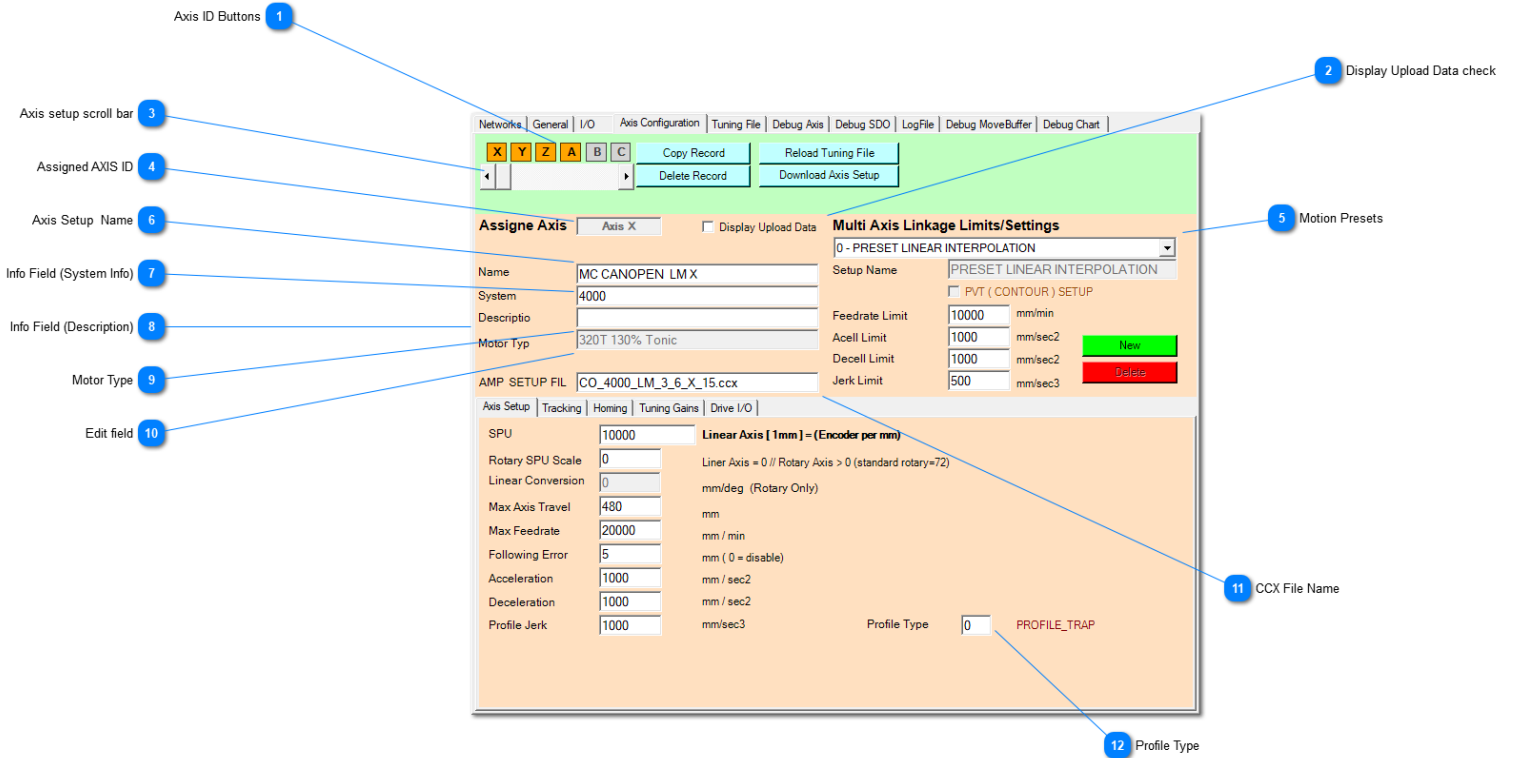
26 Edit field

27 Quick Stop Mode

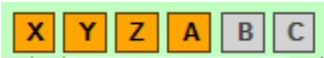
QSTOP_ABRUPT

28 Edit field

Axis Configuration



1 Axis ID Buttons



By clicking on the Axis ID buttons you can assign an axis setup to a particular axis setup (use the horizontal scroll bar to go through all available axis setups)

You can have many different axis setups but only one axis setup can be assigned to a particular axis ID

2 Display Upload Data check

☐ Display Upload Data

3 Axis setup scroll bar



4 Assigned AXIS ID



This will show what axis is assigned to the current axis setup

Only one axis setup can be assigned for each axis ID

5 Motion Presets

0 - PRESET LINEAR INTERPOLATION

Setup Name: PRESET LINEAR INTERPOLATION

☐ PVT (CONTOUR) SETUP

Feedrate Limit: 10000 mm/min

Accel Limit: 1000 mm/sec2

Decel Limit: 1000 mm/sec2

Jerk Limit: 500 mm/sec3

New

Delete

The drop down has by default two standard settings

- Interpolation move
- Contour move

- If the max feedrate of the interpolation move is set to 500mm/min all interpolation moves will be limited to 500 mm/min regardless of the programmed feedrate

Preset 0 and 1 are predefined and unless not specified through G-code are the presets that will be used

6 Axis Setup Name

MC CANOPEN LM X

7 Info Field (System Info)

4000

8 Info Field (Description)

Assigne Axis: Axis X ☐ Display Upload Data

Name: MC CANOPEN LM X

System: 4000

Description:

Motor Typ: 320T 130% Tonic

AMP SETUP FIL: CO_4000_LM_3_6_X_15.ccx

9 Motor Type

Can be edited unless a CCX file is assigned to this axis setup

Once a CCX file is assigned the motor type entry will be pulled from the CCX field and can not be edited anymore

10

Edit field

320T 130% Tonic

11

CCX File Name

CO_4000_LM_3_6_X_15.ccx

once a ccx file is assigned the software will compare the MotorType from the axis setup to the motor type loaded on the amplifier

If they don't match, the assigned ccx file will be downloaded and saved to non-volatile memory (ram) of the drive

if the same axis setup is used at the next startup the motor types will match and no download is needed

12

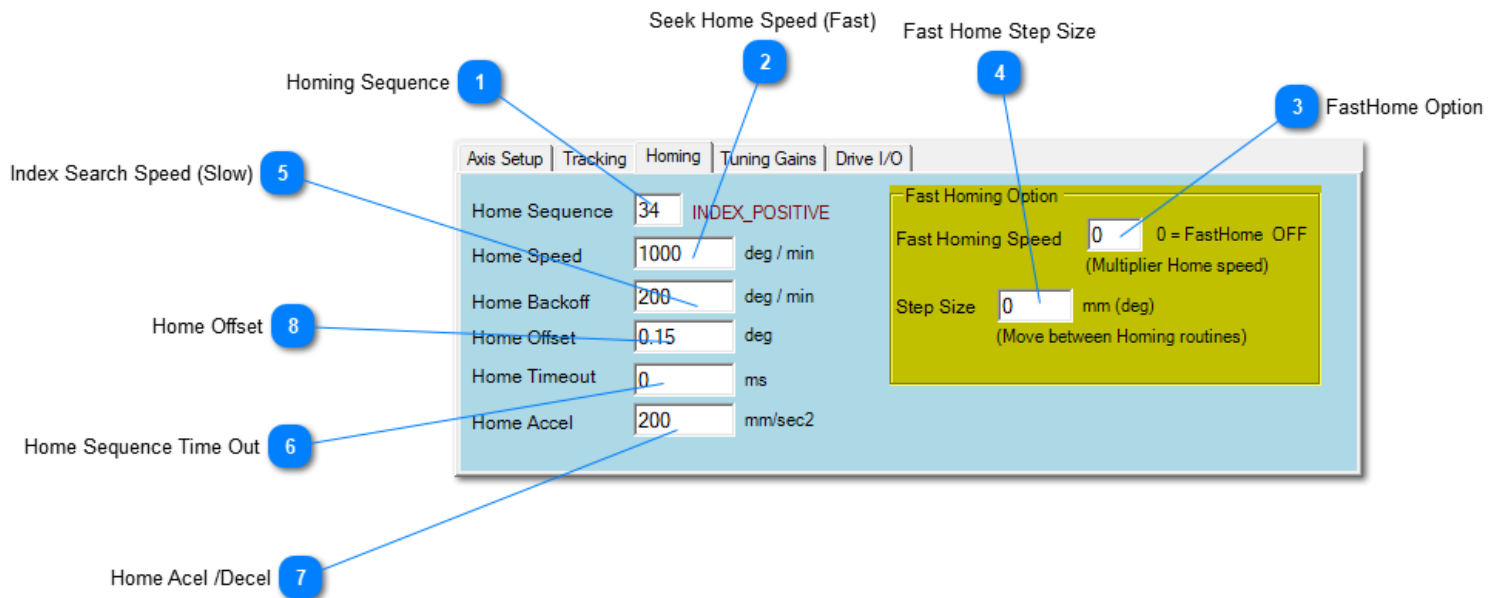
Profile Type

0

Home settings

Be aware of the fact that settings like home speed, home back off and acceleration will effect the actual home position

This could have a negative effect on production systems or NC programs that rely only on absolute positions from the home position



1 Homing Sequence

34

Select the desired Homing Sequence from the dropdown

2 Seek Home Speed (Fast)

1000

Initial Homing feed rate (seek)

3 FastHome Option

0

Fast home **multiplier** (This is a homing option - the standard (single homing) sequence is all that's needed for most axis)

A value of 0 will disable the function / a value of 2 is the minimal value for the function to have any real effect on the homing

Enabling FastHome allows to reduce the feed rates for the actual homing sequence

This sequence is mostly used with high resolution ring encoders used on the DDR Rotaries or the processing head swivel units

It could also be useful for an axis with a long travel distance (X axis on 5000 /4000 systems) as it allows to travel at higher speeds without losing any homing accuracy

4 Fast Home Step Size

0

During FastHoming a small offset step needs to be applied between homing sequence 1 and homing sequence 2

The default step size is 0.05mm (deg)

5

Index Search Speed (Slow)

Slow Creep speed for finding the home index pulse

6

Home Sequence Time Out

Maximum time allowed for the homing sequence to finish

7

Home Acel /Decel

Acceleration/ deceleration values for the homing sequence

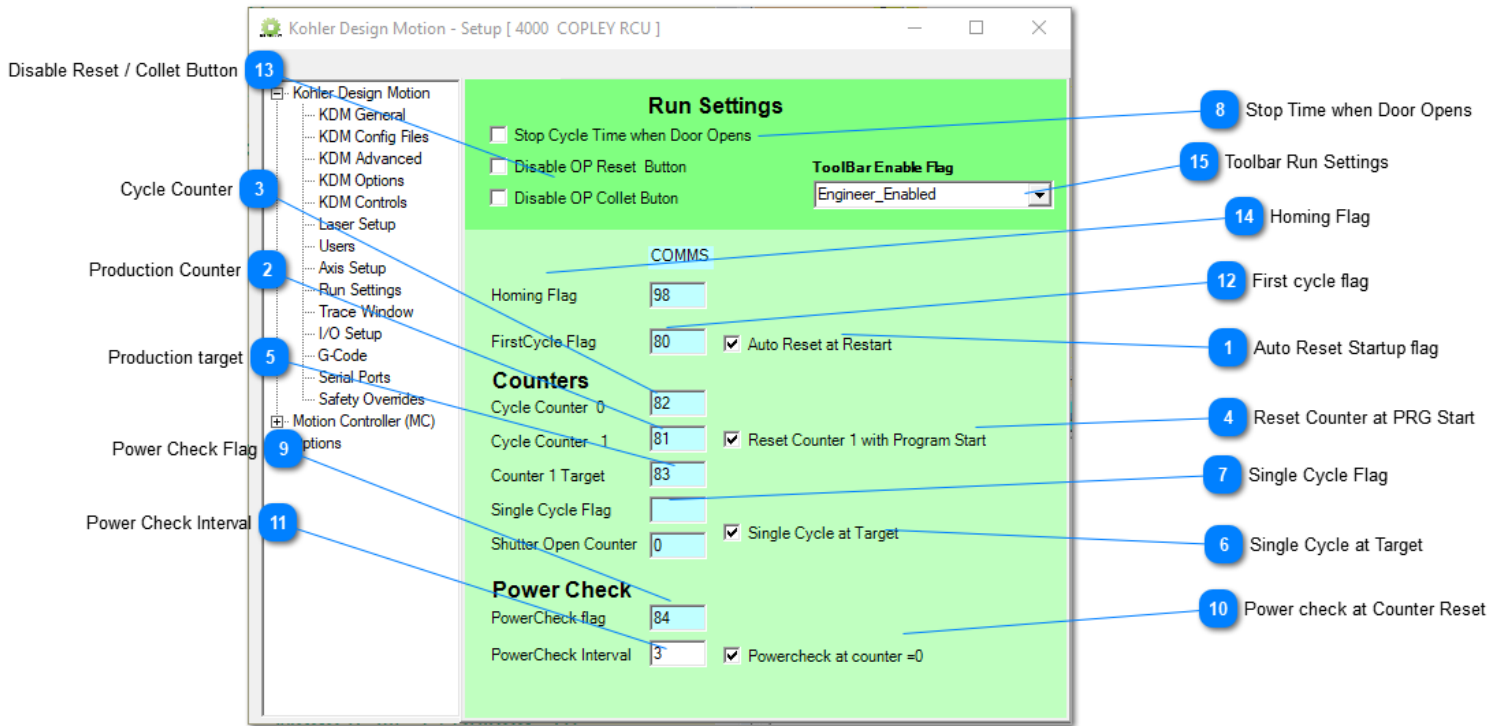
8

Home Offset

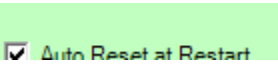
This offset will be applied to the axis after the home index has been found - after the offset has been applied the axis will move to the new 0 position

This function is usually only used on rotary axis or the swivel unit

Run Settings



1 Auto Reset Startup flag



Reset the Startup flag when starting a Program

2 Production Counter



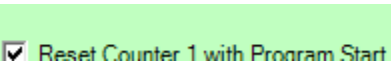
Any M2 / M47 command will increase the counter by one

3 Cycle Counter



Total Cycles run (M2/M47 will increase cycle counter by one)

4 Reset Counter at PRG Start



5 Production target



Once set the machine will set the single cycle. This will stop processing after reaching the next M47 (Rewind Command)

6 Single Cycle at Target☒ Single Cycle at Target

Set single cycle flag once target is hit

7 Single Cycle Flag

Once set, this will stop processing after reaching the next M47 (Rewind Command)

8 Stop Time when Door Opens☐ Stop Cycle Time when Door Opens

Stop cycle time counter at door open command (only for systems with automatic door)

9 Power Check Flag

This Internal flag can be used to activate a power check routine

10 Power check at Counter Reset☒ Powercheck at counter =0

This will force the power check flag to be set once the production counter is reset

11 Power Check Interval

Once the Production counter has reached the Interval the power check flag will be set

12 First cycle flag

Comms Location for the First cycle flag

13 Disable Reset / Collet Button☐ Disable OP Reset Button☐ Disable OP Collet Buton

This allows to disable the Operator Panel Buttons Reset and Collet when a program is running (preventing accidental activation of the buttons)

By default the buttons will be re-enabled during a Pause (G5 or M1)

The G5 function allows to fine tune the activation of those two buttons during the pause(the M1 does not)

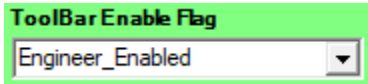
14 Homing FlagHoming Flag

This the Local variable that keeps track of the homing state

If it's not assigned then the software has now way of keeping track of the homing state

15

Toolbar Run Settings



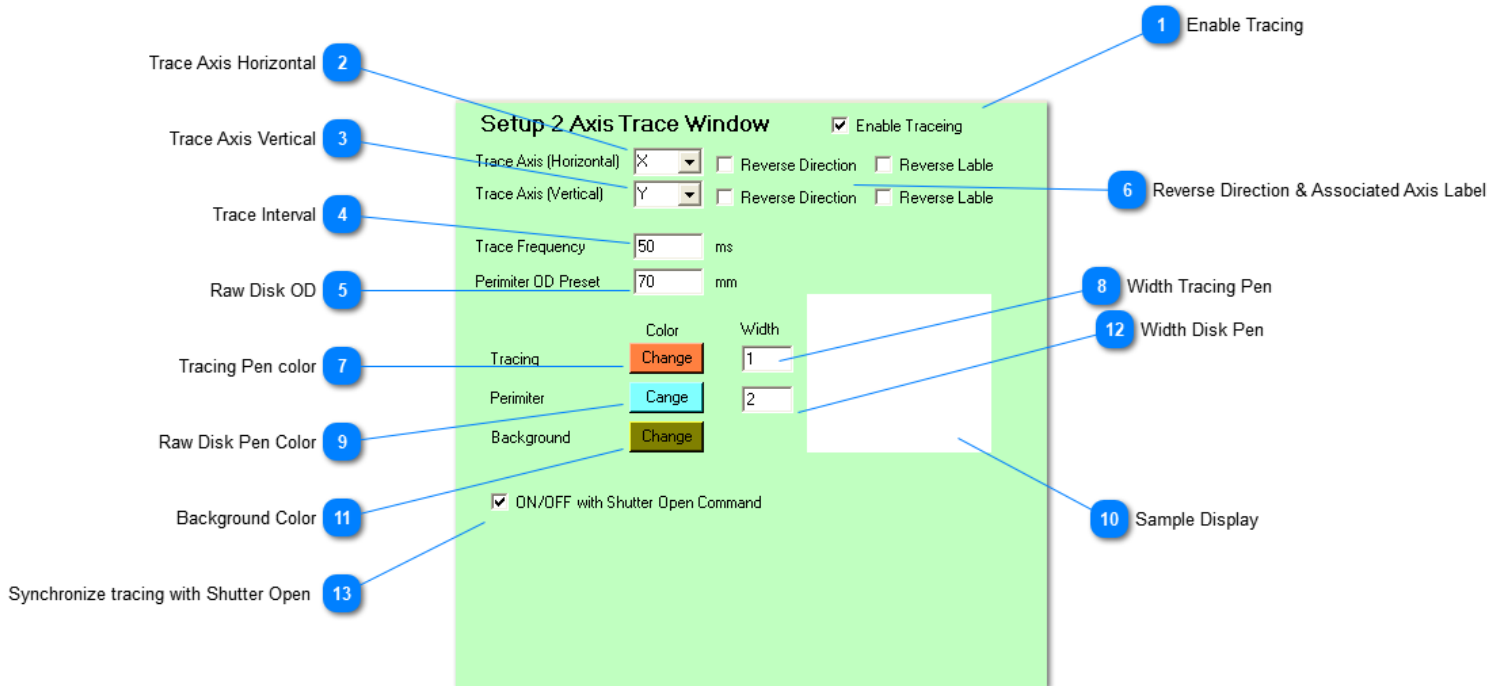
Determines the enable state of the KDM Toolbars while a cnc program is running

4 Options are currently available

- Disabled
- Enabled
- Enable Admin Level (Startup Option)
- Enable Engineering level (User setting)

If set to Engineering level both Engineering and Admin Level will keep the Toolbars active while a program is running

2D Tracing



This was specifically designed for cutting Industrial Diamonds out of circular raw material

These are slow moving processes that can take hours to finish

The 2D Tracing allows to monitor these slow moving processes in real time.

Tracing is done by reading out the actual axis position on the motion card on a given interval, therefore the current 2D tracing will not provide fast enough update cycles for fast welding application

1 Enable Tracing

☒ Enable Tracing

2 Trace Axis Horizontal

X

3 Trace Axis Vertical

Y

4 Trace Interval

50

5 Raw Disk OD

70

6 Reverse Direction & Associated Axis Label

<input type="checkbox"/> Reverse Direction	<input type="checkbox"/> Reverse Lable
<input type="checkbox"/> Reverse Direction	<input type="checkbox"/> Reverse Lable

7 Tracing Pen color

Change

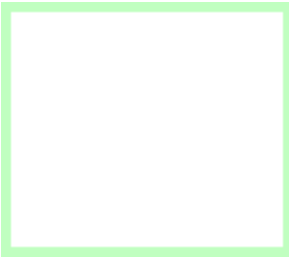
8 Width Tracing Pen

1

9 Raw Disk Pen Color

Cange

10 Sample Display



11 Background Color

Change

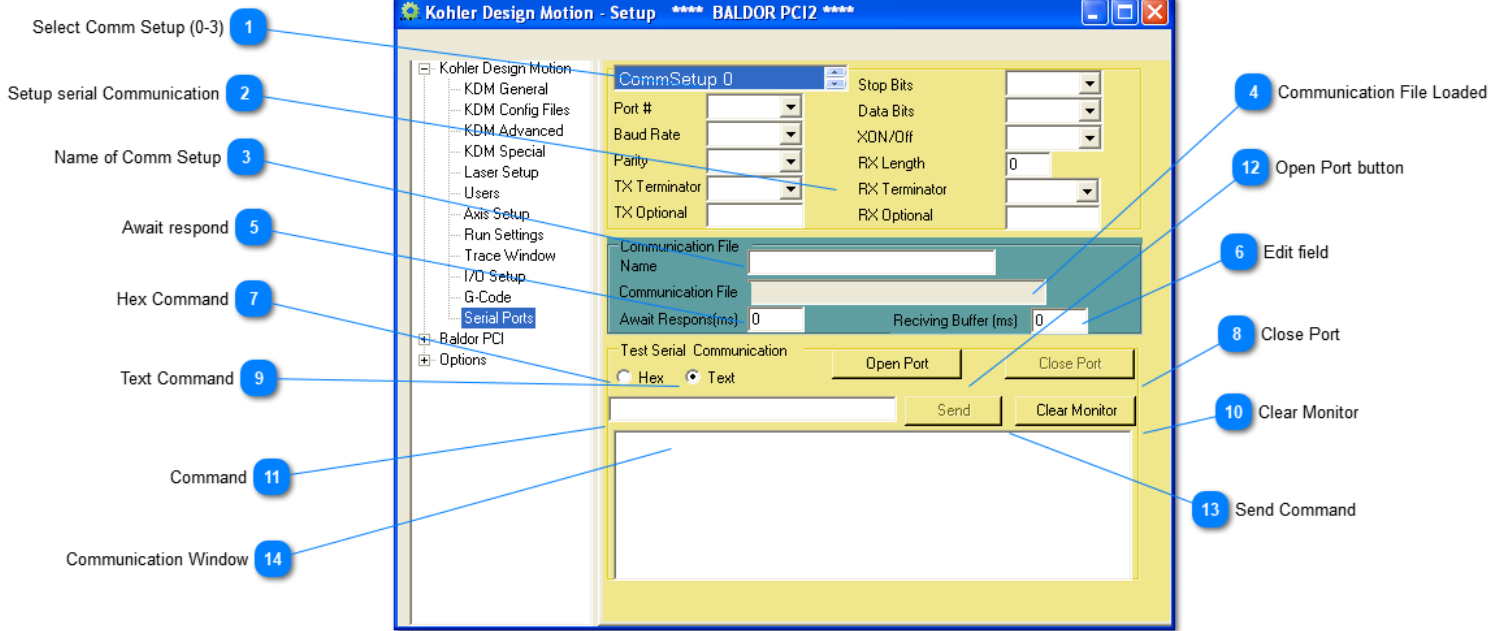
12 Width Disk Pen

2

13 Synchronize tracing with Shutter Open

☒ ON/OFF with Shutter Open Command

Serial Setup



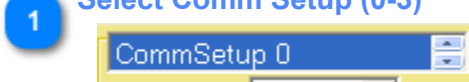
Settings for Serial Ports are loaded through a .cod file.

This window allows to change and test port settings and send custom messages to the serial port

All settings for a given serial port will be overwritten by the .cod file

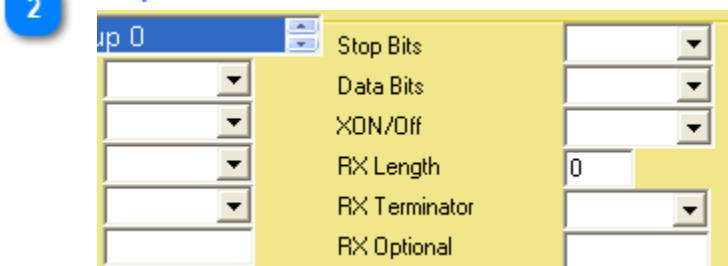
If you like retain changes for the next boot up you will have to update the cod file

1 Select Comm Setup (0-3)



There are four Serial setups available (CommSetup 0...3)

2 Setup serial Communication



3 Name of Comm Setup



4 Communication File Loaded



5 Await respond

6 Edit field

7 Hex Command

☒ Hex

8 Close Port

9 Text Command

☒ Text

10 Clear Monitor

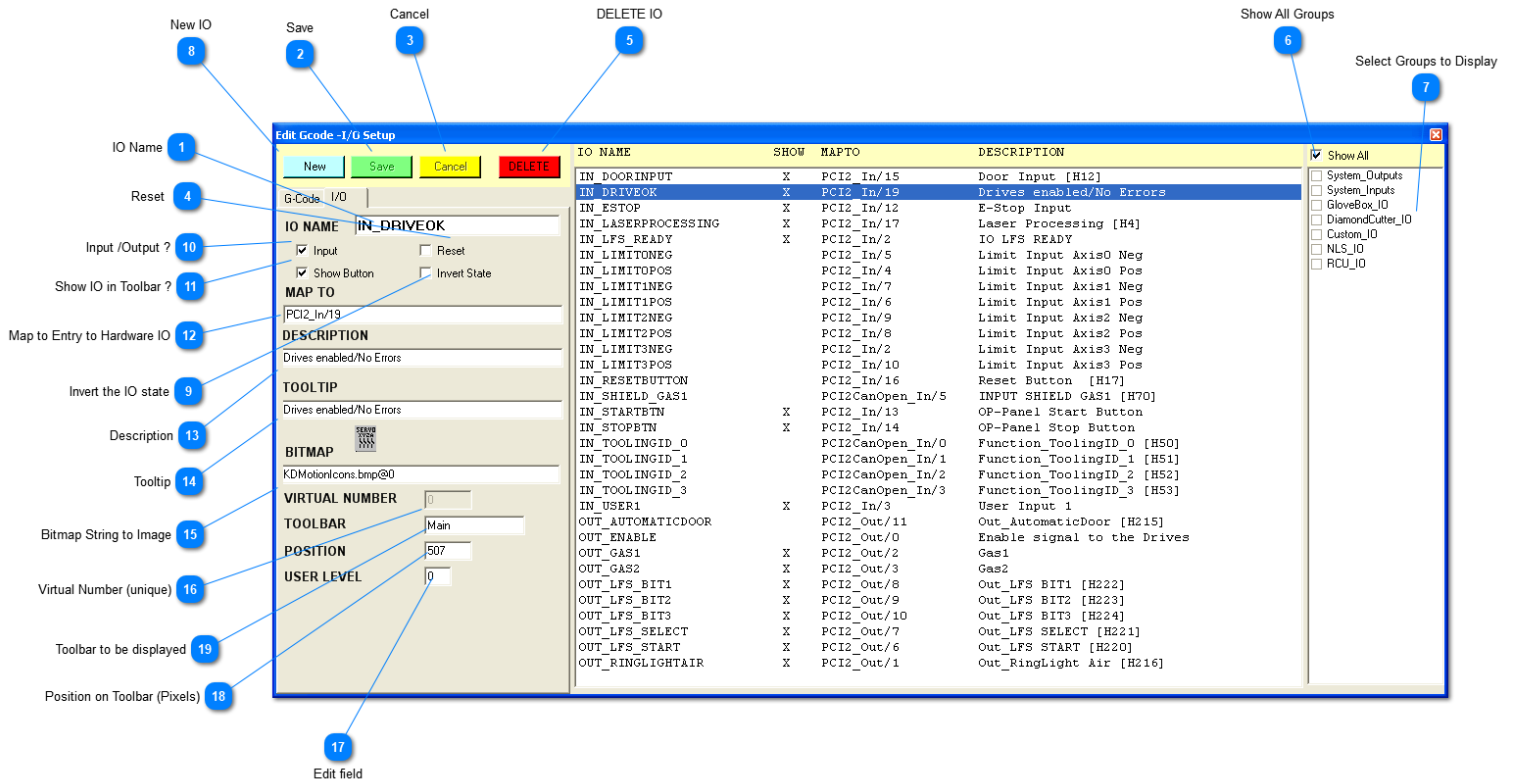
11 Command

12 Open Port button

13 Send Command

14 Communication Window

Edit I/O



1 IO Name

IN_DRIVEOK

2 Save

Save

3 Cancel

Cancel

4 Reset

☐ Reset

Affects only Outputs

Reset Outputs will automatically be reset during a pause or at the end of a program
(After a pause the outputs take on there original state before the pause)

5 DELETE IO

DELETE

6 Show All Groups

☒ Show All

7 Select Groups to Display

☐ System_Outputs
☐ System_Inputs
☐ GloveBox_IO
☐ DiamondCutter_IO
☐ Custom_IO
☐ NLS_IO
☐ RCU_IO

8 New IO

New

9 Invert the IO state

☐ Invert State

10 Input /Output ?

☒ Input

11 Show IO in Toolbar ?

☒ Show Button

12 Map to Entry to Hardware IO

PCI2_In/19

13 Description

Drives enabled/No Errors

14 Tooltip

Drives enabled/No Errors

15 Bitmap String to Image

KDMotionIcons.bmp@0

16 Virtual Number (unique)

0

17 Edit field

0

18 Position on Toolbar (Pixels)

507

New Icons will initially ALWAYS show up on the left hand side in the toolbar
Therefore they might not be visible until you move the most left toolbar Button

19 Toolbar to be displayed

Main

Edit G-Code

New functions are constantly added/ updated in the KDM software - therefore the G-code list in this manual will always be outdated / incomplete

Basics:

Two Types of functions (G-code) can be found within the KDM software

- Hardcode - fixed assigned G-code function (G1,G2,G3 M2, G4 and so on)

*These are considered "standard" G-codes that usually can be found on any CNC machine (** THE FUNCTION OF THESE G-CODES(UNLESS MODIFIED) WILL NOT BE EXPLAINED IN THIS MANUAL **)*

There are some custom variations within this Codes

Example:

G5 Q?? - where G5 is a standard G-command but with a custom modifier [Q?]

G28.5 Q?? - where G28 is a standard G-code but [.5 Q?] is a KDM custom adaption for single axis homing

- Functions - Custom KDM function that can be assigned to "any" G-code number

KDM Functions can be assigned by clicking on [New] entering a new Gcode (M??? /G???) and then right clicking into the kdm function field

A drop down with the currently available functions will be displayed - grayed out functions are already assigned !

Only functions associated with the active (loaded) KDM modules will be displayed in the list

*Example: all NLS related functions/ G-codes will be omitted from the list(s) if you didn't load an NLS setup file at startup***

<div> <div> <div>Windows</div> <div>Edit Gcode -I/O Setu</div> <div> <div>New</div> <div>Save</div> </div> <div> <div>G-Code</div> <div>I/O</div> </div> <div> <div>G-CODE</div> <div>M1</div> </div> <div>KDM FUNCTION</div> <div></div> <div>DESCRIPTION</div> <div></div> <div>CONTEXT HELP</div> <div></div> <div>SUPPORTED CO</div> <div> <input type="checkbox"/> Baldor PCI <input type="checkbox"/> </div> <div>REPLACEMENT</div> <div></div> </div> </div>	<div>Delete Entry</div> <div>FUNCTION_TEACHPOS</div> <div>FUNCTION_STORE_AXISPOS</div> <div>FUNCTION_CHECK_HOMEPOS</div> <div>FUNCTION_OPERATOR_INPUT</div> <div>FUNCTION_STOP_PROGRAM</div> <div>FUNCTION_SUBPRG_MENU</div> <div>FUNCTION_VIDEO_GET_MOUSEPOS</div> <div>FUNCTION_VIDEO_SHOW</div> <div>FUNCTION_SET_AUTOMATION_FLAG</div> <div>FUNCTION_WAIT_AUTOMATION_FLAG</div> <div>FUNCTION_SIDEDOOR</div> <div>FUNCTION_START_AUTOMATION_PRG</div> <div>FUNCTION_UNLOAD_PART</div> <div>FUNCTION_COPLEY_CONTOURING</div> <div>FUNCTION_COPLEY_MOTIONPROFILE</div> <div>FUNCTION_SET_TUBE_DIA</div> <div>FUNCTION_DEBUG</div> <div>FUNCTION_TRACECLEAR</div> <div>FUNCTION_TRACEON</div> <div>FUNCTION_TRACEOFF</div> <div>FUNCTION_TRACE_OD</div> <div>FUNCTION_TRACE_COLOR</div> <div>FUNCTION_AUTODOOROPEN</div> <div>FUNCTION_ENDPROGRAMMSG_OFF</div> <div>FUNCTION_ENTER_KEY</div> <div>FUNCTION_BARCODE_READVALUE</div> <div>FUNCTION_BARCODE_SETTARGET</div> <div>FUNCTION_BARCODE_SETLOWERLIMIT</div> <div>FUNCTION_BARCODE_SETUPPERLIMIT</div> <div>FUNCTION_FUMEEXTRACTOR_START</div> <div>FUNCTION_TESTGAS1</div> <div>FUNCTION_TESTGAS2</div> <div>FUNCTION_SMARTC_KDMEDIT</div> <div>FUNCTION_SMARTC_WORKMODE</div> <div>FUNCTION_SMARTC_CLEARING</div> <div>FUNCTION_RCU_FASTSELECT_ID</div> <div>FUNCTION_RCU_START_ON</div> <div>FUNCTION_RCU_START_OFF</div> <div>FUNCTION_RCU_START_PULSE</div>	<div>Exp</div>
---	---	----------------

The KDM software will **enable, disable or suppress** functions (G-code) based on the loaded modules or setup files

- Enabled function - A G-Code that will show up in the List is enabled (A enabled g-code will also be colored in the editor window)

Make sure to check the motion controller check box for you're system - most functions these days will work will both PCI and CanOpen - but there are a few functions that are PCI only.

If you don't check the Box for you're motion controller the g-code will be disabled

- Disabled function - A function that was loaded but can not be used based on you're setup - the G-code will be in the list

Example : A function that is PCI only but now is disabled because you are running a CanOpen System (or vise versa)

- Suppressed function - This function was hidden during startup as the required KDM module was not loaded

Outdated Function Names

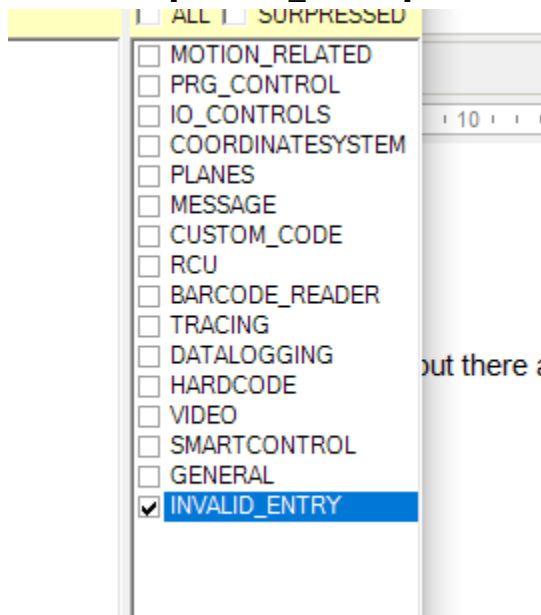
After a software update it is considered a common occurrence to get warnings about invalid function names at startup

- Usually this means that the function was reused for a new or updated KDM module and therefore the name slightly changed

This will make the g-Code unusable until the correct name has been reassigned

This can easy be done within the G-Code setup window

Click on the [INVALID_ENTRY] button



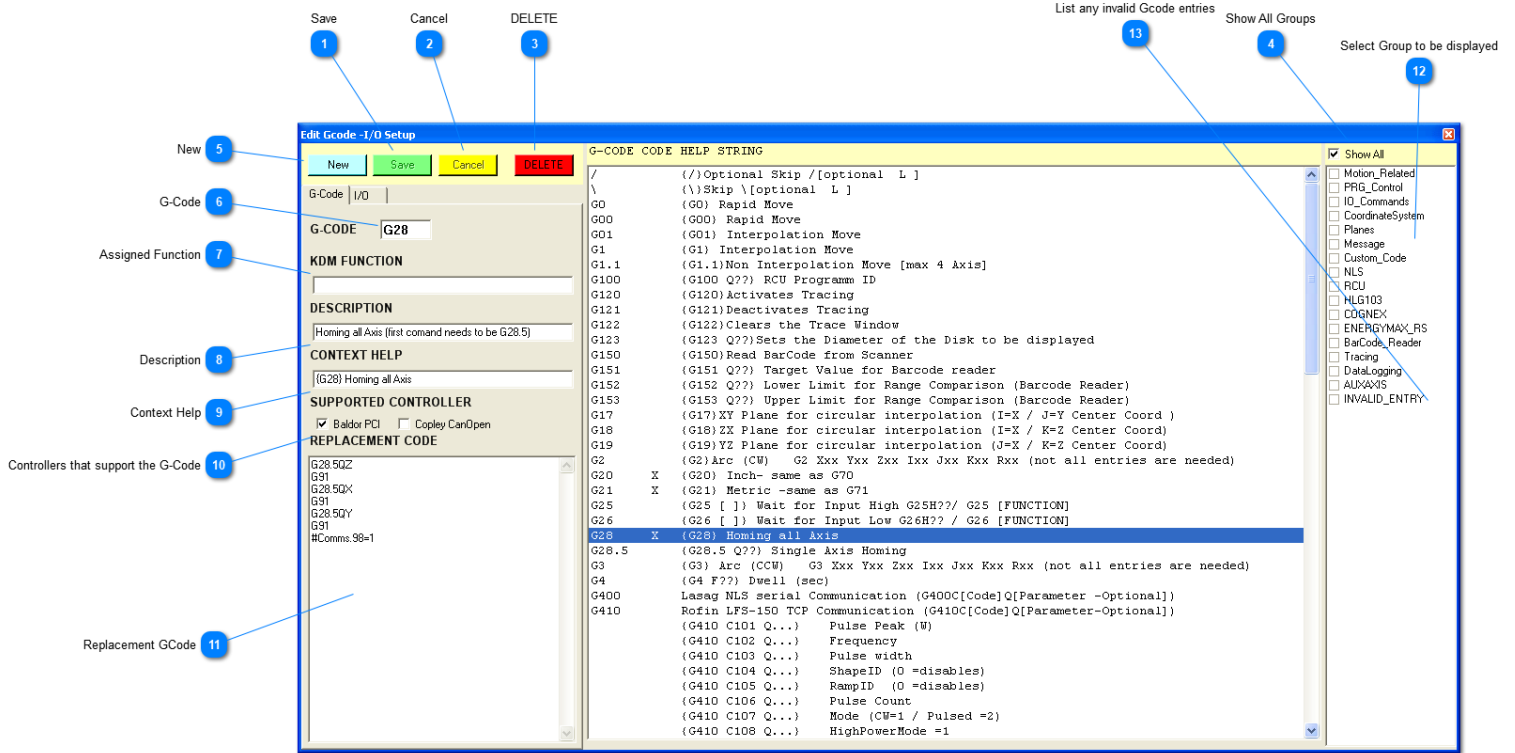
Locate the function and reassign the G-code with the updated function name from the KDM FUNCTION dropdown

Usually names will be very similar and therefore the new name is easy to spot

-Example : FUNCTION_OPEN_NLS_SHUTTER may changed to FUNCTION_OPEN_LASER_SHUTTER

[Save] the change and restart KDM

KDM Software Manual



1 Save

Save

2 Cancel

Cancel

3 DELETE

DELETE

4 Show All Groups

☒ Show All

5 New

New

6 G-Code

G28

Only M & G are allowed as Letters

7

Assigned Function

Right click in the field will show a dropdown showing the available functions

8

Description

Homing all Axis (first comand needs to be G28.5)

9

Context Help

{G28} Homing all Axis

10

Controllers that support the G-Code

☒ Baldor PCI ☐ Copley CanOpen

11

Replacement GCode

```
G28.5QZ  
G91  
G28.5QX  
G91  
G28.5QY  
G91  
#Comms.98=1
```

12

Select Group to be displayed

- ☐ Motion_Related
- ☐ PRG_Control
- ☐ IO_Commands
- ☐ CoordinateSystem
- ☐ Planes
- ☐ Message
- ☐ Custom_Code
- ☐ NLS
- ☐ RCU
- ☐ HLG103
- ☐ COGNEX
- ☐ ENERGYMAX_RS
- ☐ BarCode_Reader
- ☐ Tracing
- ☐ DataLogging
- ☐ AUXAXIS

<TODO>: Insert description text here...

13

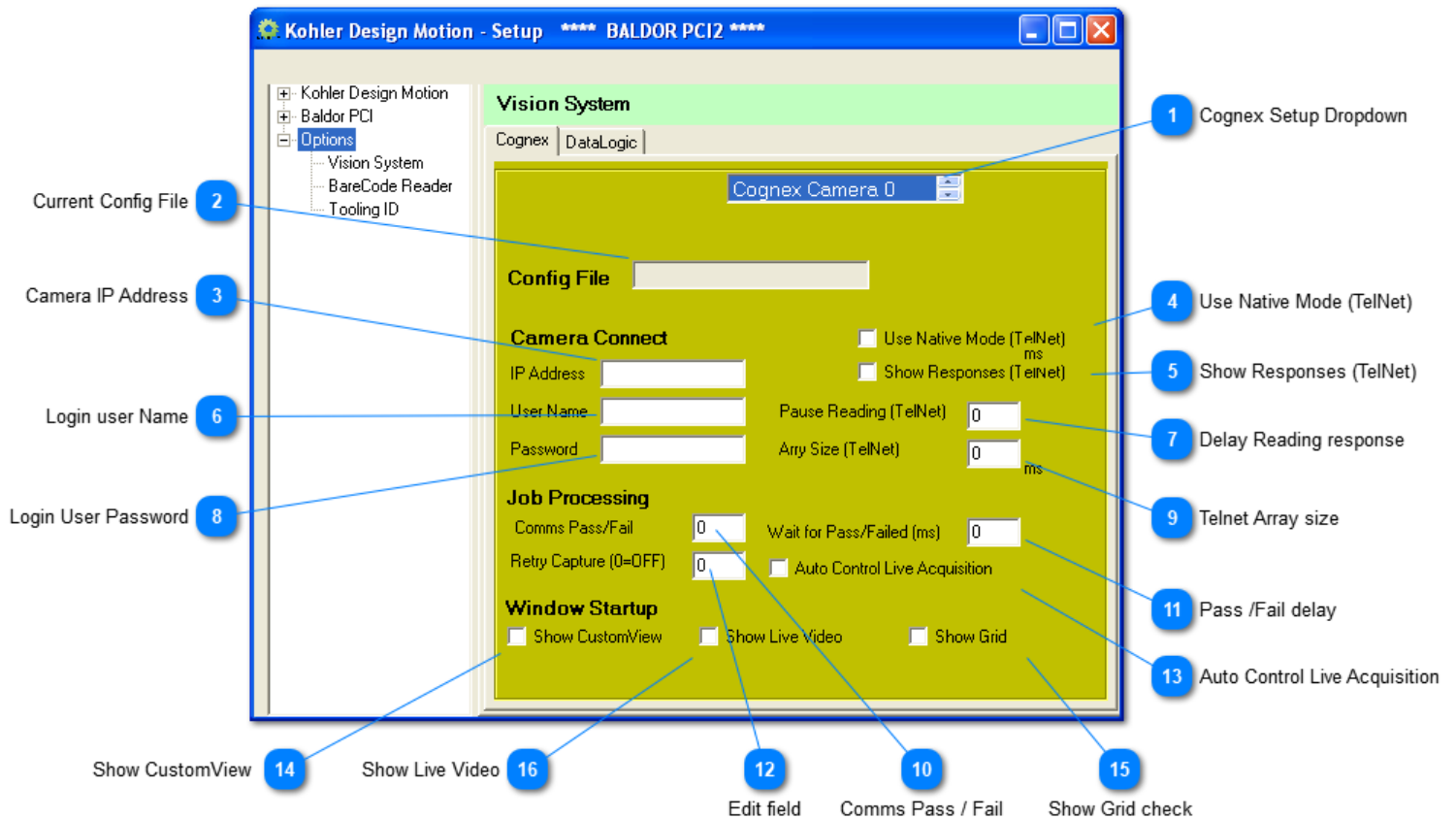
List any invalid Gcode entries

- ☐ INVALID_ENTRY

<TODO>: Insert description text here...

Options

Cognex Setup



Config files (.cod) will override the Cognex settings on this page

1 Cognex Setup Dropdown

Cognex Camera 0

The Cognex Implementation can handle multiple Cameras (Multiple Cameras have never been used so far)
Please select a setup from the dropdown

Cognex Setups consist of two parts

- KDM Cognex DLL
- Cognex .cod file (Setup file)

Both files need to be specified and enabled in the [Configuration files](#) section

2 Current Config File

3 Camera IP Address

4 Use Native Mode (TelNet)

4

☐ Use Native Mode (TelNet)
ms

5 Show Responses (TelNet)

☐ Show Responses (TelNet)
ms

6 Login user Name

7 Delay Reading response

After sending a message this will give the camera time to respond properly

8 Login User Password

9 Telnet Array size

10 Comms Pass / Fail

Comms variable location holding the Pass/Fail flag

Pass Fail / variables can also be checked through system functions

Assuming the Pass Fail for Camera Index [0] is set to 96, below codes are equal

IF [#Comms.96=1] THEN

IF [COGNEX_0_PASS_FAIL =1 THEN

Current Run System Functions

COGNEX_0_PASS_FAIL

COGNEX_1_PASS_FAIL

11 Pass /Fail delay

This gives the camera time to evaluate the result after sending the trigger command

12 Edit field

13 Auto Control Live Acquisition

☐ Auto Control Live Acquisition

14 Show CustomView

☐ Show CustomView

15 Show Grid check

☐ Show Grid

16 Show Live Video

☐ Show Live Video

Barcode Reader

Select Option

1

BarCode Reader

☐ NON
☐ USB Keyboard Stream
☒ USB Keyboard (Carrier Return)
☐ USB Keyboard (Fixed Length)
☐ Motorola Symbol Readers

0

2

Fixed Length

3

Readout Barcode Reader

With the proper setup, Barcode readers can be used to

- Select Users
- Select Products
- Select Jobs

1

Select Option

☐ NON
☐ USB Keyboard Stream
☒ USB Keyboard (Carrier Return)
☐ USB Keyboard (Fixed Length)
☐ Motorola Symbol Readers

Barcode reader mode to be used

Most applications will use USB Keyboard (Carrier Return)

For this to work properly, the barcode reader will have to send a [Carrier Return] signal at the end of the string - please see the manual of you're barcode reader for this

2

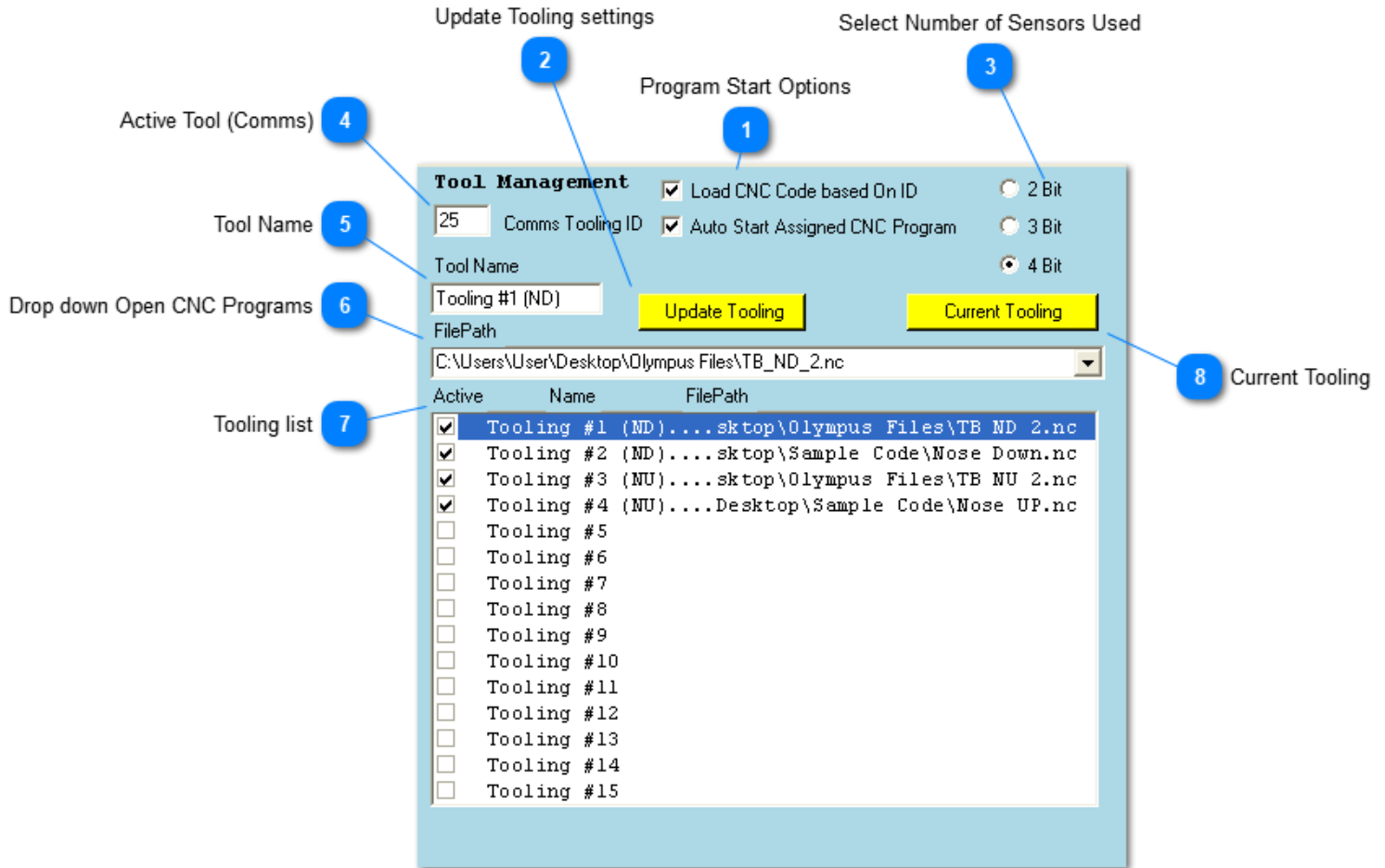
Fixed Length

0

3

Readout Barcode Reader

Tooling Management



Tooling ID can be helpful in managing multiple tooling

It requires a set of sensors (2 4 sensors) to identify the individual tooling

Once the individual tooling are identified, pre-assigned programs can be loaded or executed (automatically or manual)

The tooling Number can also be used to check for the correct tooling being loaded for a specific program
see [Active Tool \(Comms\)](#)

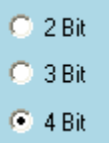
1 Program Start Options

- ☒ Load CNC Code based On ID
- ☒ Auto Start Assigned CNC Program

2 Update Tooling settings

Update Tooling

3 Select Number of Sensors Used



4 Active Tool (Comms)

Location where the current active tool number will be stored

Comms Variables can also be checked through system functions

Assuming the Active Tool Comms is set to 25, below codes are equal

- IF [#Comms.25=5] THEN
- IF [TOOLINGID_ACTIVE_TOOL =5] THEN

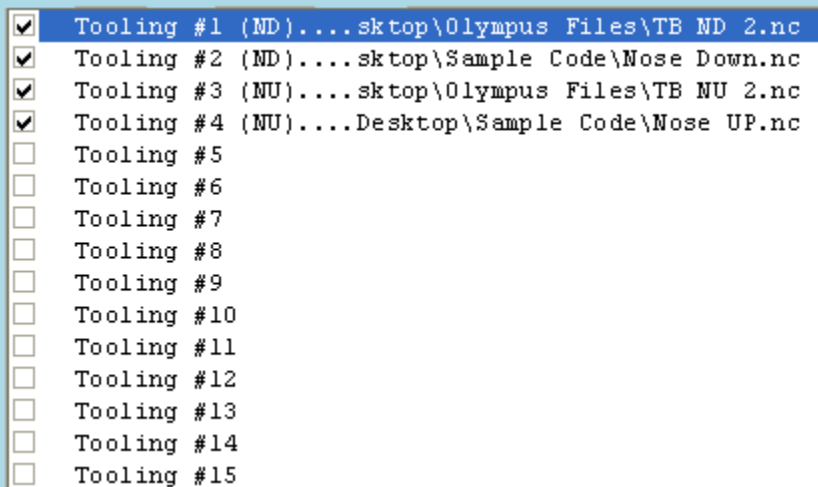
5 Tool Name

6 Drop down Open CNC Programs

Only currently open CNC Programs can be assigned to a Tooling ID

Select the appropriate Program to be assigned for the selected tooling

7 Tooling list



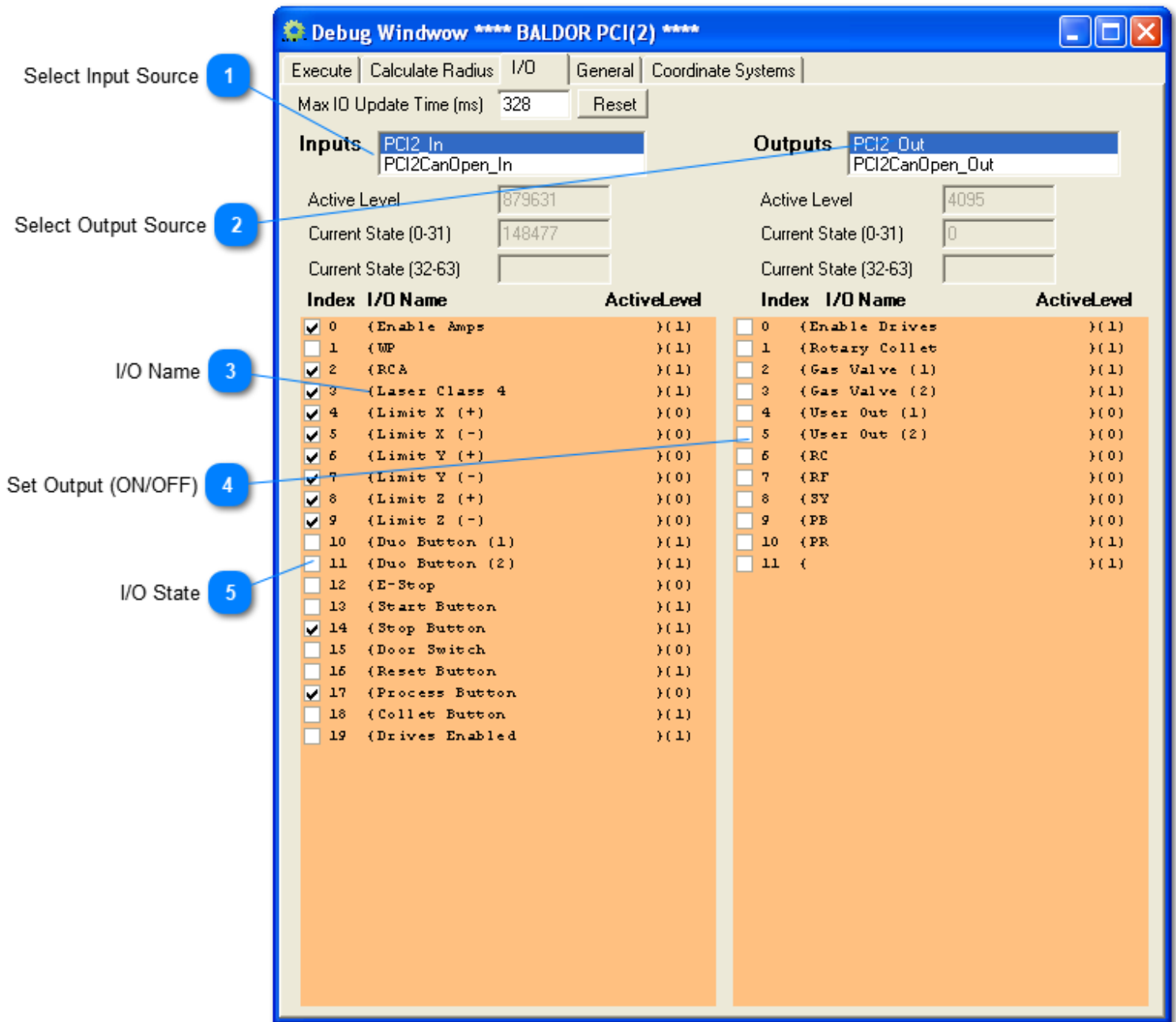
List of all assigned tooling

Checkbox [ACTIVE] needs to be checked for the tool to automatically load and start a program

8 Current Tooling

If a tooling is present it will be highlighted in the tooling list

Debug Window



The only Window of real Interest for the end user is the I/O window as it allows for easy trouble shooting of all I/O's connected to the work station

1 Select Input Source

PCI2_In
PCI2CanOpen_In

Select the Input Source from the drop down
 - Standard PCI Inputs on main motion card
 - Optional CanOpen Inputs on Wago Module

2 Select Output Source

PCI2_Out
PCI2CanOpen_Out

Select the Output Source from the drop down

- Standard PCI Outputs on main motion card
- Optional CanOpen Inputs on Wago Module

3 I/O Name

{Laser Class 4 } (1)

Right click on a line item to change the I/O Name

4 Set Output (ON/OFF)

☐ 5

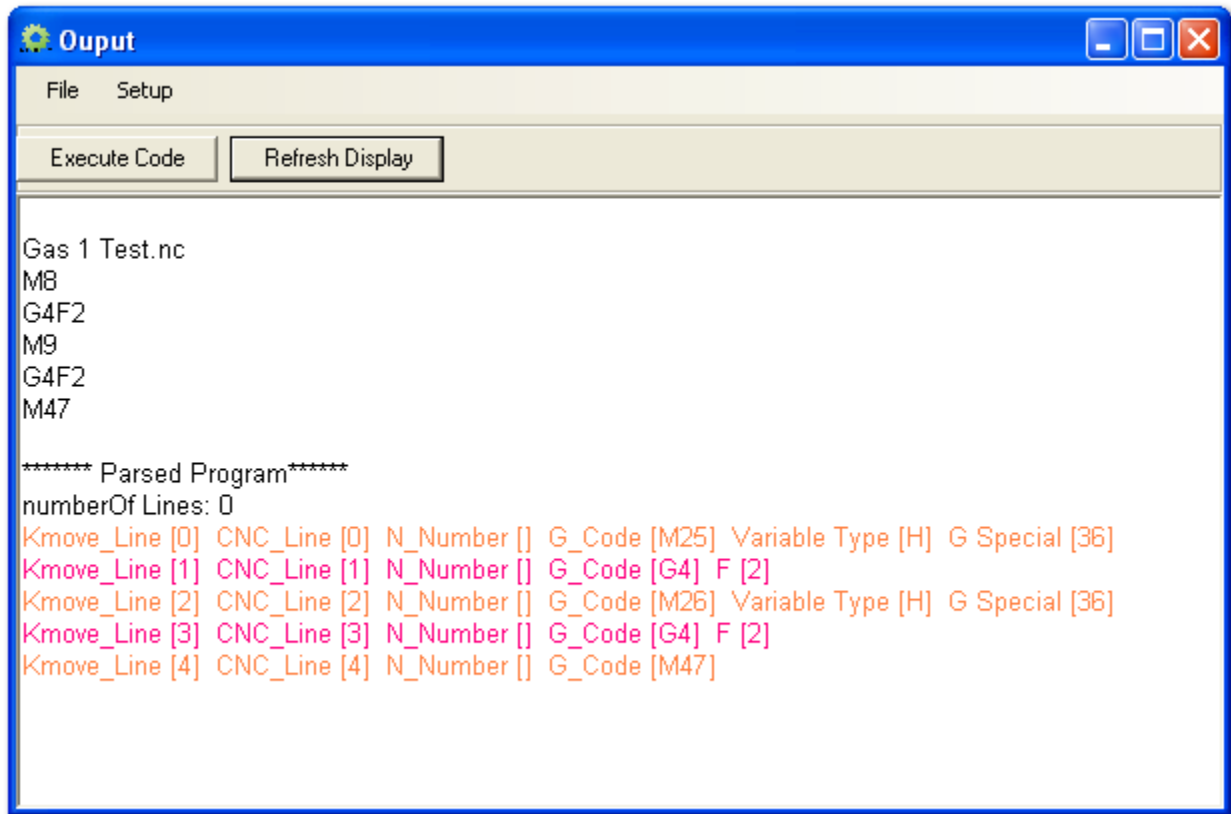
Click on Checkbox to force Output ON/OFF

5 I/O State

☐

I/O States are pulled from the source on a regular interval
(Same goes for Output States)

Output window



The output window can be displayed direct from System Menu or it can be set to automatically open before running code in the run setup by selecting [Verify Parsing]

1

Execute Code button

Once you have checked the parsing you can execute the code with this button

2

Refresh Display button

Hit Refresh to display the data based on the setup

3

Menu Strip

Setup Menu

Select the items to display - then hit [Refresh Display] to display the updated Info

4

Display

```
Gas 1 Test.nc  
M8  
G4F2  
M9  
G4F2  
M47
```

```
***** Parsed Program*****
```

```
numberOf Lines: 0
```

```
Kmove_Line [0] CNC_Line [0] N_Number [] G_Code [M25] Variable Type [H] G Special [36]  
Kmove_Line [1] CNC_Line [1] N_Number [] G_Code [G4] F [2]  
Kmove_Line [2] CNC_Line [2] N_Number [] G_Code [M26] Variable Type [H] G Special [36]  
Kmove_Line [3] CNC_Line [3] N_Number [] G_Code [G4] F [2]  
Kmove_Line [4] CNC_Line [4] N_Number [] G_Code [M47]
```

Depending on the selections made in the setup menu different information will be displayed in this window
The parsed program section will display the code as it will be run by the KDM software
This allows to verify that code has been parsed properly and the correct values have been read
It will also show you in what order G-Code will be executed, as the parser will split each G-Code command into a separate line command

KDM Process Video

The display of the Video can be done in several ways

- Through Industrial Computer (unrelated to the KDM software)
- Through the KDM software

The enclosed section is about the built in Video display for the KDM

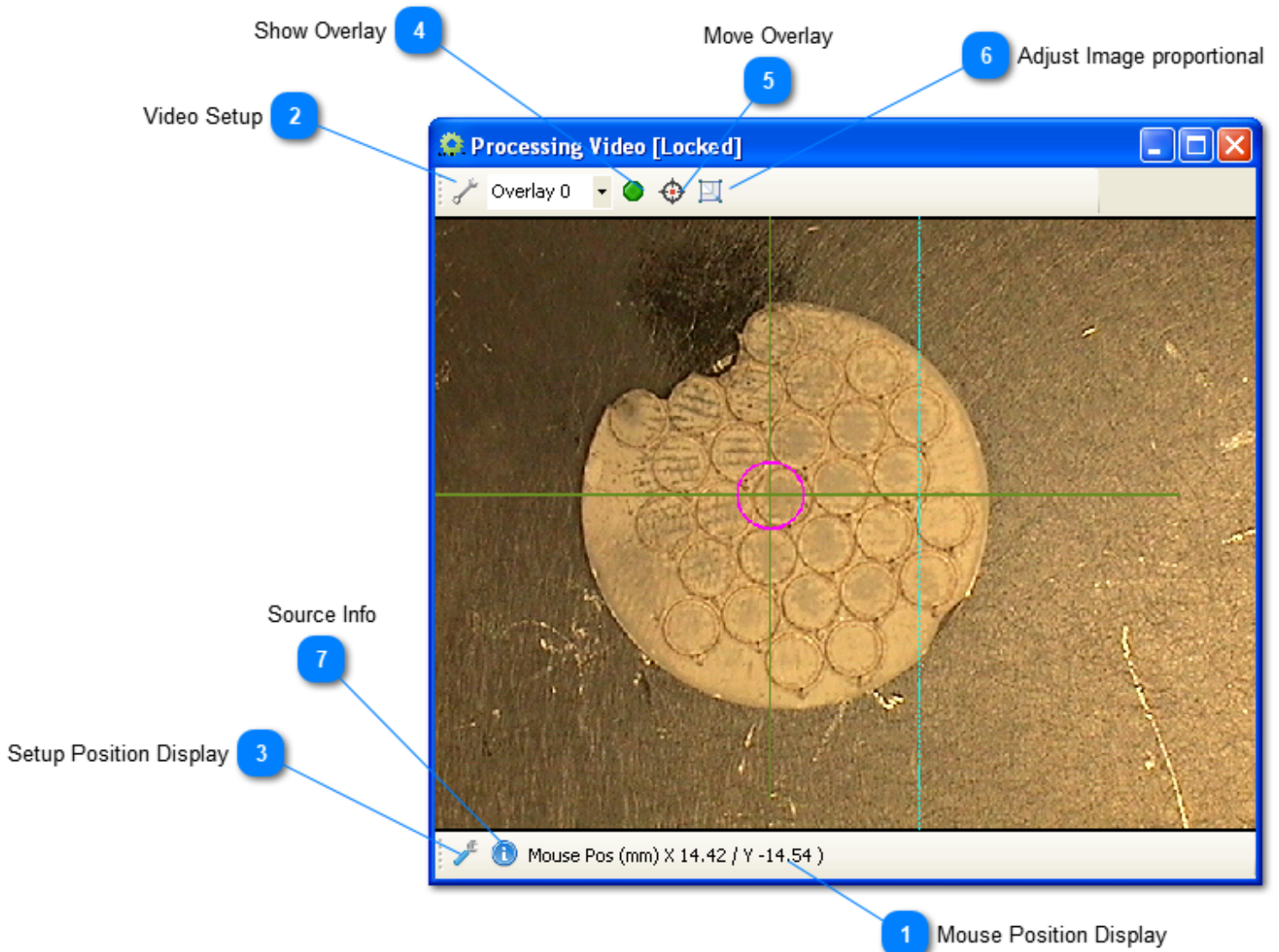
Built in functionality:

- Video display from various sources
- Cross hair overlay
- Additional overlays that can be connected to the main Overlay (will move with main overlay)
- Supported overlay shapes : cross, circle, horizontal line, and vertical line
- Simple measurement of video locations based on the main overlay location (cross)
- Easy calibration of position readout
- Reporting of the real world mouse positions to the CNC program

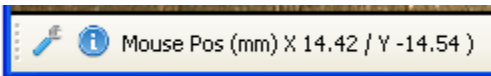
Supported Video devices:

- S video cards (PCI or S-Video/USB)

Processing Video window



1 Mouse Position Display



Displays the mouse position in relation to Overlay 0

2 Video Setup



This will open the Video setup drop down
The [Video Password](#) is required to access setup controls

3 Setup Position Display



This will open the [Setup Window](#) for the Position Display

4

Show Overlay



Click on the button to toggle the overlay Display ON or Off

5

Move Overlay



Allows to move the overlay Location /position on the next mouse click

Functionality is based on overlay shape

- Cross - moves center location
- Circle - adjusts radius
- Lines - adjusts location wither horizontal or vertical direction

The [Video Password](#) is required for this function

6

Adjust Image proportional



This will resize the height of the Video window based on the picture ratio and the current window width

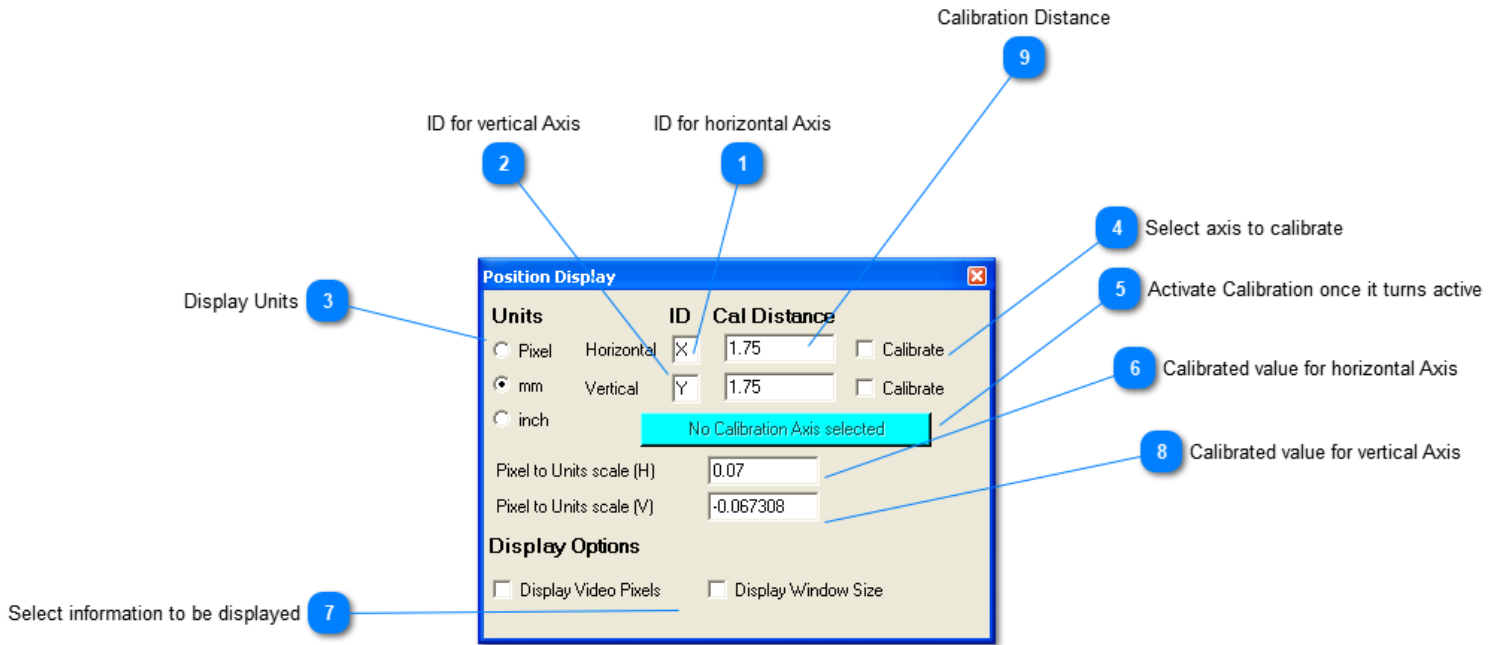
7

Source Info



Hovering over the button will display the pixel size and the frame rate of the Video source

Position Display window



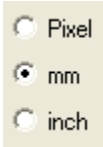
1 ID for horizontal Axis



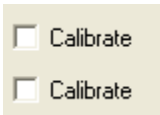
2 ID for vertical Axis



3 Display Units

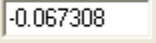


4 Select axis to calibrate



5 Activate Calibration once it turns active



6 Calibrated value for horizontal Axis0.07**7 Select information to be displayed****Display Options**☐ Display Video Pixels ☐ Display Window Size**8 Calibrated value for vertical Axis**-0.067308**9 Calibration Distance**1.751.75

Enter the calibration distance for horizontal and vertical calibration

= If the edge you'd like to calibrate is 2mm wide switch to mm and enter 2 into the field

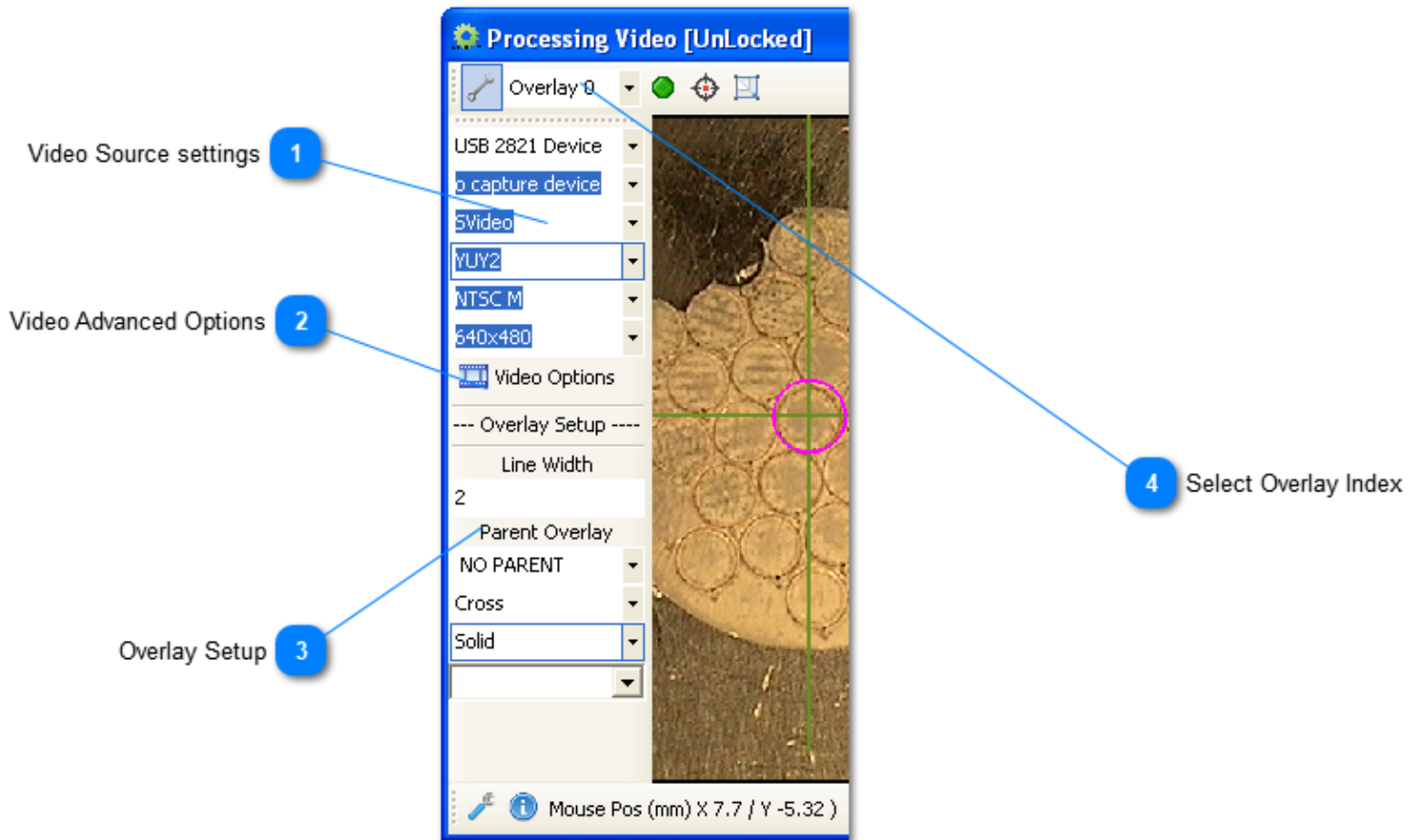
= If the edge you'd like to calibrate is 0.1" switch to inch and enter 0.1 into the field

Jog the cross to one side of your calibration part -then activate calibration by clicking the calibration button

Once calibration is active, use the mouse to locate the other end of your calibration part and click on it - the software will calculate the calibration scale base on your settings

While you can calibrate both horizontal and vertical axis at the same time depending on what you use to calibrate it might be easier to do one axis at the time ...

Video Setup Dropdown



1 Video Source settings



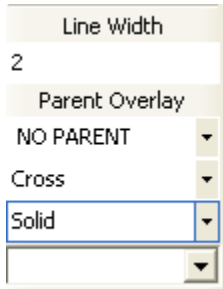
2 Video Advanced Options



<TODO>: Insert description text here...

3 Overlay Setup





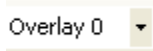
Line Width
2
Parent Overlay
NO PARENT
Cross
Solid
[Empty Dropdown]

Select the following from the dropdowns

- shape
- Line thickness
- Line Pattern
- Parent Overlay
- Color

4

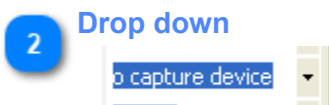
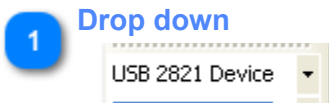
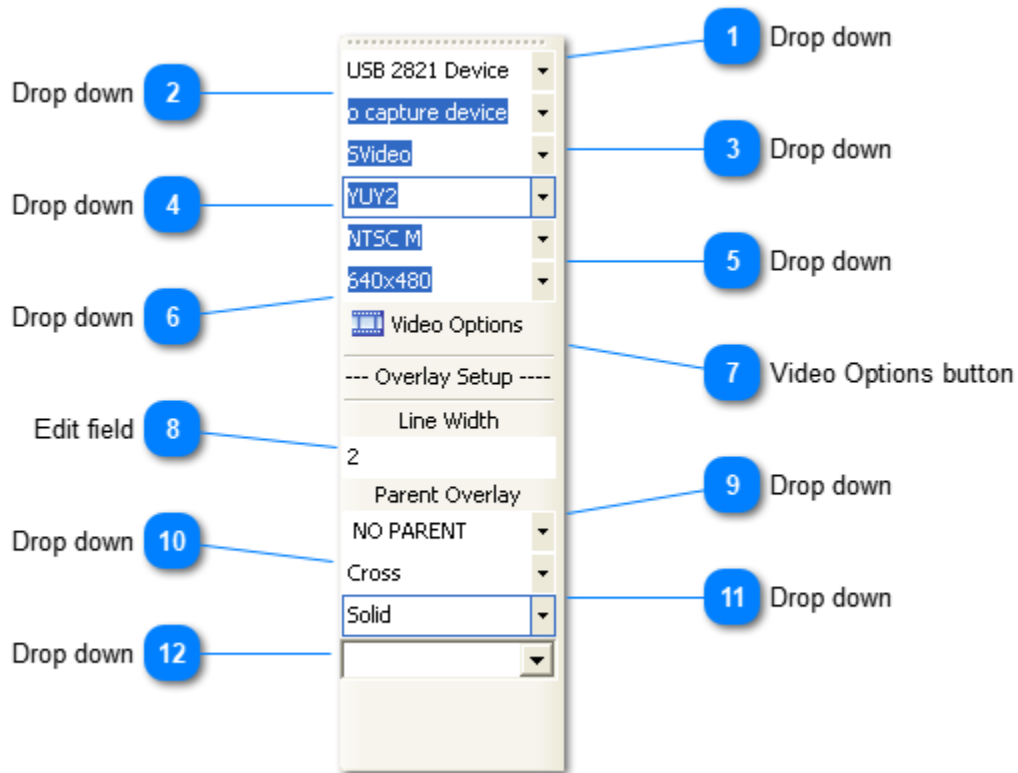
Select Overlay Index

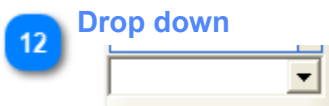
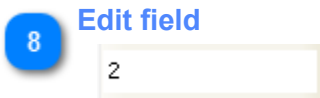
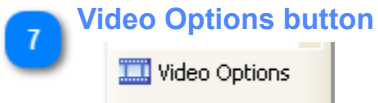


Overlay 0

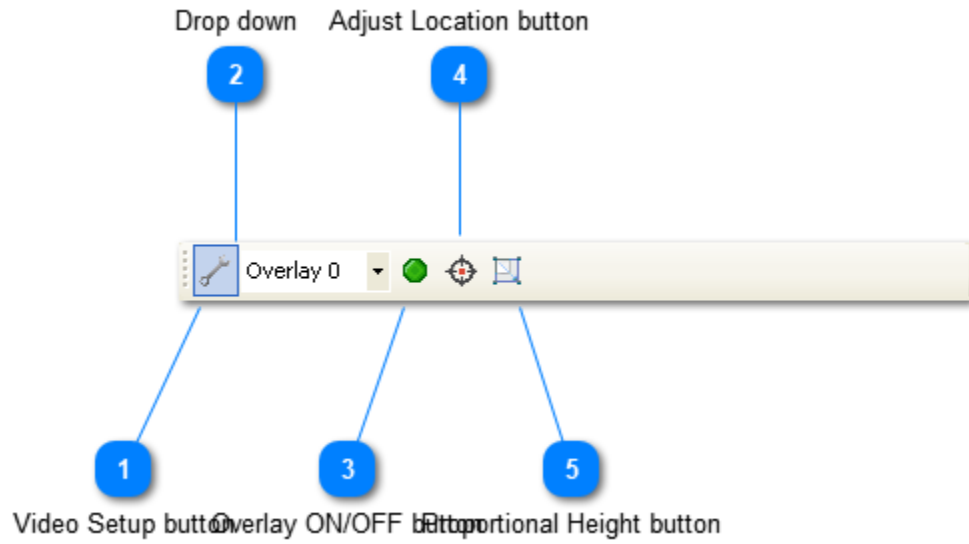
<TODO>: Insert description text here...

ToolStrip1 toolbar





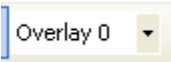
toolbar




1 Video Setup button




2 Drop down




3 Overlay ON/OFF button



4 Adjust Location button



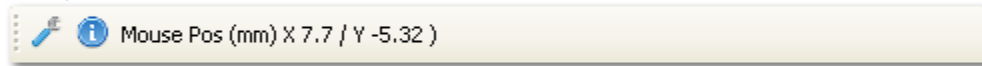
5 Proportional Height button



ToolStrip1 toolbar

Calibration button

1



ToolStripButton1 button

2

Calibration button

1

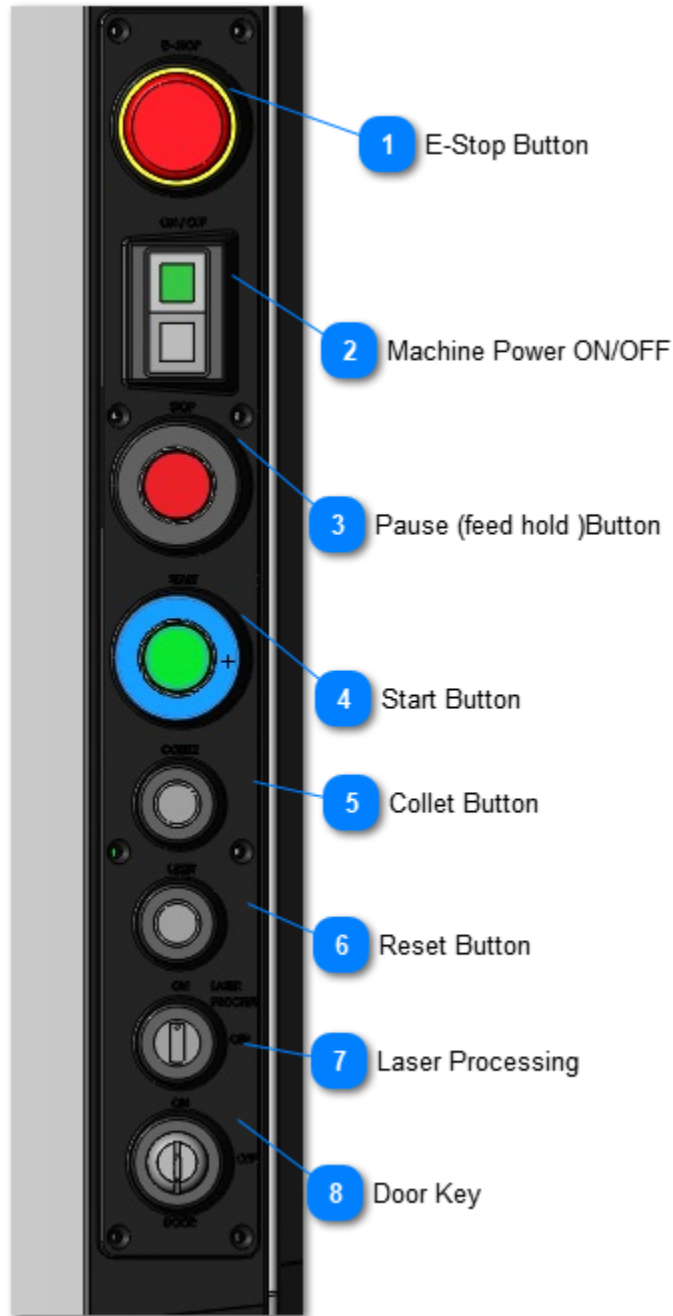


ToolStripButton1 button

2



Operator Panel



Prolas 4000 Operator Panel (All systems built by Kohler Design Corp have similar looking OP-Panels)

1 E-Stop Button



Activates E-Stop:

- 4 separate contact blocks provide E-Stop contacts (2 each) to the following components
- Workstation
 - Laser

2 Machine Power ON/OFF



Power On/Off for the Work station

3 Pause (feed hold)Button



Work station pause / feed hold button !

This will not terminate the running program - you can continue running by pushing the start button

This button will actually hold the active move - if the code is executing another code it will pause program execution

4 Start Button



Start Button

- If no program is running you need to press the button for 2 seconds to automatically start the most up front program

- If a program is running, this button can be used to continue from a pause (G5) or message (M105) code (without any delay)

5 Collet Button



This will activate the pneumatic collet valve

The button can operate in two modes:

- Momentary
- Toggle

To switch between modes, press the [COLLET] and the [RESET] Button simultaneous for > 1 second

6 Reset Button



The reset button has two functions

- Opening the automatic door
- Toggling between the two [COLLET] button modes

7 Laser Processing



This allows to temporary disable Laser processing (Dry Run)
This will ignore all Laser code inside the CNC program

8

Door Key



The door key allows to override the door signal to the Work station (Not to the Laser !)
The key will also disable the automatic door - preventing it to close.
The automatic door will always stay open with the Key in the [OFF] position !
The key can only be removed in the [ON] position

COD FILES (DEVICE SETUP FILES)

COD files are a main component when loading devices (Laser / Power Meter / Vision system and so on) While the basic concept behind the Cod file(s) stays the same the KDM functionality is constantly expanded whenever a new device is added .

Description of basic concept behind COD' files

Code Files are comma [,] separated text files - they are best viewed and edited in a simple text editor.

When opened in a different text editor then Microsoft Studio, the columns will most likely not line up

The COD file is only read by the KDM - The KDM does not write to the cod file - therefore the only way to make changes is through a text editor

- add / remove tab's as needed *** As long as you don't add or remove the Commas [,] the line will be readable

Add a semicolon [;] in front of any line that should not be processed

Add a semicolon [;] in front of any documentation text that should not be processed

There is a rather long documentation section at the beginning of each cod file

The start of the actual code section to be loaded is usually clearly indicated

```
;-----
; -- ACTUAL CODE TO BE LOADED -----
;-----
```

Usually the Start Section of the cod file should not be changed by the installer or end user

Below is a copy of start section for the smartControl+ (In this case this is a serial port device)

Couple comments:

The Cod file communication settings are used after a restart of the software

While the KDM allows you to change most communication settings within the KDM setup window - **these changes**

won't be saved - once you found working values you need to manually update the cod file

Parameters that are marked [Not user programmable] should not be changed unless requested or approved by Kohler Design

```
;PARAMETERS SECTION
[MODULE]=SMARTCONTROL           ;NOT user programmable - KDM module to be used with this interface
[GCODE_FUNCTION]=G411           ;NOT user programmable - defines serial interface to be used
[GCODE_DESCRIPTION]=SmartControl+ ;Gcode Help Text
[NAME]=SmartWeld+ PH10          ;Display Name

;SERIAL INTERFACE SETUP
[BAUDRATE]=115200                ;Baudrate - needs to be same as on the device
[DATABITS]=8
[PARITY]=None
[STOPBITS]=One
[HANDSHAKE]=None
[TELEGRAMLENGTH]=0              ;Length of standard send Telegram (allows filling msg to full length if
required)
[AWAITRESPOND]=50               ;Allowed delay for the device to respond to a Command (ms)
[RECEIVEDBYTESTHRESHOLD]=0      ;Receiving bytes threshold
[TX_TERMINATOR]=CR              ;Sets terminator when Sending [NONE,LF,CRLF,CR, or "Custom String"]
[RX_TERMINATOR]=LF              ;Sets terminator when Receiving [NONE,LF,CRLF,CR, or "Custom String"]
```

Kohler Design Corp Corvallis OR 97333

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[ECHO_COMMAND]=0 ;Indicates if the serial device will respond [ECHO] to WRITE COMMANDS sent
[DELAY_SENDING]=50 ;Delay between sending of commands (gives the serial device time to process
the last command) preset = 30ms

The next section contains specific setup commands for the device & status setup(s)

Couple comments:

Not all devices will use all entries

The particular startup command was selected because the same respond can be expected regardless of the device status - This command will be used to determine at startup if the device is connected or not

The KDM allows sending of x amount of setup commands after the device is considered alive - This can be helpful to make sure the device will have the same state / setup after each initialization (Not all devices require sending setup commands)

The KDM "reuses" existing tool strip items for similar devices (one tool strip item for all Galvo Heads), therefore the cod file allows customization of the tool strip item

The same goes for the status radio buttons and status text fields - they need to be setup properly for each device
There are 4x status radio buttons and 4x status text fields available

```
; *****
; There needs to be at least one entry in the command section for EACH Base command - It doesn't matter if it's a
read or set command - KDM will automatically update the command as needed
; *****
[SETUPCMD_TARGETS]=NewWps CopyRcp StartStop WorkMode ContourAll ScaleXY Speed MovDir TrigPoint NbCycles RotAng
DigPort0IN DigPort0Out ;*** DON'T CHANGE THIS LIST ****

; Digital IO names
[DIGITAL_INPUTS]=RC START SYNC IN0 IN1 IN2 NC NC
[DIGITAL_OUTPUTS]=OUT1 ERROR POSTRIG RUN READY OUT0 RGA NC

;STARTUP COMMAND
;TESTING IF THE CONTROL IS ACTUALLY RESPONDING
[INICOMMAND]=wbga 0 wbc 255 EthProt0 ;For testing if device is responding
[INIRESPOND]=wbrv 0 0 ;Expected Respond when Sending the INI Command

;Setup commands will be executed one after the other once communication has been established (once the INI Command
is Confirmed)
;There is "NO" limit to how many commands can be executed
;[NONE] Indicates not to send anything
;[SETUPCOMMAND]=NONE
;[SETUPCOMMAND]=NONE
;[SETUPCOMMAND]=NONE

; ***** ToolStrip DROP DOWN NAMES - by Index // use [^] for unused names [~} for Spaces
;Galvo Drop Down Order = HOSTMODE/SETUP/CONNECT/RESEND (Top to bottom)
[GALVO_TSNames]=^ SETUP~WINDOW ^ RESEND~SETUP

; ***** STATUS SECTION

; Radio Button Status 3x Status Indicators
; [space] delimiter - use [~] for spaces if required
```

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```
;
; A) Serial Command=Status pull command - add [~] for space (gethex flags / gethex extifc1 /gethex extifc2 /get
controlif /)
; B) (-)BIT=Target Bit (if needed) - use (-) to invert result display (-1 if not needed)
; C) DisplayName=Help string (no spaces allowed - add [~] for space)
; D) Always pull (0/1)=Pull when PRG is running
; E) Lable or Alarm=Optional for Text Status Fields // Alarmfor radiobuttons use [!] (Red Indicator)
;
; Example.....=[gethex flags -8 SystemFault 0 !]
;
;[RDB_STATUS1]=gethex~extifc1 7 Error 0 ! ; get [extifc1]bit 7 = Error
;[RDB_STATUS1]=gethex~flags 3 Error 0 ! ; get [flags]bit 3 = Error
;[RDB_STATUS2]=gethex~flags 1 Emission 1 ; get [flags]bit 1 = Laser activly emitting
;[RDB_STATUS3]=gethex~extifc1 21 Water~Flow 0 ! ; get [extifc1] bit 21 = Water Flow

;Text status Field (Return value = Text ) Max 4 Status Text fields are avaiiable (TXT_STATUS1 ....TXT_STATUS4)
;[TXT_STATUS1]= *** DONT USE - Assigned to RCU
[TXT_STATUS2]=wbga~@@@~wbc~255~WorkMode ^ SmartControl~Mode 1; Print SmartControl Work Mode
;[TXT_STATUS3]=
;[TXT_STATUS4]=
```

The next section is really what matters to the end user - It contains the readouts and the actual commands that can be used with the KDM

Couple comments:

Readouts will be automatically added to the readout drop list

**** The C number [10] needs to be unique ****

When adding new code try to add it to the correct section - It will make it easier to read - but in reality the actual order of how the lines doesn't matter

Make sure to pick the correct Action for the command (WRITE_INTEGER, WRITE COMMAND....)

Update the Range (for commands with Input Values) and the Scale if needed

```
;READOUT SECTION(@@@=placeholder Cookie ); Items listed will be added to the readout drop down menu
;Code UNITS      SerialCode      Text      Freq(ms)      Scale      Info
[READA],      ,wbga @@@ wbc 254 OpState,      PH10-System State,      200,      1,      (0 = Never send
Serial Code (expect Automatic Respond) /-1 = only send Serial Code once (expect Automatic Respond))
[READA],      ,wbga @@@ wbc 255 WorkMode,      PH10- ACTIVE MODE,      200,      1,      (0 = Never send
Serial Code (expect Automatic Respond) /-1 = only send Serial Code once (expect Automatic Respond))
```

```
;COMMANDS SECTION
;(@@@=placeholder Cookie
```

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Code	Function	SerialCode	Text	Range(min/max)	Scale
	Context Help				
[01]	WRITE_CUSTOM,	#####,,,			
	{G@@@ C01[.....]}		Custome String		
[09]	WRITE_INTEGER,	wbsf @@@ wbc NewWps,	NEW WPS#,	1/15,	1,
	{G@@@ C09 Q...}		NEW WPS# (NewWPS)		
[11]	WRITE_COMMAND,	wbsf @@@ wbc NewWps 11,	NEW WPS #11(VERTICAL LINE),	,,	
	{G@@@ C11 }		NEW WPS #11 (VERTICAL LINE)		

;FUNCTION CALLS TO KDM ; These are NOT serial commands ! They call a KDM Function instead (IF PREFERRED THE KDM COMMANDS COULD BE ASSIGNED TO A GCODE AS WELL)

Code	ACTION	Serial Code	Text	Range(min/max)	Scale
	Context Help				
[50]	FUNCTION_CALL,FUNCTION_SMARTC_KDMEDIT,		KDM edit Recipe#,	0/15,	1,
	{G@@@ C50 Q...}		Set KDM Recipe Edit#		
[51]	FUNCTION_CALL,FUNCTION_SMARTC_CLEARING,		Execute Clearing Move,	,,	
	{G@@@ C51}		Execute Clearing Move		

Laser Control

RCU (Rofin) based Laser System

The Rofin-Baasel RCU Controller is used to control various Laser sources built by ROFIN-SINAR or it's subsidiaries. While the basic commands to control the different Laser sources through the RCU are very similar, most lasers will require unique commands to make them work properly.

To facilitate the Laser setup, the KDM software uses a Laser_Setup.cod file that allows to fine tune the RCU communication for a specific Laser type.

Operation OEM Integration

BEFORE ATTEMPTING TO START UP THE LASER

PLEASE MAKE SURE YOU HAVE **READ AND UNDERSTAND** THE
ROFIN-SINAR **LASER MANUAL** THAT CAME WITH YOU'RE SYSTEM !
ESPECIALLY MAKE SURE YOU HAVE READ AND **UNDERSTAND**
ALL SAFETY RELATED CHAPTERS IN THE LASER MANUAL !
IF YOU ARE UNCLEAR ABOUT ANY OF THE SAFETY RELATED CHAPTERS
PLEASE CONTACT ROFIN-SINAR OR KOHLER DESIGN BEFOR PROCEEDING !

***** DO NOT TURN ON THE LASER UNLESS SO
INSTRUCTED BY THE ROFIN SERVICE PERSONAL *****

During normal production you probably you should not need to have the ROFIN GUI running.
During Setup of a new job or to get detailed information about the current laser state you will need to start the ROFIN GUI

***** Currently the ROFIN GUI when used with the StarFiber will display somewhat confusing warnings about the key state with the the door open or the E-Stop present *****

We are in contact with ROFIN to see if we can figure out why the RCU is not displaying the correct warnings.

Turn on Laser

OEM Operator Panel: (on some systems the laser operator panel might be located behind a door)

- Turn Main Power on
- Push green Start button
(Without an E-Stop condition, you will at this point hear the main contactors supplying power to the Laser unit)
- Turn Laser Key to [On] position

To Enable Emission (With the safety shutter still in place = no Laser beam will exit the fiber)

- Above POWER ON sequence without E-Stop condition
- Two items need to be satisfied before the laser will enable emission (with the Laser shutter still being closed)
 - Door needs to be closed
 - Work station [Laser Processing] switch needs to be in the "ON" position

Once all of the above requirements are met, the Laser will **Start Emission** indicated by the **Orange Warning Light** on top of the work station

You are now ready to **open the shutter** by providing the **Start signal** to the RCU through the KDM software (Start button on GUI or trough G-Code)

Normal Operation

- During production, **opening and closing the Door** will automatically **enable and disable** the **Emission on the laser source**

Dry Run

- To run CNC code without the Laser firing turn the [[Laser Processing](#)] switch to the "OFF" position
- This will prevent the Laser from enabling Emission (no orange light indicates Emission is off)
- It will also suppress all RCU related commands in the KDM Software

Example: Start signal will never get send to the RCU with the processing key in the "OFF" position

Disabling Laser Emission (for Service or Safety related issue)

- **Lockout** the main switch with an approved Lockout Tag
- **Remove Laser Key** from System (to be found on [OEM Laser panel](#) or on ROFIN Operator panel)

- ** Turning the processing key to the Off position is not enough to safely disable the Laser Emission **

OEM Laser Panel



OEM Panel integrated into Prolas 4000 System next to the ROFIN LASER RACK COMPONENTS

1 Laser Main Fuse (15A)



The main power line going to Laser is fused by a fast acting 1/4" ABC 15A fuse

Fuse used: Fast Acting 1/4" Ceramic Tube Fuse ABC 250VAC/15A MCM# 71385K35 or similar

2 Laser Main Shut Off



Unless an additional shut off was added by the customer during the installation, this is the **only means** of turning the power off to the Laser

3 Laser Start Button



Pushing the Laser Start button will allow the main power relays to the Beam Source to be engaged
You will have to push the start button after the following events

- Power Cycle
- E-Stop has been activated

4 Laser Key



Before Emission can be enabled the Laser Key needs to be in the On Position

**** Removing the key will prevent emission from being enabled on the Laser ****

RCU Setup File (.cod)

There are several different types of setups that need to be loaded in order for the RCU communication to work properly

Some of them can be changed by the customer, but some should only be changed by Kohler Design Corp or somebody familiar with the COHERENT RTI protocol

(You will need a list of the current RCU attributes to find the appropriate commands)

Below is a list of the entries that can be changed by the customer or a COHERENT Service Technician

The RCU command syntax includes a so called [Cookie] that is used to match the return value to the request
With the KOHLER DESIGN MOTION the [Cookie], an Integer value will be assigned during loading of the cod file.

- Use @@@ as placeholder for the [Cookie] in the command line

The associated G code is usually assigned by Kohler Design Corp

[GCODE_FUNCTION]=G410;NOT user programmable - G-Code to be used with this device (needs to be > 400)

Custom Code needs to have a **unique C- Number** throughout the .cod file

The C number if required, it is set at the beginning of the line in [] brackets

[105] would assign G410 **C105** to the command

Based on above information, the basic syntax for programming custom G-Code for the RCU would be:

- **G410 C105** ' fixed command

- **G410 C105 Q?** ' command that requires a numeric input (Q-Value)

RCU Setup Commands (.cod)

Some of the current available Setup commands that can be uploaded from the .cod file are:

You can test and call up commands defined in the COD file manually by using the [RCU Communication Window](#)

Status Readout

There are three status icons in the standard Toolbar of the KDM software.

To each Icon a RCU Laser status can be assigned (Return value needs to be 1/0 only)

red = Command to be send

green = Display name

;STATUS SECTION (Add Display name to end of command string (No Spaces In Display Name allowed! use "~" as place holder for space)

; Radio Button Status (Return values = 0/1)

[RDB_STATUS1]=ga @@@ SystemControl substate LaserSubState

Readout Value [READA]

This allows to add custom readouts to the readout Dropdown list in the KDM Software

;READOUT SECTION; Items listed will be added to a drop down menu

Code	UNITS	Command	Text	Freq (ms)	Scale	Context	Help
[READA],	C,	ga @@@ Laser systemTemperature,	RCU-Temperature,	200,		1,	Temperature Readout
from Laser							
[READA],	W,	ga @@@ Laser OutPower ,	RCU-Power,	200,		1,	Laser Power

Command section (WRITE_COMMAND)

This allows to add custom write commands to the KDM Software

[10] = C command used to access the particular write command

;COMMANDS SECTION

;Code	Function	Command	Text	Range	Scale	Context	Help
;[01],	WRITE_CUSTOM,	#####,	Write cUSTOM cOMMAND,			{G@@@ C01[.....]}	Custom Hex
Code (!HG0000000000)							
;[10],	WRITE_COMMAND,	sa @@@ Laser shutterOn 0,	Shutter OFF Signal,		0/1,1,	{G@@@ C10}	Shutter OFF Signal
;[11],	WRITE_COMMAND,	sa @@@ Laser shutterOn 1,	Shutter ON Signal,		0/1,	1,	{G@@@ C11} Shutter ON
Signal							

RCU StarFiber Hardware Setup

The KDM 37 PIN Laser interface Connector has two Cables

- 20 wire AWG 22 - Software Interface (XSB13 on the Laser Side)
- 12 Wire AWG 20 - Hardware Interface (XSB1 on the Laser Side)

- 24V DC power to the Laser interface is provided by the Work station

- The remote start switch is wired in to prevent the Laser source to power up automatically after a power cycle or E-Stop Condition

Laser Interface StarFiber OEM				Software	Hardware		
Pin #	AWG	Color	RCU- Name	KDC-200 Name	XSB13	XSB1	Signal Type
1	22	brown	24V DC	+24VDC	A3		KDC200 > Laser
2	22	blue	GND (VDC)	GND (DC)	A4		KDC200 > Laser
3	22	orange	START	START	B1		KDC200 > Laser
4	22	black	SELECT	SELECT	B2		KDC200 > Laser
5	22	red	Bin/Select In1	Recipe Bit1	A12		KDC200 > Laser
6	22	green	Bin/Select In2	Recipe Bit2	A13		KDC200 > Laser
7	22	white	Bin/Select In3	Recipe Bit3	A14		KDC200 > Laser
8	NC		E-Stop Software NC2 (KDC200 +24V)	External E-Stop to KDC-200			
9	22	pink	READY	READY	A5		Laser > KDC200
10	22	yellow	ERROR	ERROR	A6		Laser > KDC200
11	22	purple	BUSY	BUSY	A7		Laser > KDC200
12	22	l-brown	BUSY	BUSY	A7		Laser > KDC200
13	22	w/blue	NC				
14	22	w/yellow	NC				
15	22	w/green	NC	Option / User 1			KDC200 > Laser
16	22	w/black	NC	Option /User 2			KDC200 > Laser
17	22	r/black	STOP	Processing off	A17		KDC200 > Laser
18	22	r/yellow	NC	Door Option /Signal			KDC200 > Laser
19	22	r/green	NC	Option /Reset Button			KDC200 > Laser
20	22	w/red	NC	Option /User Input 1			Laser > KDC200
21	22	NC		Option /User Input 2			Laser > KDC200
22	20	l-brown	Laser Warn			B12	Laser > KDC200
23	NC			Optional laser Interface X9-4			Laser > KDC200
24	20	orange	E-Stop Harware NC1			A5	Work station E-stop switch
25	20	black	E-Stop Harware NC1\			C6	Work station E-stop switch
26	20	red	E-Stop Software NC2			A7	Work station E-stop switch

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27	20	green	E-Stop Software NC2\			C8	Work station E-stop switch
28	20	white	Door Software NC1			A17	KDC200 Door Dry Contact
29	20	gray	Door Software NC1\			B1	KDC200 Door Dry Contact
30	20	pink	Door Hardware NC2			B2	Work station Door sw
31	20	yellow	Door Hardware NC2\			B3	Work station Door sw
32	20	purple	Optional laser Interface X9-5				
33	22	gray	Optional laser Interface X9-6				
34			Keying CPC-37 Connector	Key			
35			Keying CPC-37 Connector	Key			
36			Keying CPC-37 Connector	Key			
37			Keying CPC-37 Connector	Key			
1	20	Brown	24V for E-stop Laser	24V DC		A11	KDC200 > Laser
2	20	Blue	GDN for E stop Laser	GND (VDC)		A12	KDC200 > Laser

AWG 22 4 wire cable (remote start)

Red	Remote Start	C2	Remote start (No)
white	Remote Start	C3	Remote start (No/)
black	Remote Stop (Optional)		
green	Remote Stop (Optional)		

Add Jumpers on XSB1

C4-C5	External Stop
A8-C9	E-stop 1 Circuit to W24
A6-C7	E-stop 2 Circuit to W24

Add Jumpers on XSB13

A4-A2	External supply GND
-------	---------------------

Basic Laser Control

Over the years the following Commands have been standardized for Laser systems using the Prolas or the KDM software

Below commands cover only the basic set

The Setup commands for each laser are covered separately for [NLS](#) and [RCU](#) based Lasers

Command	Description	NLS Command	RCU Command
M8	Gas 1 ON	Yes	Yes
M9	Gas 1 OFF	Yes	Yes
M10	Gas 2 ON	Yes	Yes
M11	Gas 2 OFF	Yes	Yes
M51	Laser OK	Yes (Wait for OK Signal)	Yes (Wait for OK Signal)
M70	Shutter Close	SO Close Signal (Load on Move Buffer)	Start Signal
M71	Shutter Open (Sync)	(Not Implemented yet)	NC
M72	Shutter Open (No Sync)	SO open Signal (Load on Move Buffer)	NC
M74	Pulse Burst	PB (Pulse length ...ms)	Start Signal
M75	Trigger	Trigger PB signal (Load onto Move Buffer with auto reset)	Trigger Signal
M80	Halt OFF	Resume firing	NC
M81	Halt ON	Stop firing	NC
M90	Ramping OFF	Pulse Ramping OFF	NC
M91	Ramping ON	Pulse Ramping ON	NC

[NLS](#) Specific Commands

Recipes / Pulse shaping

The standard NLS control on a C laser comes with 15 recipes

Recipes are special in that :

- They allow you to set individual Max / Min values for each laser parameter
- They allow you to attach a different pulse shape to each recipe (Switching the recipe is the only way to change pulse shape with the software)

The commands G400 C201 to C215 are used to copy the recipe #1 - #15 to the WPS (**W**ork **P**arameter **S**et)

G400 C200 is required to allow editing work groups C&D & WPS

Sample Code

```
G400 C200      ' Enable edit
G400 C201      ' Copy Recipe1 to WPS
```

Pulse Ramping

Lasag C type Lasers can ramp both ways **Up** and **down**

- Make sure Integrator Bit 62 is set to 2

The following commands are used to set the ramp parameters on Lasag C-Lasers (older lasers can only use the time based ramping)

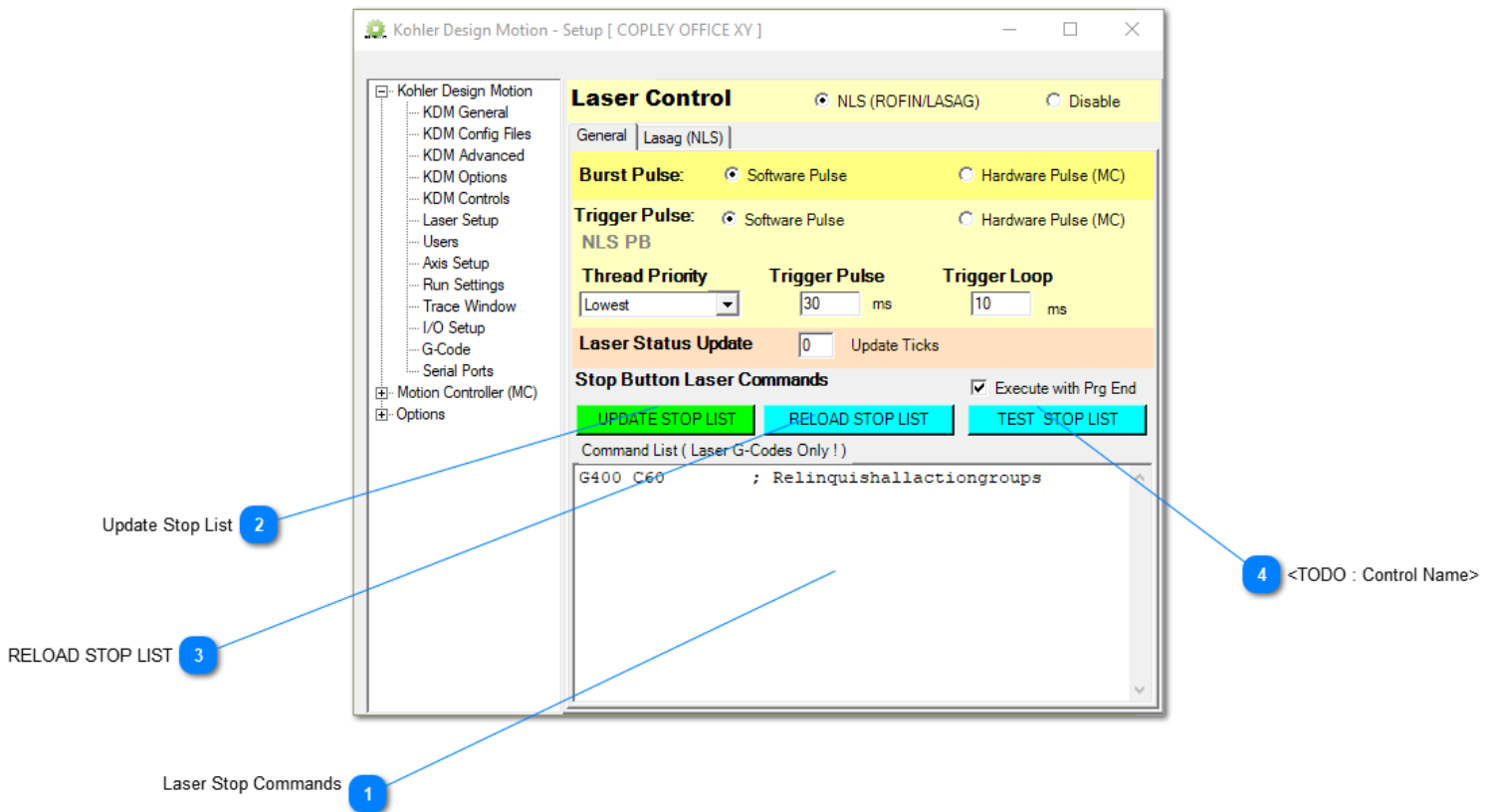
G400 C102	' Up Ramping # of pulses = needs to be at least 1 to allow the laser to come back up to
full power !	
G400 C105	' Down Ramping # of pulses
G400 C110	' Power level after down Ramping (W)

Sample Code

G400 C105 Q10	Ramp pulses
G400 C110 Q0.2	Power at end of ramping
M61	Enable remote control
G1 A10 F1000	start rotating A
M72	Open shutter (on the fly)
A360	Weld over 360 Deg
M91	Turn on Pulse ramping
A40	Continue rotating during ramping
M70	close shutter (on the fly)
M90	Ramp back up to original power setting
M60	release Remote Control

Laser Stop Commands

Depending on the Laser Source you might want to send commands at the end of the program or when you hit the stop command



1 Laser Stop Commands

Add the required stop commands to the text field

- Only Laser G Codes are allowed
- Multiple commands can be sent - put each command on a new line
- semicolon can be used to separate the command from the description

2 Update Stop List

UPDATE STOP LIST

Use this button to update the actual stop list

3 RELOAD STOP LIST

RELOAD STOP LIST

Use this button to reload the active stop list - this will show what's actually contained in the stop list
If you try to upload invalid commands, they will be automatically removed
The reload button will show you if the command was accepted or not

4 <TODO : Control Name>

TEST STOP LIST

This will allow to test the stop list - After pushing all commands found in the stop list will be executed

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NLS (LASAG) based Laser System

Operation

BEFORE ATTEMPTING TO START UP THE LASER

PLEASE MAKE SURE YOU HAVE **READ AND UNDERSTAND** THE
ROFIN-SINAR **LASER MANUAL** THAT CAME WITH YOU'RE SYSTEM !
ESPECIALLY MAKE SURE YOU HAVE READ AND **UNDERSTAND**
ALL SAFETY RELATED CHAPTERS IN THE LASER MANUAL !
IF YOU ARE UNCLEAR ABOUT ANY OF THE SAFETY RELATED CHAPTERS
PLEASE CONTACT ROFIN-SINAR OR KOHLER DESIGN BEFOR PROCEEDING !

***** DO NOT TURN ON THE LASER UNLESS SO
INSTRUCTED BY THE ROFIN SERVICE PERSONAL *****

During normal production you probably you should not need to have the Lasag PCT2 software running.
During Setup of a new job or to get detailed information about the current laser state you might want to use the PCT2 software.

Usually both, the KOHLER DESIGN MOTION and the PCT2 share the same Serial port on the Computer

Both, the KOHLER DESIGN MOTION and the Prolas software use the same use the same hardware setup and are similar in functionality

The only real difference on the hardware is the Class4 input that can be processed with the KOHLER DESIGN MOTION - this will require a free input on the machine side
Usually there is only one free input available on the Prolas systems.

If you're system is equipped with a CanOpen expansion module we would strongly recommend to connect the Class4 input to the workstation

Basic Hardware Concept

- The RC (Remote Command) is used to turn on off the Laser emission during a special event (Pause / Feed hold / Laser Processing ON/OFF)

This works, because the NLS controller will ignore all external Inputs once the RC goes low , regardless of there current state

- The E-Stop Button on the Workstations [Operator Panel](#) has two dedicated pairs of contacts (1NC /1 NO) for the Laser-Stop.

- The Workstation on the other had has a dedicated Power Input for the external E-Stop from the Laser (A Normally Closed Relay contact is required on the Laser side)

- The door of the Workstation also provides two contacts for the Class 1 beam block on the NLS equipped Laser Source

The NC (hardware) signal is a dedicated NC contact on the actual door switch , whereas the NO (software) signal is provided trough a relay on the main board of the Workstation

Normal Operation

- Laser parameters can be downloaded directly from within the CNC code (over a Serial connection)
- All parameters for the serial connection and all laser commands are uploaded from the .cod file

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- For trouble shooting, Serial communication issues you can be observed in the [Serial Setup](#) Tab from the KDM setup window
- Shutter open/ Pulse burst and laser states are set / pulled from the NLS I/O board by a set of Outputs defined in the KOHLER DESIGN MOTION

NLS Setup file (.cod)

Usually the same .cod file can be used with any NLS based Laser

The associated G code is usually assigned by Kohler Design Corp

[GCODE_FUNCTION]=G400;NOT user programmable - G-Code to be used with this device (needs to be > 400)

Custom Code needs to have a **unique C- Number** throughout the .cod file

The C number if required, it is set at the beginning of the line in [] brackets

[105] would assign G410 **C105** to the command

Based on above information, the basic syntax for programming custom G-Code for the NLS would be:

- **G410 C105** ' fixed command

- **G410 C105 Q?** ' command that requires a numeric input (Q-Value)

NLS Setup Commands (.cod)

Below is a sample NLS Cod. file (not an updated version)

- green section = generic cod documentation / description of the .cod file used with the KDM software
- black section = actual setup code

```
;-----
;--- DOCUMENTATION COD SETUP FILE(S) -----
;-----
; COD files are used for load G-codes for different Custom Controls
; Example : Serial Laser / Serial Measurement Device / Cognex Control / Dc-12 Custom Code
; The basic structure of the COD file stays the same for the various controls but the actual parameter Entries
change based on the
; selected KDM Module.
; It is therefore NOT recommended to use a Cognex COD file as the base for a new Serial Port COD File as it won't
have the proper parameter
; entries for the device.
; Not all functionality is used with each device
;
; [,] Separated table
; [;] Comments - anything afterwards will be ignored on that line of code
; Enable Logging in the KDM Setup do print all messages to serial Log (send and revived)
; NC Command = [Gcode_Function]+ "C"+ [code]
; Custom communication G codes need to be > G400 !
; Example: Gcode_function lasag NLS = [G400`], Code=[10] // resulting NC code = G400C10
; To use the "old" prolas [C] shortcuts (C10 = G400C10) replace [C] with [G400C] or
; add replacement codes to the Gcode library
; -----
;
; ** Functions (SENDING)**
; WRITE_COMMANDSendFixed Hex Command
; WRITE_VARIABLESendlast 8 bits include programmable values to be transmitted to Laser
; WRITE_CUSTOMSendSend programmable hex string to be sent to Laser
; READ_VALUEREADRead numeric Values from Device
;
; **Context Help/ {sample Code to be inserted} **
; Put in {} braces the actual code that will be inserted ({}braces will automatically be removed)
; Enter G-code as G@@@ as the @@@ will be replaced with the actual G code set in the COD file)
; Sample:
;{G@@@ C101}Test - This text will be Inserted
; Result: G430 C101;Test - This text will be Inserted
;
;
; ** Functions (RECIEVING) **
; Receiving functions are set based on a bit pattern (see below)
; Bit Pattern
; 'Bit BitValue function
; '0 1 =Stop PRG
; '1 2 =Close shutter
; '2 4 =Display Message Box
; '3 8 =Display Message Color Yellow (KDM Status Bar)
; '4 16=Display Message Color Red (KDM Status Bar)
```

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```
; '5      32=Clear Message Display (KDM Status Bar)
; '6      64=Ignore Message
; '7      128=Log Message
;
;
; ** Standard Messages (sample)
; ERROR=7Stop PRg (1) / Close Shutter(2) / Display Message Box(4)
; WARNING=16Display Message Color Red (KDM Status Bar)
; MESSAGE=8Display Message Color Yellow(8)
; IGNORE=64Ignore Message (64)
; CLEAR STATUS BAR=96Clear Message Display(32) /Ignore Message (64)
;-----
;
; ** Parameters Description **
; [...]General Settings
; [READA]Readout/automaticReadout automatic (Display Message sent by Serial Device Interval Controlled by serial
device )- continue PRg
; [READM]Readout/manualReadout by request (Interval set by KDM)- No Action
; [INICOMMAND]String that will be sent to see if the device is responding
;
;
;
;-----
; -- ACTUAL CODE TO BE LOADED -----
;-----

;PARAMETERS SECTION
[MODULE]=NLS;NOT user programmable - KDM module to be used with this interface
[GCODE_FUNCTION]=G400;NOT user programmable - defines serial interface to be used

[NAME]=LASAG NLS CONTROL;Display Name
[BAUDRATE]=9600;Baudrate - needs to be same as on the device
[DATABITS]=8
[PARITY]=None
[STOPBITS]=One
[HANDSHAKE]=None

[TELEGRAMLENGTH]=13;Length of standard send Telegram (allows filling msg to full length if required)
[AWAITRESPOND]=160;Allowed delay for teh device to respond to a Command (ms)
[RECEIVEDBYTESTHRESHOLD]=1;Receiving bytes threshold
[TX_TERMINATOR]=CR;Sets terminator when Sending [NONE,CRLF,CR, or "Custom String"]
[RX_TERMINATOR]=CR;Sets terminator when Receiving [NONE,CRLF,CR, or "Custom String"]

[ECHO_COMMAND]=0;Indicates if the serial device will respond [ECHO] to WRITE COMMANDS sent
[DELAY_SENDING]=100;Delay between sending of commands (gives the serial device time to process the last command)
preset = 30ms

[INICOMMAND]=!AB0000000000;For testing if device is responding
[INIRESPOND]=:AB0000000000;Expected Respond when Sending the INI Command

;Setup commands will be executed one after the other once communication has been established (once the INI Command
is Confirmed)
```

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```
;There is "NO" limit to how many commands can be executed
;[NONE] Indicates not to send anything
[SETUPCOMMAND]=NONE
[SETUPCOMMAND]=NONE
[SETUPCOMMAND]=NONE

;READOUT SECTION; Items listed will be added to a drop down menu
;Code UNITSSerial CodeTextFreq (ms)ScaleContex Help
[READA], Joule,?IB000000000,NLS-Readout Energy,500,0.001,Readout Power from Laser (interval set by Laser)

;COMMANDS SECTION
;Code FunctionSerial CodeTextRangeScaleContex Help
[01],WRITE_CUSTOM,#####,,,{G@@@ C01[....]} Custome Hex Code (!HG000000000)
[10],WRITE_COMMAND,!HG000000000,Energycontrol/monitoringOFF(CC),,{G@@@ C10} Energycontrol/monitoring OFF
[11],WRITE_COMMAND,!HG000000001,EnergycontrolON(CC),,{G@@@ C11} Energycontrol ON
[12],WRITE_COMMAND,!HG000000002,EnergymonitoringON(CC),,{G@@@ C12} Energymonitoring ON
[20],WRITE_COMMAND,!AE000000000,HeNelaserOFF(CB),,{G@@@ C20} HeNelaserOFF(CB)
[21],WRITE_COMMAND,!AE010000000,HeNelaserON(CB),,{G@@@ C21} HeNelaserON(CB)
[31],WRITE_COMMAND,!AC000000000,LaserOFF(CA),,{G@@@ C31} LaserOFF(CA)
[41],WRITE_COMMAND,!AD000000000,CoolingOFF(CA),,{G@@@ C41} CoolingOFF(CA)
[60],WRITE_COMMAND,!AB000000000,Relinquishallactiongroups,,,{G@@@ C60} Relinquishallactiongroups
[61],WRITE_COMMAND,!AB010000000,OccupyactiongroupAonly-Processing,,,{G@@@ C61} OccupyactiongroupAonly-Processin
[62],WRITE_COMMAND,!AB020000000,OccupyactiongroupBonly-Setup,,,{G@@@ C61} OccupyactiongroupBonly-Setup
[63],WRITE_COMMAND,!AB040000000,OccupyactiongroupConly-EditWPS,,,{G@@@ C63} OccupyactiongroupConly-EditWPS
[64],WRITE_COMMAND,!AB030000000,OccupyactiongroupA+B,,,{G@@@ C64} OccupyactiongroupA+B
[65],WRITE_COMMAND,!AB050000000,OccupyactiongroupA+C,,,{G@@@ C65} OccupyactiongroupA+C
[66],WRITE_COMMAND,!AB060000000,OccupyactiongroupB+C,,,{G@@@ C66} OccupyactiongroupB+C
[67],WRITE_COMMAND,!AB070000000,OccupyactiongroupA+B+C,,,{G@@@ C67} OccupyactiongroupA+B+C
[68],WRITE_COMMAND,!AB080000000,OccupyactiongroupDonly-NewWPS,,,{G@@@ C68} OccupyactiongroupDonly-NewWPS
[69],WRITE_COMMAND,!AB0F0000000,OccupyactiongroupA+B+C+D,,,{G@@@ C69} OccupyactiongroupA+B+C+D
[200],WRITE_COMMAND,!AB0C0000000,OccupyactiongroupC+D-EditWPS+NewWPS ,,{G@@@ C200} OccupyactiongroupC+D-EditWPS
+NewWPS
[201],WRITE_COMMAND,!BA010000000,CopyRPS1toWPS(CD),,{G@@@ C201}CopyRPS 1 toWPS(CD)
[202],WRITE_COMMAND,!BA020000000,CopyRPS2toWPS(CD),,{G@@@ C202}CopyRPS 2 toWPS(CD)
[203],WRITE_COMMAND,!BA030000000,CopyRPS3toWPS(CD),,{G@@@ C203}CopyRPS 3 toWPS(CD)
[204],WRITE_COMMAND,!BA040000000,CopyRPS4toWPS(CD),,{G@@@ C204}CopyRPS 4 toWPS(CD)
[205],WRITE_COMMAND,!BA050000000,CopyRPS5toWPS(CD),,{G@@@ C205}CopyRPS 5 toWPS(CD)
[206],WRITE_COMMAND,!BA060000000,CopyRPS6toWPS(CD),,{G@@@ C206}CopyRPS 6 toWPS(CD)
[207],WRITE_COMMAND,!BA070000000,CopyRPS7toWPS(CD),,{G@@@ C207}CopyRPS 7 toWPS(CD)
[208],WRITE_COMMAND,!BA080000000,CopyRPS8toWPS(CD),,{G@@@ C208}CopyRPS 8 toWPS(CD)
[209],WRITE_COMMAND,!BA090000000,CopyRPS9toWPS(CD),,{G@@@ C209}CopyRPS 9 toWPS(CD)
[210],WRITE_COMMAND,!BA0A0000000,CopyRPS10toWPS(CD),,{G@@@ C210}CopyRPS 10 toWPS(CD)
[211],WRITE_COMMAND,!BA0B0000000,CopyRPS11toWPS(CD),,{G@@@ C211}CopyRPS 11 toWPS(CD)
[212],WRITE_COMMAND,!BA0C0000000,CopyRPS12toWPS(CD),,{G@@@ C212}CopyRPS 12 toWPS(CD)
[213],WRITE_COMMAND,!BA0D0000000,CopyRPS13toWPS(CD),,{G@@@ C213}CopyRPS 13 toWPS(CD)
[214],WRITE_COMMAND,!BA0E0000000,CopyRPS14toWPS(CD),,{G@@@ C214}CopyRPS 14 toWPS(CD)
[215],WRITE_COMMAND,!BA0F0000000,CopyRPS15toWPS(CD),,{G@@@ C215}CopyRPS 15 toWPS(CD)

;Code ACTIONSerial CodeTextRange (low/up)ScaleContex Help
[101],WRITE_VARIABLE,!CD00#####,LaserFrequency(CHz)(CD),1/50000,0.1,{G@@@ C101 Q...}Frequency 0.1 - 5000Hz
[102],WRITE_VARIABLE,!DD00#####,LaserPulseDuration(Cms)(CD), 8/20000,0.001,{G@@@ C102 Q...}Pulse duration 0.08
- 20ms
```

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[103],WRITE_VARIABLE,!ED00#####,LaserVoltage(CV)(CVCPSonly)(CD),100/730,1,{G@@@ C103 Q...}Charging Voltage 100
- 400V
[104],WRITE_VARIABLE,!FD00#####,LaserEnergy(CJ)(CD),1/999000,0.001,{G@@@ C104 Q...}Pulse Energy 0.01 - 999J
[105],WRITE_VARIABLE,!GD00#####,LaserRamppulse(Cpulses)(CD),1/999,1,{G@@@ C105 Q...}Ramppulse 1 - 999pls
[106],WRITE_VARIABLE,!DH00#####,LaserRampduration(Cms)(CD),8/20000,0.001,{G@@@ C106 Q...}Rampduration 0.08 -
20ms
[107],WRITE_VARIABLE,!GH00#####,LaserPulseBurst(Cpulses)(CD),1/9999,1,{G@@@ C107 Q...}Pulse Burst 1 - 9999pls
[108],WRITE_VARIABLE,!EH00#####,LaserPeakPower(CW)(CRTPSonly)(CD),0/65535,1,{G@@@ C108 Q...}Peak Power 0 -
65535W
[109],WRITE_VARIABLE,!ER00#####,LaserRampPower(CW)(CRTPSonly)(CD),0/65535,1,{G@@@ C109 Q...}Ramp Power 0 -
65535W
[110],WRITE_VARIABLE,!GL00#####,LaserRampDown(Cpulses)(CD),1/999,1,{G@@@ C110 Q...}RampDown Number 1 - 999pls
[111],WRITE_VARIABLE,!EL00#####,LaserA-Scale(C%)(CRTPSonly)(CD),0/2000,2,{G@@@ C111 Q...}A-Scale 0 - 200%
;MESSAGE SECTION
```

[],7,%UAF000000001,I00	FAULT-OFF LASER	Internal Emergency-Stop
[],8,%VAF000000001,I00	NOT-READY LASER	Internal Emergency-Stop
[],7,%UAF000000002,I01	FAULT-OFF LASER	External Emergency-Stop
[],8,%VAF000000002,I01	NOT-READY LASER	External Emergency-Stop
[],7,%UAF000000004,I02	FAULT-OFF LASER	Laser Off Key
[],8,%VAF000000004,I02	NOT-READY LASER	Laser Off Key
[],7,%UAF000000008,I03	FAULT-OFF LASER	Interlock Key
[],8,%VAF000000008,I03	NOT-READY LASER	Interlock Key
[],7,%UAF000000010,I04	FAULT-OFF LASER	Beam Shutter
[],8,%VAF000000010,I04	NOT-READY LASER	Beam Shutter
[],7,%UAF000000020,I05	FAULT-OFF LASER	ILWRE, parallel to Shutter - LaserClassKey is 4 and door closed?
[],8,%VAF000000020,I05	NOT-READY LASER	ILWRE, parallel to Shutter
[],7,%UAF000000040,I06	FAULT-OFF LASER	ILOS, Optical system cover open
[],8,%VAF000000040,I06	NOT-READY LASER	ILOS, Optical system cover open
[],7,%UAF000000080,I07	FAULT-OFF LASER	ILFIB, Fibers / BAK not connected
[],8,%VAF000000080,I07	NOT-READY LASER	ILFIB, Fibers / BAK not connected
[],7,%UAF000000100,I08	FAULT-OFF LASER	ILCAB1, Cabinet1 / A, door open
[],8,%VAF000000100,I08	NOT-READY LASER	ILCAB1, Cabinet1 / A, door open
[],7,%UAF000000200,I09	FAULT-OFF LASER	ILCAB2, Cabinet2 / B, door open
[],8,%VAF000000200,I09	NOT-READY LASER	ILCAB2, Cabinet2 / B, door open
[],7,%UAF000000400,I10	FAULT-OFF LASER	LaserClass KEY parallel to Shutter
[],8,%VAF000000400,I10	NOT-READY LASER	LaserClass KEY parallel to Shutter
[],7,%UAF000000800,I11	FAULT-OFF LASER	Service KEY parallel to power supply
[],8,%VAF000000800,I11	NOT-READY LASER	Service KEY parallel to power supply
[],7,%UAF000001000,I12	FAULT-OFF LASER	ILOK, Acknowledge IL-channel1 (software) missing~Coincidence 7
[],8,%VAF000001000,I12	NOT-READY LASER	ILOK, Acknowledge IL-channel1 (software) missing~Coincidence 7
[],7,%UAF000002000,I13	FAULT-OFF LASER	LENOK, Laser enable relay 7
[],8,%VAF000002000,I13	NOT-READY LASER	LENOK, Laser enable relay 7
[],7,%UAF000004000,I14	FAULT-OFF LASER	ILSUP, IL-Voltage problem
[],8,%VAF000004000,I14	NOT-READY LASER	ILSUP, IL-Voltage problem
[],7,%UAF000008000,I15	FAULT-OFF LASER	ILCAB3, Cabinet3 / C, door open
[],8,%VAF000008000,I15	NOT-READY LASER	ILCAB3, Cabinet3 / C, door open
[],7,%UAF000010000,I16	FAULT-OFF LASER	SRELOK, Safety relay 7
[],8,%VAF000010000,I16	NOT-READY LASER	SRELOK, Safety relay 7
[],7,%UAF004000000,I26	FAULT-OFF LASER	Shutter - timeout, close
[],8,%VAF004000000,I26	NOT-READY LASER	Shutter - timeout, close
[],7,%UAF008000000,I27	FAULT-OFF LASER	Shutter - Inadmissible movement, close
[],8,%VAF008000000,I27	NOT-READY LASER	Shutter - Inadmissible movement, close

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[],7,%UAF010000000,I28 FAULT-OFF LASER Shutter - Sensor def / both sensors signal
[],8,%VAF010000000,I28 NOT-READY LASER Shutter - Sensor def / both sensors signal
[],7,%UAF020000000,I29 FAULT-OFF LASER Shutter - timeout, open
[],8,%VAF020000000,I29 NOT-READY LASER Shutter - timeout, open
[],7,%UAF040000000,I30 FAULT-OFF LASER Shutter - Inadmissible movement, open
[],8,%VAF040000000,I30 NOT-READY LASER Shutter - Inadmissible movement, open
[],7,%UAF080000000,I31 FAULT-OFF LASER Shutter - Sensor def / no sensor with signal
[],8,%VAF080000000,I31 NOT-READY LASER Shutter - Sensor def / no sensor with signal
[],64,%**F003FE0000,;64s bits 17-25
[],64,%**F000000000,;64 all bits 0
[],64,%UBF0FFFFFFF,;64 all bits for 7 UB (cooling)
[],7,%UAF300000001,M00 FAULT-OFF LASER Protection Glass BAK
[],7,%UBF300000001,M00 FAULT-OFF COOLING Protection Glass BAK
[],8,%VAF300000001,M00 NOT-READY LASER Protection Glass BAK
[],8,%VBF300000001,M00 NOT-READY COOLING Protection Glass BAK
[],8,%WAF300000001,M00 16 LASER Protection Glass BAK
[],8,%WBF300000001,M00 16 COOLING Protection Glass BAK
[],7,%UAF300000002,M01 FAULT-OFF LASER Leak in power supply or Water level low in tank
[],7,%UBF300000002,M01 FAULT-OFF COOLING Leak in power supply or Water level low in tank
[],8,%VAF300000002,M01 NOT-READY LASER Leak in power supply or Water level low in tank
[],8,%VBF300000002,M01 NOT-READY COOLING Leak in power supply or Water level low in tank
[],8,%WAF300000002,M01 16 LASER Leak in power supply or Water level low in tank
[],8,%WBF300000002,M01 16 COOLING Leak in power supply or Water level low in tank
[],7,%UAF300000004,M02 FAULT-OFF LASER Leak in optic system
[],7,%UBF300000004,M02 FAULT-OFF COOLING Leak in optic system
[],8,%VAF300000004,M02 NOT-READY LASER Leak in optic system
[],8,%VBF300000004,M02 NOT-READY COOLING Leak in optic system
[],8,%WAF300000004,M02 16 LASER Leak in optic system
[],8,%WBF300000004,M02 16 COOLING Leak in optic system
[],7,%UAF300000008,M03 FAULT-OFF LASER Cooling water flow cavity1 low
[],7,%UBF300000008,M03 FAULT-OFF COOLING Cooling water flow cavity1 low
[],8,%VAF300000008,M03 NOT-READY LASER Cooling water flow cavity1 low
[],8,%VBF300000008,M03 NOT-READY COOLING Cooling water flow cavity1 low
[],8,%WAF300000008,M03 16 LASER Cooling water flow cavity1 low
[],8,%WBF300000008,M03 16 COOLING Cooling water flow cavity1 low
[],7,%UAF300000010,M04 FAULT-OFF LASER Cooling water flow cavity2 low
[],7,%UBF300000010,M04 FAULT-OFF COOLING Cooling water flow cavity2 low
[],8,%VAF300000010,M04 NOT-READY LASER Cooling water flow cavity2 low
[],8,%VBF300000010,M04 NOT-READY COOLING Cooling water flow cavity2 low
[],8,%WAF300000010,M04 16 LASER Cooling water flow cavity2 low
[],8,%WBF300000010,M04 16 COOLING Cooling water flow cavity2 low
[],7,%UAF300000020,M05 FAULT-OFF LASER Water temp. cavity1 high
[],7,%UBF300000020,M05 FAULT-OFF COOLING Water temp. cavity1 high
[],8,%VAF300000020,M05 NOT-READY LASER Water temp. cavity1 high
[],8,%VBF300000020,M05 NOT-READY COOLING Water temp. cavity1 high
[],8,%WAF300000020,M05 16 LASER Water temp. cavity1 high
[],8,%WBF300000020,M05 16 COOLING Water temp. cavity1 high
[],7,%UAF300000040,M06 FAULT-OFF LASER Water temp. cavity2 high
[],7,%UBF300000040,M06 FAULT-OFF COOLING Water temp. cavity2 high
[],8,%VAF300000040,M06 NOT-READY LASER Water temp. cavity2 high
[],8,%VBF300000040,M06 NOT-READY COOLING Water temp. cavity2 high
[],8,%WAF300000040,M06 16 LASER Water temp. cavity2 high
[],8,%WBF300000040,M06 16 COOLING Water temp. cavity2 high

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[],7,%UAF300000080,M07	FAULT-OFF LASER Air temp. Cabinet A high
[],7,%UBF300000080,M07	FAULT-OFF COOLING Air temp. Cabinet A high
[],8,%VAF300000080,M07	NOT-READY LASER Air temp. Cabinet A high
[],8,%VBF300000080,M07	NOT-READY COOLING Air temp. Cabinet A high
[],8,%WAF300000080,M07	16 LASER Air temp. Cabinet A high
[],8,%WBF300000080,M07	16 COOLING Air temp. Cabinet A high
[],7,%UAF300000100,M08	FAULT-OFF LASER Air temp. Cabinet B high
[],7,%UBF300000100,M08	FAULT-OFF COOLING Air temp. Cabinet B high
[],8,%VAF300000100,M08	NOT-READY LASER Air temp. Cabinet B high
[],8,%VBF300000100,M08	NOT-READY COOLING Air temp. Cabinet B high
[],8,%WAF300000100,M08	16 LASER Air temp. Cabinet B high
[],8,%WBF300000100,M08	16 COOLING Air temp. Cabinet B high
[],7,%UAF300000200,M09	FAULT-OFF LASER Air temp. Cabinet C high
[],7,%UBF300000200,M09	FAULT-OFF COOLING Air temp. Cabinet C high
[],8,%VAF300000200,M09	NOT-READY LASER Air temp. Cabinet C high
[],8,%VBF300000200,M09	NOT-READY COOLING Air temp. Cabinet C high
[],8,%WAF300000200,M09	16 LASER Air temp. Cabinet C high
[],8,%WBF300000200,M09	16 COOLING Air temp. Cabinet C high
[],7,%UAF300000400,M10	FAULT-OFF LASER Air temp. OS - possible condensation on cavity
[],7,%UBF300000400,M10	FAULT-OFF COOLING Air temp. OS - possible condensation on cavity
[],8,%VAF300000400,M10	NOT-READY LASER Air temp. OS - possible condensation on cavity
[],8,%VBF300000400,M10	NOT-READY COOLING Air temp. OS - possible condensation on cavity
[],8,%WAF300000400,M10	16 LASER Air temp. OS - possible condensation on cavity
[],8,%WBF300000400,M10	16 COOLING Air temp. OS - possible condensation on cavity
[],7,%UAF300000800,M11	FAULT-OFF LASER CFRM, Discharge relais 7 in C-module 1~THIS 7 ALSO APPEARS IF THE LASER IS TURNED OFF NORMALLY
[],7,%UBF300000800,M11	FAULT-OFF COOLING CFRM1, Discharge relais 7 in C-module1
[],8,%VAF300000800,M11	NOT-READY LASER CFRM1, Discharge relais 7 in C-module1
[],8,%VBF300000800,M11	NOT-READY COOLING CFRM1, Discharge relais 7 in C-module1
[],8,%WAF300000800,M11	16 LASER CFRM1, Discharge relais 7 in C-module1
[],8,%WBF300000800,M11	16 COOLING CFRM1, Discharge relais 7 in C-module1
[],7,%UAF300001000,M12	FAULT-OFF LASER CFRM2, Discharge relais 7 in C-module2
[],7,%UBF300001000,M12	FAULT-OFF COOLING CFRM2, Discharge relais 7 in C-module2
[],8,%VAF300001000,M12	NOT-READY LASER CFRM2, Discharge relais 7 in C-module2
[],8,%VBF300001000,M12	NOT-READY COOLING CFRM2, Discharge relais 7 in C-module2
[],8,%WAF300001000,M12	16 LASER CFRM2, Discharge relais 7 in C-module2
[],8,%WBF300001000,M12	16 COOLING CFRM2, Discharge relais 7 in C-module2
[],7,%UAF300002000,M13	FAULT-OFF LASER LG10K, Charging unit1 7, check LED's on LG
[],7,%UBF300002000,M13	FAULT-OFF COOLING LG10K, Charging unit1 7, check LED's on LG
[],8,%VAF300002000,M13	NOT-READY LASER LG10K, Charging unit1 7, check LED's on LG
[],8,%VBF300002000,M13	NOT-READY COOLING LG10K, Charging unit1 7, check LED's on LG
[],8,%WAF300002000,M13	16 LASER LG10K, Charging unit1 7, check LED's on LG
[],8,%WBF300002000,M13	16 COOLING LG10K, Charging unit1 7, check LED's on LG
[],7,%UAF300004000,M14	FAULT-OFF LASER LG20K, Charging unit2 7, check LED's on LG
[],7,%UBF300004000,M14	FAULT-OFF COOLING LG20K, Charging unit2 7, check LED's on LG
[],8,%VAF300004000,M14	NOT-READY LASER LG20K, Charging unit2 7, check LED's on LG
[],8,%VBF300004000,M14	NOT-READY COOLING LG20K, Charging unit2 7, check LED's on LG
[],8,%WAF300004000,M14	16 LASER LG20K, Charging unit2 7, check LED's on LG
[],8,%WBF300004000,M14	16 COOLING LG20K, Charging unit2 7, check LED's on LG
[],7,%UAF300008000,M15	FAULT-OFF LASER LG30K, Charging unit3 7, check LED's on LG
[],7,%UBF300008000,M15	FAULT-OFF COOLING LG30K, Charging unit3 7, check LED's on LG
[],8,%VAF300008000,M15	NOT-READY LASER LG30K, Charging unit3 7, check LED's on LG
[],8,%VBF300008000,M15	NOT-READY COOLING LG30K, Charging unit3 7, check LED's on LG

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[],8,%WAF300008000,M15	16 LASER LG30K, Charging unit3 7, check LED's on LG
[],8,%WBF300008000,M15	16 COOLING LG30K, Charging unit3 7, check LED's on LG
[],7,%UAF300010000,M16	FAULT-OFF LASER GSS10K, DC-Switch1 7, check LED's on GSS
[],7,%UBF300010000,M16	FAULT-OFF COOLING GSS10K, DC-Switch1 7, check LED's on GSS
[],8,%VAF300010000,M16	NOT-READY LASER GSS10K, DC-Switch1 7, check LED's on GSS
[],8,%VBF300010000,M16	NOT-READY COOLING GSS10K, DC-Switch1 7, check LED's on GSS
[],8,%WAF300010000,M16	16 LASER GSS10K, DC-Switch1 7, check LED's on GSS
[],8,%WBF300010000,M16	16 COOLING GSS10K, DC-Switch1 7, check LED's on GSS
[],7,%UAF300020000,M17	FAULT-OFF LASER GSS20K, DC-Switch2 7, check LED's on GSS
[],7,%UBF300020000,M17	FAULT-OFF COOLING GSS20K, DC-Switch2 7, check LED's on GSS
[],8,%VAF300020000,M17	NOT-READY LASER GSS20K, DC-Switch2 7, check LED's on GSS
[],8,%VBF300020000,M17	NOT-READY COOLING GSS20K, DC-Switch2 7, check LED's on GSS
[],8,%WAF300020000,M17	16 LASER GSS20K, DC-Switch2 7, check LED's on GSS
[],8,%WBF300020000,M17	16 COOLING GSS20K, DC-Switch2 7, check LED's on GSS
[],7,%UAF300040000,M18	FAULT-OFF LASER SQ10K, Simmer source1 7, check LED's on SQ
[],7,%UBF300040000,M18	FAULT-OFF COOLING SQ10K, Simmer source1 7, check LED's on SQ
[],8,%VAF300040000,M18	NOT-READY LASER SQ10K, Simmer source1 7, check LED's on SQ
[],8,%VBF300040000,M18	NOT-READY COOLING SQ10K, Simmer source1 7, check LED's on SQ
[],8,%WAF300040000,M18	16 LASER SQ10K, Simmer source1 7, check LED's on SQ
[],8,%WBF300040000,M18	16 COOLING SQ10K, Simmer source1 7, check LED's on SQ
[],7,%UAF300080000,M19	FAULT-OFF LASER SQ20K, Simmer source2 7, check LED's on SQ
[],7,%UBF300080000,M19	FAULT-OFF COOLING SQ20K, Simmer source2 7, check LED's on SQ
[],8,%VAF300080000,M19	NOT-READY LASER SQ20K, Simmer source2 7, check LED's on SQ
[],8,%VBF300080000,M19	NOT-READY COOLING SQ20K, Simmer source2 7, check LED's on SQ
[],8,%WAF300080000,M19	16 LASER SQ20K, Simmer source2 7, check LED's on SQ
[],8,%WBF300080000,M19	16 COOLING SQ20K, Simmer source2 7, check LED's on SQ
[],7,%UAF300100000,M20	FAULT-OFF LASER SQ30K, Simmer source3 7, check LED's on SQ
[],7,%UBF300100000,M20	FAULT-OFF COOLING SQ30K, Simmer source3 7, check LED's on SQ
[],8,%VAF300100000,M20	NOT-READY LASER SQ30K, Simmer source3 7, check LED's on SQ
[],8,%VBF300100000,M20	NOT-READY COOLING SQ30K, Simmer source3 7, check LED's on SQ
[],16,%WAF300100000,M20	16 LASER SQ30K, Simmer source3 7, check LED's on SQ
[],8,%WBF300100000,M20	16 COOLING SQ30K, Simmer source3 7, check LED's on SQ
[],7,%UAF300200000,M21	FAULT-OFF LASER SQ40K, Simmer source4 7, check LED's on SQ
[],7,%UBF300200000,M21	FAULT-OFF COOLING SQ40K, Simmer source4 7, check LED's on SQ
[],8,%VAF300200000,M21	NOT-READY LASER SQ40K, Simmer source4 7, check LED's on SQ
[],8,%VBF300200000,M21	NOT-READY COOLING SQ40K, Simmer source4 7, check LED's on SQ
[],8,%WAF300200000,M21	16 LASER SQ40K, Simmer source4 7, check LED's on SQ
[],8,%WBF300200000,M21	16 COOLING SQ40K, Simmer source4 7, check LED's on SQ
[],8,%UAF308000000,M27	Waiting
[],8,%UBF308000000,M27	Waiting
[],8,%VAF308000000,M27	Waiting
[],8,%VBF308000000,M27	Waiting
[],8,%WAF308000000,M27	Waiting
[],8,%WBF308000000,M27	Waiting
[],7,%UAF310000000,M28	FAULT-OFF LASER U-act1, Actual voltage stage1 out of tolerance
[],7,%UBF310000000,M28	FAULT-OFF COOLING U-act1, Actual voltage stage1 out of tolerance
[],8,%VAF310000000,M28	NOT-READY LASER U-act1, Actual voltage stage1 out of tolerance
[],8,%VBF310000000,M28	NOT-READY COOLING U-act1, Actual voltage stage1 out of tolerance
[],8,%WAF310000000,M28	16 LASER U-act1, Actual voltage stage1 out of tolerance
[],8,%WBF310000000,M28	16 COOLING U-act1, Actual voltage stage1 out of tolerance
[],7,%UAF320000000,M29	FAULT-OFF LASER U-act2, Actual voltage stage2 out of tolerance
[],7,%UBF320000000,M29	FAULT-OFF COOLING U-act2, Actual voltage stage2 out of tolerance
[],8,%VAF320000000,M29	NOT-READY LASER U-act2, Actual voltage stage2 out of tolerance

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```
[],8,%VBF32000000,M29  NOT-READY COOLING  U-act2, Actual voltage stage2 out of tolerance
[],8,%WAF32000000,M29  16 LASER  U-act2, Actual voltage stage2 out of tolerance
[],8,%WBF32000000,M29  16 COOLING  U-act2, Actual voltage stage2 out of tolerance
[],7,%UAF34000000,M30  FAULT-OFF LASER  E-act, Actual energy out of tolerance
[],7,%UBF34000000,M30  FAULT-OFF COOLING  E-act, Actual energy out of tolerance
[],8,%VAF34000000,M30  NOT-READY LASER  E-act, Actual energy out of tolerance
[],8,%VBF34000000,M30  NOT-READY COOLING  E-act, Actual energy out of tolerance
[],8,%WAF34000000,M30  16 LASER  E-act, Actual energy out of tolerance
[],8,%WBF34000000,M30  16 COOLING  E-act, Actual energy out of tolerance
[],7,%UAF38000000,M31  FAULT-OFF LASER  Lamp pulse counter high
[],7,%UBF38000000,M31  FAULT-OFF COOLING  Lamp pulse counter high
[],8,%VAF38000000,M31  NOT-READY LASER  Lamp pulse counter high
[],8,%VBF38000000,M31  NOT-READY COOLING  Lamp pulse counter high
[],8,%WAF38000000,M31  16 LASER  Lamp pulse counter high
[],8,%WBF38000000,M31  16 COOLING  Lamp pulse counter high
[],64,%**F30FC00000,;64s bits 22-27
[],96,%**F300000000,;64 all bits 0

[],16,%**F600000001,L00  LIMIT 7  Value > Max Int/Sys Parameter
[],16,%**F600000002,L01  LIMIT 7  Value < Min Int/Sys Parameter
[],16,%**F600000004,L02  LIMIT 7  Value > Max Recipe PS
[],16,%**F600000008,L03  LIMIT 7  Value < Min Recipe PS
[],16,%**F600000010,L04  LIMIT 7  Value Parameter 1 <> Range
[],16,%**F600000020,L05  LIMIT 7  Value Parameter 2 <> Range
[],16,%**F600000040,L06  LIMIT 7  CNT / 2Cav. Changeover blocked
[],16,%**F600000400,L10  LIMIT 7  Laserparameter f > fmax
[],16,%**F600000800,L11  LIMIT 7  Laserparameter t > tmax
[],16,%**F600001000,L12  LIMIT 7  Laserparameter U < Umin
[],16,%**F600002000,L13  LIMIT 7  Laserparameter U > Umax
[],16,%**F600004000,L14  LIMIT 7  Laserparameter f > Pmax
[],16,%**F600008000,L15  LIMIT 7  Laserparameter t > Pmax
[],16,%**F600010000,L16  LIMIT 7  Laserparameter U > Pmax
[],16,%**F600020000,L17  LIMIT 7  Laserparameter f > GSS
[],16,%**F600040000,L18  LIMIT 7  Laserparameter t > GSS
[],16,%**F600080000,L19  LIMIT 7  Laserparameter U > GSS
[],16,%**F600100000,L20  LIMIT 7  Laserparameter t > Emax
[],16,%**F600200000,L21  LIMIT 7  Laserparameter U > Emax
[],16,%**F600400000,L22  LIMIT 7  Laserparameter f > Duty Cycle
[],16,%**F600800000,L23  LIMIT 7  Laserparameter t > Duty Cycle
[],16,%**F601000000,L24  LIMIT 7  Laserparameter td+t > T
[],16,%**F602000000,L25  LIMIT 7  Laserparameter f < fmin ALT
[],64,%**F6FC000380,;64s bits 7-9 and 26-31
[],96,%**F600000000,;64 all bits 0

[],8,%WAF900000001,H00  16 LASER  User1 External frequency too high
[],8,%WAF900000002,H01  16 LASER  User1 LP1...3 recipe not copied - New WPS not effective
[],64,%WAF900000004,H02  16 LASER  User1 RC not granted - Authorization denied
[],8,%WAF900000100,H08  16 LASER  LStat1 NOK
[],8,%WAF908000000,H27  16 LASER  Beam Blocked - Shutter can not be opened ~Close enclosure door and try again
[],8,%WAF910000000,H28  C-Timeout, capacitor discharge time too slow
[],8,%WAF980000000,H31  16 LASER  Beam Expander
[],64,%WAF99FC00107,;64s bits 3-7 9-21 29 and 30
[],96,%**F900000000,;64 all bits 0
```

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```
[],16,%**FC00000001,C00 COM - overrun 7
[],16,%**FC00000002,C01 COM - parity 7 Check com. parameter in LaserCom.cfg
[],16,%**FC00000004,C02 COM - framing 7 Check com. parameter in LaserCom.cfg
[],16,%**FC00000008,C03 COM - break signal occ
[],16,%**FC00000080,C07 Request
[],16,%**FC00000100,C08 No Authorization for Group _ Processing (A)
[],16,%**FC00000200,C09 No Authorization for Group _ Set-up (B)
[],16,%**FC00000400,C10 No Authorization for Group _ WPS edit (effective parameter)(C)
[],16,%**FC00000800,C11 No Authorization for Group _ Select new WPS (D)
[],16,%**FC00001000,C12 No Authorization for Group _ Change Recipe PS (E)
[],16,%**FC00002000,C13 No Authorization for Group _ Change Int/Sys parameter (F)
[],16,%**FC00004000,C14 No Authorization for Group _ G (reserved)
[],16,%**FC00008000,C15 No Authorization for Group _ H (reserved)
[],64,%**FC00010000,C16 8 wrong / unknown
[],16,%**FC00020000,C17 Password - No password or not authorized Log On with correct password
[],8,%**FC01000000,C24 Control - option not available Option not installed
[],8,%**FC04000000,C26 Command not allowed under present conditions
[],8,%**FC08000000,C27 Beam Blocked - Shutter can not be opened Close enclosure door and try again
[],64,%**FCF2FC0070,;64s bits 4-6 and 18-23 and 25 and 28-31
[],96,%**FC00000000,;64 all bits 0

[],8,:AC0200000000,Laser Not Ready for Standby (laser off / cooling off)
[],8,:AC0300000000,Laser at Standby (laser off / cooling on)
[],8,:AC0400000000,Waiting for Laser on
[],8,:AC0700000000,Laser ON
[],8,:AC0800000000,Waiting for Laser off
[],8,:AD0000000000,Cooling OFF
[],8,:AD0100000000,Waiting for Cooling on
[],8,:AD0200000000,Cooling ON
[],8,:AD0300000000,Cooling ON - Delay running
[],8,:AE0000000000,Pilot (HeNe) Laser OFF
[],8,:AE0100000000,Pilot (HeNe) Laser ON
[],8,:AF0000000000,Shutter Closed
[],8,:AF0300000000,Shutter Open
[],8,:AG0000000000,Pulse Burst finished
[],8,:AG0100000000,Pulse Burst running
[],8,:AH0000000000,Pulse Ramping OFF
[],8,:AH0100000000,Pulse Ramping ON
[],8,:AJ0000000000,HALT OFF - Laser pulsing
[],8,:AJ0100000000,HALT ON - Laser NOT pulsing
[],8,:A00000000000,Shutter unlocked - Beam Block OFF
[],8,:A00100000000,Shutter locked - Beam Block ON
[],8,:HG0000000000,Energy Control OFF
[],8,:HG0000000001,Energy Control ON
[],64,:ED00FFFFFFFF,Energy control now adjusting voltage
[],64,:ED0000000000,64s voltage reading 000V
[],8,:IE00FFFFFFFF,Pulse Ramping now adjusting pulse duration
[],64,:IB00FFFFFFFF, 64s Energy 8s
[],64,:IB0000000000, 64s Energy 8 0.000]
[],64,:CD01FFFFFFFF, 64s all laser frequency 8s
[],64,:DD01FFFFFFFF, 64s all laser pulse duration 8s
[],64,:DH01FFFFFFFF, 64s all laser ramp duration 8s
```

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```
[],64,:ED01FFFFFFFF, 64s all laser voltage/peak power 8s  
[],64,:FD01FFFFFFFF, 64s all laser set energy 8s  
[],64,:GD01FFFFFFFF, 64s all laser ramp number 8s  
[],64,:GH01FFFFFFFF, 64s all laser burst number 8s  
[],64,:AB0000000000, 64s action group 8s  
[],64,:AB0100000000, 64s action group 8s  
[],64,:AB0200000000, 64s action group 8s  
[],64,:AB0300000000, 64s action group 8s  
[],64,:AB0400000000, 64s action group 8s  
[],64,:AB0500000000, 64s action group 8s  
[],64,:AB0600000000, 64s action group 8s  
[],64,:AB0700000000, 64s action group 8s
```

NLS Hardware Setup

KDC-200 Laser Interface (same as Prolas)

Prolas Laser Interface KDC-200								
Pin #	AWG	Color	Signal	Name	Signal Type	Laser	KDC-200	Remarks
1	22	brown	24V DC	KDC-200 +24VDC	Prolas > Laser	X51-23	Light tower (green)	
2	22	blue	GND (VDC)	KDC-200 GND (DC)	Prolas > Laser	X51-11		
3	22	orange	RC	Remote Control	Prolas > Laser	X51-1	Baldor Output #6	Not accessible On PCB
4	22	black	RF	Halt	Prolas > Laser	X51-13	Baldor Output #7	Not accessible On PCB
5	22	red	SY	open Shutter Command	Prolas > Laser	X51-3	Baldor Output #8	Not accessible On PCB
6	22	green	PB	Puls Burst	Prolas > Laser	X51-15	Baldor Output #9	Not accessible On PCB
7	22	white	PR	Puls Ramping	Prolas > Laser	X51-4	Baldor Output #10	Not accessible On PCB
8	20	l-brown	External E-Stop	Ext_Estop signal	Laser > Prolas	X50-5	Jumper Ext E-stop	Set J15 Jumper (KDC200)
9	22	pink	RCA	RCA	Laser > Prolas	X51-6	Baldor Input #2	Not accessible On PCB
10	22	yellow	OK	Laser (OK)	Laser > Prolas	X51-7	Baldor Input #0	Not accessible On PCB
11	22	purple	WP	Work Pulse (WP)	Laser > Prolas	X51-21	Baldor Input #1	Not accessible On PCB
12	22	l-brown	SO	Shutter Open Signal	Laser > Prolas	X51-18	Light tower (red)	Not accessible On PCB
13	22	w/blue	-					
14	22	w/yellow	-					
15	22	w/green	User Output 1 (Handshake PR-WSM)	User 1	Prolas > WSM		X6-8 / DIP SW1-8	
16	22	w/black	User Output 2 (Request Laser)	User 2	Prolas > WSM		X6-7 / DIP SW1-7	
17	22	r/black	Laser Processing (Off)	Processing off	Prolas > WSM		X1-7/ DIP SW1-6	
18	22	r/yellow	Door Signal	Door Signal	Prolas > WSM		X1-5 / DIP SW1-5	
19	22	r/green	Reset Button	Reset Button	Prolas > WSM		X1-6 / DIP SW1-4	
20	22	w/red	USER INPUT(1) (Handshake PR-WSM)	User Input	WSM > Prolas		X3-10 / DIP SW1-3	
21	22	(w/blue)	Max Feed User In (2)	DON'T USE !	WSM > Prolas		DIP SW1-2	
22	20	(blue)	Laser Warn		Laser > Prolas	X50-8	Light Tower (Orange)	Not accessible On PCB
23	20	(brown)	24 Ext E-stop	Power to Ext E-stop	Prolas > Laser	X50-17	X9-4	connect X9-4 to +24V
24	20	orange	E-Stop Hardware NC (Laser)	ESTOPEA	Laser Contact	X50-3		
25	20	black	E-Stop Hardware NC (Laser)	ESTOPEB	Laser Contact	X50-15		
26	20	red	E-Stop Software NO (Laser)	ESTOPE	Laser Contact	X50-2		
27	20	green	E-Stop Software NO (Laser) +24V(L)	+24VF6	Laser Contact	X50-14		
28	20	white	Door Software (NO)	ILWRE	Laser Contact	X50-6		
29	20	gray	Door Software (NO) +24V (L)	+24VF6	Laser Contact	X50-18		
30	20	pink	Door Hardware (NC)	ILWREA	Laser Contact	X50-19		
31	20	yellow	Door Hardware (NC)	ILWREB	Laser Contact	X50-7		
32	20	purple	Optional I/O Laser Interface			X50-??	X9-5	Optional
33	22	gray	Optional I/O Laser Interface			X51-??	X9-6	Optional
34			Keying CPC-37 Connector	Key				
35			Keying CPC-37 Connector	Key				
36			Keying CPC-37 Connector	Key				
37			Keying CPC-37 Connector	Key				

Processing Heads**CONVENTIONAL PROCESSING HEADS**

<i>Model</i>	<i>Laser Source</i>	<i>Manufacturer</i>
LLBK45	FlashPumped YAG Laser	Coherent (ex Rofin/Lasag)
LLBK60	FlashPumped YAG Laser	Coherent (ex Rofin/Lasag)
BAK4	FlashPumped YAG Laser	Coherent (ex Rofin/Lasag)
FLBK40	FiberLaser	Coherent (ex Rofin/Lasag)
FLBK60	FiberLaser	Coherent (ex Rofin/Lasag)

GALVO HEADS

<i>Hardware</i>	<i>Controller</i>
RAYLASE	WELDMARK
SMARTWELD+	SMARTCONTROL

COHERENT SMARTCONTROL+

The Coherent SmartControl+ is an advanced galvo controller for the Coherent Smartweld+ & SmartCut+ processing heads

Also sometimes called wobble heads these processing heads allow the stirring of the laser beam following a predefined path or oscillation pattern

Usually these heads are paired with a Coherent Starfiber-P **fiber** laser

*There is an extensive Manual available for the Coherent SmartControl+. Please consult the Smartcontrol+ manual for in depth explanations on how to program /control the unit
This Manual only covers the implementation of the interface between KDM software , the SmartControl+ and the Starfiber-P*

KDM SmartControl+ LASER INTERFACE (Standard Implementation as of Oct 2020)

The Standard StarFiber-P Laser Interface was expanded with an IDEC SMARTRELAY.

This allows flexible rerouting of the Laser Interface I/O's according to the selected SmartControl+ Mode

Please consult the attached Laser Interface list and the KDM LaserInterface SmartControl+ Schematic for wiring details

*In most Modes the Laser start Signal is used to trigger the SmartControl+ Start Input
Therefore the SmartControl+ Start signal is bound to the same safety rules as any Laser signal*

- NO Output with door open

- NO output without Laser Processing switch [ON]

Please observe the KDM Laser Output enable indicator in the main Toolbar



= Laser Outputs **Enabled**



= Laser Outputs **Disabled**

SmartController+ OPERATIONAL MODES (as of Oct 2020)

- Free Run

In this mode the programmed beam path is repeated continuously

SMARTCONTROL INPUT(S): KDM [START] >> SMARTCONTROL [START]

SMARTCONTROL OUTPUT(S) : [RUN] >> KDM [PROCESSING]

LASER CONTROL: KDM [START] >> LASER [START]

Remarks: The SmartControl+ [START] is started together with the Laser [START] signal

This behavior could easily be switched to have the SmartControl [RUN] start the laser [START]

- Sync Master

In this mode the programmed beam path is repeated continuously

The Laser is direct controlled by the SmartControl+ [PosTrig] Output

SMARTCONTROL INPUT(S): KDM [START] >> SMARTCONTROL [START]

SMARTCONTROL OUTPUT(S) : [RUN] >> KDM [PROCESSING]

LASER CONTROL: SMARTCONTROL [POSTRIG] >> LASER {START}

Remarks: The KDM starts the SmartController - the laser is turned on by the SmartController

- In Sync Master mode , the class 1 safety of the Laser firing is "only" controlled by the Laser Door Interlocks
- It is technically possible for the SmartController+ to send the start signal to the laser without a start signal from the KDM (The KDM has additional (Software) functions that prevent firing with the door open)
- This is just a notification of the design features - It is **not a safety concern** as the class 1 is always guaranteed through the Laser Door Interlocks.

- Sync Slave

In this mode the programmed beam path is triggered by an external signal

SMARTCONTROL INPUT(S):	KDM [START] >> SMARTCONTROL [SYNCH]
SMARTCONTROL OUTPUT(S) :	[RUN] >> KDM [PROCESSING]
SMARTCONTROL [START]	SEND SOFTWARE START /STOP SIGNAL TO CONTROL
MOVEMENT	
LASER CONTROL:	KDM [START] >> LASER [START]

Remarks: This mode is only recommended for pulse bursts at moderate frequencies - The KDM being a PC based control system is not a real time operating system.

Because of the inherent nature of a PC based system unexpected delays can happen at any given time this could result in unsatisfying results

Sync Slave Mode could be used for "slower" pulse burst applications like triggering multiple bursts while moving around a small pin without stopping the motion (M75 Trigger Pulse)

- Clearing Move

This is actually not a laser processing mode - It allows to evenly redistribute the ball bearings inside the galvo head - please consult the SmartHead+ manual for the use of this special feature

SMARTCONTROL INPUT(S):	KDM [START] >> SMARTCONTROL [START]
SMARTCONTROL OUTPUT(S) :	[RUN] >> KDM [PROCESSING]
LASER CONTROL:	NON

- Laser Only

In this mode the SmartControl+ is not used

The smart Control will be set to mode 2 [**Free Run**] but no start signal will be sent

The SmartControl+ should be set to have the beam start position in the center of the Galvo field

SMARTCONTROL INPUT(S):	NON
LASER CONTROL:	KDM [START] >> LASER [START]

SMARTCONTROL+ SETUP WINDOW

The WPS Screen allows manipulating the active data

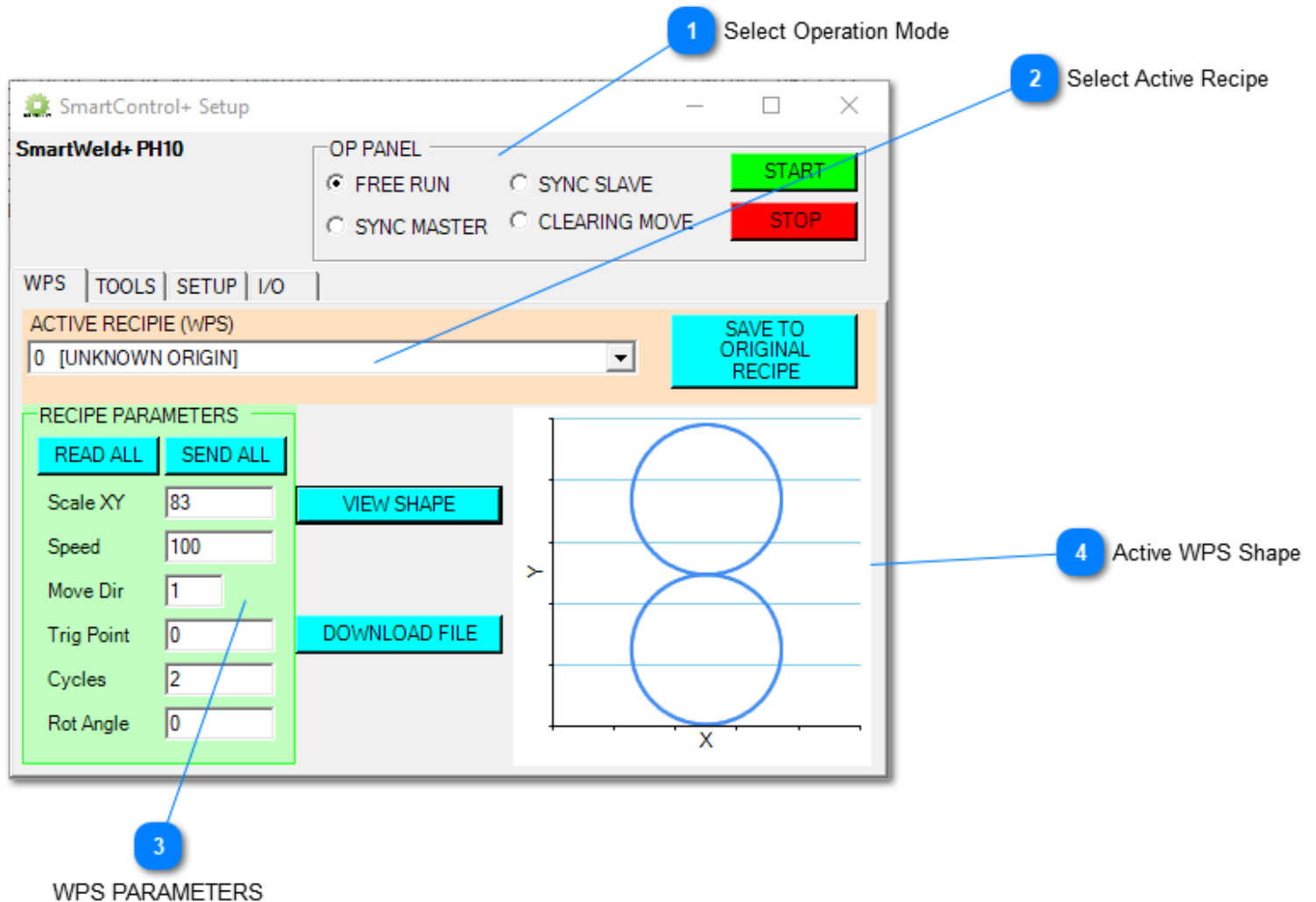
Currently there is now setup screen for the shared parameters like PosTrigger Time or standby pos

The idea is that these values should anyway be set at the beginning of each program within the first cycle loop

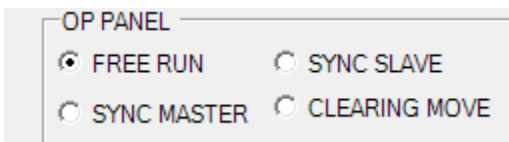
This is the only way to grantee that the setup will stay the same each time you run a production program

It's is generally considered save practice to call up recipes within production programs as they contain a full set of parameters that all will be written to the WPS

(If needed all parameters of a recipes except the shape could be set during the program startup as well)



1 Select Operation Mode



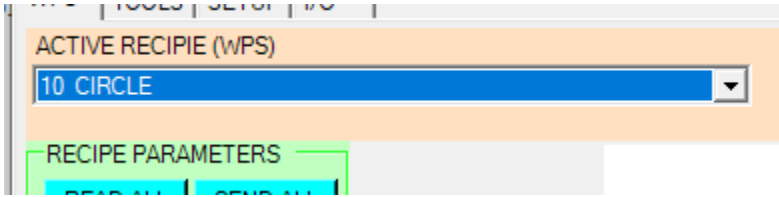
This will switch the controller to the selected Mode

2 Select Active Recipe



This will copy the selected recipe from the dropdown to the WPS
After a startup the Origin of the WPS is unknown - see above image

After selecting a source recipe the system knows where the data came from



You can now use the Save Button to update the original Recipe with the new data (This only is allowed if the target is not read Only !)



3

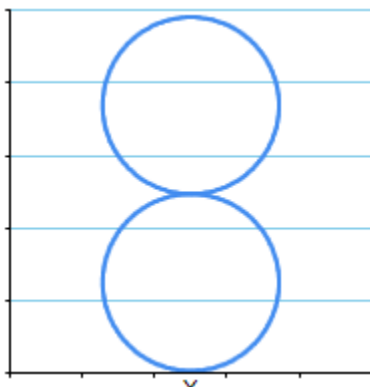
WPS PARAMETERS

Scale XY	83
Speed	100
Move Dir	1
Trig Point	0
Cycles	2
Rot Angle	0

Current WPS Parameters - new Values will be written to the WPS after pressing the [ENTER] Key

4

Active WPS Shape



<TODO>: Insert description text here...

Tools Tab

Currently on contains the copy function and the assignment of recipe nicknames
Nicknames are only used within KDM and are not stored on the Controller

There are a couple of strategies for coping recipes

A) Select the tools Tab

Copy the desired shape (Recipe 10-15) to a new location - select the "new" recipe in the source list and assign a Nickname

Switch to the WPS Tab and select the "new" recipe form the dropdown - This will copy the "new" recipe to the WPS

You can now change the recipe parameters and save them directly back to you're new Recipe

B) Select the WPS Tab

Select the desired base recipe (10..15)

Make changes to the recipe values

Now switch to the Tool tab and copy the recipe to the "new" location

Select the "new" recipe and update the nickname

The screenshot shows a software interface for the 'Tools Tab'. It features a 'Source' dropdown menu currently set to '0 [UNKNOWN ORIGIN]'. To its right is a 'NickName' text field, also containing '[UNKNOWN ORIGIN]'. Below the 'Source' dropdown is a red button labeled 'COPY RECIPE >>'. To the right of the 'NickName' field is a green button labeled 'Update Nickname'. Below the 'COPY RECIPE >>' button is a 'Target' text field, which is currently empty.

Setup Tab

Setup parameters for the Form - Non of these values will be written to the controller

The screenshot shows the 'Setup Tab' interface. On the left, there are input fields for 'Package TimeOut' (2000 ms), 'Clearing TimeOut' (2000 ms), 'Clearing Delay(s)' (350 ms), 'Max Data Points' (512), and 'Scanner Field' (1024 pt). On the right, there is a section titled 'Read Only Recipes' containing a list of 15 items. Items 1 through 9 are unchecked, while items 10 through 15 are checked. A blue callout bubble with the number '1' points to the 'Read Only Recipes' list, with the text 'Set Read Only Flag'.

Recipe ID	Recipe Name	Read Only Flag
1	JORGE	<input type="checkbox"/>
2	CopyOf [WPS ACTIVE RECEPIE [UNKNOWN	<input type="checkbox"/>
3	-	<input type="checkbox"/>
4	-	<input type="checkbox"/>
5	-	<input type="checkbox"/>
6	-	<input type="checkbox"/>
7	-	<input type="checkbox"/>
8	-	<input type="checkbox"/>
9	-	<input type="checkbox"/>
10	CIRCLE	<input checked="" type="checkbox"/>
11	VERTICAL LINE	<input checked="" type="checkbox"/>
12	DOUBLE CIRCLE	<input checked="" type="checkbox"/>
13	FIGURE EIGHT	<input checked="" type="checkbox"/>
14	SPIRAL	<input checked="" type="checkbox"/>
15	CROSS	<input checked="" type="checkbox"/>

1 Set Read Only Flag

This is a close-up of the 'Read Only Recipes' list. A blue callout bubble with the number '1' is positioned to the left of the list, with the text 'Set Read Only Flag'. The list contains 15 items, with items 10 through 15 checked.

<input type="checkbox"/>	1	JORGE
<input type="checkbox"/>	2	CopyOf [WPS ACTIVE RECEPIE [UNKNOWN
<input type="checkbox"/>	3	-
<input type="checkbox"/>	4	-
<input type="checkbox"/>	5	-
<input type="checkbox"/>	6	-
<input type="checkbox"/>	7	-
<input type="checkbox"/>	8	-
<input type="checkbox"/>	9	-
<input checked="" type="checkbox"/>	10	CIRCLE
<input checked="" type="checkbox"/>	11	VERTICAL LINE
<input checked="" type="checkbox"/>	12	DOUBLE CIRCLE
<input checked="" type="checkbox"/>	13	FIGURE EIGHT
<input checked="" type="checkbox"/>	14	SPIRAL
<input checked="" type="checkbox"/>	15	CROSS

The Read Only flag is used when copying recipes

Recipes #10 ... 15 are usually predefined patterns / shapes and should be set readonly

IO Tab

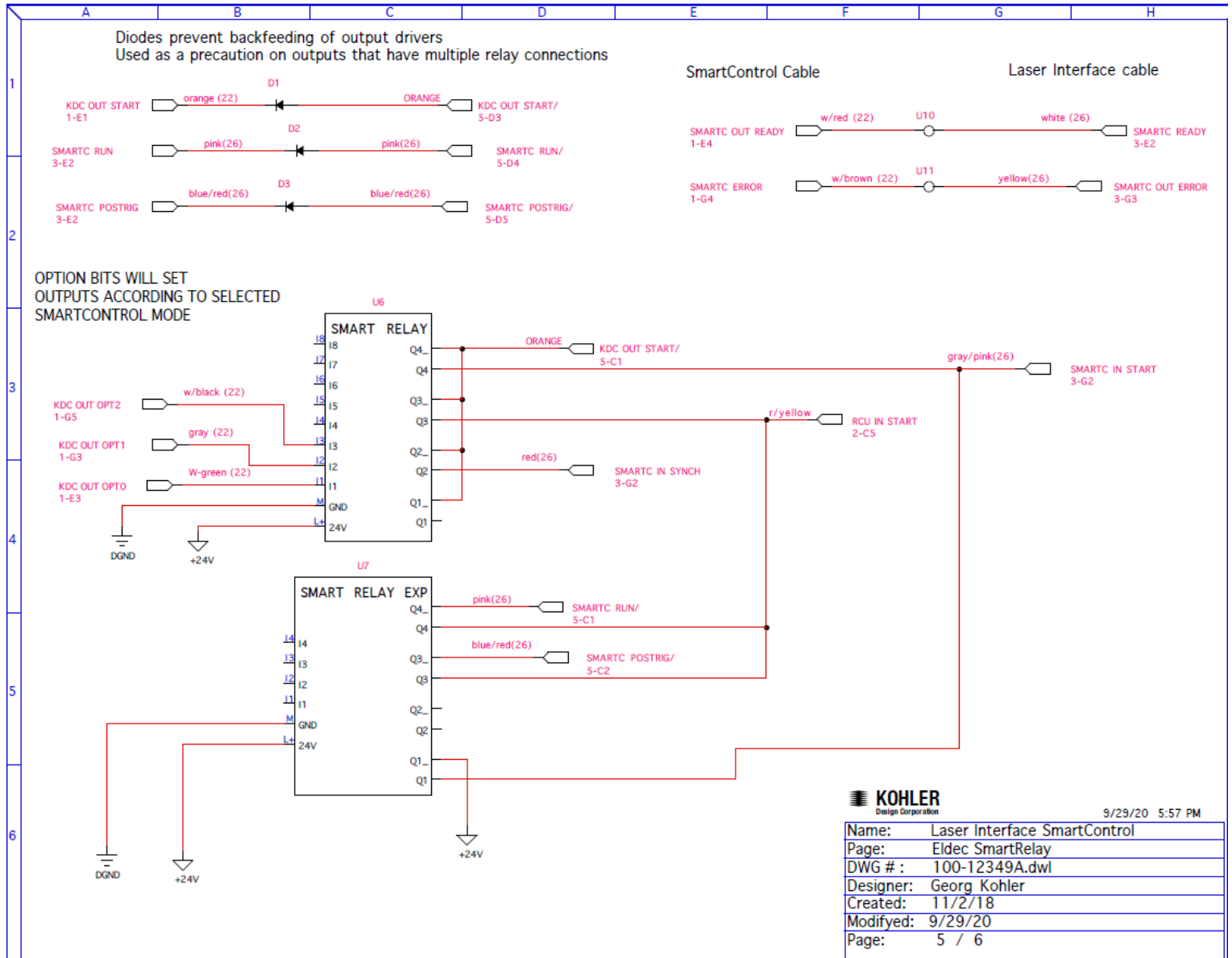
Displays the current state of the SmartControl+ IO's

INPUTS	OUTPUTS
<input type="checkbox"/> RC	<input type="checkbox"/> OUT1
<input type="checkbox"/> START	<input type="checkbox"/> ERROR
<input type="checkbox"/> SYNC	<input type="checkbox"/> POSTRIG
<input type="checkbox"/> IN0	<input type="checkbox"/> RUN
<input type="checkbox"/> IN1	<input checked="" type="checkbox"/> READY
<input type="checkbox"/> IN2	<input type="checkbox"/> OUT0
<input type="checkbox"/> NC	<input type="checkbox"/> RGA
<input type="checkbox"/> NC	<input type="checkbox"/> NC

SmartRelay Wiring

Below is the portion of the schematic showing the controls I/O's on the Relay Outputs (Rev B as of Dec 2020 - actual wiring might - please consult the latest drawings for the actual wiring of you're system)

As you can see the 8 NO relays of the SmartRelay allow some of the wiring to be changed based on the Input Bit patters (I1...I33)



SmartRelay Programming

The Idec Smart Relay was selected because it allows easy programming of the various modes without real programming experience

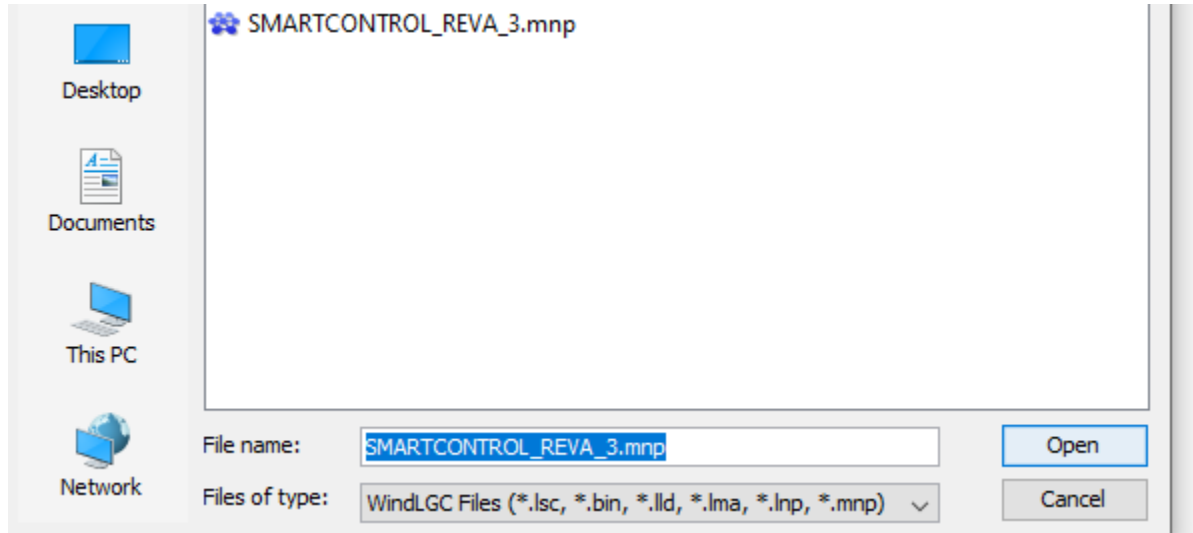
**** On most systems the Idec SmartRelay should never have to be touched *****

Each SmartControl+ system ships with the IDEC WindLGC software installed on the PC & it should come with the original install CD for IDEC

(the Software will have to be updated online after the initial install)

The system ships with the Ethernet cable clearly marked to allow direct access to the SmartRelay if needed.
Startup the WindLGC software and select [FILE OPEN]

Point to the **KDM software folder** and open the SmartRelay File .mnp (name might be slight different)

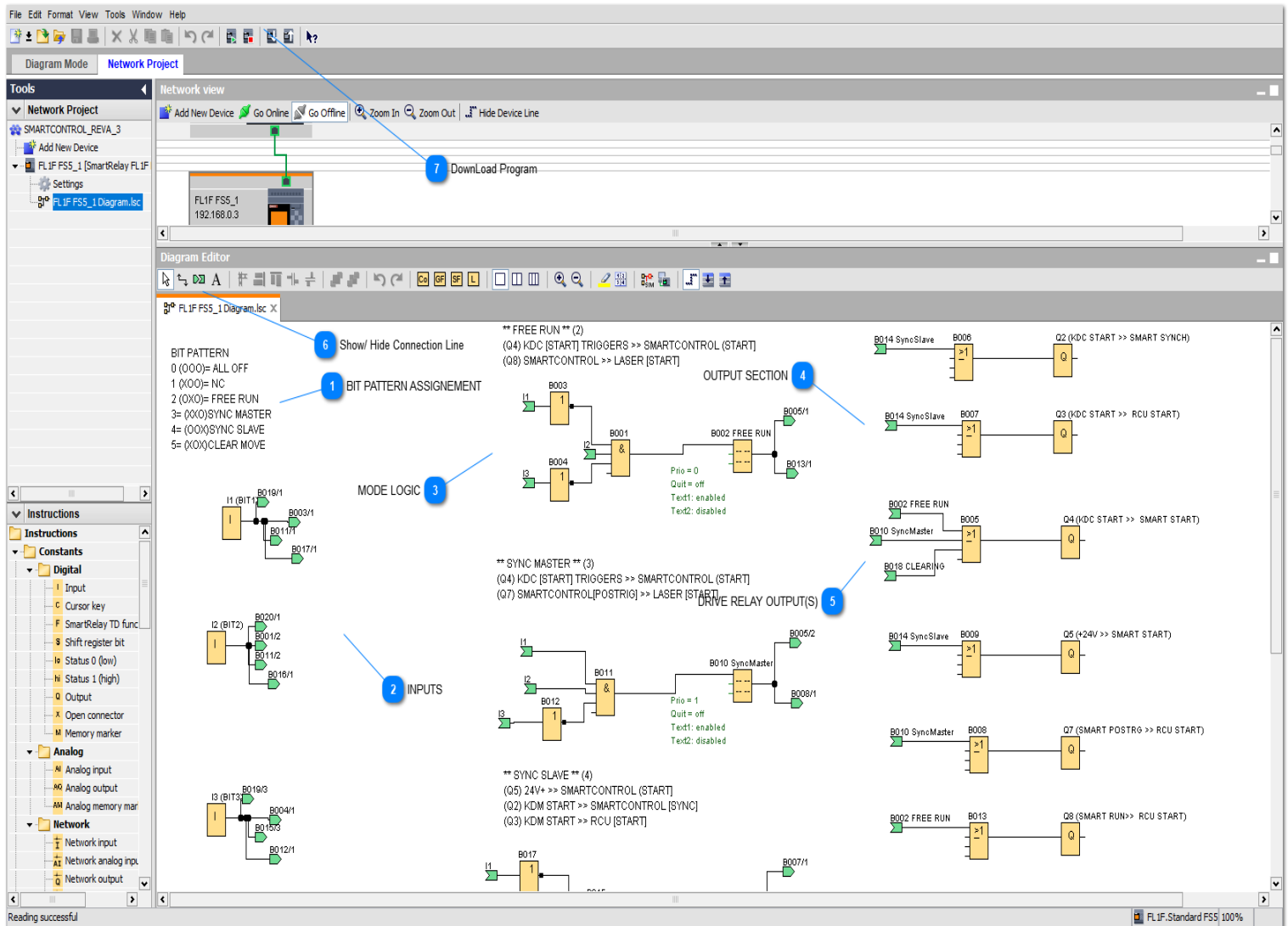


After opening the file select the [NETWORK PROJECT] tab

Then **double click** the [FL1F FS5_1 Diagram.lsc] list item in the left hand panel

You should be presented with below screen.

Before making any changes please make sure to have a backup or save the file under a new name



While this might look complicated once you understand the concept it's actually rather simple
You are dealing with 3 main sections

1 BIT PATTERN ASSIGNMENT

This is a text file defining the bit pattern
= Free run (Bit Value 2) requires Input 2 ON and Input 1 and Input 2 OFF

```
BIT PATTERN
0 (000)= ALL OFF
1 (X00)= NC
2 (OXO)= FREE RUN
3= (XXO)SYNC MASTER
4= (OOX)SYNC SLAVE
5= (XOX)CLEAR MOVE
```

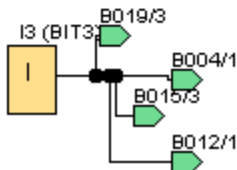
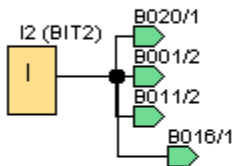
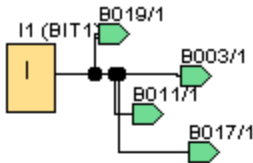
2 INPUTS

There are only 3 Inputs connected

The green blocks indicate each a connection "somewhere" on the layout

To show the actual connection click on the green block and then enable /disable the display of the line with the toolbar Icon (see 6)

No logic is in this section !



3 MODE LOGIC

This is where the actual logic is created & where the display text can be changed

B001 is a AND Function meaning ALL 4 Inputs on the left need to be satisfied (ON) for the output to be enabled (Not Connected Inputs are counted as being in the ON State)

FreeRun requires

IN1 =OFF

IN2 =ON

IN3 =OFF

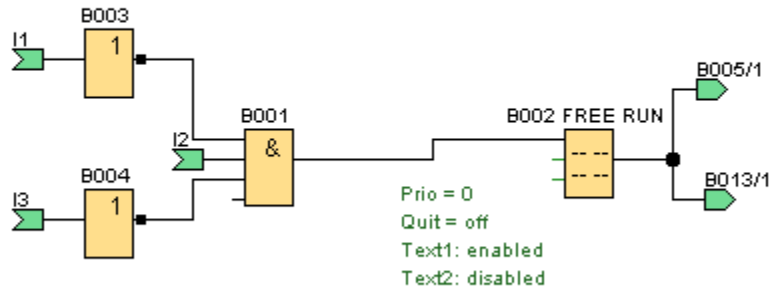
In this case we need to invert IN1 & IN3 (block functions B003 & B004) IN3 can be direct connected

If the condition is satisfied Block B001 will turn on and will display the assigned text & allow to enable the desired outputs

*** FREE RUN *** (2)

(Q4) KDC [START] TRIGGERS >> SMARTCONTROL (START)

(Q8) SMARTCONTROL >> LASER [START]

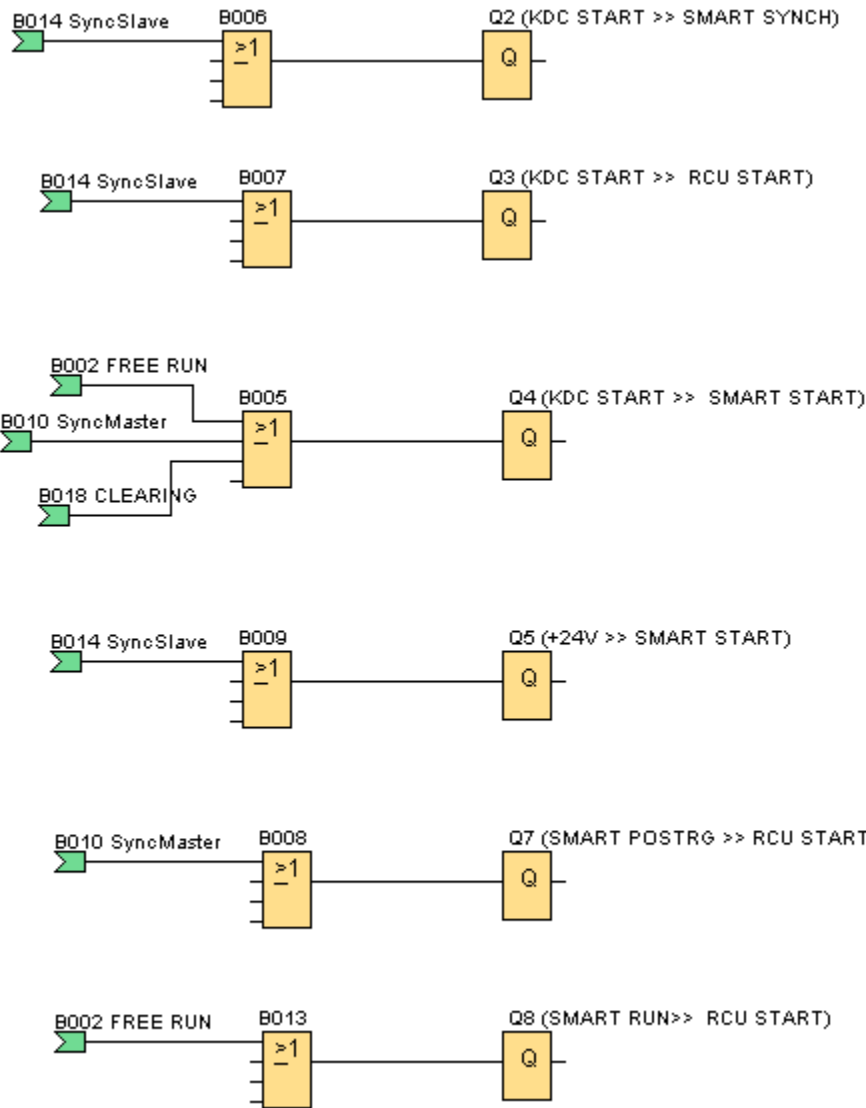


4

OUTPUT SECTION

Each Relay output has it's own Line

Relays are labeld Q1-4 on the main relay and Q5-8 for the expansion unit

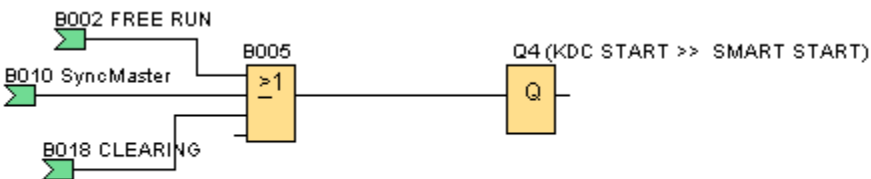


5 DRIVE RELAY OUTPUT(S)

All outputs have a OR block in front - many would not need the or block as they only have one connection but to make things the same all Outputs have a or block
In this case the OR block means that if any of the inputs are high the output will be enabled

The green connection indicators show the name of the block they are connected to.

Click on them and enable/disable the line display to show the actual line



6

Show/ Hide Connection Line

Click on the green connection block in the diagram -then use this button to display or hide the actual line between the connection points



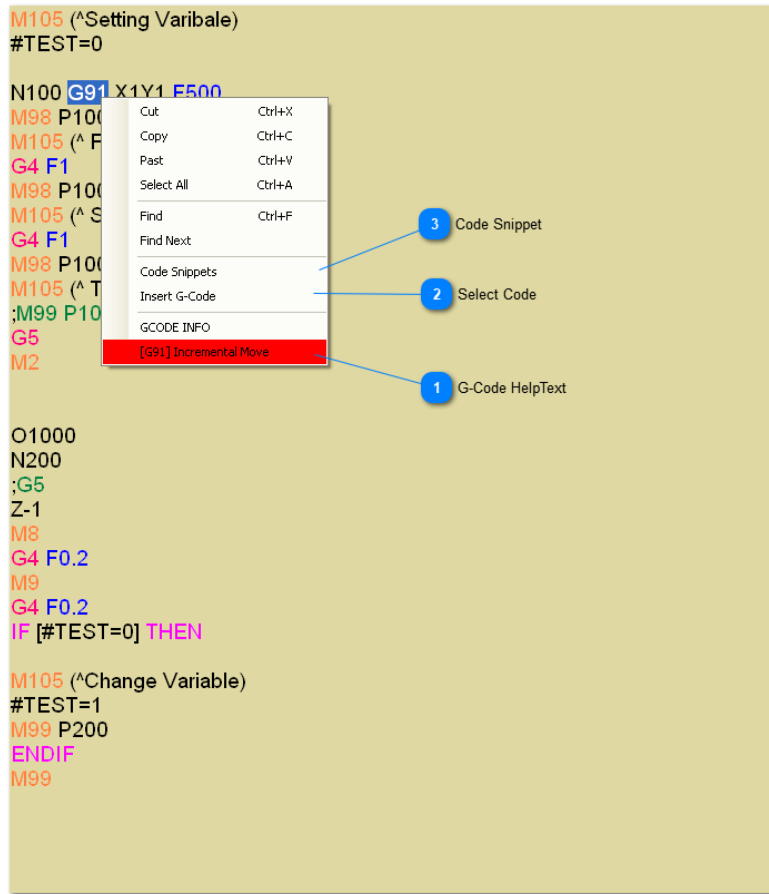
7

DownLoad Program

Once done download the updated logic to the smart Relay



Edit Window



1 G-Code HelpText

[G91] Incremental Move

Select any valid G-Code (example = G91) with the mouse and right click to activate the drop down menu. The help text (If available) for the Command will be displayed at the bottom of the dropdown. If the selected command has associated C Codes they will be displayed in a new dropdown. Highlighting G410 & right click the mouse, will display all available C codes for insertion (without going through the [Select Code](#) Window).

2 Select Code

Insert G-Code

Display the [Select Code](#) Window

3 Code Snippet

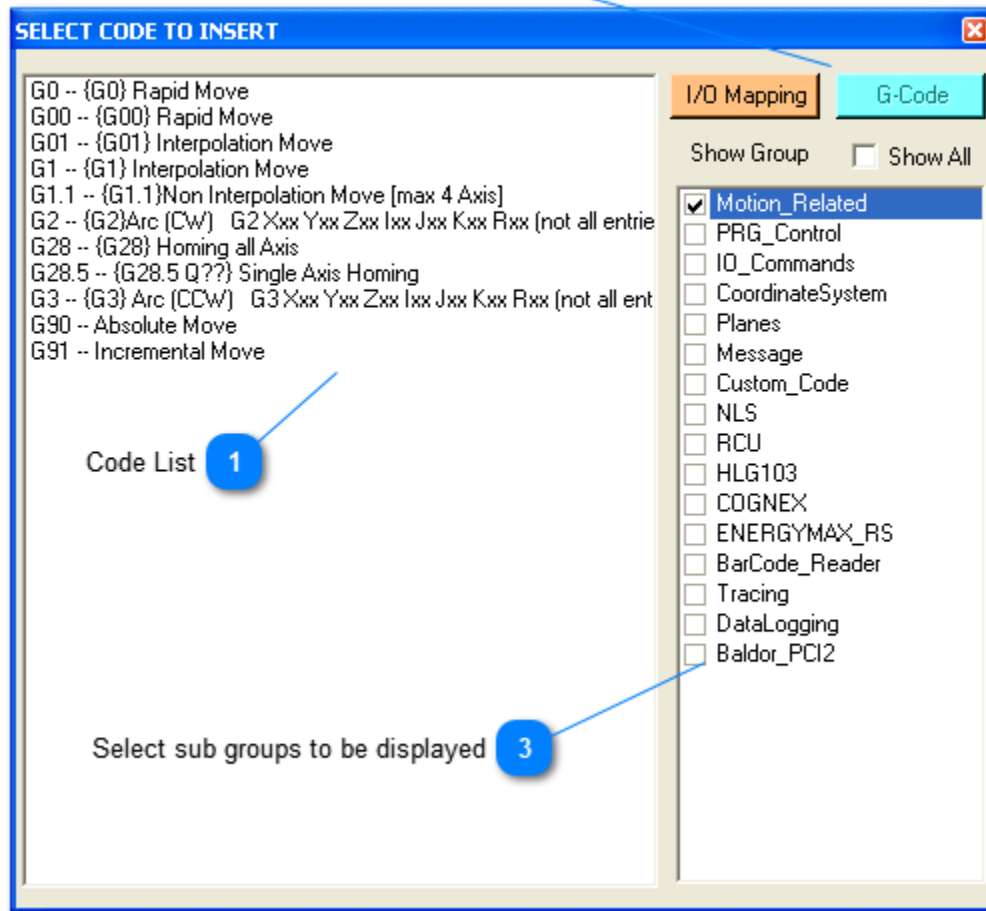
Code Snippets

Display the [Snippets](#) Window

SELECT CODE

Select IO or G-Code Items

2



Code List

1

Select sub groups to be displayed

3

1

Code List

G0 -- {G0} Rapid Move
 G00 -- {G00} Rapid Move
 G01 -- {G01} Interpolation Move
 G1 -- {G1} Interpolation Move
 G1.1 -- {G1.1} Non Interpolation Move [max 4 Axis]
 G2 -- {G2} Arc (CW) G2 Xxx Yxx Zxx Ixx Jxx Kxx Rxx (not all entrie
 G28 -- {G28} Homing all Axis
 G28.5 -- {G28.5 Q??} Single Axis Homing
 G3 -- {G3} Arc (CCW) G3 Xxx Yxx Zxx Ixx Jxx Kxx Rxx (not all ent
 G90 -- Absolute Move
 G91 -- Incremental Move

Select Code by double clicking it

2

Select IO or G-Code Items

I/O Mapping

G-Code

3

Select sub groups to be displayed

Show Group ☐ Show All

- ☒ Motion_Related
- ☐ PRG_Control
- ☐ IO_Commands
- ☐ CoordinateSystem
- ☐ Planes
- ☐ Message
- ☐ Custom_Code
- ☐ NLS
- ☐ RCU
- ☐ HLG103
- ☐ COGNEX
- ☐ ENERGYMAX_RS
- ☐ BarCode_Reader
- ☐ Tracing
- ☐ DataLogging
- ☐ Baldor_PCI2

Select commands based on sub categories or display all commands

Snippet Window

Decimal Points: 4

Circular Weld [Generate Code]

Coordinate system: G58

Start Position: 0 Deg

Welds: 10 ☐ Start with Center Shot

Weld Diameter: 1 ☒ End with Center Shot

Weld Commands: M75 ; LFS START (Trigger) (ON)

Comments: Start Point = Center of pin
Start Location = 12 O-Clock = 0 deg

Generated Code:

```

; ** Olympus Circular Weld
G100 Q1 ; LFS Programm ID
G71 ; METRIC
F300 ; Feedrate
M51 ; LFS Test Ready

; ** Olympus Circular Weld
G100 Q1 ; LFS Programm ID
G71 ; METRIC
F300 ; Feedrate
M51 ; LFS Test Ready
M25 [ OUT_RINGLIGHTAIR ]
;
; *****
G58 ; coordinate system Snippet
G92X0Y0 ; set current Position (center) to 0
G90
; --- Spot Weld #1---
G1X0.5Y0
M75 ; LFS START (Trigger) (ON)
;
; --- Spot Weld #2---
G1X0.4045Y0.2939
M75 ; LFS START (Trigger) (ON)
;
; --- Spot Weld #3---
G1X0.1545Y0.4755
M75 ; LFS START (Trigger) (ON)
;
; --- Spot Weld #4---
G1X-0.1545Y0.4755
M75 ; LFS START (Trigger) (ON)
;
; --- Spot Weld #5---
G1X-0.4045Y0.2939
M75 ; LFS START (Trigger) (ON)
;
; *****
M26 [ OUT_RINGLIGHTAIR ]

```

At this stage the snippet window is not fully functional yet

At this point it's used to create custom code on a customer request

The circular weld snippet is used to create easy spot welds around a circle

The o-Position is the center of the circle, therefore a different coordinate system needs to be used for the snippet !

- Fill in the parameters, the actual weld command to be executed at the weld spot & the header and footer section
- [Generate Code] will produce the full code in the center window based on your settings .

It's best to use Snippets as external sub programs - this will make updating them a lot easier

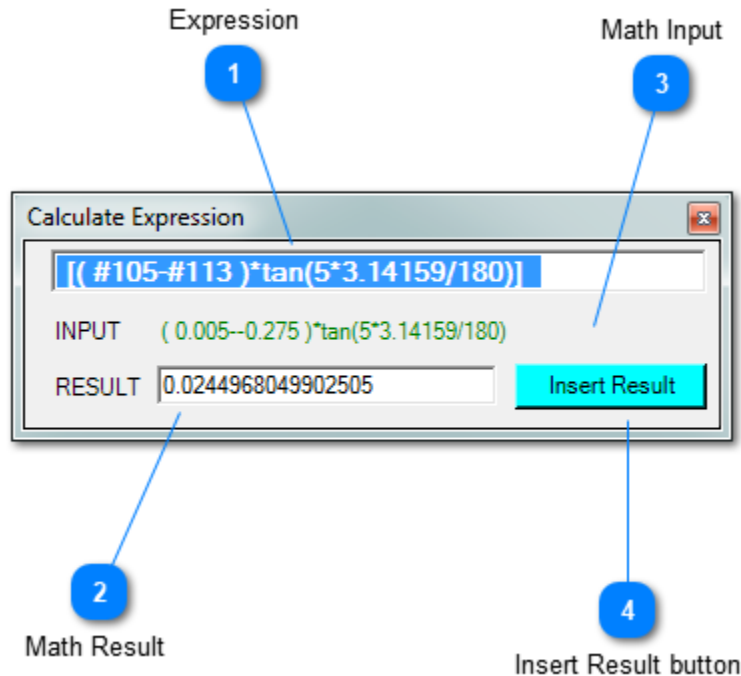
Calculate Expression window

HighLight an Expression within the Edit Window will allow you to open the Calculate Expression Window

Press Ctrl &E or right click to open the ContextMenu drop down

Select Calculate Math Expression

[Supported Math Operations](#)



Once the window opens it will automatically try to calculate the high lighted expression

1 Expression

`[(#105-#113)*tan(5*3.14159/180)]`

You can change the expression and the math calculator will try to compute the result

For the Expression to be able to replace variables (#105) or 9# TEST_VAR1) the parser will have to run once ...

If you're variables don't get replaced try to run the program once.

- It doesn't matter if it fails with an expression error as usually all variable declarations are in the top section of a programs - the variables will be initialized during the initial parsing
- If you can not run a program enable [Verify parsing] under the Setup- Run menu - this will only run the parser without automatically trying to start the program
- After that all variables (if declared) will be replaced when running an Expression

2 Math Result

`0.0244968049902505`

3 Math Input

INPUT `(0.005--0.275)*tan(5*3.14159/180)`

Valid Expressions will display green / invalid expression will be red

4

Insert Result button



This will replace the selected text in the Edit window with the displayed Math result

- use the new convert Inch/mm dropdown to convert mm to Inch and vise versa (Highlight a numeric value in the edit Window - Right click - select the conversion from the dropdown

Expansions (DLL)

The KOHLER DESIGN MOTION Software has several DLL that allow to expand the functionality of the basic software

All DLL's require to be installed on each computer. Without the Installation code, the DLL will work but will display a warning message indicating that the DLL has not been Licensed.

Missing Install codes will also prevent printing of the customer name in the production files.

Please contact Kohler Design Corp about the correct Install Codes for you're DLL

Currently the following DLL's are available

- Cognex
- Start Job (Production environment)
- Custom GUI (Simplified Operator Interface / Customer specified GUI)

COGNEX (DLL)

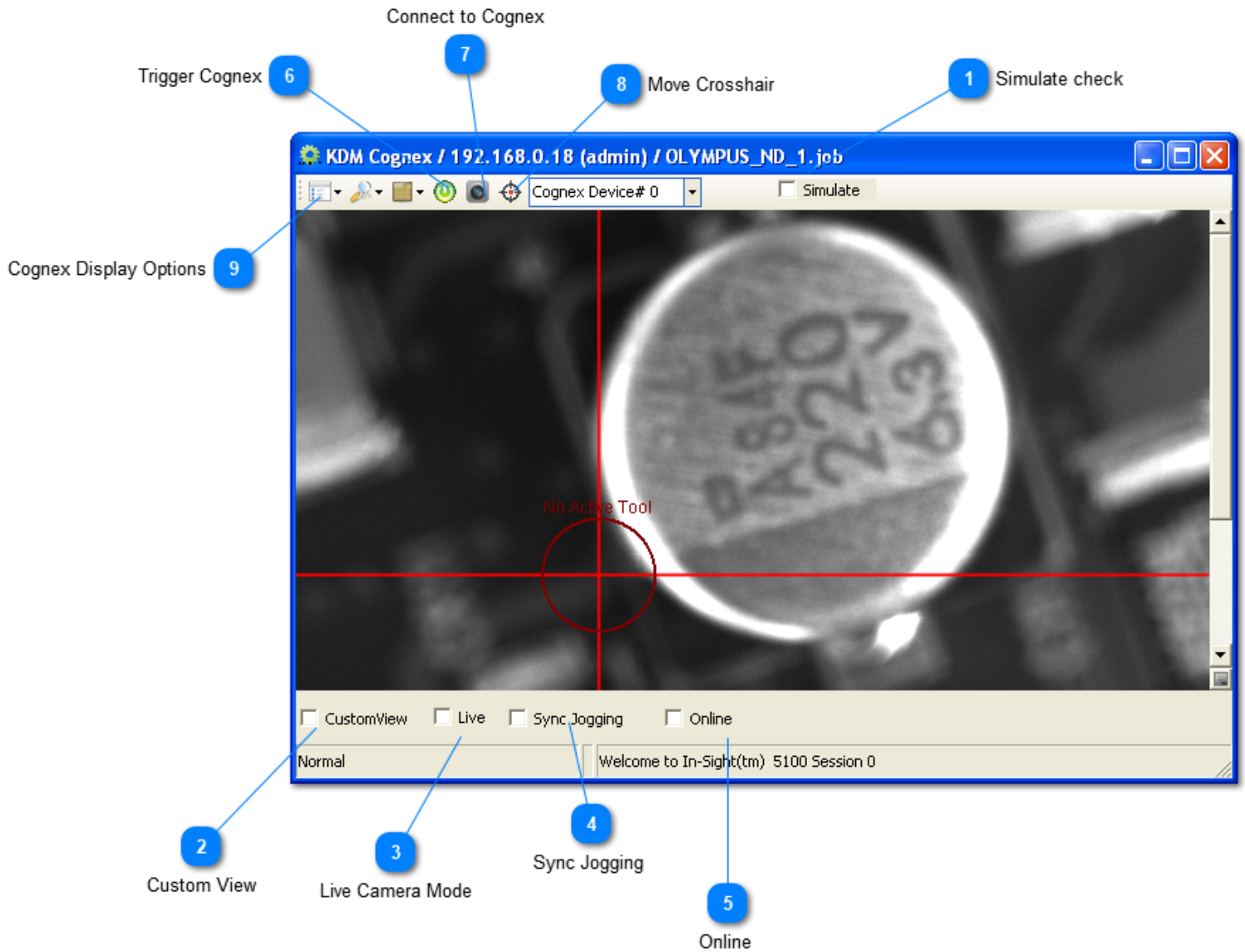
The Cognex DLL allows the CNC code to interact with Cognex application running on the camera
Some of the basic functions provided are

- Trigger the camera
- Collect Pass Fail state
- Read cell values
- Retrieve cell values
- Set camera live mode

The camera image will be displayed in a KOHLER DESIGN MOTION window

For all this to work , the Cognex application needs to be setup properly. Please contact Kohler Design Corp for more
Info about our Cognex Integration

Cognex Window



1 Simulate check

☐ Simulate

2 Custom View

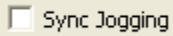
☐ CustomView

Enable Custom view in Cognex spreadsheet

3 Live Camera Mode

☐ Live

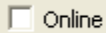
4 Sync Jogging



This allows to toggle the live camera mode together with the jog buttons

This function is especially helpful if the Cognex application is providing the cross hair to the system (Laser spot)

5 Online



6 Trigger Cognex



Manually trigger the Cognex

7 Connect to Cognex



The Cognex window will try to connect to the Camera automatically when it opens

When switching for and back between Cognex Windows Application and the KOHLER DESIGN MOTION Window it might be required to reconnect by using this button

8 Move Crosshair



This initiates the moving of the cross hair on the Cognex Camera (The Cognex application needs to be properly setup for this)

9 Cognex Display Options



These controls allow to change some of the standard view options for the Cognex Window

- Show Spreadsheet
- Show Grafik
- Show Image
- Zoom Image
- Spread sheet overlay (opacity)

Sample Code Cognex

```

#XOFFSET=0
#YOFFSET=0
#DISTANCE=0 ;MeasuredDistancePIN-CROSS
#ALLOWED_OFFSET=0.005 ; Allowed Offset Value befor Welding

IF [comms.80=0] THEN ; startup sequence -will only run once
G430 C10Q[@OLYMPUS_7] ;Load Job& Make Active - filename wo Extension
ENDIF

N1000
G430C01 ;TriggerAcquisition / waitforPass-Fail

IF [ COGNEX_0_PASS_FAIL = 0 ]THEN
M105(^Cognex FAILED-START / F5 TO CONTINUE)

ELSE
;Cogenx Passed - read offsets
G430C20Q[#XOFFSET] ;ReadXPositionforTraget#1intoVariable
G430C21Q[#YOFFSET] ;ReadYPositionforTraget#1intoVariable
G430C22Q[#DISTANCE] ;ReadOffset intoVariable
ENDIF

;G5
G91
G1X [-1*#XOFFSET] Y[#YOFFSET] F100 ;move axis by Offsets

IF [#DISTANCE> #ALLOWED_OFFSET] THEN ;check If Offset is within tolerance
M99P1000 ; Run Cognex Again
ENDIF
M2

```

This is sample code that uses the Cognex application to create a movable cross hair overlay

The Laser spot is in the center of the cross hair

The Cognex simply calculates the offset to the cross

The advantage of this setup, is that the calibration to real world dimension on the camera is not that important anymore (easier to maintain)

Kohler Design Corp Corvallis OR 97333

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If the camera calibration is off by 20% it will just take a few extra cycles to locate the spot correctly
(With the camera calibrated properly it will take a single cycle)

Cognex Commands

A setup file is used to create the custom commands controlling the Cognex DLL

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Sample Cognex Setup File

```
; Customer Name
; AUG 20th 2013 Rev-
;-----
;---- DOCUMENTATION COD SETUP FILE(S) -----
;-----
; COD files are used for uploading custom and device settings to the software
; Eaxmple : Serial Laser / Serial Measurement Device / Cognex Control / Dc-12 Custom Code / upload users
; The basic structure of the COD file stays the same for the various controls but the actual parameter
entries change based on the
; selected KDM Module.
; It is therefore NOT recommended to use a Cognex COD file as the base for a new Serial Port COD File as
it won't have the proper parameter
; entries for the device.
; Not all functunallity is used with each device
;
; [,] Seperated table
; [;] Comments - anything afterwards will be ignored on that line of code
; Serial Only- Enable Logging in the KDM Setup do print all messages to serial Log (send and recived)
; NC Command = [Gcode_Function]+ "C"+ [code]
; Custome communication G codes need to be > G400 !
; Examples: Gcode_function Panasonic HL-G103 = [G430], Code=[10] // resulting NC code = G430C10
;
; [WRITE_COMMAND]      G430C01//Trigger Aquistion Command
; [READ_VALUE]         G430C20Q[#100]//This will read the value in the specified cell into CNC variable
#100
; [WRITE_COMMAND]      G430C40Q1 //This will write a 1 (or any other value) into the specified cell
;                      (0/1 are usally used to trigger functions in the Cognex spreadsheet)
;
; ** COGNEX Settings ** (needs to be set trough Cognex Software manually befor communication can be
established!)
;Sensor Type:         Cognex Insight
;Networksettings:     Depending on PC setup - usually the Camera is connected on a separate fixed
ethernet connection (using DHCP is not recommended !)
;
; -----
;
; ** Functions**
; WRITE_COMMANDSendFixed Command
; WRITE_VARIABLESendWrite Value into specified Spread sheet cell
; READ_VALUEREADRead Value from specified Spread sheet cell
; WRITE_INTEGERSendWrite INTEGER into specified Spread sheet cell
;
; **Contex Help/ {sample Code to be inserted} **
; Put in {} braces the actual code that will be inserted ({}braces will automatically be removed)
; Enter Gcode as G@@@ as the @@@ will be replaced with the actual G code set in the COD file)
; Sample:
;{G@@@ C101}Test - This text will be Inserted
```

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```
; Result:  G430 C101;Test - This text will be Inserted
;-----
; -- ACTUAL CODE TO BE LOADED -----
;-----

;PARAMETERS SECTION
[MODULE]=COGNEX                ;NOT user programmable - KDM module to be used with this interface
[CAMERAINDEX]=0                ;Allows accessing multiple Cameras
[GCODE_FUNCTION]=G430          ;G-Code to be used with this device (needs to be > 400)
[IP_ADDRESS]=192.168.1.101     ;IP Address of Cognex Camera
[USER]=admin                   ;User Name to login automatically
[PASSWORD]=                    ;Password login automatically
[WAITFORRESULT]=200            ;(ms to wait for Fail/Pass result
[RETRYACQUISITION]=4           ; # of times the control should try to run the job (0 = single try)
[NATIVEMODE]=1                 ; Use Native Mode(TELNET) for read / write to the spreadsheet
[TELNET_ARRAY]=150             ; size of Telnet Array when reading Cognex in Native Mode
[PASSFAILCELL]=L007            ; Location of Pass Fail Cell when using Native Commands [Collum/Row]
[MOVECROSSCELL]=K006           ; Location to enable moving the focal cross [Collum/Row]
[PAUSE_READING]=200            ; After sending a command we need to give the Cogenx time before we can read
the buffer
[COMMS_PASSFAIL]=96            ; COMMS location where the PASS/FAIL state will be saved to (to be read out
by CNC code)
[AUTOCONTROL_LIVE]=1           ; Automatically turn live acquisition off befog triggering - reset current
state afterwards
[ENDOFMOVE_TRIGGER]=1          ; Will automatically trigger the Cognex at the end of jog Move or entering
a pause (requires no tool selected)

;STARTUP OPTIONS SECTION
[STARTUP_CUSTOMVIEW]=1         ; Automatically turns on CustomView at connection
[STARTUP_LIVEVIDEO]=1          ; Automatically turns on Live Video at connection
[STARTUP_GRID]=0               ; Automatically turns on Grid at connection

;*** COMMANDS SECTION
;Code Function      Collum/Row      Text/CommandRange      ScaleContex Help/sample Code to be inserted
[01],WRITE_COMMAND, , TRIGGER ACQUISITION,, ,{G@@@ C01}Trigger Acquisition -retry ?x - write
result to COMMS#96
[02],WRITE_COMMAND, , LIVE ACQUISITION ON,, ,{G@@@ C02}Live Acquisition ON
[03],WRITE_COMMAND, , LIVE ACQUISITION OFF,, ,{G@@@ C03}Live Acquisition OFF
[04],WRITE_COMMAND, , SYNC JOGGING ON, , ,{G@@@ C04} Jog Synchronication ON
[05],WRITE_COMMAND, , SYNC JOGGING OFF, , ,{G@@@ C05} Jog Synchronication OFF
[06],WRITE_COMMAND, , ONLINE, , ,{G@@@ C06} CAMERA ONLINE
[07],WRITE_COMMAND, , OFFLINE, , ,{G@@@ C07} CAMERA OFFLINE

[10],WRITE_COMMAND, ,LOAD JOB, , ,{G@@@ C10Q[@filename]}Load Job& Make Active - filename
wo Extension
```

```
;*** READ SECTION
```

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```
;Code Function      Collum/Row      Text/CommandRange      Scale      Contex Help/ { sample Code to be
inserted}
[20],READ_VALUE,      M005,      READ OFFSET      X-Position ,      ,      ,{G@@@ C20Q[#??]}READ OFFSET X-
Position into Variable
[21],READ_VALUE,      N005,      READ OFFSET      Y-Position ,      ,      ,{G@@@ C21Q[#??]}READ OFFSET Y-
Position into Variable
[22],READ_VALUE,      O005,      READ OFFSET      Center - Cross,      ,      ,{G@@@ C22Q[#??]}READ OFFSET
Center - Cross into Variable

;*** WRITE SECTION
;Code FunctionCollum/RowText/CommandRangeScaleContex Help/ sample Code to be inserted
[40],WRITE_VARIABLE,L001,Set/Reset Flag ,0/1,1,{G@@@ C40 Q??} set flag (0=Reset/1=Set)
[41],WRITE_INTEGER,K005,Select Active Toolset ,0/10,1,{G@@@ C41 Q??} Select Active Toolset (0=Disable all
Tools)
[42],WRITE_INTEGER,K008,Save Image ,0/1,1,{G@@@ C42 Q??} Save Image (1=Save Image)

;*** WRITE STRING
;Code Function      Collum/RowText/Command      IndexScaleContex Help/sample Code to be inserted
[90],WRITE_STRING,      B018,      SEND_STRING,,,{G@@@ C90 Q[???]} Update ImageFileName (*LN=Lotnumber/
*LC=LotCounter/*TN=ToolNumber/*CC=CycleCounter)
;[91],WRITE_STRING,      ,      SEND_STRING,      ,,{G@@@ C91} Set STRING

; *****
;DATA Logging - Request Info from device - write respond to log or display message
; *****
;Code ACTIONSerial CodeLog Entry (& Value)ActionScaleContex Help
[101],DATA_LOGGING,F021,Cognex Pass/Fail Pin 1,2561,{G@@@ C101}Cognex Pass/Fail Pin 1
[102],DATA_LOGGING,F022,Cognex Pass/Fail Pin 2,2561,{G@@@ C102}Cognex Pass/Fail Pin 2
[103],DATA_LOGGING,F022,Cognex Pass/Fail Pin 3,2561,{G@@@ C101}Cognex Pass/Fail Pin 3
```

Write Image FTP

The Cognex Camera has a built in FTP function, that lets you Write Images to any FTP Server .

Network Tips:

The Cognex is usually connected to separate network with **fixed IP** addresses (This is not a requirement)

Standard KDM Network Settings :

- PC = 192.168.1.100
- Cognex = 192.168.1.101

With the firewall enabled this can create an issue, as Windows will label the network as **Unidentified Network** preventing the standard firewall settings for the FTP server(s) to be effective

- usually firewall access by default is only granted to known networks (Private or Public)

One way to overcome the issue is to change the standard behavior for **Unidentified Networks** and to assigned them as being private

This can be done in the Windows Local security policy editor - see the WWW for detailed info on this can be done

You can also tweak the firewall to allow the access from the unknown network

If you are having issues writing the Image to the FTP server, disable the Firewall first to make sure that's not the problem !

Overview:

The Function WriteImageFTP require as Trigger event

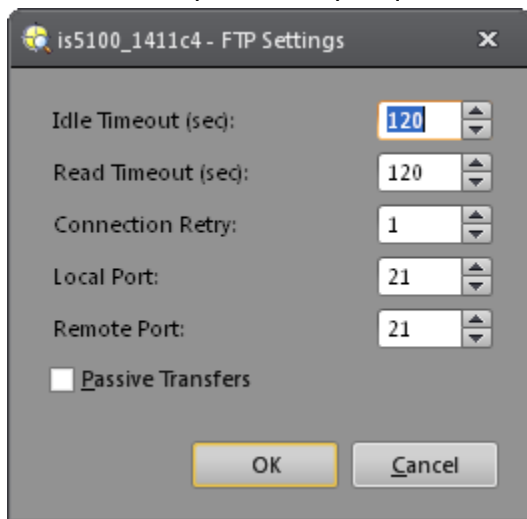
At this point, the KDM Cognex DLL uses the switch between Online/ Offline as the Trigger Event in the Spreadsheet but any other trigger event could be used also

As the KDM software allows to write Strings to text cells in the Spreadsheet this is an easy way of adjusting the actual file name for the Image File

(The Cognex SaveImageFTP function will overwrite any existing files by default)

Setup the Camera

-There is no special setup required on the camera (see below for the standard Network settings)



Setup the Function WriteImageFTP in the spreadsheet

is5100_1411c4 - Property Sheet - WriteImageFTP

Edit Insert Help

Event: \$B\$17 = Event

Host Name: 192.168.1.100

User Name: FTP

Password:

Image: \$A\$0 = Image

File Name: C41 =

Max Append Value: 996

Reset: ☒

Data Format: BMP

Screen Capture: ☐

Resolution: Full

Disable FTP Queuing: ☐

Event

An external event that forces an update. Must reference the AcquireImage function, an Event structure, a Button function or a numeric value. If the checkbox is enabled, the function will always run when an input to the function is updated.

OK Cancel

The Cognex Help file explains the individual settings in detail

- Event = Event to trigger the WriteImageFTP function
- Hostname = IP Address / Name of you're FTP server
- UserName = User Name to login to the FTP
(The standard Port is 21 but can be changed by adding the desired port number to the Login = FTP:33)
- Password = Password to be used to Login to the FTP
- Image = Usually the Captured Image = \$A\$0
- FileName = Cell containing the filename or fixed name

Actual Spreadsheet Line

In below sample, the actual Filename (C41) is assembled with the following command

Concatenate(E41,D41,"_",F41)

		Filename	Name	SubFolder	ImageFilename
40					
41	Save Image Pin1	FTP	NUP/NU_PIN1_MK902861_71	NU_PIN1	NUP/
					MK902861_71

CNC Code

With the standard Cognex Setup.cod file the following code will save the Image to the desired Location on the FTP server

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```
G430 C90 Q[@*TN_*LN_*LC]      ; COGNEX Setup ImageFileName (using Place Holders see
below)                          ; *LN=Lotnumber / *LC=LotCounter / *TN=ToolNumber /

*CC=CycleCounter

G430 C03                        ;Live Acquisition OFF
G4F0.2
G430 C06                        ;CAMERA ONLINE (Trigger WriteImageFTP)
G4F0.5
M105($Captured Image)         ; Write MSG to GUI LOG
G430 C07                        ;CAMERA OFFLINE
G4F0.2
G430 C02                        ;Live Acquisition ON
```

MT CONNECT (DLL)

From Wikipedia, the free encyclopedia

MTConnect is a manufacturing technical standard to retrieve process information from numerically controlled machine tools. As explained by a member of the team that developed it,[1]"This standard specifies the open-source, royalty-free communications protocol based on XML and HTTP Internet technology for real-time data sharing between shopfloor equipment such as machine tools and computer systems. MTConnect provides a common vocabulary with standardized definitions for the meaning of data that machine tools generate, making the data interpretable by software applications."[1] A simple, real-world example of how this tool is used to improve shop management is given by the same author.

[Introduction to MT connect](#)

[MT Connect Disclaimer](#)

[KDM Adapter Setup Window](#)

Naming Conventions for KDM MT CONNECT Implementation (simplified)

- **Device** Work Station / System (LS4000 , LS38) running KDM Software
- **Adapter** KDM Software Interface between the Device and the Agent (*KDM MT CONNECT DLL*) (*required*)
- **Agent** 3th party SW tool running on the PC providing the MT CONNECT access point for collecting the Machine data (*required*)
Kohler Design usually installs the following agent
MTConnect C++ Agent Version 1.3.0.0
Other agents could be used instead

Basic Agent Commands (use command on PC running a MT Connect Setup with local Web Browser)

- <http://localhost:5000/current/> Retrieves current values for components' Data Items
- <http://localhost:5000/probe/> Describes Agent's Devices, Components, and Data Items
- <http://localhost:5000/assets/> Things associated with a device that are not a component
- <http://localhost:5000/sample/> Retrieves values for components' Data Items

AGENT SETUP FILE (.xml) sample - file

```
<?xml version="1.0" encoding="utf-8"?>
<MTConnectDevices xmlns:m="urn:mtconnect.org:MTConnectDevices:1.1" xmlns:xsi="http://
www.w3.org/2001/XMLSchema-instance" xmlns="urn:mtconnect.org:MTConnectDevices:1.1"
xsi:schemaLocation="urn:mtconnect.org:MTConnectDevices:1.1 http://www.mtconnect.org/schemas/
MTConnectDevices_1.1.xsd">
  <Header creationTime="2019-02-05T18:44:40+00:00" sender="localhost" instanceId="1267728234"
bufferSize="131072" version="1.1" />
  <Devices>
    <Device id="dev" iso841Class="6" name="LS4000" sampleInterval="10" uuid="000">
      <Description manufacturer="KOHLER DESIGN CORP"></Description>
      <DataItems>
        <DataItem category="EVENT" name="avail" id="e1" type="AVAILABILITY"></DataItem>
        <DataItem category="CONDITION" id="c1" type="SYSTEM" name="system" />
      </DataItems>
    </Components>
```

```

<Controller id="cn1" name="KDC200">
  <DataItems>
    <DataItem category="EVENT" id="cnt1" type="PART_COUNT" name="machinecycle" />
    <DataItem category="EVENT" id="cnt2" type="PART_COUNT" name="batchcycle"></DataItem>
    <DataItem category="EVENT" id="cnt3" type="PART_COUNT_PASS" name="batchpass"></DataItem>
    <DataItem category="EVENT" id="cnt4" type="PART_COUNT_FAIL" name="batchfail"></DataItem>
    <DataItem category="EVENT" id="e2" type="MESSAGE" name="msg" />
    <DataItem category="EVENT" id="e3" type="EMERGENCY_STOP" name="estop" />
    <DataItem category="EVENT" id="e4" type="CONTROLLER_MODE" name="mode" />
    <DataItem category="EVENT" id="e5" type="USER" name="user" />
    <DataItem category="EVENT" id="e6" type="PROGRAM" name="program"></DataItem>
    <DataItem category="EVENT" id="e7" type="PART_NUMBER" name="part" />
    <DataItem category="EVENT" id="e8" type="BATCH_NUMBER" name="batch" />
    <DataItem category="EVENT" id="e9" type="POWER_READING" name="powerreading" />
  </DataItems>
</Controller>
</Components>
</Device>
</Devices>
</MTConnectDevices>

```

Typical Data pulled from a system running KDM with MT-CONNECT (based on above setup file)

Command used: <http://localhost:5000/current/>

- creationTime: 2021-11-30T03:22:16Z
- sender: DEV2
- instanceId: 1637777021
- version: 1.4.0.10
- bufferSize: 131072
- nextSequence: 127
- firstSequence: 1
- lastSequence: 126

Device: LS4000; UUID: 000

Controller : KDC200

Events

Timestamp	Type	Sub Type	Name	Id	Sequence	Value
2021-11-30T03:22:05.8934939Z	PartCount		machinecycle	cnt1	123	98
2021-11-30T03:22:05.8934939Z	PartCount		batchcycle	cnt2	124	0
2021-11-30T03:22:05.8934939Z	PartCountPass		batchpass	cnt3	125	0
2021-11-30T03:22:05.8934939Z	PartCountFail		batchfail	cnt4	126	0
2021-11-30T03:21:40.8923914Z	Message		msg	e2	116	
2021-11-30T03:09:15.8565985Z	EmergencyStop		estop	e3	109	ARMED
2021-11-30T03:22:05.8934939Z	ControllerMode		mode	e4	122	PRG_END
2021-11-30T03:21:50.8961981Z	User		user	e5	117	ADMIN
2021-11-30T03:21:50.8961981Z	Program		program	e6	119	UNTITLED(2)
2021-11-30T03:21:50.8961981Z	PartNumber		part	e7	120	
2021-11-30T03:21:50.8961981Z	BatchNumber		batch	e8	121	
2021-11-30T03:09:40.8577289Z	PowerReading		powerreading	e9	113	

Device : LS4000

Events

Timestamp	Type	Sub Type	Name	Id	Sequence	Value
2021-11-24T18:03:41.991146Z	AssetChanged			dev_asset_chg	6	UNAVAILABLE
2021-11-24T18:03:41.991146Z	AssetRemoved			dev_asset_rem	7	UNAVAILABLE
2021-11-30T03:09:11.4045810Z	Availability		avail	e1	95	AVAILABLE

Condition

Timestamp	Type	Sub Type	Name	Id	Sequence	Value
2021-11-30T03:09:11.4045810Z	Normal		system	c1	107	

Basics of MT CONNECT

Basics of MTConnect

MTConnect is an Open, Extensible, and Royalty Free standard.

As an open standard, MTConnect is based on well defined, commercially available technologies. The MTConnect protocol is based on standard Internet technologies – HTTP and XML (Extensible Mark- #Up Language) – the underlying language of most web sites).

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Extensibility is a key feature of the MTConnect standard. The MTConnect Institute clearly understands a standard cannot address every conceivable data type needed on the shop floor. MTConnect provides a clearly defined method for adding new data types which can be exchanged between machines and applications; providing the flexibility to meet the demands of any environment. The most common extensions implemented by industry will be considered for additions to future releases of the MTConnect Standard – continually improving and expanding the standard.

As a royalty free standard, no one is required to pay a licensing fee to the MTConnect Institute for use of the standard. Companies who agree to the MTConnect licensing agreement can integrate MTConnect

with their products. Costs associated with products or services related to MTConnect apply to the products or services themselves – not an additional license fee for the use of the MTConnect standard.

Additionally, from an MTConnect Institute perspective, there is no cost for a company to implement the MTConnect standard for their own equipment. This does not mean that companies cannot charge for their implementation of MTConnect. That is entirely up to those companies.

A system implemented using the MTConnect standard is made up of **five fundamental components**:

Device – commonly a machine tool, but can be any piece of equipment or data source.

Adapter – An optional piece of software (and sometimes hardware) that provides a link or conversion from the data source and proprietary data definition in the device to the MTConnect Data definition.

This can be thought of as a translator. The Adapter is not needed for devices that use MTConnect as their native language.

Agent – A piece of software that collects, arranges, and stores data from the device or adapter. It receives requests for data from applications, processes those requests, and then transmits the required data. The function of the Agent, and its associated data dictionary, is defined by the MTConnect Standard. It is the only part of the communication system that is specifically defined by the standard.

The other components (as illustrated in Figure 1 below) represent your equipment, your plant or shop communications network, and your software application.

Network – The physical connection between a data source (device) and the data consumer (application).

Typically, this is an Ethernet network. The communication on the network normally uses standard network communications methods – HTTP protocol. It should be noted that the MTConnect structure is adaptable and can be implemented in conjunction with other networking solutions other than Ethernet and Internet protocols.

Application (Client) – The application is the actual requestor and consumer of MTConnect data.

Typical

functions of the application are to request, store, manipulate and display data. The Application includes

a function called the Client which initiates all requests for MTConnect data. The Client is a software

function in the application that actually requests data from the Agent and translates that data into the

format required for the application.

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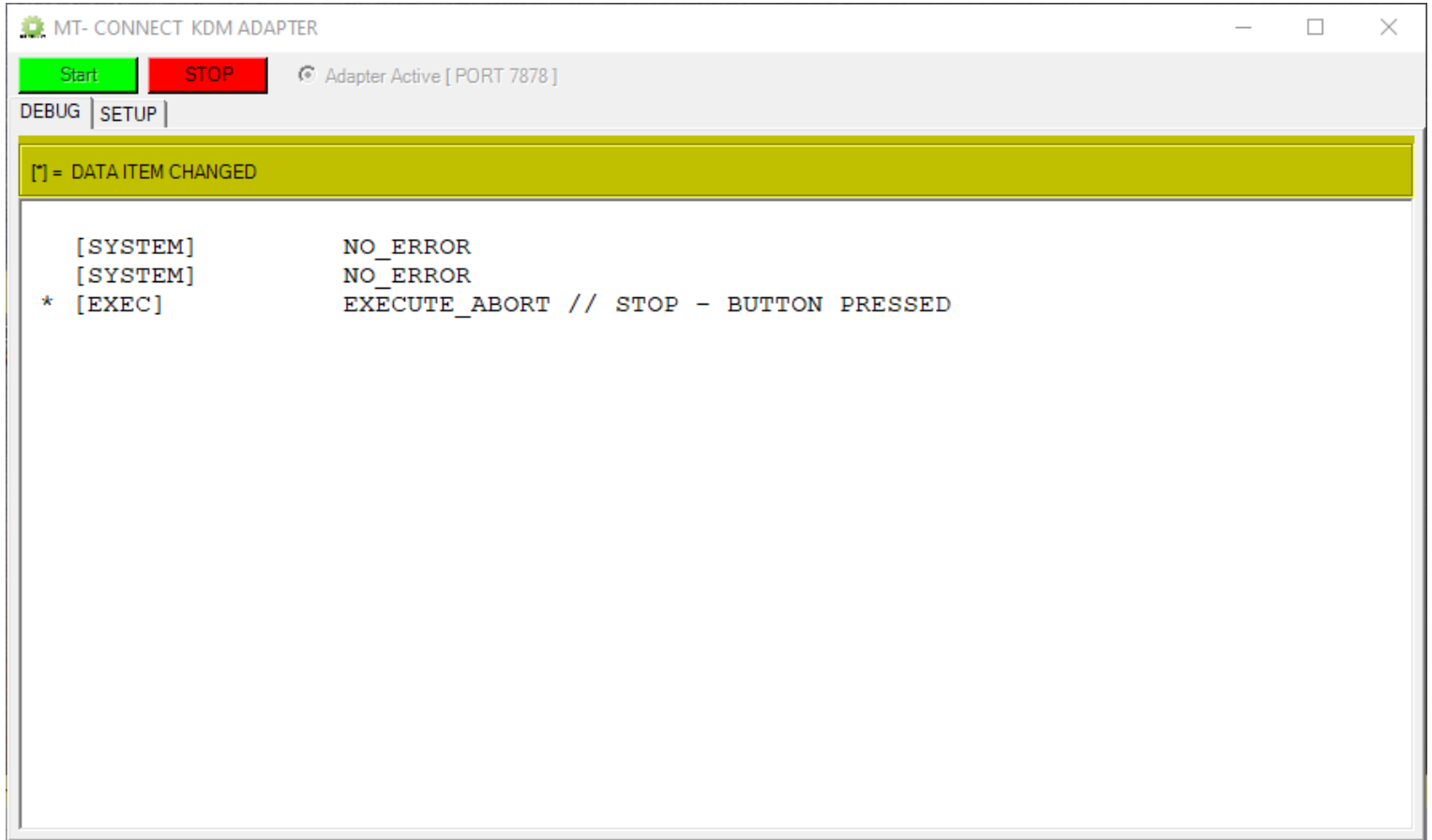
KDM Software Manual

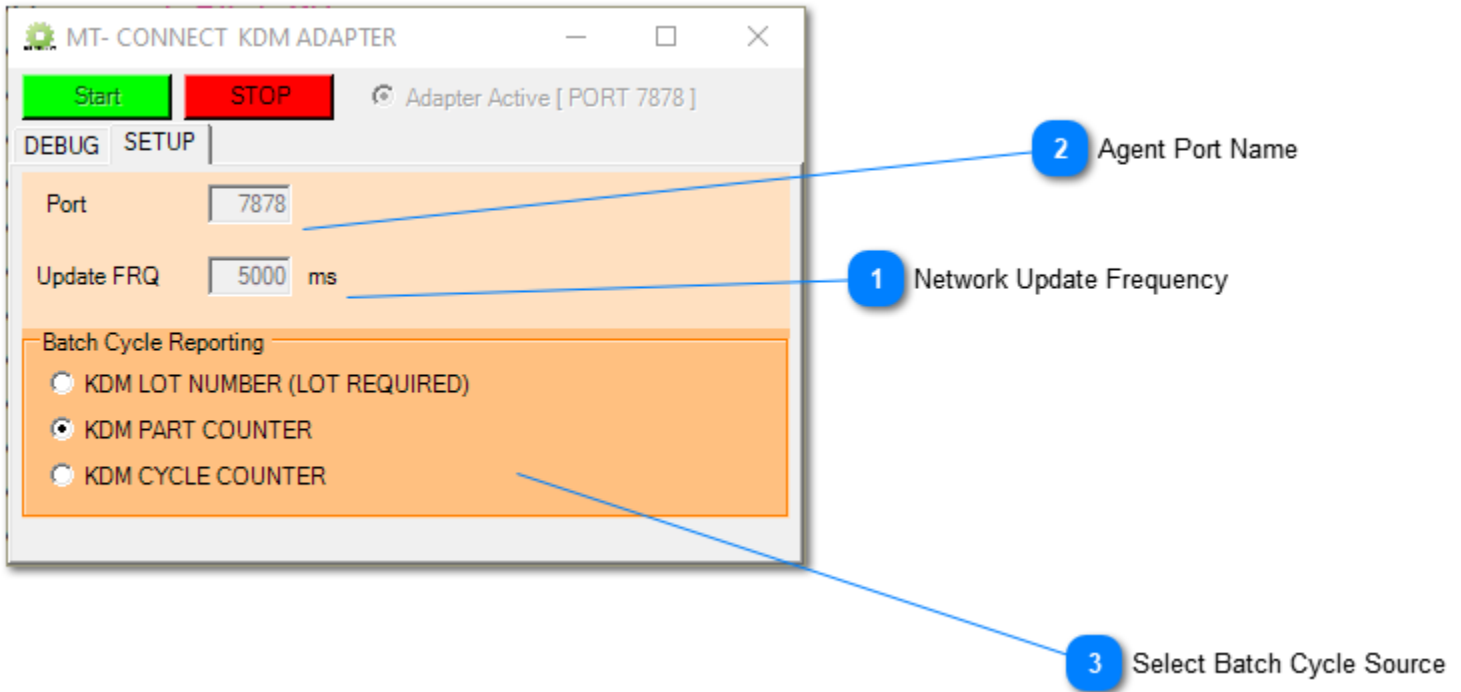
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KDM ADAPTER SETUP WINDOW

The Adapter setup window has a trace window that will show all changes to the data items

The updated values / states will be available on the Network (Agent) after the next update cycle (see Setup below)





1 Network Update Frequency

Update FRQ | 5000 ms

Adapter update frequency to the Agent (min 500ms)

Changes are only reflected on the Network once the Agent has been updated

2 Agent Port Name

Port | 7878

Default port is 7878

3 Select Batch Cycle Source

Batch Cycle Reporting

- ☐ KDM LOT NUMBER (LOT REQUIRED)
- ☒ KDM PART COUNTER
- ☐ KDM CYCLE COUNTER

In a typical KDM MTCONNECT setup there are two counters available

Timestamp	Type	Sub Type	Name	Id	Sequence	Value
2021-11-30T05:23:04.1510261Z	PartCount		machinecycle	cnt1	727	UNAVAILABLE
2021-11-30T05:23:04.1510261Z	PartCount		batchcycle	cnt2	728	UNAVAILABLE

(depending on you're setup these counters might be named differently or not available)

1. **NOT** resettable machine counter [machinecycle]

2. Resettable batch Counter [batchcycle]

For the resettable batch counter there are three different sources available

- a. KDM Part Counter
- b. KDM Cycle Counter

c. KDM LOT Counter (This requires the KDM production environment to be active)

Auxiliary Axis (DLL)

CanOpen is use to control the Auxiliary axis (Auxiliary Axis can not be interpolated)
The DLL allows the setup of multiple axis through a .cod file

Typical applications are:

- Motor Driven FO / HO head

Control of the Auxiliary Axis

- G450 has been defined for the auxiliary axis

Basic Syntax

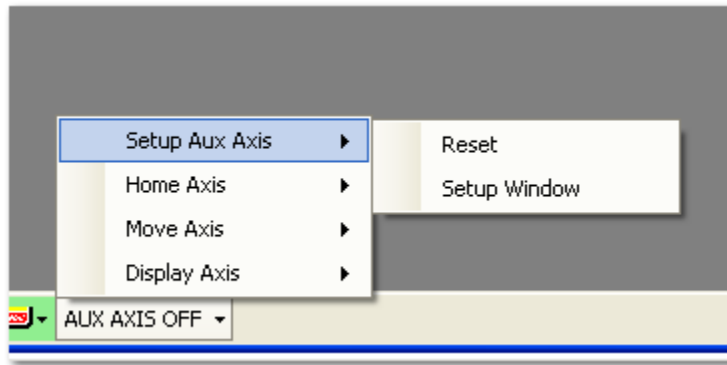
G450 C ?? Q ?? F2000

The Commands are uploaded from the .cod file

Currently the following commands are defined

- | | |
|-------------------|---|
| - G450 C01 | - Home Auxaxis_0 |
| - G450 C02 Q-1.25 | - Move Absolute Auxaxis_0 |
| - G450 C03 Q1.25 | - Move Relative Auxaxis_0 |
| - G450 C04Q[#??] | - READ Position for Auxaxis_0 into Variable |

Auxiliary Axis Drop Down



Once the Aux Axis DLL is loaded a new drop down will be visible at the bottom of the KDM main screen. The following menu items & sub menus are available:

- Display Axis

Select the Axis name to be displayed (position display) from the dropdown list

- Move Axis

Select the Axis to be moved - The [Move Window](#) will show

- Home Axis

Select the Axis to be homed from the dropdown list

- Setup Aux Axis

- Reset

This will try to reinitialize the CanOpen network and the auxiliary axis

- Setup Window

This will open the [SETUP AUXILIARY AXIS Window](#)

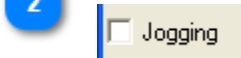
Move Window



1 STOP button



2 Jogging check



3 Client area



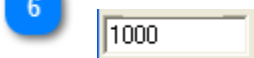
4 Edit field



5 GO button

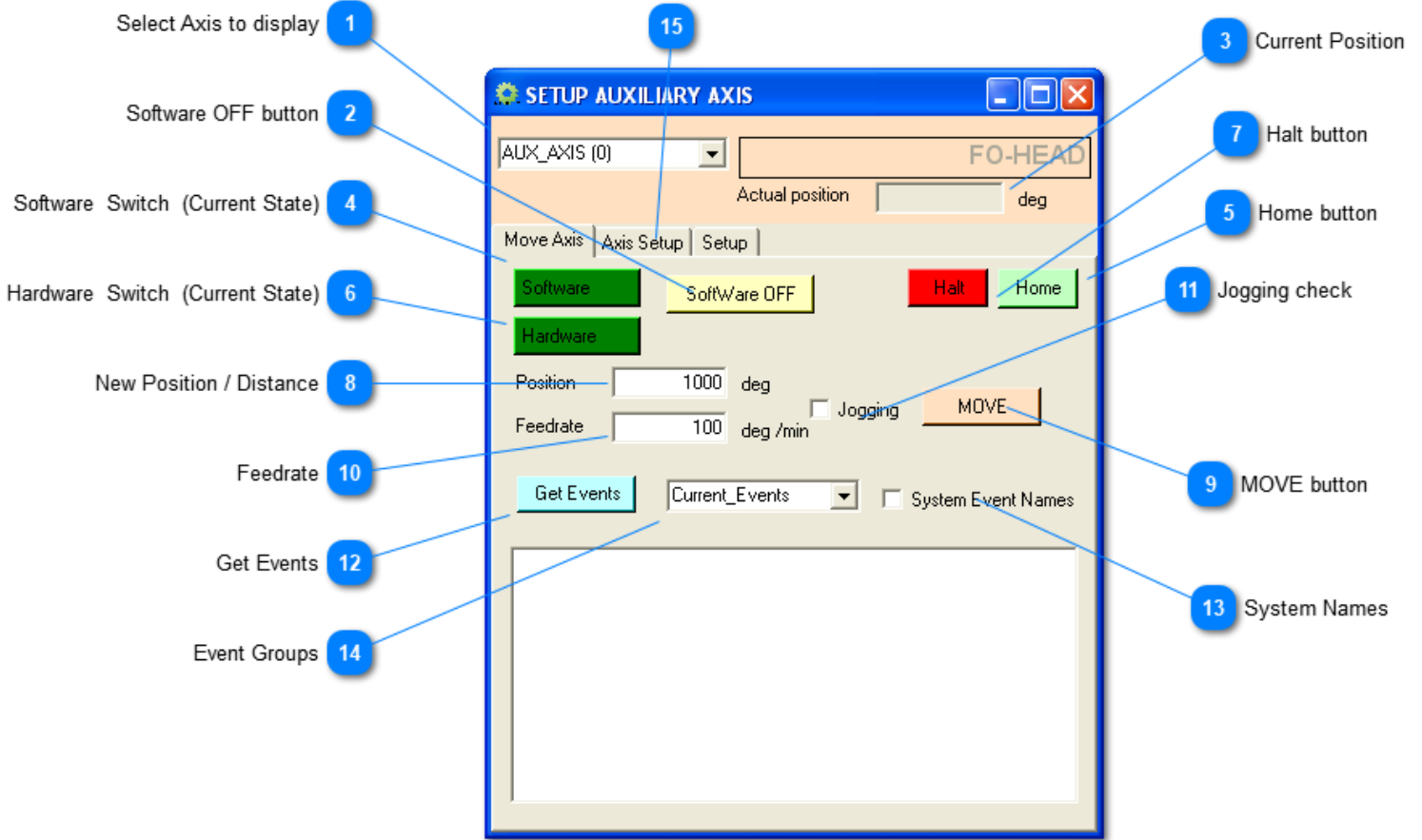


6 Edit field

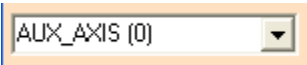


Setup Auxiliary Axis Window

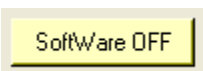
Axis setup



1 Select Axis to display



2 Software OFF button

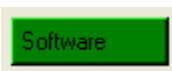


This will turn the Amp software switch on/off

3 Current Position



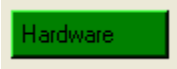
4 Software Switch (Current State)



5 Home button



6 **Hardware Switch (Current State)**



7 **Halt button**



8 **New Position / Distance**

9 **MOVE button**



10 **Feedrate**

11 **Jogging check**

☐ Jogging

12 **Get Events**



13 **System Names**

☐ System Event Names

Select if the list will display the System or Custom names for the events

Custom names = Same as what will be displayed in the message box

System names = Actual name of the event defined by the Copley CanOpen Implementation

14 **Event Groups**

Select the event group to be selected

15

Axis setup

Select tab [setup Axis](#)

Setup Axis

Apply New Settings

1

Axis setups Values

2

The screenshot shows the 'Setup Axis' dialog box. Callout 1 points to the 'Apply New Settings' button at the top. Callout 2 points to the input fields for SPU, Max Velocity, Acceleration, and Deceleration. Callout 3 points to the 'Goto 0 Pos' checkbox under the HOMING section. Callout 4 points to the 'Home Offset' input field. Callout 5 points to the 'Home FastMove' input field.

SPU	2000
Max Velocity	500 u/u
Acceleration	500 u/u^2
Deceleration	500 u/u^2

HOMING

Home Sequence	23
Home Offset	2 deg
Home FastMove	2000
Home SlowMove	500
Home Accel	250

☒ Goto 0 Pos

4 Home offset value

3 Move to 0 Position after homing

5 Homing Settings

1

Apply New Settings

Apply New Settings

Update the axis setup with the changes

*** None of the changes made in this window will be permanent ***

Once you find settings that will work, you will need to update the .cod config file with the desired values

2

Axis setups Values

This block shows a close-up of the input fields for SPU, Max Velocity, Acceleration, and Deceleration, all with values of 500 or 2000 and units of u/u or u/u^2.

SPU	2000
Max Velocity	500 u/u
Acceleration	500 u/u^2
Deceleration	500 u/u^2

3

Move to 0 Position after homing

☒ Goto 0 Pos

4

Home offset value

This block shows a close-up of the 'Home Offset' input field, which contains the value 2.

Home Offset	2
-------------	---

This offset will be applied after homing

5 Homing Settings

	23
	2
	2000
	500
	250

Production Setup

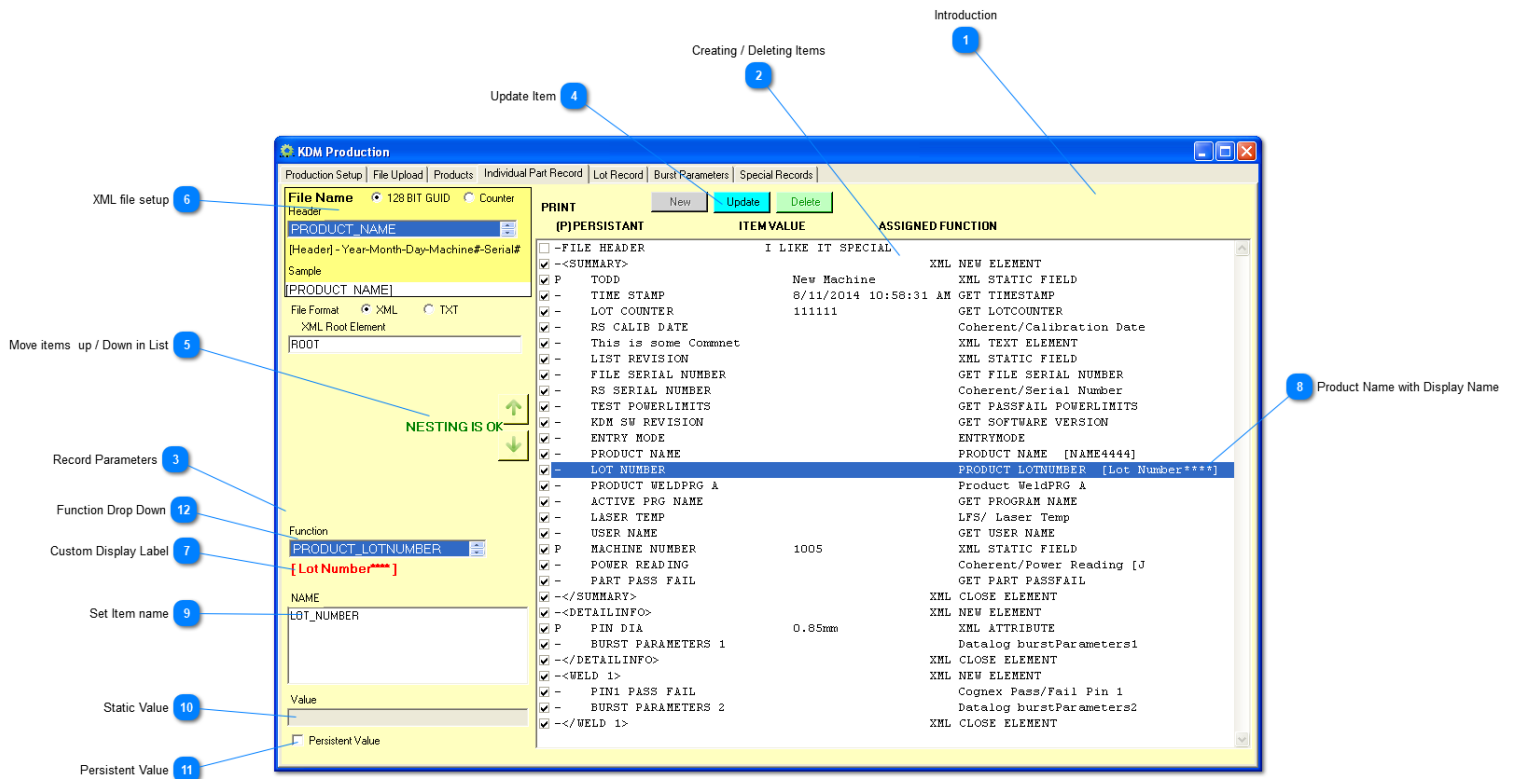
The Production Setup is where you should start if you're planning on using the [Start Job](#) (production environment) or the [Custom GUI](#)

- Production Setup by itself is not a DLL , but the [Configuration file](#) for the Production needs to be enabled

You should start by :

- Assign [Display Names](#) to product names
- Creating the static and dynamic [part records](#) , as those variables will be used by both the [Custom GUI](#) and the [Start Job](#)

Part Record

[Introduction](#)

1

Introduction

For setting up a production Environment, this is really where it really all starts

This screen allows you to define the entries that will be used (or can be used) in individual part record xml file
In reality it allows you to create custom entries that can be use throughout the production Environment and the custom GUI.

Once the items are created, you can then decide in what log they should appear

Only items marked in the column [Print to DataFile] will be part of the individual part record

I would strongly recommend to put all items not used in the part record on top of the list

A little bit of understanding of the basic xml syntax is required to shape the output file correctly

There are two main item types

- Persistent (Value won't change between different parts)
 - This value will only be loaded if the variable is empty = Serial Number of a Power Meter
- Dynamic (This value could change with every part)
 - This value will be read every time we create a part log (Program Cycle time, Cognex pass / fail flag)

2

Creating / Deleting Items

PRINT		
New Update Delete		
(P) PERSISTANT	ITEM VALUE	ASSIGNED FUNCTION
<input type="checkbox"/> -FILE HEADER	I LIKE IT SPECIAL	
<input checked="" type="checkbox"/> -<SUMMARY>		XML NEW ELEMENT
<input checked="" type="checkbox"/> P TODD	New Machine	XML STATIC FIELD

- Select [NEW] to add anew item at the bottom of the list - set the new [Item Parameters](#) - [Update Item](#)
- Select Item in list - then [DELETE] to delete the entry
- To edit an entry, select if from the list, then right click - select edit entry from drop down- set the new [Item Parameters](#) - [Update Item](#)

3

Record Parameters

Function
 PRODUCT_LOTNUMBER
 [Lot Number***]

NAME
 LOT_NUMBER

Value

☐ Persistent Value

Select function from the dropdown -based on that fields will be enabled / disabled

The list of available functions changes based on the currently enabled external devices (Cognex, Power meter...)

4

Update Item

Update

5

Move items up / Down in List

NESTING IS OK

↑

↓

Move Items up and down until they are in the desired position

The correct XML opening and closing nodes need to be present

6

XML file setup

File Name ☒ 128 BIT GUID ☐ Counter

Header
PRODUCT_NAME

[Header] - Year-Month-Day-Machine#-Serial#

Sample
[PRODUCT_NAME]

File Format ☒ XML ☐ TXT

XML Root Element
ROOT

Select desired file serialization type (GUID or Counter)

Select desired Header

Select Output format

Set Root element (If XML file type) - unless otherwise desired, "ROOT" is the standard

7 Custom Display Label

[Lot Number****]

You can add a display Label to all product names by customizing it in the [Products Setup](#)

If you added a display label it will show here in square brackets (no text will show if you don't assign a display label)

8 Product Name with Display Name

PRODUCT LOTNUMBER [Lot Number****]

A custom display name [Lot Number****] has been assigned to PRODUCT_LOTNUMBER

9 Set Item name

NAME
LOT_NUMBER

Assign a unique name to the record item

No white spaces allowed !

10 Static Value

Value

Assign a static value to the record

Example:

You could create a new record

- Select **XML_STATIC_FIELD** from the Function [Dropdown](#)
- [Name](#) the new item item "**Station ID**"
- Assign "**PRESS 10**" as a [static value](#)
- Make it a [persistent](#) value

You can use the new Record [Station ID = PRESS 10] to be displayed in the Custom GUI or in any of the production logs

11 Persistent Value

☐ Persistent Value

Select if the value should be updated every cycle or only on the first cycle (persistent)

12

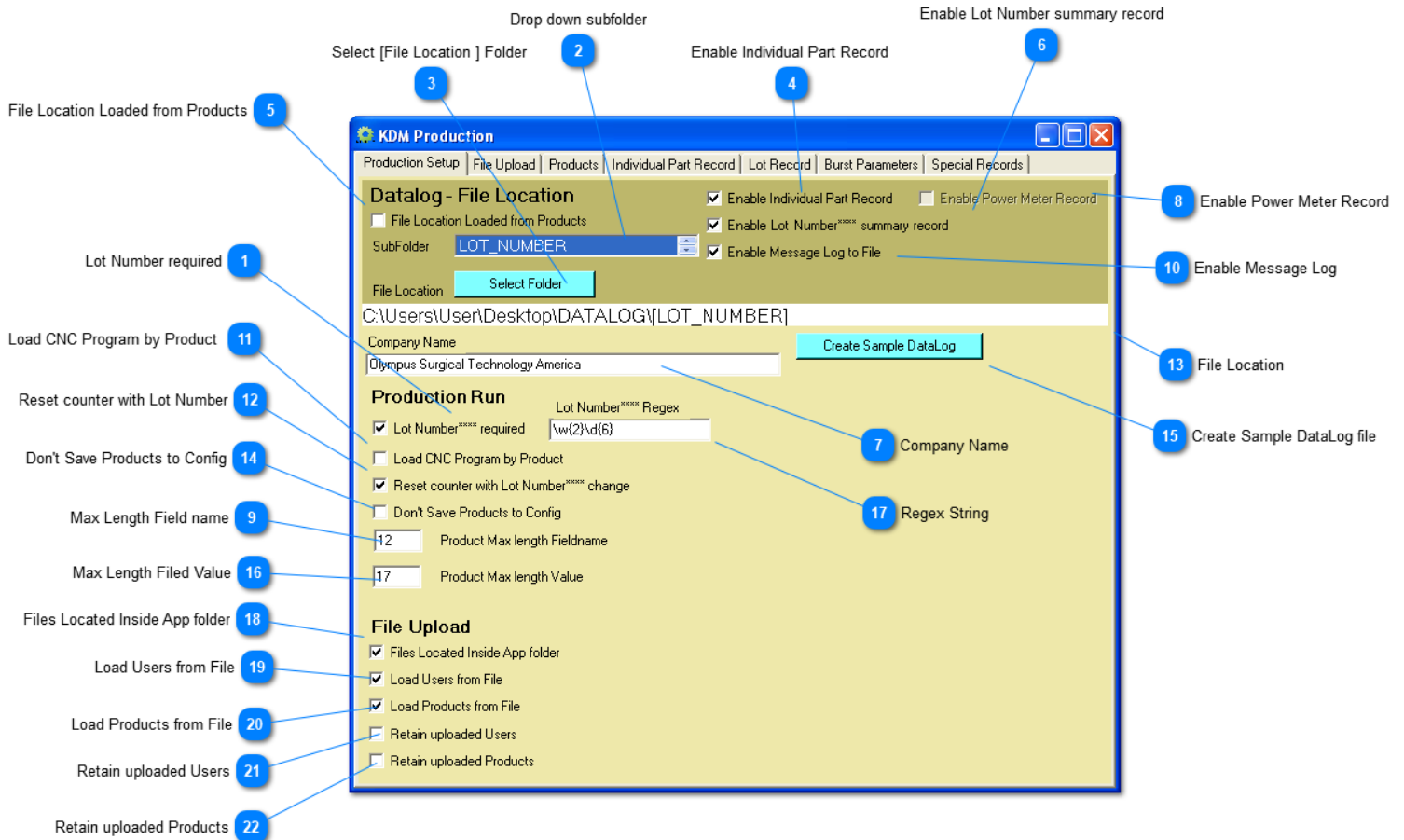
Function Drop Down

FUNCTION

PRODUCT_LOTNUMBER



Production Main Screen



1 Lot Number required

☒ Lot Number**** required

If checked, a valid Lot number is required for starting any job
Valid = matches the defined [Regex](#) string

2 Drop down subfolder

LOT_NUMBER

Select the sub folder to be created for the lot files

Any line items specified in the lot records can be used as a subfolder

Example:

*If you select the Lot Number, a new folder will be created every time the Lot Number changes
All lot files will be stored on this newly created folder*

3 Select [File Location] Folder

Select Folder

4 Enable Individual Part Record

☒ Enable Individual Part Record

Enabled this will generate a new log file for each part produced (each cycle)

5 File Location Loaded from Products

☐ File Location Loaded from Products

If checked , the File location for the part logs will be loaded from the product .xml (each product could have a different file location)

If unchecked, Part logs will be saved in the preset [File location](#)

6 Enable Lot Number summary record

☒ Enable Lot Number^{xxxx} summary record

If checked this will generate a lot file containing info about every part made in this lot

7 Company Name

Olympus Surgical Technology America

Company Name to be displayed on the various log records

If the DLL is not installed with a valid license, the customer name will be replaced by "Kohler Design"

8 Enable Power Meter Record

☐ Enable Power Meter Record

If a power meter is available , this will generate a power meter record log

9 Max Length Field name

12

Limit the max length for a custom Field name to make sure it can be displayed on the various forms and list's

10 Enable Message Log

☒ Enable Message Log to File

This will save all program messages generated for a lot number

11 Load CNC Program by Product

☐ Load CNC Program by Product

If checked, the uploaded .xml product file will determine what program to run

12 Reset counter with Lot Number

☒ Reset counter with Lot Number^{xxxx} change

If checked , the production counter will be reset with anew Lot Number

13 File Location

C:\Users\User\Desktop\DATALOG\[LOT_NUMBER]

14 Don't Save Products to Config
☐ Don't Save Products to Config

Products can be entered manually or uploaded with an xml file

If this box is checked, no products will be saved to the production configuration file

This means that all manual changes made to the product info will be lost at reboot

If you upload ALL products (don't allow engineers to create temporary products) then this checkbox should be checked

15 Create Sample DataLog file

This will create a sample Datalog file on the desktop

16 Max Length Filed Value

Limit the max length for a custom value to make sure it can be displayed on the various forms and list's

17 Regex String

Regex string to be used to test the Lot number

18 Files Located Inside App folder
☒ Files Located Inside App folder

All xml files to be uploaded are located inside the application folder (Only the file name will be displayed when selecting a file)

19 Load Users from File
☒ Load Users from File

Upload users from XML File

20 Load Products from File
☒ Load Products from File

Upload Products from XML File

21 Retain uploaded Users
☐ Retain uploaded Users

This will not override existing users when uploading from the xml file

This means, that you could manually make changes to the user on the machine and retain those changes

If checked, changes made to the xml file to be uploaded will not have an effect on this machine

22 Retain uploaded Products
☐ Retain uploaded Products

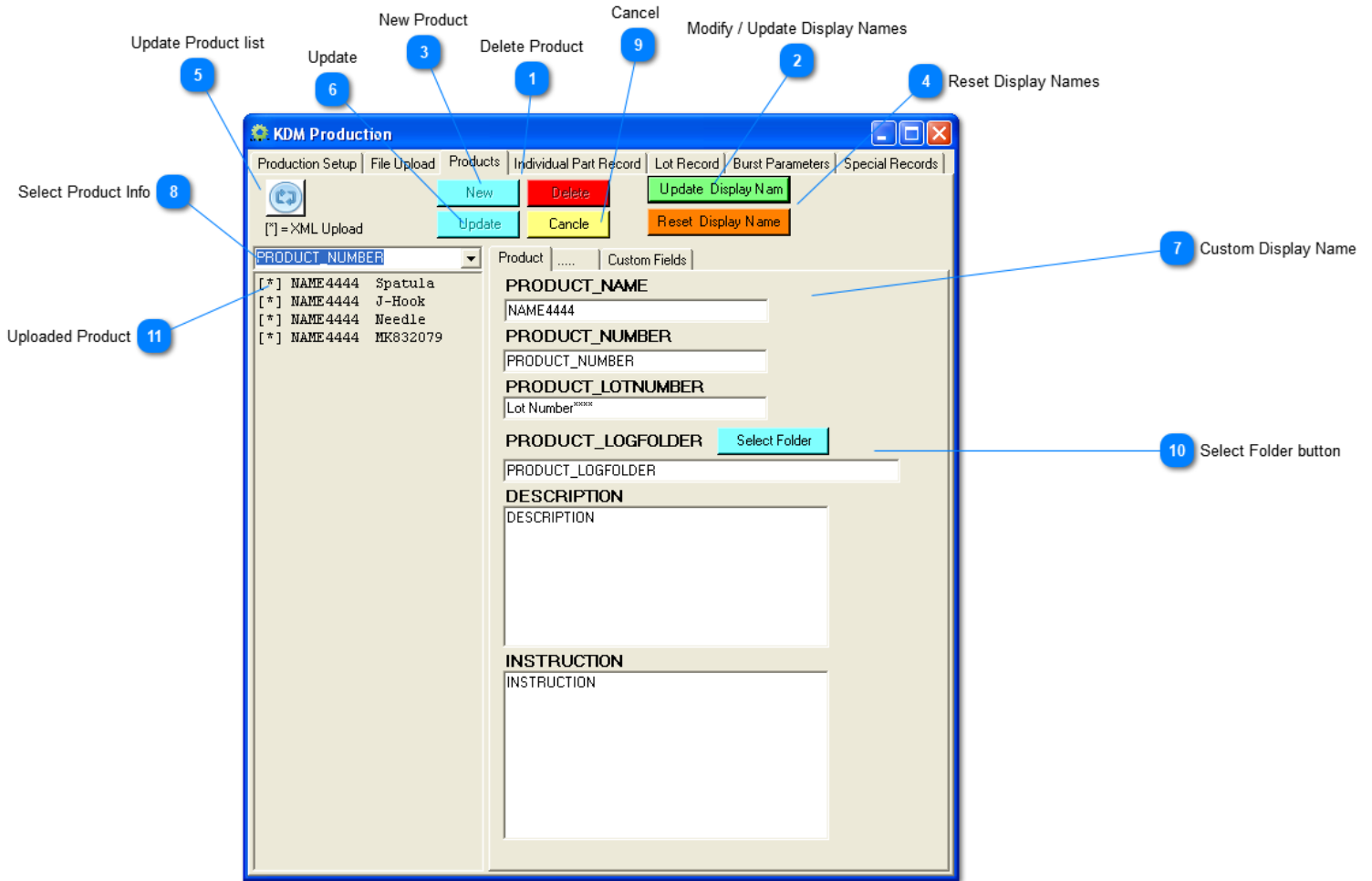
KDM Software Manual

This will not override existing products when uploading from the xml file

This means, that you could manually make changes to the products on the machine and retain those changes

If checked, changes made to the xml file to be uploaded will not have an effect on this machine

Products Setup (Display Names)



1 Delete Product



2 Modify / Update Display Names



Select this button if you'd like to assign custom labels

- To use the standard name , leave the display name the same as the system name
- To disable the field throughout the software, clear the display name
- To assign a custom display name change the display name to you're liking

The software internally will still use the system name , but in log files, the GUI and the Start Job window the display Label will be used

Example:

PRODUCT_NAME is the system name for the Product Name - If you're fine with this Label in you're production log's then nor action is needed

If you prefer to use a custom name (NAME444 In this example) then assign this custom label to PRODUCT_NAME

*Throughout the software the Display Label will be NAME444 for the ProductName - when selecting a function, the display name will be added in [] brackets
PRODUCT_NAME [NAME444]*

3 New Product



4 Reset Display Names

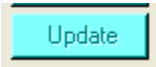


Delete all custom display names

5 Update Product list



6 Update



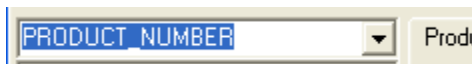
7 Custom Display Name



Assign a custom display name

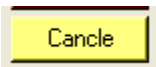
- *Clearing the entry for the display name will disable the product field throughout the software*

8 Select Product Info

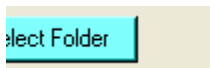


Select the product Info you'd like to list in the product list below

9 Cancel



10 Select Folder button

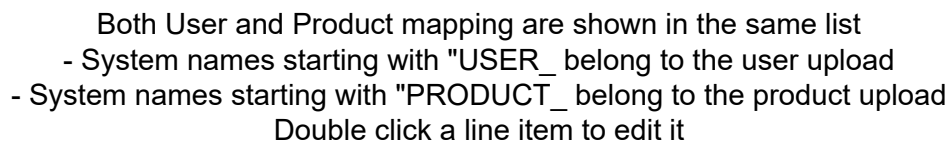


11

Uploaded Product



Products marked with [*] have been uploaded at startup from a file



Reload Products

Select Product File

Select File

3

Select User File

Select File

4

Reload Users

Reload Users

Reload user File

5

Save

Save

Save XML upload Mapping

6

XML Name

Name

7

XML Element Name

XML Element Name

8

List of XML system Names

```
USER_ROOT
USER_NODE
USER_FILEREV
USER_NAME
USER_ID
USER_PASSWORD
USER_LEVEL
PRODUCT_ROOT
PRODUCT_NODE
PRODUCT_FILEREV
PRODUCT_NAME      [NAME4444]
PRODUCT_NUMBER
```

List of all available System names that can be assigned

If a custom display name has been assigned to system field, it will be shown in [] brackets

PRODUCT_NAME [NAME4444]

9

XML names in Upload file

```

>> Users
>> User
>>
>> Name
>> OperatorID
>> Password
>> Role
>> Products
>> Product
>>
>> Name
>> ProductNumber

```

Assign the name used in the XML file to be uploaded

10

Upload mapping

```

USER_NAME                                >> Name

```

Double click a line item to edit the entry

Sample:

The custom xml file to be uploaded has a node named "**Name**" that will be mapped to the system name "**USER_NAME**"

**** IMPORTANT ****

The xml nodes in the custom XML file to be uploaded need to be in the **SAME ORDER** as shown in the mapping list !

11

XML Root/ Node Names

```

USER_ROOT                                >> Users
USER_NODE                                >> User

```

Match these entries to you're xml file **ROOT** and **NODE** Names (do the same for the Production Root / Node names)

Lot Record

Include Lot Number **1**

File Header Name **2**

Include in Lot Record **3**

KDM Production

Production Setup | File Upload | Products | Individual Part Record | **Lot Record** | Burst Parameters | Special Records

File Name ☒ Include Lot Number

File Header

Sample Name

[LotNumber]

Print to Lot Record

<input type="checkbox"/> -FILE HEADER	I LIKE IT SPECIAL	XML NEW ELEMENT
<input type="checkbox"/> -<SUMMARY>		XML STATIC FIELD
<input type="checkbox"/> P TODD	New Machine	GET TIMESTAMP
<input type="checkbox"/> - TIME STAMP	8/11/2014 12:51:43 PM	GET LOTCOUNTER
<input type="checkbox"/> - LOT COUNTER	111111	Coherent/Calibration Date
<input type="checkbox"/> - RS CALIB DATE		XML TEXT ELEMENT
<input type="checkbox"/> - This is some Comment		XML STATIC FIELD
<input type="checkbox"/> - LIST REVISION		GET FILE SERIAL NUMBER
<input checked="" type="checkbox"/> - FILE SERIAL NUMBER		Coherent/Serial Number
<input type="checkbox"/> - RS SERIAL NUMBER		GET PASSFAIL POWERLIMITS
<input checked="" type="checkbox"/> - TEST POWERLIMITS		GET SOFTWARE VERSION
<input type="checkbox"/> - KDM SW REVISION		ENTRYMODE
<input type="checkbox"/> - ENTRY MODE		PRODUCT NAME [NAME4444]
<input type="checkbox"/> - PRODUCT NAME		PRODUCT LOTNUMBER [Lot Number****]
<input type="checkbox"/> - LOT NUMBER		Product WeldPRG A
<input type="checkbox"/> - PRODUCT WELDPRG A		GET PROGRAM NAME
<input checked="" type="checkbox"/> - ACTIVE PRG NAME		LFS/ Laser Temp
<input checked="" type="checkbox"/> - LASER TEMP		GET USER NAME
<input type="checkbox"/> - USER NAME		XML STATIC FIELD
<input type="checkbox"/> P MACHINE NUMBER	1005	Coherent/Power Reading [J
<input type="checkbox"/> - POWER READING		GET PART PASSFAIL
<input checked="" type="checkbox"/> - PART PASS FAIL		XML CLOSE ELEMENT
<input type="checkbox"/> -</SUMMARY>		XML NEW ELEMENT
<input type="checkbox"/> -<DETAILINFO>		XML ATTRIBUTE
<input type="checkbox"/> P PIN DIA	0.85mm	

The Lot record is a single file that will contain entries for all parts made for a given lot (changing the lot number will create a new file)

1 Include Lot Number

☒ Include Lot Number

2 File Header Name

3 Include in Lot Record

☒

Check mark all records you'd like to print in the Lot Record

Burst Parameters

Assigned RCU Burst #

1

Burst parameters to print

2

	Assigned Burst Index	Burst Parameters to Print
Datalog BurstParameter 1	<input type="text" value="1"/>	<input checked="" type="checkbox"/> Power
Datalog BurstParameter 2	<input type="text" value="2"/>	<input checked="" type="checkbox"/> Frequency
Datalog BurstParameter 3	<input type="text" value="3"/>	<input checked="" type="checkbox"/> Pulse Width
Datalog BurstParameter 4	<input type="text" value="4"/>	<input checked="" type="checkbox"/> Shape ID
Datalog BurstParameter 5	<input type="text" value="5"/>	<input checked="" type="checkbox"/> Ramp ID
		<input checked="" type="checkbox"/> Pulse Count
		<input checked="" type="checkbox"/> CW Mode
		<input checked="" type="checkbox"/> High Power Mode

This allows to keep track and recall multiple burst settings in single program

If you use different burst settings between Weld A & Weld B in the same program, you can keep track of the burst parameters and print them to the log (s)

The following is required for this to work:

- Assign a different burst index for each weld you like to store parameters for
- Download all parameters you like to print for each burst (regardless if it changes between the bursts)
 - Burst parameters get saved during downloading to the RCU, therefore if you don't download the parameter it won't be available for printing.

1

Assigned RCU Burst #

1
2
3
4
5

Assign the RCU Burst Index to be used with the data log burst

2

Burst parameters to print

Burst Parameters to Print

- ☒ Power
- ☒ Frequency
- ☒ Pulse Width
- ☒ Shape ID
- ☒ Ramp ID
- ☒ Pulse Count
- ☒ CW Mode
- ☒ High Power Mode

Select the individual burst parameters to be printed to the log (s)

Start Job (DLL)

The Start Job DLL is required to create production logs.
Once installed it will allow to select products and start jobs

Job Toolbar



Once the Start Job DLL is loaded the above buttons will be displayed in the standard Toolbar

1 Start Job



Will open the start Job Window

2 Stop Job

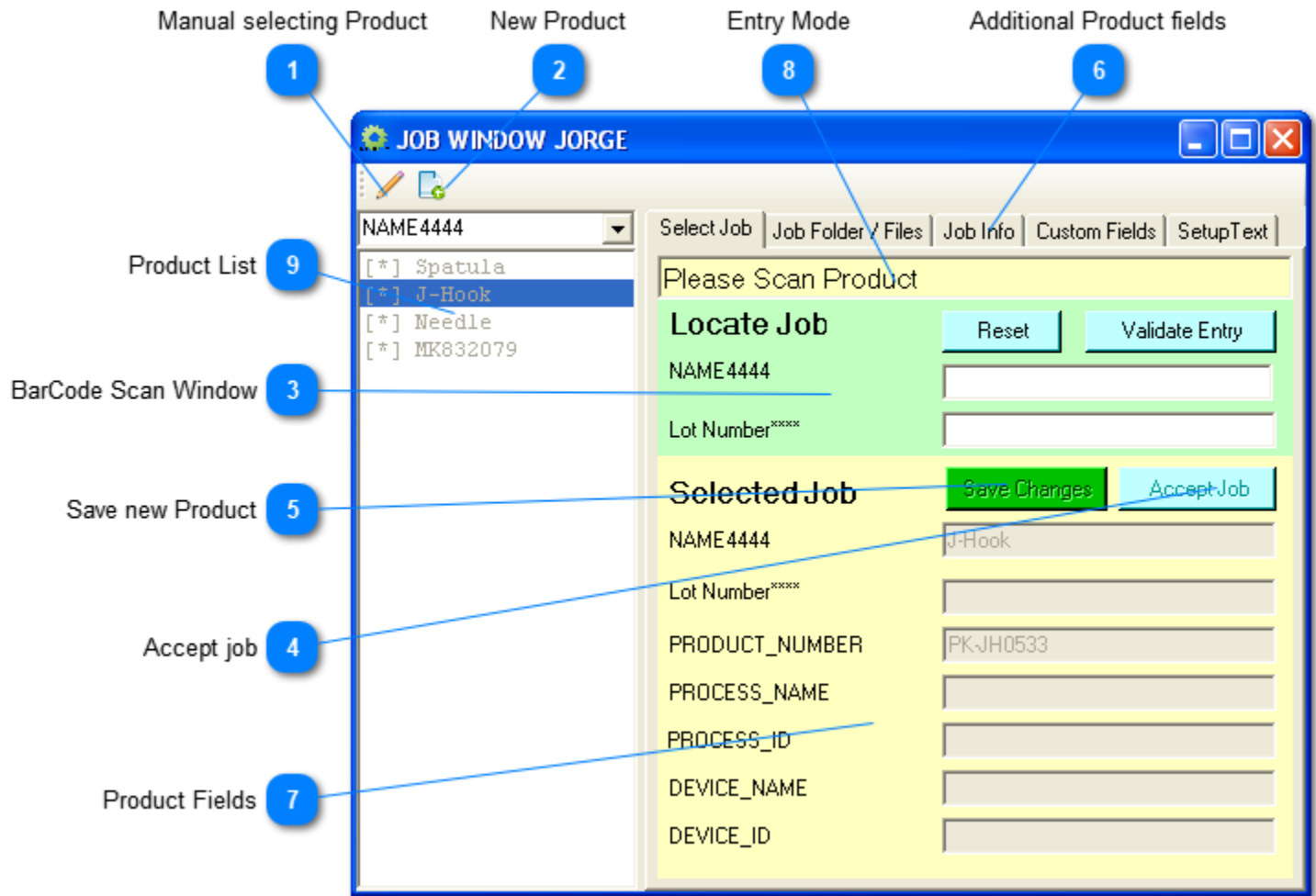


Will cancel the currently running Job

3 Active Job Name

ACTIVE JOB = NON

JOB WINDOW



Job-Start forms can be customized by Kohler Design Corp to you're needs

1 Manual selecting Product



Once selected it will allow you to select a Product from the dropdown or create a new Product
Depending on you're user Level this Button might not be available to you

2 New Product



3 BarCode Scan Window

The screenshot shows the 'Locate Job' section of the BarCode Scan Window. It has a green background and contains the following elements: a 'Reset' button, a 'Validate Entry' button, an input field for 'NAME4444', and an input field for 'Lot Number' with a placeholder 'xxxx'.

Scan both Product Name & Lot number (If required) then validate entry

If the entry is valid (Product found in list & valid Lot Number based on [Product setup](#)) the selected Product will be loaded and be ready to start

4 Accept job



Accept / Start Job

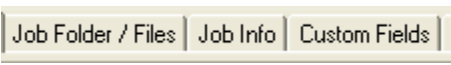
This button is only active if the job is validated

5 Save new Product



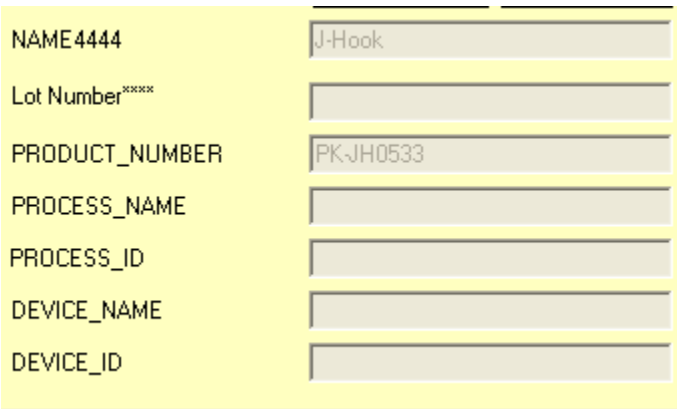
Save / update product with changes

6 Additional Product fields



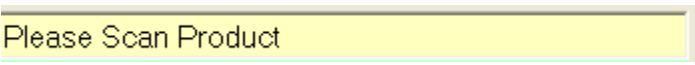
<

7 Product Fields



NAME4444	J-Hook
Lot Number****	
PRODUCT_NUMBER	PK-JH0533
PROCESS_NAME	
PROCESS_ID	
DEVICE_NAME	
DEVICE_ID	

8 Entry Mode



Scan or Manual mode

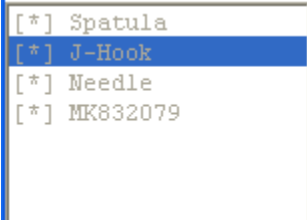
In Scan mode you can either have the scanner fill in the two lines or manually enter the data

- *Validation of the entries is required in Scan Mode*

In Manual mode you can select a Product from the [product List](#)

- *Validation is not required in this case*

9 Product List



- [*] Spatula
- [*] J-Hook
- [*] Needle
- [*] MK832079

Setup text

System Lable	
WindowName	>> JOB WINDOW JORGE
MSG_ScanMode	>> Please Scan Product
MSG_EditMode	>> Manual Enter Product In

Double click entry to change the custom text to be displayed
You need engineer permission to access this Tab

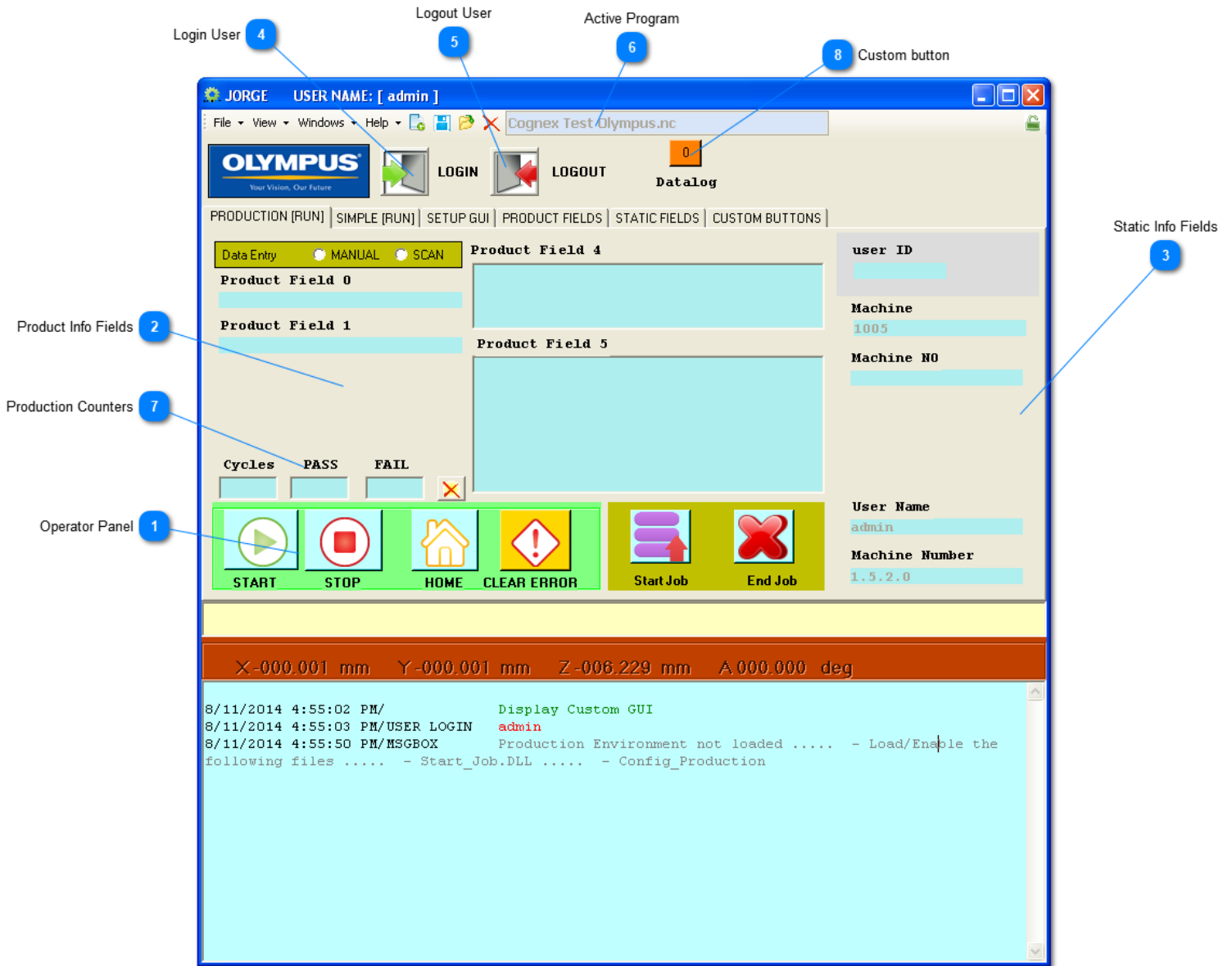
1 Update

Custom GUI (DLL)

Custom GUI is an overlay that will display a simplified Window to control the KOHLER DESIGN MOTION.

Shown is the standard GUI - Please contact Kohler Design Corp if you have special requirements regarding a Custom GUI

Custom GUI Main Window



1 Operator Panel



2 Product Info Fields

Product Field 0	
Product Field 1	Product Field 5

3 Static Info Fields

user ID
Machine
Machine NO
User Name
Machine Number

4 Login User



5 Logout User

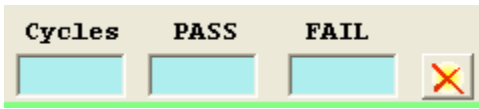


6 Active Program

Cognex Test Olympus.nc

7

Production Counters



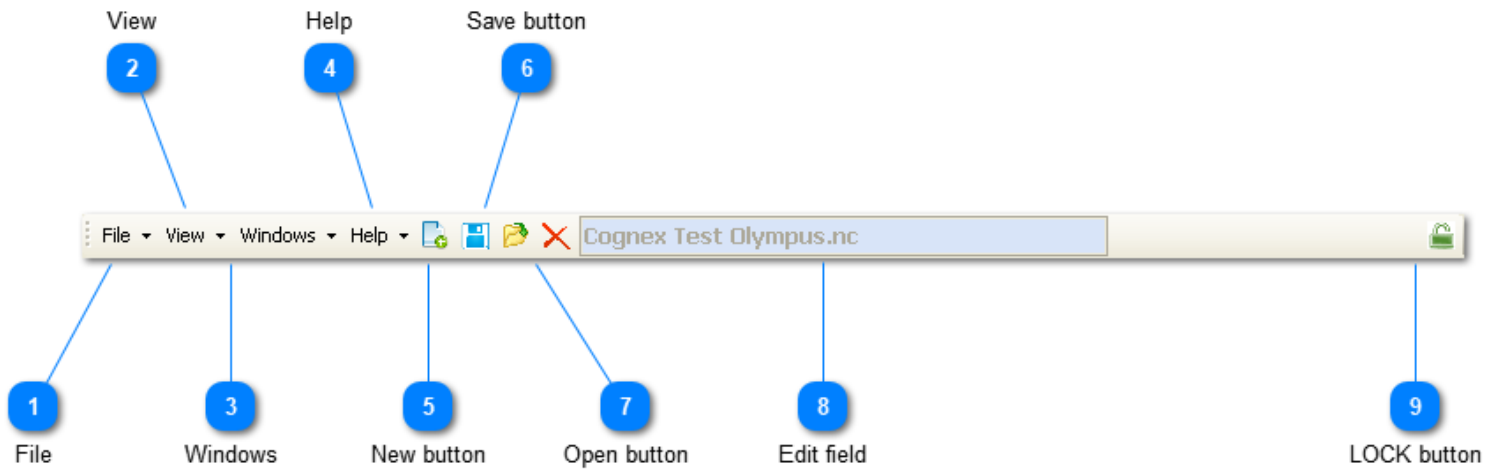
8

Custom button



Allows temporary switching to a different Program.
Up to 5 buttons can be [defined](#)

toolbar



1 File



2 View



3 Windows



4 Help



5 New button



6 Save button



7 Open button



8

Edit field

Cognex Test Olympus.nc

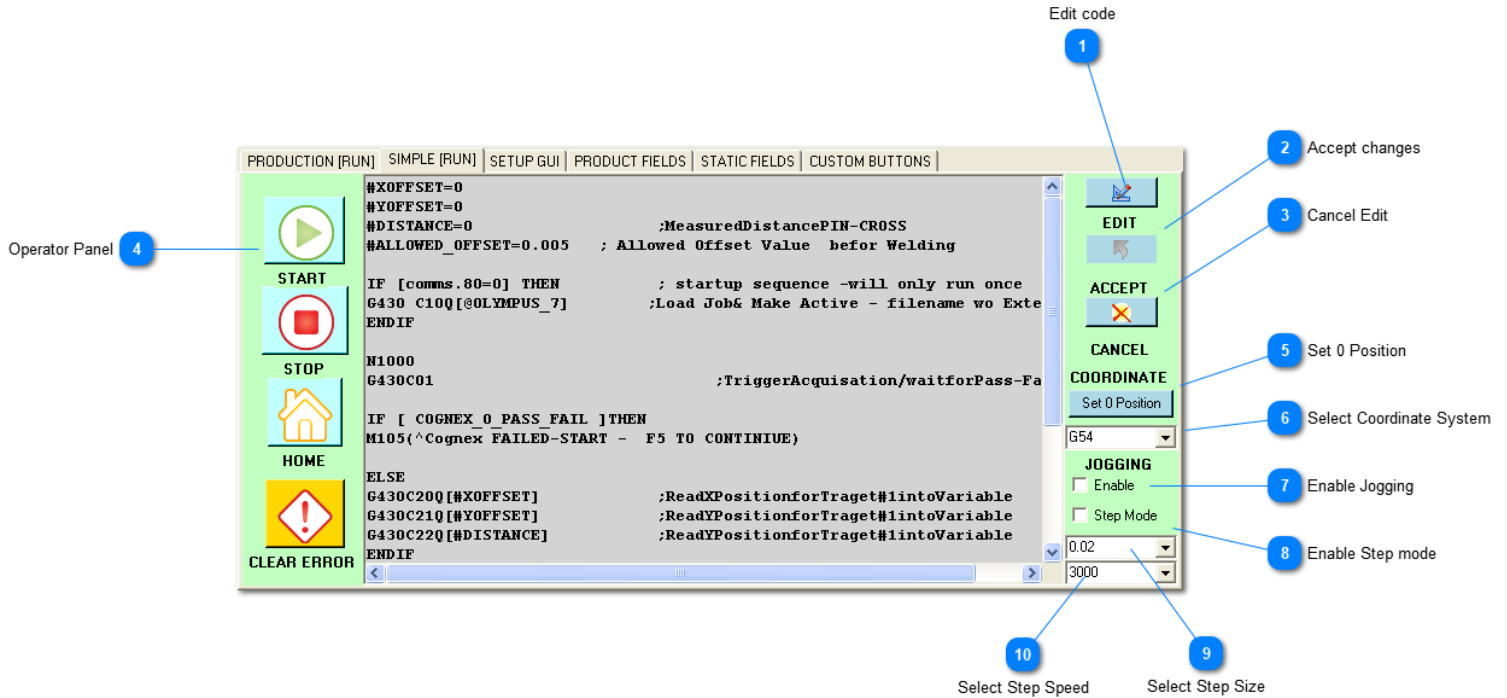
9

LOCK button

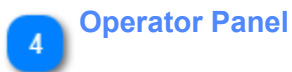
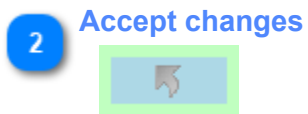


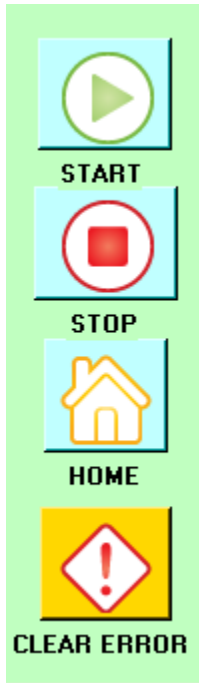
KDM Software Manual

Simple Run Window

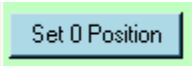


Simple run is a "dirty" way of making small changes to a program or run a different program without leaving the Custom GUI





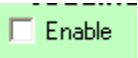
5 Set 0 Position



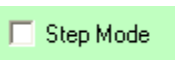
6 Select Coordinate System



7 Enable Jogging



8 Enable Step mode



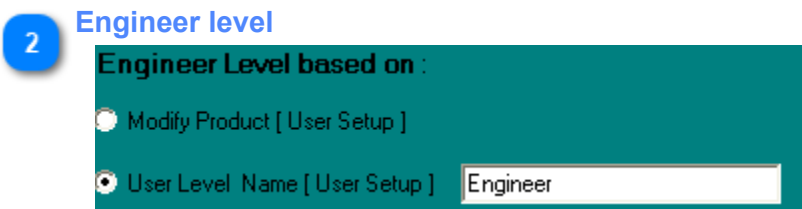
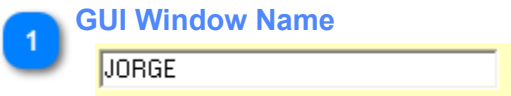
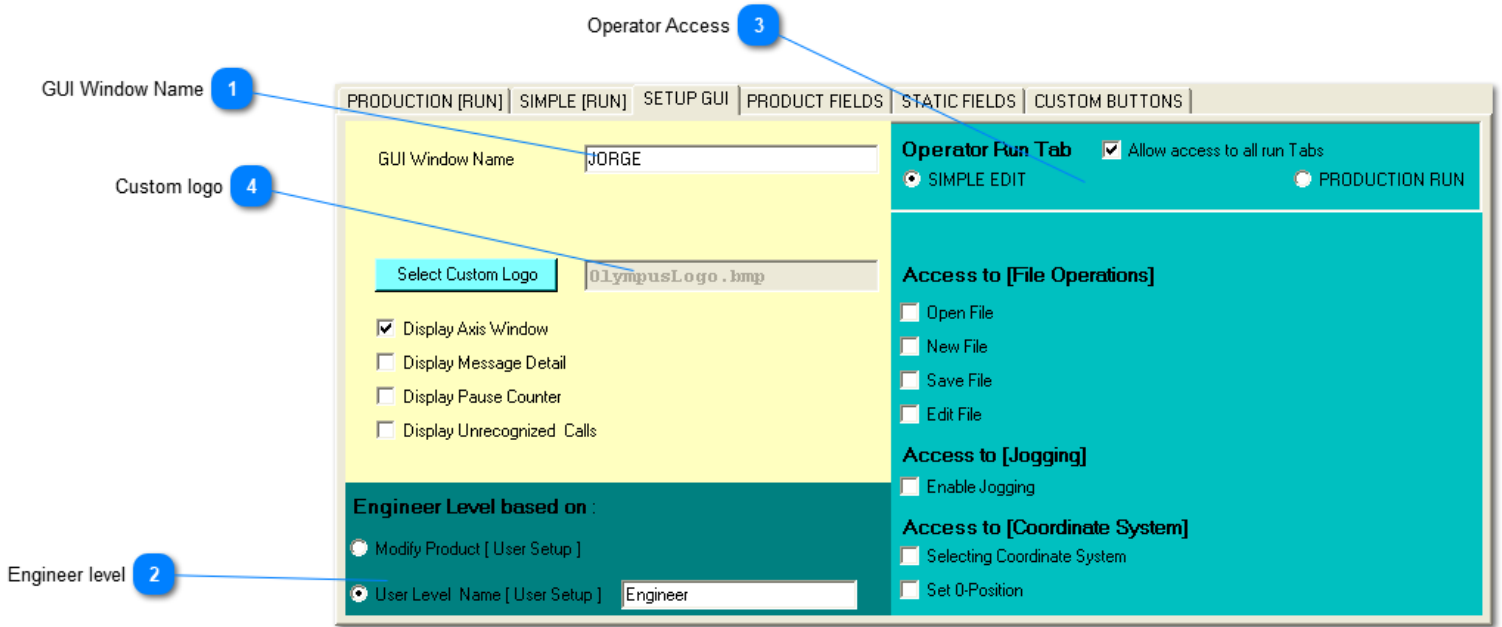
9 Select Step Size



10 Select Step Speed



Setup GUI



Determine what the engineer level is based on
Use modify Product or supply a user level name for the Engineer level from the user setup



Operator Run Tab ☒ Allow access to all run Tabs

☒ SIMPLE EDIT ☐ PRODUCTION RUN

Access to [File Operations]

- ☐ Open File
- ☐ New File
- ☐ Save File
- ☐ Edit File

Access to [Jogging]

- ☐ Enable Jogging

Access to [Coordinate System]

- ☐ Selecting Coordinate System
- ☐ Set 0-Position

Limit access for operators to Tab control

4

Custom logo

OlympusLogo.bmp

Select Custom logo to be displayed (File needs to be located inside the KDM Folder)

Setup Product Fields

Product Field List 2

Edit Production fields 1

1

Edit Production fields

Click on the radio button next to the static field you like to change

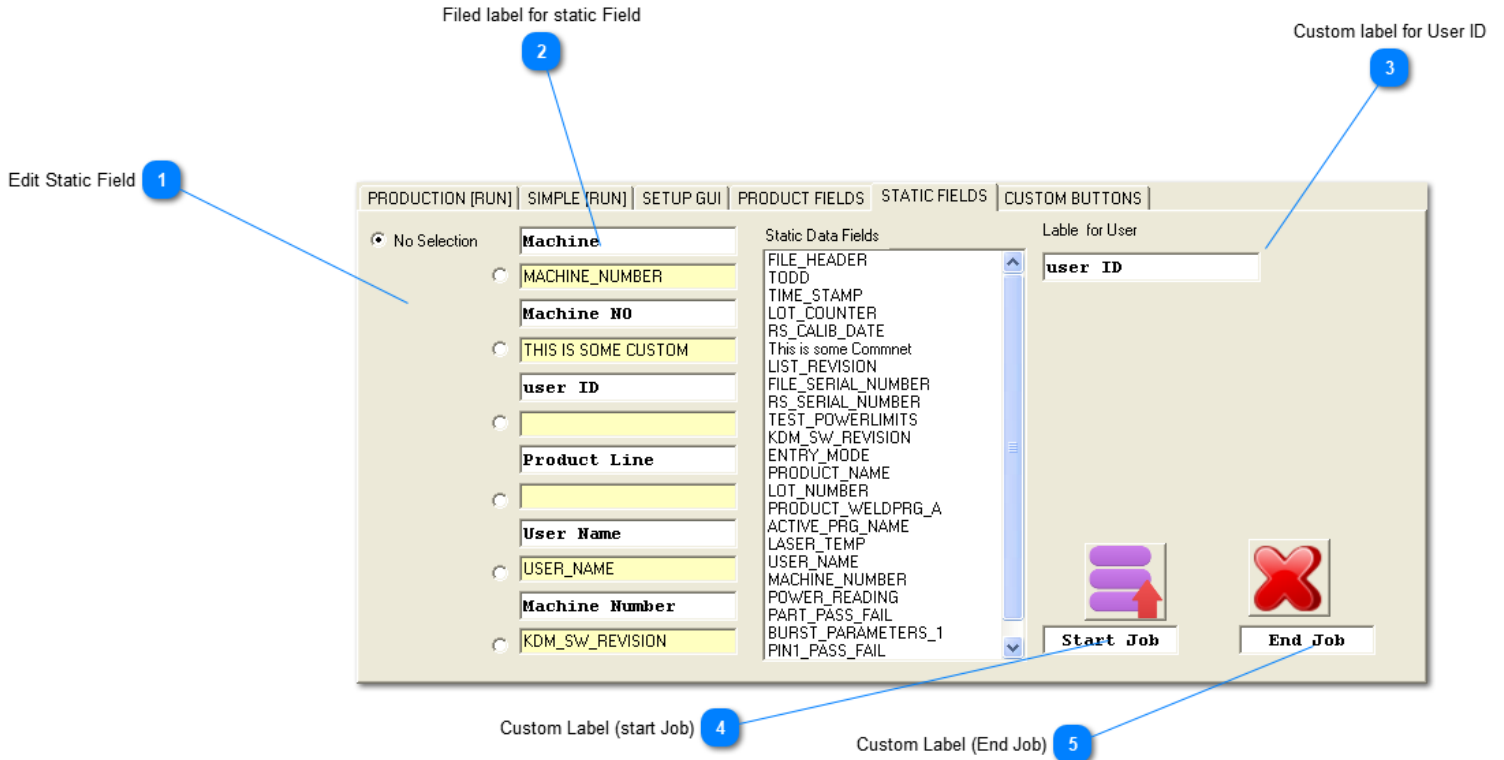
- Select a line item in the Product Field List
Static Data Fields are defined in the [production setup](#)

2

Product Field List

Displays a list of all available fields

Setup Static Fields



1 Edit Static Field

This close-up shows the 'Edit Static Field' section. It features a radio button labeled 'No Selection' and a list of static fields. The 'Machine' field is selected, and its label is 'Machine'. Other fields in the list include 'MACHINE_NUMBER', 'Machine NO', 'THIS IS SOME CUSTOM', 'user ID', 'Product Line', 'User Name', 'USER_NAME', 'Machine Number', and 'KDM_SW_REVISION'.

Click on the radio button next to the static field you like to change

- Change the static field label Name
- Select a line item in the Static Data Field List

Static Data Fields are defined in the [production setup](#)

2 Filed label for static Field

This close-up shows the 'Filed label for static Field' section. It features a text box containing the label 'Machine'.

3

Custom label for User ID

user ID

4

Custom Label (start Job)

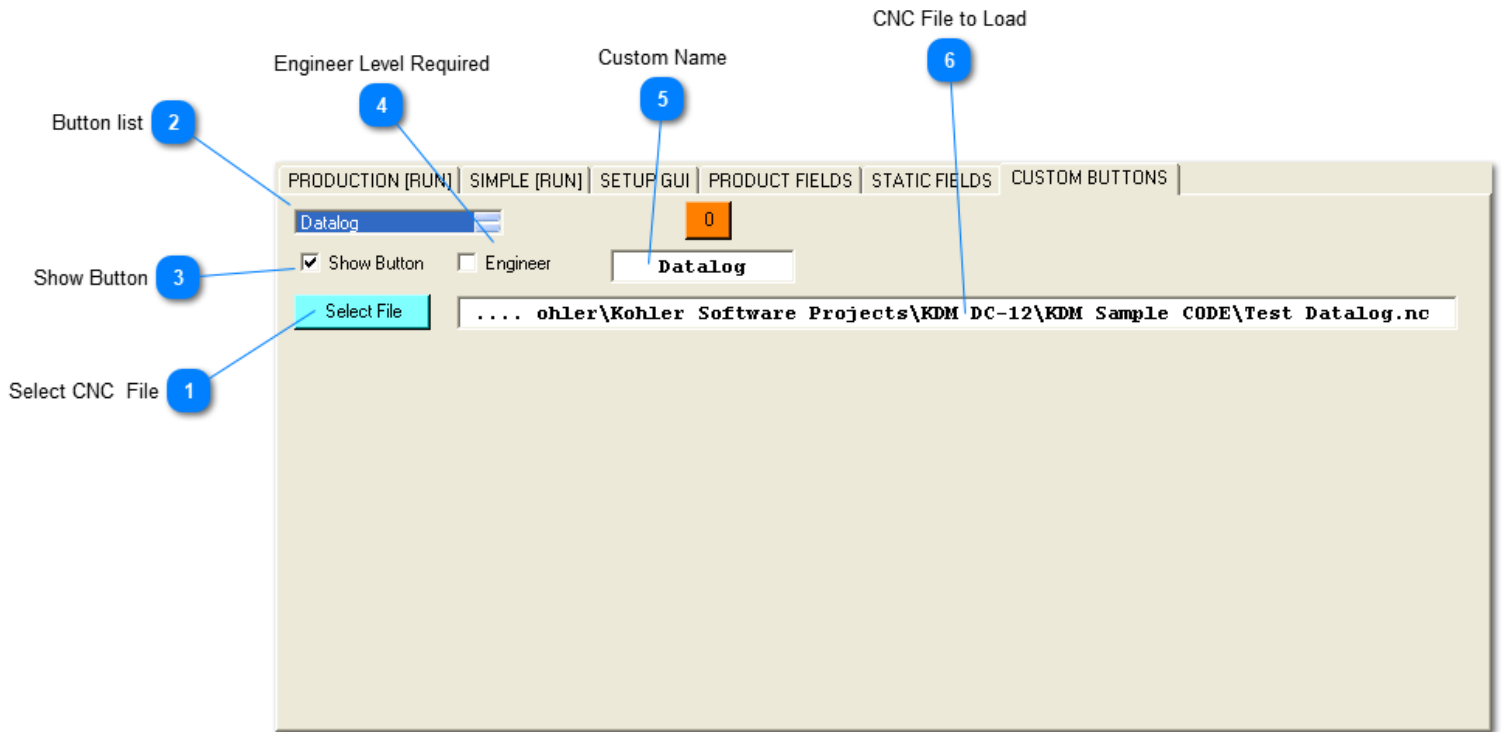
Start Job

5

Custom Label (End Job)

End Job

Setup Custom Buttons



Custom buttons are an easy way of switching temporary to a different program

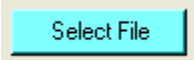
Use it for:

Setup Programs

Re-weld Programs

They could also be the only means for the operators to run different programs (max 5 buttons can be assigned)

1 Select CNC File



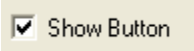
2 Button list



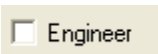
Select the Button to edit

Once a custom name is assigned it will be displayed in the List

3 Show Button



4 Engineer Level Required



If checked Engineer level is required to execute the Program

5 Custom Name

Datalog

6

CNC File to Load

```
.... ohler\Kohler Software Projects\KDM DC-12\KDM Sample CODE\Test Datalog.nc
```

Ophier Power Meter

The Ophier Power meter is a extension DLL to the KDM software

- The StarLab software package needs to be installed

Please make sure the Starlab can see and communicate with the Juno before trying to connect trough KDM

One one software package can have access to the Juno at any time !

- Currently only the Juno USB interface is supported

Enable the DLL in the KDM Config file Section - The restart KDM

Configuration Files

Loaded Config File MAIN CONFIG 4000 WD NLS2.xml

NickName 4000 DDR COPLEY NLS

Selected Config Type

Select Config File

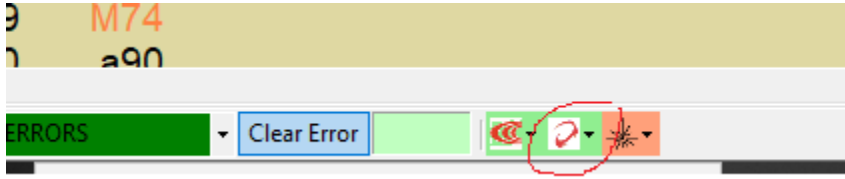
Load	Title	Config File Name
<input type="checkbox"/>	GUI DLL	
<input type="checkbox"/>	GUI CONFIG	
<input type="checkbox"/>	-----	
<input type="checkbox"/>	COGNEX DLL	COGNEXV2.dll
<input type="checkbox"/>	COGNEX CONFIG	COGNEXV2 CONFIG WD.xml
<input type="checkbox"/>	COGNEX 0 COD	SETUP COGNEXV2 WD.cod
<input type="checkbox"/>	COGNEX 1 COD	
<input type="checkbox"/>	-----	
<input type="checkbox"/>	STARTJOB DLL	
<input type="checkbox"/>	STARTJOB CONFIG	
<input type="checkbox"/>	-----	
<input type="checkbox"/>	AUXAXIS DLL	
<input type="checkbox"/>	AUXAXIS CONFIG	
<input type="checkbox"/>	AUXAXIS COD	
<input type="checkbox"/>	-----	
<input type="checkbox"/>	VIDEO DLL	
<input type="checkbox"/>	VIDEO CONFIG	
<input type="checkbox"/>	-----	
<input checked="" type="checkbox"/>	POWERMETER DLL	POWERMETER OPHIR.dll
<input checked="" type="checkbox"/>	POWERMETER CONFIG	SETUP POWERMETER OPHIER .
<input type="checkbox"/>	-----	
<input type="checkbox"/>	MTCONNECT DLL	
<input type="checkbox"/>	MTCONNECT CONFIG	

First time startup

Depending on the loaded setup file for the DLL the KDM might see the Juno at startup without any changes.

If the lower toolbar indicator for the Ophier Meter stays red after a restart you might have to update the connection settings.

If the Indicator comes up green, communication has been established but you probably still have to make changes to you're measuring setup



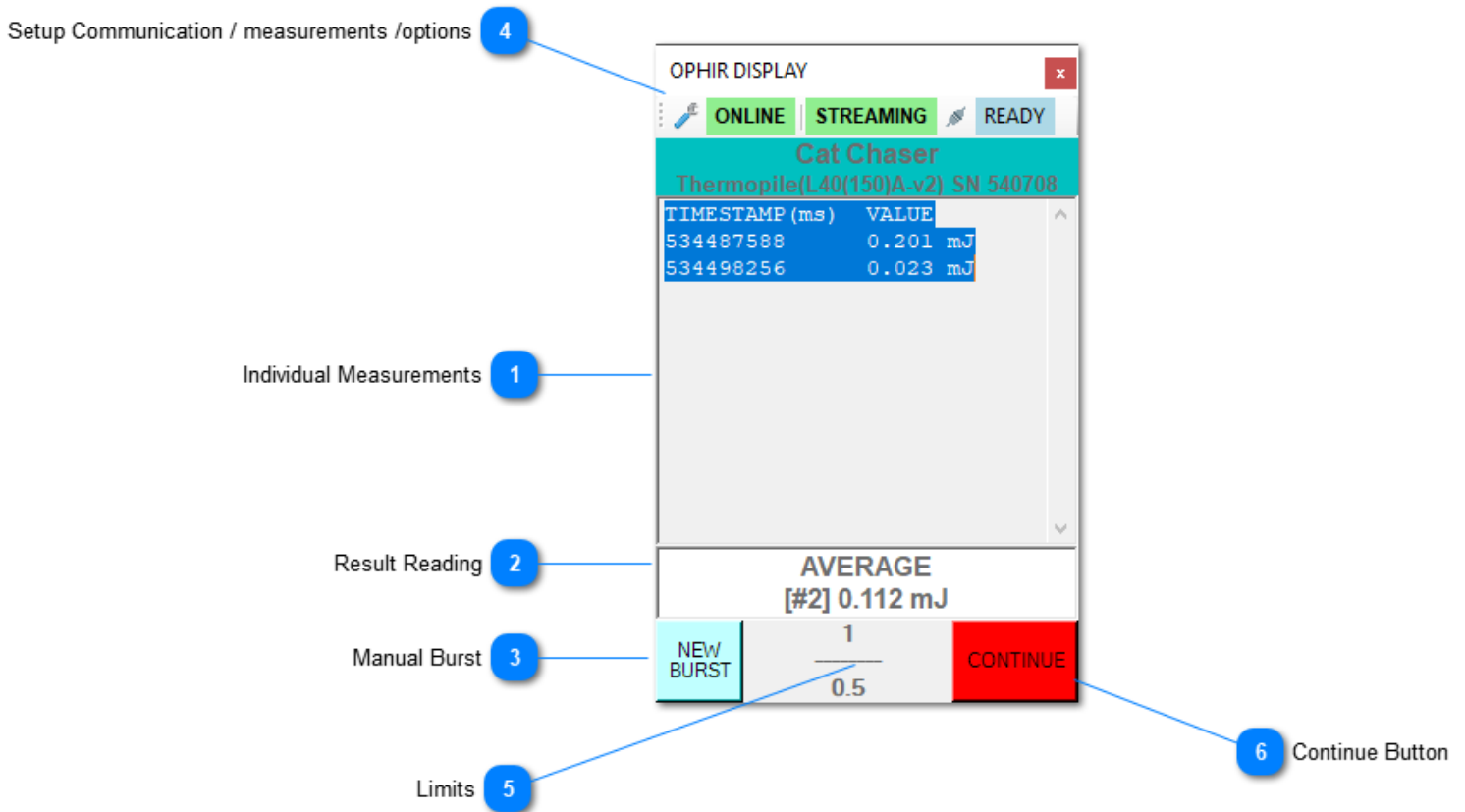
Basic CNC Commands for executing a Ophier power reading with 10 shots

```

N1
N2 ;SIMPLIFIED OPHIER POWER READING SAMPLE
N3
N4 G140 Q1 L 0.5 U 1.2 ; OPHIER NEW TEST Q?(INDEX) (L=MIN/U=MAX
N5 M8 ; [M8] GAS (1) ON / REPLACED WITH: M25 [ OUT
N6 M98 P1000 L10
N7 M9 ; [M9] GAS (1) OFF / REPLACED WITH: M26 [ OU
N8 G141 ; OPHIER PROCESS RESULT|
N9 M2 ; PROGRAM END
N10
N11
N12 O1000
N13 M74
N14 G4 F0.5
N15 M99
    
```

Run Time Window

Whenever the evaluation of the power readings are requested through the cnc code, this window will pop up



1 Individual Measurements

Timestamp (ms)	Value
534487588	0.201 mJ
534498256	0.023 mJ

2 Result Reading

AVERAGE
[#2] 0.112 mJ

3 Manual Burst



4 Setup Communication / measurements /options



5 Limits



Displays the active Limits for the current power reading

6 Continue Button



Allows the operator to continue

This button will turn green if the power reading falls between the given limits

- If the button is red the program will abort after pushing the [Continue] button

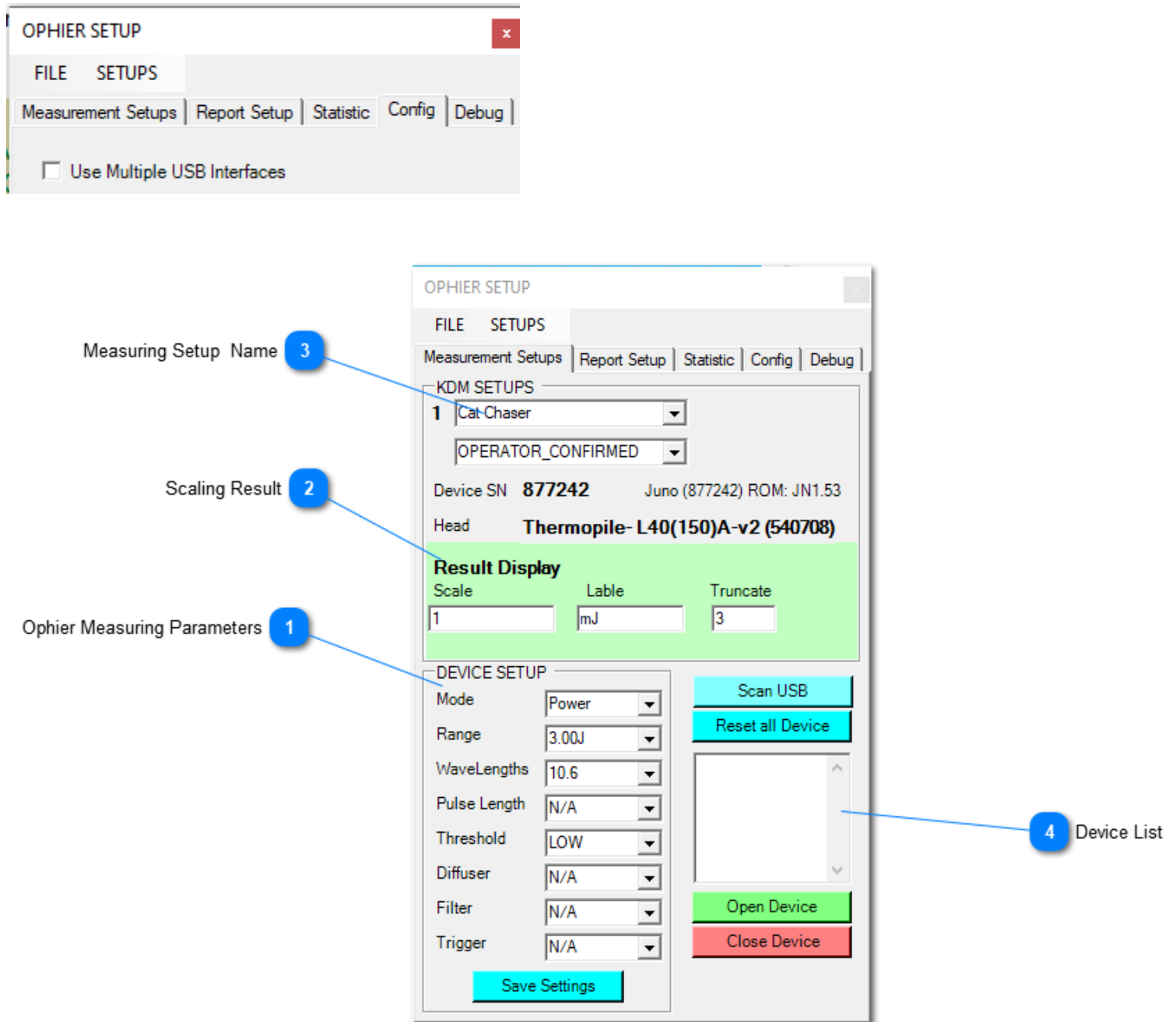
** Depending on the measurement setup there might be different buttons displayed

Setup Window

For the Ophier to be able to display the correct data the measurement parameters need to be setup properly

Unless you are planning on using multiple Ophier meters at the same time, it is important to uncheck the box [Use Multiple USB Interfaces]

This will allow the KDM to pickup the first Juno meter found in the USB list - regardless of the serial Number
If you have the check box checked the Juno serial number will be attached to the measuring setup and it connects to the Juno based on the device serial number



1 Ophier Measuring Parameters

DEVICE SETUP

Mode

Power

Range

3.00J

WaveLengths

10.6

Pulse Length

N/A

Threshold

LOW

Diffuser

N/A

Filter

N/A

Trigger

N/A

Save Settings

<TODO>: Insert description text here...

2 Scaling Result

Result Display

Scale

1

Lable

mJ

Truncate

3

<TODO>: Insert description text here...

3 Measuring Setup Name

Cat Chaser

<TODO>: Insert description text here...

4 Device List

Scan USB

Reset all Device

Open Device

Close Device

<TODO>: Insert description text here...

Basic Programming

<TODO>: Insert description text here... And don't forget to add keyword for this topic

Program Variables

There are 3 types of variables

- Local Variables

Local Variables will only retain their values within the active (same) program

This being said, they will retain their values after the program ends

Local program variables will all be cleared (removed) when loading (parsing) a different program

- Global Variables

Global Variables are defined within the KDM setup and are accessible to all programs

The Global variable value will not reset when changing programs

Unless marked as persistent global variables the variable values will be reset to 0 when starting KDM

- Comms Variables

Comms variables are a legacy type used with the PCI card

These variables (Comms.1 ... Comms.100) will keep their values unless the motion card is reset

They can not be declared persistent - all Comms variables will be cleared during a reboot of the motion card (firmware download or PC reboot)

When using the Copley Motion Controller (Can Open) system, similar functionality has been implemented for the comms variables

The KDM software allows the creation of custom variables.

Once you run the program all custom variables will be displayed with their current values in the [PRG Variable] tab in the main window (This also works within a G5 pause)

- Custom variables are not limited to numeric names anymore (No spaces allowed)

#MY_VARIABLE = 5 is a valid variable with the KDM software (must have a "#" symbol before the variable)

- Use of custom names in calculations is possible

IF [#MY_VARIABLE = 15] then (must have " [] " for a calculation)

... code to execute

ELSE

...code to execute

ENDIF

EXAMPLES:

Example #1 Compare User Custom Variables

```
#VARIABLE_1=1           ; User Variable1 assigned a value of 1
#VARIABLE_10=10          ; User Variable10 assigned a value of 10
G5                        ;Pause
#VARIABLE_1=15           ; User Variable1 assigned a value of 15
#VARIABLE_10=30          ; User Variable10 assigned a value of 30
G5                        ;Pause
IF [#VARIABLE_10=15] THEN ;
M105 (^ ok)              ; Display Custom Message
ELSE
M105 (^failed)           ; Display Custom Message
ENDIF
```

Example #2 COMMS Variables

KDM Software Manual

COMMS Variables are stored on the Motion Controller (PCI Card with Baldor Motion or PC with CanOpen Motion), and keep their values when the KDM Software is shut down.
This is useful for situations like the cycle counter.

```
:[SAMPLE CYCLE COUNTER]
```

```
G4 F0.5
```

```
; Dwell 0.5 sec
```

```
IF [ #COMMS.81  > 2 ] THEN
```

```
; Test Cycle Counter
```

```
M105 (~^ REACHED 2 CYCLES)
```

```
; Display Custom Message
```

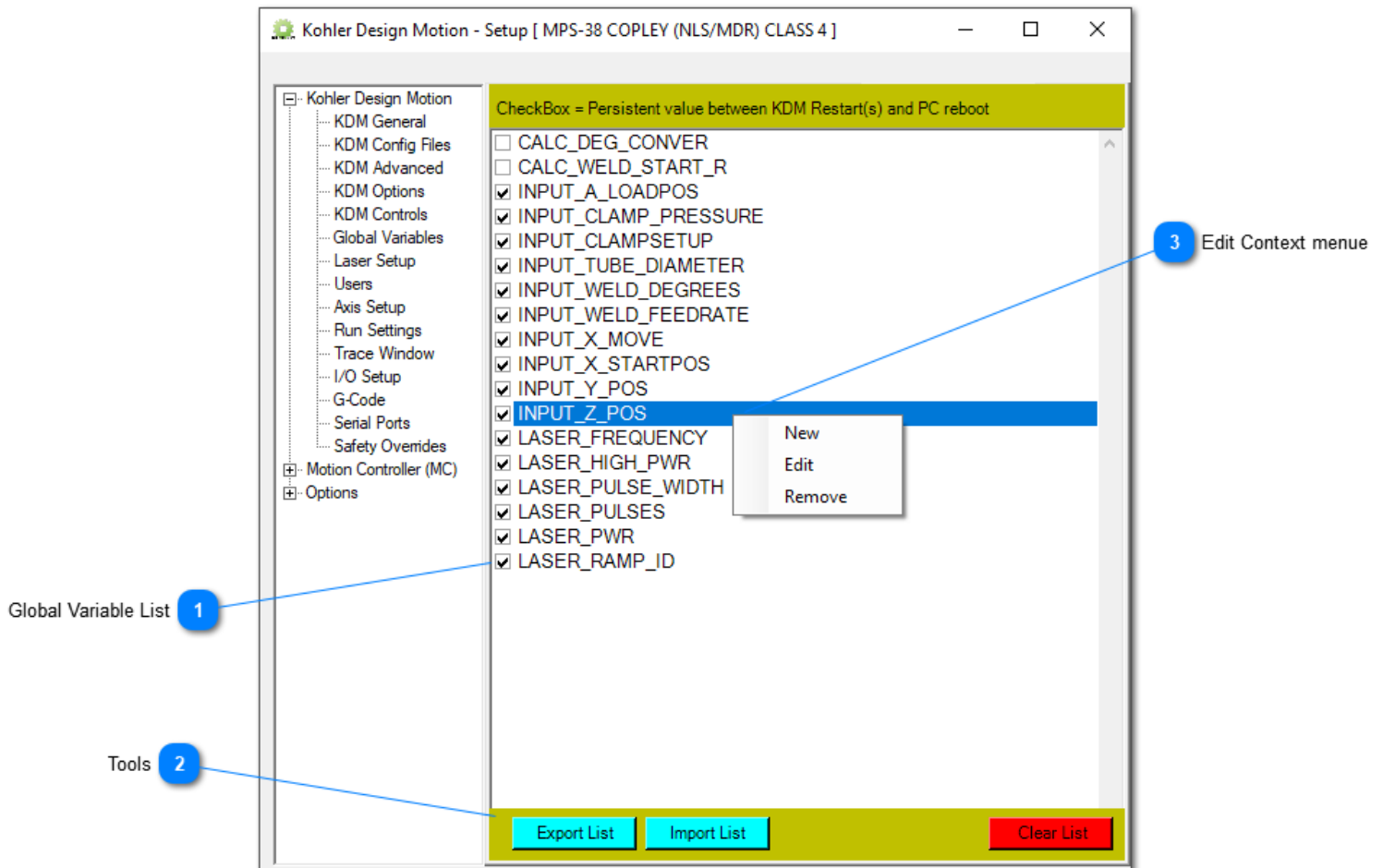
```
#COMMS.81 = -1
```

```
; reset CYCLE COUNTER
```

```
ENDIF
```

```
M2
```

Global Variables



1 Global Variable List

Setup of the Global variables is done within the KDM setup window - KDM OPTIONS. Right click into the list and a new dropdown will allow to **CREATE**, **EDIT** and **DELETE** global variables. Names are displayed without the leading # sign.

If you mark a Global Variable as being persistent, the variable value will be retained even after a restart of the PC.

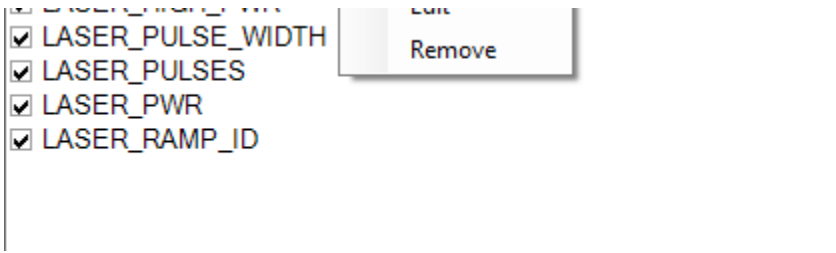
(Persistent values are stored within the active KDM folder - therefore the persistent values will only work when starting from the same KDM folder)

Most G-code standard (Fanuc) uses the following ranges for global and persistent variables (called common variables)

#100 -199 = Global variables	- accessible to all programs - will be cleared with a software restart
#500 -999 = Persistent variables	- Persistent values - will retain values after a software restart/reboot

If you prefer to use above concept you could add the required common variables to the KDM global variable list.

In general we prefer to use string names for variables rather than the "limited" numeric only variable names

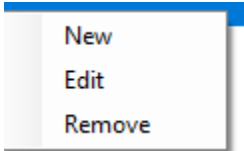


2 Tools



The tools toolbar is only visible if you are logged in as the KDM admin user

3 Edit Context menu



Right click in the Variable list to display the edit context menu
Select the function from the list

Create Custom I/Os

- Custom I/O Names can also be used instead of the usual H Numbers

M25 [**OUTPUT_GAS1**] is a valid command

To create a custom I/O, go to the System drop down / Setup KDM / Kohler Design Motion / I/O Setup / Select the "New" button.

Edit Goode -I/O Setup

Buttons: New, Save, Cancel, DELETE, Import, Export

G-Code I/O

IO NAME: **IN_CUSTOM_INPUT1**

☒ Input ☐ Invert Display State

☒ Show Button

☐ Reset

MAP TO: CopleyIO_In/21

#COMMS: 0 ☐ Enable Comms Variable

DESCRIPTION: CUSTOM INPUT 1

TOOL TIP: CUSTOM INPUT 1

BITMAP:

BITMAP: KDMotionCan.bmp@21

VIRTUAL NUMBER: 604

TOOLBAR:

POSITION:

USER LEVEL:

IO NAME	SHOW	MAP TO	DESCRIPTION
BP_TEST_LASERPROCESSING	X	CopleyIO_In/32	BP test laser processing
IN_COLLETBUTTON		CopleyIO_In/34	Collet Button [H18]
IN_DOORINPUT	X	CopleyIO_In/38	Door Input [H12]
IN_DRIVEOK	X	CopleyIO_In/33	Drives enabled/No Errors
IN_ESTOP	X	CopleyIO_In/36	E-Stop Input
IN_LASERPROCESSING	X	CopleyIO_In/32	Laser Processing [H4]
IN_RESETBUTTON		CopleyIO_In/30	Reset Button [H17]
IN_STARTBTN	X	CopleyIO_In/24	OP-Panel Start Button
IN_STOPBTN	X	CopleyIO_In/26	OP-Panel Stop Button
IN_TESTJORGE		CopleyIO_In/15	
IN_USER1		CopleyIO_In/0	Baldor Input #3
OUT_AUTOMATICDOOR		CopleyIO_Out/2	Out_AutomaticDoor [H215]
OUT_ENABLE		CopleyIO_Out/4	Enable signal to the Drives
OUT_GAS1	X	CopleyIO_Out/1	Gas1
OUT_GAS2	X	CopleyIO_Out/3	Gas2
OUT_ROTARYCOLLET		CopleyIO_Out/9	Out_Rotary Collet [H214]
IN_CUSTOM_INPUT1	X	CopleyIO_In/21	CUSTOM INPUT 1

☒ Show All

- ☐ SYSTEM_OUTPUT
- ☐ SYSTEM_INPUTS
- ☐ SYSTEM_VARIABLE
- ☐ CUSTOM_IO
- ☐ APPLICATION_IO
- ☐ NLS_IO
- ☐ RCU_IO
- ☐ KLC_IO
- ☐ DATALOG
- ☐ INVALID_ENTRY

Fill out the IO Name field. It is advised to start all inputs with IN_INPUT_NAME and all outputs with OUT_OUTPUT_NAME.

If the IO is an input, then check the "Input" box. If it's an output then leave it blank.

If you want to assign a toolbar button to this IO, then check the "Show Button" check box.

MAP TO field - Right click in the box, and a drop down menu will appear. Select the "standard" or "CAN" IO, to bring up another drop down menu. Select the corresponding IO location.

Fill out the "DESCRIPTION" field. This is the description of what the IO actually does.

Fill out the "TOOL TIP" field. This is what is displayed when you "hover" over the ICON on the toolbar.

If you checked the "Show Button" option, "BITMAP" is where you assign the ICON. Right click in the field to display to bring up a menu.

Pick "Select Icon". From here you can either hit the "Load Bitmap" button to bring up a bitmap file, or scroll thru the existing file. Once you find the Icon you desire, left click on it, and hit the "Select Icon" button. Note: You can create your own icon using MS Paint or similar. Open one of the existing

In the "Position" field, enter a high number like 100, so that the new icon appears far to the right on the tool bar. Otherwise, the new icon may be hard to see because it could be "underneath" another existing icon. Right click on the toolbar, and click on "arrange icons". Drag the new icon to the desired position and then right click and unselect "arrange icons".

Hit the Green "Save" button at the top, and you should it appear in the IO list to the right.

- Insert code or variables just right click inside the code window and select [Insert G-Code] from the drop down

This will open the [SELECT CODE](#) Window. Double click the item you wish to insert

- Highlight G-Code in the edit window and the right click with the mouse - At the bottom of the drop down it will display the help text related to the G-Code

EXAMPLES:

Example #1 Checking the Status of an Input

if [IN_CUSTOM_INPUT1 = 1] then	; if the custom_input1 goes high then
M105 (^ high)	;display custom message
else	
M105 (^low)	;display custom message if input is low
endif	

Example #2 Triggering an Output

M25[OUT_GAS1]	; Set Output High M26Hxxx / M26H [#xxx]
M26[OUT_GAS1]	; Set Output Low M26Hxxx / M26H [#xxx]

Basic Movement

A really complete program header ought to include things like:

- Program file name.
- Program author
- Version date
- Modification history--a line for each version telling what changed, who made the changes, and the date.
- Machine and control the program is intended for
- Units: inches or mm
- Setup information: What stock material is expected, what size, etc.?
- Work Coordinates: What's expected by way of work coordinates? Where is Part Zero?
- Customer info: Job shops will want information about what customer and job # the program is part of.

It's a good idea to have a header for each subprogram as well, though there is no need to repeat all the same information that's already in the main program's header.

Specifying Linear Motion With X, Y, and Z

Note that simply specifying G1, G1.1 or G1.5 does not cause any motion to happen--they merely tell the controller what type of motion is expected when you finally tell it where to move to. IF G! is not listed on the command line, the controller will assume a G1 move. For actual motion you need to specify a destination using the X, Y, and Z. We've talked about how the coordinate system works previously, so you should be quite familiar with XYZ moves. As a reminder, to move to the part zero, we might issue a command like this:

```
G1 X0Y0Z0
```

We can also do it this way:

```
X0Y0Z0
```

When we specify multiple coordinates on a line, we get what's called interpolated motion or an interpolated move. That just means more than one axis of the machine is moving at the same time. In fact, the controller will move them all at exactly the right speed relative to one another so that the laser follows a straight line to the destination and moves at the feedrate.



Interpolated
Move

"Dog Leg"
Move

If we specify the same destination, but spread the coordinates over multiple lines, each line is a separate move:

G1

X0Y0 (Move to X0Y0 in one move, keeping Z constant)

Z0 (Move to Z0 in one move, keeping X and Y constant)

Remember, G1, G1.1, & G1.5 are modal, so we only have to specify them when we want to change modes.

Careful With Z!

The concept of interpolated moves raises an interesting issue for the Z axis. It's often a good idea to move the Z on its own, rather than as coordinated motion with other axes. Doing so just makes it easier to "eyeball" whether you're going to have a problem (collision is the technical term) as the laser gets close to the workpiece and fixturing. It's really hard for the human eye to judge motion in multiple axes, particularly if you have to move a long ways in X and Y and a relatively shorter distance in Z. By first moving in X and Y and then moving in Z as shown in the example above, it's much easier to judge whether an accidental collision is about to take place. You're also much less likely to hit some random object sticking up, like a clamp, if you keep the laser high until you're directly over where you want to start.

The downside to this approach is it might be slightly slower than the coordinated move. If you're trying to wring every last second out of a job, start out making 2 moves and then when you're sure you've got the job running smoothly, update the program on a future run.

Circular Interpolation is Motion Along a Circular Arc

Having just finished discussing linear interpolation, or motion in a straight line, we next come to circular interpolation, which is motion along a circular arc. Other than the fairly exotic ability to follow a "NURBS" path, most g-code controllers only support two kinds of motion: linear and circular. Circular interpolation is quite a bit more demanding on your machine as two axes have to be precisely coordinated. Drawing a complete circle involves not just coordinated motion but reversal of direction at each of the 4 quadrant points. These would be the points

corresponding to 0, 90, 180, and 270 degrees. If the machine has any backlash at all, it will be obvious at these reversals because there will be a glitch in the cut there.

Circular Motion is a Mode Initiated Via G02 and G03

Like linear motion (initiated by G00 and G01), circular motion is a mode initiated via G02 or G03. G02 establishes a mode for clockwise circular arcs. G03 establishes a mode for counter-clockwise circular arcs.

G02 G03 Modes

Defining An Arc For the CNC Controller

Once either the G02 or G03 mode is established, arcs are defined in G-Code by identifying their 2 endpoints and the center which must be equi-distant from each endpoint or an alarm will occur. The endpoints are easy. The current control point, or location when the block is begun establishes one endpoint. The other may be established by XYZ coordinates. The center is a bit more complex.

Defining the Center Via IJK Relative Offsets

The center is most commonly identified by using I, J, or K to establish relative offsets from the starting point of the arc to the center. Here is a typical clockwise arc:

Defining an arc

Defining an arc's center with IJK...

This arc starts at X0Y2 and finishes at X2Y0. It's center is at X0Y0. We could specify it in g-code like this:

G02 (Set up the clockwise arc mode)

X2Y0 I0J-2.0

The I and the J specify relative coordinates from the start point to the center. In other words, if we add the I value to the starting point's X, and the J value to the starting point's Y, we get the X and Y for the center.

Defining the Center Via the Radius Using "R"

We can also define the center just by specifying the radius of the circle. In this case, our circle has a radius of 2, so the g-code might be simply:

G02 X2Y0 R2

Many of you will be deciding right here and now that since R is easier to understand and shorter to write, you're just going to use R and forget about IJK. But, the CNC teachers in the world will suggest that you should prefer IJK. Their argument is that when you use IJK, you get a double check that your arc is correct.

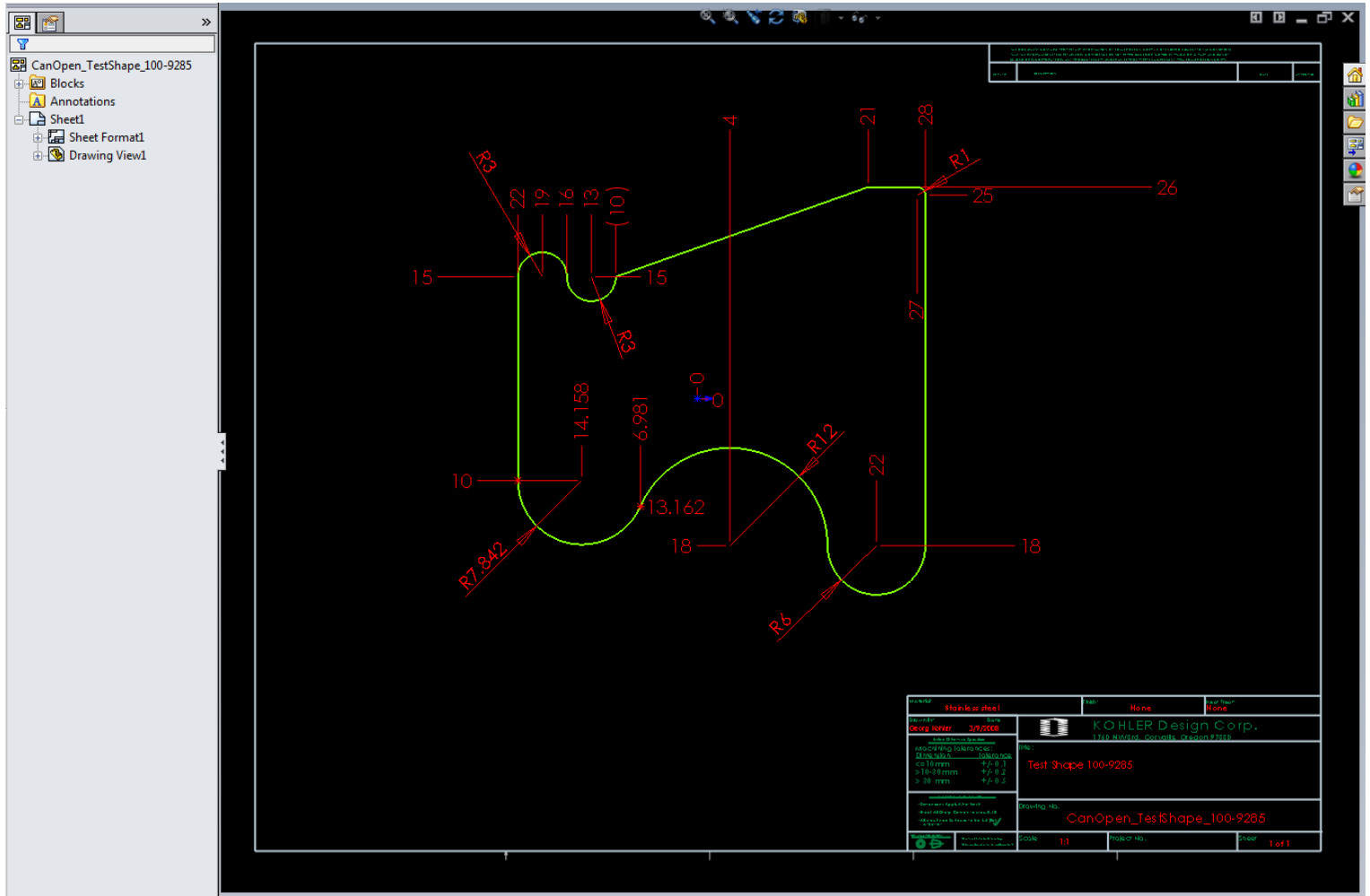
Why?

Because the controller gets to compute an actual set of coordinates for the center via IJK. Once it has the center's coordinates, it can check that it is equi-distant from both end points. The check of each of those two distances is the

double check. In the case of the "R" format, the controller has no such double check. It has to chose a center that guarantees equal distance.

SAMPLE PROGRAM

The program below follows the drawing shown. This is an example of the zero position being set as G54.



```

N10      ;Filename: CanOpen_TestShape_100-9285
N15      ; Test Shape 100-9285
N20      ; dimensions in mm
N25
N30      G54                                ;Use G54 Coordinate System
N35      G90                                ;Absolute Move
N40      X0Y0 F1000                          ; Move X0 Y0 at feedrate 1000
N45      G92                                ;set position / clear position counter
N50      M1                                ;Optional Program Stop
N55      X-22 Y-10                          ;interpolation move
N60      M1                                ;Optional Program Stop
N65      F1500                              ;feedrate 1500
N70      G130                              ;Enable CanOpen interpolation PVT mode
N75      G1 Y15 X-22                        ;interpolation move
N80      G2 X-16 Y15 I3 J0                  ;clockwise arc
N85      G3 X-10 Y15 I3 J-0                ;counter clockwise arc
N90      G1 X21 Y26                          ;interpolation move
N95      X27 Y26                            ;interpolation move
N100     G2 X28 Y25 I0 J-1                  ;clockwise arc
N105     G1 Y-18 X28                        ;interpolation move
N110     G2 X16 Y-18 I-6 J0                 ;clockwise arc
N115     G3 X-6.9814 Y-13.1618 I-12 J0     ;counter clockwise arc
N120     G2 X-22 Y-10 I-7.1765 J3.1618     ;clockwise arc
N125     M2                                ;program end
N130

```

Coordinate Systems

This section will go over the available coordinate systems and their uses.

Machine Coordinate System (G53).

This is the home position of the actual work station (X,Y,Z,A = 0) This will always remain the zero position for all axis.

Work Coordinate System (WS).

This is the parent coordinate system for G54 thru G59. This means that if the Work Coordinate System gets shifted then all G54 - G59 coordinate systems get shifted with it.

It is recommended that you set the WS to the same zero points as the Machine Coordinate System. That way when you home the system you will get all axis reading zero. If an axis does not read zero, you will know that someone has shifted the WS coordinate system.

If a motor, lead screw, belt, or ect... gets replaced, it is nearly impossible to get that axis to home in the same spot (closest index pulse). You can then offset the WS and all your programs with G54-G59 will be OK.

Reference Coordinate System (G54 - G59)

G54, G55, G56, G57, G58 & G59 are reference coordinate systems. They are children to the Work Coordinate System, meaning they all shift together if the WS gets moved.

Use a G54 - G59 for referencing directly to a fixture or tooling. Pick a reliable reference point on the tooling to set your zero point. If the tooling gets removed and replaced you can just reset the zero point and the program should work as is.

FIG 1

FIG 2

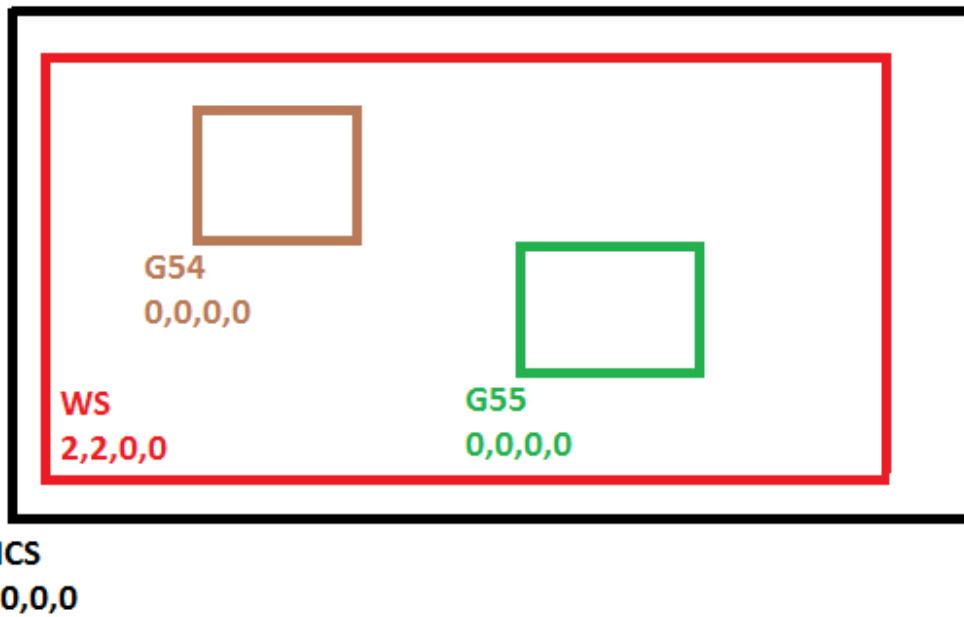
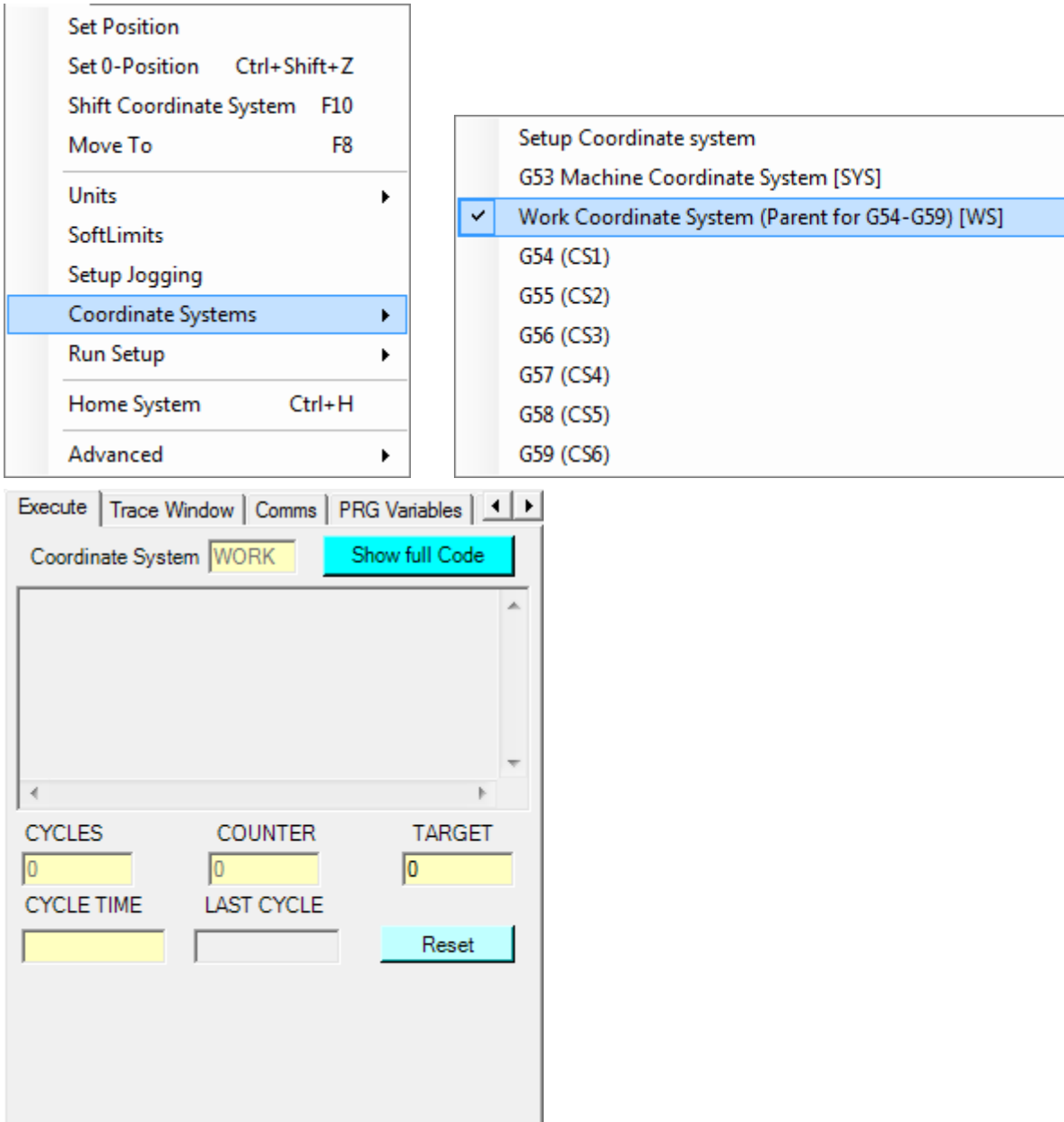


Figure 1 shows the Machine Coordinate System (G53) and the Work Coordinate System (WS) both set at zero. Figure 2 shows the WS shifted in X2, and Y2. Note how the G54 and G55 shift with the WS in Figure 2.

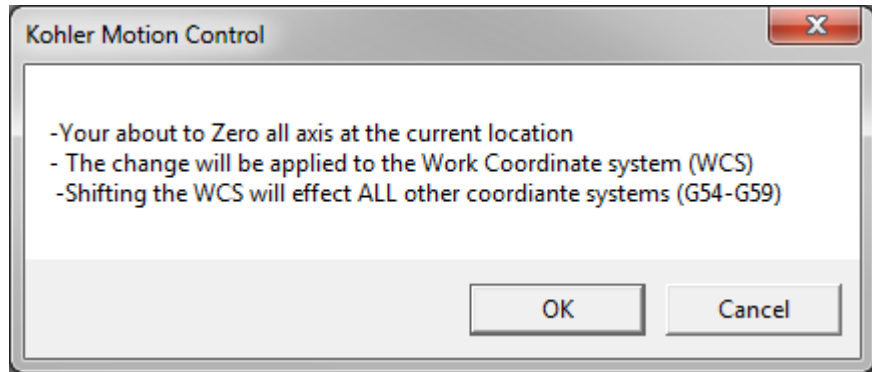
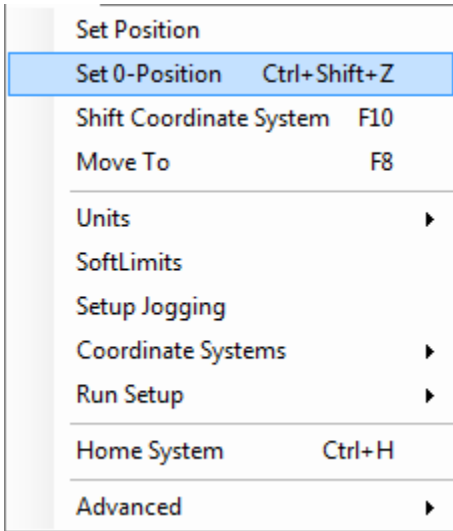
Setting the Coordinate Systems with the KDM

In the KDM software, select: Setup / Coordinate Systems / Click on the desired coordinate system to work in. After selecting, the coordinate system will be displayed in the "Coordinate System" box in the right hand menu.



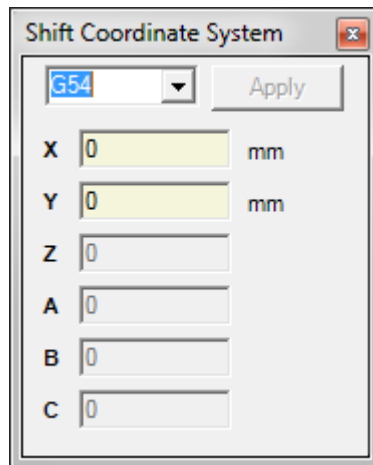
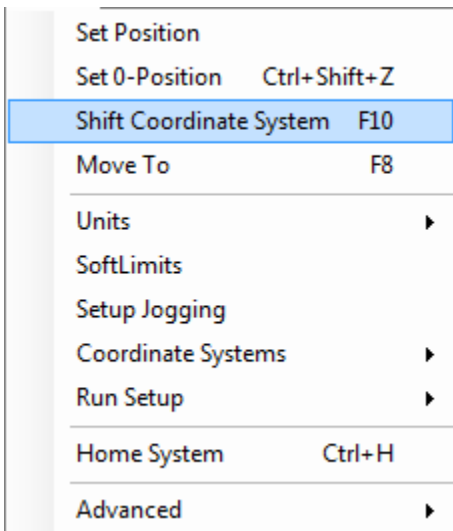
Setting the Coordinate Systems to Zero

First select the desired coordinate system as described above. In the KDM software, select: Setup / Set 0-Position



Shifting the Coordinate Systems

First select the desired coordinate system as described above. In the KDM software, select: Setup / Shift Coordinate System



Expressions

All Expressions need to be encapsulate by Square brackets [Expression]

Examples

X [10* 815.0001]

X [#STARTPOS_0 - 0.005]

X [-1* #STARTPOS_0]

IF [#START >10] THEN

ENDIF

Within the square brackets standard Math rules apply

#RESULT = [COS(#START_X)]

List of supported Math Functions by the math DLL (Ncalc)

Abs	Returns the absolute value of a specified number.	Abs(-1)
Acos	Returns the angle whose cosine is the specified number.	Acos(1)
Asin	Returns the angle whose sine is the specified number.	Asin(0)
Atan	Returns the angle whose tangent is the specified number.	Atan(0)
Ceiling	Returns the smallest integer greater than or equal to the specified number.	Ceiling(1.5)
Cos	Returns the cosine of the specified angle.	Cos(0)
Exp	Returns e raised to the specified power.	Exp(0)
Floor	Returns the largest integer less than or equal to the specified number.	Floor(1.5)
IEEERemainder	Returns the remainder resulting from the division of a specified number by another specified number.	IEEERemainder(3, 2)
Log	Returns the logarithm of a specified number.	Log(1, 10)
Log10	Returns the base 10 logarithm of a specified number.	Log10(1)
Max	Returns the larger of two specified numbers.	Max(1, 2)
Min	Returns the smaller of two numbers.	Min(1, 2)
Pow	Returns a specified number raised to the specified power.	Pow(3, 2)

Round	Rounds a value to the nearest integer or specified number of decimal places. The mid number behaviour can be changed by using EvaluateOption.RoundAwayFromZero during construction of the Expression object.	Round(3.222, 2)
Sign	Returns a value indicating the sign of a number.	Sign(-10)
Sin	Returns the sine of the specified angle.	Sin(0)
Sqrt	Returns the square root of a specified number.	Sqrt(4)
Tan	Returns the tangent of the specified angle.	Tan(0)
Truncate	Calculates the integral part of a number.	Truncate(1.7)

List of supported Logic Symbols

=	Equal
<	Smaller
>	bigger
<>	Not Equal
	OR
&	AND

```
IF [ #TEST_FLAG = 1 <> #COMMS.96 = 1] THEN      Not Equal
M105(^~PASSED)      ;Display Message
ELSE
M105(^~ FAILED)
ENDIF
```

```
IF [ #TEST_FLAG = 1 | #COMMS.96 = 1] THEN      OR
M105(^~PASSED)      ;Display Message
ELSE
M105(^~ FAILED)
ENDIF
```

Logical Functions

Currently the KDM Software supports the following Logical Functions

```
IF [EXPRESSION] THEN
    ELSE
ENDIF
```

```
DO WHILE [EXPRESSION]
    EXIT DO
    CONTINUE DO
LOOP
```

```
..OR
```

```
DO
    EXIT DO
    CONTINUE DO
LOOP WHILE [EXPRESSION]
```

IF - ELSE - ENDIF

```
IF [EXPRESSION] THEN  
ELSE  
ENDIF
```

IF - ENDIF Statements can be nested

Below code inside the IF - ENDIF statement will only if the keyboard shift key is pressed

```
IF [ GET_KEYBOARD_SHIFTKEY = 1 ] THEN  
  M98 P800  
  M107 L [ #SELECT_DIAMETER_  
    #SELECT_NAME ] Q1  
ENDIF
```

Below code inside the IF - ENDIF statement will only executed on the first cycle of a program

```
IF [ FIRST_CYCLE_FLAG = 0 ] THEN  
  G54  
  G70  
  #WELD_START_OFFSET = 0  
  #WELD_PRERUN_DEG = 60  
  #WELD_POSTRUN_DEG = 60  
ENDIF
```

DO - WHILE - LOOP

```
DO WHILE [EXPRESSION]
    EXIT DO
    CONTINUE DO
LOOP
```

```
..OR
```

```
DO
    EXIT DO
    CONTINUE DO
LOOP WHILE [EXPRESSION]
```

Do while loops are most often used to increase / decrease a value on each loop (laser power ramping)

```
N1    #TEST =0
N2    DO WHILE [ #TEST <= 3 ]           ; TEST AT START OF LOOP (MIGHT NOT EXECUTE AT ALL)
N3    EXIT DO                          ; EXIT DO LOOP
N4    CONTINUE DO                      ; CONTINUE DO LOOP (NEXT)
N5    LOOP                             ; END OF LOOP
N6    ;-----
N7    ;-----
N8    DO                               ; TEST AT END OF LOOP (WILL EXECUTE MIN OF 1 CYCLE)
N9    EXIT DO                          ; EXIT DO LOOP
N10   CONTINUE DO                     ; CONTINUE DO LOOP (NEXT)
N11   LOOP WHILE [ #TEST <> 0 ]        ; END OF LOOP
N12   ;-----
N13   ;-----
N14   DO WHILE [ IN_COLLETBUTTON =0 ] ; TEST AGAINST INPUT STATE
N15   LOOP
N16
```

SELECT CASE

```
Select Case [#VARIABLE]
  CASE [ VALUE1]
    ???
  ???
  CASE [VALUE2,VALUE3]
    ???
    ???
  CASE ELSE
    ???
    ???
CASE END
```

Only the first matching case statement will be executed

CASEELSE will only execute if **non** of the **previous** case statements match

Case statements can be nested

LOGIC FUNCTION SAMPLE CODE

IF-ENDIF BASED ON KEYBOARD SHIFTKEY

M107 DISPLAY VARIABLE LIST (EDITING)

M107 DISPLAY VARIABLE LIST (REVIEW)

```

N14 IF [ GET_KEYBOARD_SHIFTKEY = 1 ] THEN
N15     M98 P800
N16     M107 L [ #SELECT_DIAMETER_
N17         #SELECT_NAME ] Q1
N18 ENDIF
N19
N20 M107 L [ #SELECT_DIAMETER_
N21     #SELECT_NAME ] Q0
N22
N23 SELECTCASE [ #SELECT_DIAMETER ]
N24 CASE [ 0.062, 0.214 ]
N25     M105 (^ 0.062 or 0.214 SELECTED)
N26     SELECTCASE [ #SELECT_NAME ]
N27     CASE [ HANS ]
N28         IF [ #SELECT_DIAMETER = 0.214 ] THEN
N29             M105 (^ 0.124)
N30         ELSE
N31             M105 (^ 0.062)
N32         ENDIF
N33     CASE [ MAURO ]
N34         M105 (^ MAURO SELECTED)
N35     CASEELSE
N36         M105 (^ NEITHER MAURO OR HANS SELECTED)
N37     ENDSELECT
N38
N39 CASE [ 0.105 ]
N40     M105 (^ 0.105 SELECTED )
N41 ENDSELECT
N42
N43
N44
N45 M105 (^ PUSH START TO EXECUTE NEXT CYCLE)
N46 M47
N47
N48 ***** START SUB PROGRAMS *****
N49 O800
N50 M103 Q [ #SELECT_DIAMETER ] L [ 0.062 , 0.0915 , 0.105, 0.125, 0.188, 0.214 ]
N51 M103 Q [ #SELECT_NAME ] L [ HANS, MAURO, RUEDY, BRANDON, LISA ]
N52 M99

```

M103 LAD DROPDOWN VALUES

1

IF-ENDIF BASED ON KEYBOARD SHIFTKEY

```

IF [ GET_KEYBOARD_SHIFTKEY = 1 ] THEN
    M98 P800
    M107 L [ #SELECT_DIAMETER_
        #SELECT_NAME ] Q1
ENDIF

```

<TODO>: Insert description text here...

2

M107 DISPLAY VARIABLE LIST (EDITING)

```

M107 L [ #SELECT_DIAMETER_
    #SELECT_NAME ] Q1

```

THIS COMMAND WILL DISPLAY A WINDOW WITH THE VARIABLE LIST

- Q Value will determine if the values can be changed or not
- If dropdown values have been loaded for a variable the dropdown will show otherwise A textbox will allow changing of the value (If edit is enabled)

VARIABLE	NAME	VALUE
	SELECT_DIAMETER	0.214
	SELECT_NAME	MAURO

CANCEL OK

3 M107 DISPLAY VARIABLE LIST (REVIEW)

```
M107 L [ #SELECT_DIAMETER _
#SELECT_NAME ] Q0
```

NO EDITING ALLOWED

VARIABLE	NAME	VALUE
	SELECT_DIAMETER	0.214
	SELECT_NAME	MAURO

CANCEL OK

4 NESTED SELECT-CASE STATEMENTS

```
SELECTCASE [ #SELECT_DIAMETER ]
CASE [ 0.062 , 0.214 ]
  M105 (^ 0.062 or 0.214 SELECTED)
  SELECTCASE [ #SELECT_NAME ]
  CASE [ HANS ]
    IF [ #SELECT_DIAMETER = 0.214 ] THEN
      M105 (^ 0.124)
    ELSE
      M105 (^0.062)
    ENDIF
    M105 (^ HANS SELECTED)
  CASE [ MAURO ]
    M105 (^ MAURO SELECTED)
  CASEELSE
    M105 (~^ NEITHER MAURO OR HANS SELECTED)
  ENDSELECT
CASE [ 0.105 ]
  M105 (^ 0.105 SELECTED )
ENDSELECT
```

Case Statements can be either

- Variable
- Numeric value
- String value (ONLY ALLOWED WITH GLOBAL VARIABLES)

Multiple values are allowed with a case statement - they need to be separated by a [,]

[0.015 , 2.0]

[HANS,RUEDI]

5

M103 LAD DRODOWN VALUES

```
M103 Q [ #SELECT_DIAMETER ] L [ 0.062 , 0.0915 , 0.105 ,0.125, 0.188, 0.214]
M103 Q [ #SELECT_NAME ] L [HANS,MAURO,RUEDY,BRANDON,LISA]
M103
```

REQUIRES GLOBAL VARIABLE !

This command allows to define the values for a dropdown list for a particular Variable

- The drop down list does NOT limit the values of the variable !

OPTION P

Load DropDown to execute Sub program

Below Sample code will load the variable list for the Variable #SELECT_WIRE_GAUGE & will enable the execution of Sub Program O900 whenever the selected value changes

This allows the dropdown for the Variable #SELECT_COIL_OD to be customized based on the selected #SELECT_WIRE_GAUGE

```
N63 M103 Q [ #SELECT_WIRE_GAUGE ] L [ 18,19,20] P900
N64 M99
N65
N66 O900
N67
N68 SELECTCASE [ #SELECT_WIRE_GAUGE ]
N69 CASE [18]
N70 M103 Q [ #SELECT_COIL_OD ] L [0.12,0.22,0.23]
N69 CASE [19]
N70 M103 Q [ #SELECT_COIL_OD ] L [0.22,0.23,0.33]
N69 CASE [20]
N70 M103 Q [ #SELECT_COIL_OD ] L [0.32,0.33,0.43]
N72 ENDSELECT
N73 M99
N74
N75
```

Above function will only work within the PRG variable List PopUp (M107)

Above setup will load different Dropdowns for the Coil OD based on the selected Wire Gauge

PRG VARIABLE LIST [EDIT] x

VARIABLE	NAME	VALUE
SELECT_COLDPIN_DIAMETER		0.062
SELECT_COLDPIN_LENGTH		HANS
SELECT_WIRE_GAUGE		19
SELECT_COIL_OD		0.22
		0.22
		0.23
		0.33

CANCEL

BITS (BIT1=E

G-Code Commands

Below is a short List of supported G-Codes for both the Prolas and the KDM software

- Originally designed as an educational tool, the Prolas Software pretty much supports any "standard" G-code (a lot more than what is displayed in below table)

New G code functionality will be added to the KDM as needed

The KDM Software supports both, Baldor PCI and CanOpen Motion

The KDM provides similar functionality for both motion platforms (with the exception of some platform specific commands)

Gcode's get constantly added & depending on you're specific config file you most likely won't have all usable G-codes enabled

The list of all currently enabled G-codes within you're setup can be found on you're machine [KDM SETUP] - [G-CODE]

[Edit G-Code](#)

G code (standard)	NLSRCU	Description	Prolas	KDM	CanOpenRe
/		optional skip	*	*	*
\		Skip line	*	*	*
G0		Rapid Move (Interpolation)	*	*	*
G1		Linear Move (Interpolation)	*	*	*
G1.1		Linear Move (Interpolation & feedrate Limited)		*	*
G1.5		Linear Move (NON Interpolation Move)		*	*
G17		XY Plane for circular interpolation	*	*	*
G18		ZX Plane for circular interpolation	*	*	*
G19		YZ Plane for circular interpolation	*	*	*
G2		Arc Clockwise	*	*	*
G20		Inch	*	*	*
G21		Metric	*	*	*
G25		Wait for Input (High)	*	*	*
G26		Wait for Input (Low)	*	*	*
G28		Homing system	*	*	*
G28.5		Homing single axis		*	*
G3		Arc Counter Clockwise	*	*	*
G4		Dwell (sec)	*	*	*
G5		Pause	*	*	*
G52		Use work Coordinate system	*	*	*
G53		Use Machine Coordinate system		*	*
G54..G59		Use Coordinate system G54..G59	*	*	*
G5Q1		Pause & Jogging	*	*	*
G5Q1#?		Pause & Options		*	*
G70		Inch	*	*	*

G71	Metric	*	*	*	sa
G90	Absolute Move	*	*	*	
G91	Increment Move	*	*	*	
G92	Set Axis Positions	*	*	*	
G92.1	Set Position & reset Motion Card counter	*	*	*	

Mcode (standard)	NLSRCU	Description	Prolas	KDM	CanOpenRe	
M0		Pause	*	*	*	sa
M1		Optional Pause	*	*	*	
M105		Display Program MSG	*	*	*	
M2		End of Program	*	*	*	sa
M25		Set Output (High)	*	*	*	
M26		Set Output (Low)	*	*	*	
M30		End of Program	*	*	*	sa
M47		Rewind Program	*	*	*	
M98		Call sub Prg	*	*	*	
M98.1		Insert external CNC file	*	*	*	
M99		Return from Sub Prg / Goto Comand	*	*	*	M9

Mcode (Custom)	NLSRCU	Description	Prolas	KDM	CanOpenRe
M10		Gas 2 (On)	*	*	*
M100		Feedrate Override On		*	*
M101		Feedrate Override OFF		*	*
M102		End of Prg MSG OFF		*	*
M108		Test Gas 1 Pressure		*	*
M11		Gas 2 (OFF)	*	*	*
M110		Send Enter Key to PC		*	*
M120		Create Datalog		*	*
M121Q??		Set Datalog Pass/Fail Flag		*	*
M67		Open Automatic door		*	*
M8		Gas 1 (On)	*	*	*
M9		Gas 9 (OFF)	*	*	*
M122 [??] L??					
U??		Test Expression		*	*
M123		Job Required		*	*

M22	Teach Function# Collect / Save /Process Pos data	**	*	*	M
					Q1

G code (Custom)

NLSRCU	Description	Prolas	KDM	CanOpenRe
G110 Q?	Set Blendmode (0..4)		*	
G111 Q?	Set Blend Distance		*	
G112 Q?	Lock Ahead mode ON/Off (1/0)		*	
G113 Q?	Vector Dual Mode ON/Off (1/0)		*	
G114 Q?	Blend Axi (0..5)		*	
G115Q?	Countour Mode ON/Off (1/0)		*	
G116Q?	Vector Stop Mode ON/Off (1/0)		*	
G117Q?	Set Vector stop Angle (UU)		*	
G120	Activate 2D tracing		*	*
G121	Deactivate 2D tracing		*	*
G122	Clears Trace window		*	*
G123Q??	Set Trace Diameter		*	*
G125	Get Mouse Position (Video)		*	*
G130	Enable CanOpen Countour Mode ON		*	*
G150			*	*
G151Q??	set target value for bar code reader		*	*
G152Q??	set lower limit for bar code reader		*	*
G153Q??	set upper limit for bar code reader		*	*
G430C??	Cognex Vision Commands (Native code)		*	*
G440C??	EnergyMax Powermeter (RS232)		*	*
G450C??	Auxiliary Axis Commands		*	*
G460C??	HL-G103 length measuring device (RS485)		*	*

Laser Codes (M)

NLSRCU	Description	Prolas	KDM	CanOpenRe
M51	* * NLS Laser OK/RCU Ready	*	*	*
M60	* NLS Remote Control OFF	*	*	*
M61	* NLS Remote Control ON	*	*	*
M70	* * NLS Shutter close / RCU start (OFF)	*	*	*
M71	* NLS Shutter open synchronized	*	*	*
M72	* * NLS Shutter open / RCU start (ON)	*	*	*
M74	* * NLS Pulse Burst/ RCU Start (Pulse)		*	*
M75	* RCU Start (Trigger)		*	*

**Laser Codes
(G)**

	NLSRCU	Description	Prolas	KDM	CanOpenRe
G100Q??	*	Set RCU Program ID		*	*
G400C??	*	NLS Laser Commands (RS232)		*	*
G401C??		KLC (Kohler Laser Control)		*	*
G410C??	*	RCU Laser Commands (Ethernet)		*	*

M Codes

M105 Program Message

M105 is used to display a Program Message

The Function has the following options

- [^] = Pause
- [-b] = Beep
- [~] = Display the Message with a red background
- [*] = Pause & Enable Jogging (equal to [G5Q1](#))

Options can be combined

M105(~*Hello) will result in displaying the message with red background & will enter a pause with Jogging enabled

Placing the M105(????) right before a G5Q1 will preserve the Message set by the M105

M105(MESSAGE TEXT)
G5Q1

will preserve the M105 "MESSAGE TEXT"

while

M105(MESSAGE TEXT)
G4F 0.1
[G5Q1](#)

Will display "**PAUSE - START/F5 TO CONTINUE**" in the message bar during a G5 with Jogging

M106 Operator Input

M106 is used to request an operator entry (Numeric or Text)

If nothing is entered, the running cnc program will be terminated

Required Inputs

Q [#VARAIBLE] The input will be written to Variable (the variable needs to be defined ahead of time)

P [@ PROMPT] Prompt (Text) to be displayed in the Input Window "@" is always required to indicate to the parser to load a string value

P String has the following options

- []without Option Input = Numeric -Double (+/-)
- [%] Input = String Entry
- [\$] Input = Numeric Integer (+/-)
- [+] Input = Positive values only
- [^1] (...6) Input = Use buttons - see below

Select Message Box Buttons to be displayed (^1...6)

1=OKOnly

2=OKCancel

3=YesNo

4=YesNoCancel

5=RetryCancel

6=AbortRetryIgnore

Message Buttons Return values

Cancel=0

YES =1

OK =2

NO =3

Retry =4

Abort =5

Ignore =6

- [&] Preset Value in input Box with existing Variable value

Options can be combined

```
#LOOPS= 0
```

```
#RESULT= 0
```

```
M106 Q[#LOOPS] P [@${PROCESS_LOOPS}] ' request to enter the Number of loops to be executed /
Empty Input String
```

```
M98 P1000 L[#LOOPS]
```

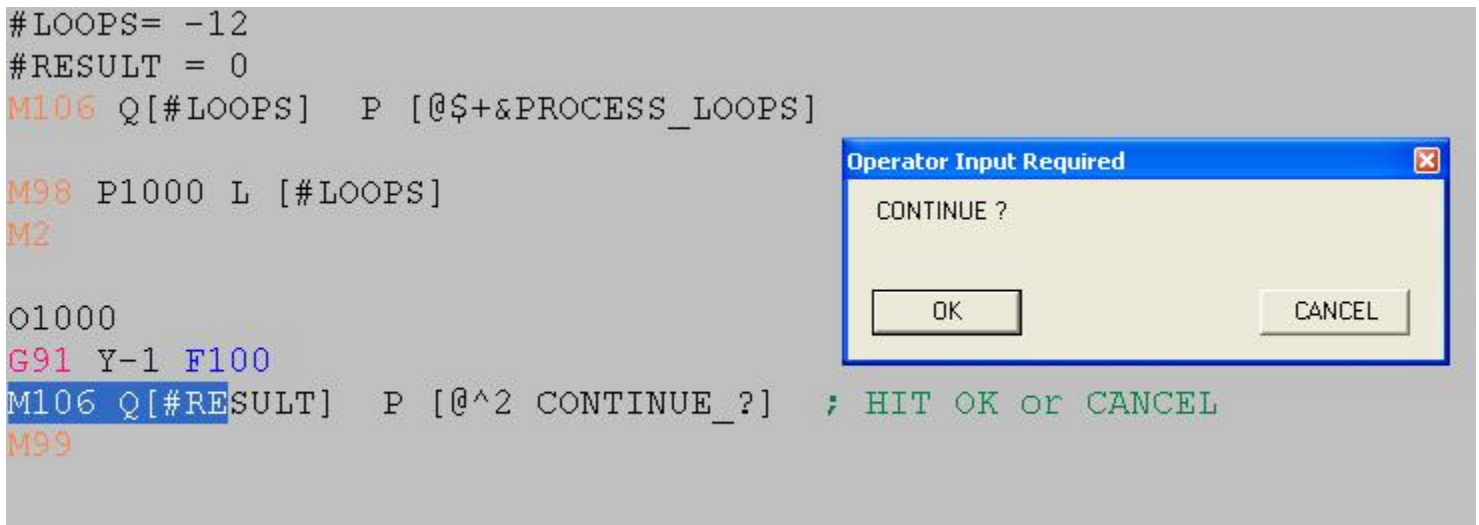
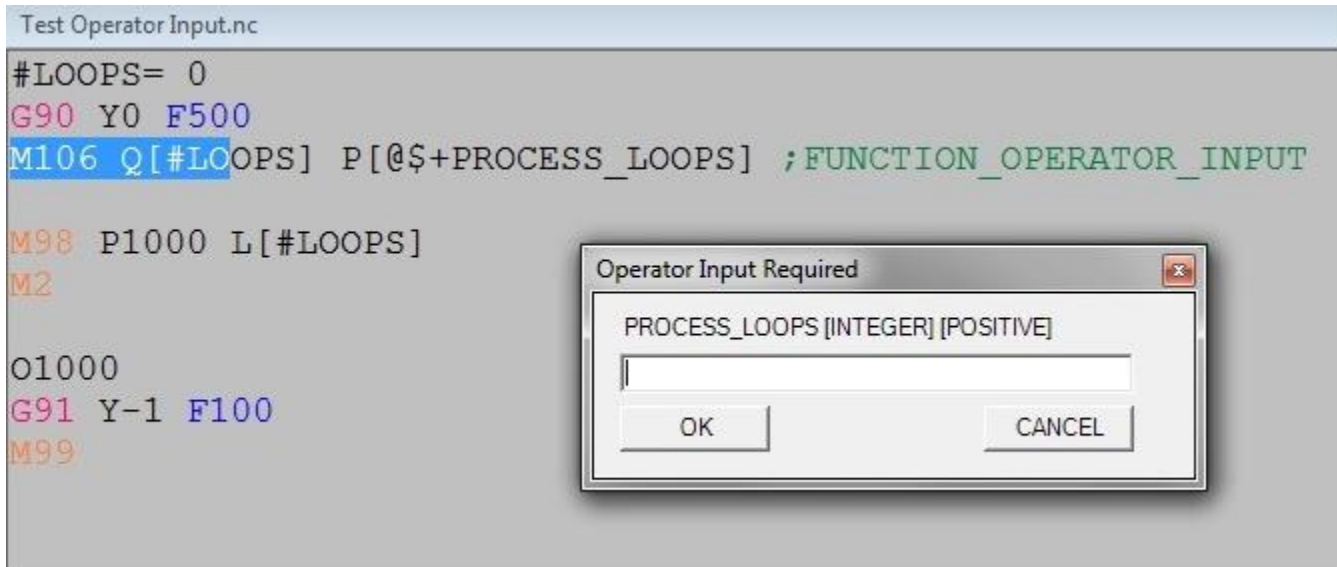
```
M2
```

```
O1000
```

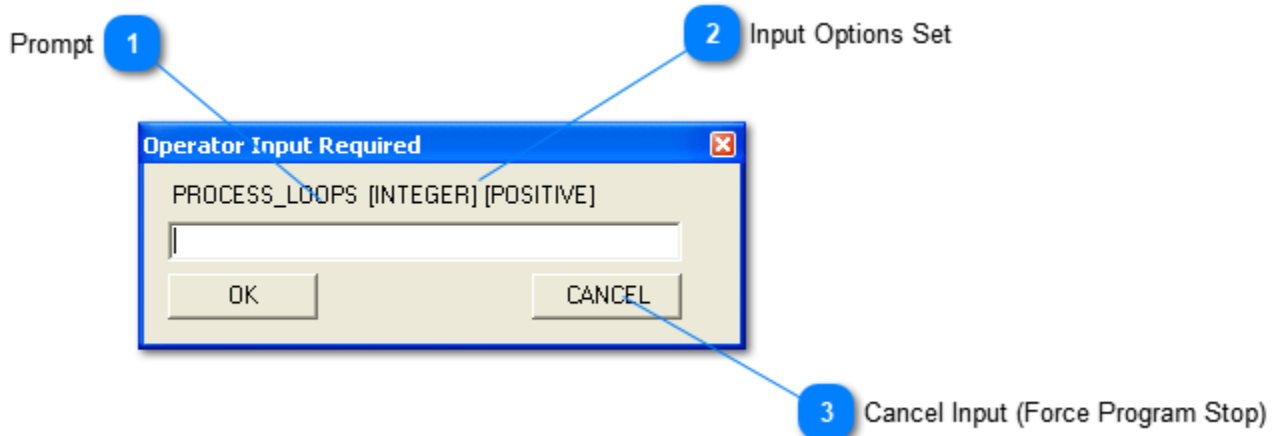
```
M106 Q[#RESULT] P [^2 CONTINUE_?] ' HIT OK or CANCEL
```

```
' #RESULT will hold Button return Value
```

```
M99
```



Operator Input window



M22 (Teach Positions)

The M22 command allows to collect (store) position points and reuse (reload) the collected data at a later time in the program.

Both Memory only and saving the data points to a text file is supported.

Absolute (preset) or relative positions can be recorded (They can not be mixed!)

The Teach command is usually used to trace a weld seam using the jog buttons/ keyboard and then saving the found points to a file or store them for reuse in memory only.

M22 Syntax

M22 Q **COMMAND** P [**FILENAME.TXT**] - Omitting the P value for saving and loading will indicate to use memory only

When using Memory only all teach point will be lost at a software restart or the M22 Q1 (start collecting) command

M22 Q **COMMAND** P [...] Optional Value P

Standard M22 Commands

M22 Q**1** Start collecting (Restart Memory file)

Hit [Enter] on the keyboard to collect (add) new position

M22 Q**2** P[**BitValue**] Set Teach options
Use bit values to set options:
Option 1 / BitValue 2 = Relative Position

M22 Q**2** *Set Teach options without Bit Value will Reset all options (including axis selection)*

M22 Q**3** P[**X...Z**] *Set Axis to be stored - list all axis to be saved during teaching*
Standard = all enabled axis will be saved

M22 Q**5** Add new Position through code (usually executed through keyboard and not through

M22 Q**6** P[FileName.txt] Stop collecting / save to file - (File name is not required)

M22 Q**7** P[fileName.txt] Load file /Set ready flag - (File name is not required)

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M22 Q10 Start Moving This will move based on the loaded Teach steps

M22 Q11 Move To Start This will move the axis to the saved start Position (absolute Position Only)
Position

The function is designed to work with the G5Q1 command (Pause with Jogging) this allows to jog all axis with the GUI or the keyboard

While in Collection mode hit [ENTER] on the keyboard to create a new position entry
Finish collecting by pushing the start button on then GUI or the machine operator panel
The first Position (when you hit [Enter] the first time will be saved as the start position (absolute position only)

It's recommended to reset all Teach options at the beginning of the program (use M22 Q2 without Optional P parameter)

Sample Code [Absolute Mode] with saving to File

```
; SAMPLE KDM TEACHING POSITIONS
; Saving Teach points to File
; Reloading Tech file

If [ FIRST_CYCLE_FLAG = 0 ] then ; ONLY COLLECT PATH on first CYCLE
X0F1000
M22 Q2           ; Reset Teach Options
M22 Q1           ; Enable Teach Pos collection
G5Q1             ; Enable Jog & Collect Position(s)
                ; Hit [enter](keyboard) to create a new position entry in memory
G4F2
G5Q1             ; Enable Jog & Collect Position(s)
                ; Hit [enter](keyboard) to create a new position entry in memory

M22 Q6 P[TeachFile.txt] ; Save Teach positions to text file [?????.txt]
G5
M22 Q7 P[TeachFile.txt] ; Load Teach position file [?????.txt] - Set Move Ready flag
endif

G5

X10F1000
G5
M22 Q11          ; Move to first Position
G5
F500
M22 Q10          ; Start Moving based on uploaded Teach Positions
G4 F5
M47
```

Sample Code [Absolute Mode] without saving to File

```
; SAMPLE KDM TEACHING POSITIONS
; Keep teach points in memory only
;

If [ FIRST_CYCLE_FLAG = 0 ] then ; ONLY COLLECT PATH on first CYCLE
X0F1000
M22 Q2 ; Reset Teach Options
M22 Q1 ; Enable Teach Pos collection

G5Q1 ; Enable Jog & Collect Position(s)
; Hit [enter](keyboard) to create a new position entry in memory
M22 Q6 ; Done Collecting Points - Use Memory Only
M22 Q7 ; Reuse Teach Points In Memory - Set Move ready flag
endif

G5

M22 Q11 ; Move to start Position
G5
M22 Q10 ; Start Moving based on uploaded Teach Positions
M47
```

Sample Code [Relative Mode] with saving to File

In Relative position Mode, the first time you hit [Enter] the position will be saved and recorded as the start position

the start position is ALWAYS saved as absolute position !

In this example only X&Z positions will be saved to file (M22 Q3P[XZ])

```

; SAMPLE KDM TEACHING POSITIONS
; Save Positions in RELATIVE Mode
; Saving Teach points to File
; Reloading Tech file
G54
G90
If [ FIRST_CYCLE_FLAG = 0 ] then ; ONLY COLLECT PATH on first CYCLE
; Setup teaching
M22 Q2 ; Reset all Teach Options
M22 Q3 P[XZ] ; Only collect X & Z Position
M22 Q2 P2 ; Set Option (relative Mode)

X0F1000

M22 Q1 ; Enable Teach Pos collection (First position = Start Position)

G5 Q1 ; Enable Jog & Collect Position(s)
; Hit [enter](keyboard) to create a new position entry in memory

M22 Q6 P[TeachFile.txt] ; Save Teach positions to text file [?????.txt]
M22 Q7 P[TeachFile.txt] ; Load Teach position file [?????.txt] - Set Move Ready flag
endif

M1

X10 F1000
M1
M22 Q11 ; Move to start Position
G5Q1 ; Jog to new Position
G91 ; Enable Relative Mode
M22 Q10 ; Start Moving based on uploaded Teach Positions (relative Positions)
G4 F5
M47

```

In above samples the system variable [FIRST_CYCLE_FLAG] is used to collect the teach point during the first loop only

Below is a sample Teach File

```

; ---- KDM TEACH FILE ---
; PRG NAME: TEST TeachMode M22 Relative.nc
; ACTIVE CS: G54
; TIME STAMP: 6/29/2017 4:07:28 PM
; POSITION_MODE = Relative

[STARTPOS_ABSOLUTE] G1 X123.49960 Z32.66438

; ***TEACH STEPS ***
G1 X-105.50040 Z-59.40250
G1 X-47.10010 Z0.00312

```

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Note: If you do not save to a teach file, you will lose all your taught data points when the software is shut down.

M23 (Save Current Position to Variable)

The M23 Command allows to store the current position for all active axis to local variable(s)

- All positions are absolute positions only !

Syntax

M23 Q[Variable_Name] - the Software will add the Axis index to the given variable Name

M23Q[START_] would result in the creation of following variables:

#START_0 = X axis Position

#START_1 = Y axis Position

#START_2 = Z axis Position

(Above example assumes that standard axis assignment where 0=X/1=Y/Z=2)

Example

```
; Sample store axis position to variable(s) & Set G5 Q?? Options
; M23Q[VARIABLE_NAME]
;G5Q? (Options)
; Bit   BitValue   Bit Function
; 0      1         Enable Jogging during Pause
; 1      2         Disable Reset Button during G5
; 2      4         Disable Collet Button during G5
; 3      8         Load Jog Presets

G54                      ; Use G54 coordinate system
G71                      ; Metric

X0Y0Z0 F1000             ;Move to initial Position
G5Q9                    ; jog in pause (9= set bit 1 (jogging on) & set bit 8 (use Jogging Preset)
M23 Q[STARTPOS_]        ; store current Pos as STARTPOS_x (x= axis Index)

G5Q1                    ; jog in pause (1= set bit 1 (jogging on) )

M23 Q[ENDPOS_]          ; store current Pos as ENDPOS_x (x= axis Index)

X [#STARTPOS_0] Y [#STARTPOS_1] F1000      ; call up start Position
X [#ENDPOS_0] Y [#ENDPOS_1]                ; call up end Position

M2
```

M124 Program Record

Program Record is a simplified record system to store Program information to a tab separated text file(s)
The min KDM Software revision for this function is 3.1

The following Items can be recorded

- Program variables
- System information
- Axis position
- Laser settings

Before you can use the Program Record function in you're program you need to create a record set
- At this point only one record set is available

The [setup screen](#) for this can be found in the Info Tab on the [main screen](#)

below is the sample Code

below code will generate 3 different record files

```
_PRG_NAME  
_FIRSTMOVE  
-SECONDMOVE
```

As there is currently only one Record set available they will all record the "same" record items (set) at different positions

- By leaving the File name modifier P [???] out all 3 positions would be written to the same file

```

; PRG RECORD SAMPLE
;
; Below Program code will write each position into a different file
; On every cyle another Line will be added to the specified file
;
; In a real world enviroment one would probabaly save these entries to a single file
;
; If no name is specified with the [P] modifier, the Program name will be used as the file name
; File Names are preceded by an underline character [_] (TESTFILE will be named [ _TESTFILE.txt])
; Existing fiels will not be overwritten ! File Location is the active KDM Program Folder
;
; At this point there is only one record set avaiable
;
; The record items are split into Headers and Record Items
; Header Information is only written when a new file is created
;
; The Program name is always inserted as the first Header
;
; The Text File is written with TAB separators.
; While the Record file can be viewed with a basic text editor it is best viwed within a spreadsheet application
; Import the file using TAB as the Text seperator only.

G54                ;Use coordinate system G54
G71                ;Metric
G90                ;Absolute
G92.1 X0Y0         ;G92 - Set Axis Position // G92.1 - Include Reset Motion Counter
X0Y0.05 F500
M124              ;Record Items to File = Filename = Program Name
X10Y10 F500
M124 P[FIRST_MOVE] ;Record Items to File = Filename = FIRST MOVE
X5.5 Y1.0005
M124 P[SECOND_MOVE] ;Record Items to File = Filename = SECOND MOVE
X0 Y0 F1000
M2

```

A "typical" output file might look like this

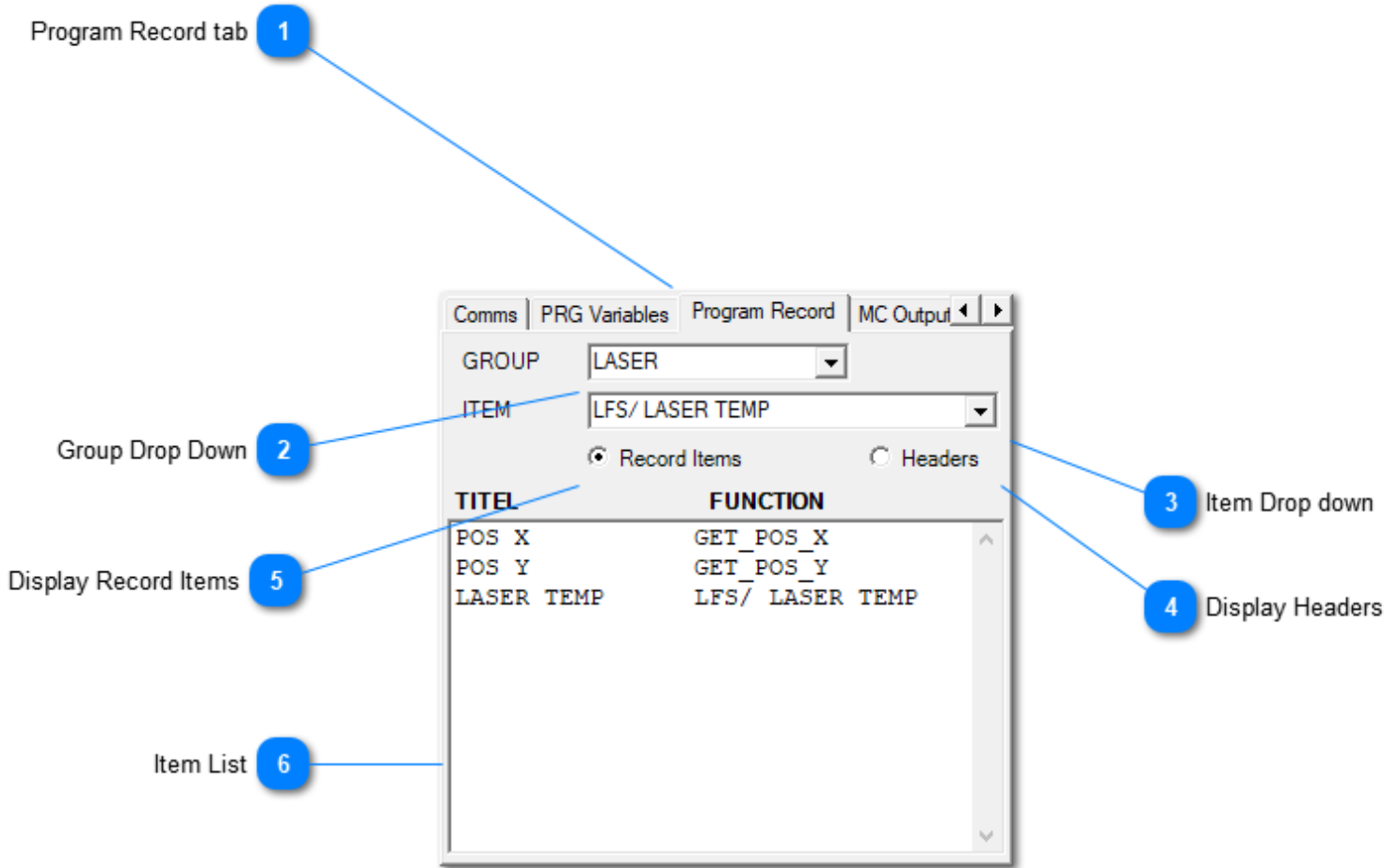
```

PRG NAME  TEST PRG RECORD.nc
USER      admin
SYSTEM #  0
ACTIVE
UNITS     mm

```

DATE	TIME	POS X	POS Y	LASER TEMP
9/1/2018	3:39 PM	0	0.0404	24.9 C
9/1/2018	3:39 PM	0	0.0404	25 C
9/1/2018	3:39 PM	0	0.0408	25 C
9/1/2018	3:39 PM	0	0.0404	25 C

Program Record setup Tab



1 Program Record tab

Select the Tab from the Info Tab control located on the right hand side of the main screen

Program Record

2 Group Drop Down

Select one of the Main Groups

- System

- Variables

- Laser

- Vision

-...

-..

**** IMPORTANT ****

- For any of the Variables to show up in the item drop down you have to "run" the program at least once
- You don't have to really run the program - you can stop it once it starts "moving" as this indicates that the parser has finished reading the G-Code
- Program variables are created when we parse the G-code and kept alive until we re-parse the code (forced by a Program change or if KDM is set to never reuse the parsed code)



3 Item Drop down

Select the desired Item from the drop down

Whenever a new Item is selected from the drop down a window will open and ask if you'd like to add the item to the active record group (Header - Record Items)

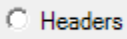
- *Hint, select the desired record group before selecting the item from the dropdown (The items can also be moved between the record groups through the [Context menu](#))*



4 Display Headers

This will show all Header records

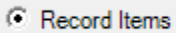
Header info will only be written when a new record file is created



5 Display Record Items

This will show all Record Items

Record Items will be added to the active record file in form of a tab separated table



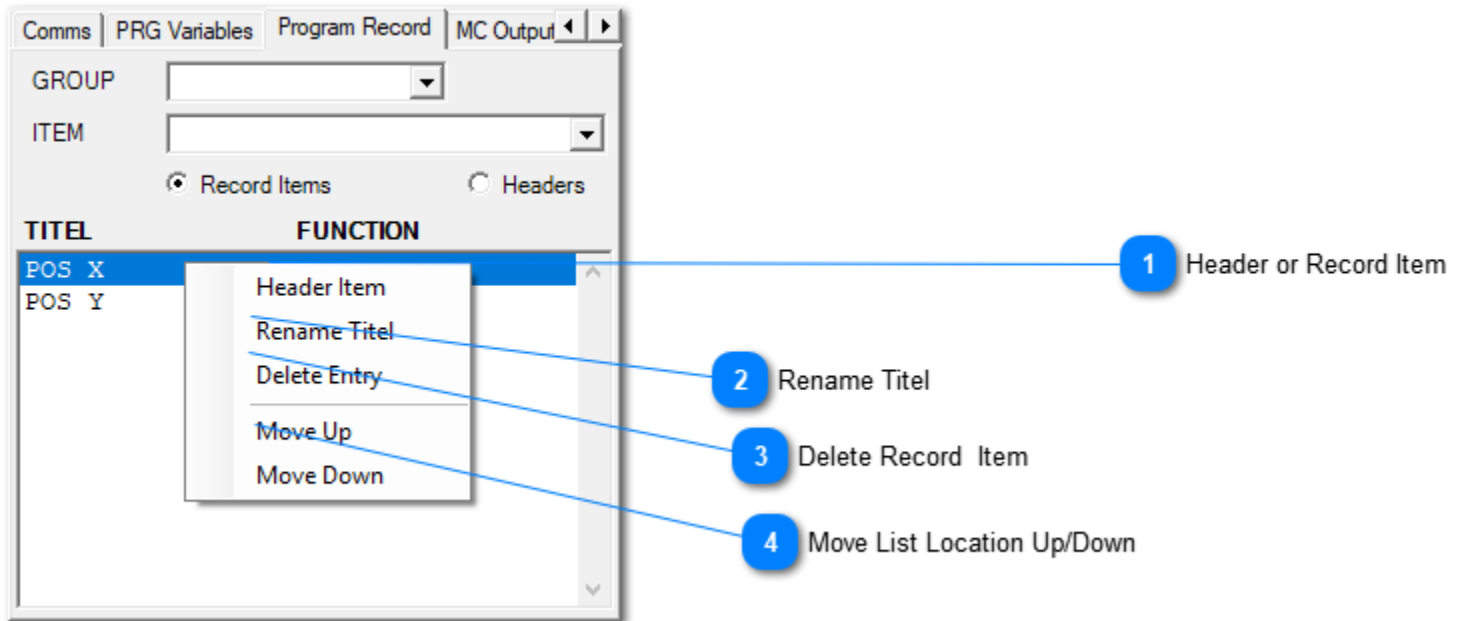
6 Item List

Displays the active Record group Items (Headers - Record Items)

POS X	GET_POS_X
POS Y	GET_POS_Y
LASER TEMP	LFS/ LASER TEMP

Record Item Context Menu

Right click on a record Item will bring up the Context menu



1 Header or Record Item

Header Item

Click on the [Header Item] will switch between header and record Item

2 Rename Titel

Rename Titel

Change Titel for selected record Item (max 15 Characters)

3 Delete Record Item

Delete Entry

4 Move List Location Up/Down

Move Up

Move Down

M145 Sub Program Menu

This Function allows to enable / disable PRG subs based on the preset or trough menu selection at run time

For a Sub program to be added to the menu list the sub number has to be updated

O1000 - will not be included in the Menu List - **but will be executed**

O1000.0 - will be added to the Menulist but is preset to be **disabled**

O1000.1 - will be added to the menu list and is preset to be **enabled**

** The menu list name is based on the comment on the O1000.?? line

G145 is assigned to the menu function

- It will read the PRG SUB list and will add all menu Items with the appropriate check flags in a list (based on .0/.1)
- The Menu window will open allowing the user to change the enable flag for each menu item if needed
- Hitting OK will update the PRG Sub list and the CNC Program will either execute or ignore the sub program based on the enable checkbox

When re-starting a program it will reset to the preset enable flags (.0/.1)

- It's probably best to include the Sub PRG Menu in the first cycle section ...

Below Screen shot shows a sample program with the open Sub Prg Window

```
; SUB MENU SAMPLE PRG
```

```
; SUB MENUES CAN BE ADDED TO THE MENU BY EXTENDING THE SUB START LINE (O1000) with
```

```
A) .0 for Include in Sub Menu - Default = OFF
```

```
B) .1 for Include in Sub Menu - Default = ON
```

```
; The Comment text on the Sub START LINE (O1000.1) with be used as the Menu name
```

```
; The actual menu will be called up with a Gcode (Standard G145)
```

```
; Below Sample with include both Subs to the Menu (SUB 1 Default =OFF / Sub 2 Default = ON)
```

```
; The Sub Menu will only be shown on the first cycle
```

```
N1 IF [ FIRST_CYCLE_FLAG =0 ] THEN
N2 G145 ; DISPLAY SUB PRG MENU
N3 ENDIF
N4 M98 P1000 ;Call Sub Program
N5 M98 P2000 ;Call Sub Program
N6 G5 ;Pause (Options Q?)
N7 M47 ;PROGRAM END
N8 O1000.0 ;SUB 1
N9 M105 (^~ SUB 1) ;Display Message(~Warn/^Pause/-bBeep/* Jog
N10 M99 ;End Sub Program - (Option Goto Command I
N11 O2000.1 ;SUB 2
N12 M105 (^~ SUB 2) ;Display Message(~Warn/^Pause/-bBeep/* Jog
N13 M99 ;End Sub Program - (Option Goto Command I
```

SELECT ACTIVE SUB PROGRAMS	
SUB#	SUB NAME
<input type="checkbox"/> 1000	SUB 1
<input checked="" type="checkbox"/> 2000	SUB 2

CANCEL OK

Interrupt Sub Routine

One sub can be defined as an interrupt sub routine

The interrupt sub is defined by the custom sub extension [.9]

Only one interrupt sub is allowed

O1000.9

...

...

..

M99

The interrupt sub can only be called by the interrupt function

- The function can be triggered by pressing the [STOP] button for xx sec (the required delay can be set in the KDM Setup - Advanced window)

The interrupt sub still needs to be called within the program

Execution of the Interrupt explained:

- pushing the [STOP] button will stop the program as usual
- when staying on the stop button long enough the Interrupt flag will be set and the CNC program will start again
- when the program reaches the call for the interrupt sub the sub will be executed and the Interrupt flag will be reset

The call to the Interrupt subroutine can be placed anywhere inside the main program - but usually it should be placed at the beginning allowing the interrupt sub to execute it's code sequence before the standard program steps are executed

Below Interrupt sub O1000 will only execute if you push the stop button for xx sec while a program was running

M98 P1000 ; Call to Interrupt sub

IF [FIRST_CYCLE_FLAG = 0] THEN

....

....

...

ENDIF

...

....

....

...

...

M2

O1000.9 ; INTERRUPT SUB

G54

G90

G1 Z50 F2000

M67

G5

G Codes

G1 Linear Moves (G1 ... G1.5)

The G1 and it's sub command are used for linear Motion

Available G1 Commands

[G1] **Standard** Multi Axis **interpolation** move (If G1 is not listed before the move, it is assumed to be a G1 command)

Sample Code:

```
G1 X10Y20Z30 F1000
G1 X5Y50Z50 F2000
G1 X25Y600Z100 F200
```

This will move all commanded axis (XYZ in the example) **together** along the given path at the commanded feed rate

All commanded axis will start and stop together.

G1 Commands can be blended together resulting in a continues path (see blending for more detail about the blending options)

Individual feed rates can be applied to each move segment.

Absolute and Incremental moves are supported

CANOPEN ONLY

G1 commands are not combined automatically - only when used within a contour move (G130) they will be combined !

Standard G1 moves (without Contouring) are limited by below Limits
This super seeds the individual axis limits

[G1.1] **Special** Multi Axis **interpolation** move with limiting **feedrate** by slowest Axis

Sample Code:

```
G1.1 X10Y20Z30 F1000
G1.1 X5Y50Z50 F2000
G1.1 X25Y600Z100 F2
```

Next to Feed rate, G1.1 has the same functionality as the standard G1

This will move all commanded axis (XYZ in the example) **together** along the given path.

The **feedrate** will be limited by the **slowest** Axis

[G1.5] Multi Axis (max 4) **Non** interpolation move

Sample

G1.5 X10Y20Z30 F1000

G1.5 X5Y50Z50 F2000

This will move all commanded axis (XYZ in the example) **Individually**

G1.5 Commands can **NOT** be blended together

Individual Accel / Decel values, defined by the Axis setup will be used for each Axis

All Axis will start together but will finish individually

Absolute and Incremental moves are supported

This is useful if you need to rewind the A axis (rotary)

G130 - CONTOURING (CanOpen)

G130 Q? P (OPTIONAL)

The Q Value is based on the bit values for the following flags

Bit 0 (Value1) Turns **ON** contouring

Bit 1 (Value2) Turns **OFF** the profile feed rate limit

(**Single** axis rotary moves already have the Profile feed rate Limit removed by default)

Bit 2 (value 2) Turns **ON** transformation

When entering a Countour Move the preset feed /acell Linkage limits for contouring will be set

- ONLY the [**PRESET CONTOURING MODE**] Limits will have an effect during Contouring (G130)

Contouring Limits

G130 Q0 will turn contouring off and reset all bit flags

Segments of motion that needs to be profiled together needs to be encapsulated by the G130 Command

Bellow sample is for NLS based Laser(s)

G130 Q3	; Enable Contouring with Profile Feedrate Limit OFF
G1 A30 F20000	Ramp up A axis to 20000 Deg/min
M72	Open Shutter on the fly
G1 A360	Rotate another 360 Deg at 2000 Deg/min
M91	Enable Ramping on the fly
G1 A 60	Finish move and come to a stop
G130 Q0	
M70	CLOSE SHUTTER
M90	RESET RAMPING FLAG

TRANSFORM (execute Linear axis Move onto a rotary Axis)

This can Only be done within Contouring

The axis involved need to be setup within KDM setup

AXIS TRANSFORM (LINEAR TO ROTARY)

Linear Axis # Y AXIS

Rotary Axis # A AXIS

Below Code sample will transform (execute) the Y axis portion of the circular move onto the A axis

```

N19      G135 Q50
N20      G130 Q5 P20
N21      G2 X0Y0 I-2 J0 F500
N22      G130 Q0
    
```

Tube Diameter = 50mm

The transformation can be enabled together with the G130 Q? command

Therefore

G130 Q5 (Bit 1(1)+ Bit 2(4)) will enable contouring including transformation

G2/G3 Arcs

The KDM supports the two standard Gcode syntax for Arc commands in clockwise and counter clockwise direction

- supplying center Locations (I,J,K)
- supplying Radius

G2 = Clockwise

G3 = Counter Clockwise

Both incremental and absolute position entries are supported

Usually the Center inputs are supplied as incremental offsets from the start point but the center Inputs can also be assigned to be absolute regardless of the active program mode
(KDM Setup - General Window)

Remember the start position for the arc is always the current pos when entering a G2/G3 command

The identifiers [X] and [Y] ([Z]) determine the end Position of the Arc

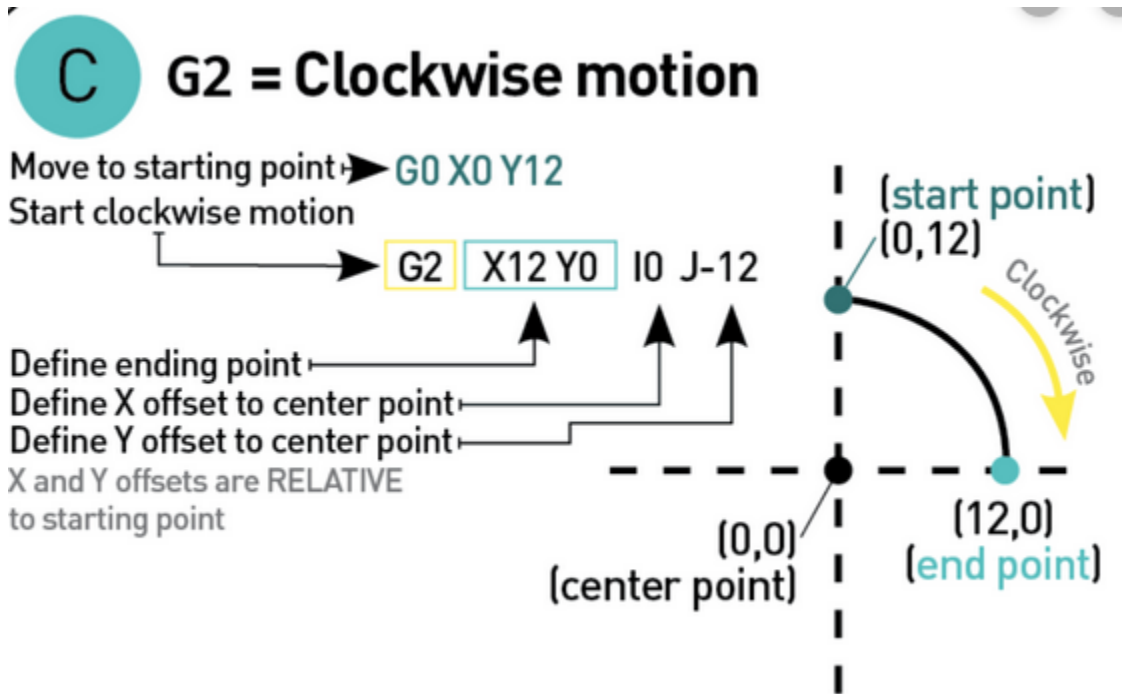
Supplying the center locations is the preferred way of programming as it allows full circles

Use the appropriate center identifier based on the selected plane

I = X axis

J = Y axis

K = Z axis



When supplying the radius a full circle is NOT POSSIBLE to be programmed

When using the Radius syntax only the end position and the Radius needs to be supplied

- there are always two possible solution when supplying the Radius

Use a negative radius value to force the bigger (longer) circle

see below samples

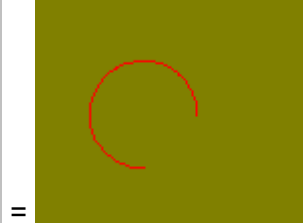
The first sample uses a positive radius Input [R 5]

The second sample uses a negative value for the radius [R - 5]

```
N13      G90
N14      G1 X0 Y0
N15      M72
N16      G2 X5 Y5 R5 F500
N17      M70
N18      G5
```



```
N13      G90
N14      G1 X0 Y0
N15      M72
N16      G2 X5 Y5 R - 5 F500
N17      M70
N18      G5
```



G5 (Q??) Pause

G5 is the Pause Function with optional setting (Q Value)
It

Q values option are selected based on a bit value (They can be used in any combination)

bit 0 = value 1	= enable Jogging
bit 1 = value 2	= Disable Reset button (prevents accidental door opening)
bit 2 = Value 4	= Disable Collet Button
bit 3 = value 8	= Load preset jog settings - see KDM Special Setup window
bit 4 = Value 16	= Keep Gas Valves on for xx sec (xx Delay based on KDM setting)

below are some of the combinations

G5	= Pause Only
G5 Q1	= Pause with jogging (1=1)
G5 Q3	= Pause with jogging / disable Reset Button (1+2=3)
G5 Q7	= Pause with Jogging / disable both Reset and collet button (1+2+4 =7)
G5 Q9	= Pause with Jogging / Load preset Jog settings (1+8=9)

There is also checkboxes in the [KDM Setup](#) - [Run settings](#) that will allow you to turn off the Reset and the Collet Button while a CNC program is running.

Once those checkboxes are set you can still control the enable/disable state of the Collet and Reset button with the above G5Q?? Values

= G5 or G5Q1 will still enable both the Reset and the Collet Button within the G5 function

Limiting Jog axis

The G5Q? code can be extended to limit the Jog axis

G5Q1 **P[X]** will only enable X for jogging during the G5 function

G5Q1 **P[AZ]** will only enable A & Z for jogging during the G5 function

G92 Set position

The G92 is used to set the position of an axis or a coordinate system.

Available G92 Commands

[G92] Sets an axis or coordinate system to a set position (typically zero)

Sample Code:

```

N30 G54 ;Use G54 Coordinate
System
N35 G90 ;Absolute Move
N40 X0Y0 F1000 ; Move X0 Y0 at
feedrate 1000
N45 G92 ;set position

```

[G92.1] Sets an axis to a set position (typically zero) and resets the motion controller counter.

The motion controller only has so much memory. So if you keep traveling in the same

direction (rotary axis) over and over, eventually you will hit a memory ceiling.

So, at the beginning of a sub program you can reset the axis position back to zero.

Sample Code:

```

N50 G55 ; Use G55 Coordinate System
N55 G4F0.1 ; Dwell 0.1 seconds
N60 G92.1 A0 F1000 ; Set position and reset the
motion counter

```

G53..G59 Coordinate Systems

List of a currently accessible Coordinate system

KDM Name	CNC Direct Call	G59 P? Calling
CS 0 Machine	G53	G59 P0
CS 1 WorkCoordinate	NA	G59 P1
CS 2 G54	G54	G59 P2
CS 3 G55	G55	G59 P3
CS 4 G56	G56	G59 P4
CS 5 G57	G57	G59 P5
CS 6 G58	G58	G59 P6
CS 7 G59	G59	G59 P7

....

... Expansion CS are not implemented yet

...

CS 8 G59 P8

CS 9 G59 P9

CS 1 G59 P10

...

...

..

G59 P?? allows the call up of all Coordinate systems (Including the Work coordinate system)

The first 6 coordinate systems can be called up "direct" with G54 ..G59 calls

Adding Q1 to the CS call will make the CS sticky

The standard behavior is for the KDM to switch back to the manually selected CS at the end of a Program

= CS call made within the CNC code are temporary only

By using Q1 this behavior can be overwritten and will allow to set the dominant CS through Code

Example:

G54 Q1 will leave the System in G54 after the program ends or is aborted

G59 P2 Q1 will also switch to G54 and leave the system in G54 after the program ends

G59 P1 Q1 will switch to the work coordinate system and leave the system at that after the program ends

G54 will temporary switch to G54 while the program is running, but after the program end will recall the CS that was active before the program started

G140-G142 Laser Power Meters

The G140-142 Functions currently support the following Laser power meters

- Coherent PowerMax RS (RS -232 Interface)

Example: PowerMax-PM150-19C

[Setup Coherent Power Meter](#)

- Ophier DLL for the USB Juno Interface

Example PE25BF-C

[Ophier DLL](#)

Above power meters are implemented different

- The Coherent Meter uses the standard Serial communication through the KDM software
- The Ophier Power Meter has its own KDM DLL including Setup window and run time display during power readings

KDM Software Manual

COHERENT POWER METER

Required KDM Files:

Coherent Setup file (.cod)

Start the Coherent GUI that is supplied with the Unit and make sure you can see the power meter

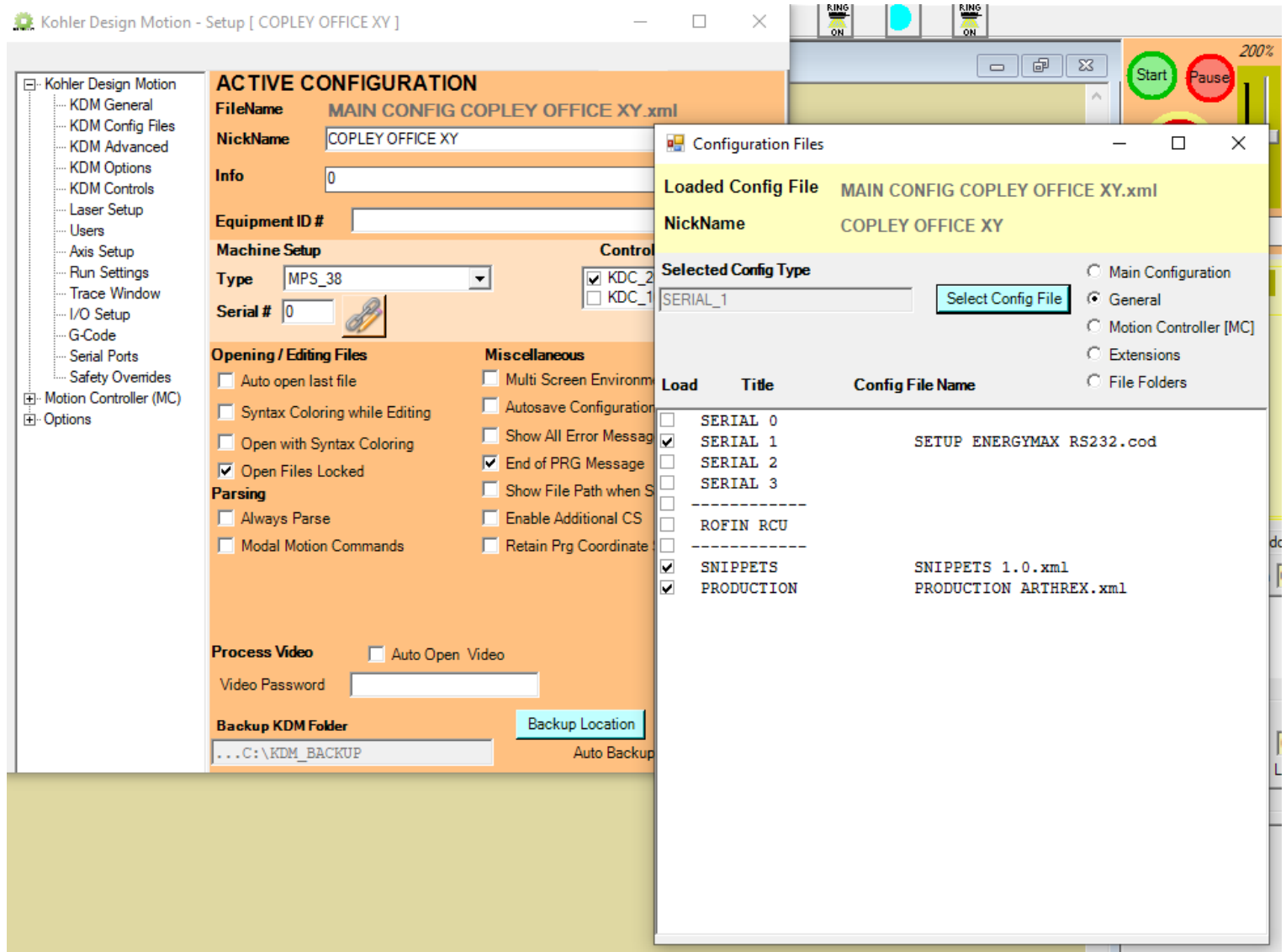
**** Make a note of the serial port the unit is connected to *****

**** CLOSE THE COHERENT GUI OTHERWISE THE KDM CAN NOT CONNECT TO IT ****

Open the KDM setup - Select [KDM ConfigurationFiles] then select [General]

- Click on one of the empty serial lines

- Click on [Select config file] and select you're Coherent setup file (.cod)

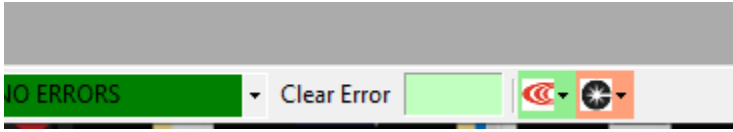


Close all windows - Save Configuration - close done KDM

Restart KDM (If you don't do this the power meter functions will not be available for the next steps)

Most likely you will get an error message at this point indicating that KDM can not find the power meter - Ignore the message for now

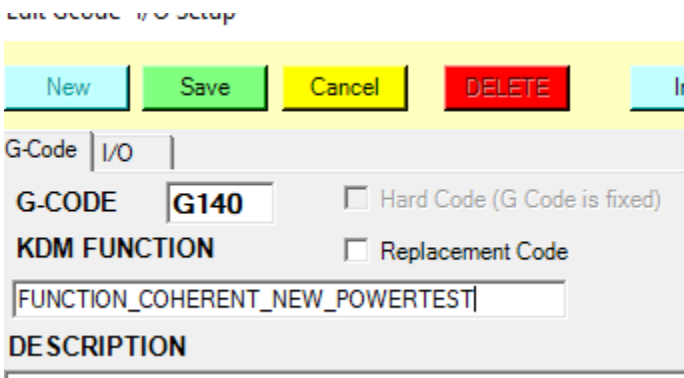
You should see a new Icon appear at the bottom of the KDM window Indicating that the power meter setup has been loaded



Open KDM setup again and select Gcode

Click on the new Button and add G140

Right click in the KDM Function Cell and select the [FUNCTION_COHERENT_NEWPOWERTEST] or similar (Functions names can change over time)



Make sure to mark both checkboxes Baldor PCI and Copley CanOpen are checked



Click the save Button

Add the other two Gcodes

G141 = FUNCTION_COHERENT_PROCESSRESULT
G142 = FUNCTION_COHERENT_READPOWERMETER

Close the Gcode Window

Select the Run tab and make sure the Power meter Comms value is set to a valid number (85 is the default that should be used)

This allows the KDM to save the last power reading. Thsi in return allows a program to check the last power reading to a given set of limits .. see below use of Gcode section

Counters

Cycle Counter 0	<input type="text" value="82"/>	
Cycle Counter 1	<input type="text" value="81"/>	<input checked="" type="checkbox"/> Reset Counter 1 with Program Start
Counter 1 Target	<input type="text" value="83"/>	
Single Cycle Flag	<input type="text"/>	
Shutter Open Counter	<input type="text" value="0"/>	<input checked="" type="checkbox"/> Single Cycle at Target

Power Check

PowerCheck flag	<input type="text" value="84"/>	
PowerCheck Interval	<input type="text" value="1000"/>	<input type="checkbox"/> Powercheck at counter =0
Power Reading	<input type="text" value="85"/>	

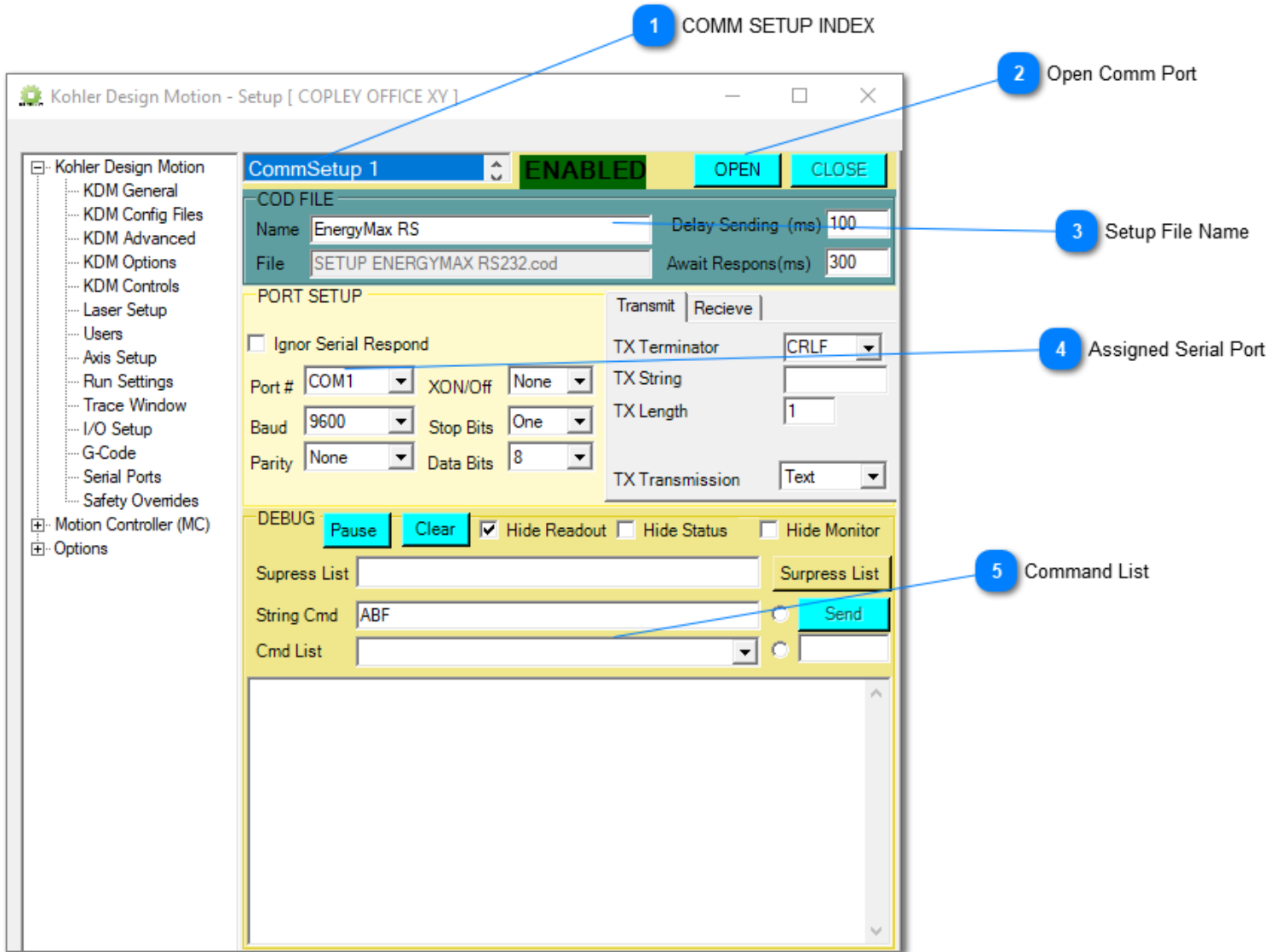
Select Serial Port form the tree in the KDM setup window

Select the appropriate CommSetup = Config file Serial Index

If the correct ComIndex is selected it will show the loaded Cod file name

Select the serial port the Power meter is connected to

At this point you could Open the Port and send a command from the command list for testing

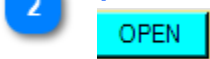


1 COMM SETUP INDEX



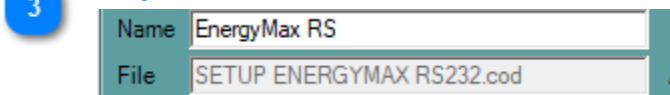
Select the Comm index from the drop down

2 Open Comm Port

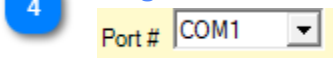


Manually Open the Comm port

3 Setup File Name



4 Assigned Serial Port



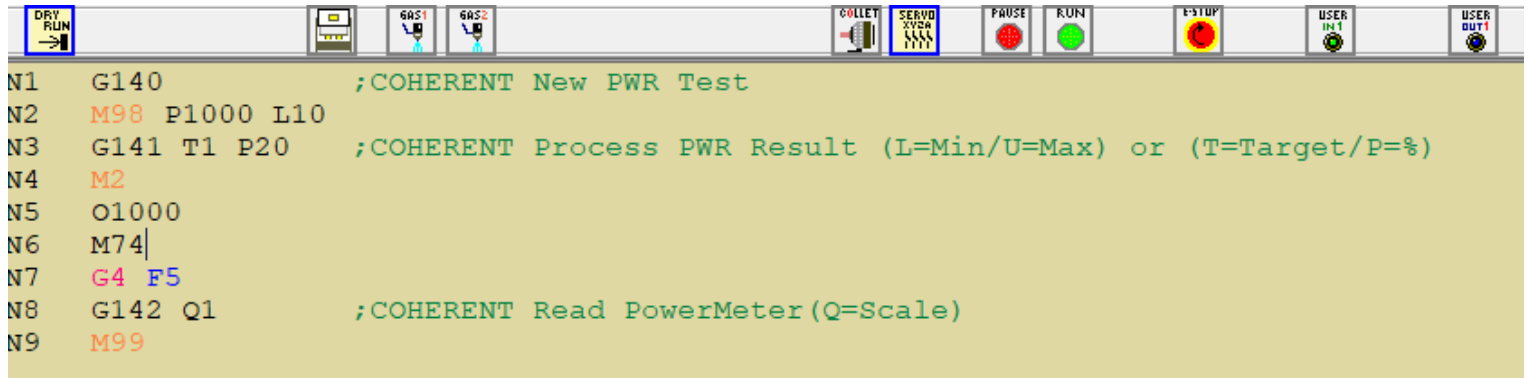
Select the appropriate Serial port for the device

5 Command List

Cmd List

Commands currently available for the Device (loaded from the Cod file)

USING THE CNC CODE



```

N1  G140                ;COHERENT New PWR Test
N2  M98 P1000 L10
N3  G141 T1 P20         ;COHERENT Process PWR Result (L=Min/U=Max) or (T=Target/P=%)
N4  M2
N5  O1000
N6  M74|
N7  G4 F5
N8  G142 Q1             ;COHERENT Read PowerMeter(Q=Scale)
N9  M99
  
```

Use G140 to start an **NEW** power reading

This will clear the last saved reading and indicate that we will compare the limits against new readings

If you leave the G140 off , the G141 Command will test the limits against the last saved power reading

Use G141 to evaluate the Average result from the last readings) or against the saved power reading

Available options

Q = 0/1 (Q1 will run the comparison silent - if the test passes you will not get any messages - used with automatic measurements)

There are two ways of setting the limits

A) Absolute limits

L = Lower Limit

U = Upper Limit

B) Percentage

T= Target value

P= Percentage

Use G142 to read the current reading from the power meter (J/W)

The KDM will read the value and calculate the average based on # of shots and received values

COHERENT SETUP FILE

Below is a copy of the current Setup file (6/12/2019)

A couple of sections should be checked or changed depending on the required setup

Kohler Design Corp Corvallis OR 97333

SETUP COMMANDS

The setup commands section allows sending xxx commands at startup to the power meter

You can have as many setup commands as you like (in case we missed one that's needed for your particular setup)

***** Cod file lines that start with [;] are ignore ******

....

....

:[NONE] Indicates not to send anything

[SETUPCOMMAND]=*RST; ResetDevice to power Up state

[SETUPCOMMAND]=TRIGger:PTJ:LEVEl LOW; Trigger Level

[SETUPCOMMAND]=CONFigure:WAVElength 1064; set Wave Length

[SETUPCOMMAND]=CONFigure:MEASure J; Measure Units J|W [J]

[SETUPCOMMAND]=CONFigure:ITEMselect MEAS; Report only Measurements (read/) items [MEAS,POS,FLAG,TST]

....

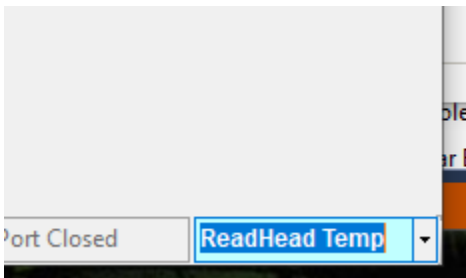
....

..

READOUT SECTION

Any cod line starting with [READM] will be added to the readout dropdown in the lower right corner of the KDM

```
; *****
; READOUT SECTION - Items listed will be added to the readout drop down menu
; *****
;Code UNITSSerial CodeTextFreq (ms)ScaleContex Help
[READM], ,SYSTem:INFormation:SNUMber?,ReadHead Serial,1000,1,Serial Number
[READM], ,SYSTem:INFormation:CDAte?,Calibration Date,1000,1,Calibration Date
[READM], ,CONFigure:GAIN:FACTOR??.Gain Factor,1000,1,Gain Factor
[READM], C,SYSTem:INFormation:TEMPERature?,ReadHead Temp,1000,1,ReadHead Temperature
[READM], J,READ?,Power Reading,1000,1,Power Reading
[READM], ,*IDN?,ReadHead Info,1000,1,ReadHead Info
[READM], ,SYSTem:ERRor:COUNT?,Error Count,1000,1,Error Count
```



CURRNET SETUP FILE

```
;-----
;--- DOCUMENTATION COD SETUP FILE(S) -----
;-----
; COD files are used for load Gcodes for different Custom Controls
; Eaxmple : Serial Laser / Serial Measurement Device / Cognex Control / Dc-12 Custom Code
; The basic structure of the COD file stays the same for the various controls but the actual parameter Entries
change based on the
```

KDM Software Manual

```
; selected KDM Module.
; It is therefore NOT recommended to use a Cognex COD file as the base for a new Serial Port COD File as it won't
have the proper parameter
; entries for the device.
; Not all functionality is used with each device

; [,] Separated table
; [;] Comments - anything afterwards will be ignored on that line of code
; Enable Logging in the KDM Setup do print all messages to serial Log (send and received)
; NC Command = [Gcode_Function]+ "C"+ [code]
; Custom communication G codes need to be > G400 !
; Example: Gcode_function Panasonic HL-G103 = [G410], Code=[10] // resulting NC code = G410C10
;
; ** Sensor Settings ** (needs to be set on sensor manually before communication can be established!)
; Sensor Type: Coherent EM-RS J-50MB-YAG-1535
; CommSetup: [RS 232]
; BaudRate: [9600]
; Sensor ID: [1]
;
; -----
;
; ** Functions (SENDING) **
; WRITE_COMMAND Send Fixed Hex Command
; WRITE_VARIABLE Send last 8 bits include programmable values to be transmitted to Laser
; WRITE_CUSTOM Send programmable hex string to be sent to Laser
; READ_VALUE Read Numeric Value from Device
; DATA_LOGGING Read out value (Numeric/ String) add to Log or Production File
;
; ** Context Help/ {sample Code to be inserted} **
; Put in {} braces the actual code that will be inserted ({} braces will automatically be removed)
; Enter Gcode as G@@@ as the @@@ will be replaced with the actual G code set in the COD file)
; Sample:
; {G@@@ C101} Test - This text will be Inserted
; Result: G410 C101; Test - This text will be Inserted
;
;
; ** Functions (RECEIVING) **
; Receiving functions are set based on a bit pattern (see below)
; Bit Pattern
; 'BitBitValue function
; '01 = Stop PRG
; '12 = Close shutter
; '24 = Display Message Box
; '38 = Display Message Color Yellow (KDM Status Bar)
; '416 = Display Message Color Red (KDM Status Bar)
; '532 = Clear Message Display (KDM Status Bar)
; '664 = Ignore Message
; '7128 = Write to Log File
; '8256 = Write to Production Log (If enabled)
;
;
;
; ** Some Common Message settings are:
```

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```
; ERROR=7Stop PRg (1) / Close Shutter(2) / Display Message Box(4)
; WARNING=16Display Message Color Red (KDM Status Bar)
; MESSAGE=8Display Message Color Yellow(8)
; IGNORE=64Ignor Message (64)
; CLEAR STATUS BAR=96Clear Message Display(32) /Ignor Message (64)
;
; Production Log= 256Write to Production Log (If enabled) - value will also be stored in a internal variable to
be used from within the CNC code
;
;
;-----
;
; ** Parameters Description **
; [...]General Settings
; [READA]Readout/automaticReadout automatic (Interval set by Laser)- continue PRg
; [READM]Readout/manualReadout by request(Interval set by KDM)- No Action
; [INICOMMAND]String that will be sent to see if the device is responding
;
;-----
; -- ACTUAL CODE TO BE LOADED -----
;-----
;PARAMETERS SECTION
[MODULE]=ENERGYMAX_RS;NOT user programmable - KDM module to be used with this interface
[GCODE_FUNCTION]=G440;NOT user programmable - defines serial interface to be used
[GCODE_DESCRIPTION]=ENERGYMAX CONTROL;Gcode Help Text
[NAME]=EnergyMax RS;Display Name
[BAUDRATE]=9600;Baudrate - needs to be same as on the device
[DATABITS]=8
[PARITY]=None
[STOPBITS]=One
[HANDSHAKE]=None

[TELEGRAMLENGTH]=1 ;Length of standard send Telegram (allows filling msg to full length if required)
[AWAITRESPOND]=300;Allowed delay(ms) for the device to respond to a Command
[RECEIVEDBYTESTHRESHOLD]=1;Recieving bytes threshold (Standard =1)
[TX_TERMINATOR]=CRLF;Sets terminator when Sending [NONE,CRLF,CR, or "Custom String"]
[RX_TERMINATOR]=CRLF;Sets terminator when Recieving [NONE,CRLF,CR, or "Custom String"]
[INICOMMAND]=SYSTem:COMMunicate:HANDshaking?;For testing if device is responding
[INIRESPOND]=OFF;Expected Respond when sending the INI Command
[ECHO_COMMAND]=0;Indicates if the serial device will respond [ECHO]to WRITE COMMANDS sent
[DELAY_SENDING]=100;Delay between sending of commands (gives the serial device time to process the last command)
preset = 30ms

;Setup commands will be executed one after the other once communication has been established
;There is NO limit on how many commands can be executed
;[NONE] Indicates not to send anything

[SETUPCOMMAND]=*RST; ResetDevice to power Up state

[SETUPCOMMAND]=TRIGger:PTJ:LEVel LOW; Trigger Level
[SETUPCOMMAND]=CONFigure:WAVElength 1064; set Wave Length
[SETUPCOMMAND]=CONFigure:MEASure J; Measure Units J|W [J]
[SETUPCOMMAND]=CONFigure:ITEMselect MEAS; Report only Measurements (read/) items [MEAS,POS,FLAG,TST]
```

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```

;[SETUPCOMMAND]=SYSTEM:ERROR:Clear?; Clear All errors
;[SETUPCOMMAND]=CONFIGure:DIAMeter 1.5; Apertura[1cm]
;[SETUPCOMMAND]=CONFIGure:GAIN:FACTOR 1.2; Gain Compensation Factor
;[SETUPCOMMAND]=CONFIGure:GAIN:COMPensation ON; Enable Gain Factor

; *****
;READOUT SECTION - Items listed will be added to the readout drop down menu
; *****
;Code UNITSSerial CodeTextFreq (ms)ScaleContex Help
[READM], ,SYSTEM:INformation:SNUmber?,ReadHead Serial,1000,1,Serial Number
[READM], ,SYSTEM:INformation:CDAte?,Calibration Date,1000,1,Calibration Date
[READM], ,CONFIGure:GAIN:FACTOR??.Gain Factor,1000,1,Gain Factor
[READM], C,SYSTEM:INformation:TEMPerature?,ReadHead Temp,1000,1,ReadHead Temperature
[READM], J,READ?,Power Reading,1000,1,Power Reading
[READM], ,*IDN?,ReadHead Info,1000,1,ReadHead Info
[READM], ,SYSTEM:ERROR:COUNT?,Error Count,1000,1,Error Count

; *****
;COMMANDS SECTION - Send Fixed Commands (Setup- usually no data will returned from the device)
; *****
;Code FunctionSerial CodeTextRangeScaleContex Help

[01],WRITE_CUSTOM,#####,,,{G@@@ C01}Custome Hex Code []
[02],WRITE_COMMAND,CONFIGure:ZERO,Zero-ReadHead,,,{G@@@ C02}Zero ReadHead
[03],WRITE_COMMAND,SYSTEM:ERROR:Clear?,Clear all Errors,,,{G@@@ C03}Clear all Errors
[04],WRITE_COMMAND,SYSTEM:ERROR:NEXT?,Next Error(DEBUG),,,{G@@@ C04}Next Error(DEBUG)

; *****
;READ SECTION - Request Info from device - Copy respond to CNC variable
; *****
;Code UNITSSerial CodeTextFreq (ms)ScaleContex Help
[10],READ_VALUE,READ?,Read Measurement,,,{G@@@ C10[Q#??]}Read last Measurement to Variable

; *****
;Write Variable - Write Variable from CNC code to Device (Numeric Value)
; *****
;Code ACTIONSerial CodeTextRangeScaleContex Help
[11],WRITE_VARIABLE,TRIGger:LEVel,Set trigger Level (%),0.01/30,1,{G@@@ C01 Q ???}Trigger Level (% of Fullscale)

; *****
; MESSAGE SECTION - Recived messages from Device without request [Errors/Status]
; *****
;Code ActionDevice MessageText to be Displayed for this code
[],7,-350,[Error] "Queue overflow" Error queue is full
[],7,-310,[Error] System error" Unexpected/unrecoverable hardware or software fault
[],7,0,[Error] No error" No error

```

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```
[],7,100,[Error] "Unrecognized command/query" The command or query is not recognized
[],7,101,[Error] "Invalid parameter" The command or query parameter is invalid
[],7,102,[Error] "Data error" A data error was encountered

; *****
;DATA Logging - Request Info from device - write respond to log or display message
; *****
;Code ACTIONSerial CodeLog Entry (& Value)ActionScaleContex Help
[101],DATA_LOGGING,READ?,Coherent/Power Reading [J],256,1,{G@@@ C101}Coherent/Power - log Value
[102],DATA_LOGGING,SYSTEM:INFormation:SNUmber?,Coherent/Serial Number,256,,{G@@@ C102}Coherentead/Serial# - log
Value
[103],DATA_LOGGING,SYSTEM:INFormation:PNUmber?,Coherent/Part Number,256,,{G@@@ C103}Coherent/Part# - log Value
[104],DATA_LOGGING,SYSTEM:INFormation:MODEl?,Coherent/Model Number,256,,{G@@@ C104}Coherent/Model# - log Value
[105],DATA_LOGGING,SYSTEM:INFormation:CDAte?,Coherent/Calibration Date,256,,{G@@@ C105}Coherent/Calibration Date-
log Value

; *****
;Print Result - Request Info from device - write respond to log or display message
; *****
;Code ACTIONSerial CodeLog Entry (& Value)UnitsScaleContex Help
[200],PRINT_RESULT,READ?,Coherent/Power Reading [J]
```

G-Code List

Below is the current G-Code list

While the KDM allows for most functions to be assigned to "any" G-code it's strongly recommended to use the pre assigned numbers

G-code list as of Sept 2018

/	optional skip	*	*	*	*	
\	Skip line	*	*	*	*	
G0	Rapid Move (Interpolation)	*	*	*	*	Rapid Move
G1	Linear Move (Interpolation)	*	*	*	*	feedrate of
G1.1	Linear Move (Interpolation & feedrate Limited)		*	*	*	4 axis Interp
G1.5	Linear Move (NON Interpolation Move)		*	*	*	4 Axis Interp
G17	XY Plane for circular interpolation	*	*	*	*	max 4 axis
G18	ZX Plane for circular interpolation	*	*	*	*	
G19	YZ Plane for circular interpolation	*	*	*	*	
G2	Arc Clockwise	*	*	*	*	
G20	Inch	*	*	*	*	same as G7
G21	Metric	*	*	*	*	same as G7
G25	Wait for Input (High)	*	*	*	*	
G26	Wait for Input (Low)	*	*	*	*	
G28	Homing system	*	*	*	*	
G28.5	Homing single axis		*	*	*	
G3	Arc CounterClockwise	*	*	*	*	
G4	Dwell (sec)	*	*	*	*	
G5	Pause	*	*	*	*	same as MC
G52	Use work Coordinate system	*	*	*	*	
G53	Use Machine Coordinate system		*	*	*	
G54..G59	Use Cordinate system G54..G59	*	*	*	*	
G5Q1	Pause & Jogging	*	*	*	*	
G5Q1...?	Pause & Options		*	*	*	Options to a
G50	Invoke Scaling	*		*		Invoke Scal
G51	End Scaling	*		*		
				*		
G68	Invoke Rotate	*		*		Rotate Cod
G69	End Rotate	*		*		End Code r
				*		
G70	Inch	*	*	*	*	same as G2
G71	Metric	*	*	*	*	same as G2
				*		
				*		
				*		
G90	Absolute Move	*	*	*	*	

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G91	Increment Move	*	*	*	*
G92	Set Axis Positions	*	*	*	*
G92.1	Set Position & reset Motion Card counter	*	*	*	*
				*	
				*	
				*	
				*	
				*	

Mcode

(standard)	LS RCU Description	Prolas	KDM	PCI	CMO	Remark
M0	Pause	*	*	*	*	same as G
M1	Optional Pause	*	*	*	*	
M105	Display Program MSG	*	*	*	*	
M106	Operator Input		*	*	*	{G@@@ (C
M2	End of Program	*	*	*	*	P[PROMPT
M25	Set Output (High)	*	*	*	*	same as M3
M26	Set Output (Low)	*	*	*	*	
M30	End of Program	*	*	*	*	same as M2
M47	Rewind Program	*	*	*	*	
M98	Call sub Prg	*	*	*	*	
M98.1	Insert external CNC file	*	*	*	*	
M99	Return from Sub Prg / Goto Comand	*	*	*	*	M99 P10 =
				*		
				*		

Mcode

(Custom)	LS RCU Description	Prolas	KDM	PCI	CMO	Remark
M10	Gas 2 (On)	*	*	*	*	
M100	Feedrate Override On		*	*	*	
M101	Feedrate Override OFF		*	*	*	
M102	End of PRg MSG OFF		*	*	*	
M108	Test Gas 1 Pressure		*	*	*	
M11	Gas 2 (OFF)	*	*	*	*	
M110	Send Enter Key to PC		*	*	*	
M120	Create Datalog		*	*	*	
M121Q??	Set Datalog Pass/Fail Flag		*	*	*	0= fail /1=pa
M67	Open Automatic door		*	*	*	
M8	Gas 1 (On)	*	*	*	*	
M9	Gas 9 (OFF)	*	*	*	*	
M122						
[??]						
L??						
U??	Test Expression		*	*	*	

M123	Job Required		*	*	*	
M124	Save PRg Record		*	*	*	M124 P?? PRgName)
				*		
M22	Teach Function– Collect / Save / Process Pos data	**	*	*	*	M22 Q?? P ;Q1=Enable Q5=Record
				*		
M23	Save Current Axis Positions to Variables (absolute Pos)		*	*	*	M23 Q[Varia M23 Q[V] w
				*		
M140	Custom Tool – Reset Tool Index		*	*	*	BSCI Reset
				*		
M900			*	*	*	M900 Q? P P=Msg to W
M999	Stop PRG Execution		*	*	*	
G code (Custom)	LS RCU Description	Prolas	KDM	PCI	CMO	Remark
G110						
Q?	Set Blendmode (0..4)		*	*		
G111						
Q?	Set Blend Distance		*	*		
G112						
Q?	Lock Ahead mode ON/Off (1/0)		*	*		
G113						
Q?	Vector Dual Mode ON/Off (1/0)		*	*		
G114						
Q?	Blend Axi (0..5)		*	*		
G115Q?	Countour Mode ON/Off (1/0)		*	*		
G116Q?	Vector Stop Mode ON/Off (1/0)		*	*		BALDOR V moves toge
G117Q?	Set Vector stop Angle (UU)		*	*		
G120	Activate 2D tracing		*	*	*	
G121	Deactivate 2D tracing		*	*	*	
G122	Clears Trace window		*	*	*	
G123Q??	Set Trace Diameter		*	*	*	
G125	Get Mouse Position (Video)		*	*	*	Read mous
				*		
G130Q? (P?)	COPLEY Enable Countour Mode ON		*		*	Multiaxis PV (ms))
				*		
G140	POWER METER START MEASUERMENT		*	*	*	G140Q? (In

G141	POWER METER TEST MEASUREMENT	*	*	*	G141 L? (L
G142	POWER METER READ MEASUREMENT	*	*	*	G142 Q? (Q
G150		*	*	*	
G151Q??	set target value for bar code reader	*	*	*	
G152Q??	set lower limit for bar code reader	*	*	*	
G153Q??	set upper limit for bar code reader	*	*	*	
G430C??	Cognex Vision Commands (Native code)	*	*	*	
G440C??	EnergyMax Powermeter (RS232)	*	*	*	
G450C??	Auxiliary Axis Commands	*	*	*	
G460C??	HL-G103 length measuring device (RS485)	*	*	*	
			*		
			*		

Laser Codes									
(M)	NLS RCU	Description	Prolas	KDM	PCI	CMO	Remark		
M51	* *	NLS Laser OK/RCU Ready	*	*	*	*			
M60	*	NLS Remote Control OFF	*	*	*	*			
M61	*	NLS Remote Control ON	*	*	*	*			
M70	* *	NLS Shutter close / RCU start (OFF)	*	*	*	*	Can be load		
M71	*	NLS Shutter open synchronized	*	*	*	*			
M72	* *	NLS Shutter open / RCU start (ON)	*	*	*	*	Can be load		
M74	* *	NLS Pulse Burst/ RCU Start (Pulse)		*	*	*	Sends a sta		
M75	*	RCU Start (Trigger)		*	*	*	Can be load		
					*				
					*				

Laser Codes									
(G)	NLS RCU	Description	Prolas	KDM	PCI	CMO	Remark		
G100Q??	*	Set RCU Program ID		*	*	*			
G400C?? *		NLS Laser Commands (RS232)		*	*	*			
G401C??		KLC (Kohler Laser Control)		*	*	*			
G410C??	*	RCU Laser Commands (Ethernet)		*	*	*			

Custom Commands

For most Functions the KDM software allows to assign the desired G-Code by the customer but for most functions it's advisable to use assigned G-Code. This will make it easier to help trouble shooting a possible problem with a particular function.

The customer can assign or change the G-code in the [Edit G Code](#) window.

After a software update it is possible that the function names have changed - The software will alarm you of function names not found

- To fix this, just reassign the Custom G-Codes in error with the new updated names

Below is a list of the **preferred** M/G-Codes to be used for various Custom Functions:

M-Codes

M67	Open Automatic door	Only the following G-Codes are allowed after G5,G5Q1,M0,M2,M105(^..),M105(*...)
M100	Function_FeedrateOverride_ON	
M101	Function_FeedrateOverride_OFF	
M102	Function_Function_EndProgramMsg_Off	
M105	Display Text Message	
M106	Operator Input	Requires the Operator to Input a value = the value will be wr
M108	Function Test Gas1 Pressure	
M120	SAVE_DATALOG	
M121	DataLogging - Set Pass/Fail	
M122	FUNCTION TEST EXPRESSION VALUE	

G-Codes

G100	Set RCU PRG ID	Trough Digital I/O
G110 Q??	Set Blend Mode	
G111 Q?/	Set Blend Distance	
G115 Q(0/1)	ContourMode On/Off	
G116 Q(0/1)	VectorMode On/Off	
G117 Q??	VectorStop Angle	

Maintenance

Startup Options

Holding down the Shift key during startup will display the Startup Option Window

There are three types of Settings

- One time

These settings will be reset automatically when the software restarts

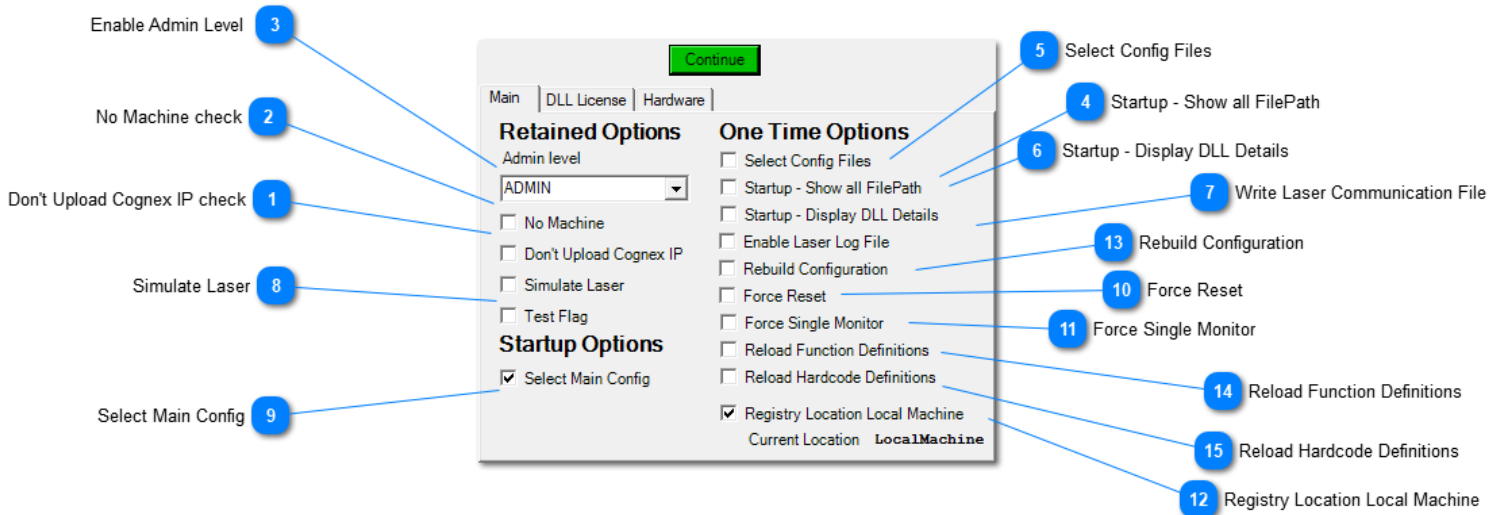
- Retained Settings

These settings are "Sticky" - they will also force the display the Options window at startup

- Startup Options

These settings are "sticky" as well but will not force the display of the Options window by them self

Startup Option Window



1 Don't Upload Cognex IP check

☐ Don't Upload Cognex IP

This allows to use the KDM IP address for the Cognex camera rather than the Uploaded IP address of the Setup File

2 No Machine check

☐ No Machine

This will allow to "run" the software without any hardware connected (not 100% implemented yet)

3 Enable Admin Level

ADMIN

Admin level will give access to restricted commands and setting across the KDM software (Not related to user settings)

4 Startup - Show all FilePath

☐ Startup - Show all FilePath

This will show all File paths during loading

5 Select Config Files

☐ Select Config Files

This will allow to select and change the Setup files before the Software starts loading.

6 Startup - Display DLL Details

☐ Startup - Display DLL Details

Displays additional Information about the loaded DLL files

7 Write Laser Communication File
☐ Enable Laser Log File
8 Simulate Laser
☐ Simulate Laser

This allows running the machine without an actual Laser source connected -This is not the same as the Process switch on the operator panel

The software will internally disable communication to the laser without getting error messages

9 Select Main Config
☒ Select Main Config

This should be enabled if switching between multiple KDM configurations is required

It will display a list of main configurations to start from before anything has been loaded

It's a sticky setting, but It does not force the Options window to be displayed if selected by itself

10 Force Reset
☐ Force Reset

This will execute a forced reset of the PCI Motion Card

11 Force Single Monitor
☐ Force Single Monitor

This will force all windows to be displayed on a single monitor . This can be helpful if running a windows setup with multiple windows after the display arrangement has changed

12 Registry Location Local Machine
☒ Registry Location Local Machine
Current Location LocalMachine

This determines the registry location used when writing the KDM serial number to the computer

13 Rebuild Configuration
☐ Rebuild Configuration

This will rebuild the configuration files - over time after software updates it's possible that unused Configuration settings can remain in a file

This function will delete the file and then save all entries based on the current software

14 Reload Function Definitions
☐ Reload Function Definitions

This will update all function information based on the exe Setup information for each function.

This information will usually only pulled when a new G-Code or I/O item is created ..

After that the help and item Info is displayed based on what's shown in the Edit Gcode or Edit I/O window - these entries can be changed by the enduser to there liking

Reloading will replace ALL custom entries with the preset definitions

15

Reload Hardcode Definitions

☐ Reload Hardcode Definitions

Similar to above [Reload function definitions] this will update the entries for all hard coded G-Code (some basic G-Code is hard coded and can not be changed by the user = G1 / G4/ M1/ M2 .. and so on) This will overwrite both context help and definition entries from the hard coded entries in the exe file (It will also make sure the Gcode entries will display within the assigned G-code group)

Exporting / Importing Settings

With [Admin level](#) enabled the software allows Exporting and Importing of the following settings:

- G-Code
- IO-Settings

***** PLEASE CREATE A MANUAL [KDM BACKUP](#) BEFORE IMPORTING ANY SETTINGS *****

The export Function will save the displayed List items to a text file (IO or G-Code)

The Import function will load the selected file

- If the Item already exists **all** data fields will be overwritten with the values from the text file !
- If the Item does not exists a new item will be added