



# Mitsubishi Electric Powertrain Solutions

## *Flexible Assembly Control Systems (MEL-FACS)*

Version 4.10



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# Table of Contents

## MEL-FACS Training Manual

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### MEAU Manual Number (ISO Number)

#### Revision History

Rev.	Date	Revision Notes
1.0	03/01/2013	Initial Framework
1.1	01/31/2014	Added Lesson 10
4.00	02/19/2016	Added Lessons 8, 13 & 14 and General Updates
4.01	04/07/2016	General Updates as per Release 4.01
4.10	05/27/2016	General Updates as per Release 4.10

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## Table of Contents

<b>Class Introduction.....</b>	<b>1</b>
Course Objectives .....	1
Prerequisites.....	1
Course Duration.....	1
List of Relevant Manuals.....	1
<b>LESSON 1 Startup the Training System .....</b>	<b>2</b>
1.1. Lesson Objectives .....	2
1.2. System Configuration.....	2
1.3. Hardware Components List for MWS .....	3
1.4. MEL-FACS in Navigator .....	4
1.5. Set IP Address for Training Station .....	4
1.6. Open PLC and HMI program.....	7
<b>LESSON 2 eHMI and MEL-FACS Workshop Simulation .....</b>	<b>9</b>
2.1. Lesson Objectives .....	9
2.2. eHMI Screen .....	9
2.3. Workshop Simulation HMI Screen.....	11
2.4. Simulate a Pallet Entering Station, Read RFID and Enable Tasks .....	12
<b>LESSON 3 Download MEL-FACS MWS to PLC and HMI.....</b>	<b>13</b>
3.1. Lesson Objectives .....	13
3.2. Exercise – Download MEL-FACS MWS.....	13
3.3. Download to PLC .....	13
3.4. Download to GOT.....	16
<b>LESSON 4 Program Structure and PLC Memory Map.....</b>	<b>18</b>
4.1. Project / Program Structure.....	18
4.2. PLC Memory Map.....	22
<b>LESSON 5 Receive Configuration from eFlex.....</b>	<b>26</b>
5.1. Lesson Objectives .....	26
5.2. Verify PLC / FACS Server Communication.....	26
5.3. Ping PLC CPU IP Address.....	26
5.4. Telnet PLC CPU IP Address.....	26

---



---

## Table of Contents

5.5.	Monitor eFlex Server Connection from PLC .....	27
5.6.	Send Configuration from eFlex Server to PLC .....	28
5.7.	Open a 'Watch' Window to Monitor 'Cfg' Data .....	28
<b>LESSON 6</b>	<b>Prerequisites .....</b>	<b>29</b>
6.1.	Lesson Objectives .....	29
6.2.	Prerequisites .....	29
6.3.	Exercise .....	30
<b>LESSON 7</b>	<b>Model Management.....</b>	<b>31</b>
7.1.	Lesson Objectives .....	31
7.2.	Model Management.....	31
7.3.	Exercise .....	32
<b>LESSON 8</b>	<b>Control without user interface logic (Error Proofing Task) .....</b>	<b>33</b>
8.1.	Lesson Objectives .....	33
8.2.	How Error Proofing Works .....	33
8.3.	Exercise .....	33
<b>LESSON 9</b>	<b>Control without user interface logic (Pick Sensor Task) .....</b>	<b>37</b>
9.1.	Lesson Objectives .....	37
9.2.	How Pick Sensor FB Works.....	37
9.3.	Exercise .....	37
<b>LESSON 10</b>	<b>Control with user interface logic (Stitching Tool Operation Task) ....</b>	<b>42</b>
10.1.	Lesson Objectives.....	42
10.2.	How Stitching Tool Tasks Work.....	42
10.3.	Exercise.....	42
<b>LESSON 11</b>	<b>Control with user interface logic (Multi-Spindle Task - subtasks).....</b>	<b>47</b>
11.1.	Lesson Objectives.....	47
11.2.	How Multi-Spindle Tool Tasks Work .....	47
11.3.	Exercise.....	47
<b>LESSON 12</b>	<b>Backup task using Stitching Tool.....</b>	<b>52</b>
12.1.	Lesson Objectives.....	52
12.2.	How Stitching Tool backup Multi-Spindle Tool Tasks Work .....	52

---



---

## Table of Contents

12.3.	Exercise.....	53
<b>LESSON 13</b>	<b>Task Sequence .....</b>	<b>57</b>
13.1.	Lesson Objectives.....	57
13.2.	Exercise.....	57
<b>LESSON 14</b>	<b>Multiple Foot Prints.....</b>	<b>62</b>
14.1.	Lesson Objectives.....	62
14.2.	How Multiple Foot Prints Work .....	62
14.3.	Exercise.....	64
<b>LESSON 15</b>	<b>Dual GOTs .....</b>	<b>67</b>
15.1.	Lesson Objectives.....	67
15.2.	How Dual GOTs Work.....	67
15.3.	Exercise.....	68
<b>LESSON 16</b>	<b>Options of Re-Run .....</b>	<b>70</b>
16.1.	Lesson Objectives.....	70
16.2.	Re-Run setup in eFlex.....	70
16.3.	PLC code.....	70
16.4.	Exercise.....	71
<b>LESSON 17</b>	<b>Other Configuration Settings and Station Interactions .....</b>	<b>73</b>
17.1.	Lesson Objectives.....	73
17.2.	Abnormal situations.....	73
17.3.	Other Configurations.....	73
17.4.	Exercise.....	74
<b>LESSON 18</b>	<b>Re-assign Tasks for Manual Work Stations .....</b>	<b>76</b>
18.1.	Lesson Objectives.....	76
18.2.	Exercise.....	76
<b>LESSON 19</b>	<b>Implement with OEM Logic .....</b>	<b>82</b>
19.1.	Lesson Objectives.....	82
19.2.	OEM Logic.....	82
19.3.	Exercise.....	82

---

---

# Table of Contents

**LESSON 20 eFlex Reporting System .....83**

- 20.1. Lesson Objectives..... 83
- 20.2. Station status data structure and the PLC code..... 83
- 20.3. eFlex Reports – Part Build History..... 83
- 20.4. eFlex Reports – Station Task Timing Diagram..... 85
- 20.5. Exercise..... 86

**Appendix 1. Task Status Code.....87**

**Appendix 2. Standard Hardware Memory Map (CC-Link).....88**

**Appendix 3. RFID Memory Map .....91**

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## Class Introduction

Mitsubishi Electric Powertrain Solutions Assembly Configuration/Control System (MEL-FACS) provides PLC and HMI programs and hardware used to interface between eFlex system and OEM logic.

The MEL-FACS solution includes:

- A central assembly configuration system – provided and supported by eFlex system
- A standardized assembly station hardware layout for Manual Work Station
- A standardized assembly station PLC control logic
- Standardized HMI screens

The MEL-FACS benefits include:

- Configure line without programming
- Reconfigure when required without programming
- Add station devices without programming
- Move station devices without programming
- Reduce testing and documentation time and effort (costs) by means of a common and reusable manual station control application and hardware layout

### Course Objectives

By the end of this training course, the student should be able to:

- Understand system architecture and hardware components of MEL-FACS system
- Understand software library of MEL-FACS
- Understand the interface between eFlex system, MEL-FACS and OEM logic
- Implement MEL-FACS into the OEM project

### Prerequisites

- PLC Basics (GX Works2)
- GX Works2 Structured Programming
- MELSOFT Navigator
- GT Designer3

### Course Duration

This course is designed for a 2 day class length.

### List of Relevant Manuals

SH(NA)-080781ENG-X                      GX Works2 Operating Manual Structured Project

SH(NA)-081220ENG-L(1507)MEE      GT Designer3 GOT2000 Screen Design Manual

MEL-FACS – Part 1 FACS and Assembly System Overview

MEL-FACS – Part 2 Function Block User's Manual

## LESSON 1 Startup the Training System

This lesson discusses the system architecture of predefined hardware of MEL-FACS and the IP address assignment for each training station.

### 1.1. Lesson Objectives

At the conclusion of this lesson, you will be able to...

- Understand the standard Manual work station hardware components of MEL-FACS
- Re-assign the IP address for each training station
- Open MEL-FACS PLC and HMI program

### 1.2. System Configuration

The MEL-FACS Manual Work Station (MWS) consists of the following standard components:

- A central assembly configuration system
- A standardized assembly station hardware layout
- A standardized assembly station PLC control logic

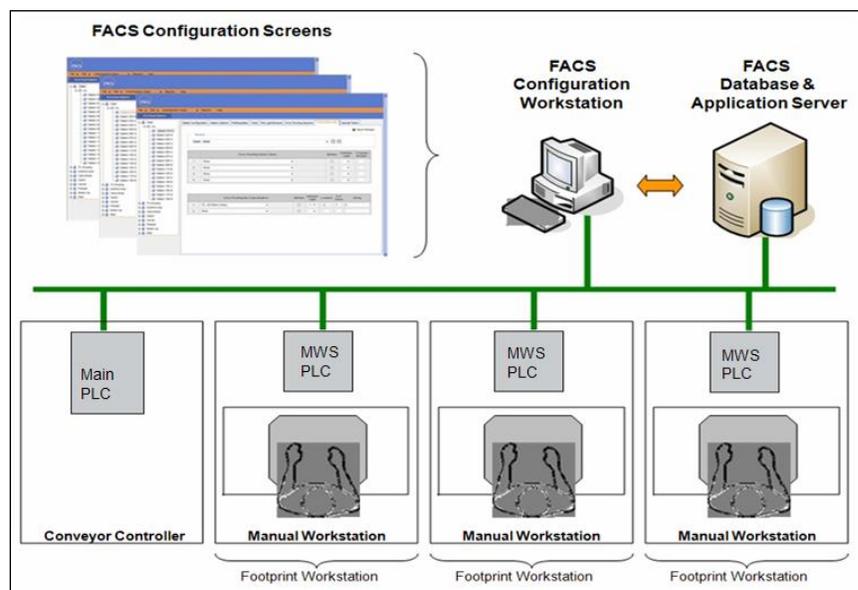


Figure 1.1 Flexible Assembly Configuration System

## Notes

### 1.3. Hardware Components List for MWS

Typical/standard Manual Work Station hardware list:

- The Hardware configuration like Fieldbus, RFID controller and the enclosure style may vary based on the Project/Customer (Optional for this Workshop Demo/Training)

Q06UDV CPU with Q4MCA-4MBS    PLC with 4M bytes SRAM cassette

\*QJ71GF11-T2                            CC-Link IE Field Network Module

\*QJ71E71-100                           Ethernet Network Module

\*EQ-V680D2                            Omron RFID Module

\*CC-Link                                CC-Link Network Module

Q35B                                      Base Rack

Q63P                                      24VDC PS

GOT2000 (GT2712 – STBA) with SD Card – 1GB

\* Optional for this Workshop Training

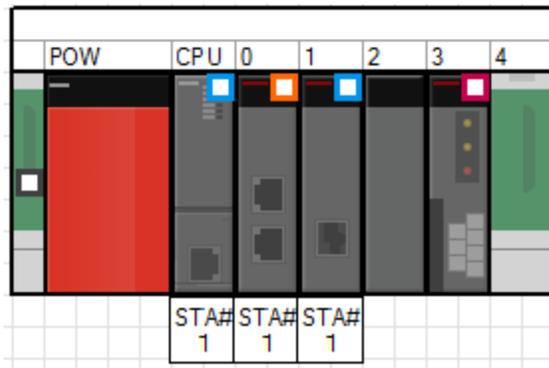


Figure 1.2 MEL-FACS Sample Rack Layout

## Notes

### 1.4. MEL-FACS in Navigator

- Open MELSOFT Navigator

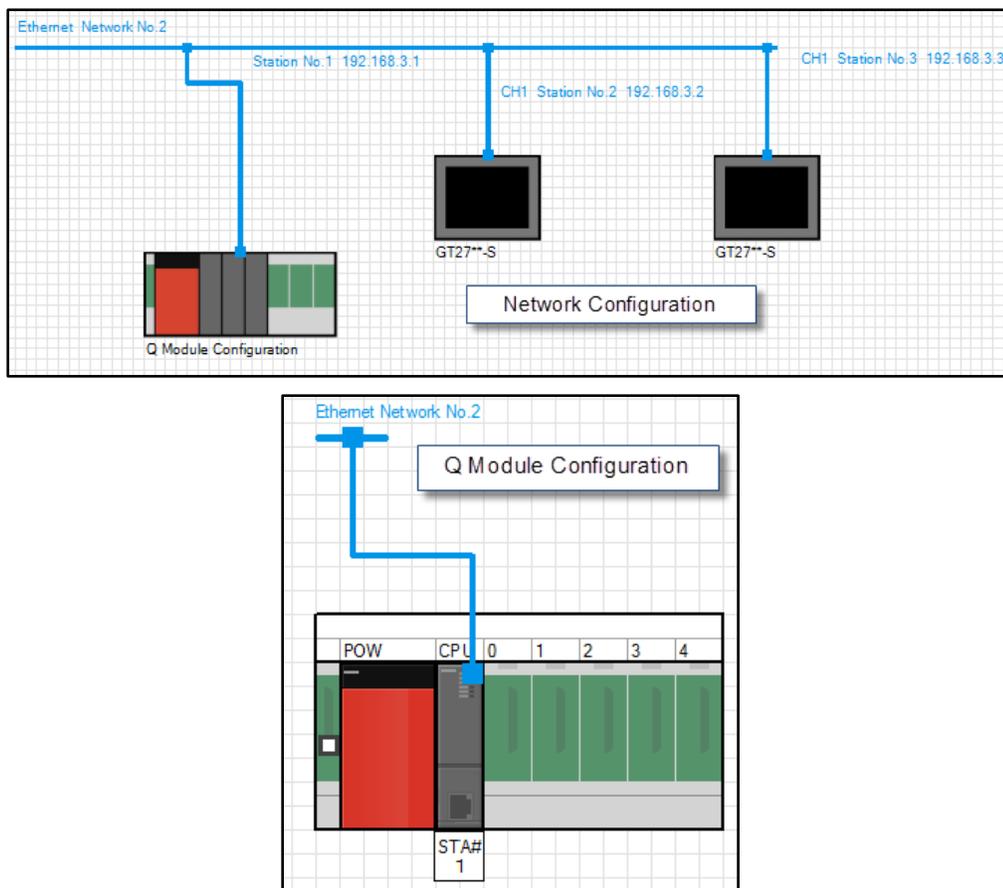


Figure 1.3 MEL-FACS in MELSOFT Navigator

### 1.5. Set IP Address for Training Station

- Set up IP addresses for PLC, HMI and laptops

Refer to the following table to set up the IP addresses for the training equipment.

Team	Subnet	Subnet Mask	PLC (CPU)	HMI	Laptop
1	192.168.3.0	255.255.255.0	192.168.3.1	192.168.3.2	192.168.3.5
2	192.168.3.0	255.255.255.0	192.168.3.11	192.168.3.12	192.168.3.15
3	192.168.3.0	255.255.255.0	192.168.3.21	192.168.3.22	192.168.3.25
4	192.168.3.0	255.255.255.0	192.168.3.31	192.168.3.32	192.168.3.35

## Notes

Team	Network	PLC Station	HMI Station
1	2	1	2
2	2	11	12
3	2	21	22
4	2	31	32

FACS Server
192.168.3.50

Within MELSOFT Navigator double click on "Q Module Configuration." A 'tabbed' window will appear, showing the PLC on a network.

Right Click the PLC module in the MELSOFT Navigator – Q Module Configuration window, select 'Parameter' and then select 'Detailed Configuration Information Input Window.'

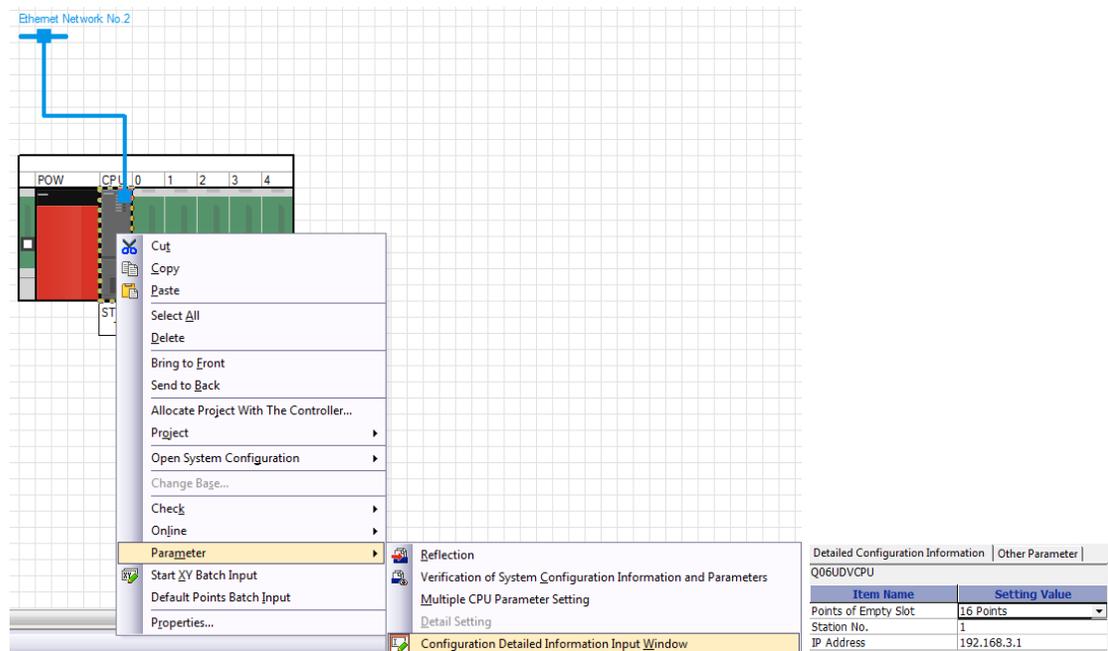
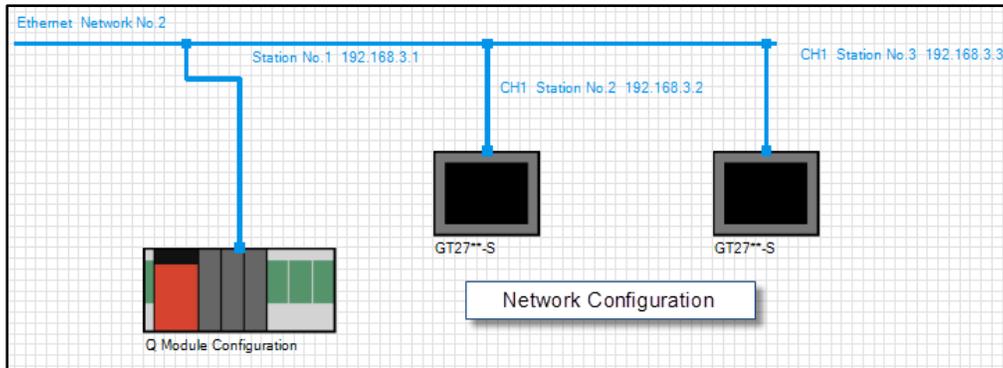


Figure 1.4 IP Address, Net and Station # for PLC

The window on the right will show the detail settings for the PLC. Change the Station No. and IP address to reflect what is shown in the table.

Notes

Single Click on the GOT (HMI) in the MELSOFT Navigator – Network Configuration window. It will be highlighted. The window on the right will show the detail settings for the HMI. Change the Station No. and IP address to reflect what is shown in the table.



Input Detailed Configuration Information (iQ Conf...)

Detailed Configuration Information | Other Parameter

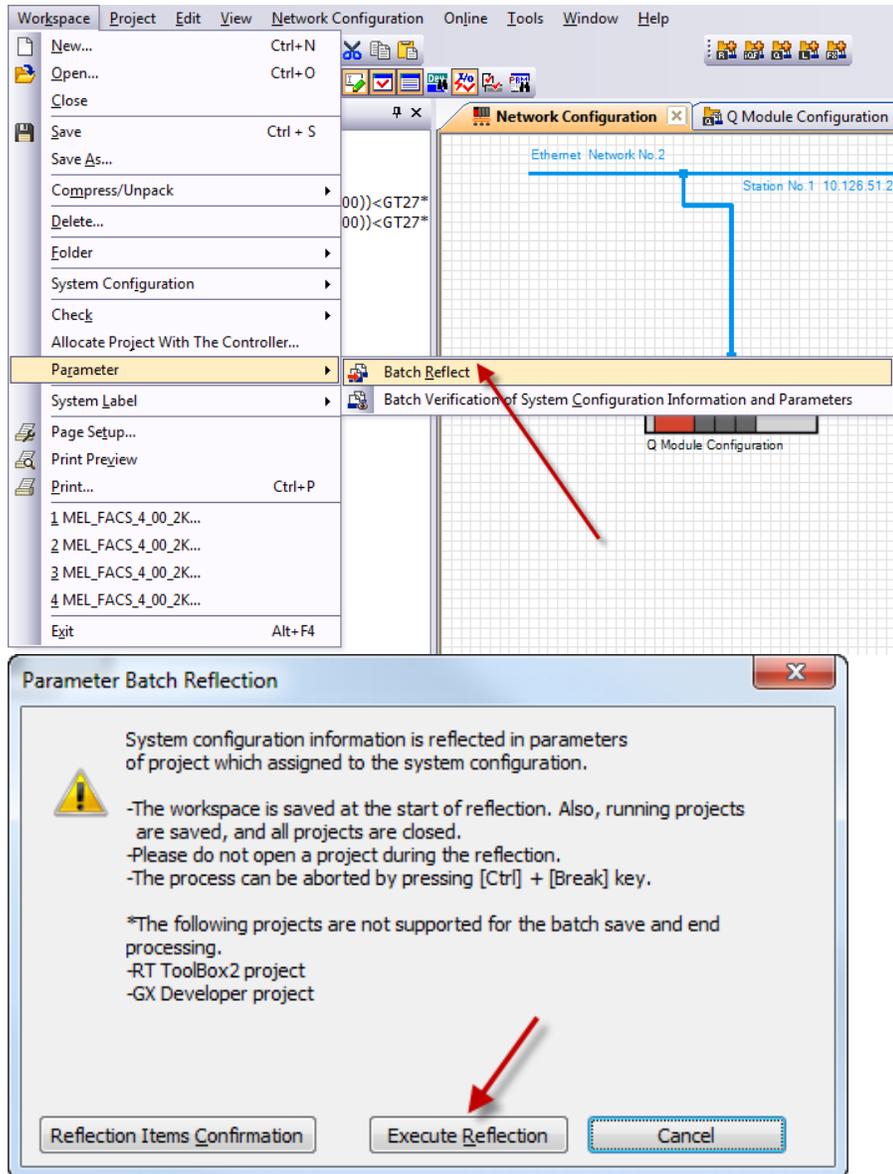
GT27\*\*S

Item Name	Setting Value
Personal Computer Connection	USB
IP Address	192.168.3.2
CH1 I/F	Standard I/F (Ethernet)
CH1 Driver	Ethernet (MELSEC), Q17n
CH1 Station No.	2
CH1 Port No.	5001
CH2 I/F	No Setting
CH3 I/F	No Setting
CH4 I/F	No Setting

**Figure 1.5 IP Address, Net and Station # for HMI**

Click on 'Workspace' in the Menu bar to select Parameter->Batch Reflect the IP addresses to GX Works2 and GT Designer 3 Programs and Select 'Execute Selection' button on the Dialog Window.

## Notes



This process will take few minutes and click Buttons appropriately to continue. Then it is ready to open PLC and HMI programs after Parameter Reflection.

### 1.6. Open PLC and HMI program

From MELSOFT Navigator, open the PLC Application by double-clicking either on the PLC project in the left window or the PLC module within the PLC rack configuration icon in the "Q Module Configuration" window.

## Notes



## LESSON 2 eHMI and MEL-FACS Workshop Simulation

This lesson discusses the function of eHMI and workshop simulation screens.

### 2.1. Lesson Objectives

At the conclusion of this lesson, you will be able to...

- Understand the eHMI basic functions
- Understand the MEL-FACS simulation interface screens and their functionalities

### 2.2. eHMI Screen

The Main screen is shown below. The task list is defined and sent from eFlex. The functions of three columns are listed below:

- BUILD/NO BUILD = "BUILD" (Green), "NO BUILD" (Red)
- STATUS = "ACCEPT" (Green), "REJECT" (Red), "BYP BAD" (Red), "RERUN" (Grey)
- TASK MODE = "ENABLED" (Grey), "SINGLE BYP" (Blue), "CONT BYP" (Blue)

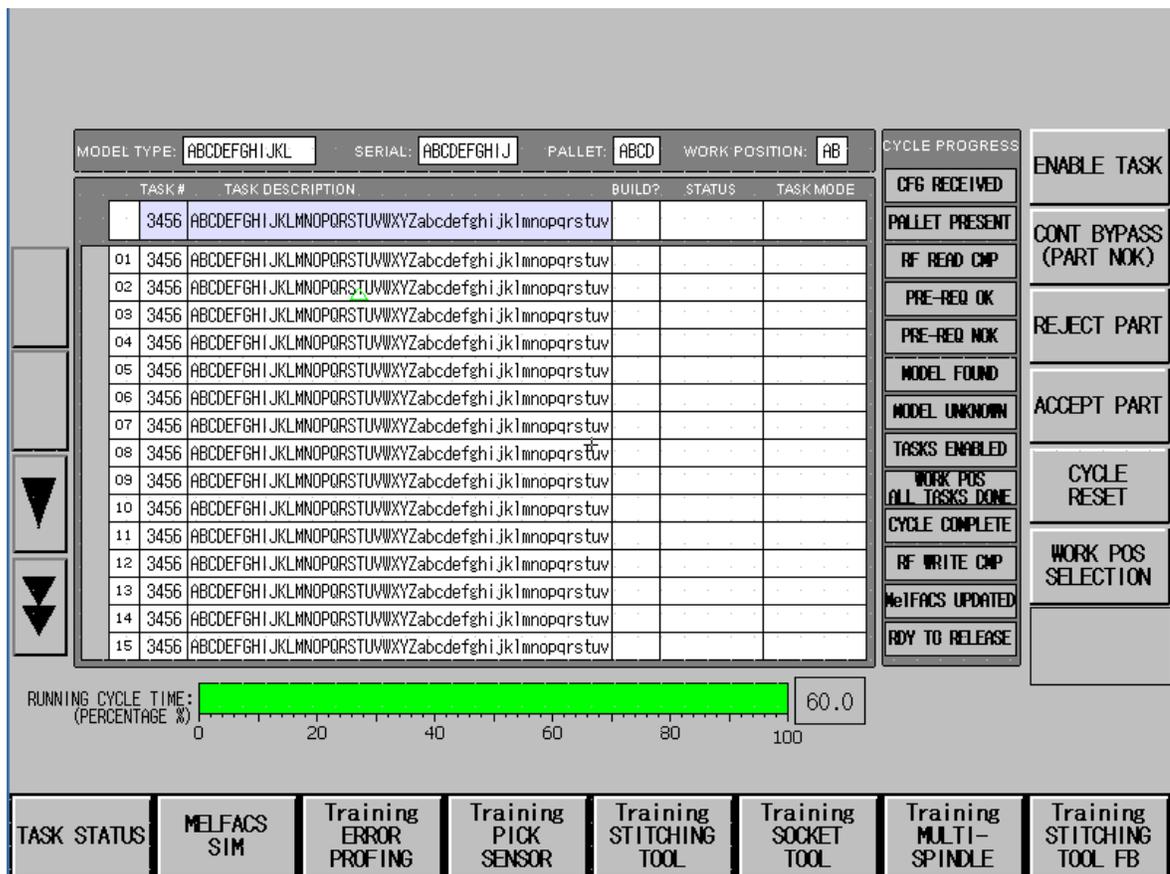


Figure 2.1 eHMI Application

## Notes

The Tasks enabled Navigation screen is shown below.

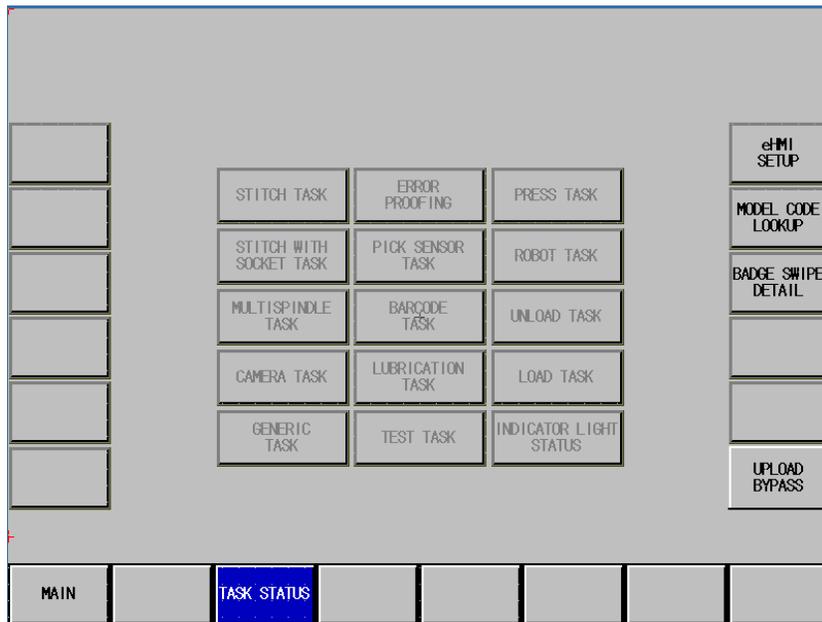


Figure 2.2 eHMI Sample Screen - Navigation

Sample task screen is shown below.

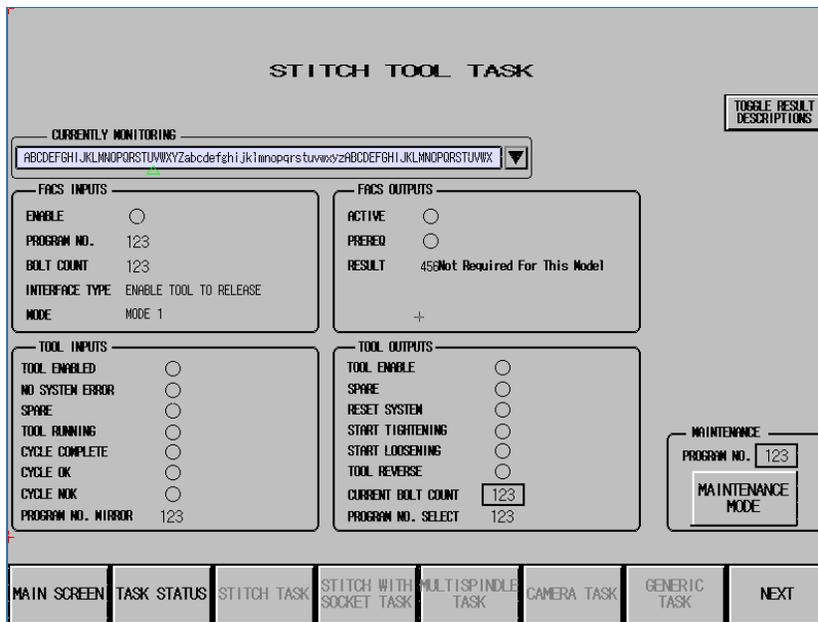


Figure 2.3 eHMI Sample Screen – Stitching Tool

Notes

### 2.3. Workshop Simulation HMI Screen

Press the second menu button, "MEL-FACS SIM" from the Main Menu of the GOT to go to the MEL-FACS Manual Work Station simulation screen.

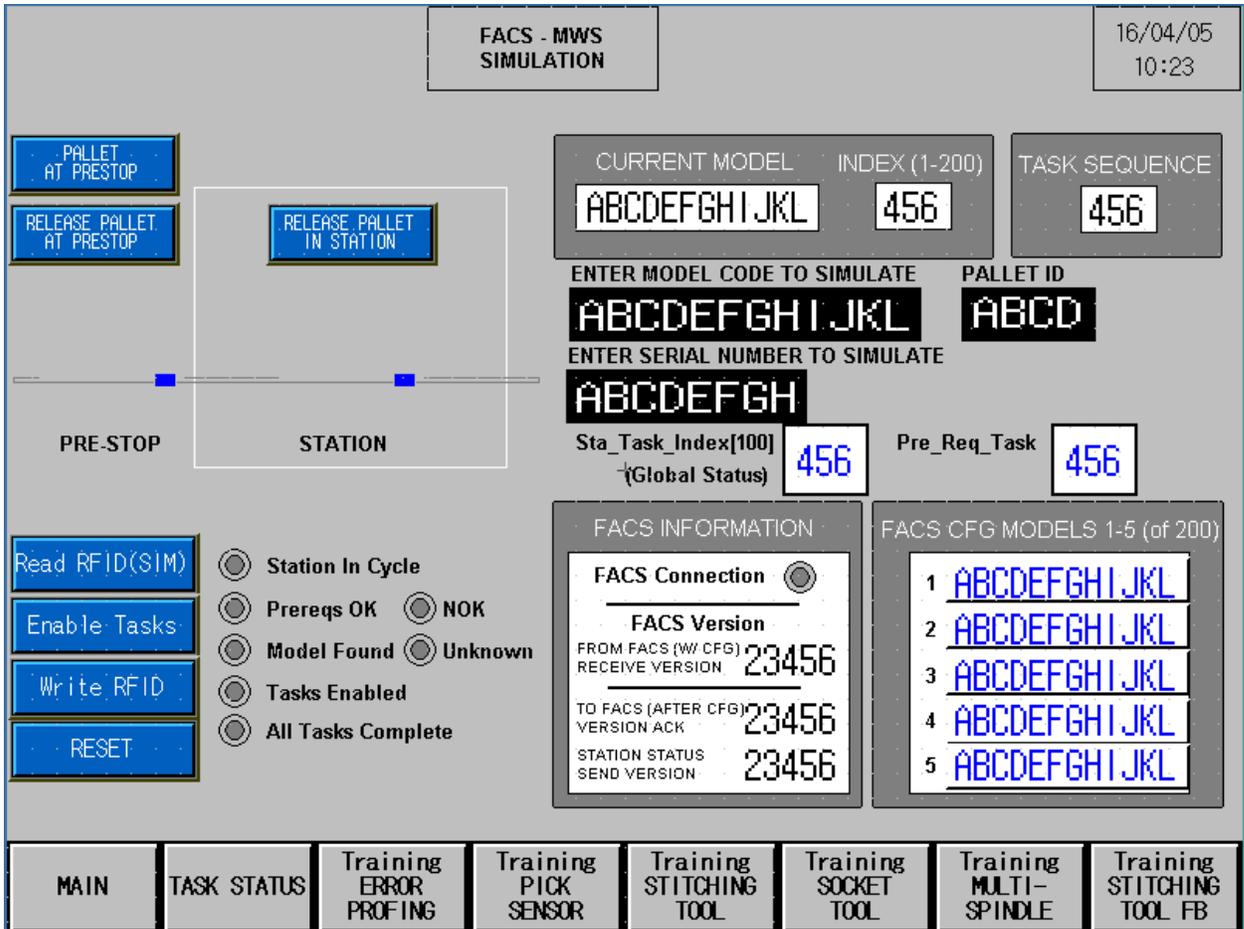


Figure 2.4 MEL-FACS Simulation

The MEL-FACS Simulation Screen allows the student to simulate a pallet in a work station, simulate reading the RFID, manually enter a Model Number, and enable the tasks.

The screen shows the first five models from the eFlex configuration, shows whether the current model is matched with one in the database and shows the indexed position of that model (1 – 200) in the eFlex configuration. The screen shows the version number of the eFlex configuration and shows the version number sent back to eFlex from the manual work station.

The screen indicates whether eFLEX has a connection to the PLC and shows other status, such as 'Tasks Enabled,' 'All Tasks Complete' and 'Prereqs OK' or 'NOK.'

The menu on this screen offers the student to five additional Buttons to training screens, for exercises in 'Pick Sensor', 'Error Proofing,' 'Stitching Tool', Socket Tool and 'Multi-Spindle' Tool tasks.

## Notes

#### 2.4. Simulate a Pallet Entering Station, Read RFID and Enable Tasks

The objective of this exercise is to show how the Model Code is read from the RFID and compared to the Model Codes in the eFLEX Configuration to determine if it is a 'Known Model.'

Press the 'numerical input' box labeled 'ENTER MODEL CODE TO SIMULATE,' and type in a Model Code (12 characters.) We'll pretend the pallet is in the station and the model code you typed in is now in the proper place in the RFID tag structure.

Now press the 'Read RFID (SIM)' button to simulate reading the RFID on the pallet. Then press "Enable Tasks". This will look up the Model Code you entered (simulated RFID) in the eFlex database. If a match is found, the Model Code will appear in the 'Current Model' field on the HMI simulation screen. You can also monitor the current model code in a 'Watch' window in the PLC if you type in 'Sta\_Status,' expand and scroll down to 'Station1\_PUN1'. You can view the values in either decimal or hexadecimal format. (To change the format, right click within the watch window and click 'Change Value Format. . .')

If there is no matching Model Code in the eFlex database, the red indicator 'Unknown' will display. If the prerequisites are met, the green 'Prereqs OK' indicator is displayed. If not, the red 'NOK' indicator is displayed.

## LESSON 3 Download MEL-FACS MWS to PLC and HMI

This lesson discusses how to download the PLC project to the PLC and the GOT project to the GOT.

### 3.1. Lesson Objectives

At the conclusion of this lesson, you will be able to...

- Download the PLC Project to the PLC
- Download the GOT (HMI) Project to the GOT

### 3.2. Exercise – Download MEL-FACS MWS

#### 3.3. Download to PLC

Set up a "Connection Destination:"

Click "Connection Destination" on the lower left window of GX Works 2, as shown in the following figure. Then click the icon on the upper left corner of the window to create a new connection.

Type "Training" as the Connection Name, and check the box denoting "Default Connection."

The 'Connection Destination' window should look something like this, where the 'current connection' is 'Training.'

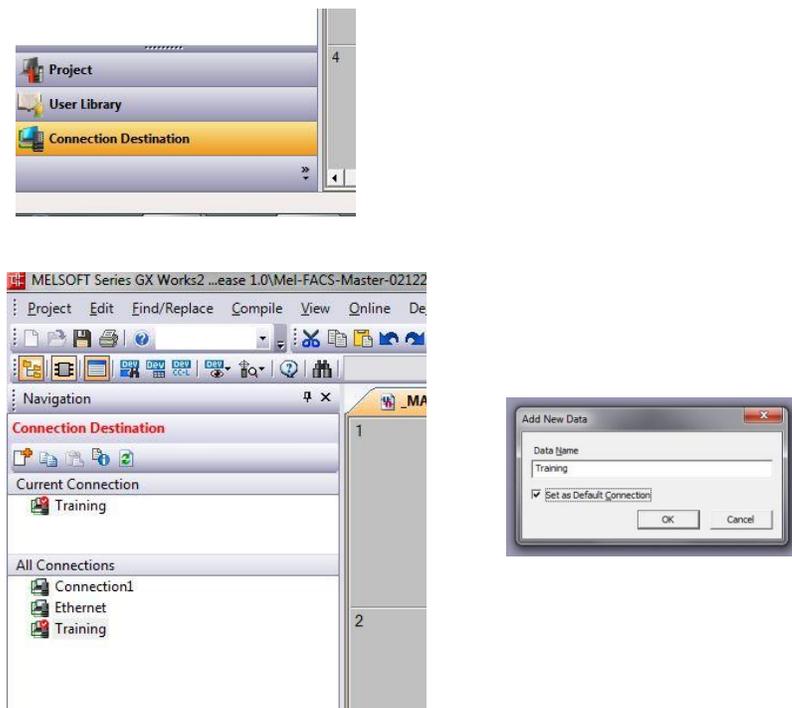


Figure 3.1 PLC Connection

## Notes

Note: To use another already configured connection, simply drag it from the 'All Connections' field up to the 'Current Connection' field. The dragged 'connection' will replace the current one, which will still be available in the 'All Connections' field.

Open the 'Training' connection by double-clicking it.

You will need to configure the 'PC Side I/F,' the 'PLC Side I/F' and the 'Other Station Setting' to reflect your hardware configuration.

On the 'PC Side I/F' click 'Ethernet Board.' Select 'Ok' when you see the following dialog box.

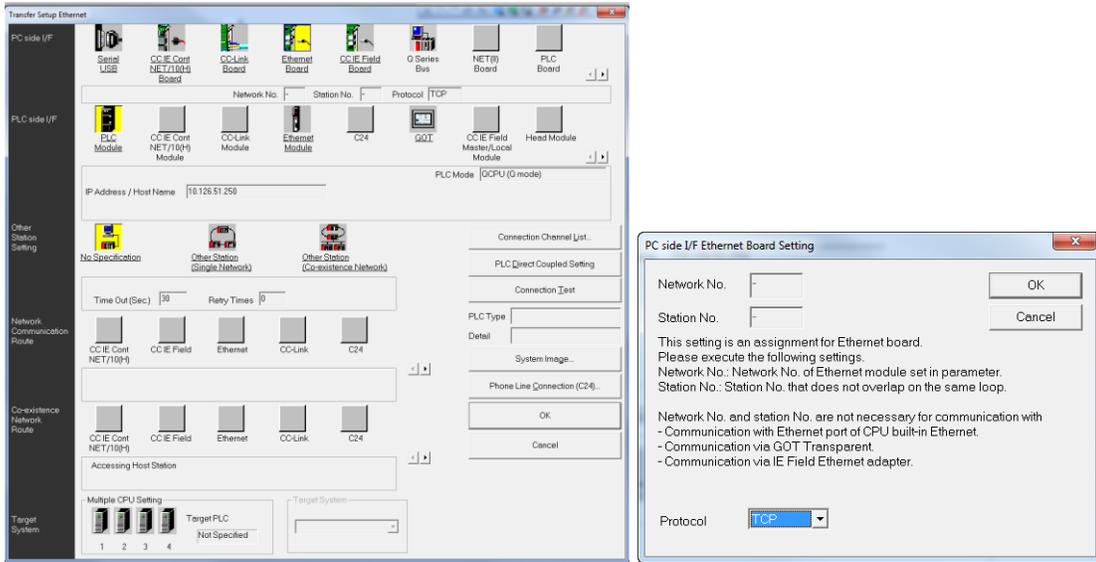


Figure 3.2 Setting for PLC Connection

Select 'PLC Module' on 'PLC Side I/F' row. Then double-click 'PLC Module' to open up the 'Detailed Settings' dialog box. Select 'Connection via Hub,' Type in the IP Address for the Ethernet Port provided in the table earlier.

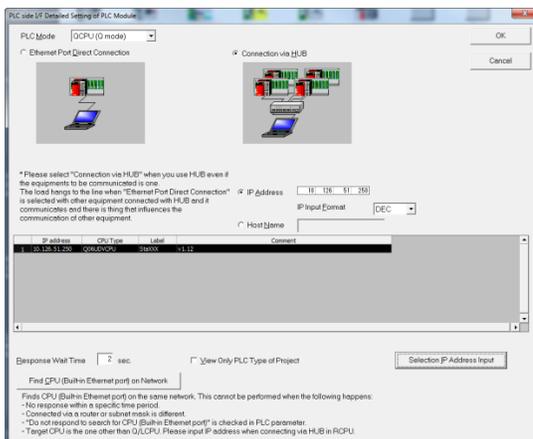


Figure 3.3 PLC Side Ethernet Setting

Notes

Then click 'No Specification' on the 'Other Station Setting' row.

With your laptop connected to the PLC either directly or via a router, click 'Connection Test.' Upon a successful communication with the PLC, click 'OK' to accept and close the newly configured 'Training' connection.

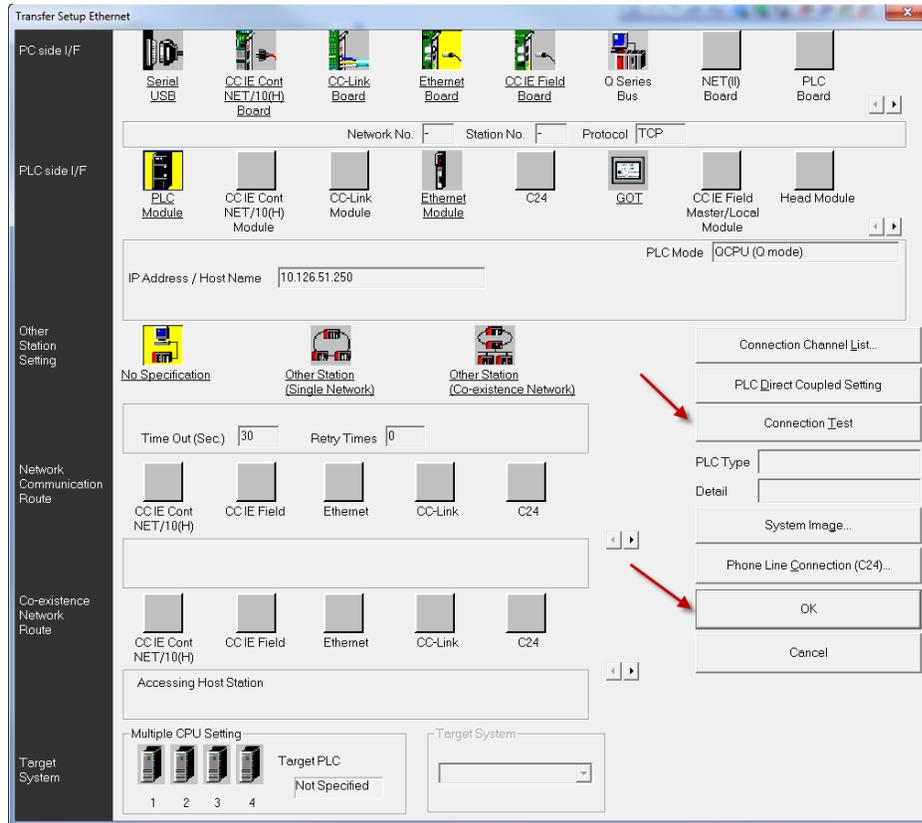


Figure 3.4 Other Settings for PLC Connection

After creating and configuring the 'Training' connection and setting it as 'default,' select 'Write to PLC' from the 'Online' menu.

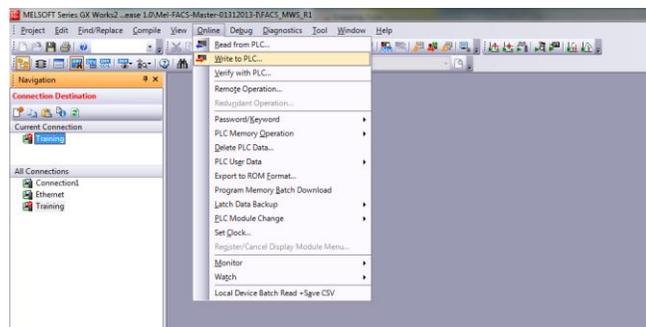


Figure 3.5 Write to PLC

## Notes

The following 'Online Data Operation' dialog box appears.

Select the boxes for 'Program (Program File)' and 'Parameter' and then click 'Execute' to write to the PLC(Program Memory) and Symbolic Information to the Standard RAM. (The process of formatting, clearing and arranging PLC Memory is covered in a different training.)

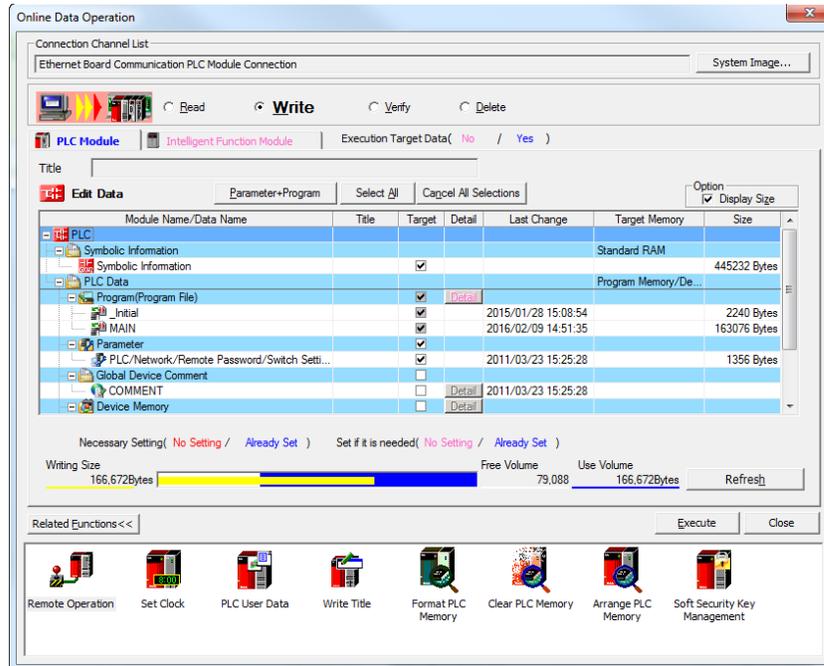


Figure 3.6 Write to PLC

Select 'Yes to all' and click the 'Completed' dialog box, then click 'Close' and reset the processor by toggling the reset switch on the front of the PLC.

### 3.4. Download to GOT

Click 'Write to GOT' on the 'Communication' menu, as shown in the following figure.

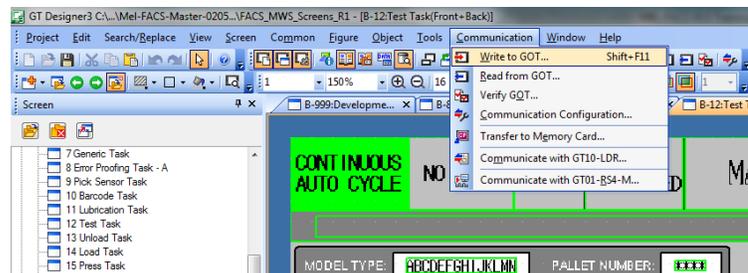


Figure 3.7 Download to GOT

## Notes

Click 'Yes' when the following dialog box comes up.

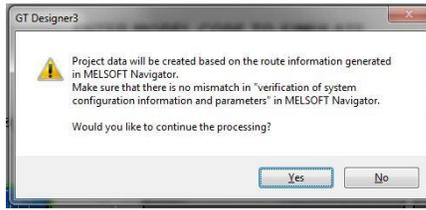


Figure 3.8 Download to GOT

Select 'Ethernet' as your communication method and type in the IP address for your team's HMI as listed in the table earlier in this document. Then click 'Ok.'

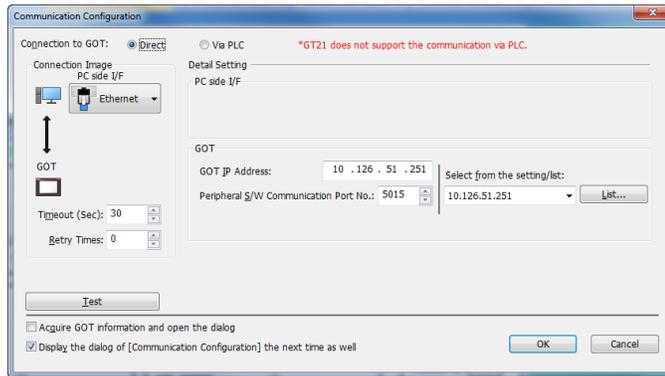


Figure 3.9 Download to GOT

Select the project main folder, which will download all the screens, and click 'GOT Write.'

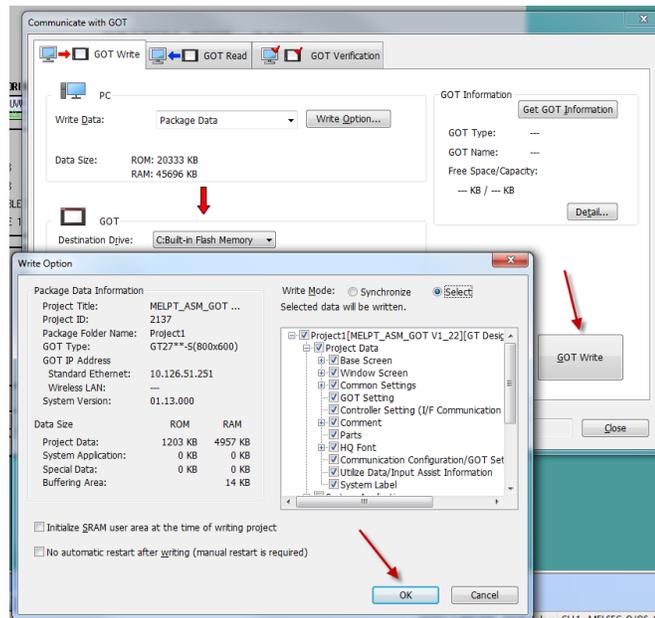


Figure 3.10 Download to GOT

## Notes

## LESSON 4 Program Structure and PLC Memory Map

### 4.1. Project / Program Structure

The MEL-FACS Software Library is implemented using Mitsubishi GX Works2 programming software. The software is an IEC1131-3 environment and supports structured programming. The following diagram shows the program structure of MEL-FACS in the GX Works2 environment.

#### 4.1.1. User Library Program Structure

All MEL-FACS FBs are called from respective programs

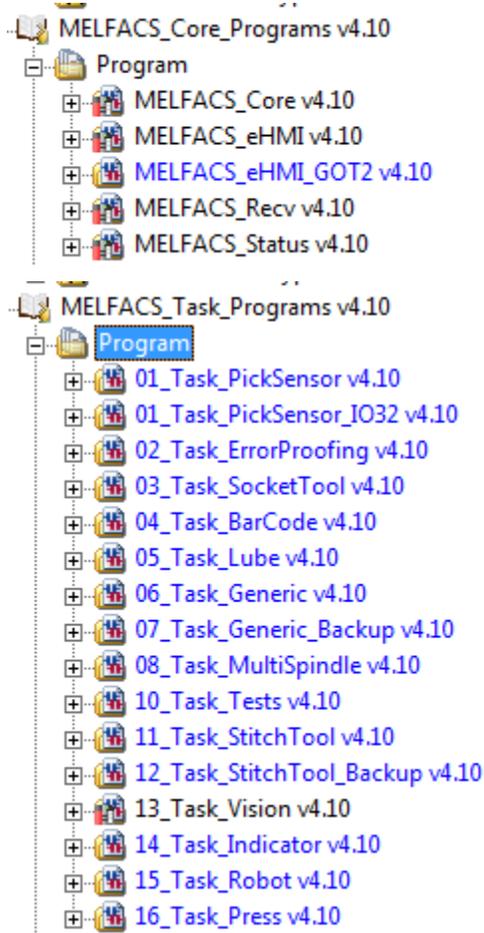


Figure 4.1 MEL-FACS MWS Program Structure – cont'd

## Notes

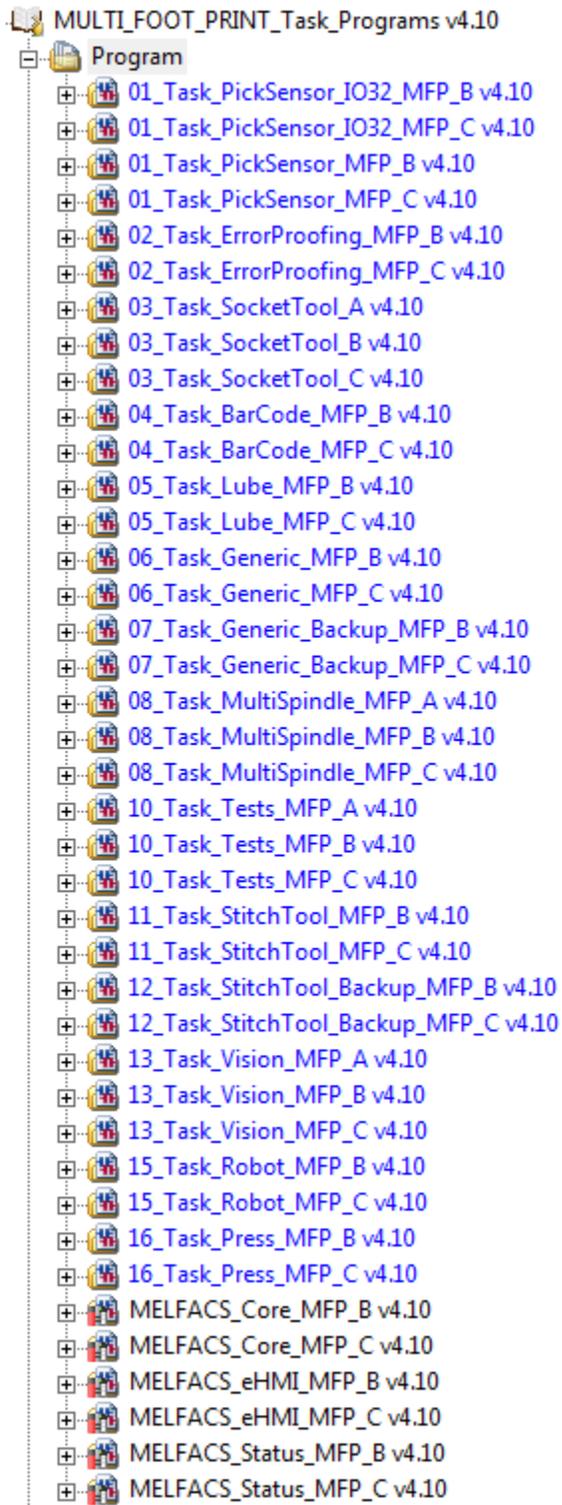
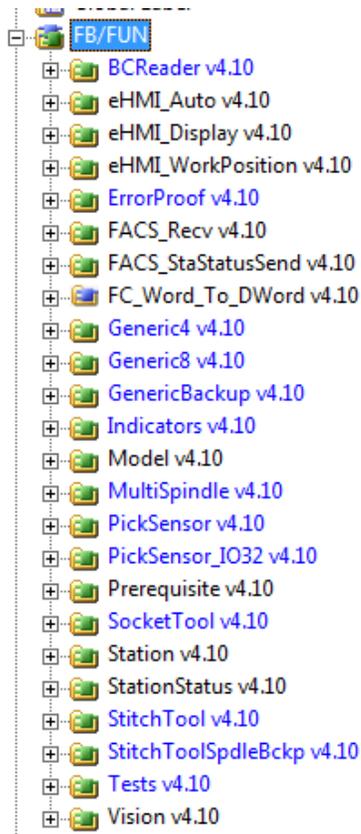


Figure 4.1 MEL-FACS MWS Program Structure

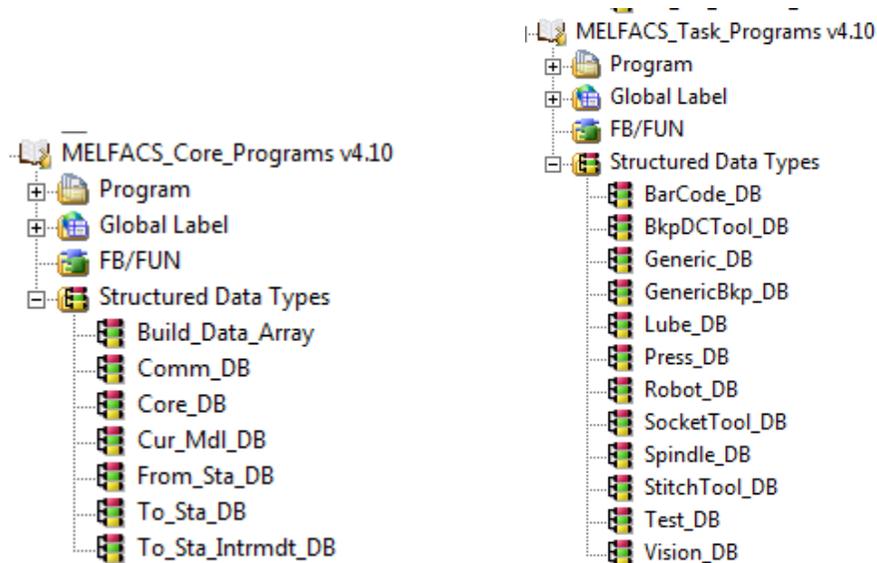
Notes

### 4.1.2. User Library FBs and FUNs

All Core, Task and OEM Function Blocks reside in User Library



### 4.1.3. Structured Data Types



## Notes

#### 4.1.4. Global Labels

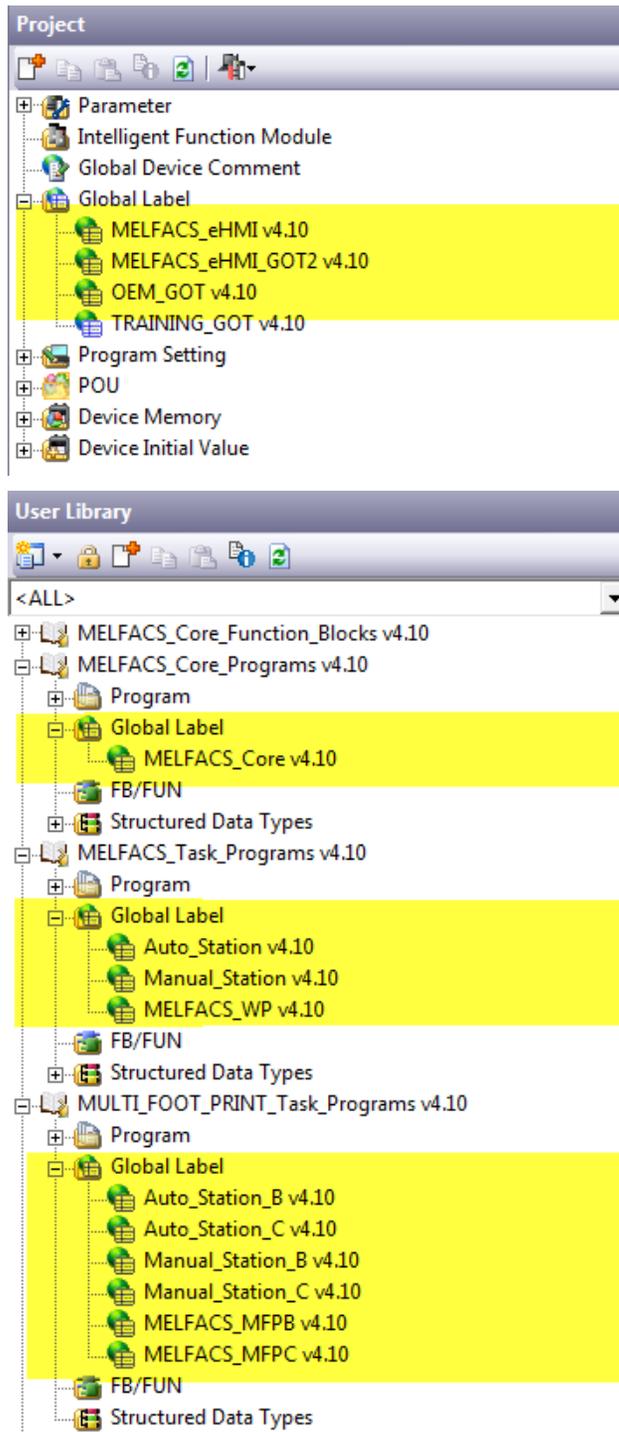


Figure 4.2 MEL-FACS MWS Project and User Library Global Labels

## Notes

## 4.2. PLC Memory Map

### 4.2.1. Parameter -> Devices

It is also critical to configure the latches for L Relay bits, W Registers, and ZR registers as shown in Figure 4.3 below so that the configuration data will not be lost when the PLC power is turned off.

(Note: Registers range could be different after merging the MEL-FACS library to a real project)

**Q Parameter Setting**

PLC Name | PLC System | PLC File | **PLC RAS** | Boot File | Program | SFC | **Device** | I/O Assignment | Multiple CPU Setting | Built-in Ethernet Port Setting

	Sym.	Dig.	Device Points	Latch (1) Start	Latch (1) End	Latch (2) Start	Latch (2) End	Local Device Start	Local Device End
Input Relay	X	16	8K						
Output Relay	Y	16	8K						
Internal Relay	M	10	60K						
Latch Relay	L	10	32K			0	32767		
Link Relay	B	16	60K						
Annunciator	F	10	0K						
Link Special	SB	16	2K						
Edge Relay	V	10	0K						
Step Relay	S	10	8K						
Timer	T	10	4K						
Retentive Timer	ST	10	1K						
Counter	C	10	512						
Data Register	D	10	40K			0	40959		
Link Register	W	16	0K						
Link Special	SW	16	1K						
Index	Z	10	20						

Device Total: 58.4 K Words  
 Word Device: 46.5 K Words  
 Bit Device: 173.0 K Bits

The total number of device points is up to 60K words.  
 Latch(1) : Able to clear the value by using latch clear.  
 Latch(2) : Unable to clear the value by using latch clear. Clearing will be executed by program.  
 Scan time is extended by the latch range setting (including L).  
 If the latch is necessary, please set the required minimum latch range.  
 When using the local devices, please do the file setting at PLC file setting parameter.

File Register Extended Setting  
 Capacity: 1000 K Points

	Sym.	Dig.	Device Points	Latch (1) Start	Latch (1) End	Latch (2) Start	Latch (2) End	Device No. Start	Device No. End
File Register	ZR(R)	10	968K			100000	749999	ZR0	ZR991231
Extended Data	D	10	0K						
Extended Link	W	16	32K	4000	7FFF			W0	W7FFF

Following setting are available when select "Use the following file" in file register setting of PLC file setting.  
 - Change of latch(2) of file register.  
 - Assignment to expanded data register/expanded link register of a part of file register area.

Indexing Setting for Device  
 32Bit Indexing  
 Use Z Z 12 After (0 -- 18)  
 Use ZZ

Latch Interval Setting  
 Time Setting  
 ms (1 to 2000ms)  
 Per Scan

When time setting is selected, latch by END processing after the specified time has passed.

Print Window... | Print Window Preview | Acknowledge XY Assignment | Default | Check | End | Cancel

Figure 4.3 Device Configuration – Parameter->Devices

## Notes

**4.2.2. Automatic Assignment**

The Devices set in Parameters -> Devices can be used directly in the programs with User Assigned Devices for Labels or Automatic Assignments by setting in Tools -> Device/Label Automatic-Assign Setting as follows for MEL-FACS MWS application

Device/Label Automatic-Assign Setting

Set a device range to automatically assign to labels.

Labels will be assigned from its way down the displayed device list when multiple devices are selected.

	Device	Digit	Assign Selection	Assignment Range		Total Points	PLC Parameter Device Setting Range
				Start	End		
<b>Word Device</b>							
VAR Range	D	10	<input type="checkbox"/>			191232	0 -- 40959
	W	16	<input type="checkbox"/>				
	ZR	10	<input checked="" type="checkbox"/>	800000	991231		0 -- 991231
VAR_RETAIN Range Latch(2)	D Latch	10	<input type="checkbox"/>			50000	0 -- 40959
	W Latch	16	<input type="checkbox"/>				
	ZR Latch	10	<input checked="" type="checkbox"/>	700000	749999		100000 -- 749999
<b>Bit Device</b>							
VAR Range	M	10	<input checked="" type="checkbox"/>	1000	57999	57000	0 -- 61439
	B	16	<input type="checkbox"/>				0 -- EFFF
VAR_RETAIN Range Latch(2)	L Latch	10	<input checked="" type="checkbox"/>	30000	32767	2768	0 -- 32767
	B Latch	16	<input type="checkbox"/>				
<b>Pointer</b>							
VAR Range	P	10	<input checked="" type="checkbox"/>	3072	4095	1024	0 -- 4095
<b>Timer</b>							
VAR Range	T	10	<input checked="" type="checkbox"/>	512	4095	3584	0 -- 4095
VAR_RETAIN Range Latch(1)	T Latch	10	<input type="checkbox"/>			0	
<b>Retentive Timer</b>							
VAR Range	ST	10	<input checked="" type="checkbox"/>	512	1023	512	0 -- 1023
VAR_RETAIN Range Latch(1)	ST Latch	10	<input type="checkbox"/>			0	
<b>Counter</b>							
VAR Range	C	10	<input checked="" type="checkbox"/>	256	511	256	0 -- 511
VAR_RETAIN Range Latch(1)	C Latch	10	<input type="checkbox"/>			0	

Latch(1) : Able to clear the value by using a latch clear.  
 Latch(2) : Unable to clear the value by using a latch clear. Please execute clearing in program.

(Caution)

- Label-nonassigned devices, of the automatically assigned ones while compiling, will be allotted the device that displayed at the lowest of the selected ones. Ex):Device will be assigned to ZR when D and ZR are selected.
- Changing the assignment target device may also change the processing speed since the arithmetic processing speed for R and ZR is difference from other devices.

OK Cancel

Figure 4.4 Device Configuration – Auto Assign Devices for Labels

**Notes**

4.2.3. PLC Memory Map

ZR - Total Device - 968K	991231	Note: Auto Assign is used by both MEL-FACS and User (OEM)						
VAR Range	0 - 99999	Please See Automatic Assignment Tab for actual usage by MEL-FACS						
VAR_RETAIN Range	100000 - 749999							
VAR Range	750000 - 991231							

Register Range	0 - 99999	100000 - 549999	550000 - 699999	700000 - 749999	750000 - 769999	770000 - 799999	800000 - 991231
Register Type	100,000	450,000	150,000	50,000	20,000	30,000	191,232
User (OEMs)	VAR						
MEL-FACS Reserved	VAR_RETAIN						
User (OEMs)	VAR_RETAIN						
Auto Assign	VAR_RETAIN						
MEL-FACS System Label	VAR						
User (OEMs)	VAR						
Auto Assign	VAR						

MEL-FACS Reserved	ZR Registers	Range
VAR_RETAIN		
Cur_Mdl	100000 - 100775	776
FACS_Comm	101000 - 101074	75
Temp_Clock_64	101990 - 101991	2
Temp_Clock_64_Bit_0	101990.0	1
Cfg	102000 - 105999	4000
Model Data (200 Models)	106000 - 261199	155,200
Sta_Status WPA To ECS	282000 - 283866	1867
Sta_Status WPB To ECS	284000 - 285866	1867
Sta_Status WPC To ECS	286000 - 287866	1867
Cur_Mdl_B	288000 - 288775	776
Cur_Mdl_C	289000 - 289775	776
Cfg Recv Header	300000 - 301023	1024
cfg (Buffer)	302000 - 481999	180,000
Sta_Task_Index	485000 - 487099	2100
CurSta_Task_Index	488000 - 490099	2100
Build_Index	491000 - 493099	2100
Bypass_Index	494000 - 496099	2100
Cfg_Bypass_Index	497000 - 499099	2100
Sta_Task_Index_B	500000 - 502099	2100
CurSta_Task_Index_B	503000 - 505099	2100
Build_Index_B	506000 - 508099	2100
Bypass_Index_B	509000 - 511099	2100
Cfg_Bypass_Index_B	512000 - 514099	2100
Sta_Task_Index_C	515000 - 517099	2100
CurSta_Task_Index_C	518000 - 520099	2100
Build_Index_C	521000 - 523099	2100
Bypass_Index_C	524000 - 526099	2100
Cfg_Bypass_Index_C	527000 - 529099	2100
Reserved	530000 - 549999	20,000

MEL-FACS System Label	ZR Registers	Range
VAR		
MEL-FACS_eHMI	750000 - 754999	5000
MEL-FACS_eHMI_GOT2	755000 - 759999	5000
OEM_GOT	760000 - 764999	5000

Figure 4.5 Device Configuration – ZR Memory Map

Notes

M - Total Device - 60K	61439	Note: Auto Assign is used by both MEL-FACS and User (OEM) Please See Automatic Assignment Tab for actual usage by MEL-FACS	
M - Bits	0 - 999	1000 - 57999	58000 - 61439
Range	1,000	57,000	3,440
User (OEMs)			
Auto Assign			
MEL-FACS System Label			

MEL-FACS System Label	M Bits	Range
MEL-FACS_eHMI	58000 - 58999	1000
MEL-FACS_eHMI_GOT2	59000 - 59999	1000
OEM_GOT	60000 - 60999	1000

Figure 4.6 Device Configuration – M bits Memory Map

Notes

## LESSON 5 Receive Configuration from eFlex

This lesson discusses the communication between PLC and eFlex and the configuration memory map downloaded from eFlex.

### 5.1. Lesson Objectives

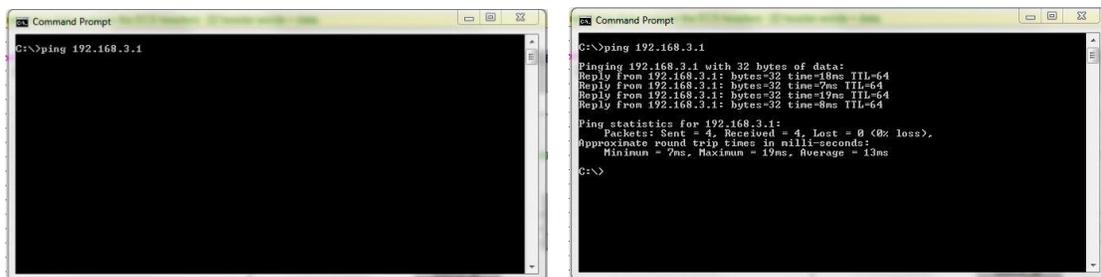
At the conclusion of this lesson, you will be able to...

- Understand the communication between PLC and eFlex
- Receive configuration data from the eFlex server
- Understand Configuration Memory Map data structure

### 5.2. Verify PLC / FACS Server Communication

### 5.3. Ping PLC CPU IP Address

Make sure the PC is physically connected to the PLC's on board Ethernet port via router and cables. Open a DOS command window by pressing the start menu and typing 'command' or 'cmd' in the search window. Check Ethernet communication with the PLC by using the 'Ping' command.



```
C:\>ping 192.168.3.1

C:\>ping 192.168.3.1
Pinging 192.168.3.1 with 32 bytes of data:
Reply from 192.168.3.1: bytes=32 time=18ms TTL=64
Reply from 192.168.3.1: bytes=32 time=7ms TTL=64
Reply from 192.168.3.1: bytes=32 time=19ms TTL=64
Reply from 192.168.3.1: bytes=32 time=8ms TTL=64

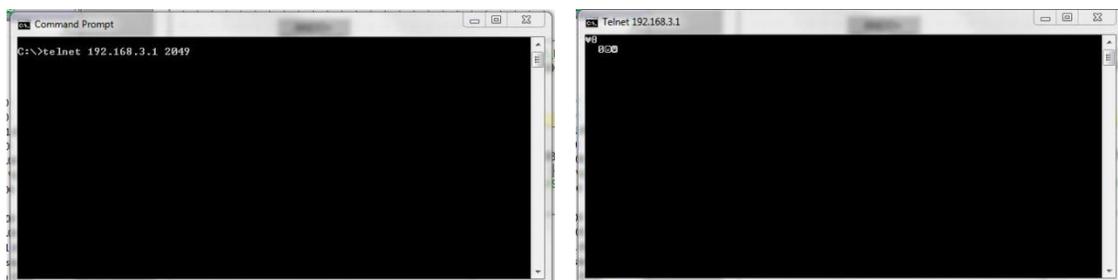
Ping statistics for 192.168.3.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 7ms, Maximum = 19ms, Average = 13ms

C:\>
```

Figure 5.1 Ping PLC

### 5.4. Telnet PLC CPU IP Address

Using the DOS command prompt,, telnet the PLC's CPU IP address (port address 2049) to establish a communication socket.



```
C:\>telnet 192.168.3.1 2049

Telnet 192.168.3.1
0x0
```

Figure 5.2 Telnet PLC

You should receive a 'sign of life' telegram like the one shown above.

## Notes

### 5.5. Monitor eFlex Server Connection from PLC

Next, we will monitor the communication between the PLC and the eFlex server by looking at the status of the 'Open Completion Signal' (SD1282.1) of the socket.

Open the PLC Parameter window. Click the 'Built-in Ethernet Port Setting' tab on the far right.

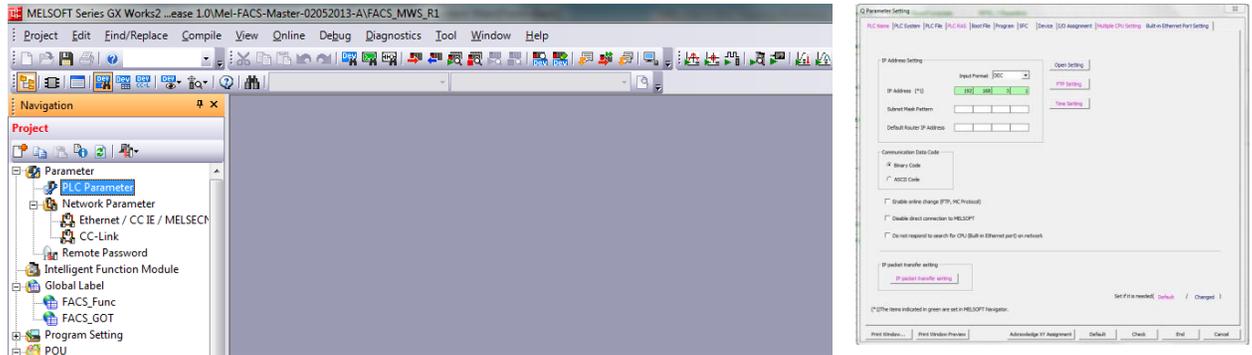


Figure 5.3 PLC Built-in Ethernet

Click the 'Open Settings' button.

This table shows the configured socket communications and port numbers used. The eFlex Server uses ports 2049 for sending and receiving data.

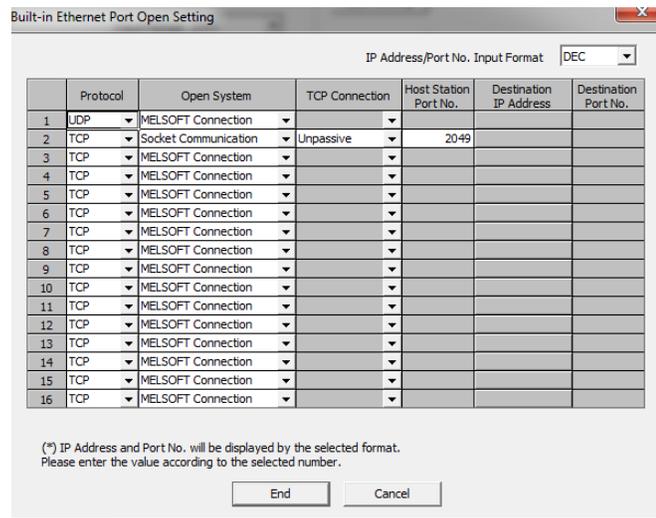
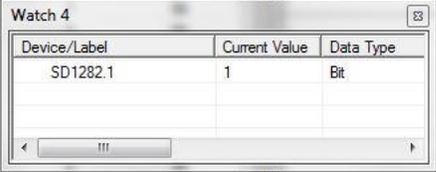


Figure 5.4 Open Setting of Built-in Ethernet Port

The next step is to monitor the communication status with the eFlex Server.

To do this, open a 'Watch' window in the PLC to monitor SD1282.1. If the eFlex Server has an open socket with the PLC, SD1282.1 will be 'TRUE.'

## Notes

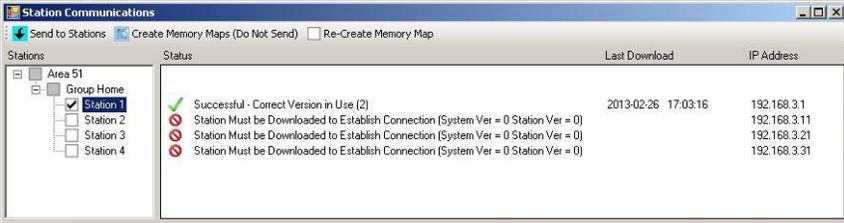


Device/Label	Current Value	Data Type
SD1282.1	1	Bit

Figure 5.5 Channel Status

## 5.6. Send Configuration from eFlex Server to PLC

To send the Configuration to PLC,, select 'PLC' on the eFlex menu to get to the following 'Station Communications' screen. (Memory map needs to be recreated after makes any changes.)



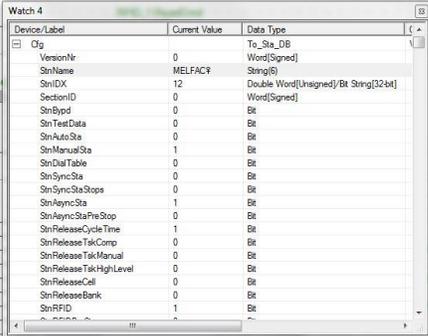
Stations	Status	Last Download	IP Address
Area 51			
Group Home			
Station 1	Successful - Correct Version in Use (2)	2013-02-26 17:03:16	192.168.3.1
Station 2	Station Must be Downloaded to Establish Connection (System Ver = 0 Station Ver = 0)		192.168.3.11
Station 3	Station Must be Downloaded to Establish Connection (System Ver = 0 Station Ver = 0)		192.168.3.21
Station 4	Station Must be Downloaded to Establish Connection (System Ver = 0 Station Ver = 0)		192.168.3.31

Figure 5.6 Download Configuration to PLC

## 5.7. Open a 'Watch' Window to Monitor 'Cfg' Data

From the 'View' menu in GX Works, select 'Docking Window' and 'Watch 1' to open up a window where you can monitor the state of PLC memory. With the 'Watch' window open, type "Cfg" in the first line. Right-click in the window and select 'Start Watch'

Since this is a structured data type, there will be a "+" sign in front of it. Click the "+" sign to expand the array. If the eFlex Server sent a new configuration to the PLC, you will see data in this structure.



Device/Label	Current Value	Data Type
+		
Cfg		
VersionNr	0	Word[Signed]
StrName	MELFAC#	String(6)
StrIDX	12	Double Word[Unsigned]/Bit String[32-bit]
SectionID	0	Word[Signed]
StrByOpd	0	Bit
StrTestData	0	Bit
StrAutoSta	0	Bit
StrManualSta	1	Bit
StrDialTable	0	Bit
StrSyncSta	0	Bit
StrSyncStaStops	0	Bit
StrAsyncSta	1	Bit
StrAsyncStaPieStop	0	Bit
StrReleaseCycleTime	1	Bit
StrReleaseTakComp	0	Bit
StrReleaseTakManual	0	Bit
StrReleaseTakHighLevel	0	Bit
StrReleaseCall	0	Bit
StrReleaseBank	0	Bit
StrRFID	1	Bit

Figure 5.7 Watch Window for 'Cfg' SDT

## LESSON 6 Prerequisites

This lesson discusses how prerequisite tasks work in MEL-FACS.

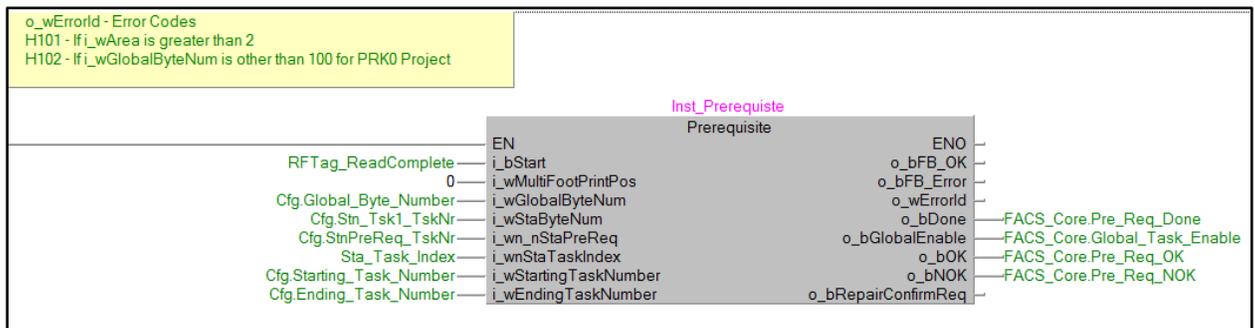
### 6.1. Lesson Objectives

At the conclusion of this lesson, you will be able to...

- Understand how prerequisites work

### 6.2. Prerequisites

#### 6.2.1. FB



#### 6.2.2. Station Level

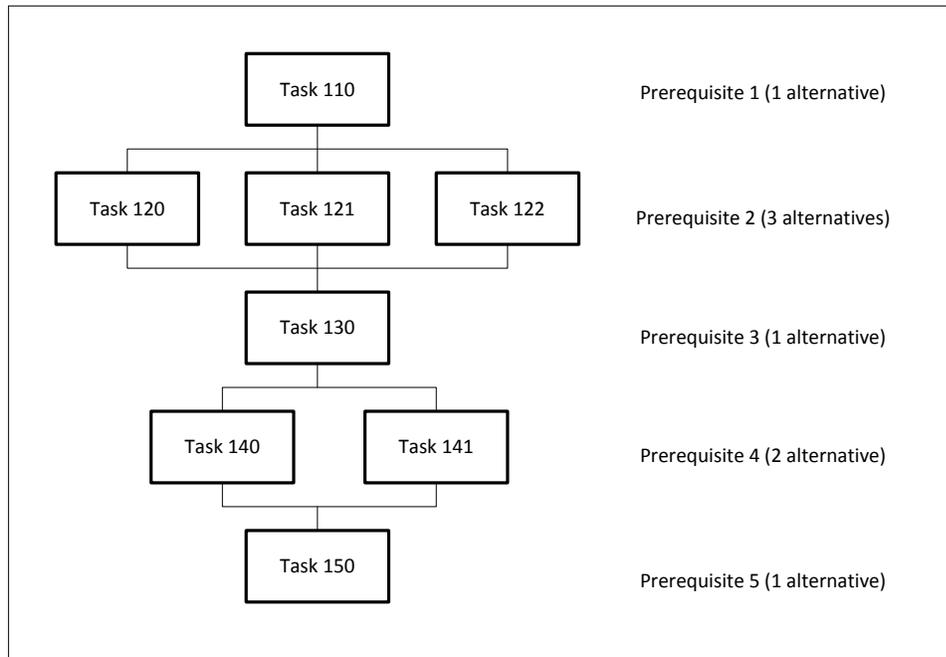
The MEL-FACS software library provides a configurable assembly station prerequisite functionality. Station prerequisites are defined as tasks which have to be completed with an “accepted” status.

Up to 10 prerequisite conditions can be defined per station. Each prerequisite condition can consist of up to 10 alternative tasks, of which, at least one has to be completed with an “accepted” status in order to meet the prerequisite condition.

This prerequisite ‘matrix’ in the PLC has up to ten rows of a possible ten parallel tasks per row. The way it works is that only one of the tasks defined in a row must be completed successfully to move on. The logic looks for the first ‘0’ value in the row to determine that there are no more tasks to look for. As it moves down through the rows, once a ‘0’ value is seen in the first position, it determines that there are no more rows to solve, meaning there are no more prerequisite conditions to look for, and therefore the prerequisite conditions have been met.

Conversely, if none of the alternate tasks defined in a row have been successfully completed, the logic determines immediately that the prerequisites for that station have not been met, and the tasks for that station will not be enabled.

## Notes



**Figure 6.1 Sample of Prerequisite Configuration**

- The above figure shows a station prerequisite configuration that defines five prerequisite conditions (prerequisite 1 ... prerequisite 5).
- The prerequisite condition 2 and 4 consist of multiple alternatives.
- The station prerequisite is fulfilled if all prerequisite conditions are met.

### 6.2.3. Global

Byte 100 of RFID is pre-assigned for Global status. Global status needs to be in an “accepted” status to satisfy the prerequisite.

## 6.3. Exercise

### 6.3.1. Procedure

1. eFlex sends configuration to station. (Pre-prerequisite = Task #275, Load Station)
2. Press “PALLET AT PRESTOP” and then “RELEASE PALLET AT PRESTOP” to simulate pallet in station.
3. Enter status code
  - Enter 251 to the window of “Global\_Status” **AND** “Pre\_Req\_Task”
  - Or enter 0 to the window of “Global\_Status” **OR** “Pre\_Req\_Task”
4. Press “Read RFID (SIM)” to simulate RFID read complete.
5. Press “Enable Tasks” to start the tasks.
6. Monitor PLC bits – FACS\_Core.Pre\_Req\_OK and FACS\_Core.Pre\_Req\_NOK

## Notes

## LESSON 7 Model Management

This lesson discusses model management and model look up function.

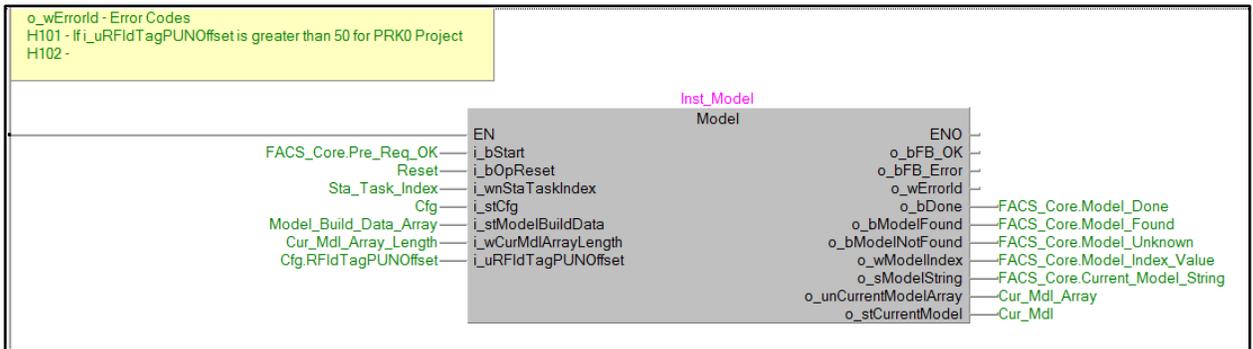
### 7.1. Lesson Objectives

At the conclusion of this lesson, you will be able to...

- Understand how model management works
- Understand Model Index and Current Model configuration

### 7.2. Model Management

#### 7.2.1. FB



#### 7.2.2. Data Flow

MEL-FACS software library supports configurable build data for up to 200 different models. The following graphic shows the basic build data concept.

The model specific identification code is extracted from the work piece identification code (RFID Model ID). The extracted model code is searched in the build data lookup table (200 Suffix Codes in Cfg.). When a match is found, the model information will be copied to Global Label (Cur\_Mdl).

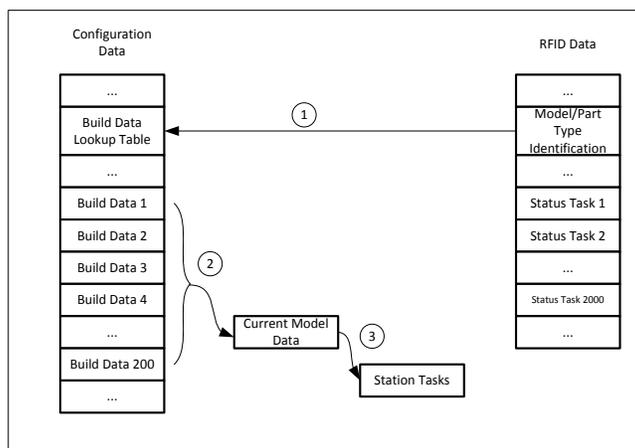


Figure 7.1 Data Flow of Model Management

## Notes

### 7.3. Exercise

#### 7.3.1. Procedure

1. eFlex sends configuration to station. (Same Configuration as previous exercise)
2. Press "PALLET AT PRESTOP" and then "RELEASE PALLET AT PRESTOP" to simulate pallet in station.
3. Enter status code
4. Enter 251 to the window of "Global\_Status" **AND** "Pre\_Req\_Task"
5. Type the model code in "Enter Model Code to Simulate" area.
  - Type a Model code that matches the code defined in eFlex
  - Or type a Model code that does not match any code defined in eFlex
6. Press "Read RFID (SIM)" to simulate RFID read complete.
7. Press "Enable Tasks" to start the tasks.
8. Monitor PLC
  - 'FACS\_Core.Model\_Found' and 'FACS\_Core.Model\_Unknown.'
  - 'FACS\_Core.Model\_Index\_Value' when Model code matches one of the Suffix Code defined in eFlex.

## LESSON 8 Control without user interface logic (Error Proofing Task)

This lesson discusses how to complete "Error Proofing" task.

### 8.1. Lesson Objectives

At the conclusion of this lesson, you will be able to...

- Understand where to find the configuration information for Error Proofing task
- Understand eHMI screens for Error Proofing task
- Understand trigger options (check continuous, I/O, delay timer)
- Understand how to complete tasks for Error Proofing

### 8.2. How Error Proofing Works



### 8.3. Exercise

#### 8.3.1. Procedure

1. eFlex sends configuration to station. (Same Configuration as previous exercise)
2. Press "PALLET AT PRESTOP" and then "RELEASE PALLET AT PRESTOP" to simulate pallet in station.
3. Enter 251 to the window of "Global\_Status" **AND** "Pre\_Req\_Task"
4. Type mode code in "Enter Model Code to Simulate" area. (Model code will be "AAAAAAAAAAAA" for this exercise.)
5. Press "Read RFID (SIM)" to simulate RFID read complete.
6. Press "Enable Tasks" to start the tasks.
7. Monitor PLC watch window for Configuration – Task Number, etc. (Global Label - Cfg)

## Notes

8. Monitor PLC watch window for Model related settings – ErrPrf\_Tsk\_Enbd, ErrPrf\_OnMsk and ErrPrf\_OffMsk. (Global Label – Cur\_Mdl)
9. Monitor watch window to see Task status. (Global Label – Sta\_Task\_Index)
10. Go to eHMI “Error Proofing” screen to monitor the configuration which is downloaded from eFlex.
11. Use either GOT or PLC watch window to simulate the sensor ON/OFF to complete the tasks that are assigned to the station.
12. Monitor watch window to see Task status again. (Global Label – Sta\_Task\_Index)
13. Monitor watch window to see Station task status. (Global Label – Sta\_Task\_Index)
14. Monitor RFID tag data. (Global Label – Sta\_RF\_Tag\_Data)
15. Configure Error-Proofing tasks for Dual GOT stations and Multi-Foot Print stations and repeat above mentioned procedures.

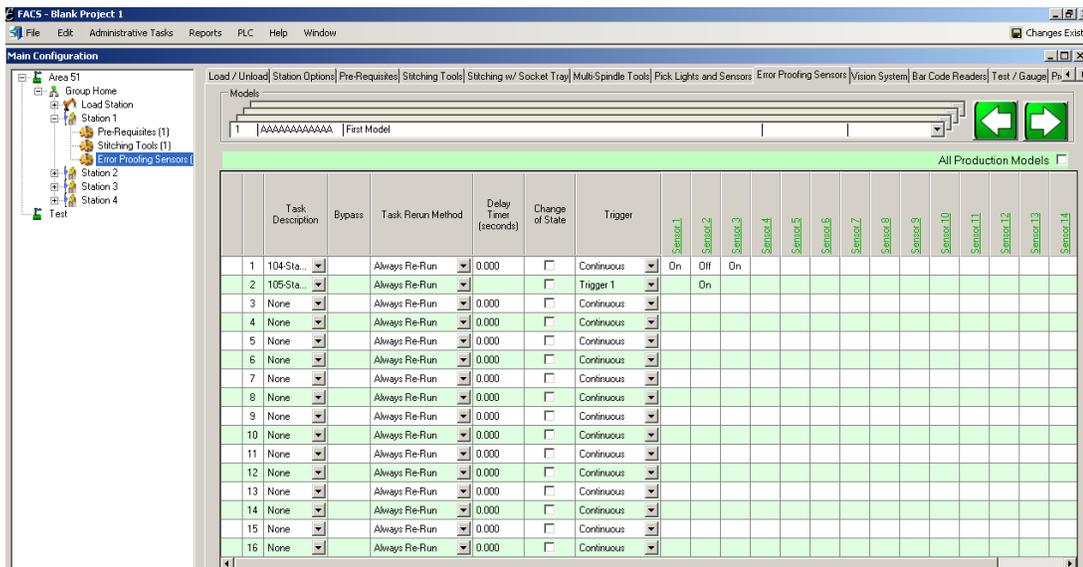
**8.3.2. List of Task Number and Current Model Information**

	Number	Sensor 1	Sensor 2	Sensor 3	Sensor 4..16	Mode
Task #1	102*	On	Off	On		Continuous
Task #2	103*		On			Trigger 1

\* Note: Task number will vary based on the training station.

**8.3.3. Example eFlex, PLC and GOT Screens for Error Proofing**

The eFlex Error Proofing configuration screen is shown below.



**Figure 8.1 Example eFlex Screen – Error Proofing Tasks**

**Notes**

The eHMI Error Proofing screen is shown below.

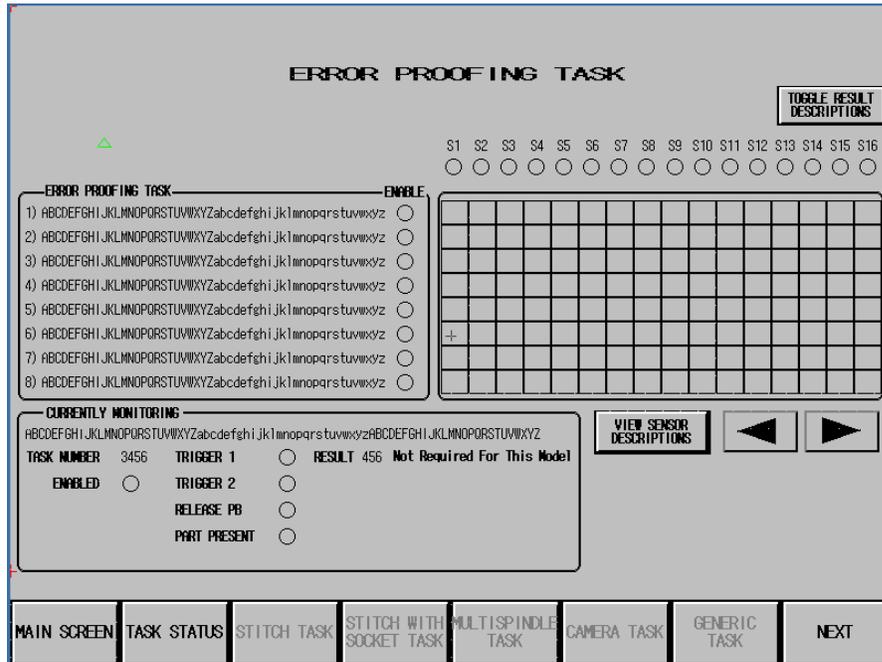
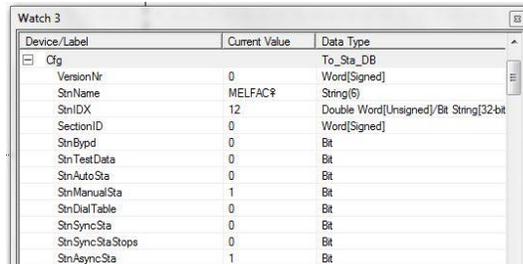


Figure 8.2 Example eHMI Screen

Open a 'Watch' window in the PLC and type 'Cfg.' Make sure to 'Start Watch.' Once active, click the '+' sign in front of 'Cfg' to expand the structure.



(continued)

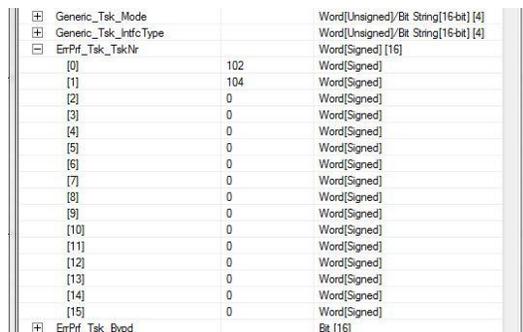
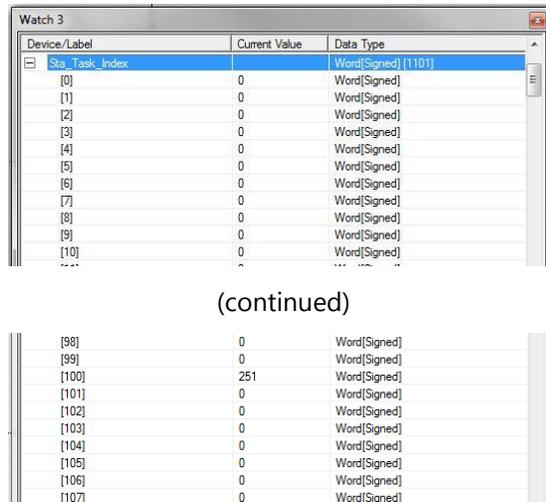


Figure 8.3 Example of Cfg

Notes

Scroll down to 'ErrPrf\_TskNr,' and click the '+' sign to expand and show the sixteen error proofing tasks.

Next, type 'Sta\_Task\_Index' on the next blank line in the PLC 'Watch' window. Click the '+' sign to expand and show the task statuses for all 2,000 tasks.



The screenshot shows a 'Watch 3' window with a table of task statuses. The table has three columns: 'Device/Label', 'Current Value', and 'Data Type'. The first row is expanded to show indices from [0] to [10]. The value for [100] is 251, while others are 0. The data type for all is 'Word(Signed) [1101]'. Below the screenshot, the text '(continued)' is centered, followed by a continuation of the table showing indices from [98] to [107].

Device/Label	Current Value	Data Type
[0]	0	Word(Signed) [1101]
[1]	0	Word(Signed)
[2]	0	Word(Signed)
[3]	0	Word(Signed)
[4]	0	Word(Signed)
[5]	0	Word(Signed)
[6]	0	Word(Signed)
[7]	0	Word(Signed)
[8]	0	Word(Signed)
[9]	0	Word(Signed)
[10]	0	Word(Signed)
...	...	...
[98]	0	Word(Signed)
[99]	0	Word(Signed)
[100]	251	Word(Signed)
[101]	0	Word(Signed)
[102]	0	Word(Signed)
[103]	0	Word(Signed)
[104]	0	Word(Signed)
[105]	0	Word(Signed)
[106]	0	Word(Signed)
[107]	0	Word(Signed)

Figure 8.4 Example of Task Status

Use either GOT or PLC Watch window to simulate the sensors ON/Off. For task #1, after sensors status matches to the configured pattern, the task will be completed immediately. For task #2, Trigger #1 condition also needs to be set after the sensors status matches the configured pattern.

---

**Notes**

## LESSON 9 Control without user interface logic (Pick Sensor Task)

This lesson discusses how to complete "Pick Sensor" task.

### 9.1. Lesson Objectives

At the conclusion of this lesson, you will be able to...

- Understand where to find the configuration information for Pick Sensor task
- Understand eHMI screens for Pick Sensor task
- Understand Look Up and Model pick options
- Understand how to complete tasks for Pick Sensor

### 9.2. How Pick Sensor FB Works



### 9.3. Exercise

#### 9.3.1. Procedure

1. eFlex sends configuration to station. (Same Configuration as previous exercise)
2. Press "PALLET AT PRESTOP" and then "RELEASE PALLET AT PRESTOP" to simulate pallet in station.
3. Enter 251 to the window of "Global\_Status" **AND** "Pre\_Req\_Task"
4. Type mode code in "Enter Model Code to Simulate" area. (Model code will be "AAAAAAAAAAAA" for this exercise.)
5. Press "Read RFID (SIM)" to simulate RFID read complete.
6. Press "Enable Tasks" to start the tasks.
7. Monitor PLC watch window for Configuration – Task Number, etc. (Global Label - Cfg)

## Notes

8. Monitor PLC watch window for Model related settings – PckSnsr\_Tsk\_Enbd and PckLts\_Enbd. (Global Label – Cur\_Mdl)
9. Monitor watch window to see Task status. (Global Label – Sta\_Task\_Index)
10. Go to eHMI “Pick Sensor Task” screen to monitor the configuration which is downloaded from eFlex.
11. Use either GOT or PLC watch window to simulate the sensor ON/OFF to complete the tasks that are assigned to the station.
12. Monitor watch window to see Task status again. (Global Label – Sta\_Task\_Index)
13. Monitor watch window to see Station task status. (Global Label – Sta\_Task\_Index)
14. Monitor RFID tag data. (Global Label – Sta\_RF\_Tag\_Data)
15. Configure Pick Sensor tasks for Dual GOT stations and Multi-Foot Print stations and repeat above mentioned procedures.

**9.3.2. List of Task Number and Current Model Information**

	Number	Mode
Task #1	104*	Look Up
Task #2	105*	Look Up
Task #3	106*	Model
Task #4	107*	Model

\* Note: Task number will vary based on the training station.

**9.3.3. Example eFlex, PLC and GOT Screens for Pick Sensor FB**

The eFlex Pick Sensor configuration screen is shown below.

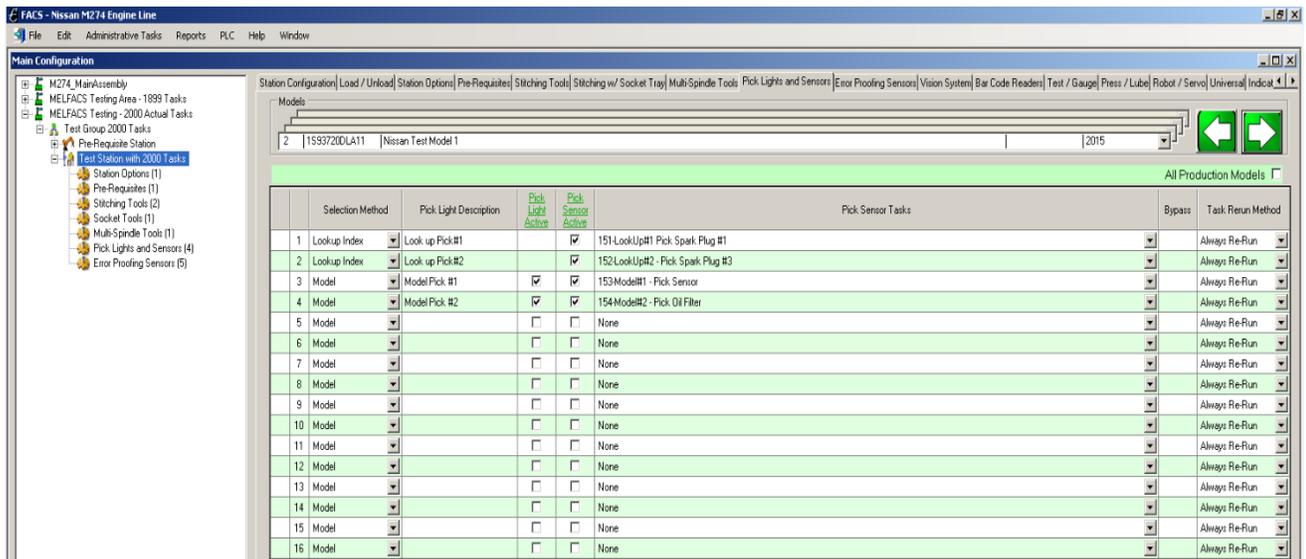


Figure 9.1 Example eFlex Screen – Pick Sensor Tasks

**Notes**

The eHMI Pick Sensor screen is shown below.

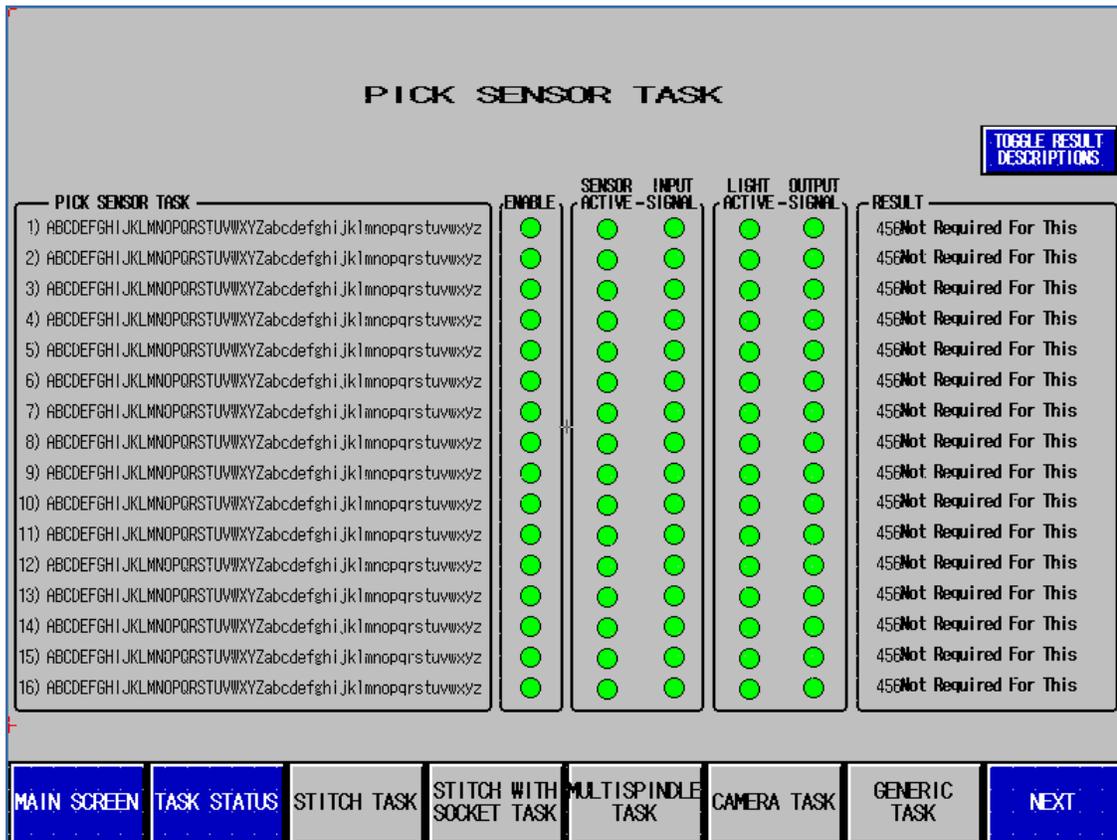
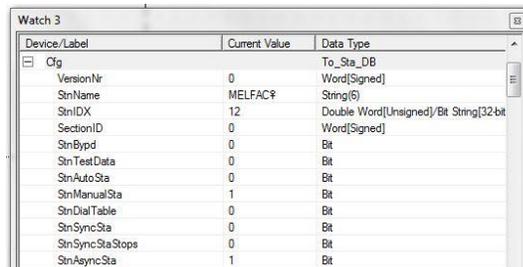


Figure 9.2 Example eHMI Screen

Open a 'Watch' window in the PLC and type 'Cfg.' Make sure to 'Start Watch.' Once active, click the '+' sign in front of 'Cfg' to expand the structure.



(continued)

Notes

Device/Label	Current Value	Data Type
PickSensor_Tsk_TskNr		Word(Signed) [16]
[0]	--	Word(Signed)
[1]	--	Word(Signed)
[2]	--	Word(Signed)
[3]	--	Word(Signed)
[4]	--	Word(Signed)
[5]	--	Word(Signed)
[6]	--	Word(Signed)
[7]	--	Word(Signed)
[8]	--	Word(Signed)
[9]	--	Word(Signed)
[10]	--	Word(Signed)
[11]	--	Word(Signed)
[12]	--	Word(Signed)
[13]	--	Word(Signed)
[14]	--	Word(Signed)
[15]	--	Word(Signed)

Figure 9.3 Example of Cfg

Scroll down to 'PickSensor\_Tsk\_\_TskNr,' and click the '+' sign to expand and show the sixteen Pick sensor tasks.

Next, type 'Sta\_Task\_Index' on the next blank line in the PLC 'Watch' window. Click the '+' sign to expand and show the task statuses for all 2,000 tasks.

Device/Label	Current Value	Data Type
Sta_Task_Index		Word(Signed) [1101]
[0]	0	Word(Signed)
[1]	0	Word(Signed)
[2]	0	Word(Signed)
[3]	0	Word(Signed)
[4]	0	Word(Signed)
[5]	0	Word(Signed)
[6]	0	Word(Signed)
[7]	0	Word(Signed)
[8]	0	Word(Signed)
[9]	0	Word(Signed)
[10]	0	Word(Signed)

(continued)

[98]	0	Word(Signed)
[99]	0	Word(Signed)
[100]	251	Word(Signed)
[101]	0	Word(Signed)
[102]	0	Word(Signed)
[103]	0	Word(Signed)
[104]	0	Word(Signed)
[105]	0	Word(Signed)
[106]	0	Word(Signed)
[107]	0	Word(Signed)

Figure 9.4 Example of Task Status

Use either GOT Simulation screen or PLC Watch window to simulate the sensors ON/Off. For task #1, enter number in PickLight>Loading\_Num for Look Up task, then after sensors status matches to the configured pattern, the task will be complete immediately.

Notes

**9.3.4. Pick Types – Look Up vs Model**

There are two types of Picking from the Pick Bins. The input pin to the FB i\_wnMode is configured from the FACS software which type of pick is used.

i\_wnMode = 0 Model Pick

i\_wnMode = 1 Look Up Pick

**Model Pick:** This is applied when one component is picked from a bin only once during the part cycle. Good example for the Model Pick is different types of Oil Filters are picked from different bins for different models of engine. Only one type of Oil Filter is picked from its bin for each model of the engine. The bin selection data is configured from eFACS software.

**Look Up Pick:** This is applied when components are picked from the same bin more than once during the part cycle. Good example for Look Up Pick is picking the Main Bearing shells from the bin where there are chances of picking same Bearing type more than once for the engine. The data to know from which bin to be picked is populated in input pin to the FB i\_wnLoadingNum. The data is populated from the OEM/customer logic.

The screen shot for the Pick Sensor Task on FACS Configuration software looks as below

	Selection Method	Pick Light Description	Pick Light Active	Pick Sensor Active	
1	Lookup Index	Look up Pick#1		<input checked="" type="checkbox"/>	151-LookUp#1 Pick Spark Plug #1
2	Lookup Index	Look up Pick#2		<input checked="" type="checkbox"/>	152-LookUp#2 - Pick Spark Plug #3
3	Model	Model Pick #1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	153-Model#1 - Pick Sensor
4	Model	Model Pick #2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	154-Model#2 - Pick Oil Filter
5	Model		<input type="checkbox"/>	<input type="checkbox"/>	None
6	Model		<input type="checkbox"/>	<input type="checkbox"/>	None
7	Model		<input type="checkbox"/>	<input type="checkbox"/>	None
8	Model		<input type="checkbox"/>	<input type="checkbox"/>	None
9	Model		<input type="checkbox"/>	<input type="checkbox"/>	None
10	Model		<input type="checkbox"/>	<input type="checkbox"/>	None
11	Model		<input type="checkbox"/>	<input type="checkbox"/>	None
12	Model		<input type="checkbox"/>	<input type="checkbox"/>	None
13	Model		<input type="checkbox"/>	<input type="checkbox"/>	None
14	Model		<input type="checkbox"/>	<input type="checkbox"/>	None
15	Model		<input type="checkbox"/>	<input type="checkbox"/>	None
16	Model		<input type="checkbox"/>	<input type="checkbox"/>	None

**Notes**

## LESSON 10 Control with user interface logic (Stitching Tool Operation Task)

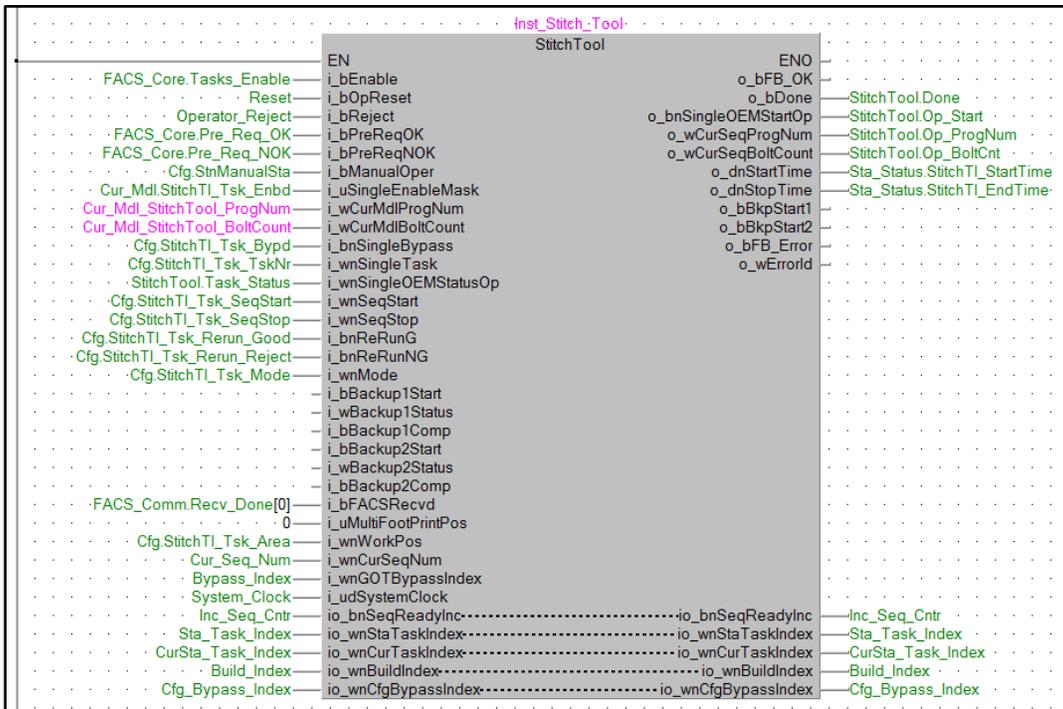
This lesson discusses how to complete “Stitching Tool” task.

### 10.1. Lesson Objectives

At the conclusion of this lesson, you will be able to...

- Understand where to find the configuration information for Stitching Tool tasks
- Understand eHMI screens for Stitching Tool tasks
- Understand how to complete tasks for Stitching Tool

### 10.2. How Stitching Tool Tasks Work



### 10.3. Exercise

#### 10.3.1. Procedure

1. eFlex sends configuration to station. (Same Configuration as previous exercise)
2. Press “PALLET AT PRESTOP” and then “RELEASE PALLET AT PRESTOP” to simulate pallet in station.
3. Enter 251 to the window of “Global\_Status” **AND** “Pre\_Req\_Task”  
16. Type the model code in “Enter Model Code to Simulate” area. (Model code will be “AAAAAAAAAAAA” for this exercise.)
4. Press “Read RFID (SIM)” to simulate RFID read complete.
5. Press “Enable Tasks” to start the tasks.

## Notes

6. Monitor PLC watch window for Configuration – Task Number, etc. (Global Label - Cfg)
7. Monitor PLC watch window for Model related settings – Enable, Program number and Bolt count, etc. (Global Label – Cur\_Mdl)
8. Monitor watch window to see Task status. (Global Label – Sta\_Task\_Index)
9. Go to eHMI “Stitching Tool” screen to monitor the configuration which is downloaded from eFlex.
10. Use either GOT or PLC watch window by entering the Task Status Code (See Appendix –1) to “StitchTool.Task\_Status” to complete the tasks that are assigned to the station.
11. Monitor watch window to see Task status again. (Global Label – Sta\_Task\_Index)
12. Monitor watch window to see Station task status. (Global Label – Sta\_Task\_Index)
13. Monitor RFID tag data. (Global Label – Sta\_RF\_Tag\_Data)
14. Configure Stitch Tool tasks for Dual GOT stations and Multi-Foot Print stations and repeat above mentioned procedures.

**10.3.2. List of Task Number and Current Model Information**

	Number	Program #	Bolt Count
Task #1	108*	1	2

\* Note: Task number will vary based on the training station.

**10.3.3. Example eFlex, PLC and GOT screens for Stitching Tool**

The eFlex Stitching Tool configuration screen is shown below.

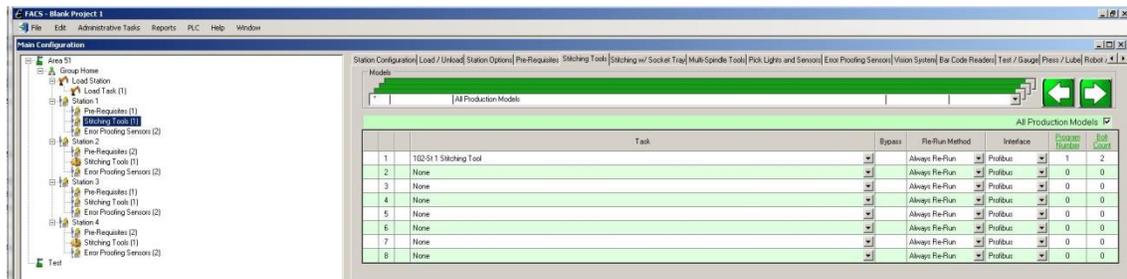


Figure 10.1 Example eFlex Screen

**Notes**

The eHMI Stitching Tool screen is shown below.

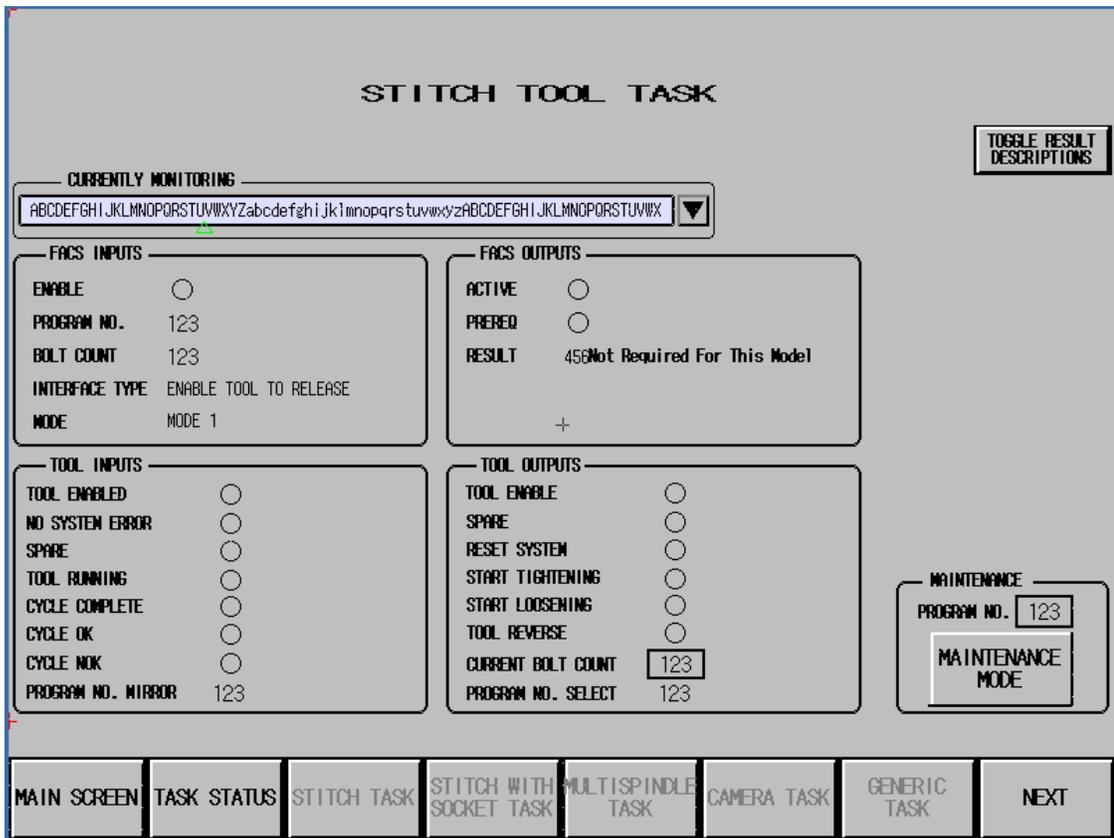
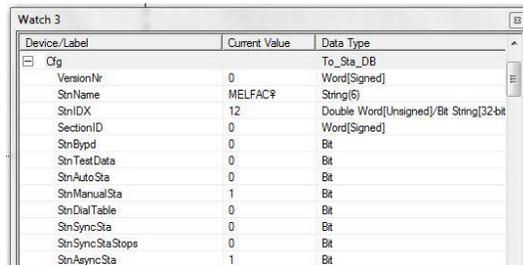


Figure 10.2 Example eHMI Screen

Open a 'Watch' window in the PLC and type 'Cfg.' Make sure to 'Start Watch.' Once active, click the '+' sign in front of 'Cfg' to expand the structure.



(continued)

Notes

Unload_Tsk1_Mode	0	Word[Signed]
StitchTI_Tsk_TskNr		Word[Signed] [8]
[0]	200	Word[Signed]
[1]	201	Word[Signed]
[2]	202	Word[Signed]
[3]	0	Word[Signed]
[4]	0	Word[Signed]
[5]	0	Word[Signed]
[6]	0	Word[Signed]
[7]	0	Word[Signed]
StitchTI_Tsk_Bypd		Bit [8]
StitchTI_Tsk_Rerun_Reject		Bit [8]
StitchTI_Tsk_Rerun_Good		Bit [8]
StitchTI_Tsk_Batch		Bit [8]
StitchTI_Tsk_SeqStart		Word[Signed] [8]
StitchTI_Tsk_SeqStop		Word[Signed] [8]
StitchTI_Tsk_Area		Word[Signed] [8]
StitchTI_Tsk_Mode		Word[Signed] [8]
StitchTI_Tsk_IntfcType		Word[Signed] [8]
Stl_Bkp_Tsk1_Msp1_TaskNrSta	0	Word[Signed]

Figure 10.3 Example of Cfg

Scroll down to 'StitchTI\_Tsk\_TskNr,' and click the '+' sign to expand and show the eight stitching Tool tasks.

Next, type 'Sta\_Task\_Index' on the next blank line in the PLC 'Watch' window. Click the '+' sign to expand and show the task statuses for all 2,000 tasks.

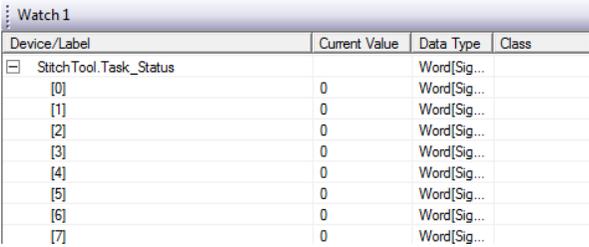
Device/Label	Current Value	Data Type
Sta_Task_Index		Word[Signed] [1101]
[0]	0	Word[Signed]
[1]	0	Word[Signed]
[2]	0	Word[Signed]
[3]	0	Word[Signed]
[4]	0	Word[Signed]
[5]	0	Word[Signed]
[6]	0	Word[Signed]
[7]	0	Word[Signed]
[8]	0	Word[Signed]
[9]	0	Word[Signed]
[10]	0	Word[Signed]

(continued)

[98]	0	Word[Signed]
[99]	0	Word[Signed]
[100]	251	Word[Signed]
[101]	0	Word[Signed]
[102]	0	Word[Signed]
[103]	0	Word[Signed]
[104]	0	Word[Signed]
[105]	0	Word[Signed]
[106]	0	Word[Signed]
[107]	0	Word[Signed]

Figure 10.4 Example of Task Status

In order to complete the Stitching Tool tasks, the Task Status Code needs to be placed in "StitchTool.Task\_Status[0...7]". Use either GOT or PLC Watch window to complete the tasks.



Watch 1			
Device/Label	Current Value	Data Type	Class
[-] StitchTool.Task_Status		Word[Sig...	
[0]	0	Word[Sig...	
[1]	0	Word[Sig...	
[2]	0	Word[Sig...	
[3]	0	Word[Sig...	
[4]	0	Word[Sig...	
[5]	0	Word[Sig...	
[6]	0	Word[Sig...	
[7]	0	Word[Sig...	

Figure 10.5 Task Status from OEM Logic

## LESSON 11 Control with user interface logic (Multi-Spindle Task - subtasks)

This lesson discusses how to complete Multi-Spindle Master and Sub tasks.

### 11.1. Lesson Objectives

At the conclusion of this lesson, you will be able to...

- Understand where to find the configuration information for Multi-Spindle Master and Sub Tasks
- Understand eHMI screens for Multi-Spindle Master and Sub tasks
- Understand how to complete Master task for Multi-Spindle
- Understand how to complete Sub tasks for Multi-Spindle

### 11.2. How Multi-Spindle Tool Tasks Work



### 11.3. Exercise

#### 11.3.1. Procedure

1. eFlex sends configuration to station. (Same Configuration as previous exercise)
2. Press "PALLET AT PRESTOP" and then "RELEASE PALLET AT PRESTOP" to simulate pallet in station.
3. Enter 251 to the window of "Global\_Status" **AND** "Pre\_Req\_Task"

## Notes

4. Type the model code in "Enter Model Code to Simulate" area. (Model code will be "AAAAAAAAAAAA" for this exercise.)
5. Press "Read RFID (SIM)" to simulate RFID read complete.
6. Press "Enable Tasks" to start the tasks.
7. Monitor PLC watch window for Configuration – Task Number, etc. (Global Label - Cfg)
8. Monitor PLC watch window for Model related settings – Enable, Program number, etc. (Global Label – Cur\_Mdl)
9. Monitor watch window to see Task status. (Global Label – Sta\_Task\_Index)
10. Go to eHMI "MultiSpindle" screen to monitor the configuration which is downloaded from eFlex.
11. Use either GOT or PLC watch window by entering the Task Status Code (See Appendix –1) to complete the tasks that are assigned to the station.
12. Monitor watch window to see Task status again. (Global Label – Sta\_Task\_Index)
13. Monitor watch window to see Station task status. (Global Label – Sta\_Task\_Index)
14. Monitor RFID tag data. (Global Label – Sta\_RF\_Tag\_Data)
15. Configure Multi-Spindle tasks for Dual GOT stations and Multi-Foot Print stations and repeat above mentioned procedures.

**11.3.2. List of Task Number and Current Model Information**

	Number	Program #	Parameter
Master Task #	109*	3	5
Sub Tasks #	110-141*		

\* Note: Task number will vary based on the training station.

**11.3.3. Example eFlex, PLC and GOT screens for Multi-Spindle**

The eFlex Multi-Spindle configuration screen is shown below.

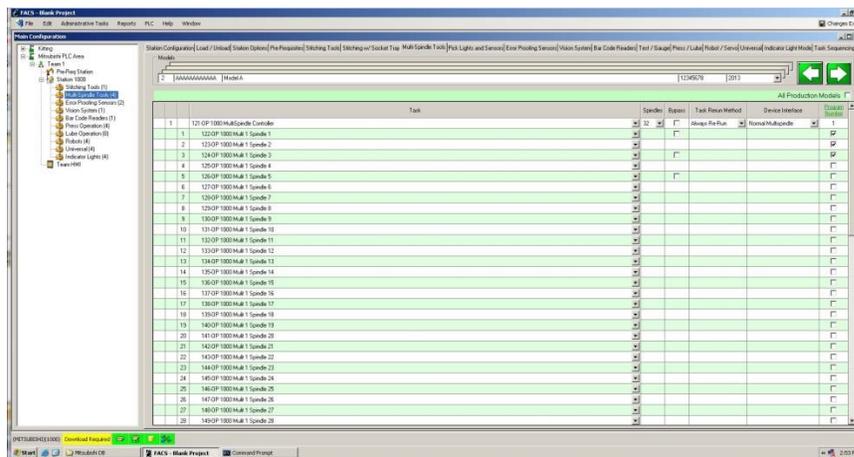


Figure 11.1 Example eFlex Screen

**Notes**

The eHMI Multi-Spindle screen is shown below.

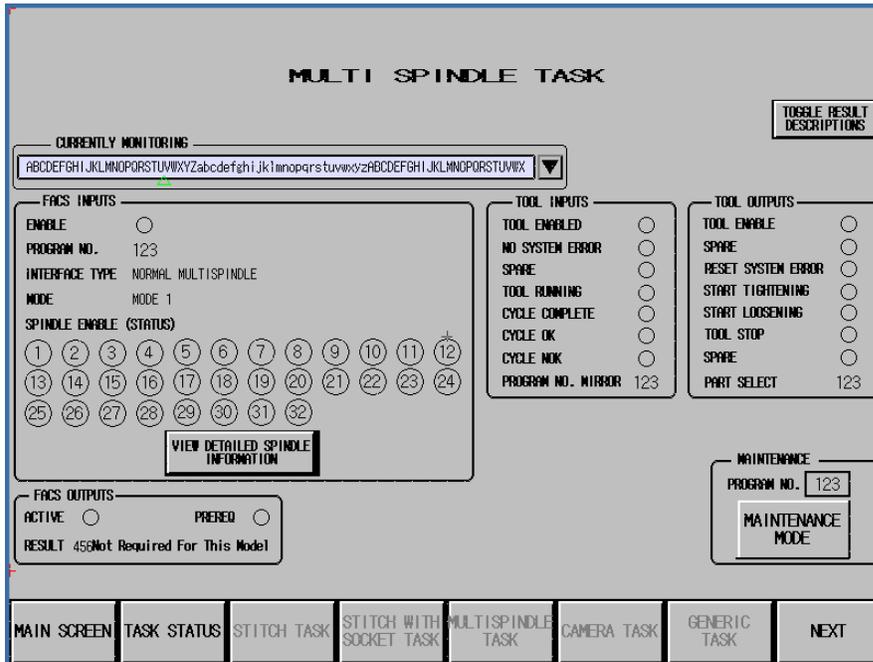


Figure 11.2 Example eHMI Screen -1

The following screen shows the spindle detail information.

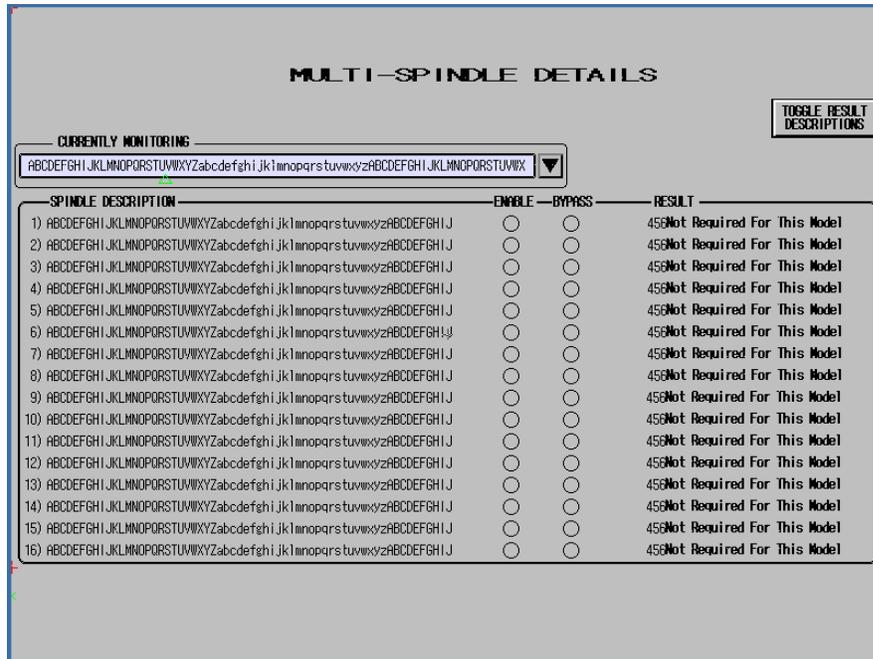


Figure 11.3 Example eHMI Screen -2

Notes

Open a 'Watch' window in the PLC and type 'Cfg.' Make sure to 'Start Watch.' Once active, click the '+' sign in front of 'Cfg' to expand the structure.

Device/Label	Current Value	Data Type
Cfg		To_Sta_DB
VersionNr	0	Word[Signed]
StnName	MELFAC?	String(6)
StnDX	12	Double Word[Unsigned]/Bit String[32-bit]
SectionID	0	Word[Signed]
StnBypd	0	Bit
StnTestData	0	Bit
StnAutoSta	0	Bit
StnManualSta	1	Bit
StnDraTable	0	Bit
StnSyncSta	0	Bit
StnSyncStaStops	0	Bit
StnAsyncSta	1	Bit

(continued)

Skt 1_1sk8_Sub_SeqStop		Word[Signed] [8]
MultiSp_Tsk1_TskNr	121	Word[Signed]
MultiSp_Tsk1_Bypd	0	Bit
MultiSp_Tsk1_Rerun_Good	1	Bit
MultiSp_Tsk1_Rerun_Reject	1	Bit
MultiSp_Tsk1_InstaBkp	0	Bit
MultiSp_Tsk1_SeqStart	2	Word[Signed]
MultiSp_Tsk1_SeqStop	2	Word[Signed]
MultiSp_Tsk1_Area	0	Word[Signed]
MultiSp_Tsk1_Mode	0	Word[Signed]
MultiSp_Tsk1_IntfcType	0	Word[Signed]
MultiSp_Tsk1_TskNrSp		Word[Signed] [32]
[0]	122	Word[Signed]
[1]	123	Word[Signed]
[2]	124	Word[Signed]
[3]	125	Word[Signed]
[4]	126	Word[Signed]
[5]	127	Word[Signed]
[6]	128	Word[Signed]
[7]	129	Word[Signed]
[8]	130	Word[Signed]
[9]	131	Word[Signed]
[10]	132	Word[Signed]
[11]	133	Word[Signed]
[12]	134	Word[Signed]
[13]	135	Word[Signed]
[14]	136	Word[Signed]
[15]	137	Word[Signed]
[16]	138	Word[Signed]
[17]	139	Word[Signed]
[18]	140	Word[Signed]
[19]	141	Word[Signed]
[20]	142	Word[Signed]
[21]	143	Word[Signed]
[22]	144	Word[Signed]
[23]	145	Word[Signed]
[24]	146	Word[Signed]
[25]	147	Word[Signed]
[26]	148	Word[Signed]
[27]	149	Word[Signed]
[28]	150	Word[Signed]
[29]	151	Word[Signed]
[30]	152	Word[Signed]
[31]	153	Word[Signed]
MultiSp_Tsk1_Bypd_SP	0	Double Word[Uns]
MultiSp_Tsk1_TskNr	121	Word[Signed]

Figure 11.4 Example of Cfg

Scroll down to 'MultiSp\_Tsk1\_TskNr' to see the task number for the configured multi-spindle task. (There may be up to four total.) Then scroll further down into the first Multi-Spindle task information to 'MultiSp\_Tsk1\_TskNrSp' and click the '+' sign to expand and show the 32 possible individual spindle subtasks.

Notes

Next, type 'Sta\_Task\_Index' on the next blank line in the PLC 'Watch' window. Click the '+' sign to expand and show the task statuses for all 2,000 tasks.

Device/Label	Current Value	Data Type
Sta_Task_Index		Word[Signed] [1101]
[0]	0	Word[Signed]
[1]	0	Word[Signed]
[2]	0	Word[Signed]
[3]	0	Word[Signed]
[4]	0	Word[Signed]
[5]	0	Word[Signed]
[6]	0	Word[Signed]
[7]	0	Word[Signed]
[8]	0	Word[Signed]
[9]	0	Word[Signed]
[10]	0	Word[Signed]

(continued)

[98]	0	Word[Signed]
[99]	0	Word[Signed]
[100]	251	Word[Signed]
[101]	0	Word[Signed]
[102]	0	Word[Signed]
[103]	0	Word[Signed]
[104]	0	Word[Signed]
[105]	0	Word[Signed]
[106]	0	Word[Signed]
[107]	0	Word[Signed]

Figure 11.5 Example of Task Status

In order to complete the Multi-Spindle Sub tasks, the Task Status Code needs to be placed in "Spindle.MSP1\_Task\_Status[0...31]". Use either GOT or PLC Watch window to complete tasks.

Device/Label	Current Value	Data Type	Class
Spindle.MSP1_Task_Status		Word[Un...	
[0]	0	Word[Un...	
[1]	0	Word[Un...	
[2]	0	Word[Un...	
[3]	0	Word[Un...	
[4]	0	Word[Un...	
[5]	0	Word[Un...	
[6]	0	Word[Un...	
[7]	0	Word[Un...	
[8]	0	Word[Un...	
[9]	0	Word[Un...	
[10]	0	Word[Un...	
[11]	0	Word[Un...	
[12]	0	Word[Un...	
[13]	0	Word[Un...	
[14]	0	Word[Un...	
[15]	0	Word[Un...	
[16]	0	Word[Un...	
[17]	0	Word[Un...	
[18]	0	Word[Un...	
[19]	0	Word[Un...	
[20]	0	Word[Un...	
[21]	0	Word[Un...	
[22]	0	Word[Un...	
[23]	0	Word[Un...	
[24]	0	Word[Un...	
[25]	0	Word[Un...	
[26]	0	Word[Un...	
[27]	0	Word[Un...	
[28]	0	Word[Un...	
[29]	0	Word[Un...	
[30]	0	Word[Un...	
[31]	0	Word[Un...	

Figure 11.6 Task Status from OEM Logic

The Master task will be automatically completed after Sub tasks are done.

Notes

## LESSON 12 Backup task using Stitching Tool

This lesson discusses how to back up the failed tasks in post-stop station.

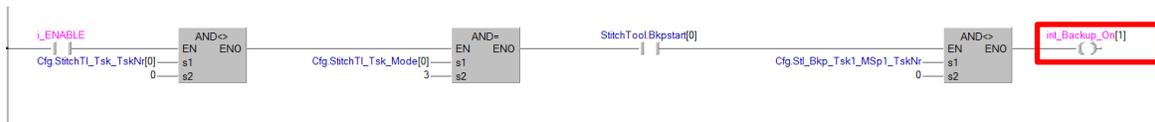
### 12.1. Lesson Objectives

At the conclusion of this lesson, you will be able to...

- Understand where to find the configuration information for Backup tasks
- Understand how to complete backup tasks for Multi-Spindles using Stitching Tool

### 12.2. How Stitching Tool backup Multi-Spindle Tool Tasks Work

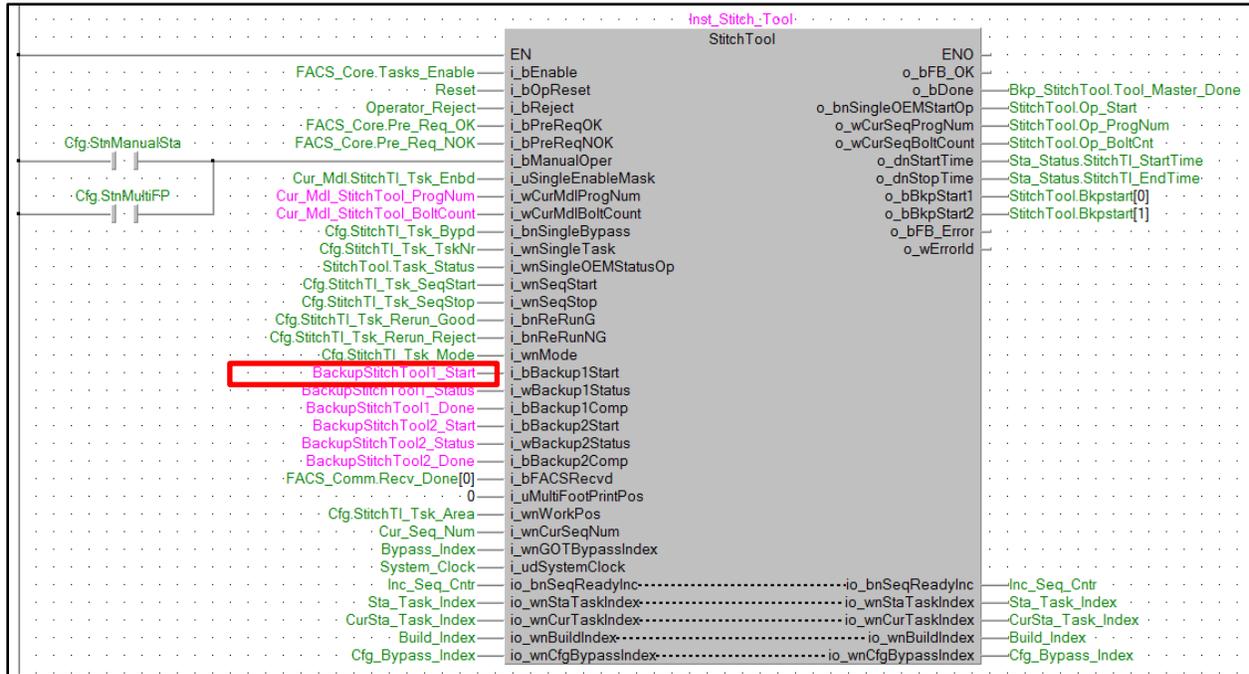
The first three stitching tools can be configured as the backup tools for the Multi-Spindles. Each stitching tool can backup up to four Multi-Spindles. To enable FB – “StitchToolSpindleBckp\_Sub”, the following conditions need to be met to turn on “int\_Backup\_On[x]” bit.



Both FBs - “StitchToolSpindleBckp” and “Stitch\_Tool” are necessary to be called when a stitching tool existed in the post-stop to backup Multi-Spindle tasks in station. FB “StitchToolSpindleBckp” will scan the status of each task assigned for Multi-Spindles. Total amount of any failed tasks will be sent to output pin – “o\_wToolCounter”. If the counter is greater than zero, the output pin – “o\_bMasterOEMStartOp” will turn ON and trigger “i\_bBackupX\_Start” of “Stitch\_Tool” FB.



## Notes



### 12.3. Exercise

#### 12.3.1. Procedure – Stitching tool for backup Multi-Spindle tasks

1. eFlex sends configuration to station. (Multi – Spindle needs to be setup as “Backup Allowed” in eFlex).
2. Press “PALLET AT PRESTOP” and then “RELEASE PALLET AT PRESTOP” to simulate pallet in station.
3. Enter 251 to the window of “Global\_Status” **AND** “Pre\_Req\_Task”
4. Type the model code in “Enter Model Code to Simulate” area. (Model code will be “AAAAAAAAAAAA” for this exercise.)
5. Press “Read RFID (SIM)” to simulate RFID read complete.
6. Press “Enable Tasks” to start the tasks.
7. Monitor PLC watch window for Configuration – Task Number, etc. (Global Label - Cfg)
8. Monitor PLC watch window for Configuration related settings – Enable, Program number, etc. (Global Label – Cur\_Mdl)
9. Monitor watch window to see Task status. (Global Label – Sta\_Task\_Index)
10. Go to eHMI “MultiSpindle” screen to monitor the configuration which is downloaded from eFlex.
11. Use either GOT or PLC watch window by entering the Task Status Code (See Appendix –1) to complete the tasks that are assigned to the station. **Set one or more sub tasks status to 41 to simulate the failed tasks.**
12. Use either GOT or PLC watch window to set “253” (Good after repair) to the 1<sup>st</sup> stitching tool to simulate the failed tasks are fixed.
13. Monitor watch window to see Task status again. (Global Label – Sta\_Task\_Index)

### Notes

- 14. Monitor watch window to see Station task status. (Global Label – Sta\_Task\_Index)
- 15. Monitor RFID tag data. (Global Label – Sta\_RF\_Tag\_Data)

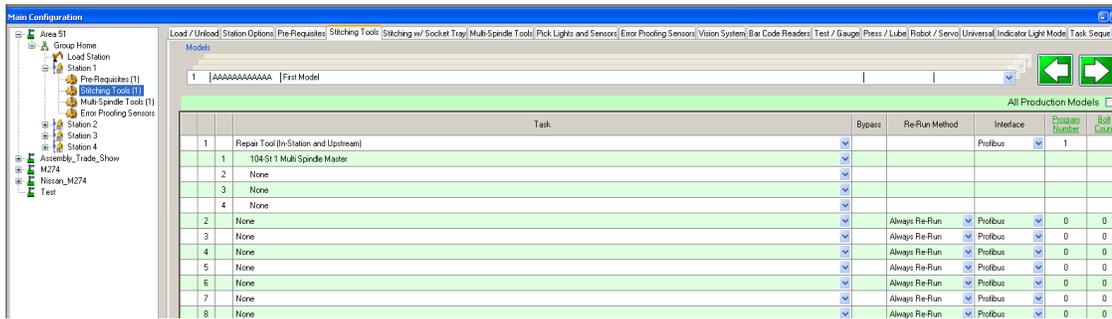
**12.3.2. List of Task Number and Current Model Information**

	Number	Program #	Mode
Master Task #	109*	1	Normal
Sub Tasks #	110-141*		Normal
Stitching Tool (backup) Task #	*	1	Normal

\* Note: Task number will vary based on the training station.

**12.3.3. Example eFlex, PLC and GOT screens for Stitching Tool to Backup Multi-Spindles**

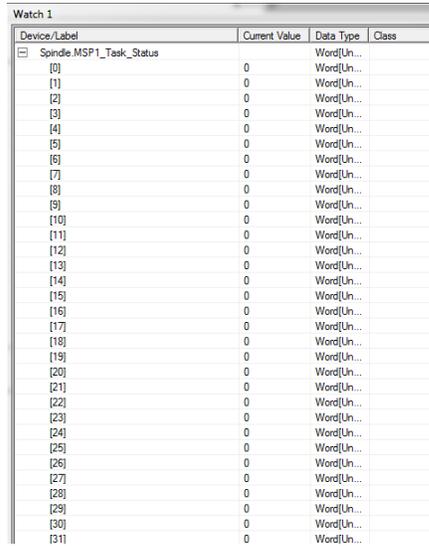
The eFlex Stitching Tool configuration screen is shown below.



**Figure 12.1 Example eFlex Screen**

To complete the Multi-Spindle Sub tasks, the Task Status Code needs to be placed in "Spindle.MSP1\_Task\_Status[0...31]". Use either GOT or PLC Watch window to complete tasks. Place a few "41" to the sub tasks and "251" for the rest tasks.

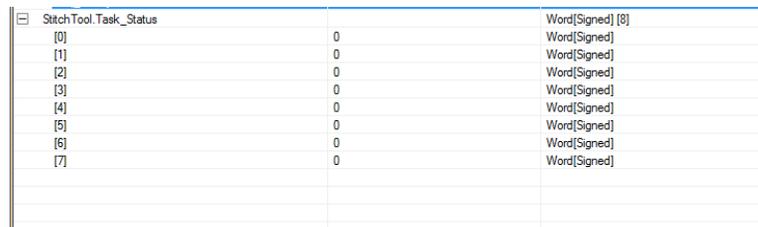
**Notes**



Device/Label	Current Value	Data Type	Class
Spindle.MSP1_Task_Status		Word(Unsigned)	
[0]	0	Word(Unsigned)	
[1]	0	Word(Unsigned)	
[2]	0	Word(Unsigned)	
[3]	0	Word(Unsigned)	
[4]	0	Word(Unsigned)	
[5]	0	Word(Unsigned)	
[6]	0	Word(Unsigned)	
[7]	0	Word(Unsigned)	
[8]	0	Word(Unsigned)	
[9]	0	Word(Unsigned)	
[10]	0	Word(Unsigned)	
[11]	0	Word(Unsigned)	
[12]	0	Word(Unsigned)	
[13]	0	Word(Unsigned)	
[14]	0	Word(Unsigned)	
[15]	0	Word(Unsigned)	
[16]	0	Word(Unsigned)	
[17]	0	Word(Unsigned)	
[18]	0	Word(Unsigned)	
[19]	0	Word(Unsigned)	
[20]	0	Word(Unsigned)	
[21]	0	Word(Unsigned)	
[22]	0	Word(Unsigned)	
[23]	0	Word(Unsigned)	
[24]	0	Word(Unsigned)	
[25]	0	Word(Unsigned)	
[26]	0	Word(Unsigned)	
[27]	0	Word(Unsigned)	
[28]	0	Word(Unsigned)	
[29]	0	Word(Unsigned)	
[30]	0	Word(Unsigned)	
[31]	0	Word(Unsigned)	

Figure 12.2 Task Status from OEM Logic

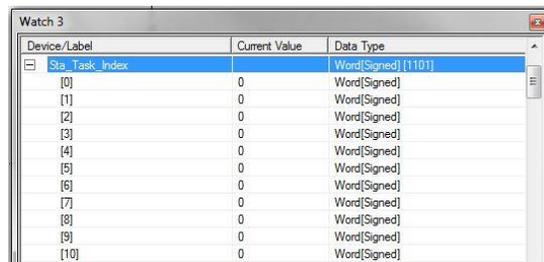
To repair those failed Multi-Spindle Sub tasks, the Task Status Code (253) needs to be placed in "StitchTool.Task\_Status[0]". Use either GOT or PLC Watch window to complete.



Device/Label	Current Value	Data Type
StitchTool.Task_Status		Word(Signed) [8]
[0]	0	Word(Signed)
[1]	0	Word(Signed)
[2]	0	Word(Signed)
[3]	0	Word(Signed)
[4]	0	Word(Signed)
[5]	0	Word(Signed)
[6]	0	Word(Signed)
[7]	0	Word(Signed)

Figure 12.3 Task Status from OEM Logic

Type 'Sta\_Task\_Index' on the next blank line in the PLC 'Watch' window. Click the '+' sign to expand and show the task statuses for all 2,000 tasks. Monitor the status of those failed tasks. "41" is shown for those failed tasks before repair occurs. After completion of repair by using the stitching tool, the status code should change to "253".



Device/Label	Current Value	Data Type
Sta_Task_Index		Word(Signed) [110]
[0]	0	Word(Signed)
[1]	0	Word(Signed)
[2]	0	Word(Signed)
[3]	0	Word(Signed)
[4]	0	Word(Signed)
[5]	0	Word(Signed)
[6]	0	Word(Signed)
[7]	0	Word(Signed)
[8]	0	Word(Signed)
[9]	0	Word(Signed)
[10]	0	Word(Signed)

(continued)

Notes

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[98]	0	Word[Signed]
[99]	0	Word[Signed]
[100]	251	Word[Signed]
[101]	0	Word[Signed]
[102]	0	Word[Signed]
[103]	0	Word[Signed]
[104]	0	Word[Signed]
[105]	0	Word[Signed]
[106]	0	Word[Signed]
[107]	0	Word[Signed]

**Figure 12.4 Example of Task Status**

## LESSON 13 Task Sequence

This lesson discusses the task sequence and the relationship to OEM Logic.

### 13.1. Lesson Objectives

At the conclusion of this lesson, you will be able to...

- Understand eHMI screens for task sequence information
- Understand how to use task sequence information for OEM logic

### 13.2. Exercise

#### 13.2.1. Procedure

1. eFlex sends configuration to station.
2. Press "PALLET AT PRESTOP" and then "RELEASE PALLET AT PRESTOP" to simulate pallet in station.
3. Type the model code in "Enter Model Code to Simulate" area. (Model code will be "AAAAAAAAAAAA" for this exercise.)
4. Enter 251 to the window of "Global\_Status" **AND** "Pre\_Req\_Task"
5. Press "Read RFID (SIM)" to simulate RFID read complete.
6. Press "Enable Tasks" to start the tasks.
7. Monitor PLC watch window for Configuration – Task Number, **Sequence**, etc. (Global Label - Cfg)
8. Monitor PLC watch window for Model related settings – Enable, Program number, etc. (Global Label – Cur\_Mdl)
9. Monitor watch window to see Task status. (Global Label – Sta\_Task\_Index)
10. Go to eHMI "Error Proofing", "Stitching Tool" and "MultiSpindle" screens to monitor the configuration which are downloaded from eFlex.
11. Use either GOT or PLC watch window by entering the Task Status Code (See Appendix –1) to sequentially complete the tasks that are assigned to the station.
12. Monitor watch window to see Station task status. (Global Label – Sta\_Task\_Index)
13. Monitor RFID tag data. (Global Label – Sta\_RF\_Tag\_Data)

#### 13.2.2. List of Task Number and Current Model Information

	Number	Start #	Stop #	Sensor 1	Sensor 2	Sensor 3	Sensor 4..16	Mode
Error Proofing Task #1	102*	1	1	On	Off	On		Continuous
Error Proofing Task #2	103*	1	1	Off	On	Off		Trigger 1

	Number	Start #	Stop #	Program #	Bolt Count	Mode
Stitching Tool Task #1	108*	2	2			Normal

	Number	Start #	Stop #	Program #	Mode
Multi-Spindle Master Task	109*	3	3	1	Normal
Sub Tasks	110-141*				Normal

\* Note: Task number will vary based on the training station.

## Notes

### 13.2.3. Example eFlex, PLC and GOT screens for Multi-Spindle

The eFlex task sequence screen is shown below.

Task Number	Task	Task Type	Footprint	Start	End	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
104	Pick Sensor Lookup Task #1	Pick Sensor Task	Footprint A	1	1	█																											
105	Pick Sensor Lookup Task #2	Pick Sensor Task	Footprint A	2	2		█																										
106	Pick Sensor Model Type #1	Pick Sensor Task	Footprint A	3	3			█																									
107	Pick Sensor Model Type #2	Pick Sensor Task	Footprint A	4	4				█																								
102	Error Proofing Task #1 - Continuous	Error Proofing Task	Footprint A	5	5					█																							
103	Error Proofing Task #2 - Triggered	Error Proofing Task	Footprint A	6	6						█																						

Figure 13.1 Example eFlex Screen

Monitor the tasks and their respective sequence start and stop numbers in a PLC watch window in the 'Cfg' data. The following PLC watch window screen shots show the various areas in the 'Cfg' table where the above configured tasks and their sequence information is stored.

Watch 3

Device/Label	Current Value	Data Type
Cfg		To_Ste
VersionNr	0	Word[S
StnName	Op 1	String(f
StnIDX	6	Double
SectionID	0	Word[S
StnBypd	0	Bit
StnTestData	0	Bit
...		
ErrPpf_Tsk_TskNr		Word[S
[0]	104	Word[S
[1]	105	Word[S
[2]	0	Word[S
[3]	0	Word[S
[4]	0	Word[S
...		
ErrPpf_Tsk_TskNr		Word[S
ErrPpf_Tsk_Bypd		Bit [16]
ErrPpf_Tsk_Rerun_Good		Bit [16]
ErrPpf_Tsk_Rerun_Reject		Bit [16]
ErrPpf_Tsk_SeqStart		Word[S
[0]	1	Word[S
[1]	2	Word[S
[2]	0	Word[S
[3]	0	Word[S
[4]	0	Word[S
...		
ErrPpf_Tsk_TskNr		Word[S
ErrPpf_Tsk_Bypd		Bit [16]
ErrPpf_Tsk_Rerun_Good		Bit [16]
ErrPpf_Tsk_Rerun_Reject		Bit [16]
ErrPpf_Tsk_SeqStart		Word[S
ErrPpf_Tsk_SeqStop		Word[S
[0]	1	Word[S
[1]	2	Word[S
[2]	0	Word[S
[3]	0	Word[S
[4]	0	Word[S
...		

## Notes

MultiSp_Tsk1_TskNr	103	Word[5]
MultiSp_Tsk1_Bypd	0	Bit
MultiSp_Tsk1_Rerun_Good	1	Bit
MultiSp_Tsk1_Rerun_Reject	1	Bit
MultiSp_Tsk1_InstaBkp	0	Bit
MultiSp_Tsk1_SeqStart	3	Word[5]
MultiSp_Tsk1_SeqStop	3	Word[5]
MultiSp_Tsk1_Area	0	Word[5]
MultiSp_Tsk1_Mode	0	Word[5]
MultiSp_Tsk1_IntfcType	0	Word[5]
MultiSp_Tsk1_TskNrSp		Word[5]

...

MultiSp_Tsk1_TskNr	103	Word[5]
MultiSp_Tsk1_Bypd	0	Bit
MultiSp_Tsk1_Rerun_Good	1	Bit
MultiSp_Tsk1_Rerun_Reject	1	Bit
MultiSp_Tsk1_InstaBkp	0	Bit
MultiSp_Tsk1_SeqStart	3	Word[5]
MultiSp_Tsk1_SeqStop	3	Word[5]
MultiSp_Tsk1_Area	0	Word[5]
MultiSp_Tsk1_Mode	0	Word[5]
MultiSp_Tsk1_IntfcType	0	Word[5]
MultiSp_Tsk1_TskNrSp		Word[5]
[0]	128	Word[5]
[1]	129	Word[5]
[2]	130	Word[5]
[3]	131	Word[5]
[4]	132	Word[5]
[5]	133	Word[5]
[6]	134	Word[5]

...

StitchTl_Tsk_TskNr		Word[5]
[0]	102	Word[5]
[1]	0	Word[5]
[2]	0	Word[5]
[3]	0	Word[5]
[4]	0	Word[5]
[5]	0	Word[5]
[6]	0	Word[5]
[7]	0	Word[5]

...

StitchTl_Tsk_TskNr		Word[5]
StitchTl_Tsk_Bypd		Bit [8]
StitchTl_Tsk_Rerun_Reject		Bit [8]
StitchTl_Tsk_Rerun_Good		Bit [8]
StitchTl_Tsk_Batch		Bit [8]
StitchTl_Tsk_SeqStart		Word[5]
[0]	4	Word[5]
[1]	0	Word[5]
[2]	0	Word[5]
[3]	0	Word[5]
[4]	0	Word[5]
[5]	0	Word[5]
[6]	0	Word[5]
[7]	0	Word[5]
StitchTl_Tsk_SeqStop		Word[5]
[0]	4	Word[5]
[1]	0	Word[5]
[2]	0	Word[5]
[3]	0	Word[5]
[4]	0	Word[5]
[5]	0	Word[5]
[6]	0	Word[5]
[7]	0	Word[5]
StitchTl_Tsk_Area		Word[5]
StitchTl_Tsk_Mode		Word[5]
StitchTl_Tsk_IntfcType		Word[5]

Figure 13.2 Example of Cfg

Notes

The "STATUS" indicators in the following screen show the sequence of the starting tasks as "Started".

	BUILD/NO BUIL	STATUS	TASK MODE
	ABCDEFGHIJKLMNQRSTUWXYZabcdefghijklnopqrst		
01	ABCDEFGHIJKLMNQRSTUWXYZabcdefghijklnopqrst		
02	ABCDEFGHIJKLMNQRSTUWXYZabcdefghijklnopqrst		
03	ABCDEFGHIJKLMNQRSTUWXYZabcdefghijklnopqrst		
04	ABCDEFGHIJKLMNQRSTUWXYZabcdefghijklnopqrst		
05	ABCDEFGHIJKLMNQRSTUWXYZabcdefghijklnopqrst		
06	ABCDEFGHIJKLMNQRSTUWXYZabcdefghijklnopqrst		
07	ABCDEFGHIJKLMNQRSTUWXYZabcdefghijklnopqrst		
08	ABCDEFGHIJKLMNQRSTUWXYZabcdefghijklnopqrst		
09	ABCDEFGHIJKLMNQRSTUWXYZabcdefghijklnopqrst		
10	ABCDEFGHIJKLMNQRSTUWXYZabcdefghijklnopqrst		
11	ABCDEFGHIJKLMNQRSTUWXYZabcdefghijklnopqrst		
12	ABCDEFGHIJKLMNQRSTUWXYZabcdefghijklnopqrst		
13	ABCDEFGHIJKLMNQRSTUWXYZabcdefghijklnopqrst		
14	ABCDEFGHIJKLMNQRSTUWXYZabcdefghijklnopqrst		
15	ABCDEFGHIJKLMNQRSTUWXYZabcdefghijklnopqrst		

Figure 13.3 Sequence in eHMI Main Screen

The "Enable" indicators in the following screen show the sequence of the starting tasks

**ERROR PROOFING TASK**

S1 S2 S3 S4 S5 S6 S7 S8 S9 S10 S11 S12 S13 S14 S15 S16

ERROR PROOFING TASK	ENABLE	
1) ABCDEFGHIJKLMNQRSTUWXYZabcdefghijklnopqrstuvwxy	<input type="radio"/>	
2) ABCDEFGHIJKLMNQRSTUWXYZabcdefghijklnopqrstuvwxy	<input type="radio"/>	
3) ABCDEFGHIJKLMNQRSTUWXYZabcdefghijklnopqrstuvwxy	<input type="radio"/>	
4) ABCDEFGHIJKLMNQRSTUWXYZabcdefghijklnopqrstuvwxy	<input type="radio"/>	
5) ABCDEFGHIJKLMNQRSTUWXYZabcdefghijklnopqrstuvwxy	<input type="radio"/>	
6) ABCDEFGHIJKLMNQRSTUWXYZabcdefghijklnopqrstuvwxy	<input type="radio"/>	
7) ABCDEFGHIJKLMNQRSTUWXYZabcdefghijklnopqrstuvwxy	<input type="radio"/>	
8) ABCDEFGHIJKLMNQRSTUWXYZabcdefghijklnopqrstuvwxy	<input type="radio"/>	

**CURRENTLY MONITORING**

ABCDEFGHIJKLMNQRSTUWXYZabcdefghijklnopqrstuvwxyABCDEFGHIJKLMNQRSTUWXYZ

TASK NUMBER 3456 TRIGGER 1  RESULT 456 Not Required For This Model

ENABLED  TRIGGER 2

RELEASE PB

PART PRESENT

Figure 13.4 Sequence in eHMI Task Screen (Error Proofing)

Notes

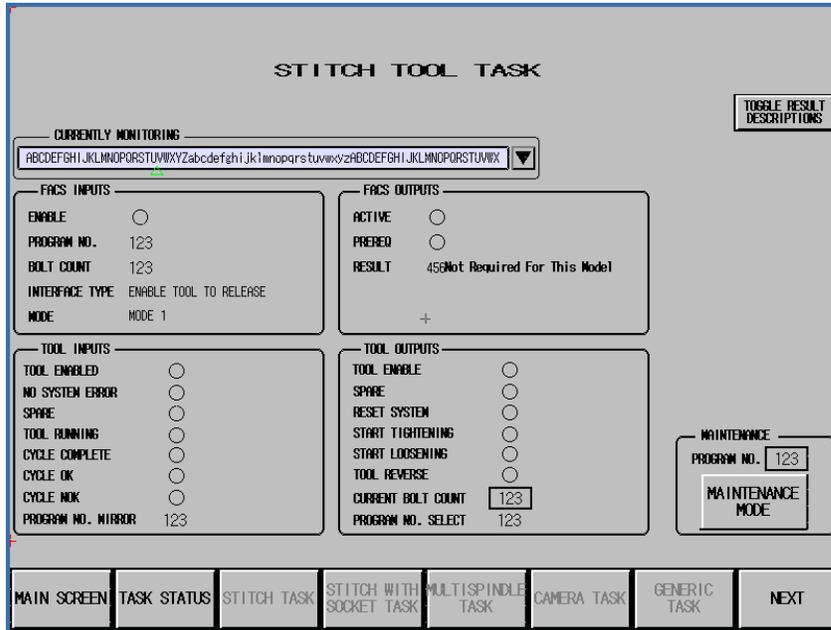


Figure 13.5 Sequence in eHMI Task Screen (Stitching Tool)

For those FBs that don't need OEM Logic, such as Error Proofing, Pick Sensor, etc., it is not necessary to do any coding for the sequence. For those FBs that need the OEM Logic, to complete the tasks, "\_\_\_\_.Op\_Start" array should be used to start the tasks.

Notes

## LESSON 14 Multiple Foot Prints

This lesson discusses the Multiple Foot Prints station, or ABC station.

### 14.1. Lesson Objectives

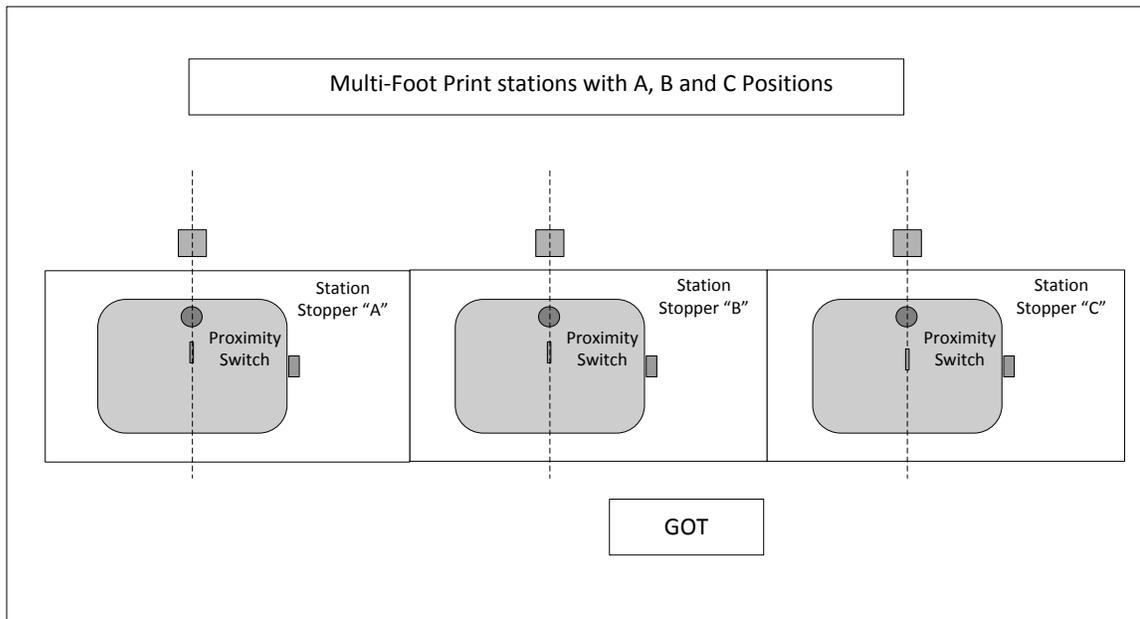
At the conclusion of this lesson, you will be able to...

- Understand eFlex configuration for Multiple Foot Prints station
- Understand eHMI screens for Multiple Foot Prints station
- Understand how Multiple Foot Prints station works in PLC program

### 14.2. How Multiple Foot Prints Work

Position A, B and C are sharing one PLC and one GOT.

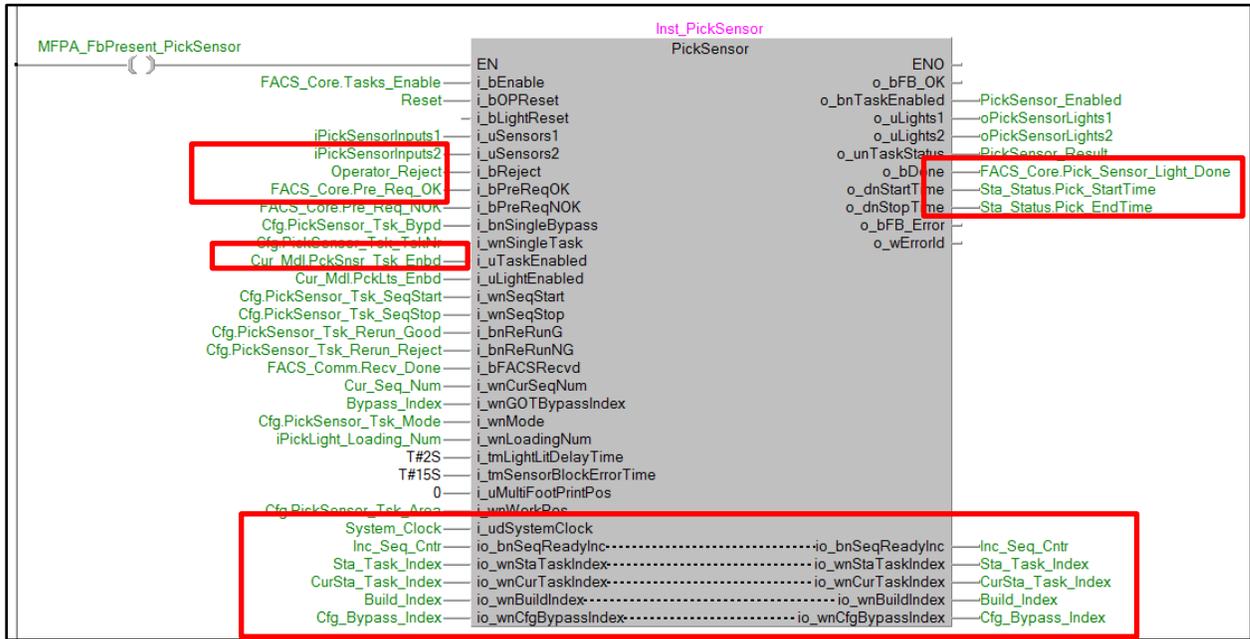
Multi-Foot Print stations are two/three independent stop-in-station cells share one PLC and one GOT based on station design. Each stop-in-station will have their own RFID. Tasks configured for the station are shared between two or three cells. Each cell will have their own task sequencing. After all of the tasks completed in each cell, the status of each cell tasks, time taken for each tasks and RFID data will be sent to FACS server. Statures of tasks in each cell are written into the RFID tag in each cell.



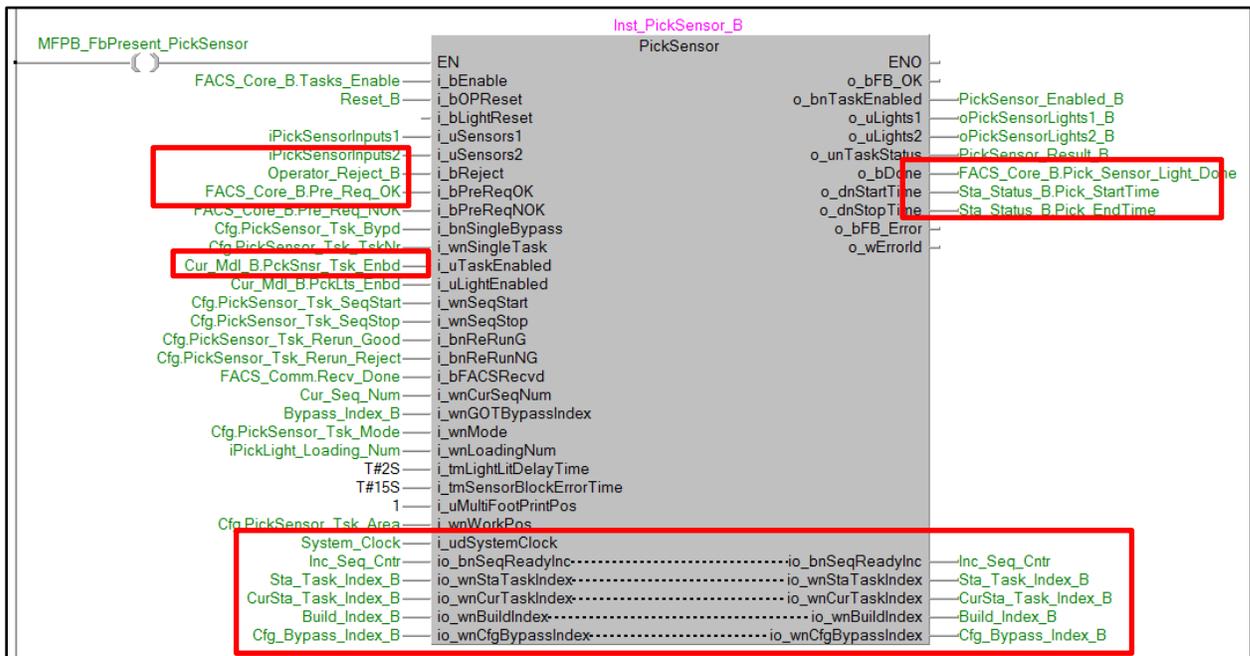
## Notes

PLC FBs (example - PickSensor) are shown below to illustrate the data structure and Program for each Position.

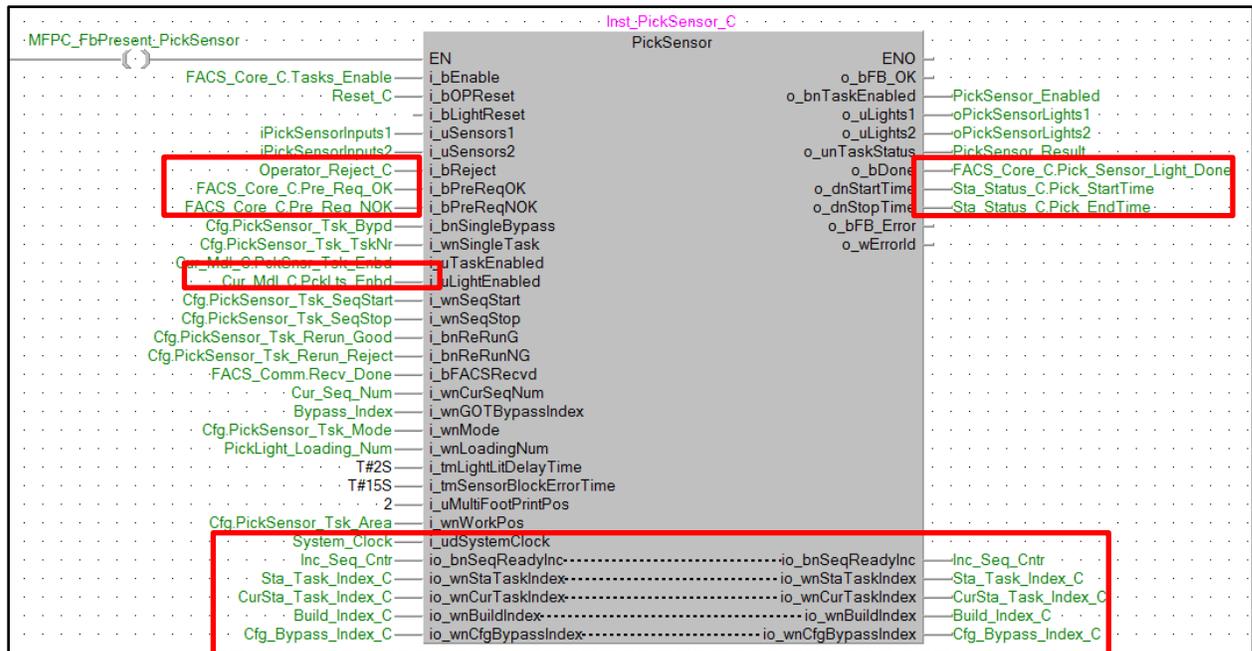
Position A



Position B



Notes

Position C**14.3. Exercise****14.3.1. Procedure**

1. eFlex sends configuration to station.
2. Press "PALLET AT PRESTOP" and then "RELEASE PALLET AT PRESTOP" to simulate pallet in stations – **A, B and C**
3. Type the model code in "Enter Model Code to Simulate" area. (Model code will be "AAAAAAAAAAAA" for this exercise.)
4. Enter 251 to the window of "Global\_Status" **AND** "Pre\_Req\_Task"
5. Press "Read RFID (SIM)" to simulate RFID read complete.
6. Press "Enable Tasks" to start the tasks.
7. Monitor PLC watch window for Configuration – Task Number, Sequence, etc. (Global Label - Cfg)
8. Monitor PLC watch window for Model related settings – Enable, Program number, etc. (Global Label – Cur\_Mdl)
9. Monitor watch window to see Task status. (Global Label – Sta\_Task\_Index)
10. Go to eHMI "Error Proofing", "PickSensor" and "Stitching Tool" screens to monitor the configuration which are downloaded from eFlex.
11. **Press "WORK POS SELECTION" to select each position.**
12. Use either GOT or PLC watch window by entering the Task Status Code (See Appendix –1) to sequentially complete the tasks that are assigned to the station.
13. Monitor watch window to see Station task status. (Global Label – Sta\_Task\_Index)
14. Monitor RFID tag data. (Global Label – Sta\_RF\_Tag\_Data)

**Notes**

**14.3.2. List of Task Number**

Position A

	Number
Stitching Tool Task #1	108*

Position B

	Number
PickSensor Task #1	104*
PickSensor Task #2	105*
PickSensor Task #3	106*
PickSensor Task #4	107*

Position C

	Number
Error Proofing Task #1	102*
Error Proofing Task #2	103*

\* Note: Task number will vary based on the training station.

**14.3.3. Example eFlex, PLC and GOT screens for Multiple Foot Prints**

The eFlex Multi-Foot Print station is shown below.

		Station Configuration   Load / Unload   Station Options   Pre-Requisites   Stitching Tools   Stitching w/ Socket Tray   Multi-Spindle Tools   Pick Lights and Sensors   Error Proofing Sensors   Vision System   Bar Code Readers   Test / Gauge   Press / Lube   Robot / Servo   Universal   Indicator Light Mode   Task Sequencing																																
Task Number	Task	Task Type	Footprint	Set 01	02	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	
108	Stitching Tool #1	Stitching Tool Task	Footprint A	1	1	■																												
104	Pick Sensor Lookup Task #1	Pick Sensor Task	Footprint B	1	1	■																												
105	Pick Sensor Lookup Task #2	Pick Sensor Task	Footprint B	2	2		■																											
106	Pick Sensor Model Type #1	Pick Sensor Task	Footprint B	3	3			■																										
107	Pick Sensor Model Type #2	Pick Sensor Task	Footprint B	4	4				■																									
102	Error Proofing Task #1 - Continuous	Error Proofing Task	Footprint C	1	1	■																												
103	Error Proofing Task #2 - Triggered	Error Proofing Task	Footprint C	2	2		■																											

**Notes**

MODEL TYPE: ABCDEFGHIJKL SERIAL: ABCDEFGHIJ PALLET: ABCD WORK POSITION: AB

TASK #	TASK DESCRIPTION	BUILD?	STATUS	TASK MODE
01	3456 ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuv			
02	3456 ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuv			
03	3456 ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuv			
04	3456 ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuv			
05	3456 ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuv			
06	3456 ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuv			
07	3456 ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuv			
08	3456 ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuv			
09	3456 ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuv			
10	3456 ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuv			
11	3456 ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuv			
12	3456 ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuv			
13	3456 ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuv			
14	3456 ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuv			
15	3456 ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuv			

CYCLE PROGRESS

- CFG RECEIVED
- PALLET PRESENT
- RF READ CMP
- PRE-REQ OK
- PRE-REQ NOK
- MODEL FOUND
- MODEL UNKNOWN
- TASKS ENABLED
- WORK POS ALL TASKS DONE
- CYCLE COMPLETE
- RF WRITE CMP
- MeIFACS UPDATED
- RDY TO RELEASE

ENABLE TASK  
CONT BYPASS (PART NOK)  
REJECT PART  
ACCEPT PART  
CYCLE RESET  
**WORK POS SELECTION**

RUNNING CYCLE TIME: (PERCENTAGE %) 60.0

Notes

## LESSON 15 Dual GOTs

This lesson discusses the Dual GOTs for one station.

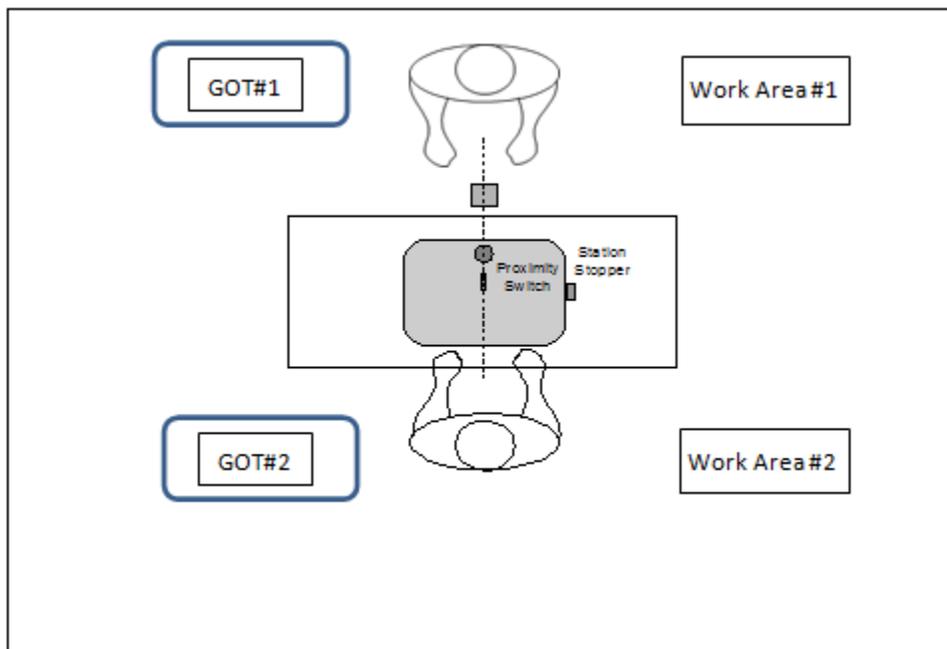
### 15.1. Lesson Objectives

At the conclusion of this lesson, you will be able to...

- Understand eFlex configuration for Dual GOTs
- Understand eHMI screens for Dual GOTs
- Understand how Dual GOTs work in PLC program

### 15.2. How Dual GOTs Work

Dual GOT feature of the MEL-FACS gives the ability to mount two GOTs/eHMI on either side of the Assembly Line in the same Stop-in-Station. With this feature, two operators are able to stand on either side of the work piece and work simultaneously on the same work piece. Tasks configured for the station can be shared between two operators. Tasks can be individually configured with independent sequencing by Configuration software. These tasks are displayed on the each GOTs/eHMIs. The Dual GOT Stop-in-station has only one PLC communicating to two GOTs. This feature allows combining independent tasks into one MWS area by reducing the foot print of the line and the tac time. The Task status from both work areas are written into one RFID tag in the stop-in-station.

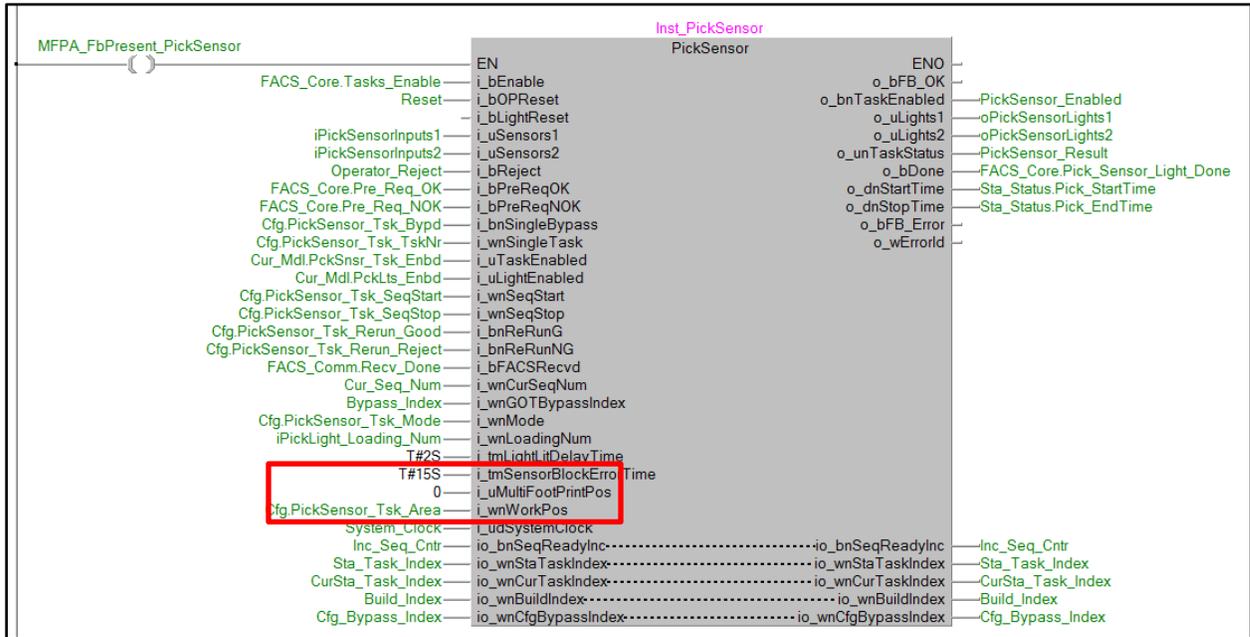


## Notes

Both GOTs are sharing one PLC. PLC FBs (example - PickSensor) are shown below to illustrate the data structure and Program for each side of the station.

Side 1 and 2:

Set "i\_uMultiFootPrintPos" = 0



**15.3. Exercise**

**15.3.1. Procedure**

15. eFlex sends configuration to station.
16. Press "PALLET AT PRESTOP" and then "RELEASE PALLET AT PRESTOP" to simulate pallet in station
17. Type the model code in "Enter Model Code to Simulate" area. (Model code will be "AAAAAAAAAAAA" for this exercise.)
18. Enter 251 to the window of "Global\_Status" **AND** "Pre\_Req\_Task"
19. Press "Read RFID (SIM)" to simulate RFID read complete.
20. Press "Enable Tasks" to start the tasks.
21. Monitor PLC watch window for Configuration – Task Number, Sequence, etc. (Global Label - Cfg)
22. Monitor PLC watch window for Model related settings – Enable, Program number, etc. (Global Label – Cur\_Mdl)
23. Monitor watch window to see Task status. (Global Label – Sta\_Task\_Index)
24. Go to eHMI "Error Proofing", "PickSensor" and "Stitching Tool" screens to monitor the configuration which are downloaded from eFlex.

**Notes**

- 25. Use either GOT **1 and 2** or PLC watch window by entering the Task Status Code (See Appendix –1) to sequentially complete the tasks that are assigned to the station (**Side 1 and 2**).
- 26. Monitor watch window to see Station task status. (Global Label – Sta\_Task\_Index)
- 27. Monitor RFID tag data. (Global Label – Sta\_RF\_Tag\_Data)

**15.3.2. List of Task Number**

Side 1

	Number
PickSensor Task #1	104*
PickSensor Task #2	105*
PickSensor Task #3	106*
PickSensor Task #4	107*

Side 2

	Number
Error Proofing Task #1	102*
Error Proofing Task #2	103*

\* Note: Task number will vary based on the training station.

**15.3.3. Example eFlex, PLC and GOT screens for Dual GOTs**

The eFlex Dual GOTs configuration screen is shown below.

Task Number	Task	Task Type	Frequency	Dist	Y	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
104	Pick Sensor Lookup Task #1	Pick Sensor Task	Left	1	1	■																											
105	Pick Sensor Lookup Task #2	Pick Sensor Task	Left	2	2		■																										
106	Pick Sensor Model Type #1	Pick Sensor Task	Left	3	3			■																									
107	Pick Sensor Model Type #2	Pick Sensor Task	Left	4	4				■																								
102	Error Proofing Task #1 - Continuous	Error Proofing Task	Right	1	1	■																											
103	Error Proofing Task #2 - Triggered	Error Proofing Task	Right	2	2		■																										

**Notes**

## LESSON 16 Options of Re-Run

This lesson discusses the eFlex options of Re-Run.

### 16.1. Lesson Objectives

At the conclusion of this lesson, you will be able to...

- Understand the options of Re-Run in eFlex configuration
- Understand how MEL-FACS handles different types of Re-Run

### 16.2. Re-Run setup in eFlex

There are three options of Re-Run that can be setup in eFlex for each task.

- Always Re-Run
- Re-Run Rejects
- Never Re-Run

Note: Only master task has Re-Run options.

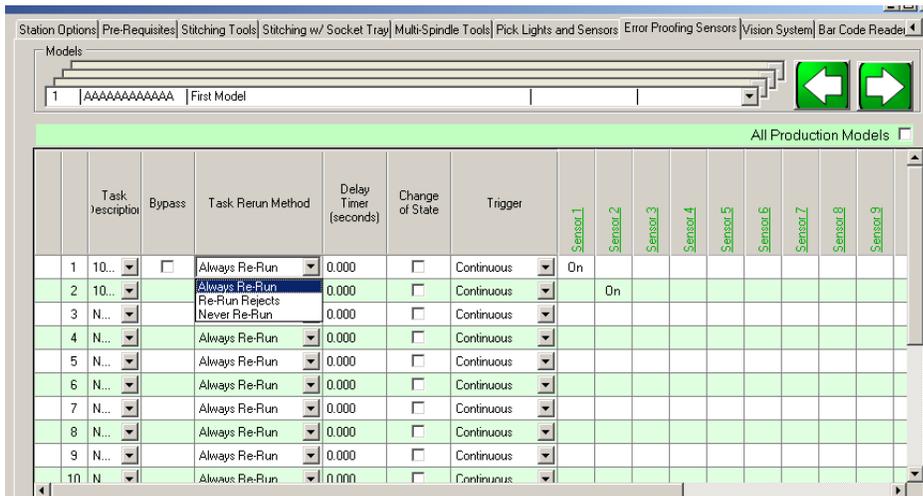


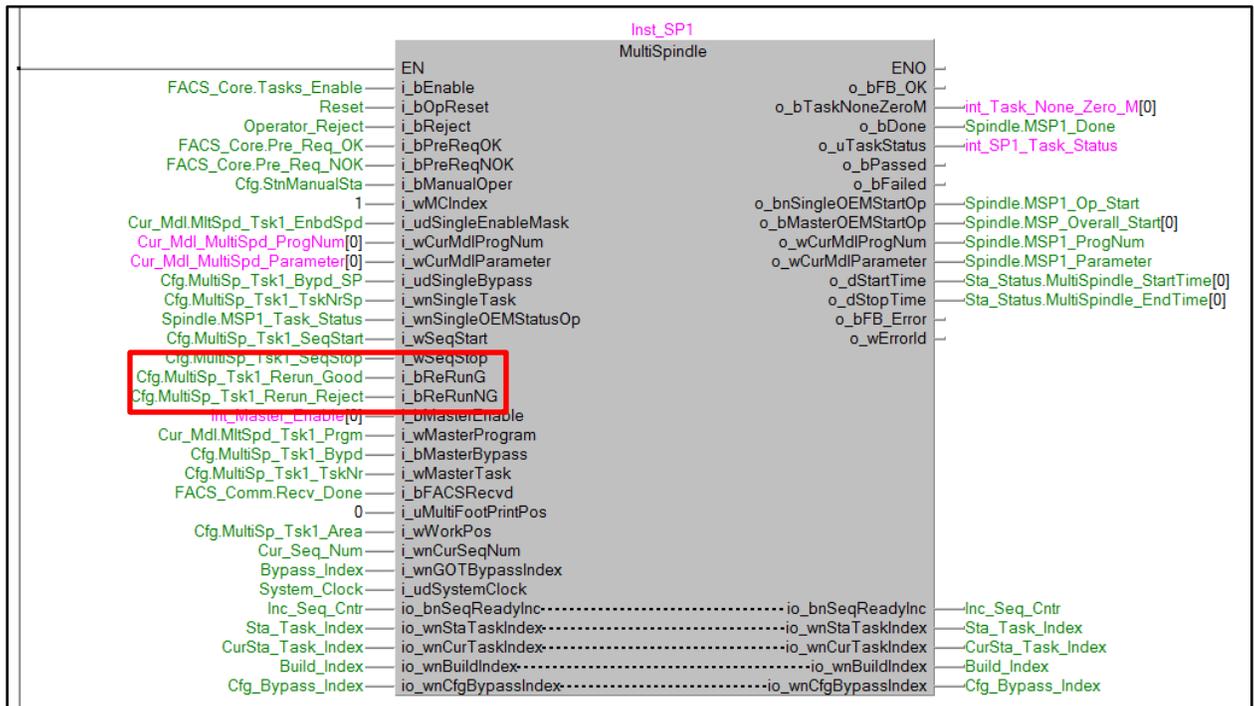
Figure 16.1 Re-Run options

### 16.3. PLC code

The rerun options are converted to two bits (Rerun\_good and Rerun\_Reject) for each task that are feed to the input variables for the FB.

	Rerun_Good	Rerun_Reject
Always Re-run	On	On
Re-run Rejects	Off	On
Never Re-run	Off	Off

## Notes



## 16.4. Exercise

### 16.4.1. Always Re-run

1. eFlex sends configuration to station.
2. Press "PALLET AT PRESTOP" and then "RELEASE PALLET AT PRESTOP" to simulate pallet in station.
3. Type the model code in "Enter Model Code to Simulate" area. (Model code will be "AAAAAAAAAAAA" for this exercise.)
4. Enter 251 to the window of "Global\_Status" **AND** "Pre\_Req\_Task"
5. Press "Read RFID (SIM)" to simulate RFID read complete.
6. Press "Enable Tasks" to start the tasks.
7. Monitor PLC watch window for Configuration – Task Number, **Sequence**, etc. (Global Label - Cfg)
8. Monitor PLC watch window for Model related settings – Enable, Program number, etc. (Global Label – Cur\_Mdl)
9. Monitor watch window to see Task status. (Global Label – Sta\_Task\_Index)
10. Go to eHMI "Error Proofing" and "MultiSpindle" screens to monitor the configuration which are downloaded from eFlex.
11. Use either GOT or PLC watch window by entering the Task Status Code (See Appendix1) to sequentially complete the tasks that are assigned to the station.
12. Monitor watch window to see Station task status. (Global Label – Sta\_Task\_Index)
13. Monitor RFID tag data. (Global Label – Sta\_RF\_Tag\_Data)

## Notes

**16.4.2. Re-run Rejects**

1. Change the Re-run method of Multi-spindle task to "Re-run Rejects". eFlex sends configuration to station.
2. Repeat steps 2-4 as above.
3. Place 251 for Spindle tasks in 109, 110 – 141 of RFID tag data. (Global Label – Sta\_RF\_Tag\_Data)
4. Repeat step 5-6 as above.
5. Monitor the Main Screen. In this case, there is no need for "Build". The "Pass" status will be logged into the RFID.
6. Release the pallet
7. Repeat steps 2-4 as above
8. Place 41 for Spindle tasks in 109, 110 – 141 of RFID tag data. (Global Label – Sta\_RF\_Tag\_Data )
9. Repeat step 5-6 as above.
10. Monitor the Main Screen. In this case, it is required to "Build". The new status will be logged into the RFID.
11. Release the pallet

**16.4.3. Never Re-run**

1. Change the Re-Run method Multi-spindle task to "Never Re-run". eFlex sends configuration to station.
2. Repeat step 2-4 as above.
3. Place 251 or 41 for Spindle tasks in 109, 110 – 141 of RFID tag data. (Global Label – Sta\_RF\_Tag\_Data)
4. Repeat step 5-6 as above.
5. Monitor the Main Screen. In this case, there is no need for "Build". The original status will be logged into the RFID.

---

## LESSON 17 Other Configuration Settings and Station Interactions

This lesson discusses the eFlex options of Bypass, Model not required and how MEL-FACS handles Pre-requisite not Met, unknown Model and Operator Reject.

### 17.1. Lesson Objectives

At the conclusion of this lesson, you will be able to...

- Understand how MEL-FACS handles "Pre-requisite not Met"
- Understand how MEL-FACS handles "Model Not found"
- Understand how MEL-FACS handles "Bypass"
- Understand how MEL-FACS handles "Model not Required"
- Understand how MEL-FACS handles "Parts Reject"

### 17.2. Abnormal situations

#### 17.2.1. Pre-requisite not Met

If a pre-requisite condition is not met, PLC bit "FACS\_Core.Pre\_Req\_NOK" will be set ON. The status of "Pre-requisite not Met" code will be automatically placed in the "Sta\_Task\_Index" for the task. User does not need to add or change any PLC code.

#### 17.2.2. Model not Found

If a pallet comes in the station, and the model ID is not found in the suffix codes in the configuration file sent from eFlex, PLC bit "FACS\_Core.Model\_Unknown" will be set ON. This is a fault situation. OEM will create a FAULT bit when this condition occurs to stop normal operation of this work station.

#### 17.2.3. Reject

If an operator manually rejects a part in the station, the status of "Reject" code will be automatically placed in the "Sta\_Task\_Index" for the task. User does not need to add or change any PLC code.

### 17.3. Other Configurations

#### 17.3.1. Bypass

If a task is setup as "Bypass" in eFlex, the status of "Bypass" code will be automatically placed in the "Sta\_Task\_Index" for the task. User does not need to add or change any PLC code.

#### 17.3.2. Model Not Required

If a task is setup as NOT required for a particular model in eFlex, when this particular model of engine pallet comes to the station, the status of "Model Not Required" code will be automatically placed in the "Sta\_Task\_Index" for the task. User does not need to add or change any PLC code.

---

## Notes

**17.4. Exercise**

**17.4.1. Procedure for Pre-requisite not Met**

1. eFlex sends configuration to station. (Same Configuration as previous exercise)
2. Press "PALLET AT PRESTOP" and then "RELEASE PALLET AT PRESTOP" to simulate pallet in station.
3. Type the model code in "Enter Model Code to Simulate" area. (Model code will be "AAAAAAAAAAAA" for this exercise.)
4. Press "Read RFID (SIM)" to simulate RFID read complete.
5. Press "Enable Tasks" to start the tasks.
6. Enter 0 to the window of "Global\_Status" **OR** "Pre\_Req\_Task".
7. Monitor Watch window to see task status. (SDT – Sta\_Task\_Index)

**17.4.2. Procedure for Model not Found**

1. eFlex sends configuration to station. (Same Configuration as previous exercise)
2. Press "PALLET AT PRESTOP" and then "RELEASE PALLET AT PRESTOP" to simulate pallet in station.
3. Type the model code in "Enter Model Code to Simulate" area. (Model code will be "AAAAAAAAAAAA" for this exercise.)
4. Press "Read RFID (SIM)" to simulate RFID read complete.
5. Press "Enable Tasks" to start the tasks.
6. Enter 251 to the window of "Global\_Status" **AND** "Pre\_Req\_Task"
7. Type mode code in "Enter Model Code to Simulate" area that will NOT match any suffix code defined in eFlex.
8. Monitor the PLC bit "FACS\_Core.Model\_Unknown".

**17.4.3. Procedure for Bypass and Model Not Required.**

See below tasks settings for Model "BBBBBBBBBBBBB"

	Number	Bypass/Not Required	Start #	Stop #	Sensor 1	Sensor 2	Sensor 3	S 4..16	Mode
Err-Proof Tsk#1	102*	Bypass	1	1	On	Off	On		Cont.
Err-Proof Tsk#2	103*		1	1	Off	On	Off		Trigger 1

	Number		Start #	Stop #	Program #	Bolt Count	Mode
Stitch Tsk #1	108*		2	2			Normal

	Number		Start #	Stop #	Program #	Mode
Multi-Sp Mst Tsk	109*	NOT Required				
Sub Tasks	110-141					

\* Note: Task number will vary based on the training station.

**Notes**

1. eFlex sends configuration to station. (Same Configuration as previous exercise)
2. Press "PALLET AT PRESTOP" and then "RELEASE PALLET AT PRESTOP" to simulate pallet in station.
3. Type the model code in "Enter Model Code to Simulate" area. (Model code will be "AAAAAAAAAAAA" for this exercise.)
4. Press "Read RFID (SIM)" to simulate RFID read complete.
5. Press "Enable Tasks" to start the tasks.
6. Enter 251 to the window of "Global\_Status" **AND** "Pre\_Req\_Task".
7. Type mode code in "Enter Model Code to Simulate" area. **(BBBBBBBBBBBB)**
8. Monitor Watch window to see task status. (SDT – Sta\_Task\_Index)

#### 17.4.4. Reject

If an operator manually rejects a part in the station, the status of "Reject" code will be automatically placed in the "Sta\_Task\_Index" for the task. User does not need to add or change any PLC code.

1. eFlex sends configuration to station. (Same Configuration as previous exercise).
2. Press "PALLET AT PRESTOP" and then "RELEASE PALLET AT PRESTOP" to simulate pallet in station.
3. Type the model code in "Enter Model Code to Simulate" area. (Model code will be "AAAAAAAAAAAA" for this exercise.)
4. Press "Read RFID (SIM)" to simulate RFID read complete.
5. Press "Enable Tasks" to start the tasks.
6. Enter 251 to the window of "Global\_Status" **AND** "Pre\_Req\_Task".
7. Type mode code in "Enter Model Code to Simulate" area.
8. Press "Reject Part" on Main eHMI screen.
9. Monitor Watch window to see Task status. (SDT – Sta\_Task\_Index)

---

## LESSON 18 Re-assign Tasks for Manual Work Stations

This lesson discusses how MEL-FACS handles switching tasks between stations.

### 18.1. Lesson Objectives

At the conclusion of this lesson, you will be able to...

- Understand how MEL-FACS handles the deleted or added tasks without changing the PLC program.

### 18.2. Exercise

#### 18.2.1. Procedure to complete the tasks

1. eFlex sends "Original" configurations to station. (See table below)
2. Press "PALLET AT PRESTOP" and then "RELEASE PALLET AT PRESTOP" to simulate pallet in station.
3. Type model code in "ENTER MODEL CODE TO SIMULATE" area. (Model code will be given in class.)
4. Press "Read RFID (SIM)" to simulate RFID read complete.
5. Press "Enable Tasks" to start the tasks.
6. Monitor PLC watch window for Configuration – Task Number, **Sequence**, etc. (Global Label - Cfg)
7. Monitor PLC watch window for Model related settings – Enable, Program number, etc. (Global Label – Cur\_Mdl)
8. Monitor watch window to see Task status. (Global Label – Sta\_Task\_Index)
9. Go to eHMI "Error Proofing", "Stitching Tool" and "MultiSpindle" screens to monitor the configuration which is downloaded from eFlex.
10. Use either GOT or PLC watch window by entering the Task Status to sequentially complete the tasks that are assigned to the station.
11. Monitor watch window to see Task status again. (Global Label – Sta\_Task\_Index)
12. Monitor watch window to see Station task status. (Global Label – Sta\_Task\_Index)
13. Monitor RFID tag data. (Global Label – Sta\_RF\_Tag\_Data)
14. eFlex sends "After Re-Balance" configurations to station. (See table below)
15. Repeat 2-13 to complete the task after tasks have been re-balanced.

#### 18.2.2. Procedure for reassign the task in eFlex

1. Select 'Area' in eFlex Configuration Tool.
2. Select 'Task Configuration' tab.
3. Right-Click on a task you wish to re-assign to another station and select 'Re-Assign.'
4. Select the Station where you wish to re-assign the task.
5. Repeat this procedure for all the tasks you wish to re-assign in the 're-balance' process.
6. Re-sequence the tasks for each of the affected stations. (This includes the stations where tasks have been removed.)
7. Make sure Stitch Tool tasks have program numbers and bolt counts.
8. Make sure Error Proofing tasks have sensors configured.
9. Save changes and download to respective stations.

---

## Notes

The following tables show the current task configuration along with the proposed re-balanced task configuration. In this exercise you will re-assign tasks from one station to another, download and simulate performing the tasks.

ORIGINAL		
Station	Task	Task Description
1	101	Station 1
	108	St 1 Stitching Tool
	102	Station 1 EP 1 Continuous
	103	Station 1 EP 2 Trigger
2	106	Station 2
	107	St 2 Stitching Tool
	109	Station 2 EP 1 Continuous
	110	Station 2 EP 2 Trigger
3	111	Station 3
	112	St 3 Stitching Tool
	114	Station 3 EP 1 Continuous
	115	Station 3 EP 2 Trigger
4	116	Station 4
	117	St 4 Stitching Tool
	119	Station 4 EP 1 Continuous
	120	Station 4 EP 2 Trigger

AFTER RE-BALANCE		
Station	Task	Task Description
1	101	Station 1
	102	St 1 Stitching Tool
	107	St 2 Stitching Tool
	104	Station 1 EP 1 Continuous
	105	Station 1 EP 2 Trigger
	109	Station 2 EP 1 Continuous (Need to add Sensor 4,5,6)
2	106	Station 2
	110	Station 2 EP 2 Trigger
3	111	Station 3
	112	St 3 Stitching Tool
	117	St 4 Stitching Tool
	114	Station 3 EP 1 Continuous
	115	Station 3 EP 2 Trigger
	119	Station 4 EP 1 Continuous (Need to add Sensor 4,5,6)
4	116	Station 4
	120	Station 4 EP 2 Trigger

**Notes**

### 18.2.3. Example eFlex, screens for Re-Assigning Tasks

In the eFlex configuration tool, select the 'Area' at the top of the tree, and then select the 'Task Configuration' tab to show the task configuration screen.

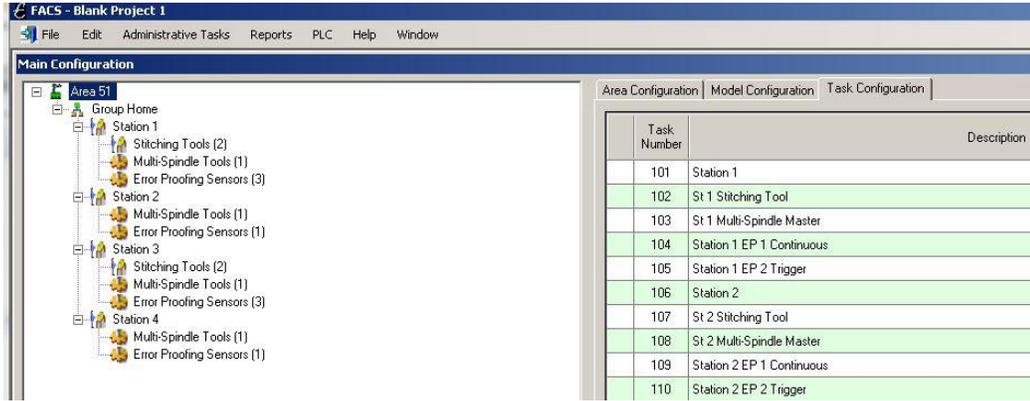


Figure 18.1 Example eFlex Task Configuration Screen -1

All the tasks configured for the area are listed here, along with the stations to which they are currently assigned.

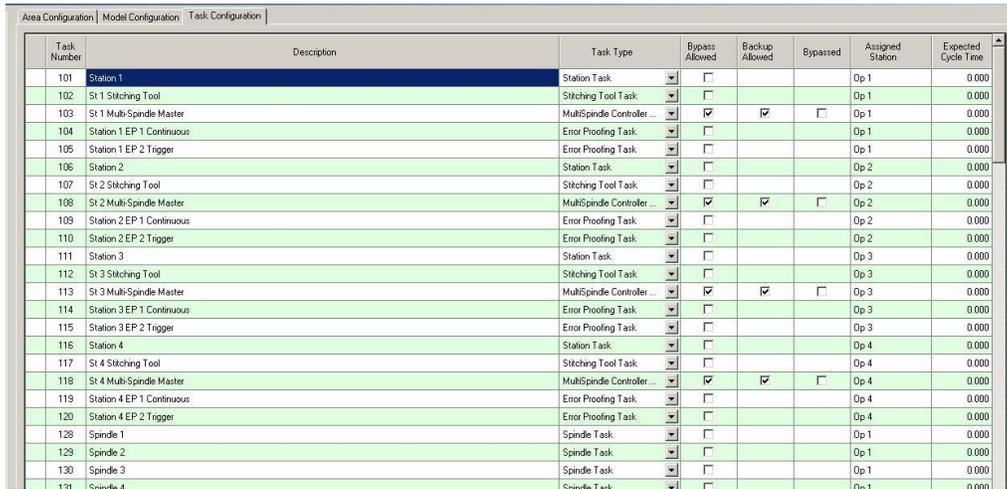


Figure 18.2 Example eFlex Task Configuration Screen -2

## Notes

Re-assign any task by right-clicking in any field of the task you wish to re-assign and select 'Re-assign Task.'

Task Number	Description	Task Type	Bypass Allowed	Backup Allowed	Bypassed	Assigned Station	Expected Cycle Time
101	Station 1	Station Task	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Dp 1	0.000
102	St 1 Stitching Tool	Stitching Tool Task	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Dp 1	0.000
103	St 1 Multi-Spindle Master	MultiSpindle Controller ...	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Dp 1	0.000
104	Station 1 EP 1 Continuous	Error Proofing Task	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Dp 1	0.000
105	Station 1 EP 2 Trigger	Error Proofing Task	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Dp 1	0.000
106	Station 2	Station Task	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Dp 2	0.000
107	St 2 Stitching Tool	Stitching Tool Task	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Dp 2	0.000
108	St 2 Multi-Spindle Master	MultiSpindle Controller ...	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Dp 2	0.000
109	Station 2 EP 1 Continuous	Error Proofing Task	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Dp 2	0.000
110	Station 2 EP 2 Trigger	Error Proofing Task	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Dp 2	0.000
111	Station 3	Station Task	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Dp 3	0.000
112	St 3 Stitching Tool	Stitching Tool Task	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Dp 3	0.000
113	St 3 Multi-Spindle Master	MultiSpindle Controller ...	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Dp 3	0.000

Figure 18.3 Example eFlex Task Configuration Screen - 3

The following screen appears, prompting you to select a new station.

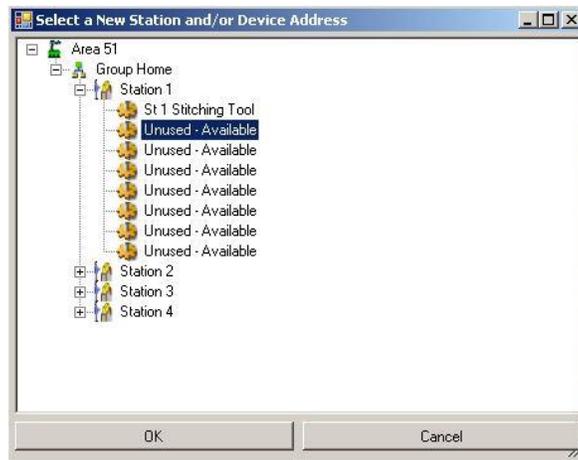


Figure 18.4 Example eFlex Task Configuration Screen - 4

Select the new station you wish to re-assign the task, and click 'Ok' when the following dialog box appears.



Figure 18.5 Example eFlex Task Configuration Screen - 5

Repeat this procedure until you have reassigned all the desired tasks to their new stations. (Follow the 're-balanced' task table to know which tasks to re-assign.)

Once you have completed this process, you then need to 're-sequence' each of the updated stations, including the stations where tasks have been removed.

Notes

The following screen shots show the sequence of Station 1 prior to rebalancing, right after new task assignment, and after re-sequencing the tasks.

Task Number	Task	Footprint	Start	End	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
104	Station 1 EP 1 Continuous	0	1	1	█																						
105	Station 1 EP 2 Trigger	0	2	2		█																					
102	St 1 Stitching Tool	0	3	3			█																				

Figure 18.6 Station 1 – Original Sequence

Task Number	Task	Footprint	Start	End	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
104	Station 1 EP 1 Continuous	0	1	1	█																						
109	Station 2 EP 1 Continuous	0	1	1	█																						
105	Station 1 EP 2 Trigger	0	2	2		█																					
102	St 1 Stitching Tool	0	3	3			█																				

Figure 18.7 Station 1 – Sequence Immediately after Task Re-assignment

Task Number	Task	Footprint	Start	End	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
104	Station 1 EP 1 Continuous	0	1	1	█																						
109	Station 2 EP 1 Continuous	0	3	3			█																				
105	Station 1 EP 2 Trigger	0	2	2		█																					
102	St 1 Stitching Tool	0	4	4				█																			

Figure 18.8 Station 1 – Re-sequenced after Task Re-assignment

Task Number	Task	Footprint	Start	End	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
104	Station 1 EP 1 Continuous	0	1	1	█																						
105	Station 1 EP 2 Trigger	0	2	2		█																					
109	Station 2 EP 1 Continuous	0	3	3			█																				
102	St 1 Stitching Tool	0	4	4				█																			

Figure 18.9 Station 1 – Re-sequence Updated after Saving Configuration

Notes

The following two screen shots show the original sequence and the updated re-sequence of Station 2.

Task Number	Task	Footprint	Start	End	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
109	Station 2 EP 1 Continuous	0	1	1																							
110	Station 2 EP 2 Trigger	0	2	2																							
107	St 2 Stitching Tool	0	3	3																							

Figure 18.10 Station 2 – Original Sequence

Task Number	Task	Footprint	Start	End	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
110	Station 2 EP 2 Trigger	0	2	2																							
107	St 2 Stitching Tool	0	3	3																							
109	Station 2 EP 1 Continuous	0	1	1																							

Figure 18.11 Station 2 – Re-sequenced and Updated after Saving Configuration

Once the tasks are reassigned and the sequence of the stations is updated, go through the procedure of downloading the new eFlex configuration to the respective stations.

NOTE: Prior to downloading, make sure the error-proofing sensors are set the way you want them, and make sure there are program numbers and bolt counts in the Stitch Tool tasks.

Simulate performing the tasks as before.

**Notes**

## LESSON 19 Implement with OEM Logic

This lesson discusses the interface between MEL-FACS with OEM Logic

### 19.1. Lesson Objectives

At the conclusion of this lesson, you will be able to...

- Understand what information to get from MEL-FACS FBs and SDT
- Understand how to connect OEM Logic with MEL-FACS FBs

### 19.2. OEM Logic

Third Party device driver logic needs to be developed, such as Multi-spindle, stitching tool, etc. MEL-FACS provides operation start, program number, bolt count, etc. information to OEM Logic. OEM Logic is responsible for send the status code back to MEL-FACS FB to finish the task.

The following is an example of Stitching Tool, which includes MEL-FACS standard FB (Stitch\_Tool) and sample OEM Logic of Bosch CS350 Tightening Tool.

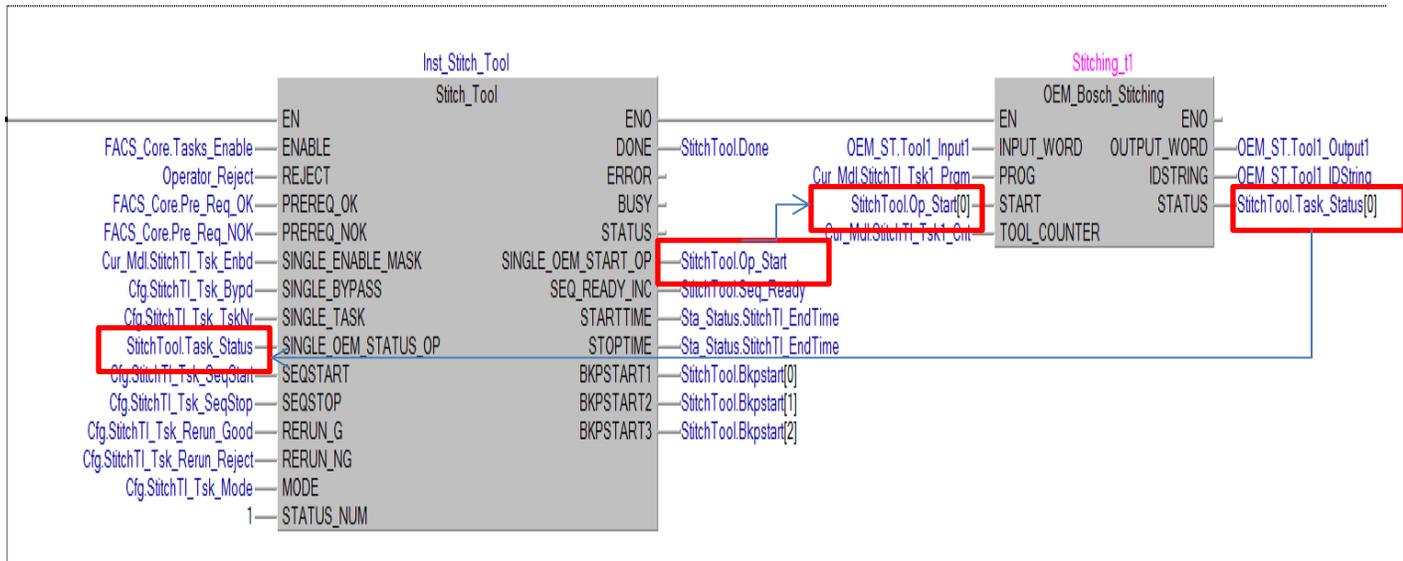


Figure 19.1 Example of OEM Logic

### 19.3. Exercise

Follow the above example of the format to write OEM Logic for Stitching Tool to complete the Stitching Tool Task.

## Notes

## LESSON 20 eFlex Reporting System

This lesson discusses the eFlex reports

### 20.1. Lesson Objectives

At the conclusion of this lesson, you will be able to...

- Understand the data structure of station status that sends back to eFlex after cycle complete
- Understand PLC code of Station status
- Understand how to view eFlex reports

### 20.2. Station status data structure and the PLC code

Sta\_Status (SDT – From\_Sta\_DB) consists two parts of data, i.e. Cycle time and RFID data.

The cycle time – start and stop time for all assigned tasks are logged into Sta\_Status every cycle. The PLC code resides in each function block. While the station cycle completes, the cycle time of all the tasks along with all the tasks status will be sent to eFlex.

### 20.3. eFlex Reports – Part Build History

In order to view the reports, please follow the following steps.

Click "Reports" from the main tool bar.

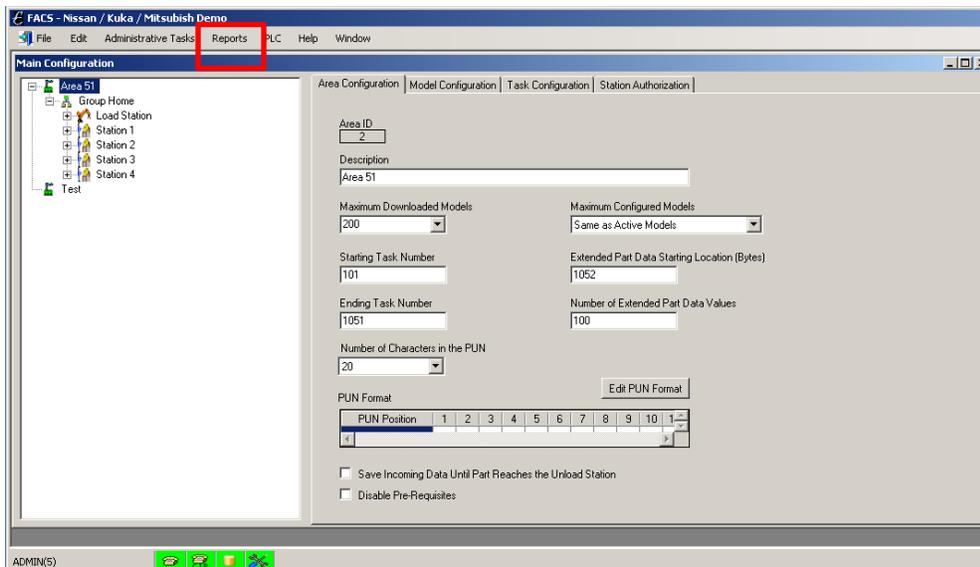


Figure 20.1 eFlex Reports

## Notes

Click "Production History" and then select "Part Build History".

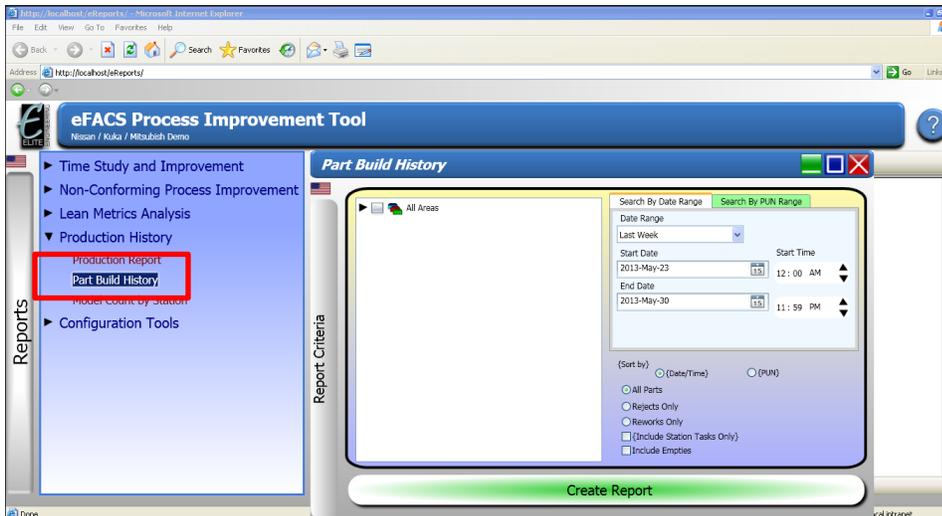


Figure 20.2 Example of eFlex Reports – Part Build History - 1

Click "All Area" and then click "Create Report".

The screenshot shows a detailed report table with the following columns: PUN, Station, Date/Time, Task, Task Type, Status, and Cycle Time. The data is organized into three main sections based on PUN values: 111111111, 545454545, and 444555555. Each section lists tasks performed at Station 1 on 5/30/2013. The tasks include 'EP 2 Trigger', 'St 1 Multi-Spindle Master', 'Spindle 1', 'Spindle 2', and 'Spindle 3'. Task types include 'Error Proofing Task', 'MultiSpindle Controller Task', and 'Spindle Task'. All tasks are marked as 'Accepted (251)'. The cycle times range from 0.1 to 4.3 minutes.

PUN	Station	Date/Time	Task	Task Type	Status	Cycle Time
111111111	Station 1	5/30/2013 05:20:56 PM	Station 1 EP 2 Trigger	Error Proofing Task	Accepted (251)	4.2
111111111	Station 1	5/30/2013 05:17:26 PM	Station 1	Station Task	Accepted (251)	29.9
111111111	Station 1	5/30/2013 05:17:26 PM	St 1 Multi-Spindle Master	MultiSpindle Controller Task	Accepted (251)	9
111111111	Station 1	5/30/2013 05:17:26 PM	Spindle 1	Spindle Task	Accepted (251)	
111111111	Station 1	5/30/2013 05:17:26 PM	Spindle 2	Spindle Task	Accepted (251)	
111111111	Station 1	5/30/2013 05:17:26 PM	Spindle 3	Spindle Task	Accepted (251)	
111111111	Station 1	5/30/2013 05:17:26 PM	Station 1 EP 1 Continuous	Error Proofing Task	Accepted (251)	20.4
111111111	Station 1	5/30/2013 05:17:26 PM	Station 1 EP 2 Trigger	Error Proofing Task	Accepted (251)	0.1
545454545	Station 1	5/30/2013 05:23:41 PM	Station 1	Station Task	Accepted (251)	23.7
545454545	Station 1	5/30/2013 05:23:41 PM	Spindle 1	Spindle Task	Accepted (251)	
545454545	Station 1	5/30/2013 05:23:41 PM	Spindle 2	Spindle Task	Accepted (251)	
545454545	Station 1	5/30/2013 05:23:41 PM	Spindle 3	Spindle Task	Accepted (251)	
545454545	Station 1	5/30/2013 05:23:41 PM	St 1 Multi-Spindle Master	MultiSpindle Controller Task	Accepted (251)	13.9
545454545	Station 1	5/30/2013 05:23:41 PM	Station 1 EP 1 Continuous	Error Proofing Task	Accepted (251)	5
545454545	Station 1	5/30/2013 05:23:41 PM	Station 1 EP 2 Trigger	Error Proofing Task	Accepted (251)	4.3
444555555	Station 1	5/30/2013 06:12:40 PM	Station 1	Station Task	Accepted (251)	24.7
444555555	Station 1	5/30/2013 06:12:40 PM	St 1 Multi-Spindle Master	MultiSpindle Controller Task	Accepted (251)	18.6
444555555	Station 1	5/30/2013 06:12:40 PM	Spindle 1	Spindle Task	Accepted (251)	
444555555	Station 1	5/30/2013 06:12:40 PM	Spindle 2	Spindle Task	Accepted (251)	
444555555	Station 1	5/30/2013 06:12:40 PM	Spindle 3	Spindle Task	Accepted (251)	
444555555	Station 1	5/30/2013 06:12:40 PM	Station 1 EP 1 Continuous	Error Proofing Task	Accepted (251)	3.7
444555555	Station 1	5/30/2013 06:12:40 PM	Station 1 EP 2 Trigger	Error Proofing Task	Accepted (251)	1.8

Figure 20.3 Example of eFlex Reports – Part Build History - 2

## Notes

### 20.4. eFlex Reports – Station Task Timing Diagram

Click “Time Study and Improvement” and select “Station Task Timing Diagram”. Highlight “All Areas” and check off “Average Cycletimes”.

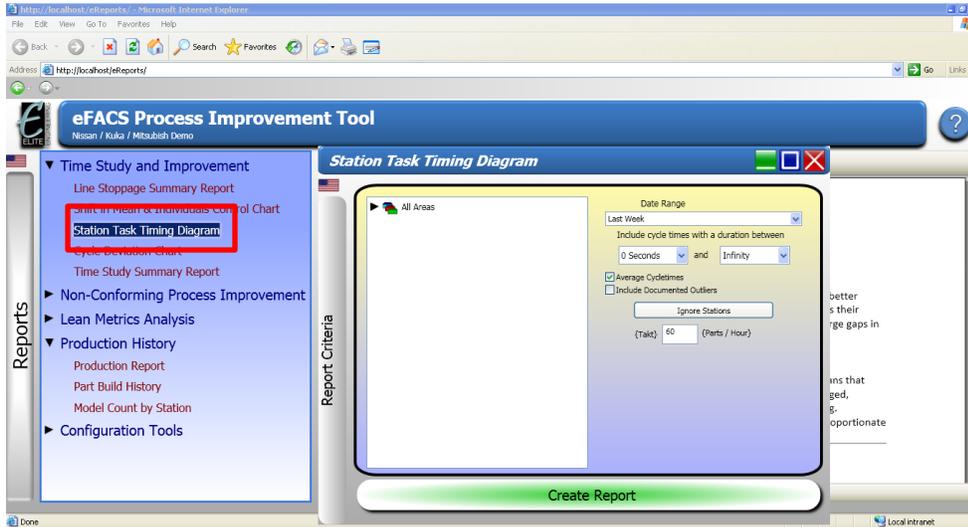


Figure 20.4 Example of eFlex Reports – Station Task Timing Diagram - 1

Highlight “All Areas” and check off “Average Cycletimes”. Click “Create Report”

Task	Task Type	Cycle Start	Cycle End	Duration
Station 1 EP 2 Trigger	Error Proofing Task	0.10	16.90	16.80
Station 1	Station Task	0.00	46.60	46.60
St 1 Multi-Spindle Master	MultiSpindle Controller Task	46.50	46.60	0.10
Station 1 EP 1 Continuous	Error Proofing Task	0.10	9.90	9.80
Station 1 EP 2 Trigger	Error Proofing Task	10.00	46.40	36.40
Station 1	Station Task	0.00	29.90	29.90
St 1 Multi-Spindle Master	MultiSpindle Controller Task	20.90	29.90	9.00
Station 1 EP 1 Continuous	Error Proofing Task	0.10	20.50	20.40
Station 1 EP 2 Trigger	Error Proofing Task	20.70	20.80	0.10
Station 1	Station Task	0.00	24.60	24.60
St 1 Multi-Spindle Master	MultiSpindle Controller Task	9.00	24.60	15.60
Station 1 EP 1 Continuous	Error Proofing Task	0.10	4.60	4.50
Station 1 EP 2 Trigger	Error Proofing Task	4.70	8.90	4.20
Station 1	Station Task	0.00	23.70	23.70
St 1 Multi-Spindle Master	MultiSpindle Controller Task	9.80	23.70	13.90
Station 1 EP 1 Continuous	Error Proofing Task	0.20	5.20	5.00
Station 1 EP 2 Trigger	Error Proofing Task	5.40	9.70	4.30
Station 1	Station Task	0.00	24.70	24.70
St 1 Multi-Spindle Master	MultiSpindle Controller Task	6.10	24.70	18.60
Station 1 EP 1 Continuous	Error Proofing Task	0.20	3.90	3.70
Station 1 EP 2 Trigger	Error Proofing Task	4.10	5.90	1.80

Figure 20.5 Example of eFlex Reports – Station Task Timing Diagram - 2

## Notes

## 20.5. Exercise

### 20.5.1. Procedure

1. eFlex sends configuration to station. (Same Configuration as previous exercise)
2. Press "PALLET AT PRESTOP" and then "RELEASE PALLET AT PRESTOP" to simulate pallet in station.
3. Enter 251 to the window of "Global\_Status" **AND** "Pre\_Req\_Task"
4. Type the model code in "Enter Model Code to Simulate" area. (Model code will be "AAAAAAAAAAAA" for this exercise.)
5. Type pallet # in "Pallet ID" area. (Pallet ID is ASCII.)
6. Press "Read RFID (SIM)" to simulate RFID read complete.
7. Press "Enable Tasks" to start the tasks.
8. Monitor PLC watch window for Configuration – Task Number, etc. (Global Label - Cfg)
9. Monitor PLC watch window for Model related settings – Enable, Program number, etc. (Global Label – Cur\_Mdl)
10. Monitor watch window to see Task status. (Global Label – Sta\_Task\_Index)
11. Go to eHMI screens to monitor the configuration which is downloaded from eFlex.
12. Use either GOT or PLC watch window by entering the Task Status Code (See Appendix1) to complete the tasks that are assigned to the station.
13. Follow the steps that described in this lesson to view the reports.

# Appendix 1. Task Status Code

Task Type	Task Statuses <small>Click for Index</small>											
	LINKDM	Station Shared	Local or Older Peripherals not met	Rejected	Not okay (no specific reason)	Under Press	Under Link	Over Link	Over Press	Over Link	Over Link	Over Link
Station	10, 11	20, 21	40, 41	...	...	...	...	...	...	...	...	...
Multi spindle (controller)	0	1	2	...	...	...	...	...	...	...	...	...
Multi spindle (spindle)	11	21	41	...	...	...	...	...	...	...	...	...
All other task types	10	20	40	95	105	115	125	190	191	...	...	...
Station	0A...0B	14...15	28...29	...	...	...	...	...	...	...	...	...
Multi spindle (controller)	00	01	02	...	...	...	...	...	...	...	...	...
Multi spindle (spindle)	08	08	15	29	...	...	...	...	...	...	...	...
All other task types	0A	14	28	5F	69	73	7D	BE	...	...	...	...
Managed by MELFACS												
Managed by OEM												
Managed by eDIAGNOSTICS												
Note: Values 180 thru 189 shall not be written to the RFID Tag. Values 180 through 189 are reserved for eDiagnostics use only. Value 254 is written to the tag by the eDiagnostic Station.												
	180	181	182	183	184	185	186	187	188	189		
Released for repair	180	181	182	183	184	185	186	187	188	189		
Removed for the model	180	181	182	183	184	185	186	187	188	189		
Released for retry	180	181	182	183	184	185	186	187	188	189		
Send part to Carats	180	181	182	183	184	185	186	187	188	189		
Decoupled Mode Part	180	181	182	183	184	185	186	187	188	189		
Remove Part to Cart	180	181	182	183	184	185	186	187	188	189		
Removed to be scrapped	180	181	182	183	184	185	186	187	188	189		
Cruciate Do Not Run	180	181	182	183	184	185	186	187	188	189		
Release Boundary Sample Part	180	181	182	183	184	185	186	187	188	189		
Task was reworked	180	181	182	183	184	185	186	187	188	189		

## Notes

## Appendix 2. Standard Hardware Memory Map (CC-Link)

- The Fieldbus and/or I/O configuration may vary based on the Project/Customer

SLOT		Q Series			
0		PLC CPU - Q06UDV CPU			
1		CC-Link IE Module 00			
2		Ethernet 20 (Optional)			
3		Omron RFID Module 40			
4		CC-Link 60			
5		Spare			
<b>CC-Link Station 1 Inputs</b>					
<b>INPUTS</b>			<b>INPUTS</b>		
X1000	Pre-Stop Raised		X1008	Downstream High Level	
X1001	Pallet at Entrance/Prestop		X1009	E-stop Pressed	
X1002	Station Stop Raised		X100A	Pallet Leaving STA Stop	
X1003	Pallet at Exit/Station Stop		X100B	Pallet Leaving PRE Stop	
X1004	Reject/No Build Pallet PB		X100C	<i>spare</i>	
X1005	Team Leader Call PB		X100D	<i>spare</i>	
X1006	Early Release Part Pushbutton		X100E	<i>spare</i>	
X1007	Part Present in Station		X100F	<i>spare</i>	
<b>CC-Link Station 2 Outputs</b>					
<b>OUTPUTS (Non-Motion)</b>			<b>OUTPUTS (Non-Motion)</b>		
Y1020	Station Beacon		Y1028	<i>spare</i>	
Y1021	In foot print Beacon		Y1029	<i>spare</i>	
Y1022	<i>spare</i>		Y102A	<i>spare</i>	
Y1023	<i>spare</i>		Y102B	<i>spare</i>	
Y1024	Reject Light		Y102C	<i>spare</i>	
Y1025	Team Leader Call Light		Y102D	<i>spare</i>	
Y1026	Foot Print Indicator		Y102E	<i>spare</i>	
Y1027	<i>spare</i>		Y102F	<i>spare</i>	
<b>CC-Link Station 3 Outputs</b>					
<b>OUTPUTS (Non-Motion)</b>			<b>OUTPUTS (Non-Motion)</b>		
Y1040	Task Indicator Lamp 1		Y1048	Task Indicator Lamp 9	
Y1041	Task Indicator Lamp 2		Y1049	Task Indicator Lamp 10	
Y1042	Task Indicator Lamp 3		Y104A	Task Indicator Lamp 11	
Y1043	Task Indicator Lamp 4		Y104B	Task Indicator Lamp 12	
Y1044	Task Indicator Lamp 5		Y104C	Task Indicator Lamp 13	
Y1045	Task Indicator Lamp 6		Y104D	Task Indicator Lamp 14	
Y1046	Task Indicator Lamp 7		Y104E	Task Indicator Lamp 15	
Y1047	Task Indicator Lamp 8		Y104F	Task Indicator Lamp 16	
<b>CC-Link Station 4 Inputs</b>					
<b>INPUTS</b>			<b>INPUTS</b>		
X1060	Error Proofing Sensor 1		X1068	Error Proofing Sensor 9	
X1061	Error Proofing Sensor 2		X1069	Error Proofing Sensor 10	

### Notes

X1062	Error Proofing Sensor 3	X106A	Error Proofing Sensor 11
X1063	Error Proofing Sensor 4	X106B	Error Proofing Sensor 12
X1064	Error Proofing Sensor 5	X106C	Error Proofing Sensor 13
X1065	Error Proofing Sensor 6	X106D	Error Proofing Sensor 14
X1066	Error Proofing Sensor 7	X106E	Error Proofing Sensor 15
X1067	Error Proofing Sensor 8	X106F	Error Proofing Sensor 16
<b>CC-Link Station 5 INPUTS and OUTPUTS</b>			
<b>INPUTS</b>		<b>OUTPUTS (Non-Motion)</b>	
X1080	Pick Sensor 1	Y1088	Pick Light 1
X1081	Pick Sensor 2	Y1089	Pick Light 2
X1082	Pick Sensor 3	Y108A	Pick Light 3
X1083	Pick Sensor 4	Y108B	Pick Light 4
X1084	Pick Sensor 5	Y108C	Pick Light 5
X1085	Pick Sensor 6	Y108D	Pick Light 6
X1086	Pick Sensor 7	Y108E	Pick Light 7
X1087	Pick Sensor 8	Y108F	Pick Light 8

<b>CC-Link NODE 6 INPUTS and OUTPUTS</b>			
<b>INPUTS</b>		<b>OUTPUTS (Non-Motion)</b>	
X10A0	Pick Sensor 9	Y10A8	Pick Light 9
X10A1	Pick Sensor 10	Y10A9	Pick Light 10
X10A2	Pick Sensor 11	Y10AA	Pick Light 11
X10A3	Pick Sensor 12	Y10AB	Pick Light 12
X10A4	Pick Sensor 13	Y10AC	Pick Light 13
X10A5	Pick Sensor 14	Y10AD	Pick Light 14
X10A6	Pick Sensor 15	Y10AE	Pick Light 15
X10A7	Pick Sensor 16	Y10AF	Pick Light 16

<b>CC-Link NODE 7 I/O Spare (10C0-DF)</b>			
<b>CC-Link NODE 8 I/O Spare (10E0-FF)</b>			
<b>CC-Link NODE 9 I/O Spare (1100-1F)</b>			
<b>CC-Link NODE 10 I/O Spare (1120-3F)</b>			
<b>CC-Link NODE 11 I/O Spare (1140-5F)</b>			
<b>CC-Link NODE 12 I/O Spare (1160-7F)</b>			
<b>CC-Link NODE 13 I/O Spare (1180-9F)</b>			
<b>CC-Link NODE 14 I/O Spare (11A0-BF)</b>			
<b>CC-Link NODE 15 I/O Spare (11C0-DF)</b>			
<b>CC-Link NODE 16 I/O Spare (11E0-FF)</b>			

<b>CC-Link NODE 17 Fasten Tool Desoutter - 1 *</b>			
<b>CC-Link NODE 18 Fasten Tool Desoutter - 2 *</b>			
<b>CC-Link NODE 19 Fasten Tool Desoutter - 3 *</b>			
<b>CC-Link NODE 20 Fasten Tool Desoutter - 4 *</b>			
<b>CC-Link NODE 21 Fasten Tool Desoutter - 5 *</b>			
<b>CC-Link NODE 22 Fasten Tool Desoutter - 6 *</b>			

**Notes**

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	CC-Link NODE 23 Fasten Tool Desoutter - 7 *
	CC-Link NODE 24 Fasten Tool Desoutter - 8 *
	CC-Link NODE 25-64 Spare

Note:

The standard memory map of the nodes for Multi-Spindle, Stitching Tool and other devices are still under development.

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**Notes**

### Appendix 3. RFID Memory Map

- The details of RFID Memory Map may vary based on the Project/Customer

ID address Hexadecimal	(Byte) (Word)		Name	Content	Remarks	Type	Protection	Data equipment
	ID address Decimal	PLC address						
System Area	0	0	Write protect setting area					
	1	1	Write protect setting area					
	2	2	Write protect setting area					
	3	3	Write protect setting area					
	4	4	Spare					
	5	5	Spare					
	6	6	Spare					
	7	7	Spare					
Basic Information	8	8	Pallet Number	0001~0009	1000'S			
	9	9	Pallet Number	0001~0009	100'S			
	A	10	Pallet Number	0001~0009	10'S			
	B	11	Pallet Number	0001~0009	1'S			
	C	12	Serial ID	Character	Always " "	ASCII		
	D	13	Serial ID	Character	Always " "	ASCII		
	E	14	Serial ID	Character		ASCII		
	F	15	Serial ID	Character		ASCII		
	10	16	Serial ID	Character		ASCII		
	11	17	Serial ID	Character		ASCII		
	12	18	Serial ID	Character		ASCII		
	13	19	Serial ID	Character		ASCII		
	14	20	Serial ID	Character		ASCII		
	15	21	Serial ID	Character	Always " "	ASCII		
	16	22	Model ID	Character		ASCII		
	17	23	Model ID	Character		ASCII		
	18	24	Model ID	Character		ASCII		
	19	25	Model ID	Character		ASCII		
	1A	26	Model ID	Character		ASCII		
	1B	27	Model ID	Character		ASCII		
	1C	28	Model ID	Character		ASCII		
	1D	29	Model ID	Character		ASCII		
	1E	30	Model ID	Character		ASCII		
	1F	31	Model ID	Character		ASCII		
	20	32	Model ID	Character	Always " "	ASCII		
	21	33	Model ID	Character	Always " "	ASCII		
	22	34	Family Code	Character	Daimler: "2" Nissan: " "	ASCII		
23	35	Family Code	Character	Daimler: "7" Nissan: " "	ASCII			
24	36	Family Code	Character	Daimler: "4" Nissan: "2"	ASCII			
25	37	Family Code	Character	Daimler: "9" Nissan: "7"	ASCII			
26	38	Family Code	Character	Daimler: "3" Nissan: "4"	ASCII			
27	39	Family Code	Character	Daimler: "0" Nissan: "A"	ASCII			
Other Information	50	80	Pump Counter High Byte	Binary				
	51	81	Pump Counter Low Byte	Binary				
	52	82	Spare					
	53	83	Spare					
	54	84	Spare					
	55	85	Spare					
	56	86	Spare					
	57	87	Spare					
	58	88	Spare					
	59	89	Spare					
	5A	90	Pallet Lap Counter For Washer - High Byte	Binary				
	5B	91	Pallet Lap Counter For Washer - Low Byte	Binary				
	5C	92	Pallet Status	Binary				
	5D	93	Spare					
	5E	94	Pallet Lap Counter For PM - High Byte	Binary				
	5F	95	Pallet Lap Counter For PM - Low Byte	Binary				
	60	96	Spare					
61	97	Spare						
62	98	Spare						
63	99	Pallet Routing						
Data	100		Global Status			Byte		
	101		Task Status 1			Byte		
	102		Task Status 2					
	103		Task Status 3					
	104		Task Status 4					
	105		Task Status 5					
	2100		Task Status 2100					

### Notes