

MCEDesigner Application Guide

Step-by-step instructions for setting up
motor control system with iMOTION™ ICs



Agenda

1 Run motor with a new iMOTION2.0 system

2 Read/Write register definition

3 Default function definition

4 User function definition

5 Re-usable function definition

6 Trace function definition

7 Fault check and display

8 Script function tuning

iMOTION2.0 MCEDesigner_V2.1.2.0 overview

› Feature:

- Compatible iMOTION 1.0 product
- Script function variables tuning and monitor are available.
- Parameters compared list for review before "Export".

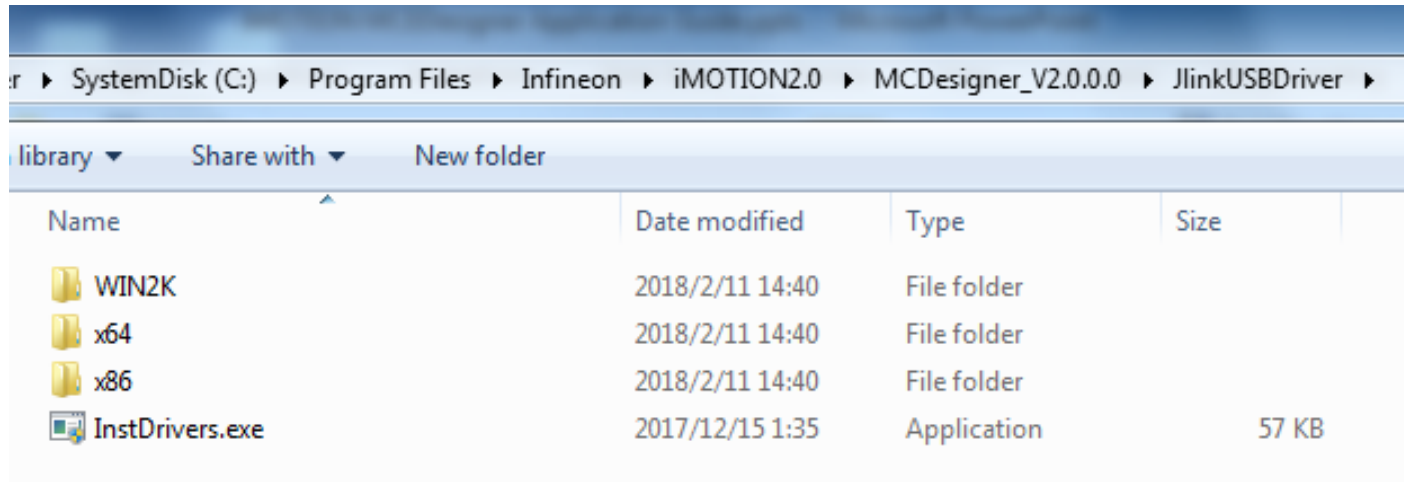
Run motor with a new iMOTION2.0 system (1)

- › (1) Prepare firmware and parameters file to be download.
 - 1) Get the supported MCE Firmware from Web.
 - The new firmware version will always update to Infineon Web.
 - <http://www.infineon.com/iMOTION>
 - 2) Using MCEWizard generate parameters file.
 - The MCEWizard needs align with firmware version.
 - The parameter needs align with hardware and motor.
 - See MCEWizard_V2.1.2.0 user guide.pdf.

Run motor with a new iMOTION2.0 system (2)

› (2) Power on system.

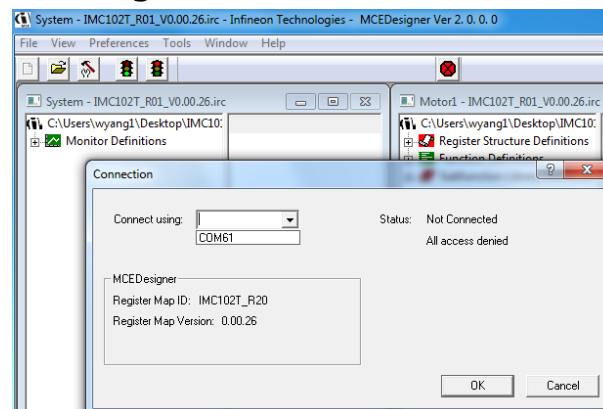
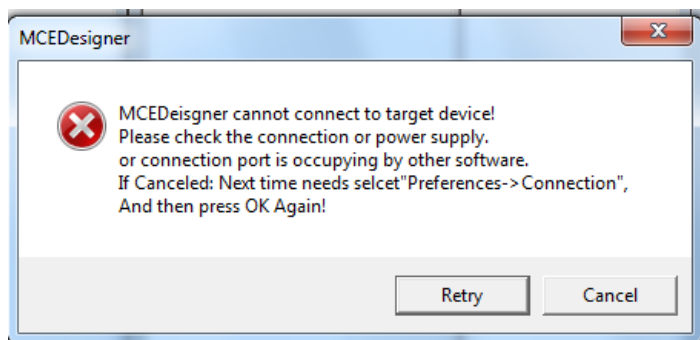
- 1) Connect debug USB port to PC and Power on motor system.
- After installing MCEDesigner package, the On-board debugger(Jlink virtual COM) has installed automatically.
- If On-board debugger(Jlink virtual COM) driver is not installed or something wrong, please install the driver by point file to MCEDesigner install JlinkUSBDriver folder.



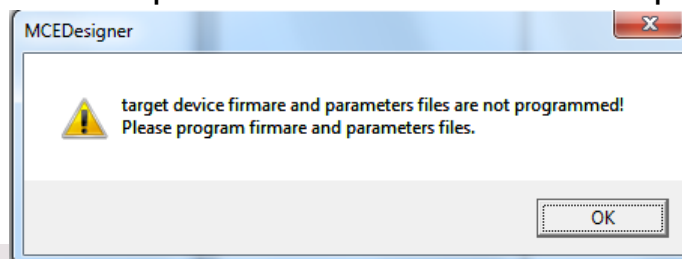
Run motor with a new iMOTION2.0 system (3)

› (3) Start software.

- 1) Open .irc file which fits for the selected firmware.
 - Double click .irc file or select irc file after open MCEDesigner.
 - Waiting MCEDesigner check device finishing.
 - There is a warning dialog promote if device is not detected or device is not programmed FW/Pars. Or the setting COM port is not available.
 - Press "Cancel" and Check the COM port setting "Preferences->Connection" after press System window.

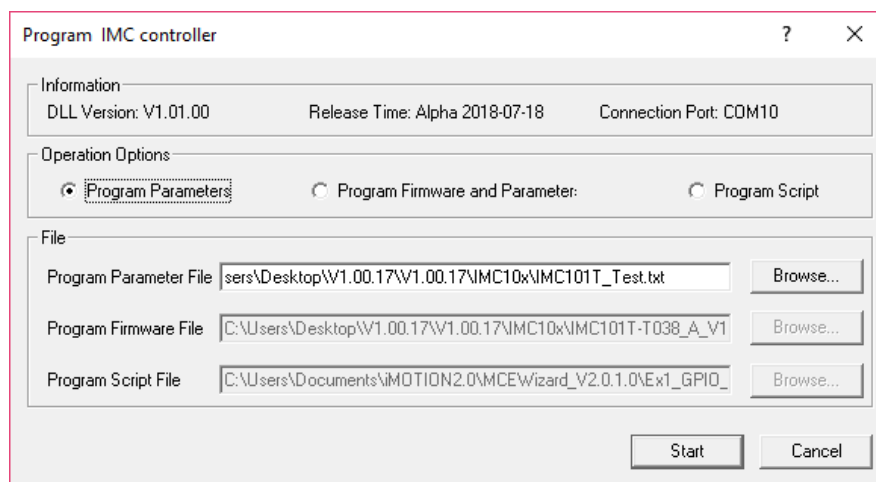


- After connection, then it will promote the device needs program firmware and parameters files.



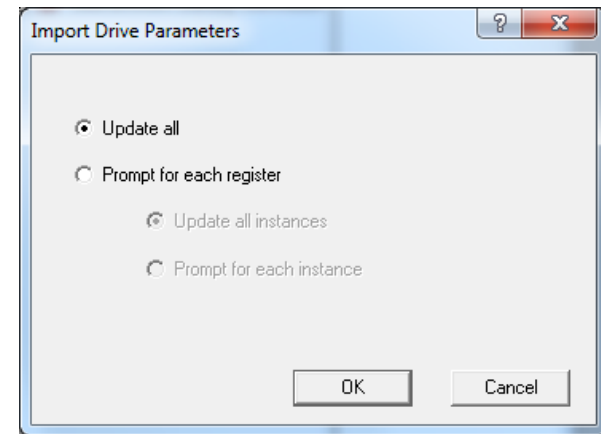
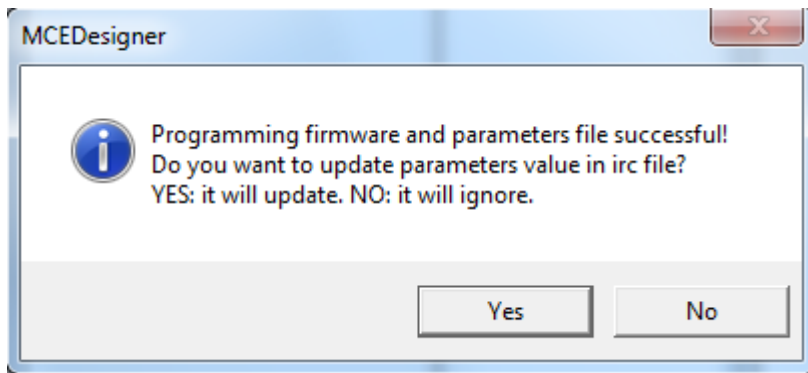
Run motor with a new iMOTION2.0 system (4)

- › (4) Download firmware and parameters file to device.
- › 1) Select System windows, Press “Tools->Programmer” at top manual bar.
 - Select right Parameter and Firmware File through Browse.. button.
 - Then Press Start to program device.
 - There is a dialog to show the program result.
 - After programming file to device FLASH, it needn't a next programming after power cycle if the FW/Pars are the same.



Run motor with a new iMOTION2.0 system (4)

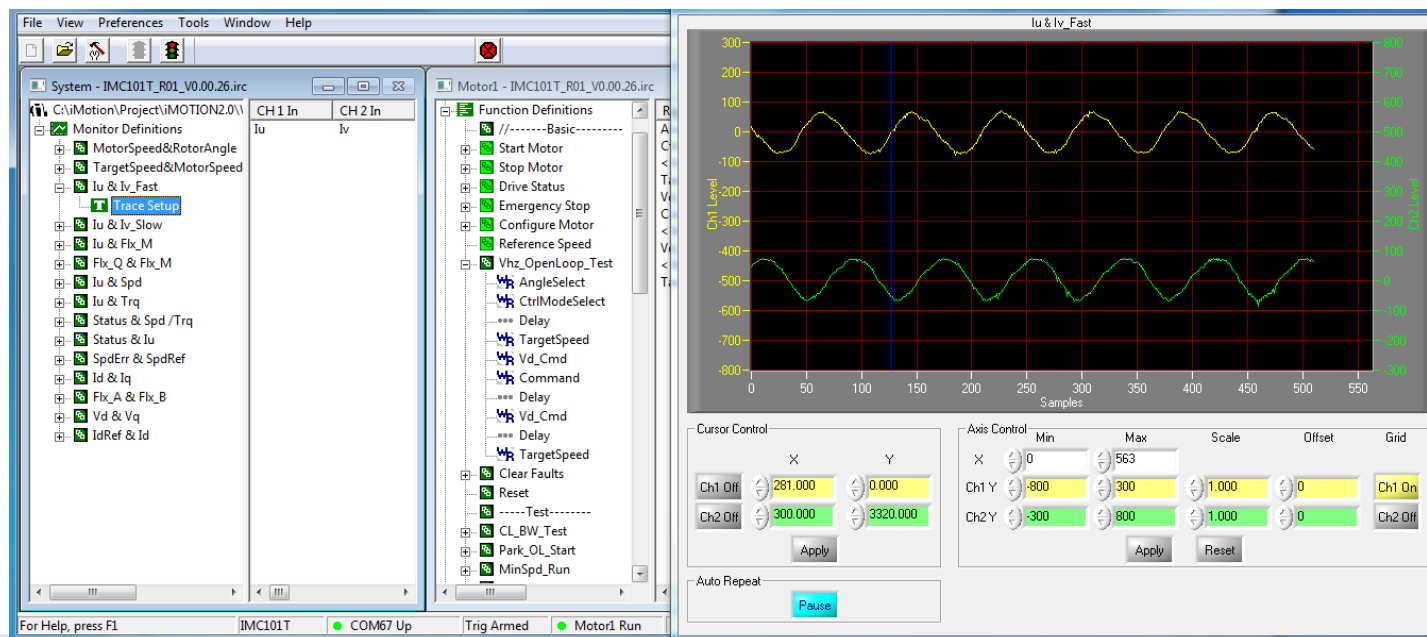
- › (4) Update register parameters value in .irc file.
- › 1) Update parameters value in .irc file.
 - After program device successful, there is a dialog to user select update parameters in irc file. If user need tune the motor, press Yes.



- › 2) Update parameters value in .irc file another method.
 - Also, we can import parameters file directly through "File-> Import Driver Parameters".
 - **Note: this method only update .irc register value, the parameters in device is the last programmed one.**

Run motor with a new iMOTION2.0 system (5)

- › (5) Start Motor with VHz open loop firstly.
- › 1) Run VHz open loop to check hardware and current wave.
 - This step is very important for new hardware and parameters configured, if there is some mistake, we can get from $I_u/I_v/I_w$ current wave.
 - If we can get a higher quality current feedback, then we can enter close loop.
 - **Note: at this step, we may need adjust parameters related with current sense in MCEWizard , then export txt file and program FLASH to update them.**

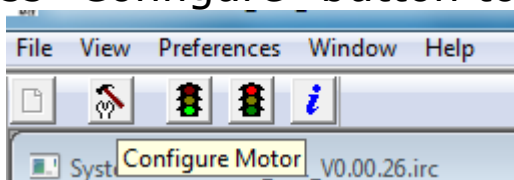


Run motor with a new iMOTION2.0 system (6)

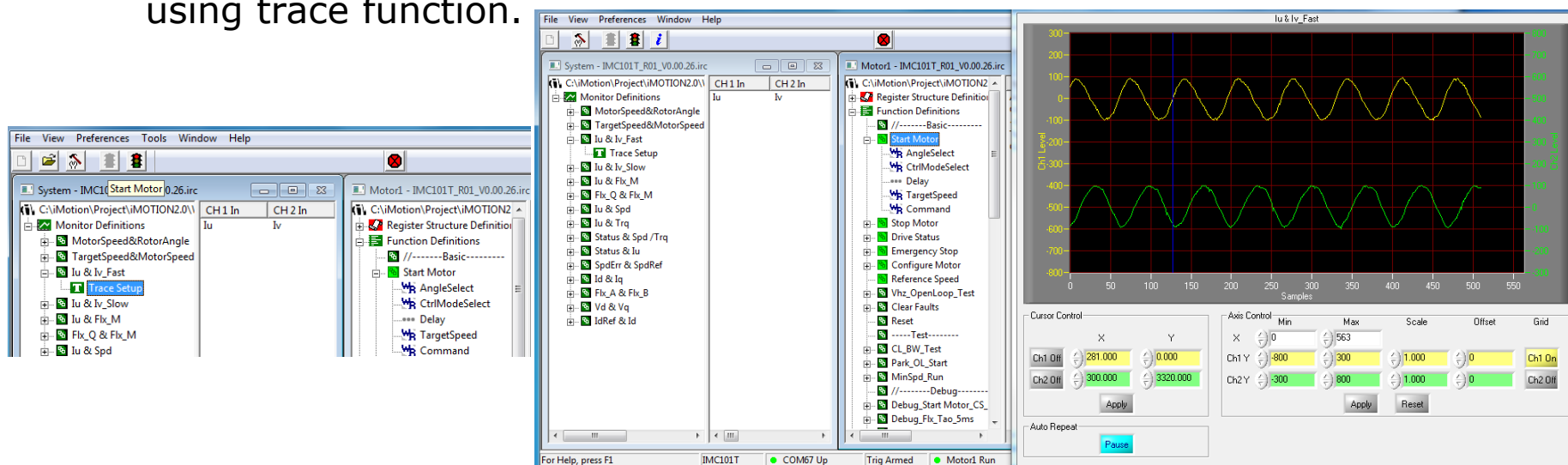
› (6) Run Motor with close loop and tune system.

› 1) Run motor in close loop.

- After confirm the current sample is well and hardware is ok, then we can run close loop.
- Press "Configure" button to change current and speed loop type.

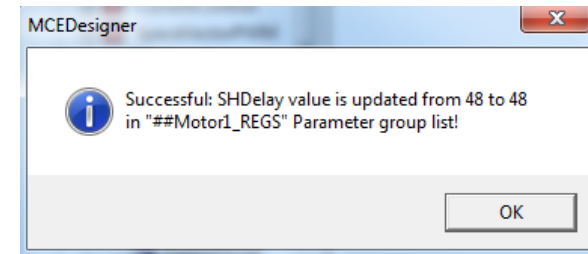
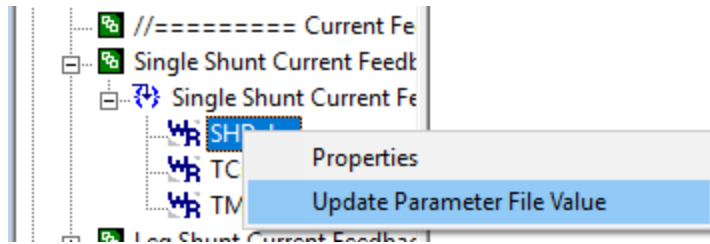


- Then press "Start Motor" button to run at target Speed. Check current wave using trace function.



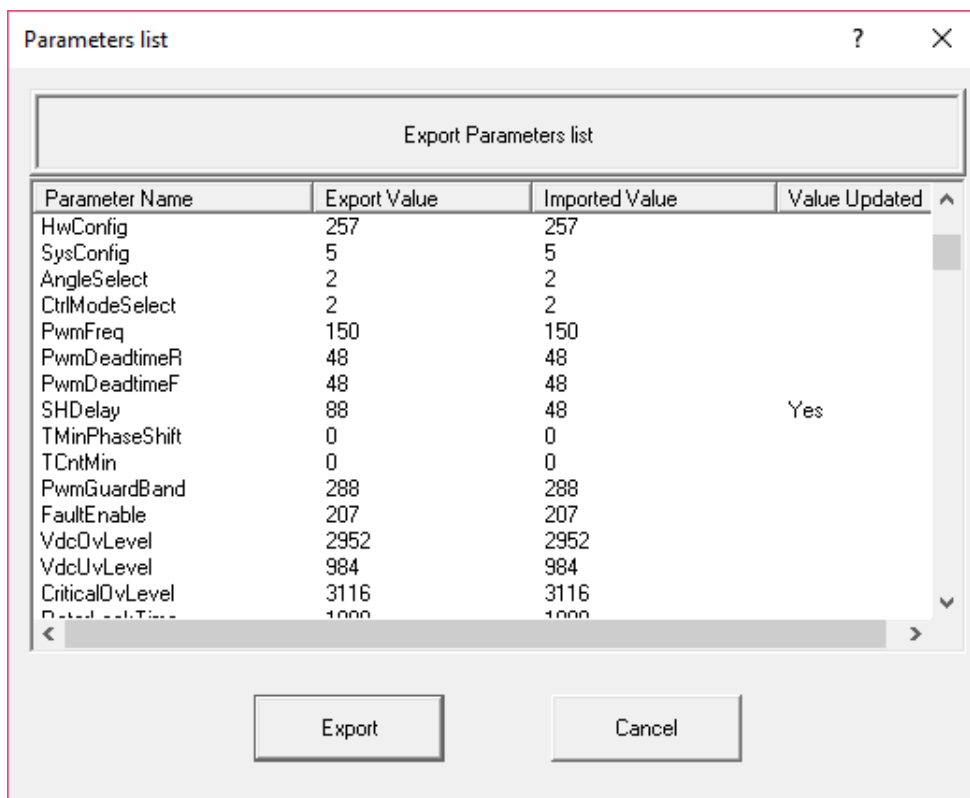
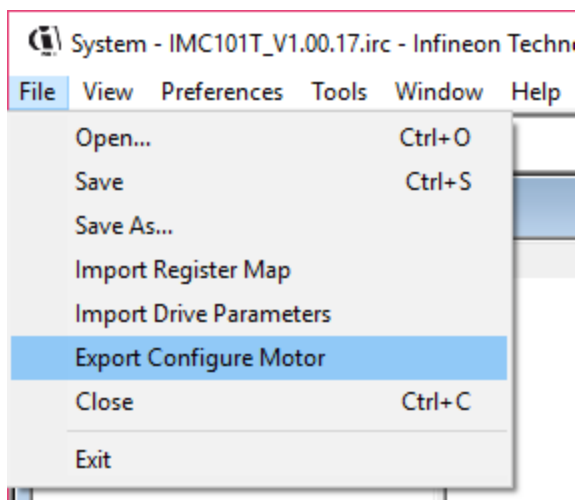
Run motor with a new iMOTION2.0 system (7)

- › (7) Update Parameter value.
- › Update Parameter temp value in .irc file before export.
 - After system tunes fine, we need to use tuned value for system, right button press parameter register, select "Update Parameter Value".



Run motor with a new iMOTION2.0 system (8)

- › (8) Export parameter file.
- › 1) Export parameter file to be program to device.
 - After system tune fine, we export parameter file to be re-use.
 - This file can be program to the same system for production.

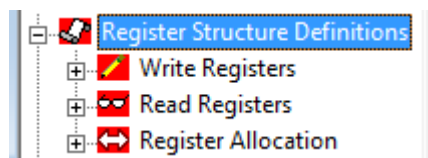


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Read/Write register definition in MCEDesigner

- › If user want to add register which is not in .irc file definition for iMOTION2.0. User can define it in "Register Structure Definition".
 - Note 1: register define only permitted in reference manual provided. (IMC Software Reference Manual.pdf)
 - Note 2: STATIC register type should select "system". DYNAMIC register type should select "MCE".
 - Note 3: STATIC register only permitted define in "Read Registers" group.



Register Type	DYNAMIC (Read Write)		
Range	Min: 0	Max: 16383	Default: 600
Scaling or Notation:	16383 = Motor Max RPM		
Description:	This register specifies the switch over speed threshold between RegenLim and MotorLim.		

3.2.2.6 LowSpeedLim

Index	35
Size	Unsigned 16 bit
Register Type	DYNAMIC (Read Write)
Range	Min: 0 Max: 16383 Default: 2047
Scaling or Notation:	4095 = 100% motor rated current.
Description:	This register specifies the maximum allowable motor current (d axis and q axis) at low speed (motor speed value less than or equal to minpsd value)

3.2.2.7 LowSpeedGain

Index	36
Size	Unsigned 16 bit
Register Type	STATIC (Read only)
Range	Min: 0 Max: 32767 Default: 0
Scaling or Notation:	U16.0
Description:	This parameter specifies the increment rate of Motor current limit between midpsd and low speed threshold

Register name	LowSpeedLim		
Scaling or Notation:	16383 = Motor Max RPM		
Description:	This register specifies the switch over speed threshold between RegenLim and MotorLim.		

3.2.2.6 LowSpeedLim

Index	35
Size	Unsigned 16 bit
Register Type	DYNAMIC (Read Write)
Range	Min: 0 Max: 16383 Default: 2047
Scaling or Notation:	4095 = 100% motor rated current.
Description:	This register specifies the maximum allowable motor current (d axis and q axis) at low speed (motor speed value less than or equal to minpsd value)

3.2.2.7 LowSpeedGain

Index	36
Size	Unsigned 16 bit
Register Type	STATIC (Read only)
Range	Min: 0 Max: 32767 Default: 0
Scaling or Notation:	U16.0
Description:	This parameter specifies the increment rate of Motor current limit between midpsd and low speed threshold

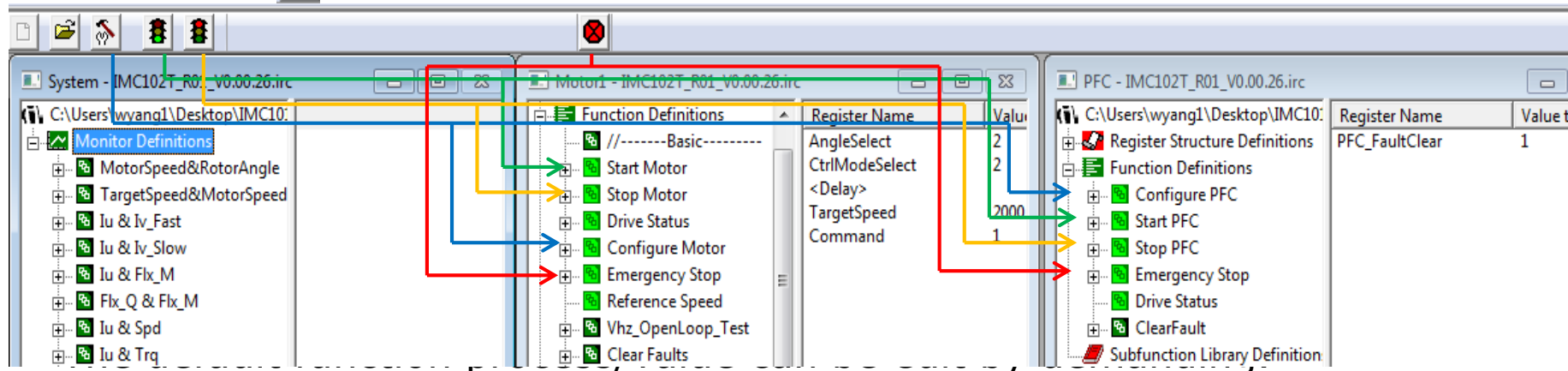
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Default function definition when tuning motor

- › MCEDesigner provides 4 frequently-used function with button related. (Configure , Start , Stop , Emergency Stop )



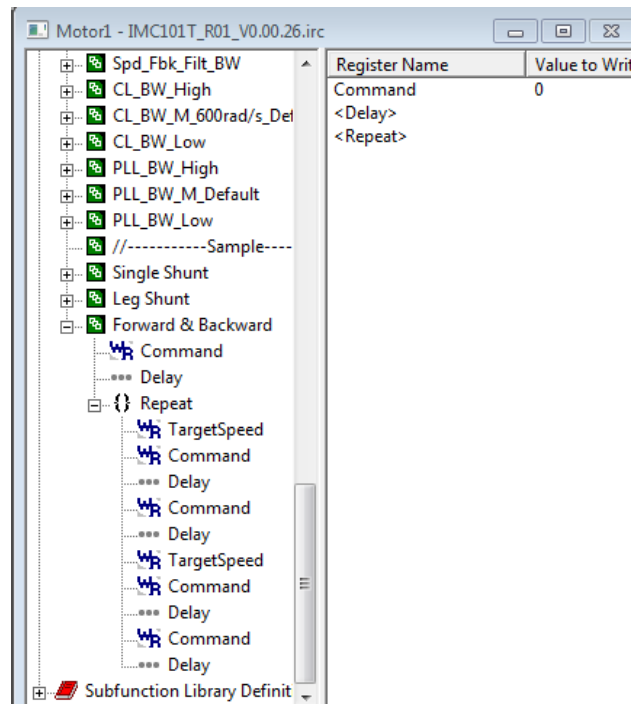
- › When system window is activation, each button process will call every part (Motor / PFC) items at one time.
- › If one sub-window part is activation, button process will only call this part defined function. Also the information button will show . Its function process is defined "Drive Status".
- › For Motor windows, there is "Reference Speed" function. It converts RPM input value to TargetSpeed value and then write device automatic according Max Speed in parameters file.

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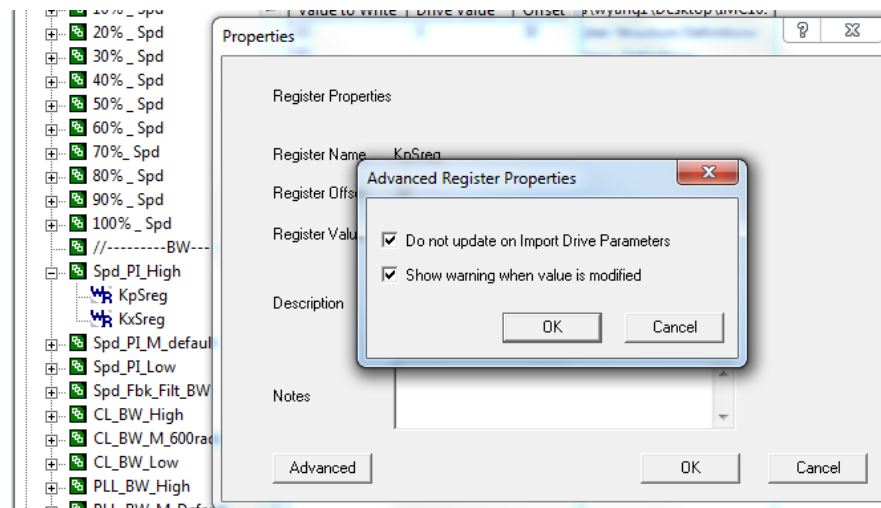
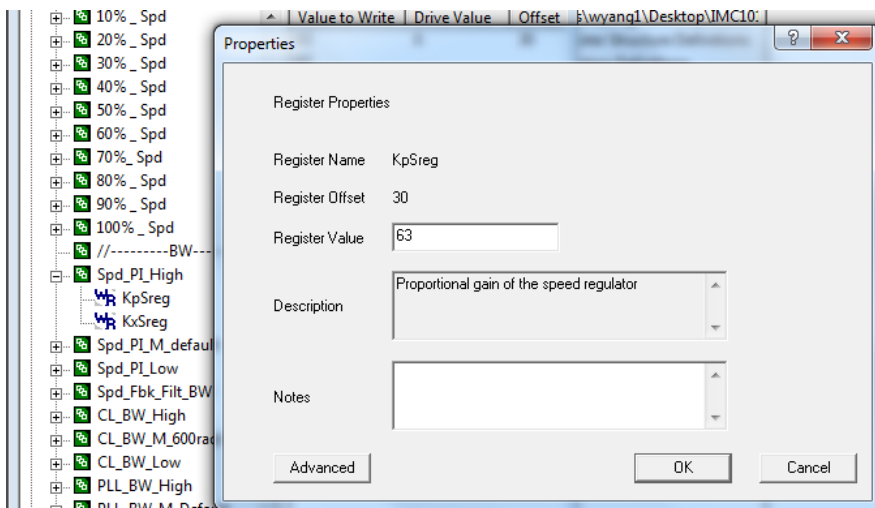
User function definition when tuning motor

- › MCEDesigner provides user definition function.
 - It has register write/read, execute delay, process repeat, Subfunction call functions...
 - “Add register” for sub level function register group. “Insert register” for the same level function register group.
 - **Note: Please use different characters for function name when create new.**



Function definition's register advanced option

- › MCEDesigner provides fixed register value in definition function.
 - It is useful when tuning to keep a fine parameter.
 - For example: we get a fine KpSreg value at motor start up, and we want keep it in the function.
 - Select KpSreg and press right button.
 - Select "Properties", press "Advanced".
 - Select the options "Do not update on Import Driver Parameters".

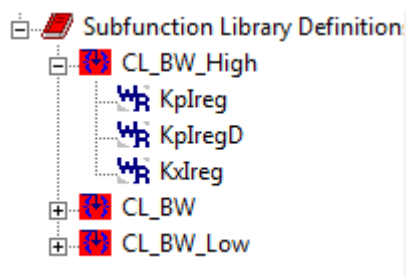


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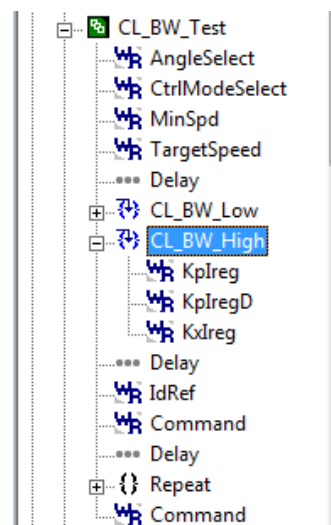
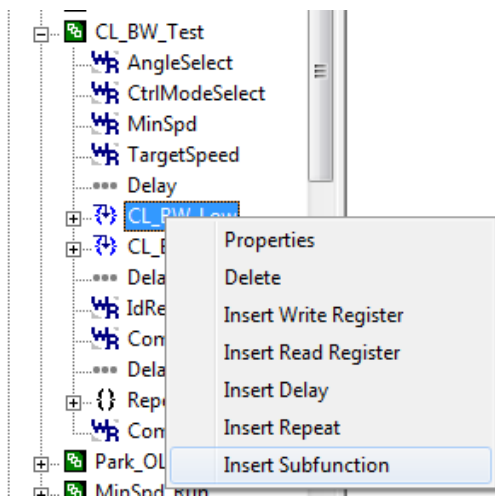
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Re-usable function definition in Subfunction

- › If user want to use a process contains multi-register operation that will be used frequency in function group. User can define as a re-usable function in Subfunction Library Definition.



- › User can insert Subfunction in function when tune motor.

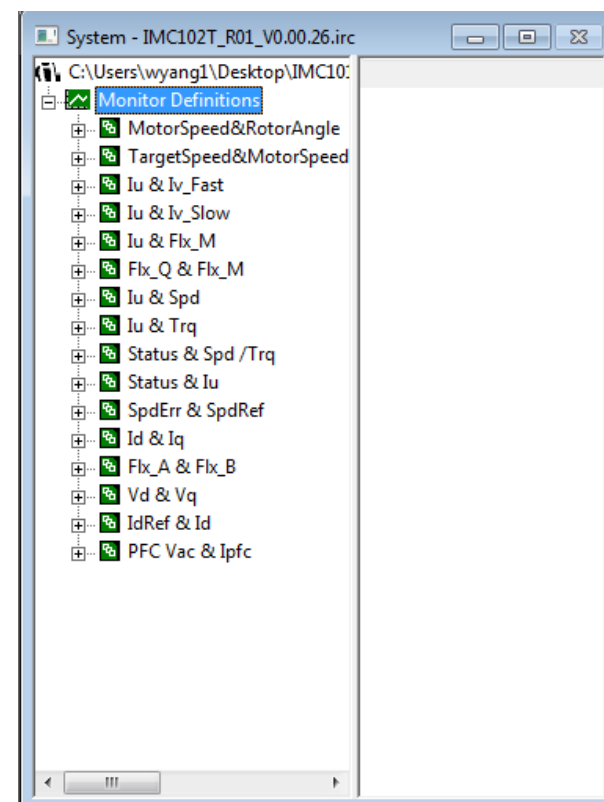


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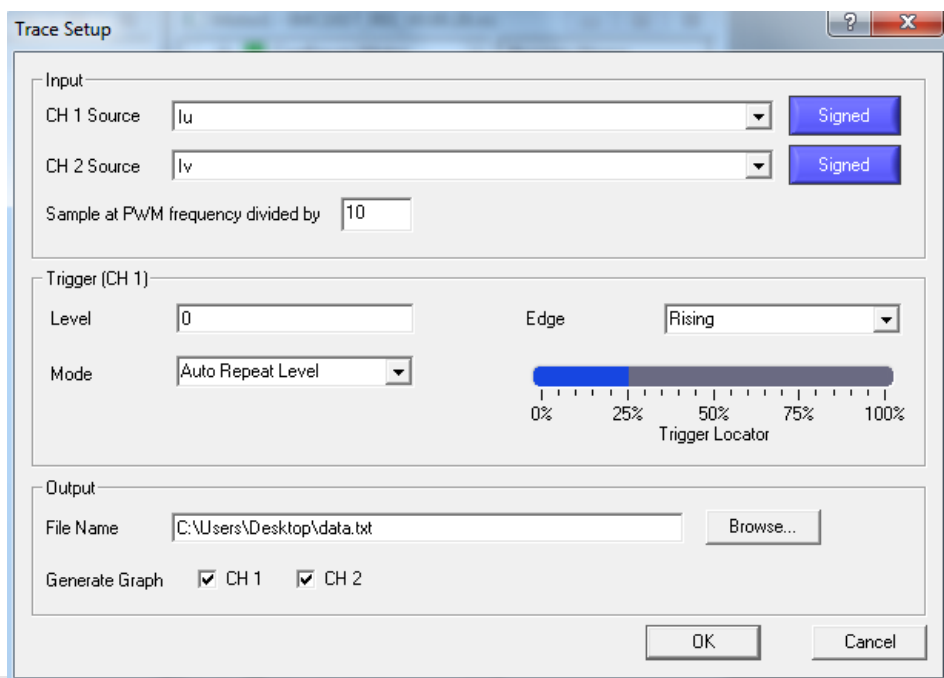
Trace function definition

- Wave trace function is very important for monitor signals.
- Default wave trace items are listing in System windows.
- The corresponding items registers are defined for user tuning motor.
- User can create addition trace function depend the tuning.



Trace function definition setting

- Convenient wave trace function setting.
- The sample point aligns with PWM frequency. The smaller divided value will get more precision signal variety.
- Can be setting different trigger modes.(Only Channel 1 can be trigger source)
- Trace edge position can be configuration.
- Trace data can be saved in .txt file for further analysis.



data.txt - Notepad

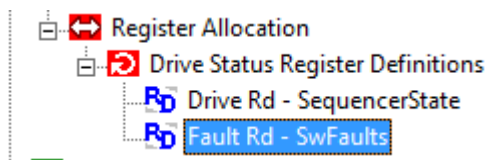
File	Edit	Format
54	-96	
61	-84	
66	-82	
76	-77	
84	-72	
82	-71	
91	-65	
89	-61	
101	-50	
89	-46	
88	-38	
86	-28	
82	-19	
75	-2	
74	6	
63	13	
62	21	
62	34	
54	34	
48	43	

Agenda

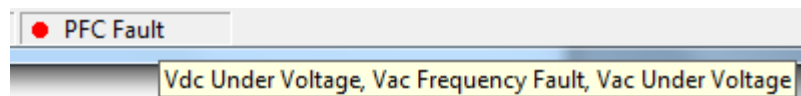
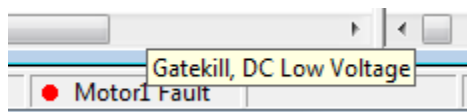
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Fault check and display

- › When motor system un-masked fault occurs, MCE will stop motor, and MCEDesigner will get fault from Sw-Faults register.



- › Faults detail information will display on the bottom strip if move mouse on red LED.



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Script function tuning

- › When motor system uses Script function, user can tune and monitor these variables.
 - After Script compiled, there is a ".map" file is generated in the same folder with the same name with "IMC101T"/ "IMC102T" / "IMM101T".

Name	Date modified	Type	Size
Ex1_GPIO_Toggle.ldf	2018/7/20 14:13	LDF File	2 KB
Ex1_GPIO_Toggle.mcs	2018/7/20 14:13	MCE Script Coding File	2 KB
Ex1_GPIO_Toggle_IMC101T.map	2018/7/20 14:13	Linker Address Map	3 KB

- › After Script GPIO/ADC Pins configuration, user needs to **regenerate** and **program** configured parameters(these parameters for power up).

Step 1: Configuration ADC/GPIO

Controller Package Type: TSSOP-38
 Motor Control Mode: Leg Shunt
 NTC Temperature Protection: Enable

ADC pin configuration

AIN0/VSP	<input checked="" type="checkbox"/>	AIN4	<input type="checkbox"/>		<input type="checkbox"/>
AIN1/IW	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
AIN2/REFW	<input type="checkbox"/>		<input type="checkbox"/>	AIN10/NTC	<input type="checkbox"/>
AIN3	<input type="checkbox"/>	AIN7/REFV	<input type="checkbox"/>	AIN11/PARAM	<input type="checkbox"/>

GPIO pin configuration

GPIO0/LED	Output		NotUsed
GPIO1/PG_OUT	Output		NotUsed
GPIO2/PAR0	NotUsed		NotUsed
GPIO3/PAR1	Input		NotUsed
GPIO4/PAR2	NotUsed		NotUsed
GPIO5/PAR3	Output		NotUsed

Step 2: Calculate parameters

Verify Parameters

Calculate Results

Export to Designer File (.txt)

Double-Click an item to JUMP to its associated question

Step 3: Expert for program parameters

Information #1 : Firmware Version
 Firmware Version is v1.01.00

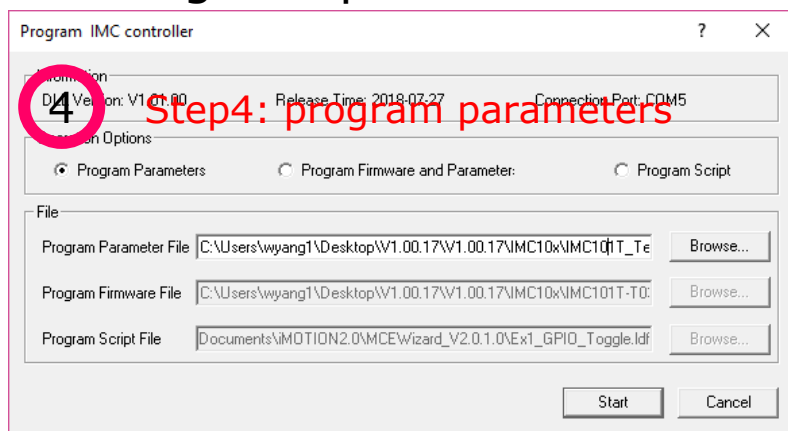
Information #2 : System Clock
 Calculations are based on an MCE clock rate of 96 MHz

Information #3 : System DC Bus Feedback Scaling
 The DC Bus Feedback Scaling is 8.20 counts/Volt and max measurable voltage is 499.54V

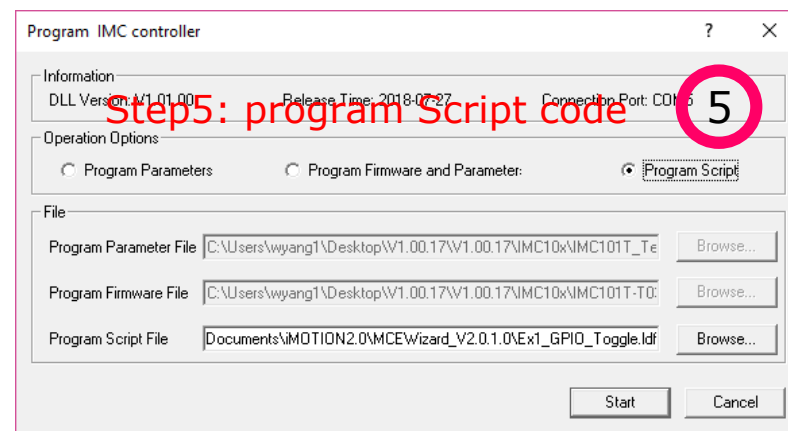
Information #4 : Motor 1 Current Feedback Scaling
 The Motor Current Feedback Scaling is 775.63 counts/Apk and range is 2.64 Apk

Script function tuning

- After Script compiled, user needs to program the script enable configured parameters and script code to device.

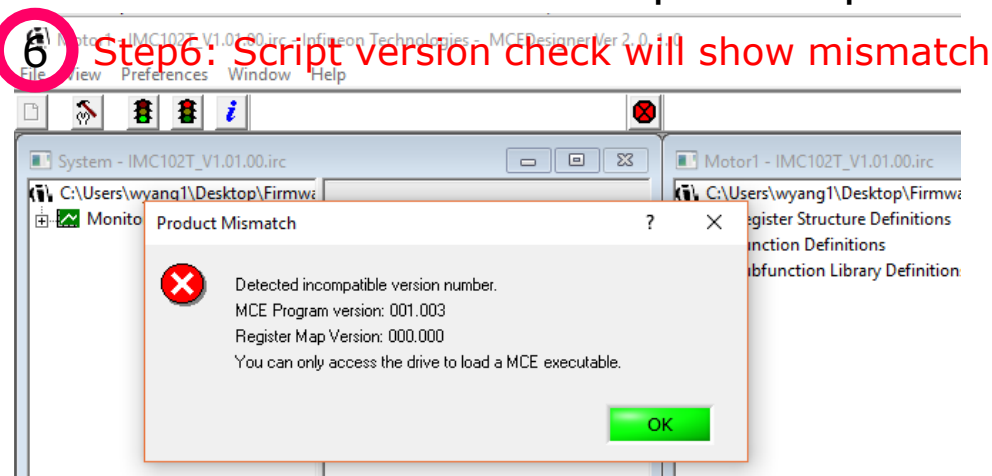


Step4: program parameters



Step5: program Script code

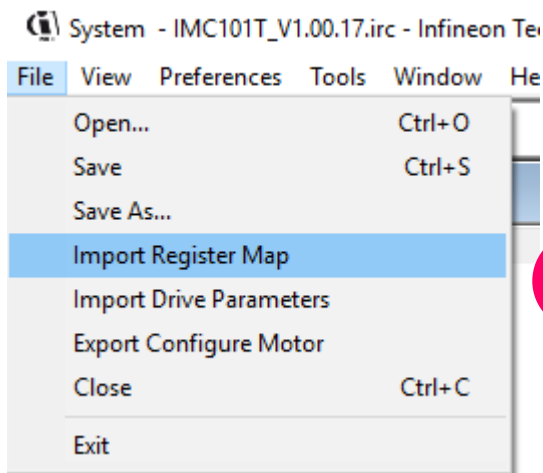
- After Script parameters and code programmer, there is a version check between IRC file and device code. User needs import map file if warning shows like below.



Step6: Script version check will show mismatch

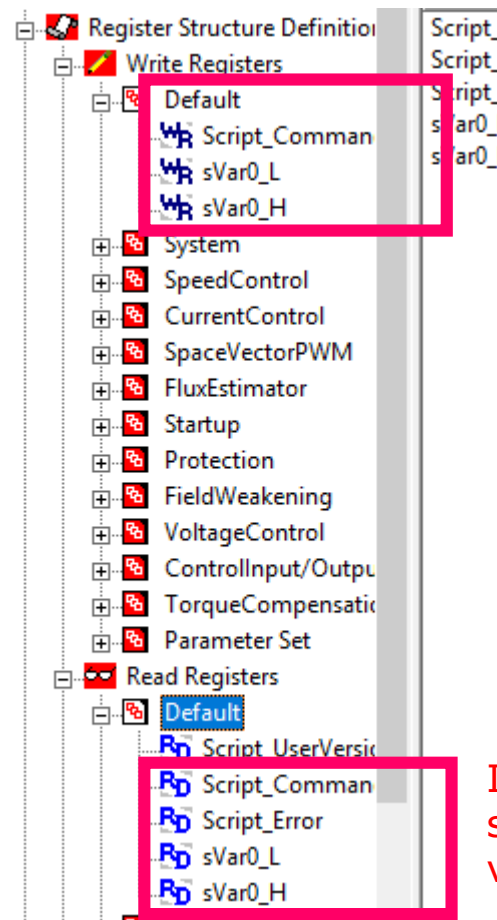
Script function tuning

- › When motor system uses Script function, user can tune and monitor these variables.
 - After import the “.map” to MCEDesigner, then the script defined variables can be tune or monitor.



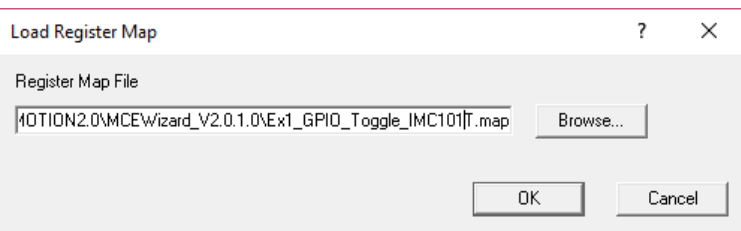
7

Step7: select action



Imported
script write
variable

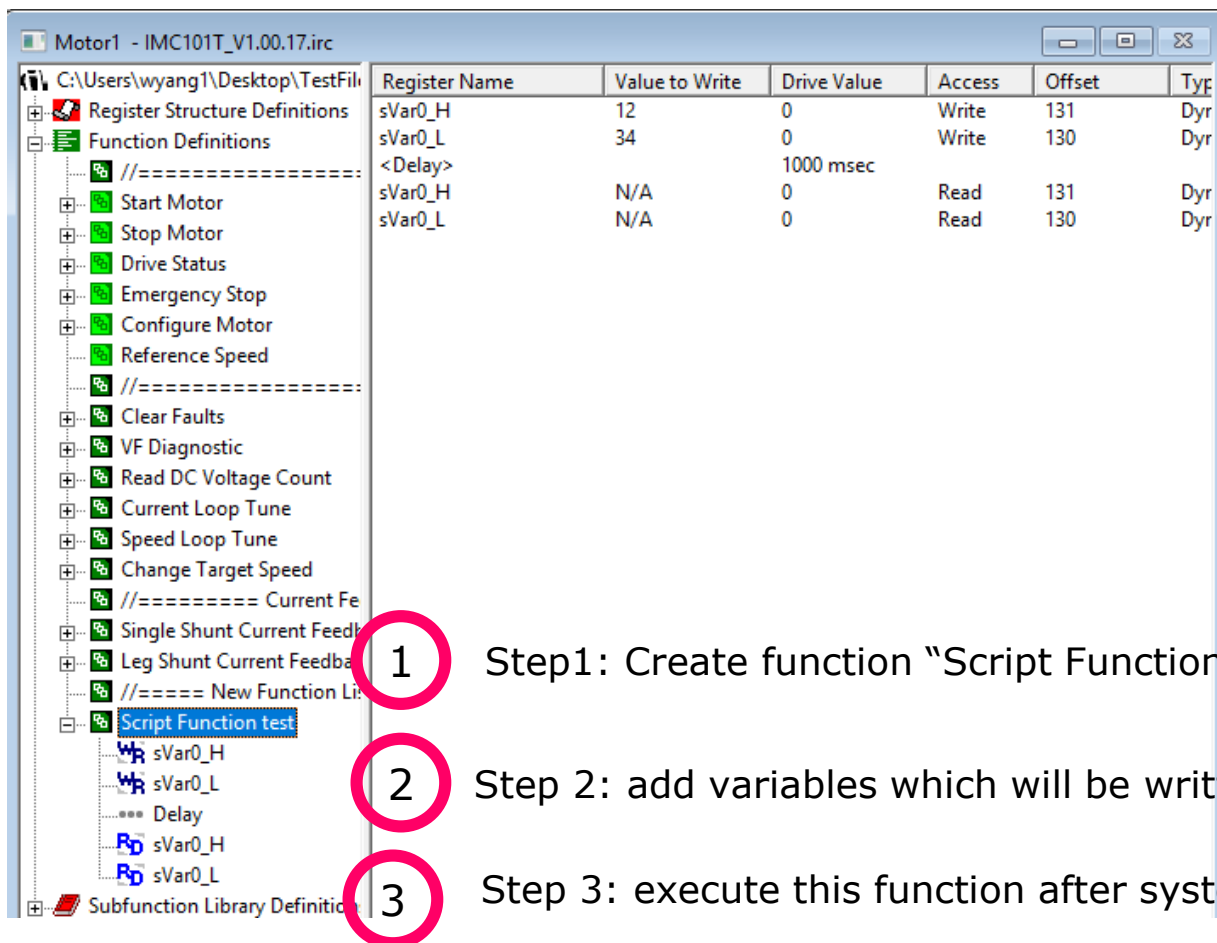
Imported
script read
variable



8 Step 8: select script “.map” file

Script function tuning

- › When motor system uses Script function, user can tune and monitor these variables.
 - Then user can create function for test, for example like below.



The screenshot shows the Motor1 - IMC101T_V1.00.17.irc interface. On the left, a tree view lists various functions under 'Function Definitions'. The 'Script Function test' function is highlighted. On the right, a table displays register definitions for sVar0_H and sVar0_L, including their values, drive values, access types, offsets, and types.

Register Name	Value to Write	Drive Value	Access	Offset	Type
sVar0_H	12	0	Write	131	Dyr
sVar0_L	34	0	Write	130	Dyr
<Delay>		1000 msec			
sVar0_H	N/A	0	Read	131	Dyr
sVar0_L	N/A	0	Read	130	Dyr

1 Step1: Create function "Script Function test"

2 Step 2: add variables which will be written and read.

3 Step 3: execute this function after system connection build up.



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